ENCOMPASS
MINING SOLUTIONS

TOOMUC VALLEY 2024 SLOPE INSPECTION

PAKENHAM QUARRY

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1. Introduction

Encompass Mining has been engaged by Holcim Australia Pty Ltd (Holcim) to undertake a site walkover / inspection of the slopes adjacent to the Mt Shamrock Quarry in Pakenham as per the requirements of Mt Shamrock Quarry – Environmental Management Plan (EMP).

The EMP requires visual inspection of vegetation planting in previously identified landslip areas, inspection of spring and drainage conditions and monitoring of slope conditions related to movements and instability in the Toomuc Valley.

Mark Sjoberg (Encompass Mining – Principal Geotechnical Engineer RPEV 16218) completed the inspection on December 18, 2024, in the company of David Steel (Holcim Contractor), which comprised a walkover and UAV survey of the relevant areas as identified in the EMP. Weather at the time of inspections was fine and wind was variable from light to medium. Temperature at the time of the inspection was estimated at approximately 18°C.

A photographic record of the inspection was compiled, however only pertinent photos applicable to notable commentary and/or recommendation have been included within this report.

1.1 History of landslips

The report by URS Australia prepared in 2005 as part of the approval process for expansion of the Mt. Shamrock Quarry presents good background discussion of the history of landslips in the Toomuc Valley. This report is also referenced in Section 10.0 of the EMP.

Information in the URS Australia (2005) report that is relevant to the December 2024 inspection is summarised below:

- Landslips observed on the flanks of the Toomuc Valley in the vicinity of the Mt Shamrock Quarry are a natural occurrence and pre-date the opening of the quarry.
- Land clearance and rainfall are major contributors to the formation of the observed style of landslip, along with soil type and slope angle. Planting of deep rooting trees over the areas affected by landslips was proposed to improve stability.
- The occurrence of springs in the area “will lead to localised saturation and weakening of the soil in those areas, contributing to the instability”.
- Establishment of surface drainage “in the vicinity of the landslips should minimise infiltration of rainfall-runoff”.

2. Site Inspection

The site inspection was carried out by Mark Sjoberg (Encompass Mining – Principal Geotechnical Engineer RPEV 16218) on December 18, 2024, under the escort of David Steel.

The inspection comprised a site walkover and UAV flyover of the slopes to the west and south of the Mt. Shamrock Quarry. The inspection involved visiting 20 masses and 3 farmers dam within the Holcim landholding boundary. The inspection commenced at 8 am and was completed by 4 pm.

The primary objective of the landslip inspection was to determine whether there has been any significant change in the stability of the Toomuc Valley slopes adjacent to the quarry in the period since the previous inspection in 2023. Any additional geotechnical observations are also to be documented.

The site walkover / UAV flyover methodology involved visual inspection of the ground surface at the locations of the previously identified EMP masses for visual signs that could indicate recent ground movement, including observations of the presence of the following surface expressions:

- Tension cracking on the ground surface
- Hummocky or disturbed ground surface
- Backscarp (or scarp) surfaces
- Rotated tree trunks
- Farmers Dam information
    - Dam / pond size
    - Dam crest
    - Embankment slopes
    - Embankment toe

3. Landslip Surface Stability

The findings from the visual inspection of the Toomuc Valley historical landslips are listed within Table 1 and broadly summarised as follows:

- South (downslope) of Mass 05: backscarps were observed within an area south of Mass 05 (outside of the historically mapped Mass 05 extent). Movement zone is small in volume and given that the location is isolated from any downhill infrastructure, it is not considered to be a significant geological risk.
- All other masses, no visual signs that could indicate recent ground movement were observed.

