GIS Management Plan (GISMP) Template

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DMS-FT-581

Template – Applicable to Infrastructure and Place

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| Divisional Management System |
| Status: |  |
| Version: | 1.0 |
| Branch: | Technical Services |
| Section: | Digital Engineering |
| Business unit: |  |
| Date of issue: | October 2021 |
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| Asset classes:  | [x] Heavy Rail; [x] Light Rail; [x] [ ] Metro; [ ] [x] Roads; [x] Bridges;[x] Multi Sites; [x] Systems; [x] Fleets |
| Project delivery model: | Not applicable |
| Project type:  | For all project types |
| Project lifecycle: | [x]  Feasibility; [x]  Scoping; [x]  Definition;[x]  Construction readiness; [x]  Implementation; [x]  Finalisation; [ ]  Not applicable |
| Process owner:  | Director Digital Twin Integration |
|  |

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Standard Governance

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| --- | --- |
| Submitter: | Digital Engineering Workstream Specialists |
| Endorser: | Program Manager Digital Engineering |
| Approver: | Director Digital Twin Integration |

Document history

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| --- | --- |
| Version | Summary of Changes |
| 1.0 | First version released as part of Release 4 of the DE Framework |
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| WARNING: This template contains guidance as *hidden text*.Before proceeding please ensure hidden text is visible by selecting the tick box at:File > Options > Display > Hidden TextTo include guidance text when printing, turn on ‘Print hidden text’ in the same window. |

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or visit

<https://www.transport.nsw.gov.au/digitalengineering>

Instructions for use

a. GIS Management Plan context

This Geographic Information System Management Plan (GISMP) Template sets out the standard requirements and minimum requirements for the contents and a standard format for the GISMP in line with the Digital Engineering (DE) Framework[[1]](#footnote-2) and the TfNSW G75 Specification[[2]](#footnote-3). The Transport for NSW (TfNSW) project team or TfNSW representative is expected to make modifications to this template before it is provided to contractors as a GISMP Template.

Unless explicitly agreed with TfNSW, where any items in the GISMP do not comply with the project contractual requirements, the project contract requirements take precedence over the GISMP.

The elements to be included in each GISMP Template are dependent on:

* The project’s contract, including deed, requirements and works/services brief;
* The ways of working to be adopted by the project team, appropriate to the required deliverables, project structure, available resources and tools; and
* Appropriate industry best practices.

For all TfNSW Projects, the GISMP is based on the requirements outlined in the QA Specification G75 – Geographic Information Systems (GIS), and is designed to work with the GIS Data Schema (FT-580) available as part of the TfNSW DE Framework.

The GISMP is to be influenced by and compatible with the documents of the TfNSW DE Framework, in particular with the Digital Engineering Execution Plan (DEXP) (FT-532), as well as relevant standards and specifications.

b. Using the GISMP template

Text highlighted blue is guidance text for the TfNSW project team. Text highlighted yellow or *green italic* is guidance text for the contractor.

This text will be either:

* Provided as guidance or an instruction only and shown as italic hidden text, for example *use below table* or *TfNSW recommends that…* . This text does not need to be amended or confirmed.
* Provided as a prompt asking for information or as an example. Shown as normal text such as XXXXX or insert here. This text should be replaced, confirmed or removed to suit the project.

The TfNSW project team should update the template as instructed by the blue guidance text, remove highlights and delete unnecessary text prior to issuing to the contractor as a GISMP Template. In certain instances, it may be appropriate to convert blue highlights to yellow.

Similarly, the contractor should then populate the template as instructed by the yellow guidance text and submit back to TfNSW as a GIS project plan.

All sections of the GISMP template may not be relevant to the project and will be dependent on GIS scope and project details. These sections will be highlighted in blue for TfNSW to confirm applicability and where they are not applicable. Those sections which are deemed unnecessary should remain in the document and include the words ‘not applicable’ under the section heading. All section number and headings should be preserved in the order they are specified in this GISMP template.

The contractor may provide additional sub-sections if applicable and consolidate responses to multiple sections under one heading if text is referenced accordingly.

The TfNSW project team must take the project specific requirements into consideration when preparing the GISMP Template to suit the project needs, and the contractor taking action to create an active Project GISMP along with other related deliverables.

Where content required in this GISMP template is covered in a separate management plan or document, the contractor may make a cross reference to that plan/document and the content does not need to be repeated in the GISMP.

**Remove this section (up to the cover page) before submitting the GISMP.**

[Doc ref/number]

GIS Management Plan

[Project Name]

[Contract Name]

Project ref: [insert project name]

Document owner: [insert owner’s name]

Authoring Company: [insert company name]

Date of issue: [insert date]

Document Control:

|  |  |  |
| --- | --- | --- |
| Revision | Date | Description (Including Status) |
| XX | XX-XX-XXXX | XXXXXXXXXX |
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Preface

Transport for New South Wales (TfNSW) is developing and implementing the Digital Engineering (DE) Framework to support projects as they adopt new digital ways of working. The way assets are planned, designed, constructed, operated and maintained are becoming faster and more accurate as a result of emerging technologies. The DE Framework connects these technologies across various project disciplines together with reliable, structured data.

