24th September 2021

Waikato District Council
Private Bag 544
NGARUAWAHIA 3742

Tēnā koe

RE: WAIKATO DISTRICT COUNCIL – RAGLAN WATER SUPPLY WATER SAFETY PLAN ADEQUACY ASSESSMENT

Thank you for submitting the *'Raglan Water Supply Water Safety Plan – version 3.0, 29 June 2021'* and associated documents to Wai Comply for formal assessment. This letter has been provided to acknowledge the receipt of the water safety plan (WSP) but also communicate the Wai Comply Assessment Unit's (WCAU) approach to WSP adequacy assessments in the lead up to the transition to Taumata Arowai.

WSP Receipt Acknowledgement
The following documents were received by the WCAU via email on the 30th of June 2021:

- Raglan Water Supply WSP Version 3.0 Final
- Raglan Reticulation Site Risk Register Revision 3.0 Final
- Raglan WTP Site Risk Register Revision 3.0 Final
- Appendix 1-9: these were received as nine separate documents.

WSP Adequacy Assessments for 2021/2022
As Council is aware, future Drinking-water regulation will be undertaken by Taumata Arowai. The sector has been advised that the transition of regulatory functions to Taumata Arowai is to occur on 1st November 2021. Upon Taumata Arowai's establishment, there will no longer be 'approvals' of WSPs (according to the latest Water Services Bill (Bill 314-2) and supporting dialogue from Taumata Arowai). To date, WSP approval has been achieved under the Health Act 1956 whereby Drinking-Water Assessors conduct an adequacy assessment and determine whether the WSP is 'approved' or not.

Whilst the regulatory regime in place is still the Health Act 1956 and Drinking-water Standards for New Zealand 2005 (Revised 2018), Drinking-water assessment units around the country have prioritised their work (functions) to align with Taumata Arowai's establishment. The WCAU has considered its existing workplan and has determined that 'WSP Adequacy Assessments' are considered low priority.

Therefore, due to Taumata Arowai's expected start date of 1st November 2021, and a future expectation for no 'WSP approval' process for regulator(s), the WCAU will not be conducting any WSP Adequacy Assessments during this transition period.

We appreciate this is a move away from our usual mode of operations, however we hope that Waikato District Council can appreciate the requirement for applying a flexible approach in executing the WCAU's functions. Please contact the undersigned should you have any questions.

Yours sincerely,

Drinking-Water Assessor

RAGLAN WATER SUPPLY
WATER SAFETY PLAN

Organisation and Supply Details: Community Name Raglan (RAG001). The registration information is below:

Component	Code	Name
Community	RAG001	Raglan
Zone	RAG001RA	Raglan
Plant	TP00128	Raglan
Source	G00464	Spring Raglan

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Table 1: Document Control Record

Version No.	Description	Author	Reviewer	Date	Authorised
1.1	Water Safety Plan			17 April 2015	
2.0	Water Safety Plan			25 June 2020	
3.0	Water Safety Plan 2021 revision			29 June 2021	

Table 2: Document Distribution List

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Name of WDC Document Management System	Waikato District Council Ngaruawahia office	Electronic
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Operations Staff	On Plant site	1
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EXECUTIVE SUMMARY

Waikato District Council (WDC) - Water Safety Plans (WSPs) have been developed to describe the management of the Water Supply Systems owned and operated by WDC and Watercare Services Limited (WSL). These plans also satisfy the legislative requirements of the Health (Drinking Water Amendment) Act 2019.

WDC and WSL operating models demonstrates a high level of commitment to drinking-water quality management. The provision of safe and secure drinking-water and a commitment to water safety planning is visible through the organisational strategy, plans and budget.

WDC and Watercare adheres to the six principles of drinking-water safety, and these principles are embedded into all systems, processes and behaviours. The six principles are:

1) Embrace a high standard of care
2) Protect source water
3) Maintain multiple barriers against contamination
4) Change precedes contamination
5) Suppliers must own the safety of drinking-water
6) Apply a preventive risk management approach.

Raglan WSP describes the management of public health risk associated with the Raglan water supply, to ensure the safe and reliable supply of drinking water to WDC customers in the community of Raglan. This WSP assesses risks from source to supply point and ranks risks according to their likelihood and consequence. Necessary improvements are identified and prioritised as part of a larger process which has considered the risks across all the WDC water supplies and prioritised the greatest risks for prioritised improvement. The improvements specific for Raglan have been included in this plan.

Each element of the Raglan water supply system has been reviewed using the Ministry of Health's (MoH) revised Water Safety Plan Framework (referred to as "the framework").

The following components of the framework are included in the Raglan WSP:

- Commitment to drinking water quality
- Assessment of the drinking-water supply for hazards, hazardous events, and risks
- Existing preventive measure
- Operational procedures
- Verification monitoring and inspection programme
- Improvement plan
- Management of incidents and emergencies
- Documentation and reporting
- Investigation
- Oversight, review and continual improvement

The Raglan WSP must be viewed together with the following documents:

- Raglan Water Supply Catchment Survey
- Raglan Water Supply Risk Register - Version 3.0

WDC WSPs have been developed to include Critical Control Points (CCPs). The CCPs are the process controls that control the water supply system, have defined limits and are monitored at a frequency to ensure that any failures are detected in time for action to be taken.

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DOCUMENT CONTROL

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AMENDMENTS

Requests for amendments or revisions of the manual are made to the Document Controller, who has the responsibility of reviewing requests and implementing amendments or revisions to the document.

Amendments and updates are documented in the Table 1: Document Control Record on page 2.

Amendments or revisions of the manual will result in a new version number and date in the footer.

GLOSSARY

Acronym	Expanded
AMP	Asset Management Plan
APHA	American Public Health Association
AWWA	American Water Works Association
CCP	Critical Control Point
CBD	Central Business District
CEO	Chief Executive Officer
Citrix	Waikato District Council System
DWSNZ	Drinking Water Standard of NZ 2005 (revised 2018)
DWA	Drinking Water Assessor
E. coli	Escherichia coli
EIR	Event Investigation Report
FAC	Free Available Chlorine
FACe	Free Available Chlorine equivalent (found by calculation)
FD	Functional Description
GIS	Geographic Information System – satellite-based mapping
GV	Guideline Value
IANZ	International Accreditation New Zealand
IEC	International Electrotechnical Commission
ISO	International Organisation for Standardization
MoH	Ministry of Health
NTU	A measure of turbidity
PLC	Programmable Logic Controller
pH	A measure of acidity / alkalinity (pH 7 = neutral)
SCADA	Supervisory Control and Data Acquisition
SOP	Standard Operating Procedure
UVT	Ultraviolet Transmittance
WSP	Water Safety Plan
WDC	Waikato District Council
WSL	Watercare Services Ltd
WTP	Water Treatment Plant

1. COMMITMENT TO DRINKING-WATER QUALITY MANAGEMENT

WDC is committed to the provision of safe and secure drinking-water for its consumers and to the future improvements that have been identified in this WSP. The organisational commitment to drinking-water quality management is signed by WDC/WSL and is included as Appendix 1A and 1B with this document.

Relationship of WSP to organisational policy and strategy

The provision of safe and secure drinking-water is visible in the company's organisational policy and strategy. WDC has established a comprehensive strategic and organisational framework in all other organisational policies and strategic planning documents that refer to drinking-water management.

Title	To access listed document
Waikato District Council AMP 2020-21	www.waikatodistrict.govt.nz
Waikato District Council LTP 2018-2028	www.waikatodistrict.govt.nz

Engaging Stakeholders

A list of all stakeholders who could affect or be affected by decisions/activities to do with the Raglan drinking-water supply, e.g. DWAs, MoH, local territorial and regional authorities, iwi, any politicians, local council and others are listed in the Appendix 2.

The Waikato District Council stakeholder/ Communications team maintains relationships with councillors and local board members and responds to queries they receive from their constituents about water quality, providing up to date results and confirmation that compliance is maintained. These elected officials, along with the public, are given the opportunity to visit treatment plants at various times throughout the year. The long-term stakeholder engagement report along with the stakeholder engagement plan template is included in Appendix 3

The delivery of Drinking Water to the community in Raglan is a joint commitment between Waikato District Council and Watercare and the Water Safety plan has been developed collaboratively. The CEO's of both organisations have endorsed the Water Safety Plan. Waikato District Council has retained responsibility Stakeholder liaison and provide customer facing activities.

Staff employed in each water supply area receive training specific to their operational area to ensure that they understand the scope of their role, can undertake required tasks safely and are competent in the delivery of their 'business as usual' responsibilities. Staff work under the supervision of experienced staff until such time as they undertake a competency assessment from their respective supervisor.
In addition to the task specific training, Watercare also focuses on the professional development of staff, for example:

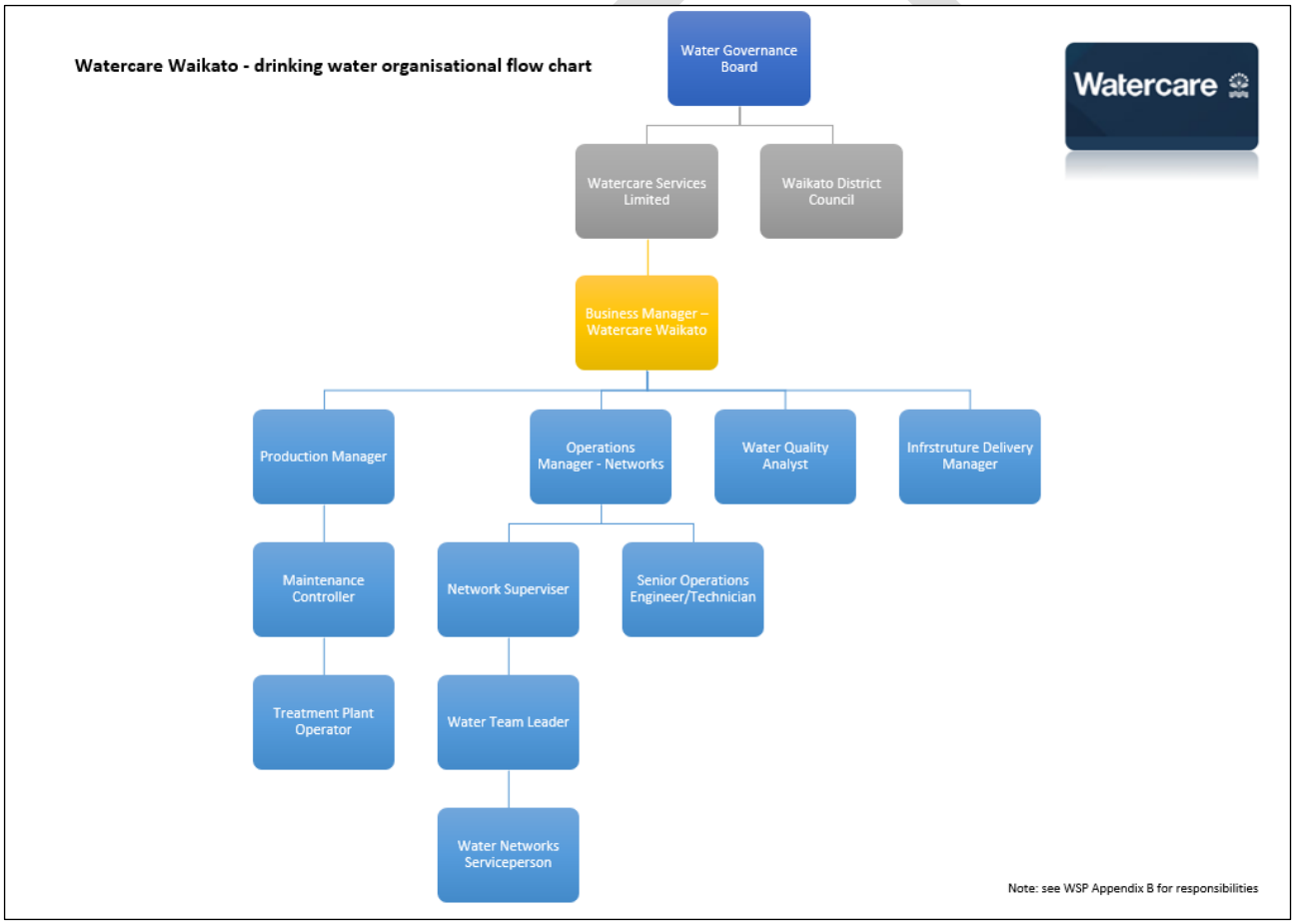
- Following initial water treatment plant-based training, operators, process technicians and process engineers are enrolled to complete either their National Certificate in Drinking-water Treatment or the National Diploma in Drinking-water Treatment. The training undertaken is dependent on prior qualifications obtained and resource availability.
- Health and Safety training, specific to role requirements.

Watercare has developed significant in-house water supply system technical and engineering capabilities. This capability development has been in recognition of the need for greater technical capability dedicated to the management of water supply risks.

Long-term employee engagement plan on awareness and involvement in safe and secure drinking-water is included in the training matrix programme Appendix 4

All training is recorded in Watercare's Draft Training Matrix Programme can be found O:\Ops\Watercare Waikato\Training.

The format of the training has been revised by WSL since the commencement of the operations and maintenance contract and work is continuing to fully population the matrix. The completed matrix is available to review on request.



The core team that lead the WSP development includes senior management, technical specialists, operational team leaders, process engineers, and water quality scientists. The senior staff within this core team hold the authority to make decisions and enact changes. They also have extensive knowledge of the legislative requirements around WSP development.
These team members have a wide range of expertise and years of experience in drinking-water production, distribution, and risk management.

Engaging Community

WDC consumer engagement strategy is led by our Communications and Customer Teams. WDC consumer engagement programmes are listed on our public website and explain how the customers and community are involved in drinking-water initiatives including water conservation measure.
When there is a change to a community's water supply, WDC uses these channels to inform people in advance and during the change.

As part of this project the following communications were made:
There is an active two-way communication program to receive customer complaints/concerns/suggestions.

Communication with community during incidents and emergencies are documented in the Incident Response plans below and can be found O:\Ops\Watercare Waikato\Training\Response Plans.

Respond to E. coli in the Network	2017
High Chlorine in Network Response Plan	2017
Low Chlorine in Network Response Plan	2017
Boil Water Communications Plan	2020

Consumer Satisfaction

Monitoring consumer comments and complaints is a vital part of WDC operations. Customer complaints are recorded on WDC property and rating database as a service request. Information on actions taken to resolve complaints and the outcomes of these actions are also recorded on the database.
Waikato District Council ensures the standard operating procedure is followed per Appendix D

- Information is made available to customers through the website/Facebook; direct mail; newsletters, and by phone
- Regularly reviewing what can be done better or differently, to reduce customer problems and complaints

Information on WDC community involvement is detailed on the website on this page:
www.waikatodistrict.govt.nz/your-council/public-consultations/current-consultations

2. ASSESSMENT OF THE DRINKING-WATER SUPPLY SYSTEM

Introduction to Waikato District Council water supplies

The Waikato District is located in the Northern Waikato region and has a resident population of 79,900 (2018 census) which is relatively evenly mixed between urban and rural. The main urban populations are centred in the towns of Huntly, Ngaruawahia, Raglan, Te Kauwhata, Pokeno and Tuakau. The community of Raglan has a usual resident population of about 3280 (2018 census).

WDC is responsible for the management and operation of the public water supply systems across the Waikato District Council which include nearly 700km of reticulation, eight water treatment plants with a total capacity of 19,000 cubic metres per day and 30 reservoirs with a total capacity of 19,527 cubic metres. Council also has an agreement with Hamilton City Council to take up to 12,000 cubic metres per day, Watercare to take

up to 5000 cubic meters per day and Te Kauwhata Water Association to take up to 4000 cubic metres per day for parts of the district. The supplies are managed by Watercare Services staff as per the operations and maintenance contract WDC has had in place from 1 October 2019. All residential properties have been metered since 2017. In addition, all commercial and industrial properties are metered. WDC operates a 24-hour call centre for customer complaints about faults and a 24-hour operation on-call service to address issues as necessary.

On the 1st of October 2019 Waikato District Council entered in a long-term Operations and Maintenance Contract with Watercare Services Limited. The contract encompasses all aspects of water and wastewater operations, maintenance, planning and customer activities. All Waikato District Staff involve with Water and Wastewater servicing were transferred to Watercare. The ex WDC staff are supplemented and supported by Watercare staff when required. The contract is currently in a 21-month transition period and will become fully operational on the 1st of July 2021 excluding all customer facing activities (including billing and faults management) which will transfer to Watercare on 1st of July 2022.

The location is shown in Figure 1 below.

Figure 1: Raglan Water Supply location

Raglan Water Supply - Overview of Raglan Spring, WTP, Reservoirs, pump station and Network

The Raglan Spring intake is located by Te Hutewai Road which is .25 km from the Raglan WTP. WS Pump Station is located by Hills Road Reservoir (1250 m3) which is 5.76 km (overland) from the Raglan WTP and 2.78km from Bow Street Reservoir (1000 m3).

The Te Hutewai Road Spring Reservoir (1136 m3) level controls the overall production requirements of the Raglan WTP with the reservoir also functioning as a chlorine contact tank.

The Bows Street and Hills Road Reservoir are connected to the distribution system through a gravity outlet from the Springs Reservoir. Treated water from the Raglan WTP is pumped to the Raglan distribution WSP.

The Raglan WTP and associated pump stations have been designed as an automated facility that operates with routine staff visits. Under normal operating conditions, the treatment process is stable and operates reliably with little operator intervention. Under abnormal conditions, increased operator input and on-site presence may be required. Abnormal conditions include process instability or equipment failure.

The site is visited at least once a week to allow staff to perform routine process monitoring procedures and, undertake schedule maintenance. Staff also respond on site to unplanned events on-site. Outside of working hours Scada trends are reviewed and monitored by the on-call operator twice a day. Alarms are sent via text message to the on-call operator via the eye-know text alert system. The operator then needs to log on to SCADA and review the alarm and either acknowledge the alarm or undertake other responses as appropriate.

The Raglan WTP supplies drinking-water to the community of Raglan with registered population of 3280people. The Health Act 1956 defines Raglan water supply as a minor networked supply.

Drinking Water Online (DWO) registration details are listed in Table 3, below:

Table 3: Drinking Water Online Registration Details

Name	Type	Code	Population	Owner Organisation
Community	Raglan	RAG001	4,000	Waikato District Council
Zone	Raglan	RAG001RA	4,000	Waikato District Council
Plant	Raglan	TP00128	4,000	Waikato District Council
Source	Spring Raglan	G00464		Waikato District Council

Process description - Overview of Raglan Spring, WTP and Network

Raglan Spring intake and Pump Station are located by Te Hutewai Road which is .25 km from the Raglan WTP and 5.76 km (overland) from the Raglan WTP and 2.78km from Bow Street Reservoir.

Raw water is pumped from the Raglan Spring and treated at the WTP prior to the entry into Bow Street and Hill Roads Reservoir. The duty/standby raw water pumps start and stop based on the level in the Onsite treated water Reservoir and operate at a controlled flowrate via variable speed drive to maintain optimum flow while sustaining spring weir level setpoints.

Raglan Spring is a non-secure bore water source that is assumed to have a level of source risk consistent with a surface water source and is required to meet protozoal compliance as specified in the DWSNZ Section 5.2.1.1. Although the DWSNZ requirements for non-secure bores, including springs, is 2-log if bacterial

compliance is met by chlorination, the DWO log credit requirement assigned to Raglan Spring is 3-log. The Raglan WTP treatment process achieves this 3-log credit requirement.

Raw water passes through UV and chlorine disinfection.

All water passes through a fixed dose UV disinfection unit which provides the required protozoa barrier, as defined by DWSNZ, to achieve 3-log protozoa removal/inactivation. The Wedeco Spektron 250e UV validation certificate is included in Appendix 5.

Water is dosed with chlorine before going to the onsite reservoir for contact time to achieve the required CT value of at least 6 for at least 98 percent of the compliance monitoring period. The automatic dosing control is based on the values set by the operator on the instruments, the PLC provides input to the automatic controller to regulate the amount of chlorine dosed. Chlorine dosing provides disinfection residual for the distribution network and an additional bacterial contamination barrier.

Following treatment, the water is stored in the onsite treated water reservoir (High Pressure) and the flows by gravity to the distribution system approximately two thirds of the water flows to Bow Street Reservoir (Low Pressure) and Hills Road Reservoirs (Boosted Pressure).

The water is supplied to consumers within the Raglan township by a mix of gravity supply and pumped supply.

There are two storage reservoirs, Bow Street and Hills Road. Bow Street reservoir supplies the CBD via gravity and Hills Road is fed via gravity which is used to boost the elevated parts of the network for high demand period use.

Water flow and level are monitored to ensure coordinated supply/demand management. Scada alarms are responded to by the productions and operations team via Eye-know monitoring system.

A flow diagram of the Raglan WTP is shown in Figure 2.

An assessment of the WTPs performance is based on the data collected from on-line instruments and physical sampling which includes:

- Flow
- Turbidity
- FAC and pH
- UV intensity and UVT
- Sample results for *E. coli*, total coliforms, pH, FAC and turbidity as well as other parameters as per sampling programme

Details of the equipment analysers number, description, make and model together with verification and calibration frequencies are specified in the SOP's and recorded, as well as the function (compliance, monitoring or control) are recorded in WDC Calibration SOP included as Appendix 6.

