



SEWAGE PUMPING STATION DESIGN STANDARD

**Supplementary Information to the WSAA Sewage Pumping Station
Code of Australia WSA 04-2005-2.1**

**Western Water
January 2018**

Executive Summary

This Design Standard has been produced as a guide for use by technical personnel involved with the design and construction of sewage pumping stations within Western Water's service area.

The design and construction of sewage pumping stations and associated pressure mains required for provision of services to subdivisions and other land development works should be carried out in accordance with this Design Standard and the WSAA Sewage Pumping Station Code of Australia WSA 04-2005-2.1 ("the SPS Code"). The requirements set out in this Design Standard take precedence over those in the SPS Code.

This document is a guideline only, and not intended to be a detailed specification for the purposes of the design and construction of sewage pumping stations. Designers and constructors are responsible for the respective aspects of the design and construction process and the justification of any variations from the requirements set out in the SPS Code and this Design Standard. Where there are any discrepancies or inconsistencies between the SPS Code, this Design Standard, or any other documents, standards or practices these should be discussed with Western Water prior to proceeding.

Enquiries or suggestions relating to the information set out in this Design Guide are welcome and can be directed via email to designstandards@westernwater.com.au

Western Water will update this document as changes become necessary, and the most up to date version will be available on our website.

This edition applies to all developments and sewage pumping station design projects issued to commence design on or after the publication date unless otherwise stated by Western Water.

Part 0: Glossary of Terms, Abbreviations and References

II Abbreviations

Additional items:

EST	Emergency Storage Tank
FLC	Full Load Current
HRC	High Rupture Capacity
L/s	Litres per second
NC	Non conformance
PWWF	Peak Wet Weather Flow
WW	Western Water

Additional section:

V Western Water Standards

Pumping stations should be designed and constructed in accordance with all relevant Western Water standards, including:

- Western Water SCADA Standards;
- Western Water Sewerage Design Standard: Supplement to WSA 02-2014-3.1 WSAA Sewerage Code of Australia Melbourne Retail Agencies Edition V2;
- Western Water Approved Products for Non-Pressure Applications;
- Western Water Approved Products for Pressure Applications; and
- Western Water Bushfire Requirements for Asset Protection.



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Part 1: Planning and Design

1. GENERAL

1.1 Scope

Additional requirements:

This Code does not apply to pressure sewerage systems.

1.6 Sewer System Design Approach

1.6.3 Objectives of design

Additional requirements:

Pumping stations should include:

- Designed to withstand the impacts of bushfire at the location based on the Bushfire Rating of the site as determined from AS 3959.

2. CONCEPT DESIGN

2.1 Life Cycle Considerations

Additional requirements:

2.1.1 Package pumping systems

Package pumping stations may be considered for design flows up to 40L/s. Written approval shall be obtained from Western Water for the use of package pumping stations where the design flows is equal to or exceeds 40L/s.

2.14 Signage

Additional requirements:

Western Water will provide a station identification sign to be installed at the pumping station. Western Water will also provide a suitable fall protection sign for installation at the site.

3. GENERAL DESIGN

3.2 Design Tolerances

Replace the last paragraph with the following:

Horizontal alignment shall be referenced to the MGA coordinate system, and where possible, to local property boundaries. Levels shall be referenced to AHD.

4 MATERIALS DESIGN

4.2 Corrosion Protection

4.2.2 Concrete surfaces

Additional requirements:

All interior surfaces of the wet-well, emergency storage and inlet MH (including the underside of any concrete access covers) should be coated with a lining system. Lining system must not be omitted without prior approval from Western Water.

For Lining of concrete the *SuperEpo*TM epoxy coating system (as provided by Peltos.com.au), or any equivalent epoxy lining system approved by Western Water shall be specified. Application shall be in accordance with the supplier's recommendations.

5 PUMPING STATION DESIGN

5.2 Site Selection, Location and Layout

5.2.5 Site layout and access

Additional requirements and sub-section:

The site must be accessible by vehicles by means of an all-weather access road. The nominated vehicle for the site is a 12.5m long single unit truck, however the designer shall confirm the requirement for any larger vehicles needed to access the particular site (e.g. chemical deliveries for sites with chemical dosing). The design shall include turning circle information to demonstrate that the site layout can facilitate all movements required for the nominated vehicle. The Designer shall also consider the safe access into and out of the site to the existing carriageway.

The access road shall be constructed from compacted gravel unless otherwise specified. The pumping station shall also be located such that cranes operating on site are clear of overhead electrical cables in accordance with the "No-Go Zone" regulations.

If the pumping station is in an area as yet undeveloped, an all-weather access track shall be provided including hard standing area and water supply taking into consideration of future stage development. If the pumping station works are being carried out by a developer, these access works shall also be carried out by the developer.

The layout of the pumping station and other features must ensure that the available space for maintenance purposes is maximised.

Bollards, comprising 1.50m high circular concrete filled or equivalent and coloured safety yellow, are to be fixed with suitable fasteners to prevent vehicles driving over the top of any non-trafficable access covers and belowground structures.

The site layout shall include a designated area for placement of a mobile generator when a permanent generator is not part of the pumping station design.

Additional:

5.2.3 (a) The top Slab is to be trafficable unless otherwise approved in writing by Western Water.

5.3 Inlet MH

5.3.2 Design

Delete paragraph 3

Step irons/ladders are required in the inlet MH.

5.3.3 Pumping station wet-well isolating valve

New paragraph at start of clause:

Valve closing direction shall be as outlined in [9.2.1](#) of this standard.

All knife gate valves shall confirm to the following criteria:

- Knife gate valve to be bi-directional with non-rising stem and fully grade 316 stainless steel (entire valve assembly not just the gate).
- Grade 316 stainless steel extension spindle extension spindle to be supported by Grade 316 stainless steel support brackets at suitable spacing. Valve to be supplied complete with valve key cover box and all nuts, bolts and washers and gaskets for insertion between flanges, drilled off centre; and,
- The mounting flange must be ductile iron or fabricated from grade 316 stainless steel.

5.4 Wet-Well Design

5.4.1 General

New paragraph at start of clause:

Wet-wells should be purpose built concrete structures. Alternative proposals shall require prior approval from the Western Water.

Preference is for a single wet well. Use of dual or split wet wells is subject to Western Water approval.

5.4.7 Washers

Replace clause with the following:

Provision for Wet well washing is required by Western Water.

For pumping stations with a flow rate above 18L/s and wet-well diameters 3.6m or less, well washers shall be riser mounted type driven by the pumps using pumped liquid from the wet-well during each pump cycle.

For pumping stations with a flow rate below 18L/s or for wet-wells larger than 3.6m diameter, rotating well washers shall be used. The preferred rotating well washer is McBerns AutoWellWasher or approved equivalent.



Potable water should only be used for well washing if recycled water is unavailable.

