Department of Transport and Main Roads

Guideline

Building Information Modelling (BIM) for Transport and Main Roads Guideline

A guide to enabling BIM on Road Infrastructure Projects

June 2025

Queensland Government

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1 Introduction

1.1 Purpose of the guideline

This document sets out the Building Information Modelling (BIM) direction for Transport and Main Roads. The purpose of this document is to assist the department's Project Managers and project stakeholders to implement BIM processes and methodology in the delivery of road infrastructure projects during the planning, development, implementation, and finalisation phases.

In reading this document it is expected that departmental staff and project stakeholders will gain knowledge of:

- Transport and Main Road's BIM implementation program and plan.
- Why the department is adopting a "digital by default" approach to deliver capital projects.
- What are the key BIM procurement documents and how they need to be developed.
- What processes need to be followed to efficiently implement BIM on projects.
- Who is responsible for which activities.

1.2 Context

In the 2016 State Infrastructure Plan (SIP), the Queensland Government stated the intention to introduce BIM to all major infrastructure projects by 2023, with a series of principles in draft to underpin whole of Government adoption.

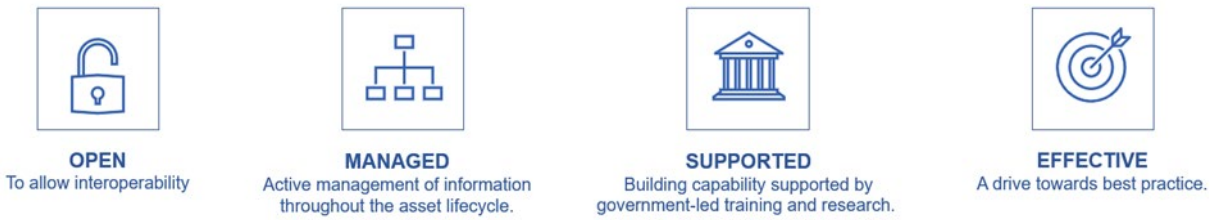
This direction was further reinforced in the State Infrastructure Strategy (June 2022) which highlighted the need for a "digital by default" approach across the infrastructure lifecycle where digital technologies and data analysis can improve the way the department designs, constructs, and maintains its assets.

BIM implementation will have an impact on the processes that underpin the planning, development, implementation, and finalisation as well as operations and maintenance of the department's infrastructure projects.

Transport and Main Roads was a key player in the development and delivery of the *Digital Enablement for Queensland Infrastructure – Principles for BIM Implementation* document published in November 2018 by the Department of State Development, Manufacturing, Infrastructure and Planning (DSDMIP). This overarching document has been published for use by all Queensland Government departments, agencies and statutory authorities and applies to the full lifecycle, including design, delivery and asset management, of all new major state infrastructure assets.

In line with the principles outlined in the publication, the department's focus is ensuring the implementation strategy aligns with the four key principles of:

Figure 1.2 – Queensland State Government principles for BIM implementation



Transport and Main Roads has been applying BIM principles on major projects since 2016. The department's criteria on the application of BIM are as follows:

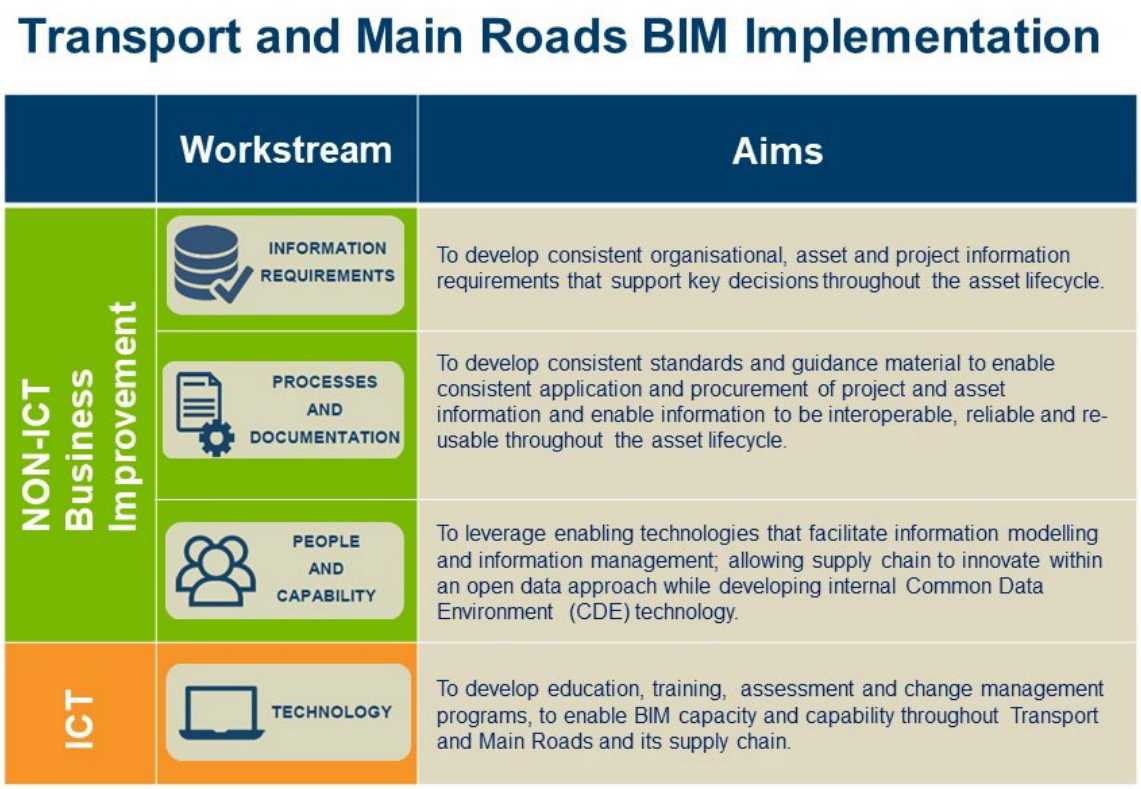
- All major projects shall implement BIM methodologies using the department's Technical Specifications, taking into account:
  - Complexity / Characteristics (For example, the requirements for complex staging, and interfacing with other infrastructure or built environment).
  - Capability (The level of collaboration and knowledge of BIM, required and/or available within Transport and Main Roads and industry).
  - Contract type (Alignment with contract provisions and risk allocation).

1.3 Transport and Main Roads BIM implementation program and plan

BIM for the department is based on the development of robust processes and defined requirements for information and data management in project delivery, supported by the development of 3D object-based modelling in design, construction and asset management.

To meet the Queensland Government's direction, the department has developed its own BIM Implementation Strategy with four "workstreams" as outlined in Figure 1.3 below.

Figure 1.3 – Transport and Main Roads BIM implementation program



Transport and Main Road's BIM implementation vision is:

To drive information sharing efficiencies within all phases of an asset's lifecycle

Efficiencies are being realised through the adoption of international standards for information management using BIM (ISO 19650 *Organisation and digitisation of information about buildings and civil engineering works, including building information modelling (BIM) – Information management using building information modelling*) which enable Transport and Main Roads and their suppliers to receive and share all required information during the correct project phases to enable informed decisions.

1.4 Benefits of BIM

Transport and Main Road's BIM program will promote the avoidance of wasteful activities, in accordance with ISO 19650 series.

Wasteful activities may include:

- Waiting and searching for information.
- Over-production of information with no defined use.
- Difficulties to identify ownership, validity, and currency of information.
- Defects caused by poor co-ordination across graphical and non-graphical data sets, resulting in rework.

The departmental BIM Implementation objectives and benefits are outlined in Table 1.4(a) and Table 1.4(b), differentiated between Strategic (S) and Project (P) objectives.

Table 1.4(a) – Strategic objectives and benefits

	Objective	Benefits
S1	Achieve consistency for the management of asset information and data in the Queensland Transport and Roads Investment Program (QTRIP) process, including the necessary requirements for departmental suppliers to meet their asset information and data obligations.	Consistency creates efficiency benefits while improving quality in information procurement and management. Providing suppliers with a consistent process will make it easier for consultants and contractors to respond to the department's BIM requirements and improve assessment.
S2	Provide the consistent processes and tools to achieve the business change and associated benefits identified by Transport and Main Road's BIM Implementation Plan.	• Reduction in time required to complete business functions (e.g. design verification). • Fewer variations. • Fewer time and cost overruns. • Reduced manual work at handover.
S3	Provide the necessary technology, process and documentation to meet current international BIM standards.	This ensures industry development is in line with departmental requirements. Alignment with supplier expectations on information management and modelling approaches, drives consistency, increases speed of delivery and improves the quality of project outcomes.

Table 1.4(b) – Project objectives and benefits

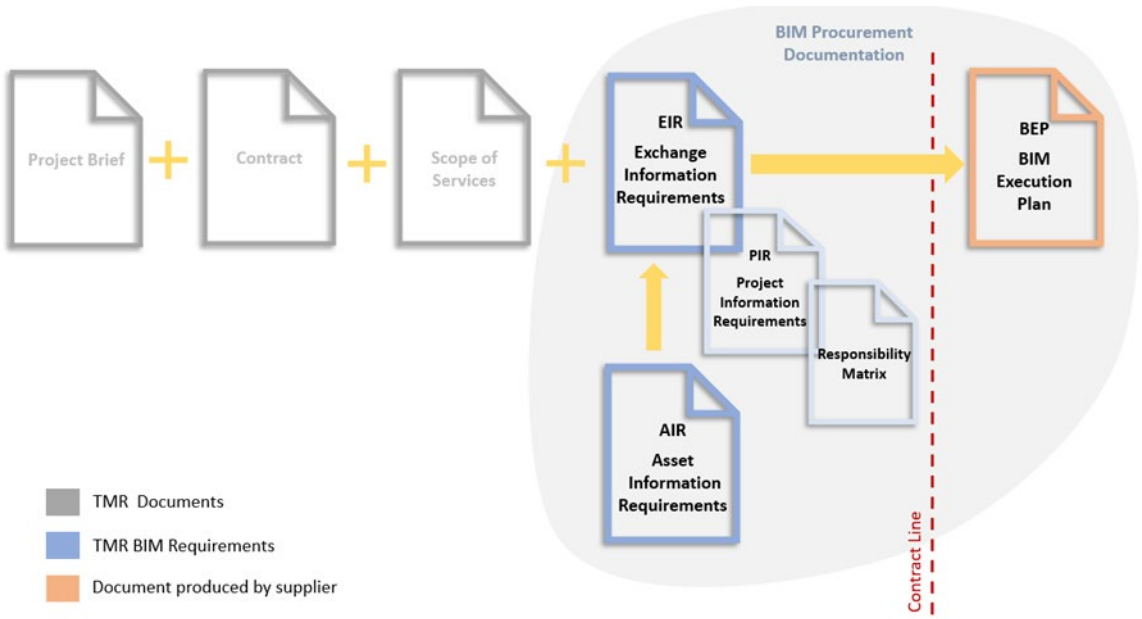
	Objective	Benefits
P1	Better information management	• Less time required to find information. • Ensure consistency on procuring, collecting, and managing information. • Reduce errors / information lost / duplication. • Lower risk and better predictability of outcomes.
P2	Communication and visualisation	• Enhance collaboration, communication, and productivity. • Improve visualisation for better decision-making.
P3	Design Co-ordination	• Reduce re-work from better coordination and clash detection. • Reduce conflicts and changes during construction.
P4	Design Review	• Improve efficiency in design reviews and approval cycles.
P5	Asset Management	• Improve data collection for digital Operation & Maintenance (O&M) handover and asset information creation.

