National Environmental Monitoring Standard

Safe Collection of Environmental Data

Guideline for safe working when undertaking environmental monitoring

Version 2.0.0

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Change register

Version Number	Revision Date	Section	Topic	Revision Summary
1.1				Original version
2.0.0	November 2024	All	All	This document has been completely restructured and contains significant changes to content

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The National Environmental Monitoring Standards

The National Environmental Monitoring Standards (NEMS), and associated codes of practice, Glossary, and National Quality Code Schema can be found at www.nems.org.nz.

Development

The strategy that led to the development of these Standards and associated documents was established by Jeff Watson (Chair) and Rob Christie (Project Director) of the initial NEMS Steering Group, in 2014.

The NEMS initiative is supported by the Environmental Data Special Interest Group (ED SIG) (formerly the Local Authority Environmental Monitoring Group (LAEMG)), who contribute members to the NEMS Steering Group.

Implementation of the strategy is overseen by the NEMS Steering Group, which currently comprises Glenn Ellery (Chair), Jeff Watson (Technical Advisor), Phillip Downes, Rachel Herbert, Jon Marks, Charles Pearson, Jochen Schmidt, Michael Ede, Dan Elder, Abi Loughnan, Sonja Miller, and Raelene Mercer (Project Manager).

The NEMS Steering Group directs preparation of NEMS documents on authority from the Chief Executives of the regional and unitary councils and the Ministry for the Environment (MfE).

The development of these documents involves consultation with regional and unitary councils across New Zealand, major electricity generation industry representatives, research institutes, and organisations providing supporting services such as laboratory processing. These agencies together are responsible for the majority of environmental monitoring in New Zealand.

Implementation

When implementing the above Standards, current legislation relating to Health and Safety in New Zealand and subsequent amendments, and these NEMS Guidelines shall be complied with.

Data fit for purpose

To facilitate data sharing, the NEMS Steering Group recommend that NEMS Standards are adopted throughout New Zealand and all data collected be processed and quality coded in accordance with the methodologies described in the Standards.

The quality code is determined from the Standard adopted and applied at the time of data acquisition. The degree of rigour with which requirements of the Standards are

applied may depend on the quality of data sought. The highest quality code (QC 600) may be assigned to data that meet the stated requirements for good data.

Data of lesser quality are accommodated but are assigned a lower quality code (i.e. less than QC 600). They may be fit for the current intended monitoring purpose but restricted in their use for a range of other current and future purposes.

Measured data coded as QC 500 (fair), or QC 400 (compromised) may be the best practicably achievable due to site limitations and/or transient lapses in data quality.

Health and safety

When implementing the Standards, current legislation relating to health and safety in New Zealand and subsequent amendments shall be complied with.

This NEMS *Safe Collection of Environmental Data - Guidelines for safe working when undertaking environmental monitoring*, provides additional guidance on health and safety issues. Use only the most recent published version of any NEMS Code of Practice (COP), or NEMS Guidelines.

Limitations

It is assumed that, as a minimum, the reader of NEMS documents has undertaken industry-based training and has a basic understanding of environmental monitoring techniques. Instructions for manufacturer-specific instrumentation and methodologies are not included in this document.

The information contained in these NEMS documents relies upon material and data derived from a number of third-party sources.

The documents do not relieve the user (or a person on whose behalf it is used) of any obligation or duty that might arise under any legislation, and any regulations and rules under those Acts, covering the activities to which this document has been or is to be applied.

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- Genesis Energy
- Contact Energy
- Mercury New Zealand Limited

Review

This document will be assessed for review approximately once every two years. Further details on the review process can be found at www.nems.org.nz. Users of this document are encouraged to provide feedback via the NEMS website.

Feedback

If you wish to provide feedback regarding this version of the document, please provide it to https://www.nems.org.nz/feedback/.

About this Guideline

Introduction

These *Guidelines for safe working when undertaking environmental monitoring* have been developed by NEMS Steering Group and the Regional Council's Environmental Data Special Interest Group (ED SIG) at the request of the Resources Management Group (RMG). They supersede but incorporate much of the content of the NEMS Code of Practice *Safe Acquisition of Field Data in and Around Freshwater*.

The review of this document has been undertaken by Stephanie Bowis (Tasman District Council), Craig Pickford (Taranaki Regional Council), Graham Timpany (NIWA) and Wendy Purdon (Greater Wellington Regional Council). Glenn Ellery (Bay of Plenty Regional Council) also provided oversight as the NEMS Steering Group representative.

The working group gratefully acknowledge:

- members of the wider environmental monitoring community throughout regional councils and NIWA who have identified key risks when undertaking environmental monitoring and developed appropriate responses. The collective knowledge of this group has formed the basis for much of the content of this guideline
- the NEMS Steering Group for their oversight and review of this document.

Objective

The purpose of this guideline is to bring readers' attention to notable risks related to the undertaking of environmental monitoring and provide information, advice, education and training recommendations to support the reader to develop their own standard operating procedures (SOPs) or policies that ensure the safe undertaking of environmental monitoring.

Scope

The scope of this guideline covers monitoring incorporated within published NEMS.

This guideline is a living document and does not profess to identify all risks or set standard responses to risks involved with undertaking environmental monitoring but aims to act as a resource to help organisations to develop and implement their own SOPs for minimising environmental monitoring-related risks. More generic or common types of risks are left to be covered by more readily available guidance.

Exclusions

This guideline is not fully inclusive. Self-awareness, personal responsibility, safe procedures and training are prerequisites when undertaking any environmental

monitoring. Risk identification and mitigation is a continual process due to the natural changes within the environmental conditions encountered, and therefore active review of operational procedures is required. This guideline must be considered as a support tool for the reader in developing and operating their own SOPs or policies.

It is the individual authority's or organisation's responsibility to develop policies and SOPs that provide for regional variance and/or deliver national direction to support safe working.

It is not the intention of this guideline to cover all risks present in undertaking environmental monitoring but to focus and provide guidance for those key risks that may impact worker well-being when undertaking NEMS monitoring activities.

The reader should be aware that a number of other risks exist when undertaking environmental monitoring, e.g., related to biosecurity, and while not within scope of this guideline should be considered when performing NEMS activities.

Terms, definitions, and symbols

Relevant definitions and descriptions of symbols used in this code of practice are contained within the NEMS *Glossary* available at www.nems.org.nz.

Normative references

This code of practice shall be read in conjunction with the following references:

- International Organization for Standardization (ISO). 2016. *How to write standards Geneva, Switzerland*
  https://www.iso.org/files/live/sites/isoorg/files/developing_standards/docs/en/how-to-write-standards.pdf
- NEMS Glossary – Terms, Definitions and Symbols
  https://www.nems.org.nz/documents/glossary
- NEMS Guidelines for Hydrological and Meteorological Structures
  https://www.nems.org.nz/documents/hydrological-and-meterological-structures
- WorkSafe - How to Manage Work Risks
  https://WorkSafe.govt.nz/managing-health-and-safety/managing-risks/how-to-manage-work-risks/
- NZTA – Safety
  https://www.nzta.govt.nz/safety/
- NZTA - Temporary Traffic Management
  https://www.nzta.govt.nz/roads-and-rail/code-of-practice-for-temporary-traffic-management/
- KiwiRail - Accessing Our Network
  https://www.kiwirail.co.nz/how-can-we-help/access-the-rail-corridor/
- Maritime NZ – Entering into MOSS

https://www.maritimenz.govt.nz/commercial/safety/safety-management-systems/MOSS/entering-MOSS/default.asp

- Maritime NZ – Developing an Operator Plan
  https://www.maritimenz.govt.nz/commercial/safety/safety-management-systems/MOSS/entering-MOSS/operator-plan.asp
- Maritime NZ – Maritime Transport Act 1994 – Maritime Rules; Part 20: Operating Rules
  https://www.maritimenz.govt.nz/media/xapnvxty/part20-maritime-rule-replacement-entire-part-2014.pdf
- Ministry of Transport -Guide to the use of Small Autonomous Surface Vessels (ASVs) in New Zealand's Maritime Area; Aug 2024
  https://www.transport.govt.nz/assets/Uploads/Guide-to-the-use-of-Small-Autonomous-Surface-Vessels-in-New-Zealands-Maritime-Area.pdf
- WorkSafe – Working at Height
  https://worksafe.govt.nz/topic-and-industry/working-at-height/
- Worksafe – Planning Entry and Working in a confined space
  https://WorkSafe.govt.nz/topic-and-industry/planning-entry-and-working-safely-in-a-confined-space/
- Health and Safety at Work (Hazardous Substances) Regulations 2017
  https://www.legislation.govt.nz/regulation/public/2017/0131/latest/DLM7309401.htm

1 Health and Safety

This guideline has been prepared with particular regard to complying with the provisions of the Health and Safety at Work Act 2015 (HSWA).