5.6 Overflow Containment

5.6.2 Emergency Storage

5.6.2.2 Configurations

New paragraph and table after paragraph 1:

Pumping stations shall be provided with a minimum emergency storage to contain sewage inflows at the rate of PDWF for as shown in Table 5.2. Western Water has based these requirements on response times to respond and act on a high level alarm.

**TABLE 5.2
MINIMUM EMERGENCY STORAGE VOLUME**

Pumping Station Size (at ultimate development)	Minimum Emergency Storage Volume
PDWF	3 hours

If a pumping station is likely to pose high risk to sensitive receiving waterways or locations, Western Water may request emergency storage volume exceeding that specified above.

Replace paragraph 2 with:

Typical emergency storage configurations are provided in Figures 5.1, 5.2 and 5.3 are preferred by Western Water. Where the typical configuration shown in Figure 5.4 is proposed then approval in writing is to be obtained from Western Water.

Emergency storage volume shall be calculated between high-level alarm and the overflow weir crest level and shall be provided in:

- a) the wet-well, and/or
- b) any required separate storage structure.

Any storage available in the upstream gravity sewerage system shall not be included to offset the volume of emergency storage to be provided for the pump station.

Add new paragraph at end of clause:

Should a separate emergency storage tank be required the following will need to be considered and agreed with Western Water:

- Type and arrangement of tank (pipe, tank etc);
- Filling mechanism;
- Emptying mechanism;
- Accessibility for operation and maintenance;
- Wash-down and cleaning requirements;
- Ventilation requirements refer to Clause 5.5;
- Level monitoring requirements; and
- Designed to be trafficable.

Where multiple emergency storage tanks are proposed, where practicable these shall be designed to fill sequentially.

All emergency storage tanks are to have spray bars, or equivalent, and programmed for automatic operation, unless otherwise approved by Western Water.

5.6.4 Emergency Relief System

New paragraphs at end of clause:

The Designer shall contact the receiving waterways controlling authority (such as Melbourne Water) and obtain approval for the new asset.

Where emergency overflow relief pipework discharges into an unformed drain, creek or water course, then the Designer should detail the hydraulic impact of 1 in 10, 1 in 20, 1 in 100 year storm events on the upstream sewerage system.

5.8 Wet-Well Access Covers

Additional Requirements:

Pump well covers providing access to the wet-well and/or valve pit should have minimum clear access of 900mm x 750mm. The covers should be of sufficient size and orientation to facilitate installation and removal of equipment and plant as well as personnel access to the wet-well. If staging requires a change of pumps, or if the catchment is anticipated to grow beyond the current design parameters, then the access covers shall be sized to accommodate the maximum size pump that the wet-well can accommodate.

Covers shall be gas tight and be lockable via clasp and staple. Covers shall finish flush with the surrounding concrete surface and not present a trip hazard.

5.9 Safety Systems

Additional Requirements:

A safety system comprising a properly designed hinged mesh cover or other Western Water approved system shall be provided to prevent a fall into the well when the access covers are open for inspection. Alternate safety provisions will be considered upon approval by Western Water. An example of a suitable fall protection system is the Austral International Safety Covers.



Figures 5.9 and 5.10 – Example Austral International Safety Covers

Anchor swivel points shall be installed at each wet-well and emergency storage tank with a minimum of 2 no. points at each location. Western Water’s preferred product is Climbtech model SWH100N.

6 PUMPING SYSTEM

6.2 Hydraulic Design

Insert new sentence at the end of paragraph 3:

Pumping stations shall have the capacity to transfer all peak wet weather flows from a 1 in 5 year ARI event unless otherwise advised by Western Water.

Additional information about a catchment’s characteristics may warrant an increase in the pumping station capacity (e.g. small catchments have less attenuation and may warrant higher factors).

6.2.1 Design Flow Estimation

6.2.1.1 New Catchment

Where the Pump station inflow is not provided determination of the inflow will be as prescribed by Western Water amendments for WSA 02-2014 Gravity Sewerage Code MRWA Edition.

6.4 Pump Selection

Additional requirement:

Pumps shall be in accordance with City West Water approved products and materials specified on the MRWA Portal www.mrwa.com.au/Pages/Products.aspx unless otherwise specifically amended by Western Water.

6.6 Submersible Pumps

6.6.5 Junction boxes

Additional Requirements:

Junction boxes are not permitted to be installed underground or within the wet-well. Motor cables shall either extend for the full distance to the motor starter cabinet or an above ground turret for external use shall be provided.

6.6.6 Pump set lifting equipment

New paragraph after paragraph 3:

Guide rails and chains shall be grade 316 stainless steel, be fully supported and provided in one continuous length. The lifting chain supplied for pump removal must comply with Statutory Authorities requirements for industrial lifting. The lifting chain shall be supported and retained by a small diameter stainless steel cable static line between the top of the chain and the top of the well adjacent to ground level, to retrieve the chain if dropped.

7 POWER SYSTEM

7.2 Power Supplies

7.2.5 Emergency Power

Additional requirements:

Where specified by Western Water a pumping station shall have a permanent on-site generator. All other sites shall have full provision for the use of a mobile generator including a designated area on site for the mobile generator to be positioned during use. The generator must have a Modbus type connection for Fuel level and Generator Status

All pumping stations are required to have a plug connection for an emergency mobile generator in accordance with clause 7.2.7. The connection co type shall be Clipsal 50 Amp socket for all pumping stations.

7.3 Power and Control Cubicle

7.3.1 Design

Additional requirements:

The cubicle design should, include the following:

- Located to provide a safe working area adjacent to covers, or approved location;
- Locating facing south where practicable;
- Designed to withstand the impact of bushfire at site (Bushfire Rating as determined from AS3959);
- Weatherproof and provided with a rain hood where practicable;
- External cubicle made from minimum 3mm thick marine grade aluminum or approved equivalent;
- Internal doors, panels, escutcheons and gear trays shall be made from at least 2mm sheet steel;
- Gland plates aluminum 3mm (unpainted) and seal with neoprene gaskets;

