Australian Government

Department of Education, Employment and Workplace Relations

CPPSIS6014A Conduct mining geology operations

Release: 1

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Modification History

Not Applicable

Unit Descriptor

Unit descriptor

This unit of competency specifies the outcomes required by surveyors of mine geology to evaluate mining potential and mining viability operations. It requires knowledge of mining operations and the ability to plan and execute project activity according to job specifications. Functions will entail complying with and developing or amending organisational guidelines.

Application of the Unit

Application of the unit

This unit of competency supports the application of planning, organisational, communication, sound problem-solving and accuracy skills; error analysis; designing and interpreting technical documentation; and a high-level understanding of technology. The skills and knowledge acquired upon completion of this unit would support the needs of employees in surveying.

Licensing, legislative and regulatory requirements for this unit may include the relevant components of state, territory and federal legislation.

Licensing/Regulatory Information

Refer to Application of the Unit

Pre-Requisites

Prerequisite units Nil

Employability Skills Information

Employability skills The required outcomes described in this unit of competency contain applicable facets of employability skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged, will assist in identifying employability skills requirements.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Identify project.	1.1 ***Organisational priorities*** are determined to identify project activity.
	1.2 ***Project specifications*** are presented to ***relevant personnel***.
	1.3 ***Geological aspects*** of possible ***ore deposits*** are ***recognised by the environment*** and the information is verified.
	1.4 Skills and knowledge are updated to accommodate changes in mining geology operations.
2 Plan and analyse a mining geology project.	2.1 Tasks are reviewed to identify requirements.
	2.2 ***Project objectives***, deliverables, ***constraints*** and ***principal work activities*** are defined and documented according to ***organisational guidelines***.
	2.3 ***Rock types and structures*** fundamental to mining operations are identified and analysed.
	2.4 ***Rock stability and ground support requirements*** are observed.
	2.5 ***Ore and minerals*** fundamental to mining operations are identified and analysed.
	2.6 ***Methods for obtaining ore and mineral samples*** are identified and analysed.
	2.7 ***Mining regulations*** with regard to management, surveying and safety are detailed according to relevant ***legislation*** and ***company policy***.
	2.8 All ***equipment*** use is planned according to ***manufacturer specifications***.
3 Apply geological information to mine resources.	3.1 Work is allocated and scheduled to be completed within ***time available*** to meet ***client requirements***.
	3.2 ***Project management mechanisms*** are implemented to measure, record and report progress of activities in relation to the agreed schedule and plans.
	3.3 Agreed communication processes between project members, ***client*** and other ***stakeholders*** are implemented and maintained.
	3.4 Ore grades and reserves are determined.
	3.5 ***OHS*** and legislative requirements are incorporated into project ***risk management*** strategy.
	3.6 Pertinent ***legal and statutory standards*** are researched, considered and adhered to.
	3.7 ***Contingencies*** and constraints are managed to ensure

ELEMENT	PERFORMANCE CRITERIA
	project meets specifications.
4 Finalise the project.	4.1 Relevant personnel are informed of the results according to organisational guidelines.
	4.2 ***Required documentation*** is completed according to organisational guidelines.
	4.3 Spatial data is archived according to project specifications.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- ability to relate to people from a range of social, cultural and ethnic backgrounds and with a range of physical and mental abilities
- analytical skills
- ability to translate requirements into design
- communication skills to:
  - consult effectively with clients and colleagues
  - impart knowledge and ideas through oral, written and visual means
- computer skills (high technical user level) to develop business documentation
- information management
- interpreting project requirements
- instrument use
- literacy skills to:
  - assess, develop and use workplace information
  - locate and interpret legislation and other written documentation
  - prepare and manage documentation and information flow
  - read and write key performance reports, including technical reports
  - research and evaluate (high level) in order to source spatial information services educational information
- negotiation skills
- numeracy skills to:
  - analyse errors
  - conduct image analysis
  - estimate costs

REQUIRED SKILLS AND KNOWLEDGE

- interpret and analyse statistics
- perform mental calculations
- record with accuracy and precision
- undertake high level computations

- organisational skills to:
  - plan and coordinate technical and human resource inputs to research activities
  - plan and prioritise activities to meet contractual requirements
- planning
- project management skills
- spatial skills to:
  - exercise precision and accuracy in relation to geological mining techniques
  - perform spatial data archival and retrieval and train others in this task
  - perform spatial data management and manipulation and train others in this task
  - perform file management and train others in this task
  - solve complex problems relating to height, depth, breadth, dimension, direction and position in actual operational activity and virtual representation
  - train others in spatial precision techniques
  - understand implications of height, depth, breadth, dimension and position to actual operational activity and virtual representation.

