



Australian Government

Department of Education, Employment and Workplace Relations

CPPSIS6017A Conduct advanced remote sensing analysis

Release: 1

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Modification History

Not Applicable

Unit Descriptor

Unit descriptor

This unit of competency specifies the outcomes required to enhance, classify and process remotely sensed data, using both hard copy and digital imagery in a geographic information systems (GIS) context. It requires the ability to apply wide-ranging specialised technical, creative and conceptual skills, a broad knowledge of spatial datasets, and accountability for personal and group outcomes. Functions will entail complying with and developing or amending organisational guidelines.

Application of the Unit

Application of the unit

This unit of competency supports high-level project management activity in the spatial information services (SIS) industry sector. It requires the application of initiative and enterprise, negotiation, problem-solving, planning and organisational skills; the development of technical documentation incorporating mapping and scientific techniques; the ability to communicate graphically; and the application of remote sensing technology. The skills and knowledge acquired upon completion of this unit would support the needs of employees in cartography, town planning, mapping and GIS.

While no licensing, legislative, regulatory or certification requirements apply holistically to this unit at the time of publication, relevant federal, and state or territory legislation, regulations and codes of practice impact upon this unit (see unit performance criteria and range statement).

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 Determine appropriate digital image processing techniques.	1.1 Appropriate image, merger and modelling techniques are determined according to organisational requirements and project specifications. 1.2 Appropriate data collection and analysis techniques in remote sensing process are determined according to project requirements. 1.3 Suitable digital image processing techniques and digital image data formats are selected. 1.4 Additional characteristics of image and metadata are included. 1.5 OHS issues are considered at all times. 1.6 Skills and knowledge are updated to accommodate changes in operating environment and equipment.
2 Select suitable computing platforms and software systems.	2.1 Spatial computing platforms and software systems are assessed for suitability in line with the project specification. 2.2 Availability of suitable data is verified with the potential suppliers. 2.3 Constraints on use of spatial data are assessed against specification. 2.4 Commercially available image processing systems are assessed to determine appropriate components, menu items, characteristics and statistics.
3 Conduct image enhancements and manipulations.	3.1 Transformation routines using image calculations are conducted. 3.2 Edge enhancements and smoothing filters are applied with the use of convolution matrices. 3.3 Image transformation is performed with channels of brightness, greenness and wetness. 3.4 Imagery for distribution is determined.
4 Perform supervised and unsupervised classifications on datasets.	4.1 Thematic classifications and relative differentiations between supervised and unsupervised classification algorithms are determined. 4.2 Supervised classifications of algorithms are conducted with the use of training areas. 4.3 Hard copy outputs are produced according to specifications. 4.4 Error analysis is applied to perform an approximate accuracy assessment of classifications.
5 Conduct data merger	5.1 Components of integration and merging techniques

ELEMENT	PERFORMANCE CRITERIA
and GIS integration.	are summarised.
	5.2 <i>Techniques of use for the GIS data</i> are documented.

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
- communication skills to:
 - consult effectively with clients and colleagues
 - impart knowledge and ideas through graphic, oral, written and visual means
- computer skills (high technical user level) to develop business documentation
- literacy skills to:
 - assess and use workplace information
 - conduct web-based searches and use digital techniques
 - 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 SIS educational information
- numeracy skills to:
 - accurately record and collate
 - analyse errors
 - conduct image analysis
 - estimate costs
 - interpret and analyse statistics
 - perform mental calculations
 - undertake complex computations
- organisational skills to plan and prioritise activities to meet contractual requirements
- project management skills, including ability to meet deadlines
- research and analytical skills
- self-management

REQUIRED SKILLS AND KNOWLEDGE

- spatial skills to:
 - exercise precision and accuracy in relation to remote sensing
 - 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
- time management skills.

Required knowledge and understanding:

- budgetary mechanisms and restraints
- computer platforms and software for image processing systems
- data quality integrity
- existing spatial datasets and dataset sources
- digital image processing techniques
- image enhancement, manipulation and merger techniques
- information management
- metadata
- OHS policies
- organisational policies and guidelines
- relevant legislative, statutory and industry requirements and standards
- resource management processes
- risk analysis principles
- spatial data formats, handling and structure
- spatial referencing systems.

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 CPPSIS5029A Determine suitable information sources to create new spatial datasets,

	and CPPSIS6004A Design a spatial project plan.
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: • applying remote sensing technology • communicating graphically • understanding copyright and ownership constraints • determining data requirements • evaluating suitability of available data against project specifications • identifying sources of data • understanding the nature of spatial projects.
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 SIS 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.

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|--|--|
| <p><i>Image, merger and modelling techniques</i> may include:</p> | <ul style="list-style-type: none"> • data merging and GIS integration • environmental modelling • supervised and unsupervised classification. |
| <p><i>Organisational requirements</i> may include:</p> | <ul style="list-style-type: none"> • Australian Computer Society code of ethics • company policy • equal employment opportunity (EEO) • legislation relevant to the work or service function • manuals • OHS policy and procedures • personnel practices and guidelines outlining work roles, responsibilities and delegations. |
| <p><i>Project specifications</i> refer to:</p> | <ul style="list-style-type: none"> • detailed technical descriptions of the spatial data and its requirements. |
| <p><i>Remote sensing process</i> includes:</p> | <ul style="list-style-type: none"> • measurement or acquisition of information of some property of an object or phenomenon by a recording device that is not in physical or intimate contact with object or phenomenon under study, including the practice of data collection in wavelengths from ultraviolet to radio regions • acquisition of information about earth's surface by electronic and optical instruments from: <ul style="list-style-type: none"> • satellites • airborne platforms • ground observation. |
| <p><i>Digital image processing techniques</i> may include:</p> | <ul style="list-style-type: none"> • image enhancement, including: <ul style="list-style-type: none"> • contrast • multi-image manipulation • spatial manipulation • image rectification, including: <ul style="list-style-type: none"> • geometric and digital image correction • noise removal. |

- Digital image data formats** may include:
- band interleaved by line (BIL)
 - band interleaved by pixel (BIP)
 - band sequential (BSQ)
 - run length encoding (RLE).
- Additional characteristics of image** may include:
- soil
 - vegetation bodies
 - water.
- Metadata** may include:
- summarised information about a spatial dataset that describes the characteristics of the dataset, including:
 - availability
 - conditions of use
 - coordinate system
 - currency
 - date of acquisition
 - quality
 - source
 - spatial data acquisition methodologies
 - version control.
- 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 equipment and signage.
- Suitability** may include:
- assessment of whether the spatial data will meet the specification in regard to:
 - accuracy
 - completeness
 - coverage
 - density
 - logical consistency.
- Availability** includes:
- assessment of whether the spatial data can be obtained and used for client requirements.
- Constraints** may include:
- administrative
 - copyright
 - financial
 - legal and legislative
 - technical limitations.
- Characteristics and statistics** may include:
- band selections
 - hard copy outputs

- histogram plots
 - lookup tables
 - univariate and multivariate statistics.
- Image calculations*** may include:
- greenness ratios
 - greenness ratios plus dark value
 - normalised difference vegetation indices.
- Error analysis*** is:
- a monitoring process that focuses on scenario planning or possible implications of probable errors.
- Integration and merging techniques*** may include:
- change detection
 - multi-sensor imagery
 - multi-temporal.
- Techniques of use for the GIS data*** may include:
- cartographic modelling
 - environmental modelling
 - land cover classification.

Unit Sector(s)

Unit sector Spatial information services