WATER NEW ZEALAND COMPETENCY FRAMEWORK

Wastewater Treatment Operator

water NEW ZEALAND
The New Zealand Water & Wastes Association Wai ora Aotearoa

Water New Zealand Competency Framework Wastewater Treatment Operator

ABOUT WATER NEW ZEALAND

Water New Zealand is a national not-for-profit sector organisation comprising approximately 1900 corporate and individual members in New Zealand and overseas.

Water New Zealand is the principal voice for the water sector, focusing on the sustainable management and promotion of the water environment and encompassing the three waters: drinking water, waste and storm waters.

www.waternz.org.nz

KEY CONTRIBUTORS

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The Water New Zealand Competency Framework is still in the development stage and we are interested in your feedback as we develop it further. If you have any questions, queries or comments, please contact training@waternz.org.nz

Further refinements of this framework will be issued on the Water New Zealand website.

www.waternz.org.nz/competence

Executive Summary

A workforce with the right skills and capabilities is key to developing an effective, efficient, accountable and resilient three waters sector in New Zealand.

This document forms part of Water New Zealand's Competences Framework (the Framework) and should be read in conjunction with the Water New Zealand Competency Framework Overview document.

The framework is intended to help the water industry to identify the knowledge and skills required by their workforce, to help assess levels of staff training that may be required and to develop training programmes.

The framework has been developed on a role-by-role basis, this document describes what ***Wastewater Treatment Operators*** should be **able to do** and what they **need to know** to competently undertake their work.

Wastewater Treatment Operators

These are the people who **operate, monitor**, and **maintain** wastewater treatment plants. Their work involves operating the systems and equipment that are used to ensure that sewage is treated before being returned to the environment. They operate wastewater treatment processes such as preliminary and biological treatment, they collect and analyse data on the processes, and carry out first line maintenance tasks.

Contents

What is the Water New Zealand Competency Framework?

The Water New Zealand Competency Framework (the Framework) identifies what the workforce:

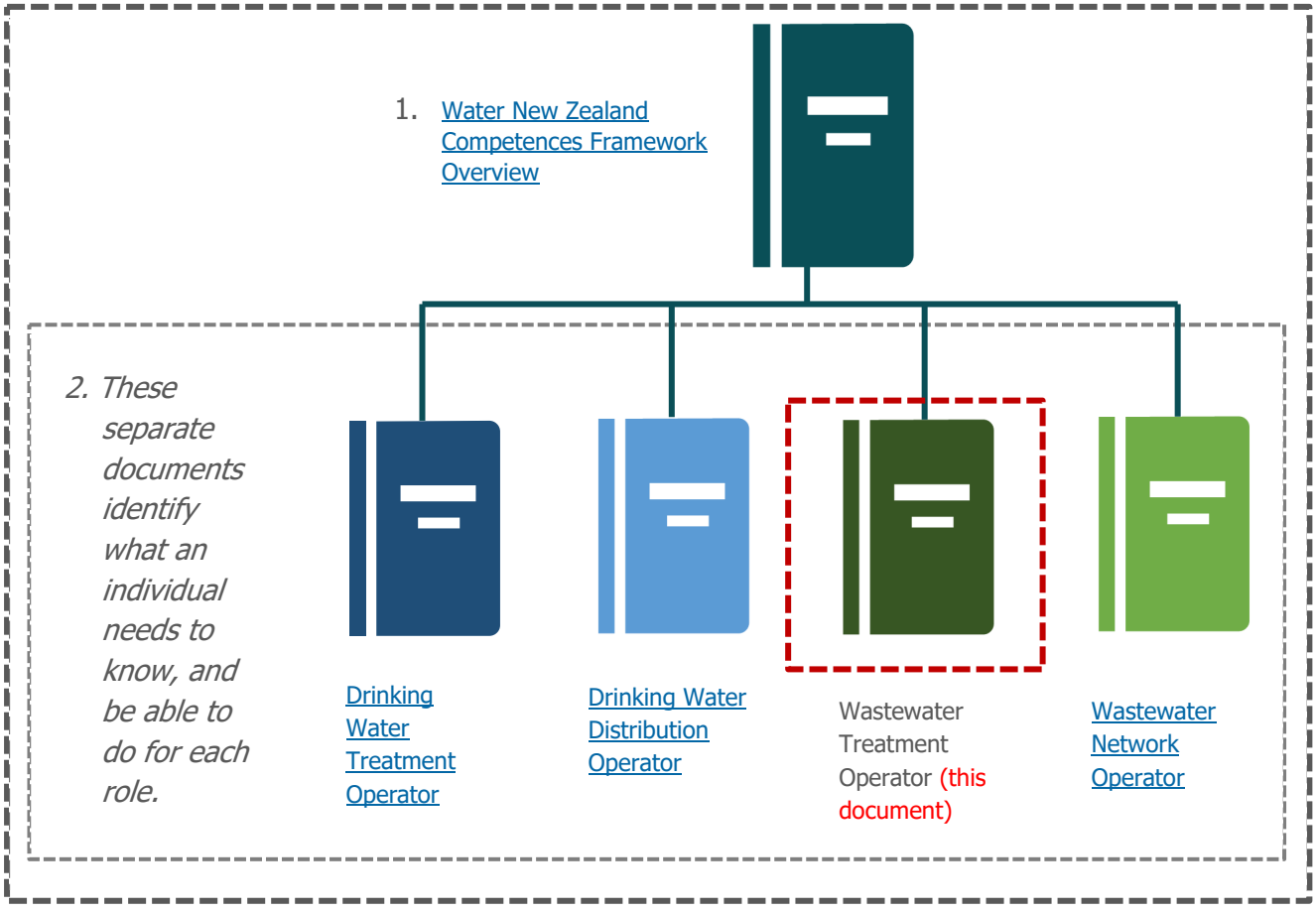
- Needs to be able to do, and
- Needs to know

In order to protect the health of the public by safely and effectively deliver three waters services to the community. While the Framework describes what people working in the three waters industry in New Zealand should be able to do and indicates what they ought to know and understand it does not define how well they should be able to perform or how this should be assessed.

How does this document fit into the Water New Zealand Competence Framework?

The Framework has been structured into a suite of documents, as shown in Figure 1. This document details what it is that **Wastewater Treatment Operators** need to know and be able to do. It should be read in conjunction with the Water New Zealand Competences Framework Overview document.

Figure 1: Water New Zealand Competences Framework Suite of Documents



Wastewater Treatment Operator Profile

Wastewater Treatment Operators take a risk management approach to protect the health of the public. They fulfil a crucial role in ensuring that wastewater from New Zealand communities is treated and safely discharged back into the environment.

They need to have a full understanding of risk assessments and documented incident and emergency procedures that they are responsible for implementing.

To competently carry out their role Wastewater Treatment Operators need to understand wastewater treatment theories and principles to ensure that processes such as preliminary and biological treatment, are maintained, and the operation of these processes is monitored and controlled. When a fault occurs within a wastewater treatment plant, the Wastewater Treatment Operator finds the cause of the fault and ensures that it is resolved as quickly as possible

Wastewater Treatment Operator Elements of Competence

The table on the following page lists the elements of competence that are relevant to those roles that **Control Operations** and **Maintain Assets** in the context of operating and maintaining a Wastewater Treatment Plant.

Each element of competence is then further drilled down to give context in a Wastewater Treatment environment, and to identify what it is a Wastewater Treatment operator needs to know and be able to do.

No one person at an organisation will be expected to be competent in all the elements that this Framework details. The entire breadth of which knowledge and skills will be required by any operator will depend on the type of technology used by each Wastewater Treatment provider. It will also depend on the depth of experience held within the team that the operator works within; some of the elements of competence will be appropriate for senior operators in a managerial role with other elements appropriate for new entrants to the industry.

What does someone who operates, monitors and maintains a Wastewater Treatment Plant need to know and be able to do?

Water NZ Competency Framework Link & Context		Elements of Competence
Strategy & Planning	**Governance, Legislation and Regulatory Frameworks** Wastewater Treatment Operators are typically employed by Local Government either directly or via an outsourcing contract. They need an understanding of the governance, legal and regulatory frameworks that they are expected to operate within. Everybody involved in the wastewater industry also needs to understand the spiritual and cultural significance of water to Tangata Whenua.	▪ Governance, Legislation and Regulatory Frameworks ▪ The Role of Resource Consents ▪ Te Mana o te Wai
Asset Management Decision Making	**Operations and Maintenance Decision Making** Decisions made by Wastewater Treatment Operators must reflect and support the principles of treating and discharging wastewater in a manner that protects public health and the environment as well as the activities and processes involved in determining operations and maintenance requirements.	▪ **Error! Reference source not found.** ▪ Development of Site Management Plans ▪ Critical Control Points ▪ Operational Monitoring and Inspection for Process Control ▪ Apply a knowledge of Science to Wastewater Treatment processes
Lifecycle Delivery	**Technical Standards** The activities that Wastewater Treatment Operators are responsible for must comply with relevant technical standards.	▪ Technical Standards related to Wastewater Treatment
	Maintenance Delivery Wastewater Treatment Operators need to be able to safely maintain the different types of equipment used in the delivery of wastewater treatment	▪ Safe Isolation of Plant and Equipment ▪ Hygiene Requirements ▪ Maintenance and Repairs of Wastewater Treatment Equipment ▪ Validation and Calibration of Monitoring Equipment ▪ Inventory Management ▪ Cranes and Lifting Equipment ▪ Maintaining Specified Building Systems
	Reliability Engineering & Root Cause Analysis Wastewater Treatment Operators need to be able to ensure that potential problems are identified as early as possible in an assets' life cycle, identifying the root cause of any lack of reliability	▪ Root Cause Analysis
	Asset Operations and Optimisation Wastewater Treatment Operators monitor, operate, control and optimise wastewater treatment assets in a manner that ensures that they meet their objectives, within appropriate design, maintenance and operational parameters.	▪ Wastewater Flows and Hydraulics ▪ Use Automated Systems to control the Process Plant and Collect Data ▪ Operate Screening and Grit Removal Processes ▪ Operate Septage Receiving and Screening Systems ▪ Operate Primary Separation Processes ▪ Operate Fixed Growth Biological Treatment Processes ▪ Operate Suspended Growth Biological Treatment Processes ▪ Operate Waste Stabilisation Ponds ▪ Operate Aerated Lagoons ▪ Operate Anaerobic Digestion Processes ▪ Operate Sludge Handling and Dewatering Processes ▪ Operate Sludge Disposal ▪ Operate Tertiary Treatment Processes ▪ Operate Ventilation Systems and Odour Control Processes ▪ Operate Resource Recovery Processes ▪ Operate Pumping Systems ▪ Manage Treated Effluent Discharges ▪ Operate Emergency Power Supplies
	Shutdown & Outage Management Wastewater Treatment Operators need to be able to manage plant shutdowns and the restarting processes. These can occur in planned, or unplanned, and emergency situations.	▪ Wastewater Treatment Plant Isolation / Shutdown / Re-commissioning of Process Streams
	Fault & Incident Response Responding to failures and incidents in a systematic manner, including incident detection and identification, fault analysis, use of standard responses, temporary and permanent repairs is the responsibility of Wastewater Treatment Operators. This includes the need to develop plans to respond to unplanned events and managing the resources required for the response to the events, and escalation criteria.	▪ Incident & Emergency Response Plans
	Asset Decommissioning and Disposal The processes used to decommission and dispose of assets due to aging or changes in performance and capacity requirements.	▪ Assisting with the Process to Decommission, Dispose or Abandon Assets
Asset Information	**Data and Information Management** Wastewater Operators gather much of the data and information that is used in asset management data analysis or is supplied to regulators.	▪ Provide Data to Assist in Asset Management Decision Making
Risk & Review	**Risk Assessment and Management** Wastewater Treatment Operators need to recognise, and be able to respond to, risks to the treatment and safe discharge of wastewater back into the environment.	▪ Implementing Site Management Plans ▪ Health and Safety ▪ Confined Spaces ▪ Hazardous Substances Management ▪ Plant Security and Asset Protection ▪ Contaminants of Emerging Concern
	Asset Performance and Health Monitoring Wastewater Treatment Operators need to understand how to monitor the performance of the assets that they are responsible for, how to report on asset performance and how to escalate problems they identify.	▪ Verification Monitoring ▪ Resource Consent Compliance Monitoring and Reporting
	Stakeholder Engagement Wastewater Treatment Operators need to be able to communicate with the community and they also need to engage with other stakeholders like Consent Compliance officers.	▪ Engage with Stakeholders and the Community

Element of Competence:	Governance, Legislation and Regulatory Frameworks
Context	The work that Wastewater Treatment Operators are responsible for is governed by a number of different pieces of legislation. The key legislation that Wastewater Treatment Operators need to be aware of includes: ▪ The Local Government Act which covers the broad management and governance obligations that Wastewater Treatment Operators are required to work within, including the setting of any specific local bylaws. ▪ The Resource Management Act which covers taking water and discharging wastes to the environment. ▪ The Health and Safety at Work Act which covers health and safety requirements. ▪ The Hazardous Substances and New Organisms Act which covers hazardous issues that may be encountered. ▪ Taumata Arowai – the Water Services Regulator Bill which when passed by parliament will cover regulation of water services.
Outcome	The work undertaken by Wastewater Treatment Plant Operators meets all legal and regulatory requirements.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Operate the Wastewater Treatment Plant within any requirements that have been set out in the local bylaws specific to their territorial authority.
- Provide information to the appropriate people regarding the performance of the Wastewater Treatment Plant to facilitate asset management planning as detailed within the element of competence Provide Data to Assist in Asset Management Decision Making.
- Operate the Wastewater Treatment Plant within the conditions set in the Resource Consent(s) for waste and air discharges for the plant and for any water takes. The requirements for Wastewater Treatment Operators are detailed further in the competency framework within the elements detailing The Role of Resource Consents and also for Resource Consent Compliance Monitoring.
- Obtain compliance schedules for any buildings at the Wastewater Treatment Plant that need a Building Warrants of Fitness as outlined within the element for Maintaining Specified Building Systems.
- Safely operate the Wastewater Treatment Plant in a manner that addresses health and safety and hazardous substances risks. The requirements for Wastewater Treatment Operators are detailed further in the competency framework within the elements for Health and Safety, Confined Spaces, Hazardous Substances Management and Cranes and Lifting Equipment.

To do this, Wastewater Treatment Operators ***need to know:***

- About the Local Government Act requirement for Councils to identify the level of service to be delivered by the Wastewater Supply and to be prudent in the stewardship of critical assets like Wastewater Treatment Plants.
- About the Local Government Act which requires Councils to set local bylaws.
- About the Resource Management Act which regulates the discharge of contaminants to water, land and air from the site to conform to the requirements of a resource consent.
- About the Building Act requirement for a compliance schedule for buildings with specified systems.
- About the Health and Safety at Work Act which is concerned with the Health and Safety of workers and visitors to the site.
- About the Health and Safety at Work (Hazardous Substances) Regulations 2017 which set out the rules for work-related activities involving hazardous substances and replaces the HSNO (Hazardous Substances and New Organisms) regulations for the workplace. Note that in the absence of specific HSWA guidance existing HSNO codes of practice (HSNOCOP) still provide useful guidance.
- About the Hazardous Substances and New Organisms Act which includes the treatment of hazardous residual, wastewater, wastes and sewage sludge that contain hazardous chemicals. This Act also address bioaccumulation and biological hazards that wastewater operators may encounter.
- About the Health and Safety in Employment (Pressure Equipment, Cranes and Passenger Ropeways) Regulations 1999. which sets out the rules for maintaining equipment like cranes which can be found at Wastewater Treatment Plants.

Element of Competence:	The Role of Resource Consents
Context	Resource consents provide permission to discharge contaminates, or take water, that would otherwise contravene the Resource Management Act. Wastewater Treatment Plants (WWTPs) require a number of resource consents in order to operate. Activities that require consent can include: ▪ The discharge of treated wastewater from the WWTP to either the coastal environment, freshwater or applied to land. ▪ The discharge of wastewater during maintenance activities or exceptional circumstances. ▪ The discharge of contaminants to air. ▪ The disposal of biosolids. ▪ The taking of water (water permit) Wastewater Treatment Operators are instrumental in ensuring that the WWTP is maintained, operated and monitored in accordance with the conditions and requirements of these resource consents.
Outcome	The publics' health, the receiving environment, and Te Mana o te Wai, is protected by maintaining, operating and monitoring the treatment process in accordance with all associated resource consents.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Operate, maintain and monitor the WWTP in a manner that complies with conditions imposed within the resource consent.

To do this, Wastewater Treatment Operators ***need to know:***

- The conditions and requirements of all resource consents related to the site. Consent conditions and requirements can:
  - Prescribe the way in which the WWTP is to be operated and managed.
  - Impose discharge parameters such as limits for Biochemical Oxygen Demand (BOD), pathogens, nutrients, and sediments that the WWTP discharge must comply with.
  - Require Site Management Plans, Incident and Emergency Response Plans and Monitoring Plans to be prepared and complied with. Refer to the elements of competence regarding the Development of Site Management Plans, Implementing Site Management Plans, Incident & Emergency Response Plans and Resource Consent Compliance Monitoring and Reporting for more information on these topics.
  - Require monitoring of the discharge for the limits specified in the consent
  - Require monitoring of the receiving environment to assess whether adverse environmental effects are occurring; and

- Require reporting of monitoring data collected to the consent authority.

