SA Water

Asset Management

Technical Standard

TS 0100 – Requirements for Technical Drawings

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Documents superseded by this standard

The following documents are superseded by TS 0100:

a. TS 0100 version 5.0

Significant/major changes incorporated in this edition

Alignment to TS0104 Design Quality Management.

Updated references to reflect current drawing management system components – LUNR and Meridian.

Updated applicability to network drawings produced by Land Development processes.

Document controls

Version history

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1.0	01-08-2011	C. McDonald	First Release
2.0	13-06-2014	P. Hawthorne	Minor Updates
3.0	21-01-2016	P. Hawthorne	Major Update
4.0	12-09-2018	P. Hawthorne	Major Update
5.0	02-05-2019	P.Hawthorne	Major Update
6.0	05-02-2026	H. Jethva	Minor Update Issued for use

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1 Introduction

SA Water is responsible for operation and maintenance of an extensive amount of engineering infrastructure.

This standard has been developed to assist in the design, maintenance, construction, and management of this infrastructure.

The engineering document management system (EDMS) includes:

- Meridian acting as repository. It supports general search and view of accepted documents by SA Water staff as well as several administrative functions. User guides can be accessed here: Aquanet Meridian
- LUNR acting as external facing exchange and collaboration platform. It support creation, update, and review workflows where users are external design teams and SA Water reviewing and administration teams. User guides are hosted on this platform and can be accessed here: LUNR

For additional assistance contact EDMS@sawater.com.au.

1.1 Purpose

The purpose of this standard is to detail minimum requirements to ensure that assets covered by the scope of this standard are constructed and maintained to consistent standards and attain the required asset life.

1.2 Glossary

Terms and Abbreviations utilised in this Standard are included in the following sections. The definitions presented below are to be used when interpreting this Standard and actions undertaken in relation to this Standard. Where a conflict exists, clarification is to be sought from SA Water.

1.2.1 Terms and Definitions

The following is a list of Terms applicable to this document:

Term	Description
Accepted	Determined to be satisfactory by SA Water's Representative.
Allow	Means that the cost of the item referred to is the responsibility of the Constructor
Asset Based Drawing	New drawing numbering format used for drawings created in Meridian.
Authorised Drawing	Any drawing that has the design or the current revision authorised with a signature, accompanied with the date and name of the signatory.
Automated Assessment	Process and systems for electronically submitting asset information for assessment and updating asset databases.
Constructor	The organisation responsible for constructing and installing infrastructure for SA Water whether it be a third party under contract to SA Water or an in-house entity.
Contract	A set of documents supplied to Constructor as the basis for construction; these documents contain contract forms, contract conditions, specifications, drawings, addenda, and contract changes.
Designer	The organisation responsible for designing infrastructure for SA Water whether it be a third party under contract to SA Water or a Constructor, or an in-house entity. A Designer is a person who effects design, produces designs or undertakes design activities as defined in the Work Health and Safety Act 2012 (SA).

Term	Description
Horizontal Datum	An official national geodetic datum spatial reference frame known as the Geocentric Datum of Australia (GDA). The national geodetic datum will be updated from time to time e.g. GDA94, GDA2020. There may be a time delay between the publication of the official national geodetic datum and implementation by SA Water of the datum. The datum to be used for SA Water as-constructed surveys shall be published on the SA Water website.
Informative	Means "provided for information and guidance".
Legacy Drawing	Any drawing created or in work before Meridian "go live" using the old numbering format.
LUNR	Tool for external users to view, download and upload drawings to Meridian.
Manufacturer	A person, group, or company that owns and operates a manufacturing facility that provides materials for use in SA Water infrastructure.
Maximo	SA Water Asset Management tool.
Meridian	Software used by SA Water to store, manage and disseminate drawings internally and to external parties.
Meridian Explorer	Internal tool for viewers to access Meridian.
Metadata	Information that describes the attributes and context of the drawing
Must	Indicates a requirement that is to be adopted in order to comply with the Standard.
Network Infrastructure	Assets related to the provision of water, sewer and recycled water services.
Person/s	Each word implying a person, or persons shall, where appropriate, also be construed as including corporations.
Portal	As-Constructed Design Certification Web Portal.
Power Web	Internal tool for editors to access Meridian.
Provide	Means "supply and install".
Requirement	Need or expectation that is stated within the Contract.
Responsible Discipline Lead	The engineering discipline expert identified in the 'Approvers' table (via SA Water's Representative).
SA Water Representative	The SA Water representative with delegated authority under a Contract or engagement, including (as applicable): • Superintendent's Representative (e.g. AS 4300 and AS 2124 etcetera) • SA Water Project Manager • SA Water nominated contact person
Shall	See 'Must'
Should	Indicates practices which are advised or recommended, but is not required
Submission	A DWG file submitted to the Portal for validation. Water, Sewer, and Recycled Water must each be submitted in their own DWG file. Each is separate submissions.
Supplier	A person, group or company that provides goods for use in SA Water infrastructure.
Technical Dispensation Request Form	This form is part of SA Water's Technical Dispensation Request Procedure which details the process by which those required to comply, or ensure compliance, with SA Water's technical requirements may seek dispensation from those requirements.
Work	Elements of a project which require design and/or construction.

1.2.2 Abbreviations

The following is a list of Abbreviations, Acronyms and Initialisms used in this document:

Abbreviation	Description
AHD	Australian Height Datum
CAD	Computer-Aided Design
CAMS	Customer Application Management System
DMS	Drawing Management System
DWG	AutoCAD native format .dwg is the standard file format for Automated Assessment
EDMS	Engineering Document Management System
GDA	Geocentric Datum of Australia
GNSS	Globa
SA Water	South Australian Water Corporation
TDRF	Technical Dispensation Request Form
TG	SA Water Technical Guideline
TS	SA Water Technical Standard

1.2.3 Terminology

The following is a list of specific interpretations for Terminology used in this standard.

- Where an obligation is given and it is not stated who is to undertake these obligations, they are to be undertaken by the Constructor.
- Directions, instructions and the like, whether or not they include the expression "the Constructor shall" or equivalent, shall be directions to the Constructor, unless otherwise specifically stated.
- Where a submission, request, proposal is required and it is not stated who the recipient should be, it is to be provided to SA Water's Representative for review.
- Each word imparting the plural shall be construed as if the said word were preceded by the word "all".
- "Authorised", "approval", "approved", "selected", "directed" and similar words shall be construed as referring to the authorisation, approval, selection or direction of SA Water's Representative in writing.
- "Submit" mean "submit to the SA Water Representative or their nominated delegate".
- Unless noted otherwise, submissions, requests, proposals are to be provided at least 10 business days prior to work commencing or material ordering (unless noted otherwise).

1.3 References

1.3.1 Australian and international

The following table identifies Australian and International standards and other similar documents referenced in this document:

Reference	Title
AS 1000	The International System of Units (SI) and its application
AS 1100 (series) (series)	Technical Drawing
AS 1101.3	Graphical Symbols for General Engineering
AS 1102	Graphical Symbols for Electrotechnical Documentation
AS 3702	Item Designation in Electrotechnology
AS 4383	Preparation of Documentation used in Electrotechnology
AS 60417	Graphical Symbols for use on Equipment

1.3.2 SA Water documents

The following table identifies the SA Water standards and other similar documents referenced in this document:

Reference	Title
TS 0101	Safety in Design
TS 0102	Information Modelling Technical Standard
TS 0104	Design quality management

2 Scope

2.1 Scope and application of this Technical Standard

This Technical Standard details the requirements for production and submission of Engineering drawings created or modified for SA Water. This document applies to the Computer Aided Design (CAD) drawings and the drawings outputted from them.

This Technical Standard applies to but is not limited to the following drawing discipline types:

1. Mechanical and Hydraulics
2. Electrical
3. Cathodic Protection
4. Civil
5. Structural
6. P&ID
7. Architectural.
8. Network infrastructure

   Currently excepting where of scope of design and installation limited to:

   - Connections
   - Fire services
   - Mains extension to existing allotments delivered by Land Development.

2.2 Works not in scope

N/A

2.3 Technical dispensation

Departure from any requirement of this Technical Standard shall require the submission of Technical Dispensation Request Form (TDRF) for the review and approval (or otherwise) of the approver of this document listed in Page 5, on a case-by-case basis.

The Designer shall not proceed to document/incorporate the non-conforming work before the party referenced above has approved of the proposed action in writing via the Technical Dispensation Request Form (TDRF).

SA Water requires sufficient information to assess dispensation requests and their potential impact. The onus is therefore on the proponent to justify dispensation request submissions and provide suitable evidence to support them.

Design works that are carried out without being appropriately sanctioned by SA Water shall be liable to rejection by SA Water and retrospective rectification by the Designer/Constructor.

