

<b>Title</b>	<b>Demonstrate knowledge of the geotechnical requirements for ground stability at surface extraction sites</b>		
<b>Level</b>	<b>5</b>	<b>Credits</b>	<b>15</b>

<b>Purpose</b>	People credited with this unit standard are able to: demonstrate knowledge of strength characteristics of soil and rock at surface extraction sites; and evaluate the geotechnical requirements of surface extraction sites.
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<b>Classification</b>	Extractive Industries > Surface Extraction
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<b>Available grade</b>	Achieved
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### Guidance Information

1 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 (General Risk and Workplace Management) Regulations 2016;
- Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2022;
- Health and Safety at Work (Worker Engagement, Participation, and Representation) Regulations 2016;
- WorkSafe (2015) H&S at Opencast Mines Alluvial Mines and Quarries
- MinEx (2018) Slope stability in opencast mines and quarries.
- Approved codes of practice issued pursuant to the HSW Act.

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.

2 Definitions

*Company procedures* mean the documented methods for performing work activities and include health and safety, operational, environmental, and quality management requirements. They may refer to legislation, regulations, guidelines, standard operating procedures, manuals, codes of practice, or policy statements.

*Industry good practice* may be documented in management plans, control plans, company procedures, managers' rules, occupational health and safety policy, industry guidelines, codes of practice, manufacturers' instructions, and safe working and/or job procedures (or equivalent).

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## Outcomes and performance criteria

### Outcome 1

Demonstrate knowledge of strength characteristics of soil and rock at surface extraction sites.

#### Performance criteria

- 1.1 The strength parameters of soil and rock types found at surface extraction sites are described in terms of their geotechnical characteristics and how those may be influenced by the geological environment.

Range strength parameters may include but are not limited to – unconfined compressive strength (UCS), shear strength, friction, cohesion, rock mass strength; characteristics and geological influences may include moisture content, density, consolidation, liquefaction susceptibility, potential failure modes, applied stress, depth, weathering, jointing, faults, karstic voids, old underground workings, subsidence, groundwater levels, rainfall and earthquake risk.

- 1.2 Investigative methods for soil and rock to determine the material type and geomechanical behaviour are described in accordance with industry good practices.

Range investigation methods may include but are not limited to – outcrop mapping, test pits, core drilling, standard penetration testing (SPT) cone penetration testing (CPT), geophysics, permeability testing, piezometer monitoring, sampling and laboratory testing, compaction and density (NDM) testing; evidence of three methods is required.

- 1.3 The considerations determining the stability and safety of cut batters and fill batters are described.

Range considerations may include but are not limited to – type of soil or rock, friction, cohesion, density, compaction, moisture content, particle size distribution (gradation), clay content, particle shape, angle of repose, batter height, failure mechanism, geological structure, groundwater levels, seepage.

### Outcome 2

Evaluate the geotechnical requirements of surface extraction sites.

## Performance criteria

- 2.1 The considerations determining the stability and safety of excavation cut batters in various geological materials and environments are described.

Range considerations may include but are not limited to – material properties (strength, friction, specific gravity, porosity), type of soil or rock (insitu or stockpile), faults, water content, groundwater levels, compaction, angle of repose, batter height, potential failure mechanism (wedge, circular, planar), time exposed, adjacent surcharge loads.

- 2.2 The considerations for geotechnical stability and construction of stockpiles and waste dumps are explained.

Range considerations may include but are not limited to – production requirements, rock or soil composition, angle of repose, foundation slope and stability, surface water drainage, construction methods, earthquake risk, consent requirements, and site constraints (property boundaries, adjacent infrastructure, available space, traffic, etc).

- 2.3 Ground monitoring and maintenance requirements are explained in relation to potential hazards in accordance with industry good practices.

Range monitoring may include but is not limited to – groundwater levels measured via vibrating wire piezometers or standpipes, induced settlement effects, inclinometers, GPS, radar, survey prisms, extensometers, vibration monitoring, rainfall monitoring, site inspections, and the use of Trigger Action Response Plans (TARP);  
potential hazards may include but are not limited to – slumping, spontaneous combustion, hanging up, rock fall, subsidence, slope failure, dust, mineral toxicity;  
maintenance may include but is not limited to – dust suppression, erosion control, rock scaling, ground support, surface water and seepage management, restricted access, rockfall protection, hydroseeding, windrows and other barriers, scheduled and responsive maintenance.

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<b>Planned review date</b>	31 December 2029
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**Status information and last date for assessment for superseded versions**

Process	Version	Date	Last Date for Assessment
Registration	1	25 July 1999	31 December 2017
Review	2	27 January 2005	31 December 2017
Rollover and Revision	3	16 July 2010	31 December 2017
Review	4	18 June 2015	31 December 2019
Review	5	1 March 2018	31 December 2026
Review	6	30 January 2025	N/A

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

0114

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

**Comments on this unit standard**

Please contact Hanga-Aro-Rau Manufacturing, Engineering and Logistics Workforce Development Council [qualifications@hangaarorau.nz](mailto:qualifications@hangaarorau.nz) if you wish to suggest changes to the content of this unit standard.