- The typical measured levels, trends and action levels for quality parameters and the role of wastewater quality alarms.
- The actions to be taken in event of an exceedance of an operational target value.
- The implications and consequences of regulatory wastewater quality sample failures, and actions to be taken as detailed in the Incident and Emergency Response Plan for the WWTP.
- The importance of investigation process in the event of wastewater quality incidents, and the regulatory requirements regarding the reporting of these.

Element of Competence:	Te Mana o te Wai
Context	Te Mana o Te Wai refers to the integrated and holistic wellbeing of a freshwater body. Each community decides what Te Mana o te Wai means to them, based on their own unique relationship with water in their area or rohe. Te Mana o te Wai is upheld by acknowledging the mana and mauri of the freshwater body which provides the source of water for the water treatment plant. The National Policy Statement for Freshwater Management (Freshwater NPS) recognises Te Mana o te Wai as an integral part of freshwater management.
Outcome	Protecting Te Mana o te Wai provides for the mauri of the water. This includes providing for: ▪ Te hauora o te taiao (health of the environment), ▪ Te hauora o te wai (health of the waterbody) and, ▪ Te hauora o te tangata (the health of the people).

To do this, Wastewater Treatment Operators ***need to be able to***:

- Te Hauora o te Taiao – Wastewater Treatment Operators help to protect the health of the environment by ensuring that the conditions of any resource consent relating to the discharge of contaminants from the site are adhered to.
- Te Hauora o te Wai – Wastewater Treatment Operators help to protect the health of the waterbody by ensuring the conditions of the resource consent to discharge treated effluent are adhered to. Wastewater Treatment Plants often have water take permits for process and site fresh water. Where this is applicable Wastewater Treatment Plant Operators need to also ensure that the conditions of consent to take water from the source are adhered to. This also aligns with the Principle of Safe Drinking Water that identifies that protecting the water source is of paramount importance, as detailed in the New Zealand Drinking Water Safety Plan Framework.
- Te Hauora o te Tangata – Wastewater Treatment Operators protect the health of the people by operating the Wastewater Treatment Plant in a manner that reflects the Site Management Plan.

To do this, Wastewater Treatment Operators ***need to know:***

- What te Mana o te Wai means to their community. Under the Freshwater NPS it is up to the community and each Regional Council to consider and recognise Te Mana o te Wai in their regions.
- The conditions of all resource consents related to the operation of the Wastewater Treatment Plant.
- That the Ministry of the Environment have produced a factsheet to provide further information about Te Mana o te Wai, the central concept for freshwater management.

Element of Competence:	Development of Site Management Plans
Context	Site Management Plans are usually a requirement of the WWTP resource consent to discharge treated effluent. Site Management Plans consider the potential risks to the receiving environment and identify ways to manage those risks. Thy are used to promote a multi-barrier approach to managing risks. Given their knowledge of the wastewater treatment operation and maintenance procedures Wastewater Treatment Operators must have input into the development of the Site Management Plan. They are also responsible for the implementation of large parts of the Site Management Plan, the requirements of which are documented in the Implementing Site Management Plans element of competence.
Outcome	The publics' health is safeguarded through the development and implementation of the Site Management Plan.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Assist with identifying the Critical Control Points (CCPs) for the WWTP.
- Assist with identifying and documenting the corrective actions which are required for the CCPs when defined action and critical limits are reached.
- Assist with identifying the operational monitoring and inspection requirements for the Wastewater Treatment Plant.
- Use their operational knowledge to help identify improvement items to include within the Site Management Plan.
- Assist with reviewing customer complaints to help identify whether operational changes can be made to improve consumer satisfaction.
- Be involved in long-term community engagement plans as detailed to in the Engage with Stakeholders and the Community element of competence.

To do this, Wastewater Treatment Operators ***need to know:***

- What their role is in the development of the Site Management Plan.
- The conditions and requirements of the sites resource consents.
- The characteristics of the influent, what hazards might arise, how these hazards arise and create risks, and the processes and practices that affect effluent quality.
- The available wastewater quality information and be able to analyse and interpret this information which identifies actual and potential wastewater quality issues.
- What the barriers to receiving environment contamination are for the Wastewater Treatment Plant, so that the failure of one barrier will be compensated for by the effective operation of the remaining barriers. Possible barriers might include:
    - Controlling hazards entering the influent (e.g. trade waste conditions).

- Physical wastewater treatment processes.
- Biological wastewater treatment processes.
- Killing, or inactivating pathogens by disinfection.

- What Critical Control Points are.
- The commitment to wastewater quality management from their employer and the relationship of the Site Management Plan to organisational policy and strategy.

Element of Competence:	Critical Control Points
Context	A Critical Control Point (CCP) is a measure that can be operated as a process control for the most important stages of wastewater treatment A few of the parameters monitored by Wastewater Treatment Operators will have been identified as CCPs within the Site Management Plan.
Outcome	CCPs are monitored regularly (ideally continuously) to ensure that barriers are effective. Appropriate actions to optimise the system, or to bring the system back into control, are undertaken when action limits are reached. Incident & Emergency Response Plans are activated when critical limits for individual parameters is reached.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Undertake Operational Monitoring and Inspection for Process Control of the Critical Control Points.
- Undertake corrective actions when routine monitoring and inspections indicate that a CCP is deviating from its expected performance and is reaching its action limit. This may include:
    - Adjustments or process control changes.
    - Communicating and notifying others of the issue.
    - Additional monitoring and inspection to confirm that the corrective action has been effective.
- Activate incident and emergency response procedures when critical limits for a CCP is reached or because the corrective action at the trigger level has not improved the performance of the CCP.
- Have input into a review into the underlying cause of why the corrective action, or incident and emergency response procedures, were needed. This includes identifying:
    - How effective the monitoring and inspection plan was.
    - How effective the corrective action was.
    - Whether the Site Management Plan needs to be updated as a result.

To do this, Wastewater Treatment Operators ***need to know:***

- What the Critical Control Points for the wastewater treatment plant are. CCPs are documented within the Site Management Plan for the site. For each of the Critical Control Points this includes:
    - Process control summaries.
    - A monitoring procedure for each control point.
    - Defined target, action, and critical limits.
    - Predefined corrective actions.

- The defined values documented in the CCP for target, action, and critical limits.
- The corrective actions listed in the Site Management Plan which are considered to be necessary when the control limit is reached.
- The corrective actions, that are listed in the Site Management Plan. Where the Site Management Plan only lists the corrective actions, the Wastewater Treatment Operator needs to know where to find the actual documented procedure, e.g. in Operations and Maintenance Manuals for the Wastewater Treatment Plant.
- The maximum values for any parameter being monitored. The CCP trigger and critical limits should always ensure that alarms and corrective actions are undertaken before maximum values are reached to ensure that the treated wastewater complies with its Resource Consent.

Element of Competence:	Operational Monitoring and Inspection for Process Control
Context	Controlling the processes at a wastewater treatment plant is an important part of ensuring the effective treatment of wastewater. The Operational Monitoring and Inspection requirements for the Wastewater Treatment Plant is documented within the Implementing Site Management Plans. Wastewater Treatment Operators undertake the operational monitoring and inspection of processes. They also instigate appropriate corrective actions to resolve potential problems before they escalate. This type of monitoring is additional to the Verification Monitoring programme required to comply with the resource consent conditions for the site.
Outcome	Wastewater Treatment processes are operating correctly and optimally. Appropriate actions to optimise the system, or to bring the system back into control, are undertaken when action limits for individual parameters is reached.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Obtain, review and interpret trends on SCADA and telemetry systems.
- Identify target and action limits which identify when intervention may be required.
- Carry out key Validation and Calibration of Monitoring Equipment using the results to identify issues with performance.
- Assess the condition of the instrument and any supply tubing. Cleaning may be required if a sensor is coated in deposits.
- Identify whether equipment has deteriorated and whether it is still operating in accordance with its design.
- Take representative samples of wastewater from key points within the treatment process, accurately using appropriate sampling equipment
- Carry out bench top analysis of samples for process performance monitoring, record and interpret the results.
- Review and analyse the performance of the wastewater process by using laboratory, and site quality reports.

To do this, Wastewater Treatment Operators ***need to know:***

- The monitoring and inspection plans documented within the Site Management Plan for the wastewater treatment plant including knowledge of:
  - The parameters to monitor / inspect
  - The purpose of each parameter
  - The method of monitoring including instrument used, location, timing, frequency, by whom, and what needs to be recorded

  - What actions to take in response to monitoring / inspection results
  - Procedures for reporting anomalies
  - The equipment that provides the process.

- The instruments used to monitor variables in the wastewater treatment process and the basic scientific principles of these key analytical instruments. This may include the following instrument types:
  - Flow meters
  - Dissolved oxygen probes
  - Suspended solids probes
  - Level meters
  - Temperature meters
  - Analytical instrument controllers such as pH, dissolved oxygen (DO), etc
  - Proportional Integral and Derivative (PID) Controllers
- The care and maintenance of monitoring equipment including instrument condition assessments and Calibration.
- The need for accurate and precise recording and reporting of process performance, in line with the Site Management Plan requirements.
- Which of the parameters being monitored are Critical Control Points (CCPs).

Element of Competence:	Apply a knowledge of Science to Wastewater Treatment processes
Context	Wastewater treatment processes may include physical, biological and chemical methods of treatment. The science that underpins the wastewater treatment processes must be understood by those responsible for operating them.
Outcome	Decisions made in the day-to-day operations and maintenance of the Wastewater Treatment Plant are made through an understanding of the scientific principles on which the treatment process is based.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Perform mathematical calculations used in the wastewater industry, for example to calculate:
  - volumes,
  - levels,
  - pressure
  - flow rates; and
  - chemical concentrations
- Use their understanding of physics to operate and control the hydraulics at the Wastewater Treatment Plant and any physical methods of treatment.
- Use their understanding of chemistry to operate and control chemical methods of wastewater treatment.
- Use their understanding of microbiology to operate biological treatment processes.
- Select and use appropriate equipment to measure performance of different parameters.
- Take wastewater samples to monitor typical wastewater characteristics including for the presence of indicator micro-organisms.

To do this, Wastewater Treatment Operators ***need to know:***

- The basic principles of physics which impact on wastewater treatment including understanding hydraulics, pressure and head and headloss.
- The basic principles of chemistry that impact on wastewater treatment including pH, acids and bases.
- The risks involved with chemical treatment including what will happen if chemicals are mixed inappropriately, and the impact of decomposition related to the storage of chemicals.
- The basic principles of microbiology that impact on wastewater treatment including aerobic and anaerobic conditions, biological nutrient removal.
- Wastewater characteristics and sampling requirements for COD/BOD/TOC, nitrogen and phosphorus fractions.
- The basic principles of how wastewater treatment works including:

- Operate Screening and Grit Removal Processes
- Operate Septage Receiving and Screening Systems
- Operate Primary Separation Processes
- Operate Fixed Growth Biological Treatment Processes
- Operate Suspended Growth Biological Treatment Processes
- Operate Waste Stabilisation Ponds
- Operate Aerated Lagoons
- Operate Anaerobic Digestion Processes
- Operate Sludge Handling and Dewatering Processes
- Operate Sludge Disposal
- Operate Tertiary Treatment Processes
- Operate Ventilation Systems and Odour Control Processes
- Operate Resource Recovery Processes
- Operate Pumping Systems
- Manage Treated Effluent Discharges

Element of Competence:	Technical Standards related to Wastewater Treatment
Context	There are a wide range of technical standards available that can be used to help operate and maintain a Wastewater Treatment Plant.
Outcome	Wastewater Treatment Plants are operated and maintained following best practice that has been documented within relevant technical standards and guidelines.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Follow the appropriate technical standards that relate to the operation and maintenance of the Wastewater Treatment Plant. This might include a mix of:
  - Internal standards developed by your employer.
  - Technical documents, guidelines and publications developed by industry groups like Water New Zealand
  - New Zealand Standards and Guidelines published by NZ Standards, or by government organisations like Worksafe.
- International standards, guidelines and resources e.g. those published by the:
  - International Organisation for Standardization (ISO),
  - International Water Association (IWA)
  - American Water Works Association (AWA)
  - World Health Organisation (WHO)

To do this, Wastewater Treatment Operators ***need to know:***

- Which technical standards relate to the work that they are responsible for. These should be identified on applicable operational and maintenance procedure documentation within the Implementing Site Management Plans.
- Where to find the technical standards, e.g. through a subscription to NZ Standards.

Element of Competence:	Safe Isolation of Plant and Equipment
Context	In order to undertake maintenance on plant and equipment Wastewater Treatment Operators need to be able to safely isolate and "lock out" the equipment that they are to work on. This would usually form part of a permit-to-work system.
Outcome	Plant and equipment are safely isolated before undertaking any maintenance in a manner that: ▪ Avoids the possibility of injury to workers ▪ Maintains the quality of the treatment process.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Identify the equipment that is to be worked on, including the point of isolation. There are occasions where this is not clear, e.g. a switchboard may not isolate all equipment in the vicinity, and some plant, e.g. actuators, may require isolating elsewhere.
- Identify the hazards that might need to be controlled in order to isolate the plant or equipment. This might include hazards from the likes of:
  - Confined Spaces
  - Hazardous atmospheres
  - Falling from heights
  - Mechanical equipment with moving parts
  - Electricity
  - Pressure
  - Chemical hazards
  - Biological hazards
- Identify any other areas of the plant that might be affected. The Wastewater Treatment Operator must be able to clearly understand and communicate the effects of the isolation to others.
- Be able to select and use the correct equipment to safely isolate the plant to be worked on e.g. valves, isolating locks and tags, locking pins etc.
- Safely remove any hazardous substances from the system by draining, venting, purging or flushing the isolation.
- Follow approved procedures to confirm that the isolation has been successful to ensure that the isolated equipment is safe to work on.
- Undertake the safe removal of isolation equipment to return the plant into service.

To do this, Wastewater Treatment Operators ***need to know:***

- The permit-to-work system in use.
- The procedures for installing isolations including:
  - Electrical isolation and tagging/locking out.

  - Proving electrical equipment is dead to ensure that you have isolated the correct piece of equipment.
  - Immobilisation techniques such as valves, chains, locking pin etc.
  - Bleeding off pressure, isolating and bypassing process equipment.
  - Cooling requirements, e.g. the time electric motors take to cool.
  - Neutralisation of chemicals (e.g. chlorine and caustic soda).
- How to adequately identify, test and confirm that the isolation has made the plant or equipment safe.
- The procedures for draining, venting, purging and flushing.
- The procedures for removing isolations and returning plant and equipment.
- The risks associated with isolating a piece of plant or equipment and how to minimise the impacts associated with these and as documented within the Implementing Site Management Plans.
- Communication, reporting and record keeping requirements associated with isolating a piece of plant and equipment. Including ensuring the work meets the requirements of the Health and Safety at Work Act.
- That the National Guidelines for Occupational Health and Safety in the NZ Water Industry provide examples of hazards that Wastewater Operators need to be aware of when they isolate plant and equipment.

Element of Competence:	Hygiene Requirements
Context	Wastewater Treatment Operators are potentially exposed to biological hazards, infectious diseases and, and a variety of hazardous chemical materials in the course of their work, both from effluent and any reagents used in treatment processes.
Outcome	Wastewater Treatment Operators do not become ill as a result of their workplace exposure to biological hazards, infectious diseases and chemical hazards.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Follow hygienic practices to protect themselves from biological hazards. This includes:
  - Avoiding direct contact with wastewater.
  - Avoiding aerosolizing wastewater or minimizing exposure time in areas where aerosolizing is occurring. Make sure ventilation systems are functioning properly when working around areas where wastewater may be aerosolized.
  - Avoid touching the face, mouth, hands, eyes or nose with dirty hands or other items and avoid nail biting.
  - Thoroughly wash the hands and face with soap and water before eating, drinking or smoking.
  - Eat/smoke in designated areas away from potential wastewater contamination. These areas must be kept free from contamination by leaving any protective clothing and boots in a separate area.
  - Use appropriate protective clothing at work (coveralls) and personal protective equipment (boots, gloves, plastic face shields) and, where required, wear respiratory protective equipment.
  - Remove personal protective clothing and footwear at the end of the shift and leave it at work.
  - Shower and change out of work clothes before leaving work.
  - Thoroughly cleanse all exposed injuries with soap and water and keep them covered with a bandage (preferably waterproof) while at work. Seek medical attention immediately after suffering cuts or penetrating injuries.
  - Report illness to your employer and doctor.
  - Receive appropriate vaccinations.

To do this, Wastewater Treatment Operators ***need to know:***

- The safe work procedures for hygiene at their worksite.
- That careful attention to personal hygiene and proper use of personal protective equipment (PPE) can greatly reduce the associated risks of exposure to wastewater.

- That the Water NZ Good Practice Guide: Occupational Health & Safety in the NZ Water Industry can provide guidance on occupational health procedures for the hazards that wastewater operators are exposed to during the course of their employment.
- That no tools or equipment used in a wastewater environment should be used at a drinking water treatment plant or on the drinking water network. For workplaces where staff and equipment have the potential to move from wastewater sites to potable water sites Wastewater Operators should also be aware of the Water NZ Good Practice Guide: Hygiene Practices to prevent water supply contamination.

