

# **Standard for Network Water Pump Stations**

**DP-15**

**Ver. 1**

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## Glossary: Terms and abbreviations

Accept(ance)	a sign-off by Watercare that it is in general agreement with a proposal. This sign-off does not transfer the designer's liability to Watercare.
BEP	Best efficiency point, typically at about 85% of the pump shut-off head. This is the pump design point.
DN	Nominal metric diameter designation conforming to the International Standards Organization.
ΣDDT	Trichloride-2,2-bis( <i>p</i> -chlorophenyl)ethane, synthetic organic compound used as an insecticide.
FD	Functional description completed to Watercare's template
Head	Measure of liquid surface elevation.
H&S	Health and Safety.
kPa	Kilopascal.
LIM	Land Information Memorandum.
l/s	Litres per second.
NES	National Environmental Standard.
PS	Pumping Station.
CS1, CS2, CS3, CS4	Watercare engineering compliance statements for design and construction.
PN	Nominal internal pressure that a component can safely withstand.
P&ID	Piping and instrumentation diagram.
Rising main	Pressurised water pipe through which water is elevated to a point of supply.
SCS	Soil contaminant standard.
VOC	Volatile organic compound.
WGS84	World geodetic system. WGS84 is the latest reference coordinate system used by global positioning systems (GPS).

# Part A – Preliminary and general requirements

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## 1. Introduction

Design and construction of pumping stations need to be completed by competent persons to the minimum requirements as set out in this standard.

This standard covers the planning, design and construction requirements for water pump stations to boost system pressure.

The electrical standards and control templates are available separately and shall be read in conjunction with this standard. Watercare's telemetry requirements are location based and require input from Watercare to identify the applicable standards and/or site requirement at the pump station site.

## 2. General Requirements

Pumping stations will only be considered by Watercare when it can be demonstrated that the water supply zone cannot be adequately serviced.

Where pump stations are developed by external developers, pumping stations shall be provided at the full expense of the developer. When properly designed and constructed to Watercare's standard; Watercare will take over the future operation and maintenance after the pumping station has been commissioned and vested in Watercare.

Pumping stations developed by Watercare or a developer shall follow the same process of review and implementation.

For the purpose of this standard, 'developer' shall be interpreted as both an external party developing a pumping station to be vested to Watercare and any party contracted to Watercare to develop a network pumping station.

This standard must be read in conjunction with the Watercare standards listed below. Where conflict or ambiguity exists this standard shall take precedence. Where there is conflict between referenced standards, the higher level of standard shall take precedence. Referenced standards:

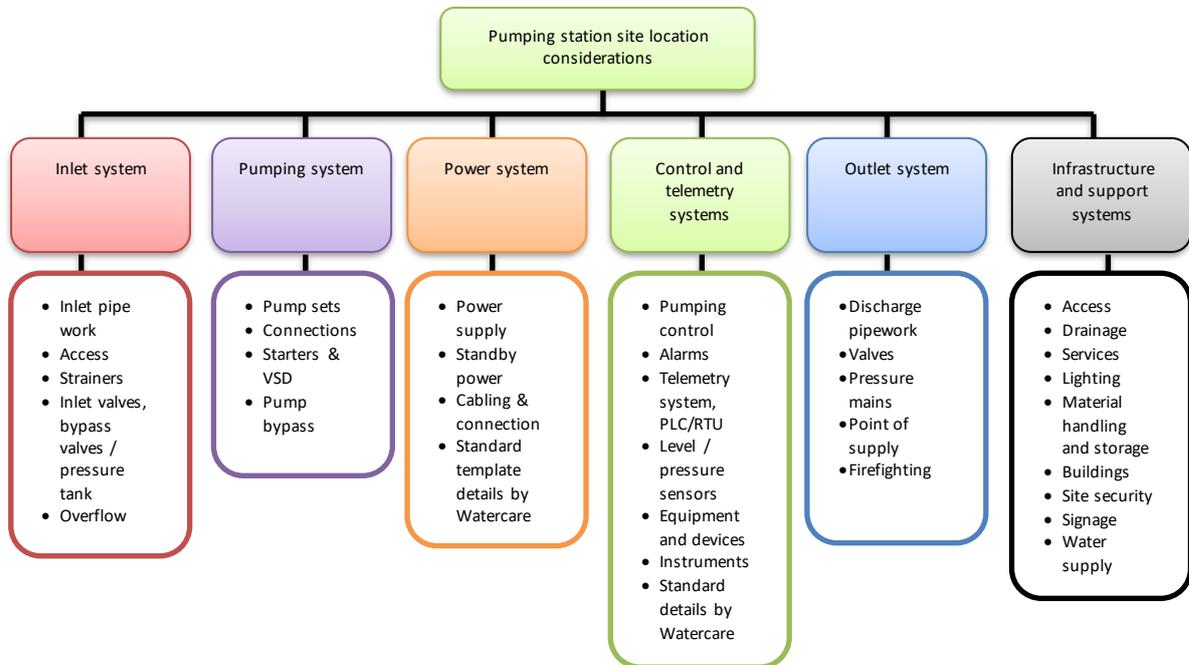
- COP-01 Code of practice for land development and subdivision, Water, Chapter 6.
- DP-10 Safety in Design guide
- DP-11 Watercare, 2017. Health and Safety in Facility Design
- DP-12 Architectural design guidelines
- 7363 – Watercare CAD manual
- AI - Data and Asset Information standard<sup>1</sup>
- MS – Material supply standard
- DP-09 Electrical design standard
- DW18 - Pump station electrical drawing set
- DW04 – Water pump station drawings for networks
- DW06 – Access structure drawings for water infrastructure
- CG – General civil construction standard

