



Australian Government

MSS025006 Collect and evaluate groundwater data

Release: 1

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Modification History

Release 1. Supersedes and is equivalent to MSS025006A Collect and evaluate groundwater data

Application

This unit of competency covers the ability to obtain, preserve and transport representative samples of groundwater for laboratory analysis; measure bore conditions; test chemical, physical parameters in the field; and to process data and interpret results. Personnel usually work within an existing sampling or monitoring plan, continually monitor levels of risk and use specified safe working procedures and equipment. They are also required to work closely with drillers during the construction of wells and bores to prevent contamination of samples, obtain logs and manage waste.

Note: This unit does not cover laboratory-based analysis of groundwater which is addressed in *MSL974003 Perform chemical tests and procedures* and *MSS02501 Perform environmental microbiological tests*.

This unit of competency is applicable to environmental technicians in a range of industry sectors, such as environmental services (e.g. sampling and monitoring of air quality, water, soil and noise); environmental compliance, auditing and inspection; groundwater and clean water (e.g. catchments, supply and environmental flows); water treatment, storm and wastewater management; solid and hazardous waste management; management of contaminated sites; site remediation or rehabilitation; geotechnical services and civil engineering; and natural resource management.

While no specific licensing or certification requirements apply to this unit at the time of publication, environmental monitoring and management activities are governed by relevant legislation, regulations and/or external accreditation requirements. Local requirements should be checked.

Pre-requisite Unit

Nil

Competency Field

Sampling and testing

Unit Sector

Environmental

Elements and Performance Criteria

Elements describe the essential outcomes.

Performance criteria describe the performance needed to demonstrate achievement of the element.

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| 1 | Confirm groundwater data requirements with supervisor | 1.1 | Confirm the scope and purpose of sampling/monitoring data requirements. |
| | | 1.2 | Review available site information, such as site plan, bore locations, construction and history of sampling/monitoring. |
| | | 1.3 | Confirm the sampling methods, locations, numbers and types of samples, and duration/frequency of sampling from workplace or client's sampling plan. |
| | | 1.4 | Check that all sampling/testing procedures are in accordance with client or workplace requirements, relevant standards and guidelines. |
| 2 | Prepare for groundwater sampling and monitoring | 2.1 | Identify site and sampling hazards and review workplace safety procedures. |
| | | 2.2 | Liaise with relevant personnel to arrange site access and obtain all clearances and/or permits, as necessary. |
| | | 2.3 | Review field sampling procedures and sample preparation methods required for specific laboratory analyses. |
| | | 2.4 | Select purging/sampling equipment and sampling conditions to achieve representative samples and preserve sample integrity during collection, storage and transit. |
| | | 2.5 | Ensure all reagents, solutions, standards and blanks (as appropriate) are obtained and/or prepared ready for field use. |
| | | 2.6 | Select field test equipment/instruments and check operation and calibration, as required, in accordance with methods/procedures and manufacturer instructions. |
| | | 2.7 | Assemble and stow all sampling equipment, field test equipment, materials, containers and safety equipment. |
| | | 2.8 | Arrange suitable transport to, from and around site as |

required.

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| 3 | Liaise with drillers during establishment of wells and bores | <div style="padding-left: 20px;">3.1 Confirm location of well or bore and groundwater monitoring requirements using site sampling and monitoring plan.</div> <div style="padding-left: 20px;">3.2 Examine the drilling/construction area to identify possible hazards.</div> <div style="padding-left: 20px;">3.3 Ensure proposed drilling/construction method will not cause contamination and that casing, drilling fluids and any other materials used in the bore are free of contaminants.</div> <div style="padding-left: 20px;">3.4 Ensure drilling and sampling equipment is cleaned thoroughly before drilling commences.</div> <div style="padding-left: 20px;">3.5 Ensure protective casings and screens are kept in their protective coverings prior to installation.</div> <div style="padding-left: 20px;">3.6 Monitor drilling to accurately log samples as required and prevent their contamination.</div> |
| 4 | Conduct representative sampling of groundwater | <div style="padding-left: 20px;">4.1 Locate sampling locations and services at the site and identify possible hazards.</div> <div style="padding-left: 20px;">4.2 Conduct sufficient measurements to accurately determine water level and bore depth, as required.</div> <div style="padding-left: 20px;">4.3 Record bore/environmental conditions and any atypical observations made during sampling that may impact on sample representativeness or integrity.</div> <div style="padding-left: 20px;">4.4 Conduct purging in accordance with defined procedure or method, collect the waste and decontaminate the equipment used.</div> <div style="padding-left: 20px;">4.5 Collect required representative samples and ensure all controls, blanks and replicate samples are properly integrated into the sampling process.</div> <div style="padding-left: 20px;">4.6 Record all information and label samples in accordance with chain of custody/traceability requirements.</div> <div style="padding-left: 20px;">4.7 Filter and prepare samples to preserve their integrity for subsequent analysis.</div> |