The main purpose of HSWA is to provide for a balanced framework to secure the health and safety of workers and workplaces.

A guiding principle of HSWA is that workers and other persons should be given the highest level of protection against harm to their health, safety and welfare from work risks as is reasonably practicable.

1.1 Overview of the Act

HSWA recognises that a well-functioning health and safety system relies on participation, leadership and accountability by agencies and workers.

HSWA sets out the principles, duties and rights in relation to workplace health and safety.

HSWA shifts the focus from monitoring and recording health and safety incidents to proactively identifying and managing risks so everyone is safe and healthy.

1.1.1 WorkSafe

WorkSafe (https://WorkSafe.govt.nz/) is New Zealand's primary workplace health and safety regulator and a primary resource for information on the HSWA and managing workplace hazards.

WorkSafe has three key roles:

- regulatory confidence
- harm prevention
- system leadership.

WorkSafe works collaboratively with workplaces to embed and promote good work health and safety practices.

1.1 Responsibilities

WorkSafe summarises workplace responsibilities as:

'If you create the risk, you manage the risk'

HSWA requires work-related health and safety risks to be managed. This means taking into consideration the potential for work-related health conditions as well as the injuries that could occur.

HSWA ensures that everyone has a role to play and makes everyone's responsibilities clear:

- businesses have the primary responsibility for the health and safety of their workers and any other workers they influence or direct. They are also responsible for the health and safety of people at risk from the work of their business
- officers (company directors, partners, board members, chief executives) must do due diligence to make sure the business understands and is meeting its health and safety responsibilities
- workers must take reasonable care for their own health and safety and ensure that their actions don't adversely affect the health and safety of others. They must also follow any reasonable health and safety instruction given to them by the business and cooperate with any reasonable business policy or procedure relating to health and safety in the workplace, and
- other people who come into the workplace, such as visitors or customers, also have some health and safety duties to ensure that their actions don't adversely affect the health and safety of others.

All workers undertaking environmental monitoring should have regard to this guideline when managing risks[1].

It is important that a competency assessment system is developed that encompasses the type of environmental monitoring activity undertaken by staff. Those who undertake the activity should be assessed for competency on a prescribed basis.

It is considered that, as a minimum, those undertaking environmental monitoring should have introductory first aid training and complete necessary competency refreshers.

[1] https://WorkSafe.govt.nz/managing-health-and-safety/managing-risks/how-to-manage-work-risks/

2 Guidance

In This Section

The following subsections provide:

- guidance or lessons about hazards, derived from practitioners that undertake environmental monitoring
- known sources of information or standards related to a hazard
- suggested safe-working training and competencies for those undertaking environmental monitoring.

2.1 Trip planning

It is crucial that a trip plan is developed prior to undertaking any trip involving environmental monitoring. The trip plan should be in response to the activity and environmental conditions in which it is being undertaken. Trip plans should be a shared responsibility of all those undertaking the monitoring.

2.1.1 Planning your departure

Good planning of any excursion is a prerequisite to:

- identifying the potential hazards that may exist at a site or during the field trip, and
- developing risk mitigation strategies.

Good planning will also help identify requirements relating to training and certification, personal protective equipment, access, communications and operational items (such as tools and materials that are needed in the field). Good planning ensures staff are safe but has additional benefits in saving money and time, and ultimately leads to better data.

Planning should include checking:

- staff are prepared for the work proposed, both physically and mentally
- the availability of a responsible person to hold your trip and estimated time of arrival details
- site Hazard Identification Forms and/or Hazard Register for each site you intend to visit
- the short- and long-term weather forecast
- river, rainfall (forecasted and actual), weather and/or other environmental conditions
- planned releases from hydroelectric power schemes or other river control schemes/devices
- equipment required, and
- the amount of work proposed is realistic and will not excessively stress or fatigue staff. Safe practices must always be prioritised over getting the planned tasks completed.

All equipment should be checked prior to leaving base to ensure it is in a satisfactory condition and good working order. Where applicable, all equipment used should conform to the appropriate New Zealand/Australian standard. It should also be ensured that the user is competent and certified in the use of the equipment.

2.1.2 Contingency planning

Any trip plan should be backed up with a contingency plan of what to do should an incident occur.

Contingency planning is a key part of caring for staff. It is often assumed that having staff tracking, communication and hazard identification nullifies any risk; however, these only identify and reduce the chances of an incident, rather than responding to an incident should it occur.

The primary focus of contingency planning should be caring for the staff involved, with organisational requirements and reputation as an important secondary focus.

Elements to consider in contingency planning generally fall into two broad groups:

Field elements:

- access
- weather
- safety equipment, including first aid
- communications and reporting schedule
- rescue plan

Office elements:

- communications and reporting schedule
- non-reporting or incident response processes
- emergency contacts.

2.1.3 Remote working, after-hours work and work in inclement weather

When planning monitoring activities either of short or long duration in areas of limited access and/or limited communications, the following actions and equipment should be considered where appropriate:

- a works plan identifying individual monitoring activities to be undertaken, their location, timing and intended travel details
- development of a contact schedule at regular times throughout the day to mitigate risk (i.e., not just start and finish of the day)
- a dedicated contact person who is responsible for checking your safe arrival according to your schedule
- list of persons/other organisations that may require the schedule
- a response plan should a schedule not be met
- personal tracking equipment and/or a personal locator beacon (PLB)

- satellite phone or radio telephone
- a dependable powerful hand-torch including spare batteries
- a weather forecast for the period of the works
- tide tables where required
- first aid or other incident response equipment, and
- survival equipment should a return be delayed, e.g. weather conditions preventing a helicopter pick-up.

2.1.4 Single and multiple staffing

Consideration should be given to the activity being undertaken and if there is an acceptable level of risk if performed by one staff member; otherwise, more than one staff member will be required. The level of acceptable risk and resultant staffing levels may be driven by one or more of the following:

- type of activity
- remoteness
- environmental factors, such as weather, high river levels etc.
- likelihood of public contact (see Section 2.12)
- staff competency, including ability, training and experience.

The cost of multiple staffing must not be a factor when staff safety is involved. In fact, there are often advantages to multiple staffing as it provides opportunity for knowledge sharing and multiple tasks to be addressed during one visit.

2.1.5 Staff tracking and communication

Understanding where staff are is a key requirement for minimising risk and identifying and responding to an incident should it occur. Staff tracking can also provide benefits to data collection by identifying times staff are at a site, travel time and availability of staff in an area.

It is recommended that more than one tracking and communication method be in place to minimise risk of staff not being able to be located or communicated with.

There is an expanding variety of tools/devices on the market for both tracking and communication. A requirements definition process may be useful prior to going to the market for solutions.

Prior to embarking on any fieldwork, a fieldwork itinerary should be left with a colleague or posted at a designated site identifying, at the least:

- the location where the fieldwork is being conducted
- the time of departure
- any call-in schedule
- an expected return time, and
- the responsible staff member who is responding to call-ins or lack there-of.

A routine but flexible reporting-in procedure during and at the end of the working day should be developed.

Any unavoidable deviation from the reporting-in arrangements should be communicated to the appointed staff member or office as soon as practically possible.

The appointed 'reporting in' staff member has responsibility for ensuring that missed 'reporting in' as scheduled or return to office or home by those undertaking the activity is investigated to resolution.

There are a number of service providers who deliver a staff tracking or emergency contact service that includes emergency response and this may provide a better level of response expertise than the use of in-house staff.

