

<b>Title</b>	<b>Explain and determine water flow, and describe the selection of pumps and structures for an extractive site</b>		
<b>Level</b>	<b>6</b>	<b>Credits</b>	<b>20</b>

<b>Purpose</b>	People credited with this unit standard are able to: explain water flow concepts and water quality properties; determine surface water flows in and around extractive sites; demonstrate knowledge of ground water flows at <del>an</del> extractive sites; describe the selection process for a pumping system for <del>an</del> extractive sites; and explain the purpose of hydraulic structures and describe the selection process for <del>an</del> extractive sites.
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<b>Classification</b>	Extractive Industries > Extractive Industries Management
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<b>Available grade</b>	Achieved
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### Guidance Information

#### Explanatory notes

- Performance of the outcomes of this unit standard must comply with the following:
  - Health and Safety at Work Act 2015 (HSW);
  - Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016;
  - ~~Health and Safety in Employment Act 1992;~~
  - ~~HSE (Mining Operations and Quarrying Operations) Regulations 2013;~~
  - Technical Memorandum No 61 - A method for estimating design peak discharge (Ministry of Works and Development, 1984).*
- Any new, amended or replacement Acts, regulations, standards, codes of practice, guidelines, or authority requirements or conditions affecting this unit standard will take precedence for assessment purposes, pending review of this unit standard.

### Outcomes and ~~performance criteria~~evidence requirements

#### **Outcome 1**

Explain water flow concepts and water quality properties.

#### Performance criteria

**Evidence requirements**

1.1 The concept of water flow is explained in terms of movement from high potential energy to low potential energy.

Range work, power, energy, flow rates, momentum.

1.2 Hydraulic head as a driving force is explained in relation to the resultant water pressure at a different levels and its ~~links to~~relationship with energy.

1.3 ~~The transition of water flow from smooth to turbulent is determined in terms of water velocity.~~

~~Range critical velocity, Reynolds's number, hydraulic jump, normal flow.~~

1.4 The effects of water quality on extractive site operations are explained in relation to quality parameters.

Range water quality parameters include but are not limited to – pH, temperature, turbidity, suspended solids, dissolved oxygen, toxic compounds, diesel spills.

**Outcome 2**

Determine surface water flows in and around extractive sites.

**Performance criteria****Evidence requirements**

2.1 Water flow is determined in terms of low flows, flood flows, and site risk from runoff in relation to the catchment area and its sources.

Range may include but is not limited to – rainfall statistics, depth-duration tables, storm return periods, topography, vegetation, geology, catchment area, unit hydrograph method analysis, flow estimation.

2.2 ~~Flow estimation methods are determined in relation to the variations and uncertainties of rainfall.~~

~~Range Technical Memorandum No 61, Regional Flood Estimation method.~~

2.32 Water flow is calculated for ~~a~~water channels and pipes.

Range may include but is not limited to – ~~simple quantity,~~ velocity and area estimation, hydraulic radius, wetted perimeter, V-notch method, ~~Manning's formula.~~

2.43 The effects of interaction between surface flow and ground water are explained.

Range water table, groundwater depth, aquifer, pumping, seepage interactions resulting in interruption or reduction of ground water flow.

2.54 ~~A Design of~~ stable channels is ~~designed~~ described for an extractive site.

Range may include but is not limited to – bed grade and type, bank batters, erosion control, seepage control, energy dissipation structures, armouring.

2.65 ~~A water~~ Water intake uptake and discharge are explained in accordance with a given resource management consent for a ~~stated~~ selected site.

### Outcome 3

Demonstrate knowledge of ground water flows at ~~an~~ extractive sites.

#### Performance criteria

#### ~~Evidence requirements~~

3.1 ~~Governing principles are used to determine the origin and movement of ground water.~~

~~Range hydrologic cycle, geology, porosity, permeability, piezometric head, Darcy's Law, aquifers and aquicludes.~~

3.2 ~~The effects of inflow and outflow of ground water are determined for an extractive site.~~

Range may include but is not limited to – types of ground water, aquifers, hydraulic properties, dewatering, geotechnical stability, ground water contamination.

