Metrolinx Exchange Information Requirements (BIM)

MX-ALM-GDC-003

Revision 00 June 2025

Metrolinx Exchange Information Requirements (BIM)

MX-ALM-GDC-003

Publication Date: June 2025 COPYRIGHT © 2025

Metrolinx,

an Agency of the Government of Ontario

The contents of this publication may be used solely as required for services performed on behalf of Metrolinx or for and during preparing a response to a Metrolinx procurement request. Otherwise, this publication or any part thereof shall not be reproduced, re-distributed, stored in an electronic database or transmitted in any form by any means, electronic, photocopying or otherwise, without written permission of the copyright holder. In no event shall this publication or any part thereof be sold or used for commercial purposes.

The information contained herein or otherwise provided or made available ancillary hereto is provided "as is" without warranty or guarantee of any kind as to the accuracy, completeness, fitness for use, purpose, non-infringement of third-party rights or any other warranty, express or implied. Metrolinx is not responsible and has no liability for any damages, losses, expenses or claims arising or purporting to arise from the use of or reliance on the information contained herein.

Preface

This is the first edition of Metrolinx's Exchange Information Requirements (BIM). The Exchange Information Requirements (EIR) document provides guidance on information production, exchange requirements and processes for the program/project. The objective is to ensure effective collaboration, minimum information standards, and interoperable information exchange between Metrolinx, Consultants, Contractors, and other stakeholders.

This standard is directed at Metrolinx Project Delivery Teams (PDT), Consultants and Designers.

This document was developed by the Metrolinx's Asset Lifecycle Management, Asset Management and Maintenance Division.

Metrolinx's Exchange Information Requirements (BIM) is available for external users to download via the Metrolinx public download site: www.metrolinx.com/en/metrolinx-technical-standards

Suggestions for revisions or improvements can be sent to Asset Lifecycle Management, Asset Management and Maintenance Division, Attention: Senior Manager of Asset Lifecycle Management. The Senior Manager of Asset Lifecycle Management ultimately authorizes the changes. A description of the proposed change shall be included along with information on the background of the application and any other useful rationale or justification. Proposals for revisions or improvements shall also include your name, company affiliation (if applicable), email address, and phone number.

June 2025

Contents

Secti Prefa	ion ace	Page iii	
Acro	Acronyms and Abbreviations3		
1. I	Executive Summary	5	
1.1	1 Key Principles	5	
1.2	2 Summary of Approach	5	
2. I	Introduction	7	
2.1	1 Purpose	7	
2.2	2 Digital Delivery Strategy and Principles	7	
2.3	3 Key Documents	8	
2.4	4 Industry Standards	9	
2.5	5 EIR Response Requirements	10	
2.6	6 Digital Twin	10	
3. I	People	12	
3.1	1 Roles and Responsibilities	12	
3.2	2 Task Team Capability and Capacity	13	
3.3	3 Mobilization Plan	13	
4. I	Information Management	14	
4.1	1 Information Management Approach	14	
4.2	2 Task/Master Information Delivery Plans	14	
4.3	3 Responsibility Matrix	14	
4.4	4 Exchange of Information	14	
4.5	5 File Naming	16	
4.6	6 Archive Management	17	
4.7	7 Information Security	18	
5. (Common Data Environment		
5.1	1 Project CDE Overview	19	
5.2	2 Consultant/Contractor CDE Requirements	19	
5.3	3 Metrolinx CDE	20	
5.4	4 Exchanging Information via CDE	21	
5.5	5 Access to Metrolinx CDE	22	
5.6	6 Document Control and Security Protocol	22	
6. I	BIM Requirements		

6.1	BIM Execution Plan	23
6.2	Model Federation Strategy	24
6.3	Metrolinx Classification	25
6.4	Level of Information Need	25
6.5	Quality Assurance and Quality Control	26
6.6	CAD Requirements	28
7. GI	5	
7.1	General	29
7.2	GIS Exchange File Standards	29
7.3	Metadata	30
7.4	Spatial Reference Schema	
7.5	Summary Data	30
8. Te	chnical Requirements	
8.1	Software Platforms	31
8.2	Hardware Requirements	31
9. Inf	ormation Management Risk Register	

Tables

Table 1 - Abbreviations	3
Table 2 - Associated Documentation	8
Table 3 - Industry Standards	9
Table 4 - Quality Assurance Checks	27
Table 5 - Software Platform Requirements	31

Figures

Figure 1 - Revision Numbering Approach	17
Figure 2 - CDE Approach	19
Figure 3 - Simplified Approach to Create, Manage, Share and Review Information	21
Figure 4 - Level of Information Need Approach	26

Acronyms and Abbreviations

Abbreviations used in this document are defined below:

Table 1 - Abbreviations

Abbreviation	Definition	
AIR	Asset Information Requirements	
BEP	BIM Execution Plan	
BIM	Building Information Modelling	
СА	Metrolinx	
CDE	Common Data Environment	
EIR	Exchange Information Requirements	
GCS	Geodetic Coordinate System	
GIS	Geographic Information Systems	
LOIN	Level of Information Need	
LoD	Level of Graphical Detail	
LOI	Level of Information	
MEPF	Mechanical, Electrical, Plumbing, Fire	
MIDP	Master Information Delivery Plan	
MPDT	Model Production and Delivery Table	
O&M	Operations and Maintenance	
QA	Quality Assurance	
RACI	Responsible, Accountable, Consulted, Informed	
ТА	Technical Advisor	
TIDP	Task Information Delivery Plan	
SME	Subject Matter Expert	

Note to Drafter:

This document serves as a baseline for Metrolinx Programs and Projects Exchange Information Requirements, detailing the minimum requirements. It may be amended at the project level to suit specific contracts where appropriate.