2.1.6 Access requirements

Prior to and during any trip, access requirements should be checked and followed; these include:

- ensuring the property or landowners are not an identified hazard
- contacting landowners where needed
- gaining any necessary permissions or information
- ensuring keys or access codes are taken by those undertaking the work and a secondary set is available to the 'reporting in' colleague, and
- reporting or following instruction as required by the landowner, eg, forestry permits, speed limits and radio reporting.

2.2 Vehicle use

2.2.1 Discussion

Driving on roads is a common risk and should be covered under more generalised The Land Transport Act 1998 sets out the law for driving in New Zealand and this needs to be followed.

However, it is recognised that environmental monitoring staff are exposed to driving elements that are different to normal road driving, such as:

- four-wheel drive use in road, farm and remote areas
- driving vehicles that are significantly laden with equipment and materials
- frequent travelling over large distances, and
- use of off-road specialised motor vehicles such as motorbikes, side-by-side and all-terrain vehicles.

2.2.2 Guidance

The range of vehicles used in undertaking environmental monitoring is extensive and specific to the use, so organisational policy should be developed to cover individual vehicle types and their use. Such policy should consider:

- ensuring all vehicles are appropriately maintained and licensed
- ensuring staff undertake vehicle use training and competency refreshers that cover the variety of vehicle types and terrain present, using a representative vehicle that is fully laden with normal equipment
- establishing a scheduled vehicle safety check process
- ensuring that vehicle doors and canopy doors are secured and equipment is stored appropriately to prevent its movement during travel or should an incident occur (the fitting of alarms to gull wing canopy doors is recommended).

Driver fatigue can be a significant issue due to the distances involved to get to remote monitoring sites. Fatigue can impair a driver long before they 'nod off' at the wheel. There are many ways driver fatigue can be prevented, including:

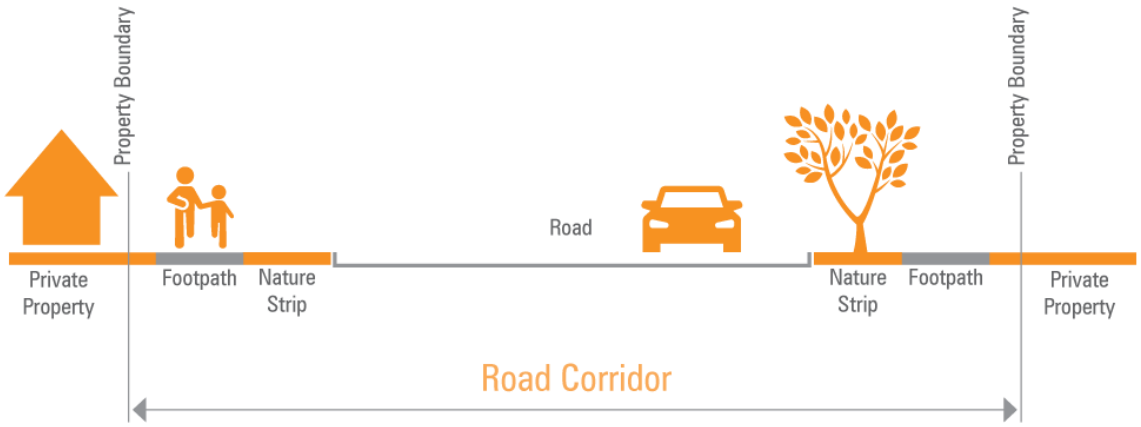
- getting a good night's sleep prior to driving
- taking a break
- taking a power nap (less than 20 min for best effect)
- staying hydrated and snacking lightly, and
- sharing the driving.

The Waka Kotahi NZ Transport Agency[2] is a good starting point for assistance with developing safe driving behaviour and policy.

2.3 Working on or near roads

2.3.1 Discussion

Those undertaking environmental monitoring adjacent to, on, above or below a road corridor (Figure 1) must follow the Waka Kotahi NZ Transport Agency (NZTA) Code of Practice for Temporary Traffic Management (CoPTTM)[3] by installing temporary traffic management (TTM).



[2] https://www.nzta.govt.nz/safety/
[3] https://www.nzta.govt.nz/roads-and-rail/code-of-practice-for-temporary-traffic-management/

Figure 1 - The road corridor.

The application of the CoPTTM ensures, so far as reasonably practicable, that the health and safety of road users and those working within the defined road corridor is maintained through effective TTM. TTM is required by WorkSafe, NZTA and the local Road Controlling Authority (RCA).

Not all roads are treated the same and are divided into different levels to reflect their intensity of use and associated risk. There are four primary levels of road:

- Level LV (low volume). For Level LV, the subcategory 'Level LV low risk' can also be designated for roads that have particularly low volumes of traffic
- Level 1 (the default level unless designated otherwise by the relevant RCA)
- Level 2, and
- Level 3.

The designation for each road is made by the RCA.

2.3.2 Guidance

Many monitoring activities and locations were historically established prior to the implementation of CoPTTM. When either undertaking established or planning new monitoring the very first step is to consider how the work being undertaken falls under the CoPTTM.

The following hierarchy of temporary traffic management (TTM) responses for working in a road corridor should be considered as a minimum:

Can working in or near a road corridor can be eliminated by adapting or relocating the activity?

The development and application of generic TTM that can be used for more than one activity as a starting point for development of an activity-specific TTM.

The development and application of activity-specific TTM.

The NZTA's CoPTTM is the standard reference for all temporary traffic management on state highways and local roads. It includes levels of temporary traffic management, standards for signage, personal protective equipment (PPE) and training, procedures for requesting access to the road corridor and a series of sample Traffic Management Plans.

The CoPTTM is extensive and undergoes regular updates so it is recommended that users subscribe to receive notifications of changes to CoPTTM and updates on topics of interest.

There are two primary types of Traffic Management Plan:

- plans for inspections and non-invasive works that take place on roads with low traffic volumes and can be done within a short, defined timeframe approved by the designated RCA, and
- site-specific plans for static temporary work sites that take more than 10 minutes and are for more complex tasks.

For both of these types of plan there is a need for:

- an approved Traffic Management Plan
- CoPTTM-compliant equipment
- CoPTTM training (all staff utilising a Traffic Management Plan should, as a minimum, be Traffic Controller certified)
- at least one Site Traffic Management Supervisor (STMS) to be responsible for the Traffic Management Plan. This is the person who should ensure that best practice is being followed. They are also the first point of contact in the event of an incident or audit, so there may also be a need for training as an STMS to meet requirements, and
- notification of use of the Traffic Management Plan to the nominated STMS, RCA and, should an incident occur, WorkSafe.

Useful considerations are:

- it may be better to contract TTM needs out to a professional due to extensive requirements of the CoPTTM
- development of a Traffic Management Plan can only be undertaken by a certified TTM Planner; contracting the development process to an external TTM provider may be cheaper and more time-efficient than maintaining a TTM Planner internally within an organisation. Whatever the approach used, budget and time needs to be considered; allow four weeks for planning
- development of generic Traffic Management Plans with multiple diagrams to cover all road levels, layouts and conditions likely to be encountered can be efficient
- some RCAs may allow simple, practical alternatives that do not strictly meet CoPTTM requirements, such as a time extension for gauging off a Level 1 bridge, and
- ensure the RCA is notified prior to undertaking work in the road corridor. Some RCAs may accept a schedule of works for a regular reoccurring activity, such as routine sampling runs.

2.3.3 Bridges

Historically, bridges have provided easy access for monitoring waterways. Users of bridges for environmental monitoring should note:

- a bridge is still classified as a carriageway in a road corridor and thus requires a Traffic Management Plan for works (like any other part of the road)
- long single-lane bridges need an alternate route or strategy to avoid delaying traffic for extended periods
- working under a bridge is considered to be the same as working on the bridge due to the risk of debris or other items falling off the bridge, and
- mounting environmental monitoring equipment onto a bridge structure must only be undertaken with the approval of the relevant RCA. Drilling into the bridge structure should be minimised as much as possible and any processes or materials used should meet the specifications of the owner of the bridge.

2.3.4 Training and competency

Recommended training varies depending on road environment; these environments are classified in Table 1.