2.4 Hazards

Hazards shall be identified and addressed in accordance with TS 0101.

3 Compliance with standards

All drawings shall comply, where applicable, with SA Water discipline-specific standards, this standard and relevant Australian Standards.

Where conflict between the standards exists, the following order of priority shall apply:

1. SA Water discipline-specific Technical Standard
2. TS 0100 – Requirements for technical drawings (this standard)
3. Drafting practices set out in the relevant Australian Standards
4. Project-specific drafting requirements. Engineering dispensation must be applied for.

3.1 SA Water Technical Standards (discipline-specific)

SA Water is continually developing various discipline-based Technical Standards, which may include specific drafting requirements. These may supplement and, in some cases, override this Technical Standard. It is the responsibility of the drafter to ensure that they are working with any relevant Technical Standards.

3.2 Australian Standards

Drawings shall comply, where applicable, with the current relevant Australian Standard including but not limited to:

- AS 1000 – The International System of Units (SI) and its application
- AS 1100 (series) – Technical Drawing
- AS 1101.3 – Graphical Symbols for General Engineering
- AS 1102 – Graphical Symbols for Electrotechnology Documentation
- AS 3702 – Item Designation in Electrotechnology
- AS 4383 – Preparation of Documentation used in Electrotechnology
- AS 60417 – Graphical Symbols for use on Equipment.

3.3 Typical and standard drawings

SA Water has created standard and Typical drawings that encompass some commonly installed infrastructure. Some of these drawings pre-date this Technical Standard. If these drawings are to be used as a base for project-specific drawings, then the new drawings shall comply with this standard.

It is the responsibility of whoever is creating/modifying a drawing to ensure that the latest versions of these documents are used. PDFs are all available for download from the SA Water website, and CAD versions can be requested from Engineering.Projects@sawater.com.au.

3.4 Existing non-compliant drawings

In some instances, there may be a requirement to work on or modify existing or legacy drawings that do not conform to the current standard. Drafting protocol is to maintain the standards that were applied at the time of drawing creation unless major modifications to the content are required or a conflict with symbology, for example, P&ID, Electrical, and Process Flow, is introduced. It is the responsibility of the drafting provider to seek clarification from the CADD Coordinator when required.

SA Water does not require that an existing drawing is migrated onto the current title block when being modified unless more than 50 per cent of the drawing content is being modified. As this figure is subjective, advice shall be obtained from the relevant discipline lead for major drawing modifications. If a drawing is migrated into the current standard, it is expected that a new drawing number will be assigned and the legacy number superseded.

If an existing non-conforming drawing is being used as a base for a drawing with a new drawing number, then the new drawing shall conform to the current version of TS 0100.

Unclassified or missing metadata relating to the drawing must be filled in or corrected within LUNR or on the Book In transmittal.

4 General CAD requirements

General CAD requirements are as follows:

1. All new drawings produced for SA Water shall be presented on the current SA Water title block. All drawings shall be either A1 landscape or A3 landscape unless prior arrangements are made. The title block shall not be modified or exploded.
2. Except for some Equipment Manufacturers drawing, and with prior arrangement, drawings not on an SA Water title block will not be accepted.
3. Drawings shall be presented in monochrome unless there is a specific requirement to show coloured line work. If a drawing is presented in colour, lighter colours such as yellow and cyan should be avoided.
4. All site layouts shall contain a north arrow.
5. All Site Layouts shall be in a coordinate system. The horizontal datum shall be planar based on MGA, for example, MGA54 – GDA 2020, coordinates derived from network Permanent Survey Marks. The origin shall be as close as possible to the centre of the survey area. If this is not practical, coordinates shall be based on observations from the Global Navigation Satellite System (GNSS).
6. All elevations shall be referenced to the Australian Height Datum (AHD).
7. All drawings shall be legible when plotted/printed at A3 size.
8. All drawings provided by SA Water remain the copyrighted property of SA Water and may only be used to assist in the preparation or modification of drawings to be provided under contract.
9. All drawings prepared for SA Water under contract (excluding equipment manufacturer's drawings) become the copyrighted property of SA Water upon submission.
10. All drawings shall be supplied in the appropriate native CAD format (see sections 5.1 and 5.2) along with PDF renditions, authorised where required.

4.1 Acceptable 2D CAD formats

All new 2D drawings shall be prepared and submitted in AutoCAD® release 2013 .dwg format or earlier unless approval of the SA Water CADD Coordinator is given prior to the commencement of any drafting work. If another package is to be used for the preparation of 2D drawings, the native CAD file, along with an AutoCAD® conversion (where available), shall be provided.

4.2 Xrefs

SA Water allows the use of Xrefs. However, they are only permitted when binding or inserting is not possible/feasible. Examples of appropriate Xref usage are drawings being used in multiple files, large survey files, high-resolution images, etcetera. Examples of inappropriate use (and rejection) are title blocks, signatures, stamps, symbols, other registered drawings, etcetera. It is expected that SA Water will build a library of common site-based Xrefs over time for use in new drawings, such as for underground services, plant layouts, etcetera Where requested, contact the EDMS@sawater.com.au for advice on usage, creation and naming.

All Xrefs need to be specified on the Book In spreadsheet and placed in the same folder as the master drawing. Regardless of the level of embedded Xrefs, a flattened structure must be presented to LUNR. Do not create an E-Transmit.

All unused Xrefs must be totally removed/Detached from the drawing prior to submission.

4.2.1 New Xrefs

While SA Water has no naming convention for Xrefs, the filename must be reflective of the contents. Additionally, to avoid duplication, the date that the Xref is placed into the master drawing (first drawing if being placed into multiple) must be included in the filename. "X-Survey.dwg" is not an acceptable name. Rather, "X-Survey-Stonyfell Tank 25-02-2019.dwg" is appropriate.

Duplication of Xrefs is not allowed, and it is the responsibility of whoever is managing any drawing updates to ensure that there is no existing Xref that can be used. This is particularly relevant for survey drawings, site layouts and underground services.

New Xrefs must be initially booked into LUNR in the same booking package as the parent to ensure that LUNR can build the necessary links.

4.2.2 Existing Xrefs

If an existing Xref is to be updated, it is the responsibility of whoever is managing any drawing updates to ensure that any affected drawings are also updated accordingly. Visibility of all parent drawings for any given Xref is not available through LUNR.

When working on existing drawings with Xrefs, the following scenarios are possible:

1. Drawing file is changed, but Xref remains unchanged

   In this instance, the Xref does not need to be checked back in or renamed. The Project Manager should be notified that the Xref is no longer required if it has been checked out.

2. The Xref has changed, and all parent files can be updated

   Any other drawings that also use the Xref (regardless of if they are in the project or not) have been checked and can be updated with the new Xref. In this instance, the Xref can retain its existing name and must be checked in with the parent drawing.

3. The Xref has changed, not all parent files can be updated

   Any other drawings that also use the Xref (regardless of if they are in the project or not) still need to show the old Xref information. In this instance, the Xref must be copied and renamed using the naming convention for new Xrefs. This new Xref is then referenced into the parent file that requires it. The Parent and new Xref must be checked in together.

4. A new drawing is created using an existing Xref

   In this instance, the three rules above still apply.

4.3 Acceptable 3D CAD formats

All new 3D CAD models shall be prepared and submitted in AutoCAD Inventor® release 2017 format or earlier unless approval of the SA Water Asset Information Lead is given prior to the commencement of any drafting work. The Inventor project shall be supplied as a "Pack and Go" composite, containing all parts, assemblies, drawings and library items. If another package is to be used for the preparation of 3D CAD models, then the native CAD file, along with a model export, in.STEP,. IGES or.SAT (where available) shall be provided. Please contact the Asset Information Lead to discuss the handover of the model. PDF versions of the drawings are still to be uploaded into LUNR.

SA Water can also accept 3D data contained within a dwg file, such as surface information created in Civil3D®.

Please refer to TS0102 for more information.

4.4 Equipment manufacturers drawings

Drawings of proprietary equipment, for example, pumps, motors, valves, etcetera that are not modified prior to installation are not considered Engineering Drawings and may be included in the Operations and Maintenance manuals. Generally, proprietary drawings should be available online or via a request based on the part number. Drawings that are specific to a site or asset are considered Engineering drawings and shall be delivered to this standard.

4.5 Fabrication drawings

Fabrication drawings, such as pipe spools, structural members, etcetera, are not required to be created to this standard and shall be included in the Manufacturers Data Record.

5 Information supplied by SA Water

At the commencement of any drafting engagements, the drafting provider must ensure that current and relevant information is sourced from SA Water. This includes the following CAD information in addition to the Technical Standards (see section 3.1).