SCADA Control

WTP and reservoir equipment are connected to both a Remote Telemetry Unit with data logging functions, and a Programmable Logic Controller (Plant PLC). Controls are shared between these systems and they communicate to execute required actions.

The telemetry system relays all continuously monitored data via radio signal, to the WDC SCADA System which is accessible remotely (e.g. via Citrix and water outlook on laptops and mobile devices). When key equipment faults or process variables fall outside of pre-set limits (as measured by on-line analysers) the control system will generate alarms. Alarms are received on operators' phones using the Eye-Know software. Critical alarms are selected based on the potential impact to treated water quality, this will initiate an automatic WTP shutdown.

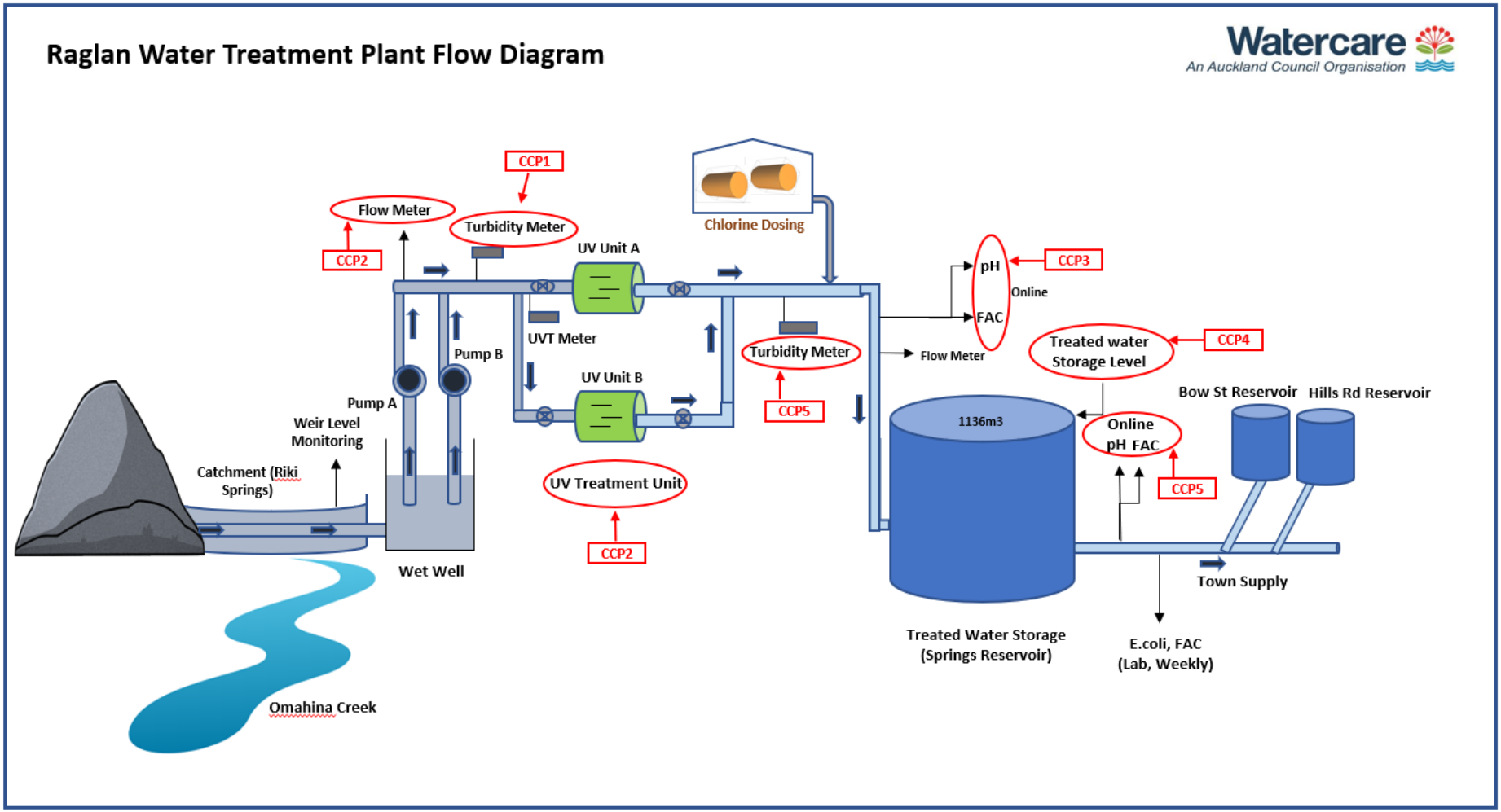


Figure 2: Raglan water supply Flow Diagram

Risk Assessment Framework

The risk assessment methodology used is consistent with the MoH WSP Framework WDC Risk Management Framework.

Potential public health risks have been evaluated using the Likelihood and Consequence scales tabulated below to determine a risk level – low, medium, high or extreme. The assessed risk level allows prioritisation of the associated improvement measures.

Hazards, hazardous event identification, risk assessment, preventive measures and corrective actions are documented in the Reglan Water Supply Risk Register included with this WSP.

The Risk Register Guidance document for each component of the risk framework is included as Appendix 7

Preventive measures

Preventive measures across the drinking-water supply system are based on a multi-barrier approach and continuous improvement.

Corrective Actions

These are taken in response to routine monitoring and inspections that indicate a preventive measure is deviating from expected performance. They re-establish control of the system usually by system adjustments.

Incident and emergency plans are activated when normal corrective actions cannot re-establish operational performance quickly enough to prevent drinking-water of an unacceptable quality from reaching consumers.

For the majority of water safety related risks, the likelihood of occurrence can be reduced by preventive measures and corrective actions. When considering the estimates of likelihood and consequence of the risk eventuating, WDC reviews current and historical monitoring data to assess the level of confidence (uncertainty descriptor) that can be placed on these assessments. Where confidence is low, or supporting information is limited, this is included in the assessment level assigned to the risk.

3. Critical Control Points

The critical control points (CCPs) and their purpose at Raglan water supply, are described in Table 5, below. The Raglan water supply flow diagram, shown in Figure 2, describing the location of the CCPs relative to the installed process barriers.

The CCPs are the process barriers and monitoring points implemented to control/manage drinking water quality risks. The CCPs for the Raglan water supply have defined limits and are monitored at a frequency to ensure that any failures are detected in time to take action to eliminate potential public health risks associated with the supply of drinking water, or to minimise these risks to an acceptable level.

The defined limits for the CCPs are described as follows:

- Target limit (operational parameters) is designed to allow checks on control and are monitored continuously.
- Action limit (performance limits) is designed to show when optimum control is lost, and corrective action needed. This is monitored continuously with alarm limits. Corrective actions are defined for when performance limits are not met.

- Critical limit is designed to shut down WTP if corrective actions fail to regain control and mitigate risks to public health.

Table 4: Critical Control Points (CCP)

CCP Description	Main Function and Defined Limits
CCP 1: Turbidity monitoring on the water entering UV.	Reduce turbidity prior UV disinfection Defined limits for this CCP are: **Target limit:** Turbidity 0.020 NTU to 0.050 NTU **Action limit:** Turbidity > 0.150 NTU for 60 seconds **Critical limit:** Turbidity > 0.300 NTU for 60 seconds If the on-line turbidity reaches the critical limit, a critical alarm is activated, and the WTP goes into automatic shutdown.
CCP 2: UV Disinfection on-line UV Intensity (UVI), UVT and flow.	To meet protozoa compliance criteria. Defined limits for UV dosed flow are: **Target limit:** 150m3/hr (41.66L/s) **Critical limit:** 160m3/hr* (Maximum design flow 44 L/s) Defined limits for UVI are: **Target limit:** >70 W/m^2 **Action limit** ≤ 60 W/m^2 for 30 seconds **Critical limit:** ≤ 50 W/m^2 for 30 seconds Defined limits for UVT are: **Target limit:** 100% **Action limit:** 90% **Critical limit:** 85% If on-line UVI or UVT reach critical limit, a critical alarm is activated, and the WTP will enter a rapid shutdown state. *If abstraction flow exceeds 160 m3/hr, a critical alarm is activated and the WTP will enter a rapid shutdown state.
CCP3: FAC monitoring	To maintain effective chlorine residual in the network. Defined limits for final water FAC are: **Target limit:** FAC between 0.70 – 0.80 mg/L **Action limit:** FAC < 0.50 mg/L for 60 seconds **Critical limit:** FAC < 0.40 mg/L for 60 seconds If on-line FAC reaches the critical limit, the WTP will shut down
CCP 4: Treated water storage level	Security of supply Defined limits for water level are **Target limit:** between 85% to 95% **Action limit:** 65% **Critical limit:** below 60%

CCP Description	Main Function and Defined Limits
CCP 5: Online final water FACe to achieve CT value of at least 6 for at least 98 percent of the compliance monitoring period.	To maintain effective chlorine residual in the network. Defined limits for final water FAC are: **Target limit:** FAC between 0.70 – 0.80 mg/L **Action limit:** FAC < 0.50 mg/L for 60 seconds **Critical limit:** FAC < 0.40 mg/L for 60 seconds If on-line FAC reaches the critical limit, the WTP will shut down. Defined limits for pH are: **Target limit:** pH 7.8 **Action limit:** pH > 8 for 60 seconds **Critical limit:** pH > 8.2 for 60 seconds This site currently has no control to shut down plant operations if pH reaches critical limit. FACe-Network (Sampling program weekly) **Target Limit:** between 0.70 mg/L to 0.8 mg/L **Action limit:** < 0.40 mg/L **Critical limit:** < 0.20 mg/L Turbidity measurements used for CT calculation is from CCP5 on the flow diagram as the turbidity throughout the process and reservoir is consistent and verified by weekly DWS sampling data from the Raglan reticulation. Supporting data provided as Appendix 9. GM 04/06/21

3.1. CCP limits preventive measures and corrective actions:

	CCP1- Turbidity monitoring on water entering UV	**CCP2**- UV Disinfection on-line UV Intensity (UVI), UVT and flow.	**CCP3**- FAC monitoring	**CCP4**- Treated water storage level	**CCP 5**- Online final water FACe to achieve CT value of at least 6 for at least 98 percent of the compliance monitoring period
Target limit preventative measure	Routine instrument Verification/Calibration by internal staff or external service provider. Daily compliance trend check by Operators. Routine flushing of turbidity analyser sample line and sampling chamber by Operators.	Servicing and maintenance of UV dosing system equipment by internal staff or external maintenance service provider. UVI sensors verified monthly and replaced annually by external service provider UV flow meters verified annually by external service provider Daily compliance trend check by Operators.	Servicing and maintenance of Chlorine dosing system equipment by internal staff or external maintenance service provider. Online monitoring and alarming for Chemically Conditioned Water FAC to provide an early indication of Chlorine dosing issues to Operators. Routine instrument Verification/ Calibration. Regular handheld measurements by Operators. Daily compliance trend check by Operators.	Levels trend check by Water Treatment Operator	Servicing and maintenance of Chlorine dosing system equipment by internal staff or external maintenance service provider. Online monitoring and alarming for Chemically Conditioned Water FAC to provide an early indication of Chlorine dosing issues to Operators. Routine instrument Verification/ Calibration. Regular handheld measurements by Operators. Daily compliance trend check by Operators.
Target limit corrective actions (mitigations)	Clean analyser sample line and sampling chamber.	Operations team to organise the cleaning and servicing of UV	Operators to change chlorine dosing train duties, if required.	Adjust production flow set point to	Operators to change chlorine dosing train duties, if required.

	CCP1- Turbidity monitoring on water entering UV	**CCP2**- UV Disinfection on-line UV Intensity (UVI), UVT and flow.	**CCP3**- FAC monitoring	**CCP4**- Treated water storage level	**CCP 5**- Online final water FACe to achieve CT value of at least 6 for at least 98 percent of the compliance monitoring period
	Re-verify/calibrate instrumentation, if required by internal staff or external service provider.	lamp sleeves and replace lamps if required. Operators to change UV train duties as required.	Internal staff or external service provider to re-verify/calibrate instrumentation, if required. Operator to adjust Chlorine dose rate set point to achieve target chlorine residual. Operator to check for any changes in raw water quality that may account for an increase in chlorine demand. Operations team to organise maintenance of Chlorine dosing system equipment, if required.	achieve required reservoir levels. Continue monitoring /trending reservoir level	Internal staff or external service provider to re-verify/calibrate instrumentation, if required. Operator to adjust Chlorine dose rate set point to achieve target chlorine residual. Operator to check for any changes in raw water quality that may account for an increase in chlorine demand. Operations team to organise maintenance of Chlorine dosing system equipment, if required.
Action limit preventive measure	As per Target limit corrective actions	As per Target limit corrective actions	As per Target limit corrective actions	As per Target limit corrective actions	As per Target limit corrective actions

	CCP1- Turbidity monitoring on water entering UV	**CCP2**- UV Disinfection on-line UV Intensity (UVI), UVT and flow.	**CCP3**- FAC monitoring	**CCP4**- Treated water storage level	**CCP 5**- Online final water FACe to achieve CT value of at least 6 for at least 98 percent of the compliance monitoring period
Action limit corrective actions (mitigations)	A control system warning alarm will be generated if turbidity reaches the Action limit. Operator to manually clean the turbidity analyser sample line and sampling chamber. Verify/ calibrate the instrument.	A control system warning alarm will be generated if UV intensity or UV flow reaches the Action limit. Operations team to organise the cleaning and servicing of UV lamp sleeves and replace lamps if required. Operators to change UV train duties as required.	A control system warning alarm will be generated if Treated Water FAC reaches the Action limit. Operators to change chlorine dosing train duties, if required. Internal staff or external service provider to re-verify/calibrate instrumentation, if required. Operator to adjust Chlorine dose rate set point to achieve target chlorine residual. Operator to check for any changes in raw water quality that may account for an increase in chlorine demand. Operations team to organise maintenance of Chlorine dosing system equipment, if required.	Network staff to monitor zone usage. Water Conservation or restriction by stakeholder communication.	A control system warning alarm will be generated if Treated Water FAC reaches the Action limit. Operators to change chlorine dosing train duties, if required. Internal staff or external service provider to re-verify/calibrate instrumentation, if required. Operator to adjust Chlorine dose rate set point to achieve target chlorine residual. Operator to check for any changes in raw water quality that may account for an increase in chlorine demand. Operations team to organise maintenance of Chlorine dosing system equipment, if required.

	CCP1- Turbidity monitoring on water entering UV	**CCP2**- UV Disinfection on-line UV Intensity (UVI), UVT and flow.	**CCP3**- FAC monitoring	**CCP4**- Treated water storage level	**CCP 5**- Online final water FACe to achieve CT value of at least 6 for at least 98 percent of the compliance monitoring period
Critical limit preventive measure	As per Action limit corrective actions	As per Action limit corrective actions	As per Action limit corrective actions	As per Action limit corrective actions	As per Action limit corrective actions
Critical limit corrective actions (mitigations)	A control system critical alarm will be generated if raw water turbidity reaches the Critical limit. The Duty raw water pump will automatically shut down. Operator to manually clean turbidity analyser sample line and sampling chamber. Verify/ calibrate the instrument. If turbidity remains elevated, undertake further source investigation by Operator.	A control system critical alarm will be generated if UV intensity or flow (abstraction) reaches the Critical limit. The UV reactor will trip and the plant will enter a rapid shutdown state Operations team to organise the cleaning and servicing of UV lamp sleeves and replace lamps if required. Operators to change UV train duties as required.	A control system critical alarm will be generated if Treated Water FACe reaches the Critical limit. The plant will enter a rapid shutdown state. Operator to investigate cause of chlorine dosing system failure, and restart the plant only after the cause of failure has been identified and resolved.	Water Conservation or restriction by stakeholder communication. Implement alternative supply via External Service provider (MoH approved tankers)	A control system critical alarm will be generated if Treated Water FACe reaches the Critical limit. The plant will enter a rapid shutdown state. Operator to investigate cause of chlorine dosing system failure, and restart the plant only after the cause of failure has been identified and resolved.

Table 5: Monitoring requirements to comply with the DWSNZ for Raglan WTP

Compliance Monitoring at the WTP Treatment plant code: **TP00128 Raglan**								
Population served	**Determinand**	**MAV**	**Associated hazard**	**DWSNZ compliance criterion**	**Sampling frequency**	**Maximum days between samples**	**Minimum days of the week to be used**	**Response to exceedances (DWSNZ compliance requirements)**
4,000	*CT* *Turbidity*	*As per continuous requirements of Section 4.2.2.a*	Bacteria	Criterion 2A	FAC, pH, Turbidity, CT all continuous	N/A	N/A	Figure 4.1
4,000	Protozoa	*<1 oo(cyst)/ 100L*	Protozoa	Section 5.16.1 (1, 2b(i), 3a(ii), 4) Section 5.16.3 (1, 2a(i), b(ii), 3)	UVI (continuous) Turbidity (continuous) Flow (continuous) UVT (continuous) Lamp outage (continuous)	N/A	N/A	Figure 5.2
Sampling Location Name: Raglan WTP								
Compliance Monitoring in the Distribution Network Distribution zone code: **RAG001RA**								
Population served	**Determinand**	**MAV**	**Associated hazard**	**DWSNZ compliance criterion**	**Sampling frequency**	**Maximum days between samples**	**Minimum days of the week to be used**	**Response to exceedances (DWSNZ compliance requirements)**
4,000	*E. coli**	*<1 E.coli/* 100ml	Bacteria	Criterion 6A	Required: 13 per quarter Actual: 22 per quarter	Required: 11 Actual: 6	Required: 5 Actual: 7	Section 4.3.6 Figure 4.2
Sampling Location Names: Bow St Reservoir, Hills Reservoir, Ocean Beach Reserve area, Raglan Wharf, Skate Park area Toilet								

* For compliance testing, a method that enumerates total coliforms and *E.coli* is used. Response to detections of *E. coli* and total coliforms is documented in the response plans.

4. VERIFICATION MONITORING PROGRAMME

Monitoring Programmes, Laboratory Sampling and Testing

The laboratory sampling and analysis programmes for Raglan Spring, Raglan WTP and distribution have been developed from risk assessments, requirements of the DWSNZ and process monitoring requirements. The monitoring programme is reviewed on an annual basis or as required during the year due to changing operational requirements.

The compliance monitoring plan that meets the requirements of its supply-specific compliance monitoring as set out in the DWSNZ.

Procedures for responding to transgressions and non-compliances with the DWSNZ are documented in the O:\Ops\Watercare Waikato\Training

Short-Term Evaluation of Results

The following tools are utilised by WDC for the ongoing review and evaluation of results:

- Daily monitoring of compliance sample results via SCADA
- Working alongside the Customer team to monitor complaints
- Daily, weekly, monthly, and annual water quality reports
- Feedback from the management team
- Review of the previous water quality incidents via the Incident Investigation Report process

A review of previous water quality incidents for causes and the effectiveness of responses is part of the internal event investigation process. An Event Investigation Report template is included in Appendix 8

Long-Term Evaluation of Results

WDC water quality trends for source, treated and reticulation water are reviewed daily as part of procedures by WSL Production Manager, Process Engineer and Treatment Plant Operators to understand the treatability, hazards and past events. The WSL Maintenance Controller is provided information and assesses over time along with following specific extreme events for trends, exceedances, major variations, abnormal results and absence of results. This also the maintenance schedule to be adjusted as required.

The Water Quality Analyst conducts yearly analysis of compliance result or trends and reviews the sampling regime accordingly.

Laboratory Service Provider

Until the 1st of October 2020 the sampling and water quality testing is contracted to Shared Services Laboratory located at Hamilton City Council. This laboratory is IANZ accredited to NZS/ISO/IEC 17025 for the chemical and biological examination of waters, wastewater, and environmental monitoring and is approved by the Ministry of Health to undertake sampling and testing for compliance purposes. All accredited test methods are confirmed by an IANZ audit. Laboratory staff undergo regular training to comply with the NZS/ISO/IEC 17025 standard. Sampling and water quality testing undertaken by Watercare Laboratory

Services located at 52 Aintree Avenue, Mangere since 1st of October 2020. This laboratory is similarly IANZ accredited to NZS/ISO/IEC 17025 for the chemical and biological examination of waters, wastewater, and environmental monitoring and is approved by the Ministry of Health to undertake sampling and testing for compliance purposes. All accredited test methods are confirmed by an IANZ audit. Laboratory staff undergo regular training to comply with the NZS/ISO/IEC 17025 standard.
Sampling protocols are in accordance with Standard Methods for the Examination of Water and Wastewater, 20th Edition, published jointly by the APHA, AWWA, and WEF.

Instrumentation

The Raglan WTP and distribution incorporate a number of analysers for the provision of real time information on the system operation to staff. They are used for a number of purposes including:

- Identification of parameter trend changes
- Operational control
- Compliance with standards

The analyser indications are displayed on the HMI SCADA displays at the WTP.
The analysers have been provided with alarm points which if reached will generate an alarm through SCADA to indicate a potential operational problem to staff.