Table 2 – Road Environment Classifications.

Category	Road environment & characteristics
Category A	Low speed roads (60 km/h and lower) Includes LV, L1 and L2 low speed roads Using both type A and B signs (depending on RCA requirements) Includes two-way two-lane roads and multilane roads
Category B	High speed two-way two-lane roads (70 km/h and over) Includes LV, L1 and L2 high speed roads Using both type A and B signs (depending on RCA requirements)
Note: Category C high speed multi-lane roads (70 km/h and over) are recommended to be managed by a certified TTM contractor.	

Table 2 provides the suggested minimum specific training and competency requirements for those working on or near roads.

Table 2 – Minimum Specific Training Requirements.

Role	Activity description	CoPTTM Learning blocks	Refresher frequency
Traffic Controller	The qualified person on Category A and B road environments who: Assists with deployment of the operation Maintains the site within existing TTM phase while the STMS is away from work site. Note: The Traffic Controller will only be able to assist an STMS installing, modifying or removing TTM at a work site. The Traffic Controller can also undertake: Non-invasive activities where the person is on foot on the roadside of a road with a permanent speed limit of 60 km/h or lower Inspection activities, including additional specialist activities, for example, assisting an STMS with event management.	Traffic Controller Use of specialist TTM equipment	3 years

Table 3 identifies additional training that may be required depending on the circumstances and the ability of an STMS to be available when needed. It is recommended that at least one member of a team undertaking environmental monitoring has completed this training to support application of the CoPTTM.

Table 3 – Potentially Required Training.

Role	Activity description	CoPTTM Learning blocks	Refresher frequency
STMS (onsite supervisor)	Set up, change and remove a work site to a predetermined plan. Covers additional specialist activities if required, eg, event management, traffic signals, and barriers.	Universal STMS STMS Category A STMS Category B	3 years

2.4 Working on or near railways

2.4.1 Discussion

The rail corridor, the land that the rail tracks run along, is **out of bounds** to the public to ensure safety. Trains run on the New Zealand rail network 24 hours a day, seven days a week. They are heavy, fast and take a long time to stop.

Working within the railway corridor may be needed for environmental monitoring purposes, such as accessing properties or waterways flowing under rail bridges.

Being in the rail corridor is classified as:

- being within the area bounded by a distance of 5 m from either side of the track
- crossing the track to access the work site
- operating plant, tools or equipment within 8 metres of any overhead lines, or
- working on KiwiRail yards, buildings, platforms or stations.
- Situations where you may need to access the rail corridor:
- undertaking construction, surveys or inspections
- installing or maintaining cables, pipes and waterways
- moving over-dimensional loads that may encroach on a rail corridor
- travelling near or through a rail corridor, or
- filming and photographing.

2.4.2 Guidance

The first step when considering working near a rail corridor is to determine if the need can be eliminated by adapting or relocating the activity. If not, an application to KiwiRail for permission is required[4]. A 'Permit to Enter' will be need to obtained, with the possibility of a 'Site Safety' or 'Yard' permit also being required. Any proposal to install equipment or structures within the rail corridor will require a Grant of Right to Access, authorised by KiwiRail.

[4] https://www.kiwirail.co.nz/how-can-we-help/access-the-rail-corridor/

A ‘Permit to Enter’ may require an approved rail protection officer to be present during the installation work and any subsequent site visits. All permit, grant and protection officer costs will need to be met by the organisation undertaking the monitoring.

Note: the KiwiRail Train Control emergency number is 0800 808 400

2.5 Working in and around water

2.5.1 Discussion

Fieldwork undertaken in or near water presents a unique set of risks, which unfortunately has historically, and on multiple occasions, led to loss of life of those undertaking environmental monitoring.

Working near the edge of a water body must be considered as much of a risk as working within the water body. The ability to assess potential hazards, mitigate risk and develop response scenarios should an incident occur while working in and around water is an essential skill that needs to be utilised continuously due to an ever-changing natural environment.

Appropriate safety training is a prerequisite for all those working in or near water bodies. It is important for the individual to develop wading and capability awareness as a minimum and ensure they work within those capabilities.

2.5.2 Guidance

Fieldwork can often be located near or in deep and/or fast flowing water. This necessitates special care as well as an awareness at all times of the hazards that can be encountered. Conditions can be particularly hazardous due to wet or steep river banks, flooding, engineered structures, darkness or adverse weather conditions.

Entry into or on a watercourse should not be undertaken unless hazards have been assessed and personnel are properly equipped for the purpose.

2.5.2.1 Assessing in-stream conditions and recommended controls

It is important for the individual to develop wading and capability awareness and ensure they work within those capabilities. To operate safely in a moving watercourse there are two key criteria to consider:

- water depth
- water velocity.

Table 4 provides guidance for controls to minimise risk. These controls are based on ideal under-foot bed conditions and other environmental conditions. Each organisation or individual should modify this table as needed to respond to staff competency and conditions present.

Table 4 - Default guidance for controls for water depth and velocity

Surface velocity (m/s)	Depth				
	Shin	Knee	Mid-thigh	Full thigh	Over groin
>1.0	Single staffing	Single staffing with personal flotation device	Double staffing with personal flotation device	Double staffing with personal flotation device and throw bag	Double staffing with personal flotation device and throw bag
0.5 to 1.0	Single staffing	Single staffing Personal floatation device is discretionary	Double staffing with personal flotation device	Double staffing with personal flotation device and throw bag	Double staffing with personal flotation device and throw bag
<0.5	Single staffing	Single staffing	Single staffing with personal flotation device	Single staffing with personal flotation device	Single staffing with personal flotation device
Note: These provisions are only applicable to able-bodied persons in normal daylight, good visibility and firm underfoot bed conditions. Awareness of personal capability of what can be safely waded must always be adhered to.					

2.5.2.2 Weir cleaning and weed clearance

Risks associated with weir cleaning and weed clearance should be carefully considered by field personnel prior to works commencing. The degree of risk associated with such activities can depend on a range of variables. The senior member of the field team should carefully consider:

- can the work be undertaken:
  - safely?
  - single-handed (alone) or are two or more personnel required?
  - only by a fully equipped specialist contractor?
  - from a position or structure that prevents entry into water?
- depth, turbidity and velocity of water
- stability of the channel bed
- type and height of the structure
- state of the river banks
- existence of upstream release structures
- extent of weed growth
- downstream hydraulics (e.g., a recirculating hole) and hazards (e.g., wood debris that may act as a sieve)
- any other variables that may require research and consideration.

2.5.3 Training and competency

The following general competencies should be addressed as a minimum:

- hydraulic features and hazards, including standing waves, eddy lines, holes and sieves
- wading techniques, including entry and exit points; assessment of velocity, depth and bed conditions from river bank; assessment of downstream hazards before entering; river crossing techniques; supported river crossing; and awareness and acceptance of personal capability of what can be safely waded
- PPE, including thigh versus chest waders, use of a chest strap, fitting of personal flotation devices, self and assisted rescue including survival swimming, avoidance of foot entrapment, throw-bag use, strainer negotiation, and management of injured/unconscious person
- risk management, including daily assessment of weather, rising/falling river levels, steep and unstable terrain management, and crisis management
- SOP peer review by trainer and inclusion of any extra related industry knowledge
- competency assessment against course outcomes by trainer, possibly followed by consideration of additional training or a modification to operational management
- sit-on-top kayak gauging techniques, if used. Includes PPE and self and assisted rescue.

Learning should be tailored to a team's requirements and be predominantly practical within a river environment. Generally a ratio of 1 trainer to 10 participants should not be exceeded. Training should enable participants to safely experience and practice rescue scenarios, while reinforcing that operational practice and risk assessment should avoid such situations.

Personal wading guidelines for specific monitoring sites should be developed and maintained.

A one- to two-day refresher training course should be done every two to three years.

It is important that a competency assessment system is developed that encompasses the type of environmental monitoring activity undertaken and that staff are assessed for competency on a prescribed basis.

