Geographic Information System Management Plan (GISMP) Template

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Important message

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Template revision history

| Issue | Date | Revision description |
| --- | --- | --- |
| 1.0 | October 2021 | First version released as part of Release 4 of the DE Framework |
| 2.0 | February 2024 | Change of template and updated content as required. |

Template governance

| Role | Position |
| --- | --- |
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Instructions for use

Instructional note: This section is for use while the GISMP is being created. Please delete this section before submitting the GISMP.

1. 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 DE Framework and the TfNSW G75 Specification. 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
* 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 *DMS-FT-580 GIS Data Schema* 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, including the *Digital Engineering Execution Plan (DEXP) (DMS-FT-532)*, as well as relevant standards and specifications.

1. Using the GISMP template

Text with green background colour is guidance text for the TfNSW project team. Text with orange background colour is guidance text for the contractor.

The TfNSW project team should update the template as instructed by the green guidance text, remove highlights and delete unnecessary text prior to issuing to the contractor as a project DEXP template. In certain instances, it can be appropriate to convert green shading to orange shading.

Similarly, the contractor should then populate the template as instructed by the orange shaded guidance text and submit back to TfNSW as a project GISMP. All remaining coloured text not applicable to final submittal should be deleted.

All sections of the GISMP template might not be relevant to the project and will be dependent on GIS scope and project details. These sections should 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 shall take the project specific requirements into consideration when preparing the GISMP template to suit the project needs, and the contractor take 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.

Instructional note: This page and all proceeding pages, including the title page for the template, are for use while the GISMP template is being created. Please delete these pages before submitting the GISMP.

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Document control

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Preface

Transport for New South Wales (TfNSW) is developing and implementing the 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 life cycle.

This document should be read in conjunction with all related DE Framework documentation. Any application of the DE Framework or any of its parts shall 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.

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# Introduction

## Purpose of **this** GISMP

*DMS-ST-207 Digital Engineering Standard, Part 2 – Requirements/QA Specification G75/PS202 Digital Engineering*

The purpose of this GISMP is:

* to demonstrate to TfNSW the contractor’s interpretation of the DE requirements, and compliance to the requirements of the TfNSW G75 QA Specification
* to provide assurance to TfNSW that the GIS requirements will be met, by setting out how GIS will be managed and executed
* 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
* 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/QA Specification G75*

This GISMP will be reviewed and maintained by the contractor throughout the course of the project as required and kept consistent with the contract management plan and other project management plans. An updated version will be submitted for TfNSW review at appropriate intermediate instances as changes occur. The current project phase and scope, project team structure and capabilities will be kept appropriately up to date.

## Terms and definitions

*DMS-SD-123 DE Terms and definitions/QA Specification G75*

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 here, however, 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 DEXP is provided in Table 1.

Locate the project DEXP and include relevant project 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.

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] |

### GIS scope and outcomes

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

Insert here key GIS outcomes/scope for this project with reference to the project inception meeting, project contract documents, the DEXP and any other relevant project documentation.

### GIS work program

*QA Specification G75, Clause 4.1.2 (f)*

Insert here relevant details about the project GIS work program to achieve identified outcomes/scope. Refer to Table 6 (Project team meetings) for an opportunity to list regularly scheduled meetings facilitating collaboration of GIS with 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/or delivery program.

### 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 GIS-specific innovation or value adding.

## GIS Roles and responsibilities

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

### Project team and GIS roles

Refer to the DEXP Project Teamsection. Use Table 2 below for additional GIS-specific roles not included in the DEXP. Cross-reference to Appendix C for GIS user role privileges if applicable.

GIS specific roles not specified in the project DEXP are provided in Table 2.

Table 2 – GIS project team (supplement to DEXP)

| Position Title | Contact Name | Organisation | GIS User Role (Appendix C) |
| --- | --- | --- | --- |
| GIS Manager | XXXX | XXXX | XXXX |
| GIS Analyst(s) | 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*

The contractor shall 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.

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

Insert here relevant details about responsibilities for nominated roles. Ensure a suitable role is nominated to fulfil each responsibility. Refer to Appendix C to define responsibilities associated with specific user roles.

