



Operations and Maintenance (O&M) Manual  
Technical Standard  
**Version 2.0**

## Document Approval and Issue Notice

It is the responsibility of the users of this standard to ensure that the application of information is appropriate and that any designs based on this Standard are fit for TasWater's purposes and comply with all relevant Australian Standards, Acts and regulations.

Users of this standard accept sole responsibility for interpretation and use of the information contained in this standard. Users should independently verify the accuracy, fitness for purpose and application of information contained in this standard.

Only the current revision of this standard should be used which is available for download from the TasWater website. The Operations and Maintenance Manual Technical Standard is a controlled document. Recipients should remove superseded versions from circulation. This document is authorised for issue once it has been approved.

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## Amendments in this release:

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### Acknowledgements

TasWater gratefully acknowledges the support of SA Water for allowing this document to be closely based on their technical standard *TS 0132 Operations and Maintenance Manuals*.

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## 1. Introduction

TasWater is responsible for the operation and maintenance of an extensive amount of engineering infrastructure.

The provision of this information for any new plant and equipment supports TasWater's asset management function as well as enabling safe and effective operation and maintenance by TasWater.

This technical standard applies to the provision and presentation of 'as constructed' (completion) information for all Operations and Maintenance (O&M) Manuals and updates for existing O&M Manuals provided to TasWater, typically required as a deliverable within a capital works project.

### 1.1. Purpose

The purpose of this standard is to specify the format, structure, and content of the O&M Manual and its relationship with other documentation and records.

The O&M Manual format presented in this standard provides for the collation and provision of constructed information by the contractor to the TasWater representative, in a single transaction to meet 'asset in service and practical completion' requirements.

Some of the final information is subject to control by different business units within TasWater (e.g. Asset Portfolio Planning & Delivery, Service Delivery and System Performance & Major Projects). It is the responsibility of the TasWater representative to ensure that the related applicable technical standards and guidelines are followed, and that information subject to 'internal quality control' is sent to the relevant business units for their record keeping and management purposes, in its native form.

All documents should be lodged and registered in accordance with TASP007 – IMS Document Control Procedure.

Provision of this information should be subject to the provider's quality management systems quality assurance and/or best practice document control requirements (e.g. ISO 9001).

## 2. Glossary and References

### 2.1. Glossary

Term	Description
ASDS	Asset Spatial Data Specification
FD	Functional Description
FDS	Functional Design Specification
GIS	Geographic Information System
HAZIP	Hazard Identification Study
HAZOP	Hazard and Operability Study
HMI	Human Machine Interface
HV	High Voltage
LV	Low Voltage
Maximo	TasWater's Asset Management Information System
O&M	Operations and Maintenance
P&ID	Piping and Instrumentation Diagram
PLC	Programmable Logic Controller
PPE	Personal Protective Equipment
SCADA	Supervisory Control and Data Acquisition
SID	Safety in Design
WHS	Workplace Health and Safety

### 2.2. References

Document Reference	Document Title
TAMSTD01	TasWater's Asset Spatial Data Specification
TPMMAN15	Electrical Project Delivery Requirements Manual
TDESTD14	PLC/RTU and Radio Technical Standard
TDESTD15	SCADA Technical Standard
TOMSTD02	Alarm Philosophy for SCADA Alarms
TOMMAN04	TasWater StationWare General Users Manual
TOMFOR07	TasWater StationWare Device Registration Form (DRF)

### 3. Scope

This standard specifies the requirements for all O&M Manuals that are either provided to TasWater by an external party or created internally by TasWater, including, but not limited to:

- The format of documents
- The number and type of manuals required
- The details to be included
- The layout, arrangement and numbering of sections.

This standard does not provide guidance as to whether O&M Manuals are required on a particular project. This requirement is determined by TasWater and specified in the contract documentation.

## 4. Document Requirements

### 4.1. General

The O&M Manual shall give a clear, comprehensive description of all plant and systems provided under the project including interfaces with other infrastructure. The O&M Manual shall cover the principles and methods of operation, and maintenance requirements, with supporting documentation.

Text shall be supported by flow diagrams, line diagrams, hydraulic grade lines, general layouts and any other illustrations, or drawings as appropriate. This information may be in the form of as-constructed drawings or may be sourced from design reports or other project documentation.

The manual shall be written in the English language, must be clear and legible, and shall only contain directly relevant information. Where the plant information is included in a publication covering a range of related equipment only the relevant content shall be extracted or copied and inserted into the O&M Manual.