2.6 Working with boats

2.6.1 Discussion

The operation of all vessels is governed by the Maritime Transport Act 1994, which applies to "every description of boat or craft used in navigation, whether or not it has any means of propulsion". The Health and Safety at Work Act 2015 also applies to commercial vessels as a place of work. These Acts and associated regulations and rules provide a framework for the safe operation, safe working environment and prevention of pollution on all waterborne craft. They also specify the duties of vessel owners/operators, skippers and other participants involved in boating activities.

Maritime New Zealand is the regulator responsible for the Maritime Transport Act and is also the agency for administering the Health and Safety at Work Act onboard boats.

Powered vessels used to undertake environmental monitoring are considered a commercial vessel. Safety management systems are required to ensure that commercial vessels are maintained and operated safely to prevent maritime accidents and to protect the environment.

Note that remotely controlled boats, such as those utilised for ADCP gaugings and bathymetric surveys, are considered powered vessels and therefore fall under the requirements of Maritime New Zealand rules and regulations.

The introduction of safety management systems in New Zealand is in line with a global move to put ongoing safety measures in place to prevent maritime accidents and place the responsibility of this on vessel owners and operators.

2.6.2 Guidance

An organisation should have an appropriate Safety Management System that includes a Maritime Operator Safety System (MOSS)[5] for boating operations and a Maritime Transport Operator Plan (MTOP). The MTOP documents and covers such things as a training programme, operating and emergency procedures, boat safety plans and boat guidelines. This plan covers all persons engaged under an organisation's activities whether the boat is owned by them or not.

Maritime New Zealand has a MTOP template[6] that provides guidance for operators so they can develop an operator plan that meets the requirements of Maritime Rules Part 19 – Maritime Transport Operator – Certification and Responsibilities.

Note: When developing or renewing your MOSS talk to your local Maritime Officer. Their free advice could save you valuable time and money.

There are four factors to consider for safe and successful boat operations:

- seamanship – includes boating experience, training, skills, health and safety awareness, communication, decision making and teamwork
- seaworthiness – includes vessel design and construction, maintenance and equipment
- system – includes health and safety plans, training, operator plans, risk assessment and emergency response
- environmental factors – tides, currents, sand banks, fog, submerged rocks etc.

2.6.3 Powered boat requirements

The requirements below apply to powered boat use in inland waterways, lakes, rivers and estuaries.

2.6.3.1 Skipper

One member shall be assigned the tasks of skippering the boat. The skipper is certified and as such is in command of the boat and all subsequent risk involved with the boating operation.

[5] https://www.maritimenz.govt.nz/commercial/safety/safety-management-systems/MOSS/entering-MOSS/default.asp
[6] https://www.maritimenz.govt.nz/commercial/safety/safety-management-systems/MOSS/entering-MOSS/operator-plan.asp

The skipper must comply with all maritime rules. This includes ensuring that basic boat safety equipment requirements are met and crew are aware of its location and operation.

2.6.3.2 Certification

The skipper or person in charge shall be certified and familiar with relevant Maritime New Zealand and Maritime Transport Operator Plan (MTOP) requirements. Motorised vessels must also hold a current Certificate of Survey and be operated in accordance with the MTOP. Skippers and crew should complete a safety induction and onboard training for any vessel they intend using.

2.6.3.3 Planning

Preliminary planning is essential for a safe and successful outcome of the work to be carried out. The skipper should be fully briefed as to the type of work to be carried out and the location. A comprehensive hazard assessment of the work to be carried should be held to ensure that the boat is fit for propose, is adequately equipped and the crew are capable of carrying out the work required.

2.6.3.4 Crew

Crew members should all be capable of swimming. Like jackets should be worn at all times while on the boat.

Survival suits should be worn when working in any body of water where short-term immersion in the water could result in the onset of hypothermia.

2.6.4 Autonomous commercial craft (remotely controlled boats) requirements

Remotely controlled boats that are utilised for environmental monitoring purposes (primarily utilised for, but not limited to, undertaking ADCP gauging and bathymetric surveys) are considered by Maritime New Zealand to be commercial vessels, and as such their use must comply with Maritime New Zealand Rules and regulations.

Therefore, these craft must also operate under MOSS, or under a specified limits plan under Part 20 of the Maritime Safety Act; 1994.

If these craft operate under a specified limits plan (part 20) then the 'skipper'/radio operator does not need to hold certification in accordance with maritime rule part 31, but they do still need to be appropriately trained and capable (i.e. a documented training programme must be in place). If the craft operate under MOSS (part 19) then part 31 still applies unless an exemption is submitted and granted.

These craft do not need to be registered in accordance with the ship registration act 1992, but they do require an MNZ number to be issued, and displayed, so that they comply with the relevant maritime rule (part 40C or 40G).

For further information see - https://www.transport.govt.nz/assets/Uploads/Guide-to-the-use-of-Small-Autonomous-Surface-Vessels-in-New-Zealands-Maritime-Area.pdf

and other Maritime New Zealand links contained within the Normative References section of this document.

2.7 Working with sit-on-top kayaks

2.7.1 Discussion

A kayak provides an alternative gauging method and a means of transport. It is used on selected rivers and water bodies to overcome issues of width and depth. While environmental monitoring personnel frequently work around water, many will not have kayaked before, nor will be familiar with managing associated risks of white water.

An organisation should develop an SOP that includes a similar range of factors as those noted in Section 2.6 for safe and successful boat operations: seamanship, seaworthiness, system and environmental factors. Use of a kayak for work does not require a ship survey or a Maritime Operator Safety System.

2.7.2 Guidance

The type of kayak covered in this document and recommended for undertaking environmental monitoring is a sit-on-top kayak. The use of kayaks with a cockpit and spray-skirt is discouraged due to the additional risks associated with exiting an enclosed kayak.

On moving water (e.g., rivers, tidal flow, where waves are present) kayaks should only be used for applications that enable the paddler to maintain their focus on the use of the paddle to control the direction of the kayak and maintain stability. On calm, still water bodies where navigational hazards and the direction and stability of the kayak do not require active management, the paddler may consider incorporating other work as appropriate (e.g., survey of plants around estuary margin).

Kayaks are used for undertaking flow gaugings where the kayak transports an Acoustic Doppler Current Profiler (ADCP) instrument across the flow. The ADCP should be mounted in a fixed position such that it does not impede boat control or self-rescue.

Kayak use is suitable for Grade 1 river sections only. Grade 1 white water can be identified by the presence of the following conditions:

- fast moving with riffles and small waves
- few obstructions, all obvious and easily avoided
- the risk to swimmers, if falling from the kayak, is slight, and
- self-rescue is easy.

Kayaks may also be used around lake and sea edges where relevant SOPs are complied with, and only:

- within 200 m of a lake or seashore, and
- in calm water and weather conditions.

Prior to carrying out kayak work, a job safety analysis should identify all potential risks and appropriate risk mitigation procedures, including but not limited to identifying or ensuring:

- site location and river flow are approved for operation as per internal SOP
- the purpose of the kayak operation (e.g., traverse main flow, access opposite bank, hand-held tagline deployment)
- the prevailing site conditions and how they may change (e.g., weather, flow, tide)
- the site-specific hazards during the period of work; these may include downstream rapids, trees, overhanging willows, wire, debris, rocks, high velocities, strong eddies, other boat traffic, swell
- a second person is available and equipped to act as a rescue buddy. Both personnel should have two forms of communications (e.g., voice and whistle)
- emergency procedures (e.g., bank/beach access and/or escape routes)
- appropriate PPE and other equipment available, including:
    - the rescue buddy has a 20 m throw-bag that shall be readily available
    - a sit-on-top kayak that is stable and easy to direct
    - a suitable paddle and river knife
    - a kayak helmet and personal flotation device, both of which must be worn, and
    - the paddler must wear footwear and clothing that will allow swimming, and be appropriate for prolonged immersion having regard for the current water temperature (e.g. neoprene chest waders or wetsuit and booties).

An organisation should develop an SOP for kayak use that includes (as a minimum):

- a list of approved sites with photos or maps identifying approved kayaking reaches, approved flow range, maximum distance from shore allowed and other environmental conditions. Locations for use should be approved by someone who is competent on Grade 3 white water and has completed a white-water river rescue course, or the equivalent sea kayak competencies, and has an understanding of how kayak use supports the monitoring being undertaken
- a job safety analysis tool, including a check of compulsory actions required prior to each gauging and a checklist of compulsory equipment
- a trip log of usage and experience gained at each site (to be referred to prior to future kayak use), and training and PPE.

