OPERATIONS & MAINTENANCE MANUAL

FRANKTON BEACH
WASTEWATER PUMP STATION

Operations & Maintenance Manual

Frankton Beach
Wastewater Pump Station

for:

Queenstown Lakes District Council

Client:
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QUEENSTOWN LAKES DISTRICT COUNCIL

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United Water

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APPENDICES

1 INTRODUCTION

The Frankton Beach Wastewater Pump Station provides wastewater servicing for the Queenstown Township, Kelvin heights and some of Frankton. Wastewater pumped at Frankton Beach WWPS is transferred to the Shotover Ponds WWTP for treatment.

United Water is responsible for the operation and maintenance of the Frankton Beach WWPS under Contract QLDC 08-002 for Management, Operation and Maintenance of Utilities between Queenstown Lakes District Council (QLDC) and United Water International Pty Limited (UWI).

This Operations & Maintenance Manual, which forms part of the overall Queenstown Wastewater Scheme Operations and Maintenance Plan, has been prepared by United Water to:

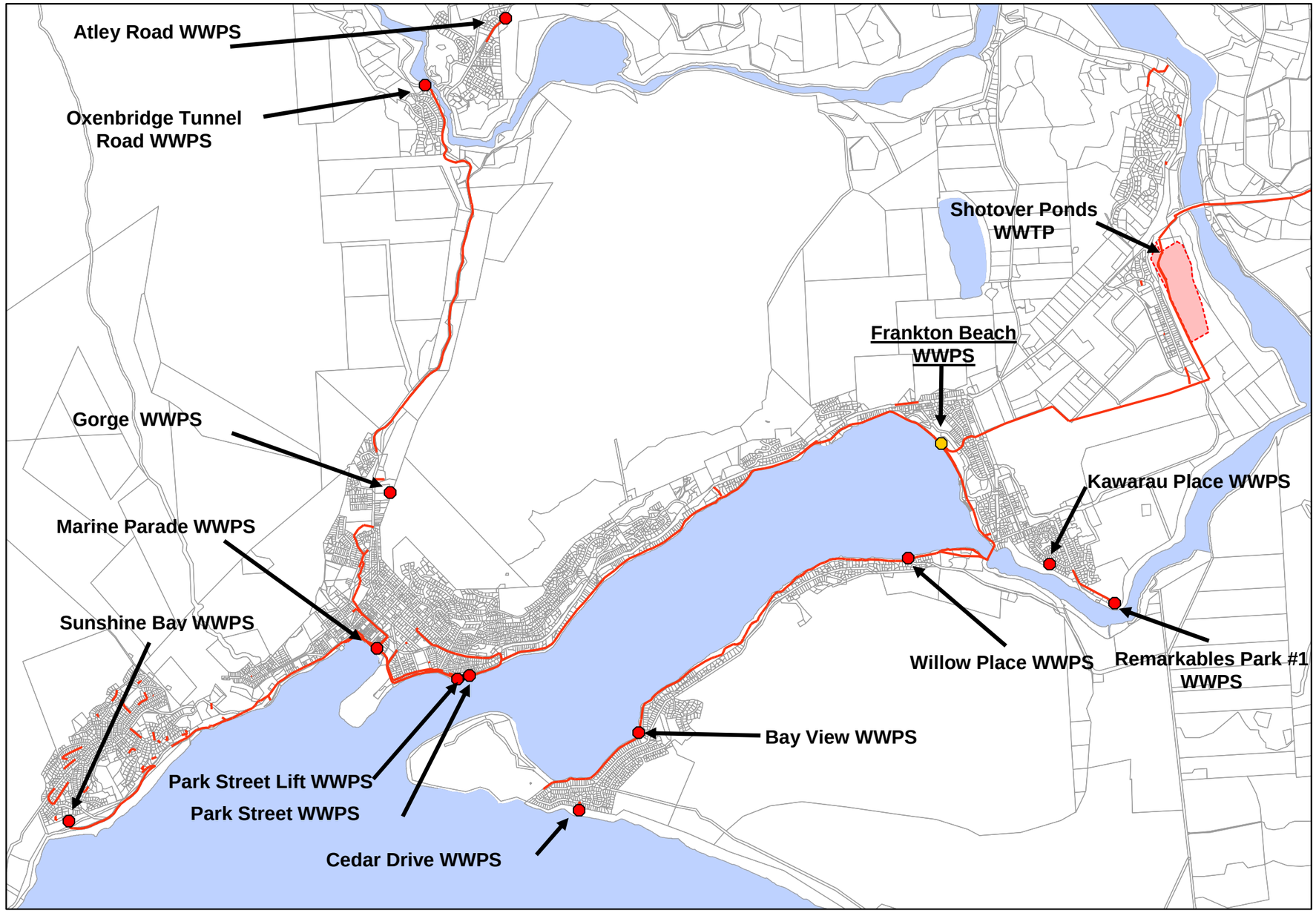
- Assist both United Water and Queenstown Lakes District Council with the efficient and effective ongoing operation of the Frankton Beach WWPS.
- Provide for compliance with clause A3.5 of contract QLDC 08-002 which requires the preparation of Operations and Maintenance Plans for the Queenstown wastewater scheme.

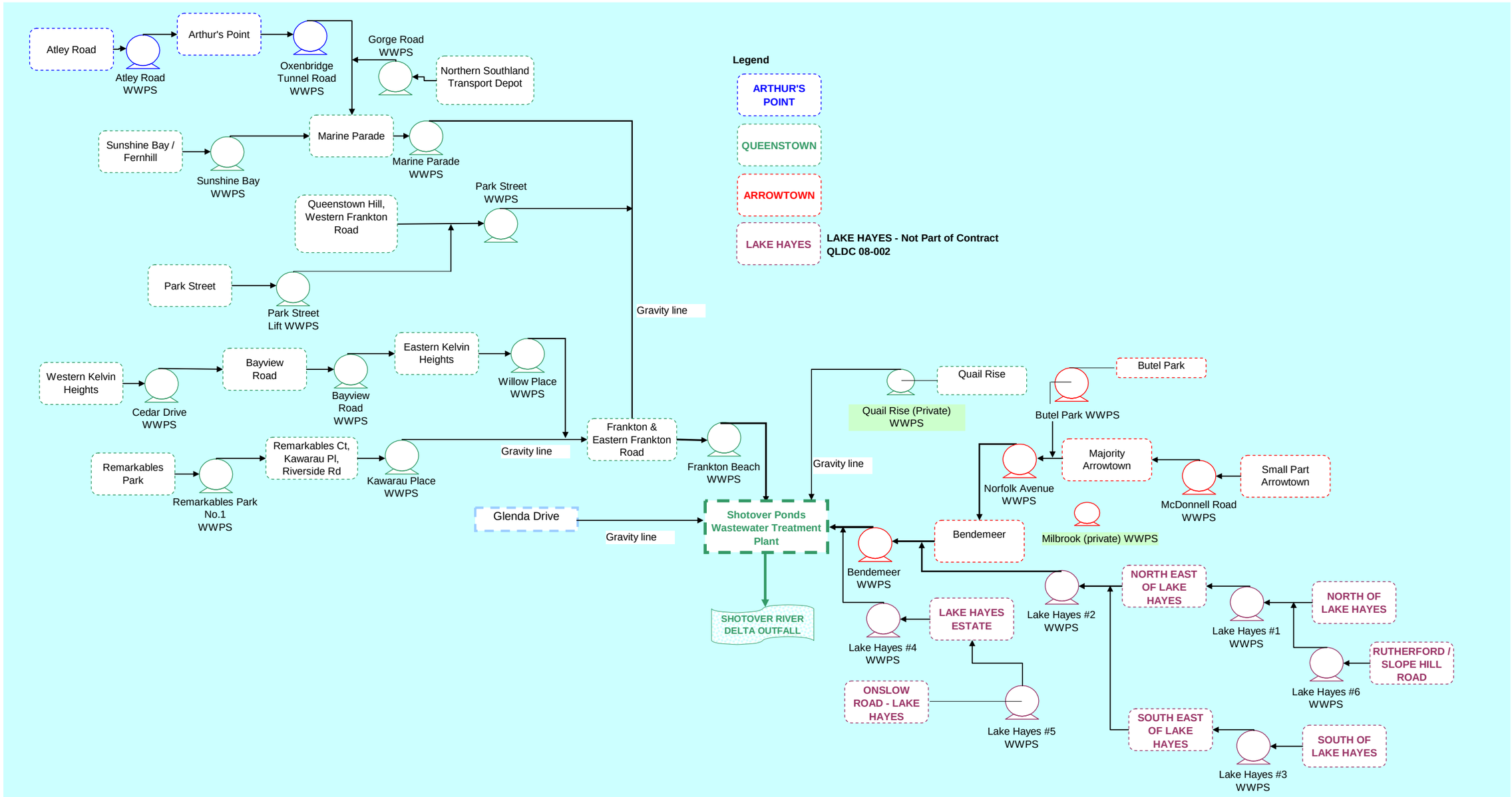
The information contained within this Frankton Beach WWPS Operations & Maintenance Manual reflects United Water's knowledge at the time of preparation of this manual, and has been prepared from limited documented information on the asset. As the time operating the Frankton Beach WWPS increases, it is expected that United Water's knowledge of the WWPS will increase. It is therefore likely that the information contained within the Frankton Beach WWPS O&M Manual will change with time, reflecting an increased knowledge by both United Water and QLDC of the Frankton Beach WWPS and the Queenstown wastewater scheme.

Reflecting the above, this Frankton Beach Wastewater Pump Station Operations and Maintenance Manual is issued by United Water in Working Draft format to enable usage by United Water operators in the ongoing operation and maintenance of the Frankton Beach WWPS.

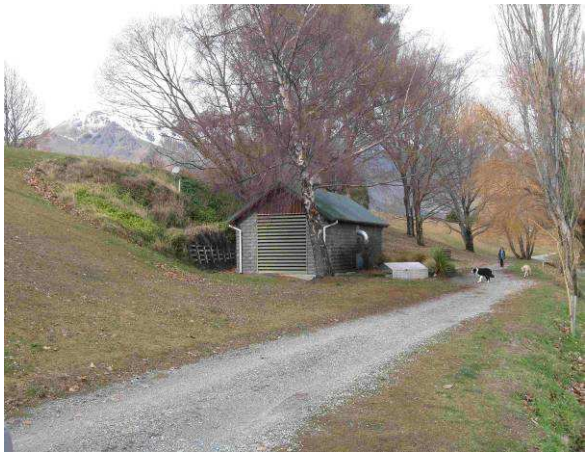
This document will remain in Working Draft status for a 12 month period to enable receipt of applicable comments from Queenstown Lakes District Council, and identification of additional learnings with respect to the Frankton Beach WWPS by United Water. After the Working Draft period this Frankton Beach WWPS Operations and Maintenance Manual will be updated and re-issued as a finalised version.