2 Transport and Main Roads BIM procurement documentation

2.1 Overview

The key documents to implement BIM within the department's capital project and the relationships between the various BIM procurement documents are shown in Figure 2.1.

Figure 2.1 – BIM procurement documentation



The suite of documents to the left of the contract line form part of the tender and appointment documents which enable tenderers to detail their response in their initial BIM Execution Plan (BEP), to the right of the contract line.

The BEP sets out the supplier's detailed plan for the production, management and quality controls of information delivered under the contract.

The BEP is to be treated as a live document and is to be updated as the project develops, agreed approaches to BIM change, or individual roles and responsibilities are changed.

The BIM procurement documents are a combination of 'static' departmental documents used across all projects without alteration, and templates that are modified for each individual project. These documents are applicable to all QTRIP projects and are based on Transport and Main Road's standard suite of procurement routes.

The information requirements are aligned to international best practice standards which include the ISO 19650 series of standards.

The processes outlined in ISO 19650-2 should be considered in conjunction with the department's *Transport Infrastructure Project Delivery System* (TIPDS).

These BIM requirements are intended to support and enable an agile and consistent approach to all project activities by adopting digital ways of working. The focus is on ensuring that the right people have the right information at the right time and in the right format to effectively carry out their roles from inception of the project through to operation and decommissioning.

A high-level definition of each BIM procurement document is detailed in Table 2.1.

Table 2.1 – BIM procurement documents

Document	Description	How it is issued	Update frequency
Asset Information Requirements (AIR)	Defines the specific information and data which must be delivered, to achieve Transport and Main Road's target state Asset Information Model (AIM).	Maintained by the department as an overarching asset requirement guide.	Static document applied across all projects (updated from time to time as lessons are learned).
Exchange Information Requirements (EIR)	Outlines the processes and practices that provides direction to the lead appointed party on what BIM deliverables must be delivered under the contract, the information requirements that must be met, and the production of a BIM Execution Plan (BEP) and supporting documentation that demonstrates how the lead appointed party will address the departments information requirements.	Issued to Tenderers.	Static document applied across all projects (updated from time to time as lessons are learned).
Project Information	Defines the specific information requirements	Issued to Tenderers.	Populated for each project.

Document	Description	How it is issued	Update frequency
Requirements (PIR)	for the project, (for example, specific requirements beyond the AIR / EIR, timing requirements and any specifics relating to information delivery and transmission.		
BIM Execution Plan (BEP)	A document that is produced by the supplier in response to the EIR. It describes the processes and standards that the team will adopt to deliver the requirements of the EIR.	Issued by lead appointed party, using the Transport and Main Roads BEP template.	Live document to be created by lead appointed party and updated as the project develops.

2.2 Transport and Main Roads Asset Information Requirements (AIR)

The objective of the AIR is to provide a clear statement of the requirements that will enable the project to deliver an AIM comprising of:

- A structured asset register, including asset characteristics suitable to Transport and Main Road's asset management requirements.
- An organised repository of drawings, documents and files required for the operational and maintenance phase of the asset lifecycle.
- Accurate as-constructed model(s) (including associated data and information).
- Coordinated components consistently cross-referenced, with minimal duplication of data, presented in a format appropriate to the organisation's systems and management capabilities.

As a State Government organisation Transport and Main Roads has legislative requirements for asset management. The Transport Infrastructure Asset Management Policy and supporting documents define the Organisational Information Requirements (OIR) and Asset Information Requirements (AIR) for the department.

There are three Asset Management Systems that currently store asset information for the department, they are:

- ARMIS – A Road Management Information System.
- BIS – Bridge Information System.
- ROAR – Road Operations Asset Register.

A review of the asset information requirements across these three major asset management databases is continually undertaken to ensure correct asset information is captured during project delivery.

To ensure accuracy and completeness of the Asset Information Model (AIM) it should be produced as an output from the information captured in the Project Information Model (PIM). This assumes the PIM is the one source of truth for all project information throughout design, construction, commissioning, and handover phases. The purpose of the AIM is to provide information that will support the ongoing management of the asset. The AIM should deliver a fully populated asset data set to be used by the department's Asset Information Management Systems.

2.3 Transport and Main Roads Exchange Information Requirements (EIR)

The EIR specifies the department's project and asset information requirements, reasons, and purpose to the project team. It also outlines the technical standards and commercial procedures to enable BIM and information management.

The EIR is a critical element of BIM and information management, and it is used to clearly define to project teams what information (models, data and documents) is required to successfully enable BIM at each project stage.

Essentially the EIR defines:

- What information is needed? – Detailed information requirements.
- Why is the information needed? – Defined information purpose.
- Who needs to develop the information? – Assign responsibilities to roles.
- When the information needs to be developed? – Defined timelines for information delivery.

The EIR is reviewed by the Project Manager prior to engaging a supplier and it will form part of the contract. All Project Briefs for the engagement of suppliers must provide clear definition of the EIR for each stage of project development.

All proponents tendering for departmental projects will be required to demonstrate their proposed approach, capability, and capacity to deliver the BIM requirements for the department though the development of a pre-appointment BEP as outlined in the EIR provided during tender engagement.

2.4 Transport and Main Roads Project Information Requirements (PIR)

The Project Information Requirements (PIR) captures the specific information to inform and manage a project. The AIR and EIR will mainly cover the standard departmental asset and project requirements for projects. The PIR may take the form of a Project Brief, Functional Specification, or a combination of documents that defines the overall project deliverables.

PIR documentation may include:

- Details of the project such as unique project challenges and risks and how BIM can be used to mitigate them.
- What existing information is available about the project (for example surveys, drawings, or models).
- Any additional requirements above and beyond the EIR and AIR (such as specific legislative requirements or information requirements required to test new innovations).
- Any agreed deviations against the EIR and AIR (such as reduction in requirements due to the scope of the project, for example if it involves minor work or refurbishment).

The PIR defines requirements for the data, information and models which need to be produced at each project stage along with the required level of information need and their purpose. This data, information and models collectively form the PIM.

The PIR is the responsibility of, and should be completed by, Transport and Main Roads.

2.5 Inclusion of BIM procurement documents in contract forms

The approach for inclusion in contract documents will depend on the underlying contract form and procurement approach.

The *Transport Infrastructure Project Delivery System* (TIPDS) Volume 1 *Selection of Delivery Options* provides guidance on selection of appropriate delivery models and contract types.

The selection of the delivery model and contract type defines the next step in identifying the contract documents required for the selected outcome.

Generally the contract type falls into two broad categories:

- Design then Construct – also known as a Transport Infrastructure Contract – Construct Only or TIC-CO.
- Design and Construct - also known as a Transport Infrastructure Contract – Design and Construct or TIC-DC.

TIC-CO contracts require the department to provide a detailed design and project documentation to be handed over to the contractor.

The detailed design is usually undertaken by Design Consultants engaged under the Consultants for Engineering Projects (CFEP) system. Functional Specifications and offer and contract documentation for engaging prequalified consultants can be found on the Transport and Main Roads website.

TIC-DC contracts require the engagement of a primary supplier who then needs to engage the designer through external consultants, or alternatively, the contractor and designer form a joint venture arrangement.

In either contract type the BIM EIR forms part of the contract.

Where other contract types are used, e.g Alliance, Collaborative Project Agreement etc, there is still the requirement to outline defined BIM deliverables in a format suitable for those particular contract agreements.

2.6 BIM Execution Plan (BEP)

The department has published a *BIM Execution Plan Template* that the tendering party / lead appointed party must use in response to the EIR.

The pre-appointment BEP is a formal document that is submitted by the proponents during the tender submission process, outlining how they intend to meet the BIM requirements defined in the department's EIR and associated contract documents, for example, PIR, Functional Specifications, Tender forms, Conditions of Contract, or Scope of Works and Technical Criteria (SWTC) used in the different contract types.

After tender award, the lead appointed party shall update the post-appointment BEP based off the previously developed pre-appointment BEP and reference the relevant PIR or EIR sections where applicable.

It is the responsibility of the tenderer to prepare the BEP for the project outlining how they will address the following:

- project information
- project schedule
- BIM goals
- project team roles, staffing and competency
- detail of individuals undertaking the information management function
- information delivery strategy including the team approach to meeting the department's EIR and PIR
- the delivery team's high-level responsibility matrix
- proposed federation strategy
- collaboration procedures and method to handle shared models
- quality control
- plan for file sharing, storage and retrieval, and data security, and
- technology infrastructure and software.

During design and construction, the lead appointed party BIM Manager shall update the BEP based on the requirements defined in the PIR or EIR and shall reference the relevant sections from this document. This will enable all parties to understand whether the BIM requirements and uses will be met for specific project stages.

