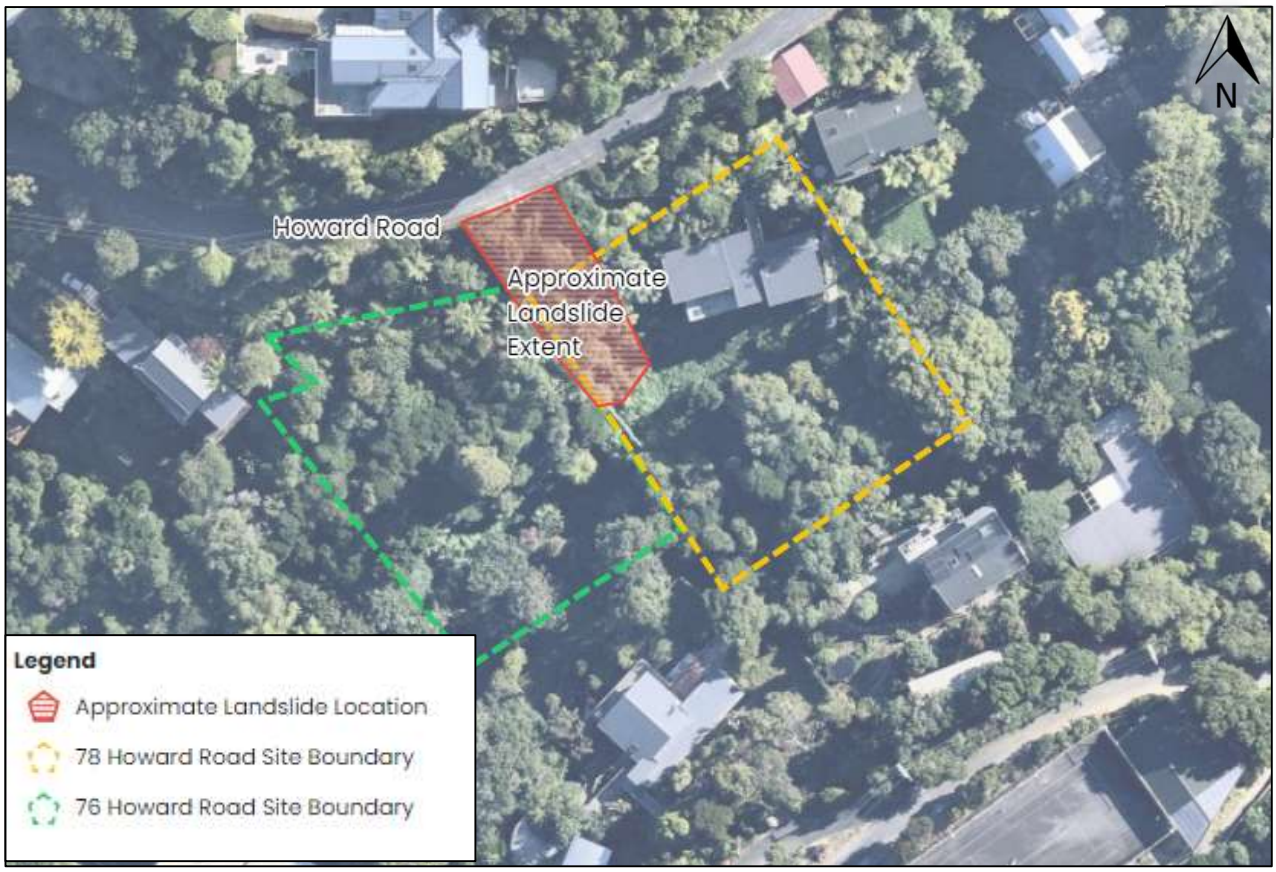
HUTT CITY COUNCIL
INITIAL LANDSLIDE ASSESSMENT REPORT

Site Address	76 and 78 Howard Road, Point Howard, Lower Hutt
Site Coordinates	Latitude: -41.251093; Longitude: 174.909924
Date Assessed	14 March 2023
Report Date	31 March 2023
Assessed by	Lauren Foote
Reviewed by	Adam Smith

Figure 1: Site Location Plan



Background Map sourced from Nearmap, dated 17 March 2021. Property boundary from Hutt City Council GIS Maps.