5.1 Drawing templates

All new title blocks must be generated within LUNR. Drawings created outside of this process will not be accepted without prior approval.

When a new template is generated, it will be pre-populated with an Asset-based drawing number and some basic information in the title block. These fields must not be altered.

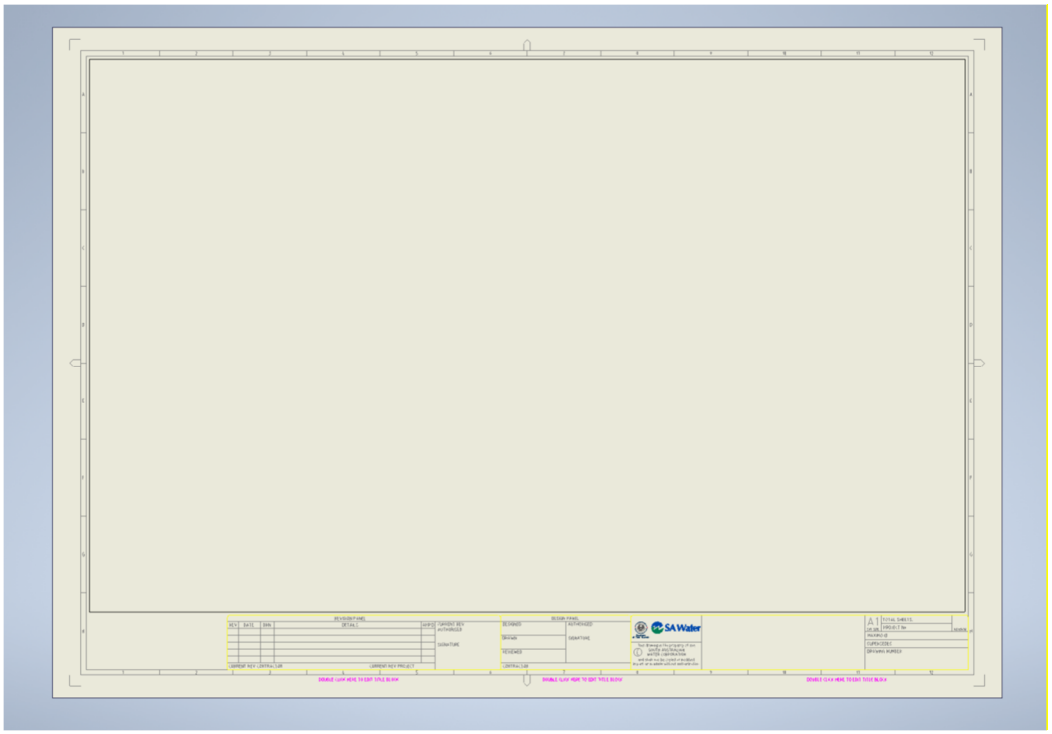


Figure 1: Capital Project Drawing template - Blank

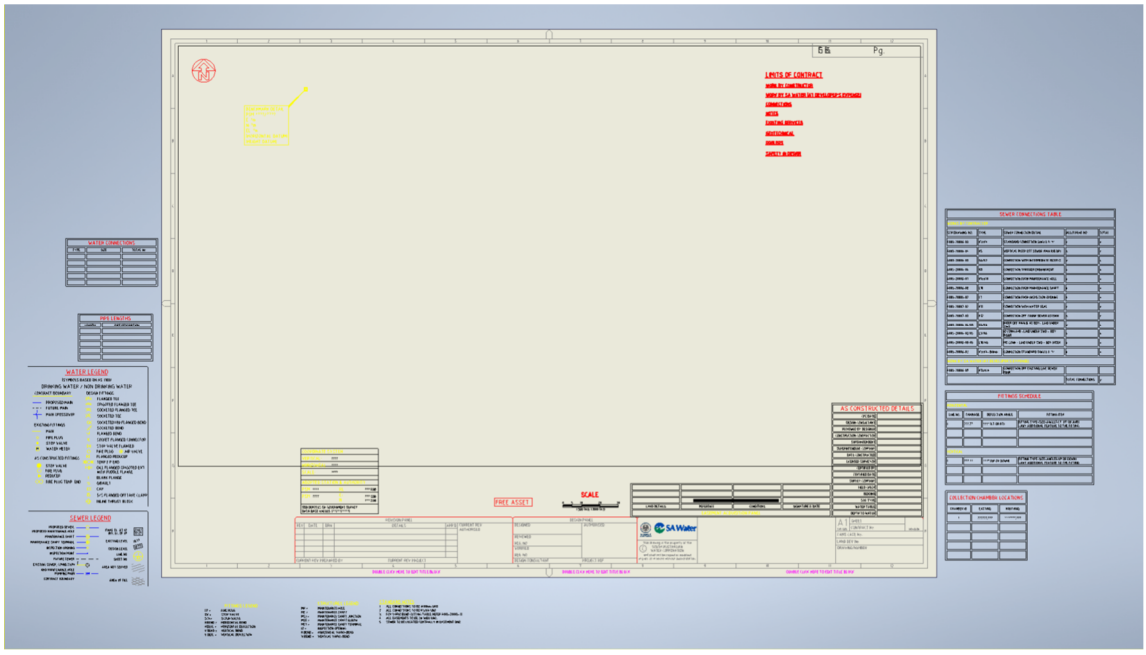


Figure 2: Land Development Drawing template - Blank

The Land Development template includes several additional elements to be used as directed by Network Engineering requirements.

5.2 Drawing numbers

Every new drawing shall have a SA Water-issued drawing number. Each drawing number can contain up to 99 sheets, however, each sheet must exist as an individual file. Multiple sheets can be used in instances where the drawing set covers a single discipline over the same asset. Sheet 0 cannot be used. New drawings must only contain one sheet per file. SA Water still supports legacy drawings, which contain multiple sheets with a single CAD file. All new drawing numbers and sheets must be created through LUNR. This includes any additional sheets that may be required for existing drawings, except Legacy drawings.

Spares should not be used for any disciplines other than electrical engineering. Instead, any unused drawings and sheets must be revoked. For Electrical drawings (single line), 99 sheets must be generated, with any unused drawings being marked as "SPARE" in line 5 of the title block. Additionally, 50 mm high text shall be placed on each drawing sheet in the centre that states "SPARE".

Unless requested, SA Water does not require a drawing index unless there are designated spares in a sheet set. This typically applies to Electrical drawings, as other disciplines should not have spare drawings in each sheet set.

The drawing number is formatted as Facility ID-DD-NNNNN_SS where Facility ID= Maximo Facility ID, DD=Discipline Code, NNNNN=Drawing Number and SS=Sheet Number. Network discipline drawings will be prefixed with WWN (Wastewater Network), WN (Water Network), or RWN (Recycled Water Network) rather than specific facility ID value.

All drawing number requests shall be obtained using LUNR.

5.3 Existing CAD files

In instances where existing CAD files are required for modification, they can be released from SA Water via LUNR.

6 Drawing requirements

6.1 Drafting space

It is expected that drawings produced for SA Water will use a combination of model and paper space. The drawing itself or model shall be drawn in Model Space at a scale of 1:1, in millimetres. The title block or drawing frame shall always remain in paper space using viewports to show the model. Unscaled drawings, for example, P&ID, Electrical Schematics, Process Flow, etcetera, are exempt from this requirement and can be drawn completely in either space. The title block, however, shall remain in paper space.

Drawing annotations may be in either Model Space or Paper Space; however, a consistent approach shall be maintained over the drawing. If Annotations are to be in Model Space, then they shall be scaled to suit the viewport. All dimensions should be associative.

6.2 Dimensions

Dimensions shall be in accordance with Australian Standard AS 1100 (series). The SA Water supplied template contains the dimension style "SA Water", which shall be used.

Linear dimensions should be in millimetres, and angular dimensions should be in decimal degrees unless industry standards for that drawing type differ, in which case the industry standard shall take preference.

Dimensions shall not be exploded.

6.3 Text styles

SA Water requires that the ISOCP font be used. If a different font must be used, it shall be an AutoCAD® standard font. Generally, the text should be vertical (Oblique=0); however, italic text is acceptable for emphasis. All text should have a width factor of 1; however, it is permissible to reduce this to fit into the drawing.

The table below defines typical sizes for font usage throughout the drawing:

Text Height	Line Weight	Usage
3mm	0.35mm	General notes, labels, tables, dimensions, etcetera
5mm	0.5mm	Minor headings
7mm	0.7mm	Major headings

It is permissible to use smaller fonts to enable good drawing presentation. In these cases, the minimum size for A1 drawings is 2.5 mm and A3 drawings 2mm, providing that the drawing is legible when plotted / printed at A3 size. 1.8mm (A3) is permissible in Electrical Drawings.