Table 1 Toomuc Valley Inspection Notes

REFERENCE	INSPECTION NOTES
Mass 01	Observation
	Established vegetation consisting of dense grass, and medium to large trees. The slope surface is hummocky, this appears to be associated with historical major landslips and no evidence of recent or ongoing instability was observed.
	Recommendation
	-
Mass 02	Observation
	Overall the area is well vegetated with dense grass cover and small to medium shrubs and large trees throughout. The slope surface is hummocky, this appears to be associated with historical major landslips and no evidence of recent or ongoing instability was observed. Spring 02 was observed within the mass with standing water at the spring location contained by an earth embankment, which was heavily grass-covered. The water depth within the spring area was estimated to be 300-500 mm deep.
	Recommendation
	-
Mass 03	Observation
	Overall, the land surface in this area is hummocky but well vegetated with dense grass and dense tree cover (medium to large trees). The trunks of a few random trees are rotated which appear in isolation and not grouped together. No evidence of recent or ongoing instability was observed.
	Recommendation
	-

REFERENCE	INSPECTION NOTES
Mass 04	Observation
	Overall, the land surface in this area is hummocky but well vegetated with dense grass cover, small to medium shrubs and medium to large trees (mostly within the downslope area). No evidence of recent or ongoing instability was observed.
	Recommendation
	-
Mass 05	Observation
	Overall the area is well vegetated with dense grass cover throughout. Minor historical circular failures were observed in four locations: these failures were observed to be associated with exposed (bare) scarps and a change in the natural topography locally downslope with remnant mobilised material. The mobilised material is well vegetated whereas the backscarps were either bare or poorly vegetated. The most recent failure (downslope) measures about 15 m in width and ~1.0 m in height. The circular failure is small in volume and given that the location is isolated from any downhill infrastructure is not considered to be a significant geological risk.
	Recommendation
	Revegetation of scarp surfaces with grasses. Maintain regular documented inspections and if conditions deteriorate notify suitably qualified geotechnical engineer for further direction.
Mass 06	Observation
	Overall, the land surface in this area is hummocky but well vegetated with dense grass cover and medium to large trees throughout. No evidence of recent or ongoing instability was observed.
	Recommendation
	-
Mass 07	Observation
	Overall, the land surface in this area is hummocky but well vegetated with dense grass cover and medium to large trees throughout. No evidence of recent or ongoing instability was observed.
	Recommendation
	-

REFERENCE	INSPECTION NOTES
Mass 08	Observation
	Overall the area is well vegetated with dense grass cover throughout. There are some historical scarps up to 1m height. The local area immediately below scarp is poorly to moderately vegetated. Bare ground was observed at the toe of the scarp No evidence of recent or ongoing instability was observed.
	Recommendation
	-
Mass 09	Observation
	Overall the area is well vegetated with dense grass cover and small to medium shrubs and trees throughout. No evidence of recent or ongoing instability was observed.
	Recommendation
	-
Mass 10	Observation
	Overall, the land surface in this area is hummocky but well vegetated with dense grass and dense tree cover (medium to large trees). The trunks of a few random trees are rotated which appear in isolation and not grouped together. No evidence of recent or ongoing instability was observed.
	Recommendation
	-
Mass 11	Observation
	Overall, the land surface in this area is hummocky but well vegetated with dense grass cover and medium to large trees. No evidence of recent or ongoing instability was observed.
	Recommendation
	-

REFERENCE	INSPECTION NOTES
Mass 12	Observation
	Overall the area is well vegetated with dense grass cover and medium shrubs and trees throughout. The slope surface is hummocky, this appears to be associated with historical major landslips and no evidence of recent or ongoing instability was observed.
	Recommendation
	-
Mass 13	Observation
	Overall the area is well vegetated with dense grass cover and medium shrubs and trees throughout. The slope surface is hummocky, this appears to be associated with historical major landslips and no evidence of recent or ongoing instability was observed.
	Recommendation
	-
Mass 14	Observation
	Overall the area is well vegetated with dense grass cover. No evidence of recent or ongoing instability was observed.
	Recommendation
	-
Mass 15	Observation
	Overall the area is well vegetated with dense grass cover and medium shrubs and trees throughout. Spring 04 within the mass zone was not inspected but was reported as dry during the time of the inspection. The slope surface is hummocky, this appears to be associated with historical major landslips and no evidence of recent or ongoing instability was observed.
	Recommendation
	-
Mass 16	Observation
	Overall the area is well vegetated with dense grass cover. No evidence of recent or ongoing instability was observed.
	Recommendation
	-