1. Executive Summary

1.1 Key Principles

- 1) This Exchange Information Requirements (EIR) document defines the program/project requirements for information production and exchange as well as the defined processes to share, coordinate and assure information between Metrolinx, Consultants, Contractor, and other stakeholders as needed. The primary purpose of the EIR is to implement processes to ensure effective collaboration and implement minimum information standards to ensure interoperable information can be exchanged between the different parties to manage interfaces. These requirements have been developed to drive consistency, interoperability and transparency to enable effective Project delivery and adoption of efficient digital processes. The key digital delivery principles that will be adopted in the delivery of this project are the following:
 - a. Common Data Environment (CDE) to manage all information and enable effective information sharing between all parties. A CDE allows the right information to be accessed by the right people at the right time;
 - b. BIM Execution Plan (BEP) to capture and communicate Consultant/ Contractor's approach to conform with the EIR;
 - c. Master Information Delivery Plan (MIDP) is to manage the delivery of the individual components which make up the Works Submittals. A MIDP is a list of deliverables which make up the Works Submittals and can be linked to the Baseline Works Schedules to provide forecasting and monitor performance;
 - d. A standardized approach to file naming, classification, and data coding to ensure consistency across the project and ensure information is easily retrievable; and
 - e. Early definition of scope and deliverables to reduce ambiguity and dispute. Enabled through the use of component catalogues and standardized model elements. The AIR details the requirements and information to manage the asset following the Contracting Authorities minimum required standards.

1.2 Summary of Approach

- 1) The following statements describe the requirements captured in this EIR to ensure digital delivery is effectively embedded in the Project:
 - a. Metrolinx will host a CDE system to facilitate information sharing between [Consultant/Contractor, Metrolinx, and other stakeholders as needed]. Consultant/Contractor shall upload information to this system for use by others, to coordinate and manage interfaces and to demonstrate conformance as defined in the Review Procedure;

- b. Consultant/Contractor shall set up CDE systems to manage their information production. These systems shall comply with ISO 19650 principles to ensure information is assured and managed, including a complete audit trail;
- c. Consultant/Contractor shall adopt the single standardized file naming, revision and metadata approach defined in this EIR for all information created;
- d. Metrolinx has defined exchange file formats that Consultant/Contractor shall use when sharing information to ensure effective coordination and interoperability. Refer to Section 4.4(b);
- e. Consultant/Contractor shall define a packaging strategy and model federation strategy prior to the Financial Close or as agreed with Metrolinx for review, which review shall take place after the Financial Close or as agreed with Metrolinx and per the Review Procedure. This packaging approach shall align with the file naming standard, Baseline Works Schedule and work breakdown structure;
- f. Consultant/Contractor shall define the software, information development methods and procedures in their BEP;
- g. Consultant/Contractor shall define how they will conform to these requirements in their BEP. Consultant/Contractor shall submit the BEP to Metrolinx, per the Review Procedure, every six months for review;
- h. This EIR defines the standard to be adopted to describe model development's Level of Information Need. Consultant/Contractor shall use this standard to build a component catalogue to explicitly define the graphical and data content of all model information produced. Metrolinx will facilitate a central component catalogue as part of their CDE systems;
- i. Consultant/Contractor shall use Uniformat for Facilities and Uniclass 2015 for Guideway and right-of-way assets as the classification systems across the Project; and
- j. Consultant/Contractor shall use a MIDP to manage delivery across the Project alongside the Baseline Works Schedule. Consultant/Contractor shall use the MIDP template to develop and manage their master and task information delivery plans.

2. Introduction

2.1 Purpose

- 1) The purpose of this document is to communicate the requirements of Metrolinx for the production and exchange of information on Metrolinx Projects.
- 2) Consultant/Contractor preparing information during the design and construction phases of the Program/Project shall familiarize themselves thoroughly with this EIR document and associated documentation listed in Section 2.3.
- 3) The EIR shall be read in conjunction with all the corresponding documents listed in Section 2.3 and all the applicable standards listed in Section 2.4. Project Team members shall be responsible for ensuring that the most current revision of the documents is being used.
- 4) In principle, the EIR will deliver the following items:
 - a. It will define Metrolinx's overall project information intentions.
 - b. It will specify how project information will be delivered across the Program/Project by whom and when.
 - c. It will provide details on the underlying processes, resources and technologies required to successfully deliver the Program/Projects, in line with Metrolinx aspirations, including:
 - i. Roles and responsibilities of parties involved;
 - ii. Applicable standards; and
 - iii. Overall information management process.

2.2 Digital Delivery Strategy and Principles

- 1) Consultant/Contractor shall deliver the Project per ISO 19650. ISO 19650-2 requires that Metrolinx provide exchange information requirements and Asset Information requirements, which specify the requirements for building information models.
- 2) The following guiding principles are intended to embed a "digital-by-default" culture across the Project:
 - a. All information associated with the Project will be created, managed and shared within the Project CDEs to ensure access to the right information at the right time by providing easily searchable information, efficient delivery workflows, and the required levels of information security;

- b. Consultant/Contractor shall establish effective processes that allow other parties to collaborate and coordinate in a structured manner that delivers the right information to the right people at the right time to inform effective decision-making;
- c. Consultant/Contractor's master information delivery plan (MIDP) shall record and track the development and status of all Project deliverables, including BIM models, drawings, calculations and documents which are to be delivered as part of the Works Submittals; and
- d. Consultant/Contractor shall develop and implement efficient review and commenting procedures to ensure the effective delivery of Works Submittals.

