To:	[redacted] (RCP Senior Project Manager)				
Copy:	[redacted] (Laura Buttimore Planning); [redacted] (BTW Team Leader Ecology); [redacted] (BTW Civil Team Leader/Associate); [redacted] (BTW Civil and Environmental Engineer)				
From:	[redacted] (Senior Ecologist, CEnvP)				
Date:	28th July 2023	**BTW Job Number:**	230129	**Client Reference**	North Taranaki Visitor Centre

Subject: North Taranaki Visitor Centre Ecological Constraints and Opportunities Memo

BACKGROUND

BTW Company Ltd (BTW) understand that Te Kotahitanga o Te Atiawa and the Department of Conservation (DOC) are redeveloping the North Egmont Visitor Centre, which will be rebranded as the North Taranaki Visitor Centre (the visitor centre). The development will include the construction of a new building, and associated infrastructure, and is part of the larger Taranaki Crossing project (Appendix A). BTW have been engaged by RCP, who are overseeing the completion of the project, to provide ecological input to the master planning process, to enhance and protect existing ecological values at the site. BTW have produced this Ecological Constraints and Opportunities Memo to support these objectives and inform spatial planning and design of the redevelopment. This memo addresses existing ecological assets at the site, site specific ecological constraints, and opportunities to enhance and protect existing and potential natural capital.

Figure 1: Existing visitor centre

INTRODUCTION

The visitor centre is located within the Egmont National Park/Te Papakura o Taranaki, which is identified as a Key Native Ecosystem (Taranaki Regional Council, 2021), consisting of largely intact indigenous forest around Taranaki Mounga and the Pouakai and Kaitake ranges. The visitor centre is built on the parcel of land legally described as Part Section 2 Block XIV Egmont Survey District, which is public conservation land (Figure 2).

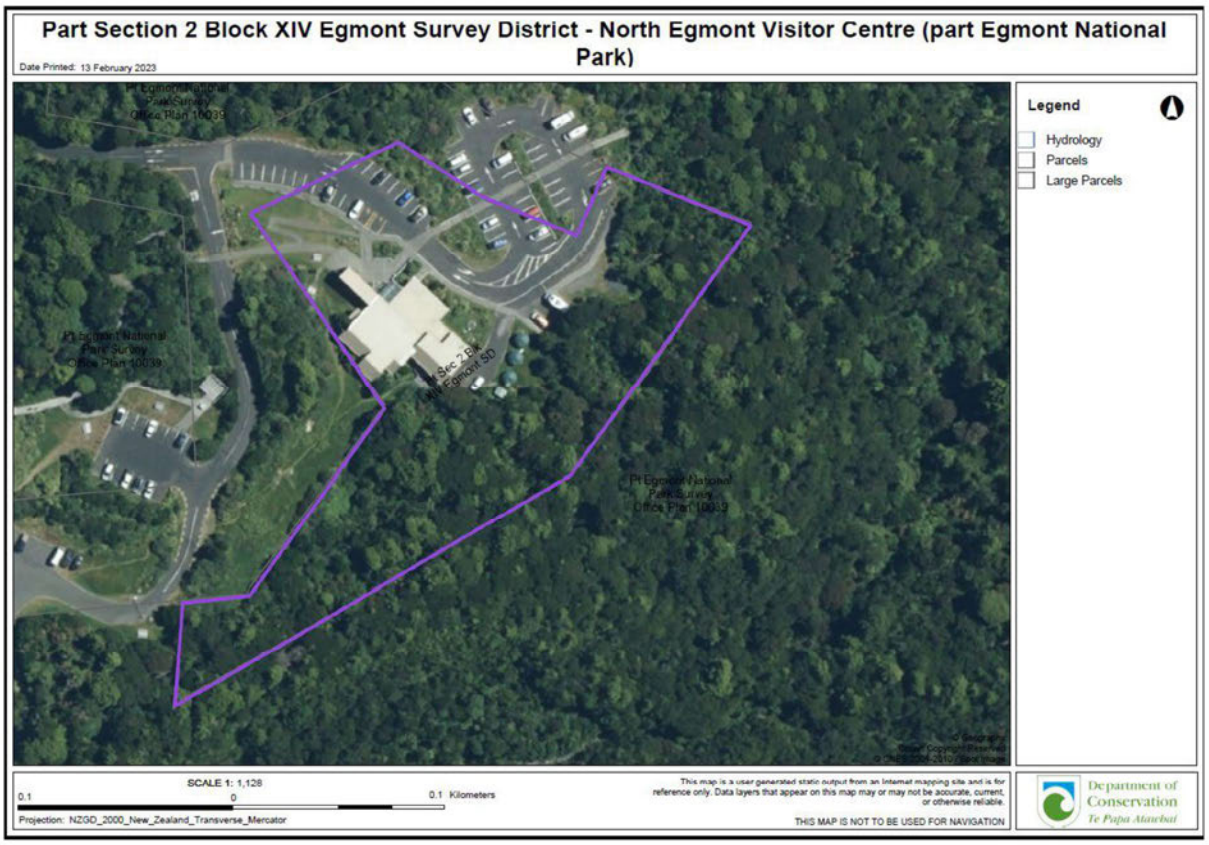

Figure 2: Part Section 2 Block XIV Egmont Survey District parcel of land (purple polygon).

The site falls on the boundary of the Waiwhakaiho River and Waiongana Stream river catchments (Figure 3). According to TRC maps, the Waiongana Stream originates 500 m downslope of the visitor centre (Figure 3). However, anecdotal evidence suggests that the stream's headwaters in fact originate upstream of the visitor centre during wetter winter periods, and adjacent the centre when the upstream reach dries out in summer (pers. comms, Greg Larkin, BTW Team Leader Ecology, 25 May 2023).

At 978 m above sea level, kāmahi (*Pterophylla racemosa*) and Hall's tōtara (*Podocarpus laetus*) dominate the lower slopes of the maunga (colloquially known as "goblin forest"), with this character largely owing to the impacts of recent volcanic eruptions. Intermittent specimens of miro (*Prumnopitys ferruginea*), kātote/soft tree fern (*Cyathea smithii*) and rimu (*Dacrydium cupressinum*) are also associated with this forest type. Over 550 plant species are found within the national park, many of which are present around the visitor centre.

The site is underlain by Holocene Lahar flow deposits of the Kahui formation from the Egmont Volcanic Centre. This formation is described as Multiple beds of andesitic conglomerate and sand, some with broken tree trunks and branches, and pyroclastic flow deposits. These deposits are estimated at between 7,000 and 12,000 years of age. The geological map (1:250K Geological map (Townsend D, et al, 2008)) indicates that nearby are underlain by more recent Holocene igneous rock deposits of the Maero Formation. These are described as multiple beds of unconsolidated andesitic conglomerate and sand, with minor pyroclastic flow deposits. These deposits are estimated at less than 1,000 years old.

The site contains existing terrestrial and freshwater natural capital that presents the redevelopment project with a range of opportunities and constraints. The ecological and environmental context of the catchment and site is outlined in the following sections, as well as a summary of identified constraints and opportunities that considers existing and potential natural capital.

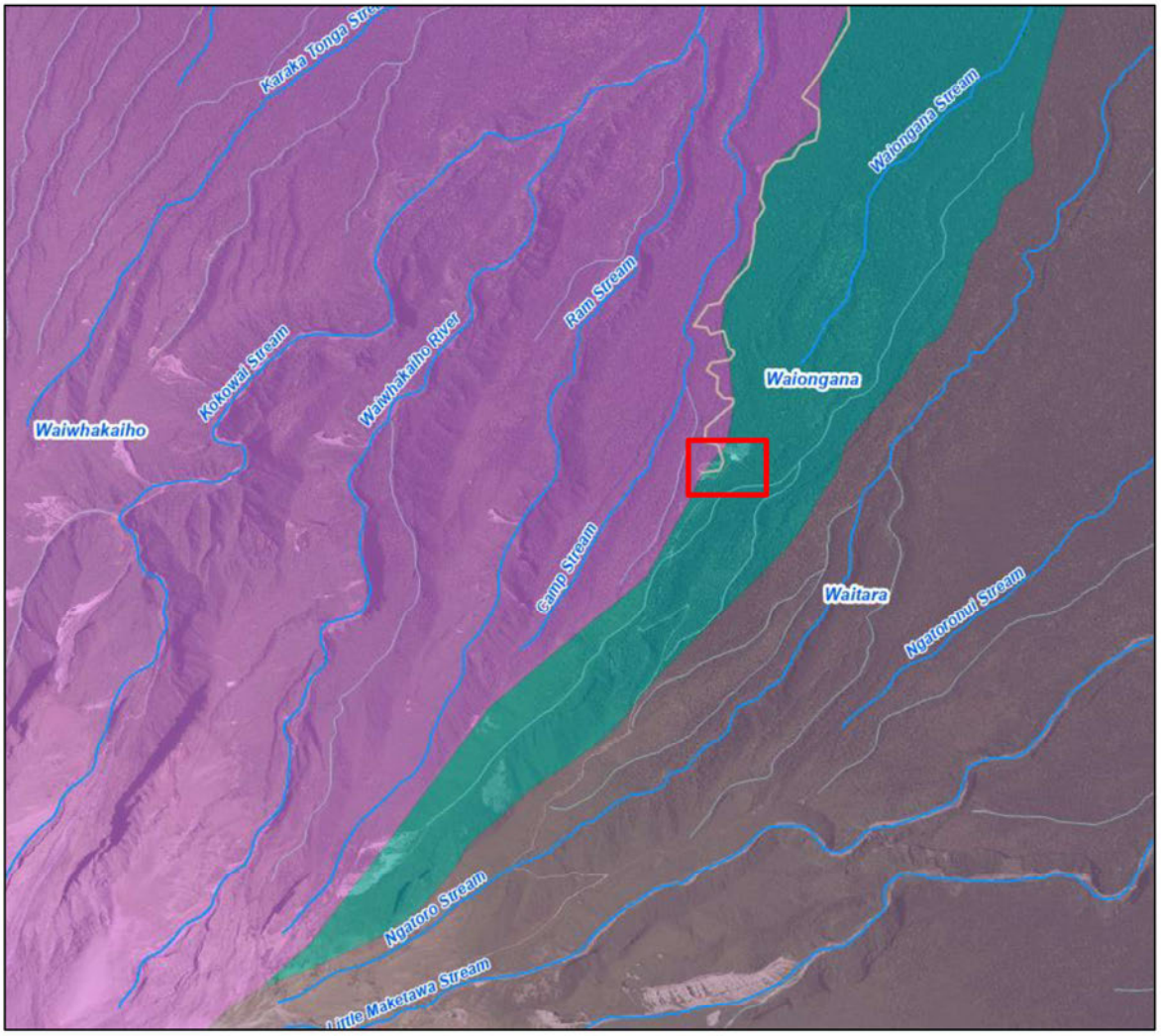

Figure 3: Position of the North Taranaki Visitor Centre (red polygon), within the indicative Waiwhakaiho and Waiongana river catchment boundaries (TRC, 2023). Unnamed tributaries are shown with pale blue lines.