Figure 2: Site Photographs (14 March 2023)

Photo 1: Aerial imagery of landslide provided by Fire and Emergency NZ

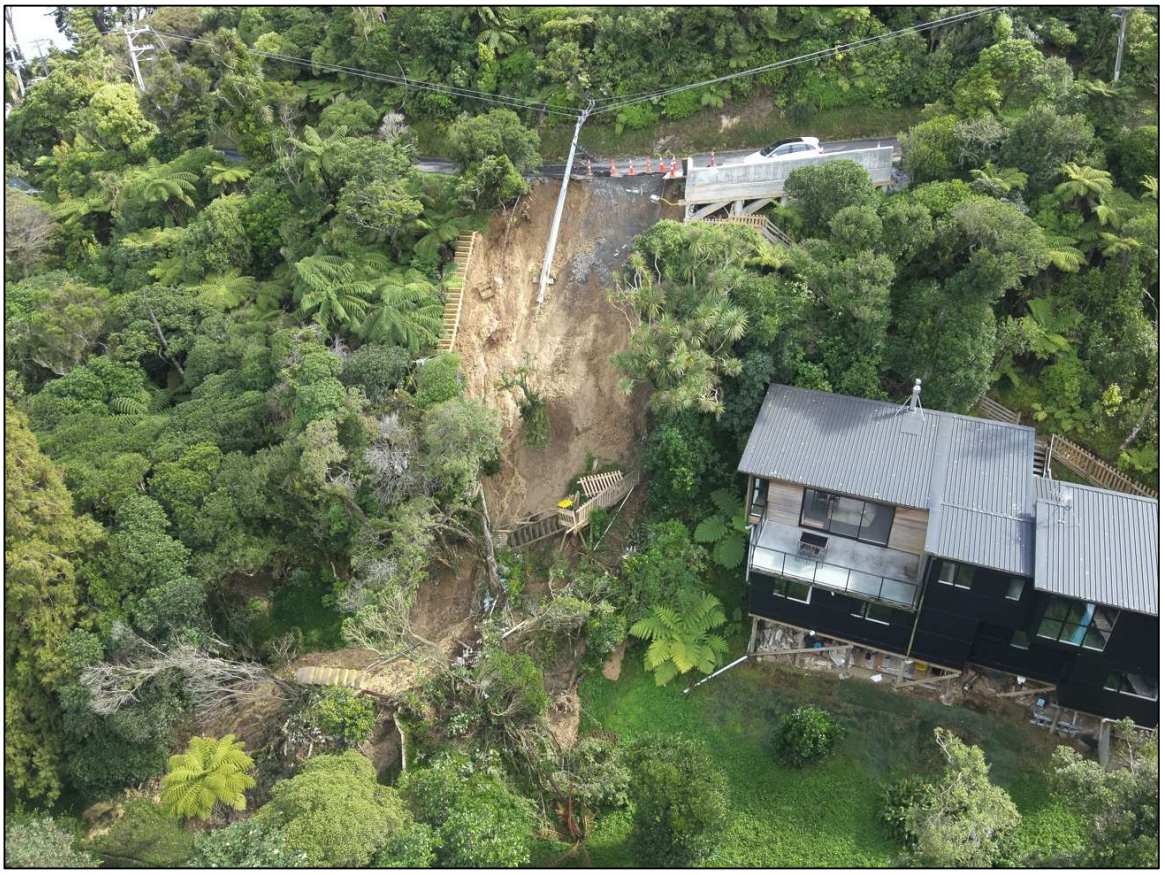


Photo 2: View of landslide facing to the southwest

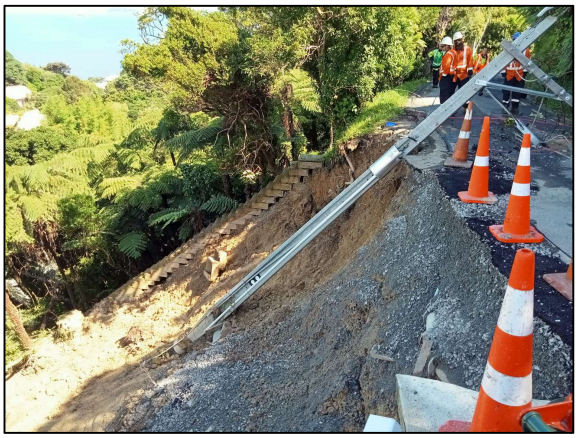
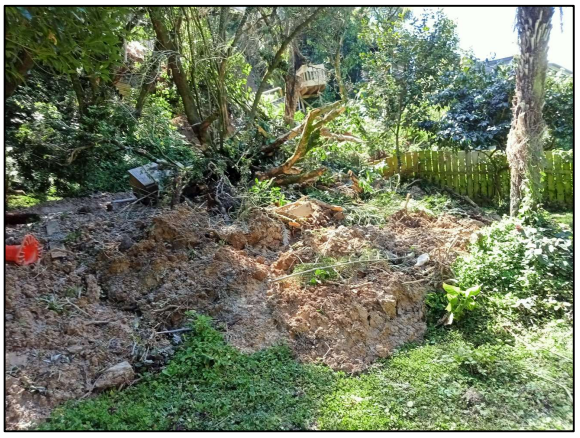


Photo3: Landslide debris deposited at toe of slope



Description of Site and Geotechnical Hazard

The site in question is a landslide that has occurred within both Hutt City Council (HCC) road reserve and the private properties at 76 and 78 Howard Road in Point Howard, Lower Hutt. We understand that there had been reports of water leaks in the weeks leading up to the landslide event, and that some roading repair/patch works had been undertaken on 13 March (the day before the landslide) in the area of the headscarp.

ENGEO visited the site on 14 and 15 March 2023 and made the observations listed below. The weather conditions on the day of the site visits were sunny and calm, however 22 mm of rain fell on the day before the landslide occurred (13 March 2023).

Landslide and Surrounding Area

- Howard Road appears to have been formed through cut and fill works. On the upslope side of the road, slightly weathered Greywacke Sandstone is exposed within the roadcut which is formed at approximately 60◦ to 70◦ from horizontal. The slope above the cutting is well vegetated with small to medium sized native plants.
- From observations of the slope adjacent to the landslide, we infer that the pre-failure slope angle would have been formed at approximately 45◦ to 50◦ from horizontal. The adjacent slopes are well vegetated with small to medium sized native plants.
- The headscarp of the landslide extends for approximately 10 m along the edge of Howard Road above the properties at 76 and 78. The scarp is approximately 2 m high and formed at approximately 60◦ from horizontal.
- Debris associated with the landslide have runout to the base of the gully, at an elevation of approximately 20 m below the headscarp.