### 4.2. Submission of O&M Manuals

A draft O&M Manual, compiled as per this technical standard, shall be provided prior to the commencement of the run or performance test period for review by TasWater.

The draft O&M Manual shall be complete in terms of original content and documentation provided by others. Outstanding information to be included in the final manual shall be clearly indicated in the draft version.

Adequate time shall be allowed for review and for the outcomes of the review to be addressed, noting that delivery of the final O&M Manuals to TasWater is a condition for the granting of practical completion.

The quantity of final manuals to be provided depends on the nature of the project and the associated site(s). One draft O&M Manual and two final O&M Manuals shall be provided unless otherwise stated in the Contract documentation. The printed O&M Manuals shall be passed to the Project Owner for distribution within TasWater's Service Delivery Division and an electronic copy should be given to Asset Information (via [assetinfo@taswater.com.au](mailto:assetinfo@taswater.com.au)) for publication on TasWater's Intranet.

### 4.3. Structure of O&M Manuals

The O&M Manual shall be structured generally as per Sections 1 to 3 and the Appendices of this standard in accordance with Table 1 below.

Table 1. Table of Contents for O&M Manuals

Section	Number	Description
Section 1		Overview
Section 2		Operating Manual
	2.1	<ul style="list-style-type: none"> <li>Introduction</li> <li>Controls Overview</li> <li>Automatic Operation</li> <li>Manual Operation</li> </ul>
	2.2	Inspections, Tests and Adjustments
	2.3	Operating Parameters
	2.4	PLC, HMI and SCADA Programs <ul style="list-style-type: none"> <li>Controls Functional Description (FD or FDS)</li> <li>PLC and HMI Diagrams</li> </ul>
	2.5	Data Storage and Retrieval
	2.6	High Voltage Switching Plan
	2.7	Isolation Plan
	2.8	Contingency Operation
	2.9	Troubleshooting
Section 3		Maintenance Manual
	3.1	Maintenance Schedules
	3.2	Special Maintenance Activities
	3.3	Critical Spares
	3.4	Consumables
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	3.6	Suppliers and Service Providers
Appendices		Appendix
	A	Drawings
	B	Warranties
	C	Instrument and Equipment List
	D	Test Results and Manufacturers Data Reports
	E	Manufacturer/Supplier Literature
	F	Training
	G	Work Health and Safety and Environmental File
	H	High Voltage Switching Plan(s)
	I	Isolation Plan(s)
	J	Statutory Compliance Certificate(s)
	K	PLC, HMI and SCADA

**NOTE: If the project does not include any content for a particular section or appendix as a result of the project scope, the clause or appendix heading shall be retained and annotated “No content” to maintain the standard document format.**



#### 4.4. Print (Paper) O&M Manuals

Printed O&M Manuals shall be compiled in accordance with Table 2.

Table 2. Requirements for paper O&M Manuals

Item	Description
Folders	The manual may be presented as a single folder or may be split into multiple folders as appropriate, depending on the nature and size of the project.
Titles	Each folder shall be identified on the front cover and on the spine with the title "Operating & Maintenance Manual for <i>Project</i> - Volume X of Y" as appropriate, unless otherwise advised by TasWater.
Folder Details	A4 sized hard cover, white vinyl or plastic; 4D ring, maximum size 50mm with compression bar; flat-opening.
Dividers	Durable hard plastic dividers, with titled or numbered tabs.
Pagination	Pages shall be consecutively numbered.
Drawings	Maximum A3 size, folded to A4 size and filed in protective plastic sleeves. Drawings shall be printed PDF versions saved from drawing (.DWG) files for clarity, i.e. not scanned prints.

#### 4.5. Digital O&M Manuals

Requirements for digital O&M Manuals shall be compiled in accordance with Table 3.