- Powder coated interior finish to all doors, panels, escutcheons, gear trays and internal surfaces to be Gloss White and all external surfaces to be Wilderness Green (Colourbond palette) to AS2700, or approved equivalent;
- All exterior doors to be fitted with neoprene sealing strips;
- Provision of ventilation to accommodate heat load from internal devices, all vents shall have insect screens and dust proofing;
- Hot dipped galvanised plinth (site flooding depth shall be assessed and plinth height increased if required);
- Doors shall swing open 180° and be capable of being fixed at a 90° opened position;
- All external doors to be fitted with door limit switches to detect entry to cabinet via RTU/PLC;
- Does not exceed 1500mm in height above top of slab;
- Fitting of stainless steel labels with chrome screws to all outer doors to identify internal sections;
- Fitting of Traffolite labels with chrome screws to all inner doors to identify internal sections and equipment
- Cabinet must have certification label
- Lockable by means of Western Water approved locking system (delivered to site with appropriate Abloy locks);
- Sufficient space to accommodate the following equipment;
 - Supply company meter located in a separate compartment with separate door and suitable power company lock;
 - AMP meters (located at eye height so these can be read without need to bend down);
 - Hour run meters (located at eye height so these can be read without need to bend down);
 - Switchgear;
 - Control circuits including pump control system and circuit breakers;
 - Telemetry equipment;
 - Electric wiring in a clear and professional manner so as not to present a 'birds nest';
 - A lockable weatherproof external connection to the switchboard for connection of a portable generator to Western Water's satisfaction, and,
 - A polarity switch - The polarity shall be capable of reversing the polarity of the alternative electrical supply to avoid the possibility of pumps running backwards.
- Drives shall be thermally isolated and located in a separate compartment to the RTU and radio with their own dedicated thermostatically controlled fans;
- Heaters and cooling fans provided in RTU cabinets with thermostat;
- Internal lighting in all cabinets;
- Document pocket for site electrical drawings and manuals; and
- Fold out laptop table behind PLC/ RTU door.

The cubicle shall be located as part of the pumping station top slab. Free standing cubicles are not permitted.

Cubicles shall be designed so that main isolator does not have to be switched off to access RTU and circuit breakers. Switch type should be defeatable.

All cubicles shall have a free-standing shelter to protect operators and equipment from the weather, particularly heat. The shelter shall have a footprint to provide a minimum overhang of 2000mm over cubicle doors and a minimum of 500mm elsewhere.



Power, control and communications cables shall all be located in separate conduits. Power conduits shall be a minimum of 63mm diameter, and control/communications conduits shall be a minimum of 40mm diameter. All conduits shall be sealed to prevent gases from the wet-well or emergency storage tank entering the cubicle. A minimum of 2 no. spare 50mm diameter conduits shall be provided from the cubicle to both the wet-well and emergency storage tank, and also the flowmeter pit (if there is one).

7.3.4 Lighting

Replace entire clause with the following:

Fluorescent lighting shall be specified inside each compartment of the power and control cubicle. The lighting shall automatically turn on when the doors are opened and turn off when the doors are closed.

A pole-mounted spotlight shall be provided at the site directed down into the wet-well, and shall provide sufficient illumination to enable night-time inspection within the wet-well. The pole shall be of the tilt type and will be of sufficient height and suitable location so as not to obstruct removal of pump sets. This pole will also serve as the Antenna mast. As a minimum a 50 mm conduit (separate to power conduit) with sweep bends shall be provided from the cabinet to pole (including a draw wire).

Additional external site lighting shall be provided in any area having an identified risk to ensure safety of personnel attending the site at night. The Water Agency should be consulted about site lighting arrangements external to the cubicle using AS/NZS 1680.2.4 for guidance.



8 CONTROL AND TELEMETRY SYSTEM

8.3 Pumping Control

8.3.1 Control design

All Western Water pumping stations shall be designed to operate on a duty/standby.

All pumping units shall be automatically controlled from a level sensing system in the wet-well. The make, type, number and location of level sensors shall be approved by the Western Water. In addition back-up of the level sensing/control system shall be specified in accordance with Western Water requirements so that the station can continue to function in the event of failure of a single component of the primary system.

The sewage level in the wet-well shall be monitored by a minimum of one analog level sensor that provides a 4–20 mA analog signal to the control system over the full range of the wet-well levels from empty to overflow.

The electrical controls shall program operation of all pumps so that running times are not necessarily equalised, so to avoid the likelihood of coincident pump failures. The stand-by pump shall automatically cut-in should any of the duty-pumps fail.

For all pumping stations, dual operation of the duty-pump and 'stand-by pump' shall be enabled (i.e. duty/assist operation). In this instance the stand-by pump shall start once the stand-by pump cut-in level is reached regardless of whether the duty-pump is operating or not.

The duty-pump shall start when the level in the wet-well rises to the cut-in level. If the duty pump fails to run, the stand-by pump shall start.

The duty-pump shall stop when the level in the wet-well falls to the cut-out level. If the running pump does not stop and the level falls to the low-level alarm point, the pump shall stop automatically and the low-level alarm shall be initiated.

8.3.2 Control switches

Delete clause and replace with the following:

Each pump shall be controlled at the switchboard control panel by a three way selector switch (Automatic, Off, Manual)

- Automatic Enables control of the pump from the RTU or float control.
- Off Disables operation of the pump.
To enable isolation of the pumps during routine maintenance of the pump station (i.e. to prevent accidental startup of the pumps by accidentally tripping the level controls).
- Manual Overrides the pump normal start triggers and forces the pump to operate.
- Low level float should not stop pump in Manual

8.3.3 Control systems

Additional requirement:

The design of the general operation of most pump stations should to be controlled by a Series 2 Kingfisher RTU using standard parts as used by Western Water.

The design of the control system monitoring of operational status, level status of the pumping station is to be displayed on a Proface HMI Screen (LT4301M 5.7" Colour or approved equivalent) installed in the switchboard for maintenance and control set points for the sewer pump station. The location and orientation of the display screen should consider the incoming direction of any bright sunlight during the day.

For systems with RTU installed the following signals are recommended to be included in the design:

- Mains Power Monitoring;
- Control power health;
- Battery Status (Charger Healthy and Battery Low);
- Access Doors Closed; and,
- Wet Well Level (Analogue Signal) scaled as % full from bottom of well- 0% to spill level 100%).

Remote resets for any motor or drive in the control circuit must be able to be reset from four sources:

- SCADA Remote Reset;
- Autodialler Remote Reset Output;
- Local Panel Reset Button; and
- Proface panel.

The control wiring on any non RTU site is to be designed to allow easy connection to Western Water's SCADA system via an RTU in the future.

8.3.4 Emergency back-up control

Additional requirement:

Pumping stations shall have a separate back-up controller that will operate the pumps upon a failure of the RTU to perform the pumping function or failure of the level transmitter. The back-up system will be incorporated into the Proface panel via a separate level transmitter.

8.5 Alarm, Status Monitoring and Control Telemetry

8.5.2 Reliability

Additional requirements:

Provide an Edac autodialler 700 series with 24 hour battery backup and a Simado GFX113G modem with internal battery back-up, set to call Western Water's emergency contact number verified by Western Water along with an identification name for the pumping station. Alarms and reports shall be confirmed with Western Water, however shall be based on the typical Autodialler configuration below:

Normal Alarms:

- DC power fail (3 min delay)
- Pumps have exceeded starts per hour (user defined number)
- Autodialler test Alarm

Reset via Autodialler

- Pump reset (an input is set up as an output) this must be within the first 10 Alarm inputs.

Optional Inputs / Alarms if site has these abilities.