Element of Competence:	Maintenance and Repairs of Wastewater Treatment Equipment
Context	Maintenance can either be planned (routine or scheduled) or unplanned (reactive). The equipment used at the Wastewater Treatment Plant needs to be maintained so that it continues to work efficiently and reliably. Not maintaining, or replacing, assets at the right time might result in an unexpected failure, which could lead to insufficiently treated effluent being discharged into the environment.
Outcome	Maintenance of the equipment at the Wastewater Treatment Plant is safely completed, at the correct frequency, in accordance with the Maintenance procedures that are identified in the Site Management plan for the work in question. Maintenance tasks and costs are recorded so that better Asset Management decisions can be made about each item including identifying when it needs to be replaced.

To do this, Wastewater Treatment Operators ***need to be able to:***

- Respond to Wastewater Treatment Plant maintenance / repair emergencies.
- Perform planned and unplanned maintenance on the equipment at the Wastewater Treatment Plant in accordance with job instructions detailed in operations and maintenance procedures that are identified in the Site Management Plan. This will require Wastewater Treatment Operators to:
    - Identify any environmental and safety hazards and how they are to be mitigated. Obtain a permit to work, where this is required for the procedure.
    - Complete the instructions/organisational procedures for the maintenance task in question e.g. as recorded in maintenance procedures.
    - Identify any reticulation network impacts on the work and inform the appropriate people e.g. if it will cause flows to back-up in the network.
    - Safe Isolation of Plant and Equipment.
    - Check that the completed maintenance and repairs meets the specification detailed in the maintenance procedure before returning the equipment to service.
- Document what work has been undertaken, including identifying any costs (including time) and spare parts used, so that better asset management decisions can be made.

To do this, Wastewater Treatment Operators ***need to know:***

- The required planned, scheduled and reactive maintenance tasks and procedures for each piece of equipment used at the Wastewater Treatment Plant, as documented in the Implementing Site Management Plans.

- How the equipment typically operates. Wastewater Treatment Operators need to observe the equipment while it is in use so that they can recognize unusual sounds, vibrations or leaks that indicate that reactive maintenance is necessary.
- What maintenance frequency is required for each task. This will be based on the suggestions of the equipment manufacturer but may also be a factor of the reliability and criticality of the equipment.
- How to identify any environmental or Health and Safety hazards, and appropriate mitigation methods.
- The Isolation requirements of plant and equipment.
- The requirements for documenting what work has been completed.
- The maintenance and asset replacement strategies for the Wastewater Treatment assets recorded in the Asset Management Plan (AMP), so that Operators are aware of what should be maintained and what should be replaced.
- That differentiating between planned and unplanned maintenance is important because an increasing incidence of unplanned maintenance might indicate that the assets at the treatment plant are deteriorating and becoming unreliable.
- That routine (planned) Maintenance comprises the periodic inspections and tests performed on equipment at regular intervals. Included are daily, weekly, monthly, quarterly etc., inspections during which minor routine maintenance tasks are carried out, e.g. cleaning, lubrication, vibration tests, adjustments replacements and calibrations.
- That scheduled (planned) Maintenance is also carried out on a time basis but is based on wear and the expected life cycle of the equipment's individual components. It involves the systematic and periodic removal from service of a piece of equipment for the replacement of parts, reconditioning, or overhaul.
- That reactive (unplanned) maintenance amounts to repairing equipment that has broken down or abandoning it and replacing it with new equipment.

Element of Competence:	Validation and Calibration of Monitoring Equipment
Context	Wastewater Treatment processes must be monitored to ensure that treatment processes are sustained. The instruments used to monitor the Wastewater Treatment processes must be validated and calibrated to ensure that the Wastewater treatment system remains functional and all preventive measures are effective in managing identified risks to effluent quality.
Outcome	The instruments used to monitor the wastewater treatment processes are validated and calibrated to ensure that the wastewater treatment system remains functional and all preventive measures are effective in managing identified risks to effluent quality.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Carry out key calibration or instrument checks of online equipment and identify issues with their performance.
- Understand the operation of control systems and how to operate each instrument in various control states.
- Carry out the practice of maintaining online instruments in line with supplier recommendations, standard operating procedures and record keeping as detailed in the Implementing Site Management Plans for the Wastewater Treatment Plant.
- Review and analyse the performance of the wastewater instruments by reviewing site and telemetry data to ensure the results are correct and accurate.

To do this, Wastewater Treatment Operators ***need to know:***

- The validation and calibration procedures documented within the Implementing Site Management Plans for the plant.
- What the Critical Control Points for the Wastewater Treatment Plant are.
- The correct type and use of various analytical equipment for wastewater quality measurement, including the levels at which the instruments operate, and their limitations are understood e.g. the accuracy and sensitivity of the equipment.
- The requirement and need for online monitoring of wastewater treatment process, including the key performance criteria for the wastewater treatment plant.
- The use and care of online equipment, including record keeping.
- The equipment required to maintain the instrument and its use.
- The calibration of the instruments including understanding the expected results.
- Communications, reporting and record keeping requirements, associated with maintenance of monitoring equipment. These will be detailed in the Implementing Site Management Plans.

- Troubleshooting requirements related to instrument performance, such as what to do when the instrument is flat lining.
- The need for accurate and precise analysis and risks associated with incomplete or inaccurate analysis or results.
- Contingency plans associated with the wastewater treatment plant when monitoring equipment is unavailable or incorrect, as documented in the Incident & Emergency Response Plans for the site.

Element of Competence:	Inventory Management
Context	Wastewater treatment systems can fail if there are no spare parts available to undertake required maintenance or repair of equipment used in the process. Holding spare parts for items that fail frequently has the benefit of allowing repairs to be undertaken immediately, instead of time being spent going to the market to search for the appropriate part. Wastewater Treatment plants can also require sufficient levels of chemicals (consumables) to be available for treatment processes. These need to be delivered to the site at the right time, and consumed on a "first in, first out" basis.
Outcome	The spare parts required to maintain, and repair equipment is known, along with where to source these parts. The quantity of parts stock held in storage is monitored, with replacement stock ordered in time. The quantity and quality of chemicals used on site is monitored, with chemicals used before they degrade in quality. Both chemicals and spare parts are used on a "first in, first out" basis.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Proactively identify what spare parts are needed to maintain and repair equipment.
- How to store parts correctly.
- Monitor the level of parts that are held in stock.
- Identify which parts are to be used first (i.e. the oldest)
- Proactively order adequate quantities of parts and consumables from the supplier, in accordance with the procurement policies of the wastewater service provider.
- When ordering chemical supplies, Wastewater Operators need to pay regard to the chemical specification, quality control, and certification requirements. Wastewater Operators need to be able to reject any chemicals supplied which do not meet the specified standard.

To do this, Wastewater Treatment Operators ***need to know:***

- What spares are held in storage at the Wastewater Treatment Plant.
- That spares should be used on a "first in, first out" basis.
- What supplier provides spare parts and how to follow the organisations procurement procedures to obtain them.
- That standardisation of equipment and parts reduces the level of risk of equipment failure, because fewer types of each part need to be stocked which makes stock management easier and because it reduces the number of skills which need to be learnt to correctly install each part by the operators.

- The correct specification of the chemicals they need to order and the quality control, testing, certification requirements that they need to meet.
- That useful information can be found in these good practice guides, which although written for drinking water operators, are also relevant in the wastewater treatment industry:
    - Water New Zealand Good Practice Guide for the supply of polyelectrolytes for use in drinking water treatment [1].
    - Water New Zealand Good Practice Guide for the supply of hydrated lime for use in drinking water treatment [2].
    - Water New Zealand Good Practice Guide for the supply of aluminium sulphate for use in drinking water treatment [3].

Element of Competence:	Cranes and Lifting Equipment
Context	Cranes are often installed at Wastewater Treatment Plants to lift heavy equipment. Unsafe use of crane equipment presents significant risk potential for people and property. Crane collapse or falling loads can cause serious injuries, fatalities as well as damage to property. The controller of the crane is responsible for the safe testing, operation, inspection, repair, and maintenance of that crane.
Outcome	Cranes are operated within their loading limits and are maintained in a safe condition with a current certificate of inspection.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Understand and comply with the written instructions relating to the safe operation of the crane.
- Calculate the load to be lifted and confirm that this is within the safe loading limit of the crane.
- Use, and understand, hand signals for the operation of the crane.
- Exercise the required level of care when operating the crane, including wearing the correct Personal Protective Equipment (PPE).
- Notify the controller of any unsafe equipment or process as soon as practicable.
- Readily locate all documentation and information related to the crane.
- Engage an Inspector to certify that the crane is safe.

To do this, Wastewater Treatment Operators ***need to know:***

- That they cannot operate the crane until they have been trained in its safe use.
- That the crane cannot be used unless it has a certification of inspection.
- The design loading limits of the crane.
- That the Approved Code of Practice for Cranes [4] covers the operation, maintenance and inspection requirements of any cranes located at the Wastewater Treatment Plant.
- That a general guide to the health and safety in employment (pressure equipment, cranes and passenger ropeways) Regulations 1999 provides guidance on regulations around the duties of equipment controllers, designers, manufacturers and suppliers, as well as workers.

Element of Competence:	Maintaining Specified Building Systems
Context	Under the Building Act [2] buildings that contain safety and essential systems, known as specified system, need a compliance schedule. Wastewater Treatment Plants often include buildings which require a compliance schedule. This means that they require an ongoing inspection and maintenance to ensure that the specified systems function as required.
Outcome	The buildings warrant of fitness (BWoF) is renewed every 12 months, and is signed, issued and publicly displayed to prove the building's specified systems have been maintained and inspected.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Obtain a compliance schedule where one is required under the Building Act [2].
- Publicly display a compliance schedule statement in their building for the first 12-month period from the issue of the compliance schedule.
- Ensure all the inspection, maintenance and reporting procedures for the specified systems stated in the compliance schedule for their building have been carried out and that those systems are performing, and will continue to perform, to the performance standards.
- Engage an Independent Qualified Person (IQP) to undertake the inspection, maintenance and reporting procedures listed on the compliance schedule and obtain a Certificate of Compliance with Inspection, Maintenance and Reporting Procedures (Form 12A).
- Provide the BWoF annually to the building team of the council (ensuring the Form 12A certificates from the IQP(s) are attached) and publicly display a copy of this for the next 12 months.
- Obtain and keep reports detailing inspections, maintenance and repairs from the people who have carried out the work. These need to be kept with the compliance schedule for at least two years after they have been issued.

To do this, Wastewater Treatment Operators ***need to know:***

- That the Ministry of Building, Innovation and Employment has published a Compliance Schedule Handbook to provide guidance on the requirements of Compliance Schedules and Building Warrants of Fitness.

Element of Competence:	Root Cause Analysis
Context	When something goes wrong at a Wastewater Treatment Plant, Wastewater Treatment Operators help to answer the question of why the problem occurred in the first place by helping to: ▪ Determine what happened ▪ Determine why it happened ▪ Figure out what to do to reduce the likelihood that it will happen again.
Outcome	The root cause of a problem is identified, and steps are put in place to prevent it happening again

To do this, Wastewater Treatment Operators ***need to be able to***:

Be involved, with others where appropriate, in the Root Cause Analysis processes. This involves helping to:

- Define the problem:
  - what is happening?
  - what are the specific symptoms?
- Collect data:
  - how long has it been happening?
  - what is the impact of the problem?
- Identify possible causal factors:
  - what sequence of events led to the problem?
  - what conditions allows it to occur?
- Identify the root cause:
  - why does the causal factor exist?
  - what is the real reason the problem occurred?
- Recommend and implement solutions
  - what can you do to prevent this happening again?
  - how do we implement the solution?
  - who will be responsible for this?
  - what are the risks of implementing the solution?
- Update the Implementing Site Management Plans based on learnings

To do this, Wastewater Treatment Operators ***need to know:***

The basic cause of the problem (there can be more than one). Usually either a:

- Physical cause – a physical item failed in some way (for example a dose pump stopped working), or a
- Human cause – somebody did something wrong or did not do something that was needed. Human causes typically lead to physical causes (for example nobody filled a dose tank, which led to the pump failing), or a

- Organisational cause - a system, process, or policy that people use to make decisions or do their work is faulty (for example, no one person was responsible for maintaining the dose tank, and everyone assumed someone else had done this).

Element of Competence:	Wastewater Flows and Hydraulics
Context	An understanding of current and forecast flows arriving at the wastewater treatment plant, along with an understanding of hydraulics and design flows, is needed by Wastewater Treatment Operators to ensure that treatment process operate in accordance with their design specifications and to ensure that all treated effluent discharge conditions are met.
Outcome	The Wastewater Treatment Plant operates in accordance to its design specification. Wastewater treatment processes are maintained, and treated effluent is returned to the environment in accordance with resource consent conditions.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Understand the nature of wastewater flows, including average dry weather flows, peak wet weather flows and diurnal variations.
- Understand how flows received at the wastewater treatment plant are managed to maintain the treatment process and meet any resource consent requirements.
- Carry out routine maintenance on flow control and monitoring equipment and control the process based on flows to ensure that wastewater quality standards are maintained.
- Monitor, interrogate, analyse and evaluate SCADA / HMI to confirm compliance with discharge consent conditions.
- Take flow measurements to monitor works performance.
- Carry out the required maintenance on flow assets, including:
    a) Flow separation assets
    b) Flow monitoring devices
- Keep and maintain accurate and up to date records
- Report information and data to the designated person including a non-compliance scenario.

To do this, Wastewater Treatment Operators ***need to know:***

- Discharge consent conditions relating to wastewater flow.
- The various influences on wastewater flows arriving at the Wastewater Treatment Plant.
- How the design specification for the treatment process relates to wastewater flows.
- How to use flow data to maintain and optimise treatment processes.
- The impacts unpredictable flows can have on wastewater treatment processes.

- How to interrogate SCADA to evaluate trend data differentiating normal operational cycles from developing fault conditions or emerging risks
- The associated Health and Safety hazards and risks with flow control and treatment systems.
- The importance of recording flow measurement from the correct locations, using approved techniques.
- The consequences of inaccurate flow measurement, recording and reporting.
- Data collection, recording, reporting and maintenance requirements.

Element of Competence:	Use Automated Systems to control the Process Plant and Collect Data
Context	Remote automation systems, such as SCADA (Supervisory, Control and Data Acquisition), are used to monitor and control processes at Wastewater Treatment Plants.
Outcome	The Wastewater Treatment Plant is controlled using remote automation. Data collected by the SCADA system is analysed and used to comply with the conditions of the discharge consent.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Use automation systems like SCADA, including being able to:
  - Log into and navigating around the SCADA system
  - Adjusting control set points and alarm levels for the different types of equipment used to control process operations.
  - Interpreting alarms
  - Accepting, or overriding, alarms
  - Viewing and understanding trend data and reporting any unusual trends
  - Setting up ad-hoc records
  - Interpreting mimic pages
  - Undertaking basic maintenance of the SCADA system i.e. shutting down and restarting nodes
- Interrogate the automation/SCADA system to:
  - Identify and control items of mechanical, electrical and instrumentation equipment.
- Evaluate trend data differentiating normal operational cycles from developing fault conditions or emerging risks

To do this, Wastewater Treatment Operators ***need to know:***

- The control philosophy for the Wastewater Treatment Plant.
- What automation/SCADA systems are, and what functions they are used for at Wastewater Treatment Plants.
- How data acquisition is done from Remote Terminal Units (RTUs) or Programmable Logic Controllers (PLCs) which connect to sensors in the process and convert sensor signals to digital data. How this data is then compiled and formatted so that Wastewater Treatment Operators can make supervisory decisions to adjust or override normal automatic controls.
- What the limitations of the automation/SCADA system are, including an understanding of how the frequency of signals impacts on the data.
- What to do if the SCADA system fails.
- The different types of equipment that require Operational Monitoring and Inspection for Process Control and what instruments are a requirement of Resource Consent Compliance Monitoring and Reporting.
- How the radio/telemetry system at the plant works.

Element of Competence:	Operate Screening and Grit Removal Processes
Context	Influent wastewater to the Wastewater Treatment Plant can contain large solids and grit which interferes with treatment processes and can wear mechanical equipment. Screening and Grit Removal are preliminary treatment processes which remove these constituents from the influent wastewater.
Outcome	Screening and grit removal processes are maintained and operated in accordance with their design specification, preventing damage to downstream assets. The processes are: ▪ Monitored to identify abnormal operation ▪ Controlled to ensure solids and grit are removed from the wastewater. ▪ Optimized on the basis of the analysis of trends. ▪ Restored to normal operation through the identification of the Root Cause of any faults.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Follow the operational procedures that are identified in the Implementing Site Management Plans.
- Identify all mechanical, electrical and instrumentation assets associated the screens and grit removal processes on SCADA and at the Wastewater Treatment Plant, and use SCADA to control them.
- Undertake the Calibration of the instruments used to monitor the screens and grit removal process, as well as undertaking the Operational Monitoring of the screening and grit removal process, completing associated calculations.
- Identify the Critical Control Points for the screening and grit removal process along other set-points applicable to screening and grit removal operations.
- Evaluate trend data from SCADA and test results to identify:
  - Normal trends or cycles for the works, and
  - Atypical trends or changes and the underlying Root Cause for the change
- Optimize the treatment processes based on test results and trend data.
- Respond to alarms and instigate corrective action to return the treatment processes to compliant condition.
- Safely carry out operational and first line Maintenance relating to the screening and grit removal processes. Including the safe Isolation of screening and grit removal equipment when required.
- Safely dispose of screenings and grit removed from the wastewater, paying attention to Health and Safety requirements.
- Identify the Root Cause of screening and grit removal problems.

