

Engineering Services

Technical Standard **TS 0132**

Operations and Maintenance Manuals

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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 SA Water'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 SA Water website.

Significant/Major Changes Incorporated in This Edition

- Number changed from TS 151
- Change of Appendix G Safety Data Sheets to Work, Health & Safety & Environmental File
- Update (for clarity) of PDF Requirements including file naming convention
- Additional Guidance based on user feedback


Document Controls

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1 Introduction

SA Water 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 SA Water's Asset Management function as well as enabling safe and effective operation and maintenance by SA Water.

This Technical Standard (TS) applies to the provision and presentation of as constructed (project completion) information for all Operating & Maintenance (O&M) Manuals and updates for existing O&M Manuals provided to SA Water, 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 Operating & Maintenance Manual format presented in this standard provides for the collation and provision of constructed information by the contractor to SA Water's 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 SA Water (e.g. Engineering, Asset Management). It is the responsibility of the SA Water's 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.

Where this information is also required by Operations & Maintenance (at the point of operational use / completion), "uncontrolled" pdf versions of documents should only be left in the transmitted manual. Native documents should be removed and transmitted by SA Water's Representative to the relevant business unit, following the agreed internal procedures. Examples include Maximo, drawings (dwg), Safety in Design risk assessments and SCADA & controls software .

Provision of this information should be subject to the providers Quality Management systems quality assurance and / or best practice document control requirements (e.g. ISO 9001).

1.2 Glossary

The following glossary items are used in this document:

Term	Description
CD	Compact Disc
DVD	Digital Video Disc
HV	High Voltage
I/O	Inputs/Outputs
O&M	Operating & Maintenance
P&ID	Piping (Process) & Instrumentation Diagram
PLC	Programmable Logic Controller
SA Water	South Australian Water Corporation

Term	Description
SCADA	Supervisory Control And Data Acquisition
TG	SA Water Technical Guideline
TS	SA Water Technical Standard
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

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:

Number	Title

1.3.2 SA Water Documents

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

Number	Title
TS 79	Supply & Installation of Low Voltage Electrical Equipment
TS 95	Requirements for Technical Drawings
TS 106	Installation Standards for Electronic Security Systems on SAW Sites
TS 112	Process and Instrumentation Diagrams
TS 146b	Requirements for Pump Specification, Procurement and Testing and the Preparation of Pump Data Sheets
TS 146c	Commissioning and Monitoring of Mechanical Equipment
TS 149	Asset Hierarchy
TS 152	Requirements for Asset Labelling
TS 155	Safety in Design
	Network Infrastructure Standards (Red book / Blue book)

1.4 Definitions

The following definitions are applicable to this document:

Term	Description
SA Water's Representative	The SA Water representative with delegated authority under a Contract or engagement, including (as applicable): <ul style="list-style-type: none"> • Superintendent's Representative (e.g. AS 4300 & AS 2124 etc.) • SA Water Project Manager • SA Water nominated contact person
Asset	An Asset (ref. Maximo) is an individual identifiable piece of equipment or a structure e.g. a pump; a pipeline; a valve; a building; or a tank structure.
Facility	A Facility (ref. Maximo) is a unique installation with a single purpose, generally consisting of numerous Assets e.g. a pump station; a water treatment plant; or a water storage tank.
System	A System comprises interconnected Assets or Facilities and infrastructure that operate together e.g. Mannum to Adelaide pipeline (MAPL) which comprises pump stations, valve stations, pipelines, surge vessels and tanks or a WWTP aeration system comprising blowers, pipework, and diffusers with associated control devices.
Plant	Plant is a generic term-of-convenience used to refer to infrastructure generally, from sub-assets to facilities and systems, both passive (pipeline) and operable (pump station).

2 Scope

This standard specified the requirements for all operations and maintenance manuals that are provide to SA Water, 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,
- etc.

This standard does not provide guidance as to whether an O&M Manuals are required on a particular project which is determined by SA Water and specified in the Contract documentation.

1 Document Requirements

1.1 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. It 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 Manual.

1.2 Submission of 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 SA Water.

The draft 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 SA Water 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 final Manuals shall be passed to SA Water Operations & Maintenance.

Each final O&M Manual shall comprise a print copy with a continued digital copy in "pdf" format including Notarium document versions (Bookmarked & optimised file size).

Refer to O&M Section 2.4 and Appendix K for additional and specific requirements for PLC, HMI & SCADA programs.