Consistent DE processes provide TfNSW with an approach that enables digital information to become a key enabler of better project outcomes. This includes, but is not limited to; stakeholder engagement, informed decision making, improved asset knowledge, capability and capacity planning.

Applying this unified vision will accelerate the value of DE, and simplify these new ways of working for both our project teams and industry, providing valuable insights, creating efficiencies and delivering cost savings throughout the project lifecycle.

This document should be read in conjunction with all related DE Framework documentation. Any application of the DE Framework or any of its parts must be considered in a project specific context. Adoption of the DE Framework should be undertaken in consultation with the DE Team to ensure best appropriate practice.

Table of Contents

[GIS Management Plan (GISMP) Template i](#_Toc83987458)

[GIS Management Plan 6](#_Toc83987459)

[1. Introduction 11](#_Toc83987460)

[1.1. Purpose of this GIS Management Plan 11](#_Toc83987461)

[1.2. Updating and developing this GISMP 11](#_Toc83987462)

[1.3. Terms and definitions 11](#_Toc83987463)

[2. Project details 11](#_Toc83987464)

[2.1. Project information, scope and program 11](#_Toc83987465)

[2.1.1. Project reference to DEXP 11](#_Toc83987466)

[2.1.2. Project objectives and GIS scope 12](#_Toc83987467)

[2.1.3. GIS work program 12](#_Toc83987468)

[2.1.4. Risks to GIS services or programs 12](#_Toc83987469)

[2.1.5. Innovation and value adding opportunities 13](#_Toc83987470)

[2.2. Roles and responsibilities 13](#_Toc83987471)

[2.2.1. Project team 13](#_Toc83987472)

[2.2.2. Responsibilities 14](#_Toc83987473)

[2.3. Identification of project specifications and requirements 14](#_Toc83987474)

[2.3.1. Compliance 14](#_Toc83987475)

[2.3.2. Interface to Digital Engineering Standards and Project DEXP 14](#_Toc83987476)

[2.3.3. Interfaces to other project management plans 14](#_Toc83987477)

[3. GIS data management 14](#_Toc83987478)

[3.1. Project coordinates 15](#_Toc83987479)

[3.2. GIS Schema 15](#_Toc83987480)

[3.2.1. Contractor requests for codes or schemas 15](#_Toc83987481)

[3.3. Initial data inputs 15](#_Toc83987482)

[3.3.1. GIS datasets 15](#_Toc83987483)

[3.3.2. Realtime data 16](#_Toc83987484)

[3.3.3. BIM or CAD Models 16](#_Toc83987485)

[3.4. Data management and quality assurance processes 16](#_Toc83987486)

[4. Collaboration 17](#_Toc83987487)

[4.1. Contractor’s internal collaboration environment 17](#_Toc83987488)

[4.2. Contractor collaboration activities 17](#_Toc83987489)

[4.2.1. Project team meetings 17](#_Toc83987490)

[5. GIS Application (if required) 18](#_Toc83987491)

[5.1. Application strategy 18](#_Toc83987492)

[5.2. General requirements 18](#_Toc83987493)

[5.3. Technical requirements 18](#_Toc83987494)

[6. GIS data validation 19](#_Toc83987495)

[7. GIS deliverables 19](#_Toc83987496)

[7.1. GIS delivery strategy 19](#_Toc83987497)

[7.2. GIS schema and deliverable management 19](#_Toc83987498)

Tables

[Table 1: Project Information with reference to DEXP 11](#_Toc83841234)

[Table 2: Project GIS objectives and scope 12](#_Toc83841235)

[Table 3: Risks to GIS services or programs 12](#_Toc83841236)

[Table 4: Project team contact details 13](#_Toc83841237)

[Table 5: Initial input GIS datasets 15](#_Toc83841238)

[Table 6: Initial input real-time data 16](#_Toc83841239)

[Table 7: Initial input 3D models 16](#_Toc83841240)

[Table 8: Project team meetings 17](#_Toc83841241)

[Table 9: Agreed GIS information exchange frequencies 18](#_Toc83841242)

[Table 10: GIS terms and definitions 20](#_Toc83841243)

[Table 11: User roles 29](#_Toc83841244)

Appendices

[Appendix A Terms and definitions](#_Toc83831925)

[Appendix B GIS Phase Objectives](#_Toc83831926)

[Appendix C Standard GIS Roles](#_Toc83831927)

[Appendix D GIS Schema [template]](#_Toc83831928)

# Introduction

## Purpose of this GIS Management Plan

DMS-ST-207 Digital Engineering Standard, Part 2 - Requirements / QA Specification G75

The purpose of this GIS Management Plan (GISMP) is:

1. To demonstrate to TfNSW the contractor’s interpretation of the Digital Engineering (DE) requirements, and compliance to the requirements of the G75 Specification;
2. To provide assurance to TfNSW that the GIS requirements will be met, by setting out how GIS will be managed and executed;
3. For clarification between TfNSW and the contractor on how GIS will be integrated and managed with the contractor’s DEXP, other management plans and associated activities;
4. To define to the contractor’s team how a GIS will be produced, coordinated and delivered in accordance with the TfNSW requirements.