- Record and report screening and grit removal equipment condition and performance data to the appropriate people to assist in Asset Management Decision Making.

To do this, Wastewater Treatment Operators ***need to know:***

- The objectives of the screening and grit removal processes, including an understanding of the design considerations and consequences of sub-optimal performance.
- Key process parameters and variables associated with screening and grit removal. Including the impact of the screening process on Wastewater Flows and Hydraulics through the plant.
- How to interrogate the SCADA system to:
    a) Identify and control items of mechanical, electrical and instrumentation equipment.
    b) Evaluate trend data differentiating normal operational cycles from developing fault conditions.
    c) How to confirm the configuration, operation and performance of the actual disinfection plant corresponds to SCADA.
- The range of mechanical, electrical and instrumentation plant used in Operational Monitoring of the screening and grit removal process and their Calibration requirements.
- The Critical Control Points, alarms, action levels, authorization levels and consequences associated with the process or processes.
- How to identify the Root Cause of screening and grit removal process problems and the sequence of actions required to restore the process to compliant conditions, taking account of all process variables and process lag times.
- The operational and maintenance tasks for the screening and grit removal processes that will be outlined in the Implementing Site Management Plans. Including the reactive and preventive Maintenance and frequencies.
- The Health and Safety hazards associated with the screens and grit removal processes and how these should be mitigated.
- How to optimise the screening and grit removal processes to minimise downstream treatment problems, on the basis of process performance management, test results and analysis of trends.
- The Isolation requirements of screens and grit removal equipment.
- What procedures to follow in an Incident & Emergency related to the screens and grit removal processes.

Element of Competence:	Operate Septage Receiving and Screening Systems
Context	On-site septic tanks and wastewater treatment systems require periodic emptying. Septage tanker trucks discharge septage waste at Wastewater Treatment Plants for further treatment. Septage receiving and screening systems reduce the incoming unwanted solids load to the wastewater treatment plant and provide a way to measure and monitor what waste is being disposed. Wastewater Treatment Operators monitor and accept deliveries of septage. This might involve using systems like WasteTRACK or similar.
Outcome	Only wastewater, which is acceptable to the site, which meets the trade waste bylaws and, where applicable, has been identified through the WasteTRACK system (or similar) is discharged into the septage receiving equipment. Septage receiving and screening equipment are maintained and operated in accordance with their design specification. They are: ▪ Monitored to identify abnormal operation ▪ Controlled to ensure they operate as designed. ▪ Optimized based on the analysis of trends. ▪ Restored to normal operation through the identification of Root Cause of any faults.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Identify what wastes are acceptable to be received at the Wastewater Treatment Plant.
- Ensure that only waste which meets the acceptance criteria identified in the Implementing Site Management Plans and local trade waste bylaws.
- Be responsible for Health and Safety of the delivery of septage wastes.
- Identify the Root Cause of septage receiving and screening problems.
- Optimise the septage receiving process to minimise odour generation e.g. by minimising exposure to air and reducing turbulent flow.
- Follow the operational procedures that are identified in the Implementing Site Management Plans for septage receiving and screening.
- Identify all mechanical, electrical and instrumentation assets associated with the septage processes on SCADA and at the Wastewater Treatment Plant and use SCADA to control the septage receiving process.
- Identify the Critical Control Points for the screening and grit removal process along other set-points applicable to septage operations

- Undertake the Calibration of the instruments used to monitor the septage process, as well as undertaking the Operational Monitoring of the septage process, completing associated calculations.
- Evaluate trend data from SCADA and test results to identify:
  - Normal trends or cycles for the works, and
  - Atypical trends or changes and the underlying or Root Cause for the change
- Optimize the septage receiving and screening treatment processes based on test results and trend data to efficiently achieve the required parameters.
- Safely dispose of screenings and grit removed from the septage, paying attention to Health and Safety requirements.
- Respond to alarms and instigate corrective action to return the septage processes to compliant condition.
- Safely carry out operational and first line Maintenance relating to the septage processes.
- Identify the Root Cause of septage problems.
- Record and report septage receiving equipment condition and performance data to the appropriate people to assist in Asset Management Decision Making.

To do this, Wastewater Treatment Operators ***need to know:***

- That the Liquid and Hazardous Wastes Code of Practice and its accompanying Operators Handbook help operators to understand regulations and requirements related to septage delivery and acceptance.
- The requirements of the local trade waste bylaw, and the impact of this on the acceptance of septage at the Wastewater Treatment Plant. Note that many trade waste bylaws are based on the New Zealand Standard NZS:9201 Part 23 Model General Bylaw for Trade Waste.
- The parameters and tests required before accepting different wastes, why the analysis is important and any limitation with sample collection and testing.
- That the Local Government Act requires fees and charges, including those related to trade waste and to septage disposal, to be identified in the Councils Annual Plan or within bylaw.
- What the fees and charges for septage disposal are, and their employers' requirements for invoicing e.g. volumetric charge rates.
- The nature and sources of the septage waste received at the site.
- The objectives of the septage receiving processes, including an understanding of the design considerations and consequences of sub-optimal performance.
- Key process parameters and variables associated with septage receiving equipment. Including the impact of the septage receiving process on Wastewater Flows and Hydraulics through the plant.
- How to interrogate the SCADA system to:
  a) Identify and control items of mechanical, electrical and instrumentation equipment.

b) Evaluate trend data differentiating normal operational cycles from developing fault conditions.
c) How to confirm the configuration, operation and performance of the actual disinfection plant corresponds to SCADA.

- The range of mechanical, electrical and instrumentation plant used in the Operational Monitoring and Inspection for Process Controlof the septage receiving process and their Calibration requirements.
- The Critical Control Points, alarms, action levels, authorization levels and consequences associated with the process or processes.
- How to identify the Root Cause of septage receiving process problems and the sequence of actions required to restore the process to compliant conditions, taking account of all process variables and process lag times.
- The operational and maintenance tasks for the septage receiving processes that will be outlined in the Implementing Site Management Plans. Including the reactive and preventive Maintenance and frequencies.
- The Health and Safety hazards associated with the septage receiving processes and how these should be mitigated.
- How to optimise the septage receiving and screening processes to minimise downstream treatment problems, based on process performance management, test results and analysis of trends.
- The Isolation requirements of septage equipment.
- What procedures to follow in anIncident & Emergency Response Plans related to the septage receiving processes.

Element of Competence:	Operate Primary Separation Processes
Context	Primary separation processes at Wastewater Treatment Plants are used to remove material that will either float or readily settle out by gravity.
Outcome	Primary separation processes are maintained and operated in accordance with their design specification, removing the material that will easily settle out or float. The processes are: ▪ Monitored to identify abnormal operation ▪ Controlled to ensure solids and grit are removed from the wastewater. ▪ Optimized on the basis of the analysis of trends. ▪ Restored to normal operation through the identification of the Root Cause of any faults

To do this, Wastewater Treatment Operators ***need to be able to***:

- Follow the operational procedures that are identified in the Implementing Site Management Plans.
- Identify all mechanical, electrical and instrumentation assets associated with the primary processes on SCADA and at the Wastewater Treatment Plant.
- Identify, and safely use any chemicals that might be used in the process, including any pumping plant used on the primary separation processes.
- Identify Critical Control Points applicable to primary separation operations and SCADA the primary separation processes.
- Undertake the Calibration of the instruments used to monitor the primary separation process, as well as undertaking the Operational Monitoring of the septage process, completing associated calculations.
- Evaluate trend data from SCADA and test results to identify:
  - Normal trends or cycles for the works, and
  - Atypical trends or changes and the underlying reason or Root Cause for the change
- Optimize the treatment processes based on test results and trend data to efficiently achieve the required parameters.
- Respond to alarms and instigate corrective action to return the treatment processes to compliant condition.
- Safely carry out operational and first line Maintenance relating to primary separation processes. Including the safe Isolation procedures for the equipment when required
- Complete sludge level monitoring to specification, appropriate to the plant requirements.
- Identify the Root Cause of primary separation problems.

- Record and report primary separation equipment condition and performance data to the appropriate people to assist in Asset Management Decision Making.
- Safely transfer solids removed from the wastewater for further treatment, paying attention to Health and Safety requirements.

To do this, Wastewater Treatment Operators ***need to know:***

- The objectives of the primary separation process, including an understanding of the design considerations and consequences of sub-optimal performance.
- Key process parameters and variables associated with primary separation, including the impact of the primary separation process on Wastewater Flows and Hydraulics through the plant.
- How to monitor sludge levels to specification and identifying any limitations.
- The consequences on the treatment quality, and subsequent process streams, as a consequence of:
  a) Maintenance
  b) Deliberate adjustments
  c) Sub-optimal sedimentation
  d) Desludging operations
  e) Taking a process unit out of service.
- How to interrogate the SCADA system to:
  a) Identify and control items of mechanical, electrical and instrumentation equipment.
  b) Evaluate trend data differentiating normal operational cycles from developing fault conditions.
  c) How to confirm the configuration, operation and performance of the actual disinfection plant corresponds to SCADA.
- The range of mechanical, electrical and instrumentation plant used to undertake Operational Monitoring of the primary separation process and their Calibration requirements.
- The Critical Control Points, alarms, action levels, authorization levels and consequences associated with the process or processes.
- How to identify the Root Cause of primary separation process problems and the sequence of actions required to restore the process to compliant conditions, taking account of all process variables and process lag times.
- The operational and maintenance tasks for the primary separation processes that will be outlined in the Implementing Site Management Plans. Including the reactive and preventive Maintenance and frequencies.
- The Health and Safety hazards associated with the primary sedimentation processes and how these should be mitigated.
- How to optimise primary sedimentation processes to minimise downstream treatment problems, on the basis of process performance management, test results and analysis of trends.
- The Isolation requirements of the primary sedimentation equipment.

- The Incident & Emergency procedures related to the primary sedimentation equipment.
- Where the primary separation process is enhanced by the use of chemicals to aid in flocculation, the Wastewater Treatment Operator would also need to know the types of chemicals used in the process, the reason why, and the factors that influence their selection, use and sequence of addition. How these potentially Hazardous Substances Management are to be safely stored, handled and managed.

Element of Competence:	Operate Fixed Growth Biological Treatment Processes
Context	Biological treatment processes at Wastewater Treatment Plants use microbial communities, under varying growth conditions to biochemically decompose organic compounds in the waste, converting it into solids which are subsequently removed from the flow. Types of biological treatment processes include: - Biological Trickling Filters - Fixed growth reactors - Rotating biological contactors - Aerated biofilters - Fixed-bed reactors
Outcome	Fixed growth biological treatment processes are maintained and operated in accordance with their design specification, decomposing organic compounds in the waste. The processes are: ▪ Monitored to identify abnormal operation ▪ Controlled to ensure organic compounds in the wastewater are decomposing. ▪ Optimized on the basis of the analysis of trends. ▪ Restored to normal operation through the identification of the Root Cause of any faults

To do this, Wastewater Treatment Operators ***need to be able to***:

- Follow the operational and maintenance procedures that are identified in the Implementing Site Management Plans for the fixed growth biological treatment process.
- Identify all mechanical, electrical and instrumentation assets associated with the fixed growth biological treatment processes on SCADA and at the Wastewater Treatment Plant.
- Identify and locate any storage, mixing and pumping equipment used in the fixed growth biological treatment processes. This might include:
  - Humus tanks and other secondary separation processes
  - Pumps
  - Recirculation equipment
- Identify Critical Control Points applicable to the fixed growth treatment process, including those related to organic and hydraulic loading.
- Use Use Automated Systems to control the Process Plant and Collect Data to control the fixed growth biological treatment process.
- Undertake the Calibration of the instruments used to monitor the fixed growth biological treatment process, as well as undertaking the Operational Monitoring of the process, completing associated calculations.

- Evaluate trend data from SCADA and test results to identify:
  - Normal trends or cycles for the works, and
  - Atypical trends or changes and the underlying reason or Root Cause for the change.
- Optimize the fixed growth biological treatment processes based on test results and trend data to efficiently achieve the required parameters. This might include taking samples and analysis related to BOD, ammonia reduction, nitrate production and sludge levels.
- Respond to alarms and instigate corrective action to return the biological treatment process to compliant condition.
- Safely carry out operational and first line Maintenance relating to fixed growth biological treatment processes. Including the safe Isolation of equipment when required.
- Complete sludge level monitoring to specification, appropriate to the plant requirements.
- Identify the Root Cause of fixed growth biological treatment problems.
- Record biological treatment equipment condition and performance data to the appropriate people to assist in Asset Management decision making.
- Safely transfer solids removed from the wastewater for further treatment, paying attention to Health and Safety requirements.

To do this, Wastewater Treatment Operators ***need to know:***

- The objectives of the fixed growth biological treatment process, including an understanding of the consequences of sub-optimal performance.
- The design parameters of the process, and the expected operational requirements and the implications of sub-optimal performance. This includes understanding:
  - Nitrifying and non-nitrifying processes
  - Recirculation or double filtration configuration
  - Hydraulic and organic loadings
  - Media types
  - Aeration equipment where applicable.
- Key process parameters and variables associated with biological treatment process Including the impact of the process on Wastewater Flows and Hydraulics through the plant, and recirculation requirements.
- The parameters and test-points required to ensure that the process is operating efficiently, and how to test, analyze and calculate:
  - BOD
  - Organic loading rate
  - Ammonia
  - Hydraulic loading rate
- How to monitor sludge levels (in secondary separation) to specification and identifying any limitations.
- The range of mechanical, electrical and instrumentation plant used to monitor and control the fixed growth process and their Calibration requirements.

- How to interrogate the SCADA system to:
    a) Identify and control items of mechanical, electrical and instrumentation equipment.
    b) Evaluate trend data differentiating normal operational cycles from developing fault conditions.
    c) How to confirm the configuration, operation and performance of the actual fixed growth biological treatment plant corresponds to SCADA.
- The range of mechanical, electrical and instrumentation plant used to undertake the Operational Monitoring of the fixed growth biological treatment process and their Calibration requirements.
- The Critical Control Points, alarms, action levels, authorization levels and consequences associated with the process or processes.
- How to identify Root Cause problems and the sequence of actions required to restore the process to compliant conditions, taking account of all process variables and process lag times.
- The potential nuisance issues associated with fixed growth treatment processes including odour and fly control problems.
- The operational and maintenance tasks for the fixed growth biological treatment processes that will be outlined in the Implementing Site Management Plans. Including the reactive and preventive Maintenance and Repairs of Wastewater Treatment Equipment and frequencies.
- The safe Isolation procedures for the equipment.
- What procedures to follow in an Incident & Emergency related to the fixed growth biological treatment processes.

Element of Competence:	Operate Suspended Growth Biological Treatment Processes
Context	Suspended growth biological treatment processes at Wastewater Treatment Plants use microbial communities, under varying growth conditions to biochemically decompose organic compounds in the waste, converting it into solids which are either recycled or subsequently removed from the flow. Types of suspended growth biological treatment processes include activated sludge and its various versions e.g.: ▪ Conventional activated sludge ▪ Contact stabilization ▪ Extended aeration ▪ Sequential batch reactors (SBR) ▪ Membrane bioreactors (MBR) ▪ Moving Bed Bioreactors (MBBR).
Outcome	Suspended growth biological treatment processes are maintained and operated in accordance with their design specification, decomposing organic compounds in the waste. The processes are: ▪ Monitored to identify abnormal operation ▪ Controlled to ensure organic compounds in the wastewater are decomposing. ▪ Optimized on the basis of the analysis of trends. ▪ Restored to normal operation through the identification of the Root Cause of any faults.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Follow the operational and maintenance procedures that are identified in the Implementing Site Management Plans for the suspended growth biological treatment process.
- Identify all mechanical, electrical and instrumentation assets associated with the suspended growth biological treatment processes on SCADA and at the Wastewater Treatment Plant.
- Identify and locate any storage, mixing/aerating and pumping equipment used in the suspended growth biological treatment processes. This might include:
    - Humus tanks and other secondary separation processes
    - Pumps
    - Recirculation equipment
- Identify Critical Control Points applicable to the suspended growth treatment process, including those related to recycling activated sludge and wasting activated sludge.
- Use SCADA to control the suspended growth biological treatment process.

- Undertake the Calibration of the instruments used to monitor the suspended growth biological treatment process, as well as undertaking the Operational Monitoring of the process, completing associated calculations.
- Evaluate trend data from SCADA and test results to identify:
  - Normal trends or cycles for the works, and
  - Atypical trends or changes and the underlying cause for the change.
- Optimize the suspended growth biological treatment processes based on test results and trend data to efficiently achieve the required parameters. This might include taking samples and analysis related to BOD, ammonia, nitrate and sludge levels.
- Respond to alarms and instigate corrective action to return the biological treatment process to compliant condition.
- Safely carry out operational and first line relating to biological treatment equipment. Including the safe Isolation of equipment when required.
- Complete sludge (MLSS) level monitoring to specification, appropriate to the plant requirements.
- Identify the Root Cause of suspended growth biological treatment problems.
- Record biological treatment equipment condition and performance data to the appropriate people to assist in Asset Management Decision Making.
- Safely transfer solids dispose solids removed from the wastewater for further treatment, paying attention to Health and Safety requirements.

