WATER NEW ZEALAND COMPETENCY FRAMEWORK

Wastewater Network Operator

water NEW ZEALAND
The New Zealand Water & Wastes Association Waiora Aotearoa

Water New Zealand Competency Framework Wastewater Network 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.

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 Competences 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 Network Operators*** should be **able to do** and what they **need to know** to competently undertake their work.

This document has been written to cover the operational tasks typically required to operate a New Zealand Wastewater Network. Depending on how roles are organised within an individual organisation the tasks identified in this document might sometimes be undertaken by a supervisor or manager rather than an entry level operator. In using this document individuals need to take into account the level of authority that they have in the context of their own organisation.

Wastewater Network Operators

These are the people who **operate, monitor**, and **maintain** wastewater networks. Their work involves operating and maintaining the sewers and pump stations which carry wastewater from the community to wastewater treatment plants. They carry out planned and preventative maintenance and they also diagnose and respond to faults and blockages.

Contents

What is the Water New Zealand Competency Framework?

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

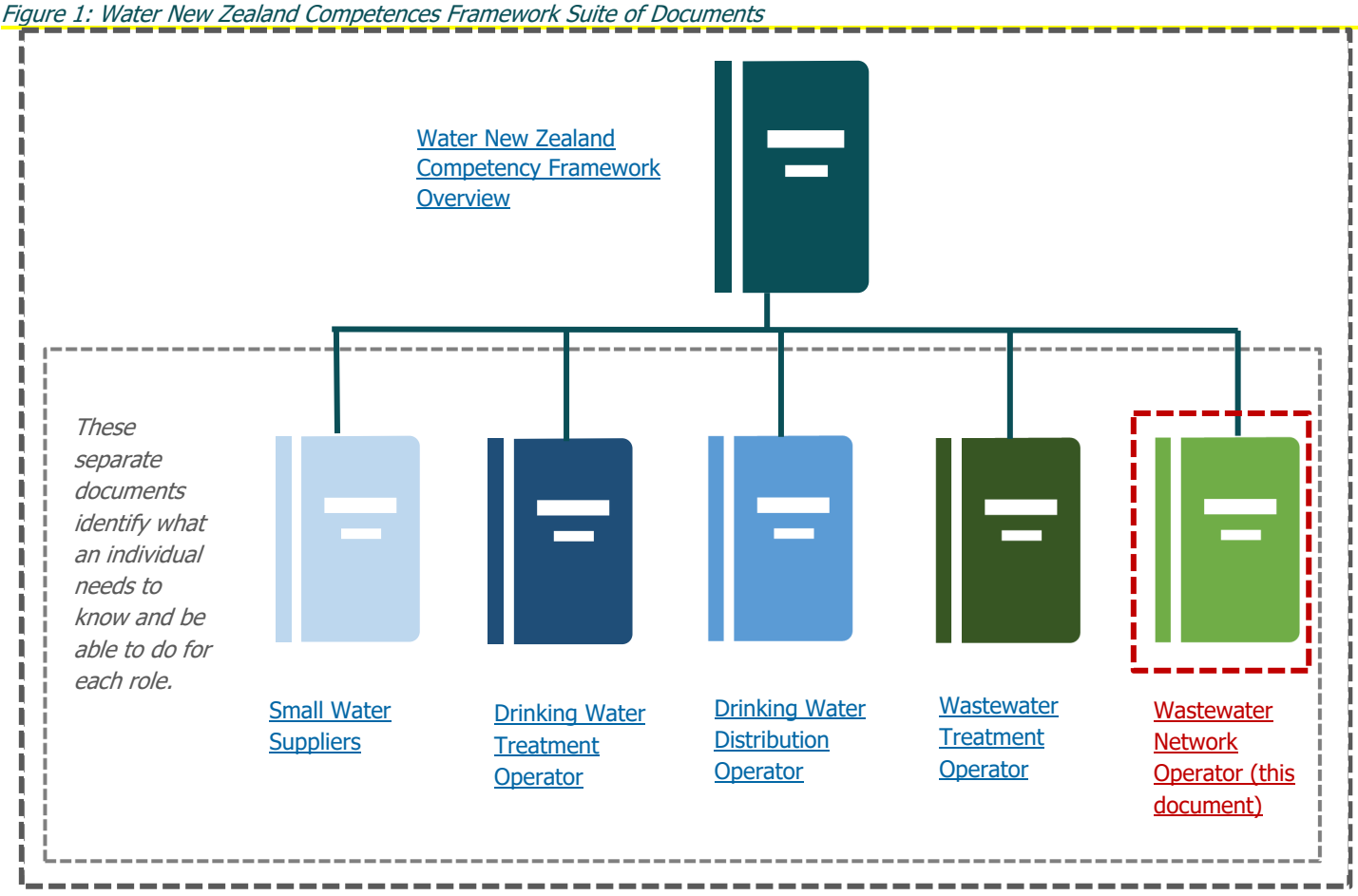
- Needs to be able to do, and
- Needs to know

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 Network 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 Network Operator Profile

Wastewater Network Operators take a risk management approach to protect the health of the public. They fulfil a crucial role in ensuring that wastewater networks, including pipelines and pump stations, are running properly, so that wastewater is safely conveyed to the Wastewater Treatment Plant for treatment and disposal.

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 Network Operators need to be able to respond to incidents like reports of blockages and overflows, find the cause of the fault and makes sure that it is resolved as quickly as possible. To do this they need to able to work in confined spaces and have a full understanding of risk assessments and emergency procedures. They also need to be able to carry out, or supervise, maintenance activities such as pump maintenance, high pressure water jetting, flushing and de-silting operations. As wastewater network assets are typically located underground within the roading corridor they need to be able to safely manage traffic, use asset locating equipment and excavation support.

Wastewater Network 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 Network.

Each element of competence is then further drilled down to give context in a Wastewater Network environment, and to identify what it is a Wastewater Network 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 Network 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. In using this document individuals need to take into account the level of authority that they have in the context of their own organisation.

What does someone who operates, monitors, and maintains a Wastewater Network 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 Network 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 Network 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.	▪ Operational Monitoring and Inspection for Process Control ▪ Apply a knowledge of Science to Wastewater Network
Lifecycle Delivery	**Technical Standards** The activities that Wastewater Network Operators are responsible for must comply with relevant technical standards.	▪ Technical Standards related to Wastewater Networks
	Maintenance Delivery Wastewater Network Operators need to be able to safely maintain the different types of equipment used in the delivery of wastewater network services.	▪ Safe Isolation of Assets ▪ Hygiene Requirements ▪ Locating Underground Services ▪ Safe Working in Roads ▪ Excavation ▪ Install and Repair Wastewater Pipes and Manholes ▪ Maintenance and Repair of Wastewater Network Assets ▪ Maintenance and Repair of Wastewater Pumping Systems ▪ Validation and Calibration of Monitoring Equipment ▪ Inventory Management ▪ Cranes and Lifting Equipment ▪ Awareness of Specified Building Systems
	Reliability Engineering & Root Cause Analysis Wastewater Network 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 Network Operators monitor, operate, control, and optimise wastewater network 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 monitor Plant and Collect Data ▪ Operate Pumping Systems ▪ Operate Grinding Pumps, Grease Traps, Screening and Grit Removal Processes ▪ Operate Ventilation Systems and Odour Control Processes ▪ Respond to Blockages ▪ Sewer Jetting Operations ▪ Pipe Inspection Operations ▪ Overflow Discharges ▪ Awareness of Trade Waste ▪ Network Performance Data Collection ▪ Operate Pressure and Vacuum Sewer Systems ▪ Operate Emergency Power Supplies
	Shutdown & Outage Management Wastewater Network Operators need to be able to manage shutdowns and the restarting processes for assets like pump stations. These can occur in planned, or unplanned, and emergency situations.	▪ Wastewater Network Asset Isolation and Re-commissioning
	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 Network 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 ▪ Environmental Clean-up of Overflows
	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
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 Network Operators need to recognise, and be able to respond to, risks to the safe conveyance of wastewater to the Network plant, responding to any wastewater overflows.	▪ Health & Safety ▪ Confined Spaces ▪ Hazardous Substances Awareness ▪ Security & Asset Protection
	Asset Performance and Health Monitoring Wastewater Network 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 ▪ Inflow and Infiltration (I/I)
	Stakeholder Engagement Wastewater Network 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 Network Operators are responsible for is governed by a number of different pieces of legislation. The key legislation that Wastewater Network Operators need to be aware of includes: ▪ The Local Government Act which covers the broad management and governance obligations that Wastewater Network 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. ▪ The Water Services Bill which when enacted will cover the regulation of water services.
Outcome	The work undertaken by Wastewater Network Plant Operators meets all legal and regulatory requirements.