The requirements for SA Water security systems are covered separately by TS 106 Installation Standards for Electronic security systems on SA Water sites.

1.3 Structure of Manuals

The 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 Manuals

Section	Description	
Section 1		Overview
Section 2		Operating Manual
	2.1	Plant Operation
	2.2	Inspections, Tests & Adjustments
	2.3	Operating Parameters
	2.4	PLC, HMI & SCADA Programs
	2.5	Data Storage & 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
	3.5	Special Tools
	3.6	Suppliers and Service Providers
Appendices	Appendix A	Drawings
	Appendix B	Warranties
	Appendix C	Instrument & Equipment List
	Appendix D	Test Results & Manufacturers Data Reports
	Appendix E	Manufacturer/Supplier Literature
	Appendix F	Training
	Appendix G	Work Health & Safety and Environmental File
	Appendix H	High Voltage Switching Plan(s)
	Appendix I	Isolation Plan(s)
	Appendix J	Statutory Compliance Certificate(s)
	Appendix K	PLC, HMI & SCADA

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.

1.4 Print (Paper) Manuals

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

Table 2 – Requirements for Paper Manuals

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 <i>X</i> of <i>Y</i> ” as appropriate, unless otherwise advised by the Superintendent
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 PDF versions saved from drawing (.dwg) files for clarity, i.e. not scanned prints

1.5 Digital Manuals

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

Table 3 – Requirements for Digital Manuals

Digital Structure	The files making up the Manuals shall be arranged in a folder structure as per Clause 1.3.
Digital Format	<p>All items in the Table of Contents shall have “hypertext links” within the document.</p> <p>All digital content shall be PDF versions, text searchable bookmarked contents.</p> <p>Manuals (typically less than 100 Mb) shall be presented in one document.</p> <p>For larger documents, Section 1 to 3 maybe combined into a single PDF. Appendices maybe merged separately in PDF documents.</p> <p>Notes;</p> <p><i>Drawings must be maintained as separate Dwg & PDF folders & files.</i></p> <p><i>Only pdf versions of drawings are to be provided to Operations, as versions control of DWG files are managed via engineering. The Project manager is responsible for ensuring that control is maintained via internal document transmittals.</i></p> <p><i>Manufacturer’s manuals may be left as individual PDF files, and shall be text-</i></p>

<p>File structure and naming convention. (Final pdf Versions & native files)</p>	<p><i>searchable when this function is available.</i></p> <p>The file name shall be structured as follows: OM-manual-W-Vol X of Y [-z]-vV</p> <p>where</p> <p>W is the SAWater Project C.No & project description</p> <p>H is the volume number</p> <p>X is the volume number</p> <p>Y is the number of volumes</p> <p>[z] is a lower case alphabetical identifier where multiple files are needed due to the PDF size limitation</p> <p>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</p> <p>Examples:</p> <p>OM-manual-C0927 Bolivar DAFF Dewatering Struvite Ctrl-Vol 1 of 1-v0.1.pdf</p> <p>OM-manual-C0927 Bolivar DAFF Dewatering Struvite Ctrl-Vol 1 of 1-v1.0.pdf</p> <p>OM-manual-C0927 Bolivar DAFF Dewatering Struvite Ctrl-Appendix G Vol 4 of 6-v1.0.pdf</p> <p>OM-manual-C1522 Bolivar MPS Upgrade-Appendices Vol 5 of 5-a-v2.pdf</p> <p>OM-manual-C1522 Bolivar MPS Upgrade-Vol 1 of 5-b-v2.pdf</p>

1.6 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 clause 3.3. File names should be common between native & PDF documents.

2 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 & shall be deleted from final versions.

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 SA Water 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 SA Water.

It is essential that the terminology used is consistent with that used by SA Water, particularly with regard to technical terminology and locations/sites descriptors. This information should be sourced from or validated by the local SA Water Operations & Maintenance personnel.

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 SA Water and all Contractors, Suppliers and Main functions.

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 automatic and manual modes of operation.

The Operating Manual may be based on the final (as-constructed) Controls Philosophy, reworked for the application and supplemented as necessary, noting that it is addressed to the system or plant operators.

The Operating Manual shall address the requirements of Section 2.1 as a minimum.

(This introduction is not a part of the Standard Template)

2.1 Plant Operation

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 Waste Water 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.

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 & Commissioning) screens and associated set points etc.