- Now flow alarm. User defined time set point
- Generator failed to start
- Generator low fuel
- Cabinet doors open
- Physical high level / spill Alarm
- Physical low level alarm

Proface Alarming

- High Level
- Low level
- Loop fail Alarm
- Proface fault Alarm

All signals that are connected to the autodialler shall be wired directly from the relay logic and not via a RTU or PLC, unless the signal is a status of the RTU/PLC or information from a remote site via a communications link. Level transmitters and alarm floats must be wired using loop isolators/relays so that in the event of a power failure of RTU failure, the levels and float signals will still pass through to the autodialler. Dialer/RTU shall be powered for a minimum of 8 hours in the event of power supply being removed. (regardless of permanent or connectable generator at the site).

All new pumping stations shall be connected to Western Water's SCADA system. The design and integration of the pumping station to the SCADA system shall comply with Western Water's SCADA Standards and associated Supplementary Manual for SCADA Ancillary Items. The most up to date versions of these documents are available from Western Water on a project basis upon request.

All identified critical spill points including ERSs shall be also fitted with an independent 'Fail Safe' alarm to provide early detection of system blockages, equipment failure or hydraulic overloading that if left unreported have the potential to result in a sewage spill. The Fail Safe alarms shall be fully



independent of any other monitoring. A spare 25mm conduit with sweep bends and draw wire shall be provided for the Fail Safe Alarm cable. This conduit will run from cabinet to well with a sealing glands at cabinet. The Fail Safe Alarm equipment including floats, instruments, antenna, etc. will be supplied by Western Water. The alarm shall be set at the level determined by Western Water Operations.

8.5.3 Alarm creation function

Replace Table 8.1 with the following:

**TABLE 8.1
DEFAULT ALARM LEVELS**

Parameter	Description
Low level alarm	Set at the snort level of the pumps
High level alarm	Set at 300mm above assist/stand-by cut-in level but never above the inflow emergency alarm
High high level alarm (backup float)	Set at 200mm below ERS spill level
ERS Overflow alarm	Set at the ERS spill level
Overflow to Emergency Storage Alarm	Set at the spill level to emergency storage

8.6 Telemetry Hardware

8.6.2 Software

Additional requirements:

The RTU program and Proface program will be provided by Western Water. The Proface configuration will include the following:

- **Pump well Schematic:** Current Levels, current flow, Pump Status symbols in Green, Amber or Red. Starts today and yesterday. Button for Pump down
- **Tab for Alarms:** pump fault, power fail, DC fail, RTU fail, loop fail, level Alarms; fault counts for high and low level alarms, power fails, pump faults, etc.
- **Tab for Setpoints:** Start and stop level, low level Alarm, high level Alarm, Fail to pump time, etc.
- **Tab for backup Control:** Current Level, Set points for Start and Stop and Alarms

The touch screen shall have a "home button" on all pages. The Proface screen should turn off when the cabinet door is closed.

8.6.4 Telemetry communications

Additional requirements:

There will be spare Terminals for two 12v fused supplies from 12v battery system.

Western Water will carry out all Telemetry Radio Surveys, equipment installations and commissioning.

8.7 Operating Levels and Default Settings

8.7.2 Cut-in and cut-out levels

Replace last 2 paragraphs with the following:

The assist/stand-by pump cut-in level shall be at least 200mm above duty pump cut-in level.

The level of pump controls shall be set at least 200mm apart.

8.7.3 Alarm levels

Replace first 2 paragraphs with the following:

The high-level alarm shall be set at least 500mm above duty pump cut-in level (300mm above assist/stand-by pump cut-in level).

An inflow emergency alarm is not required.

8.8 Equipment and Devices

8.8.1 General

Additional requirements:

All equipment supplied shall be from suppliers with adequate spare parts and service divisions located within Victoria. Western Water shall be provided with a full set of critical spares as part of the construction of the pumping station.

8.8.2 Flow measurement

Delete paragraph and replace with the following:

For pumping stations with a PDWF equal to or greater than 5L/s, the need for additional flow monitoring should be considered and agreed with Western Water. This may include an additional magnetic flowmeter at the start of the rising main and/or a flow monitor on the inlet sewer to the wet-well. All flow meters should allow continuous monitoring of flows.

The location of flowmeters and all cabling is to be included in the as constructed information with a location plan fixed to the inside of the control cabinet.

All flow meters must have a serial connection for totalising and 4-20 mA for instantaneous flow.

8.8.5 Level sensors

All level transducers shall have a range of 0-10m as standard. A wider range shall be adopted in cases where the wet-well or emergency storage tank depth exceeds 9m.

Primary level measurement in the wet-well and any emergency storage tank shall be by a Vega pressure transducer with Pro-face screen, unless otherwise approved by Western Water. Radar based level sensors may be considered on a case by case basis.

Floats shall be used for backup level sensors and control.

9 WET-WELL PIPEWORK

9.1 Pump Discharge Pipework

9.1.1 General

Additional requirements:

Any vertical pipework shall be designed with intermediate supports.

9.2 Valve Applications

9.2.1 Isolating valves

Add new paragraph after paragraph 1:

Valve closing direction shall be clockwise closing direction. Spindle caps on valves shall be painted red.



9.2.3 Scour/Emergency by-pass connection

Additional requirement:

Provide a camlock fitting on the delivery pipework within the valve chamber to allow a portable high suction pump to be used in the event of an extended power failure.

A scour shall be provided from the rising main back into the wet-well.

9.3 Valve Chamber

9.3.1 General

Replace paragraphs 1 and 2 with:

All pumping stations require a separate valve chamber to house the valves, scour and emergency bypass adjacent to the wet-well. Direct burial of these valves and appurtenances is not permitted. Valve chambers shall be concrete unless otherwise approved by Western Water.

9.3.2 Design

Additional requirements:

Operation of the isolation valves and scour valve is not required from the surface.

The wet-well roof slab shall incorporate the covers of the valve chamber unless otherwise approved. The valve chamber covers shall be large enough to enable crane access to remove valves for maintenance purposes. For valves greater than DN150mm, removal must be able to be carried out as a "direct lift" operation.

The valve chamber drain back to the pump-well shall be fitted with a Hume-King Flood gate or approved equivalent.

The depth of the valve chamber shall be the minimum necessary to accommodate the valves while providing the minimum cover to the rising main in the chamber.

9.4 Emergency Pumping Arrangements

Additional requirements:

In addition the emergency pumping facilities on the discharge pipework, an emergency suction pipe shall be installed within the wet-well. The emergency suction pipe shall consist of a suitably sized pipe (typically PVC) fixed vertically to the wet-well wall terminating at the surface with a 100mm female camlock connection.