The procedures for routine validation, calibration and verification of the performance of the equipment are recorded in the WDC Calibration SOP. Calibration and verification schedules are linked to the Operations and Maintenance Manual. A sample SOP is included as Appendix 6

The Raglan water supply specific calibration and instrument maintenance schedules have been developed and are kept on site and in WDC system called Water Outlook. Most instrument calibrations are carried out by the treatment Plant operators and Chemfeed (a specialist contractor)

5. CONTINGENCY PROCEDURES

If contamination was to occur, or be suspected to have occurred, the following actions should be taken:

Contingency plan is included into current Raglan WSP, to prevent recurrences where able a review of procedures is planned as part of improvements

Type of Event	Required Contingency Action
Contamination of source water (treatment is ineffective)	Boil Water Communications Plan following the appropriate the SOP
P 1 and 2 determinands transgression in water leaving treatment plant or distribution zone	Response per DWSNZ following the “Respond to E. coli in the network” SOP
Loss of power supply to treatment plant	Determine length of power outage and follow “Transport and Install Raglan Generator” SOP
Natural Disaster including earthquake and flow	Boil Water Communications Plan following the appropriate the SOP

6. DOCUMENTATION AND REPORTING

Scheduled operational reports on water quality are prepared on a daily, weekly, monthly quarterly and annual basis depending on the focus of the report and its intended audience. Additionally, customised reports of laboratory analysis data can be created with analytics software at any time. Water quality event reports are prepared in response to transgressions and other incidents for the attention of senior management and the DWA-unit for Waikato DHB

Annual water quality reports are prepared by WDC to report on compliance with the requirements of DWSNZ at the treatment plants and in the water supply network.

The report summarises WDC performance against its objectives set out in the Statement of Intent and provides an insight into the company's operations during the financial year. It provides both the strategic view of the business and the more detailed aspects of its day-to-day functioning and describes how WDC is turning to technology and innovation, while it realigns its culture and organisation.

7. INVESTIGATIONS

WDC takes any events related to the quality or quantity of water supplied to its customers and the associated investigations very seriously. During reactive investigations staff follow procedures and protocols to:

- Understand why potentially unsatisfactory performance has occurred and implement corrective measures as appropriate; and
- Ensure that issues are resolved effectively.

These procedures and protocols provide a detailed step-by-step process to follow in response to each type of water quality situation. This includes the criteria to determine when an investigation is needed; who has responsibility for the investigation; steps to take while it proceeds; and actions to be taken at its completion. A report containing investigation findings is completed for every water quality parameter breach incident. Investigations also inform planning and continuous improvement processes, identifying the need for future proactive investigations, project planning, and provide valuable ideas for the future suitable designs and best practice.

8. OVERSITE, REVIEW AND CONTINUAL IMPROVEMENT

Reporting of the WSP plan

A brief report on the performance of the plan, including information from the assessment of the plan will be provided by the Watercare to Waikato District Council annually on the anniversary of finalisation of the plan as part of the annual Water and Wastewater Business Plan. The report will cover the items listed in the assessment of the performance of the plan, listed above. Watercare will be responsible for ensuring that any matters requiring attention will be appropriately included into the Business Plan, Annual Plan or the Asset Management Plan for Water Supplies. If significant capital funding is required, then Watercare will include the matter into the Council approval process via the Water Governance Board and the Council Long Term Plan.

Five- yearly approval under the Health Act 1956

Watercare and Waikato District Council are committed to the long-term evaluation of results and a systematic review of operational monitoring, verification monitoring and inspection results. This enables the company to assess its overall performance against regulatory requirements and guidelines; identify emerging issues and trends and determine priorities for improving drinking-water quality.

The following tools are utilised by Watercare / WDC for the systematic review and evaluation of results:

- Annual Survey of Drinking-water Quality in New Zealand
- Watercare Project Management Framework
- Contracts Management Framework

WDC water supply system undergoes annual assessment, evaluation and audit by a number of regulatory bodies in the areas of health and safety, contracts management, finance and many others. Annual water quality and public health audits provide WDC with valuable and systematic evaluation of its drinking-water quality management system. These audits focus on grading, compliance with the DWSNZ and implementation of the WSPs.
Watercare's senior leadership team regularly review the consolidated information about the overall system performance.

Internal audits
The WSP internal audit process is consistent with WDC organisation-wide internal audit format. The following documents define the internal audit process:

- WSP Internal Audit Guideline
- WSP Internal Audit Schedule
- WSP Internal Auditor Log

Any non-conformances identified as a result of the internal audit are logged in the audit schedule and assigned to the person responsible to complete the task. The auditor maintains the schedule and will follow up on the completion of tasks.

WDC undertakes internal audits to ensure that the drinking-water quality management system is properly implemented and remains effective in ensuring drinking-water quality. Auditing is one of the key functions of the Water Contract Relationship team.

Audits are undertaken to ensure that the following system components are functioning as intended:

- Operational procedures
- Monitoring and inspection programmes, records and use of corrective actions
- Incident and emergency responses
- Staff training and competencies
- Delivery of the improvement plan

External audits

External audits of Watercare are conducted by the DWA-unit of the MoH. Watercare is also audited by Deloitte on service expectations and its Statement of Intent. Reports are provided by both auditing parties.

Review by senior leadership

A weekly meeting is held at Watercare's Hamilton office in which the overall system performance is reviewed and reported to the Watercare Waikato Business Manager and the Chief Operations Officer if required. Events, incidents and issues arising are all discussed, and actions are agreed upon.

Water quality performance is also reported via the Water Relationship Manager to the Water Governance Board at Waikato District Council. This reporting is focused on the measures documented in Watercare's operations and maintenance contract and includes District wide-level reporting of specific water quality and quantity related risks.

The Water Governance Board are also involved in the development and approval of funding cases to manage and maintain Watercare's commitment to the supply of safe drinking-water to Auckland's and Waikato District communities. Here, decisions regarding operational and capital expenditure are made based on the risk to Watercare's Waikato water supply systems.

9. IMPROVEMENT PLAN

Watercare's risk management strategy for Raglan water supply is based on the understanding of source water quality and quantity which is determined through routine monitoring of the groundwater.

Preventive measures across the Raglan WTP drinking-water supply system are based on a multi-barrier approach (single barrier for protozoa and dual barrier for bacteria) and continuous improvement. Engineering controls are also in place at the WTP. Risks are continuously evaluated based on process performance and issues/risks arising identified, assessed and improvements defined. Therefore, further improvements were identified for several risks.

These risks and improvements have been registered In the Raglan WTP Site Risk Register Version 3.0 and are summarised in Table 6, below.

Table 6: Improvement Plan for the Raglan WTP

Improvement	Objective	Priority	Actions to take	Accountability / Owner	Timeline	Temporary actions to reduce the risk
Treatment						
Undertake a review and Install Pre-treatment filtration at Raglan WTP	To introduce additional barrier in water protection	Medium	Undertake a review of the treatment processes at the Raglan WTP and Install Pre-treatment filtration	Infrastructure/ Production Manager	Mar-22	Continue to monitor raw and treated water quality.
Document Management System is being reviewed and Digital tools improved	To improve documents management and document control procedures.	Medium	Review document management system and improve digital tools	Digital Operations	Jul-22	Continual improvement
Inventory Management System supporting software under review in new software platform EAM	To meet the required drinking water quality/quantity objectives	Medium	Transition to EAM	Operations Manager	Jul-22	Continue to use current software tools
Upgrade Control System hardware and Software Spares Management Planning investigation underway. Looking at solutions to replace existing control system hardware and	To meet the required drinking water quality/quantity objectives	Medium	Upgrade Control System hardware and Software Spares Management Planning investigation underway. Looking at solutions to replace existing	Production Manager	Mar-23	Maintain current level of controls

Improvement	Objective	Priority	Actions to take	Accountability / Owner	Timeline	Temporary actions to reduce the risk
architecture. Undertake single point failure analysis			control system hardware and architecture. Undertake single point failure analysis			
Replacement of aging transformers onsite	To meet the required drinking water quality/quantity objectives	Medium	Engaging Wells for the replacement of aging transformers onsite	Production Manager	Jul-22	Continue monitoring power quality
Investigation underway as part of a wider review Reviewing appropriate security system solutions and enhancements. Complexity to impact on implementation.	To meet the required drinking water quality/quantity objectives	Medium	Review appropriate security system solutions and enhancements. Complexity to impact on implementation.	Production Manager	Ongoing	Maintain current security practices
Implement a 5-yearly assessment of chemical contaminants in the source water	To meet the required drinking water quality/quantity objectives	Medium	Review and align systems and processes to WSL systems	Production Manager/Water Quality Scientist	Jul-22	Continually review development and commercial activities within the catchment
Implement regular inspection of well and raw water main	To meet the required drinking water quality/quantity objectives	Medium	Implement regular inspection of well and raw water main	Production Manager	Ongoing	Maintain current schedule

Improvement	Objective	Priority	Actions to take	Accountability / Owner	Timeline	Temporary actions to reduce the risk
Preparing a Source Water Risk Management Plan for Raglan drinking-water supply	To prevent/manage any contamination from other private springs or bores abstracting from the same aquifer	Medium	Prepare a Source Water Risk Management Plan for Raglan drinking-water supply	Operations Manager	On-going until Source water Risk Management is required under the Water Services Act	Continually review development and commercial activities within the catchment; Quarterly full chemical analysis in place
Hatch alarm installation in progress	To meet the required drinking water quality/quantity objectives	Medium	Organise installation of Hatch alarm	Production Manager	Ongoing	Maintain current security practices
Create a 5 yearly inspection plan for Treated water reservoir	To meet the required drinking water quality/quantity objectives	Low	Create a 5 yearly inspection plan for Treated water reservoir	Production Manager/ Networks Operation Manager	Jul-22	Planned Preventative Maintenance
Review Drought Management Plan and Strategic Plan	To meet DWSNZ compliance while ensuring WSL high standard to distribute and treat water is completed effectively and efficiently	Low	Prepare a revised drought management plan	Operations Manager	Jul-22	Continue to use principles defined in the existing Waikato District DMP when assessing the impacts of drought on water supplies
Reticulation						
Replace ageing cast-iron and AC watermains as required under a planned capex renewal program to identify areas with large amounts of cast-iron and AC watermains	To meet required drinking water quality/quantity objectives of distribution networks	High	Replace ageing cast-iron and AC watermains as required under a planned capex renewal program to	Infrastructure Delivery Manager	Ongoing	Existing engineering controls and monitoring

Improvement	Objective	Priority	Actions to take	Accountability / Owner	Timeline	Temporary actions to reduce the risk
			identify areas with large amounts of cast-iron and AC watermains			
Adoption of the Watercare Waikato Backflow prevention policy in the Waikato District to allow compliance with the Health Act . Develop a programme to test all BPD's in the Raglan Zone annually - currently only a sample are tested annually	To eliminate chemical or microbial contamination - Backflow from consumer connections and to meet DWSNZ compliance	High	Transition to Watercare backflow policy and testing regime Expanding BPD annual survey programme include all BPD'd Additional resources including staffing Boundary fire supply devices to be managed by Watercare	WDC/WSL	Jul-23	Continue to use FDC backflow policy and continue to monitor Backflow devices
Undertake review of Security at Plant and Networks	To meet required drinking water quality/quantity objectives of distribution networks	High	Stricter provisions for network access through a Bylaw review. Ongoing education of contractors. Increased visibility of who is working on network through the implementation of activity trackers	Networks Operations Manager/ Production Manager	Jul-22	Maintain current security practices

Improvement	Objective	Priority	Actions to take	Accountability / Owner	Timeline	Temporary actions to reduce the risk
Increased operational monitoring Development of "the internet of things" – more sensors allow for increase real-time monitoring Resourcing Level investigation of potential for the installation of emergency by-passes at all Reservoirs	To meet DWSNZ compliance while ensuring WSL high standard to distribute and treat is completed effectively and efficiently	High	Increased operational monitoring. Resourcing level investigation to potential for the installation of emergency by-passes at all reservoirs	Networks Operations Manager	Jul-23	Continue to monitor treated water quality
Increased operational monitoring Ongoing maintenance and replacement of sample taps Resourcing levels investigations led by the Water Quality Science team Strict hydrant use policy New meter installation standards Adoption of the WSL Disinfection Code of Practice in the Waikato District increasing contractor awareness of the importance of water quality Increased external support from consultants Continued focus on international best practice	To meet DWSNZ compliance while ensuring WSL high standard to distribute and treat is completed effectively and efficiently	High	Increased operational monitoring. Ongoing maintenance and replacement of sample taps. Resourcing levels. Investigations led by the Water Quality Science team. Strict hydrant use policy. New meter installation standards. Adoption of the WSL Disinfection Code of Practice in the Waikato District.	Networks Operations Manager/ Water Quality Scientist	Ongoing	Continue to monitor treated water quality; Planned Preventative Maintenance

Improvement	Objective	Priority	Actions to take	Accountability / Owner	Timeline	Temporary actions to reduce the risk
			Increasing contractor awareness of the importance of water quality. Increased external support from consultants. Continued focus on international best practice.			
The Document Management System review	To meet required drinking water quality/quantity objectives of distribution networks	Medium	The Document Management System is being reviewed and Digital tools are being improved and being migrated to WSL Systems	Digital Operations/ Networks Operations Manager	Jul-22	Continual improvement of document management
Transition to EAM	To meet DWSNZ compliance while ensuring WSL high standard to distribute and treat is completed effectively and efficiently	Medium	Use EAM to proactively replace potential failure points	Networks Operations Manager	Jul-22	Continually monitor and maintain equipment to prevent unplanned failures

10. RAGLAN WTP SITE RISK REGISTER TABLE

The full list of risks 20210623_Raglan_WTPs Site Risk Register Reticulation_Rev3.0 and 20210623_Raglan_WTPs Site Risk Register Treatment_Rev3.0 be accessed through this link:

Link to Raglan WTP Risk Tables

The site risk register scores are assigned based on the Risk Register Guidelines document which includes guidance on how to assign likelihood and consequence scores. This document is included as Appendix 7

WDC reviews current and historical monitoring data to assess the level of confidence (uncertainty descriptor) that can be placed on the risks documented in the risk tables.

For risks registered for Raglan WTP the uncertainty descriptor has been defined as reliable based on the following inputs:

- At least 5 year of continuous data monitoring
- Biological and chemical Lab sampling as per DWSNZ monitoring requirements,
- Operation sampling based on WTP performance requirements, some seasonal variance & catchment risk
- Inspection and calibration records
- Good hazard and risk assessment
- Good understanding of preventative measures/processes

STANDARD OPERATING PROCEDURES

Operational procedures include a defined set of performance criteria to assess and confirm the performance of the components of the water supply.

Controlled copies of these documents are stored electronically in O:\Ops\Watercare Waikato\Training and are accessible by operations staff. Changes to the procedures must be approved by the person responsible for document control.

Staff records confirm that operations staff have been trained in procedures appropriate to and recorded in the Watercare (Waikato) Training Matrix 2019-20 which is saved electronically. Training records can be sighted at WDC offices during DWAs audits.

Operational and maintenance procedures have been prepared for all components of the water supply. Operational and maintenance procedures at Watercare are grouped as following:

- Standard Operating Procedures (SOPs)
- Functional Descriptions (FDs)
- Process related drawings (P&IDs and PFDs)
- Operational Manuals
- Calibration Manuals
- Maintenance Schedules

Operational Documents include a defined set of performance criteria to assess and confirm the performance of the components of the water supply. Performance criteria are defined across Watercare's water supply system based on the principal to allow enough time for actions to be taken to bring the system back under control before the DWSNZ compliance limits are breached. Due to the number of SOP's available WSL has not attached to this report but available for review if required. as an example, the isolation procedure has been attached.

Raglan water supply site-specific SOPs, FDs and Operations Manuals are listed in the table below

Title	To access listed document
Water Production	
Isolations Procedure	O:\Ops\Watercare Waikato\Training
Chlorine Gas Drum Changeover	O:\Ops\Watercare Waikato\Training
Physical Entry into Treated water reservoirs/chamber	O:\Ops\Watercare Waikato\Training
UV module Cleaning	O:\Ops\Watercare Waikato\Training
Manage a Level 1 Minor Local (Contained) Chlorine Gas Leak	O:\Ops\Watercare Waikato\Training
Manage a Level 2 Moderate Local (Contained) Chlorine Gas Leak	O:\Ops\Watercare Waikato\Training
Manage a Level 3 Major Local (Uncontained) Chlorine Gas Leak	O:\Ops\Watercare Waikato\Training
UV Sensor Check - Raglan	O:\Ops\Watercare Waikato\Training
Transport and Install Raglan Generator	O:\Ops\Watercare Waikato\Training
Spill Free Chlorine Buffer (solution)	O:\Ops\Watercare Waikato\Training

Manage spill of Phosphoric acid (solution)	O:\Ops\Watercare Waikato\Training
Enter Data into the weekly verification tab	O:\Ops\Watercare Waikato\Training
Enter data into water outlook primary calibration	O:\Ops\Watercare Waikato\Training
Manage SCADA On-Call and Alarm system – Treatment Plants	O:\Ops\Watercare Waikato\Training
Respond to SCADA Alarms for Treatment Plants	O:\Ops\Watercare Waikato\Training
Create a Trends Page on Archestra	O:\Ops\Watercare Waikato\Training
Perform a Calibration for the real UV254 (realtech)	O:\Ops\Watercare Waikato\Training
Perform a Primary Calibration for the Chlorine Analyser (Deplox 3)	O:\Ops\Watercare Waikato\Training
Perform a Primary Calibration on the Hach Turbidimeter	O:\Ops\Watercare Waikato\Training
Perform a Primary Calibration on the pH Analyser (Crius)	O:\Ops\Watercare Waikato\Training
Perform a Primary calibration on the pH analyser (Depolox 3)	O:\Ops\Watercare Waikato\Training
Perform a Primary Calibration on Treated Water Chlorine Analyser	O:\Ops\Watercare Waikato\Training
Perform a Verification for the Chlorine Analyser (Crius)	O:\Ops\Watercare Waikato\Training
Perform a Verification for the Chlorine Analyser (Depolox 3)	O:\Ops\Watercare Waikato\Training
Perform a Verification for the Hach Turbidimeter	O:\Ops\Watercare Waikato\Training
Perform a Verification for the pH Analyser (Crius)	O:\Ops\Watercare Waikato\Training
Perform a Verification for the pH Analyser (Depolox 3)	O:\Ops\Watercare Waikato\Training
Undertake a Water Shutdown (Planned or unplanned)	O:\Ops\Watercare Waikato\Training
Operations	
Carry Out Reservoir Inspections	O:\Ops\Watercare Waikato\Training
Customer Water Quality Complaint	O:\Ops\Watercare Waikato\Training
Flush a water main (routine and Reactive)	O:\Ops\Watercare Waikato\Training
Install _ Replace a Faulty Water Meter	O:\Ops\Watercare Waikato\Training
Inspect and Test Hydrants	O:\Ops\Watercare Waikato\Training
Installing a New Hydrant or Valve	O:\Ops\Watercare Waikato\Training
Investigate a Water Pressure or Flow Complaint	O:\Ops\Watercare Waikato\Training
Manage SCADA On-Call System - Reticulation	O:\Ops\Watercare Waikato\Training
Perform a chorine test to check for potable water	O:\Ops\Watercare Waikato\Training
Remove _ Reinstall Flow Restrictors in Rural Metered Water Connections	O:\Ops\Watercare Waikato\Training
Repair a Major Water Break	O:\Ops\Watercare Waikato\Training
Repair a Minor Water Break	O:\Ops\Watercare Waikato\Training

Undertake a Water Shutdown (Planned or unplanned)	O:\Ops\Watercare Waikato\Training

FUNCTIONAL DESCRIPTIONS

Title	To access listed document
Raglan Water Treatment Plant Upgrade Operation and Maintenance Manual Volume 1	Available at WSL Te Rapa Office and on site at Raglan WTP

MAINTENANCE SCHEDULES

WDC utilises an extensive planned maintenance programme to ensures asset protection, asset efficiency and appropriate maintenance of assets.

Delivery of maintenance work is managed by the maintenance connection system and Water outlook. Maintenance tasks and schedules are grouped into maintenance plans based on site specific requirements to ensure the rigor and due diligence applied for each process area.

Maintenance delivery work aims to optimise assets efficiency and assets integrity through managing the life cycle of assets to optimise cost, resilience and value of the assets. Assets condition and predictive maintenance is based on programs of work that discover conditions of in-service equipment; ensures collection and processing of data to early fault detect; constructs Model Based Condition Monitoring predictions using various techniques.

Full details of maintenance procedures and records can be sighted at WDC offices during DWAs audit.

Maintenance planning is delivered by planned and unplanned work scheduling; stores and logistics management; warranty and materials management; bill of materials creation; workflow management; breakdown planning; overhaul coordination; asset history and cost analysis; planning and scheduling reporting; and budget development.

A list of approved contractors can be supplied on request.

Site-specific maintenance schedule for Raglan water supply is listed in the table below. A full set of operational and maintenance procedures and records can be sighted at WDC offices during DWA audits.

Maintenance Plan description	To access listed document
Raglan Water Treatment Plant Upgrade Operation and Maintenance Manual Volume 1	Available on WSL Te Rapa Office and on site

APPENDIX 1: WSL COMMITMENT TO DRINKING WATER QUALITY

Please see attached.

APPENDIX 2: RAGLAN STAKEHOLDER LIST

Please see attached.

APPENDIX 3: WDC COMMUNITY ENGAGEMENT STRATEGY

Please see attached.

APPENDIX 4: TRAINING MATRIX

For training records go to:

O:\Ops\Watercare Waikato\Training

Each Watercare (Waikato) personnel name is recorded and the appropriate date and training activity is entered for each.

Training records can be sighted at Watercare (Waikato) office during DWAs audits.

APPENDIX 5: UV VALIDATION CERTIFICATE

For the UV validation Certificate go to:

Link to UV Validation Certificate

APPENDIX 6: SOP

Please see attached.