## Updating and developing this GISMP

DMS-ST-207 Digital Engineering Standard, Part 2 – Requirements, Section 6.6 / QA Specification G75

The GISMP should be reviewed and maintained by the contractor throughout the course of the project and kept consistent with the Contract Management Plan and other project management plans. An updated version should be submitted for TfNSW review at each major project milestone and at appropriate intermediate instances as changes occur. The current project phase and scope, project team structure and capabilities should be kept appropriately up to date.

## Terms and definitions

DMS-SD-123 DE Terms and definitions

DE Framework terms and definitions are provided in DMS-SD-123 Digital Engineering Terms and definitions. In addition, GIS specific terms and definitions are listed in Appendix A, as well as QA Specification G75.

Additional terms and definitions may be added by the contractor, but existing terms and definitions should not be amended.

# Project details

## Project information, scope and program

This section provides general project information and scope.

### Project reference to DEXP

A summary of project information with reference to the Project Digital Engineering Execution Plan (DEXP) is provided in Table 1.

Locate the Digital Engineering Execution Plan (DEXP) and include reference information in the table below. If the DEXP is not yet completed, refer to the Project DE Manager or email the DE team: [Digital.Engineering@transport.nsw.gov.au](http://mailto:).

Table 1: Project information with reference to DEXP

|  |  |
| --- | --- |
| **Project** | **Details** |
| Project Name | [insert project name] |
| Project Address/Location | [insert project Address/Location] |
| TfNSW Project Number | [insert project number] |
| Procurement Type | [insert procurement type] |
| Project DEXP Document Number | [insert DEXP document number] |

### Project objectives and GIS scope

DMS-ST-202 Digital Engineering Standard, Part 1 – Concepts and principles, Section 3 / QA Specification G75, Clauses 2 and 3.1

This section summarises the GIS scope and strategy which supports the general project scope and objectives.

A key objective of a GIS is to form the base for the project’s Digital Engineering and other spatial information. The objective of a GIS is to assemble, manage and maintain a spatial database of GIS layers in accordance with the Australian Spatial Data Infrastructure (ASDI) standard, that can be used by stakeholders in decision making across all stages of the project, including planning, design, construction, operations an asset management. Project objectives, GIS scope and benefits are summarised in Table 2. Use the remainder of this section to provide any additional details for scope clarity.

*Prior to populating the tables below, the TfNSW project team should have undertaken a DE project strategy assessment through consultation with the DE team. Undertake a GIS strategy assessment and ensure that the GIS scope is tailored appropriately to the overall project objectives. Refer to the project Scope of Works and Technical Criteria (SWTC) or any other contract documents which capture GIS scope. Ensure scope is aligned with DE strategy and objectives. Provide in the table below the GIS strategy assessment results which link the project objectives to the applicable GIS scope and expected benefits.*

Use the table below to list GIS objectives, scope and benefits with reference to a DE project strategy assessment. A general example is provided.

Table 2: Project GIS objectives and scope

| **Project Objective** | **GIS Scope** | **Benefits** |
| --- | --- | --- |
| Upgrade of the Pacific Highway between Hexham and Qld Border providing safer travel, reduced travel times, more consistent travel and improved amenities. | Provide Digital Engineering GIS services, spatial data management and a GIS mapping portal Application for project planning, design, construction, operation and maintenance. | Facilitate enhanced visualisation of up-to-date and accurate spatial data to enable TfNSW data integration and digital twin initiatives, information sharing, collaboration and well-informed decision-making across entire project team.  |
| XXXXX | XXXXX | XXXXX |
| XXXXX | XXXXX | XXXXX |
| XXXXX | XXXXX | XXXXX |
| XXXXX | XXXXX | XXXXX |
| XXXXX | XXXXX | XXXXX |
| XXXXX | XXXXX | XXXXX |

### GIS work program

QA Specification G75, Clause 4.1.2 (f)

Insert here relevant details about the project GIS work program.

Refer to Table 8 (Contractor collaboration project team meetings) for an opportunity to list regularly scheduled meetings facilitating collaboration with GIS and broader project teams.

### Risks to GIS services or programs

QA Specification G75, Clause 4.1.2 (f)

Insert here any risks with potential to impact on GIS services and delivery program.

Use the table below to list identified risks to GIS services or work programs. Provide a corresponding risk rating, impact and mitigation strategy. A general example is provided.

Table 3: Risks to GIS services or programs

| **Risk Description** | **Risk Rating (Low, Medium, High)** | **Risk Impact** | **Mitigation Strategy** |
| --- | --- | --- | --- |
| Personnel/management absences or changes | Medium - High | Impact to agreed delivery program, dataset approvals or review requirements | Mitigate through sufficient set-up of project team structure  |
| Software/hardware transition or malfunction | High | XXXXX | XXXXX |
| Internal and external approvals not obtained in a timely fashion | Medium | XXXXX | XXXXX |
| XXXXX | XXXXX | XXXXX | XXXXX |
| XXXXX | XXXXX | XXXXX | XXXXX |
| XXXXX | XXXXX | XXXXX | XXXXX |
| XXXXX | XXXXX | XXXXX | XXXXX |

### Innovation and value adding opportunities

*It is recommended that each GIS project team demonstrates innovation or opportunities to add value to improve the delivery and overall outcomes of the project.*

Insert here any identified opportunities for innovation or value adding.