EXISTING NATURAL CAPITAL

Vegetation – Shrubs and Trees

The site and surrounds have a Potential Ecosystems Threat Category rating of Less Reduced or Intact, reflective of the very high percentage of vegetation remaining within the national park. Vegetation has historically been cleared across most of the site for recreational purposes, although the surrounds include dense indigenous forest. The TRC Potential Ecosystem Extent layer indicates that, without human influence, the site would support CDF4-1, Hall's tōtara, pāhautea, kāmahi forest, which aligns which the surrounding ecosystem type. This ecotype can be found in cold, humid and semi-humid environments, at altitudes between 800 and 1200 m above sea level, following disturbance events such as volcanic eruptions.

The publicly available results of an eDNA sample collected by BTW from the Waiongana Stream (in the lower national park, prior to the ring plain) on 2 October 2021 (sample number 513176) were reviewed for plant species[1]. The species detected within the eDNA sample are presented in Wilderlab's Wheel of Life application, which provides a snapshot of the species present within the Waiongana catchment (Appendix B). Plant species detected within the sample correlate with the plants identified during a site visit undertaken by a BTW Senior

[1] Sample collected for an unrelated project.

Ecologist on 18 May 2023. Notably, kāmahi, miro, *Veronica* sp. and *Coprosma* sp. were detected (Appendix B).

The vegetation present within the subject site generally consists of isolated fragments of shrubs and groundcover species, in planted areas between and surrounding carparks, amenity bench seating, lawn and the building. Mountain toetoe (*Austroderia fulvida*) is arguably the most distinctive shrub species at the site, punctuating carpark areas and amenity planting around the existing building. Along with mountain toetoe, prominent shrubs surrounding the building include koromiko (*Veronica stricta*), New Zealand broadleaf, bush flax (*Astelia fragrans*), kanono (*Coprosma autumnalis*) and the common tree daisy (*Olearia arborescens*) (Figure 4). Less frequent species include hakeke (*Olearia ilicifolia*), *Cassinia vauvilliersii* and *Dracophyllum filifolium.* Clusters of red tussock grass (*Chionochloa rubira*) are common in disturbed areas at the site, along with clumps of *Juncus* sp. on open, grassy banks.

A clear transition was observed between regenerating bush bordering the more mature forest interior, around the perimeter of the site. The regenerating bush consisted of the aforementioned species, intermixed with Hall's tōtara saplings and established specimens of tōī/mountain cabbage tree (*Cordyline indivisa*), patē (*Schefflera digitata*) and lancewood (*Pseudopanax crassifolius*). The dense forest interior was characterised by regenerating, established Hall's tōtara and kāmahi forest and was determined to have relatively higher ecological value than the peripheral scrub, with a greater incidence of connected overhead canopy, less edge effects and the presence of At Risk – Declining vascular plants (Hall's tōtara). Based on the current preliminary design, vegetation clearance within this higher value, dense forest interior will be avoided.

An isolated kāmahi tree, approximately 4 m tall, was observed on the western side of the existing building (Figure 6) and is proposed to be removed prior to earthworks. The vegetation fragment supports an impressive assemblage of flora, including a dense mat of kiokio (*Parablechnum novae-zelandiae*), New Zealand broadleaf and a Hall's tōtara sapling, and provides ecological connectivity with the surrounding forest, in a "stepping stone" effect. Although kāmahi is a Not Threatened vascular plant species, it is recommended that the tree and groundcover are relocated if practicable. Transplanting mature trees is best undertaken in autumn or in late winter/early spring, and root pruning (to encourage new growth) six months prior to relocation is recommended. Once the root ball (including root regrowth) has been dug out, the bound roots should be left in place for a few weeks prior to removal. Mulch and a continuous water source (e.g., water bags) is required following transfer. Expert advice (e.g., a relocation plan) from an arborist would be required.

In summary, early ecological recommendations have been integrated into engineering design in that, based on current preliminary design drawings, vegetation clearance is to be limited to the marginal bush/shrubbery and pockets of toetoe (substantially lower ecological value relative to the intact forest interior). Infrastructure is proposed to be positioned in cleared areas with existing shrub, herb, gravel or grass cover, generally avoiding tree clearance altogether. Vegetation clearance associated with the proposed earthworks is likely to be very minimal. Innovative ideas are being considered to minimise the extent of wastewater soakage trench required e.g., recycling greywater for toilet flushing, positioning trenches beneath carparks, and utilising a wastewater holding tank. Multiple, smaller soakage fields are also being considered, to maximise available, cleared landscape and avoid vegetation clearance for the purposes of wastewater treatment. It should be noted that the meteorological recording and Geonet stations (for GNS volcanic and TRC weather monitoring purposes) coincide with one example of available land near the entrance to the visitor centre; appropriate planning measures should be taken to identify constraints around the locations of these instruments (Figure 5).

Figure 4: Representative photograph showing existing shrubs and toetoe vegetation proposed for clearance around the carparks.

Figure 5: Meteorological monitoring instruments and setup.

Figure 6: Solitary kāmahi tree on the western side of the building, proposed for clearance.

Vegetation – Groundcover

The groundcover present at the site includes the non-native bryophytes Juniper haircap moss (*Polytrichum juniperinum*), *Camptochaete* sp., *Dicranolomasp* sp. as well as the native, Not Threatened lichen species *Stereocaulon ramulosum,* fern kiokio (*Parablechnum novae-zelandiae*), ground herb *Gonocarpus aggregatus*, and liverworts including *Marchantia* species (Figure 7 A-G). Further ground cover at site, (shown in figure Figure 7 H) includes *Poa* grass species and creeping buttercup (*Ranunculus repens*). These species were present within the shrubbery and on exposed lawn grasses. Salvage of groundcover species is not considered necessary, given that all species identified during the site visit are either exotic or Not Threatened, and are likely to recolonise following disturbance.