APPENDIX 7: RISK REGISTER GUIDELINE

Please see attached.

APPENDIX 8: EVENT INVESTIGATION REPORT

For EIR template please go to:

Link to Event Investigation Report

APPENDIX 9: RAGLAN NTU RESULTS 2018-20

Please see attached.

Watercare's commitment to drinking water quality

Watercare Services Limited (Watercare) is committed delivering safe, high-quality drinking water that consistently meets the expectations of the *New Zealand Drinking Water Safety Plan Framework;* the requirements of the Health Act; the *Drinking Water Standards for New Zealand*; and other regulatory and consumer requirements.

To achieve this, Watercare works in partnership with stakeholders and relevant agencies to:

- **Manage water sources effectively**
  - We acknowledge that protecting our water sources is a critical part of our job and helps to keep our customers safe from waterborne illnesses.

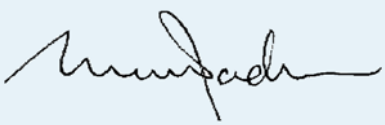
- **Treat water to a high standard and distribute it safely**
  - We take great care when treating water and make sure it is well managed as it travels from its source, through our plants and networks, to our customers.
  - We ensure there are multiple barriers that prevent contamination and protect our customers from harm.

- **Manage risks and respond to change**
  - We use a preventive risk-based approach in which potential threats to water quality and quantity are identified and managed.
  - We carry out contingency planning and focus on developing our incident response capability.
  - We know that contamination is usually preceded by some kind of change (including changes to processes and hazardous events) and therefore we monitor and respond to change.

- **Listen and respond to stakeholder feedback**
  - We listen to stakeholder feedback and integrate their expectations into our planning.
  - We continually improve our practices by assessing performance against corporate commitments, stakeholder expectations, and regulatory requirements.

- **Meet regulatory requirements and contribute to nationwide conversations on water quality**
  - We monitor the quality of our drinking water and provide timely information to stakeholders to promote confidence in the water supply and our management of it.
  - We participate in investigative activities to ensure continued understanding of drinking water quality issues and performance.

All managers and employees involved in the supply of drinking water are responsible for understanding, implementing, maintaining and continually improving the drinking water quality management system.



Raveen Jaduram **Date 4 September 2019**
Chief Executive Officer, Watercare Services Limited

Watercare
An Auckland Council Organisation









Listening to you...

...our community engagement strategy

Waikato DISTRICT COUNCIL
Te Kaunihera aa Takiwaa o Waikato

Listening to you... our Community Engagement Strategy

Outlines a plan of action that Council are will undertake to enable your views to be heard more clearly when you want to have a say about the things we are doing.

This strategy has been under development since 2012 and is the result of you telling us you wanted more effective and more relevant ways to have input into Council's decision-making.

The Community Engagement Strategy has a life of three years after which we'll review it, with your input and feedback welcome, to see if we are on the right track.

Why have we developed this strategy?

The Local Government Act defines the purpose of local government as being to 'meet the current and future needs of communities for good-quality local infrastructure, local public services, and performance of regulatory functions in a way that is most cost-effective for households and businesses'. It also requires councils to 'give consideration' to the views and preferences of people affected by their decisions.

And while councils have always given consideration to the views of its residents through consultation, we accept this is a very formal process and tends to come at the stage when decisions are already drafted.

Engagement comes at the pre-drafting stage and allows you to be involved at the earliest stage of the decision-making process.

We want to make engagement easier for everyone in the community so we've developed this strategy in order to become more responsive and better at listening to you.

We want to:

- ***be clearer about who to engage with, when and how***
- ***include a diversity of views in our decision-making process***
- ***ensure we invest in engagement to get the best bang for our buck***
- ***improve relationships with all people and groups in the Waikato***
- ***meet all legal obligations***
- ***include our Treaty partners.***

What does the strategy cover?

- ***Our main goal***
- ***Underpinning principles***
- ***The actions we are committed to undertaking***
- ***How we will measure the Community Engagement Strategy's effectiveness.***

At the end of this document is a glossary to help clarify any jargon we use.

Appendix One outlines the process we followed to develop this strategy.

Council has also adopted a Significance and Engagement Policy which identifies the degree of significance attached to particular issues, proposals, assets, decisions and activies. (See our website).

This strategy has been developed, based on your feedback, to:

- ***enable us to make better informed decisions***
- ***make it easier for you to have your say when you want to***
- ***make options for having your say clearer***
- ***be more efficient in our systems and processes.***

Our main goal is to make it easier for you to have your say and for us to hear and understand your views before decisions are finalised.

Principles that underpin our community engagement strategy

The Waikato District Council exists through statute. This statute includes having elected members making cost-effective decisions for the current and future needs of the people who live here. It specifically states that councils should 'give consideration' to the views and preferences of people affected by their decisions.

To do this really well benefits from having input from more minds, more experience and more diversity than we can ever have around the council's decision-making table.

Community engagement enables us to do this.

The principles we consider most important to achieve this are as follows.

1. We will be prepared

We will ensure we are prepared well in advance of formal decision-making processes on issues relevant to you and provide appropriate ways for you to hear and understand what is being proposed or planned at the earliest opportunity.

We will ensure the relevant history and purpose of the proposal are reviewed and then explained clearly.

We will do our best to ensure that different community engagement processes are 'joined-up' where possible - recognising that your time is limited and noting that 'joined-up' communication is more sensible.

2. We will be inclusive

We will make sure we have explored all reasonable avenues for contacting groups or individuals who may have an interest in an activity or proposal that is coming before the council. We will make sure our information is accessible and available across the widest (and most cost-effective) and most 'fit for purpose' means.

We will make additional efforts to engage those whose voices may not normally get heard. This may include going the extra mile to maximise the opportunity for some groups to be heard.

We will develop and build relationships that enhance open dialogue and conversation.

3. We will be flexible, responsive, timely

We will provide different ways you can engage with us, and listen to you about the ways that work best for you.

We will do our best to respond in a timely manner.

4. We will be open, honest and respectful

We will be open to your ideas and constructive in our feedback. This includes being considerate of your views and weighing them as we consider our proposals.

We will do our best to be clear and will always be honest in the sharing of knowledge and process.

We will always respect your privacy.

5. We will be accountable

We will be transparent in our decision-making and you will be able to see how your input has had an effect.

We will communicate the outcome of our decision-making to you either personally or through appropriate, thoughtful means.

Actions we are committed to undertaking

A strategy has actions that state how we are going to achieve the goal. Not all actions can be achieved at once as some take time to implement. The actions described below are staged to ensure we do things in the right order and maximise the opportunity we have to get them right.

While we are implementing the actions outlined below we will do our best to ensure that our principles still underpin any engagement activity we undertake.

Action 1 – Databases enhanced

Enhance the existing databases to include specific interest groups and submitters for any current and anticipated community engagement activity.

This database will use existing information and will be grown over time to include new interest groups. It will be updated on a regular basis.

Action 2 – Processes developed

(a) Specific interest groups will be contacted so they have the opportunity to be made aware of matters that may be of interest to them. This may include regular newsletters, emails, social media or other forms of engagement.

(b) A process will be established for receipt and acknowledgment of all community engagement inputs – this includes informal and formal inputs.

Action 3 – Opportunities provided

A range of opportunities to provide your views will be provided and promoted every time an issue requires engagement with you.

Our Significance and Engagement Policy outlines the type of issues and engagement opportunities that may be considered.

These include such things as web forums, pamphlet drops, advertisements, submission processes, council 'Open Days' in your area, fronting up at your meetings, suggestion boxes in places you frequent and events that are targeted to your needs.

Action 4 – Duplication will be avoided

Where possible we will first check other relevant projects, activities or issues and consult once to ensure that we are making efficient use of your time.

Consideration will be given to timing of engagement activity so, where possible, it can be joined up with other activities.

Action 5 – Communication established

Feedback or engagement with us on projects, activities or issues to any community engagement process will be available online or on request (unless confidentiality is specifically requested).

Action 6 – Feedback

The outcomes/decisions resulting from our community engagement will be provided to participants (assuming they are named) and made publicly available on our website or on request.

Measuring the effectiveness of our strategy

Our goal is to **make it easier** for you to have your say and for us to hear and understand your views before decisions are finalised.

Waikato District Council can only assess how well we are progressing towards this goal if you provide the feedback.

There are three ways we will measure this strategy and whether or not we are achieving our goal.

Annual residents' survey

How well we are doing this will mostly be on be on a case-by-case basis although a more general question will be asked of all residents such as:

- do you think Waikato District Council has provided you with sufficient opportunities for your views to be heard on matters that are important and of interest you?

Follow-up participant surveys

With regard to discrete issues or place-based proposals and activities, the Council will be taking action to ensure that the principles of this community engagement strategy are met.

For example: Waikato District Council has provided online and hard copy feedback forms, online and hard copy surveys, held public meetings for your views to be heard on important issues like Psychoactive Substances, Gambling Policy amd Local Alcohol Plans. Were you interested in these? If you were do you think it was easy to have your views heard? And did your views get acknowledged?

Numbers of views that have been received

The number of participants in a process is a good way to measure engagement noting that 'participants' does not equal 'submitters'. Sometimes an input to a process is by making a comment by phone or to a staff member.
(See action 3 - Opportunities provided)

Glossary

Strategy: a strategy is a plan of action designed to achieve a long-term or overall aim.

Consultation: a formal statutory process asking for feedback on a specific proposal or plan. Consultation may provide options for consideration. It will involve a formal submission process.

Engagement: a two-way process that involves dialogue between citizens and the council to consider an idea and/or create a proposal. It is a conversation and does not necessarily have any formal submission process. Engagement is also the way we describe a whole range of processes that enable us to listen to your views of which consultation is a subset.

Community: any grouping of people with an agreed or potential interest in a particular proposal.

Specific interest groups: any group of persons who have an interest in common which is relevant to a council project, activity or issue. They do not need to be formalised in any way.

Key stakeholder: generally a more formalised version of a 'specific interest group'.

Place-based: specific to a community that has been defined by location.

Information: material that enhances understanding, awareness or clarity and does not invite feedback.

Joined up: characterised by coordination and coherence of thought; integrated.

Fit for purpose: well-equipped or well suited for its designated role or purpose.

Appendix One: Process we followed to develop the strategy

A community engagement project concept was formulated in 2012, based on feedback and analysis received from our 2011 and 2012 Customer Needs Surveys. And preferred consultation methods identified through feedback received from Councillors, Community Boards, Iwi, staff and members of the public through the development of our 2012-2022 draft Long Term Plan. The purpose of the project was to develop a strategy and terms of reference in response to gaps in our consultation process and other engagement experiences.

As part of the project a community engagement working group was established (which included representation from our rural community, Federated Farmers, Community Boards and Committees, Iwi representation, Councillors and staff) who met during 2012 and 2013 to brainstorm the perceived and real issues of community engagement and how to best serve our communities going forward. The feedback we received identified common areas of concern and has informed our approach in developing the Community Engagement Strategy.








Waikato
DISTRICT COUNCIL
Te Kaunihera aa Takiwaa o Waikato

Training Required	
Mandatory	To review 1 Oct 2020
Acknowledge	Acknowledged holds
Optional	

TASKS and/or ACTIVITIES	Review	Production	Gil Miers - Manager	Nigel Connelly - Process Engineer/Technologist	Alicia Blom - Mainatenance Controller	Quinn Coyle - Water Treatment Operator	Cesar Waksman - Water Treatment Operator	Mark Doughty - Water Treatment Operator	David Luke - Water Treatment Operator	Danny Duffull - Water Treatment Operator	Tony Grey - Water Treatment Operator	Operations	Rob Ball - Manager	Ross Dillon - Senior Operations Engineer/Technician	Dan Su - Operations Engineer/Technician	Abbs Safa - Operations Engineer/Technician	Josh Deane - Network Supervisor	Jimmy Foggin - Water Team Leader	Caleb Deane - Network Serviceman	Michael Hodgson - Network Serviceman	Rex Wilbore - Network Serviceman	Tahi Don - Network Serviceman	Jacob Patterson - Network Serviceman	Brain Tahu - Wastewater Team Leader	Major Kahukura - Network Serviceman	Ross Erihe - Network Serviceman	Mark Thomas - Network Serviceman	Roger Smith - Network Serviceman
Drivers Licence (Full)																												
Comprehensive First Aid																												
Advanced Driving Competence																												
Confined space & Gas Detection																												
Height Safety																												
LTSA Basic TC level 1																												
Breathing Apparatus Operational																												
H&S Inductions																												
Inoculations																												
On Call																												
Fire Extinguisher course																												
Wetwell																												
Sewer																												
Water Safety Training (Workplace water safety)																												
Chemical Awareness																												
Chemical Handler																												
Chlorine Gas Handling																												
Chain Saw course																												
Water																												
Rechlorination																												
Wastewater																												
LTSA STMS level 1																												
Elevated work platforms																												
Trailer mounted MEWP																												
Hiab																												
Dogman																												
Gantry Operation																												
Wheeled Tracks and Rollers																												
CLASS 2 (HT)																												
CLASS 4																												
OSH & F Endorsement Course (Forklift)																												
Fire Warden																												
Permit Receiver																												
Isolations Procedure																												
Team Leader (Mentor)																												
Supervisor Water (Mentor) (EMA NZ Certificate in Business and Communication)																												
Supervisor Wastewater (Mentor) (EMA NZ Certificate in Business and Communication)																												
Relevant Industry qualification Level 5																												
Relevant Industry qualification Level 4																												
Relevant Industry qualification Level 2																												
Service / Industry experience 1				16	1	5.00	2.00	3.00	8.00	14.00	15.00																	
Service / Industry experience 5																												
Service / Industry experience 10																												
Service / Industry experience 20																												
Service / Industry experience 30																												
Service / Industry experience 40																												
Mentoring new wsl staff																												
Watercare induction trainings																												
Safe workplace																												
Work Place First Aid Training (Basic 6402/ Level 1 -6401 / Level 2-6400)																												
Personal safety/security at work																												
Fire Warden Training																												
MHF Emergency and Evacuation Plan																												
Emergency Drill																												
Fire Extinguisher																												
Healthy Hearts																												
Stress																												
Safe manual handling (Lifting)																												
Site Safety Audit Inspection Training (Synergi)																												
Site Safe training																												
Water Safety Training																												

AA/JSA/PTW Procedure																												
Height Training																												
Isolation competency - Isolation training																												
Confined Space and Gas Detection																												
Technical Trainings																												
Certified Chemical Handlers Training																												
Cl2 connect & Disconnect training																												
Chlorine Facility Operation Competency																												
Breathing Apparatus Operational Training																												
Chemical site induction? Refresher?																												
Gantry Crane Overhead Training																												
VHF Radio Transmitter Use and Operation Training? 10y refresher?																												
Forkhoist Driver Training																												
Drinking water standards (know where to find regulatory requirements, understand																												
Water Safety Plans																												
Environmental																												
Chemical spill management training (include dechlorination procedure)																												
Chemical delivery management, i.e: bunds valves at WKO)																												
Resource consents limits and Discharge Management Plans understanding																												
Professional developement																												
Health and safety Leadership training																												
Incident response investigation and injury management																												
Contractor management																												
National Certificate in Drinking Water Treatment																												
National Diploma in Drinking Water Treatment																												
Workplace Assessor - Certificate																												
CPEng																												
Management Training - University Level																												
Site Safety Supervisors Training																												
IPENZ Project Management Training																												
KT Project Management																												
KT Problem Solving & Decision Making																												
Quality Auditing - Internal Auditing																												
DeltaV Implentation																												
SAP (to be further detailed?)																												
PI User Training																												
Advanced Report Writing Skills																												
Finance for Non-financial Managers																												
Presentation Skills Training																												
Microsoft Word Skills - Basic																												
Microsoft Word Skills - Advanced																												
Microsoft Excel Skills - Basic																												
Microsoft Excel Skills - Advanced																												
Maintenance Planners School - Maintenance Planning																												
Finance training - WSL by numbers																												

Standard Operating Procedures (SOPs)																													
Production																													
Isolations Procedure	Annually																												
Chlorine Gas Drum Changeover	Annually																												
Physical Entry into Treated water reservoirs/chamber	Annually																												
UV module Cleaning	Annually																												
Manage a Level 1 Minor Local (Contained) Chlorine Gas Leak	Annually																												
Manage a Level 2 Moderate Local (Contained) Chlorine Gas Leak	Annually																												
Manage a Level 3 Major Local (Uncontained) Chlorine Gas Leak	Annually																												
UV Sensor Check - Raglan	Annually																												
Transport and Install Raglan Generator	Annually																												
Spill Free Chlorine Buffer (solution)	Annually																												
Manage spill of Phosphoric acid (solution)	Annually																												
Enter Data into the weekly verification tab	Annually																												
Enter data into water outlook primary calibration	Annually																												
Manage SCADA On-Call and Alarm system – Treatment Plants	Annually																												
Respond to SCADA Alarms for Treatment Plants	Annually																												
Create a Trends Page on Archestra	Annually																												
Perform a Calibration for the real UV254 (realtech)	Annually																												
Perform a Primary Calibration for the Chlorine Analyser (Deplox 3)	Annually																												
Perform a Primary Calibration on the Hach Turbidimeter	Annually																												
Perform a Primary Calibration on the pH Analyser (Crius)	Annually																												
Perform a Primary calibration on the pH analyser (Depolox 3)	Annually																												
Perform a Primary Calibration on Treated Water Chlorine Analyser	Annually																												
Perform a Verification for the Chlorine Analyser (Crius)	Annually																												
Perform a Verification for the Chlorine Analyser (Depolox 3)	Annually																												
Perform a Verification for the Hach Turbidimeter	Annually																												
Perform a Verification for the pH Analyser (Crius)	Annually																												
Perform a Verificiation for the pH Analyser (Depolox 3)	Annually																												
Undertake a Water Shutdown (Planned or unplanned)	Annually																												
Operations																													
Carry Out Reservoir Inspections	Annually																												
Customer Water Quality Complaint	Annually																												
Flush a water main (routine and Reactive)	Annually																												
Install Replace a Faulty Water Meter	Annually																												
Inspect and Test Hydrants	Annually																												
Installing a New Hydrant or Valve	Annually																												
Investigate a Water Pressure or Flow Complaint	Annually																												
Manage SCADA On-Call System - Reticulation	Annually																												
Perform a chorine test to check for potable water	Annually																												
Remove _ Reinstall Flow Restrictors in Rural Metered Water Connections	Annually																												
Repair a Major Water Break	Annually																												
Repair a Minor Water Break	Annually																												
Undertake a Water Shutdown (Planned or unplanned)	Annually																												
Response Plans																													
Manage Water Mains Failure on Bridge	Annually																												
Respond to Cyanobacteria Bloom (002)	Annually																												
Respond to E. coli in the network	Annually																												
Respond to high chlorine in the network	Annually																												
Respond to High Fluoride in the network	Annually																												
Respond to low chlorine in the network	Annually																												

XYLEM/Wedeco

THIRD-PARTY VALIDATION OF THE SPEKTRON 250e UV REACTOR

October 2012

carollo

Engineers...Working Wonders With Water

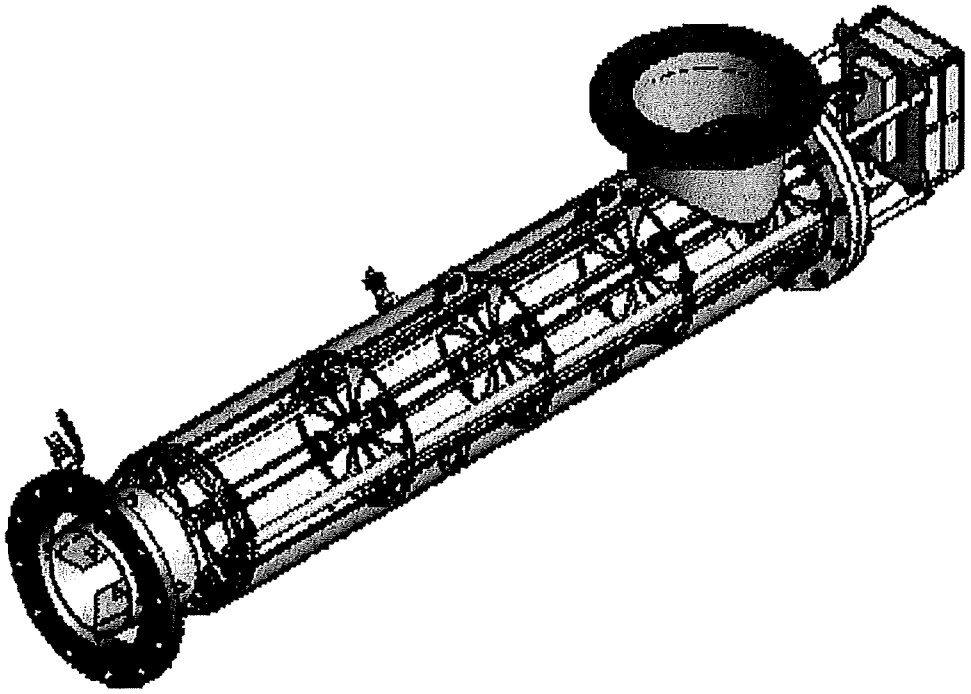
12592 WEST EXPLORER DRIVE • SUITE 200 • BOISE, IDAHO 83713 • (208) 376-2288 • FAX (208) 376-2251

SUMMARY

The Wedeco Spektron 250e closed-vessel ultraviolet (UV) disinfection system was validated at a test facility located in Portland, OR, and the results were analyzed in accordance with the UV Disinfection Guidance Manual as part of the Long Term 2 Enhanced Surface Water Treatment Rule, published by the United States Environmental Protection Agency (USEPA, 2006).