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<sup>1</sup> At the time of publication, the referenced standard is still under review and will take effect once published.

- ME – General mechanical construction standard
- EC - General electrical construction standards
- COP-03 Code of Practice for commissioning

The design considerations for review by Watercare shall follow the following output format:



### 3. Pump station planning considerations

When planning and designing for a pumping station; consideration shall be given to pumping station placement; the ultimate development of the pressure zone and demonstrate:

- Servicing strategy at initial start-up and long term
- Consideration of future development / upgrades that will allow the existing infrastructure to accommodate the overall increase in the capacity of the pumping station and staged infrastructure
- Resilience of pumping stations include site specific flexibility as well as the wider system that the pumping station is functioning within to sustain a level of service and absorb or adapt to changing conditions when there is a failure at the pumping station.
- Running costs, life-cycle and ongoing maintenance costs
- Environmental and health and safety risks
- Pumping station structures shall allow for the following minimum design life:
  - i. Pipework 100 years
  - ii. Valves and meters 30 years
  - iii. Electrical equipment 25 years
  - iv. SCADA and control 15 years

#### 4. Pump station site

Pump stations shall be sited on public land or a dedicated lot for the exclusive purpose of housing the station and all related structures and equipment. The site must provide adequate space for service vehicle movements and future expansion as may be predicted.

The pumping station general site layout shall have:

- a) A level aspect within the boundaries of the pumping station.
- b) 24hr all-weather vehicle access, adequate parking and adequate manoeuvrability and hard stand areas to access all components for maintenance and replacement.
- c) Dedicated underground mains power supply.
- d) A dedicated control room / cabinet to house electrical equipment as specified in the Watercare electrical and control standards.
- e) Building doors, switchboards, control cabinets and chamber cover-plates are to be provided with adequate clearances for maintenance access.
- f) Electrical connection facilities for the provision of a temporary generator.
- g) Dedicated utility service ducting.
- h) Associated valves and metering.
- i) Landscaping and planting as required by consent conditions or as otherwise specified by Watercare during the design review. Refer to Watercare architectural design guidelines.

##### 4.1 Contaminant-free site

Ground investigations shall be completed in accordance with the New Zealand Ground investigation specification, 2017 (<http://www.nzgs.org/library/nz-ground-investigation-specification>).

All data collected shall be uploaded to the New Zealand Geotechnical Database in AGS4 format at:  
<https://www.nzgs.org>

Contaminated sites should be avoided. Where a contaminated site has been confirmed, written approval to proceed shall be obtained from the Auckland Council. The following issues shall be addressed in the request for approval:

- The nature of the contamination;
- Compliance with statutory requirements;
- Options to de-contaminate the area;
- Selection of pipeline materials to achieve the required life expectancy of the wastewater main;
- Safety of construction and maintenance personnel; and

Any contaminants in the soil, including topsoil on the site, shall be at the lesser levels of the health-based or environmental related protection values as described below:

- Health based protection values:  
NES Soil contaminant standards (SCS) for residential land use (no produce, if applicable) as derived in accordance with Ministry for the Environment Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health (Chapter 7). In the absence of a derived NES Soil SCS, then a standard following the hierarchy outlined in the Ministry for the Environment, Contaminated Land Management Guidelines No 2 shall be adopted.
- Environmental related protection values:

Auckland Council Air Land and Water (ALW) Plan criteria for discharges as described in Rules 5.5.41.