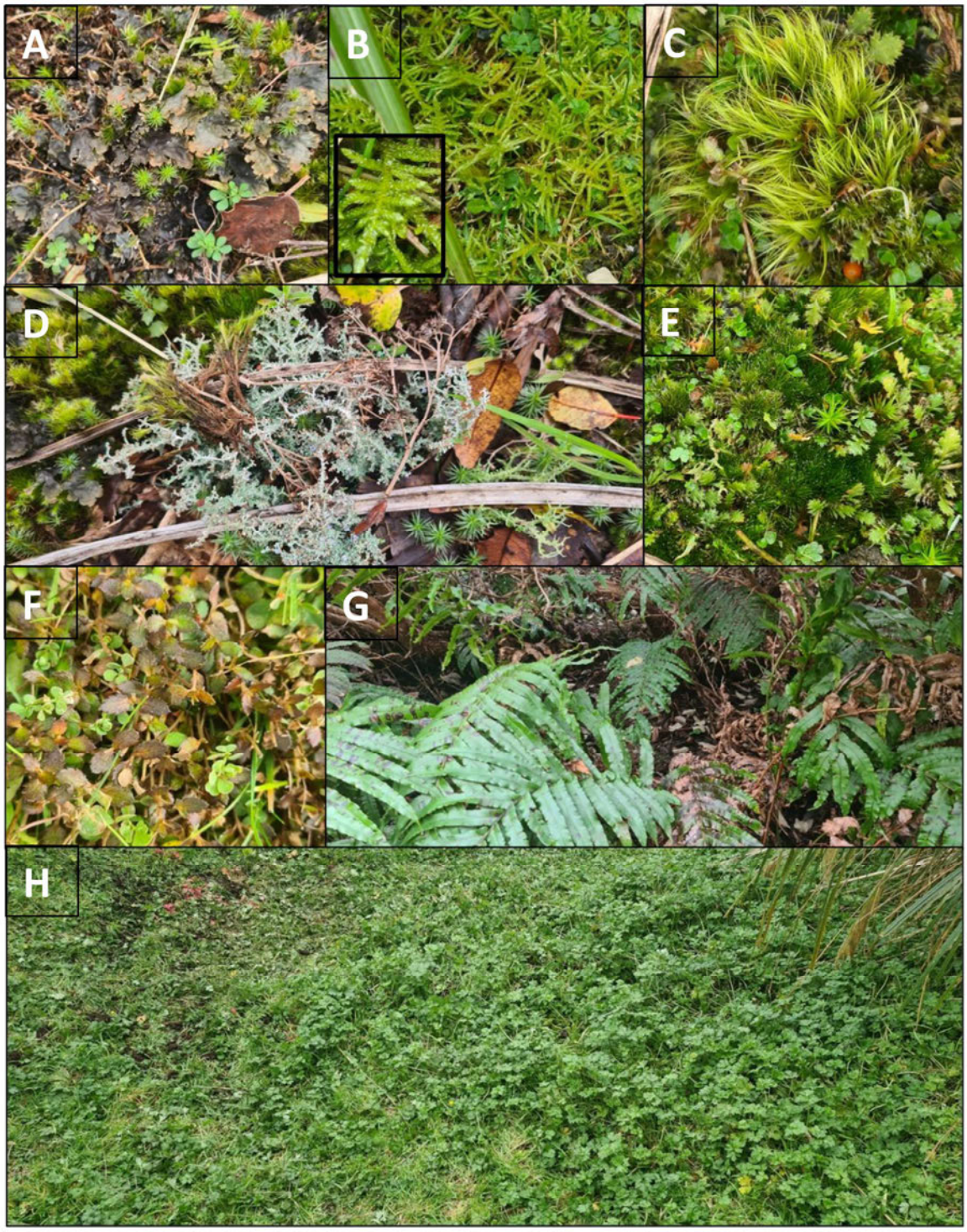

Figure 7: Ground cover at the site includes A) Juniper haircap mass (*Polytrichum juniperinum*), with *Machantia* sp; B) *Camptpchaete* sp.; C) *Dicranoloma* sp. ; D) *Stereocaulon ramulosum* with Juniper haircap mass (*Polytrichum*

***juniperinum*) mosses to the right of the photo; E) Mix of common bryophytes; F) herb species *Gonocarpus aggregatus*; G) Kiokio (*Parablechnum novae-zelandiae*); H: exotic grass and common weed species.**

Avifauna

The dense kāmahi forest surrounding the site provides suitable habitat for a wide range of passerine and nocturnal bird species. A list of bird species that have been sighted in the iNaturalist database and on the eBird hotspot database between North Egmont and Tahurangi Lodge is included in Appendix C.

Five bird species with a conservation status of At Risk or Threatened (Robertson et al., 2021) have been recorded within the surrounding area, including the Threatened – Nationally Increasing New Zealand bush falcon (*Falco novaeseelandiae ferox*), Threatened – Nationally vulnerable whio (*Hymenolaimus malacorhynchos*), and At Risk – Declining North Island rifleman/tītitipounamu (*Acanthisitta chloris granti*), North Island fernbird (*Bowdleria punctata vealeae*) and toutouwai/North Island robin[2] (*Petroica longipes*). These species are unlikely to roost or forage within the vegetation proposed for removal. Avoidance of the interior forest will minimise impacts on sensitive avifauna, whilst noise, bird strike and light pollution impacts are addressed in the "Building Design Considerations" section below. The proposed landscaping presents an opportunity to integrate avifauna habitat into the design through selection of eco-sourced plant species found locally, the creation of new bird roosting and foraging opportunities, and integration of pest animal control.

Herpetofauna

A herpetofauna habitat assessment of the likely vegetation clearance areas was carried out by Mounga Ecology (**Error! Reference source not found.**). Skink habitat typically consists of scrubland, deep leaf litter layers, fallen dead wood and thick grasslands, while arboreal geckos generally prefer mature trees. The bush edge around the existing carpark, made up of toetoe tussocks and flaxes growing alongside kiokio and low growing koromiko, creates a matrix of refugia for ground dwelling herpetofauna. Suitable habitat for arboreal geckos was also identified in the canopy, bark, foliage and epiphytes of the dense kamahi, tōtara kōtukutuku and tōī forest.

The assessment determined that the project footprint[3] of the North Taranaki Visitor Centre upgrade contains both high- and moderate- quality habitat for a range of indigenous skinks and geckos, including:

- High quality habitat within the bush edge vegetation, and some in the carpark and building periphery plantings, with an abundance of ground vegetation, leaf litter and epiphytes providing refuges and food sources.
- Moderate quality habitat within the tussocks and shrubs along the carpark and building periphery, which are isolated from the surrounding available habitat.

Given the composition and density of existing vegetation and refuge within the potential vegetation removal areas and records of lizards within the locality, the potential vegetation removal area is considered to have the potential to support At Risk indigenous skinks and arboreal geckos.

As such, a project specific Lizard Management Plan was submitted to the Department of Conservation in June 2023 as part of a Wildlife Act Authority Permit application for approval (Appendix D). The timeline (6-9 months) from lodgement of the application to receipt of the permit is a project constraint, with respect to vegetation removal, and it is recommended that

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[2] Released to the north eastern side of Mount Taranaki in 2017-2018: https://www.trc.govt.nz/environment/working-together/towards-predator-free-taranaki/predator-free-news/native-bird-returns-after-112-years/

[3] Based on current plans, which are subject to change

the clearance of high-value vegetation is minimised so far as practicable. Opportunities include undertaking habitat restoration and pest animal control.

Bats

Bats were historically common in Taranaki but are now rare or functionally extinct in most areas, due to deforestation and predation by introduced mammals. Surveys undertaken by DOC have found no evidence of short-tailed bats (*Mystacina tuberculata rhyacobia*) on Mount Taranaki/Taranaki Maunga and depleted populations of long-tailed bats (*Chalinolobus tuberculatus*). Long-tailed bats preferentially roost beneath the bark or in cavities of large, mature native canopy trees, such as Hall's totara/tōtara kotukutuku. Bat roosts may therefore be found within the dense forest interior but are considered to not be present within the peripheral shrubs at the site, given the maturity and composition of vegetation. Avoidance of the forest interior will consequently avoid the inadvertent clearance of bat roosts. However, light pollution effects need to be managed through design and are discussed in the "Building Design Considerations" section below.

Natural Inland Wetlands

There are no Scheduled Wetlands (TRC FWP 2001) within or immediately surrounding the site. Likewise, there are no wetlands detected on the Regional Wetlands Layer. However, a vast expanse of swamp was historically positioned within 700 m of the site, 200 m downstream of the Waiongana Stream headwaters. This extent is shown in Figure 8.

An interesting vegetation feature dominated by cutty grass (*Carex geminata)* was noted on the lawn behind the existing building, in the vicinity of the wastewater treatment soakage trenches (Figure 9). Given that cutty grass has a wetland indicator status of Facultative Wetland[4], it appears likely that the existing trenches are overloaded and ponding, providing suitably wet conditions for cutty grass to persist. This, and the fact that tangata whenua prefer wastewater treatment infrastructure to be positioned downgradient of buildings, supports the redevelopment of the wastewater treatment system. The project engineers have advised that a new treatment system is being developed.

According to Section 3.21 (1) of the *National Policy Statement for Freshwater Management 2020 (updated February 2023)*, "a natural inland wetland means a wetland (as defined in the Act) that is not… a wetland that has developed in or around a deliberately constructed water body, since the construction of the water body…". Section 5.1 of the Ministry for Environment's *Defining 'natural wetlands' and 'natural inland wetlands'* guidance document[5] says that "Wetlands constructed by artificial means includes wetlands and waterbodies that have been deliberately constructed for a specific purpose and that may require maintenance over time (for example, vegetation or silt removal) to continue to fulfil that purpose". Further in the document (Section 5.3), wetlands associated with effluent treatment and disposal systems are specifically excluded.

The vegetation feature therefore appears to not pose a risk to the project, based on the above assessment. Taranaki Regional Council Senior Planners have been consulted on the matter and agree with BTW's assessment that the feature is not a natural inland wetland.

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[4] Usually occurs in wetlands (estimated probability 67% – 99%), but occasionally found in non-wetlands (estimated probability 1% – 33%).

[5] To support the interpretation of the *National Policy Statement for Freshwater Management 2020* and the *Resource Management (National Environmental Standards for Freshwater) Regulations 2020*. Cited as: Ministry for the Environment. 2021. Defining 'natural wetlands' and 'natural inland wetlands'. Wellington: Ministry for the Environment.

Figure 8: Extent of historical swamp identified on Taranaki Regional Wetlands Layer (source: TRC), with visitor centre shown in red.

Figure 9: Cutty grass (*Carex geminata*) vegetation feature in the vicinity of the existing wastewater treatment soakage trenches, behind the existing building.

Freshwater

Consideration needs to be given to sedimentation and erosion control, given that the site is adjacent the nearby Waiongana Stream. The Waiongana Stream and its tributaries provide valuable ecological habitat for freshwater fauna and flora and are Te Ātiawa statutory acknowledgements. The stream, which originates within Te Papakura o Taranaki and flows northeast through agricultural land to the Tasman Sea within the rohe of Puketapu hapū, holds social, cultural, historical and spiritual importance for Māori. The Waiongana Stream is a waterbody of regional significance for it cultural, spiritual and historical associations (mahinga

kai/traditional food gathering, mātaitai reefs[6], wāhi tapu/sacred), along with its trout and whitebait fishery and spawning values and native fishery habitat values. Native fish of significance include the Not Threatened banded kōkopu (*Galaxias fasciatus*), At Risk – Declining īnanga (*Galaxias maculatus*), tuna/longfin eels (*Anguilla dieffenbachii*) and kōaro[7] (*Galaxias brevipinnis*), Threatened – Nationally Vulnerable kanakana/lamprey (*Geotria australis*) and short jawed kokopu (*Galaxias postvectis*).