3 BIM and information management process

3.1 Setting information requirements

QTRIP project contracts need to include comprehensive requirements for suppliers to provide a full set of information about every asset when it is handed over.

As described above, the EIR and PIR are the primary documents for communicating information requirements and establishing information management processes from Transport and Main Roads to its suppliers.

A key step in setting up the team for development of the EIR / PIR is to nominate a competent individual for the information management role (BIM Information Manager). The BIM Information Manager role can be covered by departmental staff or a third party working on behalf of the department. Their role will be to ensure that the project acquires knowledge about the assets to be specified and handed over. It is the responsibility of the Project Manager to ensure this role is established at the beginning of the project.

The BIM Information Manager performs a key, integral function alongside all other project management activities. As such the role holder must be fully supported by and closely aligned with the Project Manager.

Table 3.1 defines the activities required to implement the BIM procurement documents.

Table 3.1 – Tasks required to compile BIM procurement documents

Document	Responsible	Tasks
AIR and EIR	Transport and Main Roads BIM Information Manager	• Brief internal Transport and Main Roads Project Team on the requirements.
EIR / PIR	Transport and Main Roads BIM Information Manager	• Assist the Transport and Main Roads Project Manager to prepare the EIR / PIR incorporating the responsibility matrix. • Brief internal Transport and Main Roads Project Team on the requirements.
BEP	Lead appointed party	• Using the Transport and Main Roads BEP template, provide a BEP responding to the requirements highlighted in the EIR. • Following contract award, agree on approach with Transport and Main Roads BIM Information Manager. • Ensure supply chain have been briefed and have the capability to meet the requirements.
	Transport and Main Roads BIM Information Manager	• Evaluate BEP quality and completeness as part of the tender stage. • Following contract award, review the supplier's BEP and confirm that it complies to the requirements.

3.2 Evaluation and assessment of BIM Execution Plans (BEPs)

The evaluation and assessment of BEPs will be undertaken by the Transport and Main Roads Project Manager and Transport and Main Roads BIM Information Manager as part of the Tender Assessment process. In the process of finalising the contract with the successful proponent, the BEP is revisited and updated as required. The BEP is to be treated as a live document and is to be updated as the project develops, agreed approaches to BIM change, or individual roles and responsibilities are changed.

3.3 Ensuring the Information Requirements are delivered

The Transport and Main Roads BIM Information Manager is responsible for validating the information and deliverables provided by the supplier against the requirements stated in the PIR and EIR. The Transport and Main Roads BIM Information Manager is also responsible for coordinating the review process at every information exchange to include input from relevant Transport and Main Roads BIM Reviewers to ensure compliance.

Information will be submitted to the department by the lead appointed party's BIM Manager at the relevant project milestones into the agreed Common Data Environment (CDE). The Transport and Main Roads BIM Information Manager is responsible for raising the collaborative workflow to coordinate design review by distributing the files among the Transport and Main Roads BIM Reviewers and managing the process until all comments are closed. The CDE will support the collaborative review and a record of the comments and mark-ups will be retained within the CDE.

3.4 Common Data Environment (CDE)

The CDE is a technology platform that provides a single source of truth for all project information. It is used to collect, manage, and disseminate all relevant project information in a managed process that allows information to be shared between all members of the project team.

The CDE will support the capture of digital data and asset information, including contractual documents and correspondence, during the QTRIP phases and ongoing Operation & Maintenance phases of the asset lifecycle. The CDE solution will also meet the needs of Collaborative Contract Management, i.e. the management of contractual documents and correspondence (such as models, drawings, specifications, letters, inspector diaries, photographs, lots, etc) on an infrastructure project.

4 Roles and responsibilities

Transport and Main Roads has developed the following roles and responsibilities to provide clarity to project teams.

The department will establish the roles outlined below, with both general and specific BIM and information management responsibilities. It is expected that the lead appointed party will provide equivalent roles to interact with the department. The lead appointed party resources must take full responsibility for delivery of BIM and information management for their contracted part of a Transport and Main Roads project.

Roles and responsibilities are defined below and should not be confused with job titles and do not necessarily reflect full time equivalent (FTE) positions. It is important to consider these roles in terms of ownership, responsibility, and authority.

Table 4 – Roles and responsibilities

Role	Responsibilities
Transport and Main Roads – Project Manager	The Transport and Main Roads Project Manager must retain overall control of the project program, deliverables, and communication. To support BIM the Transport and Main Roads Project Manager must perform the following activities: • Assign a Transport and Main Roads BIM Information Manager for the project. • With assistance from Transport and Main Roads BIM Information Manager, prepare the EIR / PIR to go out during the invitation to tender process. • Review and comment on BIM Execution Plans (BEPs). • Guide in the establishment, monitoring and reporting of BIM KPIs.
Transport and Main Roads – BIM Information Manager	• Assist the Transport and Main Roads Project Manager to complete the, EIR / PIR to go out during the invitation to tender process (for smaller projects, this role could be taken by the department's Project Manager). • Lead in the evaluation of the BEP received from proponents during the tender evaluation. • Review and comment on BIM Executive Plans (BEPS). • Establish, monitor, and report BIM KPIs. • Periodic reviews of project processes, outputs, and compliance against the EIR / PIR for auditing purposes.

Role	Responsibilities
	• Manage the Transport and Main Roads CDE (depending on solution adopted and as defined in the EIR / PIR). • Manage and maintain the exchange of information between stakeholders. • Report on the delivery of information exchanges at all project stages / milestones to the Transport and Main Roads Project Manager. • Enable integration and coordination of information within the PIM.
Transport and Main Roads –BIM Reviewer	• Review and comment on the BEP. • Ensure relevant discipline models comply with the EIR. • Approve graphical models and design artefacts developed.
Lead appointed party – Project Manager	• Retain overall control of the project program, deliverables, and communication with appointing party and appointed parties.
Lead appointed party – BIM Manager	• Develop the BEP, using the Transport and Main Roads BEP template. • Liaise with Lead appointed party – Discipline BIM Leads to include their inputs from the Appointed Party – Task Team Discipline BIM Leads into the BEP. • Aggregate the task information delivery plan (TIDP) from each task team to establish the delivery team's master information delivery plan (MIDP). • Coordinate delivery of information into Transport and Main Roads CDE at designated data drops / exchanges. • Ensure information is delivered as per Responsibility Matrix. • Confirm suitability of models throughout project to enable collaboration. • Manage spatial coordination on behalf of the whole project team. • Manage clash avoidance where sub-contracted assets interface. • Manage all coordination and clash detection within contracted part of graphical models. • Ensure production of information in compliance with standards and methods.
Lead appointed party – Discipline BIM Lead	• Lead and coordinate the BIM processes for the delivery team.
Appointed party – Task Team Discipline BIM Lead	• Establish, and maintain a task information delivery plan (TIDP). • Provide input into the delivery team's master information delivery plan (MIDP) to support the project BEP. • Coordinate delivery of information into lead appointed party's CDE or Transport and Main Roads CDE at designated data drops. • Production of design outputs related to a discipline specific package of work. • Production of information in compliance with standards and methods. • Ensure information is delivered as per Responsibility Matrix. • Confirm information is suitable for issue to the CDE. • Manage spatial coordination on behalf of the discipline specific team. • Propose resolutions to coordination issues / clashes.

5 Model uses and outputs

The following are model uses which Transport and Main Roads deem valuable to enhance the delivery of projects and to support better outcomes into operations and maintenance. The lead appointed party should consider the applicable model use, their approach, and clearly articulate this as part of their BEP submission and revise accordingly if this approach should change.

Table 5.1 – Existing conditions modelling

Intended purpose	Information production considerations	Required output for delivery to Transport and Main Roads
To provide an accurate understanding of above and below ground assets and conditions.	The origin and prior governance of any information relied upon. Any prior interpretations that may have been made. What standards and levels of accuracy were referenced in the capture and production of information about existing assets and site conditions.	• Surface modelling. • Sub-surface modelling. • 3D feature lines. • 3D objects with attributes. • Digital Terrain Model (DTM) or contour models.

Table 5.2 – Design authoring and development

Intended purpose	Information production considerations	Required output for delivery to Transport and Main Roads
To enhance the coordination and understanding of the design as it progresses throughout project stages, through the use of spatial and object-based design models.	Models should be iteratively produced and coordinated amongst other disciplines through collaborative working procedures. Attribute data should be applied to modelled objects through the design development stage to enable asset information to be extracted at the completion of design development.	3D discipline specific models in: • Native file formats. • IFC 2x3 (for spatial coordination). • Other Published review formats as agreed. • Attribute data sets to be provided for extraction and uploading into the departments Information Management Systems.

Table 5.3 – Design / construction review and communication

Intended purpose	Information production considerations	Required output for delivery to Transport and Main Roads
To assist project stakeholders in understanding the physical and functional designs in a spatial manner and to manage input and feedback from reviews.	Interoperability between design authoring software and the ability for other stakeholders to reference and interact with discipline specific models should be considered, particularly if software or training is required.	• Federated models in a format that can be easily interfaced with by the appointing party.

Table 5.4 – Design visualisation

Intended purpose	Information production considerations	Required output for delivery to Transport and Main Roads
To allow project stakeholders to see and understand design solutions that represents reality so they can work towards improving the building design before construction starts.	Development of 3D federated virtual models to assist decision making and comprehension of the ultimate physical construction with added functionality for virtual fly-throughs and model interrogation.	• Federated models containing all required discipline models that fully represent the final construction.

Table 5.5 – Spatial coordination for clash avoidance / detection

Intended purpose	Information production considerations	Required output for delivery to Transport and Main Roads
To provide assurance that the collaborative and iterative design process is generating coordinated design and construction information and is being reported and managed effectively.	The focus should be on clash avoidance through the regular sharing and coordination of 3D models. Sharing of models should occur as and when they are ready and not only as per prior agreed regular intervals. Clash reporting should be used as a way of communicating key coordination issues and tracking the input, review and resolution of any coordination challenges.	• Evidence that the collaborative procedures outlined in the lead appointed party's BEP are being followed consistently. • Availability of a federated 3D attributed model comprising of all relevant discipline models. • A clash detection report made available prior to and leveraged during design and construction review meetings.