2.3 Key Documents

1) Consultant/Contractor shall comply with this EIR and the associated documents in Table 2.

Document Reference Title		Scope
MX-ALM-STD-004	Metrolinx CADD/ BIM Standards Manual	Metrolinx Wide
MX-ALM-GDC-002	Metrolinx Asset Information Requirements (BIM)	Metrolinx Wide
MX-ALM-STD-001	Metrolinx Asset Information Standard	Metrolinx Wide
MX-ALM-DIC-001	MX Asset Information and Data Dictionaries:	
MX-ALM-DIC-002	Civil	
MX-ALM-DIC-003)3 Signals	
MX-ALM-DIC-004 Tracks		
MX-ALM-DIC-005	LM-DIC-005 Station Facilities	
MX-ALM-DIC-006	Bus Facilities	
	Rail Facilities	
CKH-DMC-GDE-	CPG ISO19650 Compliant Numbering Guide	Metrolinx Wide
007		
MX-ALM-GDC-001	Metrolinx Level of Information Need Guide (BIM)	Metrolinx Wide

Table 2 - Associated Documentation

2.4 Industry Standards

1) Consultant/Contractor shall comply with the industry standards listed in Table 3, which are relevant to this EIR:

Table 3 - Industry Standards

Standard	Description	Requirements
BS EN ISO 19650-1	Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) - Information management using building information modelling Part 1 - Concepts and Principles	Compulsory
BS EN ISO 19650-2	Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) - Information management using building information modelling Part 2 - Delivery phase of the assets	Compulsory
BS EN ISO 19650-3	Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) - Information management using building information modelling - Part 3: Operational phase of the assets	Compulsory
BS EN ISO 19650-5	Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) - Information management using building information modelling - Part 5: Security-minded approach to information management	Compulsory
BS 1192-4: 2014	Collaborative production of information Part 4: Fulfilling employer's information exchange requirements using COBie - Code of Practice	Compulsory
PAS 1192-6: 2018	Specification for collaborative sharing and use of structured health and safety information using BIM	Guidance
BS 8536-1: 2015	Briefing for design and construction - Code of practice for facilities management (Buildings Infrastructure)	Guidance
BS 8536-2:2016	Briefing for design and construction - Part 2: Code of practice for asset management (Linear and geographical infrastructure)	Guidance
BS 8541 (Suite)	Library objects for architecture, engineering, and construction	Guidance
AIA Standard/ BIMForum Level of Development (LOD) Specification	LOD Spec for Building Information Models	Guidance
UniClass 2015	Tables	Compulsory

ASTM E1557	Standard Classification for Building Elements and Related Sitework - UNIFORMAT II	Compulsory
ISO 19139	Metadata Implementation Specification	Compulsory

2.5 EIR Response Requirements

- 1) Consultant/Contractor shall produce the following documents per this EIR:
 - a. Pre-appointment BIM Execution Plan (BEP);

Consultant/Contractor shall produce this at the tender stage in response to the invitation to tender. It shall outline the delivery methodology the delivery team intends to implement to meet the information requirements.

b. Delivery team's BEP;

Consultant/Contractor shall submit a BEP that outlines how they intend to meet the information requirements.

- c. master information delivery plan (MIDP);
- d. document control and security protocol; and
- e. BIM Implementation Plan.
- 2) Templates are provided for the BEP and MIDP

2.6 Digital Twin

- 1) Consultant/Contractor shall support Metrolinx in realizing maximum value using digital tools and processes throughout the Project Term. The development of a digital twin has the potential to support this aim and improve the efficiency of handover and operation during the life of the assets.
- 2) Consultant/Contractor shall include within their BEP a section which describes efficiency and innovation items which align with Metrolinx digital twin principles. The Consultant/Contractor shall include within their BEP their strategy for testing and embedding these items on the project using the innovation process throughout the Project Term.
- 3) Metrolinx considers the following digital twin principles in alignment with its digital twin vision:
 - a. Structured and connected data environments, enabling deeper insights and efficient data transfer;

- b. Use of Internet Of Things (IOTs) to capture data from the physical world and connect to the real world to generate deeper insights and understanding;
- c. Implementation of effective data management processes to improve information retrieval and connectivity. Examples include common data schemas, advanced governance tracking, and mature hosting solutions; and
- d. Development of digital behaviours and culture to enhance the implementation of digital tools.

