Standard for Transmission

Wastewater Pumping Stations

DP-13

Ver. 0.3

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Table of contents

GLOSSARY: TERMS AND ABBREVIATIONS 6

PART A – PREAMBLE AND GENERAL DESIGN REQUIREMENTS 8

1. INTRODUCTION 9

2. REFERENCED STANDARDS 9

2.1 STANDARDS LIST 9
2.1.1 Watercare standards 9
2.1.2 National and international standards 10
2.1.3 Other publications 10

3. DESIGN DELIVERABLES 10

4. CRITICALITY AND INFRASTRUCTURE FLEXIBILITY PRINCIPLES 11

4.1 DESIGN LIFE 11
4.2 FUNCTION CLASSES AND CRITICALITY 11
4.3 RESILIENCE AND REDUNDANCY 12
4.3.1 Resilience measurements {Table based on the IIMM, 2015 example table 3.2.8} 12
4.3.2 Scoring 13

5. RISK 13

6. SAFETY AND HAZARD MITIGATION 13

6.1 SAFETY IN DESIGN GUIDELINES 13
6.2 SAFETY IN FACILITIES DESIGN GUIDELINES 13

7. DESIGN PROCESS FOR TRANSMISSION PUMPING STATIONS 14

8. PUMPING STATION PLANNING CONSIDERATIONS 16

9. DESIGN OUTPUT FORMAT 16

10. PUMPING STATION SITE 17

10.1 SITE GROUND CONDITIONS 17

11. GENERAL DESIGN CONSIDERATIONS 19

12. DESIGN REVIEW 20

13. CONSTRUCTION 21

14. PUMPING STATION ASSET DATA 21

15. TESTING AND HANDOVER 21

15.1 COMMISSIONING 21
15.2 REJECTION OF MATERIALS OR PRODUCTS 22
15.3 HANDOVER DOCUMENTS 22

PART B – WET WELL/DRY PUMPING STATIONS 24

1. PUMPING STATION INLET SYSTEM 25

1.1 GENERAL 25
1.2 GRIT COLLECTION AND SCREENS 25
1.3 INLET STRUCTURE MATERIAL PREFERENCE 25

2. WET WELL 25

2.1 GENERAL REQUIREMENTS 25
2.2 SIZE OF THE WET WELL AND LEVELS 26
2.3 PUMP STATION OVERFLOW 26
2.4 WET WELL INLET 26
2.5 PUMP INTAKES (WET WELL OUTLET PIPEWORK) 27
2.6 MATERIAL SELECTION 27
2.6.1 Wet well 27
2.6.2 Inlet and outlet pipework 27
2.6.3 Valves 27
2.6.4 Ventilation 27

3. PUMPING SYSTEM 28

3.1 HYDRAULIC DESIGN 28
3.2 PUMP SELECTION 28
3.3 PUMP PRODUCT REQUIREMENTS 29

4. PUMPING STATION OUTPUT SYSTEM 29

4.1 DRY WELL 29
4.1.1 Sump pumps 29
4.2 RISING MAIN 30
4.2.1 General 30
4.2.2 Hydraulic design 30
4.2.3 Pipe Material 31
4.2.4 Rising main levels 31
4.2.5 Combined rising mains 31
4.3 VALVES 31
4.3.1 Non-return valves 32
4.3.2 Isolation valves 32
4.3.3 Air release valves 32
4.4 RECEIVING STRUCTURE (DISCHARGE MANHOLE) 32
4.5 WASH-OUT 32

PART C – ELECTRICAL, CONTROL AND TELEMETRY 33

1. ELECTRICAL, CONTROL AND TELEMETRY 34

1.1 ELECTRICAL 34
1.2 CONTROL SYSTEM AND TELEMETRY 34

PART D – INFRASTRUCTURE AND SUPPORT SYSTEMS 36

1. WATER SUPPLY 37

1.1 ABLUTION FACILITIES 37

2. LIGHTING 37

3. VENTILATION 37
4. SITE DRAINAGE 37
5. NOISE CONTROL AND VIBRATION 37
6. LIFTING EQUIPMENT 38
7. SECURITY, ACCESS AND FIRE ALARMS 38
8. SIGNAGE 38
9. SITE ACCESS ROAD 39
10. ODOUR CONTROL 39

APPENDIX A: WATERCARE NETWORK DISCHARGE CONSENT (NDC) EXECUTIVE SUMMARY 40

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.
ADWF	Average dry weather flow.
AEE	Assessment of environmental effects.
BEP	Best efficiency point, typically at about 85% of the pump shut-off head. This is the pump design point.
CS1, CS2, CS3, CS4	Watercare engineering compliance statements for design and construction.
dB	Decibels.
DN	Nominal metric diameter designation conforming to the International Standards Organization.
ΣDDT	Trichloride-2,2-bis(*p*-chlorophenyl)ethane, synthetic organic compound used as an insecticide.
EDC	Engineered discharge consent.
FD	Functional description completed to Watercare's template.
GRP	Glass reinforced pipe.
Head	Measure of liquid surface elevation.
H_2S	Hydrogen Sulphide.
H&S	Health and Safety.
kPa	Kilo-Pascal.
LIM	Land Information Memorandum.
l/s	Litres per second.
MH	Manhole.
NDC	Network Discharge Consent. Watercare's global discharge consent for overflows from its wastewater network in existing urban areas and some planned future urban areas.
NES	National Environmental Standard.
ppb	Parts per billion.
ppm	Parts per million.
PN	Nominal internal pressure that a component can safely withstand.
P&ID	Piping and instrumentation diagram.

Rising main	Pressurised wastewater pipe through which wastewater is elevated to a point of discharge.
SCS	Soil contaminant standard.
VOC	Volatile organic compound.

Part A – Preamble and general design requirements

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 of Transmission network pumping stations and typically over 78 l/s. Transmission rising mains are covered in the Code of Practice for the design of transmission water and wastewater pipelines (DP-07). Transmission wastewater pumping stations are typically wet well/dry pumping design. For submersible pumping stations refer Watercare's Local network pumping station standard, DP-06.

The electrical standards and standard pumping 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. Referenced standards

2.1 Standards list

This standard must be read in conjunction with the Watercare, national and international 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.

2.1.1 Watercare standards

DP-07 Design principles for transmission water and wastewater pipeline design

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[1]

MS – Material supply standard

DP-09 Electrical design standard

DW18 - Pump station electrical drawing set

DW05 – Access structure drawings for wastewater infrastructure

CG – General civil construction standard

ME – General mechanical construction standard

EC - General electrical construction standards

COP-03 Code of Practice for commissioning

[1] At the time of publication, the referenced standard is still under review and will take affect once published.