3.32 ~~Bore~~ Ground water testing methods ~~used~~ are described ~~for an extractive site~~.

Range includes but is not limited to – non-flowing bores, flowing bores, test equipment, analysis methods ~~may include but is not limited to – constant discharge test, step drawdown test, recovery test, transmissivity, storage coefficient, radius of influence, steady state flow, non-steady state flow.~~

3.43 ~~Construction methods~~ Types of wells ~~bores~~ are explained for ~~an~~ extractive sites.

~~Range may include but is not limited to – casing, screens, drilling mud, development, static water level, dynamic water levels, safe yield.~~

### Outcome 4

Describe the selection process for a pumping system for ~~an~~ extractive sites.

**Performance criteria**  
**Evidence requirements**

- 4.1 The different types of pumps and pipes are explained in terms of their purpose.
- Range includes but is not limited to – positive displacement pumps (piston, diaphragm), rotodynamic pumps (centrifugal, axial flow, mixed flow), other pump types (jet, submersible, slurry, airlift, borehole).  
~~includes but is not limited to—constant displacement, variable displacement, centrifugal, axial flow, jet, submersible, slurry, airlift, friction losses, suction lift, positive submergence.~~
- 4.2 Pump characteristics are explained in terms of their design and purpose.
- Range includes but is not limited to – flow rate, suction lift, suction head, delivery head, efficiency, power consumption, ~~rotation~~ speed, cavitation, friction losses, water hammer, priming, positive submergence.
- 4.3 A pumping system selection process is described in accordance with the stated performance requirements for ~~an~~ extractive sitess.

**Outcome 5**

Explain the purpose of hydraulic structures and describe the selection process for ~~an~~ extractive sitess.

**Performance criteria**  
**Evidence requirements**

- 5.1 Basic hydraulic structures are explained in terms of their purposes.
- Range includes but is not limited to – orifice structures, culvert, weirs, flumes, spillway, diversion channels, energy dissipation ~~structures~~, drainage channels.
- 5.2 The hydraulic structure selection process for ~~an~~ extractive sitess is described in terms of the stated performance requirements.

<b>Planned review date</b>	31 December <del>2019</del> <u>2022</u>
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**Status information and last date for assessment for superseded versions**

Process	Version	Date	Last Date for Assessment
Registration	1	25 November 2000	31 December 2017
Review	2	24 November 2005	31 December 2017
Rollover and Revision	3	16 July 2010	31 December 2017
Review	4	18 June 2015	<u>31 December 2019</u> N/A
<u>Review</u>	<u>5</u>		<u>N/A</u>

**Consent and Moderation Requirements (CMR) reference**

0114

This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.

**~~Please note~~**

~~Providers must be granted consent to assess against standards (accredited) by NZQA, before they can report credits from assessment against unit standards or deliver courses of study leading to that assessment.~~

~~Industry Training Organisations must be granted consent to assess against standards by NZQA before they can register credits from assessment against unit standards.~~

~~Providers and Industry Training Organisations, which have been granted consent and which are assessing against unit standards must engage with the moderation system that applies to those standards.~~

~~Requirements for consent to assess and an outline of the moderation system that applies to this standard are outlined in the Consent and Moderation Requirements (CMR). The CMR also includes useful information about special requirements for organisations wishing to develop education and training programmes, such as minimum qualifications for tutors and assessors, and special resource requirements.~~

**Comments on this unit standard**

~~Please contact [MITO New Zealand Incorporated info@mito.org.nz](mailto:info@mito.org.nz) if you wish to suggest changes to the content of this unit standard.~~

~~Please contact the NZ Motor Industry Training Organisation (Incorporated) (MITO) [info@mito.org.nz](mailto:info@mito.org.nz) if you wish to suggest changes to the content of this unit standard.~~