10 PRESSURE MAIN

10.2 Location of Pressure Mains

10.2.1 General

Western Water will provide the signage to be installed at the developers/contractors cost. The sign shall be connected to the post using self-tapping stainless steel screws. Posts shall be made from green recycled plastic, with signs attached.

10.3 Hydraulic Design

10.3.5 Velocity in Pressure Mains

Replace 2nd last paragraph with the following:

The maximum allowable velocity of flow in the pressure main shall be 2.5m/s.

10.8 Pipeline Materials

Additional requirement:

The designer shall carry out the materials assessment and recommend the preferred rising main material. Only standard size and approved pipework shall be used.

If PVC is specified it shall be RRJ and minimum class 16. All non-metallic pipes shall be installed with a detectable marker tape.

Pressure mains must comply with colour and marking requirements of the relevant WSA Product Specification and Western Water's Approved Products Catalogue to differentiate pressure sewer mains from potable water and recycled water mains. These colours are currently PVC pipe to be coloured cream and PE pipe coloured black with cream stripes.

10.10 Odour and Septicity Control

10.10.1 Chemical Dosing

If all possible design parameters have been addressed to minimise the septicity of the sewage in the pump station and rising main, and still a problem of septicity remains, it may be necessary to chemically dose the rising main, pump well, and / or the reticulation lines leading to the pumping station. Where chemical dosing is considered necessary to control septicity then the Designer should detail dosing options, available impacts, advantages and disadvantages, capital / operating costs associated with the dosing.

Where it is considered necessary to dose chemical to control odour / septicity, the Designer should carry out an odour assessment. The odour assessment should detail chemical dosing options, impacts, advantages / disadvantages, operating / capital costs of all dosing options. The assessment should also include consideration of:

- Chemical availability and cost (including delivery distances and costs);
- Chemical handling issues;
- Impacts of the chemical on the downstream recycled water plant process efficiency and/or operation;
- Potential impact of a build-up of chemical in the system;
- Impacts of the chemical addition on the quality of recycled water produced at the downstream recycled water plant, and shall ensure that under no circumstance shall the Western Water stated quality of recycled water be compromised; and,
- Instrumentation and control system to ensure that the dosing is carried out to optimise the amount of chemical used to manage the odour levels in the receiving sewer.
- All chemical dosing pipework will be Industrial PVC Schedule 80 grade (to ATSM 1784) and pipework exposed to sun should have one coat of PVC etching paint and two coats of Solarguard type paint

The Designer should liaise closely with Western Water on the proposed ventilation and odour dosing.

The Designer should also consider the treatment of odours at the pumping station if necessary.

As part of the design of the chemical dosing facility, an independent consultant shall be engaged by the developer/designer to undertake an independent safety assessment of the chemical dosing facility design, and then a second safety assessment of the installed dosing facility prior to handover.

During commissioning the odour loggers shall be installed to monitor odour control performance and fine tune the chemical dosing setup.

10.11 Receiving System

10.11.2 Discharge MHs

Additional Requirements:

All pressure mains shall discharge to a discharge MH (receiving structure).

The maximum velocity before discharge to the receiving sewer shall be less than 2m/s unless otherwise approved by Western Water.

The receiving structure including the cover should have a protection system to minimise corrosion and should be vented.

The internal surface of the discharge MH shall be epoxy coated unless otherwise approved by Western Water. The *SuperEpoc*[™] epoxy coating system (as provided by Peltos.com.au), or any approved equivalent epoxy lining system should be specified. Application shall be in accordance with the supplier's recommendations.

12 SUPPORTING SYSTEMS

12.1 Services

12.1.2 Water

Replace clause with the following:

A metered water property service of minimum 20mm diameter and a static pressure of 20m head shall be provided to the pumping station site. The Designer shall detail the installation of backflow prevention devices. All RPZ and meters shall be located inside a lockable, covered enclosure (not mesh which can expose the equipment to freezing).

A RPZD backflow prevention device must be installed for any potable or recycled water supply for the wet-well washer. Wash down hoses or connections require dual check valves at the meter and a vacuum breaker and removable tap handle.

An inverted anti vandal hose bib shall be provided in a separate below ground meter pit for wash down purposes with two spare tap keys left in the electrical control cabinet.

In all instances, if connection to Western Water's recycled water system is available at the site, only recycled water shall be used for well washing. Where recycled water is adopted for well washing, a potable water connection shall also be made for hand washing purposes. Each service (potable water/recycled water) shall be clearly differentiated and marked as such on site. Any above ground recycled water pipework shall be clearly marked as "Recycled Water – DO NOT DRINK". The Designer shall ensure that there will be no cross connections between recycled water and potable water systems.

12.1.3 Telephone/Telemetry Lines

Additional paragraph:

The communication system shall be using a modem that negates the need for a landline. Where the designer believes that a landline provides the most secure and optimum communication form for the site, this shall be discussed and agreed with Western Water. The modem shall be a Simado GFX113G with integral back up battery

12.2 Materials Handling

12.2.1 Lifting equipment

Replace clause with the following:

The designer shall consider how the pump sets are to be removed from the wet well and refitted. Based on the size and weight of the pump sets, site layout and surrounding area, the need for a permanent lifting gantry over the wet well shall be confirmed with Western Water.

As a minimum, it is expected that all pumping stations will have either a permanent lifting gantry or a thickening of the wet-well cover slab to enable use of a mobile crane track to remove the pumpsets. The approach shall be agreed with Western Water on a case by case basis.

12.3 Security

Additional requirements:

Unless otherwise specified by Western Water, install a 1.8m high (min) cyclone fence which is coated green or black with 3 strands of barb wire on top.

Provide padlock-locking device for access covers. Western Water will provide a Western Water common keyed padlock upon commissioning of the pumping station.

12.4 Fire Control

Additional requirements:

The design shall comply with Western Water's Bushfire Requirements for Asset Protection. These requirements apply to the site selection, design and operational aspects for all new assets to improve their resistance to bushfire attack from burning embers, radiant heat, flame contact and a combination of the three attack forms.

A deluge system shall be provided for sewage pumping stations located in high bushfire risk areas.

14 DESIGN REVIEW

Western Water requires the Sewage Pumping Station Design Checklist (attached in Appendix A of this Design Guide) to be completed and submitted along with the design drawings for auditing purposes.

New paragraph:

Once the design has been completed, Design Drawings shall be submitted to Western Water for auditing purposes, accompanied by Western Water's Sewage Pumping Station Design Checklist which shall be completed by the designer. In general, Western Water will audit designs in the order they are received. It is Western Water's expectation that all designs submitted for auditing will comply with Western Water's design standards and will match the information provided in the accompanying Sewage Pumping Station Design Checklist. Where discrepancies are found, the designer will be expected to revise the design drawings and/or checklist and submit them for re-auditing.