2.1.2 National and international standards

NZS 1170 Structural design actions

Part 5 Earthquake actions – New Zealand

Part 5 Supp 1 earthquake actions – New Zealand - Commentary

NZS 3101 Concrete structures

NZS 3106 Design of concrete structures for the storage of liquids

AS 3996 access covers and grates

AS/NZS1657 Fixed platforms, walkways, stairways and ladders. Design, construction and installation AS 1418

AS 1418 Cranes, hoists and winches

AS 4991 Lifting devices

NZS 3640 chemical preservation of round and sawn timber

AS/NZS 3000 Wiring rules

AS/NZ S61439 Low voltage switchgear and controlgear assemblies

2.1.3 Other publications

Roberts, R, New Zealand Geotechnical Society, 2017, New Zealand Ground investigation specification, Volume 0, 1, 2 and 3

Worksafe NZ, Approved Code of Practice for cranes

3. Design deliverables

Design work shall be completed by Chartered Professional Engineers or a suitably qualified engineer who have their work reviewed by a Chartered Professional Engineer in accordance with the Watercare compliance statement policy. Any design produced may be subjected to review by a Chartered Professional Engineer.

The designer must consider the design under the full operational requirements and apply good engineering practice that reflects:

- Compliance with New Zealand legislation, the most recent national standards, regulations and local conditions
- Watercare standards as included and referenced in this standard
- Historical information that may impact on the design
- Community and customer expectations
- Other information or specific conditions as provided by Watercare

The design shall not re-draw or amend a current approved Watercare standardised design. Specific design drawings shall cross-reference to the standard Watercare design and constructions standards. Where template designs are provided they shall be amended for material components only.

The following comprehensive documents shall be provided to Watercare for evaluation of the design:

a) Geotechnical reporting on the suitability of the land for the life of the asset
b) Basis of design report describing options and selection of design

c) Risk analysis
d) Design report
e) Material schedules
f) Project execution plan
g) Site specific specification for construction
h) Nominated minimum levels of construction supervision
i) Drawings showing location, detailed long sections, pipe grades and sectional details
j) Functional descriptions (FD) of the transmission system function in network
k) O&M manual draft
l) Standard operating procedure (SoP) draft
m) New assets register in accordance with Watercare's data and asset information standards
n) Design compliance statement – See Watercare compliance statement policy

4. Criticality and infrastructure flexibility principles

4.1 Design life

The design life for transmission pumping stations system and associated structures is to provide 100 years of service life within an acceptable level of service (quality and capacity of service) offset against an acceptable cost of maintenance of the service at this level. Some components may require maintenance or intervention before the 100 year service life, such as instrumentation or pump replacements, and must be included in the overall lifecycle cost of the pump station.

Note: *Further information on life cycle cost and optimal point of replacement can be found in the International Infrastructure Maintenance Manual (IIMM, 2015)*

4.2 Function classes and criticality

Transmission pump stations and the associated infrastructure within the pumping station site shall have a minimum function class of 3.

Note: *Refer to the New Zealand Ground investigation specification for the level of geotechnical information to be applied*

Function class		Description	Design Safety Factors				Seismic return period factor (NZS1170) R_u
			Peak ground acceleration	Liquefaction /subsidence	Landslide/ lateral movement	Surface loading	
3	Critical	Pump stations servicing large numbers of customers (>10,000 people) failure could cause significant economic impact or substantial hazard to human life, the natural environment and properties.	1.8	1.35	1.6	1.5	1.8
4	Essential lifeline	Pump stations that are essential to maintain service post natural disaster or man-made mishap and are intended to remain in service.	2.3	1.5	2.6	2	1.8

4.3 Resilience and redundancy

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.

4.3.1 Resilience measurements {Table based on the IIMM, 2015 example table 3.2.8}

Dimension	Principle	Indicators	Assessment method
Technical vulnerability	Robustness	Maintenance regime i.e. preventative or run-to-failure	Audit against best practice
		Asset renewal strategy is up to date	Audit against standards
		Design standards are followed and reviewed	Audit against best practice
		Spare capacity in the network system	Audit / system modelling
		Condition rating of exiting asset/system	Audit
	Redundancy	Supply of backup equipment/components are identified and suppliers hold stock	Supplier audit
		System diversion plans are in place, kept up to date with new assets/system changes	System modelling and audit of plan
		Capacity from alternative source	System modelling
	Modularity / flexibility	Modular systems, interchangeability	Standard design / best practice
		Future allowance for upgrade, improvements and strengthening	Audit against best practice
Organisational vulnerability	Variation readiness	Qualifications of staff are appropriate to roles and responsibilities	Audit
		Staff quantity and resources are adequate to deal with reactive changes	Audit
		Continual development of staff	Survey / audit
		Communication is clear with protocols in place	Survey
		Information on systems and assets such as drawings and operational manuals are readily availability	Survey / audit
		Readiness/response planning are in place and practiced	Audit
		Funding availability to effect operational variance	Audit
		Insurance are up to date and with appropriate risk cover	Audit
	Leadership / culture	Decisive decision making	Survey
		Situational awareness	Survey
		System knowledge	Survey
		Innovative thinking	Survey
	External partners	Ability to leverage on external knowledge	Survey
		Partnerships, design and service delivery arrangements	Audit
		Behavioural/communication barriers that could restrict productive solutions	Survey

4.3.2 Scoring

Scores are assigned based on the assessment outcome for the individual fields listed under section 5.3.1 and collated under the principle categories and rolled up as averages for technical and organisational averages.

Score	Description
1	Poor, not adaptive, complete loss of level of service
2	Marginal, adaptive but with system constraints or reduced level of service
3	Good, adaptive
4	Excellent, very adaptive/diverse with multiple redundancy options

5. Risk

Risk shall be assessed in accordance with the current Watercare Risk Management Framework.