3. People

3.1 Roles and Responsibilities

- Consultant/Contractor shall assign individuals to fulfil the roles set out in ISO 19650. Consultant/Contractor shall capture their responsibilities and contact information in the BEP. Consultant/Contractor shall provide a statement of qualifications to Metrolinx to demonstrate conformance with these roles and other roles defined in Section 3.1.
 - a. Digital Delivery Manager
 - i. Consultant/Contractor shall appoint a digital delivery manager responsible for:
 - 1. Managing and leading the digital delivery strategy within Consultant/Contractors organization and ensuring compliance with Metrolinx digital requirements;
 - 2. Acting as the key interface for digital delivery between Consultant/Contractor, Metrolinx, Consultants, Contractors, and other stakeholders as needed;
 - 3. Management of the Consultant/Contractor's digital delivery team;
 - 4. Managing the establishment and roll-out of the CDE and managing the information exchange processes for the contract with Subcontractors, Consultants, Contractors and Metrolinx; and
 - 5. Working collaboratively with Metrolinx and other Consultant's and Contractors' digital delivery managers to ensure compliance with the exchange information requirements.
 - b. BIM Manager
 - i. Consultant/Contractor shall appoint a BIM manager responsible for the following:
 - 1. ownership and authority for the Consultant/Contractor's BIM model, and responsible for the Project's BIM/CAD deliverables;
 - 2. ensuring the BIM Execution Plan is compliant, up-to-date, communicated and implemented within the Project;
 - 3. ensuring disciplines are sharing information through a controlled, ISO19650-compliant process and using each other's information effectively in a BIM environment; and
 - 4. ensuring that Consultant/Contractor attends progress meetings with Metrolinx to review progress on the execution of the BEP and MIDP.
 - c. Other Roles

i. Consultant/Contractor shall define its approach to skills and resources in its BEP to ensure conformance with the requirements of this EIR.

3.2 Task Team Capability and Capacity

- 1) Consultant/Contractor shall assess each task team's capability and capacity to deliver information per the exchange information requirements. Consultant/Contractor shall detail this process within the BEP and provide the corresponding assessment to Metrolinx.
- 2) Consultant/Contractor shall identify and record any training requirements and all training deployed to their personnel or Subcontractor personnel.

3.3 Mobilization Plan

- In accordance with the Project Agreement, Consultant/Contractor shall establish the delivery team's mobilization plan that Consultant/Contractor will initiate and implement for each new task team and document this process within the BEP. Consultant/Contractor shall take into account its approach, timescales and responsibilities for:
 - a. testing and documenting the proposed information production methods and procedures;
 - b. testing the information exchanges between task teams, Consultants, Contractors, and other project stakeholders as needed;
 - c. testing the information sharing and delivery to the Metrolinx, Consultants, Contractors, and other project stakeholders as needed;
 - d. testing the project-shared CDE approach;
 - e. procuring, implementing, configuring and testing additional software, hardware and IT infrastructure;
 - f. developing additional shared resources to be used by the delivery team;
 - g. developing and delivering education (knowledge required) to delivery team members;
 - h. developing and delivering training (skills required) to the delivery team members;
 - i. recruiting additional members of the delivery team to achieve the required capacity; and
 - j. offboarding staff leaving the Project, removing system access and ensuring information security as the Project demobilizes.

4. Information Management

4.1 Information Management Approach

1) Information management is the process of providing the right information to the right people at the right time. Consultant/Contractor shall implement effective processes, supported by digital technologies, to ensure the efficient management and delivery of information throughout the Project Term, as defined in the following sub-sections of Section 4.

4.2 Task/Master Information Delivery Plans

- 1) To effectively manage the delivery and review of the Project, an effective and consistent delivery packaging strategy of design and construction information is required. As a minimum, this shall include the Work Submittals set out in the Review Procedure/Submittal Procedure.
- 2) Consultant/Contractor shall develop and maintain an up-to-date MIDP per the MIDP/responsibility matrix template to define the deliverables within each Works Submittal package. Consultant/Contractor shall submit the MIDP and the responsibility matrix to Metrolinx for review per the Review Procedure/Submittal Procedure.

4.3 Responsibility Matrix

- 1) Consultant/Contractor shall develop and maintain a responsibility matrix per the MIDP/responsibility matrix template.
- 2) Consultant/Contractor shall define and document the model elements in the responsibility matrix per the Baseline Works Schedule, the packaging strategy and in collaboration with Subcontractors and Suppliers.
- 3) Consultant/Contractor shall derive the responsibility matrix directly from the MIDP.
- 4) Consultant/Contractor shall align the model zonal breakdown in the responsibility matrix with the packaging strategy.

4.4 Exchange of Information

- 1) The purpose of this Section is to communicate the content and format of data exchanges. Consultant/Contractor data exchanges shall include:
 - a. Regular sharing of model information to Metrolinx CDE; and
 - b. Works Submittals.
- 2) Exchange File Formats for Regular BIM Model Sharing

- a. Exchange files are used to exchange BIM model information during regular model sharing and formal Works Submittals. Consultant/ Contractor shall regularly share information into Metrolinx CDE to support the Integration Committee, the Design Integration Working Group, the Construction Integration Working Group and Project progress meetings as defined in PA to enable the management of crosscoordination, risks, and interfaces.
- b. Consultant/Contractor shall facilitate this collaboration by uploading the latest shared BIM models and supporting information to Metrolinx CDE on a biweekly basis, in advance of and as agreed within the Design Integration Working Group and Construction Integration Working Group, as applicable, or as agreed with Metrolinx, per PA.
- c. Consultant/Contractor shall regularly review Metrolinx CDE for the latest available information. Metrolinx CDE will provide notifications when other parties share information in Metrolinx CDE. Consultant/Contractor shall not rely on such notifications, and this provision shall not relieve Consultant/Contractor from the obligations set out in the Project Agreement.
- d. Consultant/Contractor shall facilitate regular information sharing using the accepted exchange file formats provided by Metrolinx. The following exchange file formats shall be accepted for federated BIM model deliverables:
 - i. Navisworks (.nwd); and
 - ii. Industry Foundation Class (.ifc).
- e. If Consultant/Contractor identifies other data exchange formats required to achieve the Project's objectives or improve the efficiency of data exchange and coordination, then Consultant/Contractor shall document these in their BIM Execution Plan.
- 3) Works Submittals
 - a. Works Submittals describe the package of information exchanged at completion milestones defined in the Baseline Works Schedule, as defined in the Review Procedure/Submittal Procedure.
 - b. Consultant/Contractor shall submit all model deliverables as defined in the responsibility matrix at each submission milestone. This shall include all required components of the BIM models and Asset Information to Metrolinx for their review and return at each phase gate.
 - c. Consultant/Contractor shall include in each Works Submittal both native files and exchange files for CAD, BIM and GIS information. Consultant/Contractor shall submit drawings in both PDF and native file format.