- No asbestos containing material or volatile organic compounds in site soils.

No free (or separate) phase liquid contaminants and groundwater contaminant concentrations, with the exception of volatile organic compounds, which must be below the Australian and New Zealand Guidelines for Fresh and Marine Water Quality at the level of protection for 80% of freshwater species. Concentrations of volatile organic compounds shall be below typical laboratory screening detection limits (0.5 mg/L or lower).

The following table sets out the acceptance criteria for contaminant free sites:

Contaminant	Acceptance level (mg/kg)
Arsenic	<24
Cadmium	<7.5
Chromium	<400
Copper	<325
Lead	<250
Mercury	<0.75
Nickel	<105 <sup>1</sup>
Zinc	<200 <sup>1</sup>
Benzo(a)pyrene equivalent	<2.15
Pyrene	<1
ΣDDT	<0.7
VOCs	Below laboratory detection limit

<sup>1</sup> Can use upper limit background concentration in Auckland region (i.e. 320 for Nickel and 1160 for Zinc) if the soil is volcanic source

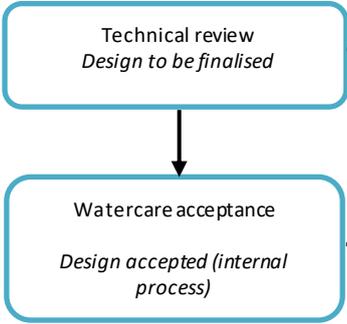
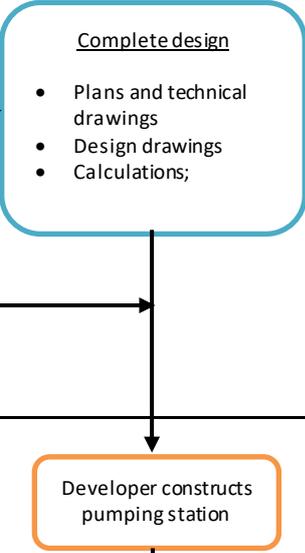
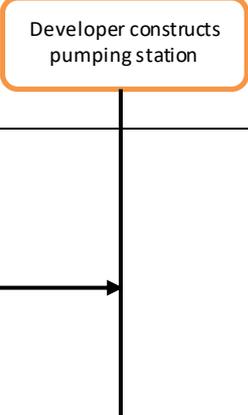
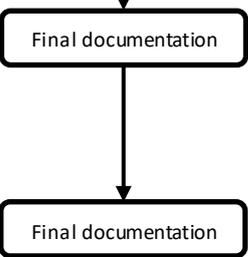
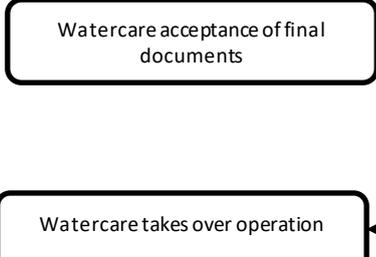
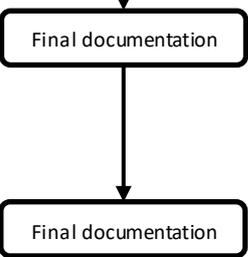
A site investigation including soil sampling and testing must be undertaken and a report submitted to Watercare in accordance with the requirements of the Ministry for the Environment, 2011, Contaminated Land Management Guidelines No. 1 - Reporting on Contaminated Sites in New Zealand. Testing shall be conducted by a NATA/IANZ accredited laboratory.

Soil testing data is required at the position for the proposed pumping station. Depending on the size of the proposed site additional soil testing at more than one location may be required if a single sample is not considered representative of the site.