The Spektron 250e system utilized four 320 W low-pressure high output (LPHO) lamps oriented in parallel to the bulk flow and a calibrated germicidal sensor for performance monitoring that meet international standards (DVGW, 2006; ÖNORM, 2001). The lamps were housed within quartz sleeves. Each quartz sleeve was equipped with a mechanical wiping mechanism to remove foulants that accumulate on the external surfaces of the sleeves and the UV sensor port window. A control panel housing the lamp power supplies and ballasts was used to control operation of the system and to monitor performance. The UV intensity within the reactor was monitored by a single ÖNORM-compliant UV sensor (ÖNORM, 2001). Accuracy of the UV sensor was confirmed by comparison to three reference UV sensors. Figure 1.1 shows a schematic of the installation piping at the Portland validation facility. Figure 1.2 shows an isometric view of the reactor, including lamps and UV sensor location.

The Spektron 250e was tested over a range of flow rates, UV transmittance (UVT) values, and lamp power settings to develop a "calculated dose" monitoring equation (USEPA UVDGM, 2006). The calculated dose algorithm predicts the log inactivation of the microorganism of interest within the validated range using the UV sensitivity of the target microorganism (D_L) and the measured UV sensor readings, flow, and UV absorbance (UVA). The UV sensitivity of the microorganism of interest is defined as the ratio of the UV dose to the log inactivation provided by that UV dose and varies from microorganism to microorganism. MS2 has a high sensitivity (approximately 20 mJ/cm^2 per log inactivation), but Cryptosporidium parvum, the target microorganism for drinking water applications of this reactor, has a much lower sensitivity (3.9 mJ/cm^2 per log inactivation). The dose monitoring equation was validated using three challenge organisms - MS2, T1UV, and T7 bacteriophage. These microorganisms have UV sensitivities that vary from 1.29 to 26.2 mJ/cm^2 per log inactivation.



Functional testing of the Spektron 250e UV reactor was conducted on 23 November 2011. Biodosimetric validation was conducted on 22, 28, 29, 30 November 2011 and 1 December 2011. The UV reactor was validated with inlet piping that included a 90-degree bend located immediately upstream of the reactor, and the reactor body housed a diffuser/flow straightener on the downstream side of the reactor (Figures 1.1 and 1.2). The UV reactor was validated under the third party oversight of Carollo Engineers, P.C. (CE). Microbial analysis was provided by GAP Environmental Services (GAP) of London, Ontario, Canada. The challenge microbes were MS2, T1UV, and T7 phage, and the UV absorber was LSA (Fraser Papers of Park Falls,USA). Analysis of the validation data was undertaken in accordance with the USEPA UVDGM (2006).

The test conditions of flow rate, UV transmittance (UVT), and lamp output were designed to validate the dose delivery by the UV reactor. MS2, T1UV and T7 phage log inactivation and UV intensity were measured at various lamp power settings at flow rates ranging from 0.20 to 5.0mgd and at a UVT ranging from 69.19 to 99.6 percent. Power settings were adjusted from 50 percent to 100 percent ballast power which resulted in MS2 RED values up to 137.7 mJ/cm^2, T1UV RED values varying from 5.32 to 27.11 mJ/cm^2, and T7 RED values varying from 1.95 to 12.20 mJ/cm^2.

carollo
Engineers...Working Wonders With Water®

July 26, 2012

ITT WEDECO, GmbH.
Boschstr, 6
32051 Hereford, Germany

Attention: Dr. Christian Bokermann

Subject: Spektron e UV Reactor Line Validation

Dear Dr. Bokermann:

Carollo Engineers conducts UV validation testing of UV systems manufactured by Xylem/WEDECO at the Portland UV Validation test facility in accordance with the USEPA 2006 UV Disinfection Guidance Manual (UVDGM). The validation work includes all of the field testing performed at the Portland, OR (USA) test facility, UV sensor evaluations conducted by other third parties, analysis of the validation data, and the preparation of the report.

The Spektron 250e, 350e, 650e, and 900e UV reactors were validated by Carollo Engineers in Portland between September of 2011 and March of 2012. Sizing tools for determining USEPA Long Term 2 Enhanced Surface Water Treatment Rule-compliant *Cryptosporidium parvum* and *Giardia lamblia* log inactivation credits are available while the final reports are being prepared.

Respectfully submitted,
CAROLLO ENGINEERS, P.C.

Jeff Bandy, Ph.D.
Engineer

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P. 208.376.2288 F. 208.376.2251
carollo.com

15.3 Declaration of Conformity

CE

xylem
Let's Solve Water

EG-Konformitätserklärung

gemäß Maschinenrichtlinie 2006/42/EG Anhang II 1A
Declaration of Conformity – subject to the Directive 2006/42/EC Annex II 1A

Hersteller: Manufacturer.	Xylem Water Solutions Herford GmbH Boschstr. 4-14, 32051 Herford, Germany		
Projekt- Nr.: Project No.:	Siehe Typenschild See type plate	Produktbezeichnung: Product Name:	UV Anlage UV System
Anlagen-Typ: Type of System	Spektron 30e; Spektron 50e; Spektron 90e; Spektron 180e; Spektron 250e; Spektron 350e; Spektron 650e; Spektron 900e		
Herstellernummer: Factory-No.:	Siehe Typenschild See type plate	Baujahr: Year of Construction:	Siehe Typenschild See type plate

Wir erklären, dass das vorgenannte Projekt hinsichtlich seiner Konzeption, der Bauart und der Ausführungen den grundlegenden Sicherheits- und Gesundheitsanforderungen mit den nachfolgend aufgeführten Richtlinien konform ist:
We herewith confirm that the Project (Pressure equipment) specified above is in accordance with the below mentioned directives of the European Community. Design, completion and applied test procedures followed the guiding rules / regulations as stated below in order to fulfill the general safety and health requirements stipulated by the EU.

Richtlinie 2006/42/EG Directive 2006/42/EG	des Europäischen Parlaments und des Rates vom 17. Mai 2006 zur Angleichung der Rechts- und Verwaltungsvorschriften der Mitgliedstaaten für Maschinen (Gilt nur für UV-Reaktoren mit Wischersystem) of the European Parliament and of the Council of 17. Mai 2006 on the approximation of the laws of the Member States relating to machinery (Only for UV-Reactors with wiping-system)
Richtlinie 2006/95/EG Directive 2006/95/EC	des Rates vom 12. Dezember 2006 zur Angleichung der Rechtsvorschriften der Mitgliedstaaten betreffend elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen of 12 December 2006 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits
Richtlinie 2004/108/EG Directive 2004/108/EC	des Rates vom 15.Dezember 2004 zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit und zur Aufhebung der Richtlinie 89/336/EWG of 15 Dezember 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC

Harmonisierte Normen Harmonized Standards		Nationale Normen/Spezifikationen National Harmonized Standards
EN ISO 12100-1	EN ISO 12100-2	VDI 4500
EN 14121-1	EN ISO 13849-1	VDE 0100
EN 60204-1	EN 61000-6-2	VDE 0413
EN 61439-1		

Herford, den 24.01.2012

Dokumentationsbevollmächtigter
Herr Thomas Heinrichs

rechtsverbindliche Unterschrift
Herr Joachim Sigg

Xylem Water Solutions Herford GmbH, Boschstr.4-14, 32051 Herford, Germany Telefon +49 (0) 5221/930 0, Fax +49 (0) 5221/930-222

The Spektron 250e and its fit into the Raglan WTP

In 2012 Wedeco Germany released the latest generation of its flagship drinking water UV range, the new Spektron 'e' series. These new reactors come factory-fitted with the latest Ecoray lamp and ballast technology and also if required the options of variable lamp power and automated quartz sleeve wiping.

For the fit into Raglan WTP we have selected the Spektron 250e, this UV reactor system is validated USEPA (UVDGM), DVGW and ONORM M5873-1. For the Raglan tender selection we are utilising the systems USEPA validated performance.

The Spektron 250e's performance for this submission is based on the following set -points:

USEPA Validated Performance Per Reactor

Design Flow – 160m³/hr (approx. 44.00 LPS)

Design UVT – 95% (per cm)

USEPA Validated Dose at this flow and UVT – 50.3mJ/cm²

Challenge Organism – Cryptosporidium (Protozoa)

CAF Factor – 0.809

Please note as standard practice with USEPA-based submissions that the actual full and comprehensive validation report will be supplied to the end-user only if definite purchase of the equipment is pending. An agreement of non-disclosure must be signed (also standard practice) prior to the USEPA validation reports handover due only to the commercially sensitive information that a full USEPA report carries. The report will be provided as a hard copy file supplied to Waikato D.C by the Wedeco factory in Germany.

For the immediate purpose of this tender we can supply the letter issued by Carollo Engineers of Portland to the Wedeco R&D facility in Germany confirming that USEPA (UVDGM) validation has been completed on the Spektron 250e (and other new generation Spektron 'e' models) in July 2012. Additionally following this letter is a condensed version of the 250e's USEPA validation report.

It is important to note also that the above stated USEPA performance for the Spektron 250e offered in this tender was calculated using the validation sizing tool that is mentioned in the included Carollo letter. Hence this UV system has been sized not using individual interpretation of a multi-page report but with the very tool issued by the actual validating authority and developed by them in accordance with the findings of their USEPA test regime on the named equipment.

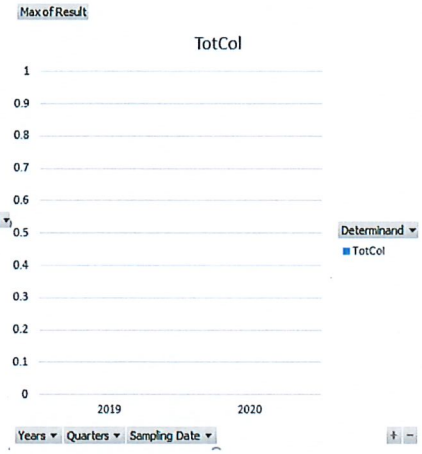
3.7.2.1 TECHNICAL SCHEDULE

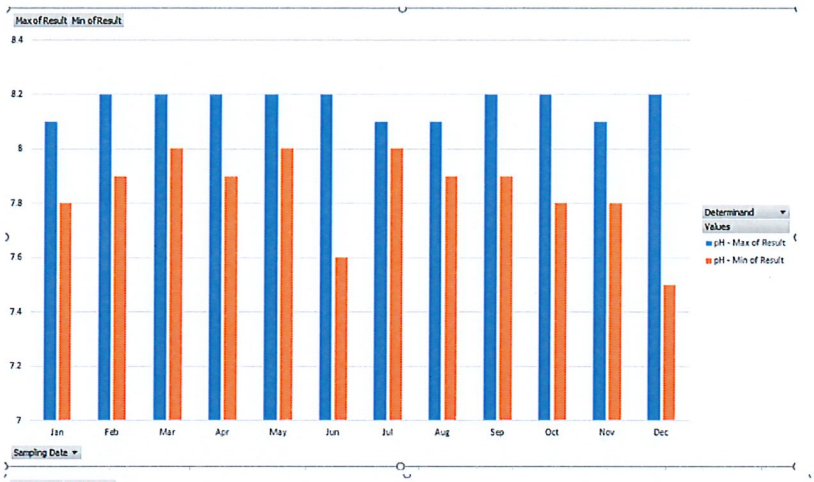
The contractor shall provide with its tender the following completed schedule

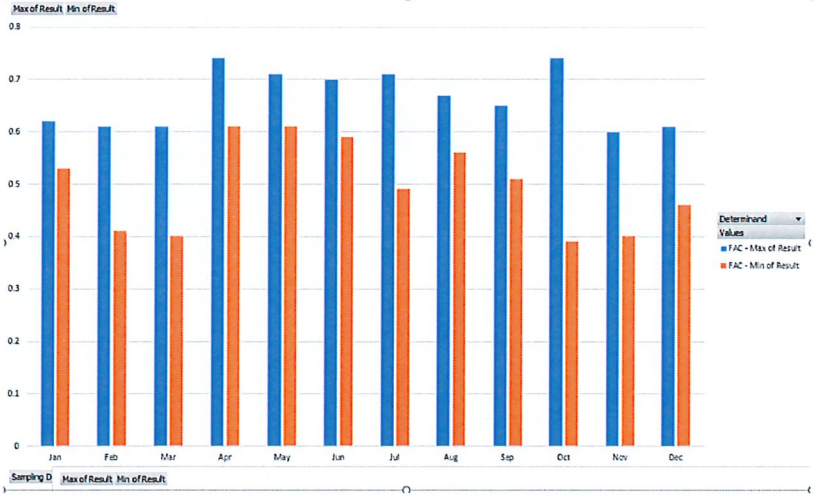
Table 1: Technical Schedule		
UV Disinfection		
Manufacturer	Wedeco	
Place of Manufacture	Germany	
Type	Spektron 'e' Series	
Model Number	250e	
Vessel Length	2061mm (Please see GA drawing)	mm
Vessel Diameter	470mm	mm
Ballast Dimensions	255mm x 150mm (two per system)	mm
Additional Length for Maintenance	2000mm	mm
Maximum Flow at required UV Dose	55.83 L/s (40mJ/cm2)	L/s
Head Loss through UV disinfection equipment at design flow	Please see provided head-loss graph	
Inlet Connection (Size and Type)	DN300 PN10	
Outlet Connection (Size and Type)	DN300 PN10	
Lamps		
Manufacturer	Wedeco	
Model Number	VLR30	
Orientation (vertical/horizontal)	Horizontal	
UV dose at design flow	31.3mJ/cm2	
Number of lamps per vessel	Four	
Total number of lamps installed	Eight in two reactors (4 each)	
Material of lamp sleeves	Pure quartz	
Maximum power per lamp	120 Watt output (@ 254nm)	
Replacement labour per lamp	5 minutes	Hours
Bulb replacement frequency	Minimum 14,000 operating hours	Hours
System Control		
Method of dose control	Flow based intensity, dose displayed	
UVT meter type make and model	HF Technologies AccUView	
Location of ballast	Inside wall mounted control cabinet	
Power Requirements		

DRINKING WATER QUALITY ANALYSIS

APRIL 2019 TO MARCH 2020

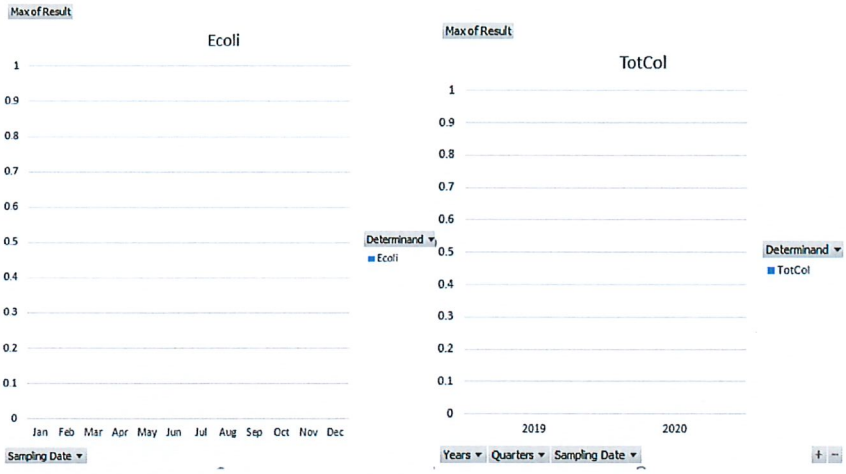


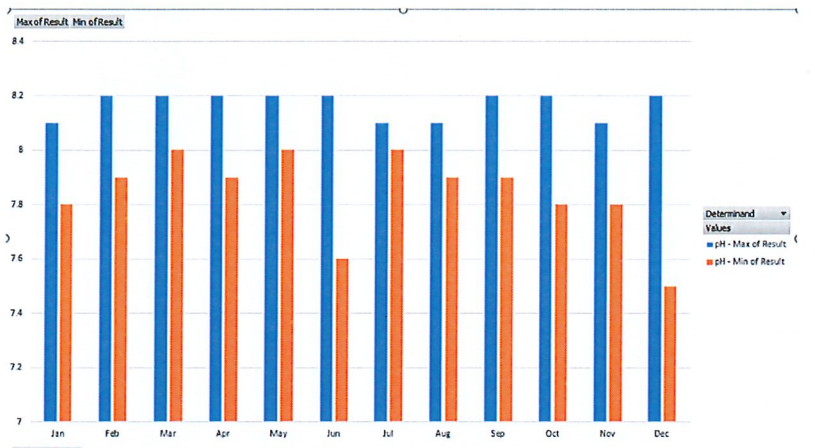


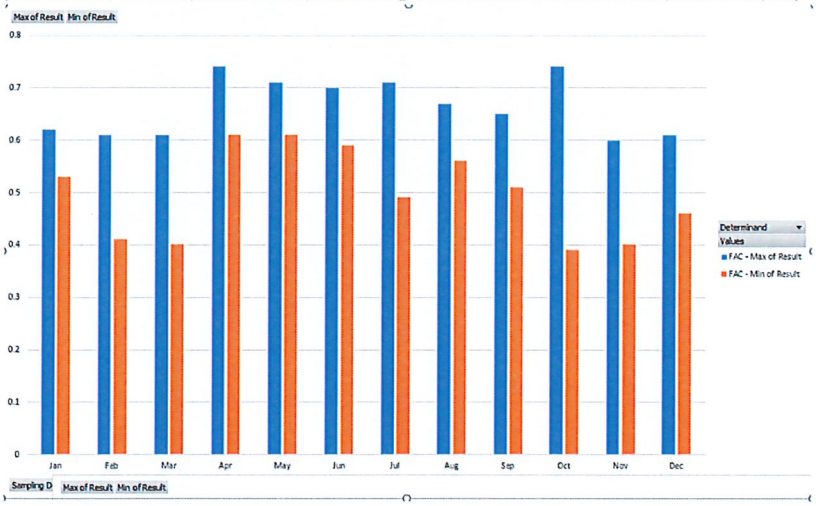


DRINKING WATER QUALITY ANALYSIS

APRIL 2019 TO MARCH 2020

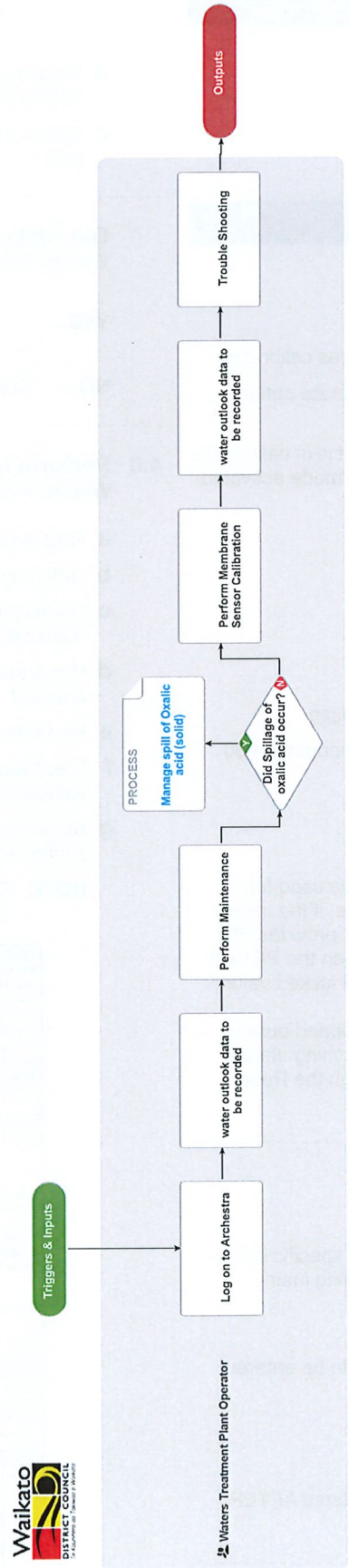






Review	Date and Who:	Findings:
Improvements		Who:

Perform a Primary Calibration for the Chlorine Analyser (Depolox 3) v4.0



Perform a Primary Calibration for the Chlorine Analyser (Depolox 3) v4.0

Summary

Objective
To calibrate the Depolox 3 Chlrorine electrode

Owner David Kennington

Expert David Kennington

Procedure

1.0 Log on to Archestra
Waters Treatment Plant Operator

a Navigate to find the instrument that requires calibration.

b Select the instrument then select the calibrate option from the pop up menu.

c A blue hand will be displayed to indicate it is in calibration mode as shown in the image 'Calibration mode activated indication'.

☐ Calibration mode activated indication.jpg

d Please Note: All calibration modes will timeout after 30 minutes.

NOTE **What is calibration mode?**
Whilst in calibrate mode:

The PV is locked. This is the value used for alarming and feedback. Therefore, if the instrument is in calibration mode and it provides PID feedback, for a pump or valve, then the PID will adjust its output according to that locked value.

All non latching alarms will be stopped during calibration mode however any latching alarms will still need to be cleared through the Reset button.

2.0 water outlook data to be recorded
Waters Treatment Plant Operator

a water outlook data to be recorded for this specific instrument into water outlook BEFORE performing maintenance or calibration.

