Australian Government

Department of Education, Employment and Workplace Relations

SFIAQUA411A Manage water quality and environmental monitoring in enclosed systems

Release: 1

SFIAQUA411A Manage water quality and environmental monitoring in enclosed systems

Modification History

Not Applicable

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Unit Descriptor

Unit descriptor	This unit of competency involves developing and implementing a water quality and environmental monitoring and management program, including developing workplace procedures for others involved in water quality monitoring and maintenance activities. It covers interpreting and analysing water quality and environmental data, developing management strategies and solving problems and manipulating water chemistry in pond, tank or raceway systems. Licensing, legislative, regulatory or certification requirements may apply to this unit. Therefore it will be necessary to check with the relevant state or territory regulators for current licensing, legislative or regulatory requirements before undertaking this unit.

Application of the Unit

Application of the unit	This unit has application to any enclosed aquaculture or holding facility. Aquaculture and ornamental production and holding facilities are subject to environmental protection regulations as a condition of their operating permit. All enterprise or workplace procedures and activities are carried out according to ***relevant government regulations***, ***licensing and other compliance requirements***, including ***occupational health and safety*** (***OHS***) ***guidelines*** and ***ecologically sustainable development*** (***ESD***) ***principles***. Equipment operation, maintenance, repairs and calibrations are undertaken in a safe manner that conforms to manufacturer instructions. Appropriate ***personal protective equipment*** (***PPE***) is selected, checked, used and maintained.

Licensing/Regulatory Information

Refer to Unit Descriptor

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Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

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

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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Develop a water quality management program	1.1. Monitoring schedule is developed to identify ***routine water quality and environmental parameters*** to be measured, their frequency and the monitoring method. 1.2. Workplace procedures are developed for routine water quality, environmental monitoring and routine management of culture or holding water. 1.3. ***Data collection*** and record management activities are organised.
2. Oversee non-routine water quality monitoring, sampling and ***manipulation***	2.1. Potential problematic ***non-routine parameters*** are identified and ***measurement methods*** developed. 2.2. Monitoring and sampling are carried out, and external analysis arranged. 2.3. Effects of health treatments on the quality of the culture or holding water are identified and managed.
3. Analyse and present ***data*** in tables and graphs	3.1. Water quality and environmental data is checked to identify transcription errors or atypical entries. 3.2. Data is accurately presented in tables and graphs. 3.3. ***Data*** is **analysed**; recognise and report on ***features and trends in data***.
4. Assess and adjust water for cultured or held stock	4.1. The suitability of supply water for cultured or held stock is assessed. 4.2. ***Husbandry practices which impact adversely on water quality*** are identified and modifications made to practices to minimise impacts. 4.3. Water chemistry is manipulated to improve water quality. 4.4. ***Management strategies*** based on data collected are identified.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
• analysing and interpreting graphs and trends in data • developing measuring methods in response to potential problematic water quality factors

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REQUIRED SKILLS AND KNOWLEDGE
• scientific skills to manipulate water chemistry • unit conversion • using computer software for analysing data and presenting information. **Literacy skills used for**: • analysing and reporting on data • writing procedures. **Numeracy skills used for**: • applying mathematical concepts, such as decimals, ratios, proportions and percentages • calculating perimeters, areas, volumes and angles • calculating scientific quantities, such as concentration • using significant figures, rounding off, estimation and approximation.
Required knowledge
• interaction between stock, water chemistry and husbandry practices • monitoring equipment options, operation, calibration and limitations • procedures for collecting, storing, retrieving and communicating data • procedures for verifying data and rectifying mistakes • relevant scientific and technical terminology, such as precision, accuracy, units, significant and standard deviation • water chemistry and interaction between parameters.

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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, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessment must confirm the ability to: • develop a valid and appropriate water quality management program • develop realistic management strategies based on analysis of data • presents accurate data in the required format • recognise obvious trends in data • recognise the difference between routine and non-routine water quality parameters • respond to non-routine water quality emergencies. Assessment must confirm knowledge of: • interaction between stock, water chemistry and husbandry practices • monitoring equipment operation, calibration and limitations • water chemistry and interaction between parameters.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. Resources may include: • data sets and records • computer and relevant software • relevant enterprise procedures • measurement equipment and rearing units.
Method of assessment	The following assessment methods are suggested: • case studies of non-routine situations to assess the candidate's data analysis and management strategies • feedback from supervisors and peers • observation of the candidate as they measure non-routine parameters and manipulate water chemistry • questions to assess understanding of relevant procedures and trends in data

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EVIDENCE GUIDE	
	• review of records transcribed, maintained or stored by the candidate • review of work procedures, data sheets, calculations, graphs and tables prepared by the candidate.

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EVIDENCE GUIDE	
Guidance information for assessment	This unit may be assessed holistically with other units within a qualification.

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, if used in the performance criteria, is detailed below. 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) may also be included.	

Relevant government regulations, ***licensing and other compliance requirements*** may include:	• aquaculture regulations, permits, licences, quotas, catch restrictions, and other compliance requirements, including international treaties and agreements
	• ESD principles, environmental hazard identification, risk assessment and control
	• Indigenous native title, land claims and cultural activities, including fishing by traditional methods
	• land, buildings and vehicles:
	  • buildings and structures design and appearance, constructions and additions
	  • poaching, trespass and theft
	  • road laws for use of motor vehicles, bikes, trucks and other transport equipment
	  • soil and water management
	  • use of chemicals and biological agents
	  • use of firearms and powerheads
	  • use of utilities, including water, natural gas, electricity and sewage
	  • water or land lease, tenure or ownership and use
	• OHS hazard identification, risk assessment and control
	• product quality assurance:
	  • correct naming and labelling (e.g. country of origin, Australian Fish Names Standard

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RANGE STATEMENT	
	and eco-labelling) • correct quantities, sizes and other customer requirements • third-party certification (e.g. Australian Grown and ISO 14001:2004 Environmental management systems).

