



Australian Government

Department of Education, Employment and Workplace Relations

MSS025006A Collect and evaluate groundwater data

Release: 1

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Modification History

Not applicable.

Unit Descriptor

This unit of competency covers the ability to obtain, preserve and transport representative samples of groundwater for laboratory analysis; measure bore conditions and 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 *MSL974003A Perform chemical tests and procedures* and *MSS025012A Perform environmental microbiological tests*.

Application of the Unit

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
- natural resource management.
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Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

Not applicable.

Elements and Performance Criteria Pre-Content

Not applicable.

Elements and Performance Criteria

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 enterprise or client's sampling plan
		1.4	Check that all sampling/testing procedures are in accordance with client or enterprise requirements, relevant standards and guidelines
2	Prepare for groundwater sampling and monitoring	2.1	Identify site and sampling hazards and review enterprise 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
- 3 Liaise with drillers during establishment of wells and bores
 - 3.1 Confirm location of well or bore and groundwater monitoring requirements using site sampling and monitoring plan
 - 3.2 Examine the drilling/construction area to identify possible hazards
 - 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
 - 3.4 Ensure drilling and sampling equipment is cleaned thoroughly before drilling commences
 - 3.5 Ensure protective casings and screens are kept in their protective coverings prior to installation
 - 3.6 Monitor drilling to accurately log samples as required and prevent their contamination
- 4 Conduct representative sampling of groundwater
 - 4.1 Locate sampling locations and services at the site and identify possible hazards
 - 4.2 Conduct sufficient measurements to accurately determine water level and bore depth, as required
 - 4.3 Record bore/environmental conditions and any atypical observations made during sampling that may impact on sample representativeness or integrity
 - 4.4 Conduct purging in accordance with defined procedure or method, collect the waste and

- decontaminate the equipment used
- 4.5 Collect required representative samples and ensure all controls, blanks and replicate samples are properly integrated into the sampling process
 - 4.6 Record all information and label samples in accordance with chain of custody/traceability requirements
 - 4.7 Filter and prepare samples to preserve their integrity for subsequent analysis
 - 4.8 Secure and transport all samples back to base in accordance with enterprise 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 enterprise 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 enterprise procedures, if required

- 6.4 Record and report processed results in accordance with enterprise 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
 - 6.8 Finalise reporting of results in accordance with enterprise requirements
- 7 Maintain a safe work environment
- 7.1 Use defined safe work practices and personal protective equipment 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 enterprise 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

Required Skills and Knowledge

Required skills

Required skills include:

- planning and preparing for field activities
- observational and descriptive skills
- communicating effectively with site personnel, drillers and supervisors
- applying field sampling and monitoring procedures, including pre-treatment, containers, preservation, storage, labelling and traceability
- demonstrating correct and safe use, of field instruments and/or equipment, including field calibration
- identifying and rectifying basic instrument faults
- collecting representative samples in accordance with a sampling plan
- preserving the integrity of samples
- identifying atypical sampling conditions and samples and taking appropriate action
- cleaning, decontaminating and maintaining purging/sampling equipment
- completing sampling records and writing/compiling concise and accurate reports
- seeking advice when issues/problems are beyond scope of competence/responsibility
- following requirements for the disposal of waste and the preservation of the environment
- working safely

Required knowledge

Required knowledge includes:

- terminology used to describe aquifers, drilling/construction of wells and bores, and groundwater sampling/testing procedures
- principles of representative sampling and field testing of common groundwater parameters
- preservation of the integrity of samples
- maintaining identification of samples relative to their source, enterprise and/or legal traceability requirements
- typical values of groundwater parameters, common pollutants/contaminants
- links between quality control, quality assurance, quality management systems and sampling procedures
- enterprise procedures dealing with legislative requirements for the handling, labelling and transport of hazardous goods
- links between correct occupational health and safety (OHS) procedures and personal and environmental safety particularly at high risk sites

Evidence Guide

Overview of assessment	Competency must be demonstrated in the ability to perform consistently at the required standard.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	<p>Assessors must be satisfied that the candidate can competently and consistently apply the skills covered in this unit of competency in new and different situations and contexts. Critical aspects of assessment and evidence include:</p> <ul style="list-style-type: none"> • interpreting and applying groundwater sampling/monitoring plans and procedures for site • recognising site hazards and applying safe work procedures during sampling, testing and transport • providing advice to drillers about environmental requirements • obtaining reliable, representative samples of groundwater • demonstrating correct and safe use and calibration of field instruments and/or equipment • measuring bore conditions and conducting field tests of groundwater parameters to obtain reliable data • calculating results using appropriate units/precision • identifying atypical results as out-of-normal range or an artefact • providing accurate, complete records of sampling and field testing • working safely and following relevant legislative requirements for the disposal of waste and the preservation of the environment.
Context of and specific resources for assessment	<p>This unit of competency is to be assessed in the workplace or a simulated workplace environment.</p> <p>Assessment should emphasise a workplace context and procedures found in the candidate's workplace.</p> <p>This unit of competency may be assessed with:</p> <ul style="list-style-type: none"> • <i>MSS025014A Perform sampling and testing of contaminated sites.</i> <p>The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team.</p>