## Roles and responsibilities

DMS-ST-207 Digital Engineering Standard, Part 2 – Requirements, Section 7 / QA Specification G75, Clause 1.4

### Project team

Insert here details of the resources within the project team with specific responsibilities and authority. Contact details for the project team are provided in Table 4.

Use the table below to list project team details.

Table 4: Project team contact details

| **Role** | **Contact Name** | **Company** | **Contact Details** |
| --- | --- | --- | --- |
| TfNSW Project Manager | XXXX | TfNSW | XXXX |
| TfNSW Technical Manager(s) | XXXX | TfNSW | XXXX |
| TfNSW Digital Engineering Manager | XXXX | TfNSW | XXXX |
| TfNSW GIS Manager / Coordinator | XXXX | TfNSW | XXXX |
| TfNSW GIS Analyst(s) | XXXX | TfNSW | XXXX |
| Principal’s GIS Representative | XXXX | XXXX | XXXX |
| Contractor’s GIS Representative | XXXX | XXXX | XXXX |
| Project Manager/Director | XXXX | XXXX | XXXX |
| GIS Manager | XXXX | XXXX | XXXX |
| GIS Analyst(s) | XXXX | XXXX | XXXX |
| Insert additional key GIS roles as required | XXXX | XXXX | XXXX |

### Responsibilities

QA Specification G75, Clause 1.4.2

All nominated roles will have completed the appropriate and relevant training to fulfil their GIS responsibilities prior to project commencement.

The contractor must ensure they nominate a suitable role to fulfil each responsibility. TfNSW recognises that, depending on project size, multiple roles may be performed by one person.

## Identification of project specifications and requirements

DMS-ST-202 Digital Engineering Standard, Part 1 – Concepts and principles, Section 2.5 and Part 2 – Requirements, Appendix A / QA Specification G75, Clauses 4.1 and 4.2

### Compliance

The applicable DE standards and guides are listed in Appendix B of the Project DEXP.

As specified in QA Specification G75, this GISMP needs to describe:

* 1. The contractor’s approach and procedures to be adopted to ensure compliance with the requirements outlined in the G75 Specification;
	2. How the project team delivers the outcomes listed under the G75 Technical Requirements Clauses:
		1. 2.1. Dataset file formats, naming conventions, metadata and dataset level schema,
		2. 2.2. Cartographic Products,
		3. 2.3. Data Type Specific Requirements, and
		4. 2.4. Coordinate Reference System (Datum and Projection);
	3. How this GISMP is consistent with DMS-ST-207 Digital Engineering Standards;
	4. How this GISMP addresses required inclusions listed in G75 Clause 4.1.2;
	5. How this GISMP will be integrated and managed with the contractor’s other project management plans (if applicable).

The contractor must confirm the specific standards and guidelines identified in the DE Standard and QA Specification G75 to be followed by all project participants. Adoption of any other standards related to GIS may be proposed and any deviation from the listed standards must be agreed with the TfNSW GIS Representative.

### Interface to Digital Engineering Standards and Project DEXP

QA Specification G75 Clause 4.2.1, QA Specification G75, Clause 4.2.1

*When completing this GIS Management Plan, reference should be made to DMS-ST-207 Digital Engineering Standard Parts 1 and 2, as well as the Project DEXP. This section may be used to include specific project information pertaining to the relationship/interface of these standards and plans.*

### Interfaces to other project management plans

*DMS-ST-202 Digital Engineering Standard, Part 1 – Concepts and principles, Section 2.5 and Part 2 – Requirements, Appendix A*

Insert here any references to other relevant project management plans.

# GIS data management

DMS-ST-202 Digital Engineering Standard, Part 1 – Concepts and principles, Sections 5,DMS-ST-207 Digital Engineering Standard Part 2 – Requirements, Sections 4 and 5.3, QA Specification G75, Clause 2

This section defines how the TfNSW GIS data schema is to be applied. The consistent application of structured data results in a more coherent digital twin, enabling efficient computational management of project information and, ultimately, the physical assets.

All project participants work to the same Project Data Schemas (PDS), which are generated from a set of Digital Engineering Project Data Building Blocks (PDBB) owned by the TfNSW project team.

*All TfNSW-mandated and project-created datasets are managed in the Project Data Building Blocks (PDBB), developed by the TfNSW project team from the TfNSW template (DMS-FT-548).*

*The schema for GIS (FT-580) must be aligned with the PDBB prior to being issued to the contractor (e.g. making sure that the correct project milestone, discipline and other codes are translated from the MPDBB and version dates are reflected in the “Version Control” tab).*

## Project coordinates

QA Specification G75, Clause 2

It is essential to have a consistent Coordinate Reference System (CRS) across all project disciplines. Refer to the Project DEXP (Section 5.3) for project coordinate system definition.

## GIS Schema

DMS-ST-207 Digital Engineering Standard, Part 2 – Requirements, Section 6.6; and QA Specification G75 Geographical Information Systems, Clause 4.1.2; DMS-FT-580 GIS Schema, QA Specification G75, Clause 2

The purpose of the GIS Schema template is to standardise the naming, structure and metadata of TfNSW spatial data.