6.4 Line types

Line styles applied to drawings shall conform to AS 1100 (series) and industry standards. Where possible, all line work should use standard AutoCAD® line styles. If a custom line style is to be used, then a copy of the line type file (*.lin) shall be provided. Globally, LTSCALE should be set to 1. All line properties, including colour, line weight, and line type, shall be set to ByLayer.

6.5 Line weights

The following AutoCAD® colours shall be used to represent the various line weights or "pen thicknesses" when plotted at full size.

AutoCAD® Colour No	Colour	Line Weight
1	Red	0.5mm
2	Yellow	0.35mm
3	Cyan	1.4mm
4	Green	2.0mm
5	Blue	0.7mm
6	Magenta	1.0mm
7	White	0.25mm
8	Light Grey	0.18mm

The SA Water supplied plot style – SA Water Mono.ctb shall be used to ensure compliance with the above requirements.

6.6 Layers

Layer naming should follow a logical approach and be descriptive but brief. Ideally, the layer name should be no more than 20 characters. The same applies to any layer groups created.

Any layer beginning with SAW_ should not be deleted.

Layer 0 should not be used except for the creation of blocks.

6.7 Drawing scales

Drawings should be scaled as per AS 1100 (series). Otherwise, industry-accepted scales may be used. Every effort should be made to reduce the number of different scales displayed on a single drawing.

If a single scale is applied for the entire drawing, this shall be clearly indicated at the bottom of the drawing. Individual views with differing scales shall have the scale clearly indicated below the view heading.

6.8 Revisions

All revisions, including As Constructed and Issued for Construction, shall be recorded in the revision table. Revision clouds and adjacent revision triangles are to be used for the current revision where appropriate. Revision clouds and triangle for previous revisions shall be removed, however, the details shall remain in the revision table.

6.9 Preparing CAD files for submission

CAD files shall be prepared as follows prior to submission to SA Water:

1. All drawing model space items not used in the final view shall be deleted.
2. All files shall be purged to remove unused items.
3. All files shall be audited with "fix errors" enabled.
4. All sheets shall be zoomed to extents.
5. All unused Xrefs must be totally removed/Detached from the drawing.
6. All superfluous non-visible entities, such as un-associated associative dimensions, must be removed from the drawing.

6.10 Multi-sheet drawings

While SA Water no longer accepts the development of new Multi Sheet drawing files, legacy files that contain more than one sheet are still supported. This is not to be confused with new multi sheet drawings, which are still supported, providing there is one drawing/sheet per file. An exception applies to the Technical Service team, whereby multisheet drawings are permitted solely for water main relay drawings.Legacy multi-sheet CAD files are supported by a multi-page PDF rendition. For example, a single CAD file contains 10 sheets, and the associated PDF also contains 10 pages. It is the responsibility of the drafter to ensure that any changes to the CAD file, even if it is one sheet, result in a new PDF containing all relevant sheets.

7 Drawing sheet information

The SA Water Drawing Sheet or Title Block is designed to capture required information throughout the life of the drawing. As the CAD file itself is a constantly evolving document, SA Water relies on plots taken at various milestones to record the various revisions to the drawing. As this also provides an audit trail, it is a requirement that all mandatory fields are filled out prior to creating any plots that are to be submitted as a project deliverable.

To automate data extraction, all fields shall be entered into the existing set of attributes. To access the attribute table, simply double-click on any existing fields or on the purple text along the bottom of the sheet that reads "DOUBLE CLICK HERE TO EDIT TITLE BLOCK". This text is on a non-plot layer. The block definition must not be altered in any way.

The standard drawing sheet (which is generated in LUNR) has been set up to accommodate most information likely to be entered. If text fields run outside of the designated areas, it is acceptable to alter the width factor of the text to ensure a better fit. At all times, the text must be legible. To generate a new drawing in LUNR, some key pieces of information are required. This is then used to auto-populate some title block fields.

The Title Block can be divided into 3 areas, each capturing different stages of the drawing lifecycle.

***Revision** Panel* ***Design** Panel* ***Drawing Information** Panel*

Figure 1: Title Block Panels

7.1 Drawing information panel

This area contains all the information that identifies the drawing, such as Title, number, sheet count, etc. The following section is true for assets that exist in Maximo. The various fields are described as follows:

Figure 2: Drawing Information Panel - Blank

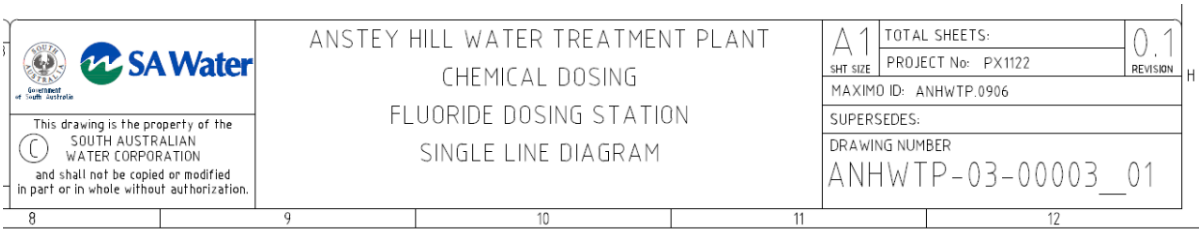


Figure 3: Drawing Information Panel - Example

Table 1: Drawing information panel components

ID	Criteria	Description
1	Drawing Number	This is the unique identifier for the drawing. It consists of the Location ID, Discipline Code, the drawing number and sheet number. All four fields are mandatory and can only be generated within Meridian or the Contractor Portal. **Example**: ANHWTP-03-00003_1 would be a valid drawing number for sheet 1 of an Electrical drawing for Anstey Hill Water Treatment Plant.
2	Drawing Title	This contains information about the drawing and its location. The first three lines are based on a Maximo Asset hierarchy and must be set in LUNR. The fourth line is the discipline, and the fifth line is free text. Lines 1 and 4 are mandatory, and a drawing number cannot be assigned without this information. Lines 2 and 3 are populated, if this data exists, from the Child and Grandchild locations, although once the drawing has been created, free text can be entered if it makes the drawing title clearer. Manually entering data into or modifying fields (lines 1 and 4) will result in a validation error. **Note**: The text fields in the title block have a width factor of 1.0, providing legibility is maintained; this may be reduced to fit long titles. a. The first line contains the asset location of the drawing as it appears in Maximo. b. The second line is the Child Location of the asset location as it appears in Maximo. This information may not exist or be irrelevant to the actual drawing, in which case more relevant information may be manually entered. Note: manually entering information here applies to the drawing title only, not the Child and Grandchild location fields in the Book In spreadsheet, which must follow a Maximo hierarchy, if one exists. c. The third line is the Grandchild Location of the asset location as it appears in Maximo. This information may not exist or be irrelevant to the actual drawing, in which case more relevant information may be manually entered. Note: manually entering information here applies to the drawing title only, not the Child and Grandchild location fields in the Book In spreadsheet, which must follow a Maximo hierarchy, if one exists. d. The fourth line is used for drawing type. This includes but is not limited to the subcategories listed under each Discipline below. e. The fifth line is used for miscellaneous or extra information. Leave blank if not required.

ID	Criteria	Description
3	Discipline	This numerical code refers to the discipline that is covered by the drawing content. If you require an additional subdiscipline to be added, contact EDMS.Support@SAWater.com.au. The subcategories are the type of drawing. The available fields are currently: 01 Other 02 Mechanical and Hydraulics 03 Electrical Electrical General (and Arrangements) Cable Schedules LV Distribution PLC RTU HV Distribution Electrical General Arrangement Electrical Site Layout Network Architecture Single Line Diagram Equipment list Block Diagram Earthing Diagram 04 Cathodic Protection 05 Network/Reticulation Water Network Wastewater Network Recycled Water Network 06 Civil Civil General (and Arrangements) Site Plan/GA (Including Facilities) Site Services (underground) Survey Site Drainage Fencing 07 Structural Structural General (and Arrangements) Condition Assessments Concrete Reinforcement Steelwork Aluminium Details 08 P&ID 09 Architectural
4	Sheet Count	This shows the total number of sheets (including spares) contained within the drawing number. This field shall only be filled out on sheet number 1 of any sheet set. For all subsequent sheets contained within a drawing number, this field shall be left blank. For single-sheet drawings, this field can be left blank. **Note**: If an existing drawing set is to have a sheet added, then only the Sheet Count on sheet 1 should be modified to reflect the new amount.