Table 3. Requirements for digital O&M Manuals

Item	Description
Digital Structure	The files making up the O&M Manuals shall be arranged in a folder structure as per document Section 4.3.
Digital Format	<p>All items in the Table of Contents shall have "hypertext links" within the document. All digital content shall be PDF versions, text searchable bookmarked contents. O&amp;M Manuals (typically less than 100 Mb) shall be presented in one document. For larger documents, Section 1 to 3 may be combined into a single PDF. Appendices maybe merged separately in PDF documents.</p> <p><b>NOTE:</b>  <b>Drawings must be maintained as separate DWG &amp; PDF folders &amp; files.</b>  <b>Only PDF versions of drawings are to be provided to Service Delivery, as version control of DWG files are managed via Asset Information. The Project Manager is responsible for ensuring that control is maintained via internal document transmittals.</b>  <b>Manufacturer's manuals may be left as individual PDF files, and shall be text searchable when this function is available.</b></p>
File Structure and Naming Convention. (Final PDF Versions & native files)	<p>The file name shall be structured as follows: <b>OM-Manual-W-Vol X of Y [-z]-vV</b>            Where:            W is the TasWater Project C.No &amp; project description            H is the volume number            X is the volume number            Y is the number of volumes            [z] is a lower case alphabetical identifier where multiple files are needed due to the PDF size limitation            V is the version number. Published versions are whole numbers, draft versions are decimals            For examples, 0.1 is the first minor version, 1.3 is the third minor version of a file that was published once, and 2 is the second major version of a published file.            Examples:</p>

Item	Description
	OM-Manual-C0927 Bolivar DAFF Dewatering Struvite Ctrl-Vol 1 of 1-v0.1.pdf OM-Manual-C0927 Bolivar DAFF Dewatering Struvite Ctrl-Vol 1 of 1-v1.0.pdf OM-Manual-C0927 Bolivar DAFF Dewatering Struvite Ctrl-Appendix G Vol 4 of 6-v1.0.pdf OM-Manual-C1522 Bolivar MPS Upgrade-Appendices Vol 5 of 5-a-v2.pdf OM-Manual-C1522 Bolivar MPS Upgrade-Vol 1 of 5-b-v2.pdf

#### 4.6. Original (Native) Format Files

All original content such as text, tables, spreadsheets, etc. shall also be provided in original formats such as Word or Excel, and shall be unlocked. These should be presented in the folder structure as per document Section 4.3. File names should be common between native and PDF documents.

## 5. O&M Manual template

The following sections are presented such that a standard template can be created. The explanatory text details the requirements for each section and shall be deleted from final versions.

### 5.1. Section 1 - Overview

This section should comprise a high level project overview and general scope of works. This will include a general description of the plant and its interfaces/interdependencies with other plant and systems. It is **NOT** a copy of the Contract scope or price schedule, though it may be partly based on this information.

It should also provide the general context of the project in terms of other TasWater plant and systems. This information will not always be obvious or known to the author, particularly when it is a construction Contract, and may require input by TasWater.

It is essential that the terminology used is consistent with that used by TasWater, particularly with regard to technical terminology and locations/sites descriptors. This information should be sourced from or validated via the TasWater Project Manager from internal TasWater Departments.

References to or extracts from existing manuals, drawings, and other documentation relevant to the plant or equipment may be included.

The author of the O&M Manual is responsible for managing input from TasWater and all contractors, suppliers and manufacturers.

### 5.2. Section 2 - Operating Manual

#### Introduction to Guidance Notes on Section 2 Operating Manual

The Operating Manual should provide information and directions for the safe and effective operation of the plant under all conditions of operation and design parameters.

The Operating Manual will be based on the final (as-constructed) controls philosophy, noting that it is to be addressed to the system or plant operators.

The Operating Manual shall address the requirements of Section 2 as a minimum.

**NOTE: This introduction is not a part of the standard template.**

#### 5.2.1. Plant Operation

##### 5.2.1.1. Introduction

This Section addresses:

- What it is
- How it works
- Its relationship with other plant or systems.

It comprises a step by step description of each method of operating the plant in a logical sequence and describes relevant plant and control interfaces with existing plant.

If the plant comprises discrete sections or systems they are addressed individually, and then as a whole, e.g. in a sewage treatment plant the inlet works, aeration system and sludge handling are all

discrete systems that will be presented individually initially, and then later as part of the whole plant.

Photos of the plant, screen dumps of the HMI and SCADA screens, and similar illustrative material shall be used to support the descriptive text.

#### **5.2.1.2. Controls Overview**

This section shall provide an overview of the controls for each mode of operation, including the interfaces and relationships with other parts of the plant or with existing systems embedded. Copies of the main HMI/SCADA screens may be used to aid understanding and when used should be representative of final (as constructed and commissioning) screens and associated set points etc.

#### **5.2.1.3. Automatic Operation**

A detailed description of the methods of operating the plant in automatic mode, including descriptions of how to:

- Activate the plant for automatic operation
- Adjust any operator-adjustable parameters, set points or alarms
- Acknowledge alarms
- Reset faults
- Place the system into an operator driven automatic control regime by adjusting normal control parameters or set-points. Shut down individual pieces of plant or individual systems; shut down the whole plant.