2 QUEENSTOWN WASTEWATER CONVEYANCE – SCHEME PLAN




Atley Road
Atley Road WWPS
Arthur's Point
Oxenbridge Tunnel Road WWPS
Gorge Road WWPS
Northern Southland Transport Depot
Sunshine Bay / Fernhill
Sunshine Bay WWPS
Marine Parade
Marine Parade WWPS
Queenstown Hill, Western Frankton Road
Park Street WWPS
Park Street
Park Street Lift WWPS
Gravity line
Western Kelvin Heights
Cedar Drive WWPS
Bayview Road
Bayview Road WWPS
Eastern Kelvin Heights
Willow Place WWPS
Remarkables Park
Remarkables Park No.1 WWPS
Remarkables Ct, Kawarau Pl, Riverside Rd
Kawarau Place WWPS
Gravity line
Frankton & Eastern Frankton Road
Frankton Beach WWPS
Glenda Drive
Gravity line
Shotover Ponds Wastewater Treatment Plant
SHOTOVER RIVER DELTA OUTFALL
Quail Rise
Quail Rise (Private) WWPS
Gravity line
Butel Park
Butel Park WWPS
Majority Arrowtown
Small Part Arrowtown
Norfolk Avenue WWPS
McDonnell Road WWPS
Bendemeer
Milbrook (private) WWPS
Bendemeer WWPS
Lake Hayes #2 WWPS
NORTH EAST OF LAKE HAYES
NORTH OF LAKE HAYES
Lake Hayes #1 WWPS
RUTHERFORD / SLOPE HILL ROAD
Lake Hayes #6 WWPS
LAKE HAYES ESTATE
Lake Hayes #4 WWPS
ONSLOW ROAD - LAKE HAYES
Lake Hayes #5 WWPS
SOUTH EAST OF LAKE HAYES
SOUTH OF LAKE HAYES
Lake Hayes #3 WWPS
Legend
ARTHUR'S POINT
QUEENSTOWN
ARROWTOWN
LAKE HAYES
LAKE HAYES - Not Part of Contract
QLDC 08-002

3 FRANKTON BEACH WASTEWATER PUMP STATION OVERVIEW



North Western view of Frankton Beach WWPS building

Control room interior

Surge vessel (Defunct)

Diesel tank with volume gauge

Control room overhead lifting beam

Pump controls 1-3

Pump 2, header pipework rising and suction isolating valve (green)

Main controls cabinet interior.

Shows RTU, Flowmeter display, Multiranger™

Stilling well cover and safety cage

3.1 Summary of Frankton Beach Wastewater Pump Station

- Number of Pumps: 3*
- Typical Pump Capacity – 1 Pump 59 l/s (FM 70- 80l l/s)**
- Typical Pump Capacity – 2 Pumps 118 l/s (FM 140-150 l/s)**
- Typical Pump Capacity – 3 Pumps 177 l/s (FM 210-220 L/s)***
- Station on SCADA (Yes / No) Yes (RTU Site #14)
- Standby Generator (Yes / No) Yes – Automated Start
- Overflow Storage Chamber (Yes / No) No

- Primary pump control: PLC using Ultrasonic measure to Multiranger™
- Backup pump control: Multitrode™ measurement
- Local control switch and local control: Yes (RTU/Multiranger™)
- SCADA signal transmittance type: Microwave IP

*Provision exists for a future fourth pump

**As each pump has frequency modulation the pump flows and power output of the motors can be increased with the retained safety of the motor protection relays. Thus flows higher than manufacturer standard flow configurations can be achieved.

***A third pump would not be operated unless absolutely necessary due to the electrical loads and costs involved.

Frankton Beach WWPS provides wastewater conveyance servicing for all of Western Queenstown, Central Queenstown, Kelvin Heights areas of Queenstown and Arthurs Point. Only Quail Rise, Bendemeer, Glenda Drive and Arrowtown are not serviced by Frankton Beach Wastewater Pump Station. Wastewater pumped at Frankton Beach WWPS is piped to Shotover Ponds WWTP for treatment.

Defunt plant – Frankton Beach Waste water plant contains many efunt items of plant and are listed in this manual and described as Defunct. Many of these items would normally be listed to be removed if not required or repaired if required by QLDC with approval for UW to undertake the actions. However due to the intension to redesign and upgrade this pump station no works of this nature have been undertaken. An exceptio to this is wher health and saftey consideration require immediate action.

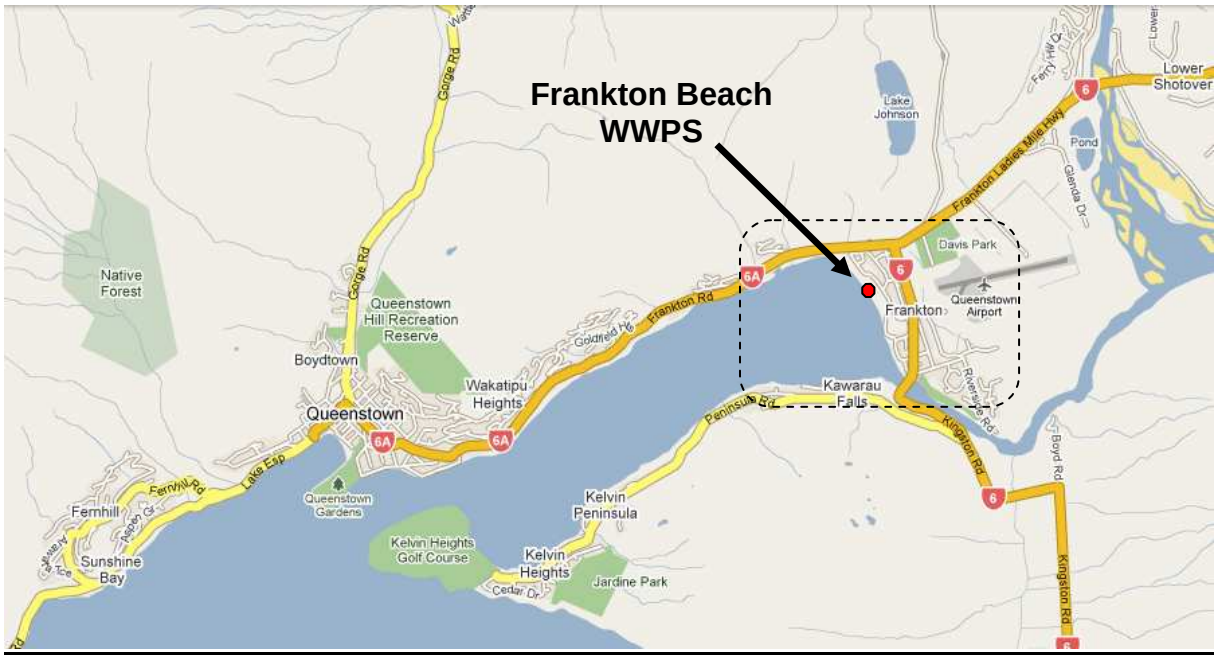
3.2 Site Location

<u>Physical Address & Specific Location Details</u>

- Frankton Beach, Queenstown
    - Frankton Beach WWPS is located above the lake (foreshore) side of Frankton Beach, approximately 100m North West of the intersection of Lake Avenue and Brise Street. Access is by turning into the access lane which is beside the camping ground and the foreshore reserve. A tight left hand turn and travelling past the public toilets and BBQ area to a bollard

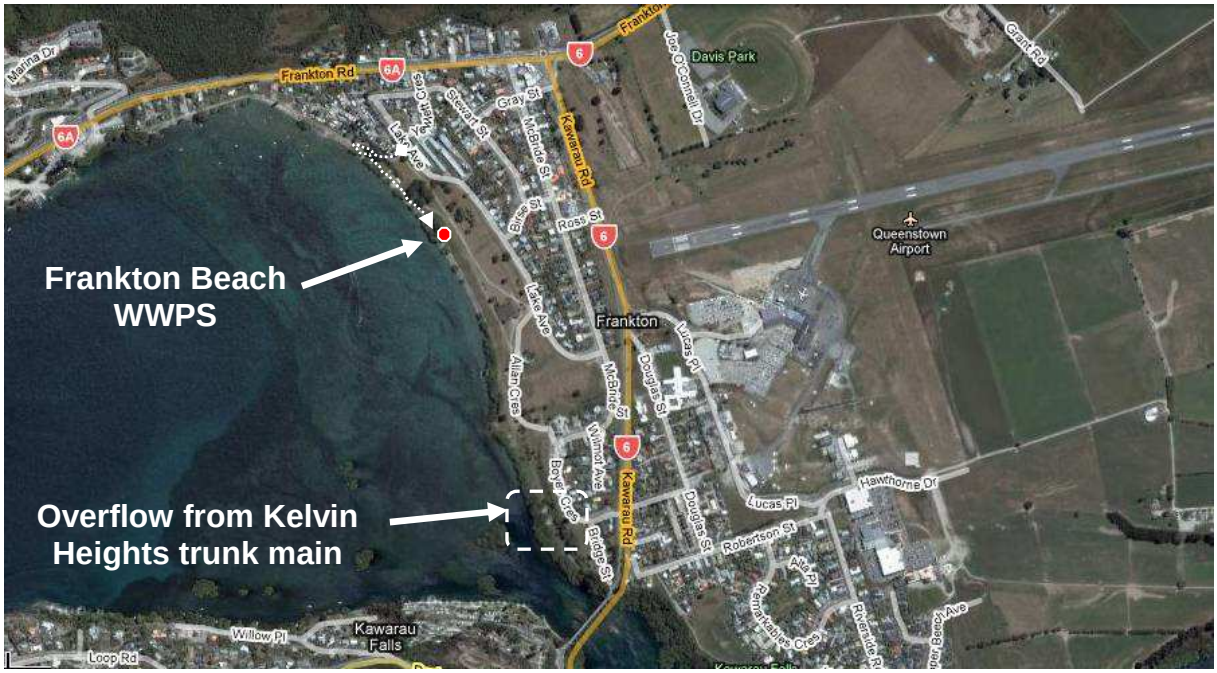
protected track. A "Q" master key will unlock the bollard which is lifted out of its socket and placed aside. Continue along the track to the station building. Be aware of pedestrians as the track is a shared path.