REFERENCE	INSPECTION NOTES
Mass 17	Observation
	Area is well vegetated with dense grass cover. The slope surface is hummocky, this appears to be associated with historical major landslips and no evidence of recent or ongoing instability was observed.
	Recommendation
	-
Mass 18	Observation
	Overall the area is well vegetated with dense grass cover and medium shrubs throughout. Spring 01 flowing into bin area. The slope surface is hummocky, this appears to be associated with historical major landslips and no evidence of recent or ongoing instability was observed.
	Recommendation
	-
Mass 19	Observation
	Overall the area is well vegetated with dense grass cover and medium shrubs and trees throughout. Water flowing from Spring 03. The slope surface is hummocky, this appears to be associated with historical major landslips and no evidence of recent or ongoing instability was observed.
	Recommendation
	-
Mass 20	Observation
	Area is well vegetated with dense grass cover. The slope surface is hummocky, this appears to be associated with historical major landslips and no evidence of recent or ongoing instability was observed.
	Recommendation
	-

REFERENCE	INSPECTION NOTES
Farmers Dam 05	Observation
	The water level within the dam was 400-600 mm below the crest, dam size approx. 310 m^2 (0.03 ha), holding approx. 310 m^3 (0.31 ML), maximum storage capacity 500m^3 (0.5 ML). The crest of the dam was mostly covered with grass. A trail of bare ground had formed on the crest caused by livestock. The upstream face (southwest) of the embankment is also partially bare and eroded from livestock activity. The western and eastern downstream sides of the dam are well vegetated with grasses. The upstream gully which drains into the dam is partially obstructed with building rubble.
	Recommendation
	The dam is in satisfactory condition. Holcim to maintain regular documented inspections and if conditions deteriorate notify suitably qualified geotechnical engineer for further direction.
Farmers Dam 06	Observation
	The water level within the dam was 600-800 mm below the crest, dam size approx. 900 m^2 (0.09 ha), holding approx. 540 m^3 (0.54 ML), maximum storage capacity 900m^3 (0.9 ML). The crest of the dam was mostly covered with grass. A trail of bare ground had formed on the crest caused by livestock. The downstream (south) and western sides of the dam are well vegetated with grasses, some minor erosion caused by livestock. The upstream face (north) is partially bare and eroded from livestock activity. A natural overflow channel flows northeast and then south, this low point is also partially eroded by livestock with bare soil around the current water level.
	Recommendation
	The dam is in satisfactory condition. Holcim to maintain regular documented inspections and if conditions deteriorate notify suitably qualified geotechnical engineer for further direction.
Farmers Dam 13	Observation
	The water level within the dam was 200-400 mm below the crest, dam size approx. 400 m^2 (0.04 ha), holding approx. 320 m^3 (0.32 ML), maximum storage capacity 480m^3 (0.48 ML). The crest of the dam is mostly bare. The downstream (west) and southern sides of the dam are well vegetated with grasses, extensive minor erosion caused by livestock. The upstream face (east) is partially bare and eroded from livestock activity. A natural overflow channel flows northwest, this low point is also eroded by livestock with bare soil around the current water level. A small shallow slump on the upstream (northern) side was observed. This area has been previously identified during the annual inspections with only minor changes in deterioration and condition of the slumping.
	Recommendation
	The dam is in satisfactory condition. Revegetation of small failure surface with grasses/shrubs if possible. Holcim to maintain regular documented inspections and if conditions deteriorate notify suitably qualified geotechnical engineer for further direction.

4. 2023 Inspection Action Items

An action item recommended from the AECOM 2023 report was a site-specific assessment of the three (3) Farmers Dams 05 / 06 / 13. A consequence category rating was carried out as per the ANCOLD Guidelines on Tailings Dams (2019). The consequence category assessment is based on the severity level of impacts a dam embankment failure on infrastructure, business importance, public health, social dislocation, impact area, impact of duration and environmental impacts.

The severity level together with the population at risk (PAR) are used in consequence category assessment of the facility as presented in Table 2 and Table 3.