Include a check-list of related equipment (assets) with its required state and set points for automatic operation of the plant.

#### **5.2.1.4. Manual Operation**

A detailed description of the methods of safely operating the plant in manual mode, including descriptions of how to:

- Manually start and run individual plant or systems
- Adjust any operator adjustable parameters, set points or alarms
- Acknowledge alarms
- Reset faults
- Change plant status (e.g. duty 1/duty 2/standby); shut down individual pieces of plant or systems
- Shut down the whole plant.

### **5.2.2. Inspections, Tests and Adjustments**

This section shall contain the procedures and/or instructions for inspection, tests and adjustments that cannot be planned or scheduled in Maximo.

Examples include; seasonal, emergency or condition based changes (e.g. raw water, influent quality) that may require process adjustments; non-routine or special tests or adjustment (e.g. torque settings and adjustments); procedures for long term shut down/mothballing (e.g. seasonal irrigation, chemical dosing or process unit outage).

### **5.2.3. Operating Parameters**

A list of all fixed and adjustable operating parameters such as set points, inhibits, alarms, timers, flow rates and pressures. For each parameter provide the related P&ID instrument number, value

set at commissioning, range, process units, fixed or operator adjustable, and the location at which it can be adjusted.

Table 4. Examples of operational parameters to be included

Description (Parameter) (Description As HMI / SCADA)	P&ID Tag No.	Initial Setting	Range	Resolution	Operator adjustable
Hypochlorite Batch Strength	-	5.0%	0-20.0%	0.10%	Y - SCADA
Nominal Dose Set point	-	1.00 mg/L	0-5.00 mg/L	0.01 mg/L	Y - SCADA
Mode Change Time Delay	-	10 min	0-60 min	1 min	Y - SCADA
Residual Chlorine Set point	AIT01	1.20 mg/L	0-3.00 mg/L	0.01 mg/L	Y - SCADA
Minimum Water Flow Set point	FIT01	2 L/s	3-20.0 L/s	1 L/s	Y - SCADA

#### 5.2.4. PLC, HMI & SCADA Programs

This section shall contain tables of all PLC, Radio, HMI & SCADA programming software installed and amended under the project and defined in the Device Registration form as per TOMFOR07. TasWater requirements for provision of software via StationWare must be met.

All Licenses and/or Software Agreements are to be listed as per Appendix K

##### 5.2.4.1. Controls Functional Description (FD or FDS)

For all control systems installed or modified the following is to be included in each O&M Manual:

- An Adobe© (.PDF) copy of the functional description, updated to as constructed status, “native” versions are to be provided.

Table 5. Example of functional descriptions to be included

Description	Name	Print Copy (Yes/No)
Filter Control Functional Design Specification	51-64385-11-FDS-0001	Yes
Predictive Alum Dose Control System Functional Description (PADCS)	51-64385-11-FDS-0003	Yes

##### 5.2.4.2. PLC & HMI Programs

For all PLCs, RTU’s, Radio’s HMI and SCADA Servers installed or programs modified the following is to be included in each O&M Manual:

- Listing of PLC, RTU, Radio, HMI and SCADA Code is required
- Listing of SCADA alarm severity and responses are required as per the Alarm review process as detailed in TOMSTD02 – Alarm Philosophy for SCADA Alarms

For all SCADA or HMIs installed or SCADA or HMI programs modified the following is to be included in each O&M Manual:

- An overview of the screen structure
- A screen “shot” of all screens, including trending screens
- A description of screen operation
- A description of equipment operation using the screens.

#### 5.2.5. Data Storage & Retrieval

Provide a list of reports or spread sheets available from the control system or SCADA, with an example of each.

The methods by which operators can prepare print, store, and retrieve reports from data captured within the HMI, the control system, or SCADA.

**NOTE: This section will be updated in 2018/19 to reflect proposed changes to be introduced by TasWater's Enterprise Historian.**

### 5.2.6. High Voltage Switching Plan

A High Voltage Switching Plan is required for all HV electrical works. All switching plans to be included in native and PDF format in Appendix H. Operator/contractor training may be required.

Table 6. Example of high voltage plan parameters to be included

Plan No/Reference (Description aligned with electronic copy)	Switching Plan	Brief Description

### 5.2.7. Isolation Plan

A description of the activities required to ensure the plant is isolated from energy sources, flow, or harmful product and is made-safe for events such as maintenance activities and equipment replacement or repair. This includes isolation of sections or elements of plant and cessation of flow. All isolation plans are to be included in native and PDF format in Appendix I.