Map of Site Location



Map of Location (Street Directory)

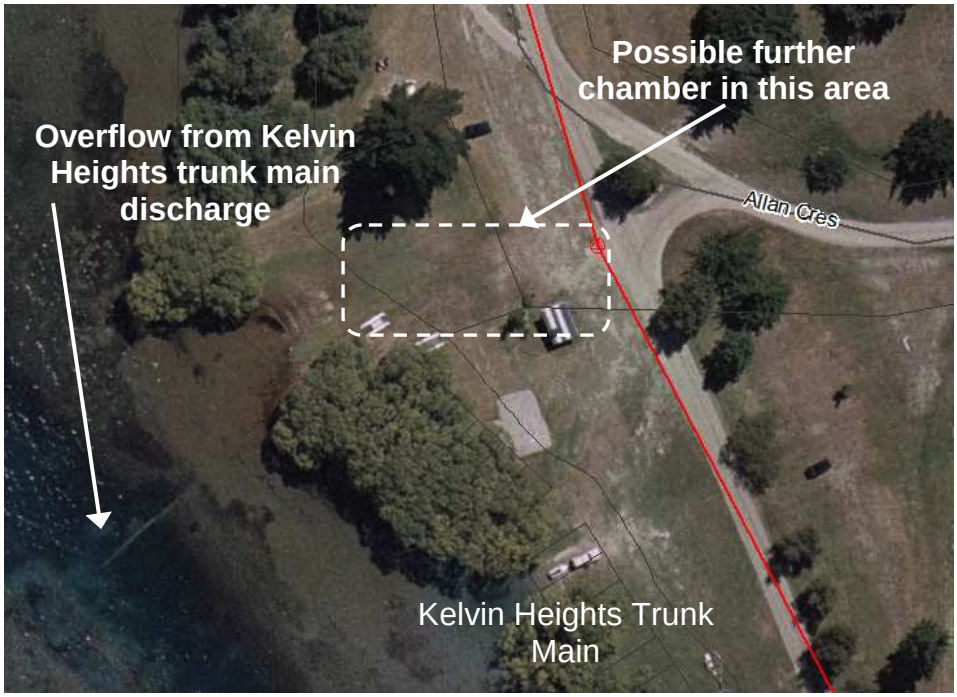
Aerial Photograph of Location



3.3 Frankton Beach WWPS Criticality

- Criticality: High
  - Frankton Beach WWPS is located on the foreshore of Lake Wakatipu at the Northern end of the Frankton Arm. Any overflow from the WWPS will discharge direct to Lake Wakatipu area via a reticulation manhole near the start of the Kawarau River
- Available Storage: Low
- Hours of Available Storage at ADWF: Negligible*

* Calculation of Hours of Available Storage is outside the scope of the O&M Manual. Provision is however made for this information once calculated by the QLDC Network Manager.



Overflow manhole location

3.4 Frankton Beach WWPS Principal Component Descriptions

Pumps

Label	Make / Model	Comment	Manual (Y/N)
Pump 1	ABS - AFP 2501 Motor: M1600/4	Serial Number: 65306159 -372 Discharge Diameter:250 Impellor Size: 460	Y – B1
Pump 2	ABS - AFP 2501 Motor: M1600/4	Serial Number: 65306159 -373 Discharge Diameter: 250 Impellor Size:460	Y – B1
Pump 3	ABS - AFP 2501 Motor: M1600/4	Serial Number: 65306159 -374 Discharge Diameter: 250 Impellor Size: 460	Y – B1
Flood Control Pump	Unknown	This is a sump pump used to keep the pump room floor dry	N

Generator

Label	Make / Model	Comment	Manual (Y/N)
Generator	Kohler 750	New in 1998	Y#

Electrical and SCADA Componentry

Label	Make / Model	Comment	Manual (Y/N)
LSP1	Tercell	Lightning strike protection	Y – B5
BC1	Battery trickle charge control	Custom	N
TU1	Abbey Systems Swampfox™	Telemetry RTU	Y – B9
SS1	Allen Bradley™ AB SMC Plus	Soft starter controller P1	Y – B7
SS2	AuComm™	Soft starter controller P2	N
SS3	Allen Bradley AB SMC Plus	Soft starter controller P3	Y – B7
PPC1	Power Phase Controller	Varplus™ m4 50kvar 440/470v	Y – B8
PPC2	Power Phase Controller	Varplus™ m4 50kvar 440/470v	Y – B8
PPC3	Power Phase Controller	Varplus™ m4 50kvar 440/470v	Y – B8
PLC1	Milltronics™ Multiranger Plus	Pump logic controller	Y – B10
PLC2	Milltronics™ Multiranger Plus	Pump logic controller	Y – B10
PLC3	Milltronics™ Multiranger Plus	Pump logic controller	Y – B10
CF1	Schneider™ Himel VF85	Cabinet fan	Y – B11
CF2	Schneider™ Himel VF85	Cabinet fan	Y – B11
CF3	Schneider™ Himel VF85	Cabinet fan	Y – B11
MMP1	ABS Sealminder™ 00887	Moisture monitor probe set. 3No. of Cable entry, Motor Chamber & Oil chamber	N
MMP2	ABS Sealminder™ 00887	Moisture monitor probe set. 3No. of Cable entry, Motor Chamber & Oil chamber	N
MMP3	ABS Sealminder™ 00887	Moisture monitor probe set. 3No. of Cable entry, Motor Chamber & Oil chamber	N
EF1	Unknown	Extract fan of the wet well to the odour bed	N

Label	Make / Model	Comment	Manual (Y/N)
PFR	Crompton Protection trip Relays	Phase failure relay (turns generator on)	Y – B12
ES1	Earthing strip	Laid outside near lake See drawing FBGA2	N
HU1	Skope	Fan convector unit in pump well, defunct	N
HU2	Unknown	Pipe element convector heater X3 Defunct	N

N * Off the shelf item
N ◘ Hire unit in case of breakdown
N ◊ Out of production/ Not available
Y# Large folder held permanently by QLDC engineering office, a copy is also held at UWI office.

- Where available, As-builts and electrical diagrams are included within Appendix A.
- Manufacturer Manuals, as indicated above, are provided within Appendix B.

3.4.1 Pump Station building and surroundings

- The pump station building is built in concrete block with a dark cement or imitation stone veneer on the outside. This increases the buildings ability to retain sound energy from both pumps and the emergency power generator when operating.
- The roof is a metal clad skillion roof and has polystyrene insulation within, the colour is a karaka green to reduce the visual impact of the structure in the scenic reserve surroundings.
- The main building machinery room is rectangular in shape. There is a small square concrete block construction beside the main room which contains an electricity suppliers' transformer. The transformer room has two outward opening doors with a padlock hasp that only the Electrical Company can access.
- The main building has several penetrations to the façade, they are:
  - North West wall;
    - is almost completely occupied by a large air inlet louver which allows a large fan on the emergency power generator to draw air through the generator cooling radiator,
    - Two spouting down pipes discharge to ground, there are remains of broken PVC drain pipe here which may drain stormwater out toward the lake or ground soak hole.
  - North East wall; has two penetrations:
    - The first is the exhaust pipe from the diesel generator which is a uniformly curved pipe from the wall, facing downwards.
    - The second penetration is the plenum box of the extraction fan which ventilates the pump chamber from low level.

- SCADA cable: This cable comes from the microwave dish pole above the retaining wall and is shielded in a black Alkathene pipe. This pipe enters the building under the eaves of the skillion roof above the roof of the lean too transformer building.
- Landscaping opposite North Eastern walls:
  - This area is levelled ground into the lake embankment. The cut of the embankment has been stabilised and protected by the use of concrete crib walling and sub drainage.

- South East wall; has 3 penetrations:
  - Double, vertical timber slated doors, to the transformer room.
  - Double horizontal louver ventilated doors of the control room. Open able by the padlock hasp. The upper section of the wall all the way up to the roof apex has an extended pair of doors made in the same louvered materials as the ground level doors, these are called loft doors. The triangular sections between the roof apex and the loft doors are special fitting infill panels (triangular) these close around the protruding lifting beam.
  - Close to where the main roof eave that meets with the start of the low pitch lean too shed roof is a galvanised pipe vent from the Diesel tank
- South West wall; has three penetrations being:
  - The first is the exhaust pipe from the diesel generator which is a uniformly curved pipe from the wall facing downwards.
  - The second is the external part of the wet well air extract fan. This unknown fan pulls air from the wet well and forces it via a portion of partially exposed PVC ducting underground and out to the Bio Filter.

3.4.2 Water supply

- Potable water supply enters the building at the South Western building corner by black Alkathene pipe. An isolating gate valve with turn wheel is exposed at the outside foundation level which isolates the supply to the pump wash supply. Within the building the supply has a RPZ backflow preventor on both the washdown hose supply and the supply to the old wash hand basin and the pump cooling jacket flushing supply

3.4.3 Bio Filter

- Located several meters to the South East of the control room is a Bio Filter. The Bio Filter is constructed with timber half rounds and is built partially dug into the lake embankment. The bio filter has a Black PVC liner and contains a bark, shells and humus media.
- A system of ducting in PVC pipe has been used to distribute the foul air to the media for odour digestion.
- The PVC ducting continues through the timber construction and terminates in a manhole on the opposite side. Within the manhole the PVC duct has a screw on end cap attached by a gibault connector. The screw cap has a smaller threaded

cap located centrally on the cap. The same manhole has a PVC duct or sub base drain discharge into the manhole.

- There are some flowering plants planted in the biofilter by council which must be removed. There is no moisture monitoring or spray irrigation of the media.
- There is no schedule to turn the media over at regular intervals.

3.4.4 Wet well

- Inlets, there are two trunk main inlets to the wet well being:
    - Kelvin Heights trunk main which is the combination of the following mains prior to entry:
        - 600mm concrete trunk main built 1976
        - Queenstown trunk main 600mm concrete trunk main built 1976 also.
    - Indicated as connecting to the wet well but unconfirmed in location is the old 450mm concrete pump station rising main built 1974, sealed and defunct. (position in wet well wall unallocated)
- The wet well is a half circular concrete chamber 6.8m wide at the wall between it and the pump chamber. Depth is approximately 4.4m allowing a maximum volume of approximately 72.6 m^3
- There are 4 suction pipe penetrations. Configuration is unknown but assumed to be protruding bell mouth pipes.
- Stilling well for waste water level measurement is located to the left half of the well between the 7-8 o'clock positions approximately. The access to the stilling well has its own special lid and cover. (See stilling chamber section below).
- Discharge point of the header pipe bypass drain is at high level in the wet well.
- An ultrasonic depth measuring sensor (un-located) fixed into the wet well roof or chamber side.
- Access lid which is a square steel hinged lid with a padlocked hasp. A set of ladder hooks are available however are badly corroded and may be more of a hindrance for any access through the square hatchway.
- The roof of the wet well appears to be an in situ concrete roof. The roof sits below the outside edge of the chamber walls and allows for top soil to be placed and light landscaping planting being grown within.