ID	Criteria	Description
5	Project Number	This is the SA Water project number for which the drawing was created. This is auto populated and should not be modified. For Land Development projects, the Project Number shall be the CAMS Case Number. This number is generated by the CAMS system and must not be modified.
6	Revision	This displays the current revision of the drawing and shall always match the latest revision in the revision table. This is auto populated and should not be modified. Once a drawing leaves LUNR, external parties can modify this revision value to reflect internal systems. However, it must be reset to its original value before being uploaded to LUNR. Any renditions must also match this value.
7	Maximo ID	This is the Maximo ID of the infrastructure associated with the drawing. It is auto populated and should not be modified.
8	Supersedes	If the drawing is replacing or superseding an existing drawing, then this drawing number is entered here.

7.2 Design panel

This panel contains all the information relating to the drawing's design. This is generally filled in at the completion of the design. The authorised section is generally completed at the "Issued for Construction/Tender" revision. The fields are described below.

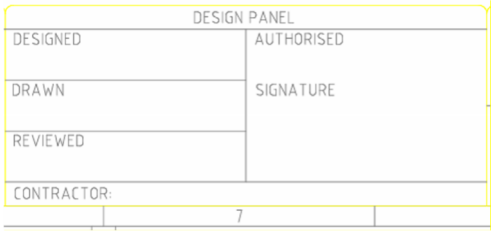


Figure 4: Drawing design panel – Blank

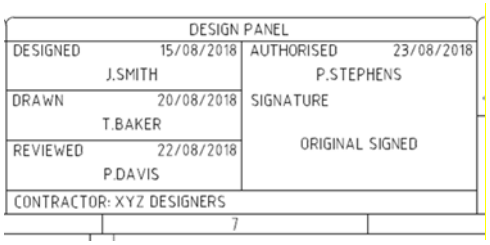


Figure 5: Drawing design panel – Example

Table 2: Drawing design panel components

ID	Criteria	Description
1	DESIGNED	Use this box to enter the name of the designer and the date of the design.
2	DRAWN	Use this box to enter the name of the drafter and the drawing's completion date.
3	REVIEWED	Use this box to enter the name of the reviewer and the date of the review.
4	AUTHORISED	The drawing is generally authorised at the "Issued for Construction/Tender" revision. The name of the person authorising and ultimately assuming responsibility for the design is entered, along with the date on which the drawing is authorised. The drawing is to be plotted with the signature field left blank. Once a signature has been applied to the PDF (refer to section 10 for valid signatures), the text "ORIGINAL SIGNED" is to be entered into the signature field and then saved.
5	CONTRACTOR	This box contains the company name of the contractor responsible for authorising the design. "SA Water" is to be entered into this field for internal drawings.

7.3 Revision panel

This area contains all the information that identifies the drawing, such as Title, number, sheet count, etcetera. The following section is true for assets that exist in Maximo. The various fields are described as follows:

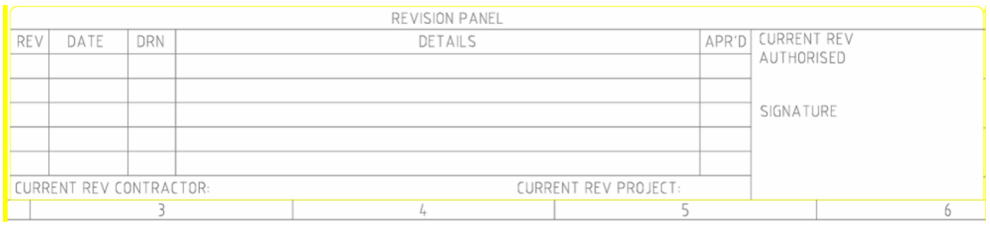


Figure 6: Drawing revision panel – Blank

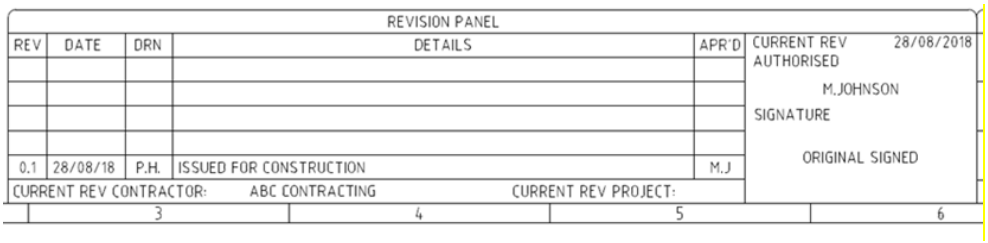


Figure 7: Drawing revision panel – Example

Table 3: Drawing information panel components

ID	Criteria	Description
1	REV	This field contains the revision letter or number of the revision being described.
2	DATE	The date that the revision was drafted
3	DRN	The initial of the drafter responsible for the revision
4	DETAILS	A description of or brief summary of the revision. With the exception of "Issued for Construction/Tender" and "As Constructed", revisions should also be referred to on the drawing with clouds and triangles. Refer to section 7.8 for more detail.
5	APP'D	The initial of the person who has approved the revision. This field is not mandatory.
6	CURRENT REV AUTHORISED	The name of the person authorising and ultimately assuming responsibility for the revision is entered, along with the date on which the revision is authorised. The drawing is to be plotted with the signature field left blank. Once a signature has been applied to the PDF (refer to section 10 for valid signatures), the text "ORIGINAL SIGNED" is entered into the signature field and then saved. **Note**: The revision authorisation information is only valid for the current revision. Once a new revision is undertaken, the authorisation fields are entered anew.
7	CURRENT REVISION CONTRACTOR	This box contains the company name of the contractor responsible for authorising the current revision. **Note**: The contractor information is only valid for the current revision. Once a new revision is undertaken, the contractor fields are entered anew. "SA Water" is entered into this field for internally completed revisions.

8 Drawing development

Most Engineering Drawings produced for SA Water follow the same steps. These steps generally follow a similar sequence and ultimately produce an authorised deliverable (Authorised PDF). See TS 0104 for details on the design and review process for authorised design.

There will always be exceptions to this, so issues must be raised early to avoid rework. Refer to Appendices A1 to A3 for detailed workflows.

While drawings still have revisions, the actual status of the drawing is determined by Metadata. The status can be observed and set through the LUNR through the Book In spreadsheet.

The table below maps existing EDMS drawing status tag values to the design gate terminology defined in TS0104, to support consistent use and interpretation across systems.

Design review gate	Description	EDMS Tags
30% Design	General arrangement and configuration of key design elements determined, to establish a realistic baseline for cost and schedule.	• Concept • Initiated
60% Design	Technical aspects of design materially complete, to enable design refinements through review, constructability and SiD activities	• Detail • Issued for Tender
90% Design	Design essentially complete, excepting final refinements	• Issued for Construction
Constructed	This phase represents the final, constructed state of the asset and includes verified drawings, data, and documentation reflecting what was actually built.	• As Constructed
Decommissioned	as it formally represents the asset being removed from service, whether by demolition, abandonment, or replacement.	• Superseded • Decommissioned

- Spare - (Electrical drawing placeholders that were not used as a part of the design. These are released to masters and kept.)
- Unused - (These are drawing placeholders that aren't used in the system. Ideally these should be imported and then archived so that they're available going forward as a reference of what was issued to the project.)
- Final Issue - (This is a way of indicating that a drawing will not proceed beyond a particular status. For example, it may have been received as IFC, with no expectation that an As Constructed drawing will be submitted.)

8.1 New drawing development

LUNR provides a self-service drawing number creation tool for registered external contractors i. As the drawing number is determined by the asset location and discipline, it is important to know this information upfront. Additionally, new drawings must be created inside of an existing project. Refer to section 11 for more information on projects.

It is the responsibility of whoever is creating the new drawing to ensure that there is not an existing drawing that can be used instead. Additionally, reasonable attempts must be made to ensure that any existing drawings that overlap new drawings are updated, superseded or made obsolete.

8.1.1 Reproduction of Existing Drawings

Where possible, drawings should be upgraded rather than reproduced. The following drawings shall not be reproduced unless absolutely required:

- P&ID
- Single Line Drawings
- Underground Services Drawings
- Hazardous Areas Drawings
- All drawings referred to in isolation procedures.

If a new drawing is created to replace (whole or partially) an existing drawing, then the existing drawing shall be superseded (see section 8.4) or updated to identify the relationship between the two drawings.

8.1.2 Concept and temporary drawings

Occasionally, drawings may be generated as part of a concept design, options study or for assets that do not yet exist in Maximo. LUNR allows the use of a Concept or Temporary drawing number for these purposes. These drawing numbers will start with either a "CONC" or "TEMP" prefix instead of an asset location. Drawings of this type will have to have asset data assigned to them before they can be released from the project and promoted to Master. If the drawing is never published to Masters, it will be archived with the project in which it was created.

Drawings of this nature cannot form part of a project deliverable unless requested via the formal Engineering Standards Dispensation process.