Table 7. Example of Isolation Plan parameters to be included

Plan No/Reference (Description aligned with electronic copy)	Plant, Equipment/Asset Isolation	Brief Description

**NOTE: Suggested template is included to Appendix I. Training Service Delivery personal should be undertaken.**

### 5.2.8. Contingency Operation

Response procedures for common disruptive scenarios are included in TasWater's Incident and Emergency Management Plan, e.g. flood, fire, loss of disinfection, sewer spill. This section of the O&M Manual shall comprise any site-specific contingency requirements.

Provide a detailed description of how the plant can be operated and the control system configured for operation in defined contingency modes, where this capability has been provided, e.g. bypass around blocked inlet screens. Include set point changes, alarm changes and inhibit overrides required to achieve the desired outcome.

### 5.2.9. Troubleshooting

A basic troubleshooting guide, in tabular form, to aid in simple fault diagnosis. It shall comprise a list of alarms and responses; typical symptoms; and instructions as to how to further investigate and resolve the fault.

Include instructions on how to safely run the appropriate test or diagnostic programs and instructions for regaining normal operational control.

### 5.3. Section 3 - Maintenance Manual

#### Introduction to Guidance Notes on Section 3 Maintenance Manual

The Maintenance Manual provides information, including asset hierarchy, asset criticality, maintenance regimes and tasks to be performed, to support the effective and optimised maintenance of plant in its original condition and to its design performance.

**NOTE: This introduction is not a part of the standard template**

#### 5.3.1. Maintenance Schedules

This section provides maintenance schedules which are:

- Required for statutory compliance
- Required to satisfy manufacturer's/supplier's warranty conditions
- Recommended by the manufacturer/supplier or contractor
- Operational maintenance requirements.

A copy of the maintenance plans "loaded" into Maximo should be included here for reference.

**NOTE: Asset Strategy & Performance and Service Delivery teams should review and agree the requirement for maintenance schedules prior to Maximo being loaded and activated.**

Table 8. Example of asset management (Maximo) schedule to be included

Asset		Tasks				Planning				
Location ID	Description	Task Frequency	Frequency Units	Reason Source	Task No.	Task Description	Task Duration (Hours)	Labour Type	First Start Date	Work Order Group #
RSBSP01-002	Battery 24 Ah	5	YEARS	Recommended	10	Replace Battery	2	Electrical Fitter	20/06/2019	
RSBSP01-003	Battery 65 Ah (No 1)	5	YEARS	Recommended	10	Replace Battery	2	Electrical Fitter	20/06/2019	
RSBSP01-004	Battery 65 Ah (No 2)	5	YEARS	Recommended	10	Replace Battery	2	Electrical Fitter	20/06/2019	
RSBSP01-017	Switchboard Cabinet	6	MONTHS	Recommended	10	Check Switchboard interior clean, dry and vermin free	0.25	Electrical Fitter	20/12/2014	
RSBSP01-019	Protection Equipment	6	MONTHS	Recommended	10	Check Mains Surge Diverter OK	0.25	Electrical Fitter	20/12/2014	
RSBSP01-022	RPZ Device (ME03)	1	YEARS	Statutory	10	RPZ annual testing & certification.	2	Plumber	20/06/2015	
RSBSP01-026	Dosing Pump 1 (PU01)	2	YEARS	Recommended	10	Servicing	4	Mechanic	20/06/2016	
RSBSP01-027	Dosing Pump 2 (PU02)	2	YEARS	Recommended	10	Servicing	4	Mechanic	20/06/2016	
RSBSP01-123	Chlorine Analyser 1 (AIT01) Tank Inlet	1	MONTHS	Recommended	10	Polishing of Indicator Electrode	1	Operator	20/07/2014	
RSBSP01-123	Chlorine Analyser 1 (AIT01) Tank Inlet	1	YEARS	Recommended	10	Replacement of Indicator Electrode	1	Operator	20/06/2015	
RSBSP01-123	Chlorine Analyser 1 (AIT01) Tank Inlet	3	MONTHS	Recommended	10	Ceramic Beads Cleaning	1	Operator	20/09/2015	
RSBSP01-123	Chlorine Analyser 1 (AIT01) Tank Inlet	1	YEARS	Recommended	10	Replacement of Ceramic Beads	1	Operator	20/06/2015	

**NOTE: The Maximo Asset Register Template sheet should be provided in Appendix C.**

### 5.3.2. Special Maintenance Activities

This section should describe the procedures for any maintenance on plant that is either:

- Non-proprietary or not covered by manufacturer/supplier literature; or
- Complex or specialist, in which case the information should be provided copied into this section from the manufacturer/supplier literature.