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 or over-riding normal control parameters or set-points. This is generally limited to water and wastewater treatment plants and pump stations
- shut down individual plant or systems; Shut down the whole plant.

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

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 plant or systems
- shut down the whole plant.

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).

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.

Example

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
					Fixed SCADA

2.4 PLC, HMI & SCADA Programs

This Section shall contain tables of all PLC & HMI programming Software installed & amended under the Project. Appendix K will contain the PDF native digital versions B and / or software.

TS 1000 requirements for provision of software via SAW knowledge tree must also be met

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

Functional Descriptions

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

2.4.2 PLC & HMI Programs

For all PLCs installed or PLC programs modified the following is to be included in each O&M Manual:

- an Adobe© (.pdf) copy of PLC programs only* – no print version
- an Adobe© (.pdf) version of the PLC I/O only*, including tag names – no print version
- an Adobe© (.pdf) version of the Alarm List only* – no print version.

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

- an Adobe© (.pdf) copy of all HMI programs only* – no print version
- an overview of the screen structure
- a screen “shot” of all screens, including trending screens
- a description of screen operation
- a list of all user names and passwords configured in the program
- a description of equipment operation using the screens.

* “Native” versions are to be provided

PLC & HMI Programs

Table 6 – Example of PLC & HMI Programs to be Included

Description	Program Name	Print Copy Yes / No
Main PLC Program	UW_BAR.acd	Not required
Filter 1-4 PLC Program	BAROS_F14PLC.acd	Not required
HMI screen shots		Yes

2.4.4 SCADA Programs

For all SCADA screens installed or modified the following is to be included:

- information required in TS 1000 and the TS 1000 integrator manual
- an Adobe© (.pdf) copy of SCADA User Manual (where provided in accordance with the TS 1000 Integrator’s Manual)
- an overview of the SCADA screen structure for that site
- a screen “shot” of all SCADA screens
- a description of equipment operation from the SCADA screens
- an Adobe© (.pdf) copy of equipment alarms only* – no print version.

* “Native” versions are to be provided

SCADA Programs

Table 7 – Example of SCADA Programs to be Included

Description	Program Name	Print Copy Yes / No
WTP Point Instructions		Y
WTP SCADA Graphic files		Y
WTP SCADA TGD files		Not required
WTP SCADA Database csv file	BAROSS.csv	Not required
WTP SCADA Database PDB file	BAROSS.pdb	Not required
WTP SCADAprime SS01 Alarms csv file	Alarm Server 1.csv	Not required
WTP SCADAprime SS01 Backup file		Not required
WTP SCADA SS01 IGS opf file	BAROSS01.opf	Not required

2.4.5 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.

2.5 High Voltage Switching Plan

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

Plan No / Reference <i>(Description aligned with electronic copy)</i>	Switching plan	Brief description

2.6 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 & PDF format in Appendix I.

Plan No / Reference (<i>Description aligned with electronic copy</i>)	Plant, equipment / asset isolation	Brief description

Note 1: Suggested template is included to Appendix I.

Note 2: Training for Operational & Maintenance personal should be undertaken.

2.7 Contingency Operation

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.

2.8 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.

Section 3 Maintenance Manual

Introduction to Guidance Notes on 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.

(This introduction is not a part of the Standard Template)

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. (If agreed with Operations Maintenance)
- Operational maintenance requirements (As agreed with SA Water Operational Maintenance teams)

A copy of the "loaded" Maximo maintenance plans should be included here for reference. *Note: Operations & Maintenance teams should review and agree the requirement prior to MAXIMO being loaded and activated.*