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

- Operate the Wastewater Network 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 Network to facilitate asset management planning as detailed within the element of competence Provide Data to Assist in Asset Management Decision Making.
- Operate the Wastewater Network within the conditions set in the Resource Consent(s) for overflow discharges. The requirements for Wastewater Network Operators are detailed further in the competency framework within the elements detailing The Role of Resource Consents and also for Resource Consent Compliance Monitoring and Reporting. Obtain compliance schedules for any buildings within the Wastewater Network that need a Building Warrants of Fitness as outlined within the element for Awareness of Specified Building Systems.
- Safely operate the Wastewater Network in a manner that addresses health and safety and hazardous substances risks. The requirements for Wastewater Network Operators are detailed further in the competency framework within the elements for Health & Safety, Confined Spaces and Hazardous Substances Awareness .

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

- About the Local Government Act requirement for Councils to identify the level of service to be delivered by the Wastewater Network and to be prudent in the stewardship of critical assets.

- About the Local Government Act requirement for Councils to set local bylaws, and how the particular bylaws for their area impact on the operation of the wastewater network. Wastewater network issues covered by bylaws commonly include:
  - What wastes are acceptable to discharge to the network, including Inflow and Infiltration (I/I) restrictions.
  - Network connection requirements.
  - Ownership and responsibilities related to laterals.
  - Trade Waste management.
- About the Resource Management Act (RMA) which regulates the discharge of contaminants to water, land and air from the site to conform to the requirements of a resource consent. Along with requiring consents to be held for the discharge of wastewater the RMA also requires Councils to have a District Plan, which will typically reference the required engineering standards to be used in wastewater network construction.
- 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 Network 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 Pump Stations, or on the back on trucks used for wastewater network maintenance.

Element of Competence:	The Role of Resource Consents
Context	Resource consents provide permission to discharge contaminants, or take water, that would otherwise contravene the Resource Management Act. Both dry weather and wet weather overflows can occur from Wastewater Networks, discharging contaminants into the environment. Some networks have resource consents which allow this overflow to occur in certain circumstances. Wastewater Network Operators are instrumental in ensuring that the wastewater network is maintained, operated, and monitored in accordance with the conditions and requirements of these resource consents. Wastewater Network Operators are required to notify the appropriate people in the event of an overflow, this is of particular importance when the overflow is not consented or does not comply with resource consent requirements.
Outcome	The publics' health, the receiving environment, and Te Mana o te Wai, is protected by maintaining, operating, and monitoring the Network process in accordance with all associated resource consents.

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

- Operate, maintain, and monitor the wastewater network in a manner that complies with conditions imposed within any resource consent related to the network.

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

- The conditions and requirements of all resource consents related to the network. Consent conditions and requirements can:
  - Prescribe the way in which the wastewater network is to be operated and managed.
  - Impose limits on parameters that the discharge from overflow points must comply with. These limits could relate to chemical, physical, or biological parameters, including visible parameters like suspended solids, rags, scums, and oils.
  - Require operations and maintenance manuals, Incident & Emergency Response Plans and monitoring plans to be prepared and complied with. Refer to the elements of competence regarding Incident & Emergency Response Plans and Resource Consent Compliance Monitoring and Reporting for more information on these topics.
  - Require monitoring of potential discharges 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 actions to be taken in event of an overflow, whether consented or not. These actions may include a requirement to report data such as quantities, time, location, and impact. Reporting may also need to also include what actions the Wastewater Network Operator has taken to stop the overflow, clean-up the impacted site and to prevent future overflows.
- The regulatory requirements regarding the reporting of non-compliance with Resource Consents.

Element of Competence:	Te Mana o te Wai
Context	Protecting freshwater protects the health and wellbeing of the community and wider environment. Founded in mātauranga Māori, Te Mana o Te Wai is a concept that encompasses this fundamental importance of water. Te Mana o te Wai is upheld by acknowledging the mana and mauri (lifeforce) of water. Under the Water Services Act all people involved in the water industry have a collective responsibility to give effect to Te Mana o te Wai; we need to make sure that water sources are not degraded and instead are enhanced and healthy.
Outcome	Protecting Te Mana o te Wai provides for the mauri of the water. This includes providing for: 1. Te hauora o te taiao (health of the environment), 2. Te hauora o te wai (health of the waterbody) and, 3. Te hauora o te tangata (the health of the people). Wastewater Network Operators can give effect to Te Mana o te Wai by making sure that the operation of the wastewater network does not negatively impact the swim-ability, fishability or drinkability of any waterbody. In doing so they will be protecting the mauri of the water.

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

- Te Hauora o te Wai – Wastewater Network Operators help to protect the health of the waterbody by ensuring that are overflows from wastewater networks are prevented and when they do happen, they are reported to the consenting authority and cleaned-up according to standard operating procedures.
- Te Hauora o te Tangata – Wastewater Network Operators protect the health of the people by operating the wastewater network in a manner reflected in operation and maintenance manuals, preventing overflows and ensuring that in the event of unavoidable overflows the public are prevented from accessing the area until it has been cleaned up.
- Te Hauora o te Taiao – Wastewater Network Operators help to protect the health of the environment by ensuring that overflows from the network are prevented. Where overflows are unavoidable Wastewater Network Operators ensure that the conditions of any Resource Consents related to the discharge are adhered to, and the area impacted is cleaned following the discharge.

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

- What Te Mana o Te Wai means to their community. Under the National Policy Statement for Freshwater Management 2020 (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 network.

Element of Competence:	Operational Monitoring and Inspection for Process Control
Context	Wastewater networks include processes like pumping systems which need to be monitored and inspected. The operational monitoring and inspection requirements will be documented within the operations and maintenance (O&M) manual for the site in question. This can include instigating appropriate corrective actions to resolve potential problems before they escalate. This type of monitoring is additional to the Verification Monitoring programme which may be required to comply with Resource Consent conditions related to the operation of the wastewater network.
Outcome	Wastewater networks 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 Network 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 instruments 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 network, accurately using appropriate sampling equipment.

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

- The monitoring and inspection plans identified within the Operations and Maintenance manual for the site 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 network 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 Validation and Calibration of Monitoring Equipment records.
- The need for accurate and precise recording and reporting of process performance, in line with standard operating procedures for the network.

Element of Competence:	Apply a knowledge of Science to Wastewater Network Operations
Context	The science that underpins the wastewater network must be understood by those responsible for operating them.
Outcome	Decisions made in the day-to-day operations and maintenance of the wastewater network are made through an understanding of the scientific principles on which the network design is based.

To do this, Wastewater Network 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, where applicable
- Use their understanding of physics to operate and control the hydraulics within the wastewater network.
- Use their understanding of chemistry to operate and control chemical methods of dosing within the wastewater network, where this is applicable e.g. for those networks that use nitrate dosing to reduce hydrogen sulphide formation.
- Use their understanding of chemistry to assess gas readings and the associated risks from exposure to gasses commonly found in wastewater networks like hydrogen sulphide and methane.
- Use their understanding of microbiology to understand the risks of overflows and hygiene requirements.
- 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 Network Operators ***need to know:***

- The basic principles of physics which impact on wastewater networks including understanding hydraulics, pressure, head and headloss and how pumping systems operate.
- The basic principles of chemistry that impact on wastewater network including pH, acids and bases, methane, and hydrogen sulphide generation.
- The basic principles of microbiology that relate to the wastewater network and the risks to human health and the environment from exposure to wastewater.

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

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

- Follow the appropriate technical standards that relate to the operation and maintenance of the Wastewater Network Plant. This might include a mix of:
  - Internal standards developed by your employer.
  - Technical documents, guidelines and publications developed by 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 Network 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.
- Where to find the technical standards, e.g. through a subscription to NZ Standards.

Element of Competence:	Safe Isolation of Assets
Context	In order to undertake maintenance on assets, plant and equipment within the wastewater network, operators need to be able to safely isolate and "lock out" the assets or equipment that they are to work on, whether this is a pipe or part of a pumping system. This would usually form part of a permit-to-work system.
Outcome	Assets, 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 network, avoiding overflows.

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

- Identify the asset that is to be worked on, including the point of isolation. There are occasions where this is not clear, e.g. at a pump station 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 network that might be affected. The Wastewater Network 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 pipe or asset to be worked on e.g. pipe plugs, valves, isolating locks and tags, locking pins etc.
- Safely remove wastewater 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 pipe or asset into service.

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

- The permit-to-work system in use.
- The procedures for installing isolations. This might include:
  - Installing pipe plugs including blocker plugs, and bypass/flow-through plugs (bungs).

  - Draining, venting, purging and flushing wastewater from the asset to be isolated
  - Electrical isolation and tagging/locking out tags.
  - 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 pumping equipment.
  - Cooling requirements, e.g. the time electric motors take to cool.
  - How to remove isolations and return pipes and other assets back to service.
- How to adequately identify, test and confirm that the isolation has made the plant or equipment safe.
- The risks associated with isolating a piece of plant or equipment and how to minimise the impacts associated with these and as documented within operational procedure manuals.
- 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 Networks Operators need to be aware of when they isolate plant and equipment.