6. Safety and hazard mitigation

6.1 Safety in Design guidelines

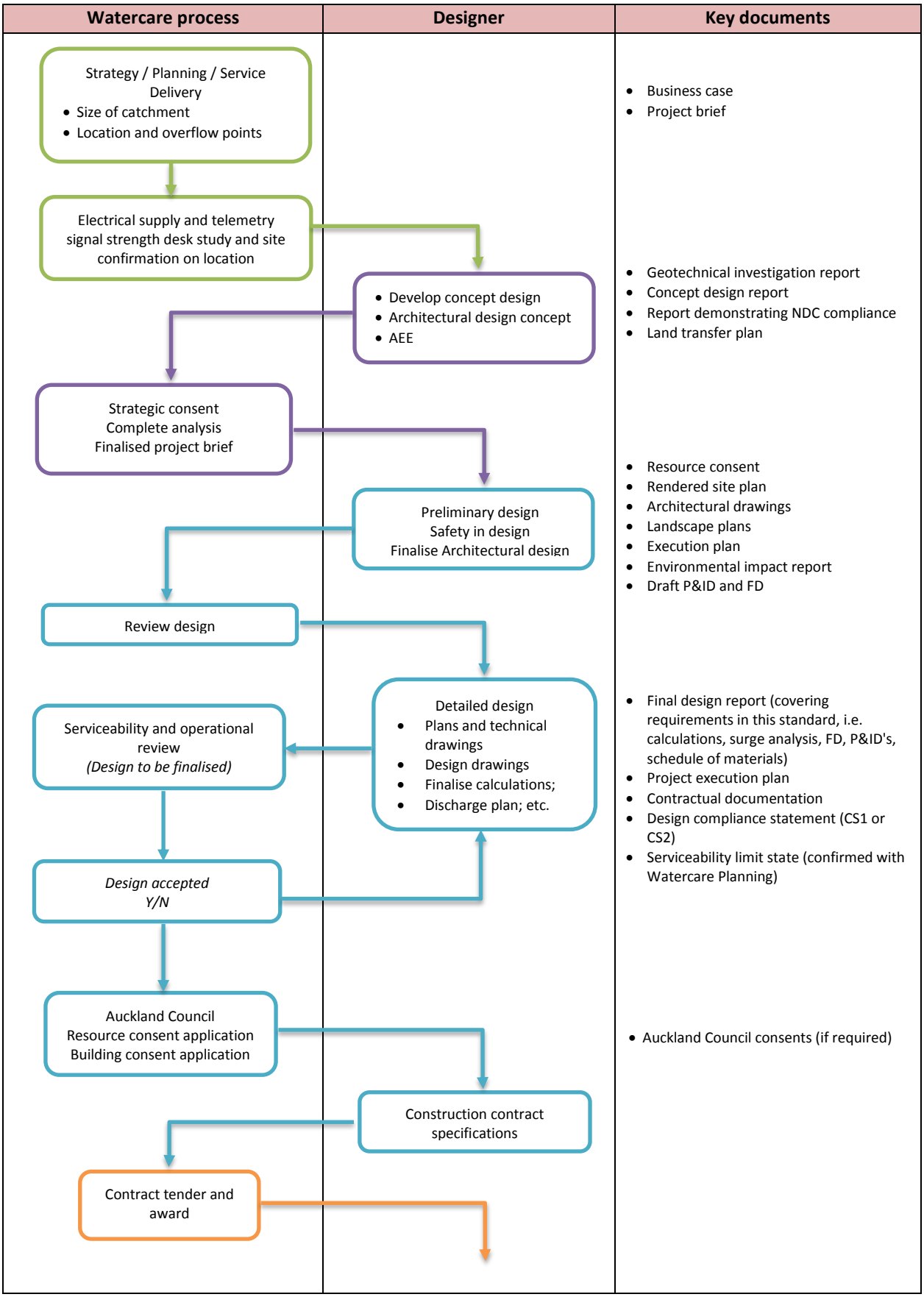
Refer to the Watercare Safety in Design standard for output requirements and to complete HAZOP analysis.

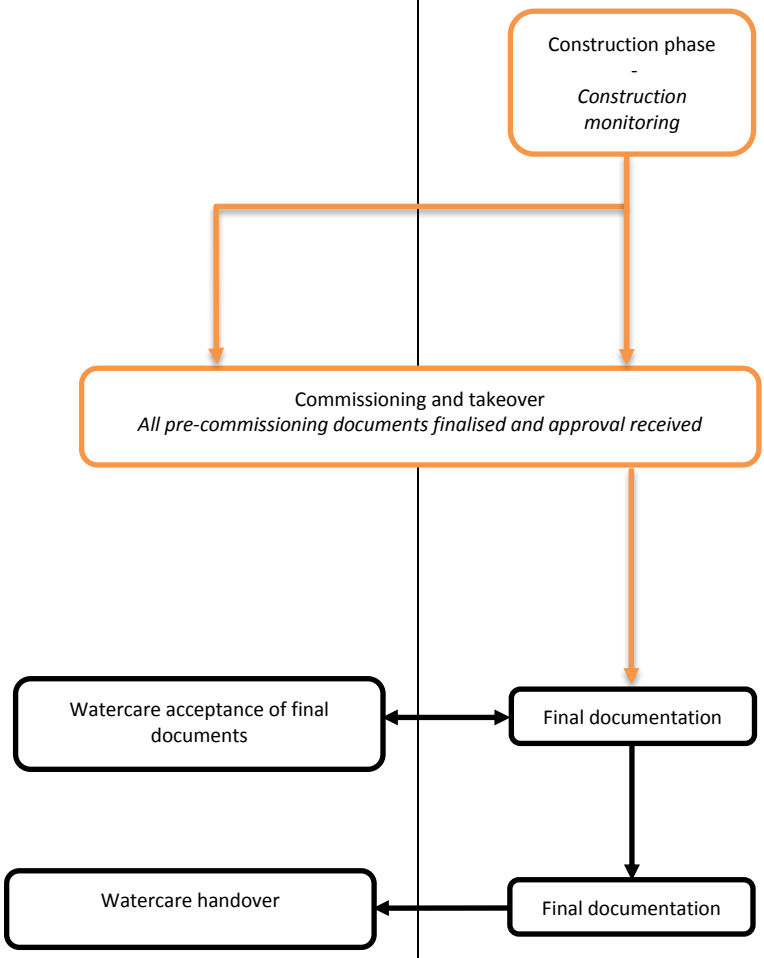
6.2 Safety in Facilities Design guidelines

Refer to Watercare Health and Safety in Facilities guidelines, 2017 for the functional safety outputs required at pumping stations.

7. Design process for transmission pumping stations

The following flow chart is a guideline on the expected stages for developing the pump station design:



Watercare process	Designer	Key documents
		• Prelim as-built drawings • Electrical certificate of compliance (CoC) • Signed-off pre-commissioning test results of structures and pipework. • Draft Operations and Maintenance Manual. • Factory acceptance testing (FAT). Refer Appendix B • Pre-commissioning plan • Construction QA/QC sign-off (CS3 and CS4 with supporting documentation) • Commissioning plan • Approval to connect • Post-construction residual risks register • Operations and Maintenance Manual • Final Functional Description (FD) supplied separately to the O&M manual. • Electrical Certificate of Compliance • Design drawing sets, as-built drawings and survey data • Asset certificate • Engineering compliance statements • Agreed to transfer of liability