## 5. Design process of network water pump stations

There are a number of operational and technical considerations for the developer to discuss with Watercare before beginning the consenting process with Council. The following flow chart is a guideline on the expected timeframes and requirements at each stage of the process:

Estimated timeframe	Process	Developer	Key documents
1 week	Determine PS requirement		
1 week	Watercare Developments / Planning / electrical / Service Delivery Review and set meeting date	<p><u>Proposal</u></p> <ul style="list-style-type: none"> <li>• Size of zone</li> <li>• Location</li> <li>• Demonstrate general requirements</li> <li>• Demonstrate planning considerations</li> </ul>	<ul style="list-style-type: none"> <li>• Application forms</li> <li>• Draft design</li> <li>• Land transfer plan</li> <li>• EDC form (engagement)</li> </ul>
1 week	Watercare Electrical and telemetry deskstudy on location serviceability Watercare provides cost estimate for control and telemetry connection		
	Watercare Draft approval / rejection of proposal	Amend proposal / proceed to next phase	
Approx. 3 weeks	Watercare conditions Supplied within 3 days of Council notice (if complying)	<p>Auckland Council Resource consent application</p> <p>Consent approval</p>	<ul style="list-style-type: none"> <li>• All fees paid</li> <li>• Auckland Council consent</li> </ul>

Estimated timeframe	Process	Developer	Key documents
Minimum 2 weeks			<ul style="list-style-type: none"> <li>Final design report (covering requirements in this standard, i.e. calculations, surge analysis, FD, P&amp;ID's, schedule of materials)</li> <li>Design compliance statement (CS1 or CS2, ref. section 6)</li> <li>Engineering design approval</li> </ul>
			<ul style="list-style-type: none"> <li>Construction QA/QC</li> </ul>
Minimum 2 weeks			<ul style="list-style-type: none"> <li>Prelim as-built drawings</li> <li>Electrical certificate of compliance (CoC)</li> <li>Signed-off pre-commissioning test results of structures and pipework. Refer section 9</li> <li>Draft Operations and Maintenance Manual.</li> <li>Factory acceptance testing</li> <li>Commissioning plan</li> <li>Construction QA/QC sign-off</li> </ul>
Minimum 4 weeks			<ul style="list-style-type: none"> <li>Commissioning plan</li> <li>Approval to connect</li> </ul>
			<ul style="list-style-type: none"> <li>Post-construction residual risks register</li> <li>Operations and Maintenance Manual</li> <li>Final Functional Description (FD) supplied separately to the O&amp;M manual.</li> <li>Electrical Certificate of Compliance and Electrical safety certificate</li> <li>Design drawing sets, as-built drawings and survey data</li> <li>Asset certificate</li> <li>Engineering compliance statements (CS3 and CS4)</li> <li>Agreed to transfer of liability</li> </ul>

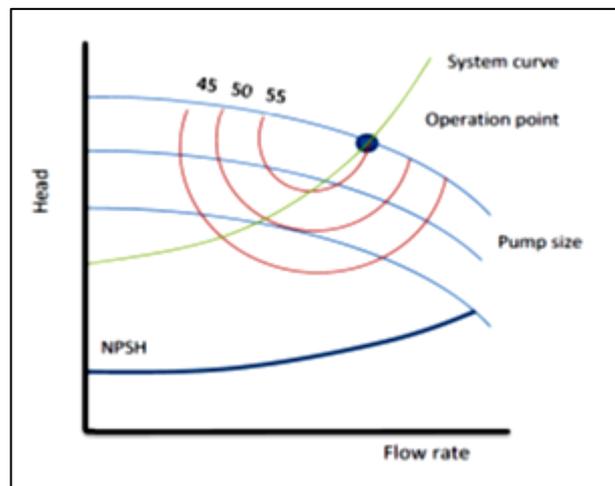
## 6. Design

### 6.1 General design considerations

The design shall be carried out in conjunction with the standard drawing templates, showing the typical layout that is expected for a pumping station.

The general design considerations include:

- a) The general principles for pipe layout and structural design shall be reflected in accordance with the requirements of the Code of Practice for Land development and subdivision, Chapter 6.
- b) A designation schedule of essential infrastructure for post-disaster operational continuity shall be determined in consultation with Watercare and to determine the appropriate serviceability limit state.
- c) Determine the station lifting height requirements, flow losses through pipework and fittings to calculate the total head.
- d) Determine the operating philosophy and associated SCADA and telemetry requirements.
- e) Develop the system curve that considers:
  - The flow velocity initial flow and ultimate state and any staging.
  - Static and friction losses.
  - Total lifting head.
- f) Select pumps where the pump curve intersects with the system curve (Figure 1) allowing an overall inaccuracy factor of 10% for friction losses in the system curve. See Part B, Section 3.2 on pump selection.