Include procedures for safe disassembly, repair and reassembly; cleaning; inspection; alignment and adjustment; with a logical step-by-step set of instructions for each procedure.

**NOTE: If no specialist maintenance insert 'No Content'**

### 5.3.3. Critical Spares

This section should comprise a table of critical spares, as agreed between TasWater and the contractor.

The list should include the following information:

- Component name or descriptor
- Part number or other identifier
- Recommended minimum stock-holding (re-order trigger)
- Supplier and contact information.



The component names and descriptors should be consistent in terminology with the rest of the O&M Manual.

**NOTE: If no critical spares are required or provided under the contract insert 'No Content'.**

#### 5.3.4. Consumables

This section should comprise a table list of recommended consumable items including component name or description; part number or ID; and supplier information.

Consumables include items regularly added or replaced during regular servicing such as lubricants, coolants, seals and gaskets, filters, belts, etc.

The item descriptions should be consistent in terminology with the rest of the O&M Manual.

**NOTE: If no consumable items are required or provided under the contract insert 'No Content'.**

#### 5.3.5. Special Tools

This section should comprise a table of recommended special tools and equipment required for the maintenance of the plant, including any associated software. Include instructions, training or certification for their use and maintenance, and information on any special storage or calibration requirements.

**NOTE: If no specialist tools are required or provided under the contract insert 'No Content'.**

#### 5.3.6. Suppliers and Service Providers

Insert a table providing the name, address, and contact information for suppliers and service providers for each (significant) piece of plant, or equipment group e.g. switchboard, package plant etc.

Include contact details of the principal contractor who will provide the warranty cover under the project.

Table 9. Example of suppliers and service providers details to be included

Supplier Name	Contact/Address	Phone	Website/Email
Principal Contractor	Mr Big. 600 Main Road, Hobart, TAS, 7009	(03) 6234 5678	www.PCMain.com
Grundfos	515 South Road, Derwent Park, TAS, 7009	(03) 6261 4611	http://au.grundfos.com

## 6. Appendices

### Appendix A: Drawings

An electronic (watermarked PDF) copy of all the final (as-constructed) drawings shall be included in this section.

**Native CAD (.DWG) files shall NOT be included in O&M Manuals;** these files (including original signed PDF files) shall be provided in accordance with TasWater's drawing management requirements.

Provide hard copy (A3 folded) for selected as-constructed drawings as agreed with TasWater Service Delivery teams.

All PDF versions of drawings supplied in the O&M Manual shall be watermarked "UNCONTROLLED" are to be provided to Service Delivery, as versions control of DWG files are managed via Asset Information. The Project Manager is responsible for ensuring that control is maintained via internal document transmittals.

A PDF version of the drawing transmittal can be used as the Drawing Register.

The following drawing types should be included:

- Mechanical
- Electrical
- Civil
- Structural
- P&ID
- Site Plans
- Site Services
- Survey
- Cathodic Protection
- Network Infrastructure (Water, Sewerage & Recycled Water) pipeline & profile drawings
- Network Communications.

## Appendix B: Warranties

Include the Warranty Documentation Register and warranty documentation **other than** that associated with the standard 12 months contract defects liability and any special conditions imposed.

The warranty period should be aligned with any extended warranty agreements.

Unless specifically agreed otherwise, the warranty period on equipment starts from when plant is commissioned.

Examples of such documentation are:

- Documentation associated with shorter or longer defects liability periods, for either part of or the whole works
- Warranties that extend beyond the defects liability period
- Documentation for conditional warranties or special conditions
- Evidence of approval of the installing contractor where such approval is a condition of warranty. This is usually associated with specific materials or technologies that require specialised training and/or equipment for correct installation.

Table 10. Example of warranties information to be included

Maximo Location ID (Description aligned with electronic copy)	Maximo Equipment / Asset Description	Supplier	Make or Model (if different from supplier)	Serial No.	Warranty Start (Purchase or Installation Date)	Warranty Period	Print Copy (Yes / No)
RSBSP01-034	Booster Pump	Grundfos	SEG			24 months	

### Appendix C: Instrument and Equipment Lists

This appendix should contain all information relevant and the asset, instrumentation equipment provided under the contract.

A copy of the relevant columns, (example below) of the list of asset data (Maximo and GIS input information) – refer to the TasWater asset data specification and requirements.