8. Pumping station planning considerations

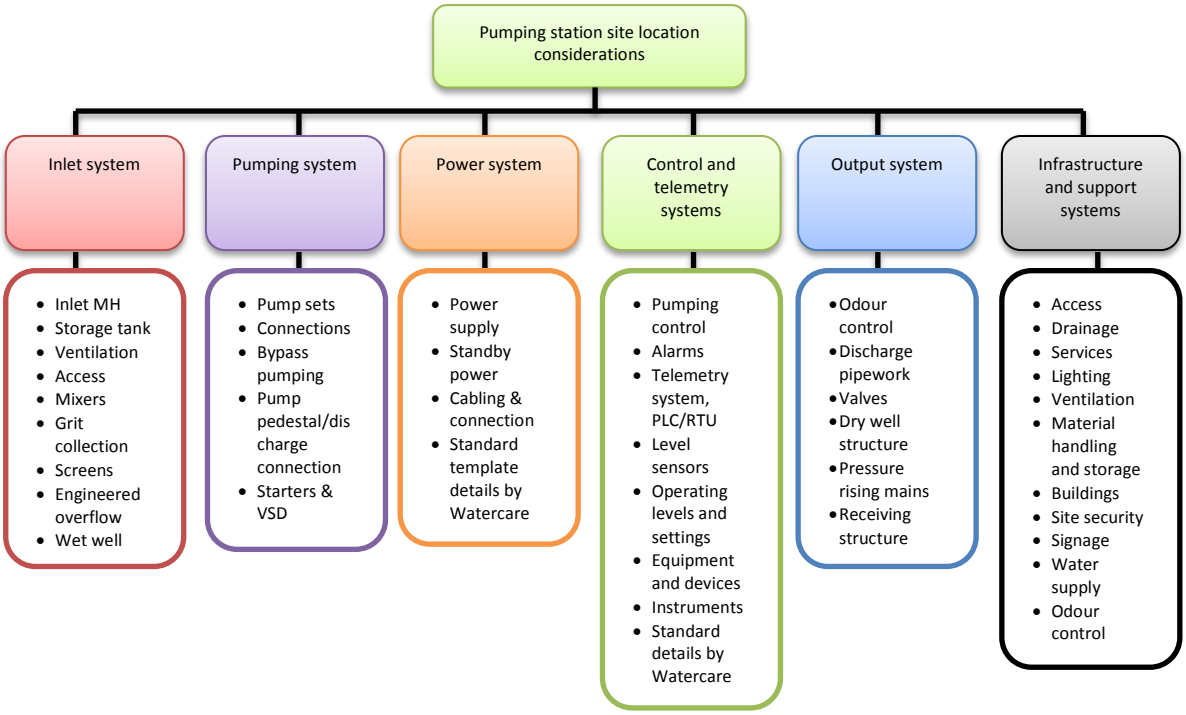
The feasibility study shall considertechnical, environmental and financial criteria over the entire design life of the system.

When planning and designing for a pumping station; consideration shall be given to pumping station placement including:

- Future expansion / upgrades that will allow the existing infrastructure to accommodate overall increase in the capacity of the pumping station and other staged infrastructure
- Running costs, life-cycle and ongoing maintenance costs
- The impact on existing pumping stations requires a full system integrated design
- Septicity within the pump station and connected pipework, odour issues and corrosion of equipment and pipes
- Environmental and health and safety risks
- Dry-weather storage capacity
- Pumping station structures shall allow for the following minimum design life:
    i. Storage tanks 100 years
    ii. Pipework (pressure and gravity) 100 years
    iii. Valves and meters 30 years
    iv. Electrical equipment 25 years
    v. SCADA and control 15 years

9. Design output format

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



10. Pumping station site

Transmission pumping 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. By their nature, pumping stations are typically sited in low laying areas or coastal areas.

The site must provide adequate space for service vehicle movements and future expansion as may be predicted.

A reverse sensitivity (or non-sensitivity) covenant must be placed on the titles to be issued for any adjoining lots within a distance of a minimum of 20 metres from the pumping station lot boundary. Factors that determine the covenant distance to be greater than 20 metres shall be based on the nature of the pump station operations, the pump station size and its location.

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) Odour control system(s) shall be required at the pumping station and have a minimum of 12m horizontal clearance from the adjacent property boundaries.

d) Emergency storage of a minimum of 8 hours ADWF and an engineered overflow.

e) Dedicated underground mains power supply.

f) A dedicated control room or cabinet to house electrical equipment as specified in the Watercare electrical and control standards. Control rooms and cabinets shall be a minimum of 500mm above the 100 year flood level.

g) Building doors, switchboards, control cabinets and chamber cover-plates are to be provided with adequate clearances for maintenance access.

h) Electrical connection facilities for the provision of a temporary generator.

i) Dedicated utility service ducting.

j) The pump station inlet structure.

k) Wet well/drywell with associated outlet valves and metering.

l) Landscaping and planting as required by consent conditions or as otherwise specified by Watercare during the design review. Refer to Watercare architectural design guidelines.

10.1 Site ground conditions

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 Auckland Geotechnical Database in AGS4 format at:
https://agd.projectorbit.com

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 [1]
Zinc	<200 [1]
Benzo(a)pyrene equivalent	<2.15
Pyrene	<1
ΣDDT	<0.7
VOCs	Below laboratory detection limit

[1] 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.

11. General design considerations

The design shall be carried out in conjunction with the standard drawings for Watercare transmission pumping stations, showing the typical layout that is expected for a pumping station. It is expected that the core requirements shall remain unchanged with design outcomes establishing the pipe sizes, fall/grade changes, pump and discharge sizes, wet well size and depth, and dry well dimensions.

The general design considerations include:

a) Determine type of pumping station:

Pump application type			
Wet well/dry pump	Rotodynamic	Centrifugal	Single or double entry volute
			Two stage volute
			Multistage split or barrel case
		Mixed flow	Volute
			Bowl
Low lift	Positive displacement	Rotary	Progressive cavity
			Screw
			Gear
		Reciprocating	Piston

b) Determine pumping system demands in accordance with DP-07 Design principles for transmission water and wastewater pipeline design, Part B.

c) The general principles for pipe layout and structural design shall be reflected in accordance with the requirements of DP-07 Design principles for transmission water and wastewater pipeline design, Part C and D.

d) 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.

e) Determine the station lifting height requirements, flow losses through pipework and fittings to calculate the total head.

f) Determine the operating philosophy and associated SCADA and telemetry requirements.

g) Develop the system curve that considers:

- The flow velocity initial flow and ultimate state and any staging.
- Static and friction losses.
- Total lifting head.

h) Pumps shall be duty standby for each size of pump (set). Motor control equipment must not be shared.

i) For the selected pump, demonstrating pump curves to meet system requirements at the best efficiency point. Where pumps are VSD driven voltage / frequency curves needs to be included to make sure the selection does not coincide with the rotor's natural frequency and the rate in wavefront rise does not cause electromagnetic disturbances. The starter method is also dependant on

the power supplier should direct-on-line be considered. Refer to the below table for typical application between soft starters and VSD's:

Soft starters	Variable speed drives
Applications with low or medium starting torques	Applications with high starting torques
Light loaded applications	Speed control and system efficiencies operating at reduced speeds during run mode
Little or no speed control	Continuous feedback for critical position control

j) Onsite storage to provide a minimum of 8 hours average dry weather flow (ADWF) capacity for the ultimate catchment. Overflows shall not exceed the requirements of Watercare's NDC at the expected end of life of the asset. Refer Appendix A.

k) Septicity and odour control measures.

l) Complete geotechnical investigation for the purpose of structural design, construction considerations and land contamination report.

m) Structural design of infrastructure.

n) Pipework and general arrangements of equipment shall take into consideration best practice to minimise the likelihood of corrosion and the need for ongoing maintenance. Refer to Watercare Design principles for transmission water and wastewater pipeline design, DP-07.

o) The inlet screening should be by static design to reduce the need for maintenance on mechanical components. Acceptable examples such as baffle plates must be considered.

p) Storage drainage is preferred to be gravity in and gravity out.

q) The component layout design shall consider safe access and egress, operational ergonomics and minimisation of confined space entry under the expected operational situations.

r) Design of the rising main, or consideration of any existing rising mains the pumping station is being connected to. Refer to Part B, section 4.3 for rising main design considerations.

s) All drawings shall comply with Watercare's CAD drawing standards.