Element of Competence:	Hygiene Requirements
Context	Wastewater Network Operators are potentially exposed to biological hazards, infectious diseases and, and a variety of hazardous chemical materials in the course of their work.
Outcome	Wastewater Network Operators do not become ill because of their workplace exposure to biological hazards, infectious diseases, and chemical hazards.

To do this, Wastewater Network 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 Network 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:	Locating Underground Services
Context	Most wastewater network assets are located underground. Wastewater Network Operators need be able to safely locate wastewater collection assets whilst avoiding other buried utilities assets. Knowing where underground assets are buried before digging helps to protect Wastewater Network Operators from injury and minimises the risk of asset damage and service interruption.
Outcome	Wastewater network assets are safely located using plans and electronic locating equipment.

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

- Use service plans, GPS, and Geographic Information Systems (GIS) to determine the location of both underground wastewater network assets and assets belonging to other utility services.
- Request a locate service using a range of internet based services such as Before U Dig.
- Follow Safe Working in Roads procedures for assets located in the road reserve.
- Visually inspect the work area surface to identify evidence of any wastewater network assets along with evidence of other utility assets.
- Use electronic locating equipment to determine the location of buried utility assets including:
  - Passive line tracing
  - Active line tracing
  - Sonde Locating
- Mark and record the position of services and sub-structures on the work site.
- Communicate to others the details of the position and type of services and sub-structures.
- Report deviations in the expected position of assets to the appropriate people.
- Excavate trial pits to expose the exact location of utility assets.

  Store tools and equipment safely and securely and leave the work area work in a safe condition.

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

- The Health & Safety hazards associated with working on or near underground services relating to including hazards related to the following utility types:
  - Water
  - Stormwater
  - Gas
  - Electricity
  - Telecommunications / Fibre optic
  - Oil / Petroleum
  - Traffic signal cables and detector loops
  - Working in the roading corridor

- The requirements of any Traffic Management Plan (TMP) which relate to the site in question.
- How to interpret GIS, utility drawings and line search documents to identify underground utilities assets.
- Methods of visually locating and identifying underground services including typical markers and signs.
- The typical locations and depths of underground utilities.
- Methods of accurately marking out services.
- Methods for undertaking test pit excavations.
- That plans may not be accurate and the potential outcomes of incorrect marking out of services and excavations including injury, costs, loss of time, and material wastage.
- How to use, and interpret the results, of electronic locating equipment.
- The possible effects of external influences on electronic locating equipment readings and reduce the effects e.g. metal fencing, reinforced concrete.
- The procedures for reporting and recording work problems including who to inform when assets on site deviate from their position marked out on plans.

Element of Competence:	Safe Working in Roads
Context	Most wastewater network assets are in the transport corridor. To safely work in the transport corridor, Wastewater Network Operators need to have made a Corridor Access Request (CAR) to obtain a Work Access Permit (WAP) from the Corridor Manager. They must also implement the approved Traffic Management Plant for the site.
Outcome	Work undertaken by Wastewater Network Operators in the transport corridor minimises the disruptions to other road users whilst maintaining safe working conditions for both the operators and the public.

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

- Apply for a Corridor Access Request (CAR) to obtain a Work Access Permit (WAP) from the Corridor Manager.
- Implement the Traffic Management Plan (TMP) for the work.
- Ensure that a copy of the Corridor Access Request (CAR), including global CARs, and Work Access Permits (WAP) are held at all work sites along with a copy of the Traffic Management Plan (TMP).

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

- That the National Code of Practice for Utility Operators' Access to Transport Corridors produced by the New Zealand Utilities Advisory Group [3] is a requirement under the Utilities Access Act 2010 and provides a framework for the access rights to the transport corridor for utility operators like water suppliers.
- That a Corridor Access Request (CAR) must by lodged with the Corridor Manager before any work can be carried out in Transport Corridors. Utilities such as water supplies can operate under a global CAR however each individual site will require an appropriate Traffic Management Plan (TMP).
- That the New Zealand Transport Agency Code of Practice for Temporary Traffic Management (NZTA COP/TTM) requires that appropriately trained and qualified personnel must carry out and supervise Temporary Traffic Management duties on all roadwork sites.
- That the Site Traffic Management Supervisor (STMS) has specific duties and has ultimate responsibility for overall traffic management at the site.

Element of Competence:	Excavation
Context	The installation or repair of wastewater pipeline assets can require excavation, this can include: ▪ Open excavation ▪ Pot holing ▪ Pit excavations ▪ Trenches ▪ Excavating to grade
Outcome	Excavations undertaken to repair or install wastewater network assets follows safe working procedures for both operators and the general public, complying with the Health and Safety at Work Act 2015. The work should provide safe working conditions for both the operators and the public.

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

- Safely use tools and large earthmoving equipment to excavate the ground to provide access to Underground Services, or to install new assets.
- Load excavated materials onto the trucks, using attachments if necessary.
- Backfill, compact, and reinstate the surface of excavated area with suitable materials.
- Avoid Underground Services when excavating, making sure not to undermine nearby structures by digging away from them and by hand digging when close to services.
- Prevent excavation collapse by shoring, benching, or battering back.
- Provide safe access to get in and out of the trench.
- Prevent people and materials falling into the excavated area. This will require Wastewater Network Operators to install barriers strong enough not to collapse if someone falls against them.
- Check the excavation each day before starting work and after any event that may affect its stability.
- Where applicable Wastewater Network Operators need to hold a special license e.g. Class 2 licence with a roller, tracks, and wheels (R, T and W) endorsement.
- Following standard operating procedures to ensure that the site is safe before leaving the site.

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

- That the Good Practice Guide: Excavation Safety [2] produced by Worksafe New Zealand provides practical guidance for how to manage the health and safety risks associated with excavation work.
- That the Guide for Safety with Underground Services [3] sets out the work methods and preferred work practices for the location and excavation of Underground Services.

- That activities like concrete cutting, which can be used to cut through pavements prior to excavation, produces a wastewater which cannot be discharged to the environment, or the stormwater network.
- That they should not start excavations until they have located Underground Services.
- Safe Working in Roads procedures.
- How to operate different types of digger attachments.
- What different support systems available and the hazards to be aware of when on sites e.g. ground water, soil type, sloping ground, surcharges such as vehicles, structures, or stockpiled materials.
- The safe working methods and construction methodologies for different types of excavation support systems including:

  a) Proprietary support systems
  b) Steel sheet support systems
  c) Timber support systems.
- The availability and capacity of excavation equipment and temporary works.
- The duties of a banksperson and slinger / signaller when working with excavation support systems.
- How to interpret a trench support system design.
- How to provide support to protect exposed services.
- How to recognise situations that could be, or become, a confined space and report in accordance with the Water Suppliers procedures.
- How to monitor excavation conditions for stability and atmospheric gasses.
- The causes of instability in excavated areas, including soil types, moisture content, presence of surface water and ground water.
- How to exclude and remove water from excavations.
- The environmental considerations to be considered when disposing of trench water and contaminated ground.
- The emergency and rescue procedures in the event of a collapse.
- The Health & Safety hazards and risks that can occur with the use of incorrect trench support practices.
- The Network Utility Operators notification and reporting processes following the detection of any issue.
- How to backfill and reinstate surfaces.

Element of Competence:	Install and Repair Wastewater Pipes and Manholes
Context	Wastewater network piped assets are installed either as: ▪ a planned extension to the network, ▪ as part of a reactive repair; or ▪ as part of a planned renewal or maintenance work.
Outcome	Installation and repair of new wastewater network assets is safely completed, using suitable material, in accordance with standard operating procedures. The material installed, their location and costs are recorded so that so that asset management decisions can be made in the future.

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

- Respond to wastewater network maintenance / repair emergencies.
- Perform planned and unplanned maintenance / repairs, or installation, of new assets in accordance with job instructions detailed in standard operations and maintenance procedures. This will require Wastewater Network Operators to:
  - Complete the instructions/organisational procedures for the installation or repair task in question e.g. as recorded in maintenance procedures, or contract specifications.
  - Identify any environmental and Health & Safety hazards and how they are to be mitigated. Obtain a permit to work, and where this is required for the procedure.
  - Follow Working in Roads procedures for assets located in the road reserve.
  - Identify any network impacts on the work and inform the appropriate people e.g. if there is to be an interruption in customer service.
  - Undertake Excavation to allow construction, or repair, to proceed, providing suitable excavation support.
  - Determine what methods and materials are suitable to repair broken wastewater network assets for different types of asset failures e.g. pipe replacement versus a repair clamp.
  - Install a temporary pumped overland bypass between manholes to provide continuity of service where this is required.
  - Ensure materials, pipes and fittings are suitable for use in the wastewater network.
  - Install, or repair, pipe, and fittings including manholes.
  - Join pipe together. Where pipe is to be welded, operators will need to hold a welding certificate.

- Check that the completed installation maintenance and repairs meets the specification detailed in the maintenance procedure before returning the asset to service.
- Document what work has been undertaken, including identifying any costs (including time) and inventory items used.