To do this, Wastewater Treatment Operators ***need to know:***

- The objectives of the suspended growth biological treatment process, including an understanding of the consequences of sub-optimal performance.
- The design parameters of the process, and the expected operational requirements and the implications of sub-optimal performance. This includes understanding:
  - Nitrifying and non-nitrifying processes plant
  - Recirculation or double filtration configurations
  - Hydraulic and organic loadings
  - Media types
  - Aeration and mixing equipment where applicable.
- Key process parameters and variables associated with suspended growth biological treatment process including the impact of the process Wastewater Flows and Hydraulics through the plant, and recirculation requirements.
- The parameters and test-points required to ensure that the process is operating efficiently, and how to test, analyse and calculate:
  - BOD
  - Nitrogen (Ammonia + Nitrate)
  - Phosphorous
  - Organic loading rate
  - Hydraulic loading rate
  - Food to Micro-organism (F:M) ratios

- How to monitor sludge levels (in return and waste flows) to specification and identifying any limitations.
- How to interrogate the SCADA system to:
  a) Identify and control items of mechanical, electrical and instrumentation equipment.
  b) Evaluate trend data differentiating normal operational cycles from developing fault conditions.
  c) How to confirm the configuration, operation and performance of the actual plant corresponds to SCADA.
- The range of mechanical, electrical and instrumentation plant used in the Operational Monitoring of the suspended growth biological process and their Calibration requirements.
- The Critical Control Points, alarms, action levels, authorization levels and consequences associated with the process or processes.
- How to identify Root Cause problems and the sequence of actions required to restore the process to compliant conditions, taking account of all process variables and process lag times.
- The potential nuisance issues associated with suspended growth treatment processes including odour and foaming control problems.
- The operational and maintenance tasks for the suspended growth biological treatment processes that will be outlined in the Implementing Site Management Plans. Including the reactive and preventive Maintenance and Repairs of Wastewater Treatment Equipment and frequencies.
- The safe Isolation procedures for the equipment.
- What procedures to follow in an Incident & Emergency Response Plansrelated to the suspended growth treatment process.

Element of Competence:	Operate Waste Stabilisation Ponds
Context	Waste Stabilisation Ponds are a commonly used wastewater treatment process in New Zealand to reduce BOD, suspended solids, nitrogen phosphorus and microbial pathogens in wastewater. There are different types of Waste Stabilisation Ponds including anaerobic, facultative, oxidation and maturation ponds.
Outcome	Waste Stabilisation Ponds are maintained and operated in accordance with their design specification, reducing the contamination loading of the wastewater. The processes are: ▪ Monitored to identify abnormal operation ▪ Controlled to ensure contaminants are being reduced. ▪ Optimized based on the analysis of trends. ▪ Restored to normal operation through the identification of the Root Cause Analysisof any faults

To do this, Wastewater Treatment Operators ***need to be able to***:

- Follow the operational procedures that are identified in the Implementing Site Management Plans.
- Identify all mechanical, electrical and instrumentation assets associated with the waste stabilization pond on SCADA and at the pond.
- Identify, and safely use any chemicals, mixing and pumping plant used on the waste stabilisation pond processes.
- Identify Critical Control Points applicable to the waste stabilisation pond operations.
- Use Automated Systems to control the Process Plant and Collect Data the waste stabilisation pond.
- Undertake the Calibration of the instruments used to monitor the waste stabilisation process, as well as undertaking the Operational Monitoring of the process, completing associated calculations.
- Collect samples to verify that the process is meeting resource consent compliance e.g. for BOD, TSS (Total Suspended Solids), Nitrogen (ammonia and Nitrate), DRP, Total Phosphorus, *E. coli*
- Collect samples for operational monitoring of the process, including DO, pH, conductivity, temperature, algae, chlorophyll, sludge levels.
- Optimize the treatment processes based on test results and trend data to efficiently achieve the required parameters.
- Evaluate trend data from SCADA and test results to identify:
  - Normal trends or cycles for the works, and

- Atypical trends or changes and the underlying or cause for the change.

- Safely carry out operational and first line Maintenance and Repairs of Wastewater Treatment Equipment relating to the waste stabilisation pond. Including the safe Isolation procedures for the equipment when required.

- Complete sludge level monitoring to specification, appropriate to the pond requirements.
- Identify Root Cause of waste stabilisation problems.
- Record equipment condition and performance data to the appropriate people to assist in Asset Management Decision Making.
- Safely dispose solids removed from the Waste Stabilization Ponds, paying attention to Health and Safety requirements.
- Undertake general housekeeping around the site.

To do this, Wastewater Treatment Operators ***need to know:***

- That the Water New Zealand Good Practice Guide for Waste Stabilisation Ponds: Design and Operation [3] details how Waste Stabilisation Ponds work, how to operate and maintain them and what to do when things go wrong.
- That the Guidelines for the Hydraulic Design of Waste Stabilisation Ponds can help to troubleshoot waste stabilisation pond problems that are hydraulic in nature
- The objectives of the waste stabilisation pond process, including an understanding of the design considerations and consequences of sub-optimal performance.
- Key process parameters and variables associated with waste stabilization pond, including the impact of the treatment process on Wastewater Flows and Hydraulics.
- How to monitor sludge levels to specification and identifying any limitations.
- The range of mechanical, electrical and instrumentation plant used in the Operational Monitoring of the waste stabilisation ponds and their Calibration requirements.
- The consequences on the treatment quality, and subsequent process streams, as a consequence of:
  a) Short-circuiting
  b) Desludging operations
- How to interrogate SCADA to control the system to:
  - Identify and control items of mechanical, electrical and instrumentation equipment.
  - Evaluate trend data differentiating normal operational cycles from developing fault conditions.
  - How to confirm the configuration, operation and performance of the actual disinfection plant corresponds to SCADA.
- The Critical Control Points, alarms, action levels, authorization levels and consequences associated with the process or processes.
- How to identify the Root Cause of waste stabilization ponds process problems and the sequence of actions required to restore the process to compliant conditions, taking account of all process variables and process lag times.

- How to monitor sludge levels to specification and identifying any limitations.
  - The operational and maintenance tasks for the waste stabilization ponds processes that will be outlined in the Implementing Site Management Plans. Including the reactive and preventive Maintenance and Repairs of Wastewater Treatment Equipment and frequencies.
  - The Health and Safety hazards associated with the waste stabilisation pond processes and how these should be mitigated.
  - How to optimise waste stabilisation ponds to minimise downstream treatment problems, on the basis of process performance management, test results and analysis of trends.
  - What procedures to follow in an Incident & Emergency related to the waste stabilisation pond.

Element of Competence:	Operate Aerated Lagoons
Context	Aerated Lagoons are a commonly used wastewater treatment process in New Zealand. to reduce BOD, suspended solids, nitrogen phosphorus and microbial pathogens in wastewater, particularly in industrial applications. There are different types of Aerated Lagoons including partially or fully mixed ponds or lagoons.
Outcome	Aerated Lagoons are maintained and operated in accordance with their design specification, reducing the contamination loading of the wastewater. The processes are: ▪ Monitored to identify abnormal operation ▪ Controlled to ensure contaminants are being reduced. ▪ Optimized on the basis of the analysis of trends. ▪ Restored to normal operation through the identification of the Root Cause of any faults

To do this, Wastewater Treatment Operators ***need to be able to***:

- Follow the operational procedures that are identified in the Implementing Site Management Plans.
- Identify all mechanical, electrical and instrumentation assets associated with the aerated lagoons on SCADA and at the pond.
- Identify, and safely use any chemicals, mixing and pumping plant used on aerated lagoon processes.
- Identify Critical Control Points applicable to the aerated lagoons operations
- Use SCADA to control the aerated lagoon equipment and instrumentation.
- Undertake the Calibration of the instruments used to monitor the aerated lagoons, as well as undertaking the Operational Monitoring of the process, completing associated calculations.
- Collect samples to verify that the process is meeting resource consent compliance e.g. for BOD, TSS, Nitrogen (Ammonia and Nitrate), DRP, Total Phosphorus, *E. coli.*
- Collect samples for operational monitoring of the process, including TSS, DO, pH, conductivity, temperature, sludge levels.
- Optimize the treatment processes based on test results and trend data to efficiently achieve the required parameters.
- Evaluate trend data from SCADA and test results to identify:
  - Normal trends or cycles for the works, and
  - Atypical trends or changes and the underlying reason or Root Cause of the change

- Safely carry out operational and first line Maintenance and Repairs of Wastewater Treatment Equipment relating to the aerated lagoons. Including the safe Isolation procedures for the equipment when required.
- Complete sludge level monitoring to specification, appropriate to the aerated lagoons requirements.
- Identify the Root Cause of waste stabilisation problems.
- Record equipment condition and performance data to the appropriate people to assist in Asset Management Decision Making.
- Safely transfer solids removed from the wastewater for further treatment, paying attention to Health and Safety requirements.
- Undertake general housekeeping around the site.

To do this, Wastewater Treatment Operators ***need to know:***

- That the Water New Zealand Good Practice Guide for Waste Stabilisation Ponds: Design and Operation [3] includes some details on how aerated lagoons work, how to operate and maintain them and what to do when things go wrong. There are also links to other useful documents.
- How to troubleshoot aerated lagoon problems that are hydraulic in nature
- The objectives of the aerated lagoon process, including an understanding of the design considerations and consequences of sub-optimal performance.
- Key process parameters and variables associated with aerated lagoons, including the impact of the treatment process on Wastewater Flows and Hydraulics.
- How to monitor sludge levels to specification and identifying any limitations.
- The range of mechanical, electrical and instrumentation plant used to undertake the Operational Monitoring of the aerated lagoons and their Calibration requirements.
- The correct operation of the waste stabilisation and desludging processes.
- The consequences on the treatment quality, and subsequent process streams, as a consequence of:
  a) Short-circuiting
  b) Desludging operations
- How to interrogate the SCADA system to:
  - Identify and control items of mechanical, electrical and instrumentation equipment.
  - Evaluate trend data differentiating normal operational cycles from developing fault conditions.
  - How to confirm the configuration, operation and performance of the actual disinfection plant corresponds to SCADA.
- The Critical Control Points, alarms, action levels, authorization levels and consequences associated with the process or processes.
- How to identify the Root Cause of aerated lagoons process problems and the sequence of actions required to restore the process to compliant conditions, taking account of all process variables and process lag times.

- How to monitor sludge levels to specification and identifying any limitations.
- The operational and maintenance tasks for aerated lagoon processes that will be outlined in the Implementing Site Management Plans. Including the reactive and preventive Maintenance and Repairs of Wastewater Treatment Equipment and frequencies.
- The Health and Safety hazards associated with aerated lagoon processes and how these should be mitigated.
- How to optimise aerated lagoons to minimise downstream treatment problems, on the basis of process performance management, test results and analysis of trends.
- What procedures to follow in an Incident & Emergency Response Plans to the aerated lagoons.

Element of Competence:	Operate Anaerobic Digestion Processes
Context	Sludge is a by-product of treated wastewater. It is made up of both organic and inorganic materials and pathogens. Anaerobic digestion is one form of sludge treatment commonly used at Wastewater Treatment Plants to reduce and stabilise solid organic material. It decomposes sludges into more stable substances and reduces pathogens. Methane-rich biogas is also produced in most circumstances.
Outcome	Anaerobic digestion processes are maintained and operated in accordance with their design specification, to allow for the safe use or disposal of the final sludge or biosolids. The processes are: ▪ Monitored to identify abnormal operation ▪ Controlled to ensure contaminants are being reduced. ▪ Optimized on the basis of the analysis of trends. ▪ Restored to normal operation through the identification of the Root Cause of any faults

To do this, Wastewater Treatment Operators ***need to be able to***:

- Follow the operational and maintenance procedures that are identified in the Implementing Site Management Plans for anaerobic digestion.
- Identify all mechanical, electrical and instrumentation assets associated with the anaerobic digestion processes on SCADA and at the Wastewater Treatment Plant.
- Identify and locate any storage, mixing and pumping equipment used in the anaerobic digestion processes.
- Identify Critical Control Points applicable to the anaerobic digestion operations,
- Use SCADA to control the digesters.
- Respond to alarms and instigate corrective action to return the anaerobic digester to compliant condition.
- Undertake the Calibration of the instruments used to monitor the anerobic digestion, as well as undertaking the Operational Monitoring of the process, completing associated calculations.
- Optimize the anaerobic digestion processes based on test results and trend data to efficiently achieve the required parameters.
- Evaluate trend data from SCADA and test results to identify:
  - Normal trends or cycles for the works, and
  - Atypical trends or changes and the underlying reasons or Root Cause for the change

- Safely carry out operational and first line Maintenance and Repairs of Wastewater Treatment Equipment relating to the anaerobic digesters, including the safe Isolation procedures for the equipment when required.
- Complete sludge level monitoring to specification, appropriate to the digester requirements.
- Identify the Root Cause of anaerobic digester problems.
- Record equipment condition and performance data to the appropriate people to assist in Asset Management Decision Making.
- Safely transfer solids removed from the wastewater for further treatment, paying attention to Health and Safety requirements.

To do this, Wastewater Treatment Operators ***need to know:***

- The objectives of the anaerobic digestion process, including an understanding of the consequences of sub-optimal performance.
- The chemical, biological, microbiological and physical differences of primary, secondary and septic sludge's and their impact on the anaerobic digestion process.
- The stages of digestion at the Wastewater Treatment Plant and the required temperature ranges.
- The design parameters of the anaerobic digestion process, and the expected operational requirements. Including any quantity and quality requirements of the sludge storage assets and sludge liquor management.
- How to monitor sludge levels to specification and identifying any limitations.
- The range of mechanical, electrical and instrumentation plant used in the Operational Monitoring of the anaerobic digestion process and their Calibration requirements.
- How the digester heating system operates and any ancillary equipment requirements.
- The importance of pH, volatile fatty acids, and alkalinity to the anaerobic digestion process.
- Working volumes of digesters, feed volumes, rates and regimes; organic loadings and retention times and issues that can impact available performance
- What causes digester foaming and options for controlling it.
- What factors can affect the sludge and return liquor quality including operational, mechanical, chemical and weather-related factors.
- The configuration of the anaerobic digestion process equipment and their operational and performance requirements. Including understanding the flow route for sludges and how, and why, liquors require further treatment.
- Gas production rates and how to optimise the production of gas.
- What the gas testing requirements for the process are, and the relevance of gas testing results to digester performance. Gas management systems should have procedures to ensure plant and equipment is intrinsically safe. Gas management procedures should require regular gas monitoring (for parameters such as oxygen, hydrogen sulphide, carbon monoxide and methane).

- How gas from the anaerobic digester is stored and ancillary equipment related to gas collection is operated, including any design considerations associated with these assets.
- Where the gas collected from an anaerobic digester is used in a combined heat and power (CHP) /cogeneration unit, wastewater treatment operators need to be aware of the requirements to ensure compliance with the relevant electricity and gas safety regulations and industry codes of practice.
- The consequences on the treatment quality, and subsequent process streams, as a consequence of:
  a) Maintenance
  b) Deliberate adjustments
  c) Sub-optimal sedimentation
  d) Desludging operations
  e) Taking a process unit out of service.
- How to interrogate the SCADA to:
  a) Identify and control items of mechanical, electrical and instrumentation equipment.
  b) Evaluate trend data differentiating normal operational cycles from developing fault conditions.
  c) How to confirm the configuration, operation and performance of the actual disinfection plant corresponds to SCADA.
- The range of mechanical, electrical and instrumentation plant used to monitor and control the anaerobic digestion process and their Calibration and Operational Monitoring requirements.
- The Critical Control Points, alarms, action levels, authorization levels and consequences associated with the process.
- How to identify the Root Cause of anaerobic digestion process problems and the sequence of actions required to restore the process to compliant conditions, taking account of all process variables and process lag times.
- The operational and maintenance tasks for the anaerobic digestion processes that will be outlined in the Implementing Site Management Plans. Including the reactive and preventive Maintenance and Repairs of Wastewater Treatment Equipment and frequencies.
- The Health and Safety hazards associated with the anaerobic digestion processes and how these should be mitigated.
- The safe Isolation procedures for the anaerobic digestion equipment and the associated shut down / start up procedures.
- What procedures to follow in an Incident & Emergency related to the anaerobic digestion.