12. 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

13. Construction

Each section, the inlet structure, the wet well with pumps and the outlet 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 15 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

14. Pumping station asset data

Pumping station data shall be captured in accordance with Watercare's Data and Asset Information standard.

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

15. Testing and Handover

15.1 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 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 (CoC)
- 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

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)
- Wet well level sensors and height adjustment
- Alarm status
- Pump control units
- Remote control and data transmission (RTU and PLC checks)
- Data logging and analysis
- Pump flow rates and rising main performance
- Noise and vibration level conforming during operation
- Odour control testing (following operational time) where required

Following the commissioning of the pumping station, any odour control systems installed shall be tested. A minimum of 4 weeks of operation shall have passed from the date of commissioning before testing H_2S levels at all venting locations. Any faults shall be corrected and retested after a further 4 weeks of bio-acclimatisation. H_2S concentration shall be measured under still atmospheric conditions.

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

15.2 Rejection of materials or products

All materials specified shall be accepted or standardised equipment as appropriate. Where products are required to be sourced that is not listed on any of these materials lists, 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 pumping station designer is required.

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

15.3 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) Electrical Certificate of Compliance

f) Provisional takeover certificate (following commissioning)

g) Design drawing sets, as-built drawings and survey data

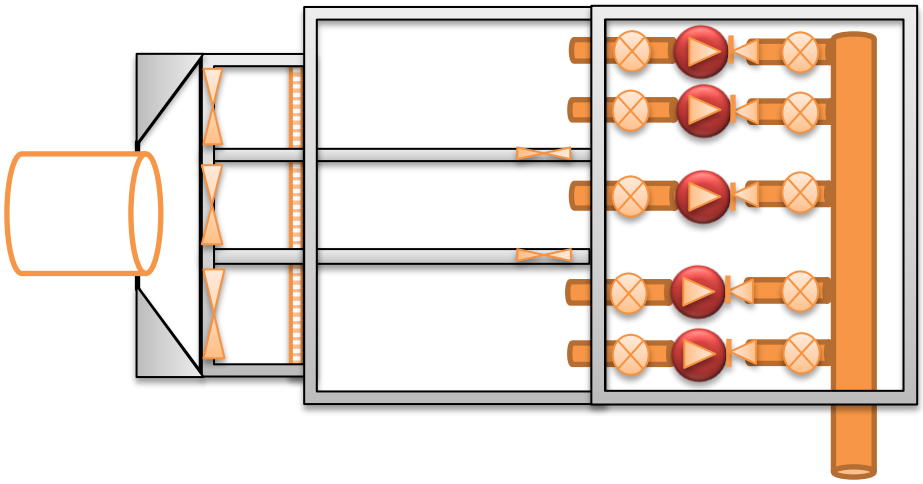
h) New assets register including for associated linear assets in accordance with Watercare's Data and Asset Information standard

i) Final handover certificate on completion of all as-built information and any outstanding retention items

j) Engineering compliance statements for design, construction and construction monitoring

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

Part B – Wet well/Dry pumping stations



1. Pumping Station Inlet System

1.1 General

The design of the inlet structure shall have the following functions and requirements:

a) Collect all wastewater inflow into the pumping station.

b) Provide access or location for grit collection when required.

c) Be able to facilitate bypass pumping and selective isolation by penstock or similar suitable valve for the purpose of maintenance.

d) Isolation valves shall be accessible for operation without the need for confined space access.

e) The inlet structure shall be configured to minimise incoming flow turbulence and prevent build-up of debris.

1.2 Grit Collection and Screens

a) In areas where grit collection or pre-treatment by screening is required, the system shall be incorporation into the inlet structure.

b) Penstocks or knife-gate valves shall be installed upstream of screens to allow isolation for cleaning.

1.3 Inlet structure material preference

a) The inlet structure shall be constructed from either concrete with resistance to corrosive attack i.e. calcium aluminate, polymer concrete or be protected with a suitable painting system. The designer must complete the project schedule in the Material Supply standard and provide this to the coating supplier to support the coating selection.

2. Wet well

2.1 General requirements

a) Structural design shall be to the selected function class. Refer to Part A, section 4.2.

b) The wet well shall be divided into two or more compartments with penstock isolation between wet well chambers and individual inlets, outlets and isolation.

c) The wet well level shall be monitored.

d) The base shall be shaped and angled to prevent septicity and “dead zones” where solids can accumulate.

e) Benching shall be formed (fluted) to guide flow towards the pump suction, not pass solids past one pump suction to another and achieve self-cleaning.

f) Allow adequate clearance from well sides and base to pump intakes in accordance with the pump manufacturer’s installation recommendations.

g) Ventilation shall be installed for all pumping stations at a level of at least 150mm above the well overflow level and 150mm below the well lid. The location and angle of the outlet of the duct will allow condensation to freely drop back into the well and be at the furthest point away from the inlet. Ventilation shall not be directed through the dry well or control room

h) A suitably sized odour filter shall be installed at ground level. The ventilation system shall be designed to provide an appropriate ventilation velocity. The capacity design for filter replacement frequency shall be proposed site specifically for Watercare’s acceptance. Refer to Part D, section 9 for biofilter and carbon filter requirements.

i) Watercare standard design details shall be used for all lids, see drawing set DW05. Hatches shall be tested to comply with AS3996 to an appropriate class.

j) All access hatches shall be fitted with a hinged safety grille underneath the lockable access hatch, when opened will provide an added perimeter barrier. Safety grilles shall be tested to comply with AS3996 class A.

k) Access to the wet well by staircase to landing platforms that are designed to AS/NZS1657.

2.2 Size of the wet well and levels

The size of the wet well shall be determined by the following criteria.

a) The maximum retention time of wastewater during normal operation shall be 2 hours.

b) The wet well operating range (pump start to the minimum level above pump intakes) to prevent settling (typically 1m) and also limit the pump starts to no more than 6 starts per hour.

c) The maximum top water level shall be determined by examination of the upstream surcharge level. The maximum top level is only reached when the duty pump is unable to manage the inflow. Standby pumps are switched on at this level and may be staged for more than one standby pump.

d) The overflow level is set above the maximum top water level. The overflow alarm is activated at this level and all pumps running. See section 2.3 below for overflow arrangements.

e) The volume between pump start and pump stop shall be determined by pump capacity and be set to limit the frequency of pump starts. The pump start level shall take into account the water head required to prime the pumps (typically 150mm above the pump intake pipe soffit).

f) A physical hydraulic model shall be carried out to test the wet well design for uniform hydraulic distribution over the pump station operational range.

2.3 Pump station overflow

The pump station overflow may be placed at the pump station or another nearby suitable location in a purpose built overflow manhole and include the following requirements:

a) The overflow shall be from the inlet structure.

b) The overflow location and level (impact on well storage size) shall be determined with undertaking an environmental impact assessment and designed to reflect consented conditions.

c) The overflow shall be into an overflow structure with connecting outfall that must be accessible by a sucker truck.

d) The outlet from the overflow manhole shall be fitted with a stainless steel baffle plate or concrete where maintainable, to prevent scum discharge to the environment.

e) Drainage fall shall be away from the overflow manhole to allow draining back to the wet well or the remote overflow manhole.

f) The outfall outlet shall be fitted with a non-return flap valve.

g) The outfall shall be constructed with a wing wall and fitted with a stainless steel grid. The stainless steel grid bar spacing shall be minimum 25mm to prevent blockages and not be more than 100mm spacing.

h) The specific design shall take into consideration energy dissipation and erosion control in the receiving environment.