To do this, Wastewater Network Operators ***need to know***

- How to identify any environmental and Health & Safety hazards, and appropriate mitigation methods.
- Working in Roadsprocedures.
- The isolation and overpumping procedures for wastewater network assets.
- The procedures to follow when locating Underground Services.
- How to safely excavate, support/shore, backfill and reinstate holes and trenches needed for construction.
- How to safely operate tools, machinery, and equipment.
- How to install pipe including understanding:
  - position tolerances
  - pipe grade requirements
  - appropriate bedding materials, pipe surround and compaction requirements
  - the need for vertical and horizontal separation from other services
  - appropriate jointing techniques
  - how to install a trace wire
- The different rehabilitation and repair techniques associated with different material types including, but not limited to:
  - the use of structural liners
  - the use of non-structural liners
  - hydro-excavation
  - drilling
  - pipe-bursting
- The procedures associated with the handling, storage, installation, repair, testing and commissioning of different pipe material types including:
  - reinforced concrete
  - asbestos cement
  - polyethylene pipe
  - ductile iron
  - PVC
- How to join pipe materials by:
  - electrofusion processes
  - butt fusion processes
  - mechanical joints
- Weld testing requirements for pipes that are to be fused together and what to do when a weld fails a test.
- How to undertake pressure and pipe integrity tests for gravity flow and what to do when a pipe fails a test.

- The requirements for documenting what work has been completed.
- That there are technical standards that cover the installation and repair of wastewater network assets.

Element of Competence:	Maintenance and Repair of Wastewater Network Assets
Context	Maintenance on wastewater networks can either be planned (routine or scheduled) or unplanned (reactive). Wastewater network assets need to be maintained to ensure they continue 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 wastewater network is safely completed, at the correct frequency, in accordance with the organisation's maintenance procedures. 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 Network Operators ***need to be able to:***

- Respond to Wastewater network emergencies e.g. blockages.
- Perform planned and unplanned maintenance on the Wastewater network assets in accordance with job instructions detailed in operations and maintenance procedures. This will require Wastewater Network 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 e.g. as recorded in maintenance procedures.
    - Identify any network impacts on the work, e.g. if it will cause flows to back-up in the network, and inform the appropriate people
    - Safe isolation of pipes, plant, and equipment.
    - Make the site safe from the public.
    - Check that the completed maintenance and repairs meets the specification detailed in the maintenance procedure before returning pipes, or plant and 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 Network Operators ***need to know:***

- The required maintenance procedures assets within the wastewater network.
- What maintenance frequency is required for each task. This might be based on the suggestions of equipment manufacturers but may also be a factor of the reliability and criticality of equipment, or the history of past problems like blockages.

- How to identify any environmental or Health & Safety hazards, and appropriate mitigation methods.
- The requirements for Safe Isolation of Assets before performing maintenance.
- The requirements for documenting what work has been completed.
- That the maintenance and asset replacement strategies for Wastewater Network assets are recorded in the Asset Management Plan (AMP); Operators should be 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 within the network 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. regular cleaning of pipes where there are known problems such as fat accumulation or where there are sags in gravity pipework.
- 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 assets, such as collapsed pipes, or abandoning them and replacing with new assets.

Element of Competence:	Maintenance and Repair of Wastewater Pumping Systems
Context	Wastewater network pumping assets need to be maintained so that the system works. A lack of pump maintenance can lead to increased risk of failure, and subsequent overflow. Maintenance can either be planned (routine or scheduled) or unplanned (reactive).
Outcome	Maintenance of wastewater network pumping systems is safely completed, at the correct frequency, in accordance with the Maintenance procedures that are documented within operational manuals and procedures. Maintenance tasks and costs are recorded so that better decisions can be made about maintaining each item and identifying when they need to be replaced.

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

- Respond to water distribution pumping system repair emergencies.
- Perform planned and unplanned maintenance on assets in accordance with job instructions detailed in operations and maintenance procedures. Maintenance may be required on assets such as:
  - Pumps
  - Wet and Dry Wells
  - Macerators
  - Surge Vessels
  - Screening equipment
  - Inverted Siphons
  - Lifting Equipment
- Identify any environmental or Health & Safety hazards and how they are to be mitigated. Obtain a permit to work, where this is required for the procedure.
- Identify any impacts of the work, considering how to maintain pass forward flow and duty/stand-by considerations. Wastewater Network operators need to inform the appropriate people of network impacts, particularly if there is to be a service interruption.
- Select and use appropriate tools and equipment to complete the work, this might include things like:
  - Lifting equipment,
  - Davits,
  - Harnesses,
  - Escape breathing apparatus
  - Intrinsically safe tools.
- Undertake safe isolation of assets, plant, and equipment.

- Make sure materials, pipes and fittings are suitable for use a wastewater environment and are not used in the drinking water network.
- 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.

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

- The required planned, scheduled, and reactive maintenance tasks and procedures for the wastewater network pumping assets.
- The flow rates and available storage in the network. Including knowledge of available storage and how long assets can be isolated for before there is a risk of overflow.
- How the equipment typically operates. Wastewater Network 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 asset manufacturer but may also be a factor of the reliability and criticality of the asset.
- How to identify any environmental or Health & Safety hazards, and appropriate mitigation methods.
- Safe shut down and isolation procedures before performing maintenance.
- The requirements for documenting what work has been completed.
- The maintenance and asset replacement strategies for the wastewater network assets that are recorded in the Asset Management Plan, 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 system is 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.
- That communication around wastewater network asset maintenance is particularly important for where the maintenance activity might lead to:
  - interruption to service, or
  - the possibility of overflow from the site.

Element of Competence:	Validation and Calibration of Monitoring Equipment
Context	Wastewater network processes must be monitored to ensure that the network is correctly functioning. Typically, instruments are used within a wastewater network to monitor parameters such as: ▪ flow ▪ wet-well levels ▪ pressure These instruments must be validated and calibrated to confirm the accuracy of their measurements. This ensures that the Wastewater Network is functioning as intended and all measures to prevent pollution incidents are effective in managing risks to the network and to the environment.
Outcome	The instruments used to monitor the wastewater network processes are validated and calibrated to ensure that the wastewater Network system remains functional and all preventive measures are effective in managing identified risks to effluent quality.

To do this, Wastewater Network 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 operations and maintenance manuals for the network.
- 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 Network Operators ***need to know:***

- The validation and calibration procedures documented within operations and maintenance manuals.
- What any Critical Control Points within the wastewater network are.
- The correct type and use of various analytical equipment for measurement, including understanding the levels at which the instruments operate along with the accuracy and sensitivity of the equipment.
- The requirement and need for online monitoring of wastewater network, including the key performance criteria.
- 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.
- 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 network when monitoring equipment is unavailable or incorrect.

Element of Competence:	Inventory Management
Context	Wastewater Network 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.
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.

To do this, Wastewater Network 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.

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

- What spares are held in storage.
- 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.

Element of Competence:	Cranes and Lifting Equipment
Context	Cranes are often installed at Wastewater pump stations, or on the back of maintenance trucks, 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 Network 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 Network 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 Network 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:	Awareness of 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 Networks can potentially include buildings, such as at larger pump stations, which require a compliance schedule. Where this is the case Wastewater Network Operators will need to be aware that the specified systems require ongoing inspection and maintenance to ensure that they 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 Network Operators ***need to be able to***:

- Ensure that the current version of the BWoF is publicly displayed.
- Inform the appropriate people have been informed if the displayed BWoF is out-of-date.
- Induct the Independent Qualified Person (IQP) engaged to undertake inspections and maintenance of the specified systems onto the site in question.

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

- That buildings with specified systems need to have a compliance schedule where one is required under the Building Act [7].
- That inspections, maintenance and reporting procedures for the specified systems stated in the compliance schedule for the building in question will need to be carried out by an Independent Qualified Person (IQP) to confirm that those systems are performing, and will continue to perform, to the performance standards.
- That reports detailing inspections, maintenance, and repairs from IQP need to be kept with the compliance schedule for at least two years after they have been issued.
- 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 within a wastewater network, Wastewater Network Operators assist, as part of a broader team, 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 Network 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?

To do this, Wastewater Network 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 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 cleared the wetwell of rags, 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 clearing the rags, and everyone assumed someone else had done this).

Element of Competence:	Wastewater Flows and Hydraulics
Context	An understanding of wastewater flows and hydraulic conditions is needed by Wastewater Network Operators.
Outcome	The wastewater network operates as it was designed.

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

- Understand the nature of wastewater flows, including average dry weather flows, peak wet weather flows, diurnal variations, and Trade Waste discharges.
- Carry out routine maintenance on flow control and monitoring equipment
- Monitor, interrogate, analyse, and evaluate SCADA / HMI to confirm pumping systems are operating as per design.
- Install Data Logging equipment within the wastewater network.