3.4.5 Stilling Chamber

- The stilling chamber is a vertical square concrete chamber built against the wet well wall. The base of the chambers side walls are finished on an angle creating an inverted buttress construction. The interior wall faces are built up to the wet well lid where it contains a full opening. The stilling chambers purpose is to allow a waste water level to rise within it with very little flows, eddies or waster water motion. This chamber was originally a screen well. The original drawings illustrate a catch screen which was located in the well. The inlet appears to have been moved from this position to discharge to the side of the chamber.

- The equipment typically housed in the stilling chamber is waste water level probes. The chamber when viewed from the opened cover has the following equipment.
    - Retaining hoops. There are 5 retaining hoops on the left had side which are to retain level probes (or float lines) within in a hanging position. One of these hoops is being used.
    - Level sensor. Fixed to the left hand side wall but not using any of the retaining hoops is flexi tube ducting this may connect to an ultrasonic level sensor. This is the primary level sensor which signals to the Millitronics™ Multiranger Plus (PLC1, PLC2, PLC3) control to start or stop pumps.
    - Level sensor probe. Located by hanging from the safety cage bars is a line which suspends a Multitrode™ into the well. This sensor activates at two levels in the same settings as the ultrasonic sensor. This is a standby level sensor. It is however maintained weekly and is operational.
    - Insulator rack. Fixed at high level on the left hand side of the well is a steel bar with 5 porcelain electrical insulators. These are for the old sensor "organ pipe" arrangement which was suspended from the insulators.
    - Probe cleaning tab. Located on the inside face of the stilling chamber about 1.5m below the opening is a tab designed that when an operator lifts a probe up he can then push it through the hole in this bracket and scrape off any accumulations which may be affecting the probes performance.
    - Safety cage. The opening of the stilling chamber has a steel safety cage across its entire opening. The cage is corroded and sits in position by weight and fit.
    - Access cover. The access cover is a tent shaped aluminium cover with side walls. The cover splits into two halves across the length and the left hand side is hinged and the angled roof part lifts back in one piece. The lid has a padlock hasp and the weight of the lid allows one person to open it.

3.4.6 Pump chamber

- The pump chamber consists of:
    - Suction pipes and valves
    - 3 No. pumps on resilient steel channel fabricated support frames
    - Rising main header pipe and valves
    - Heaters, wall mounted pipe element heaters (Defunct)
    - Wall mounted fan heater(Defunct)
    - Lighting, two positions both corroded and only one operational. (Sodium vapour lamps in control room above provide light by being directed through grating).
    - Access service ladder
    - Extract ducting
    - Wet well water temperature sensor Honeywell brand (Defunct)
    - Sump pump and discharge with non return valve

3.4.7 Pump suction pipes

- Ther is a bell mouth made at each suction protruding into the wet well
- 4 ductile iron or cast iron pipes penetrate the wet well wall into the pump chamber. Each stub is connected by a gibault joint to flange plate (flange adaptor). Only three ofthese are connected to a pump. The fourth is provisional for a fourth pump.
- Each isolation gate valve has a full height bonnet configuration body and a wheel operated spindle.
- There is a red painted split pipe joint (Victaulic™) in the mid span of the spacer pipe between the pump suction inlet flange and the radius bend flange.
- Each pump has a cast radius bend into the suction inlet.
- The three pumps have the scroll case casting, foot, flange jointed to the suction pipe at this point.

3.4.8 Wastewater pumps (Pump 1, Pump 2, Pump 3)

- Three ABS – AFP 2501 waste water pumps. Each pump is seated on a steel pedestal or support frame designed to absorb vibration. A pump this size seated onto the existing concrete pillars would crack the concrete with any vibration and this allows the suction inlet to be connected with free access.
- Operating head is 52.4m. These are typical low head high flow pumps.
- Each pump has a steel encased water jacket around the motor for cooling. The water used to cool the water jacket is sourced from the upstream suction header pipe through the scroll case casting channels and is returned this way also on the discharge.
- In addition to the scroll case channels cooling water can be sourced from potable water supply piped from the control room area down into the pump water jackets. Black Alkathene pipe drops from the Back Flow Preventer (BFP) in the control room and is connected to a valve fitted to the top of the water jacket with a screw coupling and an isolating gate valve. This is used to allow cleaning of the water jacket interior and removal of baked on flock or other debris which may be affecting cooling performance within the jacket.
- There are also taps on the soffit and the side of the rising main sections immediately off of the pump discharge which are isolated with a ball valve and have the plastic screw thread couplings for connection to flushing water supply. It is not obvious how these connections work with the flushing system.
- Each pump has a sealed cap on the head of the motor. All power and communication cables penetrate here and are then spliced to electrical connections or sensors. Any moisture in the head or cap of the motor will trip a motor fault on the switch board
- Power cables are slung over the main outlet header pipe or the structural steel beams above in looped fashion are also tethered with a light chain. There is an excess of cable to most pumps. Wiring is directly to the control cabinet.

No.	Item	value

No.	Item	value
1	Motor rated output in kW	160kW
2	Motor frame number	M1600/4-63
3	Motor full speed tolerance	1474 rpm
4	Motor full load current	292 amps
5	Motor Voltage	400 V
6	Motor starting current	1975 amps
7	Motor starting torque	2251 Nm
8	Motor pull out torque	1037 Nm @ 100% load
9	Motor full load power factor	0.86 @ 100% Load
10	Motor full load efficiency	92.3% @ 100%
11	Weight of motor/pump	1710kg
12	Rated Starts per hour	10 per hour at 6 min intervals
13	Class of insulation and rated temperature rise	Class "F" insulation 155 ℃

3.4.9 Pump riser header pipes

- The pipes from the pump discharge consist of:
  - Welded pipe sectional elbows, top and bottom
  - Swing check NRV 250mm (Val-Matic) X3*
  - Isolating gate valve with bonnet case 250mm and hand wheel X4
  - Main header 400mm spiral wound receiving four 250mm pump risers and one 150mm bypass pipe,
  - A bypass pipe of 150mm connects to the wet well and discharges when the isolating gate valve is opened.
  - Surge vessel connection pipe. A closed isolation valve on this 100mm pipe connects to the surge chamber in the controls room. The surge chamber is defunct.
  - Rising Main outlet consists of a 400mm spiral welded steel pipe flowing in both directions along the long axis of the control room plan.

  Note: As built data shows Val-Matic check valves, however the check valves on site do not resemble this brand and also have no brand name marked on them.

3.4.10 Pump chamber heaters

- The pump chamber has three element pipe natural convection heaters and one scope™ fan heater in the pump chamber. All appear to be defunct or are badly corroded from immersion in water.

3.4.11 Pump chamber lighting and power points

- The two existing light fitting positions within the pump chamber do not function. The two light fittings have corroded from being immersed in water and so therefore any light is provided by the sodium vapour lamps (refer Section 3.4.19) in the control room.
- The power points in the pump chamber are also defunct. Any power required is supplied by an extension power cable from the mains control cabinet which is tied to the top rail of the access ladder.

3.4.12 Wet well water temperature sensor

- Located at low level between the pedestal for pump 4 (empty) and pump 2 on the wall separating the wet well from the pump chamber is a sealed metal disc with an armoured probe cable protruding from it. The cable is plugged into a white steel box fixed away or out from the wall surface. The box is a control box for a wet well temperature probe. The operating ideal is that when the probe cooled down after not being immersed in warm waste water the low level alarm is triggered. This equipment is now defunct.

3.4.13 Pump chamber Flood Control Pump

- Located between the inlet suction pipes to pump 2 and 3 is a sump pit with a submersible Flood Control Pump. The Flood Control Pump has its own float switch and a non return valve. The rising main from the Flood Control Pump rises to high level and discharges to the wet well in the adjacent space.

3.4.14 Control room

The control room is accessed from the main paired doors on the Eastern side of the building. The control room contains (Left to right):

- Louvered doors and loft doors above,
- Floor opening above pumps with personnel grating panels over,
- Overhead lifting beam and chain hoist,
- Lightning strike protection system, (defunct),
- Sodium vapour lights,
- Main switch board and pump controls cabinets,
- Biofilter fan box and control panel,
- Wash hand basin and instantaneous hot water heater,
- Battery charger control panel,
- Water supply with BFP for pumps,

- Two portable compressors, one is non operational,
- Surge vessel and pipework (defunct),
- Emergency power diesel generator with mufflers and air cooling fan,
- Ladder access opening to pump chamber,
- Extract ducting from the pump chamber below,
- Diesel fuel tank,
- Water hose with BFP and
- Fire extinguisher.

3.4.15 Louvered access doors

- Access to the control room is through double louvered doors and loft doors above for moving tall plant. The doors have a louvered infill with a chicken wire mesh on the inside face. These doors are installed to promote ventilation and air movement especially when the emergency power generator is running. Louvered doors can be damaged easily.
- Above the personnel entry doors (~1980mm high) are the loft doors which are the same as the ground level doors. These doors open to allow suspended plant that is moved in or out of the building on the lifting beam at the roof apex to pass. The triangular space between the apex and the loft doors top edge is filled by special infill panels.

3.4.16 Control room floor gratings

- The central rectangular area of the control room has a large opening to allow the lifting of the pumps in the pump chamber up to ground level and removal or delivery. The floor is covered in a galvanised floor grating. Three sections may be lifted to allow a clear opening area to bring lift plant through. Half of the floor area is now inaccessible to direct lifting to the space below because the emergency power generator is now seated over the grating and middle floor beam.
- Note: When grates are lifted a falling environment exists which requires special safety procedures.

3.4.17 Overhead lifting beam and chain hoist

- Located at the apex of the control room ceiling and running the room length is a lifting beam with attached chain hoist. The lifting rating of the beam is unknown. The new chain hoist is rated for 1.5 ton. Rating and testing is required annually, refer to section 5.2

3.4.18 Lightning Strike Protection (LSP1)

- Lightning strike protection is provided by a Teracel™ lightning protection unit. This unit protects the equipment by grounding the building structure to a ground field. This equipment is not operated by plant operators but should be monitored for signals that a lighting strike has been registered.

- The device currently has no indicator lights on the three phases being grounded. Because the unit sacrifices its own electrical components instead of the critical electrics within the pump station, it is possible that a previous strike has already destroyed this unit and that it may be serving little or no protection.