- Immediately to the northeast of the landslide is a pile supported, concrete car parking platform. From our review of historical aerial imagery, we can constrain the time of construction to between 17 March 2021 and 25 May 2022.
- Immediately to the southwest of the landslide is a timber staircase which appears to have provided access to the lower level of the site.
- The remaining roadway is 3.8 m wide at its narrowest point, measured from the crest of the headscarp through to the road cut.
- The failure mechanism appears to be shallow translational sliding of the surface fill and colluvium soils. It appears that the upper 1 m to 1.5 m of soil has been released downslope.
- Within the asphalt surface of the road to the northeast and southwest of the site there are multiple depressions and cracks suggesting past movement / settlement. Vegetation growth within cracks suggests that these have not formed in conjunction with the recent landslide.

Services

- The landslide undermined and caused the collapse of a power pole, which has since been disconnected and removed.
- The gas and water mains were also broken and exposed within the headscarp; with temporary repairs to both of these services having now been completed.
- We understand that residents noted water flow from the slope in the weeks leading up to the landslide event. We observed a series of small trenches (approximately 200 mm wide and 200 mm deep) that had been formed at the base of the gully. It is our understanding that these were formed by the residents in an attempt to direct the water flow.
- From discussions with Wellington Water, who were on-site undertaking repairs, we understand that the water main was a 210 mm outside diameter pipe. Trenching works were undertaken to repair and temporarily divert the water main overground. The trench was completed in the approximate centre of Howard Road, parallel to the direction of the road. On the side of the trench closest to the road cut (upslope), we observed moderately weathered Greywacke Sandstone. On the downslope side of the road cut a combination of fill and colluvium soils were observed.