Although highly unlikely to occur, an uncontrolled sediment discharge to the receiving environment could result in increased suspended sediments, increasing water turbidity and potentially adversely impacting native predatory fish behaviour and vigour by restricting visibility and ultimately hunting success. Entrained sediments are also known to directly led to fish mortality through clogging of the gills and to negatively impact aquatic plant photosynthesis through reduced light attenuation, lowering dissolved oxygen levels in the waterbody. Further, sediments that fall out of suspension when the waterbody loses energy have the potential to infill interstitial spaces on the streambed and smother the algal mats and films (periphyton) that provide habitat complexity and a vital food source for macroinvertebrates.

The position of the site (upper part of catchment) is also fundamental as any inadvertent impacts on water quality within the receiving environment could affect the water quality and ecology of a substantial portion of the catchment, to some degree. Erosion and sediment control is therefore crucial to preserving existing freshwater values within the receiving environment and should be documented within a site-specific Erosion and Sediment Control Plan.

Building and Landscape Design Considerations

Integrating ecological function into building and landscape design early provides an opportunity to maximise ecological outcomes for indigenous fauna whilst enhancing educational and amenity outcomes. Fostering positive, intergenerational human interactions with the natural world allows people (locals, tangata whenua, national and international visitors, tamariki) to immerse themselves in, and fully appreciate, nature, which is integral to conservation resilience. The following considerations would facilitate this immersion at the visitor centre:

- Minimise exotic turf/lawn extent, in favour of native plants.
- Plant multiple vegetation layers/tiers throughout (e.g., tall trees, medium shrubs, short grasses/flowers), utilising a variety of eco-sourced species that are suitable for the environment and attractive to birds (providing seeds, berries and/or flowers for nectar).
- Encourage ecological education in a natural, outdoor classroom e.g., provide a mounted binocular setup at a lookout; children's activities, such as recording all the birds found against a photographic identification booklet; educational outdoor signs.
- Provide weta and lizard hotels and insect refugia.
- Integrate nesting boxes, freshwater sources and bird feeders (if approved by DOC), to encourage birdlife around the visitor centre.

Further to this, there are a variety of tools available to minimise adverse anthropogenic impacts on wildlife, whilst allowing humans and wildlife to coexist in an educational setting. The key anthropogenic impacts of concern associated with the building redesign include bird strike, noise pollution and light pollution.

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[6] Recognise and provide for traditional fishing through local management.

[7] Not specified by TRC with respect to being a waterbody of regional significance, but detected by BTW in eDNA sampling (Appendix B)

The following design considerations are recommended to minimise bird strike:

- Minimise reflective surfaces as reflections of trees and sky on glass can confuse birds.
- Reduce the amount of glass, as practicable.
- Utilise fritted glass, ultraviolet reflective patterned glass[8] (visible to birds but transparent to the naked human eye), or external films and coverings (shorter lifespan) to create a visual barrier cueing birds to fly around, rather than through, glass. Visual patterns can break up the glass such that birds perceive they cannot fit through the transparent or reflective areas.
- Utilise architectural features such as shutters, louvers, mesh, double-skin facades or awnings to reduce reflections of vegetation or visibility into transparent areas.
- Avoid creating an effect where landscaping (e.g., walkways, passageways) funnels birds towards glass panes.
- Avoid using glass in supplemental structures, such as toilet blocks.
- Position indoor plants away from clear glass windows and/or treat adjacent glass with bird-safe measures.
- Apply all glass treatments to the height of the adjacent vegetation.

Low frequency human noise can affect wildlife via changes in stress response, foraging or other behaviours including breeding, direct physical damage. The following design considerations are recommended to minimise the adverse impacts of noise pollution on fauna:

- Installation of a "living" noise barrier (e.g. concrete construction), fitted with plants, mosses and refugia for lizards.

Birds can be attracted to lighted structures resulting in collisions, entrapment, excess energy expenditure, and even exhaustion in some situations; eliminating or reducing unnecessary lighting can reduce bird collisions with glass. Lighting can however attract insects and enhance foraging success for nocturnal fauna such as ruru/morepork (*Ninox novaeseelandiae novaeseelandiae*). The following design considerations are recommended to minimise the adverse impacts of light pollution on fauna:

- Install motion sensors so that lights are only active when people are present.
- Install lights as low as possible, cast light downward and fully shield exterior lighting to prevent skyward shining light.
- Reduce glare by using low voltage and intensity lamps.
- Use long-wavelength lights such as amber or red lamps to avoid disturbing nocturnal animals.

[8] New Zealand example includes the Auckland Zoo glass enclosures

SUMMARY OF CONSTRAINTS AND OPPORTUNITIES

Table 1: Summary of ecological constraints and opportunities for the North Taranaki Visitor Centre Upgrade

Management Area	Details	Likely to significantly affect development capacity?	Constraints and Opportunities	Extent of Ecological Value (Catchment/Regional/ National/International)
Vegetation – shrubs and trees	Shrubs and trees within, and immediately surrounding, the site include shrubs and trees typical of the CDF4-1 ecotype Surrounding forest is CDF4-1, Hall's tōtara, pāhautea, kāmahi forest.	No	Relocate the kāmahi and associated vegetation on the western side of the existing centre if possible. Avoid disturbing the forest interior. Apply innovative engineering approaches to minimise vegetation clearance extent. Ecologist to review engineering plans. Location of meteorological monitoring instruments may be a constraint. Planting plan to be prepared by project ecologist.	Regional
Vegetation – ground cover	Not Threatened and exotic plants.	No	No salvage necessary.	Catchment
Avifauna	Five Threatened or At Risk species found locally.	No	Minimise noise, bird strike and lighting effects through design. Avoid clearance of forest interior. Opportunity for habitat enhancement and pest animal control.	National
Herpetofauna	Potential clearance area contains both high- and moderate- quality habitat for a range of indigenous skinks and geckos, potentially including At Risk species.	**Yes**	Wait period (6-9 months) for DOC permits may constrain vegetation clearance timeline. Minimise clearance of high-value habitat. Opportunity for habitat restoration and pest animal control.	National
Bats	Long tailed bat roosts likely to be present in forest interior, but not in marginal shrubs.	No	Avoid clearance of forest interior. Minimise noise and lighting effects through design.	National

Management Area	Details	Likely to significantly affect development capacity?	Constraints and Opportunities	Extent of Ecological Value (Catchment/Regional/ National/International)
Natural Inland Wetlands	Potential wetland identified in location of existing soakage trenches. Brief assessment determined the feature to not be a natural inland wetland.	No	N/A	N/A
Freshwater	Waiongana Stream (high ecological and cultural value) headwaters originate upslope winter months and dry out to approximately adjacent the site during summer.	No	Erosion and Sediment Control Plan necessary for preserving existing, downslope freshwater values.	Regional
Building and Landscape Design Considerations	A range of options provided for minimising adverse impacts on fauna, and connecting people with nature.	No	Living noise barrier opportunity (not essential). Various design options for minimising bird strike. Various lighting options for minimising light pollution. Various landscape and educational opportunities for connecting people with nature.	Regional

I trust that this memo meets your requirements. Please do not hesitate to contact me to discuss.

Ngā mihi,

(Author)

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BTW Company Ltd
Ph: | Email:

(Reviewer)

Team Leader Ecology
BSc Ecology, MSc Env Sci (Dist)
BTW Company Ltd
Ph: | Email:

APPENDIX A DRAFT SCHEMATIC OF PROPOSED ENGINEERING DESIGN

NORTH TARANAKI VISITOR CENTRE

NORTH TARANAKI VISITOR CENTRE UPGRADE PRELIMINARY DESIGN DRAWINGS

TE KOTAHITANGA O TE ATIAWA

DRAWING REGISTER

DRAWING	SHEET	TITLE	DATE OF ISSUE / REVISION				
			WD				
230129.03	C00	COVER SHEET	25/07/23				
230129.03	C01	EXISTING SITE LAYOUT PLAN	25/07/23				
230129.03	C02	CARPARK LAYOUT PLAN	25/07/23				
230129.03	C03	SITE GRADING PLAN	25/07/23				
230129.03	C04	EARTHWORKS PLAN	25/07/23				
230129.03	C05	EARTHWORK SECTIONS - 1	25/07/23				
230129.03	C06	EARTHWORK SECTIONS - 2	25/07/23				

PROJECT LOCATION PLAN
SCALE N.T.S

KEY

WD	WORKING DRAFT	C	TENDER
A	APPROVAL	0	CONSTRUCTION
B	CONSENTS	AS	AS BUILT

TRANSMITTAL

TO	ATTENTION	DATE OF ISSUE / REVISION				
		WD				
OWNER / DEVELOPER	TE KOTAHITANGA O TE ATIAWA	25/07/23				
ARCHITECT / DESIGNER						
QUANTITY SURVEYOR						
BUILDER / CONTRACTOR						
TERRITORIAL AUTHORITY	NEW PLYMOUTH DISTRICT COUNCIL					