3.4.19 Sodium Vapour Lamps

- Lighting to the control room and the pump chamber is from two sodium vapour lamps. These high lux output lamps illuminate to the pump chamber through the floor gratings. The lamps are fixed to a high level near the ceiling well clear of both sides of the lifting beam path.

3.4.20 Pump Control

- Primary control: PLC using Ultrasonic measure to Multiranger™
- Backup control: Multitrode™ measurement
- Phase Power Control: Each pump has a Power Phase Controller (PPC1, PPC2, PPC3) consisting of a set of capacitors which ensure a smooth wave form of 3 Phase power to the pump motor. These capacitors can get very hot and require good ventilation. These are located in each pump control cabinet which is locked.
- Motor protection: Each pump has a Multilin™ motor protection relay unit. This unit monitors motor characteristics and diagnoses what caused a fault if a fault occurs. Currently the stator or external winding temperature is monitored and data is sent to SCADA in real time.
- Starter control: Each pump has a Soft Starter Controller (SS1, SS2, SS3) module "AuComm™" or Allen Bradley SMC Plus rand. Good ventilation is required for the soft starter module which has three built in cooling fans.
- Switch board ventilation: Each of the pump control cabinets has fitted to the front panel a 150mm diameter Schneider Himel VF85 electrical Cabinet Fan (CF1, CF2, CF3). These fans ensure adequate cooling air flow. (Not shown on photographs)

3.4.21 Mains and Pump control cabinets

- There are 4 vertical cabinets located on the left hand side of the control room. Each is a vibrant orange colour. These are SIMITROL™ cabinets made in 1996 and rated to 415 Volts 1300 Amps. A summary of the controls on each cabinet from 1 – 4 are:
  - Cabinet 1
    - Main isolator
    - Generator isolator
    - Main Voltage meter with:
      - Selector for RY, YB, BR phases and RN, YN, BN phases,
      - "Lag" and "Lead" cosϕ power meter,
    - Surge vessel controls (Defunct)
      - Compressor running hours clock x 2,

        - Compressor fault indicator light (red),
        - Surge vessel level fault light (red),
        - Blank plate.
    - Well level controls
        - High level alarm fault light (red),
        - Low level alarm fault light (red),
        - System fault alarm fault light (red),
        - Control on indicator light (green),
        - Fault reset, lamp test, push button (blue),
        - Duty (selection) 1-2-3 indicator light (yellow),
        - Duty (selection) 2-3-1 indicator light (yellow),
        - Duty (selection) 3-1-2 indicator light (yellow),
        - Levels controls selector turn switch "RTU" or "Multiranger™ "
    - Well Level (indication)
        - Shimaden level display face panel (Defunct)
- Cabinet 2 + Cabinet 3 + Cabinet 4 – Pump controls for Pump 1, Pump 2 & Pump 3 respectively
    - Pump hours clock
    - "Control on" press button and indicator light (green)
    - "Pump run" press button and indicator light (green)
    - "Drive fault" press button and indicator light (red)
    - "Protection trip / Reset" press button and indicator light (red)
    - "Cable entry fault" press button and indicator light (red)
    - "Motor Chamber" press button and indicator light (red)
    - "Oil chamber fault" press button and indicator light (red)
    - "Start" press button (green)
    - "Stop" press button (red)
    - "Auto", "Off" and "Manual"
    - Motor protection relay Multilin™ module
    - Ventilation fan on cupboard face Schneider Himel™
    - AuCom™ Soft starter (internal) or Allen Bradley™ SMC Plus, soft starter
    - Power phase correction (internal)(Varplus™)
    - 2 sets of fuses in each cabinet, 3 on the buss bar and 3 off the transformer relays.

    Note: Due to pumps being shifted to different pedestals and each pump being unique the Multilin™ relay controller for pump 2 is on the cabinet of pump 3 and vice versa. This is labelled on the cabinet.

3.4.22 Biofilter fan and control panel

- Located beside the control panel of Pump 3 control cabinet is a small plenum box for the wet well odour extract ventilation fan. The box receives air flow from a floor penetration below, turns flow 90 degrees and penetrates the south west wall to outside. From outside the transformed circular duct is taken underground to the biofilter.

- Controlling the fan is a stand alone control box fixed to the wall in the control room. Controls presented on the panel are:
  - "on", "off" and "lock"
  - Fault indicator light (red)

3.4.23 Wash hand basin and instantaneous water heater

- Located beside the Biofilter fan controls is a stainless steel wash hand basin with an overhead electric instantaneous water heater with tap. The drain on the sink is unusable as the tap is not plumbed in. So waste water could be disposed to this drain but no wash water can be used at the sink. The instantaneous water heater taps are defunct and have been disconnected. The water supply is used for the pump cleaning water supply instead.

3.4.24 Battery charger control panel

- Located to the right of the wash hand basin is a cream coloured cabinet mounted high on the wall. This cabinet contains the trickle charge and battery charging control electronics (BC1). The batteries serviced by this control box are three large truck batteries that start the emergency power Generator. Controls presented on the cabinet door are:
  - "Low battery Volts", push switch (red), indicator light (red)
  - "Battery charger fault" indicator light (red)
  - Ammeter -20 to +20.

3.4.25 Pump wash water supply RPZ - BFP

- Potable water supply from outside is piped past the surge vessel and has a reduced pressure zone back flow preventer fitted each side of an isolating ball valve. This supply then tee's to a blank cap that used to connect the wash hand basin tap and then penetrates the floor to supply water to flush the suction pipes and flush the pump water jackets and cooling water channels.
- The other branch of the T connects the irrigation system in the plant bed over the wet well roof.
- Fixed below the wash hand basin is a water supply which has an inline filter and a reduced pressure zone back flow preventer. This did supply the wash hand basin and the irrigation system on the wet well roof. This is defunct and is to be removed.

3.4.26 Air compressors

- Sitting beside the surge chamber (refer Section 3.4.27) are two portable air compressors. One is non operational the other is not used. They were used to charge the bladder in the surge chamber but since the chamber is not used then both compressors are defunct.

3.4.27 Surge chamber

- Fixed against the south west wall is a small surge chamber. The chamber is defunct and has been isolated from the rising main header by a gate valve located under the steel grating floor in the pump chamber.
- The chamber has two pressure sensors, a small access hole and two inlet points with a regulating valve. There is a pressure gauge on a drop pipe with an isolating valve.

3.4.28 Emergency power generator

- The Emergency power generator is a "Kohler Power system 750" diesel generator. The generator motor is seated on a steel chassis which has resilient mounts to prevent vibration being transmitted to the structure. The Engine chassis sits over top of half of the steel gratings that provides the opening to the pump chamber below.
- The cooling of the generator is by a large surface radiator which is close to the North Western wall opening. The large louvered opening in the wall has a cowling to the radiator and fan.
- Exhaust gasses from the manifold of the generator are ducted to two large barrel mufflers suspended from the ceiling beams. The engine is isolated from the exhaust mufflers by two bellows pipe fittings.
- Each exhaust after muffler attenuation, follows the fall of the ceiling angle and then penetrates the concrete and block walls to outside. Each exhaust has a radius bend to direct the exhaust towards the ground.
- **Maintenance of this generator is to be strictly undertaken by a specialist firm.**

3.4.29 Ladder access to the pump chamber

- Access to the pump chamber is via a service ladder. The ladder is narrow and has separated hand rails to ensure hands are not gripping contaminated rungs. This ladder is very narrow and due to the difficulty in ascending and descending this ladder the pump chamber is assessed as a confined space. The ladder has handrails surrounding the floor penetration at the top.

3.4.30 Pump chamber low level extract system

- Located at the top of the access ladder is the extract fan box for the pump chamber ventilation extract system. The fan discharges through the North East wall through a mesh grated box. Air is drawn from the low floor level by a circular duct with an angled foot inlet, then drawn up to head height in the control room and discharged to outside. It is unsure how this is controlled and even if it is operational.

3.4.31 Diesel Fuel tank

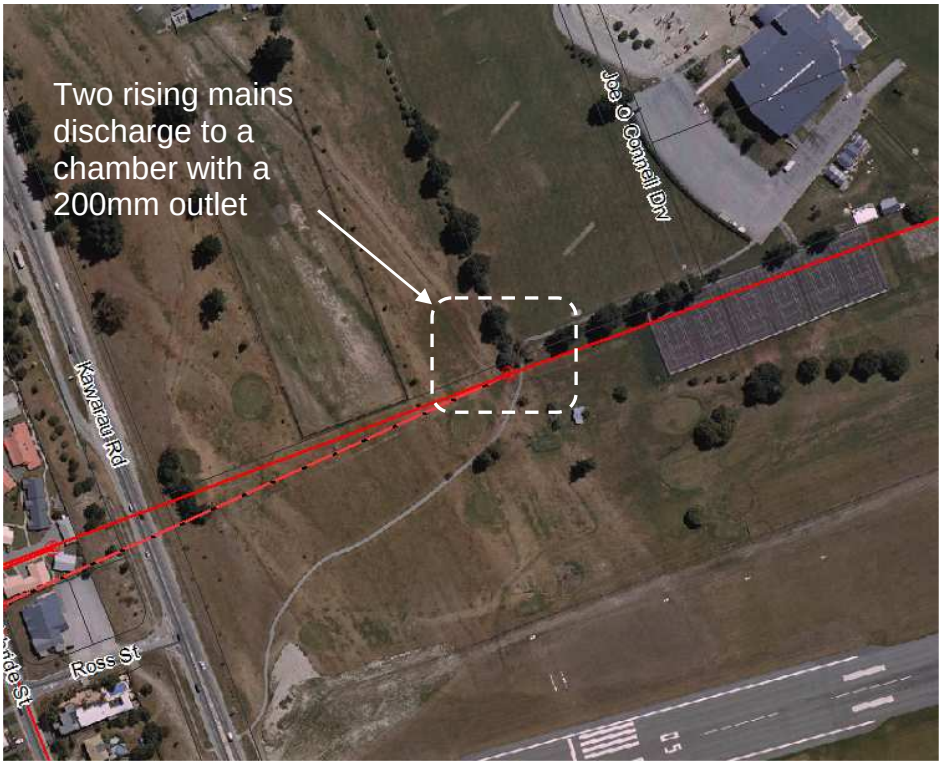
- The 600 litre diesel fuel tank is located between the access ladder and the double entry doors. The tank is elevated on four legs and has a fuel feed line which is clipped to the wall and runs past the access ladder opening to the generator.
- The fuel line has a special safety valve which consists of a ball valve with a weighted lever arm. The arm is held up by a taught line which is strung up to the ceiling and then through the engine blocks area of the generator. Should the generator or the high roof area catch fire and melt the nylon line, the weight will fall and stop any fuel flow to the engine. Also there is a manual isolating ball valve at the tank.
- The tank has a fuel level gauge on the front face and there is a level sensor affixed to the top of the tank which is wired to the display panel of the power generator
- A fuel tank vent pipe is taken up to high level and is brought high outside the building and turned to discharge downwards. This is a galvanised steel vent pipe.