Part 2: Products and Materials

16 PRODUCTS AND MATERIALS OVERVIEW

16.6 Selection Guide for Pipeline Systems

New paragraph:

Pipe and other associated products used on Western Water sewerage works shall be approved Western Water products and materials. Written approval from Western Water must be obtained for any alternative pipe materials prior to their proposed use.

Part 3: Construction

19 GENERAL CONSTRUCTION

19.1 General

New paragraph:

The following emergency contact numbers are in place for Western Water’s on-call operations staff and applicable for all existing Western Water assets in these areas:

Towns	Emergency contact numbers
Northern Depot Region - Macedon, Woodend, Gisborne, Sunbury, Riddells Creek, Diggers Rest, Romsey and Lancefield	0408 391 545
Southern Depot Region - Melton, Bacchus Marsh, Eynesbury and Rockbank	0412 844 281
Western Water Operations Centre	(03) 9218 5595

20 PRODUCTS, MATERIALS AND EQUIPMENT

20.1 Authorised Products and Materials

Additional requirement:

All equipment supplied shall be from suppliers with adequate spare parts and service divisions located within Victoria. Western Water shall be provided with a full set of critical spares as part of the construction of the pumping station.

22 TELEMETRY

22.1 Compliance with Authorities, Statutes, Regulations and Standard

New paragraph:

The design and installation of the system shall comply with Western Water's SCADA Standards. Western Water will generate SCADA pages for site and carry out all Telemetry Installations and commissioning.

30 PIPE LAYING AND JOINTING

30.6 Marking Tapes

30.6.2 Detectable marking tape

Replace 3rd paragraph with the following:

Detectable marking tape shall be installed above:

- a) all non-metallic pipelines;
- b) all curved pipelines; and
- c) at other locations as specified.

37 COMMISSIONING

37.1 General

Additional Requirements:

Commissioning of a pumping station should typically follow a staged process unless otherwise agreed prior with Western Water. These stages should be as follows:

- Stage 1 – Pre-Commissioning
- Stage 2 - Operator Commissioning
- Stage 3 – SCADA Commissioning (by Western Water and not Contractor)

Pre-Commissioning must fully test everything, including every Auto-dialler Alarm. This must be done before operators are called for Operator commissioning.

Operator Commissioning shall include testing and commissioning of all operational aspects of the pumping station, pressure main and associated equipment. This shall include checking all operational level triggers and all auto-dialler alarms are working correctly. Every single dialler alarm shall be checked (inputs and outputs) and this should also be carried out during Pre-Commissioning.

The SCADA Commissioning will be carried out by Western Water's SCADA Co-ordinator once the pumping system is operating correctly and Operator Commissioning is completed. Notification of the upcoming Site commissioning must be made to the SCADA Coordinator 14 days in advance, to ensure that telemetry equipment is set up.

The pumping station will not be commissioned /deemed operational until all documentation has been provided including:

- Plant data sheets. (2 hard copies, 1 digital copy);
- As constructed drawings for Civil, Mechanical & Electrical (SPS & RM). (2 hard copies, 1 digital);
- PLC / RTU code, HMI code and Autodialler .bin file emailed to SCADA Coordinator.
- Job Safety Analysis for all routine maintenance tasks to be performed at the SPS;
- Two copies of the operational and Maintenance manuals inclusive of pump system curves;
- Copy of concrete compressive strength and slump test results;
- Factory pump test results;
- Switchboard factory & site acceptance test certificates completed and signed;
- Asset list in excel spreadsheet; and
- Digital drawings shall be in AutoCAD (.dwg) format. & PDF (.pdf) adobe acrobat format.

Prior to commissioning all documentation should be forwarded to Western Water. In addition the Pre-Commissioning checklist (Appendix B) shall be completed and lodged 5 working days prior to the planned commissioning date.

The Contractor shall have completed all Pre-Commissioning activities and pre-tested all aspects prior to Commissioning. Western Water may impose a financial charge on the Contractor in the event of a failed Commissioning attempt resulting from lack of preparedness.

39 WORK AS-CONSTRUCTED DETAILS

39.1 General

Additional Requirements:

The following information is to be provided with the pump station prior to Western Water's preliminary acceptance of the pumping station.

- 2 electronic copies 1 in Microsoft Word format (.doc, .docx) and 1 in Portable Document Format (.pdf) of an operation and maintenance manual for the pump station, in accordance with Western Water's requirements. A standard template and an example can be provided upon request.
- Paper and electronic Autocad (.dwg) and Portable Document format (.pdf) produced in accordance of 'As constructed' detailed plans.
- Asset list (Western Water can provide a template on request).



Appendix A – Sewage Pumping Station Design Checklist

Criteria	Complete	Comments
Wet Well		
Minimum Design Capacity @ PDWF provided. In accordance with specification and drawings as approved by WW.		
Computations for flotation confirm minimum Factor of Safety of 1.1. In accordance with specification and drawings as approved by WW.		
Coating of concrete surfaces. In accordance with specification and drawings as approved by WW.		
Top slab to incorporate all below ground structures. In accordance with specification and drawings as approved by WW.		
Wet well shall be self-draining. In accordance with specification and drawings as approved by WW		
Covers in accordance with specification and drawings as approved by WW.		
Minimum wet well diameter complies. In accordance with specification and drawings as approved by WW.		
Volume between Cut in Cut out levels comply. In accordance with specification and drawings as approved by WW.		
Wet Well washers comply. In accordance with specification and drawings as approved by WW.		
Concrete strength specified. In accordance with specification and drawings as approved by WW.		
Clearance from overhead power lines. In accordance with specification and drawings as approved by WW.		
Ladders comply with specification and drawings as approved by WW.		
Penstock complies. In accordance with specification and drawings as approved by WW.		
Pipework complies. In accordance with specification and drawings as approved by WW.		
Pipe supports comply with specification and drawings as approved by WW.		
Pump well inlet pipe complies with specification and drawings as approved by WW.		
Computations for pump selection inclusive of NPV. In accordance with specification and drawings as approved by WW.		



Criteria	Complete	Comments
Approved pumps. In accordance with specification and drawings as approved by WW.		
Emergency Relief System		
Complies with specification and drawings as approved by WW.		
Valve Chamber		
Pit Accessible. In accordance with specification and drawings as approved by WW.		
Pipe supports comply with specification and drawings as approved by WW.		
Rising main tapings in accordance with specification and drawings as approved by WW.		
Ladders comply with specification and drawings as approved by WW.		
Operation of valves without need to remove cover. In accordance with specification and drawings as approved by WW.		
Chamber is self-draining. In accordance with specification and drawings as approved by WW.		
Closing direction of valves. In accordance with specification and drawings as approved by WW.		
Pipework and fittings comply with specification and drawings as approved by WW.		
Infrastructure		
Water supply in accordance with specification and drawings as approved by WW.		
Lighting in accordance with specification and drawings as approved by WW.		
Access road in accordance with specification and drawings as approved by WW.		
Bollards in accordance with specification and drawings as approved by WW.		
Switchboard location complies with specification and drawings as approved by WW.		
Termination of generator connectors complies with specification and drawings as approved by WW.		
Telemetry mast complies with specification and drawings as approved by WW.		