- 4.8 Secure and transport all samples back to base in accordance with workplace procedures and relevant guidelines.
- 5 **Conduct field testing of groundwater**
 - 5.1 Assemble required monitoring instruments, equipment, and reagents and conduct pre-use checks in accordance with manufacturer instructions.
 - 5.2 Retrieve samples for designated field tests or locate established locations for in-situ testing.
 - 5.3 Set up, calibrate and operate equipment/instruments in accordance with test methods/procedures and manufacturer instructions.
 - 5.4 Take sufficient measurements of groundwater field parameters to obtain reliable data and in accordance with specified methods/procedures.
 - 5.5 Record all field observations/data and ensure that they are accurately transferred to workplace information database.
- 6 **Process and interpret groundwater data**
 - 6.1 Review test data noting atypical observations.
 - 6.2 Ensure calculated values are consistent with expectations.
 - 6.3 Estimate and document uncertainty of measurements in accordance with workplace procedures, if required.
 - 6.4 Record and report processed results in accordance with workplace procedures.
 - 6.5 Interpret trends in data and/or results and report out-of-specification or atypical results promptly to appropriate personnel.
 - 6.6 Determine if obvious procedure or equipment problems have led to atypical data or results.
 - 6.7 Compare results with established groundwater quality standards, statutory environmental quality concentration limits or similar, if relevant.

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| | | 6.8 | Finalise reporting of results in accordance with workplace requirements. |
| 7 | Maintain a safe work environment | 7.1 | Use defined safe work practices and personal protective equipment (PPE) to ensure personal safety and that of others. |
| | | 7.2 | Rehabilitate sampling site to render it safe and to minimise environmental impact. |
| | | 7.3 | Clean/decontaminate all equipment, containers, work area and vehicles according to workplace procedures. |
| | | 7.4 | Check serviceability of all equipment before storage. |
| | | 7.5 | Minimise the generation of wastes and environment impacts. |
| | | 7.6 | Liaise with relevant personnel for the safe collection of all hazardous wastes for appropriate disposal. |

Foundation Skills

This section describes those required skills (language, literacy and numeracy) that are essential to performance.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Legislation, regulations, standards, codes, workplace procedures and requirements include the latest version of one or

- federal legislation, such as the Environment Protection and Biodiversity Conservation Act, and National Environmental Protection Measures
- state/territory government legislation and local government by-laws, policies, regulations and plans dealing with land use, acquisition, planning and protection; water and water management; pollution and contaminated sites; mining operations
- legislation, standards and codes of practice for work health and

more of:

- safety (WHS) and handling of dangerous goods
- government policies dealing with sustainable development and environmental impact assessment
- Australian and international standards covering environmental management, such as AS/NZS ISO 14000 Basic Set:2007 Environmental Management Basic Set; and sampling of groundwater, such as AS/NZS 5667 Water quality series
- industry guidelines, such as Australian Drinking Water Guidelines; Australian and New Zealand Guidelines for Fresh And Marine Water Quality; and Geoscience Australia's field guide for groundwater sampling and analysis
- registration/licensing and/or accreditation requirements
- information for specific sites, such as applicable legislative requirements and approval requirements, site access and work schedules, groundwater monitoring, sampling and in-situ test procedures
- workplace documents, such as standard operating procedures (SOPs); equipment manuals and warranties; job hazard analyses; work method statements; safety data sheets (SDS) and safe work procedures; waste minimisation, containment, processing and safe disposal procedures.

Workplace procedures for field activities include one or more of:

- use of field notebooks or log books
- standard operating procedures covering fieldwork, sampling and testing
- equipment operating manuals, calibration procedures, instrument fault-finding procedures and general maintenance and repair procedures
- emergency, first aid and survival procedures
- requirements related to protection of the environment
- use of incident/accident/injury report forms.

Sampling/monitoring plans include one or more of:

- purpose of sampling, such as:
 - identification of aquifers, leakage and hydraulic connection of aquifers
 - assessment of groundwater movement, flow, recharge and discharge and quality
 - assessment of salt, nutrients, pesticides and other contaminants
- sampling criteria, such as:
 - spatial and depth distribution within target
 - depth to water level for shallow/deep aquifers
 - contamination potential and land use
 - nature of recharge/discharge mechanisms

- diversity of groundwater use
- bore accessibility and bore equipment availability
- sampling frequency/duration depending on purpose, such as level, quality indicators (e.g. temperature and electrical conductivity), long-term quality parameters and could be continuous, hourly, daily, monthly, quarterly, six monthly, annual and long term.