8.2 Existing drawing modification

Existing drawings can be found in LUNR. Only drawings in the Master's branch are available for viewing through Lunr Repository tab. . Previous versions of the drawing, such as Issued for construction, are still available through Lunr's version history feature.. Decommissioned and Superseded drawings are also available in Masters, so it is the responsibility of the drawing user to determine the status of a drawing before using it.

Any modifications made to the drawing throughout its life shall be recorded as a revision. Refer to section 6.8 for information on revision clouds and section 8.3 for how revisions are applied. Each revision shall be authorised when completed and delivered to SA Water's Representative via LUNR. Refer to section 7.3 for information on filling out the revision table.

8.3 Drawing revisions

All drawings created and modified within LUNR have their revisions managed automatically. SA Water no longer uses an alphanumeric system to denote a drawing phase. Every drawing (including legacy) now has a drawing status, which is kept as metadata. Drawings under change or in a workflow will have an incremental revision (0.1 increments), while drawings published in Masters as the final version will be a whole number only, as Constructed drawings should be published to Masters.

A drawing will have its incremental revision applied to it when it is placed in a workflow in anticipation of potential changes to it. As such, it must be returned to that workflow reflecting the same revision. For example, if you check a drawing out of LUNR at revision 1.1, then it must be returned as revision 1.1, not 1.2 or 2.0. While the drawing is in work, the drafter is free to apply whatever revision structure suits their workflow, if it is returned correctly.

Once the drawing is published into Masters, the revision is automatically adjusted to the next whole number. This may cause a mismatch between the CAD file and the authorised rendition in Masters. Providing that the revision panel is identical between the CAD file and the rendition, the drawing is valid. For example, a drawing may become an As Con (and

produce a signed PDF) while in a workflow where LUNR has assigned a revision of 1.3. When this drawing is published, LUNR will increment the record and CAD file to revision 2. However, the signed PDF will still show it has been authorised at 1.3. This is normal and expected behaviour.

If a user wishes to capture a version within the revision history, then the document must be released from the workflow and then placed in a new workflow if further work is required. Any workflow can only result in a single revision being added to the revision history of that document. For external submissions through the LUNR. This will capture the latest submission as a revision. These incremental revisions are captured as part of the document history and will remain even though only the final version is published to Masters. This process is used to capture drawing milestones. If a drawing is not released from the workflow, then every subsequent version uploaded will overwrite the previous version.

For new drawings created in LUNR, the revision attribute in the title block is mapped to the system and is controlled by LUNR. Any incorrect values will be overwritten when the workflow is finished.

For legacy drawings, there are three scenarios based on what LUNR thinks the revision is:

1. LUNR recognises that a legacy drawing has a numeric revision equal to or greater than 1.

   The revision, in this instance will just increment from whatever the current revision value is. The title block will not be controlled or queried by LUNR, so the title block value must be manually updated to match the value in LUNR. For example, a legacy drawing is booked out, and while the title block shows revision 1, LUNR has registered the drawing at revision 1.1. The drawing must be returned with 1.1 in the title block revision field.

2. LUNR recognises the legacy revision as an alpha value or zero.

   The above scenario will be applied, with the exception that the revision counter will begin at 0.1. Any previous alpha revisions are still valid and can remain in the revision table.

3. LUNR does not recognise that the drawing has a revision, even though it exists in the title block. If the revision in the title block is alpha, zero, or does not exist, then scenario 2 is valid.

   If there is a numeric value, the drawing must have the revision set to this value before creating a project copy. Scenario 1 will then run its course.

   If the revision is not set, or the error is only noticed when the drawing is being modified, the value can be corrected once the drawing is published to Masters. In this case, incremental revisions are arbitrary, provided they are in a logical sequence, and the final published revision is higher than the previous one.

8.4 Obsolete and superseded drawings

Occasionally, a drawing is no longer required due to infrastructure being removed or superseded by another drawing. When this occurs, the drawing is given one final revision with a description stating why the drawing is no longer required. In addition to this, 50 mm high text shall be placed on each drawing sheet in a prominent location (usually the centre of the drawing sheet) that states either "DRAWING OBSOLETE" OR "SUPERSEDED BY: enter new drawing number". The drawing status must also be updated to reflect the new state. If superseded, then the new drawing number must also be specified. This can be done through LUNR on the Book In spreadsheet.

If the drawing being made obsolete or superseded is part of a sheet set, then the sheet allocation for the remaining drawings stays in place.

9 Plotting and authorising drawings

As the CAD file is an evolving document, all authorisations and signatures are applied to a plot at key milestones determined by the project. All signed drawings shall be provided to SA Water through LUNR in PDF format. Hard copy drawings will not be accepted. All signatures shall be entered in the Signature portion of the relevant area of the title block. The authorised details, such as name and date, shall also be provided. If a PDF is not provided, Meridian will generate a rendition of the CAD file. However, unauthorised renditions will not be published to Masters. Authorisations of drawings at other stages, such as Issued for Construction, etc., are dependent upon project requirements.

A drawing is not authorised until it contains a valid signature and the identification of whoever is signing the drawing. SA Water recognises two acceptable methods of signing.

All new drawings shall have a signed PDF stored in Meridian. Valid design signatures are required on all drawings at IFC, the next uploaded drawing and when significant design changes are made.

9.1 Digital signatures

Digital Signatures are the preferred method and by far the easiest and most secure way to sign a drawing. They can be applied by most PDF authoring software.

An important distinction between digital signatures and electronic signatures is that the latter are not validated for authenticity. An electronic signature is simply an electronic representation of somebody's autograph; a digital signature contains a unique digital ID to verify its authenticity. As the PDF should be locked to prevent any changes, it is important that the drawing is presented in the correct orientation.

Most PDF authoring software can create and validate signatures from self-signed certificates, which is acceptable for certification that occurs within organisations or among trusted parties. SA Water also allows the use of commercially available certificates that can be purchased from third-party providers. However, this is not a requirement.

The digital signature shall contain an image of the authoriser's signature, name, date, and other details if necessary.

9.2 Wet pen signatures

SA Water no longer accepts wet pen signatures on scanned PDFs.

9.3 Plotting

Drawings to be plotted should use "SA Water Mono.ctb" file to ensure that all line weights are set. If plotting to PDF format, then the DWG To PDF.pc3 should be used. This ensures that the drawing is in the correct orientation and that layer information is exported to the PDF.

9.4 Authorising revisions to existing drawings

In many instances an existing drawing on an old title block shall be modified. Some old title blocks do not have sufficient fields to properly capture a revision authorisation. In this instance and providing there is no requirement to migrate the drawing into the current Title Block, a block shall be inserted into the CAD file: "Revision Authorise Block.dwg". It is preferable that it is located near the pre-existing revision section of the title block if the drawing allows. The revision details are to be entered in the pre-existing revision table. Refer to section 4.4 for guidance on when to continue to use an existing title block or to update to the current one.

10 Submission of files to SA Water

Unless alternative arrangements are made with the Asset Information Lead, Lunr will be used for all drawing submissions and requests/downloads. Once a drawing leaves LUNR control, it is the responsibility of whoever has checked the drawing out to maintain correct version control and backups. Drawings can only be downloaded and uploaded to an active workspace. Refer to section 11 for more information on workspaces. As drawings get assigned to a named external contractor, only that user can upload the drawings back into the system. If someone else wishes to upload the drawings, then contact must be made with the SA Water Project Manager, the workspaces assigned Project Controller, or EDMS@sawater.com.au to get the drawings re-assigned.

Note: This does not apply to new legacy drawings being uploaded for the first time.

10.1 File names for legacy format drawings

Note: The following naming conventions apply only to legacy drawings that do not already exist in Meridian. For existing drawings, refer to section 10.3.

10.1.1 Single sheet CAD files

The following format is to be used for single sheet CAD files: YYYY-NNNNN-SS.dwg where Y=Year, N=Drawing Number and S=Sheet Number. All fields shall be used, with zeros substituting missing digits; for example, *2015-00123-01.dwg* is a valid drawing filename, and *15-123-1.dwg* is not.

10.1.2 Multiple sheet CAD files

The following format is to be used for multiple sheet CAD files: YYYY-NNNNN.dwg where Y=Year and N=Drawing Number. All fields shall be used, with zeros substituting missing digits; for example, *2015 00123.dwg* is a valid drawing filename, and *15-123.dwg* is not.

10.2 Authorised PDFs

The PDF filename must be identical to the associated CAD file, as per the naming convention in sections 10.1.1and 10.1.2.

10.3 File names for existing drawings

All existing drawings obtained from Meridian must not have their filename changed or altered in any way. This includes new asset-based drawings and legacy-based drawings.