2.7.3 Training and competency

Approval of sites and flow ranges suitable for kayak gauging should be by a person qualified with Grade 3 white-water kayaking capability and white-water river rescue training experience. This capability and training is a description of experience and judgement, allowing the person to be able to look upstream, downstream and at the site to consider what risks and consequences may exist at various flows, managing the risk for kayakers who are Grade 1 competent. Assessment considerations for each site should also be communicated to potential kayakers. If a team does not have such a person, someone from the wider staff team or a local training provider could be used. A trained and experienced person is to approve operational areas on lakes, inshore coastal margins and other water bodies.

The suggested minimum specific training and competency requirements for those using kayaks (paddler and rescue buddy) are:

- completed basic river safety training as outlined in Section 2.5.3
- paddler to have also completed basic white-water kayak training, including identifying moving water features, basic paddle strokes, self-rescue, getting on/off the kayak, getting back on the kayak in deep water
- PPE – fitting of a personal floatation device and kayak helmet
- current First Aid qualification, including CPR competency and hypothermia symptoms/treatment
- use of a job safety assessment tool for trip planning and risk management (refer Section 2.1)
- carrying and transport of kayaks
- understanding of the current peer reviewed SOP, and
- competency assessment by trainer against whitewater course outcomes, possibly followed by consideration of additional training and/or a modification to operational management.

Training should be tailored to a team's requirements and be predominantly practical. Generally a ratio of 1 trainer to 10 participants should not be exceeded. Training should enable participants to safely experience and practice rescue scenarios, while reinforcing that operational practice and risk assessment should avoid such risks.

A refresher training course should be done every two to three years and would generally be in conjunction with a refresher river/wading safety course.

It is important that a competency assessment system is developed that encompasses the type of environmental monitoring activity undertaken and that staff are assessed for competency on a prescribed basis.

2.8 Working with helicopters and fixed-wing aircraft

2.8.1 Discussion

Helicopter and fixed-wing aircraft operators are certified professionals who must conform to the rules set out by the Civil Aviation Authority. A safety briefing session should be held between the pilot and workers before operations commence.

The pilot will provide training and guidance for safe travel in the aircraft prior to your departure. They will also want to understand what risks you may be introducing during travel (e.g., type of load, weight, size) and at your work destination (eg, overhead lines, unstable landing terrain).

Where helicopters are employed for specific monitoring operations (eg, heli-gauging, coastal water quality sampling) an organisation should develop an SOP and consider if additional training is required (e.g., submerged helicopter evacuation training).

2.8.2 Guidance

Helicopters are generally used to provide access to monitoring sites in remote locations, with flight paths often crossing mountainous terrain and landing often being on unformed ground. Materials may be carried within the machine or slung underneath. Fixed-wing aircraft are generally used in environmental monitoring for aerial surveillance and photography of both populated and remote locations. Trip planning factors in Section 2.1 should be considered.

2.8.3 Training and competency

The suggested minimum training and competency requirements for those using helicopters and fixed-wing aircraft are:

- actions to manage operational hazards (e.g., spinning rotor blades, the exhaust, the recirculating downwash, static electricity on strops)
- PPE (eg, safety footwear, high visibility garments, eye protection, hearing protection) and communication
- preparing for ground operations and helipad
- procedures and safety measures to operate within the aircraft (eg, photography through open door), and
- emergency procedures.

A useful reference for helicopter work is https://safetree.nz/wp-content/uploads/2015/03/Working-with-Helicopters.pdf.

2.9 Working with remote controlled craft (drones and boats)

2.9.1 Discussion

The use of remote controlled craft in both private and professional capacity, both in the air and on the water, has grown quickly. The use of these craft for data collection has created extra monitoring opportunities, cost savings, and benefits to the health and safety aspects of work. However, the use of remote controlled craft comes with rules and regulations which, by law, must be followed.

2.9.2 Guidance

2.9.2.1 Remotely piloted aircraft systems

Remotely piloted aircraft systems (RPAS), such as drones, can be a hazard to people, property and other aircraft. It is important to know the rules before you fly and be able to apply them. If you are found in breach of these rules you could face prosecution or disciplinary action by the Civil Aviation Authority (CAA).

RPAS pilots need to follow the 'Rules and regulations for unmanned aircraft in New Zealand'[7].

When flying RPAS, CAA Part 101 rules must be followed as a minimum and may be done without obtaining a formalised qualification, depending on your organisation's policies and guidelines. CAA Part 102 certification, which incorporates training and a certification process, may be needed depending on the operating environment or if your workplace requires it.

Rules under CAA Part 101 include:

- the RPAS must NOT exceed 25 kg and must always be safe to operate and well maintained
- you must take steps to minimise hazards to people, property and other aircraft
- you must only fly during daylight, unless you are doing a shielded operation
- you must give way to all crewed aircraft, e.g., planes, helicopters, hang gliders and paragliders. You must land your RPAS immediately if another aircraft approaches
- you must be able to see your RPAS with your own eyes at all times. Don't watch it through binoculars, a monitor or smartphone. Do not fly it behind objects or through or above fog and cloud
- you must fly below 120 metres (400 feet) above ground level
- you must get consent before flying over people and property, and
- you must be aware of no-fly zones – check for any airspace restrictions in your area before you fly.

Before using any RPAS it is advisable that your organisation develop a policy to provide a framework to enable the safe and efficient use of this technology. This should go hand in hand with your organisation's Privacy Policy because of the use of camera equipment and possible encroachment on private space.

Certification in accordance with CAA Part 102 is not absolutely necessary in order to operate in accordance with the CAA Part 101 rules. However, it is highly recommended that organisational policy should state a requirement for all pilots to be professionally trained and assessed as competent, or equivalent competency assessed, in order to assure compliance and understanding of these rules. If CAA Part 101 rules cannot be followed Part 102 certification is mandatory.

The CAA, in conjunction with Unmanned Aerial Vehicles New Zealand (UAVNZ) and Airways, have set up the Airshare website to provide information for RPAS users. This website provides information on how to operate the RPAS safely, plan flights and request access to controlled airspace.

Flight planning check lists should include guidance for:

- pre-flight planning (consents/permissions, locations, flight purpose, signage, hazard assessment, staff involved, weather, local restrictions/bylaws/PPE)
- pre-flight technology checks (battery condition and charge, RPAS and props condition and test, controller functions, condition and charge, camera, memory card)

[7] https://www.aviation.govt.nz/drones/rules-and-regulations-for-drones-in-new-zealand/

- hazard identification, risk management and incident reporting
- post-flight assessment (RPAS condition, incidents, learnings or improvements)
- list of staff involved
- contacts, and
- flight data/image checks (for control and correct treatment of collected images).

Helpful references:

- AirShare: www.airshare.co.nz
- AIP NZ: www.aip.net.nz
- CAA Rules: www.caa.govt.nz/rules/rules
- CAA Advisory Circulars: www.caa.govt.nz/rules/acs
- CAA Rule Change Notification Service: https://notifications.caa.govt.nz/
- Contact CAA after an incident: 0508 447 2338: CA005@caa.govt.nz
- Unmanned boats (https://www.transport.govt.nz/assets/Uploads/Guide-to-the-use-of-Small-Autonomous-Surface-Vessels-in-New-Zealands-Maritime-Area.pdf)

The use of remote controlled boats is relatively new and little formalised safety guidance in their use exists. Users should carefully identify, consider and manage the following and any other risks identified:

- weight of craft and requirements for safe handling and operation
- safe access for launching and retrieval of a boat, and
- potential impacts on other users of the river.

2.10 Working at height

2.10.1 Discussion

Working at height means working in a place where a person could be injured if they fall from one level to another. This can be above or below ground level.

Working at height does not include slipping, tripping or falling at the same level.

In some cases, due to changes in regulations over time, it may be mistakenly believed that no controls are needed where a person faces a fall of less than three metres. That belief is wrong and ignores the overarching duties in the Health and Safety at Work Act 2015 (HSWA).