	<p>Resources may include:</p> <ul style="list-style-type: none"> • vehicles, sampling equipment, field test equipment, digital camera, containers, reagents, consumables and manuals • enterprise procedures, test methods, maps, site plans and site sampling/monitoring plans • safety equipment.
Method of assessment	<p>The following assessment methods are suggested:</p> <ul style="list-style-type: none"> • inspection of groundwater samples collected by the candidate • review of groundwater measurements, test results, calculations and site observations produced by the candidate • review of sampling/testing records completed by the candidate • feedback from peers and supervisors about the candidate's ability to consistently apply enterprise procedures and work safely • oral and written questioning to check underpinning knowledge of groundwater parameters, sampling/test procedures and calculations. <p>In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly.</p> <p>Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability.</p> <p>The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work-like environment.</p>
Guidance information for assessment	

Range Statement

Codes of practice	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used
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<p>Legislation, standards, codes, procedures and/or enterprise requirements</p>	<p>Legislation, standards, codes, procedures and/or enterprise requirements may include:</p> <ul style="list-style-type: none"> • federal legislation, such as • Environment Protection and Biodiversity Conservation Act 1999 • state/territory government legislation and regulations and local government by-laws, policies, and plans dealing with: <ul style="list-style-type: none"> • land use, acquisition, planning and protection • water and water management • pollution and contaminated sites • Australian and international standards and guidelines, such as: <ul style="list-style-type: none"> • AS/NZS ISO 14000 Basic set:2007 Environmental management basic set • AS/NZS 5667 series: Water quality - Part 11 Guidance on sampling of groundwaters • Geoscience Australia, Groundwater sampling and analysis - A field guide • Australian drinking water guidelines • Australian and New Zealand Guidelines for fresh and marine water quality • enterprise sampling and monitoring protocols • equipment manuals and warranties, supplier catalogue and handbooks • government policy (e.g. sustainable development and impact assessment) • material safety data sheets (MSDS) • OHS national standards and codes of practice • site-specific requirements
<p>Enterprise procedures for field activities</p>	<p>Enterprise procedures for field activities may include:</p> <ul style="list-style-type: none"> • 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 • incident/accident/injury report forms
<p>Sampling/monitoring plans</p>	<p>Sampling and monitoring plans may include:</p> <ul style="list-style-type: none"> • purpose, such as:

	<ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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	<p>Site and sampling hazards may include:</p> <ul style="list-style-type: none"> • 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	<p>Safe working procedures may include:</p> <ul style="list-style-type: none"> • use of safety harness, suitable clothing and boots, sunglasses, hat and gloves • 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

	<p>devices and connectors (especially at waterlogged sites)</p> <ul style="list-style-type: none"> • shielding of hot surfaces and exhausts • careful handling of glass containers and preservatives • regular medical checks
Drilling and construction of wells and bores	<p>Drilling and construction of bores and wells may include:</p> <ul style="list-style-type: none"> • 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	<p>Purging and field sampling equipment will vary according to the position of the sampler intake, purge criteria used and composition of the groundwater to be sampled, and may include:</p> <ul style="list-style-type: none"> • 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 • first aid equipment, sunscreen, drinking water and mobile phone
Sample preparation and transport	<p>Sample preparation and transport may include:</p> <ul style="list-style-type: none"> • 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

	<p>samples</p> <ul style="list-style-type: none"> 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	<p>Field testing equipment and instruments may include:</p> <ul style="list-style-type: none"> 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 colourimeters 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	<p>Field measurements/tests may include:</p> <ul style="list-style-type: none"> 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	<p>Field observations and data may include:</p> <ul style="list-style-type: none"> sampling point name, location, time, date and type nature of aquifer and water bearing strata

	<ul style="list-style-type: none"> • 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
<p>OHS and environmental management requirements</p>	<p>OHS and environmental management requirements:</p> <ul style="list-style-type: none"> • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Environmental

Custom Content Section

Not applicable.