Equipment and instrumentation lists developed during design should be provided in this appendix, together with a register of contents.

Table 11. Example of instrument equipment list to be included

File Ref/Name (Description aligned with electronic copy)	Description
Maximo hierarchy.pdf	Facility / Asset Maximo hierarchy View
Maximo hierarchy.xls	MAXIMO (As submitted for loading)
Valve schedule.xls	Site xx valve schedule
Pipe Schedules	etc.
Instrument Schedule	
Equipment (Technical) Data Sheets	
Switchboard Label & Component schedules	
Cable Schedules	

## Appendix D: Test Results and Manufacturer's Data Report

The content of this appendix will vary widely depending on the nature and extent of the project. Separate folders may be used for clarity within this appendix.

A register of contents should be provided.

Table 12. Typical test results test sheet

Folders/Document (Description aligned with electronic copy)	Source	Print Copy (Yes / No)
Quality records (or TasWater reference documents)		
Design calculations, specialist reports and calibrated models		
Fabrication details & drawings		
Inspection test results/records/certificates		
Factory acceptance test results		
Materials test certificates		
Pump test curves		
Site acceptance test results		
Compaction density & moisture content tests		
Surface preparation & protective coating records		
Weld tests		
Calibration certificates		
Noise and vibration test results (working area & community)		
Noise, vibration & alignment test result (mechanical)		
Hydrostatic test results		
Surge and hydraulic performance test results (local, system & performance) commissioning records		
Water / sewerage / effluent quality test results		
Disinfection test results		
Alarm point to point records		
RTU test results		

## Appendix E: Manufacturer/Supplier Documentation and Literature

Include a register and all relevant manufacturer/supplier literature for the installed plant.

The register shall include the following information: Item (descriptor), manufacturer/supplier and model. A register of contents should be provided.

Table 13. Example of manufacturer's information to be included

File No (Description aligned with electronic copy)	Item/Description	Supplier/Manufacturer	Model	Print Copy (Yes / No)
1. Grundfos.pdf	Pumps	Grundfos	SEG	Yes
2. E&H FMX21.pdf	Hydrostatic Level Transmitter	Endress & Hausser	FMX21	Yes
3. E&H Mecas 10.pdf	Level Switches	Endress & Hausser	Mecas 10	Yes
4. E&H ProMag 51.pdf	Flow Meter	Endress & Hausser	ProMag 51	Yes
5. AVK Series 57/41.pdf	Gate/Check Valves	AVK	Series 57/41	Yes

## Appendix F: Training Information

Include a register of training material and copies of all training materials or courses, including presentations (PowerPoint), hand-outs, and records of personnel to whom the training was provided, along with recommendations for any necessary future or refresh training.

Any relevant license(s), accredited or demonstrated competencies or associated skills identified as training prerequisites and/or outcomes associated with this training should also be included.

Table 14. Example of training details to be included

File No (Description aligned with electronic copy)	Description
	Training Program
	Training Register
	Training Feedback / Records
	Completions Records
	Licence / Certificates

## Appendix G: Work, Health & Safety (WHS) and Environment

The requirements for ensuring that relevant WHS and environmental information is transferred throughout the process of designing, constructing and operating new or updated plant must be adhered to. TasWater documents and WHS and environmental documents may want to be referenced.

This appendix should include all information developed and utilised during the design, construction, commissioning and operation of the package/equipment, plant etc. in order that the process of WHS and environmental risk identification, treatment and communication can be documented.

All WHS and environment related documentation should be presented in this appendix.

Table 15. Example of WHS and environmental information to be included

Document (Description aligned with electronic copy)	Date	Version	Print Copy (Yes / No)
(SID) Safety in design risk assessment (Note 1 & 3)			Yes
HAZOP/HAZID report (Note 1 & 3)			Yes
Decommissioning, dismantling, demolition and / or disposal information			Yes
Noise and vibration hazards (restricted areas, PPE req. etc.)			Yes
Practical completion asset WHS checklist (Note 2)			Yes
Safety data sheets			
Environmental or heritage protection, exclusion or management requirements			

**Note 1:** The final "Post Construction Design Reviews" version of risk assessment / action lists must be included i.e. those that have been validated against the finished product, post commissioning and / or on transfer of responsibility for operation to TasWater including the communication of any residual operational WHS or environmental risk.

**Note 2:** There may be multiple asset WHS checklists for separable portion or staged transfer of operational responsibility to TasWater.