**Figure 1:** Pump selection by combining system curve and pump curve to determine the best efficiency point

- g) Complete geotechnical investigation for the purpose of structural design, construction considerations and land contamination report.
- h) Layout and structural design of infrastructure.

### 6.2 Design review

Once the design has been completed the designer shall undertake a review to ensure compliance with the requirements set out in this standard. The design shall be signed-off by a suitably qualified Chartered Professional Engineer. Compliance checks shall cover the following minimum criteria before submittal for evaluation by Watercare:

- Health and safety considerations identified during the design that includes for construction, normal operation, maintenance and emergency operation
- Community and environmental impact assessment
- System components, layout and configuration meet this standard and are in accordance with the typical pumping station standard details in the standard drawings
- Pump selection
- Plans indicating layout covering pipe size, grade, material types, transfer points and long sections
- Details of air release/vacuum and scour points
- Route selection meets concept/planning design
- Easements as appropriate
- Geotechnical data and considerations are taken into account during design
- Provisions made for future extension as appropriate, including upgrade staging and triggers
- Life cycle cost
- Compliance with referenced standards

## **7. Construction**

Each section of the pump system shall be constructed but not connected until individually tested, unless suitable isolation is available to complete individual tests before testing and commissioning the system as a whole (refer to section 9 on commissioning).

Construction practices for components shall comply with the following Watercare standards:

- a) General civil construction standard
- b) General mechanical construction standard
- c) General electrical construction standard
- d) Material supply standard

## **8. Pumping station asset data**

Asset shall be captured in accordance with Watercare's data and asset information standard.

## **9. Testing and Handover**

### **9.1 Commissioning**

This section shall be read with Watercare's Code of Practice for Commissioning.

All pre-testing and quality assurance checks shall be completed before commencing with commissioning.

Once the individual sections of the installation have been tested, the final connections are made ready for commissioning of the pumps. A suitably qualified Watercare representative for the respective engineering disciplines shall witness the commissioning in conjunction with the third party professional(s) that is responsible for the commissioning works.

Commissioning work shall not progress unless the following documentation has been provided and has been accepted to proceed:

- Preliminary as-built drawings
- Electrical certificate of compliance and Electrical safety certificate

- Signed-off pre-commissioning test results of structures and pipework
- Draft Functional Description
- Process and instrumentation diagrams (P&ID)
- Draft Operations and Maintenance (O&M) Manual
- Factory acceptance testing (FAT) completed, see Watercare Code of Practice for Commissioning (COP-03)
- Redline mark-up drawings
- Commissioning plan
- Applicable construction quality control signed off

**Note:** As a minimum, redline mark-ups will be accepted for commissioning in anticipation of the final CAD versions being provided at handover.

The commissioning plan shall include, but is not limited to:

- HAZOP study
- Testing of all control system inputs and outputs (I/O's), see Watercare Code of Practice for Commissioning (COP-03)
- Pressure and level sensor adjustment
- Alarm status
- Pump control units
- Remote control and data transmission (RTU and PLC checks)
- Data logging and analysis
- Pump flow rates and pressure main performance
- Noise and vibration level conforming during operation

Any non-conformance with this standard shall be corrected and re-tested.

## 9.2 Rejection of materials or products

All materials specified shall be accepted or standardised equipment as appropriate for the design purpose. Where products are required to be sourced that is not listed in the Watercare material supply standard then prior approval by Watercare is required.

Materials supplied shall comply with the nominated standards and the minimum certification criteria provided as part of the handover process. Where substitutions of any materials or products are deemed necessary during the construction of the pumping station, approval in writing from both Watercare and the pump station designer is required.

Materials not accepted by Watercare shall be replaced at no additional cost to Watercare.

## 9.3 Handover documents

Watercare shall take over the pumping station when all of the below documentation are finalised and supplied:

- a) Post-construction residual risks register.
- b) Signed construction quality control sheets.
- c) Operations and Maintenance Manual, see Watercare's Data and Asset Information standard.