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

- The various influences on wastewater flows in the wastewater network.
- How the design specification for the Network process relates to wastewater flows.
- How to use flow data to maintain and optimise Network processes.
- The impacts unpredictable flows can have on wastewater Network processes.
- How to interrogate SCADA to evaluate trend data differentiating normal operational cycles from developing fault conditions or emerging risks
- The associated Health & Safety hazards and risks with changing flow conditions.
- 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 monitor Plant and Collect Data
Context	Remote automation systems, such as SCADA (Supervisory, Control and Data Acquisition) are used to monitor and control processes within wastewater networks, particularly at sites like pump stations or controlled overflows.
Outcome	Where applicable, assets within the wastewater network are controlled using remote automation. Data collected by the SCADA system is analysed and used to make asset management decisions.

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

- The control philosophy for the wastewater network assets.
- What automation/SCADA systems are, and what functions they are used for within wastewater networks.
- 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 Network 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 used to control processes and any applicable Resource Consent Compliance Monitoring and Reporting requirements for the network.

- How the radio/telemetry system at the site works.

Element of Competence:	Operate Pumping Systems
Context	Pumps are used within the wastewater networks to move wastewater from lower to higher elevations as it is transported to the Wastewater Treatment Plant.
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 based on the analysis of trends. ▪ Restored to normal operation through the identification of root cause of any faults.

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

- Follow the operational procedures that are identified in the operational and maintenance manual for the site including removal of blockages and fault finding.
- Identify and mitigate Health & 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 Network Plant.
- Validate and calibrate the pump monitoring instruments.
- Evaluate trend data from SCADA to identify:
  - Normal trends or cycles for the works, and
  - Atypical trends or changes and the underlying 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
- Safely carry out operational and first line maintenance and repairs relating to pump station assets, including the safe isolation 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 Network Operators ***need to know:***

- The operating philosophy of the pump station and an understanding of the design considerations including:
  - Pump delivery head and suction
  - Friction losses, self-cleansing velocities, pipe size and material type of the pipework

  - The nature of the wastewater to be pumped including the thickness, volume, and abrasiveness.

- The different types of pumping systems including wet well and dry well installations, and the different types of pumps and associated equipment which are in use.
- Key process parameters and variables associated with pump station operation including:
  - pump start/stop control
  - the duty/standby situation
- The interaction between the pump station and the wider wastewater network infrastructure including an understanding of how the operation of the pump station impacts on wastewater flows and hydraulics.
- The consequences of sub-optimal performance including:
  - the capacity of the wet well.
  - 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.
- How to interrogate 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 monitor and control the pump station and their Validation and Calibration requirements.
- The 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 operations and maintenance manuals including the reactive and preventive maintenance requirements.
- 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 & Safety hazards associated with the pump station and how these should be mitigated.
- How to safely isolate pumps and take them out of service.
- What procedures to follow in an emergency, including what to do if the pump station has an emergency overflow.

Element of Competence:	Operate Grinding Pumps, Grease Traps, Screening and Grit Removal Processes
Context	Influent wastewater to the wastewater network can contain large solids, grit and grease which can block sewers, wear mechanical equipment, and cause pollution in overflow events. Grinding pumps, grease traps, screening and grit removal processes are sometimes used within wastewater networks to prevent damage to downstream assets or remove solids from frequent overflow sites.
Outcome	Grinding pumps, grease traps, 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 based on the analysis of trends. ▪ Restored to normal operation through the identification of the Root Cause Analysis of any faults.

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

- Follow the operational procedures that are identified in Operational and Maintenance Manuals.
- Identify all mechanical, electrical and instrumentation assets associated with grinding pumps, screens, or grit removal processes on SCADA and within the wastewater network.
- Validate and calibrate the monitoring equipment used in screening and grit removal processes.
- Identify the control mechanisms for the screening and grit removal process along other set-points applicable to screening and grit removal operations.
- Evaluate trend data from SCADA to identify:
  - Normal trends or cycles for the works, and
  - Atypical trends or changes and the underlying or root cause for the change
- Respond to alarms and instigate corrective action to return the assets to compliant condition.
- Safely carry out operational and first line maintenance and repairs of relating to the screening, grease traps and grit removal processes. Including the Safe Isolation of Assets when required.
- Safely dispose of screenings, grease and grit removed from the wastewater, paying attention to Health & Safety requirements.
- Identify the Root Cause Analysis of screening, grease trap 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 Network Operators ***need to know:***

- The objectives of the grinding, grease trap, 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, grease traps and grit removal. Including the impact of the screening process on downstream assets.
- 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 control the screening and grit removal process and their validation and calibration requirements.
- The, action levels, authorization levels and consequences associated with the process or processes.
- How to identify the root cause of screening, grease trap 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 both reactive and preventive maintenance and maintenance frequencies.
- The Health & Safety hazards associated with the grinding, screening and grit removal processes and how these should be mitigated.
- How to optimise the screening and grit removal processes to minimise downstream Network problems, based on process performance management, test results and analysis of trends.
- How to safely isolate grinding, screening, and grit removal equipment and how to take it out of service.
- What procedures to follow in an incident.

Element of Competence:	Operate Ventilation Systems and Odour Control Processes
Context	Wastewater network sites can be a source of objectionable odour to the community, while wastewater network sites such as pump stations need to be ventilated to allow for safe operator access. Air discharges from wastewater network occur in accordance with the requirements of any air discharge consent.
Outcome	Odour complaints related to the operation of the Wastewater Network plant are minimised. The ventilation system and odour control processes are maintained and operated in accordance with their design specification. 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 Analysis of any faults

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

- Optimise the network to minimise odour generation e.g. by minimising turbulent flow or exposure to air.
- Follow the operational procedures that are identified for odour control.
- Identify all mechanical, electrical and instrumentation assets associated with the ventilation and odour control processes on SCADA.
- Identify the root cause of odour problems.
- Identify, and safely use any chemicals used in the odour control process.
- Identify control points applicable to the ventilation system and odour control processes.
- Complete the validation and calibration of any instrumentation associated with the ventilation system any odour control processes.
- Respond to alarms and instigate corrective action to return the Network processes to compliant condition.
- Safely carry out operational and first line maintenance and repairs to any ventilation system assets and odour control infrastructure.
- 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.
- Install temporary ventilation systems to allow for safe confined space access.

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

- The nature and sources of odour generation within the wastewater network and any resource consent requirements that control air discharges from the network.
- How ventilation systems assist in preventing corrosion within wastewater networks.
- How ventilations systems help to allow for safe confined space entries.
- The hazards associated with Confined Spaces and the use of ventilation systems to reduce hazardous atmospheric conditions.
- That the Water NZ Manual for Wastewater Odour Management [8] provides guidelines for the preventing and controlling wastewater odours.
- 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 approaches.
- 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 from the site.
- Key process parameters and variables associated with ventilation and odour control. Including the impact of ventilation on Health & Safety
- 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.
- The range of mechanical, electrical and instrumentation plant used to monitor and control the ventilation system and odour control.
- The, action levels, authorization levels and consequences associated with the process.
- The operational and maintenance requirements of the ventilation system and odour control processes.
- How to identify the Root Cause Analysis 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 & Safety hazards associated with the ventilation and odour control processes and how these should be mitigated.
- How to safely isolate the ventilation and odour control equipment to take it out of service.

Element of Competence:	Respond to blockages
Context	Many different materials can block and cause damage to the wastewater network. Common causes of blockages include tree roots, sediments, wet wipes, and fats, cooking oils and grease (FOG). These can all cause sewers to block, resulting in overflows. Wastewater Network Operators respond to reports of blockages, clear them, using techniques like sewer jetting, and clean-up any resultant overflow.
Outcome	Where blockages occur within the network, the likely cause(s) is identified, and any resultant blockage is cleared.

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

- Respond to reports of blockages within the wastewater network, and safely access the wastewater network to use techniques such as sewer jetting to clear them.
- Identify whether a blockage is located in the public network, or whether they are located in a private sewer connection.
- Where blockages are located in private connections Wastewater Network Operators need to be able to communicate to the homeowner their responsibilities to clear the blockage and to also prevent recurrences.
- Where blockages in the network are located in the public network, Wastewater Network Operators use their knowledge of the network and local dischargers, to identify the most likely cause of a blockage or FOG issue in the network.
- Ensure that any identified cause of a blockage is recorded in the organisations records and communicated to other stakeholders e.g. the Trade Waste Officer, where appropriate.
- Where blockages have resulted in overflows, these must be cleaned up.

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

- The procedures for safely accessing the wastewater network, including how to safely work in the roads.
- How to determine whether a sewer is privately or publicly owned.
- The procedures for clearing blockages, e.g. sewer jetting.
- The procedures for cleaning up overflow discharges.
- Wastewater Network Operators need to also know the network utility operators' internal procedures for data collection, recording and reporting required for blocked sewers. This will ensure that costs can be recovered from those cause the blockages and for this information to be used in future asset management decision making.
- The details for Trade Waste discharge consents for business connected to the wastewater network.