Define how the DMS-FT-580 GIS Schema will be used to support the development of the GIS deliverables including assurance of alignment and integration with the project’s other DE Project Data Schemas. Refer to Project DEXP Section 3.5 for a table of all schemas used on the project including survey, BIM, CAD, asset data, etc.

### Contractor requests for codes or schemas

*If an appropriate classification or reference code or schema cannot be determined, the contractor will request a new code from TfNSW via the DE Change of Code Request Form, submitted by your TfNSW DE Manager to the TfNSW DE Team at Digital.Engineering@transport.nsw.gov.au.*

Insert in this section details pertaining to specific requests for codes or schemas.

## Initial data inputs

QA Specification G75, Clause 4.1.2(b)

GIS data can originate from many different sources or data producers and the data may be in several different file formats and data structures. At various stages of the project, whether it is at project initiation or during any phase, data may be acquired from other sources as input data for the GIS activities. This section defines initial data inputs for the project.

### GIS datasets

Insert in this section details of the initial input GIS datasets used for the project. Defining this initial set of data required will assist in ensuring the correct datasets are sourced to initiate the development of the GIS database. This section may also just reference the relevant sections of the GIS Schema (FT-580), which should be used to manage the relevant details once the data has been procured or sourced for use by the project.

Enter in the below table relevant information regarding initial input GIS datasets.

Table 5: Initial input GIS datasets

| **Description** | **Source** | **Link/Reference** | **Contact**  | **Date of Reference** |
| --- | --- | --- | --- | --- |
| Dataset #1 | XXXX | XXXX | XXXX | XXXX |
| Dataset #2 | XXXX | XXXX | XXXX | XXXX |
| Dataset #3 | XXXX | XXXX | XXXX | XXXX |
| XXXX | XXXX | XXXX | XXXX | XXXX |

### Realtime data

This section provides details of any real-time data feeds (from IoT sensors or other sources) used as inputs for the GIS. Insert in this section details of the initial input realtime datasets used for the project.

Enter in the below table relevant information regarding initial input real-time data.

Table 6: Initial input real-time data

| **Description** | **Source** | **Link/Reference** | **Contact**  |
| --- | --- | --- | --- |
| Feed #1 | XXXX | XXXX | XXXX |
| Feed #2 | XXXX | XXXX | XXXX |
| Feed #3 | XXXX | XXXX | XXXX |
| XXXX | XXXX | XXXX | XXXX |

### BIM or CAD Models

This section provides details of any BIM or CAD models used as inputs for the GIS. Insert in this section details of the initial input BIM or CAD (2D or 3D) datasets used for the project.

Enter in the below table relevant information regarding initial BIM or CAD models.

Table 7: Initial input BIM or CAD models

| **Description** | **Source/Reference** | **Format** | **Provider Contact**  | **Date** |
| --- | --- | --- | --- | --- |
| Model #1 | XXXX | XXXX | XXXX | XXXX |
| Model #2 | XXXX | XXXX | XXXX | XXXX |
| Model #3 | XXXX | XXXX | XXXX | XXXX |
| XXXX | XXXX | XXXX | XXXX | XXXX |

## Data management and quality assurance processes

QA Specification G75, Clauses 4.1.2 (c) and 4.2.2, DMS-ST-207 Digital Engineering Standard, Part 2 – Requirements, Section 8.1

This section provides an overview of the key GIS data management and quality assurance processes for this project including:

* The process by which new datasets are created, and their source datasets identified and verified (including metadata management);
* The process for updating each dataset as the work progresses, and how these processes are triggered; and
* How the “single source of truth” principle will be maintained when the GIS form part of the federated project model.
* Systems and processes used to ensure that the information presented in the GIS Application remains consistent with each discipline within your project team.
* How the electronic content management (ECM) system will be used to manage GIS datasets.

Information provided includes data governance, project specific procedures and security aspects.

Insert in this section an overview of the proposed data management processes and/or procedures for creating and updating new GIS datasets. This section may also be used for change management details.

Refer to Project DEXP (Sections 6.1 and 6.2) for project quality control strategy, checks and processes. For clarification or further information, contact the Project Digital Engineering Manager. Include additional information here for GIS-specific quality control strategies.

# Collaboration

## Contractor’s internal collaboration environment

DMS-ST-202 Digital Engineering Standard, Part 1 – Concepts and principles, Section 7 and DMS-ST-207 Digital Engineering Standard Part 2 – Requirements, Section 2 / QA Specification G75, Clauses 4.2.1 and 4.2.2

Refer to Project DEXP (Section 4.1) for contractor’s internal collaboration environment. The referenced section defines project hardware/technology infrastructure requirements, as well as software platforms and versions. *For further information liaise with the Project Digital Engineering Manager.*

Insert here any information here specific to GIS internal collaboration environment.