Element of Competence:	Operate Sludge Handling and Dewatering Processes
Context	Sludge is a by-product of treating wastewater. It is made up of both organic and inorganic materials and pathogens. Handling and dewatering of sludges can include: ▪ A thickening process to increase the solids percentage and to reduce its volume and make it easier to handle. ▪ Operate Anaerobic Digestion Processes, to decompose the sludge into stable substances, and disinfect pathogens. ▪ Dewatering to reduce the moisture content and produce a solid mass. ▪ Storage of sludge until it can be safely disposed of, either to landfill, or as a fertilizer, depending on its chemical composition as part of a resource recovery process.
Outcome	Sludge handling, storage and dewatering processes are maintained and operated in accordance with their design specification, to allow for the safe use or disposal of the appropriately treated sludge. The processes are: ▪ Monitored to identify abnormal operation ▪ Controlled to ensure contaminants are being reduced. ▪ Optimized on the basis of the analysis of trends. ▪ Restored to normal operation through the identification of the Root Cause of any faults

To do this, Wastewater Treatment Operators ***need to be able to***:

- Follow the operational procedures that are identified in the Implementing Site Management Plans for sludge handling and dewatering.
- Identify all mechanical, electrical and instrumentation assets associated with sludge handling and dewatering processes on SCADA and at the Wastewater Treatment Plant.
- Identify and locate any chemical, storage, mixing and pumping equipment used in the sludge handling and dewatering processes.
- Identify Critical Control Points applicable to the sludge handling and dewatering operations.
- Use SCADA to control the sludge handling and dewatering processes.
- Undertake the Calibration of the instruments used to monitor the sludge handling and dewatering processes, as well as undertaking the Operational Monitoring of the process, completing associated calculations.
- Evaluate trend data from SCADA and test results to identify:
  - Normal trends or cycles for the works, and
  - Atypical trends or changes and the underlying reason or Root Cause for the change

- Optimize the sludge handling and dewatering processes based on test results and trend data to efficiently achieve the required parameters.
- Respond to alarms and instigate corrective action to return the sludge handling and dewatering processes to compliant condition.
- Deal with spillages or pollution events in accordance with incident and emergency plan for the site.
- Safely carry out operational and first line Maintenance and Repairs of Wastewater Treatment Equipment relating to the sludge handling and dewatering process. Including the safe Isolation procedures for the equipment when required.
- Identify the Root Cause of sludge handling and dewatering problems.
- Record equipment condition and performance data to the appropriate people to assist in Asset Management Decision Making.
- Safely transfer dewater solids for disposal, paying attention to Health and Safety requirements.

To do this, Wastewater Treatment Operators ***need to know:***

- The objectives of the sludge handling and dewatering process, including an understanding of the design considerations and consequences of sub-optimal performance.
- Key process parameters and variables associated with sludge handling and dewatering process. Including the flow route for liquor return.
- How to interrogate the SCADA to:
    a) Identify and control items of mechanical, electrical and instrumentation equipment.
    b) Evaluate trend data differentiating normal operational cycles from developing fault conditions.
    c) How to confirm the configuration, operation and performance of the actual disinfection plant corresponds to SCADA.
- The range of mechanical, electrical and instrumentation equipment used to monitor and control sludge handling and dewatering assets and Calibration and Operational Monitoring requirements. This may include equipment such as:
    - Centrifuges
    - Belt Presses
    - Fournier presses
    - Picket-fence thickeners
    - Mono pumps
- Where the sludge dewatering process is enhanced by the use of chemicals, the Wastewater Treatment Operator would also need to know the types of chemicals used in the process, the reason why, and the factors that influence their selection, use and sequence of addition. How these potentially hazardous substances are to be safely stored, handled and managed.
- Factors that can affect the sludge and return liquor quality including operational, mechanical, chemical and weather-related factors.

- The Critical Control Points, alarms, action levels, authorization levels and consequences associated with the sludge handling and dewatering process.
- How to identify the Root Cause of sludge handling and dewatering process problems and the sequence of actions required to restore the process to compliant conditions, taking account of all process variables and process lag times.
- The operational and maintenance tasks for the sludge handling and dewatering processes that will be outlined in the Implementing Site Management Plans. Including the reactive and preventive Maintenance and Repairs of Wastewater Treatment Equipment and frequencies.
- The Health and Safety hazards associated with the sludge handling and dewatering processes and how these should be mitigated.
- How to optimise the sludge handling and dewatering processes to minimise downstream treatment problems, on the basis of process performance management, test results and analysis of trends.
- How to safely take the sludge handling and dewatering equipment out of service.
- What procedures to follow in an Incident & Emergency Response Plans to the sludge handling and dewatering.

Element of Competence:	Operate Sludge Disposal
Context	Following treatment, sludge is discharged to the environment, whether to landfill or to further treatment for recycling (see Operate Resource Recovery Processes).
Outcome	Treated sludge is disposed of in a manner that minimises adverse cumulative environmental effects and meets resource consent condition requirements. Treated sludge disposal assets are maintained and operated in accordance with their design specifications, with the pumping and transportation processes required to dispose of sludges being: ▪ Monitored to identify abnormal operation ▪ Controlled to ensure contaminants are being reduced. ▪ Optimized on the basis of the analysis of trends. ▪ Restored to normal operation through the identification of the Root Cause of any faults

To do this, Wastewater Treatment Operators ***need to be able to***:

- Monitor sludge disposal from the Wastewater Treatment Plant to ensure that it meets Resource Consents conditions.
- Monitor the wide environment for cumulative environmental impacts.
- Deal with spillages or pollution events in accordance with incident and emergency plan for the site. Including safely shutting down the sludge disposal process, paying attention to Health and Safety requirements.
- Safely carry out operational and first line Maintenance and Repairs of Wastewater Treatment Equipment relating to the sludge disposal infrastructure that are identified in the Implementing Site Management Plans. This may include undertaking condition assessments on infrastructure e.g.
  - Inspect the condition of the disposal infrastructure, including pipeline, trucks, or organise for these inspections to occur.
  - Inspect public warning signage about sludge disposal to ensure that the risk to the public is minimised.
- Record equipment condition and performance data to the appropriate people to assist in Asset Management Decision Making.

To do this, Wastewater Treatment Operators ***need to know:***

- The conditions and monitoring requirements of the Resource Consent.
- That the Water New Zealand Guidelines for the Beneficial Use of Organic Materials on Productive Lands [7] provides advice on monitoring and sampling guidelines for the disposal of sludges.

- The operational and Maintenance and Repairs of Wastewater Treatment Equipment for the sludge handling and dewatering processes that will be outlined in the Implementing Site Management Plans. Including the reactive and preventive Maintenance and Repairs of Wastewater Treatment Equipment and frequencies.
- The Health and Safety risks and hazards associated with sludge disposal and how these should be mitigated.
- What procedures to follow, as documented in the emergency management plan, if the sludge disposal process needs to be shut-down or bypassed.

Element of Competence:	Operate Tertiary Treatment Processes
Context	Tertiary treatment can be required at Wastewater Treatment Plants to improve the discharge quality. Tertiary treatment allows for further reductions in organics, solids, nitrogen, phosphorus and pathogens. For example, tertiary treatment processes can be used to: - Polish the effluent by removing the last traces of suspended solids. - Remove additional nitrogen and phosphorus loads in order to reduce the potential of unwanted plant growth in receiving waters. - Provide a final disinfection stage to destroy virus, bacteria and other pathogens within the effluent. Most tertiary treatment includes UV disinfection and extensions of conventional secondary biological treatment to further stabilize oxygen-demanding substances in the wastewater or to remove nitrogen and phosphorus. Some tertiary treatment includes chemical enhanced removal, via coagulation and flocculation, of phosphorus. While other tertiary treatment processes can include physical-chemical separation techniques such as filtration.
Outcome	Tertiary treatment processes are maintained and operated in accordance with their design specification, to allow for optimal tertiary treatment. The processes are: ▪ Monitored to identify abnormal operation ▪ Controlled to ensure contaminants are being reduced. ▪ Optimized on the basis of the analysis of trends. ▪ Restored to normal operation through the identification of the Root Cause of any faults

To do this, Wastewater Treatment Operators ***need to be able to***:

- Follow the operational procedures that are identified in the Implementing Site Management Plans for tertiary treatment.
- Identify all mechanical, electrical and instrumentation assets associated with tertiary treatment processes on SCADA and at the Wastewater Treatment Plant.
- Identify and locate any chemical, storage, mixing and pumping equipment used in the tertiary treatment processes.
- Identify Critical Control Points applicable to the tertiary treatment, control the tertiary treatment processes.
- Undertake the Calibration of the instruments used to monitor the tertiary treatment processes, as well as undertaking the Operational Monitoring of the process, completing associated calculations.

- Evaluate trend data from SCADA and test results to identify:
  - Normal trends or cycles for the works, and
  - Atypical trends or changes and the underlying reason or Root Cause for the change
- Optimize the tertiary treatment processes based on test results and trend data to efficiently achieve the required parameters.
- Respond to alarms and instigate corrective action to return the tertiary treatment processes to compliant condition.
- Deal with spillages or pollution events in accordance with incident and emergency plan for the site.
- Safely carry out operational and first line Maintenance and Repairs of Wastewater Treatment Equipment relating to the tertiary treatment process. Including the Safe Isolation of Plant and Equipment of equipment when required.
- Identify the Root Cause of tertiary treatment problems.
- Record equipment condition and performance data to the appropriate people to assist in Asset Management Decision Making.

To do this, Wastewater Treatment Operators ***need to know:***

- The objectives of the tertiary process, including an understanding of the design considerations and consequences of sub-optimal performance.
- Key process parameters and variables associated with tertiary treatment. Including the impact on wastewater flows and hydraulics on the tertiary treatment process.
- How to interrogate the SCADA to:

  d) Identify and control items of mechanical, electrical and instrumentation equipment.
  e) Evaluate trend data differentiating normal operational cycles from developing fault conditions.
  f) How to confirm the configuration, operation and performance of the actual disinfection plant corresponds to SCADA.

- The range of mechanical, electrical and instrumentation plant used in the Operational Monitoring of the process and their Calibration requirements This might include equipment such as.

  - Lamps
  - Transmissivity probes and monitors
  - Intensity probes and monitors
  - Baffles
  - Ballast cards
  - Flow meters

- The Critical Control Points, alarms, action levels, authorization levels and consequences associated with the process or processes.
- The operational and Maintenance and Repairs of Wastewater Treatment Equipment for the tertiary treatment processes that will be outlined in the Implementing Site Management Plans. Including the reactive and preventive Maintenance and Repairs of Wastewater Treatment Equipment and frequencies.

- How to identify the Root Cause of screening and tertiary treatment process problems and the sequence of actions required to restore the process to compliant conditions, taking account of all process variables and process lag times.
- The Health and Safety hazards associated with the tertiary treatment processes and how these should be mitigated.
- How to optimise the tertiary treatment processes to minimise the impact on the receiving environment, on the basis of process performance management, test results and analysis of trends.
- How to safely take the tertiary treatment equipment out of service.
- What procedures to follow in an Incident & Emergency Response Plansrelated to tertiary treatment.

Element of Competence:	Operate Ventilation Systems and Odour Control Processes
Context	Wastewater treatment sites can be a source of objectionable odour to the community. Air discharges at Wastewater Treatment Plants must be operated in accordance with the requirements of the air discharge consent and the Implementing Site Management Plans.
Outcome	Odour complaints related to the operation of the Wastewater Treatment plant are minimised. The ventilation system and odour control processes are maintained and operated in accordance with their design specification, to allow for optimal tertiary treatment. The processes are: ▪ Monitored to identify abnormal operation ▪ Controlled to ensure contaminants are being reduced. ▪ Optimized on the basis of the analysis of trends. ▪ Restored to normal operation through the identification of the Root Cause of any faults

To do this, Wastewater Treatment Operators ***need to be able to***:

- Identify the Root Cause of odour problems.
- Optimise site processes to minimise odour generation e.g. by minimising turbulent flow or exposure to air.
- Follow the operational procedures that are identified in the Implementing Site Management Plans for ventilation and odour control.
- Identify all mechanical, electrical and instrumentation assets associated with the ventilation system and odour control processes on SCADA and at the Wastewater Treatment Plant.
- Identify, and safely use any chemicals used in the odour control process.
- Identify Critical Control Points applicable to the ventilation system and odour control processes, control the ventilation system and odour control processes.
- Undertake the Calibration of the instruments used to monitor the ventilation and odour control processes, as well as undertaking the Operational Monitoring of the process, completing associated calculations.
- Evaluate trend data from SCADA and test results to identify:
  - Normal trends or cycles for the works, and
  - Atypical trends or changes and the underlying reason or Root Cause of the change
- Optimize the ventilation and odour control treatment processes based on test results and trend data to efficiently achieve the required parameters.
- Respond to alarms and instigate corrective action to return the treatment processes to compliant condition.

- Safely carry out operational and first line Maintenance and Repairs of Wastewater Treatment Equipment relating to the ventilation system and odour control treatment process, including the Safe Isolation of Plant and Equipment when required.
- Record equipment condition and performance data to the appropriate people to assist in Asset Management Decision Making.
- Monitor, check, record and report on chemical dosing used in odour control processes.

To do this, Wastewater Treatment Operators ***need to know:***

- The nature and sources of odour generation at the wastewater treatment plant and the resource consent requirements that control air discharges at the site.
- How ventilation systems assist in preventing corrosion at Wastewater Treatment Plants.
- The hazards associated with confined spaces and the use of ventilation systems to reduce hazardous atmospheric conditions.
- That the requirements for odour management control that will be outlined in the air discharge resource consent for the site, and the consequences of sub-optimal performance
- That the Water NZ Manual for Wastewater Odour Management [8] provides guidelines for the preventing and controlling wastewater odour at Wastewater Treatment Plants.
- The different types of odour management processes available and the associated ancillary equipment used to control odour. An understanding of the design considerations associated with each of the different types of odour management processes e.g. the type of odour to be treated, media used, chemicals used, passive or active treatment.
- The objectives of the ventilation and odour control processes, including an understanding of the design considerations and consequences of sub-optimal performance.
- How atmospheric conditions can affect the dispersion of odour at the Wastewater Treatment Plant site.
- Key process parameters and variables associated with ventilation and odour control. Including the impact of ventilation on Health and Safety and corrosion within other treatment processes.
- How to interrogate the SCADA to:
  - Identify and control items of mechanical, electrical and instrumentation equipment.
  - Evaluate trend data differentiating normal operational cycles from developing fault conditions.
- The range of mechanical, electrical and instrumentation plant used in the Operational Monitoring of the process and their Calibration requirements.
- The Critical Control Points, alarms, action levels, authorization levels and consequences associated with the process.

- The first line Maintenance tasks for the odour control process that will be outlined in the Implementing Site Management Plans. Including the reactive and preventive Maintenance and Repairs of Wastewater Treatment Equipment frequencies.
- How to identify the Root Cause of ventilation and odour control problems and the sequence of actions required to restore the process to compliant conditions, taking account of all process variables and process lag times.
- The parameters and tests required to monitor the odour control process and why the analysis is important and any limitation with the monitoring.
- The Health and Safety hazards associated with the ventilation and odour control processes and how these should be mitigated.
- How to optimise the ventilation and odour treatment processes to minimise odour, Health and Safety and corrosion problems, on the basis of process performance management, test results and analysis of trends.
- The safe Isolation procedures for the ventilation and odour control equipment
- What procedures to follow in an Incident & Emergency related to the ventilation and odour control process.

Element of Competence:	Operate Resource Recovery Processes
Context	Scarcity of resources and sustainability are increasingly moving the focus of Wastewater Treatment Plant operations into areas of beneficial use and resource recovery. Established resource recovery processes include: ▪ Wastewater energy recovery by anaerobically digesting biosolids to produce digester gas (predominantly methane) for co-generating electricity and heat ▪ Nutrient and biosolids (appropriately treated sludge) recovery by capturing nutrients such as phosphorus and nitrogen for beneficial uses such as compost / soil amendments. ▪ Water recovery through reuse as non-potable water for instance for industrial processes, landscape or agricultural irrigation.
Outcome	Resource recovery assets are maintained and operated in accordance with their design specification. They are: ▪ Monitored to identify abnormal operation ▪ Controlled to ensure they operate as designed. ▪ Optimized on the basis of the analysis of trends. ▪ Restored to normal operation through the identification of theRoot Cause Analysisof any faults.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Follow the operational procedures that are identified in the Implementing Site Management Plans for resource recovery processes.
- Identify all mechanical, electrical and instrumentation assets associated with the resource recovery processes on SCADA and at the Wastewater Treatment Plant.
- Identify, and safely use any chemicals used in resource recovery process.
- Identify Critical Control Points applicable to the resource recovery process, control the resource recovery process.
- Undertake the Calibration of the instruments used to monitor the ventilation and odour control processes, as well as undertaking the Operational Monitoring of the resource recovery process, completing associated calculations.
- Identify and mitigate Health and Safety hazards related to resource recovery asset operation and maintenance, including the safe entry and ventilation requirements of confined spaces.
- Evaluate trend data from SCADA and test results to identify:
  - Normal trends or cycles for the works, and
  - Atypical trends or changes and the underlying or Root Cause of the change

- Optimize the resource recovery processes based on test results and trend data to efficiently achieve the required parameters.
- Respond to alarms and instigate corrective action to return the operation to compliant condition.
- Safely carry out operational and first line Maintenance and Repairs of Wastewater Treatment Equipment relating to the resource recovery process. Including the Safe Isolation of Plant and Equipment when required.
- Identify the Root Cause of resource recovery problems.
- Record equipment condition and performance data to the appropriate people to assist in Asset Management Decision Making.
- Monitor, check, record and report on any chemical dosing used in resource recovery processes.