BTW COMPANY

SURVEYING
ENGINEERING
PLANNING
ENVIRONMENT

TE KOTAHITANGA O TE ATIAWA
Te iho whenua, te iho tangata

ISSUED FOR APPROVAL

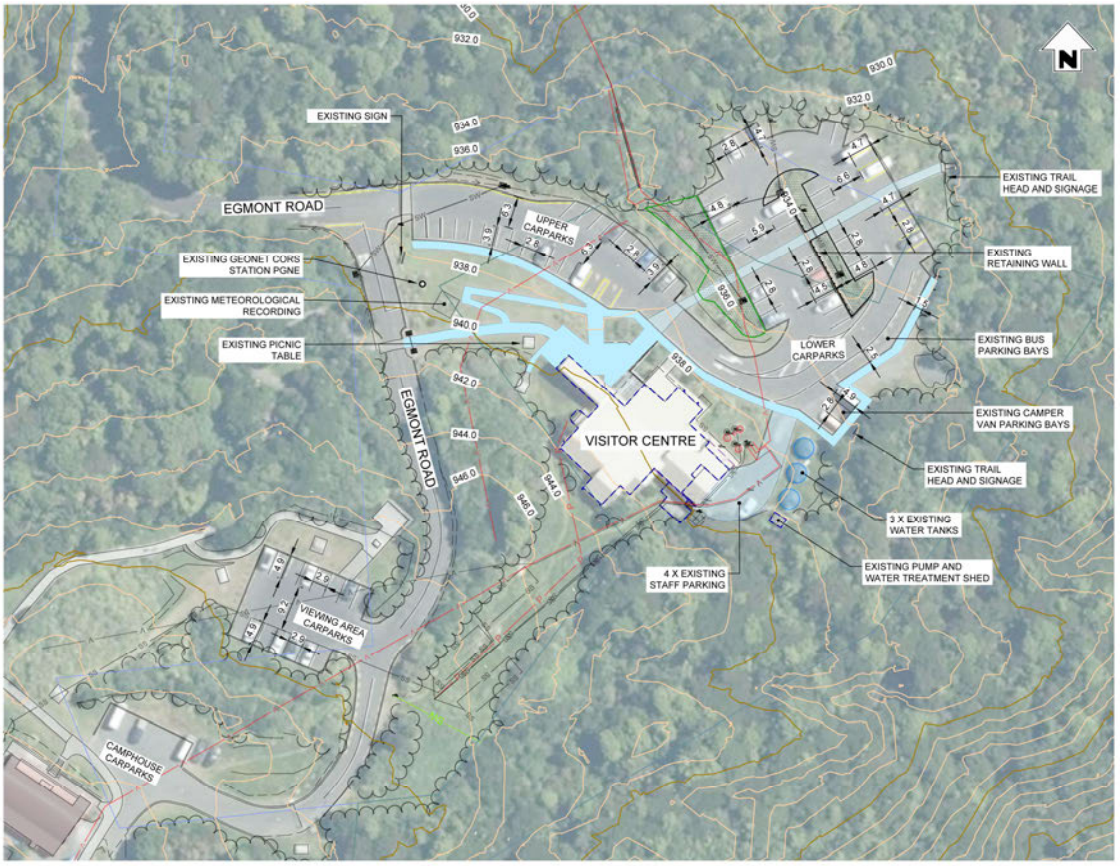
GENERAL NOTES

1. AERIAL IMAGE CIRCA 2022 MAY NOT BE FULLY REPRESENTATIVE OF THE SITE.
2. ALL SERVICES ARE SHOWN INDICATIVELY ONLY.

LEGEND

	EXISTING
MAJOR CONTOUR	
MINOR CONTOUR	
BOUNDARIES	
FLUSH NIB KERB	
EDGE OF SEAL	
POWER	V
SEWER	SS
TREE DRIP LINE	
BOTTOM OF BANK	
NIWA DUCT	P
SUBSOIL DRAIN	
MANHOLE	
SUMP	
BUILDING	
FOOTPATH	
RAINGARDEN	

	EXISTING CARPARKS
UPPER	23 + 2 (DISABLED PARKING) = 25
LOWER	44
VIEWING AREA PARKING	15
BUS PARKING	2
CAMPHOUSE	5
STAFF PARKING	4
TOTAL	95



5 0 5 10 15 20 25 30 35m

SCALE 1 : 750

Disclaimer:
Areas and dimensions may be subject to scale error.
Scaling from this drawing is at the users risk.

PLAN
SCALE 1:750

ISSUED FOR APPROVAL

BTW COMPANY

SURVEYING
ENGINEERING
PLANNING
ENVIRONMENT

NO	DATE	BY	CHKD	APPR	DREV	DESCRIPTION
00	17/07/23	KA	SH	SH		ISSUED FOR APPROVAL

REVISIONS

NUMBER | TITLE
REFERENCE DRAWINGS

GENERAL NOTES
1. Coordinates in terms of : Geodetic Datum (Taranaki 2000)
2. Elevations in terms of : NZ Vertical Datum 2016
3. Contour interval is : 2m

TE KOTAHITANGA O TE ATIAWA

LOCATION	NTVC
PROJECT No	230129
AS SCALE	AS SHOWN
SURVEYED	MCKINLAYS
DRAWN	KA 17/07/2023
CHECKED	SH 17/07/2023

TITLE
TE KOTAHITANGA O TE ATIAWA
NORTH TARANAKI VISITOR CENTRE UPGRADE
EXISTING SITE LAYOUT PLAN

ORIGINAL SIZE	DRAWING No	SHEET	REVISION
A3	230129-03	C01	WD

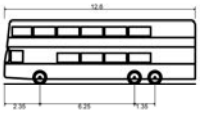
File Name: C:\1345\Data\BTW\2D\230129 - RCP_S1\2407 Drawings\230129-03 Nth Taranaki Visitor Centre_ Preliminary Design.dwg - C01 Plot Date: 25/07/2023 Plot Time: 16:40

GENERAL NOTES

1. AERIAL IMAGE CIRCA 2022 MAY NOT BE FULLY REPRESENTATIVE OF THE SITE.
2. ALL SERVICES ARE SHOWN INDICATIVELY ONLY.
3. NEW SERVICES (THREE WATERS) ARE NOT SHOWN ON THIS PLAN.
4. EXISTING MARKINGS TO BE REMOVED AND REINSTATED.
5. ALL SIGNS AND PAVEMENTS ARE TO BE IN ACCORDANCE WITH THE NZTA MANUAL OF TRAFFIC SIGNS AND MARKINGS.

LEGEND

	EXISTING	PROPOSED
MAJOR CONTOUR		
MINOR CONTOUR		
BOUNDARIES		
FLUSH NIB KERB		
EDGE OF SEAL		
POWER	V	
SEWER	SS	
TREE DRIP LINE		
BOTTOM OF BANK		
NIWA DUCT	P	
SUBSOIL DRAIN		
MANHOLE		
SUMP		
FOOTPATH		
RAINGARDEN		
ASPHALT / CHIPSEAL		
GRASS / PLANTED		
FILL BATTER		
CUT BATTER		

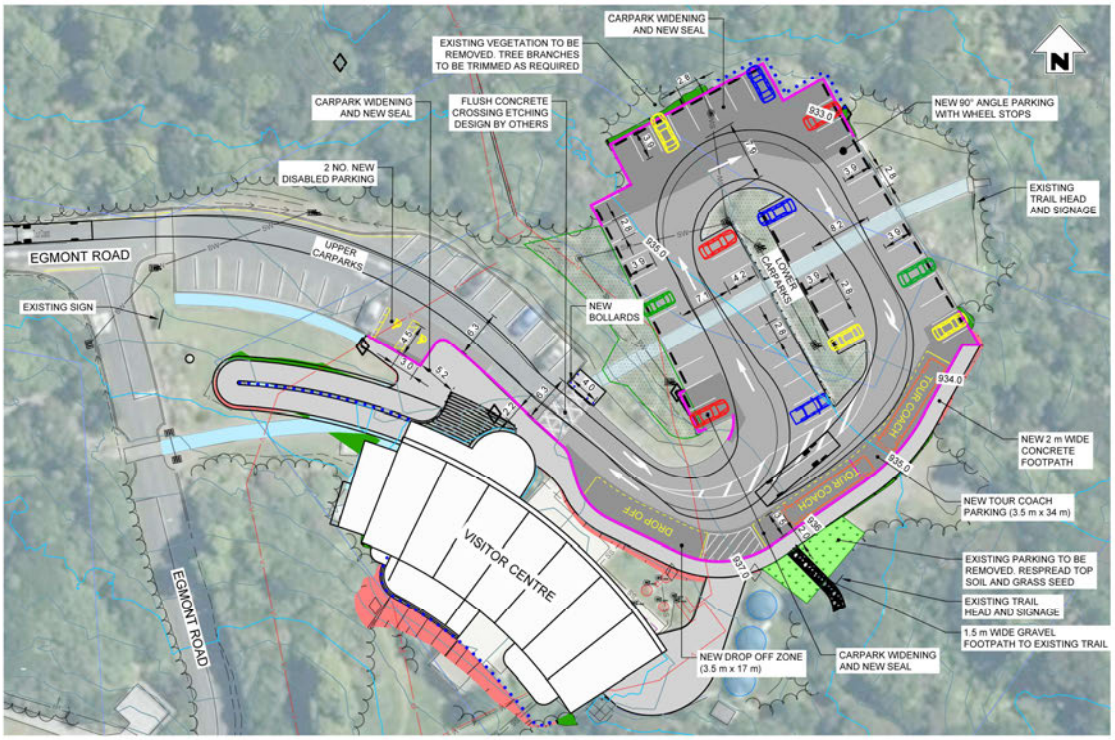


Tour Coach

Overall Length	12.600m
Overall Width	2.500m
Overall Body Height	4.164m
Min Body Ground Clearance	0.335m
Track Width	2.500m
Lock-to-lock time	6.00s
Wall to Wall Turning Radius	12.500m

5 0 5 10 15 20 25

SCALE 1 : 500



PLAN
SCALE 1:500

	EXISTING CAR PARKING	PROPOSED CAR PARKING
UPPER	23 + 2 (DISABLED PARKING) = 25	20 + 2 (DISABLED PARKING) = 22
LOWER	44	48 (90 DEGREE)
BUS PARKING	2	2 (TOUR COACH) + 3 DROP OFF) = 5
VIEWING AREA PARKING	15	15
CAMPHOUSE	5	5
STAFF PARKING	4	4
TOTAL CARPARKS	95	99

Disclaimer:
Areas and dimensions may be subject to scale error.
Scaling from this drawing is at the users risk.