The HSWA requires that if there is a potential for a person at work to fall from **any** height, reasonable and practicable steps must be taken to prevent harm from resulting.

Examples of environmental monitoring situations that may be classified as working at height are:

- construction projects
- use of ladders

- working on roofs, steep banks or cliffs
- working above or within pits (confined space hazards may also need to be considered), and
- walkways to environmental housings.

Consideration should be given to:

- can design changes be put in place to prevent a fall hazard being present?
- specialist procedures, equipment and training to reduce risk, and
- rescue procedures should a fall or other incident occur.

2.10.2 Guidance

First preference is to avoid working at height and the resulting potential for a fall. This is often made possible through engineered alternatives or shifting monitoring work to a nearby location.

If working at height is deemed necessary then safer design and controls can be utilised to minimise risk.

Examples of safer design and controls are:

- use of low maintenance solutions
- placement of equipment at lower levels, and
- installation of isolation and minimisation controls such as handrails or fall arrest equipment.

Extensive and useful guidance can be sourced from WorkSafe[8].

There are multiple types of working at height and specific Job Safety Analysis (JSA) should be undertaken and necessary controls developed and implemented for each situation. While the focus is on preventing a fall, similar effort should also be placed in preparing a response plan if a fall does occur, as many of the places where monitoring is undertaken are challenging or remote.

Specialist procedures, equipment, training and notifications to WorkSafe must be established and adhered to. In some cases it may be more effective to obtain specialist contractor support.

2.10.3 Training and competency

Those undertaking work at heights should have an appropriate level of training and competency with a refresher frequency of not greater than three years.

There is a significant range of work that occurs at height and correspondingly there is a wide range of training options available to cover the needs. A non-exhaustive list of training providers is provided in Annex 1.

[8] https://worksafe.govt.nz/topic-and-industry/working-at-height/

Although training can be conducted in the classroom or on the ground, it is recommended that realistic workplaces and equipment are utilised to ensure the training is specific to the work environment and contextualised specifically to those doing the work. It is useful to provide a copy of the developed control safe system of work for working at height to the training provider to allow them to take account of this as part of the course.

Figure 3 – Task-specific training in fall arrest systems and rescue techniques occurring on a manned cableway

If working at heights that are considered to be minor, such as working from a step ladder or low raised platform, then an assessment of competency may be all that is required. However, these competency assessments should be developed specific to the type of work being carried out and reassessed on a periodic basis.

2.11 Confined spaces

2.11.1 Discussion

A confined space is classified as an enclosed or partially enclosed space that is not intended or designed primarily for human occupancy and may present a risk from one or more of the following at any time:

- unsafe concentration of harmful airborne contaminants
- unsafe concentration of flammable substances
- unsafe levels of oxygen

- substances that can cause engulfment, and
- possible restricted means for entry and exit.

Any work that may incorporate any of the above needs to be assessed to determine if it is a confined space and controls put in place if it is.

Examples of environmental monitoring situations that may be classified as working in confined space are:

- construction projects
- working in stilling wells
- constructing and operating lysimeter pits
- working in rivers which may rise quickly and result in poor or confined access, and
- culverts.

Consideration should be given to putting design changes in place to prevent a confined space being present. Specialist procedures, equipment, training and notification to WorkSafe is required if a confined space is present, so it is therefore advisable to avoid working in or creating a confined space.

2.11.2 Guidance

First preference is to avoid creating or entering a confined space. This is often made possible through engineered alternatives or shifting monitoring work to a nearby location. In some cases, the work can be done from outside the confined space.

If confined space work is deemed necessary there are strict requirements when working in a confined space that must be adhered to. Guidance can be sourced from WorkSafe[9] and must be followed.

Specialist procedures, equipment, training and notifications to WorkSafe must be established and adhered to. In some cases it may be more effective to obtain specialist contractor support.

2.12 People and animals

2.12.1 Dogs and other animals

2.12.1.1 Discussion

Uncontrolled animals in areas being accessed for environmental monitoring is a risk that should be considered even if none are observable at the time of entry.

Animal welfare may also be an issue. For example, farmers may not want you to access a particular area due to sick animal, lambing etc.

[9] https://WorkSafe.govt.nz/topic-and-industry/planning-entry-and-working-safely-in-a-confined-space/

2.12.3 Guidance

It is recommended that workers:

- contact the property owner to assess if it is safe to enter and if animals are an issue
- avoid going into paddocks with bulls or other potentially dangerous animals
- have some understanding of how to move around or through livestock if it is absolutely required, and
- have undertaken a form of dog behaviour recognition and risk management training.

2.12.4 People

2.12.4.1 Discussion

Unfortunately, members of the public or landowners must be considered a potential risk either in residential or remote areas. People may:

- have had prior negative dealings or perception of the monitoring agency
- not be aware of why you are on a property
- be willing to take advantage of a remote location to intimidate, abuse or steal
- be undertaking illegal activities, e.g., manufacturing or growing drugs
- have a medical issue or be under the influence of drugs or medication, or
- be stressed due to environmental impacts, e.g., being impacted by flooding.

2.12.4.2 Guidance

It is recommended that workers:

- contact the property owner to gain approval to access a property and make an informed assessment about likely behaviour based upon the conversation
- undertake some sort of conflict resolution training
- consider working in pairs at remote or unknown locations
- have formal identification
- have some sort of emergency SOS contact if needed
- consider colour of clothing being worn in areas with gang presence
- have a system for recording and identifying people and property risk sites, and
- have access to counselling should an incident occur.

2.13 Electrical

2.13.1 Discussion

The use of electricity is a familiar and necessary part of undertaking environmental monitoring work.

Commonly, environmental monitoring utilises battery-powered environmental monitoring stations and equipment. In general, these installations are very small, have limited energy storage and have been built without reference to external standards. A common misunderstanding is that because these are low voltage (<60 V direct current) systems there is little risk, but both high or low voltage electricity can kill or severely injure people and cause damage to property.

Many environmental monitoring sites operate with thousands of amps of potential short circuit current, potentially lethal battery and solar voltages, and mains voltages from inverters or grid.

Environmental monitoring has a long history in New Zealand and many older electrical installations may have been appropriate at the time of installation but do not meet current requirements. Therefore, all monitoring installations and equipment should be regularly reviewed and, if needed, upgraded to meet current standards.

2.13.2 Guidance

Environmental monitoring-related electrical installations may not be a particularly good fit to any one of the existing electrical standards, which are targeted around larger installations; however, the construction and use of systems using electricity should be safe. Relevant parts of New Zealand standards that apply to the operation of power supplies, battery banks and associated generators, battery chargers and solar panels should be followed.

Installation and operation of environmental monitoring equipment needs to be safe, legal and appropriate to needs, and be installed by appropriately skilled and trained staff.

Relevant standards at the time of publication are:

- AS/NZS 3000:2018 Electrical Installations
- AS/NZS 4509.1 and 4509.2 Stand-alone power systems
- AS/NZS 5033:2014 Installation and safety requirements of photovoltaic (PV) arrays
- AS/NZS 60950.1:2011 Information technology equipment—Safety
- AS/NZS 3010:2017 Electrical installations - Generating sets.

Note: The above AS/NZS documents were correct at the time that this document was published however, users of this document should at all times ensure that they are utilising the most current version of these AS/NZS documents.

Any equipment or enclosures with electrical voltages present should be resistant to water ingress during normal operation.

When batteries are being used appropriate consideration should be given to:

- transportation to prevent shorting of connection terminals, excessive weight, gas emissions, fluid spills or damage to the battery
- the physical size and weight of batteries and how to move them
- appropriate venting to prevent the build-up of vented gases
- prevention of falling or movement during earthquakes or similar, and
- care and disposal.

2.13.2.1 High voltage

Unless the worker holds appropriate electrical registration, no modification may occur on any mains-powered circuits. All work involving high voltage systems shall be undertaken by a registered and competent electrician or electrical engineer.

Mains voltage equipment shall be configured as an appliance and shall be connected to its power supply only by a conventional plug.

Enclosures with mains voltages shall be entirely weather tight during normal operation. During inclement weather care must be taken to ensure there is no possibility of water ingress to mains-powered circuits if you are working in the enclosure.