- d. Consultant/Contractor shall deliver native data in the formats identified in Metrolinx CADD/BIM Standards Manual (MX-ALM-STD-004).
- e. Consultant/Contractor shall deliver the GCS requirements as per PA.
- f. Consultant/Contractor shall deliver supporting geographic information system data in compliance with Section 7.
- g. Consultant/Contractor shall deliver supporting Asset Information in formats defined in the Asset Information Requirements.
- 4) As-Built Drawings and Models
 - a. For As-Built Drawings and Model, refer to the AIR.

4.5 File Naming

- 1) Consultant/Contractor shall apply a common coding convention to all data created across the Project to provide information consistency, searchability, and accessibility across their CDE.
- 2) Consultant/Contractor shall comply with the file naming standard (CKH-DMC-GDE-007) for all files produced for the Project.
- 3) Refer to the file naming guidance document for further details.
- 4) Metrolinx will maintain taxonomy fields. Consultant/Contractor shall use taxonomy fields from the maintained list.
- 5) Metadata
 - a. Consultant/Contractor shall manage, at a minimum, the following metadata values against all files created for the Project:
 - i. name;
 - ii. description;
 - iii. revision;
 - suitability code; In accordance with ISO19650 to define the status of information;
 - v. security class; and
 - vi. approval status.
 - b. Consultant/Contractor shall submit metadata to Metrolinx CDE when sharing information.

- 6) Revisions
 - a. Consultant/Contractor shall tag each file with a revision in compliance with ISO 19650-2 (P, C or Z). Figure 1 describes the approach that will be configured in all CDEs and adopted across the Project. Refer to the file naming guidance document for further details.

Project Co	Contracting	g Authority		
Design development / internal sharing P01.1 → P01.2 → P01.3 → P01.4	For sharing / For info	Work Submittal	For Construction	As-built
P02.1 + P02.2 + P02.3	P02	First work submittal		
P03.1 + P03.2	P03	Subsequent		
P04.1 + P04.2 + P04.3	P04	C02	Issued For	
P05.1 + P05.2 + P05.3	P05			
Post-Construction				
Z01.1 + Z01.2				→ Z01

Figure 1 - Revision Numbering Approach

- b. All Works Submittals shall use the same unique reference number described in the Review Procedure/Submittal Procedure.
- c. Consultant/Contractor shall define each Works Submittal by a unique revision following the standards described in this section. Consultant/Contractor shall use "P" revisions for all packages.

4.6 Archive Management

 Consultant/Contractor shall define its approach to archiving project data in their BEP. This shall include all Project information within the Consultant/Contractor's CDE and all Consultant/Contractor correspondence, including emails. Consultant/Contractor shall include their approach to the backup and storage of data in safe custody, per the Project Agreement.

4.7 Information Security

- 1) Consultant/Contractor shall establish an approval process for onboarding all members of the project team. Consultant/Contractor shall make this information available to Metrolinx upon request, per the management of Personal Information as defined in the Project Agreement.
- 2) Consultant/Contractor shall manage all information in Consultant/Contractor's CDE per ISO 19650-5 to reduce the risk of loss, misuse or modification of sensitive or commercial information, personal data and Intellectual Property as defined in the Project Agreement. Consultant/Contractor shall define its approach in the BEP.
- 3) Metrolinx will retain ownership of all information within Metrolinx CDE, including after the Termination Date, per the Project Agreement.

5. People Common Data Environment

5.1 Project CDE Overview

 The CDE provides an underlying consistency and connectivity driven by a common approach to terminology, naming, and data schemas, while allowing information to be created and managed in separate systems, suitable to the type of information created.



Figure 2 - CDE Approach

5.2 Consultant/Contractor CDE Requirements

- 1) Consultant/Contractor shall provide a collaborative production environment to manage information production, assurance, and coordination, including coordination with Subcontractors. The production environment shall comply with ISO 19650-1, ISO 19650-2 and ISO 19650-5.
- 2) Consultant/Contractor shall provide and maintain a designated system deployed, tested, and configured no later than eight (8) weeks after the Financial Close or as agreed with Metrolinx.
- 3) All CDEs shall comply with the four-state process set out in ISO 19650-1 for the collaborative production of information: 'work in progress,' 'shared,' 'published,' and 'archived.' Consultant/Contractor shall share information with Metrolinx CDE to facilitate coordination as defined in Section 4.4. Consultant/Contractor shall publish Works Submittal packages into Metrolinx CDE for review as defined in Section 4.4 and Schedule 10 Review Procedure.