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RANGE STATEMENT	
OHS guidelines may include:	• appropriate workplace provision of first aid kits and fire extinguishers • clean, uncluttered, hygienic workplace • codes of practice, regulations and/or guidance notes which may apply in a jurisdiction or industry sector • enterprise-specific OHS procedures, policies or standards • hazard and risk assessment of workplace, maintenance activities and control measures • induction or training of staff, contractors and visitors in relevant OHS procedures and/or requirements to allow them to carry out their duties in a safe manner • OHS training register • safe lifting, carrying and handling techniques, including manual handling, and the handling and storage of hazardous substances • safe systems and procedures for outdoor work, including protection from solar radiation, fall protection, confined space entry and the protection of people in the workplace • systems and procedures for the safe maintenance of property, machinery and equipment, including hydraulics and exposed moving parts • the appropriate use, maintenance and storage of PPE.
ESD principles may include:	• controlling use and recycling of water, and managing water quality and quantity • increasing use of renewable, recyclable and recoverable resources • managing environmental hazard identification, risk assessment and control • managing imported products quarantine and inspection, facility biosecurity, translocation of livestock and genetic material, and health certification • managing stock health and welfare, especially for handling, holding, transport and slaughter • managing, controlling and treating effluents, chemical residues, contaminants, wastes and pollution

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RANGE STATEMENT	
	• minimising noise, dust, light or odour emissions • planning environmental and resource efficiency improvements • preventing genetically modified and live cultured or held organisms from escaping into environment • protecting native and protected flora and fauna, marine or land parks or areas, adhering to the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), the Ramsar Convention, World Heritage and other international treaties for which Australia is a signatory • reducing emissions of greenhouse gases • reducing use of non-renewable resources • reducing disturbances to soils, erosion and surface water flows from machinery use and other activities • reducing energy use and introducing alternative energy sources.

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RANGE STATEMENT	
PPE may include:	• buoyancy vest or personal floatation device (PFD) • hard hat or protective head covering • hearing protection (e.g. ear plugs and ear muffs) • non-slip and waterproof boots (gumboots) or other safety footwear • personal locator beacon or Emergency Position Indicating Radio Beacon (EPIRB) • protective eyewear, glasses and face mask • protective hair, beard and boot covers • protective outdoor clothing for tropical conditions • respirator or face mask • safety harness • sun protection (e.g. sun hat, sunscreen and sunglasses) • uniforms, overalls or protective clothing (e.g. mesh and waterproof aprons) • waterproof clothing (e.g. wet weather gear and waders).
Routine water quality and environmental parameters may include:	• alkalinity • ammonia • dissolved oxygen • hardness • nitrate • nitrite • pH • salinity and conductivity • temperature • turbidity (e.g. secchi disc and transparency).
Monitoring method may include:	• observations • surveys • tests and measurements.
Data collection may include:	• computer software • data loggers • data sheets.
Manipulation may include:	• adding chemicals (e.g. lime, copper sulphate, sodium bicarbonate, salt and magnesium sulphate) • changing husbandry practices (e.g. feed

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RANGE STATEMENT	
	composition, handling techniques stocking densities, aeration and filtration - biological and mechanical).

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RANGE STATEMENT	
Non-routine parameters may include:	• bacterial levels, such as E. coli and faecal coliforms • biological oxygen demand (BOD) • carbon dioxide, methane and hydrogen sulphide gas • changes in native land-based and/or aquatic life around the farm, including macro-invertebrates and macrophytes • clay content of soil and types of sediments • contaminants/chemicals, including pesticides, herbicides and heavy metals • dissolved or suspended solids or wastes • ozone • phosphorus (total and orthophosphate) • presence of severe weather conditions (e.g. king tides, extreme temperatures and fluctuations) • redox potential • soil or sediment pH • toxic micro-algae.
Measurement methods (non-routine parameters) may include:	• external laboratory tests • meters • spectroscopy • test kits (e.g. colorimetric and titration).
Data may be presented in the form of:	• charts • graphs • tables Data could also take the form of semi-quantitative observations and be expressed on a scale (for example, 1 to 4 or + to ++++).

Analysed may include:	• calculations including
	  • percentage content, such as protein and phosphate
	  • concentration, such as mg/L, ppm
	  • conversions between SI units
	  • industry specific ratios, such as feed conversion ratio (FCR) and NPK
	  • percentages, fractions and decimals
	  • ratios, such as mass to mass, mass to volume and volume to volume percentages

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RANGE STATEMENT	
	• significance • variables, such as flow rates • volumes (L, ML, tonne) of rearing and holding facilities • comparison with/between: • feed types • industry standards • rearing units • scientific standards and literature • sites • stockings.
Features and trends in data may include:	• increasing/decreasing data and rate of change • maximum and minimum values • outliers, and data beyond control limits or normal range • spread of data.
Husbandry practices which impact adversely on water quality may include:	• cleaning practices • disease management practices • feed types and schedule • filtration systems • holding and rearing facilities • stocking densities.
Management strategies may include:	• modifying: • cleaning and quarantine procedures • equipment • fallow period • feed type • monitoring program • stocking rate • water treatment.

Unit Sector(s)

Unit sector	Aquaculture operations

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Co-requisite units

Co-requisite units		

Competency field

Competency field	

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