Example

Table 8 – Example of Maximo Schedule to be Included

Asset		Tasks				Planning				
Asset ID	Description	Task Frequency	Frequency Units	Reason/Source	Task Number	Task Description (100 Character Maximum)	Task Duration (Hours)	Labour Type	First Start Date	Work Order
BE40411.0306	Battery 24 Ah	5	YEARS	Recommended	10	Replace Battery	2	Electrical	20/06/2019	
BE40411.040110	Battery 65 Ah (No 1)	5	YEARS	Recommended	10	Replace Battery	2	Electrical	20/06/2019	
BE40411.040112	Battery 65 Ah (No 2)	5	YEARS	Recommended	10	Replace Battery	2	Electrical	20/06/2019	
BE40411.040104	Switchboard	6	MONTHS	Recommended	10	Check Switchboard interior	0.25	Electrical	20/12/2014	
BE40411.040103	Protection	6	MONTHS	Recommended	10	Check Mains Surge Diverter OK	0.25	Electrical	20/12/2014	
BE40411.0108	RPZ Device (ME03)	1	YEARS	Statutory	10	RPZ annual testing &	2	Plumber	20/06/2015	
BE40411.0201	Dosing Pump 1	2	YEARS	Recommended	10	Servicing	4	Mechanic	20/06/2016	
BE40411.0204	Dosing Pump 2	2	YEARS	Recommended	10	Servicing	4	Mechanic	20/06/2016	
BE40411.0211	Chlorine Analyser 1	1	MONTHS	Recommended	10	Polishing of Indicator Electrode	1	Operator	20/07/2014	
BE40411.0211	Chlorine Analyser 1	1	YEARS	Recommended	10	Replacement of Indicator	1	Operator	20/06/2015	
BE40411.0211	Chlorine Analyser 1	3	MONTHS	Recommended	10	Ceramic Beads Cleaning	1	Operator	20/09/2015	
BE40411.0211	Chlorine Analyser 1	1	YEARS	Recommended	10	Replacement of Ceramic Beads	1	Operator	20/06/2015	

Note: The Maximo Asset Register Template (ART) sheet should be provided in Appendix C.

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.

If no specialist maintenance insert 'No Content'

3.3 Critical Spares

This section should comprise a table of critical spares, as agreed between SA Water 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 Manual.

If no Critical spares are required or provided under the contract Insert 'No Content'

3.4 Consumables

This section should comprises 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 Manual.

If no consumable items are required or provided under the contact insert 'No Content'

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.

If no specialist tools are required or provided under the contact insert 'No Content'

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 construction street, Adelaide	(08) 1234 5678	www.PCMain.com
Grundfos	515 South Road, Regency Park, SA, 5010	(08) 8461 4611	http://au.grundfos.com

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 TS 95.

Provide hard copy (A3 folded) for selected as-constructed drawings as agreed with SA Water Operations & Maintenance teams.

All pdf versions of drawings supplied in the O&M manual shall be watermarked “UNCONTROLLED” are to be provided to Operations & maintenance, as versions control of DWG files are managed via engineering. 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, Waste Water & Recycled Water) pipeline & profile drawings.

Appendix B Warranties

Include all Warranty Documentation Register and warranty documentation **other than** that associated with the standard 12 months Contract Defects Liability and any special conditions imposed.

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

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.

Example

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)
	Booster Pump	Grundfos	SEG			24 months	

Appendix C Instrument & Equipment Lists

This Appendix should contain all information relevant & the Asset, Instrumentation Equipment provided under the Contract.

A copy of the relevant columns, (example below) of the list of Asset Data (Maximo input information) - refer to the General Specification, Section 21 Asset Data, and the Asset Data Input Worksheet (which forms part of the Project Spreadsheet).

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

Typical content may include the following:

Table 11 – Example of Instrument Equipment List to be Included

File ref / name <i>(Description aligned with electronic copy)</i>	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	

Example - MAXIMO view for Appendix C. (SA Water support may be required to provide view from submitted & reviewed Maximo input.)