Monitoring installations and equipment should only be accessible to authorised personnel and shall be regularly reviewed and maintained to meet current standards, testing requirements and certification.

2.13.2.2 Low voltage

Electrical installations at low and extra low voltage shall be installed in accordance with the requirements of the New Zealand Electrical Regulations. Useful guidance on low and extra low voltage electrical installations is available at WorkSafe[10].

2.14 Chemicals, sprays and other hazardous substances

2.14.1 Discussion

About 150,000 workplaces throughout New Zealand use hazardous substances. The risks they pose are often underestimated. When undertaking environmental monitoring the worker may be exposed to hazardous substances from maintaining a monitoring site, calibrating or validating an instrument or from the componentry or method used within instrumentation. Serious harm can result if not managed safely.

Not understanding the harm that can occur when working with hazardous substances can have serious consequences. Between 600 and 900 New Zealanders are estimated to die from work-related illness every year, many from exposure to hazardous substances. Exposure to different hazardous substances affects people in different ways. Health effects can include personality changes, sleep disorders, memory loss, cancer, fertility problems and even death. These serious

[10] https://www.worksafe.govt.nz/topic-and-industry/electricity/installations-and-networks/low-voltage-electrical-installations/

health risks are why it is so important to safely manage the hazardous substances at the workplace and protect the health and wellbeing of workers and others in nearby areas.

2.14.2 Guidance

The Health and Safety at Work (Hazardous Substances) Regulations 2017[11] are the legal requirements that must be followed by all organisations that use and store hazardous substances in New Zealand.

WorkSafe.govt.nz also has information and guidance for working with hazardous substances.

The Hazardous Substances Toolbox[12] provides information, tools and support material towards managing use, handling and storage of the hazardous substances at work safely and forms a key resource for managing risk. The Toolbox also helps you meet your obligations under the Health and Safety at Work Act and the Health and Safety at Work (Hazardous Substances) Regulations.

The Toolbox has five simple steps to managing hazardous substances and these should be followed:

1. Prepare an inventory
2. Assess the risk and eliminate or minimise them
3. Use and store substances safely
4. Prepare for and be able to respond to an emergency
5. Put in place key controls.

Everyone at the workplace must have access to information, training, instruction and appropriate supervision. They need to protect themselves from the risks of hazardous substances they use or to which they are exposed. If they don't have this knowledge or experience, they need to be supervised by someone who does.

Workers also need to know where to find information about how to safely handle and store hazardous substances in the workplace and the hazards these substances can cause. Safety data sheets (SDS) provide important information about hazardous substances. It is mandatory to have a current SDS for each of the hazardous substances in the workplace regardless of the quantity held.

A safety data sheet provides comprehensive information about the properties of a hazardous substance, how it affects health and safety in the workplace and how to manage these risks. It explains how the substance should be safely used, stored, transported and disposed of. It provides first aid information, information about the personal protective equipment that the person handling the substance should wear and what to do in the event of an emergency, such as a spill or fire.

[11] http://www.legislation.govt.nz/regulation/public/2017/0131/latest/DLM7309401.html
[12] www.hazardoussubstances.govt.nz

2.14.2.1 Training and competency

Workers must be adequately trained in the management and use of hazardous substances. Training needs to cover all plant, objects, substances or equipment the worker may use or handle, including PPE (how to wear, use, clean and store it safely) and control measures in place to reduce risks caused by those hazardous substances. The training and instruction need to reflect:

- the nature of the work
- what is known about the risks involved with the work at the time the supervision and training is provided, and
- control measures that are in place to reduce the risks caused by those hazardous substances.

The training and instruction need to cover:

- the hazards of the hazardous substances that the worker will work with (e.g., are they flammable, corrosive, toxic)
- the control measures in place to reduce the risks caused by those hazardous substances
- how to safely use, handle, manufacture, store and dispose of the substances – including any specific duties the worker has under the regulations (eg, making sure tanks are not filled beyond their maximum filling level), and
- what the worker needs to do in an emergency involving the hazardous substances.

Make sure that your worker gets the practical experience they need in your workplace under direct supervision and that a record is kept of the training and instruction provided to the worker. If a worker has previous training from another workplace an induction and supervised experience in the workplace still needs to be obtained and signed off.

2.15 Air Quality Monitoring

2.15.1 Discussion

Air quality monitoring uses specialist equipment, gases and housings and carries some generic potential risks that should be considered. Some risks and methods to avoid or mitigate them are:

- access to housings and instrument inlets are commonly at height, and should have necessary safety controls in place to address fall and trip hazards
- some equipment may have radioactive or dangerous light sources present so equipment should only be serviced or disposed of as described by the manufacturer
- gases used shall have necessary signage, hardware and controls in place to ensure they do not present a hazard. Consideration should be given to gases exhausted by equipment and prevention of a gradual build-up of gas levels within equipment shelters
- instruments, rack systems and power supplies should be installed and labelled in a tidy manner to minimise potential hazards, and
- noise levels from instruments and pumps should not cause a potential health hazard to staff.

2.16 Electric fishing

2.16.1 Discussion

Electric fishing is a task performed as part of ecological investigations. There are several factors to consider when establishing guidelines for the safe operation of electric fishing. Particular consideration should be given to:

- other relevant chapters of this document, such as Section 2.5 (Working in and around water) and
- the inherent risk of mixing electricity and water.

Electric fishing is, by its nature, a potentially dangerous operation. An electric fishing machine is capable of producing sufficiently high voltages and currents to cause lethal electric shock. Therefore, it is essential that users of the equipment have a good understanding of general electric fishing principles and necessary training.

2.16.2 Guidance

Electric fishing machines have a significant weight of 10–12 kg, so attention should be given to the added fatigue form carrying a machine. This is particularly significant given the working environment of being in a body of water and the impact on manoeuvrability.

Additional safety precautions include, but are not limited to:

- maintaining the equipment in good condition at all times
- inspecting the casing prior to every use to ensure a watertight seal is maintained, there is nothing loose or damaged inside the machine and that all external cables and connections are in good condition. If in doubt get the unit serviced by an authorised agent. Do not attempt to service the machine yourself
- regularly checking the operation of all safety switches, kill switches, tilt switches and auto rest functions of the wand
- always safely transporting the equipment and ensuring the equipment is safely stowed before travelling. This is particularly critical with the batteries; refer to Section 2.13.2 regarding safe transportation of batteries
- completing a site risk assessment before commencing fishing. This should take into account people outside the fishing team who may enter the waterway. Signage or cordoning off of the fishing area may be required
- wearing watertight neoprene waders and rubber gloves
- always electric fishing in a team of two or more. At least one team member should be licensed or suitably trained/experienced
- clearly communicating to all nearby parties when the waterway is about to become ‘live’, by using commands such as ‘fishing’ or ‘sampling’
- not electric fishing in the rain or other adverse conditions, including fast water flow, high winds or lightning
- not touching any live part of the machine or the water when the batteries are fitted to the machine

- not carrying any metal objects when electric fishing, and
- always disconnecting and removing the batteries before charging. Never charge the batteries in the electric fishing machine.

2.16.3 Training and competency

Electric fishing should be undertaken by a team of at least two people including at least one trained and experienced user. The experienced worker is to provide guidance to those who are less familiar with safe electric fishing practice.

NIWA provide a training course for those users who wish to formalise their training. Training should always be specific to the machine being used.

It is recommended that organisations and operators review their procedures as new electric fishing machines become available.

2.17 Structures

Many types of structures are utilised for environmental monitoring, many of which have been in place for many years or were constructed prior to current regulations and practices.

When undertaking environmental monitoring it is recommended that:

- older structures that may have been constructed under a different regulatory environment are independently reviewed by an appropriate certified practitioner in terms of current condition and regulations
- any variations that exist with the structure compared to current regulations are placed into an asset management process for prioritisation and rectification
- staff are made aware of on-site variations to current regulations, and necessary hazard controls are put in place to mitigate risk until corrective actions occur, and
- structures and equipment are put into a formalised audit process to ensure they meet current regulations in the future.

The NEMS *Hydrological and Meteorological Structures* provides useful information in relation to structures.