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PLANNING
ENVIRONMENT

NO	DATE	BY	CHKD	APPR	DESCRIPTION
00	17/07/23	KA	SH	SH	ISSUED FOR APPROVAL

REVISIONS

NUMBER | TITLE
REFERENCE DRAWINGS

GENERAL NOTES
1. Coordinates in terms of : Geodetic Datum (Taranaki 2000)
2. Elevations in terms of : NZ Vertical Datum 2016
3. Contour interval is : 2m

TE KOTAHITANGA O TE ATIAWA

LOCATION	NTVC
PROJECT No.	230129
AS SCALE	AS SHOWN
SURVEYED	MCKINLAYS
DRAWN	KA 17/07/2023
CHECKED	SH 17/07/2023

TITLE
TE KOTAHITANGA O TE ATIAWA
NORTH TARANAKI VISITOR CENTRE UPGRADE
CARPARK LAYOUT PLAN

ORIGINAL SIZE	DRAWING No.	SHEET	REVISION
A3	230129-03	C02	WD

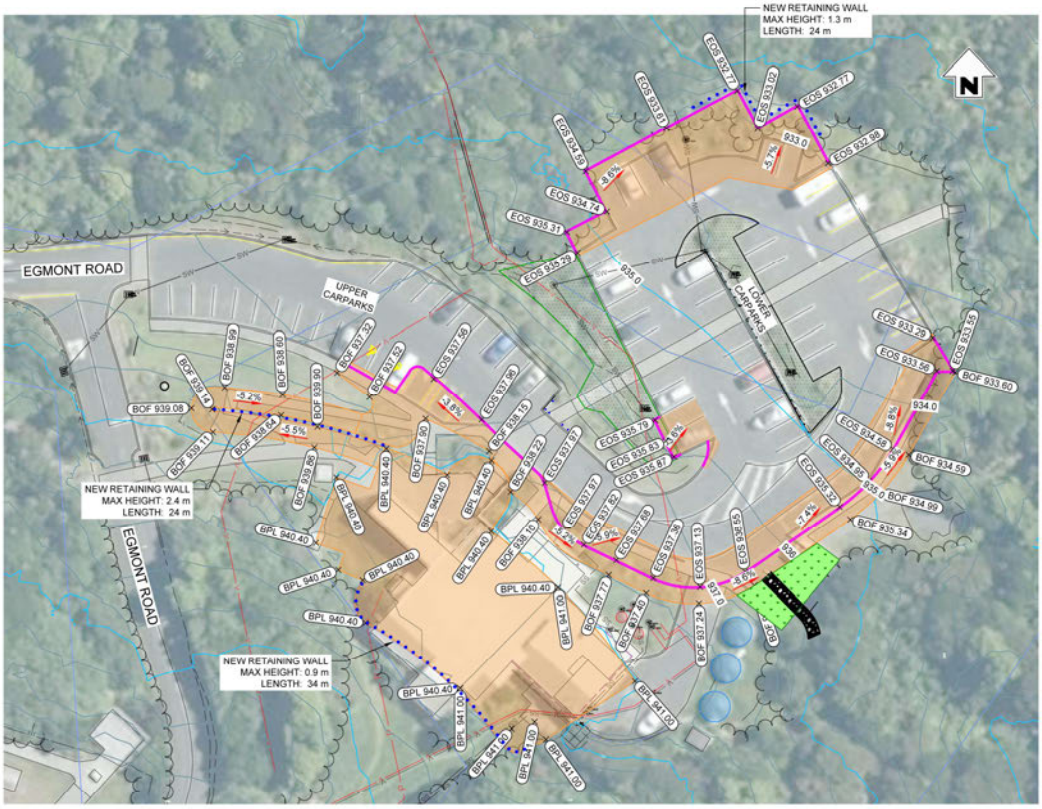
File Name: C:\12d\Data\BTW\2D\230129 - RCP_ST2400' Drawings\230129-03 Nth Taranaki Visitor Centre _ Preliminary Design.dwg - C02 Plot Date: 25/07/2023 Plot Time: 16:43

GENERAL NOTES

1. EOS = NEW EDGE OF SEAL LEVELS
2. BOF = NEW BACK OF FOOTPATH LEVELS
3. BPL = NEW BUILDING PAD LEVELS
4. TOTAL GRADING AREA = 1900 m²

LEGEND

- MAJOR CONTOURS
- MINOR CONTOURS
- FLUSH NIB KERB
- GRADING AREA



PLAN
SCALE 1:500

5 0 5 10 15 20 25
SCALE 1 : 500

Disclaimer:
Areas and dimensions may be subject to scale error.
Scaling from this drawing is at the users risk.

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ENGINEERING
PLANNING
ENVIRONMENT

IND	17/07/23	KA	SH	SH	ISSUED FOR APPROVAL
NO	DATE	BY	CHKD	APPR	DESCRIPTION

REVISIONS

NUMBER	TITLE

REFERENCE DRAWINGS

GENERAL NOTES
1. Coordinates in terms of : Geodetic Datum (Taranaki 2000)
2. Elevations in terms of : NZ Vertical Datum 2016
3. Contour interval is : 2m

TE KOTAHITANGA O TE ATIAWA

LOCATION	NTVC
PROJECT No	230129
AS SCALE	AS SHOWN
SURVEYED	MCKINLAYS
DRAWN	KA 17/07/2023
CHECKED	SH 17/07/2023

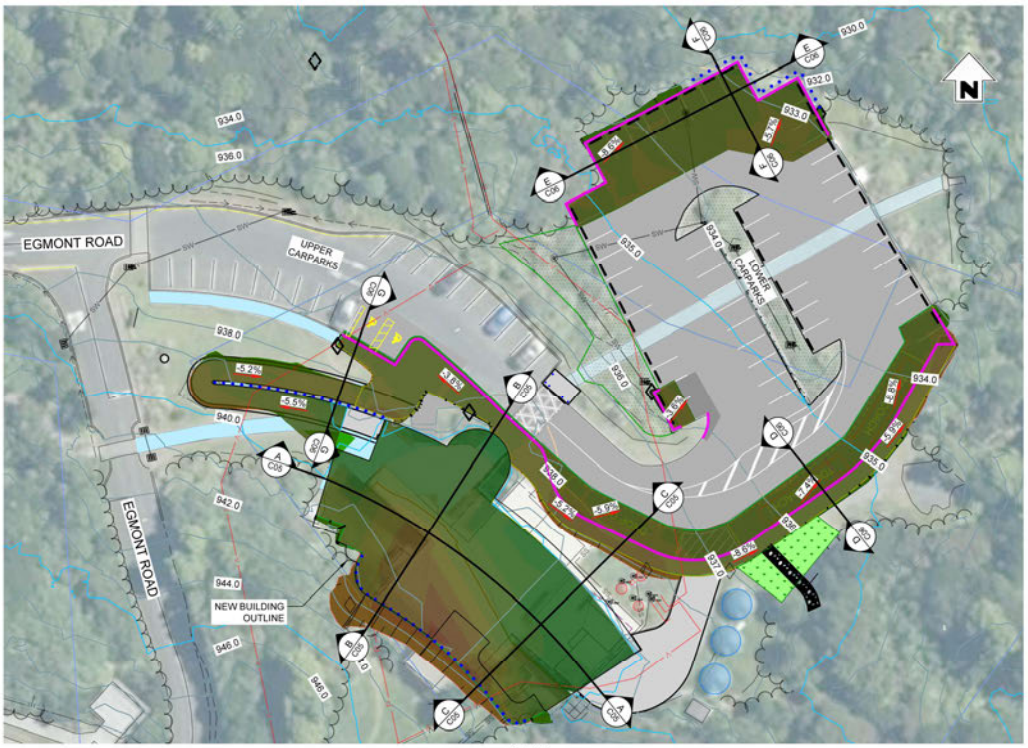
TITLE
TE KOTAHITANGA O TE ATIAWA
NORTH TARANAKI VISITOR CENTRE UPGRADE
SITE GRADING PLAN

ORIGINAL SIZE	DRAWING No	SHEET	REVISION
A3	230129-03	C03	WD

File Name: C:\1345\Data\BTW\2D\230129 - RCP_ 5724\07 Drawings\230129-03 Nth Taranaki Visitor Centre_ Preliminary Design.dwg - C03 Plot Date: 25/07/2023 Plot Time: 16:51

GENERAL NOTES

1. THE CONTRACTOR SHALL STABILISE EXPOSED SURFACES AS SOON AS PRACTICABLE.
2. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH NZS4404 UNLESS NOTED OTHERWISE.
3. EARTHWORK SECTIONS REFER TO SHEET C05 AND C06.
4. DESIGN CUT SLPE 1V:1H & 1V:2H
5. DESIGN FILL SLOPE 1V:2H & 1V:8H
6. NEGATIVE NUMBERS = CUT
7. POSITIVE NUMBERS = FILL
8. TOTAL CUT VOLUME = 247 m³
9. TOTAL FILL VOLUME = 785 m³



PLAN
SCALE 1:500

EARTHWORKS CUT AND FILL VOLUME TABLE

Number	Color	Minimum Elevation (m)	Maximum Elevation (m)
1		-2.000	-1.500
2		-1.500	-1.000
3		-1.000	-0.500
4		-0.500	0.000
5		0.000	0.500
6		0.500	1.000
7		1.000	1.500
8		1.500	2.000
9		2.000	2.500

5 0 5 10 15 20 25
SCALE 1 : 500

Disclaimer:
Areas and dimensions may be subject to scale error.
Scaling from this drawing is at the users risk.