- 4) Consultant/Contractor shall provide Metrolinx with access to team-shared information in Consultant/Contractor's CDE per the Project Agreement. Metrolinx will provide Consultant/Contractor with the names of specific users to facilitate the onboarding and access process.
- 5) Consultant/Contractor shall describe within the BEP:
 - a. its approach for managing the Consultant/Contractor's CDE processes and supporting systems, per the standards listed in Table 3;
 - b. details of all CDE interfaces and the process for managing them; and
 - c. configuration change procedures, including training and communication.
- 6) Consultant/Contractor shall develop, share, manage, and deliver project information through the CDE process and supporting systems per the BIM Execution Plan. Metrolinx will review conformance on a six-month basis, per the Review Procedure/Submittal Procedure.
- 7) Consultant/Contractor shall work with Metrolinx to synchronize Consultant/Contractor's CDE and Metrolinx's CDE and automate workflows where practical.
- 8) Consultant/Contractor shall implement common coding to provide information consistency, searchability and accessibility across Consultant/Contractor's CDE. Common coding is the use of consistent naming conventions throughout the Project to tag all information. Consultant/Contractor shall comply with the following standards when setting up CDE technologies:
 - a. file naming standard (refer to Section 4.5);
 - b. work breakdown structure (including work package strategy naming convention); and
 - c. asset-naming convention (refer to AIR).

5.3 Metrolinx CDE

- 1) Metrolinx CDE will be made up of a variety of different systems chosen for their ability to handle specific file types.
- 2) Metrolinx will provide a designated system, that is deployed, tested and complies with ISO 19650-1, ISO 19650-2 and PAS 1192-5, to manage the master version of shared BIM models and Asset Information, and to manage Metrolinx's review of and response to Works Submittals.

5.4 Exchanging Information via CDE

- 1) Metrolinx CDE will facilitate the exchange of this information between Consultant/Contractor and Civil Contractors, Metrolinx, external Stakeholders, and third parties. The Project will adopt a file-based approach to information sharing. All information submitted to Metrolinx CDE shall pass through an automated information validation step to ensure compliance with the information requirements set out in this document. Consultant/Contractor shall review and update any content that fails this automated compliance check and resubmit the content to Metrolinx CDE.
- 2) Consultant/Contractor shall submit Works Submittals to Metrolinx CDE in a published state for review and comment. Consultant/Contractor will not receive notification from the Metrolinx review and return process when information in the Metrolinx CDE is published. Consultant/Contractor shall update information in the Consultant/Contractor's CDE accordingly to maintain consistency across both systems.
- 3) Consultant/Contractor shall submit information to Metrolinx CDE in a 'shared' state. All work-in-progress information shall remain in the Consultant/Contractor's CDE.
- 4) Consultant/Contractor shall only exchange information with other Consultant/Contractors via Metrolinx CDE.



Figure 3 - Simplified Approach to Create, Manage, Share and Review Information on Metrolinx Wide Programs/Projects

5.5 Access to Metrolinx CDE

- 1) Metrolinx digital delivery manager will act as the point of contact for all matters related to Metrolinx's CDE.
- 2) Only specific pre-identified roles in the Consultant/Contractor's organization and identified in the Consultant/Contractor's BEP may access Metrolinx CDE. Consultant/Contractor's digital delivery manager shall request user access to Metrolinx CDE from Metrolinx per Metrolinx's information security and onboarding process.

5.6 Document Control and Security Protocol

- 1) Consultant/Contractor shall describe the information receipt and issuing processes within their document control and security protocol, which their document control team will follow. This shall include the following, at a minimum:
 - a. detailed information issuing process and guidance;
 - b. roles and responsibilities of document control staff;
 - c. incoming data approval and validation processes;
 - d. approach to managing templates, checklists and document control standards;
 - e. document control quality checks; and
 - f. reporting procedures and registers, including management of the MIDP.

6. BIM Requirements

6.1 BIM Execution Plan

- 1) BEP Overview
 - a. The BIM Execution Plan sets out how the delivery team will carry out the information management aspects of the Works per Metrolinx exchange information requirements, Project information requirements and Asset Information requirements.
- 2) BEP Requirements
 - a. The purpose of the BIM Execution Plan is to define how Consultant/Contractor will comply with the exchange information requirements, Consultant/Contractor's approach to information management, the production of BIM, CAD and GIS information and Consultant/Contractor's approach to implementation throughout the Project Term.
 - b. Consultant/Contractor shall include the following in the BIM Execution Plan, at a minimum:
 - i. description of how the BIM Execution Plan complies with relevant industry standards, including those listed in Table 3;
 - ii. the process and evidence that the BIM models and Asset Information Submittals are verified against the EIR and AIR; and
 - iii. processes to ensure that all information submitted by Consultant/Contractor is validated and assured, and the associated evidence is available in Consultant/Contractor's CDE before delivery and available for audit until the Termination Date.
 - c. The BEP shall also include:
 - i. organization and contact information of all key staff associated with digital delivery;
 - ii. details of how compliance will be met with Metrolinx CADD/BIM Standards Manual (MX-ALM-STD-004);
 - iii. plan to conform with the BIM quality control requirements of the project, including a schedule for quality control checking and monthly reporting on the integrity of the models;
 - iv. process for tracking changes to discipline models;

- v. BIM software applications and versioning required by the Project;
- vi. file formats and naming conventions for all BIM/CAD Submittals;
- vii. site coordination: units, coordinate systems and vertical datum;
- viii. Project-wide data exchange, sharing and viewing protocols;
- ix. Project Specific LOIN Matrix in compliance with Metrolinx Level of Information Need Guide (MX-ALM-GDC-001);
- x. CAD drafting/symbols standards;
- xi. coordination/clash detection requirements;
- xii. BIM/CAD quality control protocols;
- xiii. approach to tagging objects within the BIM models;
- xiv. approach to managing BIM object unique IDs; and
- xv. approach to managing Asset Information associated with objects within the BIM models to enable progressive assurance and effective Asset Information handover.
- d. Consultant/Contractor shall submit a draft of the BIM Execution Plan no later than eight (8) weeks after the Financial Close for review by Metrolinx, per the Review Procedure/Submittal Procedure. Consultant/Contractor shall implement the BIM Execution Plan per the requirements in this EIR.
- e. Consultant/Contractor shall revise and resubmit the BIM Execution Plan to Metrolinx for review per Review Procedure/Submittal Procedure:
 - i. at a minimum every 6-months until Substantial Completion; and
 - ii. in response to significant changes that affect the BIM Execution Plan, the CDE, the Baseline Works Schedule, or the responsibility matrix.