NOTE **which tabs are applicable?**
majority of the sites require data to be entered under the tabs:
Daily plant checks
weekly verifications
Primary calibrations

b take note on data the is required to be entered AFTER performing maintenance or calibration.

3.0 Perform Maintenance
Waters Treatment Plant Operator

a Clean equipment

NOTE **Why do you clean the flow chambers & probes?**
To remove iron and manganese build up.

b Remove flow cell and clean using a tissue and dilute (5-8%) oxalic acid

c Clean pH probes with a tissue and dilute (5-8%) oxalic acid

? **Did Spillage of oxalic acid occur?**
Waters Treatment Plant Operator

YES.... ☐ PROCESS **Manage spill of Oxalic acid (solic**

NO.... Continue

4.0 Perform Membrane Sensor Calibration
Waters Treatment Plant Operator

a Take a sample at the measuring cell.

b Determine the residual value of this sample.

c Starting from the basic display, press the F key until the "Calibration" menu is displayed.

d Press the 'Down Arrow' key until the menu "DIS span" is reached.

e Press the 'tick' key to open the menu.

f Press keys 'Up Arrow' or 'Down Arrow' until the displayed value agrees with the manually measured value.

g Store the value using the 'tick' key. The disinfectant measuring cell is now calibrated.

NOTE **Did a error message appear?**
Please refer to the two attached images.

Error Message	Cause	Remedy
High/Low Alarms:		
*min DIS ? *	Alarm value exceeded	Check dosing
*max DIS ? *		Check sample water flow
*min pH ? *		
*max pH ? *		
*min Fluor ? *		
*max Fluor ? *		
General Faults:		
*mA-output? *	mA loop impedance too high	Check mA loop <1000 ohm
	Loop interrupted	Jump if not used
*cell DIS ? *	Sensor wrongly connected	Check wiring
*cell pH ? *	Sensor cables interchanged	Perform calibration
	or	or
	(In ph compensated mode) pH is out of range	Adjust pH
*cell Fluor ? *	Sensor defective	Replace sensor
*Circ.Fail. ? *	Internal failure	Contact Evoqua Water Technologies
*temperature ? *	Temperature failure	Check temp. Sensor, wiring
Warnings		
*Range ? *	Alarm value out of range	Adjust range or limit value
	Range changed subsequently	
	Setpoint Cl_2 out of range	Adjust range or setpoint
*ADU 1 ? *	Internal failure	Call Evoqua Water Technologies service
*ADU 2 ? *		
*ADU 3 ? *		
*Cal. DIS ? *	Calibration error	Perform new calibration
*Cal. pH ? *		Check buffer solutions
*Cal. Fluor ? *		Replace electrolyte
*OVR DIS ? *	Value exceeds range	Check range and dosing
*OVR pH ? *	Range does not fit	
*OVR Fluor ? *	Dosing too high	
*DI1 ? *	Signal at the digital input	Check for the origin of the signal, e.g., sample water flow too low
*DI2 ? *		Jump if not used
*DI3 ? *		

☐ In case of error message for membrane sensor calibration 1.jpg

Error Message	Cause	Remedy
Additional Errors Device has no display	No mains power Defective fuse or wrong setting of mains voltage	Turn on external mains switch Check voltage setting and replace fuse, see paragraph 2.1.3
Displayed/output value wrong	Wrong calibration Old electrolyte or clogged membrane Wrong wiring or setting	New calibration Sensor maintenance Check sensor, wiring and setting
Device not responding correctly to software adjustments or corrections.	Incorrect software programming or corrupted memory.	Initialize software, see paragraph 3.1.9.

☐ In case of error message for membrane sensor calibration.jpg

h Return to the basic menu by pressing the ESC key twice.

5.0 water outlook data to be recorded
Waters Treatment Plant Operator

a Enter the data that is required AFTER performing maintenance or calibration and the instrument readings have settled down.

b When all data has been entered in that tab select the SAVE bottom at the bottom of that tab before exiting or changing tabs.

6.0 Trouble Shooting
Waters Treatment Plant Operator

NOTE **Chlorine calibrations are consistently unsuccessful? Or readings become unstable shortly after calibration?**
Check Cl2 probe electrolyte and top up if necessary.

a Replace chlorine membrane if build up is leading to poor chlorine response

NOTE **Having other problems?**
For other issues see an up to date instrument manual for this piece of equipment.
Contact supplier for replacement parts.

Depolox Manual.pdf

Triggers & Inputs

TRIGGERS

Starts	Frequency	Volume
Routine Calibration Required	Monthly	12 per year
Checks indicate the analyser has drifted out of calibration	N/A	N/A

INPUTS

None Noted

Outputs & Targets

OUTPUTS

Output	To Process	How Used
The Depolox 3 Chlorine electrode is calibrated	Equipment Calibration Management	Update Calibration log

PERFORMANCE TARGETS

None Noted

Process Dependencies

PROCESS LINKS FROM THIS PROCESS

Process Name	Type of Link	Assigned Role
Manage spill of Oxalic acid (solid)	Decision	Waters Treatment Plant Operator

PROCESS LINKS TO THIS PROCESS

Process Name	Type of Link	Assigned Role
Easy access to the primary calibration instruments processes	Process	Waters Treatment Plant Operator

RACI

RESPONSIBLE
Roles that perform process activities

Waters Treatment Plant Operator

ACCOUNTABLE
For ensuring that process is effective and improving

Process Owner	David Kennington
Process Expert	David Kennington
Risk Managers	
Publishers	Annetta Purdy

CONSULTED
Those whose opinions are sought

STAKEHOLDERS
David Kennington, Waters Treatment Plant Operator, Waters Treatment Plants Supervisor

STAKEHOLDERS FROM LINKED PROCESSES

Process	Owner	Expert	Process Group
Easy access to the primary calibration instruments processes	David Kennington	David Kennington	All Calibrations & Verifications
Manage spill of Oxalic acid (solid)	David Kennington	David Kennington	Spills

INFORMED
Those notified of changes

All of the above. These parties are informed via dashboard notifications.

Process Approval

Date	Approver	Type
Approval bypassed	Madelina Baena-Escamilla	Process Group Approver
Approval bypassed	David Kennington	Process Expert

Approval bypassed	Mark Curtis (DELETED)	Process Owner
11-07-2018 (GMT)	Madelina Baena-Escamilla	Promaster

Published on 11-07-2018 (GMT) by Madelina Baena-Escamilla

Timeframes

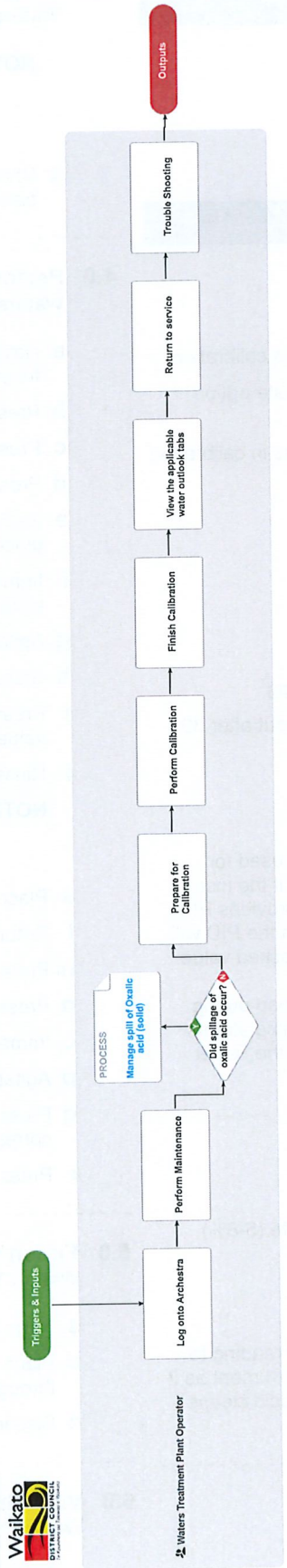
Activity		Incl.	Active Time	Wait Time
1.0	Log on to Archestra			
		✗	(-)	(-)
2.0	water outlook data to be recorded *			
		✓	(-)	(-)
3.0	Perform Maintenance *			
		✓	(-)	(-)
?	Did Spillage of oxalic acid occur?			
		✗	(-)	(-)
4.0	Perform Membrane Sensor Calibration *			
		✓	(-)	(-)
5.0	water outlook data to be recorded *			
		✓	(-)	(-)
6.0	Trouble Shooting *			
		✓	(-)	(-)
	TOTAL		(-)	(-)

Variance Scenarios:

Risk & Compliance

None Noted

Perform a Primary Calibration on the pH Analyser (Depolox 3) v5.0



Perform a Primary Calibration on the pH Analyser (Depolox 3) v5.0

Summary

Objective
To calibrate Depolox 3 pH electrode

Owner David Kennington

Expert David Kennington

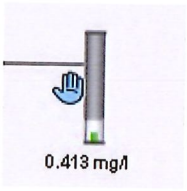
Procedure

1.0 Log onto Archestra
Waters Treatment Plant Operator

a Navigate to find the instrument that requires calibration.

b Select the instrument then select the calibrate option from the pop up menu.

c A blue hand will be displayed to indicate it is in calibration mode as shown in the image.



☐ Calibration mode activated indication.jpg

d Please Note: All calibration modes will timeout after 30 minutes.

NOTE **What is calibration mode?**
Whilst in calibrate mode:

The PV is locked. This is the value used for alarming and feedback. Therefore, if the instrument is in calibration mode and it provides PID feedback, for a pump or valve, then the PID will adjust its output according to that locked value.

All non latching alarms will be stopped during calibration mode however any latching alarms will still need to be cleared through the Reset button.

2.0 Perform Maintenance
Waters Treatment Plant Operator

a Clean dirty electrode using a tissue and dilute (5-8%) oxalic acid.

b Rinse thoroughly with water after cleaning.

NOTE **wait for stable reading**
It is vital that you wait for the output reading to stabilise before calibration of the instrument as it is bound to stray after calibration if acid cleaned and calibrated straight away.

? Did spillage of oxalic acid occur?
Waters Treatment Plant Operator

YES.... PROCESS **Manage spill of Oxalic acid (solic**

NO.... Continue

3.0 Prepare for Calibration
Waters Treatment Plant Operator

NOTE **Safe handling of buffer solution**
Make sure bottle is opened for as short as possible to keep the pH value remaining constant.

a Check the expiry date for all buffers and reagents. Replace if required.

4.0 Perform Calibration
Waters Treatment Plant Operator

a Navigate through the interface menu to find the calibrate function

b Press the menu button on the interface.

c Press F key to get to the menu "Calibration."

d Press "Arrow Down" key to the menu "Cal. pH7."

e Remove the pH-probe, rinse with distilled water then place into buffer

f Immerse the electrode at least 20mm deep into buffer solution pH7.00.

g Agitate gently until the digital display has stabilized.

h Store the Calibration Value.

i Press "tick" key twice to enter and store the calibration value pH7.00.

j Rinse probe with distilled water

NOTE **Why rinse the probe?**
This prevents contamination of the buffer solution.

k Place pH-probe into second buffer (pH 4 Buffer)

l Return to the Calibration Menu

m Press the "Down Arrow" key to the menu "cal. PH."

n Press "tick" to open the menu "cal. PH."

o Immerse at least 2cm deep into buffer solution

p Agitate gently until the digital display has stabilized

q Press the "Up or Down Arrow" keys until the display value corresponds to the value of the buffer solution.

r Press "tick" to store the value.

5.0 Finish Calibration
Waters Treatment Plant Operator

a To go back to the basic display press the "Esc" key twice.

b Place the probe again into the measuring cell or the flow-through assembly.

c Discard the buffer solutions.

6.0 View the applicable water outlook tabs
Waters Treatment Plant Operator

a Check to see if you have entered all the required information.

b If all the required information has been entered, select the save tab at the bottom of the tab.

7.0 Return to service
Waters Treatment Plant Operator

a Bring the pH meter back into service on Archestra.

NOTE **How do you bring the pH meter back into service?**
Navigate to applicable subsection of the plants Archestra screens.
Select the meter or meters that required their probes calibrated.
Deselect the calibrate option in the pop up menu.

8.0 Trouble Shooting
Waters Treatment Plant Operator

NOTE **pH calibrations are consistently unsuccessful?**
Ensure the probe is clean and undamaged and that the cables are tight.

NOTE **The measured pH value in the buffer solution is incorrect?**
First check:
Shelf Life of the buffer solution
Correct Storage (away from heat and UV light)
The buffer solution has not already been used e.g. Poured back into container after previous use.

NOTE **Having other problems?**
See an up to date instrument manual for this piece of equipment.
Contact supplier if new manuals or depolox parts are required.

a Read manual for further information and/or if problems arise

Depolox Manual.pdf

Triggers & Inputs

TRIGGERS

Starts	Frequency	Volume
Routine Calibration Required	1 every 3 months	4 per year
Verification indicates the analyser has drifted out of calibration	N/A	N/A

INPUTS

None Noted

Outputs & Targets

OUTPUTS

Output	To Process	How Used
The Depolox 3 pH analyser & probes are calibrated	Equipment Calibration Management	Update Calibration log

PERFORMANCE TARGETS

None Noted

Process Dependencies

PROCESS LINKS FROM THIS PROCESS

Process Name	Type of Link	Assigned Role
Manage spill of Oxalic acid (solid)	Decision	Waters Treatment Plant Operator

PROCESS LINKS TO THIS PROCESS

Process Name	Type of Link	Assigned Role
Easy access to the primary calibration instruments processes	Process	Waters Treatment Plant Operator

RACI

RESPONSIBLE
Roles that perform process activities

Waters Treatment Plant Operator

ACCOUNTABLE
For ensuring that process is effective and improving

Process Owner	David Kennington
Process Expert	David Kennington
Risk Managers	
Publishers	Annetta Purdy

CONSULTED
Those whose opinions are sought

STAKEHOLDERS
David Kennington, Waters Treatment Plant Operator, Waters Treatment Plants Supervisor

STAKEHOLDERS FROM LINKED PROCESSES

Process	Owner	Expert	Process Group
Easy access to the primary calibration instruments processes	David Kennington	David Kennington	All Calibrations & Verifications
Manage spill of Oxalic acid (solid)	David Kennington	David Kennington	Spills

INFORMED
Those notified of changes

All of the above. These parties are informed via dashboard notifications.

Process Approval

Date	Approver	Type
Approval bypassed	Madelina Baena-Escamilla	Process Group Approver
Approval bypassed	David Kennington	Process Expert

Approval bypassed	Mark Curtis (DELETED)	Process Owner
11-07-2018 (GMT)	Madelina Baena-Escamilla	Promaster

Published on 11-07-2018 (GMT) by Madelina Baena-Escamilla

Timeframes

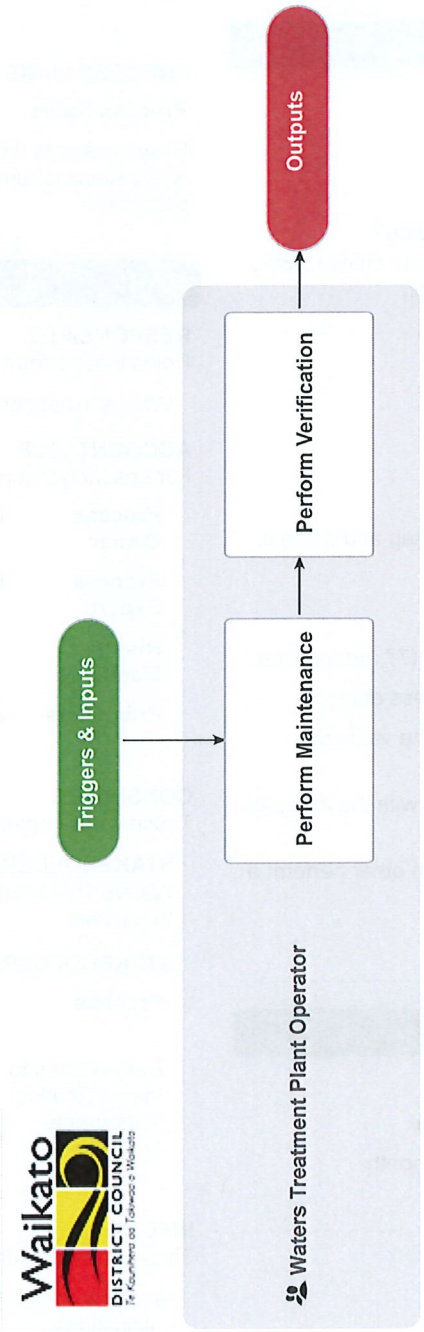
Activity	Incl.	Active Time	Wait Time
1.0 Log onto Archestra *	✓	-	-
2.0 Perform Maintenance *	✓	-	-
? Did spillage of oxalic acid occur?	✗	-	-
3.0 Prepare for Calibration *	✓	-	-
4.0 Perform Calibration *	✓	-	-
5.0 Finish Calibration *	✓	-	-
6.0 View the applicable water outlook tabs *	✓	-	-
7.0 Return to service *	✓	-	-
8.0 Trouble Shooting *	✓	-	-
	TOTAL	-	-

Variance Scenarios:

Risk & Compliance

None Noted

Perform a Verification for the Chlorine Analyser (Depolox 3) v3.0



Perform a Verification for the Chlorine Analyser (Depolox 3) v3.0

Summary

Objective
To verify the chlorine electrode.

Owner David Kennington

Expert David Kennington

Procedure

1.0 Perform Maintenance
Waters Treatment Plant Operator

- **a** Clean the electrode.

  NOTE **How do you clean the electrode?**
  Clean the probe with a tissue and dilute (5-8%) oxalic acid then rinse with water.

2.0 Perform Verification
Waters Treatment Plant Operator

- **a** Assemble; test tube and a photometer
- **b** Locate the analyser being verified.
- **c** Collect three samples from the sample tap and a blank.
- **d** Test the sample using the photometer.
- **e** Turn on the photometer.
- **f** Chose the test 'FAC Free available Cl2 (7)', press enter.
- **g** Insert the blank into the photometer, press enter.
- **h** Insert sample, press enter and record the value displayed. Repeat for all three samples.
- **i** Average the three values and compare with the analyser reading on the instruments interface.
- **j** If the readings are not within 0.1 of each other perform a calibration on the instrument.
- **k** Verification complete.

Triggers & Inputs

TRIGGERS

Starts	Frequency	Volume
Routine verification required	Weekly	4 per month

INPUTS

None Noted

Outputs & Targets

OUTPUTS

Output	To Process	How Used
Verified chlorine electrode	N/A	N/A

PERFORMANCE TARGETS

None Noted

Process Dependencies

PROCESS LINKS FROM THIS PROCESS

None Noted

PROCESS LINKS TO THIS PROCESS

Process Name	Type of Link	Assigned Role
Easy access to the verification instruments processes	Process	Waters Treatment Plant Operator

RACI

RESPONSIBLE
Roles that perform process activities

Waters Treatment Plant Operator

ACCOUNTABLE
For ensuring that process is effective and improving

Process Owner	David Kennington
Process Expert	David Kennington
Risk Managers	
Publishers	Annetta Purdy

CONSULTED
Those whose opinions are sought

STAKEHOLDERS
Waters Treatment Plant Operator, Waters Treatment Plants Supervisor

STAKEHOLDERS FROM LINKED PROCESSES

Process	Owner	Expert	Process Group
Easy access to the verification instruments processes	David Kennington	David Kennington	All Calibrations & Verifications

INFORMED
Those notified of changes

All of the above. These parties are informed via dashboard notifications.

Process Approval

Date	Approver	Type
Approval bypassed	Madelina Baena-Escamilla	Process Group Approver
Approval bypassed	David Kennington	Process Expert

Appróval bypassed	Mark Curtis (DELETED)	Process Owner
11-07-2018 (GMT)	Madelina Baena-Escamilla	Promaster

Published on 11-07-2018 (GMT) by Madelina Baena-Escamilla

Timeframes

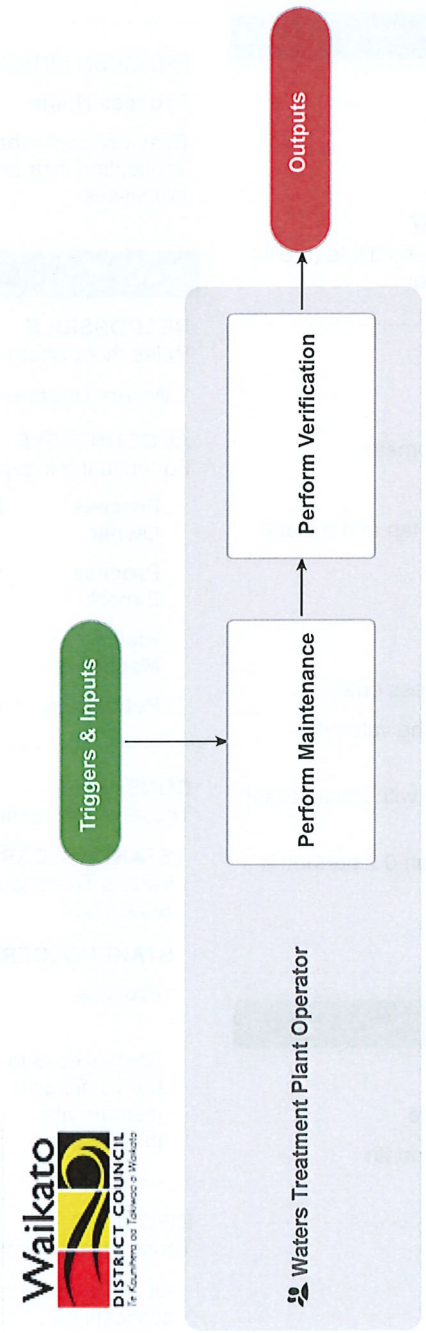
Activity		Incl.	Active Time	Wait Time
1.0	Perform Maintenance			
		✗	(-)	(-)
2.0	Perform Verification *			
		✓	(-)	(-)
		TOTAL	(-)	(-)

Variance Scenarios:

Risk & Compliance

None Noted

Perform a Verification for the pH Analyser (Depolox 3) v3.0



Perform a Verification for the pH Analyser (Depolox 3) v3.0

Summary

Objective
To perform a verification on the pH electrode.