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ENVIRONMENT

NO	DATE	BY	CHKD	APPR	DPDR	DESCRIPTION
1	17/07/23	KA	SH	SH		ISSUED FOR APPROVAL

REVISIONS

NUMBER | TITLE
REFERENCE DRAWINGS

GENERAL NOTES
1. Coordinates in terms of : Geodetic Datum (Taranaki 2000)
2. Elevations in terms of : NZ Vertical Datum 2016
3. Contour interval is : 2m

TE KOTAHITANGA O TE ATIAWA

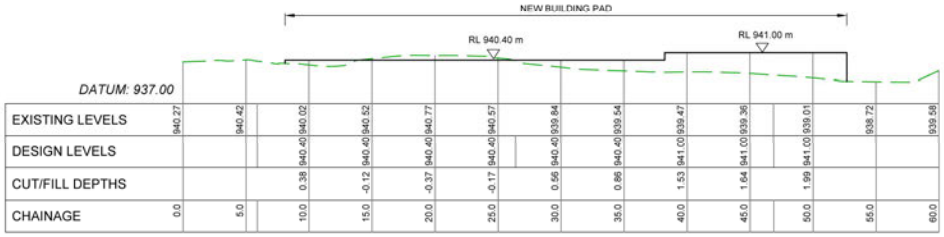
LOCATION	NTVC
PROJECT No.	230129
A3 SCALE	AS SHOWN
SURVEYED	MCKINLAYS
DRAWN	KA 17/07/2023
CHECKED	SH 17/07/2023

TITLE
TE KOTAHITANGA O TE ATIAWA
NORTH TARANAKI VISITOR CENTRE UPGRADE
EARTHWORKS PLAN

ORIGINAL SIZE	DRAWING No.	SHEET	REVISION
A3	230129-03	C04	WD

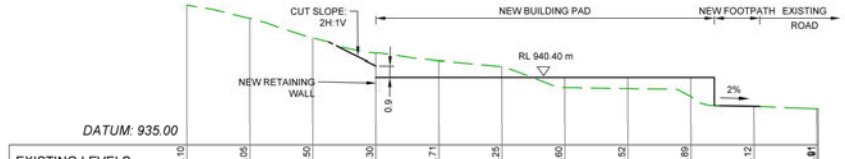
File Name: C:\12d\Data\BTW\2D\230129 - RCP_5724\07 Drawings\230129-03 Nth Taranaki Visitor Centre_ Preliminary Design.dwg - C04 Plot Date: 25/07/2023 Plot Time: 16:51

LEGEND		
	EXISTING	PROPOSED
SURFACE LEVEL	- - -	———



EXISTING LEVELS	940.27	940.42	940.02	940.52	940.77	940.57	939.84	939.54	939.47	939.36	939.01	938.72	939.58
DESIGN LEVELS			940.40	940.40	940.40	940.40	940.40	940.40	941.00	941.00	941.00		
CUT/FILL DEPTHS			0.38	-0.12	-0.37	-0.17	0.56	0.86	1.53	1.64	1.99		
CHAINAGE	0.0	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0	55.0	60.0

A C04 SECTION
SCALE 1:300



EXISTING LEVELS	946.10	945.05	943.50	942.30	941.71	941.25	939.60	939.52	938.89	938.12	937.91
DESIGN LEVELS				940.40	940.40	940.40	940.40	940.40	940.40	938.12	
CUT/FILL DEPTHS				-1.90	-1.31	-0.85	0.80	0.88	1.51	0.00	
CHAINAGE	0.0	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0

B C04 SECTION
SCALE 1:300

EXISTING LEVELS	943.16	942.01	940.61	939.49	938.94	938.68	938.35	937.43	937.08
DESIGN LEVELS		941.00	941.00	941.00	941.00		937.67	937.43	
CUT/FILL DEPTHS		-1.01	0.39	1.51	2.06		-0.68	0.00	
CHAINAGE	0.0	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0

C C04 SECTION
SCALE 1:300

3 0 3 6 9 12 15m
SCALE 1 : 300

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ENVIRONMENT

NO	DATE	BY	CHKD	APPR	DSGN	DESCRIPTION
1	17/07/23	KA	SH	SH		ISSUED FOR APPROVAL

REVISIONS

NUMBER TITLE
REFERENCE DRAWINGS

GENERAL NOTES
1. Coordinates in terms of : Geodetic Datum (Taranaki 2000)
2. Elevations in terms of : NZ Vertical Datum 2016
3. Contour interval is : NA

TE KAHUI KAUKAWA O TE ATIAWA
TE ATIAWA

LOCATION	NTVC
PROJECT No.	230129
A3 SCALE	AS SHOWN
SURVEYED	MCKINLAYS
DRAWN	KA 17/07/2023
CHECKED	SH 17/07/2023

TITLE
TE KOTAHITANGA O TE ATIAWA
NORTH TARANAKI VISITOR CENTRE UPGRADE
EARTHWORK SECTIONS - 1

ORIGINAL SIZE	DRAWING No.	SHEET	REVISION
A3	230129-03	C05	WD

File Name: C:\1Jobs\data\BTW\2D\230129 - RCP_5724\07 Drawings\230129-03 Nth Taranaki Visitor Centre _ Preliminary Design.dwg - C05 Plot Date: 25/07/2023 Plot Time: 15:53

LEGEND		
	EXISTING	PROPOSED
SURFACE LEVEL	- - - -	———

DATUM: 933.00

EXISTING LEVELS	935.54		935.45	935.44	935.40
DESIGN LEVELS		935.52	935.45		
CUT/FILL DEPTHS		0.07	0.01		
CHAINAGE	0.0	5.0	10.0		14.0

D / C04 SECTION
SCALE 1:300

DATUM: 929.00

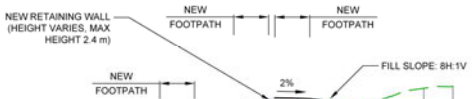
EXISTING LEVELS	935.34	935.12	934.59	934.18	933.76	932.97	932.95	931.98	930.85
DESIGN LEVELS			934.61	934.17	933.77	933.45	933.09		
CUT/FILL DEPTHS			0.01	0.00	0.01	0.49	0.14		
CHAINAGE	0.0	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0

E / C04 SECTION
SCALE 1:300

DATUM: 927.00

EXISTING LEVELS	933.38	933.03	932.93	930.69	929.98
DESIGN LEVELS	933.36	933.23	933.07		
CUT/FILL DEPTHS	-0.02	0.19	0.14		
CHAINAGE	0.0	5.0	10.0	15.0	16.9

F / C04 SECTION
SCALE 1:300



DATUM: 935.00

EXISTING LEVELS	937.13	937.29	938.20	939.31	939.42	940.80	940.95
DESIGN LEVELS		937.30	938.19	939.99	939.44		
CUT/FILL DEPTHS		0.01	-0.01	0.68	0.02		
CHAINAGE	0.0	5.0	10.0	15.0	20.0	25.0	27.3

G / C04 SECTION
SCALE 1:300

3 0 3 6 9 12 15m
SCALE 1 : 300

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ENVIRONMENT

NO	DATE	BY	CHKD	APPR	DRFR	DESCRIPTION	NUMBER	TITLE
1	17/07/23	KA	SH	SH		ISSUED FOR APPROVAL		

REVISIONS — REFERENCE DRAWINGS

GENERAL NOTES
1. Coordinates in terms of : Geodetic Datum (Taranaki 2000)
2. Elevations in terms of : NZ Vertical Datum 2016
3. Contour interval is : NA

TE KOTAHITANGA O TE ATIAWA

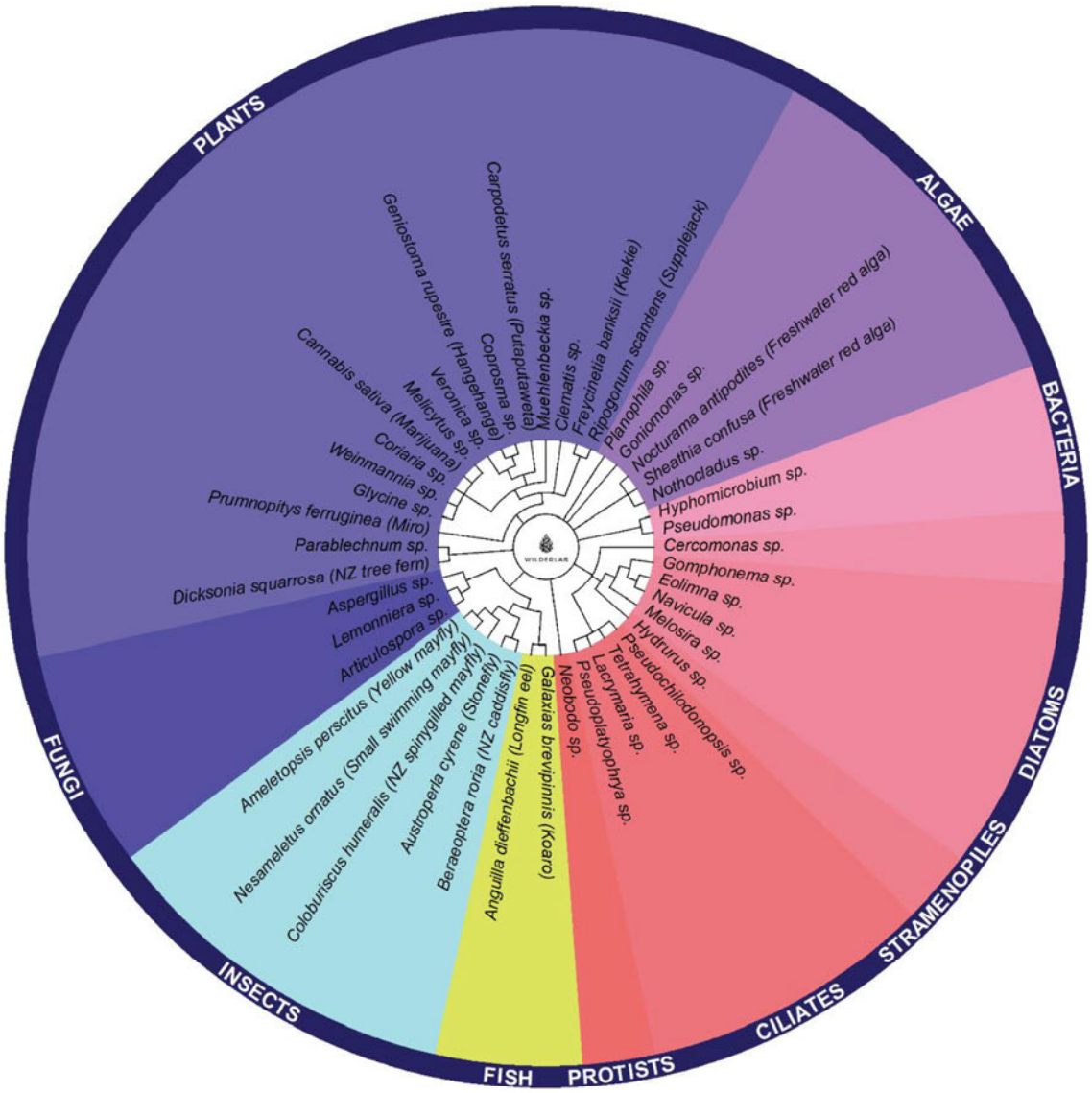
LOCATION	NTVC
PROJECT No.	230129
A3 SCALE	AS SHOWN
SURVEYED	MCKINLAYS
DRAWN	KA 17/07/2023
CHECKED	SH 17/07/2023