Table 12 – Example of Maximo Information to be Included

Asset or Location	Classification	Status	ID	Capital Project	P&ID Drawing	P&ID Tag	Manufacturer	Model	Serial #
Beaumont Hypo Dosing Chlorinator	Sodium Hypochlorite Water	NEW	BE40411	C5704					
Building	Building	NEW	BE40411.01	C5704					
Building Structure	Building Structure	NEW	BE40411.0101	C5704	2012-02989-				
Lighting	Lighting	NEW	BE40411.0102	C5704	2012-02989-				
Air Conditioner 1 (AC01)	Ventilation Fan	NEW	BE40411.0103	C5704	2012-02989-	AC01	Samsung	RJ100F5HXEA	ENYWP3CD200069J
Air Conditioner 2 (AC02)	Air Conditioning Unit	NEW	BE40411.0104	C5704	2012-02989-	AC02	Samsung	RJ100F5HXEA	ENYWP3CD200069J
EL278 Tank Inlet Flowmeter	Flowmeter	NEW	BE40411.0105	C5704	2012-02989-	FE01	ABB	FEW321 - WATER	3K220000121433
Building Security	Security System	NEW	BE40411.0106	C5704			CHUBB SECURITY		
Exhaust Fan (ME04)	Ventilation Fan	NEW	BE40411.0107	C5704	2012-02989-	ME04		CPE0254F	
RPZ Device (ME03)	Isolating Valve Unit	NEW	BE40411.0108	C5704	2012-02989-	ME03	Tyco	DC03	72162
Hypo Dosing System	Chemical Dosing System	NEW	BE40411.02	C5704					
Dosing Pump 1 (PU01)	Pump Unit	NEW	BE40411.0201	C5704	2012-02989-	PU01	GRUNDFOS	DDA7.5 - 16	A9772286210001138P11325
Static Mixer (ME16)	Mixer	NEW	BE40411.0202	C5704	2012-02989-	ME16	WESTALL		N/A
Hypo Storage Tank (TK01)	Tank Structure	NEW	BE40411.0203	C5704	2012-02989-	TK01	THE NEWELL GROUP PTY		21837
Dosing Pump 2 (PU02)	Pump Unit	NEW	BE40411.0204	C5704	2012-02989-	PU02	GRUNDFOS	DDA7.5 - 16	A9772286210001138P11326
Sump Pump (PU03)	Pump Unit	NEW	BE40411.0205	C5704	2012-02989-	PU03	TECHNIFLO	401 PW - N	12052821
Service Water Pump (PU05)	Pump Unit	NEW	BE40411.0206	C5704	2012-02989-	PU05	GRUNDFOS	CM BOOSTER PM2	A97530070P11309
Sample Return Pump (PU04)	Pump Unit	NEW	BE40411.0207	C5704	2012-02989-	PU04	GRUNDFOS	CRI - 3A-A-AE-HQQE	A96529108PH234
Safety Shower & Eye Wash 1	Eye Wash	NEW	BE40411.0208	C5704	2012-02989-	ME07	PRATT	SE -607	N/A
Safety Shower & Eye Wash 2	Eye Wash	NEW	BE40411.0209	C5704	2012-02989-	ME17	PRATT	SE -607	N/A
Sample Water Container (TK02)	Sampler Equipment	NEW	BE40411.0210	C5704	2012-02989-	TK02	GRUNDFOS	100L98149057	N/A
Chlorine Analyser 1 (AIT01) Tank	Sampler Equipment	NEW	BE40411.0211	C5704	2012-02989-	AIT01	YOKOGAWA	FC400G-63*A	N/A
Chlorine Analyser 2 (AIT03) Tank	Sampler Equipment	NEW	BE40411.0212	C5704	2012-02989-	AIT03	YOKOGAWA	FC400G-63*A	N/A
Injection Lance 1 (ME01)	Injector	NEW	BE40411.0213	C5704	2012-02989-	ME01	GRUNDFOS	95709571	N/A
Injection Lance 2 (ME02)	Injector	NEW	BE40411.0214	C5704	2012-02989-	ME02	GRUNDFOS	95709571	N/A
Flowmeter Primary (FE02)	Flowmeter	NEW	BE40411.0215	C5704	2012-02989-	FE02	Siemens	Sitrans F. M. Mag	505912H063
Telemetry	Telecommunication	NEW	BE40411.03	C5704					
SCADAPACK RTU	Remote Telemetry Unit	NEW	BE40411.0301	C5704	2013-01015-		SCHNEIDER ELECTRIC	SCADAPAC 357E	S156445
Antenna	Radio Communication	NEW	BE40411.0302	C5704			CYBERTEC	CYBERTEC 2150	18411
Next G Modem	Radio Communication	NEW	BE40411.0303	C5704	2013-01015-		CYBERTEC	CYBERTEC 2150	18411
Battery Charger 8 Amp	Battery	NEW	BE40411.0304	C5704	2013-01015-		POWER BOX	PB256-1210CML	A130513-0177
Comms Cabling	Cabling	NEW	BE40411.0305	C5704				Cat 5 Ethernet	N/A
Battery 24 Ah	Battery	NEW	BE40411.0306	C5704	2013-01015-		YUASA	NP24-12BFR 12V 24Ah	N/A
Power Supply	Power Supply	NEW	BE40411.04	C5704	2013-01015-				
Switchboard	Switchboard	NEW	BE40411.0401	C5704	2013-01015-				
Isolator	Isolator	NEW	BE40411.04010	C5704	2013-		SPRECHER + SCHUH	SLBM633P	13M28
Contactor	Contactor	NEW	BE40411.04010	C5704	2013-		SPRECHER + SCHUH	CA7-23-10-240VAC	
Protection Equipment	Power Protection Equipment	NEW	BE40411.04010	C5704	2013-			SDD3-50-275	13010844
Switchboard Cabinet	Enclosure Structure	NEW	BE40411.04010	C5704	2013-		LAI	IP54	Custom Manufacture
Control Equipment	Control Equipment	NEW	BE40411.04010	C5704	2013-		SCHNEIDER ELECTRIC	RM35 JA32MW	84971150
PLC Compact logic Power Supply	Programmable Logic Controller	NEW	BE40411.04010	C5704	2013-		ALLEN - BRADLEY	1769-PB4	459060-0254
PLC Compact logic CPU	Programmable Logic Controller	NEW	BE40411.04010	C5704	2013-		ALLEN - BRADLEY	1769-L32E	27766220
PLC Panel view Plus 1000	Programmable Logic Controller	NEW	BE40411.04010	C5704	2013-		ALLEN - BRADLEY	2711-RDT10C	27358983
Battery Charger 18 Amp	Battery	NEW	BE40411.04010	C5704	2013-		AMTEX	BCH500-28FT	0H77 1001
Battery 65 Ah (No 1)	Battery	NEW	BE40411.04011	C5704	2013-		YUASA	NP 65-12	N/A
Smart Relays	Control Equipment	NEW	BE40411.04011	C5704	2013-		ZELIO	SR3B261BD	84973025
Battery 65 Ah (No 2)	Battery	NEW	BE40411.04011	C5704	2013-		YUASA	NP 65-12	N/A
Mains Power Connection	Power Connection	NEW	BE40411.0402	C5704	2013-01015-				