Owner David Kennington

Expert David Kennington

Procedure

1.0 Perform Maintenance
Waters Treatment Plant Operator

- **a** Clean the probe.

  NOTE **How do you clean the probe?**
  Clean the probe with a tissue and dilute (5-8%) oxalic acid then rinse with water.

2.0 Perform Verification
Waters Treatment Plant Operator

- **a** Assemble; three test tubes and a photometer.
- **b** Locate the analyser being verified.
- **c** Collect three samples from the sample tap and a blank.
- **d** Test the samples using the photometer.
- **e** Turn on the photometer.
- **f** Chose the test 'pH 27', press enter.
- **g** Insert the blank into the photometer, press enter.
- **h** Insert sample, press enter and record the value displayed. Repeat for all three samples.
- **i** Average the three values and compare with the analysers reading on the instruments interface.
- **j** If the readings are different by more than 0.2 perform a calibration on the instrument.
- **k** Verification complete.

Triggers & Inputs

TRIGGERS

Starts	Frequency	Volume
Routine verification required	Weekly	4 per month

INPUTS

None Noted

Outputs & Targets

OUTPUTS

Output	To Process	How Used
The pH electrode is verified	N/A	N/A

PERFORMANCE TARGETS

None Noted

Process Dependencies

PROCESS LINKS FROM THIS PROCESS

None Noted

PROCESS LINKS TO THIS PROCESS

Process Name	Type of Link	Assigned Role
Easy access to the verification instruments processes	Process	Waters Treatment Plant Operator

RACI

RESPONSIBLE
Roles that perform process activities

Waters Treatment Plant Operator

ACCOUNTABLE
For ensuring that process is effective and improving

Process Owner	David Kennington
Process Expert	David Kennington
Risk Managers	
Publishers	Annetta Purdy

CONSULTED
Those whose opinions are sought

STAKEHOLDERS
Waters Treatment Plant Operator, Waters Treatment Plants Supervisor

STAKEHOLDERS FROM LINKED PROCESSES

Process	Owner	Expert	Process Group
Easy access to the verification instruments processes	David Kennington	David Kennington	All Calibrations & Verifications

INFORMED
Those notified of changes

All of the above. These parties are informed via dashboard notifications.

Process Approval

Date	Approver	Type
Approval bypassed	Madelina Baena-Escamilla	Process Group Approver
Approval bypassed	David Kennington	Process Expert

Approval bypassed	Mark Curtis (DELETED)	Process Owner
11-07-2018 (GMT)	Madelina Baena-Escamilla	Promaster

Published on 11-07-2018 (GMT) by Madelina Baena-Escamilla

Timeframes

Activity		Incl.	Active Time	Wait Time
1.0	Perform Maintenance			
		✗	-	-
2.0	Perform Verification *			
		✓	-	-
		TOTAL	-	-

Variance Scenarios:

Risk & Compliance

None Noted

Risk Register Guideline

Risk Table Category	Definition
Item	The unique number of the risk
Process Area	A description of the area(s) in Watercare to which the process relates. Plant specific. Select from a specified list
MoH Supply Element	A series of Water Safety Plan guides covering the system elements (e.g. filtration, disinfection, water storage, distribution etc.) that are most frequently found in drinking-water supplies, for reference in preparing a Water Safety Plan. Select from a specified list
Risk Title	A concise description giving an overview of the event that will occur
Hazard	Hazard Type 1: Biological (incl. bacteria, protozoa & viruses) Hazard Type 2: Chemicals >100% MAV (incl. cyanotoxins & radiological) Hazard Type 3: Chemicals 50-100% MAV Hazard Type 4: Chemical and physical above GV (incl. aesthetics) Hazard Type 5: All – this specification can be applied where treatment process is a barrier to Hazard Type 1 to 4. NOTE: Biological considered the highest risk for this.
Risk Cause	The trigger that causes the Hazardous Event to occur
Risk Consequence	Consequence of the event / hazards reasonably expected to be associated with the Hazardous Event
Uncontrolled Risk	The impact of the Hazardous Event with no controls in place
Likelihood Score	Likelihood of the Risk Cause occurring if no controls are in place
Consequence Score	The severity of the Risk Consequence where no controls, contingencies or mitigating factors are in effect
Risk Rating	The overall score of the risk based on the Likelihood and Consequence Scores
Preventive Controls	Controls currently in place to prevent or reduce the likelihood of the Hazardous Event occurring
Mitigating Factors	Actions taken to decrease the Likelihood and Consequence Scores
Critical Control Points	Process control points that control the water supply system
Contingency	Actions put in place to manage the effects of the Hazardous Event once it has occurred
Current Likelihood Score	The likelihood that the Hazardous Event will occur with the Preventive Controls and Mitigating Factors in place
Current Consequence Score	Consequences of the event if it occurs with Preventive Controls, Contingencies and Mitigating Factors in effect
Current Risk Rating	The overall score for the risk based on the Current Likelihood and the Current Consequence Scores
Risk Acceptability	Current Risk Rating of 1 or 2 = Acceptable Current Risk Rating of 3 = Tolerable Current Risk Rating of 4 or 5 = Unacceptable; improvement required
Justification	Explanation of the reasoning behind the Risk Acceptability assessment
Priority	Priority to implement required improvements
Improvement Actions	Further actions or controls required to reduce the Risk Acceptability to Tolerable or Acceptable

Estimated Cost ($)	The assessed cost of the Improvement Actions
Planned Completion Date	The date set for completion of the Improvement Actions
Owner	The nominated person who will monitor the risk, record any changes to the Current Risk Rating and will make sure the controls and Improvement Actions are in place / progressing as planned
Uncertainty Descriptor	Certain • At least 5 years of continuous data monitoring • Biological and chemical Lab sampling as per DWSNZ monitoring requirements, • Operation sampling based on WTP performance requirements, seasonal events & catchment risk • Inspection and calibration records • Robust hazard and risk assessment • Preventative measures/processes thoroughly understood Confident • At least 2 years of continuous data monitoring • Biological and chemical Lab sampling as per DWSNZ monitoring requirements, • Operation sampling based on WTP performance requirements, seasonal events & catchment risk • Inspection and calibration records • Robust hazard and risk assessment • Preventative measures/processes thoroughly understood Reliable • At least 1 year of continuous data monitoring • Biological and chemical Lab sampling as per DWSNZ monitoring requirements, • Operation sampling based on WTP performance requirements, some seasonal variance & catchment risk • Inspection and calibration records • Good hazard and risk assessment • Good understanding of preventative measures/processes Estimate • Limited monitoring data • Reasonable understanding of hazardous events and preventative measures/procedures involved Uncertain • Limited or no monitoring data • Hazardous events or preventative measures/processes are not well understood

Scoring Guidance - Descriptors of Likelihood and Consequences

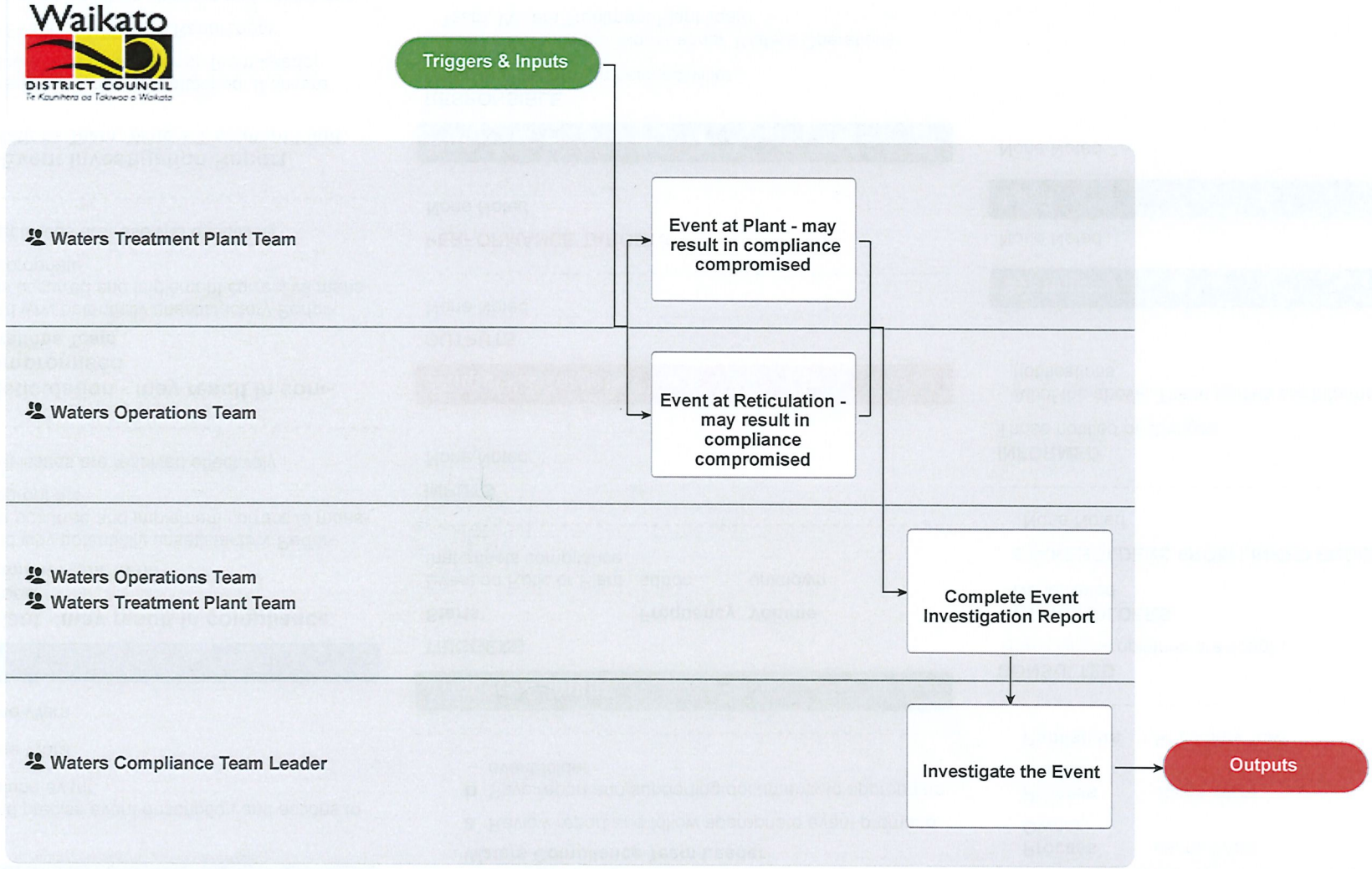
Likelihood (MoH WSP Framework)	Descriptor	%	Description
5	Very High	>75%	>1/week
4	High	50-75%	>1/month
3	Medium	25-50%	>1/year
2	Low	5-25%	>1/five years
1	Very Low	<5%	> or equal five years

Consequence*	Descriptor	Quality	Quantity
5	Very High	• Illness causing acute harm to multiple people with confirmed link to the drinking-water supply or wastewater discharges. • Non-compliance with the Health Act and/or DWSNZ requirements that necessitates a large-scale response/remedial actions. • WSP is not approved within required timeframe and a non-compliance is issued. • Statutory powers of the DWA or designated officers are exercised. • More than 1,000 customer complaints received from customers relating to a Watercare service.	• Water storage well below satisfactory levels requiring mandatory restrictions under the Auckland Drought Management Plan to be implemented. • Unplanned loss of supply/service for 1,000-5,000 customers for more than 24 hours. • Water restrictions implemented due to an operational incident for more than 20,000 customers for more than 24 hours. • Key Account Holder/National Hospital/Private Hospital or Care Facility (with more than 100 beds) without Watercare services for more than 24 hours. • Inability to meet long term regional growth or service SHAs of more than 5,000 dwellings due to lack of trunk infrastructure capacity.

Consequence*	Descriptor	Quality	Quantity
4	High	• Illness causing acute harm to a single person with a confirmed link to the drinking-water supply or wastewater discharges. • Non-compliance with the Health Act and/or DWSNZ requirements that necessitates a small-scale response/remedial actions. • WSP is not approved within required timeframe and a non-compliance is issued. • DWAs issue a non-compliance report assigning timeframes to achieve compliance. • From 500 – 1,000 complaints received from customers relating to a Watercare service	• Water storage below satisfactory levels requiring voluntary restrictions under the Auckland Drought Management Plan to be implemented. • Unplanned loss of supply/service for 500-1,000 customers for more than 24 hours. • Water restrictions implemented due to an operational incident for 10,000 to 20,000 customers for more 24 hours. • Key Account Holder/National Hospital/Private Hospital or Care Facility (with more than 50 beds) without Watercare services for 12 to 24 hours. • Inability to meet long term growth for one or more former LNO area(s) or service SHAs of 1,000 – 5,000 dwellings due to a lack of trunk infrastructure capacity.
3	Medium	• Multiple people with illness in the community with a confirmed link to the drinking-water supply or wastewater discharges. • Non-compliance with the Health Act and/or DWSNZ requirements where limited remedial actions required. • DWA follow up inspection required. • From 50 - 500 complaints received from customers relating to a Watercare service	• Water storage below satisfactory levels where voluntary savings by public are promoted by Watercare. • Unplanned loss of supply/service for 100-1,000 customers for more than 24 hours. • Water restrictions implemented due to an operational incident for 5,000 to 10,000 customers for 12 to 24 hours. • Key Account Holder/National Hospital/Private Hospital or Care Facility (with more than 20 beds) without Watercare services for 6 to 12 hours. • Inability to meet long term growth for one or more water supply zone(s) / wastewater catchment(s) but less than a former LNO area, or service SHAs of 100-1,000 dwellings due to a lack of trunk infrastructure capacity.

Consequence*	Descriptor	Quality	Quantity
2	Low	• Single person with illness in the community with confirmed links to the drinking-water supply or wastewater discharges. • Transgression from DWSNZ requirements or non-compliance with the Health Act, where limited remedial action is required. • From 10 - 50 complaints received from customers relating to a Watercare service.	• Water storage below satisfactory levels with increased use of river sources required to reduce potential shortfalls in supply. • Unplanned loss of supply/service for 10 to 100 customers for more than 24 hours. • Water restrictions due to an operational incident implemented for 1,000 to 5,000 customers for 12 to 24 hours • Key Account Holder/National Hospital/Private Hospital or Care Facility (with more than 10 beds) without Watercare services for 3 to 6 hours. • Inability to meet long term growth in a single water supply zone / wastewater catchment or SHA qualifying development of 10-100 dwellings due to a lack of trunk infrastructure capacity.
1	Very low	• Unconfirmed illness without a link to the drinking-water supply or wastewater discharges. • Transgression from DWSNZ or non-compliance with the Health Act, requirements where minimal / no remedial action is required. • Less than 10 complaints received from customers relating to a Watercare service.	• Water storage remains at satisfactory levels, with the system operated as per the production plan. • Unplanned loss of supply/service for less than 10 customers for more than 24 hours. • Water restrictions due to operational incident implemented for less than 1,000 customers for less than 24 hours. • Key Account Holder/National Hospital/Private Hospital or Care Facility (less than 10 beds) without Watercare services for less than 3 hours. • Inability to meet long term growth for a single development of SHA qualifying development <10 dwellings due to a lack of trunk infrastructure capacity.

Service Delivery 3 Waters - Complete a Event Investigation Report [In Progress] v0.13



Service Delivery 3 Waters - Complete a Event Investigation Report [In Progress] v0.13

Summary

Objective
To give a clear and precise event description and actions to remedy and conclude event

Owner Jaime Wara

Expert Jaime Wara

Procedure

1.0 Event at Plant - may result in compliance compromised
Waters Treatment Plant Team

- **a** Understand why potentially unsatisfactory Performance has occurred and implement corrective measures as appropriate
- **b** Ensure that issues are resolved effectively

1.1 Event at Reticulation - may result in compliance compromised
Waters Operations Team

- **a** Understand why potentially unsatisfactory Performance has occurred and implement corrective measures as appropriate
- **b** Ensure that issues are resolved effectively

2.0 Complete Event Investigation Report
Waters Operations Team, Waters Treatment Plant Team

- **a** Complete each field per form attached. If unsure please discuss with Supervisor or Team Leader
  - Form Event Investigation Report.docx
- **b** Identify the need for future planning and continuous improvement processes. Provide valuable ideas for future suitable designs and best practice.
- **c** Email completed form to Income and Compliance Team Leader to investigate

3.0 Investigate the Event
Waters Compliance Team Leader

- **a** Review report and follow appropriate event promapp
- **b** Save report and supporting documents to appropriate event folder

Triggers & Inputs

TRIGGERS

Starts	Frequency	Volume
Event on Retic or Plant that affects compliance	adhoc	unknown

INPUTS
None Noted

Outputs & Targets

OUTPUTS
None Noted

PERFORMANCE TARGETS
None Noted

RACI

RESPONSIBLE
Roles that perform process activities

Waters Compliance Team Leader, Waters Operations Team, Waters Treatment Plant Team

Systems that perform process activities

None Noted

ACCOUNTABLE
For ensuring that process is effective and improving

Process Owner Jaime Wara

Process Expert Jaime Wara

Publishers Rosemary Towl

CONSULTED
Those whose opinions are sought

STAKEHOLDERS
None Noted

STAKEHOLDERS FROM LINKED PROCESSES

None Noted

INFORMED
Those notified of changes

All of the above. These parties are informed via dashboard notifications.

Systems

None Noted

Lean

None Noted

Waikato DISTRICT COUNCIL Te Kaunihera aa Takiwaa o Waikato	Service Delivery Compliance
	Event Investigation Report

Report ID	
Date	[Date of incident]
WATER ☐ WASTEWATER ☐ STORMWATER ☐	
PLANT ☐ RETIC ☐ OTHER: _____	
Site	
Parameter	
Compliance criteria compromised	
Report completed by	
Report Date	

1. Event Description

[Summary of incident and potential compliance issue e.g. Sandfilter 1 Enhanced Turbidity]

2. Event Details/Data

[Incidents leading to event]

3. Event Investigation/Timeline

[Time line leading up to incident and until resolved]

4. Compliance Analysis

[Exceed Resource Consent or maxium acceptable values]

5. Further Actions to be Taken

Action	Owner	Deadline

[add rows if required]

6. Event Conclusion

7. Attachments

[attachment if any]