Criteria	Complete	Comments
Site drainage complies with specification and drawings as approved by WW.		
Bushfire requirements considered and included in the design.		
Pump Energy Efficiency		
Consideration of operating the pumps at maximum efficiency during average demand periods as opposed to during peak demand periods.		
Consideration of multiple duty points over the useful life of the pump station		
Consideration of the use of multiple pumps and combinations of variable and fixed speed pumps to minimise energy consumption		
Rising Main		
Minimum pipe class as per specification and drawings as approved by WW.		
Computations verifying velocity complies with specification and drawings as approved by WW.		
Discharge MH complies with specification and drawings as approved by WW.		
Air valve complies with specification and drawings as approved by WW.		
Scour Valve assembly complies with specification and drawings as approved by WW.		



Appendix B – Pre-Commissioning Checklist

REQUIREMENTS BY CONTRACTOR

The following checklist is required to be fully completed, signed and returned to Western Water before a joint commissioning is considered.

STATION NAME: _____ **STATION NO:** _____

- | | | |
|--|-----|----|
| • Supply Authority Power available. | Yes | No |
| • Provision of sufficient water for all testing purposes. | Yes | No |
| • Fresh water discharge flushing system operating as per design | Yes | No |
| • Ancillaries (GPO's, lightning etc.) tested and working correctly | Yes | No |

AUTODIALLER	1/	Dialler check	Site must be equipped with an Autodialler test button. When this is pushed Dialler must ring On call person with a test Alarm	Yes	No
	2/	Dialler check	Disconnect Autodialler. Press test button again. Autodailler should work through call list as supplied.	Yes	No
	3/	Dialler check	Remove AC power. Ensure Autodialler remains operating. Also ensure 3G Modem has battery back up	Yes	No
	4/	Dialler check	With SPS at rest, ring Dialler. It should report Well level (& ES if equipped) and pump Status, if there is a flow meter it should read Zero and not a negative number	Yes	No
	5/	Dialler check	Run each pump and ring dialler whilst running, it should report which pump is running, well level and flow if it has a flow meter	Yes	No
	6/	Dialler check	Run both pumps if site is capable of this, ring dialler and check it reports each pump is running	Yes	No
	7/	Dialler check	Some sites also <u>Alarm</u> on both pumps running, if this is required, ensure it does this when both pumps are running	Yes	No
	8/	Dialler check	Fault each pump. Dialler should alarm on each pump fault	Yes	No
	9/	Dialler check	Turn both pumps to OFF position. There should be an alarm for both pumps unavailable	Yes	No
	10/	Dialler check	Simulate a Mains failure. (sites with a generator should have a test switch) Autodialler should ring with Mains or Phase failure	Yes	No
	11/	Dialler check	For sites with a Generator, Mains fail should only trigger <u>one alarm</u> . It should be a combined alarm saying that mains has failed and Generator is either running or has failed to start.	Yes	No
	12/	Dialler check	There should be a general alarm for Generator that must alarm at any time if Generator is unable to run or is Low on Fuel	Yes	No



13/	Dialler check	Simulate a DC power supply failure. Dialler should ring with DC power system fault. Some sites have a subsequent low Batt alarm	Yes	No
14/	Dialler check	Low level alarm. Run pump and adjust set point to trigger a low level alarm. Autodialler will ring with this alarm. Pump Stn should stop and not run again until alarm has cleared	Yes	No
15/	Dialler check	Trigger a high level alarm. Autodialler should ring with this Alarm. This should be a Configurable alarm from Analogue and a fixed float alarm (sometimes a fixed float may be set up as a Spill alarm)	Yes	No
16/	Dialler check	Turn RTU OFF and perform above step with <u>fixed float</u> . Autodialler should still ring with this alarm	Yes	No
17/	Dialler check	Level transmitter must be either a 0-4 or 0-10mt Vega 52	Yes	No
18/	Dialler check	Level to dialler must be in %. 100 % will be the spill level of either a Manhole prior or top of well	Yes	No
19/	Dialler check	Remove level transmitter from well. It must Zero	Yes	No
20/	Dialler check	Turn RTU OFF. Ensure Autodialler still reports level. Remove level transmitter from Well and ensure level reports Zero	Yes	No
21/	Dialler check	If site has an ES, perform step 19	Yes	No
22/	Dialler check	There will be a fail to pump alarm on Proface and SCADA. Set this to 1 min with pumps not running and ensure it alarms after 1 min	Yes	No
23/	Dialler check	There will be an alarm for pumps exceeding the normal starts per day number. Lower this to One and ensure it Alarms	Yes	No
24/	Dialler check	There will be an alarm for a pump exceeding a runtime setpoint. Reduce this to a min number and ensure it alarms.	Yes	No
25/	Dialler check	Trigger a loop fail, e.g for level. There should be a loop fail alarm	Yes	No
26/	Dialler check	With the above alarm still ON, trigger another Loop fail and ensure Dialler re Alarms with Loop fail	Yes	No
27/	Dialler check	RTU fault. Trigger each of these faults separately and check Autodialler alarms. Remove or add an RTU Module, turn RTU OFF and stop Ladder logic	Yes	No
28/	Dialler check	Run a pump and trigger a no flow fault. Ensure Autodialler alarms. This should be on <u>both</u> start of pump not achieving flow and flow dropping away once running	Yes	No
29/	Dialler check	There may be ES fixed floats, ensure these all alarm when RTU is OFF	Yes	No
30/	Dialler check	SPS cabinets will be fitted with door switches. Ensure these alarm when door is first opened	Yes	No
31/	Dialler check	Some site will be fitted with ancillary equipment, e.g. Chem dosing. Ensure this alarms if faulted. (alarming may only be required to SCADA)	Yes	No



New sites are now being fitted with a Proface Display that is also capable of back up Control. This will also have Autodialler alarming

32/	Dialler check	Remove power to Proface, this will generate a Back up Controller fault Alarm	Yes	No
33/	Dialler check	Simulate a Proface level loop fail. This should generate a back up level loop fail	Yes	No

Note: To aid commissioning reduce all alarms to one sec to save time, return alarming to previous set points when done