6.2 Model Federation Strategy

- 1) Consultant/Contractor shall establish the model federation strategy in line with the Works Submittal packaging strategy, document this in the BIM Execution Plan and ensure conformance during delivery. In defining the model federation strategy, Consultant/Contractor shall account for the following principles:
 - a. multi-user access;
 - b. operational efficiency on large projects;

- c. inter-disciplinary collaboration;
- d. limiting file size to ensure information accessibility;
- e. minimization of modelling interfaces; and
- f. breakdown by discipline ownership.
- 2) Consultant/Contractor shall maintain a master zoning model defining the spatial breakdown of the federation strategy, incorporating rooms, areas, levels and zones.

6.3 Metrolinx Classification

- 1) Consultant/Contractor shall use the following classification systems for all BIM information:
 - a. Uniformat for Facilities; and
 - b. Uniclass for Guideway and right-of-way assets.
- 2) Consultant/Contractor shall define its approach to managing and applying the classification system within the BIM Execution Plan.
- 3) Alternative classification systems may be proposed where they are better aligned with EN 50126.

6.4 Level of Information Need

 'Level of Information Need' is defined in ISO19650, which covers geometrical and non-geometrical information, previously known as LOD (Level of Development) and LOI (Level of Information). Figure 4 details the project's approach to defining the Level of Information Need.



Figure 4 - Level of Information Need Approach

- 2) Consultant/Contractor. shall produce their Level of Information Need Matrix to be aligned to EN 51026.
- 3) Consultant/Contractor shall model all elements per Metrolinx Level of Information Need Guide (MX-ALM-GDC-001).
- 4) Component Catalogue
 - Consultant/Contractor shall submit its component catalogues in response to the Level of Information Need requirements to explicitly define the LoD and LOI for each component prior to beginning design development. Consultant/Contractor shall append these catalogues to the BIM Execution Plan;
 - b. Metrolinx CDE will facilitate sharing a project-wide component catalogue. Consultant/Contractor shall submit any models created to meet the Level of Information Need to Metrolinx CDE; and
 - c. Metrolinx will provide a component catalogue template to define the format in which Consultant/Contractor shall submit components for review and to enable automatic validation and checking of compliance of modelled elements.

6.5 Quality Assurance and Quality Control

1) The following section defines Consultant/Contractor's requirements regarding model quality, auditing, and assurance.

- 2) Interface Checking/Clash Detection and Resolution
 - a. Consultant/Contractor shall be responsible for quality control and assurance of its respective information containers. Consultant/Contractor shall state in the BEP how Consultant/Contractor will manage and audit this responsibility. Consultant/Contractor shall store audit evidence on Consultant/Contractor's CDE and make this available to Metrolinx; and
 - b. Consultant/Contractor shall, at a minimum, undertake the checks included in Table 4 during information development.

Check	Definition	Frequency	
Visual Check	Ensure there are no unintended model components, and the design intent is followed.	Weekly	
Interference Check	Utilizing 3D coordination tools to identify As defined by the all issues from a model in both soft and hard clash detection. BIM manager and set out in the BEP		
Standards Check	Ensure that all models and drawings respect the established BIM standards for the project (model naming, tags, dimensions, LoD's, etc.)	Before official submission	
Model Integrity Check	The QA/QC validation process ensures the project facility dataset has no undefined or duplicate elements.	Weekly	

Table 4 - Quality Assurance Checks

- 3) Clash Detection and Conflict Resolution (Internal Contract)
 - a. Consultant/Contractor shall conduct and manage a thorough clash detection process throughout the information development phase. Consultant/Contractor shall define this process in the BEP. Consultant/Contractor shall append clash detection reports to any model Works Submittals.
- 4) Clash Detection and Conflict Resolution (Between Contracts)
 - a. Models and information shared via Metrolinx CDE, support the Design Integration Working Group, Construction Integration Working Group and the Integration Committee per the PA. Prior to each meeting, Consultant/Contractor shall issue an updated clash report unless otherwise agreed with the Integration Committee. Consultant/Contractor shall define the process to share models

and clash reports for intermediate design reviews in the Integration Committee in the BIM Execution Plan.

- 5) Clash Detection and Conflict Resolution (Construction Phase)
 - a. Consultant/Contractor shall use coordination software to assemble the various construction models to electronically identify, collectively coordinate resolutions, and track published interference reports between all disciplines. Consultant/Contractor shall update their models to reflect the coordinated resolution. Consultant/Contractor shall review the model and the clash reports in coordination meetings as required by the BEP, until all spatial and system coordination issues have been resolved.