## Contractor collaboration activities

DMS-ST-202 Digital Engineering Standard, Part 1 – Concepts and principles, Sections 7 and 8 and DMS-ST-207 Digital Engineering Standard Part 2 – Requirements, Section 2 / QA Specification G75, Clauses 4.5.3 and 4.5.4

This section outlines the information exchange / deliverable submission requirements and processes, including how the contractor will ensure compliance in meeting the requirements outline in Section 5 GIS deliverables of this management plan.

Refer to Project DEXP (Section 4.2) for contractor’s internal collaboration activities. For further information liaise with the Project Digital Engineering Manager. Include specific information here specific to GIS internal collaboration environment.

This section is for the contractor to define and communicate collaboration processes as well as coordination workflows specific to GIS.

The contractor is to summarise the approach to collaboration with TfNSW, internal team and other stakeholders and provide an overview of the proposed GIS dataset submission process, including any data validation activities.

### Project team meetings

QA Specification G75, Clause 4.3

In the below table add team meetings including collaboration with broader DE and other disciplines. These may include coordination, design review, constructability reviews, health and safety walkthroughs. This table should include all meetings with TfNSW, external project stakeholders and key internal meetings.

Table 8 lists collaborative meetings on projects which are fundamental to ensure success of GIS development and delivery. This includes meetings focused on implementing and managing GIS processes and deliverables.

Table 8: Project team meetings

| Meeting Type | Date/ Frequency | Facilitator | Attendees |
| --- | --- | --- | --- |
| Client Brief | XXX | TfNSW Project Manager | XXX |
| GIS Inception Meeting | XXX | TfNSW GIS Manager | XXX |
| GIS Management Plan Review | XXX | TfNSW GIS Manager | XXX |
| DE Collaboration Meeting | XXX | DE Manager | XXX |
| XXX  | XXX | XXX | XXX |

# GIS Application (if required)

## Application strategy

QA Specification G75, Clause 4.2.2

Insert here strategy for GIS Application including development, delivery and information exchange plan.

Refer to the Project DEXP (Section 4.1.2) for project software platforms and agreed frequencies of information exchange across the project team. Insert here processes used to ensure that the information presented in the GIS Application remains consistent with each discipline within your project team. Use the table below to details how the datasets in the GIS Application will be submitted at each information exchange.

In the table below detail frequency of information exchanges between TfNSW, discipline teams (external and internal) and other stakeholders.

Table 9: Agreed GIS information exchange frequencies

| GIS Application | Information Submission/ Exchange Frequency | Formats | Other Software Applications (Survey, Design, Model Review etc.) | Stakeholders |
| --- | --- | --- | --- | --- |
| XXX | XXX | XXX | XXX | XXX |
| XXX | XXX | XXX | XXX | XXX |
| XXX | XXX | XXX | XXX | XXX |
| XXX | XXX | XXX | XXX | XXX |

## General requirements

QA Specification G75, Clauses 3.2 and 4.1.2 (i)

Use this section to define how the GIS Application will meet G75 Clause 3.2 - GIS Application General Requirements.

## Technical requirements

QA Specification G75, Clauses 3.3 and 4.1.2 (i)

Use this section to define how the GIS Application will meet G75 Clause 3.3 - GIS Application Technical Requirements.

# GIS data validation

QA Specification G75, Clause 4.1.2 (e)

Insert here an overview of the contractor’s internal data validation procedures, or refer to the relevant quality management plan.

Summarise applicable quality control procedures, including:

* Receiving data from the TfNSW or other stakeholders;
* Managing quality of project information within the Contractor-CDE during coordination;
* Validation and verification prior to submission to TfNSW;
* Audits of GIS processes, including tracking of issues;
* Understanding of hold point requirements;
* Demonstrating compliance with Project Data Schemas.

# GIS deliverables

## GIS delivery strategy

Outline the means by which the objectives and scope of a project GIS are to be delivered.

## GIS schema and deliverable management

DMS-ST-202 Digital Engineering Standard, Part 1 – Concepts and principles, Sections 7 and 8 and DMS-ST-207 Part 2 – Requirements, Section 2, QA Specification G75, Clauses 4.1.2 (a), 4.1.2 (h) and 4.5

Insert here reference to the Project GIS Data Schema (FT-580). Use this section to include additional detail for GIS deliverables including datasets, services, cartographic products and/or applications.

Appendix A Terms and definitions

Refer to DMS-SD-123 Digital Engineering Terms and definitions. Table 10 contains additional terms and definitions relevant to cartography and GIS services.

*Contractor to define any terms used which are not defined in DMS-SD-123 or Table 10.*