## Identification of project specifications and requirements

*DMS-ST-202 Digital Engineering Standard, Part 1 – Concepts and Principles, and Part 2 – Requirements, Appendix A/QA Specification G75/PS202 Digital Engineering*

### Compliance

Confirm and review the specific standards and guidelines that are to be followed by all project participants (refer above DE document references). Adoption of any other standards related to GIS may be proposed and any deviation from the listed standards shall be agreed with the TfNSW GIS principal representative.

The applicable DE standards and guides are listed in Appendix A of the project DEXP.

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

* the contractor’s approach and procedures to be adopted to ensure compliance with the requirements outlined in the G75 Specification
* how the project team delivers the outcomes listed under the G75 Technical Requirements Clauses:
	+ 2.1. dataset file formats, naming conventions, metadata, and dataset level schema
	+ 2.2. cartographic products
	+ 2.3. data type specific requirements
	+ 2.4. coordinate reference system (datum and projection)
* how this GISMP is consistent with *DMS-ST-207 Digital Engineering Standards*
* how this GISMP addresses required inclusions listed in G75 Clause 4.1.2
* how this GISMP will be integrated and managed with the contractor’s other project management plans (if applicable).

### Interface to DE standards and project DEXP

*QA Specification G75 Clause 4.1.3*

When completing this GISMP, reference should be made to *Digital Engineering Standard Parts 1 (DMS-ST-202) and 2 (DMS-ST-207)*, as well as the project DEXP.

Insert here specific project information pertaining to the relationship/interface of DE standards and plans.

### Interfaces to other project management plans

*DMS-ST-202 Digital Engineering Standard, Part 1 – Concepts and Principles 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, DMS-ST-207 Digital Engineering Standard Part 2 – Requirements/QA Specification G75, Clause 2*

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

For all DE projects, the *DMS-FT-580 GIS Schema* must be generated from the PDBB prior to being issued to the contractor.

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 the PDBB owned by the TfNSW project team.

## Project coordinates

*QA Specification G75, Clause 2.4*

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

## GIS schema

*DMS-ST-207 Digital Engineering Standard, Part 2 – Requirements/QA Specification G75, Clause 2/4.1.2; DMS-FT-580 GIS Schema*

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 PDS. Refer to the project DEXP 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 cannot be determined, request a new code from TfNSW via the DE Change of Code Request Form. This form should be submitted by the 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. Furthermore, the data can 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 can 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 assists in ensuring the correct datasets are sourced to initiate the development of the GIS database. This section may also reference the relevant sections of *DMS-FT-580 GIS Schema*, 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.

Initial input datasets are provided in Table 3.

Table 3 – 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 |

### Real-time data

This section provides details of any real-time data feeds (from IoT sensors or other sources) used as inputs for the GIS.

Insert here details of the initial input real-time datasets used for the project.

Initial input real-time data information is provided in Table 4.

Table 4 – 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 here initial input BIM or CAD (2D or 3D) datasets used for this project.

Initial input BIM or CAD datasets are provided in Table 5.

Table 5 – 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 4.1.2 (e)/DMS-ST-207 Digital Engineering Standard, Part 2 – Requirements*

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
* 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* for project quality control strategy, checks and processes. For clarification or further information, contact the project DE 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 and DMS-ST-207 Digital Engineering Standard Part 2 – Requirements*

Refer to *Project DEXP* for contractor’s internal collaboration environment. The referenced section defines project hardware/technology infrastructure requirements, as well as software platforms and versions.

Insert here any information here specific to GIS internal collaboration environment. For further information liaise with the project DE manager.

## Contractor collaboration activities

### General

*DMS-ST-202 Digital Engineering Standard, Part 1 – Concepts and principles and DMS-ST-207 Digital Engineering Standard Part 2 – Requirements/QA Specification G75, Clause 4.5*

This section outlines the information exchange/deliverable submission requirements and processes, including how the contractor will ensure compliance in meeting the requirements outlined in Section 7 (GIS deliverables) of this GISMP.