Required knowledge and understanding:

- abilities of work teams
- accuracy and precision requirements
- data capture and data set out
- calibration of specialised surveying equipment
- concept of mining in terms of the objectives, types, classifications and purpose
- data formats
- data management
- data reduction and manipulation techniques
- development of headings in underground mining operations
- economic geology, including:
  - different methods and techniques for discovering economic mineral deposits
  - economics of mineral industries
  - familiarisation with mining and metallurgical technology
  - physical and chemical characteristics of rocks and structures
  - theories of formation
- economic significance of mining in terms of domestic and international markets and global technological demands
- guidelines of projects
- high-level, relevant engineering-related tasks and associated computations

REQUIRED SKILLS AND KNOWLEDGE

- industry standards
- legislative, statutory and industry requirements and standards
- limitations of the guidelines relating to equipment, measuring and analysis
- mineral exploration methods: geophysical, geochemical and geological techniques
- mining methods for metalliferous and coal mines
- mining technology revolution
- organisational policies and guidelines, such as OHS guidelines
- phases and stages of exploration procedures and possible methods of exploration relevant to each
- planning and control processes
- processes and procedures involved in undertaking exploration of mineral deposits
- project review procedures
- safe work practices (high level)
- scope of mining in terms of cultural, economical and social significance
- spatial reference systems
- surveying equipment for data capture
- surveying computation skills (high level)
- surveying reference systems
- terminology and nomenclature applicable to mining.

Evidence Guide

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, the range statement and the Assessment Guidelines for this Training Package.

Overview of assessment	This unit of competency could be assessed on its own or in combination with other units relevant to the job function, for example units CPPSIS6001A Conduct open mine pit surveying, and CPPSIS6013A Conduct underground mine surveying.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	A person who demonstrates competency in this unit must be able to provide evidence of: • conducting a collection and validation process based on thorough assessment of all relevant considerations • matching objectives with resources to ensure project proceeds in an organised and timely manner • ensuring that achievement of required accuracy has been attempted by:

- accessing and interpreting design information to identify the components to be measured and monitored
- applying solutions to a range of problems
- contingency management
- documenting and reporting
- organising and prioritising activity
- performing measurements
- planning resources
- reducing and manipulating spatial data

- ensuring that non-conformity aspects are recorded and reported
- knowledge of mining geology operations
- taking responsibility for team outputs in work and learning.

Specific resources for assessment

Resource implications for assessment include access to:

- assessment instruments, including personal planner and assessment record book
- assignment instructions, work plans and schedules, policy documents and duty statements
- registered training provider of assessment services
- relevant guidelines, regulations and codes of practice
- suitable venue and equipment.

Access must be provided to appropriate learning and assessment support when required.

Where applicable, physical resources should include equipment modified for people with disabilities.

Context of assessment

Holistic: based on the performance criteria, evidence guide, range statement, and required skills and knowledge.

Method of assessment

Demonstrated over a period of time and observed by the assessor (or assessment team working together to conduct the assessment).

Demonstrated competency in a range of situations, that may include customer/workplace interruptions and involvement in related activities normally experienced in the workplace.

Obtained by observing activities in the field and reviewing induction information. If this is not practicable, observation in realistic simulated environments may be substituted.

Guidance information for assessment

Assessment requires that the clients' objectives and industry expectations are met. If the clients' objectives are narrowly defined or not representative of industry needs, it may be necessary to refer to portfolio case studies of a variety of spatial information services requirements to assess competency.

Oral questioning or written assessment and hypothetical situations (scenarios) may be used to assess underpinning knowledge (in assessment situations where the candidate is offered a preference between oral questioning or written assessment, questions are to be identical).

Supplementary evidence may be obtained from relevant authenticated correspondence from existing supervisors, team leaders or specialist training staff.

All practical demonstration must adhere to the safety and environmental regulations relevant to each State or Territory.

Where assessment is for the purpose of recognition (recognition of current competencies [RCC] or recognition of prior learning [RPL]), the evidence provided will need to be authenticated and show that it represents competency demonstrated over a period of time.

In all cases where practical assessment is used it will be combined with targeted questioning to assess the underpinning knowledge.

Assessment processes will be appropriate to the language and literacy levels of the candidate and any cultural issues that may affect responses to the questions, and will reflect the requirements of the competency and the work being performed.

Range Statement

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. ***Bold italicised*** wording in the performance criteria is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Organisational priorities

- client focus
- external influence and focus

may include:
- financial priorities
- internal influence and focus
- operational plan
- strategic plan.

Project specifications may include:
- detailed technical descriptions of survey data and its requirements
- preparation of cross-sections and plans with all information included.

Relevant personnel may include:
- colleagues
- registered surveyors
- company personnel
- staff or employee representatives
- supervisors or line managers
- suppliers.

Geological aspect:
- a deposit of ore minerals in geological terms is not always an ore deposit
- while an ore mineral is a mineral from which a metal can feasibly be extracted, an ore deposit (or an ore body) is a mass of rock from which a metal or mineral can be profitably produced.

Ore deposits may include:
- ores formed at or near a contemporary surface:
  - chemical precipitates
  - laterites
  - place deposits
  - ocean ridge spring deposits
  - sea floor nodules
  - shale-hosted base and precious metal deposits
  - volcanogenic massive sulphide deposits
- ores formed in bodies of rock, including ores formed by:
  - cool solutions of uncertain provenance
  - deep volcanic environment
  - epicrustal volcanic environment chemical precipitates
  - pluton-centered environment
- ores formed by magmatic segregation
- ores formed by metamorphic processes
- ores composed of common rock varieties.