Table 10: GIS terms and definitions

| **Terms & Acronyms** | **Definition** |
| --- | --- |
| **Alignment** | A line that describes the route to be used for the design and construction of the railway. |
| **ASDI** | Australian Spatial Data Infrastructure. A framework of people, policies and technologies that expedite ready access to, and use of, spatial data resources held around Australia. |
| **Attribute Table** | A database table containing fields (attributes) that describe an Entity. |
| **Base Map** | A map showing planimetric, topographic, geological, political, and/or cadastral information that may appear in many different types of maps. The base map information is a foundation upon which other types of changing thematic information can be overlaid. Base map information may be as simple as major political boundaries, major hydrographic data, or major roads. The changing thematic information may be bus routes, population distribution, or caribou migration routes. |
| **Cadastre** | A record of interests in land, encompassing both the nature and extent of interests. Generally, this means maps and other descriptions of land parcels as well as the identification of who owns certain legal rights to the land (such as ownership, liens, easements, mortgages, and other legal interests). Cadastral information often includes other descriptive information about land parcels. |
| **Cartographic Output**  | The graphic results, in either hard or soft copy, of the processing of GIS data through various operations. |
| **CDE** | Common Data Environment represented by a central server that can be linked by dedicated +hardwire or a cloud server linked by internet connection. |
| **Coordinate system** | The system used to measure horizontal and vertical distances on a map. In a GIS, it is a system whose units and characteristics are defined by a map projection. A common coordinate system is used to spatially register geographic data for the same area. |
| **CPD** | Collaborative Project Delivery where all participants in the Project share their data and information through a CDE to achieve a fully coordinated design. |
| **Data Capture** | A series of operations required to encode data in a computer-readable digital form. Examples of data capture methods include digitizing, scanning, text entry, etc. |
| **Data model** | a)    A generalized, user-defined view of the data related to applications. |
| b)    A formal method for arranging data to mimic the behaviour of the real world entities they represent. Fully developed data models describe data types, integrity rules for the data types, and operations on the data types. Some examples of data models are : triangulated irregular networks, images, and georelational or relational models for tabular data. |
| **Data Set** | A collection of objects with a common theme or characteristics. |
| **Data Structure** | The hierarchical organization of data, particularly the reference linkages among data elements. |
| **Datum** | A mathematical reference framework for geodetic coordinates defined by the latitude and longitude of an initial point, the azimuth of a line from this point, and the parameters of the ellipsoid upon which the initial point is located. |
| **Digital Data** | In this documentdigital data is the electronic binary code used as input to a software application programme or the resultant output from a software application programme. |
| **Easting (E) /** **Northing (N)** | Eastward and northward coordinates on a map projection plane. NOTE: The eastward and northward directions on a map projection plane are only an approximation to the true east and north direction. |
| **Ellipsoid** | The model used to represent the shape of the earth. Because the shape of the earth’s surface differs from one geographic area to another often different ellipsoids are used to model different areas. |
| **Entity** | An object that exists at a specific geographic location. |
| **Entity Class** | A group of Entity Types that have similar attributes or characteristics. |
| **Entity Set** | A collection of Entity Classes. |
| **Entity Type** | The logical name for all geographic entities that have exactly the same attributes. Synonyms: feature type. |
| **Feature** | A set of points, lines or polygons that represent a real-world entity. The terms *entity*, *feature* and *object* are often used synonymously. |
| **Latitude** | The distance of a point north or south of the equator. A line running east-west parallel to the equator. |
| **Line** | An ordered set of coordinates that is used to represent 1) the edge of a natural geographic feature, 2) the location of a geographic feature which is too narrow to be displayed as an area at the map publication scale (for example, a road or river), or 3) a geometrically or legally defined feature such as a road centreline, survey traverse, or administrative boundary. |
| **Longitude** | The angular distance, measured in degrees, cast or west from the Greenwich meridian.  |
| **Map Objects** | A set of points, lines or polygons in a spatial database that represent a geographic entity or feature. The terms *entity*, *feature* and *object* are often used synonymously. |
| **Map Projection** | A mathematical model for converting locations on the earth's surface from spherical to planar coordinates, allowing flat maps to depict three dimensional features. Some map projections preserve the integrity of shape; others preserve accuracy of area, distance, or direction. |
| **Metadata** | Information about a document, model, drawing, object, asset, or other thing. |
| In general, any data describing the accuracy or source of data. This can include collection methods, date of collection, who collected it, how it was processed, etc. |
| **Model Files**  | The base files representing common project data (2D or 3D). Drawing coordination of all disciplines working on the Project is achieved by producing drawings files from externally referenced Model file data (eg. Base Map). |
| **Originator** | All PSC’s, Contractors their Sub-Contractors, Design Consultants and Suppliers who produce data, design drawings and models for the Project (see PSC). |
| **Orthophoto** | A photograph of the earth's surface in which geographic distortion has been removed. |
| **PIM** | Project Information Model developed during the design and construction phase of a project.  |
| **Pixel** | The smallest indivisible element of a digital image. |
| **Point** | An object that has a location but no dimensions. |
| **Polygon** | A series of connected lines forming a closed area.  |
| **Raster** | A format for storing and displaying graphic data in which values are stored as uniform grid of cells. |
| **Rectify** | The process by which an image or grid is converted from image coordinates to real-world coordinates. Rectification typically involves rotation and scaling of grid cells, and thus requires resampling of values. |
| **Registration** | The procedure used to bring two maps or data layers into concurrence via known ground location control points or the procedure of bringing a map or data layers into concurrence with the earth's surface. |
| **Resolution** | 1. The pixel size of a digital image. 2. The size of a cell in a grid or raster.  |
| **Responsible Person** | The Originator’s staff authorised to sign off design drawings as approved, for issue to The Principal. |
| **Scale** | The relationship between a distance on a map and the corresponding distance on the earth, normally expressed as a ratio, e.g., 1:1000. |
| **Spatial Data** | Data pertaining to the location and dimensions of geographical entities. |
| **Survey Drawings** | Drawings that show the primary survey monuments and relevant survey information used to inform the design, setting out and construction of the Works. |
| **Symbol**  | A graphic element used to indicate the occurrence/location of an item or feature, but not necessarily drawn to scale. CAD symbols can be graphic elements contained in a block. |
| **The Principal** | The client body (Transport for NSW) |
| **The Works** | All the collective activities associated with the Project. |
| **Thematic Map** | A map depicting selected kinds of information relating to one or more specific themes (e.g. soil type, land classification, population density). |
| **TIFF** | An industry standard raster image format which supports black-and-white, grey-scale, pseudo-colour, and true-colour images. |
| **Tile** | A rectangle that is part of a grid used to divide map data into manageable units. |
| **Topographic map** | A map of natural and cultural (man-made) features such as drainage, roads, landmarks, vegetation, buildings and/or populated areas, and relief or elevation. Administrative boundaries are also usually included. |
| **Topology** | The spatial relationships between connecting or adjacent features. |
| Topological relationships are built from simple elements into complex elements, points being the simplest elements, lines being sets of connected points, and areas being sets of connected lines. |
| **Validation**  | The process to ensure the final product conforms to defined user needs and/or requirements. |
| **Vector Data** | A coordinate-based data structure commonly used to represent map features. Each linear feature is represented as a list of ordered x, y, z coordinates. Attributes are associated with the feature (as opposed to a raster data structure, which associates attributes with a grid cell). |
| **Verification**  | The process to ensure that the outputs of a design stage (or stages) meet the design inputs requirements. |