Use this section to define and communicate coordination processes as well as collaborative workflows specific to GIS. Refer to *Project DEXP* for contractor’s internal collaboration activities. For further information liaise with the project DE manager. Include specific information here specific to GIS internal collaboration environment. 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*

Table 6 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.

In the below table add team meetings including GIS 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 6 – 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 |
| DGIS Meeting | XXX | TfNSW DE Manager | XXX |
| XXX | XXX | XXX | XXX |

# GIS Application (if required)

## Application strategy

*QA Specification G75, Clause 3/PS202 Digital Engineering*

Prior to completing this section, refer to *PS202 Digital Engineering* for GIS Application requirements. Similarly, refer to the *Project DEXP Section 4* 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 detail frequency of information exchange and how the datasets in the GIS application will be submitted at each information exchange.

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

Agreed GIS information exchange frequencies and details are provided in Table 7.

Table 7 – Agreed GIS information exchange frequencies

| GIS application | Information Submission/ Exchange Frequency | Formats | Other Software Applications (Survey, Design, Model Review, and so on) | 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 how 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 and DMS-ST-207 Part 2 – Requirements/QA Specification G75, Clauses 4.1.2 (a), 4.1.2 (h) and 4.5/PS202 Digital Engineering*

Review DE document references in italics above for deliverable requirements. Insert here reference to *DMS-FT-580 GIS Data Schema*. Use this section to include additional detail for GIS deliverables including datasets, services, cartographic products and/or applications.

## Work-in-progress (WIP) GIS submissions

*PS202 Digital Engineering/Project SWTC*

Refer to project contract documents*, PS202 Digital Engineering, Rail Technical Requirements Specification*, Digital Engineering Specification Requirements (DERS) and‌/‌or the project SWTC for WIP GIS submission requirements. Use this section and table below to detail planned WIP GIS submissions with reference to project design package submittals.

Table 8 provides design package and associated GIS WIP submittal information.

Table – Design package/work-in-progress (WIP) GIS submissions

| Design Package Code | Design Package Description | Milestone | Formal Submission Date | GIS WIP Submission Day(s)/Frequency | Submission Format |
| --- | --- | --- | --- | --- | --- |
| XXX | XXX | XXX | XXX | XXX | XXX |
| XXX | XXX | XXX | XXX | XXX | XXX |
| XXX | XXX | XXX | XXX | XXX | XXX |
| XXX | XXX | XXX | XXX | XXX | XXX |

###### Terms and definitions

Refer to *DMS-SD-123 Digital Engineering Terms and Definitions*. Table 9 contains additional terms and definitions relevant to cartography and GIS services.

Define any terms used which are not defined in DMS-SD-123 or Table 9.

Table 9 – GIS terms and definitions

| Terms, acronyms and initialisms | 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 can 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 can be as simple as major political boundaries, major hydrographic data, or major roads. The changing thematic information can be bus routes, population distribution, or caribou migration routes. |
| Cadastre | A record of interests in land, encompassing both the nature and extent of interests. In general, 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 digitising, scanning, text entry, and so on. |
| Data Model | 1. A generalised, user-defined view of the data related to applications.
2. 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 as follows: 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 organisation 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 document digital 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. The shape of the Earth’s surface differs from one geographic area to another, therefore different ellipsoids are often 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 the same attributes. Synonym: 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, east 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.  |
| 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 (for example, Base Map). |
| Originator | All PSCs, contractors their sub-contractors, design consultants and suppliers who produce data, design drawings and models for the project. |
| 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, for example, 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 (for example, soil type, land classification, population density). |
| TIFF | Tagged Image File Format. 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. |

###### GIS phase objectives

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, and so on)
* 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.

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.

###### Standard GIS roles

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

The table below should be used to define user access rights, and so on. Any additional roles, or different descriptions can be updated in the table below and applied consistently for the project.

Table 10 – User roles

| User Role | Description |
| --- | --- |
| Viewer | View items such as maps, apps, scenes, and layers that have been shared with the public, the organisation, 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 organisation’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 organisation and other users. An organisation shall 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. |

###### GIS schema [template]

TfNSW project team to pre-populate the *DMS-FT-580 GIS Schema* 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.