If a PDF rendition is generated from an existing CAD file, then it must be named identically to the CAD file except for the file extension.

11 Workspace

In Lunr, a Workspace is referred to as a Project Folder. This Project Folder serves as the primary workspace and will be identified as such throughout the system. Drawings can be viewed, and uncontrolled copies can be made from the Master's branch. Drawings can only be created or modified from an active project. Projects can only be created and managed internally by SA Water. External contractors can only download and upload drawings to a project folder. External contractors may have to request access to a project folder through the email to Project Controller or EDMS team if they do not have permission to view it. If a user has been requested to work on a project that does not yet exist in Meridian/LUNR, then this must be raised with the SA Water Project Manager for action.

11.1 Capital delivery

For information on Programs / Project / Output structures, lifecycle and management, contact the Capital Planning and Delivery Meridian coordinator. It is important that project folder duplication is avoided. Before creating a new project folder for a project or output, it is the responsibility of that person to ensure that there is not already a project folder in existence or that they are creating the project folder in the correct location, with the correct name and structure. The Capital Delivery folders are structured by Delivery Program for Outputs and Major Projects for standalone projects.

11.2 Minor projects

This branch is dedicated to business units that need a space to compile their own projects that are not be associated with capital delivery or land development processes. To get a business unit added to this list, contact the EDMS.Support@sawater.com.au. It is the responsibility of the business unit to manage their space.

11.3 Workshops

This branch is dedicated to workshops that need a space to compile their own projects that are not associated with capital delivery or land development processes. To get a workshop added to this list, contact EDMS.Support@sawater.com.au. It is the responsibility of the workshop to manage their space.

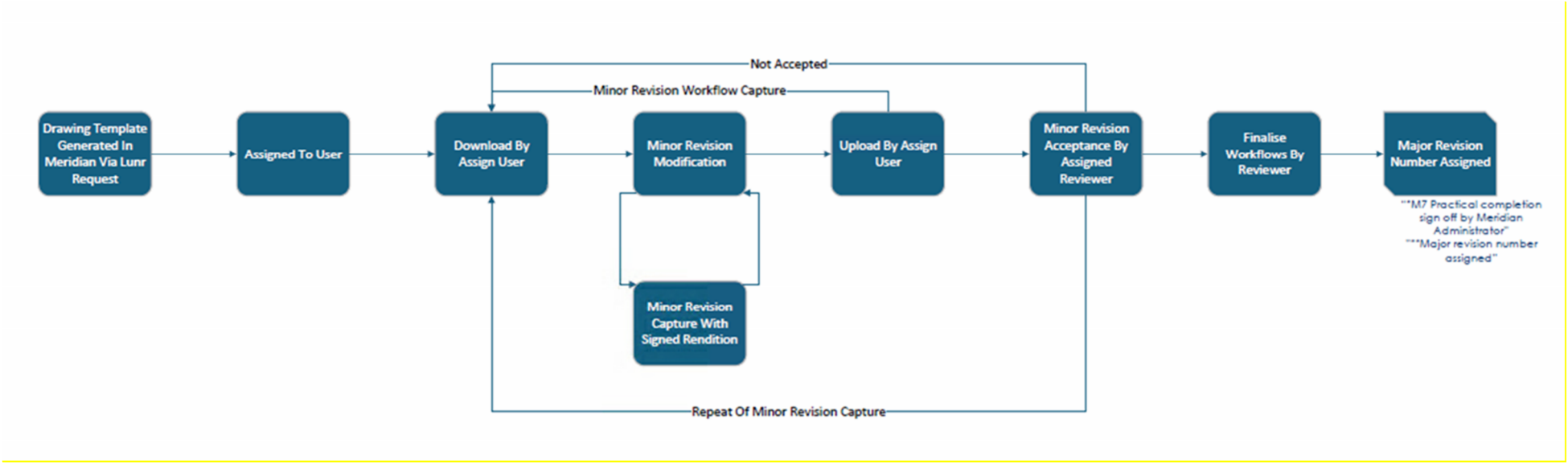
11.4 Land Development

The Land Development Project Folder in Lunr is created automatically Once CAMS generates a water or sewage agreement number in system

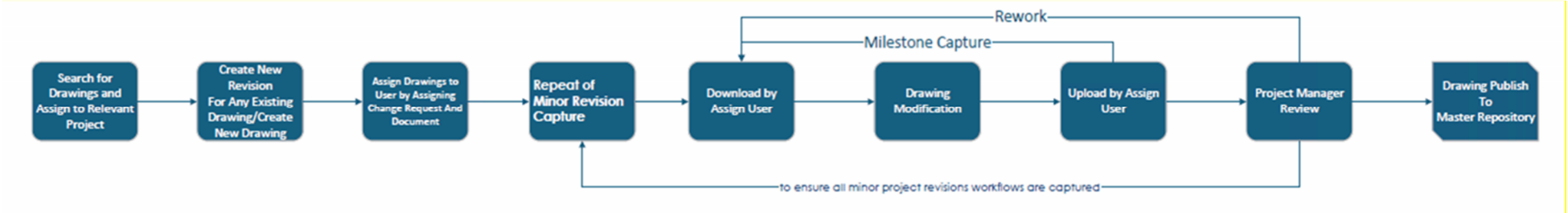
This branch is dedicated to the Land Development and Network Reticulation teams for managing linear assets. In this structure, the case number serves as the project number. Manual creation of project folders for Land Development projects is not possible. For any exceptions or special requirements, coordination with the EDMS Team is required.

A Workflows for internal and external users

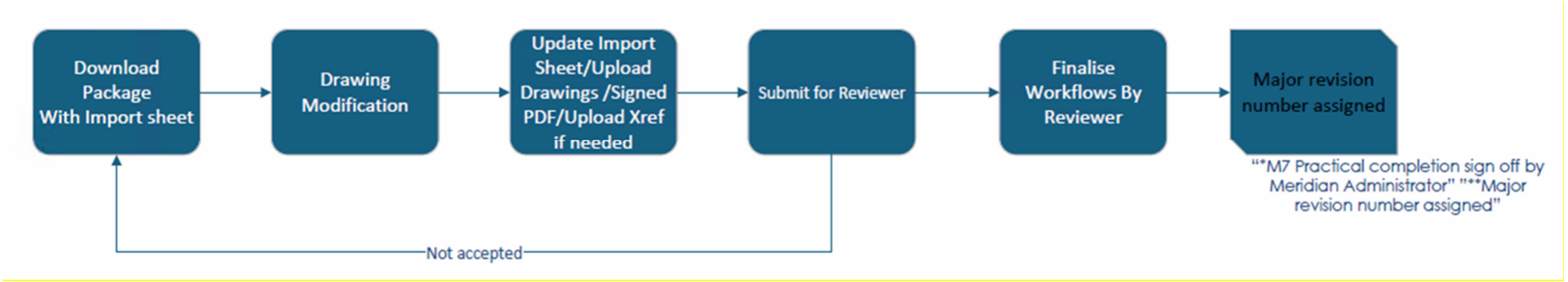
A1 Drawing creation workflow for external contractors



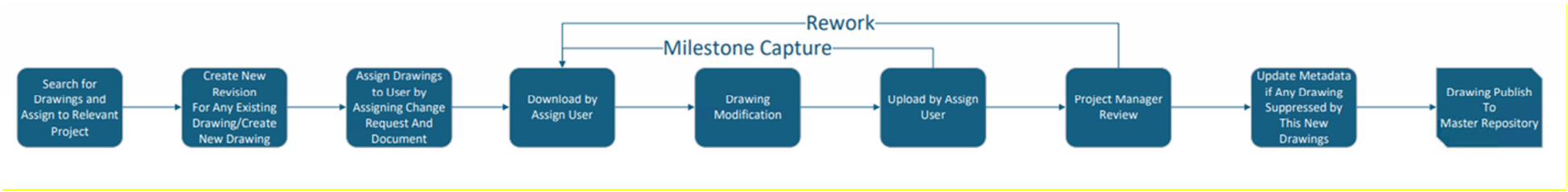
A2 Drawing modification workflow for external contractors