Element of Competence:	Sewer Jetting Operations
Context	Sewer blockages are a cause of pollution to the environment. They are commonly caused by build-ups within the wastewater network of fat, wet wipes and other 'unflushables' that the wastewater network has not been designed to convey. Sewer jetting is one of the main methods used to clear blockages within the wastewater network. Care must be taken during sewer jetting operations to reduce the risk of pipe damage which could lead to increased infiltration and/or further pollution events.
Outcome	Sewers are cleaned and cleared of blockages in accordance with the organisations operational and maintenance procedures, including the removal and disposal of material that is dislodged.

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

- Select, set-up, maintain and operate appropriate jetting equipment to undertake sewer cleaning and blockage removal, following the operational procedures that are identified for sewer jetting operations.
- Identify an appropriate source of water. Where this is a hydrant on the drinking water distribution network the appropriate connection/disinfection techniques must be followed to avoid contaminating the drinking water supply.
- Provide, and maintain, safe access to the wastewater network to allow the jetting operations to be undertaken.
- Follow Working in Roads procedures
- Safely transfer solids removed from the wastewater network for disposal, paying attention to Health & Safety requirements.

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

- How to use wastewater network plans to determine the likely position of a blockage and access points for the sewer jetting operation.
- The objectives of the sewer jetting work, whether it is to remove a blockage or sedimentation, including an understanding of the design considerations and consequences of pipe damage from jetting.
- The abilities, limitations, and recommended applications of various types of jetting nozzles.
- That the maximum working pressure to avoid damage will vary according to the material of the pipe, condition of the pipe and type of nozzle used.
- That choosing a suitable jetting nozzle for the work should consider the composition of the blockage and the pipe material and condition.
- That the water connection and disinfection procedures may require approval by the Drinking Water supplier.

- That different jetting techniques should be used dependent on whether the blockage is upstream or downstream from the sewer access point.
- The Health & Safety requirements related to sewer jetting operations.

Element of Competence:	Pipe Inspection Operations
Context	Visual inspection of the inside of a pipe is the main method used to determine the condition of gravity sewer pipelines. Most gravity pipes are too small for person-entry inspection, and therefore Closed-Circuit Television (CCTV) cameras are the primary visual inspection technique used.
Outcome	Pipes are inspected to assess their condition, with the results of these inspections are recorded and reported in a consistent manner to allow asset management decisions to be made.

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

- Determine the right approach to use for the inspection. This might involve a walk/crawl through visual inspection or a CCTV inspection using either a:
  - a pan-tilt (zoom) camera
  - a fixed axial camera
  - a digital scanning camera
  - a zoom (pole) camera
  - an action camera.

- Determine the appropriate transportation system for the camera including either a:
  - Push road
  - Tractor/crawler
  - Floating platform
  - Pole support.

- Locate the asset and expose access points. Where the wastewater network is located in the road reserve, Working in Roads procedures must be followed.
- Prepare pipes and manholes for inspections including cleaning pipelines of debris, gravel, fats, and roots to enable inspection completion.
- Temporary divert flows, or overpump.
- Where walk/crawl through visual inspections are to be undertaken the sewer must be ventilated and made safe for confined space entry and exit.
- Identify defects which are commonly found in wastewater networks, including:
  - Displaced joints
  - Intruding connections
  - Cracks and fractures
  - Pipe deformation
  - Root ingress
  - Encrustation
- Extract pipe wall samples.
- Undertake non-destructive in-situ testing of pipe walls
- Safely insert and remove CCTV equipment into and from the wastewater network in line with company and manufacturers' procedures

- Operate CCTV equipment functions including lights, focus, sonde and where appropriate zoom, pan & tilt, elevation, and reverse
- Record and store CCTV survey and communicate results with others in line with company procedure
- Store tools and equipment safely and securely and leave the work area work in a safe condition in accordance with company procedures.

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

- The 4th edition of the New Zealand Gravity Pipe Inspection Manual [7] provides guidelines on how to undertake inspections of sewers and manholes and laterals to assess their conditions along with acceptance procedures for new pipes.
- The specific Health & Safety requirements relating to CCTV operations including Working in Roads procedures, ventilation procedures and confined space procedures.
- How to use GIS and sewer records to determine safe entry and exit points.
- How to select the appropriate inspection method and equipment based on pipe diameter, depth, extent of survey and other relevant operational factors.
- The abilities and limitations of the different CCTV systems.
- How to insert and remove CCTV equipment to and from the wastewater network.
- How to locate the underground position of CCTV equipment
- The procedures for reporting and recording pipe inspection results as detailed in the New Zealand Gravity Pipe Inspection Manual [7].
- Wastewater Network Operators need to also know the network utility operators' internal procedures for data collection, recording and reporting inspection information to ensure it is used in future asset management decision making.

Element of Competence:	Overflow Discharges
Context	At times, particular following blockages or high rainfall events, wastewater can overflow from the network, discharging into the environment. Overflow discharges can occur from Combined Sewer Overflows (CSOs) in older combined wastewater catchments, or from Sanitary Sewer Overflows (SSOs) in separated networks. Locations within the wastewater network that are known to be likely overflow points are monitored to identify overflow events, the root cause of any overflow is identified, and rectified where this is possible, and communicated to the appropriate people. Some known overflow sites may have resource consents related to their operation; other sites will be unconsented.
Outcome	The Wastewater network is operated in a manner that reduces the risk of overflows. When overflows do occur, they are managed in a manner that minimises cumulative environmental effects and meets resource consent condition requirements of any consented overflows.

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

- Monitor the wastewater network to identify when overflows are imminent or have occurred.
- Identify the locations of likely overflows e.g. from past complaints.
- Monitor the wider environment for cumulative environmental impacts.
- Maintain overflow infrastructure, such as screens or copasacs on consented overflows.
- Provide data and information about overflow events to others to help assist in Asset Management decision making.
- Clean-up of Overflows and disinfect impacted areas.

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

- The conditions and monitoring requirements of any related Resource Consent. These are likely to be very site specific since overflows occur intermittently and often with little warning.
- That while the monitoring of sewer overflows is not specifically addressed in the New Zealand Municipal Wastewater Monitoring Guidelines some of the receiving environment monitoring methods in the guidelines may be useful if the effects of the overflow are under consideration.
- The operational and maintenance procedures for unscreened overflow sites including:
  - surge relief
  - weirs
  - vortex overflows

- The operational and maintenance procedures related to screened overflow sites including:
  - Both static and powered screens
  - Copasac (or similar)
- The operational and maintenance procedures related to any bypass or flow control related to overflow sites. This might include assets such as:
  - Penstocks
  - Throttle pipes
  - Weirs
  - Hydrobrakes and hydroslides.
- The Health & Safety risks and hazards associated with managing and maintaining the overflow infrastructure and the manner in which these may be mitigated.
- What procedures to follow, as documented in the incident and emergency plan for the network in the event of an overflow from the network. Including how to clean-up and disinfect sites affected by overflows.

Element of Competence:	Operate Pressure and Vacuum Sewer Systems
Context	Alternative wastewater collection systems, such as pressure and vacuum sewer systems are used to provide wastewater services to some communities. They differ from a traditional wastewater service with each individual property, or small cluster of properties, having a wastewater storage tank from where wastewater is pumped, either under pressure or via a vacuum pumping system, rather than flowing via gravity, to the wastewater treatment plant.
Outcome	The pressure or vacuum sewer system processes are maintained and operated in accordance with their design specification, to allow for optimal performance. Each stage of the pressure or vacuum system is: ▪ Monitored to identify abnormal operation ▪ Controlled to ensure performance meets design specification. ▪ Optimized based on the analysis of trends. ▪ Restored to normal operation through the identification of the root cause of any faults.

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

- Safely carry out operational procedures and first line maintenance procedures that are documented in operations and maintenance manuals relating to the pressure or vacuum sewer system. This might include tasks such as:
  - Responding to tank alarms and instigate corrective action to return the assets to compliant condition
  - Responding to power failure event
  - Routine inspection and maintenance requirements
- Make new connections to an in-situ / operating pressure/vacuum sewer line either by cutting and inserting an electrofusion coupler, a tee, or a branching saddle.
- Identify all mechanical, electrical and instrumentation assets associated with the pressure system on SCADA and within the sewer network.
- Validate and calibrate the monitoring equipment used the pressure sewer system processes.
- Identify control requirements for pressure or vacuum sewer system process along other set-points applicable to their operation.
- Evaluate trend data from SCADA to identify:
  - Normal trends or cycles for the works, and
  - Atypical trends or changes and the underlying or root cause for the change
- Undertake the Safe Isolation of Assets within the pressure or vacuum sewer system.
- Safely dispose of screenings and grit removed from the wastewater holding tanks, paying attention to Health & Safety requirements.

- Identify the Root Cause of pressure or vacuum sewer problems.
- Record and report equipment condition and performance data to the appropriate people to assist in Asset Management decision making.