Table 5.6 – Design and engineering modelling for functional analysis

Intended purpose	Information production considerations	Required output for delivery to Transport and Main Roads
Leveraging analysis tools and performance simulations to test and significantly improve the design of the infrastructure.	Consider the engineering analysis tools to be used and how evidence and assurances of the virtual tests and simulations can be provided.	• Automate analysis resulting in saved time and cost. • Achieve the optimal design solution. • Improve quality of design through design analysis.

Table 5.7 – Quantity take-off and cost planning

Intended purpose	Information production considerations	Required output for delivery to Transport and Main Roads
Used for quantity take-off to determine material quantities from the design models for inclusion in the estimating process.	Consider cost estimation throughout each project development phase and allow access for financial management tracking against budget allocation.	• Material volume for estimation and scheduling. • Asset quantities for estimation and scheduling. • Exploration of design options. • Provision of cost information at each stage gate. • Ability to stay within budget. • Updated cost materials.

Table 5.8 – 2D drawing production

Intended purpose	Information production considerations	Required output for delivery to Transport and Main Roads
To clearly represent the design that is required to be constructed.	The information shown must be adequate for tendering and construction and align with Transport and Main Roads Drafting and Design Presentation Standards Manual.	• 2D drawings shall be derived from 3D attributed models to the fullest extent possible.

Table 5.9 – As Constructed models

Intended purpose	Information production considerations	Required output for delivery to Transport and Main Roads
To provide a static dataset reflecting both spatial and attribute data which fully represents what has been installed or constructed.	The precision and tolerances used in capturing or post-producing As Constructed models and data sets should be clearly stated. Consideration of the timing and methodology of how data will be captured is also important and should be included in the BEP. Mark-ups and redlining need to be resolved and used to update any model and attribute data prior to delivery to the appointing party for acceptance.	Model formats for As Constructed models and datasets can include: • 3D attributed information models created from As Constructed survey data capture. • Post-produced surface modelling.

Table 5.10 – 3D model attribution for asset handover

Intended purpose	Information production considerations	Required output for delivery to Transport and Main Roads
To provide the necessary data for transferral into Transport and Main Roads systems to support asset maintenance and operations activities.	The attributes must be complete, accurate and consistent with the standards, methods and procedures required by Transport and Main Roads and the project contract. Attributes for handover into operations and maintenance can be both embedded and associated with the 3D models. However, the preference is to have the data associated via the Unique Object Code for each maintainable asset to avoid the risk of duplication and issues with change control of data.	• 3D attributed models with unique object codes as a minimum. • Attributes to be extracted from the models and uploaded into departmental asset information management systems. • Associated attributes for use into operations and maintenance.

Table 5.11 – Construction, operations and maintenance planning and simulation

Intended purpose	Information production considerations	Required output for delivery to Transport and Main Roads
To assist operations and maintenance stakeholders in understanding and influencing the design and construction of assets.	Consider the systems and availability of operations and maintenance stakeholders in capturing their input and feedback on any simulation and how they can leverage the model and attribute information provided by projects beyond handover.	• Discipline and federated models which have been fully coordinated and approved. • Asset data in a format for consumption within the key asset information management systems.

6 Modelling and documentation practices

The following are the key considerations for modelling and documentation best practice.

6.1 Planning the modelling process

All projects have slightly different drivers and all companies will have different modelling standards and protocols. It is not the intention of this guide to try and make all projects the same. This is both impractical and would inhibit innovation. However, as a minimum, all planning and modelling processes shall comply with the department's survey and modelling standards / policies / and guidelines. Refer to the following references for more details:

- *Drafting and Design Presentation Standards Manual* (DDPSM)
- *Transport and Main Roads Surveying Standards*
- Transport and Main Roads' Technical Specifications (MRTS)
- Other relevant departmental technical policies, standards and guidelines found on the departmental website via http://www.tmr.qld.gov.au/business-industry/Technical-standards-publications.

The collaborative development of the BIM Execution Plan is where the standards, processes and procedures for the project are aligned.

6.2 Model location and orientation

Models should be located in accordance with the department's survey standards / policies and guidelines.

All survey plan co-ordinates must be on the Map Grid of Australia (MGA), which is based on the Geocentric Datum of Australia (GDA). All survey levels must refer to Australian Height Datum.

The lead appointed party must ensure that all surveying complies with the *Transport and Main Roads Surveying Standards*. The *Transport and Main Roads Surveying Standards* are comprised of a manual in two parts: a Schedule and technical notes.

6.3 Naming conventions and structure

As more and more information is shared digitally, the use of structured, consistent and understandable naming conventions for information becomes vital. The department has developed a naming convention and structure based on the concept of "container-based collaborative working".

In this sense it should be noted that a "container" can be a 3D model, a drawing, a document, a database, also known in general terms as a file.

All files and models should be consistently identified as per the agreed project information standards for file transfers to the appointing party under the client shared / published arrangements of the CDE. All files must follow a consistent naming convention throughout each design submission stage and during construction as outlined below.

Figure 6.3 – Transport and Main Roads file naming convention

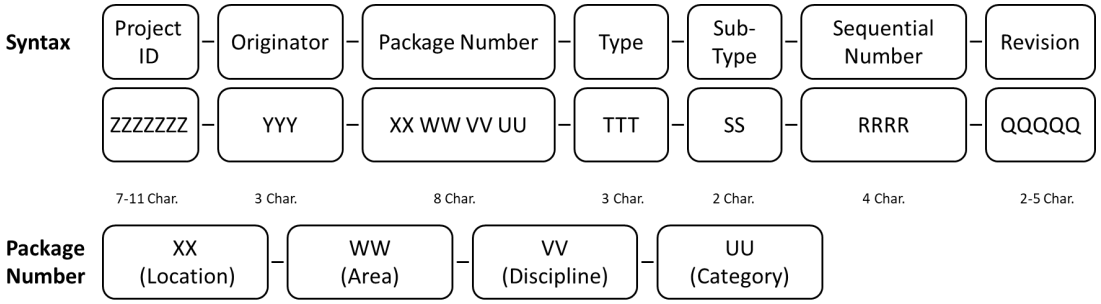


Table 6.3 – File naming convention guideline

Field	Description
Project ID (7 – 11 characters)	The project identifier the information container relates to, e.g IPMWR2D, CN19520.
Originator (3 characters)	The party responsible for producing the information container (as defined in the detailed responsibility matrix), e.g. TMR, DJV, CJV.
Location (2 characters)	The spatial aspect of the project the information container relates to. For example: specific work area within project extents e.g. global, early works, motorway, local roads.
Area (2 characters)	Additional spatial aspect of the project location if necessary, default 00
Discipline (2 characters)	The (technical) branch of the industry responsible for producing the information container. For example: civil engineer, structural engineer, drainage engineer, surveying.
Category (2 characters)	The functional aspect of the project the information container relates to. For example: road alignment geometry, hydrology assessment, intelligent transport systems.
Type (3 characters)	The type of information contained in the information container. For example: model, drawing, general correspondence, report.
Sub-Type (2 characters)	The sub-type of information contained in the information container. For example: pavement model, site plan, technical note
Sequential Number (4 characters)	A sequential/grouped number to make the ID unique when the codes in the other fields are otherwise the same.
Revision Number (2 – 5 characters)	The status of the information container to keep track of revisions that are shared by a task/project team. E.g PO1.1, PO2 (pre-contractual revision) in WIP or Shared state, CO1, CO2 (contractual revision) in Published state.

6.4 Asset object attributes

The ability to efficiently reuse data and information throughout the life of the model and the asset it relates to is one of the greatest benefits of BIM.

Even if the end use of the model / data has not been confirmed, the data must be created in a structured and consistent way for future translation.

In trying to achieve this consistency, and alignment with the department's asset management system requirements, the following Object Attributes Tables provide guidance on the objects and attributes that the department is looking to capture with a view to digitally extracting the asset attributes and uploading to the relevant systems.

The information listed in the following tables is not considered to be a comprehensive list at this stage but gives guidance to users on what the department is looking to achieve.

Where the department identifies additional objects to suit the needs of the project that are not listed in the Object Attributes Tables shown below, the department shall define the object’s attributes for inclusion in the lead appointed party’s BIM Execution Plan.

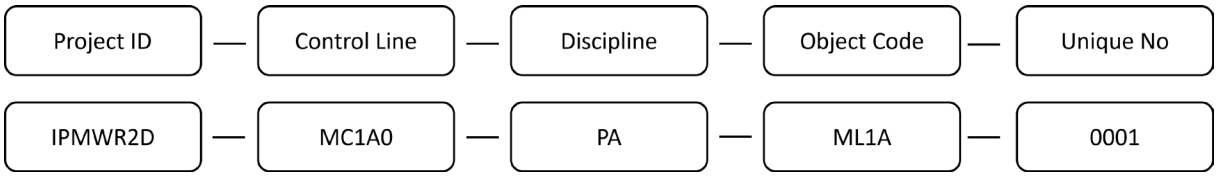
All required attributes shall be applied to the objects in the models and displayed on a dedicated “DTMR attributes” property set.

Where possible civil infrastructure components within specific discipline model files should be clearly identified by the use of unique object codes, as outlined below in Figure 6.4.

The unique object codes should be included as an attribute to the modelled object.

The use of the unique object codes as an attribute can be used to enable an effective process for automating and validating the object attributes which can have impacts to downstream BIM workflows such as estimating and validation of model object information.

Figure 6.4 – Example of the Transport and Main Roads unique object coding for civil infrastructure



Project ID = Ipswich Motorway Rocklea 2 Darra (IPMWR2D)

Control Line = MC1A0

Discipline = Pavements (PA)

Object Code = ML1A (Pavement configuration label)

Unique Number = 0001

Refer Section 6.5 for examples of a proposed list of unique object codes for Civil objects.

The full BIM object codes for bridges can be found in the *Building Information Modelling (BIM) for Bridges Manual*.