3.4.32 Cleaning down hose and BFP

- Located in the right hand corner adjacent to the double doors is a washing down hose connected to a 25mm pipe with a reduced pressure zone, backflow preventer. The hose is controlled by a ball valve. Note the BFP is a separate BFP to that which supplies the ols sink and the water jacket flushing suupply.

3.4.33 Rising main valves

- From the 400mm diameter rising main header pipe two rising mains begin, each from an end of the header pipe. They consist of:
  - 560mm diameter HDPE pipe laid away from the South Eastern side of the building (wall with main doors). There is an isolating valve by the entry doors for this pipeline. This pipeline pumps for about 700m before discharging to a manhole located 80m south west of the tennis courts which are beside the Airport runway and near the sports centre.



The two rising mains combine in an outlet chamber.

This pipe is a recently built asset.
The second rising main is a 425mm diameter main of 666m length which is also is laid through Brise Street beside the 560mm diameter HDPE main. This main also discharges to the same manhole in the airport and sports ground area. The main takes a 90 degree or more bend soon after the isolating valve. The pipe is a steel pipe up to a position above the cribb wall embankment where a gibault joint marks the change to Asbestos Cement pipe.
An isolating valve is available for this pipe line located within a manhole directly outside of the air louver wall of the diesel generator on the North West wall.

- Council GIS information of "medium" confidence shows that the two rising mains discharge into a 200mm Diameter mPVC pipe which falls to the Shotover ponds. However inspection of the incoming pipework to the Shotover ponds chamber indicates a 400mm NB concrete pipe. So both the bore diameter and the pipe type are not known by records.

3.4.34 Flow meters

- From the 400mm header pipe each rising main is flow metered. The SCADA system displays the flows. There is only one display panel in the plant room inside Pump 1 control panel which is locked. This is the display for the 425mm pipe line (original). The flow meters are buried in the ground in the embankment areas above the pump station where each pipe has a straight

run (exact location unrecorded). This is because each rising main needs to turn a sharp or uniformly curved angle in excess of 45 degrees.

- The flow meter on the 425mm diameter rising main is an ABB magmaster flow meter and has the display located in the locked Pump1 control cabinet.
- The flow meter on the 560mm diameter rising main is a Thermo Polysconics flow meter. This brand is currently no longer in production and no product information is available. The meter body appears to be a part of a HDPE fusion coupling or fashioned into the pipe. The sensor is wrapped with layer of Denso tape™ or similar. The information cable is laid back to the telemetry. The display module is buried in a polyethylene valve chamber (simular to an accuflow valve box only larger). The box is buried and has not been brought to the surface.

Note: Verbal information obtained from Just Dig It in May 2010 states that the flowmeters on both the 425mm and 560mm rising mains out of Frankton Beach WWPS are ABB Electromagnetic flowmeters. They were installed in 2007/08 and are situated at the top of the bank.

4 FRANKTON BEACH WWPS RESOURCE CONSENTS

4.1 Resource Consent Summary

There are no resource consents relating to the Frankton Beach Wastewater Pump Station.

5 FRANKTON BEACH WWPS OPERATIONS & MAINTENANCE

5.1 WWPS Operating Configuration

The Frankton Beach wastewater pump station has three operational pumps (with positions for a future fourth pump). The operation logic for this station is as follows:

- A set of three pumps are selected in a duty sequence on the main switch board. E.g. 1-2-3.
- An ultrasonic sensor is located suspended a distance below the lid to ensure a good send and receive signal without interference from side and bottom reflections from the lid.
- Waste water is received into the wet well from the two 600mm diameter trunk mains.

Duty Pump

- When the waste water reaches a level of 2m above the base level of the wet well, the ultrasonic sensor signals for the Duty Pump to start via the Milltronics Multiranger pump controller
- The Duty Pump will run until the waste water level reduces to a depth of 0.7m from the base level of the wet well. Then the Duty pump will turn off. The Duty Pump which has just finished a duty now becomes the Duty Assist Pump, for the next wet well filling and pump down cycle.
- During a high flow cycle the following occurs:
  - When the waste water reaches a level of 2m above the base level, the ultrasonic sensor signals for the Duty Pump to start via the Milltronics Multiranger pump controller
  - The Duty Pump will continue to run until the waste water level reduces to a depth of 0.7m from the base level and the Duty Pump will turn off. But if the water level continues to raise above the 2m level the Multitronics Multiranger™ controller will signal the Duty Assist Pump to start.
  - When the waste water level reaches 2m depth the Duty Assist Pump will turn off and leave the Duty Pump to continue pumping.
  - When the waste water is reduced to a depth of 0.7m from the base of the wet well, the Duty Pump will turn off.

Standby Pump:

- The third pump of any duty selection order is the Standby Pump.
- In the event of any of the Duty or Duty Assist pumps having a Fault occur the Standby pump will initiate instead of that faulty pump. This procedure is controlled by the Multitronics Multiranger™

Maximum Pumps:

- The pump station can run a maximum of two pumps. This limitation is due to the electrical supply and equipment ratings.

	Start Depth (m)*	Stop Depth (m)*	Comment
Pump 1	2	0.7	2m duty assist start depth
Pump 2	2	0.7	2m duty assist start depth
Pump 3	2	0.7	2m duty assist start depth

* Depth from WWPS wet well base

	Depth (m)*	Comment
Low Level Alarm	0.3	Measured from the Ultrasonic sensor
High Level Alarm	2.29	Measured from the Ultrasonic sensor
Overflow Pipe Level	None	There is no overflow within the wet well

* Depth from WWPS wet well base

5.2 Summary and Frequency of Operating / Maintenance Activities

Frankton Beach WWPS – Weekly Operating / Maintenance Activities

Item	Action	Check
General operation	o Record Keeping – refer Record Keeping Activity Table o Verify absence of alarms on WWPS switchboard and pump well level within WWPS Operating Configuration (Section 5.1) o Manually run and verify the operation and maintenance of each WWPS pump * o Inspect pump chamber. Sweep floors of water and debris to the sump pump o Check sump pump is operating. o Check pump water jacket cleaning pipes are in correct connection. o Check level probe in the stilling chamber and clean. o Inspect and confirm the security of the WWPS building o Undertake building / grounds maintenance as required (Operator to refer to WO sheet) o Check lightning strike protection module for signs that	

Item	Action	Check
	a strike has occoured.	

* Due to each pump rotating into and off the duty operation every three cycles this check may be considered redundant checking

Frankton Beach WWPS – Fortnightly Operating / Maintenance Activities [Activities in Addition to Weekly Task List]

Item	Action	Check
Generator	o Inspect and test run the emergency standby generator (refer to operating procedure in Section 6.6) o Ensure generator is fuelled	
Biofilter	o Check Biofilter is in correct condition (refer to operating procedure in Section 6.10) o Check the air fan is running smoothly	

Frankton Beach WWPS – Six Monthly Operating / Maintenance Activities [Activities in Addition to Weekly & Fortnightly Task List]

Item	Action	Check
Pumps	o Check pumps for low or contaminated oil, failure of water seals, impellor wear and general wear and tear*	
Alarms	o Testing of Low Level and High Level controls to ensure functionality and alarm operation	

*With the three, built in moisture sensors on each pump checking oil need not be undertaken but checking the sensor trip indicator on the board and testing can.

Frankton Beach WWPS – Yearly Operating / Maintenance Activities [Activities in Addition to Weekly, Fortnightly & Six Monthly Task List]

Item	Action	Check
Generator	o Annual generator servicing by contractor	
Electrical	o Annual electrical testing and servicing by contractor o Annual testing of all SCADA alarms o Check and may replace Sodium Vapour lamps	
Biofilter	o Annual turning of biofilter media, preferably during Autumn or Spring	
Dry well ventilation	o Service the in-line extract fan	
Lifting beam	o Rating of the lifting beams shall be certified	
Wet well	o Clean wet well walls and ceiling o Inspection of wet well internal surfaces	

Item	Action	Check
	o Spot repair any decayed concrete o Replace any loose fixings o Remove sediments and large unpassable items from wet well base	
RPZ	o Reduced Pressure Zone backflow preventors and single check and double check valves where able to be tested shall be tested by an Independent Qualified person.	
Isolation valves	o Operate all isolation valves o Repair or repack any valves that leak or will not operate o Locate any unallocated valves	

Frankton Beach WWPS – Record Keeping Activities

Item	Frequency	Record Location
Power Usage (Pumps)	Weekly	Work Order sheet
Pump Hours (all)	Weekly	Work Order sheet
Amperage Readings (all)	Weekly	Work Order sheet
Observed abnormalities	Weekly	Work Order sheet and advise supervisor
Inspect valve chambers	Weekly	Work Order sheet
Electricity power reading	Weekly	By radio interrogation (other party)

5.3 Frankton Beach WWPS Alarms and Operating Responses

Digital Alarm	Alarm Test Procedure	Likely Alarm Cause	Likely Consequences if not Attended To	Typical Alarm Response
PUMP 1 FAULT ON	Engage electrician to simulate a pump fault	Overload tripped. Pump jammed. Pump motor damaged. Wiring to pump damaged. Control circuitry faulty.	Pump damage	Visit site and attempt to reset fault. Listen to pump noise and check amperage drawn.If fault re-occurs, contact supervisor and engage an electrician to diagnose the fault.
PUMP 2 FAULT	Engage electrician to simulate a pump fault	Overload tripped. Pump jammed. Pump motor damaged. Wiring to pump damaged. Control circuitry faulty.	Pump damage	Visit site and attempt to reset fault. Listen to pump noise and check amperage drawn. If fault re-occurs, contact supervisor and engage an electrician to diagnose the fault.
PUMP 3 FAULT	Engage electrician to simulate a pump fault	Overload tripped. Pump jammed. Pump motor damaged. Wiring to pump damaged. Control circuitry faulty.	Pump damage	Visit site and attempt to reset fault. Listen to pump noise and check amperage drawn. If fault re-occurs, contact supervisor and engage an electrician to diagnose the fault.
CONTROL FAILED	Engage electrician to simulate a controls power failure	Controls power supply failed. Control circuitry faulty.	Overflow of overflow chamber to Lake and river.	Visit site and attempt to reset fault. Start the enmergency power supply. If fault re-occurs, contact supervisor and engage an electrician to diagnose the fault. Call vacuum truck contractor for stand by service May require manning of pump station with manual control