Appendix D Test Results & 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.

Typical content may include the following;

Table 13 – Typical Test Results Test Sheet

Folders / Document <i>(Description aligned with electronic copy)</i>	Source	Print Copy (Yes / No)
Quality records (Ref : SAW Contract General Specification)		
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 / Water Waste /Effluent Quality test results		
Disinfection test results		
Alarm Point to Point Records		
Rtu test Results		

Appendix E Manufacturer/Supplier 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.

Example

Table 14 – Example of Manufacturers 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

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.

Typical content may include the following;

Table 15 – Example of Training Details to be Included

File No (<i>Description aligned with electronic copy</i>)	Description
	Training Program
	Training Register ^(Note 1)
	Training Feedback / Records ^(Note 2)
	Completions Records
	Licence / Certificates

Note 1: *Examples of training register and training feedback.*

Note 2: *Forms are included for reference & use if QA System formats are not available.*

Area of plant
**Full site operation
 Training**

**TRAINING
 REGISTER**

Note 1: Example Training attendance form.

Project/Site			Register No.
List of Equipment covered by training			

Section 1 Names of persons attending training

Name	Signature	Name	Signature

Section 2 Detail of training session. *(or attach training plan)*

Details of all attachments/references used during training.

Training carried out by:

Name(s) _____ Date _____

Signature(s) _____
For(Contractor)

Note 2 : Example training feedback form

Full site operation
Training

**TRAINING
FEEDBACK**

Project/Site			
--------------	--	--	--

Course attended

PRACTICAL



Documentation Provided

5	4	3	2	1
5	4	3	2	1

Overall Course Rating

Was the pace of the course...?

Too fast	Just right	Too Slow
Too short	Just right	Too long

Was the length of the course...?

Out of 100% what proportion of the course was relevant to you?

Which parts of the course were most relevant?

Which parts of the course were least relevant?

Was the training sufficient to enable you to carry out your work on the equipment?

YES / NO

THE TRAINER

On a scale of 1-5, would you state your satisfaction with the following:



Technical Ability

5	4	3	2	1
5	4	3	2	1
5	4	3	2	1
5	4	3	2	1

Presentation Techniques

Question Handling

Helpfulness

Comments

Training Attendee

Name _____

Signature _____

Appendix G Work, Health & Safety & Environmental File

TS 0155 Safety in design and WHS Code of practice: Safe design of structures, recognise and specify the requirements for ensuring that relevant WHS information is transferred throughout the process of designing, constructing and operating new or updated plant.

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

All WHS and environmental related documentation should be presented in this Appendix.