6.4.1 Object Attributes Tables – Civil

Table 6.4.1(a) – Drainage

Object	Attribute	Example Attribute
Culvert	UniqueObjectCode	IPMWR2D-MC1A0-DR-CU-0001
	ControlLine	MC1A0
	Chainage	62100
	SkewAngle	0°
	Type	RCP
	PipeSize	450
	NumberOfCells	2
	InvertUS	4.010
	InvertDS	3.900
	ConstructionLotNumber	To Contractors QA system
	ConstructionDate	DD/MM/YYYY
Pipe (Network)	UniqueObjectCode	IPMWR2D-MC1A0-DR-DG_0001
	NetworkName	8/124 to 9/124
	Type	RCP

Object	Attribute	Example Attribute
	PipeSize	450
	InvertUS	4.010
	InvertDS	3.900
	ConstructionLotNumber	To Contractors QA system
	ConstructionDate	DD/MM/YYYY
Gully pit / field inlet	UniqueObjectCode	IPMWR2D-MC1A0-DR-GP_0001
	UniqueObjectCode	IPMWR2D-MC1A0-DR-FI-0001
	Name	1/101
	Type	RKO
	PitTypeRemarks	INLET ON GRADE - 'S' LINTEL - LIL
	CoverRL	7.564
	PitCentreX	535763.782
	PitCentreY	6894618.016
	InvertDS	6.294
	PitDepth	1.270
	ConstructionLotNumber	To Contractors QA system
	ConstructionDate	DD/MM/YYYY
Access Chamber	UniqueObjectCode	IPMWR2D-MC1A0-DR-AC-0001
	Description	stormwater
	Type	MH1050
	PitTypeRemarks	REFER TMR DWG 1307
	CoverRL	7.603
	PitCentreX	535765.026
	PitCentreY	6894618.410
	SetoutZ	7.603
	InvertUS	5.270
	InvertDS	5.250
	PitDepth	2.353
	ConstructionLotNumber	To Contractors QA system
	ConstructionDate	DD/MM/YYYY

Table 6.4.1(b) – Pavements

Object	Attribute	Example Attribute
Pavements	UniqueObjectCode	IPMWR2D-MC1A0-PAV-MLLE-0001
	PavementConfiguration	MLLE
	LayerNumber	1, 2, 3, etc
	LayerDescription	Stone Mastic Asphalt
	LayerCode	G3
	LayerDepth	100 mm
	BinderType	A5S
	Additive	
	AdditivePercentage	
	LayerWidth	7.0 m
	ControlLine	MC1A0
	DesignESA's	7×10^5
	RoadSectionID	U16
	StartCHG	61950
	EndCHG	62300
	TdistStart	61.950 km
	TdistEnd	62.300 km
	CarriagewayDescription	Primary through undivided
	CarriagewayCode	2
	CarriagewayDirection	Gazettal / Against Gazettal
	ConstructionLotNumber	To Contractors QA system
	ConstructionDate	DD/MM/YYYY

Table 6.4.1(c) – Road Furniture

Object	Attribute	Example Attribute
Fence	UniqueObjectCode	IPMWR2D-MC1A0-RF-FNC-0001
	ModelName	Road Furniture
	FenceType	Chainwire
	ControlLine	MC1J0
	StartCHG	113.200
	EndCHG	245.000
	ConstructionLotNumber	To Contractors QA system
	ConstructionDate	DD/MM/YYYY

Object	Attribute	Example Attribute
Safety barrier	UniqueObjectCode	IPMWR2D-MC1A0-RF-SBCB-0001
	BarrierType	Concrete Barrier Single Slope Extruded TL5
	ModelName	Road Furniture
	StartType	SD1468 EJ
	EndType	SD1475 CB to WB
	ControlLine	MC1B0
	StartCHG	61800.000
	EndCHG	62030.000
	ConstructionLotNumber	To Contractors QA system
	ConstructionDate	DD/MM/YYYY
Safety barrier transition	UniqueObjectCode	IPMWR2D-MC1A0-RF-SBTR-0001
	ModelName	Road Furniture
	StartType	Concrete barrier
	EndType	W-Beam
	ControlLine	MC1B0
	StartCHG	61695.500
	EndCHG	61664.100
	ConstructionLotNumber	To Contractors QA system
	ConstructionDate	DD/MM/YYYY
Kerb / channel	UniqueObjectCode	IPMWR2D-MC1A0-RF-KB01-0001
	ModelName	Road Furniture
	KerbType	Type 1
	ControlLine	MD1A0
	StartCHG	61695.500
	EndCHG	61664.100
	ConstructionLotNumber	To Contractors QA system
	ConstructionDate	DD/MM/YYYY
Signage	UniqueObjectCode	PMWR2D-MC1A0-RF-SIG1-0001
	ModelName	Road Furniture
	ControlLine	MC1A0
	Chainage	61659
	Offset	7.5R
	SignID	20.14
	SignType	G1-1

Object	Attribute	Example Attribute
	Location	539482.297,6891706.702
	ConstructionLotNumber	To Contractors QA system
	ConstructionDate	DD/MM/YYYY

Table 6.4.1(d) – Noise Barriers

Object	Attribute	Example Attribute
Noise Barrier	UniqueObjectCode	IPMWR2D-MC1A0-RF-NB-0001
	ModelName	Road Furniture
	RoadSectionID	10A
	TdistStart	12.5
	TdistEnd	12.8
	InternalSpan	5000
	EndSpan	2500
	PostSize	400
	FootingDepth	2
	BarrierHeight	4.6
	PostType	Timber, Steel
	PanelType	Concrete, Krusscrete, Timber, Steel, Brick, Plywood, Asbestos, Hebel, Glass, Acrylic, Polycarbonate, Composite
	ConstructionDate	DD/MM/YYYY
	ConstructedBy	Fenco
	InspectionDate	DD/MM/YYYY
	InspectionLevel	1, 2
	InspectedBy	SLR, Projex Partners, Noise Team, Region, RoadTek
	OverallCondition	CRL0, CRL1, CRL2
	InspectComment	Free text
	InspectionReport	"Record"
	MaintnDate	DD/MM/YYYY
	MaintnBy	RoadTek
	MaintnDetails	Free text
	MaintnReport	"Record"
	DisposalDate	DD/MM/YYYY
	Comments	Free text

Table 6.4.1(e) – Public Utility Plant

Object	Attribute	Example Attribute
Existing utilities	UniqueObjectCode	IPMWR2D-MC1A0-PUPE-COM-0001
	ModelName	PUP Existing
	PUPType	SS
	AssetOwner	CGC
	AS5488QualityLevel	QL-C
	LocateMethod	GPR
	Size	225
	Material	PVC
	Status	Live / Decommissioned
Proposed utilities	UniqueObjectCode	IPMWR2D-MC1A0-PUPN-COM-0001
	ModelName	PUP New
	AssetOwner	Telstra
	PUPType	TU31DRdia100L
	AS5488QualityLevel	QL-A
	Size	100
	Material	PVC
	ConstructionLotNumber	To Contractors QA system
	ConstructionDate	DD/MM/YYYY

6.5 Examples of unique object codes – Civil

Civil Object Category	Design Object	Category Code	Object Code	Unique Object Code	Type Attribute	Comment
				Project ID — Control Line — Category — Object Code — Unique No IPMWR2D — MC1A0 — PA — ML1A — 0001		
Pavement	Pavements	PA	ACL	IPMWR2D-MC1A0-PA-CONFIG-0000	Pavement Layers	Project specific Pavement Configuration code defined in the project. Addition attributes will be applied at pavement layer level.
Drainage	Culvert	DR	CU	IPMWR2D-MC1A0-DR-CU-0001	Cross culvert	This code can be used for high level reporting of culverts. The Type of culvert (RCP, RCBC, and so on), shall be included in the Attribute list to allow for lower level sorting of objects
	Pipe_Network	DR	DG	IPMWR2D-MC1A0-DR-DG-0001	Longitudinal drainage network	
	Gully Pit	DR	GP	IPMWR2D-MC1A0-DR-GP-0001	Gully Pit	
	Field Inlet	DR	FI	IPMWR2D-MC1A0-DR-FI-0001	Field Inlet	
	Access Chambers_Manhole	DR	AC	IPMWR2D-MC1A0-DR-AC-0001	Access Chamber	Standard Drawings SD1307, SD1308 and SD1441 all relate to Access Chambers.
Road Furniture	Fence	RF	FNN	IPMWR2D-MC1A0-RF-FNN-0001	Fence Line no posts	To cater for different fences, as an alternative, we could include TYPE as an attribute to cater for FC/FP/FW/WF survey codes
			FNC	IPMWR2D-MC1A0-RF-FNC-0001	Chainwire	
			FNP	IPMWR2D-MC1A0-RF-FNP-0001	Fence incl posts	
			FNW	IPMWR2D-MC1A0-RF-FNW-0001	Weldmesh	
			FND	IPMWR2D-MC1A0-RF-FND-0001	Wind/Dust fence	
	Safety Barrier	RF	SBFB	IPMWR2D-MC1A0-RF-SBFB-0001	W Beam	As an alternative, to cater for different barriers include TYPE as an attribute to cater for FB/FE/FH barrier types.
			SBFE	IPMWR2D-MC1A0-RF-SBFE-0001	Wire Rope	
			SBFH	IPMWR2D-MC1A0-RF-SBFH-0001	Thrie Beam	
	Concrete Barrier	RF	SBCB	IPMWR2D-MC1A0-RF-SBCB-0001	Concrete Barrier	
	Concrete Barrier Transition	RF	SBTR	IPMWR2D-MC1A0-RF-SBTR-0001	Transition	
	Kerb_Channel	RF	KBnn	IPMWR2D-MC1A0-RF-KB01-0001	Type = 1	Refer Standard Drawing SD1033
			KBnn	IPMWR2D-MC1A0-RF-KB02-0001	Type = 2	
			KBnn	IPMWR2D-MC1A0-RF-KB03-0001	Type = 3	
			KBnn	IPMWR2D-MC1A0-RF-KB04-0001	Type = 4	