Digital Alarm	Alarm Test Procedure	Likely Alarm Cause	Likely Consequences if not Attended To	Typical Alarm Response
SYSTEM FAULT	Engage electrician to simulate a system fault	Power supply failed. Control circuitry faulty.	Overflow of overflow chamber to Lake and river.	Visit site and attempt to reset fault. Start the enmergency power supply. If fault re-occurs, contact supervisor and engage an electrician to diagnose the fault. Call vacuum truck contractor for stand by service May require manning of pump station with manual control
HIGH LEVEL ALARM	Engage electrician to simulate a high level fault	High Level in wetwell. Faulty level control. Wiring damaged. Control circiutry faulty. Excessive rain fall. Jammed pump	Overflow of overflow chamber to Lake and river.	Check all pumps for noise and high amperage. Check rising main flow meters that flows of approximatly 70-80l/s are being achieved Visit site and attempt to reset fault. If fault re-occurs, contact supervisor and engage an electrician to diagnose the fault.
LOW LEVEL ALARM	Engage electrician to simulate a low level fault	Low Level in wetwell. Faulty level control. Wiring damaged. Control circiutry faulty.	Damage to pumps	Visit site and attempt to reset fault. If fault re-occurs, contact supervisor and engage an electrician to diagnose the fault. Observe the pumps operate and record running times as run on timmers may be at fault.
LOW FUEL	Engage electrician to simulate a low fuel fault	Generator fuel level low. Wiring damaged. Control circiutry faulty.	Generator running out of fuel. Downtime to re prime fuel pumps	Visit site and attempt to reset fault. If fault re-occurs, contact supervisor and engage an electrician to diagnose the fault.

Digital Alarm	Alarm Test Procedure	Likely Alarm Cause	Likely Consequences if not Attended To	Typical Alarm Response
			Overflow of wetwell	
PHASE FAIL ALARM ON	Engage electrician to simulate a power failure	One phase Power failure Wiring to power failure unit damaged. Control circuitry faulty.	Pump will not start Multilin unit will stop pumps Overflow of wet well	Visit site and check Multilin display pannels. Reset if possible. Contact power supply company and enquire if a supply problem has occoured. If fault re-occurs, contact supervisor and engage an electrician to diagnose the fault.
GENERATOR FAULT ON	Engage electrician to simulate a generator fault	Generator failed to start. Faulty battery charger or batteries. Wiring damaged. Control circiutry faulty.	Overflow of wetwell	Visit site and attempt to start generator manually. If fault re-occurs, contact supervisor and engage the contracted maintenanace firm to correct the fault.

Analog Alarm	Alarm Test Procedure	Likely Alarm Cause	Likely Consequences if not Attended To	Typical Alarm Response
WETWELL HIGH LEVEL	Engage electrician to simulate a high level fault or Stop pumps and allow wet well to fill to alarm level in manual mode	High Level in wetwell. Faulty level control. Wiring damaged. Control circiutry faulty. Excessive rainfall and infiltration	Overflow of Kelvin Heights Trunk main to the overflow chamber and discharge to the lake	Visit site and attempt to reset fault. If fault re-occurs, contact supervisor and engage an electrician to diagnose the fault.
WETWELL LOW LEVEL	Engage electrician to simulate a low level fault or run two pumps in manual mode	Low Level in wetwell. Faulty level control. Wiring damaged. Control circiutry faulty.	Damage to pumps	Visit site and attempt to reset fault or use each pup isolation switch. If fault re-occurs, contact supervisor and engage an electrician to diagnose the fault.
PUMP 1 STATOR TEMP HIGH	Engage electrician to simulate a pump stator temp high	Pump running hot. Cooling jacket blocked Pump jammed or pump impellor sheared off Pump motor damaged. Wiring to pump damaged. Control circuitry faulty.	Pump damage	Visit site and attempt to reset fault. If fault re-occurs, contact supervisor and engage an electrician to diagnose the fault.
PUMP 2 STATOR TEMP HIGH	Engage electrician to simulate a pump stator temp high	Pump running hot. Cooling jacket blocked Pump jammed or pump impellor sheared off Pump motor damaged. Wiring to pump damaged. Control circuitry faulty.	Pump damage	Visit site and attempt to reset fault. If fault re-occurs, contact supervisor and engage an electrician to diagnose the fault.

Analog Alarm	Alarm Test Procedure	Likely Alarm Cause	Likely Consequences if not Attended To	Typical Alarm Response
PUMP 3 STATOR TEMP HIGH	Engage electrician to simulate a pump stator temp high	Pump running hot. Cooling jacket blocked Pump jammed or pump impellor sheared off Pump motor damaged. Wiring to pump damaged. Control circuitry faulty.	Pump damage	Visit site and attempt to reset fault. If fault re-occurs, contact supervisor and engage an electrician to diagnose the fault.

5.4 WWPS Troubleshooting and Operating Responses

Troubleshooting covers items not included under Section 5.3 (Alarms and Operating Responses). It also includes "Operational Notes" – Items of which operators should be aware.

Operational Notes

- Frankton Beach WWPS has had problems in the past with overheating of the pump motors. To alleviate the overheating problem a solution was to fill the pump chamber with water. The water surrounded the motors and cooled them. The mass of water in the pump chamber would sometimes become too warm and was pumped out and refilled with cool fresh water. While this issue has been resolved by United Water, this is the reason that all the electrical lights and heaters in the pump chamber are now not working. There is also corrosion on pipes and structural steel where normal life expectancy would not observe this occurring.
- The pump station has no overflow point within the facility. The only known overflow is that of the manhole upstream on the Kelvin Heights trunk main, which has a high level overflow. The discharge location of this overflow is opposite the manhole/chamber near the toilet block at the exit of the lake to the Kawarau River (refer to Section 3.2 - Site Location).
- When a duty or duty assist pump has a fault occour the third pump automatically takes up the fault pump position in the duty cycle. If a pump is removed for maintenance and a duty or duty assist pump faults again then an alarm received by an operator must be responded to quickly.

5.4.1 Loss of SCADA signal

- PROBLEM: SCADA is not communicating. [The SCADA microwave antenna is mounted on a timber pole on the bank above the retaining crib wall – this is also below a large tree. High winds or vandalism could affect the antenna.
- ACTIONS:
    - Check the antenna on site and organise for repair as necessary
    - Especially check the black Alkathene pipe which is laid above ground between the crib wall and the plant roof. This houses the SCADA cable to the antennae.
    - Unlock the main cabinet (not pumps 1-3 cabinets), locate the Swampfox™ RTU. Check that the multi board of 240 volt plugs has all the plugs in securely. Then check the RTU to see if it is powered.

5.4.2 Pump fouling/blockage

- PROBLEM: Pump has an object jammed in the impellor [Signs shown by the pump that there is an object lodged in the pump impellor are excessive noise from the pump case and motor and / or high amperage or continual flickering of the amp meter].

- ACTIONS:
  - Isolate and shut down the pump using isolating valves in the pump chamber and the main isolating switch on the pump cabinet for that pump.
  - Loosen the scroll case bolts connecting to the motor bearing.
  - Rig the pump motor to the lifting chain and lift the motor off of the scroll case. Move the motor away to a safe drop zone.
  - Clear and clean the scroll case and the impellor. Remove the obstruction. Thoroughly inspect the impellor surface and record any imbalance or excessive wear locations. Take photographs if possible and measure.
  - Return the seals and the motor as per the manufacturers workshop manual details.
  - Return isolating valves and switches and change duty order to that required.
  - Test run the pump. Record amperage indicator after several minutes operation. Check the Multilin motor relay protection module that all temperatures and diagnostics are reset and measuring acceptable values. Record these values.
  - Task complete.

5.4.3 Odour complaint

- PROBLEM: A complaint of bad odour at the plant. Odour may occur due to the following:
  - Open wet well hatch
  - Odour bed overload
  - Pump chamber flood
  - Failed wet well odour extract fan or ducting

- ACTIONS:
  - Check the wet well hatches are closed and locked. If not investigate and close hatches and lock.
  - Check the odour bed is in an ideal state, the fan should be running and the ducting in operating condition. If not arrange to fix.
  - Open station doors, turn on lights and smell the plant room. Check pump chamber for any leaking flange plates or oozing seals which may have the offensive matter. As required clean and service joins or seals to eliminate the leak.

5.4.4 Control panel fault

- PROBLEM: Electrical switch board arcing. This can occur due to corrosion of the wastewater electrical components due to H_2S gasses or due to any number of failed electrical components within the control circuitry.

- ACTIONS:
  - If a pump or mains switch is getting hot or performing badly due to switch board problems the pump should be switched off immediately and an electrician called.

NB: Switchboards have been overheating in the past and the doors have been left open to improve ventilation. This has made the condition of the switch degrade faster. There has also been considerable heat output from the cabinet due to the phases of the power supply not being in an ideal distribution.

Case study >
In January 2010, a Surge Diverter within the switchboard was found to be burnt out. The process of events was as follows;

- On call Operator receives control fault alarm.
- Operator attends site and attempts to reset circuit breaker.
- Reset failed. Electrical contractor called.
- Electrical contractor identified burnt out Surge Diverter as a result of a failed power factor correction contactor.
- Surge Diverter and contactor both subsequently replaced.
- Fault reset and pump station re started.

5.4.5 High pump motor temperature

- PROBLEM: Motor temperature consistently high.

- ACTIONS: Water jacket flushing
  - Any of the three pumps may become hot if there is excessive load on the motor or if the phase of the power is not correct. Typically this should not occur as the Multilin™ motor protection relay will send a fault signal to the control panel and may even trip the pump.
  - However you may find the motor temperature is high but does not reach such a high temperature as to trip the fault and alarm. This can be caused by the accumulation of flock and smudges in the water jacket that surrounds the motor.
  - This sludge and flock material can bake onto the water jacket internal surface and effectively insulate the motor from the cooling transfer of heat to the water jacket flow.

- To clean and to immediately introduce cooling water there are black Alkathene water hoses suspended from above with a screw coupling on each. At the top of each pump motor there is an isolating valve and a screw connector for the water jacket. Connect this valve and open the valve.
- Upstairs in the controls room there is a BFP with two isolating valves, this should be opened and potable water flow introduced to the water jacket. This works via:
  - Clean water flowing through the jacket over a period of time, outside the pump operating times, which softens and flushes debris and sludge's from the water jacket out via the built in channels cast in the pump scroll case.
  - The increased water flow also cools the water jacket between operations which can be a short as 12 minutes.
- When the cooling and cleaning of the water jacket is not required the couplings and valves shall be disconnected and closed.