Recognised by the environment may include:
- age of mineralisation e.g. banded iron formation deposits are characteristic of Pre-Cambrian age rocks
- association with specific types of igneous rocks e.g. copper with quartz-monzonite porphyry, diamonds

	with kimberlite pipes and tin with granites • gangue mineral association e.g. gold associated with quartz-ankerite veins • host rock association e.g. lead and zinc with carbonate rocks • ore and gangue mineral in fresh or oxidised states in outcrop of derived sediments may give surface evidence of underlying or adjacent deposits • physiographic associations e.g. silicified breccias often stand up as isolated hills, oxidised pyretic bodies in limestone generally form low-covered areas • structural controls e.g. laterite deposits associated with unconformities, replacement deposits associated with crests of anticlines • trace metal association e.g. gold associated with arsenic and mercury in trace amounts • weathering effects e.g. oxidation of pyrite leaves a residue of iron oxide gossan making possible underlying deposits.
Project objectives may include:	• agreed client requirements • written survey specifications.
Constraints may include:	• coverage • datum • environmental factors • industry requirements • legal and statutory • financial • resource availability • time.
Principal work activities may include:	• activity and sequence of activity determined to be essential in order to meet project objectives.
Organisational guidelines may include:	• appropriate timelines • code of ethics • company policy • final product formats • formal design parameters • legislation relevant to the work or service function • manuals • OHS policies and procedures • personnel practices and guidelines outlining teamwork, work roles and responsibilities • requirements for data processing.

Rock types and structures may include solid, cohesive aggregates of one or more types of minerals, formed as a result of various geological processes. Rocks are classified according to their:

- chemical composition
- formation (igneous, sedimentary or metamorphic)
- grain-size
- mineral content
- physical appearance.

Rock stability and ground support requirements may include:

- principles for rock support in underground operations
- techniques for providing rock support, including:
  - cable bolts
  - rock bolts.

Ore and minerals may include:

- copper
- gold
- iron
- lead
- limestone
- mercury
- quartz
- silver
- tin
- zinc.

Methods for obtaining ore and mineral samples may include:

- assaying:
  - geochemical
  - quantitative
- drilling:
  - diamond core
  - rotary percussion
- geological mapping:
  - presence of gossans or leached capping
  - rock alteration
- geological sampling:
  - exploration geochemistry
  - geochemical prospecting
- geophysical prospecting:
  - analysis of satellite imagery
  - computer modelling
  - geophysical surveying
  - subsurface mapping of geological units
- logging
- sampling

- surface and underground testing
- trenching.

Mining regulations may include:

- Australian standards
- coal mining Acts and regulations
- environmental agency regulations
- isolation procedures
- manufacturer specifications and recommendations
- other applicable legislation, including:
  - electricity and gas
  - radiation
  - mine.

Legislation may include:

- Australian standards
- award and enterprise agreements
- certification requirements
- codes of practice
- environment protection legislation
- equal employment opportunity (EEO)
- OHS legislation
- quality assurance requirements.

Company policy may include:

- company OHS standards
- customer service standards
- company goals, such as mission statement
- governance guidelines
- guidelines on the use of equipment
- internal and external communication guidelines
- operational manuals
- operational plan
- strategic plan.

Equipment may include:

- augers and drills
- bucketwheel
- draglines
- equipment, such as trailers and floats
- excavators
- four-wheel drive passenger vehicles
- high well miners
- scrapers
- water and service machines.

Manufacturer specifications may include:

- equipment specifications
- operator manuals.

Time available may involve estimates for time duration

- client instructions
- consideration of contingencies

of project, including:	• consideration of past project experiences • experience of project personnel • location of project • methods to be employed • resources and equipment to be used.
Client requirements refer to description of outputs and may be contained in:	• contracts • memos • tender briefs • verbal instructions • written instructions.
Project management mechanisms may include:	• communication with stakeholders • dispute resolution guidelines • monitoring and adjusting key milestones.

Client may include:	• customers with routine or special requests
	• external to organisation
	• internal to organisation
	• regular and new customers, including:
	  • business enterprises
	  • government agencies
	  • members of the public
	  • suppliers.

Stakeholders may include:	• human resource personnel: internal or external • procurement agency: internal or external management.
OHS may include:	• Australian standards • development of site safety plan • identification of potential hazards • inspection of work sites • training staff in OHS requirements • use of personal protective clothing • use of safety equipment and signage.
Risk management may include:	• adhering to budget • anticipating external influences • contingency planning • guidelines for the selection of contractors • effective communication and consultation • effective project management • internal and external audit processes • milestone review and evaluation • realistic timelines • targeted activity.
Legal and statutory	• local government requirements

standards may include:	• national standards • state statutes and regulations.
Contingencies may include:	• equipment failure • injury to personnel • personnel turnover • observation errors • obstructions to mining operation • weather.
Required documentation may include:	• electronic or paper-based correspondence with client • field records • final report • records of conversation • survey plots • organisational work activity sheets.

Unit Sector(s)

Unit sector	Spatial information services