2.4 Wet well inlet

The inlet between the inlet structure and wet well shall have the following features:

a) An inlet arrangement to minimise turbulence that could create H_2S gas generation or poor pump performance, and be situated as far as possible away from the pump intakes.

b) Discharge from the inlet structure will not flow directly onto a pump intake and be arranged such that the inflow into the wet well during high flow does not cause eddies (e.g. deflector or flow diffuser).

c) The inlet height shall not exceed 1.5m above the bottom operating water level to limit air entrapment and shall be graded towards the pump takes.

2.5 Pump intakes (wet well outlet pipework)

a) The pump intake pipe shall be formed with a long radius bend facing downwards and a bell-mouth.

b) The centre-to-centre clearance between pump intakes shall be a minimum of 1.5 times the external pipe diameter, or as otherwise required by the pump supplier to prevent vortices, air entrapment and pre-swirl.

c) The side clearance from the centre of the pump intakes to the well walls shall be minimum 0.8 times the external pipe diameter, or as otherwise required by the pump supplier.

2.6 Material selection

All materials shall comply with Watercare's material supply standards. The following special considerations shall be taken into account at key infrastructure:

2.6.1 Wet well

a) The wet well design shall take into account high corrosion and sulphide attack on concrete surfaces. Concrete wet wells shall be constructed from either concrete with resistance to corrosive attack i.e. calcium aluminate, polymer concrete and be protected with a suitably painting system. The designer must complete the project schedule in the Material Supply standard and provide this to the coating supplier to support the coating selection.

2.6.2 Inlet and outlet pipework

a) Inlet pipework to the wet well shall be selected to the appropriate design class from the materials listed in the Watercare Material Supply standard.

b) Pump intakes from the wet well through the dry well wall and up to the first flange within the dry well shall be internally and externally corrosion protected to withstand H_2S levels of up to 50 ppm with a high abrasion resistance rating in excess of 25 years. Refer to the Watercare Material supply standard for the suitable epoxy coating system.

c) Inlet and outlet pipework shall be fabricated in epoxy lined steel (ELS) pipe to a suitable grade.

2.6.3 Valves

a) Penstock valves are suitable for inlets in the wet well.

2.6.4 Ventilation

a) All components, fixings, supports, etc. shall be fabricated from corrosion resistant materials. Preferred materials include stainless steel 316, PVC and GRP.

b) Galvanised steel is not acceptable.

c) Refer to Part D, section 9 for air quality treatment.

3. Pumping System

3.1 Hydraulic design

The hydraulic design shall be determined by the following parameters:

a) Invert level of the incoming wastewater.

b) Pumping station capacity (initial and ultimate capacity).

c) Internal diameter, length, route and materials of the rising main, including surge and fatigue analysis, see section 4.3 below.

d) In deriving the system curve the static head shall be based on pump duty start level at 150mm below the invert level of the incoming wastewater pipe.

e) Levels and profile of the rising main and discharge point.

f) High points - to account for possible characteristics controlled by intermediate highpoints along the rising main.

g) Combined detention times for wet well and rising main(s) not exceeding 8 hours.

h) Shear velocity to prevent slime build-up in rising mains that will increase flow resistance over time

i) Capacity restriction in the receiving sewer

3.2 Pump selection

a) Common pump arrangement are vertical centrifugal pumps in a dry well with direct motor drive, or extended drive shaft with the motor mounted at ground level. Submersible pumps in dry wells should be considered for transmission applications where surface and dry well flooding can occur. Dry-mounted submersible pumps require consideration of the specific cooling method.

b) Pump with motor decibel rating shall be less than 80 dB.

c) Pump selection shall be within ±5% of the pump best efficiency point (BEP)

d) The pump efficiency is influenced by the type of impeller selected for the specific pumping application. The minimum overall pump efficiency shall not be less than 50%. Lower efficiency may be considered in the following exceptional circumstances:

   i. The pump curve is very flat thereby consuming less power at intermediate flows, or

   ii. The anticipation of excessive impeller clogging and the associated maintenance outweighs the energy saving costs of selecting a more efficient impeller type.

e) Pump head curves with very flat head flow characteristics can make the pump difficult to control. Small changes in system resistance can create large changes in flow rate or cause 'hunting'. The use of variable speed drives (VSD) in these scenarios shall require prior approval from Watercare.

f) Consideration to pump wear over the pump maintenance cycle to achieve flow design criteria.

g) The number of pumps depends on the pump station flow range, volume and power rating. The maximum discharge rate should be slightly more than the maximum incoming flow rate. Standby capacity shall be sufficient to maintain the pumping station operation in the event of a pump failure or maintenance. Where a single pump provides duty an equal capacity pump shall be provided for standby. Where three pumps of equal capacity is provided, a fourth of the same capacity shall be provided as standby. For large or critical pumping stations two or more standby pumps shall be used.

h) For wide varying flow ranges different pump sizes should be considered to minimize power costs. The number and size of standby pumps should be assessed base on the ultimate flow conditions and available storage.

i) Phased pump installations should be considered for growth projections by selecting impeller size, variable speed drives and adequate space for additional pumps or larger replacements.

j) Pump stop/start shall not to exceed more than 6 cycles per hour for ADWF. Pump duty standby to rotate on each successive pumping cycle.

k) Select pumps where pump curve intersects with the system curve (Figure 1) allowing an overall inaccuracy factor of 10% for friction losses in the system curve.

l) Refer to Watercare electrical standards for VSD and soft starter requirements.

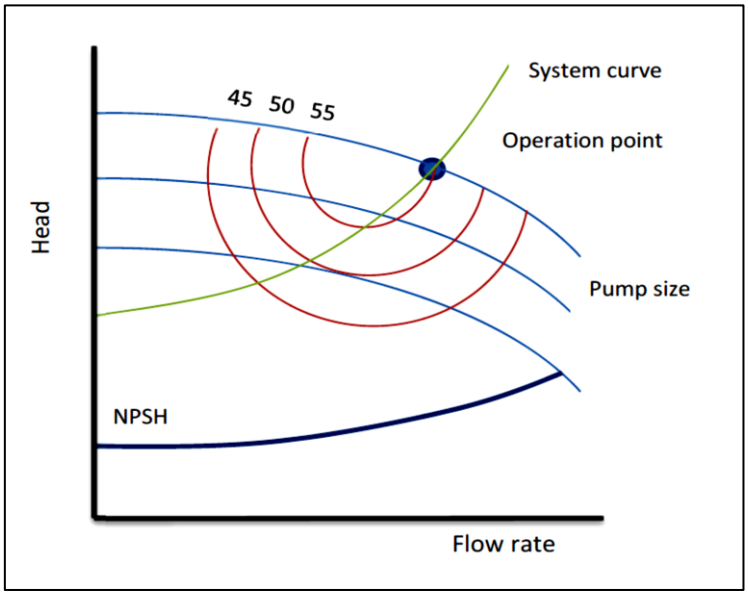


Figure 1: Pump selection by combining system curve and pump curve to determine the best efficiency point.