Civil Object Category	Design Object	Category Code	Object Code	Unique Object Code	Type Attribute	Comment
			KBnn	IPMWR2D-MC1A0-RF-KB05-0001	Type = 5	
			KBnn	IPMWR2D-MC1A0-RF-KB06-0001	Type = 6	
			KBnn	IPMWR2D-MC1A0-RF-KB07-0001	Type = 7	
			KBnn	IPMWR2D-MC1A0-RF-KB08-0001	Type = 8	
			KBnn	IPMWR2D-MC1A0-RF-KB09-0001	Type = 9	
			KBnn	IPMWR2D-MC1A0-RF-KB10-0001	Type = 10	
			KBnn	IPMWR2D-MC1A0-RF-KB11-0001	Type = 11	
			KBnn	IPMWR2D-MC1A0-RF-KB12-0001	Type = 12	
			KBnn	IPMWR2D-MC1A0-RF-KB13-0001	Type = 13	
			KBnn	IPMWR2D-MC1A0-RF-KB14-0001	Type = 14	
			KBnn	IPMWR2D-MC1A0-RF-KB15-0001	Type = 15	
			KBnn	IPMWR2D-MC1A0-RF-KB22-0001	Type = 22	
			KBnn	IPMWR2D-MC1A0-RF-KB23-0001	Type = 23	
			KBnn	IPMWR2D-MC1A0-RF-KB24-0001	Type = 24	
			KBnn	IPMWR2D-MC1A0-RF-KB25-0001	Type = 25	
			KBnn	IPMWR2D-MC1A0-RF-KB26-0001	Type = 26	
			KBnn	IPMWR2D-MC1A0-RF-KB27-0001	Type = 27	
			KBnn	IPMWR2D-MC1A0-RF-KB28-0001	Type = 28	
	Signage	RF	SIGN	IPMWR2D-MC1A0-RF-SIGN-0001	Information from MUTCD Part 1: *General introduction and index of signs* July 2023	
			SIR1	IPMWR2D-MC1A0-RF-SIR1-0001	Regulatory Signs	R1 = Movement series
			SIR2	IPMWR2D-MC1A0-RF-SIR2-0001		R2 = Direction series
			SIR3	IPMWR2D-MC1A0-RF-SIR3-0001		R3 = Pedestrian series
			SIR4	IPMWR2D-MC1A0-RF-SIR4-0001		R4 = Speed series
			SIR5	IPMWR2D-MC1A0-RF-SIR5-0001		R5 = Parking series
			SIR6	IPMWR2D-MC1A0-RF-SIR6-0001		R6 = Miscellaneous series
			SIR9	IPMWR2D-MC1A0-RF-SIR9-0001		R9 = Supplementary plates for general use
			SIRX	IPMWR2D-MC1A0-RF-SIRX-0001		RX = Railway crossing flashing signal assembly
			SIW1	IPMWR2D-MC1A0-RF-SIW1-0001	Warning Signs	W1 = Intersection series
			SIW2	IPMWR2D-MC1A0-RF-SIW2-0001		Intersection series
			SIW3	IPMWR2D-MC1A0-RF-SIW3-0001		W3 = Advance warning of traffic control device series
			SIW5	IPMWR2D-MC1A0-RF-SIW5-0001		W5 = Road Obstacle series
			SIW6	IPMWR2D-MC1A0-RF-SIW6-0001		W6 = Pedestrian, bicycle and school series
			SIW7	IPMWR2D-MC1A0-RF-SIW7-0001		W7 = Railway crossing series

Civil Object Category	Design Object	Category Code	Object Code	Unique Object Code	Type Attribute	Comment
			SIW8	IPMWR2D-MC1A0-RF-SIW8-0001		W8 = Supplementary plate series
			SIG1	IPMWR2D-MC1A0-RF-SIG1-0001	Guide Signs	G1 = Advanced direction series
			SIG2	IPMWR2D-MC1A0-RF-SIG2-0001		G2 = Major intersection direction (Type 1) series
			SIG3	IPMWR2D-MC1A0-RF-SIG3-0001		G3 = Minor intersection direction (Type 2 and Type 3) series
			SIG4	IPMWR2D-MC1A0-RF-SIG4-0001		G4 = Reassurance direction series
			SIG5	IPMWR2D-MC1A0-RF-SIG5-0001		G5 = Street name and pedestrian direction series
			SIG6	IPMWR2D-MC1A0-RF-SIG6-0001		G6 = Geographical feature series
			SIG7	IPMWR2D-MC1A0-RF-SIG7-0001		G7 = Service series
			SIG8	IPMWR2D-MC1A0-RF-SIG8-0001		G8 = Route marker series
			SIG9	IPMWR2D-MC1A0-RF-SIG9-0001		G9 = Traffic instruction series
			SIG10	IPMWR2D-MC1A0-RF-SIG10-0001		G10 = Kilometre posts
			SIG11	IPMWR2D-MC1A0-RF-SIG11-0001		G11 = Tourist series
			SIGE1	IPMWR2D-MC1A0-RF-SIGE1-0001		GE1 = Expressway advanced direction series
			SIGE2	IPMWR2D-MC1A0-RF-SIGE2-0001		GE2 = Expressway exit direction series
			SIGE3	IPMWR2D-MC1A0-RF-SIGE3-0001		GE4 = Expressway reassurance direction series
			SIGE6	IPMWR2D-MC1A0-RF-SIGE6-0001		GE6 = Expressway information series
			SIGE7	IPMWR2D-MC1A0-RF-SIGE7-0001		GE7 = Expressway service series
			SIGE9	IPMWR2D-MC1A0-RF-SIGE9-0001		GE9 = Expressway traffic instruction series
			SIGE11	IPMWR2D-MC1A0-RF-SIGE11-0001		GE11 = Expressway tourist series
			SIT1	IPMWR2D-MC1A0-RF-SIT1-0001	Temporary Signs	T1 = Advance series - index of signs for works on roads and temporary hazards
			SIT2	IPMWR2D-MC1A0-RF-SIT2-0001		T2 = Position series
			SIT3	IPMWR2D-MC1A0-RF-SIT3-0001		T3 = Road condition series
			SIT4	IPMWR2D-MC1A0-RF-SIT4-0001		T4 = Special hazard series
			SIT5	IPMWR2D-MC1A0-RF-SIT5-0001		T5 = Traffic diversion series
			SIT6	IPMWR2D-MC1A0-RF-SIT6-0001		T6 = Vehicle mounted series
			SIT7	IPMWR2D-MC1A0-RF-SIT7-0001		T7 = Hand banner series

Civil Object Category	Design Object	Category Code	Object Code	Unique Object Code	Type Attribute	Comment
			SIT8	IPMWR2D-MC1A0-RF-SIT8-0001		T8 = Pedestrian series
						Electronic series
			SITM1	IPMWR2D-MC1A0-RF-SITM1-0001	Multi-message series	TM1 = Advance signs
			SITM2	IPMWR2D-MC1A0-RF-SITM2-0001		TM2 = Position signs
			SITM3	IPMWR2D-MC1A0-RF-SITM3-0001		TM3 = Road condition signs
			SITM4	IPMWR2D-MC1A0-RF-SITM4-0001	Hazard markers	TM4 = Special hazard signs
			SITM5	IPMWR2D-MC1A0-RF-SITM5-0001		TM5 = Traffic diversion signs
			SITM8	IPMWR2D-MC1A0-RF-SITM8-0001		TM8 = Pedestrian and cyclist signs
			SITM9	IPMWR2D-MC1A0-RF-SITM9-0001		TM9 = Event signs
			SITM10	IPMWR2D-MC1A0-RF-SITM10-0001		TM10 = Lane status signs
			SIRM	IPMWR2D-MC1A0-RF-SIRM-0001		RM = Temporary regulatory signs
			SIWM	IPMWR2D-MC1A0-RF-SIWM-0001		WM = Temporary warning signs
			SIGM	IPMWR2D-MC1A0-RF-SIGM-0001		GM = Temporary direction signs
	Line Marking	RF	LM			
PUP	PUP Existing	PE	COM	IPMWR2D-MC1A0-PE-COM-0001	Communications	
			EL	IPMWR2D-MC1A0-PE-EL-0001	Electricity	
			FU	IPMWR2D-MC1A0-PE-FU-0001	Fuel	
			GAS	IPMWR2D-MC1A0-PE-GAS-0001	Gas	
			OIL	IPMWR2D-MC1A0-PE-OIL-0002	Oil	
				IPMWR2D-MC1A0-PE-SEW-0003	Sewer	
			WAT	IPMWR2D-MC1A0-PE-WAT-0001	Water	
	PUP New	PN	COM	IPMWR2D-MC1A0-PN-COM-0001	Communications	
			EL	IPMWR2D-MC1A0-PN-EL-0001	Electricity	
			FU	IPMWR2D-MC1A0-PN-FU-0001	Fuel	
			GAS	IPMWR2D-MC1A0-PN-GAS-0001	Gas	
			OIL	IPMWR2D-MC1A0-PN-OIL-0002	Oil	
				IPMWR2D-MC1A0-PN-SEW-0003	Sewer	
			WAT	IPMWR2D-MC1A0-PN-WAT-0000	Water	
Noise Barriers	Noise barrier	RF	NB	IPMWR2D-MC1A0-RF-NB-0001	Noise Barrier	Included in the Road Furniture category
Lighting	Power/Points of Supply	LI	POWPOS	IPMWR2D-MC1A0-LI-POWPOS-0001	Similar to ITSE - POW	POS = Point of supply
			POWGEN	IPMWR2D-MC1A0-LI-POWGEN-0001		GEN = Generator
			POWUPS	IPMWR2D-MC1A0-LI-POWUPS-0001		UPS = Uninterruptible power supply
			POWBAT	IPMWR2D-MC1A0-LI-POWBAT-0001		BAT = Battery