- d) Final Functional Description (FD) (supplied electronically and separate to the O&M manual), see Watercare's Data and Asset Information standard.
- e) Certifications required by the electrical construction standard.
- f) Design drawing sets, as-built drawings and survey data.
- g) New assets register including for associated linear assets in accordance with Watercare's Data and Asset Information standard.
- h) Engineering compliance statements for design, construction and construction monitoring with associated quality assurance documentation

Where materials have not been supplied by Watercare, all product and material warranties and guarantees shall be transferred to Watercare.

## Part B – Network pump stations

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## 1. Pump station layout

- a) Pump stations shall be installed above ground in an architectural designed building housing all the associated equipment. Small underground pump station installations servicing a few properties, is not relying on the pump station for firefighting and there is no future expansion predicted, may be approved be exception. A firefighting booster point may be required for these installations.
- b) Provision shall be made for pump standby connection and pump redundancy.
- c) The pump station shall be installed at minimum 500mm above the 100 year flood level.
- d) The building or enclosure shall have a minimum internal height clearance of 2150mm with sufficient clearances around equipment of:
  - Pipework and pumps shall be at a height of minimum 400mm from the base of the building.
  - Minimum 300mm lateral spacing between valves and pumps .
  - Minimum 600 mm spacing between the wall and piping.
  - 600mm clear space from the end of control and electrical cabinet doors when opened.
  - Control cabinets shall be mounted at operator standing height.
  - Valves and pumps must all be installed on a horizontal plane – equipment shall not be required to be removed on a lateral plane for replacement or servicing.
  - Pipe protrusions through walls shall have a minimum clearance of 150mm before the first flange
- e) Footings or supports shall be provided underneath larger valves, pumps and manifolds that are in excess of 35kg for the individual component.
- f) Pipe support shall be provided to withstand structural and dynamic forces , and to provide the required height from the base of the building.
- g) The pump station building shall be isolated against noise, refer Part D, section 4.
- h) Service doors shall be sized to accommodate handling and removal of the pump station components to the largest removable component as a whole. Doors shall be sliding type or hinge open outwards.
- i) Access to the pump station building shall be unhindered with a adequate clearance for service trucks and any equipment required to maintain components.

## 2. Material selection

### 2.1 Pipework

- a) Above ground pipework, or pipe transitioning from below ground to the surface shall be selected from Stainless steel, epoxy lined mild steel, or ductile iron.
- b) Pipe fitting connections shall be flanged. Threaded, socketed, vitaulic or compression couplings are not acceptable.
- c) Strategically located restrained dismantling joints are acceptable. Un-restrained joints are not acceptable.
- d) Welded pipe connections shall be fabricated in removable sections, and shall be flange jointed as per above.
- e) The minimum pipe pressure rating shall be PN12 (unless otherwise stated), and any other component, valve, or fitting shall have a minimum pressure rating of PN16.
- f) Pipework shall be configured to allow the pump station to be bypassed.
- g) An inlet strainer shall be provided on the pup sets to allow separate isolation for cleanout.

## 2.2 Valves

### 2.2.1 Isolation valves

- a) Main inlet and outlet isolation of the pump system shall be by resilient seated gate valve. Geared butterfly valves may be approved on a case-by-case application.
- b) Individual pump train isolation may with ball valve type up to 50mm diameter or butterfly valves over 50mm diameter.

### 2.2.2 Non-return valves

- a) Non-return valves shall be swing check type with a rubberised steel disc and as accepted by Watercare.

### 2.2.3 Pump bypass valves

- a) Pump bypass valves used for pump performance control shall either be a controlled needle valve type or a diaphragm release valve type. Modulated butterfly valves shall not be used for this purpose.

## 3. Pumping system

### 3.1 Hydraulic design

- a) Demand estimation shall be based on the requirements of the Watercare Code of Practice for Land development and subdivision, Chapter 6.
- b) Pump performance control shall be from the following options:
  - Speed control. Preferred for larger pump stations
  - Bladder pressure tank. Preferred for small pump stations
  - Bypass control / relief in parallel with the pump set to adjust maximum head limit. Typical use for small systems, but should be not for larger pump stations due to energy costs.

Outlet valve throttle-control is not acceptable.

- c) The maximum flow velocity shall not exceed 3m/s.
- d) The maximum discharge pressure at the top of the hydraulic line shall not exceed 800kPa. The maximum operating pressure shall be less than the maximum cyclic pressure range (MCPR) for the selected outlet pipework. Refer to section 4.
- e) Surge pressure shall be anticipated at minimum 200kPa regardless if calculated to be less.