Appendix B GIS Phase Objectives

Example GIS phase objectives for:

**B.1. Plan, Design and Construction Phase Objectives**

The following data sets will be included in the GIS during the design and construction phase:

* Base mapping
* Imaging data (aerial photography, satellite imagery, etc.)
* Survey data
* Utilities data
* Rail data
* Roads data
* Bridge data
* Cadastral data
* Ground investigation data
* Constraints data (utilities, buildings, foundations, flooding, noise and vibration and others)
* Geotechnical data
* Alignment geometry
* Crossing feature locations and attributes
* Structure locations and attributes
* Environmental data (flooding, contamination, dust, noise and vibration and others)
* Systems assurance data (risk, hazard, safety and others)
* Others as defined

**B.2. Operation and Asset Management Phase Objectives**

The GIS is scalable and will continue to have value added to it during the operations and asset management phase to support activities, including:

* Land management
* System Assurance (Reliability, Availability, Maintainability and Safety (RAMS)
* Asset management
* Facility management
* Rail and track maintenance
* Structure maintenance
* Signage and advertising panel maintenance and management
* Emergency and incident management
* Environmental management
* Human resource management
* Demographic and market analysis
* General data storage, query and retrieval
* Others as defined

Appendix C Standard GIS Roles

Standard roles that can be assigned to users within a GIS Application.

*The contractor is to use the user roles defined in the table below to define user access rights, etc. Any additional roles, or different descriptions can be updated in the table below and applied consistently for the project.*

Table 11: User roles

| User Role | Description |
| --- | --- |
| Viewer | View items such as maps, apps, scenes, and layers that have been shared with the public, the organization, or a group to which the member belongs. Members assigned the Viewer role cannot create or share content, or perform analysis. The Viewer role is compatible with all user types. |
| Data Editor | Viewer privileges plus the ability to edit features shared by other users. The Data Editor role is compatible with all user types except Viewer. |
| User | Data Editor privileges plus the ability to create groups and content. Users can use the organization's maps, apps, layers, and tools, and join groups that allow members to update all items in the group. Members assigned the User role can also create maps and apps, edit features, add items to the portal, share content, and create groups. |
| Publisher | User privileges plus the ability to publish hosted web layers, shared server layers, register data stores, publish from data store items, and perform feature and raster analysis. |
| Administrator | Publisher privileges plus privileges to manage the organization and other users. An organisation must have at least one administrator, though two is recommended. There is no limit to the number of members who can be assigned to the Administrator role within an organisation; however, for security reasons, you should only assign this role to those who require the additional privileges associated with it. |

Appendix D GIS Schema [template]

TfNSW project team to pre-populate the DMS-FT-580 *GIS Schema Template* with relevant GIS information relevant to the contractor’s scope of work. Where previous work has been done, the GIS Schema from a previous phase may be used as the template for the latter.

Contractor to populate for the full scope of work contracted for relevant submissions as defined in the QA Specification G75 and Digital Engineering Standard. Where previous work has been done, the schema and GIS deliverables from a previous phase may be used as the basis for the next phase.

The contractor is expected to submit the populated GIS Schema as a separate deliverable, cross-referenced from the GISMP (and/or DEXP). This appendix is to be retained, containing the GIS Schema template used by the contractor.

1. https://www.transport.nsw.gov.au/digital-engineering/resources [↑](#footnote-ref-2)
2. https://www.rms.nsw.gov.au/business-industry/partners-suppliers/documents/specifications/g075.pdf [↑](#footnote-ref-3)