**Note 3:** It is the responsibility of the project manager to ensure that all safety in design risk assessment records (Excel format) are forwarded to TasWater Design and Standards specialist in Engineering Services for final review and filing. TasWater documents and requirements may want to be referenced.

Only pdf versions (Notes 1 & 3 above) are to be provided to Service Delivery via internal transmission.



## Appendix H: High Voltage Switching Plan

It is the contractor’s responsibility to prepare, trial and validate switching sheet for operation correctness as part of the requirement for project commissioning. TasWater documents and switch plan document/sheets may want to be referenced.

The high voltage switching plan consists of HV single line diagram and individual switching sheet / switching program.

### High voltage single line diagram

The high voltage single line diagram depicts the power supply arrangement for HV equipment that is installed, such as circuit breakers, contactors and fuses, isolators, earthing switch, switchboard busbars, power supply transformers, key interlocks etc. The interface between equipment that are owned by TasWater and power supply utility should be clearly shown in the single line diagram.

In order for the single line diagram to be used as the HV switching diagram, the following information for the installed equipment are required to be shown:

- Identification number and current rating for switches including earthing switch e.g. CB No.2 1000A
- Keying system detail
- Key interlock number for individual switching component
- Switchboards location
- Primary/secondary voltage and power rating (kVA) of supply transformers so that both the HV and LV equipment that are supplied by the transformers can easily be identified.

### High Voltage Switching Sheet / Switching Program

High voltage switching sheets are steps of safety instruction that a high voltage switching operator and checker need to follow while undertaking high voltage isolation and restoration work. The switching sheet will clearly states the limit of isolation. Equipment that is referred to in the switching sheet shall have the same unique identification number and detail in the high voltage single line diagram.

The following table can be completed to identify included plans in this appendix.

Table 16. Example HV switching sheet

Plan No / Reference (Description aligned with electronic copy)	Switching Plan No	Drawing No	Maximo	Description

**NOTE: Demonstration of HV switching may be required as a part of operational handover for specialist contractor or qualified TasWater personnel.**

### Appendix I: Isolation Plan

The plant and/or main equipment that require isolation and the procedures for isolation to be followed should be identified below.

Examples may include:

- Power supply for main control centre (power)
- Items of plant/equipment. Whole process, individual asset, (process flows)
- Chemical doing systems/lines (treatment chemicals, liquid, powder, gas)
- Tanks and pipework (inundation/atmosphere).

Table 17. Example isolation plan

Plan No/Reference (Description aligned with electronic copy)	Plant, Equipment/Asset Isolation (include MAXIMO ID)	Description of Isolation (Process, Electrical, etc.

**NOTE: Demonstration of safe isolation procedures should be included in Service Delivery training.**

## Appendix J: Statutory Compliance Certificates

Include a register and copies of all compliance certificates.

Table 18. Example compliance certificate list

Certificate (Description aligned with electronic copy)	Certifying Authority	Date Issued	Expiry/Renewal Date	Print Copy (Yes / No)
1. Electrical compliance certificate				
2. Crane Certificate				
3. Dangerous Substances License				
4. Pressure Vessel certification (Plant Registration and Design Approval)				
5. Backflow prevention certification				
6. Gas Certificate of Compliance				

## Appendix K: PLC, HMI and SCADA

Listing of all native PLC, RTU, Radio, HMI & SCADA programming software installed and/or amended versions are to be included in this appendix.

The SCADA applications team requirements and systems standard are pre-requisites for compliance and presentation of as constructed Information. TasWater documents and SCADA document requirements shall be referenced.

All PLC, RTU code shall be as per:

- TDESTD14 - PLC RTU and Radio Hardware Software Technical Standard.

All ClearSCADA developed code shall be as per:

- TDESTD15 - SCADA Technical Standard

All Alarms SCADA alarm severity and responses are to be documented as per:

- TOMSTD02 - Alarm Philosophy for SCADA Alarms

All programmable device settings shall be registered and stored in StationWare as per:

- TOMMAN04 - TasWater StationWare General Users Manual
- TOMFOR07 - TasWater - StationWare Device Registration Form (DRF)

Table 19. Example of functional descriptions

Description	Name	Print Copy (Yes/No)
Filter Control Functional Design Specification	51-64385-11-FDS-0001	Y
Option Items Functional Design Specification	51-64385-11-FDS-0002	Y
Predictive Alum Dose Control System Functional Description (PADCS)	51-64385-11-FDS-0003	Y

Table 20. Example of licenses and/or software agreements

Description	Name	Print Copy (Yes/No)
Software Licenses		
Radio Licenses		