Civil Object Category	Design Object	Category Code	Object Code	Unique Object Code	Type Attribute	Comment
			POWSOL	IPMWR2D-MC1A0-LI-POWSOL-0001		SOL = Solar panel
	Switchboards_Junction box	LI	POWSWI	IPMWR2D-MC1A0-LI-POWSWI-0001		
	Pits_Barrier Voids	LI	POWPIT	IPMWR2D-MC1A0-LI-POWPIT-0001		
	Mounts_Poles_mounting brackets	LI	MTSPOL	IPMWR2D-MC1A0-LI-MTSPOL-0001		
	Luminaire_Lighting	LI	LMRLED	IPMWR2D-MC1A0-LI-LMRLED-0001	See ITSE - LMR	
	Linear Segments	LI	CON	IPMWR2D-MC1A0-LI-CON-0001		CON = Conduit
Traffic Signals	Cabinet Housing	TS	ENCTSC	IPMWR2D-MC1A0-TS-ENCTSC-0001		TSC = Traffic signal controller
	Cameras	TS	CAMRLC	IPMWR2D-MC1A0-TS-CAMRLC-0001		RLC = Red light camera
			CAMRLS	IPMWR2D-MC1A0-TS-CAMRLS-0001		RLS = Red light with speed camera
	Detectors	TS	DETLDV	IPMWR2D-MC1A0-TS-DETLDV-0001		DET = Detector / LDV = Loop Detector for vehicles
			DETPBP	IPMWR2D-MC1A0-TS-DETPBP-0001		DET = Detector / PBP = Push button detector for pedestrians
	Field Processors	TS	PROTSC	IPMWR2D-MC1A0-TS-PROTSC-0001		PRO = Processor / TSC = Traffic signal controller
	Lanterns	TS	LANVRA	IPMWR2D-MC1A0-TS-LANVRA-0001		LAN = Lantern / VRA = Vehicle Roundel Aspect
	Mounting Structures	TS	MTSPST	IPMWR2D-MC1A0-TS-MTSPST-0001		MTS = Mounting Structure / PST Post
			MTSTSM	IPMWR2D-MC1A0-TS-MTSTSM-0001		MTS = Mounting Structure / TSM = Traffic Signal Mast Arm
Intelligent Transport ITS&E	Power/Points of Supply	IT	POWPOS	IPMWR2D-MC1A0-IT-POWPOS-0001	Power	POS = Point of supply
			POWGEN	IPMWR2D-MC1A0-IT-POWGEN-0001		GEN = Generator
			POWUPS	IPMWR2D-MC1A0-IT-POWUPS-0001		UPS = Uninterruptible power supply
			POWBAT	IPMWR2D-MC1A0-IT-POWBAT-0001		BAT = Battery
			POWSOL	IPMWR2D-MC1A0-IT-POWSOL-0001		SOL = Solar panel
	Detectors_ITSE	IT	DETLDV	IPMWR2D-MC1A0-IT-DETLDV-0001	Detectors	LDV = Loop detector for vehicles
			DETLDC	IPMWR2D-MC1A0-IT-DETLDC-0001		LDC = Loop detector for cyclists
			DETPEZ	IPMWR2D-MC1A0-IT-DETPEZ-0001		PEZ = Piezoelectric detector
			DETSTR	IPMWR2D-MC1A0-IT-DETSTR-0001		STR = Strain gauge
			DETWTS	IPMWR2D-MC1A0-IT-DETWTS-0001		WTS = Wireless traffic sensor
			DETINF	IPMWR2D-MC1A0-IT-DETINF-0001		INF = Infrared detector
			DETRAV	IPMWR2D-MC1A0-IT-DETRAV-0001		RAV = Radar detector for vehicles
			DETRAP	IPMWR2D-MC1A0-IT-DETRAP-0001		RAP = Radar detector for pedestrians

Civil Object Category	Design Object	Category Code	Object Code	Unique Object Code	Type Attribute	Comment
			DETPBP	IPMWR2D-MC1A0-IT-DETPBP-0001		PBP = Push button detector for pedestrians
			DETPBC	IPMWR2D-MC1A0-IT-DETPBC-0001		PBC = Push button detector for cyclists
			DETPBV	IPMWR2D-MC1A0-IT-DETPBV-0001		PBV = Push button detector for vehicle access
	Dynamic Signs	IT	DYNVMS	IPMWR2D-MC1A0-IT-DYNVMS-0001	Dynamic Signs	VMS = Variable message sign
			DYNLUM	IPMWR2D-MC1A0-IT-DYNLUM-0001		LUM = Lane use management sign
			DYNVSL	IPMWR2D-MC1A0-IT-DYNVSL-0001		VSL = Variable speed limit sign
			DYNRCS	IPMWR2D-MC1A0-IT-DYNRCS-0001		RCS = Road condition information sign
			DYNTTS	IPMWR2D-MC1A0-IT-DYNTTS-0001		TTS = Travel time sign
			DYNCMS	IPMWR2D-MC1A0-IT-DYNCMS-0001		CMS = Changeable message sign
			DYNFWS	IPMWR2D-MC1A0-IT-DYNFWS-0001		FWS = Flashing warning sign
			DYNVAS	IPMWR2D-MC1A0-IT-DYNVAS-0001		VAS = Vehicle activated sign
			DYNSVA	IPMWR2D-MC1A0-IT-DYNSVA-0001		SVA = Enhanced school zone vehicle activated sign
			DYNESZ	IPMWR2D-MC1A0-IT-DYNESZ-0001		ESZ = Enhanced school zone speed limit sign
	ITS Enclosures	IT	ENCTSC	IPMWR2D-MC1A0-IT-ENCTSC-0001	Enclosures	TSC = Traffic signal controller
			ENCITS	IPMWR2D-MC1A0-IT-ENCITS-0001		ITS = Intelligent transport systems
			ENCNOD	IPMWR2D-MC1A0-IT-ENCNOD-0001		NOD = Network node
			ENCNET	IPMWR2D-MC1A0-IT-ENCNET-0001		NET = Networking assets enclosure
			ENCVMS	IPMWR2D-MC1A0-IT-ENCVMS-0001		VMS = Variable message sign enclosure
			ENCLUM	IPMWR2D-MC1A0-IT-ENCLUM-0001		LUM = Lane use management sign enclosure
			ENCDMS	IPMWR2D-MC1A0-IT-ENCDMS-0001		DMS = Dynamic message sign enclosure
			ENCSWS	IPMWR2D-MC1A0-IT-ENCSWS-0001		SWS = Speed warning sign enclosure
			ENCFOB	IPMWR2D-MC1A0-IT-ENCFOB-0001		FOB = Fibre optic breakout enclosure
			ENCPTB	IPMWR2D-MC1A0-IT-ENCPTB-0001		PTB = Post top box enclosure for switchboard
			ENCPIL	IPMWR2D-MC1A0-IT-ENCPIL-0001		PIL = Pillar box enclosure for switchboard
			ENCTOP	IPMWR2D-MC1A0-IT-ENCTOP-0001		TOP = Top hat enclosure

Civil Object Category	Design Object	Category Code	Object Code	Unique Object Code	Type Attribute	Comment
	ITS Mounting Structures	IT	MTSPOL	IPMWR2D-MC1A0-IT-MTSPOL-0001	Mounting Structures	POL = Pole
			MTSPST	IPMWR2D-MC1A0-IT-MTSPST-0001		PST = Post
			MTSTSM	IPMWR2D-MC1A0-IT-MTSTSM-0001		TSM = Traffic signal mast arm
			MTSITS	IPMWR2D-MC1A0-IT-MTSITS-0001		ITS = Intelligent transport system pole
			MTSOUT	IPMWR2D-MC1A0-IT-MTSOUT-0001		OUT = Outreach arm
			MTSBKT	IPMWR2D-MC1A0-IT-MTSBKT-0001		BKT = Bracket
			MTSTOW	IPMWR2D-MC1A0-IT-MTSTOW-0001		TOW = Tower
	Lanterns_ITSE	IT	LANVRA	IPMWR2D-MC1A0-IT-LANVRA-0001	Lanterns	VRA = Vehicle roundel aspect
			LANVAA	IPMWR2D-MC1A0-IT-LANVAA-0001		VAA = Vehicle arrow aspect
			LANUTA	IPMWR2D-MC1A0-IT-LANUTA-0001		UTA = U-Turn aspect
			LANBLA	IPMWR2D-MC1A0-IT-LANBLA-0001		BLA = Bus lane aspect
			LANEMA	IPMWR2D-MC1A0-IT-LANEMA-0001		EMA = Emergency aspect
			LANPDA	IPMWR2D-MC1A0-IT-LANPDA-0001		PDA = Pedestrian aspect
	Luminaires	IT	LMRLED	IPMWR2D-MC1A0-IT-LMRLED-0001	Luminaire	LED = Light emitting diode
			LMRHPS	IPMWR2D-MC1A0-IT-LMRHPS-0001		HPS = High pressure sodium
			LMRMHL	IPMWR2D-MC1A0-IT-LMRMHL-0001		MHL = Metal Halide
			LMRCFL	IPMWR2D-MC1A0-IT-LMRCFL-0001		CFL = Compact Fluorescent
			LMRLFL	IPMWR2D-MC1A0-IT-LMRLFL-0001		LFL = Linear Fluorescent
			LMRMVP	IPMWR2D-MC1A0-IT-LMRMVP-0001		MVP = Mercury vapour
			LMRLPS	IPMWR2D-MC1A0-IT-LMRLPS-0001		LPS = Low pressure sodium
	Cameras	IT	CAMAID	IPMWR2D-MC1A0-IT-CAMAID-0001	Cameras	AID = Automatic incident detection cameras
			CAMFIX	IPMWR2D-MC1A0-IT-CAMFIX-0001		FIX = Fixed camera, non web
			CAMNPR	IPMWR2D-MC1A0-IT-CAMNPR-0001		NPR = Automatic number plate recognition camera
			CAMPTZ	IPMWR2D-MC1A0-IT-CAMPTZ-0001		PTZ = Pan, tilt, zoom camera
			CAMWEB	IPMWR2D-MC1A0-IT-CAMWEB-0001		WEB = Fixed web camera
			CAMRLC	IPMWR2D-MC1A0-IT-CAMRLC-0001		RLC = Red light camera
			CAMRLS	IPMWR2D-MC1A0-IT-CAMRLS-0001		RLS = Red light with speed camera
			CAMFSC	IPMWR2D-MC1A0-IT-CAMFSC-0001		FSC = Fixed speed camera
			CAMPTP	IPMWR2D-MC1A0-IT-CAMPTP-0001		PTP = Point to Point camera
			CAMMPT	IPMWR2D-MC1A0-IT-CAMMPT-0001		MPT = Multipurpose trailer site

7 Definition of Terms

The following are terms used in this guideline or in common usage in discussion about BIM.