To do this, Wastewater Treatment Operators ***need to know:***

- The objectives of the resource recovery process, including an understanding of the design considerations and consequences of sub-optimal performance.
- Key process parameters and variables associated with resource recovery.
- How to interrogate the SCADA to:
  - Identify and control items of mechanical, electrical and instrumentation equipment.
  - Evaluate trend data differentiating normal operational cycles from developing fault conditions.
  - How to confirm the configuration, operation and performance of resource recovery process corresponds to SCADA.
- The range of mechanical, electrical and instrumentation plant used in the Operational Monitoring of the resource recovery process and their Calibration requirements.
- The Critical Control Points, alarms, action levels, authorization levels and consequences associated with the process.
- The operational and Maintenance and Repairs of Wastewater Treatment Equipment requirements for the resource recovery process that will be outlined in the Implementing Site Management Plans. Including the reactive and preventive Maintenance and Repairs of Wastewater Treatment Equipment frequencies.
- How to identify the Root Cause of resource recovery process problems and the sequence of actions required to restore the process to compliant conditions, taking account of all process variables and process lag times.
- The Health and Safety hazards associated with the resource recovery processes and how these should be mitigated.
- How to optimise the resource recovery processes to minimise downstream treatment problems, on the basis of process performance management, test results and analysis of trends.
- The Safe Isolation of Plant and Equipment requirements for the resource recovery equipment.

- What procedures to follow in an Incident & Emergency related to the resource recovery process.

Element of Competence:	Operate Pumping Systems
Context	Pumps are used at Wastewater Treatment Plants to pump flows from lower to higher elevations to allow for the continuous treatment. Pumps are used to transport influent wastewater, sludges, chemical feed applications, flush and spray water, recirculating processes and to discharge the final treated effluent.
Outcome	Pump station assets are maintained and operated in accordance with their design specification. The pumps are: ▪ Monitored to identify abnormal operation ▪ Controlled to ensure they operate as designed. ▪ Optimized on the basis of the analysis of trends. ▪ Restored to normal operation through the identification of the Root Cause of any faults.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Follow the operational procedures that are identified in the Implementing Site Management Plans for pumps and the pump station including removal of blockages and fault finding.
- Identify and mitigate Health and Safety hazards related to pumps and pumps station operation and maintenance, including the safe entry and ventilation requirements of confined spaces.
- Identify all mechanical, electrical and instrumentation assets associated the pump processes on SCADA and at the Wastewater Treatment Plant.
- Identify Critical Control Points applicable to the pump station, control the pump station operation.
- Undertake the Calibration of the instruments used to monitor the pumping system, as well as undertaking the Operational Monitoring
- Evaluate trend data from SCADA and test results to identify:
  - Normal trends or cycles for the works, and
  - Atypical trends or changes and the underlying or Root Cause of the change
- Identify and set, or adjust, pump and pump station controls including optimizing the pumping station operations to ensure efficiencies are maintained.
- Respond to alarms and instigate corrective action to return the Pump Station operation to compliant condition
- Optimize the pump station operation based on test results and trend data to efficiently achieve the required parameters. including optimizing the pumping station operations to ensure efficient operation.
- Respond to alarms and instigate corrective action to return the pump station operation to compliant condition.

- Safely carry out operational and first line Maintenance and Repairs of Wastewater Treatment Equipment relating to the pump station, including the Safe Isolation of Plant and Equipment of equipment when required.
- Identify the Root Cause of pump station problems.
- Record equipment condition and performance data to the appropriate people to assist in Asset Management Decision Making.

To do this, Wastewater Treatment Operators ***need to know:***

- The objectives of the pump station operation, including an understanding of the design considerations, wastewater flows and hydraulics and consequences of sub-optimal performance including the capacity of the wet well.
- The different types of pumping systems, including the different types of pumps and associated equipment used at wastewater treatment plants.
- The impact of vibration on the long-term operation and maintenance of the pumps.
- That pumps with variable speed drives can introduce harmonics into the electrical network. Harmonics can damage electronic equipment, interfere with communication systems and cause false readings on measurement devices.
- Key process parameters and variables associated with pump station operation.
- How to interrogate the SCADA to:
  - Identify and control items of mechanical, electrical and instrumentation equipment.
  - Evaluate trend data differentiating normal operational cycles from developing fault conditions.
  - How to confirm the configuration, operation and performance of the pumps corresponds to SCADA.
- The range of mechanical, electrical and instrumentation plant used to in the Operational Monitoring of the pump station and their Calibration requirements.
- The Critical Control Points, alarms, action levels, authorization levels and consequences associated with the process.
- The operational and maintenance tasks for the pump station that will be outlined in the Implementing Site Management Plans. Including the reactive and preventive Maintenance and Repairs of Wastewater Treatment Equipment frequencies.
- How to identify the Root Cause of pump station problems and the sequence of actions required to restore the process to compliant conditions, taking account of all process variables and process lag times.
- The Health and Safety hazards associated with the pump station and how these should be mitigated.
- How to optimise pump station operation. For example, the use of variable speed drives (VSDs) can help to reduce energy consumption. But Wastewater Treatment Operators need to be aware that the use of VSDs on pumps, fans and other drives can contribute to harmonics, which when left uncompensated, might be the cause problems such as overheating transformers, nuisance tripping and reducing asset life etc.
- How to safely take the pump equipment out of service,

- What procedures to follow in an emergency situation, including what to do if the pump station has an emergency overflow.

Element of Competence:	Manage Treated Effluent Discharges
Context	Following treatment, effluent is discharged back into the environment, either to land or via an outfall to the coastal or freshwater environment.
Outcome	Treated effluent is discharged to the environment in a manner that minimises cumulative environmental effects and meets resource consent condition requirements. Treated effluent discharge assets are maintained and managed in accordance with their design specification. Outfalls and effluent discharges are: ▪ Monitored to identify abnormal operation ▪ Controlled to ensure they operate as designed. ▪ Optimized on the basis of the analysis of trends. ▪ Restored to normal operation through the identification of the Root Cause of any faults.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Monitor effluent discharges from the Wastewater Treatment Plant to ensure it meets Resource Consent conditions.
- Identify the extent of any mixing zones.
- Monitor the wider environment for cumulative environmental impacts.
- Maintain discharge infrastructure as detailed in the Implementing Site Management Plans this may include undertaking condition assessments of the outfall infrastructure e.g.
  - inspect the condition of the discharge infrastructure, including pipeline, nozzles and ports, or organise for these inspections to occur.
  - Inspect public warning signage about the effluent discharge to ensure that is in good condition.
- Undertake emergency management operations and to bypass the outfall including the Safe Isolation of Plant and Equipment.

To do this, Wastewater Treatment Operators ***need to know:***

- The conditions and monitoring requirements of the Resource Consent.
- That the New Zealand Municipal Wastewater Monitoring Guidelines provides advice on wastewater monitoring requirements.
- The extent of any mixing zone which may be defined in the resource consent.
- The operational and maintenance procedures related to the outfall and Implementing Site Management Plans.

- The Health and Safety risks and hazards associated with managing and maintaining the outfall infrastructure and the manner in which these may be mitigated.
- What procedures to follow, as documented in the emergency management plan, if the outlet needs to be shut-down or by-passed.

Element of Competence:	Operate Emergency Power Supplies
Context	In the event of a loss of mains power an alternative power supply, such as an emergency generator and/or an uninterrupted power system (UPS) are used to allow the treatment of wastewater to continue uninterrupted.
Outcome	The Wastewater Treatment Plant continues to operate during a loss of mains supply power.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Follow the operational procedures relating to the emergency power system that are identified in the Implementing Site Management Plans.
- Identify the voltage, load and phase of all assets associated with the treatment plant.
- Ensure that the generator is regularly serviced by a qualified technician as specified by the supplier.
- Regularly run the generator under full load for extended periods to test for any problems.
- Ensure that the UPS is regularly tested and serviced by a qualified technician as specified by the supplier.
- Arrange for fuel in storage tanks to be tested to ensure that it remains viable. Undertake fuel conditioning, or fuel replacement, on a regular basis to maintain the quality of the fuel in the tank.
- Implement the incident and emergency response plan for loss of power at the site, including informing their lines network provider of the loss of mains electricity supply.
- For sites which rely on portable emergency generators the wastewater treatment operator needs to be able to select a generator which is suitable for the site and be able to safely transfer the load from the mains to the generator.
- Safely carry out operational and first line Maintenance and Repairs of Wastewater Treatment Equipment relating to the emergency power system.

To do this, Wastewater Treatment Operators ***need to know:***

- The operating and maintenance cycles for the emergency power system components including inspection requirements.
- How much fuel is needed to operate the site, or the time period specified in the incident and emergency response plan and the on-site fuel capacity
- If there isn't a permanently installed generator the Wastewater Treatment Operator needs to know what type of generator is needed and where this is to come from. The following variables will need to be in order to select an appropriate emergency generator:
  - Voltage – the generator must have the appropriate voltage to match the motors it will be powering

- Load – the Full Load Amps of all motors that are to be run off the generator needs to be known.
- Phase (rotation)
- Location of the transfer switch to transfer the load
- The power rating and load factor of the genset.

- Reactive and preventive maintenance tasks and frequencies.

Element of Competence:	Wastewater Treatment Plant Isolation / Shutdown / Re-commissioning of Process Streams
Context	Plant shutdown and the restarting processes can occur in planned, or unplanned, and in an Incident & Emergency Shutdowns and restarts might involve: ▪ A complete plant shutdown and purging of all process materials from equipment; or ▪ A short shutdown to allow minor work with retention of some or all of processes; or ▪ A short shutdown in response to a plant upset or trip.
Outcome	▪ Identify early warning signs that equipment/processes need attention. ▪ Identify the range of circumstances in which a treatment plant will shut down automatically, including the range of failsafe criteria, and Critical Control Points. ▪ Identify the range of circumstances treatment plants may be shutdown manually. ▪ Identify the range of possible causes of a shutdown and be able to determine the most likely cause. ▪ Apply the procedures, including required communications, to manage treatment plant shutdowns and re-starts effectively, reducing the impacts as far as practicable.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Carry out the planning and actions required for the following types of shutdowns:
  a) An automatic plant shutdown
  b) A manual plant shutdown
  c) A controlled plant shutdown on discovery of process issues
- Shutdown the treatment plant in line with standard operating procedures.
- Identify the work area to be accessed using documentation, systems and work instructions.
- Troubleshoot major components and their problems to identify the cause of an emergency shutdown.
- Re-start the treatment works in line with standard operating procedures, including:
  a) Reporting and recording
  b) Observing, sampling and testing
  c) Information systems and manual checks

To do this, Wastewater Treatment Operators ***need to know:***

- The correct methods of starting, stopping, operating and controlling each process including understanding the impact of plant shutdown on each treatment processes and how to respond.
- The architecture of the process/production system including knowing the process control philosophy and process parameters and limits e.g. temperature, pressure, flow, pH.
- How to identify the cause of plant shutdown including relevant alarms and actions.
- Start-up procedures including standard operating procedures and local procedures
- The range of sampling and testing required in the event of a plant shutdown and re-start.
- Communications, reporting and record keeping requirements associated with a plant shutdown, including ensuring the response meets the requirements of the Resource Consent.
- The risks associated with works shutdown and re-start and how to minimize the impacts associated with these and as documented within the Implementing Site Management Plans.
- Contingency plans associated with the works shutdown.
- How to respond in the event of an Incident & Emergency that caused an unplanned plant shutdown.

Element of Competence:	Incident & Emergency Response Plans
Context	Incidents or emergencies that might threaten public health or the environment, can occur when operating a Wastewater Treatment Plant. Wastewater Treatment Operators need to be able to be able to provide input into the development of Incident and Emergency Response Plans and be able to able to implement the operational response to such incidents.
Outcome	During incidents or emergencies Wastewater Treatment Operators implement the operational response in accordance with the Incident and Emergency Response Plan.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Understand the nature and sources of different types of incidents and their impact on public health and the environment.
- Provide input the development of the Incident and Emergency Response Plan.
- Implement the operational corrective actions, which may include process control adjustments or a plant isolation and shutdown to ensure that the discharge of insufficiently treated effluent is prevented.
- Report the nature of the incident to the appropriate people, instigating escalation procedures.
- Demonstrate that they have been trained in emergency situations.
- Test response plans prior to an emergency situation arising.
- Make use of "lessons learned" information by contributing to the implementation and continuous improvement of quality systems in the wastewater industry.

To do this, Wastewater Treatment Operators ***need to know:***

- How to ascertain the nature of an incident, including spills and pollution incidents, accidents and loss of process control.
- Where to find the documented Incident and Emergency Response Plan.
- What potential incidents and emergencies will require an operational response.
- The triggers for activating the incident and emergency response plan, for example when a critical control point level has been reached.
- Communications, reporting and record keeping requirements associated with emergency, including ensuring the response meets the requirements of all resource consents related to the site.
- What civil defense obligations they have during an emergency situation.

Element of Competence:	Assisting with the Process to Decommission, Dispose or Abandon Assets
Context	Wastewater Treatment Operators assist with the decommissioning and removal of assets and significant parts of an operating plant from service. They also involved with managing ongoing risks from any assets which have been abandoned but remain in place.
Outcome	Assets are safely decommissioned and either disposed of, or if they remain in place the ongoing risk of these assets is understood and managed by the Wastewater Treatment Operator.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Assist with a risk assessment, prior to starting the decommissioning process, that is reflective of the scope and complexity of the decommissioning process. The risk assessment may need to include the following items to provide assurance that all hazards are identified, understood and eliminated:
  - An engineering assessment of the structural integrity of any associated building and structure carried out be a Chartered Structural Engineer.
  - A Health and Safety electrical assessment that identifies and marks out the power supply to, and the distribution of power in the work area, to identify the isolation requirements or protection of the supply to other areas of plant or equipment carried out by an Electrical Engineer or the plants Electrician.
  - A Health and Safety fire assessment if changes to fire protection systems might be required carried out by a Fire Engineer.
  - A Health and Safety asbestos assessment to establish if any asbestos is present and if so, how to deal with it.
  - A Health and Safety assessment of specific toxic substances such as mercury from Fixed Growth Reactor turntables and UV lamps.
- Assist with the decommissioning process and disposal of wastewater treatment assets at the end of their life once the risks above have been eliminated.

To do this, Wastewater Treatment Operators ***need to know:***

- The Decontamination and Demolition of Plant and Assets Procedure outlined in the Guidelines for Occupational Health & Safety in the New Zealand Water Industry. [4]

Element of Competence:	Provide Data to Assist in Asset Management Decision Making
Context	Data that is collected by Wastewater Treatment Operators supports effective decision making at various levels within an organisation, including operation staff and management, senior leadership and elected officials or boards of directors. The operation of the wastewater treatment system leads to the generation of large amounts of data that needs to be recorded. Efficient record keeping is an essential tool for identifying potential problems, or as a means of providing evidence that the system is operating effectively.
Outcome	The relevant people within an organisation receive the information they need to be able to make informed decisions about the management of the wastewater treatment plant. The organisations knowledge base is continuously developed with information provided by Wastewater Treatment Operators

To do this, Wastewater Treatment Operators ***need to be able to***:

- Undertake a systematic approach to collecting, recording and reporting data.
- Follow the reporting requirements and procedures that are either referenced or documented within the Implementing Site Management Plans.
- Follow reporting requirements and procedures for the performance measures and targets that are either referenced or documented within the Asset Management Plan.

To do this, Wastewater Treatment Operators ***need to know:***

- What mechanisms are in place for recording and reporting data to others within the organisation. This includes what reporting responsibilities and accountabilities the Wastewater Treatment Operator will have.
- What higher level oversight, performance assessment against organisational goals and objectives is expected. This includes needing to know about:
    - The required level of service for the wastewater treatment plant.
    - The performance measures and targets that are to be used to assess compliance with the required level of service.
- How performance is to be assessed and reported.

Element of Competence:	Implementing Site Management Plans
Context	Site Management Plans are usually a requirement of the WWTP's resource consent(s). They document the operations and maintenance requirements of the wastewater treatment assets. Site Management Plans also consider the potential risks to the receiving environment and the publics' health and identify ways to manage those risks. They promote a multi-barrier approach to manage risks. Wastewater Treatment Operators are responsible for the implementation of large parts of the Site Management Plan.
Outcome	The environment, and the publics' health, is safeguarded through the implementation of the Site Management Plan.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Operate and maintain the Wastewater Treatment Plant in a manner that aligns with the procedures that are documented in the Site Management Plan.
- Monitor the Critical Control Points and undertake the corrective actions for the CCPs when the defined action and critical limits are reached.
- Verify the treatment performance, as documented in the Site Management Plan and/or the Resource Consent Compliance Monitoring Plan. This includes undertaking corrective actions when monitoring and inspections indicate that a measure is deviating from expected performance and communicating this to the appropriate people.
- Implement the procedures that are documented in the Site Management Plan that detail how to respond to transgressions and non-compliances with the Resource Consents held for the site.
- Assist with reviewing customer complaints to help identify whether operational changes can be made to improve consumer satisfaction.
- Communicate with the appropriate people when updates to the Site Management Plan are identified.

To do this, Wastewater Treatment Operators ***need to know:***

- What their role is in the implementation of the Site Management Plan.
- The conditions and requirements of the sites resource consents.
- The characteristics of the influent, what hazards might arise, how these hazards arise and create risks, and the processes and practices that affect effluent quality.
- Where to find the available effluent quality information and how to analyse and interpret this information which identifies actual and potential quality issues.
- What the barriers to environmental contamination the Wastewater Treatment Plant provides, so that the failure of one barrier will be compensated for by the effective operation of the remaining barriers. Possible barriers might include:

- Controlling hazards entering the influent (e.g. trade waste conditions)
- Physical wastewater treatment processes
- Biological wastewater treatment processes
- Killing, or inactivating pathogens by disinfection

- What Critical Control Points the WWTP has.
- The commitment to wastewater quality management from their employer and the relationship of the Site Management Plan to organisational policy and strategy.