Sample Number	Component	Code	Type	Date	Purpose	Determinand	Result	Unit	Recognised Test	Test Method	Laboratory
2018004962	Raglan	RAG001RA	Zone	2/07/2018	Monitoring	Turb	0.12	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018005098	Raglan	RAG001RA	Zone	5/07/2018	Monitoring	Turb	0.33	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018005307	Raglan	RAG001RA	Zone	13/07/2018	Monitoring	Turb	0.08	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018005409	Raglan	RAG001RA	Zone	17/07/2018	Monitoring	Turb	0.21	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018005571	Raglan	RAG001RA	Zone	23/07/2018	Monitoring	Turb	0.16	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018005798	Raglan	RAG001RA	Zone	31/07/2018	Monitoring	Turb	0.06	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018005860	Raglan	RAG001RA	Zone	1/08/2018	Monitoring	Turb	0.33	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018006046	Raglan	RAG001RA	Zone	8/08/2018	Monitoring	Turb	0.06	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018006225	Raglan	RAG001RA	Zone	15/08/2018	Monitoring	Turb	0.09	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018006263	Raglan	RAG001RA	Zone	16/08/2018	Monitoring	Turb	0.2	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018006703	Raglan	RAG001RA	Zone	24/08/2018	Monitoring	Turb	0.14	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018006874	Raglan	RAG001RA	Zone	30/08/2018	Monitoring	Turb	0.11	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018006996	Raglan	RAG001RA	Zone	3/09/2018	Monitoring	Turb	0.16	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018007218	Raglan	RAG001RA	Zone	11/09/2018	Monitoring	Turb	0.15	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018007398	Raglan	RAG001RA	Zone	14/09/2018	Monitoring	Turb	0.3	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018007521	Raglan	RAG001RA	Zone	19/09/2018	Monitoring	Turb	0.12	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018007842	Raglan	RAG001RA	Zone	27/09/2018	Monitoring	Turb	0.45	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018007932	Raglan	RAG001RA	Zone	1/10/2018	Monitoring	Turb	0.14	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018007981	Raglan	RAG001RA	Zone	2/10/2018	Monitoring	Turb	0.15	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018008021	Raglan	RAG001RA	Zone	3/10/2018	Monitoring	Turb	0.34	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018008124	Raglan	RAG001RA	Zone	8/10/2018	Monitoring	Turb	0.08	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018008151	Raglan	RAG001RA	Zone	9/10/2018	Monitoring	Turb	0.24	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018008216	Raglan	RAG001RA	Zone	10/10/2018	Monitoring	Turb	0.12	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018008298	Raglan	RAG001RA	Zone	12/10/2018	Monitoring	Turb	0.29	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018008402	Raglan	RAG001RA	Zone	17/10/2018	Monitoring	Turb	0.09	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018008423	Raglan	RAG001RA	Zone	18/10/2018	Monitoring	Turb	0.19	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018008461	Raglan	RAG001RA	Zone	19/10/2018	Monitoring	Turb	0.2	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018008565	Raglan	RAG001RA	Zone	24/10/2018	Monitoring	Turb	0.14	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018008592	Raglan	RAG001RA	Zone	25/10/2018	Monitoring	Turb	0.08	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018008669	Raglan	RAG001RA	Zone	26/10/2018	Monitoring	Turb	0.15	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018008716	Raglan	RAG001RA	Zone	29/10/2018	Monitoring	Turb	0.23	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
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2018008960	Raglan	RAG001RA	Zone	5/11/2018	Monitoring	Turb	0.11	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018009033	Raglan	RAG001RA	Zone	6/11/2018	Monitoring	Turb	0.27	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018009081	Raglan	RAG001RA	Zone	7/11/2018	Monitoring	Turb	0.24	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018009180	Raglan	RAG001RA	Zone	12/11/2018	Monitoring	Turb	0.14	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018009211	Raglan	RAG001RA	Zone	13/11/2018	Monitoring	Turb	0.14	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
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2018009368	Raglan	RAG001RA	Zone	20/11/2018	Monitoring	Turb	0.24	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018009500	Raglan	RAG001RA	Zone	21/11/2018	Monitoring	Turb	0.15	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018009537	Raglan	RAG001RA	Zone	22/11/2018	Monitoring	Turb	0.26	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018009684	Raglan	RAG001RA	Zone	28/11/2018	Monitoring	Turb	0.37	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018009725	Raglan	RAG001RA	Zone	29/11/2018	Monitoring	Turb	0.25	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
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2018010106	Raglan	RAG001RA	Zone	7/12/2018	Monitoring	Turb	0.15	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018010137	Raglan	RAG001RA	Zone	10/12/2018	Monitoring	Turb	0.13	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
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2018010284	Raglan	RAG001RA	Zone	14/12/2018	Monitoring	Turb	0.17	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018010327	Raglan	RAG001RA	Zone	17/12/2018	Monitoring	Turb	0.69	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018010326	Raglan	RAG001RA	Zone	17/12/2018	Monitoring	Turb	0.47	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
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2018010679	Raglan	RAG001RA	Zone	28/12/2018	Monitoring	Turb	0.47	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2018010786	Raglan	RAG001RA	Zone	4/01/2019	Monitoring	Turb	0.45	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
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2019000078	Raglan	RAG001RA	Zone	12/01/2019	Monitoring	Turb	0.32	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019000226	Raglan	RAG001RA	Zone	16/01/2019	Monitoring	Turb	0.13	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019000327	Raglan	RAG001RA	Zone	21/01/2019	Monitoring	Turb	0.14	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019000552	Raglan	RAG001RA	Zone	29/01/2019	Monitoring	Turb	0.5	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019000688	Raglan	RAG001RA	Zone	31/01/2019	Monitoring	Turb	0.13	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019000823	Raglan	RAG001RA	Zone	7/02/2019	Monitoring	Turb	0.11	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019001122	Raglan	RAG001RA	Zone	14/02/2019	Monitoring	Turb	0.48	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
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2019001573	Raglan	RAG001RA	Zone	1/03/2019	Monitoring	Turb	0.13	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
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2019002594	Raglan	RAG001RA	Zone	1/04/2019	Monitoring	Turb	0.11	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019002723	Raglan	RAG001RA	Zone	4/04/2019	Monitoring	Turb	0.1	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019002973	Raglan	RAG001RA	Zone	12/04/2019	Monitoring	Turb	1	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
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2019003281	Raglan	RAG001RA	Zone	23/04/2019	Monitoring	Turb	0.1	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
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2019003488	Raglan	RAG001RA	Zone	30/04/2019	Monitoring	Turb	0.43	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019003749	Raglan	RAG001RA	Zone	8/05/2019	Monitoring	Turb	0.14	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
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2019003989	Raglan	RAG001RA	Zone	16/05/2019	Monitoring	Turb	0.13	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019004132	Raglan	RAG001RA	Zone	22/05/2019	Monitoring	Turb	0.14	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019004215	Raglan	RAG001RA	Zone	24/05/2019	Monitoring	Turb	0.22	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019004469	Raglan	RAG001RA	Zone	4/06/2019	Monitoring	Turb	0.1	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019004527	Raglan	RAG001RA	Zone	5/06/2019	Monitoring	Turb	0.42	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019004770	Raglan	RAG001RA	Zone	11/06/2019	Monitoring	Turb	0.23	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory

2019005004	Raglan	RAG001RA	Zone	18/06/2019	Monitoring	Turb	0.07	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019005038	Raglan	RAG001RA	Zone	19/06/2019	Monitoring	Turb	0.13	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019005304	Raglan	RAG001RA	Zone	27/06/2019	Monitoring	Turb	0.14	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
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2019005563	Raglan	RAG001RA	Zone	4/07/2019	Monitoring	Turb	0.14	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019005798	Raglan	RAG001RA	Zone	12/07/2019	Monitoring	Turb	0.24	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019005922	Raglan	RAG001RA	Zone	17/07/2019	Monitoring	Turb	0.24	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019006057	Raglan	RAG001RA	Zone	22/07/2019	Monitoring	Turb	0.16	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019006303	Raglan	RAG001RA	Zone	30/07/2019	Monitoring	Turb	0.13	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019006389	Raglan	RAG001RA	Zone	1/08/2019	Monitoring	Turb	0.23	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019006539	Raglan	RAG001RA	Zone	7/08/2019	Monitoring	Turb	0.18	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019006855	Raglan	RAG001RA	Zone	15/08/2019	Monitoring	Turb	0.49	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019006907	Raglan	RAG001RA	Zone	16/08/2019	Monitoring	Turb	0.19	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019007126	Raglan	RAG001RA	Zone	23/08/2019	Monitoring	Turb	0.32	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019007340	Raglan	RAG001RA	Zone	30/08/2019	Monitoring	Turb	0.13	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019007374	Raglan	RAG001RA	Zone	2/09/2019	Monitoring	Turb	0.17	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019007667	Raglan	RAG001RA	Zone	10/09/2019	Monitoring	Turb	0.22	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019007867	Raglan	RAG001RA	Zone	16/09/2019	Monitoring	Turb	0.25	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019007957	Raglan	RAG001RA	Zone	18/09/2019	Monitoring	Turb	0.14	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019008211	Raglan	RAG001RA	Zone	26/09/2019	Monitoring	Turb	0.21	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019008390	Raglan	RAG001RA	Zone	1/10/2019	Monitoring	Turb	0.14	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019008432	Raglan	RAG001RA	Zone	2/10/2019	Monitoring	Turb	0.12	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019008519	Raglan	RAG001RA	Zone	4/10/2019	Monitoring	Turb	0.09	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019008667	Raglan	RAG001RA	Zone	9/10/2019	Monitoring	Turb	0.32	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019008794	Raglan	RAG001RA	Zone	14/10/2019	Monitoring	Turb	0.17	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019008834	Raglan	RAG001RA	Zone	15/10/2019	Monitoring	Turb	0.33	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019008922	Raglan	RAG001RA	Zone	17/10/2019	Monitoring	Turb	0.3	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019009046	Raglan	RAG001RA	Zone	22/10/2019	Monitoring	Turb	0.27	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019009158	Raglan	RAG001RA	Zone	25/10/2019	Monitoring	Turb	0.26	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019009225	Raglan	RAG001RA	Zone	29/10/2019	Monitoring	Turb	0.15	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019009279	Raglan	RAG001RA	Zone	30/10/2019	Monitoring	Turb	0.36	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019009454	Raglan	RAG001RA	Zone	5/11/2019	Monitoring	Turb	0.58	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019009545	Raglan	RAG001RA	Zone	7/11/2019	Monitoring	Turb	0.33	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019009625	Raglan	RAG001RA	Zone	11/11/2019	Monitoring	Turb	0.57	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019009729	Raglan	RAG001RA	Zone	13/11/2019	Monitoring	Turb	0.1	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019009804	Raglan	RAG001RA	Zone	15/11/2019	Monitoring	Turb	0.13	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019009984	Raglan	RAG001RA	Zone	21/11/2019	Monitoring	Turb	0.29	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019010025	Raglan	RAG001RA	Zone	22/11/2019	Monitoring	Turb	0.08	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019010091	Raglan	RAG001RA	Zone	25/11/2019	Monitoring	Turb	0.11	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019010301	Raglan	RAG001RA	Zone	29/11/2019	Monitoring	Turb	0.31	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019010329	Raglan	RAG001RA	Zone	2/12/2019	Monitoring	Turb	0.13	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019010405	Raglan	RAG001RA	Zone	3/12/2019	Monitoring	Turb	0.28	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019010529	Raglan	RAG001RA	Zone	6/12/2019	Monitoring	Turb	0.15	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019010684	Raglan	RAG001RA	Zone	10/12/2019	Monitoring	Turb	0.12	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019010697	Raglan	RAG001RA	Zone	11/12/2019	Monitoring	Turb	0.11	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019010916	Raglan	RAG001RA	Zone	18/12/2019	Monitoring	Turb	0.08	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019010954	Raglan	RAG001RA	Zone	19/12/2019	Monitoring	Turb	0.07	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019011011	Raglan	RAG001RA	Zone	20/12/2019	Monitoring	Turb	0.2	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019011099	Raglan	RAG001RA	Zone	24/12/2019	Monitoring	Turb	0.15	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019011129	Raglan	RAG001RA	Zone	27/12/2019	Monitoring	Turb	0.14	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2019011266	Raglan	RAG001RA	Zone	3/01/2020	Monitoring	Turb	0.1	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020000024	Raglan	RAG001RA	Zone	6/01/2020	Monitoring	Turb	0.15	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020000188	Raglan	RAG001RA	Zone	9/01/2020	Monitoring	Turb	0.1	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020000312	Raglan	RAG001RA	Zone	14/01/2020	Monitoring	Turb	0.36	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020000434	Raglan	RAG001RA	Zone	17/01/2020	Monitoring	Turb	0.32	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020000471	Raglan	RAG001RA	Zone	20/01/2020	Monitoring	Turb	0.09	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020000592	Raglan	RAG001RA	Zone	22/01/2020	Monitoring	Turb	0.29	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020000631	Raglan	RAG001RA	Zone	23/01/2020	Monitoring	Turb	0.44	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020000723	Raglan	RAG001RA	Zone	28/01/2020	Monitoring	Turb	0.11	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020000840	Raglan	RAG001RA	Zone	30/01/2020	Monitoring	Turb	0.82	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020001023	Raglan	RAG001RA	Zone	5/02/2020	Monitoring	Turb	0.13	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020001102	Raglan	RAG001RA	Zone	7/02/2020	Monitoring	Turb	0.16	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020001187	Raglan	RAG001RA	Zone	10/02/2020	Monitoring	Turb	0.23	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020001359	Raglan	RAG001RA	Zone	13/02/2020	Monitoring	Turb	0.18	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020001447	Raglan	RAG001RA	Zone	17/02/2020	Monitoring	Turb	0.9	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020001676	Raglan	RAG001RA	Zone	21/02/2020	Monitoring	Turb	0.3	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020001737	Raglan	RAG001RA	Zone	24/02/2020	Monitoring	Turb	0.11	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020001785	Raglan	RAG001RA	Zone	25/02/2020	Monitoring	Turb	0.16	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020001880	Raglan	RAG001RA	Zone	27/02/2020	Monitoring	Turb	0.13	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020002033	Raglan	RAG001RA	Zone	3/03/2020	Monitoring	Turb	0.18	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020002064	Raglan	RAG001RA	Zone	4/03/2020	Monitoring	Turb	0.34	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020002281	Raglan	RAG001RA	Zone	11/03/2020	Monitoring	Turb	0.2	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020002331	Raglan	RAG001RA	Zone	12/03/2020	Monitoring	Turb	0.16	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020002425	Raglan	RAG001RA	Zone	16/03/2020	Monitoring	Turb	0.21	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020002606	Raglan	RAG001RA	Zone	19/03/2020	Monitoring	Turb	0.29	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020002655	Raglan	RAG001RA	Zone	20/03/2020	Monitoring	Turb	0.17	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020002860	Raglan	RAG001RA	Zone	27/03/2020	Monitoring	Turb	0.08	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020002895	Raglan	RAG001RA	Zone	30/03/2020	Monitoring	Turb	0.11	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020002972	Raglan	RAG001RA	Zone	1/04/2020	Monitoring	Turb	0.12	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020003005	Raglan	RAG001RA	Zone	2/04/2020	Monitoring	Turb	0.29	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020003073	Raglan	RAG001RA	Zone	6/04/2020	Monitoring	Turb	0.2	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020003155	Raglan	RAG001RA	Zone	9/04/2020	Monitoring	Turb	0.07	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020003232	Raglan	RAG001RA	Zone	14/04/2020	Monitoring	Turb	0.13	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020003330	Raglan	RAG001RA	Zone	17/04/2020	Monitoring	Turb	0.15	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020003373	Raglan	RAG001RA	Zone	20/04/2020	Monitoring	Turb	0.06	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020003457	Raglan	RAG001RA	Zone	22/04/2020	Monitoring	Turb	0.16	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020003536	Raglan	RAG001RA	Zone	28/04/2020	Monitoring	Turb	0.11	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020003619	Raglan	RAG001RA	Zone	30/04/2020	Monitoring	Turb	0.12	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020003751	Raglan	RAG001RA	Zone	6/05/2020	Monitoring	Turb	0.13	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020003817	Raglan	RAG001RA	Zone	8/05/2020	Monitoring	Turb	0.09	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020003956	Raglan	RAG001RA	Zone	14/05/2020	Monitoring	Turb	0.08	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory

2020004046	Raglan	RAG001RA	Zone	18/05/2020	Monitoring	Turb	0.12	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020004217	Raglan	RAG001RA	Zone	22/05/2020	Monitoring	Turb	0.22	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020004282	Raglan	RAG001RA	Zone	25/05/2020	Monitoring	Turb	0.19	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020004281	Raglan	RAG001RA	Zone	25/05/2020	Monitoring	Turb	0.11	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020004561	Raglan	RAG001RA	Zone	2/06/2020	Monitoring	Turb	0.17	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020004644	Raglan	RAG001RA	Zone	3/06/2020	Monitoring	Turb	0.19	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020004848	Raglan	RAG001RA	Zone	10/06/2020	Monitoring	Turb	0.11	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020004884	Raglan	RAG001RA	Zone	11/06/2020	Monitoring	Turb	0.21	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020005032	Raglan	RAG001RA	Zone	18/06/2020	Monitoring	Turb	0.15	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020005061	Raglan	RAG001RA	Zone	19/06/2020	Monitoring	Turb	0.16	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020005223	Raglan	RAG001RA	Zone	26/06/2020	Monitoring	Turb	0.13	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020005260	Raglan	RAG001RA	Zone	29/06/2020	Monitoring	Turb	0.17	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020005259	Raglan	RAG001RA	Zone	29/06/2020	Monitoring	Turb	0.11	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020005348	Raglan	RAG001RA	Zone	1/07/2020	Monitoring	Turb	0.13	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020005468	Raglan	RAG001RA	Zone	6/07/2020	Monitoring	Turb	0.11	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020005662	Raglan	RAG001RA	Zone	14/07/2020	Monitoring	Turb	0.21	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020005696	Raglan	RAG001RA	Zone	15/07/2020	Monitoring	Turb	0.2	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020005890	Raglan	RAG001RA	Zone	22/07/2020	Monitoring	Turb	0.51	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020006040	Raglan	RAG001RA	Zone	28/07/2020	Monitoring	Turb	0.13	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020006085	Raglan	RAG001RA	Zone	30/07/2020	Monitoring	Turb	0.17	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020006268	Raglan	RAG001RA	Zone	7/08/2020	Monitoring	Turb	0.2	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020006335	Raglan	RAG001RA	Zone	11/08/2020	Monitoring	Turb	0.09	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020006463	Raglan	RAG001RA	Zone	17/08/2020	Monitoring	Turb	0.11	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020006537	Raglan	RAG001RA	Zone	19/08/2020	Monitoring	Turb	0.25	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020006624	Raglan	RAG001RA	Zone	24/08/2020	Monitoring	Turb	0.31	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020006655	Raglan	RAG001RA	Zone	25/08/2020	Monitoring	Turb	0.15	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020006884	Raglan	RAG001RA	Zone	2/09/2020	Monitoring	Turb	0.45	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020007020	Raglan	RAG001RA	Zone	7/09/2020	Monitoring	Turb	0.13	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020007166	Raglan	RAG001RA	Zone	10/09/2020	Monitoring	Turb	0.28	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020007408	Raglan	RAG001RA	Zone	18/09/2020	Monitoring	Turb	0.14	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020007452	Raglan	RAG001RA	Zone	21/09/2020	Monitoring	Turb	0.37	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
2020007643	Raglan	RAG001RA	Zone	28/09/2020	Monitoring	Turb	0.33	NTU	Excluded	Turbidity Meter	Hamilton CC Laboratory
5933995	Raglan	RAG001RA	Zone	3/10/2020	Monitoring	Turb	0.15	NTU	Excluded	Turbidity Meter	Watercare Services Ltd (Lab)
5945888	Raglan	RAG001RA	Zone	8/10/2020	Monitoring	Turb	0.1	NTU	Excluded	Turbidity Meter	Watercare Services Ltd (Lab)
5956852	Raglan	RAG001RA	Zone	13/10/2020	Monitoring	Turb	0.1	NTU	Excluded	Turbidity Meter	Watercare Services Ltd (Lab)
5969423	Raglan	RAG001RA	Zone	18/10/2020	Monitoring	Turb	0.1	NTU	Excluded	Turbidity Meter	Watercare Services Ltd (Lab)
5982740	Raglan	RAG001RA	Zone	23/10/2020	Monitoring	Turb	0.1	NTU	Excluded	Turbidity Meter	Watercare Services Ltd (Lab)
6002055	Raglan	RAG001RA	Zone	28/10/2020	Monitoring	Turb	0.1	NTU	Excluded	Turbidity Meter	Watercare Services Ltd (Lab)
6017376	Raglan	RAG001RA	Zone	2/11/2020	Monitoring	Turb	0.1	NTU	Excluded	Turbidity Meter	Watercare Services Ltd (Lab)
6018245	Raglan	RAG001RA	Zone	7/11/2020	Monitoring	Turb	0.05	NTU	Excluded	Turbidity Meter	Watercare Services Ltd (Lab)
6029460	Raglan	RAG001RA	Zone	12/11/2020	Monitoring	Turb	0.1	NTU	Excluded	Turbidity Meter	Watercare Services Ltd (Lab)
6041700	Raglan	RAG001RA	Zone	17/11/2020	Monitoring	Turb	0.15	NTU	Excluded	Turbidity Meter	Watercare Services Ltd (Lab)
6068954	Raglan	RAG001RA	Zone	20/11/2020	Monitoring	Turb	0.1	NTU	Excluded	Turbidity Meter	Watercare Services Ltd (Lab)
6062005	Raglan	RAG001RA	Zone	22/11/2020	Monitoring	Turb	0.15	NTU	Excluded	Turbidity Meter	Watercare Services Ltd (Lab)
6069575	Raglan	RAG001RA	Zone	27/11/2020	Monitoring	Turb	0.3	NTU	Excluded	Turbidity Meter	Watercare Services Ltd (Lab)
6081126	Raglan	RAG001RA	Zone	2/12/2020	Monitoring	Turb	0.15	NTU	Excluded	Turbidity Meter	Watercare Services Ltd (Lab)
6093569	Raglan	RAG001RA	Zone	7/12/2020	Monitoring	Turb	0.15	NTU	Excluded	Turbidity Meter	Watercare Services Ltd (Lab)
6109405	Raglan	RAG001RA	Zone	12/12/2020	Monitoring	Turb	0.15	NTU	Excluded	Turbidity Meter	Watercare Services Ltd (Lab)
6123614	Raglan	RAG001RA	Zone	13/12/2020	Monitoring	Turb	0.15	NTU	Excluded	Turbidity Meter	Watercare Services Ltd (Lab)
6121722	Raglan	RAG001RA	Zone	17/12/2020	Monitoring	Turb	0.15	NTU	Excluded	Turbidity Meter	Watercare Services Ltd (Lab)
6093573	Raglan	RAG001RA	Zone	20/12/2020	Monitoring	Turb	0.15	NTU	Excluded	Turbidity Meter	Watercare Services Ltd (Lab)
6134248	Raglan	RAG001RA	Zone	22/12/2020	Monitoring	Turb	0.2	NTU	Excluded	Turbidity Meter	Watercare Services Ltd (Lab)
6148637	Raglan	RAG001RA	Zone	27/12/2020	Monitoring	Turb	0.15	NTU	Excluded	Turbidity Meter	Watercare Services Ltd (Lab)
6123525	Raglan	RAG001RA	Zone	30/12/2020	Monitoring	Turb	0.1	NTU	Excluded	Turbidity Meter	Watercare Services Ltd (Lab)