RTU Testing

1/		Ensure all set points on Proface can be changed * changes must only be permitted after log in. logout will occur after 5 min's	Yes	No
2/		Pump should start at Cut in level and stop at cut out level. Set points should be in mm's	Yes	No
3/		If site has electrical capacity, ensure second pump cuts in at Standby cut in level and then both pumps stop at cut out level	Yes	No
4/		Check if one pump fails the other will start and then continues to be duty pump on subsequent starts (check for both pumps) Ensure pump stops on low level analogue set point. Pump inhibit should be removed on rise low set point. It should <u>not</u> latch requiring then a reset	Yes	No
5/				
6/		Ensure pump cannot run if there is a Phase fail	Yes	No
7/		Test pump will not stop on low level when in Manual	Yes	No
8/		If site is equipped with a MAS relay and GO / NO-GO I/O, ensure it will stop pump	Yes	No
9/		Turn RTU OFF. Ensure pumps start and stop at required levels and that if a pump fails, it continues to run on good pump for subsequent starts	Yes	No
10/		Run Snort function and ensure it operates properly. Ensure it will not start if function loops have failed	Yes	No
11/		On flow meter loop fail, the pump should be enabled to keep running via a rung in logic, but it must report a loop fail alarm on Dialler. Initiate this fault to ensure it works	Yes	No
12/		Ensure no flow alarming stops pump on both not achieving a flow by a time, and then on falling below a flow once running.	Yes	No
13/		Ensure Critical pump and drive faults stop pumps and alerts operators	Yes	No

SCADA TESTING

refer Western Water SCADA, Process Control & Radio Telemetry Standard



Appendix C – Commissioning Checklist

Verification of as constructed levels and operation

Note: Levels taken from well cover down

Setting/ Alarm	Measurement	Operational function (contractor to verify correct operation)
Spill alarm	M	Yes No
H/L back up pump 2 start	M	Yes No
H/L back up pump 1 start	M	Yes No
High level alarm	M	Yes No
H/L pump cut out/ Transfer	M	Yes No
Duty pump cut-in	M	Yes No
Duty pump cut out	M	Yes No
Low level alarm (indication only)	M	Yes No
Wet well level indicator		Yes No
Level controller span	0-..... M	
Level controller datum	MAHD	

Level settings according to design Yes No NA

Commissioning of Civil Works

Item	Complete	Date / Initials
Management		
Verify that Designer has provided all documentation. (as constructed details, operating manuals, test results etc.)		
If NO then close audit.		
Concrete		
Verify that the concrete slab is flush with the finished surface level.		
Verify that there is no damage to any exposed concrete surface.		
Verify that the top slab does not affect the drainage of the site.		
Verify that the surface dimensions of the top slab are in accordance with specification and drawings as approved by WW.		
Verify that the below ground concrete structures are dimensionally correct and in accordance with specification and drawings as approved by WW.		
Verify no leakage through the concrete structure.		



Item	Complete	Date / Initials
Verify the verticality of the structure is within tolerance in accordance with specifications and drawings as approved by WW.		
Verify that all chamfers are provided in accordance with specification and drawings as approved by WW.		
Verify that the pump well benching has been provided in accordance with specification and drawings as approved by WW.		
Verify that the specified coating to the walls has been applied in accordance with specification and drawings as approved by WW.(extent/coverage)		
OH&S		
Verify that ladder access to wet well meets OH&S requirements.		
Verify that ladder access to valve chamber meets OH&S requirements.		
Verify that all ladders are provided with the extension above the FSL.		
Verify that the ladders have non-slip treads.		
Have safety cages been specified		
Verify that safety cages have been installed in accordance with specification and drawings as approved by WW.		
Verify that adequate distance between wet well opening and switchboard is in accordance with OH&S requirements.		
Verify that adequate set down areas for the covers has been provided in accordance with OH&S requirements.		
Verify that no overhead cables restrict access via crane trucks.		
Products & Materials		
Verify that all products incorporated on the project are approved by WW		
Verify that all markings as required by specification and drawings as approved by WW are visible on the covers.		
Verify that the covers and frames are greased in accordance with the manufacturer’s requirements.		
Verify that the interchangeable multi part covers have lifting lugs on the beams for removal and covers have clockwise lifting key holes.		
Verify that WW approved penstock stuffing box is installed.		
Pipes & Fittings		
Verify that the valves are closing the correct direction (clockwise/anti-clockwise).		



Item	Complete	Date / Initials
Verify that adequate supports have been provided for the valves.		
Are valve extension spindles required.(includes penstock)		
Are adequate supports provided in accordance with specification and drawings as approved by WW.		
Verify that pipework has been provided to correct DN.		
Verify that adequate supports for vertical pipework have been provided. (i.e. vibration not noticeable when pumps operating)		
Verify that all gate valves operate through the full range and are left in the open position.		
Verify that a flap valve has been installed on the valve chamber drain.		
Verify that bleeders have been installed on the NRV's		
Verify that the specified pressure gauges have been installed in the valve chamber.		
Verify that the WW specified coating for all valves has been applied.		
Verify that the WW specified coating for the pipework has been applied.		
Verify that the pipework for the incoming sewer is in accordance with the design drawings.		
Verify that the specified bolting system on the flanges has been used.		
Verify that all valves can be removed through the available cover opening.		
Verify that uni-flanges have been provided to allow ease of removal of valves in accordance with specification and drawings as approved by WW.		
Verify penstock installed as per specification and drawings as approved by WW.		
Other Services		
Verify that the water service has been fitted with an approved back flow prevention device and hose reel in cabinet.		
Verify that all conduits through the top slab have been sealed to prevent odour escaping.		
Verify that electricity is below ground, not above.		
Verify that the access track is in accordance with the specification and drawings as approved by WW.		
Verify that adequate site drainage has been provided.		



Item	Complete	Date / Initials
Verify that wet well washers have gate valves and regulators fitted		
Restorations		
Verify that the site restoration has been completed.		
Testing.		
Verify that pump well infiltration test passed.		
Verify that pump draw down tests passed.		
Verify the operation/commissioning testing of the pump station as well as the rising main.		
Mechanical Equipment.		
Verify that the guide rails comply with the specification and drawings as approved by WW.		
Verify that the lifting chain complies with specification and drawings as approved by WW.		
Verify that the Pump footstool has been secured to wet well floor with appropriate chemical anchors.		
Are wet well washers specified approved by WW.		
Verify that they meet the specification and drawings as approved by WW.		
Electrical Equipment.		
Verify that the Station Identification plaque has been fitted to the electrical cabinet. This should also state its Electrical Certification and compliance numbering		
Verify that external lighting over the switchboard has been provided.		
Verify that the WW locks fitted to switchboard are operational.		
Verify that quick link generator connectors are provided		
Verify that both the telemetry and control equipment work.		
Security.		
Verify that the security fencing has been installed in accordance with specification and drawings as approved by WW.		
Verify that WW keyed locks installed.		
Have all NC items been resolved (including any raised as a result of <i>this</i> audit)		
If YES Issue Acceptance of Works, and close audit		
Will outstanding NC items impact on the ability to operate the pump/s		
If YES then close audit (wait for NC items to be resolved)		



Item	Complete	Date / Initials
Has Operations authorised the pumps to remain on.		
If YES record the name of the person who authorised this. NAME.....		