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

- The Water New Zealand Pressure Sewer National Guidelines [8] offer operation and maintenance guidance for pressure sewer networks.
- That there is a potential risk to the wastewater network and to their own Health and Safety, wherever pressure or vacuum mains transition to an unpressurised state because of the likelihood of hydrogen sulphide (H_2S) release.
- The Water Services Association of Australia WSA-06 – Vacuum Sewerage Code of Australia provides vacuum system guidelines.
- Key process parameters and variables associated with pressure and vacuum systems, including an understanding of the design considerations and consequences of sub-optimal performance.
- The nature and sources of odour generation within the pressure or vacuum sewer system and any resource consent requirements that control air discharges from the network.
- The range of mechanical, electrical and instrumentation plant used to monitor and control the pressure system.
- Reactive and preventive maintenance tasks and frequencies.
- How to interrogate the SCADA to:
  c) Identify and control items of mechanical, electrical and instrumentation equipment.
  d) Evaluate trend data differentiating normal operational cycles from developing fault conditions.
- The alarms, action levels, authorization levels and consequences associated with the system.
- How to identify the Root Cause Analysisof any problems related to the pressure system 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, why the analysis is important and any limitation with the monitoring.
- The Health & Safety hazards associated with each stage of the pressure or vacuum system and how these should be mitigated.

Element of Competence:	Operate Emergency Power Supplies
Context	In the event of a loss of mains power to pump stations an alternative power supply, such as an emergency generator and/or an uninterrupted power system (UPS) are used to allow the site to continue to continue uninterrupted.
Outcome	Pump stations continue to operate during a loss of mains supply power.

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

- Follow the operational procedures relating to the emergency power system that are identified in the operations and maintenance manual for the site.
- Identify the voltage, load and phase of all assets associated with the site.
- 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 Network 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 maintance and repair of wastewater network Maintenance and Repair of Wastewater Network relating to the emergency power system.

To do this, Wastewater Network 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 is not a permanently installed generator the Wastewater Network Operator needs to know what type of generator is needed and where this is to come from. The following variables will need to be known 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:	Network Performance Data Collection
Context	Telemetered sites, along with portable data loggers, are deployed across wastewater networks to collect information that is then used to manage and maintain the network, and to also provide assurance and validation of the network performance.
Outcome	Data collected across the network is retrieved and stored in the appropriate data system.

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

- Maintain data collection equipment in line with manufacturers' recommendations including calibration requirements.
- Confirm the data type needed, this could include:
  - Flow
  - Levels
  - Pump status
  - Alarm status
- Use GIS to identify locations where data is collected; this could include locations like:
  - Pumping stations
  - Overflows / incident locations
- Safely access wastewater network to install, and to retrieve, portable data loggers, confirming that logging device is active and recording required data in line with standard operating procedures.

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

- The monitoring requirements of any related Resource Consent for which data is to be collected.
- The operational and maintenance procedures related to data collection instruments and portable data loggers, including calibration requirements.
- What procedures to follow to install loggers and to retrieve the data.
- The Health & Safety risks and hazards associated with installing data loggers, included confined space hazards, and the manner in which these may be mitigated.

Element of Competence:	Awareness of Trade Waste
Context	Industrial and trade wastes discharged to the wastewater network have the potential to cause process problems at downstream wastewater treatment plants, or to cause blockages within the Wastewater Network. To counter this, local bylaws put in place restrictions on what can be discharged to the wastewater network and may require companies to hold trade waste discharge consents which place limits on both the quantity and quality of the discharged effluent.
Outcome	Wastewater Network Operators are aware of which customers hold trade waste consents and notify the Trade Waste Officer if they: ▪ become aware that the conditions of these trade waste consents are being breached. ▪ notice that the characteristics of un-consented discharges indicate that a trade waste consent may be required e.g. unusual colour/smell of discharges from industrial connections

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

- Identify what customers hold trade waste consents.
- Find / identify discharges that breach consent conditions e.g. unusual coloured discharges into the network.
- Communicate with others within the organisation e.g. the Trade Waste Officer, when unusual discharge characteristics are identified.

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

- Which customers hold trade waste consents and their location within the Wastewater Network Catchment.
- The characteristics of what is permitted to be discharged into the wastewater network.
- What is prohibited from being discharged into the wastewater network.
- The organisations communication procedures to flag potential trade waste breaches.

Element of Competence:	Wastewater Network Asset Isolation and Re-commissioning
Context	Wastewater network assets, particularly those located at pump stations, sometimes need to be isolated so that maintenance work can be undertaken. This shutdown and restarting process can occur in planned, or unplanned, and emergency situations. Shutdowns and restarts might involve: ▪ A complete asset isolation and shutdown with purging of all wastewater from the asset; or ▪ A short shutdown to allow minor work with retention of some or all of wastewater; or ▪ A short shutdown in response to a plant upset or trip.
Outcome	▪ Identify early warning signs that assets and equipment need attention. ▪ Identify the range of circumstances in which network assets, such as pump stations, will shut down automatically, including the range of failsafe criteria, and control points. ▪ Identify the range of circumstances network assets 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 Network plant shutdowns and re-starts effectively, reducing the impacts as far as practicable.

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

- Carry out the planning and actions required for the following types of shutdowns:
  a) An automatic pump station shutdown, planned or unplanned.
  b) A manual asset isolation and shutdown
  c) A controlled pump station shutdown on discovery of process issues
- Shutdown the asset 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 asset operation 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 Network Operators ***need to know:***

- The correct methods of starting, stopping, operating, and controlling each asset including understanding the impact of shutdown on the wider network and how to respond.
- The architecture of the network including knowing the control philosophy and the location of isolation valves particularly at Pump Stations.
- How to identify the cause of automated plant shutdowns e.g. at pump stations including relevant alarms and actions.
- Start-up procedures including standard operating procedures and local procedures.
- Communications, reporting, and record keeping requirements associated with a shutdown, including ensuring the response meets the requirements of any Resource Consent.
- The risks associated with works shutdown and re-start and how to minimize the impacts associated with these.
- Contingency plans associated with the works shutdown.
- How to respond in the event of an incident or emergency.

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 network. Wastewater Network 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 Network Operators implement the operational response in accordance with the Incident and Emergency Response Plan.

To do this, Wastewater Network 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 with respect to the Incident and Emergency Response Plan.
- Provide input into the development of the Incident and Emergency Response Plan.
- Implement the operational corrective actions, which may include Clean-up of Overflows and blockages.
- 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 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 Network Operators ***need to know:***

- How to ascertain the nature of an incident, including overflows and pollution incidents.
- 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 control 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:	Environmental Clean-up of Overflows
Context	At times, particular following blockages or high rainfall events, wastewater can overflow from the network, discharging into the environment. When this occurs, Wastewater Network Operators are involved in the clean-up of the spill.
Outcome	Areas affected by wastewater overflows are cleaned up and disinfected, whilst access to the impacted area by the public is restricted

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

- Follow the operational procedures for the environmental clean-up of overflows. This might include:
  - Removing wastewater and solids to the maximum amount practicable e.g. by pumping wastewater into a liquid waste truck for discharge at the wastewater treatment plant, or elsewhere in the wastewater network.
  - Washdown of contaminated hard surface areas with clean water and an approved chemical disinfectant.
  - Ensure that wash water used is not disposed of into the stormwater network. It must either be allowed to soak naturally into surrounding soil, or if it is pooling it should be pumped not a liquid waste truck for disposal at the wastewater treatment plant, or elsewhere in the wastewater network.
  - Communicate with impacted homeowners.
  - Restrict site access to the public are a period of at least 24 hours following clean-up and disinfection process.

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

- How to respond in the event of an overflow.
- The decontamination procedures outlined in the Guidelines for Occupational Health & Safety in the New Zealand Water Industry. [4]
- Communications, reporting, and record keeping requirements associated with clean-ups, including ensuring the response meets the requirements of all resource consents related to the site.

Element of Competence:	Assisting with the Process to Decommission, Remove or Abandon Assets
Context	Wastewater Network Operators are involved in the process of decommissioning and removing assets from service. They also need to manage the ongoing risks from any assets which have been abandoned but remain in place. Within wastewater networks, decommissioning of assets is most likely to be associated with the removal of illegal cross connections, where private properties illegally connect stormwater drains to the wastewater network, or misconnections between the wastewater and stormwater networks.
Outcome	Assets identified for decommissioning are either removed, or are abandoned but remain in place, no longer not directly connected to the network. The ongoing risk of assets that have been decommissioned but remain in place is understood and managed by the Wastewater Network Operator.

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

- Assist with Inflow and Infiltration (I/I) programmes to identify the location of illegal connections to the Wastewater Network.
- Safely decommission and/or remove direct connections between the wastewater and stormwater networks.
- Identify the location of abandoned in place assets within the network.

To do this, Wastewater Network 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 Network 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 network 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 network. The organisations knowledge base is continuously developed with information provided by Wastewater Network Operators

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

- Undertake a systematic approach to collecting, recording, and reporting data.
- Follow the organisations required reporting procedures.
- Follow reporting requirements and procedures for the performance measures and targets that are either referenced or documented within the Asset Management Plan. This can often include condition assessment information.