3.3 Pump product requirements

The pump shall comply with the standards as listed and amended in Watercare's material supply standard.

4. Pumping Station Output System

4.1 Dry well

The drywell needs to provide adequate clearances around machinery and equipment for visual inspection, routine maintenance and replacement with the following consideration:

a) Structural design shall be to the selected function class.

b) General clearances around valves and pipework as stipulated in the Watercare Design principles for transmission water and wastewater pipeline design, Part C, and as described by the Health and Safety in Facility design guidelines.

c) Adequate space for future replacement with larger diameter pipework and components.

d) The discharge manifold shall not be placed above the pump discharge pipework to prevent solids settling and building up within pipework from pumps on standby.

e) Suitable drainage must be included to maintain the chamber in a dry condition from any seepage. The floor must be graded to a sump location with sump pump that discharges above the flood level.

4.1.1 Sump pumps

a) Sump pumps shall be duty standby and monitored.

b) The drywell sump shall be fitted with a level alarm.

4.2 Rising main

4.2.1 General

a) The length of the rising main must be kept as short as possible to achieve the required lift or physical obstruction that would otherwise have required very deep gravity sewers.

b) The rising main structural design and location shall be to Watercare's Design principles for transmission water and wastewater pipeline design. Rising mains shall not be situated in private properties.

c) The rising main layout shall include for a connection to bypass pumping.

4.2.2 Hydraulic design

The rising main pipe shall be designed in combination with the pumping system (see section 3 above) and include:

a) Length of the main and overall allowable detention time of up to 8 hours.

b) Maximum allowed number of pump starts and the impact of cyclic fatigue on the selected rising main material.

c) Withstand surge pressures not less than 200kPa. Pressure surges shall be within the amplitude of the acceptable limits throughout the system. The surge analysis shall take into account the material fatigue of the selected pipe material and the derived maximum allowable operating pressure. The design shall identify solutions for Watercare's approval to mitigate the surge effects.

   Pressure surge solutions may include:

   - VSD drives for even start-up.
   - Slow-closing non-return valves.
   - Pressure relief valve and quick-closing non-return valve.
   - Automatic stepped main shut-off. Initial quick closing, thereafter slow-closing simultaneously with the pump shutdown.
   - Soft starter soft stop option

d) Withstand a transient pressure of at least 80kPa below atmospheric pressure. Negative pressures can be prevented by:

   - Pump inertia/flywheel to continue pump rotation for a short period after power failure.
   - Surge tank.
   - Double acting air relief valves.
   - Air vessel.

e) A minimum flow velocity is 0.9m/s. The minimum flow velocity shall be calculated at the expected start of the service life. The design shall be carried out on the basis of full bore flow

f) The maximum rising main flow velocity shall not be more than 2m/s at ultimate service.

g) The dynamic and static head.

h) Head loss shall be calculated using the Darcy-Weisbach equation with frictional coefficients determined using the Colebrook-White equation. A Colebrook-White friction coefficient of **0.3** shall be used.

i) Head losses through fittings shall be determined using the component manufacturer's value with a 10% inaccuracy factor. Where no data is available refer to Watercare's design principles for transmission pipeline systems on manufactured fitting friction losses.

4.2.3 Pipe Material

a) Pipe material shall be supplied as complying with the applicable Watercare material standard.

b) The minimum pipe pressure rating shall be PN16 and any other component valve or fitting shall have a minimum pressure rating of PN16.

c) The maximum pressure design shall consider pipe and fittings to be pressure de-rated based on the material maximum cyclic pressure range (MCPR).

d) The maximum operating pressure shall be less than the MCPR.

4.2.4 Rising main levels

a) The main shall, wherever possible, rise continuously from the pumping station and terminate at its upper end into the receiving structure.

b) Rising and falling mains (complex rising mains) shall be considered as exceptional circumstances.

c) The minimum rising or falling grade shall be 0.5%.

Where a continuously rising main is not achievable the following shall be provided for:

d) Peaks and low points shall be minimised.

e) Peaks shall be constructed with a double acting air release valve structure. The air release chamber shall be fitted with suitable ventilation and treatment of foul air at the expected air flow rate.

f) Low points shall be prominent and fitted with a discharge and pump-out arrangement that allows for safe access by a sucker truck and staff, refer to section 4.5 below.

g) Scour valve and air release valve chamber access shall where practicable be located in the back berm of the road corridor (the first 1m width of the road berm adjacent to the road carriageway is defined as the front berm).

4.2.5 Combined rising mains

a) Under exceptional circumstances, parallel pumping may be considered. For existing systems where the design basis is for a completely new parallel system or where the existing systems are redesigned and replaced a specific design philosophy must be developed and approved by Watercare.

b) The parallel system shall be both as duty mains. Standby mains are not accepted due to operational constraints for maintenance and septicity in the standby mains.

c) The operating points for parallel pumping stations shall be considered for the full system to set individual pumping points based on the pumping head for each pumping station or pump set on the common rising main. The combined output shall be graphically determined using the individual geodetic heads; head loss components for each pumping station to the discharge point and then combined onto a single graph.

d) Where the common rising main is a complex rising main the graphical determination shall be supported by modelling software. Watercare prefers that the modelling information is provided in *InfoWorks*.

4.3 Valves

a) Valves and componentry shall be suitable for use with wastewater and the installed environment.

b) Valve installations shall be constructed with adequate support that will allow the valves to be freestanding, should any other component be removed.

c) Dismantling joints shall be provided to allow removal of components.

d) Isolation and non-return valves shall be the same diameter as the pipework they are being installed on.

e) Isolation valves shall be operable from ground level.

4.3.1 Non-return valves

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

4.3.2 Isolation valves

a) Valves shall be metal seated gate valves. Isolation valves shall be installed on each pump intake and on the discharge downstream of the non-return valves.

4.3.3 Air release valves

a) Air release valves where installed on the rising main shall be double acting and as accepted by Watercare.

b) The air valves shall be located in an accessible chamber that is vented and fitted with either an activated carbon filter or vent stack with no noticeable odour at the nearest property boundary. H_2S shall be less than 0.004ppm measured at the filter outlet.

4.4 Receiving structure (discharge manhole)

a) The rising main shall discharge into a fit-for-purpose manhole structure that will dissipate the energy of the rising main prior to transition into the gravity system.

b) The rising main shall discharge into the discharge manhole on a rising gradient. The rise into the receiving structure shall be a minimum of 3m long. No other connections shall be made into the discharge manhole.

c) The fall through the chamber between the top of the rising main pipe entry and the outlet pipe shall be a minimum of 150mm.

d) The rising main and manhole outlet shall not be more than 30 degrees out of alignment.

e) Refer to section 6.9 for odour control options.