### 3.2 Pump selection

- a) Pump stations are designed as open systems with variable demand that depends on customer usage with a potential zero night-time flow.
- b) Depending on the zone, the pump station may also need to boost enough water for firefighting purposes.
- c) To meet this demand variability the pumping system is designed for constant pressure control. Pumps are arranged in parallel for demand fluctuation, raising pressure and redundancy purposes; and arranged in series for high pressure applications.
- d) A minimum of two pumps of exact capacity shall be installed for redundancy purposes.
- e) Combined efficiency (pump at best efficiency point and motor efficiency) shall be 80% or better.
- f) Pump selection shall be within  $\pm 5\%$  of the pump best efficiency point (BEP)
- g) Refer to Watercare electrical standards for VSD and starter requirements.

#### **4. Pump station outlet**

- a) All pump stations shall have a meter installed on the pump station discharge pipework.
- b) The inlet and outlet pipework shall be interconnected with a non-return valve and an isolation valve installed (normally closed), regardless of whether bypass control is used for pump control inside the pump station pipework. This bypass is to allow the pump station to be bypassed under emergency.
- c) The pump discharge pipe material design shall consider pipe and fittings to be pressure de-rated based on the material maximum cyclic pressure range (MCPR). The maximum operating pressure shall be less than the MCPR.

# Part C – Electrical, Control and Telemetry

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## 1. Electrical, Control and Telemetry

- a) Electrical, control and telemetry design and installation shall comply with the Watercare electrical and control standards and template drawing set DW18 for pumping stations.
- b) Electrical and control equipment shall be 500mm above the 100 year flood level.

### 1.1 Electrical

Additional to the electrical standards the following requirements for establishing electrical power on site shall also be completed:

- Sites owned by Watercare shall be coordinated for connection through Watercare. Early engagement with the mains provider is required.
- Where mains electricity is not available at the site a new installation point (ICP) will be provided.
- Mains electricity shall be of sufficient capacity taking into account future expansion.
- Unless otherwise approved, substations on a consumer's premises shall be for the sole supply of the Watercare facility.
- Information required for the ICP include: supply phase; maximum demand load in amps; physical address of connection; name and contact of the electrical contractor undertaking the works.
- Cabinetry shall be fitted with a generator connection.
- Any easement requirements for electrical mains and transformers must be referred to Watercare.

### 1.2 Control system and Telemetry

- a) Watercare will complete a connection suitability study for the location, to establish the telemetry requirements for the proposed pumping station site. A desk study will determine if there is an available connection for the location.
- b) If a connection is possible, the desktop study is followed by a site check to establish the signal to noise level ratio to ensure a good quality signal is available.
- c) Should there be no communications available or the signal strength is less than -90dB a specific design will be required.
- d) The telemetry and radio system shall be from a Watercare standardised supplier, refer to Watercare's material supply standard. The installation shall be carried out by a Watercare approved contractor.
- e) The designer shall obtain a facility code from Watercare that is used to provide the tag information used to configure the control system. The information required to obtain the facility code is:
  - GIS location of the site
  - The physical address associated with the site
  - Lot number or Land Registry identification
- f) The SCADA software shall be developed and implemented by a Watercare approved developer.
- g) Watercare has five different control systems that operate in various areas, they are:
  - Emerson DCS
  - In Touch SCADA
  - IFIX LNT SCADA
  - Citect SCADA
  - Abbey Systems Powerlink

In order for Watercare to complete the SCADA the following will be developed and supplied by the designer:

- i. A level 1 Functional Description (FD), to be reviewed and accepted by Watercare Service Delivery before software programming commences.
- ii. Liaise with Watercare point of contact in the production of the Electrical/ Control system design.
- iii. Process and instrumentation diagrams (P&IDs).
- iv. Bill of materials.
- v. Confirmed Input and Output lists (I/O).

### **1.3 Vendor supplied control system**

Watercare may approve a supplier turnkey control system with integrated switchboard and pump controls for low risk, small network pump systems, on a case-by-case basis and where the functionality can be seamlessly integrated with Watercare's systems.

# Part D – Infrastructure and support systems

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## 1. Water supply

- a) A site water connection shall be installed for cleaning purposes when specified. The connection shall be a typical domestic connection fitted with a tap connection with  $\frac{3}{4}$ " BSP thread to allow fitting of a hose. See G12/AS1 of the Building Code, for the methods and devices required to comply with Watercare's requirements.
- b) Where firefighting supply is not within reach as per the New Zealand code of practice for firefighting water supplies, then a suitable firefighting supply shall be installed in accordance with the Watercare Code of Practice for Land Development and Subdivision, Chapter 6.