6.6 CAD Requirements

- 1) Consultant/Contractor shall comply with Metrolinx CADD/BIM Standards Manual (MX-ALM-STD-004);
- 2) Consultant/Contractor shall describe in the BEP its approach to managing any data transformations required for project delivery; and
- 3) Consultant/Contractor shall produce all 2D drawings from 3D models unless specifically agreed upon by Metrolinx for particular deliverables.

7. GIS

7.1 General

- 1) Consultant/Contractor shall develop, manage, and deliver geographic information consistently across the Project per Good Industry Practice.
- 2) Consultant/Contractor shall produce all data files in an approved format that can be uploaded or translated into the Metrolinx ArcGIS Enterprise GIS system.
- 3) Consultant/Contractor shall provide details within the BEP on how GIS data is produced and structured, how quality and integrity are maintained, and how GIS is used to achieve Metrolinx's digital delivery strategy.
- 4) Consultant/Contractor shall develop GIS mapping per Metrolinx EGIS Map Templates.

7.2 GIS Exchange File Standards

- 1) Consultant/Contractor shall comply with the following exchange file standards:
 - a. Tabular data:
 - i. Microsoft Excel (.xlsx);
 - ii. tab or comma-delimited text (.txt, .csv);
 - iii. File Geodatabases Tables (.gdb); and
 - iv. Extensible Markup Language (.xml);
 - b. Mapping products:
 - i. Esri ArcGIS Pro Project (.aprx);
 - ii. Esri ArcMap (.mxd); and
 - iii. map or project package files (.mpx or .ppkx);
 - c. Vector geospatial data:
 - i. Esri File Geodatabase Feature Class (.gdb);
 - ii. GeoJSON File (.geojson or .json) and
 - iii. ArcGIS Server REST API service;
 - d. Raster and Aerial imagery:
 - i. TIFF image with world reference file (.tif, .twf);
 - ii. GeoTIFF (.tif); and
 - iii. LIDAR/point cloud data (.las, .laz)
 - iv. Tile package format (.tpkx).

7.3 Metadata

- 1) All geospatial files developed shall have associated metadata that align with the information standards in Section 4.
- 2) Consultant/Contractor shall comply with the ISO 19139 Metadata Implementation Specification GML3.2 metadata-style format.

7.4 Spatial Reference Schema

- 1) All geospatial vector or raster file types in Section 7.2 shall have the Project spatial reference schema applied that describes the projection, coordinate system, datum, and units of measure used.
- 2) Project geospatial data to comply with Metrolinx CADD/ BIM Standards Manual (MX-ALM-STD-004).
- 3) If no native GIS format is available, Consultant/Contractor shall use the following CAD requirements for translation/conversion and import into the GIS platform:
 - a. use DWG, DXF and DGN file formats;
 - b. a projection (.prj) or world (.wld) file shall be included with all CAD files;
 - c. all polygon features shall be 'snapped' closed; all line features shall be 'snapped' to associated endpoint features where applicable;
 - d. all layer names shall be easily recognizable;
 - e. proposed and existing entities shall be on separate layers; and
 - f. drawing features/layers shall include descriptive attributes in a featurelinked attribute table.

7.5 Summary Data

- 1) Consultant/Contractor shall describe the purpose of the geospatial file in its metadata. This shall include:
 - a. original data source name, e.g., X-S-TS-U001.dwg;
 - b. original data source date, e.g., 2/23/2022;
 - c. original data owner name;
 - d. original data layer name; and
 - e. original data URL or Workspace, if available, such as a location on an external website to the source data.

8. Technical Requirements

8.1 Software Platforms

- 1) The BEP shall list the BIM software and computer operating system or systems that Consultant/Contractor will use. Consultant/Contractor shall identify the software and operating systems by vendor, product name, version identifier, and patch number.
- 2) The BEP shall define Consultant/Contractor's approach to managing software changes on the Project.
- 3) The BEP shall propose the intended software applications that will be used for each of the uses listed in Table 5 during preconstruction, design and construction.

BIM use	Software Example
Architectural model	Autodesk Revit/ FormIt
authoring	
Structural model	Revit/ Robot Structural Analysis/ Advance
authoring	Steel
MEPF model authoring	Autodesk Revit
Civil/ Infrastructure model	AutoCAD Civil 3D/ Infraworks/Inventor
authoring	
Coordination and clash	Navisworks Manage
detection	
4D scheduling	Synchro, Navisworks Manage (Timeliner),
	Primavera

Table 5 - Software Platform Requirements

8.2 Hardware Requirements

1) The BEP shall list the minimum hardware specifications that Consultant/Contractor will use. Where specific roles require specific hardware specifications, Consultant/Contractor shall detail this in the BEP.

9. People Information Management Risk Register

- 1) Consultant/Contractor shall establish the delivery team's information management risk register containing the risks associated with timely information delivery, per Metrolinx's exchange information requirements, and outline how the delivery team intends to manage these risks.
- 2) In doing this, Consultant/Contractor shall take into account risks associated with:
 - a. assumptions the delivery team has made in relation to Metrolinx's exchange information requirements;
 - b. meeting Metrolinx project information delivery milestones;
 - c. related clauses in the project agreement;
 - d. achieving the proposed information delivery strategy;
 - e. adopting the Project's information standard and information production methods and procedures as listed in Metrolinx's CAD/BIM standards;
 - f. inclusion (or non-inclusion) of proposed amendments to the Project's information standard; and
 - g. mobilization of the delivery team to achieve the required capability and capacity.
- 3) Consultant/Contractor shall append the latest version of the risk register to the BEP.