Table 2 ANCOLD Consequence Guidelines Severity Level Impact

DAMAGE TYPE	MINOR	MEDIUM	MAJOR	CATASTROPHIC
Infrastructure	< $10M	$10M - $100M	$100M - $1B	> $1B
Business importance	Some restriction	Significant impacts	Severe to crippling	Business dissolution, bankruptcy
Public health	< 100 people affected	100 – 1000 people affected	< 1000 people affected for more than one month	> 10,000 people affected for over one year
Social dislocation	< 100 person or < 20 business months	100 – 1000 person months or 20 -2000 business months	> 1000 person months or > 200 business months	> 10,000 person months or numerous business failures
Impact area	< 1 km2	< 5 km2	< 20 km2	< 20 km2
Impact duration	< 1 (wet) year	< 5 years	< 20 years	> 20 years
Impact on natural environment	Damage limited to items of low conservation value (degraded or cleared land, ephemeral streams, non-endangered flora and fauna) Remediation possible	Significant effects on rural land and local flora and fauna. Limited effects on: A Item(s) of local & state natural heritage. B Native flora and fauna within forestry, aquatic and conservation reserves, or recognised habitant corridors, wetlands or fish breeding areas.	Extensive rural effects Significant effects on river system and areas A & B. Limited effects on: C Item(s) of National or World natural heritage. D Native flora and fauna within national parks recognised wilderness areas, RAMSAR wetlands and nationally protected aquatic reserves. Remediation difficult.	Extensively affects areas A & B. Significantly affects areas C & D. Remediation involves significant altered ecosystems.

Table 3 ANCOLD Recommended Consequence Category

POPULATION AT RISK	SEVERITY OF DAMAGE AND LOSS			
	MINOR	MEDIUM	MAJOR	CATASTROPHIC
< 1	Very Low	Low	Significant	High C
> 1 to 10	Significant	Significant	High C	High B
> 10 to 100	High C	High C	High B	High A
> 100 to 1000	Note 1	High B	High A	Extreme
> 1000		Note 1	Extreme	Extreme

Based on the MINOR severity level impact and the MINOR population at risk categories the three Farmers Dams (05, 06, 13) would be classified as 'VERY LOW'.

With a VERY LOW dam failure consequence category the current regular site inspections should enable Holcim (dam owner) to be aware of faults before partial or total failure occurs. Times when additional inspections are recommended include:

- before a predicted major rainstorm (check embankment and spillway)
- after severe rainstorms(check embankment and spillway)
- after any earthquake or tremor, whether directly felt on the owner's property or reported locally (check all aspects of the dam).

5. Conclusions

The project area contains numerous historic landslips that predate the construction of the quarry and occur naturally due to the prevailing conditions relating to the geological setting, slope profile and orientation, and meteorological events.

Typically, the landslips observed in the project area present themselves as small remobilisations of old larger landslides. The remobilisation landslips tend to be minor earth slide / debris flows which typically can be triggered by periods of increased rainfall. The observations made during the 2024 landslip inspection suggest that no sign of new areas of instability were identified on the Masses located within slopes surrounding the quarry.

Based on the observations, the following general recommendations are suggested:

- Maintain existing regular visual inspection procedures by site personnel (i.e. maintain the approximately monthly to fortnightly inspections of each area as part of general operations, with additional visits to Farm Dam locations as identified in Section 4 of this report. If indications of slope instability are identified, notify a suitably experienced and qualified geotechnical engineer / engineering geologist for further assessment;
- Continue efforts to manage surface water runoff from the natural springs; and
- Continue to undertake annual inspections.

A consequence assessment was undertaken for the three (3) Farmers Dam which are assigned a consequence category of **VERY LOW.** The hazard rating assigned to these dams is not an assessment of the risk of failure, but rather the potential impact in the event of controlled or uncontrolled escape of material or seepage, or the partial or complete failure of the dams.

Additionally, the site inspection observed three Farmers Dams (05 / 06 / 13) exhibiting varying levels of degradation. This is an active farm therefore there will always be stock damage around the dam locations. If possible, construction of a fence to exclude stock around the bare soil / eroded areas to allow the grass to re-establish some cover. The best alternative is to provide stock water from a trough or install a fenced walkway to a restricted area of the stored water.

Based on the observations, the following specific recommendations are suggested:

- Remedial treatment of Farmers Dam 13 with revegetation of the small failure surface with grasses/shrubs to limit the ongoing rilling and erosion.
- Remedial treatment of lower Mass 05 backscarp areas with revegetation of grasses/shrubs to limit the ongoing erosion.