## 2. Lighting

- a) Where considered an operational requirement or for safety reasons, site lighting must be specified. The designer must confirm the requirement and location such as to provide adequate lighting not have obstructive and obtrusive effects. The lighting shall be adequately controlled to prevent annoyance to the neighbouring properties.
- b) Lighting shall be provided at the pump station control and machinery rooms
- c) Fluorescent lights shall be phase shifted to stop strobe effects on machine rotating shafts.
- d) Positioning of lights shall be such as not to cast shadows or unlighted areas in the drywell and control room.
- e) The design shall take into account the types of activities to ensure the safety of people for the task types in the pumping station environment so that any hazards are visible and well lit.

## 3. Site drainage

- a) The site shall have adequate drainage and fall to prevent standing or ponding water and prevent inflow into dry areas.
- b) Overland drainage shall not affect neighbouring properties and may require a storm water system to be installed for discharge to a suitable location.

## 4. Noise control and vibration

- a) Noise generated by the pumping station shall not exceed the Council permitted levels. The design shall include measures to reduce noise appropriately. Where the maximum noise level has not been specified in the resource consent the maximum shall level be 45 dB  $L_{Aeq}(15min)$  measured at the pumping station boundaries.
- b) Strong and long term vibrations can cause soil settlement in certain soil types as well as long-term structural problems. Apart from the effects on physical structures vibration may also cause discomfort to adjacent property occupiers. The vibration velocity level shall not exceed 1mm/s measured at the pumping station wet well.

## 5. Lifting equipment

- a) Lifting devices shall comply with AS1418, AS4991 and the Worksafe NZ Approved Code of Practice for Cranes.
- b) Adequate access shall be provided for mobile lifting plant around the pumping station installation and suitable hard stand areas.
- c) Overhead gantry cranes shall be provided for handling large pumps, motors and valves. If the equipment requires low maintenance and can be removed by mobile plant through suitable access arrangements in the building design, then dedicated lifting equipment is not required.

The design of lifting equipment shall reflect:

- d) The design safe working load (SWL) shall be suitable for the heaviest component in the plant.
- e) Equipment may need to be lifted in part or assembled.
- f) Positioning of equipment and the lifting cover area. In some instances the layout may require more than one gantry. The positioning shall provide for lifting equipment or parts onto and off trucks.
- g) Structural design required where the crane girders and runways form part of the building design. It should be considered that cranes may be used as part of the temporary works when the pump station is constructed to lift materials and component into the build.
- h) Permanent access needs to be provided for overhead cranes. Isolators must be provided adjacent to the crane access.

## **6. Ventilation**

- a) The ventilation characteristics must be documented.
- b) The pump room shall have 4-6 air changes per hour.
- c) Where the control panel is situated inside the pump room, the room shall have a minimum of 10-15 air changes per hour within the limitations of AS/NZS61439 and be fitted with replaceable filters.

## **7. Security and access lids**

- a) All cabinets and other access points to the main pump station building shall be lockable.
- b) Traversable access lids shall comply with the appropriate loading class under AS3996.
- c) All entry points shall be fitted with an alarm that will signal unauthorised access through the Watercare security system. Security systems are fitted with a dual communications option that provides alarm to Watercare's security supplier and the Watercare central control room.
- d) Pump stations shall be fitted with fire detection equipment to meet building act requirements.
- e) Fire alarms shall be monitored for high priority pumping stations. Fire alarm systems are fitted with a dual communications option that provides alarm to Watercare's service supplier and the Watercare central control room. Lower priority pumping stations may only be fitted with a smoke alarm at the control panel that provides a fire alarm to the Watercare central control room.

## **8. Signage**

- a) Signage shall be provided that identifies the pumping station as the property of Watercare
- b) Informative operational, health and safety signage that shall be required at the pumping station perimeter.

## **9. Site access road**

- a) The site access road shall comply with Watercare's general civil construction standard.
- b) Adequate vehicle turning area shall be provided within the site.
- c) The access road shall be sealed have a minimum laden load bearing capacity of 25 tons (unless otherwise stated) and a minimum width of 3.5m.