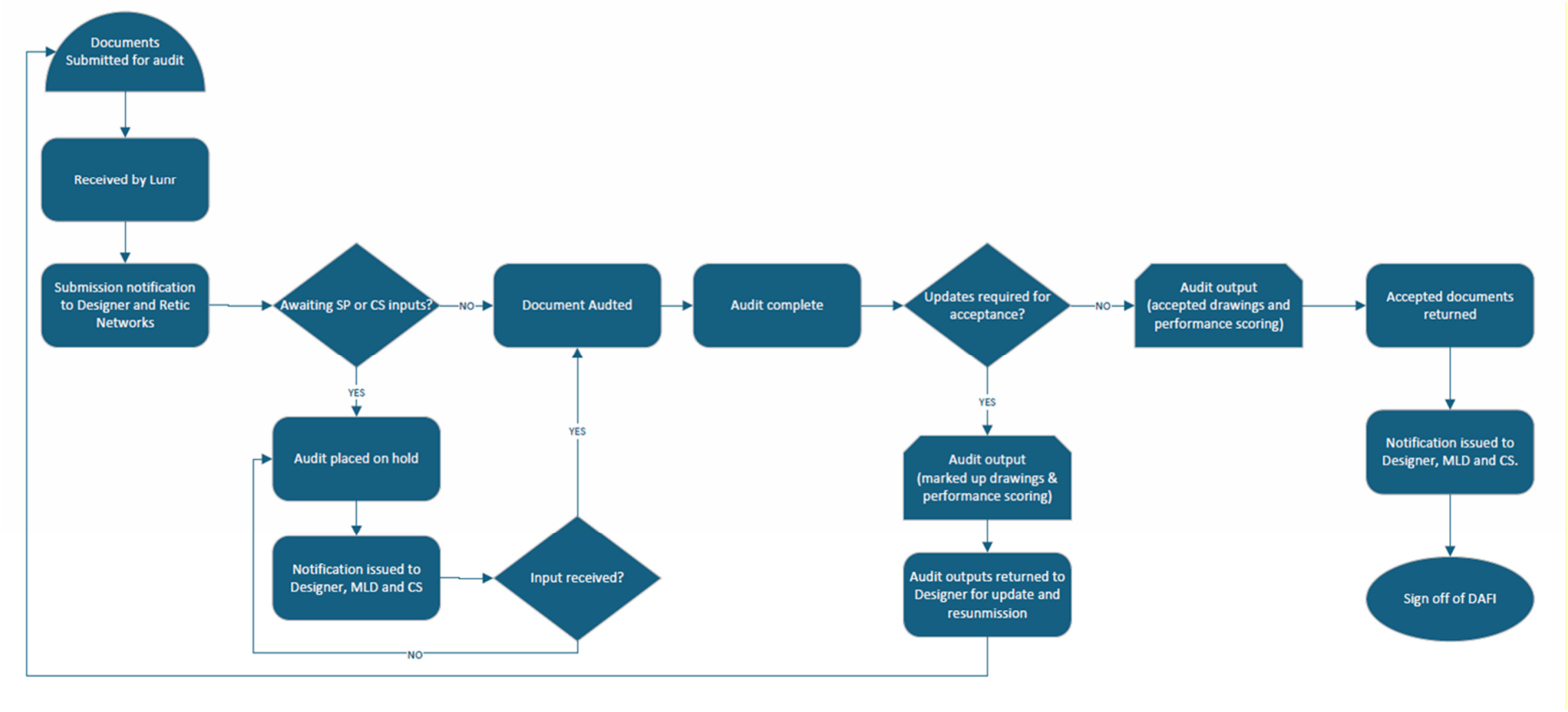
A3 Uploading drawings through LUNR



A4 Drawing creation and modification workflow for internal power web users



A5 Land Development drawing review workflow



B Process for SA Water project managers

The following outlines the responsibilities of SA Water project managers and highlights common issues and checks that should be undertaken both at project commencement and closeout.

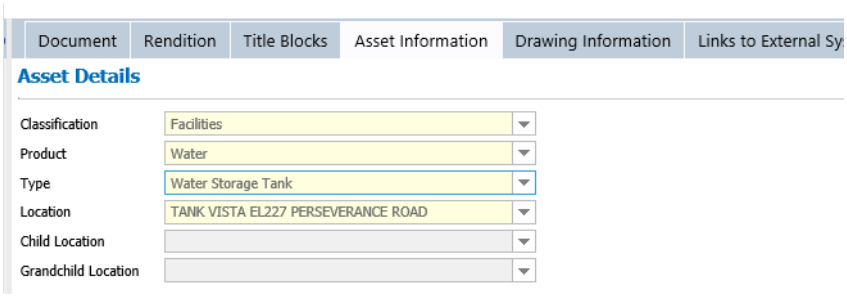
Before engaging contractors to use LUNR, project managers must ensure that:

1. A valid project exists in the structure defined by the Capital Delivery team.
2. A valid asset exists in Maximo. A hierarchy is not required, just a location and Maximo ID. An enhancement is underway to allow the creation of Concept and Temporary drawings that are not associated with an asset; however, until this is rolled out, these drawings can be created using the legacy title block and legacy drawing number.
3. If starting work on an asset that is due to be decommissioned, all new drawings are created against the new asset location ID. Ref item 2 above.
4. New drawings are only created if we do not already have existing drawings or it is not feasible to use them. Any existing drawings must be either updated or superseded to reflect new/modified infrastructure.
5. Contractors (at the user level) have LUNR access to your project workspace. Contractors can request access to additional projects through LUNR.
6. Anyone undertaking modifications to existing drawings, has the drawing checked out to them. If they exist, the contractor may also require access to Xrefs. Refer to **QRG – Working with Xrefs** for more information.

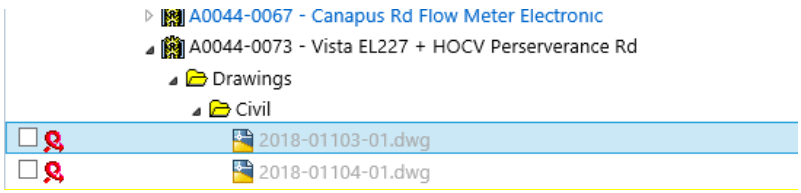
While the project is in work, it is the responsibility of the project manager to ensure that key milestones are captured as revisions. At a minimum, the Issued for Construction and As Constructed revisions must be retained as separate versions. To ensure that any given revision is not overwritten by the next issue, the drawing must be released from the workflow to save that version and then put back into a workflow.

Before requesting the signing of the Practical Completion Checklist, the following tasks must be undertaken:

a. Ensure that any legacy drawings (except for Xrefs) have a valid asset location assigned to them. Unclassified will not be accepted without prior arrangement with the CADD Coordinator.



b. Ensure that any legacy drawings (except for Xrefs) have a valid discipline assigned to them. Unclassified or Other will not be accepted without prior arrangement with the CADD Coordinator.



c. All drawings are removed from any workflows.

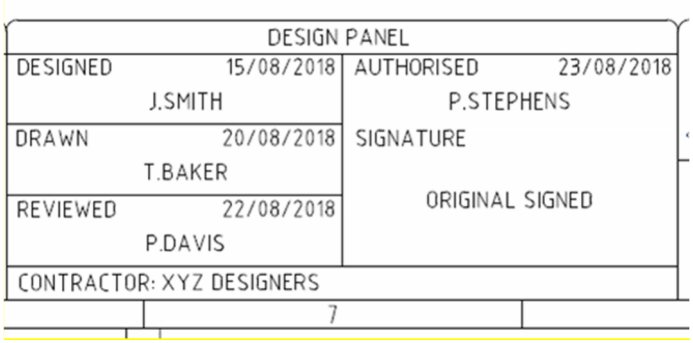
d. CAD files are viewed (in Power Web) in addition to the PDFs to ensure that all Xrefs are linked and that any extraneous features have been removed from the file. Refer to **QRG – Checking CAD file Integrity** for more information.

e. Any unused drawings/sheets have been revoked or marked as spare. For Electrical sets where 99 sheets may have been requested, but not all of them were used, the unused drawings are valid drawings that must be marked as SPARE in both the drawing and title. Do not revoke them. Any other unused sheets or drawings should be revoked. Revoked sheets can still be used in the future if required. Refer to **QRG – Create New Drawings and Drawing Numbers in Power Web** for more information.

C Reference for old SA Water drawing template

C1 Design panel

This Panel contains all of the information relating to the design of the drawing. This is generally filled in at the completion of the design. The authorised section is generally completed at the "Issued for Construction/Tender" revision. The fields are described below.



- DESIGNED

  Use this box to enter the name of the designer and the date of the design.

- DRAWN

  Use this box to enter the name of the drafter and the completion date of the drawing.

- REVIEWED

  Use this box to enter the name of the reviewer and the date of the review.

- AUTHORISED

  The drawing is generally authorised at the "Issued for Construction/Tender" revision. The name of the person authorising and ultimately assuming responsibility for the design is entered along with the date on which the drawing is authorised. The drawing is to be plotted with the signature field left blank. Once a signature has been applied to the PDF (refer clause 9 for valid signatures), the text "ORIGINAL SIGNED" is to be entered into the signature field and then saved.

- CONTRACTOR

  This box contains the company name of the contractor responsible for authorising the design. "SA Water" is to be entered into this field for internal drawings.