Element of Competence:	Health and Safety
Context	Wastewater Treatment Plant operators work in an area with a number of high risks to their own, and to others, health and safety. They need to be able to work in a manner that mitigates the hazards and risks that they, and others, may be exposed to. The Water New Zealand Good Practice Guide for Occupational Health and Safety in the New Zealand Water Industry [4] provides guidance and model procedures for how mitigate common health and safety risks in the three waters industry in New Zealand.
Outcome	Wastewater Treatment Operators work in a safe manner that mitigates the hazards and risks that they, and others, may be exposed to.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Identify hazards, risk assessment and control measures.
- Safely undertake their work and look after the health and safety of any other workers that they direct. To do this Wastewater Treatment Operators need to be able to:
  - Conduct a health and safety induction for visitors to the site
  - Test for hazardous atmospheres to safely enter confined spaces
  - Work alone, and in isolated areas
  - Work with hazardous substances
  - Work at heights
  - Work in, and above, wastewater
- Control plant and equipment hazards by:
  - Safely operating machinery
  - Safely operating vehicles
  - Safely operating mobile plant
- Implement Incident and Emergency response plans for the site.

To do this, Wastewater Treatment Operators ***need to know:***

- That the Health and Safety at Work Act 2015 (HSWA) [5] is New Zealand's workplace health and safety legislation. Employers must look after the health and safety of their Wastewater Treatment Operators and any other workers that they influence or direct.
- That the Water New Zealand Good Practice Guide for Occupational Health and Safety in the New Zealand Water Industry [4] provides guidance and model procedures for how to comply with the HSWA.
- What "permits to work" and operational procedures are in place at the Wastewater Treatment Plant that control identified hazards.
- What Personal Protective Equipment (PPE) is required when operating and maintaining processes at the Wastewater Treatment Plant.
- The Hazardous Substances Management requirements at the WWTP.

Element of Competence:	Confined Spaces
Context	Wastewater Treatment Plant operators often need to work in areas that have been defined as being a confined space. They need to be able to identify what areas are deemed to be confined spaces and to plan an entry to, and work safely within, a confined space.
Outcome	Wastewater Treatment Operators can enter, and work within, confined spaces without endangering the Health and Safety of themselves or others.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Identify confined space hazards, undertake risk assessments and identify the control measures for confined space entry work.
- Select and safely use the correct PPE for a confined space entry. This may include the use of safety harnesses and lifelines, and respiratory protection.
- Ensure that communication between the person within the confined space and the confined space standby person is always maintained during any confined space entry.
- Secure confined space entry and exit points to allow for safe access, ensuring that appropriate danger signs are used.
- Isolate the confined space to prevent the inflow of hazardous substances.
- Ensure that the space is ventilated, either through forced, extraction, or natural ventilation.
- Undertake atmospheric testing prior to, and during a confined space entry.
- Clear atmospheric conditions in a confined space by purging.
- Implement incident and emergency response plans for confined space entries and rescues.

To do this, Wastewater Treatment Operators ***need to know:***

- That the Worksafe Quick Guide to Confined spaces: planning entry and working safely in a confined space gives a brief overview of the requirements and procedures required to plan an entry to and also to work safely within a confined space.
- That Worksafe New Zealand accepts the Standard AS/NZS 2865:2001 Safe working in a confined space as having the current state of knowledge on confined space entry work. It follows the approach of the Health and Safety at Work Act 2015 (HSWA) [5] in requiring that the hazards associated with working in confined spaces be identified and controlled either by elimination or minimisation.
- That the Water New Zealand Good Practice Guide for Occupational Health and Safety in the New Zealand Water Industry [4] provides guidance and model procedures for planning an entry into a confined space.
- What "permits to work" and operational procedures are in place at the Wastewater Treatment Plant that control identified hazards like confined space.

- What Personal Protective Equipment (PPE) is required when entering, or working within, a confined space.
- What the atmospheric conditions within the confined space are.
- That the concentration of potential atmospheric contaminants will determine whether it is safe to be within the confined. The Exposure Standards for Atmospheric Contaminants in the Occupational Environment [NOHSC:3008(1995)] identify what the safe level of atmospheric contaminants that Wastewater Treatment Operators can be exposed to.
- That the Standard AS/NZS 1891 Industrial fall-arrest systems and devices covers the selection, use and maintenance of harnesses and ancillary equipment used in confined space entry work.

Element of Competence:	Hazardous Substances Management
Context	Wastewater Treatment Operators ensure that chemicals and hazardous substances used at Wastewater Treatment Plant are used and stored in a safe manner. The Water New Zealand Good Practice Guide for Occupational Health and Safety in the New Zealand Water Industry [4] provides guidance and model procedures for how to manage chemical and hazardous substances at Wastewater Treatment Plants.
Outcome	Chemicals and hazardous substances are stored and used in a safe manner.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Manage an inventory of all chemicals and hazardous substances used at the site, including all consumable chemicals, process chemicals, laboratory chemicals and gas storage. The inventory needs to be kept up-to-date, accurate and easily accessible to emergency workers.
- Ensure that Safety Data Sheets are available for all chemical and hazardous substances used or generated (e.g. methane) at the site.
- Safely work with chemicals and hazardous substances (both in terms of handling and storage requirements) including for:
  - Asbestos
  - Fuel
  - Chemicals
  - Gas
- Use the correct Personal Protective Equipment (PPE) and other appropriate controls (e.g. ventilation) as indicated on the Safety Data Sheet when handling chemicals and hazardous substances.
- Label containers containing hazardous substances correctly, including when they are decanted or transferred into smaller containers.
- Store hazardous substances safely
- Ensure that correct signage is in place for hazardous substances.
- Follow the procedures are detailed in the event of an Incident & Emergency at the Wastewater Treatment Plant site in the event of a spill.

To do this, Wastewater Treatment Operators ***need to know:***

- What hazardous substances (i.e. any product or chemical that has explosive, flammable, oxidising, toxic, corrosive or ecotoxic properties) are stored or used at the Wastewater Treatment Plant and the dangers that these substances pose.
- That they cannot work with or around hazardous substances until they have the knowledge and practical experience to do so safely.

- That the Incident and Emergency Plan for the Wastewater Treatment Plant site for detail the procedures to follow in the event of a spill at the site.
- That the Health and Safety at Work (Hazardous Substances) Regulations [6] identifies how the chemicals and hazardous substances such as those used in Wastewater Treatment processes need to be managed.
- That the Water New Zealand Good Practice Guide for Occupational Health and Safety in the New Zealand Water Industry [4] provides guidance and model procedures for how to manage chemical and hazardous substances at Wastewater Treatment Plants.
- That health and safety information is available for all chemicals on Safety Data Sheets (SDS) that must be provided at the time of supply.
- That the Water New Zealand National Asbestos Cement Pressure Pipe Manual [7] details the health and safety requirements when working with asbestos material containing pipes, i.e. for work involving cutting into, removal, storage or replacement of AC pipes Refer to the Water New Zealand Good Practice Guide for Occupational Health and Safety in the New Zealand Water Industry [4] for procedures for asbestos material not associated with pipes i.e. asbestos material present in switchboards or building materials.
- That depending on the type and quantity of hazardous substances stored at the site, a Wastewater Treatment Plant might be considered a Major Hazard Facility. Where this is the case there will be additional requirements for the site to comply with the Health and Safety at work (Major Hazard Facilities) Regulations 2016 which the Wastewater Treatment Operators will need to be aware of.

Element of Competence:	Plant Security and Asset Protection
Context	Delivering wastewater treatment services to the community includes ensuring that there are appropriate security measures in place to protect the security of the Wastewater Treatment Plant.
Outcome	Access to the Wastewater Treatment Plant is restricted to authorised personnel. Contractors and temporary workers and visitors are inducted onto site and supervised.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Induct and supervise visitors to the Wastewater Treatment Plant in accordance with Health and Safety procedures.
- Lock and alarm all points of entry, including doors, windows and gates.
- Maintain a key register to identify who holds keys for each site.
- Routinely perform visual examinations of the exterior of the Wastewater Treatment Plant and remove objects that could be used to aid an intruder.
- Respond to security breaches at the Wastewater Treatment Plant in accordance with the requirements of the Incident & Emergency Response Plans for the site.

To do this, Wastewater Treatment Operators ***need to know:***

- Who has access to the Wastewater Treatment Plant, and where the keys are kept.
- How to induct and supervise visitors to site.
- How to implement the Incident & Emergency measures for security breaches.

Element of Competence:	Contaminants of Emerging Concern
Context	Sometimes chemicals, or contaminants, that had not previously been detected, or were previously found in far smaller concentrations, are discovered in the wastewater influent. These are known as contaminants of emerging concern.
Outcome	Wastewater Treatment Operators are aware of what is considered normal for influent to the Wastewater Plant and communicate the presence of abnormal inflow conditions to others. Wastewater influent and effluent monitoring sample results are reviewed in order to identify contaminants of emerging concern.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Review the results of both the wastewater Resource Consent Compliance Monitoring and Reporting and the Operational Monitoring and Inspection for Process Control to identify what is normal, and what is abnormal, for the treatment plant.
- Where contaminants of emerging concern are identified, Wastewater Treatment Operators need to communicate this to the appropriate people.
- Ensure that this new risk, and how it is to be mitigated, is documented within the Implementing Site Management Plans.

To do this, Wastewater Treatment Operators ***need to know:***

- What monitoring results are considered normal for the influent and effluent and what results are abnormal.

Element of Competence:	Verification Monitoring
Context	Verification monitoring is the process of regularly checking the system to make sure everything is ok. It should be considered as an additional requirement to operational monitoring and is a final check that, overall, the wastewater treatment processes required to protect public health and the environment, are working. Verification monitoring at Wastewater Treatment Plants includes: ▪ Resource Consent Compliance Monitoring and Reporting, including monitoring within the receiving environment. ▪ Community satisfaction ▪ Short-term evaluation of results to assess trends over time in the quality of the waters, sediments, biota or air in the receiving environment. Verification monitoring provides confidence regarding the level of treatment and is a useful indication of possible problems with the treatment processes.
Outcome	The verification monitoring process confirms that the site is treating wastewater to an acceptable standard.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Follow the Resource Consent Compliance Monitoring and Reporting plan that is referenced in the resource consent(s) for the site.
- Review complaints and use them to make improvements to the treatment process. Monitoring comments and complaints can provide valuable information on problems with the treatment processes.
- Review the results of the Resource Consent Compliance Monitoring and Reporting, the Operational Monitoring and Inspection for Process Control to identify target and action limits when intervention may be required and communicate this to the appropriate people.

To do this, Wastewater Treatment Operators ***need to know:***

- The objectives of the monitoring being undertaken including knowing the:
  - Critical Control Points
  - Response procedures when trigger levels are reached
  - Reporting requirements
- The Default Guideline Values (DGVs) for the toxicants that are within the effluent being discharged, as published in the Australian & New Zealand Guidelines for Fresh & Marine Water Quality.
- The procedures for responding to transgressions and Resource Consent Compliance Monitoring and Reporting
- The Engage with Stakeholders and the Community and how complaints are to be reviewed and used with helping to make improvements.

- The parameters being monitored, refer to the New Zealand Municipal Wastewater Guidelines for more information, this might include the likes of:
    - Flow
    - Physical characteristics
    - Chemical characteristics
    - Microbiological Characteristics
    - Toxicity

- The sampling frequency for each of the parameters, analytical methods and quality control requirements.

Element of Competence:	Resource Consent Compliance Monitoring and Reporting
Context	Wastewater Treatment Plants require a resource consent to discharge contaminants onto land or into the air or water (a discharge permit). Sometimes they also require a resource consent to take water (a water permit). A resource consent provides permission to discharge contaminates, or take water, that would otherwise contravene the Resource Management Act. When resource consents are issued, they include conditions that are intended to ensure that wastewater is treated and disposed of in a way that minimises the public health risk and in a manner that least affects the receiving environment. As a consent holder there is a legal obligation to comply with any conditions set out in the resource consent. Wastewater Treatment Operators need to operate the Wastewater Treatment Plant within the confines of the resource consent(s). This may include collecting and providing data to the Consent Authority on the operation of the Treatment Plant e.g. data on the quality and amount of wastewater discharged, or confirmation that maintenance has occurred.
Outcome	All resource consent conditions related to the Wastewater Treatment Plant are met.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Follow the compliance monitoring plan that is referenced in the resource consent(s) for the supply. This plan will detail the specific requirements for compliance monitoring requirements and might include being able to:
- Take representative samples of wastewater from key points within the treatment process, safely using appropriate sampling equipment.
- Taking representative samples from the receiving environment, safely using appropriate sampling equipment.
- Review and analyse the performance of the wastewater treatment process by using laboratory and site quality reports.
- Recording and responding to complaints about odour.
- Fulfil the resource consent conditions related to the operation and maintenance of the Wastewater Treatment Plant.
- Assist staff from the consent authority when they undertake site inspections, e.g. induct them onto site.
- Provide operational data to the consent authority in accordance with the conditions of consent and as outlined in the site management or the compliance monitoring plan for the site.

- Monitor the performance of the Wastewater Treatment Plant, including trending data, and communicate with the appropriate people when conditions of consent are close to being breached so that action can be taken to prevent this before it occurs.
- Notify the appropriate people when the operation of the Wastewater Treatment Plant fails to comply with the resource consent conditions and implement the operational response in accordance with the Incident & Emergency Response Plans.

To do this, Wastewater Treatment Operators ***need to know:***

- What resource consent conditions are in place for the Wastewater Treatment Plant and the limitations these apply to the operation of the Wastewater Treatment Plant (e.g. maximum discharge flow rates).
- The compliance monitoring plan that is referenced in the resource consent(s). This details what data needs to be collected and monitored to meet the conditions of the consent. Items in the compliance plan that the Operator will need to aware of will include:
  - Sampling locations
  - Sampling methods (timing, frequency, volumes, sampling equipment, preservation requirements)
  - Laboratory delivery details
  - Quality assurance requirements
  - Data interpretation protocols and statistical analyses
- What to do if the operation of the Wastewater Treatment Plant fails to comply with the resource consent conditions, as detailed in the Incident & Emergency Response Plans.

Element of Competence:	Engage with Stakeholders and the Community
Context	Wastewater Treatment Operators will at times need to be involved with proactively communicating to members of the public, particularly with neighbours of the site. They also need to engage with other stakeholders both external to an organisation, like Consent Compliance Officers, and also internal stakeholders including the Reticulation Operators and Asset Managers
Outcome	Effective communication is used by Wastewater Treatment Operators to engage with stakeholders and the community.

To do this, Wastewater Treatment Operators ***need to be able to***:

- Identify the stakeholders that they are required to engage with. This will include, but not be limited to, those identified in the Implementing Site Management Plans.
- Engage with stakeholders by following the mechanisms and documentation within the Implementing Site Management Plans for stakeholder engagement.
- Provide input into the long-term employee engagement plan (management and operational) on awareness and involvement in safe treatment of wastewater and disposal effluent.
- Identify the contact list and communication plan for incidents and emergencies.

To do this, Wastewater Treatment Operators ***need to know:***

- That the stakeholders who could affect, or be affected by, decisions or activities to do with the wastewater treatment will have been identified in the Implementing Site Management Plans.
- That the Implementing Site Management Plans will also have documented the appropriate mechanisms that they should use to obtain input and involvement from the stakeholders.
- The long-term community engagement plan on awareness and involvement in the treatment of wastewater and the disposal of effluent.
- The organisations two-way communication programme to receive the communities' suggestions, complaints and concerns.

References

[1] Water New Zealand, "Good Practice Guide for the supply of polyelectrolytes for use in drinking-water treatment.".

[2] Water New Zealand, "Good Practice Guide for the supply of hydrated lime for use in drinking-water treatment".

[3] Water New Zealand, "Good Practice Guide for the supply of aluminium sulphate for use in drinking-water treatment".

[4] Department of Labour, "Approved Code of Practice for Cranes".

[5] New Zealand Legislation, "Building Act," 2004.

[6] Water New Zealand, "Good Practice Guide for Waste Stabilisation Ponds: Design and Operation".

[7] Water New Zealand, "Guidelines for Beneficial Use of Organic Materials on Land," 20 12 2017. [Online]. Available: https://www.waternz.org.nz/Article?Action=View&Article_id=1212.

[8] Water New Zealand, "Manual for Wastewater Odour Management," March 1999. [Online]. Available: https://www.waternz.org.nz/Attachment?Action=Download&Attachment_id=219.

[9] Water New Zealand, "Good Practice Guide for Occupational Health and Safety in the New Zealand Water Industry," 2017.

[10] New Zealand Legislation, "Health and Safety at Work Act," 2015.

[11] New Zealand Legislation, "Health and Safety at Work (Hazardous Substaneous) Regulations".

[12] Water New Zealand , "National Asbestos Cement Pressure Pipe Manual".

[13] Water New Zealand, "Management of Water Treatment Plant Residuals in New Zealand".