To do this, Wastewater Network 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 Network 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 network.
    - 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.
- How asset condition is to be recorded and reported.

Element of Competence:	Health & Safety
Context	Wastewater Network 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 Network Operators work in a safe manner that mitigates the hazards and risks that they, and others, may be exposed to.

To do this, Wastewater Network 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 Network 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 Network 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 Network 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 for the Wastewater Network that control identified hazards.
- What Personal Protective Equipment (PPE) is required when operating and maintaining the Wastewater network.

Element of Competence:	Confined Spaces
Context	Wastewater Network 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 Network Operators can enter, and work within, confined spaces without endangering the Health & Safety of themselves or others.

To do this, Wastewater Network 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 davits, 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 & Emergency Response Plans for confined space entries and rescues.

To do this, Wastewater Network 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 for the Wastewater Network 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 Network 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 Awareness
Context	Wastewater networks can generate hazardous gases. They can also involve the use of hazardous substances, for instance diesel for generators or chemicals used to dose the network to reduce septicity. Wastewater Network Operators ensure that they protect themselves from exposure to hazardous gases. They also need to ensure that chemicals and hazardous substances used within the wastewater network 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 dealing with hazardous substances.
Outcome	Wastewater Network Operators are protected from hazardous gases generated within the wastewater network. Chemicals and hazardous substances used within the network are stored and used in a safe manner.

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

- Manage an inventory of all chemicals and hazardous substances used within the network. 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) within the network.
- Safely work with chemicals and hazardous substances (both in terms of handling and storage requirements) including for:
  - Asbestos Pipes
  - Fuel
  - Chemicals
  - Hazardous gases
- 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 Incident & Emergency Response Plans for the wastewater network in the event of a spill.

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

- What hazardous substances (i.e. any product or chemical that has explosive, flammable, oxidising, toxic, corrosive or ecotoxic properties) are used within the wastewater network 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 & Emergency Response Plans for the wastewater network details the procedures to follow in the event of a spill.
- That the Health and Safety at Work (Hazardous Substances) Regulations [6] identifies how the chemicals and hazardous substances such as those used in Wastewater Networks 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 protecting workers from hazardous gasses and also how to manage chemical and hazardous substances used within wastewater networks.
- 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.

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

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

- Induct and supervise visitors to Wastewater Network facilities in accordance with Health & Safety procedures.
- Lock and alarm all points of entry, including doors, windows, and gates at pump stations.
- Maintain a key register to identify who holds keys for each site.
- Routinely perform visual examinations of the exterior of Wastewater Network facilities and remove objects that could be used to aid an intruder.
- Respond to security breaches within the Wastewater Network in accordance with the requirements of the Incident & Emergency Response Plans for the network.
- Follow required procedures to ensure their own personal safety when in customer facing situations.

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

- Who has access to wastewater network assets and facilities and where the keys are kept.
- How to induct and supervise visitors to site.
- How to implement the Incident & Emergency Response Plans measures for security breaches.

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 network is operating in a manner that protects the publics' health and the environment. Verification monitoring within wastewater networks includes Resource Consent Compliance Monitoring and Reporting within the receiving environment following an Overflow. Verification monitoring provides confidence regarding the level of service and is a useful indication of possible problems with the network.
Outcome	The verification monitoring process confirms that the network is conveying wastewater to an acceptable standard.

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

- Follow the Resource Consent Compliance Monitoring and Reporting plan that is referenced in any resource consent(s) related to the network.
- Review complaints and use them to make improvements to the network operations. Monitoring comments and complaints can provide valuable information on problems with the network.

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

- The objectives of the monitoring being undertaken including knowing:
  - Control points
  - Response procedures when trigger levels are reached
  - Reporting requirements
- The procedures for responding to transgressions identified through the Verification Monitoring process.
- How to engage with stakeholders and the community, particularly around using complaints about the wastewater network to help 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	Some wastewater networks hold resource consents related to the Overflow or discharge of contaminants onto land or into the air or water (a discharge permit). A resource consent provides permission to discharge contaminates that would otherwise contravene the Resource Management Act. When resource consents are issued, they include conditions that are intended to minimise the public health risk and with the least effect on the receiving environment. As a consent holder there is a legal obligation to comply with any conditions set out in the resource consent. Wastewater Network Operators need to operate the wastewater network within the confines of any resource consent(s) related to the network. This may include collecting and providing data to the Consent Authority on the operation of the network e.g.: ▪ Data on the number times an Overflow has operated, ▪ Information on the level of Inflow and Infiltration (I/I) within the network, ▪ Confirmation that maintenance has occurred.
Outcome	All resource consent conditions related to the wastewater network operation are met.

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

- Follow the compliance monitoring plan that is referenced in the resource consent(s) for the network. 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 network, 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 network 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 network.
  - 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 s compliance monitoring plan for the consent.

- Monitor the performance of the wastewater network, 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 network 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 Network Operators ***need to know:***

- What resource consent conditions relate to the wastewater network and the limitations these apply to the operation of the network (e.g. limitations on infiltration).
- 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 network fails to comply with the resource consent conditions, as detailed in the Incident & Emergency Response Plans.

Element of Competence:	Inflow and Infiltration (I/I)
Context	Inflow is stormwater which directly enters the wastewater network through connections and shows up as a fast increase in flows during rainfall events. Infiltration is where groundwater seeps into the network via cracks, joints or manholes and has a longer response time within the network. Both inflow and infiltration (I/I) lead to increases flows in the wastewater network, which in turn: - reduces the available hydraulic capacity for wastewater, - increases the quantity of fluid which needs to be conveyed and treated at the wastewater treatment plant, - increases the likelihood of overflows. Wastewater Network Operators are involved in I/I reduction programmes to reduce both inflow and infiltration within the wastewater network.
Outcome	The wastewater network is inspected by Wastewater Network Operators to identify sources of inflow and infiltration.

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

- Follow a variety of different methods and operational procedures to determine the source of inflow and infiltration within the wastewater network, this could include:
  - visual and smoke testing to identify direct stormwater connections
  - private property inspections e.g. to identify low gully traps
  - manhole inspections
  - CCTV inspection of both sewers and house laterals
  - hydraulic testing of sewers and house laterals to determine typical water tightness.

- Follow a variety of different methods and operational procedures to repair of manholes using a variety of different rehabilitation techniques which could include:
  - Mortar patch repair
  - Resin-impregnated felt patch repairs
  - PVC plastic lining systems
  - Complete manhole replacement
  - Manhole ring and lid replacement.
- Identify and mitigate Health & Safety hazards related to I/I programs including Working in Roads and Confined Spaces entry and ventilation requirements.
- Record asset condition and provide rehabilitation data to the appropriate people to assist in Provide Data to Assist in Asset Management Decision Making.

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

- That the Water New Zealand, Infiltration & Inflow Control Manual; Volume 1: Overview, Background & Theory [13] provides higher-level information on the management of Inflow and infiltration, the corresponding issues and complexities, and good practice strategies to effectively reduce and manage I/I.

- That the Water NZ, Infiltration & Inflow Control Manual; Volume 2: Practical Guidelines [14] provides details on how to manage and reduce I/I, including the detailed information on how to undertake each of the five stages in the good practice methodology.
- That the New Zealand Gravity Pipe Inspection Manual, 4th Edition, 2019 provides details on how to undertake inspections of sewer pipes and manholes including how to undertake infiltration source investigation inspections.

Element of Competence:	Engage with Stakeholders and the Community
Context	Wastewater Network Operators will at times need to be involved with proactively communicating to members of the public, particularly with neighbours of worksites, or during Overflow events. Events like overflows can be particularly emotive to the community and Wastewater Network Operators need to be able to emphatically communicate to upset members of the community whilst being mindful of their own personal security. Wastewater Network Operators also need to engage with other industry stakeholders both external to an organisation, like Consent Compliance Officers, and also internal stakeholders including the Wastewater Treatment Operators and Asset Managers.
Outcome	Effective communication is used by Wastewater Network Operators to engage with stakeholders and the community.

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

- Identify the stakeholders that they are required to engage with. This will include, but not be limited to, customers who have the following issues:
  - odour
  - blockages
  - flooding
  - collapse or sewer damage
  - property owners as part of an I/I reduction program.
- Engage with stakeholders by following the organisations documented approach to both communication and personal security to ensure the resolution of customer issues.
- Provide input into the long-term employee engagement plan (management and operational) on awareness and involvement in planning of future network changes.
- Identify the contact list and communication plan for incidents and emergencies.

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

- How stakeholders who could affect, or be affected by, decisions or activities to do with the wastewater network are identified.
- That the organisations communication and engagement plan will 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 of the wastewater network e.g. "bin it, don't flush it" campaigns.
- The organisations two-way communication programme to receive the communities' suggestions, complaints, and concerns.

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[14] Water New Zealand, Infiltration and Inflow Control Manual, Volume 2: Practical Guidelines, 2nd Edition, March 2015.