Typical contents may include the following;

Table 16 – Example of WHS 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 / HAZOP / HAZID Report ^(Note 1 &3)			Yes
Decommissioning, dismantling, demolition and / or disposal information			Yes
Noise & Vibration Hazards (Restricted Areas, PPE Req. etc.)			Yes
Practical Completion Asset WHS checklist (SAWL-WHS-0006) ^(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 SA Water 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 SA Water.

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 SA Water Design and Standards specialist in Engineering Services for final review and filing in the SiD ‘RIVER’ workspace in accordance with TS 155 Safety in Design Standard, Section 7.11 Safety in Design Risk Assessment Records, clause 7.12.4.

Only pdf versions (Notes 1 & 3 above) are to be provided to Operations and Maintenance via Internal transmission.

Appendix H High Voltage Switching Plan

SA Water’s HV switching sheet proforma SAWT-WHS-0043 High Voltage Switching Program Sheet Template or Allwater High Voltage Activity authorisation (TMF-5026-SA-0064) for high voltage equipment shall be used (unless otherwise agreed for all supplied equipment to SA Water. It is the contractor’s responsibility to prepare, trial and validate switching sheet for operation correctness as part of the requirement for project commissioning. 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. Equipment such as circuit breakers, contactors & fuses, isolators, earthing switch, switchboard busbars, power supply transformers, key interlocks etc. The interface between equipment that are owned by SA Water 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 17 – Example HV Switching Sheet

Plan No / Reference <i>(Description aligned with electronic copy)</i>	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 SA Water 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 & pipework (Inundation / atmosphere)

Table 18 – Example Isolation Plan

Plan No / Reference <i>(Description aligned with electronic copy)</i>	Plant, equipment / asset isolation (include MAXIMO ID)	Description of Isolation (Process, Electrical, etc.)

See attached Isolation plan format.

Note: *Demonstration of Safe Isolation procedures should be included in Operational & Maintenance training.*

EXAMPLE Isolation plan

Table 19 – Example Isolation Plan

Isolation point plan < Insert equipment/Process etc. >					
<p>Reference drawings/plans.</p> <ul style="list-style-type: none"> • PROCESS & INSTRUMENTATION DIAGRAM Drawing No. 2012 – 02991 - 01 • .. • .. • .. 					
Isolation Point No	Isolation Point Description	Isolation Point Equipment ID e.g. VV01	Energy Type	Isolation Sequence	How Isolated/Locked
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Appendix J Statutory Compliance Certificates

Provide a register and copies of all compliance certificates.

Typical contents may include the following;

Table 20 – Example Compliance Certificate List

Certificate (<i>Description aligned with electronic copy</i>)	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 & SCADA

All native & PDF versions (*where relevant*) of PLC, HMI & SCADA programming software installed and / or amended versions are to be included in this appendix.

The SAW SCADA applications team requirements (e.g. SA Water knowledge tree etc.) & TS 1000 SCADANET, SCADA & DCS Systems standard are pre-requisites for compliance and presentation of as constructed Information.

Typical contents may include the following;

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

PLC Programs

Description	Name	Print Copy Yes / No
Main PLC Program	UW_BAR.acd	Not Required
Filter 1-4 PLC Program	BAROS_F14PLC.acd	Not Required
Alum PLC Program	BAR_UW2062_1 BAR_UW2062_2	Not Required

HMI Programs

Description	Name	Print Copy Yes / No
Filter 1-2 HMI	BAR_FIL12.apa	Not Required
Filter 3-4 HMI	BAR_FIL34.apa	Not Required
Barossa WTP Main HMI	Barossa WTP Main HMI.apa	Not Required

SCADA Programs

Description	Name	Print Copy Yes / No
WTP Point Instructions		Y
WTP SCADA Graphic files		Y
WTP SCADA TGD files		Not Required
WTP SCADA Database csv file	BAROSS.csv	Not Required
WTP SCADA Database PDB file	BAROSS.pdb	Not Required
WTP SCADAphone SS01 Alarms csv file	Alarm Server 1.csv	Not Required
WTP SCADAphone SS01 Backup file		Not Required
WTP SCADA SS01 IGS opf file	BAROSS01.opf	Not Required

Ethernet Switch Programs

Description	Name	Print Copy Yes / No
Filter 1-4 Ethernet switch configuration	Filter 1.ocf	Not Required
Filter 1-4 Ethernet switch configuration	Filter 5.ocf	Not Required

Licenses and / or Agreement

Description	Name	Print Copy Yes / No
Software Licenses		
Radio Licenses		