Interpretation of Geotechnical Hazard

Based on our site assessment, we consider that the landslide has likely occurred due to a combination of the following:

- Leaking Water Pipe – Based on the reported water flow from the slope leading up to the landslide event, and the repairs that occurred in the day prior to the landslide, it appears that the water main had been leaking at a moderate to high rate and saturated the near surface soils.
- Recent Rainfall – The landslide event occurred on the day following a 22 mm rainfall event. While this is a notable rainfall event, it is not exceptionally high and therefore is unlikely to be the sole contributor to the landslide trigger.

Assessment of Risk to Council Assets and Appropriate Remedial Works

(refer Risk Matrix below):

For the purpose of this risk assessment, three events have been considered, as follows:

Event 1 – Regression of the headscarp into Howard Road (assuming a maximum of up to 1 m of regression from the current scarp location).

Event 2 – Lateral expansion of the headscarp to the southwest, displacing the current timber staircase but not encroaching on road beyond that of the current headscarp.

Event 3 – Lateral expansion of the headscarp to the northeast, undermining the foundations of the car parking platform and destabilising the platform but not resulting in catastrophic downslope movement (not encroaching on the road beyond that of the current headscarp).

Likelihood of Events

Event 1 – Based on our assessment we consider this event is ***"Possible"***, based on our interpretation of the ground conditions beneath the road where we expect it to be underlain approximately half by rock and half by fill.

Event 2 – We consider that this event is ***"Possible"*** to occur, given that part of the staircase has already been displaced downslope.

Event 3 – While we do not have any information around the construction of the car parking platform, we anticipate that this has been founded within the underlying rock layer. Accordingly, lateral expansion of the landslide which then undermines the foundations is considered to be ***"Rare".***

Consequences of Events

Event 1 – Further regression of the headscarp by up to 1 m further into Howard Road would leave the total roadway width on the order of 2.8 m, which would likely result in road closure to vehicles until a remedial solution can be installed. Accordingly, the consequence of this event is assessed as ***"Disastrous"***.

Event 2 – Lateral expansion of the landslide to the southwest would result in displacement of the current timber staircase, with this damage to private property considered to be of ***"Medium"*** consequence.

Event 3 – Lateral expansion of the landslide to the northeast and undermining of the concrete car parking platform is considered to be of ***"Major"*** consequence, given that the car platform would likely require repair or rebuild.

Risk

Using the Qualitative Risk Assessment Framework, the Risks are assessed as follows:

Event 1 – Likelihood ***"Possible"***, Consequence "***Disastrous"***, Risk "***High"***

Event 2 – Likelihood ***"Possible",*** Consequence ***"Medium"***, Risk "***Low"***

Event 3 – Likelihood ***"Rare",*** Consequence ***"Major"***, Risk "***Very Low"***

The overall risk is therefore considered to be "***High".*** The current risk requires a detailed investigation, design, planning and implementation of treatment options to reduce risk to acceptable levels.

Short Term Action

To decrease the risk of the above-mentioned events occurring we recommend that a bund (asphalt) is installed at the top of the slope to try to prevent surface runoff from the road onto the landslide face. ENGEO visited the site on 16 March 2023 and advised Wellington Water on the location where this should be installed.

We also recommend that survey monitoring of the roadway is undertaken to detect any future movement in either vertical or horizontal planes. This should comprise the placement of markers on the asphalt surface of the current road. ENGEO directed surveyors from Spencer Holmes to undertake the installation and baseline readings of these markers on 16 March 2023. Ongoing monitoring should be undertaken as follows:

- The markers should be surveyed approximately once a week.
- Additional monitoring should be undertaken following any heavy rainfall events (more than 20 mm per 24 hours).