6 OPERATIONS & MAINTENANCE PROCEDURES

6.1 Lifting a pump

To lift one of the submersible pumps from Frankton Beach WWPS refer to NZ WWN-05: REMOVAL AND WORK ON SUBMERSIBLE PUMPS AT WASTEWATER PUMP STATIONS found in Appendix E.

NOTES:

- The pump shall be cleaned thoroughly in the pump chamber to a standard that is clean enough to be received to a workshop. The pump should not be cleaned outside the station in the public area.
- Handling the pumps at Frankton Beach WWPS for removal is difficult due to the position of the generator over the pump chamber.
- Once the chain and hoist is attached to the pump and it has been partly lifted, pull the pump toward the entry doors end of the well. You may need to switch the weight of the pump to the second lifting beam in order to move the lifted pump around an active pump which is in the path. Extreme caution should be exercised during this procedure.
- When the pump is located in the clear area near pump 3 the floor gratings above should be removed and the lifting tackle from the control room then used to lift the pump to ground floor level.
- To bring the raised pump outdoors open the double doors and double loft doors. The pump can then be railed outside to await transit.

6.2 Installing a pump into the pump chamber

Once the existing pump has been lifted (refer to section 6.1), the new pump can be installed.
Refer to NZ WWN-05: REMOVAL AND WORK ON SUBMERSIBLE PUMPS AT WASTEWATER PUMP STATIONS for an explanation for installing a pump back into the pump chamber. Further information for installing a new pump is below:

- Once the pump has been lifted out, the electrician will disconnect the old pump from the cabinet.
- The electrician will tie a draw wire onto the lead that he has just disconnected and pull that through to the old pump.
- Connect the other end of the draw wire onto the new pump and and pull it back through the cabinet.
- The electrician will join the lead back up to the pump chamber and wire it onto the new pump.
- Lower the new pump using the HIAB truck.
- Test the pumps to ensure they are operating properly.
- If the pumps are running backwards, the pumps will have to be lifted back up again and the electrician will have to re wire the cabling again.

- Test the pumps to ensure they are operating properly, and;
- When complete, make the site safe and secure before you leave.

6.3 Isolating plant and equipment

Refer to OPS-05 ISOLATING PLANT AND EQUIPMENT for the method for isolating plant and equipment.

United Water (Queenstown) internal procedures dictate that the isolation of any electrical or mechanical equipment should be done in accordance with OPS-05 Procedures together with additional safety steps undertaken. Lock out tags and permits are posted on a specific Plant/ Equipment Isolation Board in UW offices.
The form NZ Q487 is subsequently required to be filled in by the Operator in order to provide an audit trail and details of the isolation.

6.4 Cleaning wet well

Access to the pump chamber or wet well at Frankton Beach WWPS is notoriously bad. This prevents access to the wet well for the purpose of cleaning it, a practically difficult exercise.

- The accumulation of fats and grease at Marine Parade WWPS is not repeated at Frankton Beach WWPS where cleaning of the wet well is infreuqently undertaken. The jet blasting of this site and nearby man holes is not on the schedule of wastewater pump station sites looked at by SJ Allen.

6.5 Multitrode inspection and cleaning

- Unlock the stilling well cover and locate the cable and hanging bar which supports the Multitrode.
- The Multitrode sensor is a back up sensor and can be lifted without affecting the pumps operation
- Lift the Multitrode by hand until at the level of the cleaning bracket in the stilling well.
- Bring the control cable into the centre of the cleaning bracket and pull the Multitrode bar through the eye of the bracket.
- Any accumulations on the Multitrode sensor bar should be scraped off and fall back into the well.
- Lower the Multitrode back into the well and secure the bar onto the safety cage in the same way as it was found.
- Close the stilling well cover and lock the padlock.

6.6 Test running the generator

- Visually check the generator to ensure there is no loose items or equipment in or around the generator that may cause a problem.

- Check the diesel fuel tank fuel level and that the fuel supply valves are open.
- Check the water traps and dust traps are clean and empty on the generator.
- Check the battery charging control panel to make sure no fault has occurred that may have stopped the starting batteries charging.
- Check the batteries sitting on the chassis is below the motor. Any corrosion of the terminals should be cleaned and removed.
- Visually check the battery fluid level to ensure the plates are covered. Any battery low of fluid should be taken to the workshop for a top up.
- Pull the two dipsticks to ensure there is adequate oil in the generator sump. If not cancel run and advise oil is required.
- Check generator control panel, any red lamps will require maintenance attention.
- Any amber (yellow) warning lights should be checked. Physically check that the engine heater is working. A warm engine water hose is a good indicator.
- Throw the toggle switch to "run" from the "auto" position.
- The engine should engage.
- Allow to run
- The operator must switch the main switch board over to generator supply and run the generator at load.
- Record operating values from the gauges and ensure they meet the running marks indicated on the dials
- When finished running switch power at the main switchboard to mains supply.
- Throw the toggle switch to "off"
- Throw the toggle switch further to "Auto"
- Record the running hours of the generator and provide to the office.
- Allow engine to cool. Check fuel level in tank.

NOTES:

- No oils, greases or chemicals other than the Diesel fuel shall be kept on site. When fluids are needed the operator should organise to bring fluids to site of the correct type and quantity for the plant.

6.7 Electrical service check

As per contract QLDC 08-002, an electrical contractor shall undertake a planned mechanical and electrical check at the pump station at a minimum of a once yearly procedure. This inspection should check the following;

- Switchboard for damage;
- Operation of all RCD (Residual Current Device);
- Operation of all GPO (General Power Outlets);
- Switchboard heater and adjust if condensation present;
- All terminals for lose wiring;
- Main earth of switchboard and record results (in ohms);
- Earth tags and replace if necessary;

- Relays, timers and level controls for operation and damage;
- Motor overload settings and adjust if needed;
- Pump full load current on all phases and record results;
- Operation of duty pump selector switch;
- Operation of time sequencing;
- Operation in both manual and auto mode, and;
- Pumps in pump chamber and listen for defects while running.

Further to this also:

- Megger test between motor windings to earth and record results (in ohms);
- Measure and record earth continuity to pump;

The inspection may incorporate a thermal imaging survey to assess for 'hot spots' as part of this Preventative Maintenance procedure.

United Water (Queenstown) currently uses the following supplier for electrical service checks and audits;

Steve Pay
Neutral Inspection Services Limited
9 Short Street Bannockburn,
RD 2 Cromwell
neutralinspection@xtra.co.nz
Mobile: 027 6128 125

6.8 Pump maintenance & service

Refer to user the manual in Appendix B.

Any pump fault or mechnical problem that requires servicing should be sent to;

Hall Machinery
PO Box 2770
125 Antigua Street
Addington
Christchurch

6.9 Standby generator service

Yearly generator Preventative Maintenance servicing of standby generators within Queenstown Lakes District is undertaken by DPS Ltd.

Dependable Power Solutions Ltd
P O Box 2235, South Dunedin 9044
Phone +64 3 455 5946,
Cell 021 246 8845

The standard procedure for generator servicing is listed below and is used in conjunction with the Preventative Maintenance check sheet included in Appendix C.

1 Assess any site hazards and record on the Tailgate Sheet (see Appendix C).
2 Inspect the outside of the unit – note any issues.
3 Open all doors – check operation of all catches, locks, retainers and hinges – lubricate as necessary.
4 Visual inspection as per Preventative Maintenance Test Sheet.
5 Start engine – record as required on the Preventative Maintenance Test Sheet.
6 Run for 15 minutes.
7 Isolate/tag out to prevent automatic operation.
8 Drain oil and take sample for testing. Complete oil sample documentation.
9 Remove filters and contain/clean up any spill.
10 Fit new filters.
11 Refill with oil. Record volume and type.
12 Bleed fuel system.
13 Remove isolation/tags.
14 Start engine and check for any leaks – remedial action as required.
15 Check oil level and adjust as required.
16 Shut off engine and return to automatic mode.
17 Clean inside cabinet.
18 Close cabinet and lock all doors.
19 Check site for rubbish or spill. Clean up as necessary.
20 Complete documentation.
21 Advise clear of site.

6.10 Checking the biofilter

Especially during warm weather the biofilter should be maintained as follows;

- A moisture content which keeps the media feeling damp.
- The media should be loose and tumbled with voids and not compacted and matted.
- Air movement should be obvious through the media.
- Little or no odour should be present.

If any of the above is not present the operator should arrange to have the bed turned and/or irrigated or replaced with new substrate and bark.
The ventilation ducting fan should be checked; if the manometer is present it should be within range. Otherwise listen for any sound that the fan is either labouring or over-revving. Each may indicate that the fan or beds are not in the correct condition.

7 HEALTH & SAFETY

7.1 Risk Assessment

The Health & Safety Risk Assessment for the Frankton Beach WWPS is included within Appendix D.

APPENDIX A

As-Builts and Electrical Diagrams

As-built and Electrical Diagram Index

* Preparation of As-builts and electrical diagrams is outside the scope of the O&M Manual. Provision is however made for this information if located / prepared and provided by the QLDC Network Manager.

A1 – Plan on Pumps 1996
A2 – Section View 1996
A3 – Support frame elevations and plan 1996
A4 – Electrical drawings 15 drawings 1999
A5 – Original pump station plans 1974

APPENDIX B

Manufacturer Manuals

APPENDIX B

Manufacturer Manual Index

B1 – ABS – AFP-2501 Pump, technical information
B2 – 10K Iron gate valve
B3 – Val-Matic™ swing Check valve
B4 – Franksew PLC logic routine print out
B5 – Tercel™ lightning strike protection
B6 – Multilin™ 239 Motor Protection Relay
B7 – Allen Bradley SMC Plus™ soft starter
B8 – Schneider Electric – Varplus™ m4 50kvar 440/470v
B9 – Abbey systems Swampfox™
B10 – Miltronics Multiranger Plus™
B11 – Schneider™ Himel VF85 cabinet air supply fan
B12 – Crompton Protector trip Relays

APPENDIX C

Resource Consents

Resource Consent Index

There are no resource consents relating to the Frankton Beach Wastewater Pumping Station.

APPENDIX D

Frankton Beach WWPS H&S Risk Assessment

APPENDIX E

NZ WWN-05: REMOVAL AND WORK ON SUBMERSIBLE PUMPS AT WASTEWATER PUMP STATIONS