4.5 Wash-out

a) The wash-out locations shall be at the lowest points of the pipeline.

b) The number of wash-out location shall be decided based on the length of the rising main at adequate intervals to reduce drain down time for repair and maintenance.

c) The washout shall be located with a hard-stand area that is accessible by truck.

d) The chamber shall be provided with a pump sump.

Part C – Electrical, Control and telemetry

1. Electrical, Control and Telemetry

Electrical, control and telemetry design and installation shall comply with the Watercare electrical and control standards and template drawing set DW18 for pumping stations.

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 an electrical 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.
- 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 one Functional Description (FD), to be reviewed and accepted by Watercare 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).

Part D – Infrastructure and support systems

1. Water supply

a) A metered water supply with reduced pressure zone backflow preventer (RPZ) shall be installed to allow for wash-down and general cleaning. 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.

1.1 Ablution facilities

a) All pumping stations shall be designed with toilet and washing facilities.

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 and 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 room and dry well. Dry well lighting shall provide proficient lighting to allow 24 hour operability and functions for maintenance.

c) Fluorescent lights should be avoided and shall be phase shifted to stop strobe effects on machine rotating shafts where accepted to be used.

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. Ventilation

a) The ventilation characteristics must be documented.

b) The wet well shall not be ventilated to the dry well or the control room. The wet well ventilation shall be designed at a rate to meet the inflow velocity.

c) The dry well shall not be ventilated to the control room.

d) The dry well shall have 4-6 air changes per hour.

e) The control room shall have a minimum of 10-15 air changes per hour within the limitations of AS/NZS61439 and be fitted with replaceable filters.

4. 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.

5. 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.

6. 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 components into the build.

h) Permanent access needs to be provided for overhead cranes. Isolators must be provided adjacent to the crane access.

7. Security, access and fire alarms

a) All cabinets and access manholes not accessible through the main pump station building shall be lockable.

b) All entry points shall be fitted with an alarm that will signal unauthorised access through the Watercare security system. Security systems are to be fitted with a dual communications option that provides alarm to Watercare's security supplier and the Watercare central control room.

c) Fire alarms shall be monitored for high priority pumping stations. Fire alarm systems are to be 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 be fitted with a smoke alarm at the control panel only that provides a fire alarm to the Watercare central control room.

d) Access lids shall be to the standard Watercare details and supplied with 'universal' padlocks and locking bolts. These shall be replaced by Watercare after commissioning of the pumping station as part of the cost for the lid installation with a bespoke Transmission wastewater crox key.

e) Where access lids of larger sizes are required the design shall comply with AS3996.

f) Pump stations shall be fitted with fire detection equipment to meet the Building Act requirements.

8. Signage

a) Signage shall be provided that identifies the pumping station as the property of Watercare

b) Informative operational, health and safety signage is required at the pumping station perimeter. Refer to Watercare's mechanical construction standard.

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 25tons (unless otherwise stated) and a minimum width of 3.5m.

10. Odour control

a) Refer to DP-07 Design Principles for Transmission Water and Wastewater Pipeline Systems, for odour control requirements.

Appendix A: Watercare Network Discharge Consent (NDC) executive summary

Introduction

This summary provides a high-level overview of the considerations for complying with the wastewater network discharge permit in the Auckland region.

The consent authorises the discharge of wastewater from Watercare's wastewater networks to land, freshwater and coastal receiving environments in accordance with section 15(1)(a) and (b) of the Resource Management Act 1991, during times of dry and wet weather flow.

The overflows may occur as a result of network blockages and failures; network damage by third parties; failure at pump stations or storage facilities and capacity constraints. Once a pumping station is in operation overflows must be minimised, continuously monitored and inspected.

Existing networks area:

- Discharge from any new engineered overflow point within the existing network is allowed provided that the discharge frequency is not more than two (2) *Wet Weather Overflow Events* per year and the location of the proposed overflow point is not in a Class 1 Recreational Receiving Environment.
- Should the above not be achievable then the Best Practical Option (BPO) methodology and an improvement strategy may be considered to determine an alternative overflow frequency and/or overflow location. This option must be acceptable to Watercare before submitting to Auckland Council. The acceptance does not guarantee approval by Auckland Council
- No discharge is allowed to a *Tangata Whenua Management Area* as identified in the *Regional Plan: Coastal*, or an equivalent area in the Unitary Plan where discharges are a prohibited activity.

Future networks area:

- Discharge from any new engineered overflow point which is zoned for urban activity under the relevant Resource Management Act statutory document, and is within a future network is allowed provided that:
    - The overflow point is located within 500m of a predetermined proposed overflow location as shown on the relevant indicative future urban area map or of a similar location (see map attached below)
    - The overflow point is designed and managed to achieve the discharge frequency of no more than two *Wet Weather Overflow Events* per year, and the location of the proposed overflow point is not in a Class 1 Recreational Receiving Environment
    - A minimum of four (4) hours storage at *Dry Weather Flow* is provided at or near the o*verflow point. Note: Watercare requires additional four (4) hours storage for operational purposes.*
- Discharge from any new engineered overflow in the *Indicative Future Urban Area* but not identified in the below map as a predetermined proposed overflow location requires certification from Auckland Council. Watercare's agreement and guidance are required before making the application and should be based on the following criteria:
    - The potential overall risk of the discharge is very low or low. This is to be determined by the applicant using Watercare's Methodology for the Assessment of Effects of Wet Weather Wastewater Overflows. The methodology is available from Watercare
    - The overflow point is designed and managed to achieve the discharge frequency of no more than two (2) *Wet Weather Overflow Events* per year, and the location of the proposed overflow point is not in a Class 1 Recreational Receiving Environment
    - The Best Practical Option (BPO) methodology and an improvement strategy may be considered to determine an alternative overflow frequency and/or overflow location. This option must be

acceptable to Watercare before submitting to Auckland Council. The acceptance does not guarantee approval by Auckland Council.

- Direct discharges to the coastal marine area shall be avoided unless an assessment using the BPO methodology demonstrates that this is the most suitable location, taking into account cultural and ecological factors.

- No discharge is allowed to a *Tangata Whenua Management Area* as identified in the *Regional Plan: Coastal,* or an equivalent area in the Unitary Plan where discharges are a *Prohibited Activity.*
- No overflow point shall be located on private property without the written consent of the property owner and other affected parties that they agree to the location of the overflow point.

Future networks outside mapped areas:

Where a discharge application is outside any of the identified areas of the map, the statutory assessment of the application should be based on providing the same conditions of the existing statutory assessment for the NDC with the following criteria:

- Watercare requires that the applications use Watercare's *Methodology for the Assessment of Effects of Wet Weather Wastewater Overflows*, the Best Practical Option (BPO) methodology and an improvement strategy may be considered to determine an alternative overflow frequency and/or overflow location. The methodology and templates are available from Watercare
- For the purpose of gaining consent with Auckland Council, additional considerations may be required under the Auckland unitary plan and if applicable existing regional plans
- Stakeholder reports demonstrating consultation with Watercare, Auckland Council, local boards, Auckland Regional Health Services and Iwi.

Map: Existing network and indicative future urban areas. Up-to-date detailed area maps showing the *Future Network* are available from Watercare on request.