Term	Definition
3D attributed model	A 3D model that has attributes / data attached to objects. The attributes can be used to extract information into a database or table format. In relation to the ISO 19650-1 definition of an information model, Transport and Main Roads are focussed on the 3D attributed model component with respect to this EIR. All documentation requirements are as per contract and Transport and Main Roads requirements.
A Road Management Information System (ARMIS)	A bespoke Transport and Main Roads information management system made up of multiple sub-systems, ARMIS provides a data warehouse and a number of presentation and analysis tools. The information within ARMIS includes road location, road inventory, pavement condition, traffic data, crash history and routine maintenance performance contracts and so on. These systems capture and store the information, which is then fed into the data warehouse for retrieval using the presentation tools.
Appointed party	Is typically comprised of the task team commonly referred to as the sub-consultant / sub-contractor. A member of both the project team and a delivery team. The appointed party may include a number of task teams within it. According to ISO 19650-1 the appointed party is a provider of information concerning works, goods or services.
Appointed party – Task Team Discipline BIM Lead	Leads the BIM processes for their discipline.
Appointing party	Is the client, in this case Transport and Main Roads, responsible for owning the appointment / project. Primarily focused on providing the information requirements for the project and reviewing and approving the information supplied by the delivery team. The appointing party is considered a member of the project team. According to ISO 19650-1, the appointing party is a receiver of information concerning works, goods or services from a lead appointed party.
Asset Information Model (AIM)	Information model relating to the operational phase. (Refer to ISO 19650-1)
Asset Information Requirement (AIR)	Defines the specific information and data which must be delivered, along with the delivery format, to achieve Transport and Main Roads target state AIM. (Refer to ISO 19650-1)
Asset Information Management Systems (AIMS)	A suite of departmental IT systems (i.e. ARMIS, ROAR, BIS, etc.) that supports asset management.
BIM Execution Plan (BEP)	A formal document that is submitted by the proponents during a tender process outlining how they intend to meet the BIM requirements defined in Transport and Main Roads EIR. (Refer to ISO 19650-2) The BEP must be updated in line with trigger events throughout the life of the project.

Term	Definition
Building Information Modelling (BIM) (Process)	BIM is a process for creating and managing information of a built asset throughout its whole life cycle from planning, design, construction, operations, maintenance through to demolition. Information containers may take the form of 2D, 3D, or other structured or unstructured data sources. The effective and efficient use of BIM for decision support and achievement of desired project outcomes is impacted by "when" and "why" information is used and shared.
Bridge Information System (BIS)	A bespoke Transport and Main Roads information management system as part of the larger Bridge Asset Management System (BAMS). The objective of the BAMS is to establish effective business processes for the management of structures and to support this goal by an integrated and accessible information system. The BAMS includes: • development of an overarching policy for the management of structures, • development of an inspection methodology and manual for structures, • improvement of the processes involved in determining load carrying capacities of structures, and • implementation of the BIS. The purpose of the BIS is to support the BAMS by providing an integrated and accessible information system, containing comprehensive quality information on structures.
Common Data Environment (CDE)	A central repository where design and construction project information are housed. The contents of the CDE are not limited to information created in a 'BIM environment' and it will therefore include documentation, graphical models and non-graphical assets.
Computer Aided Design (CAD)	A geometric / symbol-based computer drawing system that replicates hand drawing techniques.
Container naming convention	A standard structured, consistent and understandable naming convention / information identification convention. The ISO 19650 series recommended principles are to be adopted: 1. Each information container should have a unique identifier, based upon an agreed information identification convention, which comprises a string of data fields. 2. Each information identification field is to be assigned a value from an agreed and documented codification standard.
Deliverables	The product of engineering and design efforts to be delivered to the appointing party as digital files and/or hardcopy documents. A deliverable may have multiple phases.
Delivery team	The delivery team is responsible for the production of the information requested by the appointing party under the contract and is comprised of resources from the lead appointed party and their appointed parties. (Refer to ISO 19650-1).
Exchange Information Requirements (EIR)	A key document intended to be part of the wider tender document set for the procurement of the design team and the constructor.

Term	Definition
Federated model	A single shared model resulting from combining the various individual discipline models and other data sources that do not lose their identity or integrity by being combined. The individual discipline models must remain the primary data source of information at all times throughout the contract.
Geographical Information Systems (GIS)	A computer-based system that captures, stores, analyses, and presents spatial and geographic data, aiding in the planning and management of various projects and resources.
iMAPS	Transport and Main Roads Interactive Mapping Solution (iMaps) – A Transport and Main Roads facing, browser based interactive mapping solution which integrates spatial and non-spatial data from both internal and external suppliers. It is tightly integrated into a range of Transport and Main Roads business processes and utilises Oracle Spatial, the ESRI technology stack and GeoCortex.
Industry Foundation Class (IFC)	A system of defining and representing standard architectural and construction-related graphic and non-graphic data as 3D virtual objects to allow data exchange among BIM tools, cost estimation systems, and other construction-related applications in a way that preserves the ability to perform analysis on those objects as they move from one BIM system to another. IFC files saved or exported from BIM-authoring software can be used for the following tasks: • coordination of BIM models and related design disciplines • carrying asset attributes for data extraction • clash detection • rules-based checking • sharing models between different BIM-authoring software • energy testing data derived from BIM models, and • systems simulation.
Information	Reinterpretable representation of data in a formalised manner suitable for communication, interpretation or processing.
Information management	Supports the data standards and data requirements for BIM use. Data continuity allows for the reliable exchange of information in a context where both sender and receiver understand the information.
Information model	As defined by ISO 19650-1, an information model is a coordinated set of structured and unstructured information containers in the form or geometric models, attribute data and/or documentation. The term ‘project model’ is also referenced on occasion i.e. within the *Drafting and Design Presentation Standard Manua*l and is relating to a 3D attributed model.
Information modelling	Information modelling is a sub-set of BIM and relates to the production and use of digital models that represent built assets.
Interoperability	The ability of two or more systems or components to exchange information and to use the information that has been exchanged.
Lead appointed party	Is the party responsible for co-ordinating information between the delivery team and the appointing party (client). The lead appointed party is a member of both the project team and a delivery team. Commonly referred to as the consultant / contractor.

Term	Definition
Lead appointed party – BIM Manager	Responsible for leading and implementing the BIM systems and processes to meet the project exchange and information modelling requirements.
Lead appointed party – Discipline BIM Lead	Leads and coordinates the BIM processes for the delivery team.
Lead appointed party – Project Manager	Retains overall control of the project program, deliverables, and communication with appointing party and appointed parties.
Level of development (LOD)	The department has adopted the use of this term to define the level of geometric model detail i.e. graphical representation of model geometry ranging from simplified (for space saving, e.g., LOD 200) to detailed (for visualisation e.g., LOD 300).
Level of information (LOI)	The department has adopted the use of this term to define the level of attribute data information i.e. non-graphical information or data associated to model geometry e.g. object name, object location, object material type, etc.
Level of information need	The level of information need is a framework, as defined by ISO 19650-1, which helps to define the minimum information requirements of 3D attributed models with respect to requirements outlined for each Transport and Main Roads delivery phase.
Map Grid of Australia (MGA)	A coordinate system based on the Universal Transverse Mercator projection and the Geocentric Datum of Australia. The unit of measure is the metre.
Master Information Delivery Plan (MIDP)	This is a term referred to in ISO 19650-2 which is a full schedule of information model deliverables for a project to be prepared by the lead appointed party. The MIDP should include all geometric, asset data and documentation deliverables. For Transport and Main Roads, this is captured by the work breakdown structure for the schedule of activities to include key information delivery milestones.
Model Production Delivery Table (MPDT)	The MPDT is a schedule of models which the delivery team, including the task / discipline teams, intend to create. The MPDT is to be coordinated and issued to the appointing party by the lead appointed party prior to commencing with model production.
Model use	A unique task or procedure on a project which can benefit from the application and integration of BIM into that process.
Project Information Model (PIM)	Information models including documentation, non-graphical information and graphical information developed during the design and construction phases of a project in response to requirements set out in the EIR. Information model relating to the delivery phase. (Refer to ISO 19650-1).
Project Information Requirements (PIR)	Defines the specific information requirements for the project, (for example, specific requirements beyond the AIR / EIR, timing requirements and any specifics relating to information delivery and transmission. (Refer to ISO 19650-1).
Project team	The project team has responsibility for the overall management of the project and is comprised of resources from the appointing party, the lead appointed party and all appointed parties. (Refer to ISO 19650-2).

Term	Definition
Road Operations Asset Register (ROAR)	A bespoke Transport and Main Roads asset register which holds asset related data for Intelligent Transport Systems and Electrical (ITS&E), Traffic Survey Data Management (TSDM), busway and tunnel assets.
Supplier	The provider of information concerning works, goods or services.
Task Information Delivery Plan (TIDP)	The TIDP is a subset of the MIDP to be produced by all appointed parties and coordinated to form the MIDP. According to ISO 19650-2 TIDP is a schedule of information containers and delivery dates, for a specific task team.
Task team	Task teams are teams focused on undertaking particular packages of work relating to discipline or task and is comprised of resources from the appointed parties. (Refer to ISO 19650-1).
Technical Publications	Are Transport and Main Roads documents published on the Technical Publications webpage, or Internal Publication Series.
Transport and Main Roads	Also referred to as Department of Transport and Main Roads, the department, the client, or the appointing party.
Transport and Main Roads BIM delivery phases	The three primary delivery phases, Procurement and Planning, Project Delivery, and Operations and Maintenance that provide the overarching guidance to the eight corresponding ISO 19650-2 Section 4 *Information management during the delivery phase of assets aligned sub-phases*. These BIM delivery phases are not to be confused with delivery stages / submission gates within the development phase of a project.
Transport and Main Roads – BIM Information Manager	Leads and coordinates the appointing party BIM processes for the project.
Transport and Main Roads – BIM Reviewer	Review and comment on the BEP. Ensure relevant discipline models comply with the EIR. Approve graphical models and design artefacts developed.
Transport and Main Roads – Project Manager	Retains overall control of the project program, deliverables, and communication for the appointing party.

8 References

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2. ISO 19650-2 *Organisation and digitisation 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*. The International Organization for Standardization https://www.iso.org/standard/68080.html
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