Site and sampling hazards include one or more of:

- risk of surface collapse around old wells
- unsafe stages and ladders
- working in confined spaces, such as wells, boreholes, wellheads and basements
- exposure to contaminated groundwater and confined space atmospheres
- solar radiation, dust and noise
- handling bulky or heavy equipment.

Safe working procedures include one or more of:

- use of safety harness, suitable clothing and boots, sunglasses, hat and gloves and sunscreen
- use of breathing apparatus
- ensuring two persons are present during sampling of wells (one at the surface)
- testing of atmosphere for oxygen deficiency and flammable/toxic vapours
- working upwind of known contaminants
- prohibition of eating, drinking and smoking
- separation of heavy equipment into smaller units/cases for transport
- location and avoidance of site utility services
- securing and counterbalancing of pumps and water filled hoses down the hole
- testing and earthing of electrical generators, trip out devices and connectors (especially at waterlogged sites)
- shielding of hot surfaces and exhausts
- careful handling of glass containers and preservatives
- regular medical checks
- access to drinking water, first aid equipment and mobile phone.

Drilling and construction of wells and bores includes one or more of:

- drilling techniques, such as auger, rotary air, rotary mud, cable tool, direct push technologies, sonic drilling and vibro coring
- bore construction techniques, such as:
 - use of PVC, stainless steel and fibreglass casings

- mechanical casing joints
- screen and gravel packs
- cement or bentonite seals
- lockable caps, bore name and ID label
- piezometer construction techniques, such as:
 - shallow piezometers
 - bundled mini piezometers.

Purging and field sampling equipment include one or more of:

- Teflon, glass and stainless steel items
- bailers and cords, and syringe devices
- air-lift, suction-lift, gas operated, bladder, submersible, inertial (foot pump) and submersible piston pumps
- inlet screens
- flow meter water sampler
- groundsheets, scrubbing brushes, hoses, buckets, jerry cans and waste containers
- cables, batteries, generator and air compressor
- tripods, stands, swivelling blocks and tools
- eskies and ice

and will vary according to the position of the sampler intake, purge criteria used and composition of the groundwater to be sampled.

Sample preparation and transport include one or more of:

- filtering groundwater samples using syringes, filter capsules and hand operated pumps
- sample preparation for major and minor chemistry, nutrients and isotope analysis
- sampling and filtration for incubated microbiology samples
- collecting samples of dissolved and entrained or evolving gases
- labelling and packing of samples to ensure integrity, traceability, preservation and prevention of cross-contamination during transit
- sample delivery within specified holding times.

Field testing equipment and instruments include one or more of:

- maps, global positioning system (GPS), two-way radio and mobile phone
- tape measures and weights, plover/samplers and water level meters
- flow cells
- parameter specific meter or multi-probes, such as dissolved oxygen, electrical conductivity, pH, turbidity, nitrates, phosphates

and temperature

- field test kits for parameters such as dissolved gases, chemical anions and cations, heavy metals, E. coli and biological oxygen demand (BOD)
- portable colorimeters and field microscopes
- portable gas analyser for CH₄, O₂, CO₂, CO and H₂S
- sterile sample bottles and other sample containers specific to analytical method
- reagents, calibration solutions and cleaning solutions
- media/substrates for presence or absence microbiology field tests
- filters and sieves
- data loggers and digital camera
- equipment manuals and sampling/testing procedures.

Field measurements/tests include one or more of:

- measuring depth of bores and water levels
- pH and temperature
- electrical conductivity
- dissolved oxygen
- redox potential
- alkalinity using burette titration and alkalinity titrator
- presence or absence microbiology field tests
- field gas analysis for CH₄, O₂, CO₂, CO and H₂S.

Field observations and data include one or more of:

- sampling point name, location, time, date and type
- nature of aquifer and water bearing strata
- well/bore dimensions and description of conditions
- pumping status, depth of pump suction and/or discharge
- water level within well or borehole
- method of sampling and depth of sampling
- sample appearance when collected (colour, clarity and odour)
- results of on-site analysis (e.g. pH, electrical conductivity and dissolved oxygen)
- details of sample preservation techniques used
- details of on-site filtration (e.g. filter pore size)
- details of sample storage method required/used
- name of sample collector.

WHS requirements include:

- compliance with relevant federal/state/territory WHS legislation at all times
- assuming that samples are potentially hazardous and applying standard precautions

- accessing and applying current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and state/territory Departments of Health, where relevant.

Unit Mapping Information

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Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.education.gov.au/Pages/TrainingDocs.aspx?q=5b04f318-804f-4dc0-9463-c3fb9a3fe998>