We consider it appropriate to re-open the roadway as a single lane for resident only access, with the following conditions:

- Roadway to be as narrow as practicable (2.5 m wide measured from the rock cut on the upslope side of the road; any vehicles wider than this will not have access).
- Vehicle speed limit of 10 km/hr.
- Lightweight vehicles only.
    - Te Manatu Whaka (Ministry of Transport) defines a light vehicle as being less than 3.5 tonnes and comprises cars, vans, utes, SUVs and 4WDs. Vehicles on the upper end of this scale should not be carrying additional heavy loads.
- No stopping above the landslide and within a zone 10 m on either side.

Report prepared by

Lauren Foote, PEngGeol

Senior Engineering Geologist

Report reviewed by

Adam Smith, CMEngNZ (PEngGeol)

Senior Engineering Geologist

Attachments: *Risk Matrix*

Qualitative Risk Assessment Framework

Colour Coding

Event 1 – Regression of the headscarp by up to 1 m into Howard Road
Event 2 – Lateral expansion of the headscarp to the southwest, displacing the current timber staircase
Event 3 – Lateral expansion of the headscarp to the northeast, undermining the car parking platform

Measures of Likelihood

Level	Descriptor	Description	Annual Probability of Occurrence
A	Almost Certain	The event is ongoing, or is expected to occur during the next year	100%
B	Very Likely	The event is expected to occur	20% to 100%
C	Likely	The event is expected to occur under somewhat adverse conditions	5% to 20%
D	Possible	The event is expected to occur under adverse conditions	1 to 5%
E	Unlikely	The event is expected to occur under high to extreme conditions	0.2 to 1%
F	Rare	The event could occur under extreme conditions	Less than 0.2%

Measures of Consequence (see notes below)

Level	Descriptor	Example Descriptions (Damage to Private Property)	Example Descriptions (Damage to WCC Assets)
1	Catastrophic	Large scale damage to multiple properties	Arterial routes and lifelines blocked an extended length of time (several days) – significant affects to communities for extended periods
2	Disastrous	Large scale damage involving private property and dwelling requiring major engineering works for stabilisation	Both lanes of local road blocked / slipped for an extended length of time (several days); or arterial route blocked causing major and extended delays to traffic; major emergency works
3	Major	Extensive damage to property but dwelling not involved	Both lanes of local road temporarily blocked/slipped (few hours to a day) or one lane of arterial route blocked with major delays; significant emergency works
4	Medium	Moderate damage to private land	One lane of road blocked / slipped with some emergency works necessary *or* several metres of footpath destroyed; no alternative access available
5	Low	Limited damage to private land	Half of one lane of road blocked for short period of time; emergency works limited to clean up only *or* footpath destroyed over several metres; alternative access is available
6	Minor	No damage	Shoulder of road damaged/blocked only; reinstatement works can be delayed *or* footpath locally undermined but still usable; reinstatement works can be delayed

Risk Matrix

		Consequences to Property/Assets					
		1: Catastrophic	2: Disastrous	3: Major	4: Medium	5: Low	6: Minor
Likelihood	A – Almost Certain	VH	VH	VH	H	H	M
	B – Very Likely	VH	VH	H	H	M	L
	C – Likely	VH	H	H	M	L	L
	D – Possible	VH	H	M	L	VL-L	VL
	E – Unlikely	H	M	L	VL	VL	VL
	F – Rare	M	L	VL	VL	VL	VL

Risk Level Implications

Risk Level		Implications for Risk Management
VH	Very High Risk	Detailed investigation, design, planning and implementation of treatment options to reduce risk to acceptable levels: may involve very high costs
H	High Risk	Detailed investigation, design, planning and implementation of treatment options to reduce risk to acceptable levels
M	Moderate Risk	Broadly tolerable provided treatment plan is implemented to maintain or reduce risks. May require investigation and planning of treatment options
L	Low Risk	Acceptable. Treatment requirements to be defined to maintain or reduce risk
VL	Very Low Risk	Acceptable. Manage by normal maintenance procedures

Notes:

1. The examples of consequence given should only be used as a general guide. The implications for a particular situation may be required to be specifically determined.
2. The risk matrices above are based on those given in Appendix G of AGS (2000): *Landslide Risk Management Concepts and Guidelines*