REFERENCES

- AECOM (2024), Mt Shamrock Quarry – Toomuc Valley Slope Inspection, January 2024.
- ANCOLD. (2012). Guidelines on the Consequence Categories for Dams.
- ANCOLD. (2019). Guidelines on Tailings Dams (Planning, Design, Construction, Operations and Closure), Revision 1.
- Department of Environment, Land, Water and Planning (2018). Your dam: Your responsibility. A guide to managing the safety of small dams. Authorised and published by the Victorian Government.
- Department of Environment and Primary Industries (2014). Consequence Screening Tool for Small Dams. Authorised and published by the Victorian Government.
- Holcim (2015) Pakenham Quarry, Environmental Management Plan. Version 3.
- URS (2005) Mount Shamrock Quarry (Pakenham), Proposed Extension, Environment Effects Statement, Slope Stability.

APPENDIX A. MAP OF MASS / SPRINGS / FARMERS DAMS

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Legend

- Springs and Dams POI
- Landslip Areas (defined by EMP)
- Elevation Contours (SRTM)
- Landholding Boundary

ISSUE		DRAWN	DATE
A		AD	1/23/25

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0 250 500 750 m

Landslip Areas defined by EMP - Toomuc Valley

Scale 1:9,000 | DATUM:GDA94 / MGA zone 55 | DATE: 1/23/25

SURVEYED:
DRAWN: AD
CHECKED:
DRAWING no: 00_Rev1

ISSUE A

A3 SHEET
Do Not Scale

APPENDIX B. SITE PHOTOS

2024 Toomuc Valley Slope Inspection

Mass 01 - looking north

Mass 01 - looking southwest

Mass 02 - looking north

Mass 02 - looking south (downslope)

Mass 03 - looking south (downslope)

Mass 03 - looking west

Mass 04 - looking north

Mass 04 - looking northwest

2024 Toomuc Valley Slope Inspection

Mass 05 - looking north

Mass 05 - midslope, looking south

Mass 06 - looking north

Mass 06 - midslope, looking south

Mass 07 - looking northwest

Mass 07 - looking north

Mass 08 - looking south

Mass 08 - looking southwest

2024 Toomuc Valley Slope Inspection

Mass 09 - looking west

Mass 09 - midslope, looking north

Mass 10 - looking south

Mass 10 - looking east

Mass 11 - looking north

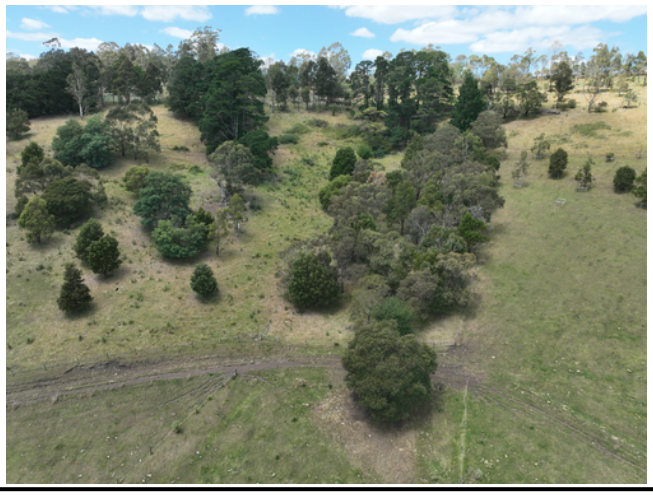
Mass 11 - looking northeast

Mass 12 - looking south

Mass 12 - looking southwest

2024 Toomuc Valley Slope Inspection

Mass 13 - looking east



Mass 13 - looking northwest

Mass 14 - looking west

Mass 14 - looking west

Mass 15 - looking north

Mass 15 - looking northeast

Mass 16 - looking east

Mass 16 - looking southeast

2024 Toomuc Valley Slope Inspection

Mass 17 - looking northwest

Mass 17 - looking north

Mass 18 - looking southwest

Mass 18 - looking northeast

Mass 19 - looking south

Mass 19 - looking northwest

Mass 20 - looking southwest

Mass 20 - looking west

2024 Toomuc Valley Slope Inspection

Dam 05 - looking west

Dam 05 - looking south

Dam 06 - looking east

Dam 06 - looking north

Dam 13 - looking east

Dam 13 - looking north