TITLE
TE KOTAHITANGA O TE ATIAWA
NORTH TARANAKI VISITOR CENTRE UPGRADE
EARTHWORK SECTIONS - 2

ORIGINAL SIZE	DRAWING No.	SHEET	REVISION
A3	230129-03	C06	WD

File Name: C:\1Jobs\data\BTW\2D\230129 - RCP_STAGE\Drawings\230129-03 Nth Taranaki Visitor Centre_ Preliminary Design.dwg - C06 Plot Date: 25/07/2023 Plot Time: 15:54

APPENDIX B WILDERLAB WHEEL OF LIFE FOR WAIONGANA SAMPLE 513176 (2 OCTOBER 2021)



APPENDIX C EBIRD AND INATURALIST BIRD SPECIES LISTS

Table C 1: Bird observations within the vicinity of the North Taranaki Visitor Centre.

Common Name	Species Name	Threat Status (Robertson *et al.*, 2021)	Observations eBird - North Egmont to Tahurangi Lodge Hotspot	iNaturalist
Mirimiro / North Island tomtit	*Petroica macrocephala*	Not Threatened	2003- 2023	2010-2022
Toutouwai / North Island Robin	*Petroica longipes*	**At Risk - Declining**	N/A	2017-2018
Kārearea / New Zealand bush falcon	*Falco novaeseelandiae ferox*	**Threatened - Nationally Increasing**	2023	N/A
Tauhou / Silvereye	*Zosterops lateralis lateralis*	Not Threatened	2019-2023	2017-2023
Pīwakawaka / Fantail	*Rhipidura fuliginosa*	Not Threatened	2021-2023	
Riroriro / Grey warbler	*Gerygone igata*	Not Threatened	2003-2023	2010-2022
Korimako / New Zealand Bellbird	*Anthornis melanura melanura*	Not Threatened	2019-2023	N/A
Welcome Swallow	*Hirundo neoxena*	Not Threatened	2019-2023	2019-2022
Whio / Blue Duck	*Hymenolaimus malacorhynchos*	**Threatened - Nationally Vulnerable**	N/A	2016-2020
Pōpokotea / Whitehead	*Mohoua albicilla*	Not Threatened	N/A	2022
Tūī	*Prosthemadera novaeseelandiae novaeseelandiae*	Not Threatened	2022	2022-2023
Kererū / New Zealand pigeon	*Hemiphaga novaeseelandiae*	Not Threatened	2019-2022	2002-2018
Mātātā / Fernbird	*Bowdleria punctata vealeae*	**At Risk - Declining**	2021	2020-2022
Kāhu / Swamp harrier	*Circus approximans*	Not Threatened	2020	N/A
Kōtare / Sacred kingfisher	*Todiramphus sanctus*	Not Threatened	2020	N/A
Ruru / Morepork	*Ninox novaeseelandiae novaeseelandiae*	Not Threatened	2020	N/A
North Island Brown kiwi	*Apteryx mantelli*	Not Threatened		2019* Feather only
Rifleman	*Acanthisitta chloris*	**At Risk - Declining**	2003	2018
Starling	*Sturnus vulgaris*	Introduced and Naturalised	N/A	2023
Dunnock	*Prunella modularis*	Introduced and Naturalised	2019-2023	2016-2022
Common chaffinch	*Fringilla coelebs*	Introduced and Naturalised	2019- 2023	N/A
Sparrow	*Passer domesticus*	Introduced and Naturalised	2019- 2023	N/A
Eurasian skylark	*Alauda arvensis*	Introduced and Naturalised	2019- 2023	N/A

Common Name	Species Name	Threat Status (Robertson *et al.*, 2021)	Observations eBird - North Egmont to Tahurangi Lodge Hotspot	iNaturalist
Eurasian Blackbird	*Turdus merula*	Introduced and Naturalised	2019- 2023	2022
Yellowhammer	*Emberiza citrinella*	Introduced and Naturalised	2022	N/A
Song thrush	*Turdus philomelos*	Introduced and Naturalised	2019-2022	N/A

APPENDIX D LIZARD MANAGEMENT PLAN (MOUNGA ECOLOGY)

LIZARD MANAGEMENT PLAN FOR AN UPGRADE OF NORTH EGMONT VISITOR CENTRE MOUNT TARANAKI

Prepared for: BTW Company Ltd
Attn: [redacted] Senior Environmental Scientist
179-181 Courtenay Street
New Plymouth, Taranaki 4340

Date: June 2023

Prepared by: [redacted] Principal Ecologist, Mounga Ecology Ltd, Taranaki

Report Preparation, Technical Advice and Peer Review by:
[redacted] Herpetologist, Kūkūwai Consulting Ltd

Citation reference: Mounga Ecology Ltd 2023. *Lizard Management Plan for an Upgrade of North Egmont Visitor Centre, Mt Taranaki.* Report prepared by Mounga Ecology Ltd for BTW Company Ltd
Version: DRAFT 1.0
Internal reference: Report1026 North Egmont LMP
Cover photograph: Existing North Egmont Visitor Centre with restoration planting to be removed.

CONTENTS

1. Introduction

BTW Ltd, on behalf of their client, Te Kotahitanga o Te Atiawa, are managing the process to upgrade the North Egmont Visitor Centre on Mount Taranaki. The project will require *c.*444 m² vegetation removal to accommodate new auxiliary building, carpark and associated turning routes and road diversion. The vegetation proposed for removal includes *c.*67 m² of indigenous vegetation along a bush margin to the northern extent of an existing access road and parking area, as well as *c.*119 m² of established plantings around the existing building, in many discrete segments (Figure 1); the remaining vegetation is comprised of mown exotic grasses and herbaceous weeds. The vegetation of value is characterised by a mixture of indigenous ferns, grasses, sedges, shrubs and trees that, overall, provide moderate and high value potential habitat for indigenous lizards.

A site assessment was carried out on 31 May 2023 by Sarah Roth of Mounga Ecology, to determine potential habitat values of the vegetation proposed for removal. No presence/absence surveys have been undertaken to date to inform this report, and it remains unknown if indigenous lizards are present within the construction footprint. Records held by the Department of Conservation were reviewed, showing multiple records of indigenous lizards of at least four species in the forest surrounding the visitors centre; therefore, it is considered highly likely that lizards are present. As such, it is recommended that the applicant gain a Wildlife Act Authority permit (WAA) from the Department of Conservation to enable lizards to be caught and relocated out of harm's way (if they are present) prior to and in conjunction with vegetation clearance activities.

This Lizard Management Plan (LMP) has been adapted from a previously prepared Lizard Management Plan for the Dawson Falls Visitor Centre; a project that has already gained a WAA (97975-FAU) on the south-eastern side of Mount Taranaki. This report describes a proposed strategy to catch and relocate any lizards within the vegetation clearance footprint at North Egmont Visitor Centre. Technical advice and peer review in preparing this Lizard Management Plan were provided by Jacqui Wairepo of Kūkūwai Consulting Ltd, who is an experienced herpetologist.

2. Site Context

2.1 Ecological Context

The project site is situated within the Egmont Ecological District (*c.*270,300 ha) which includes Mount Taranaki, its ring plain and much of the land within the Taranaki bight (Clarkson *et al.*, 2013). The pre-human lowland forests of the Egmont Eco-region were historically dominated by rimu (*Dacrydium cupressinum*), rātā (*Metrosideros robusta*) and tawa (*Beilschmiedia tawa*) podocarp forest in the well to moderately drained soils, and pukatea (*Laurelia novae-zelandiae*), kahikatea (*Dacrycarpus dacrydioides*), swamp maire (*Syzygium maire*) forest in the poorly drained areas (Clarkson, 1986).

2.2 Surrounding Environment

The site is located at North Egmont Visitors Centre, which is situated at the top of Egmont Road on the north-eastern side of Mount Taranaki, within the Egmont National Park. The site contains a visitor centre, the camp house (accommodation) and carparks, with access to a number of walking trails.

2.3 Terrestrial habitats

The bush edge along the existing carpark is characterised by toetoe tussocks (*Austroderia toetoe*) and harakeke (*Phormium tenax*) growing alongside kiokio (*Parablechnum novae-zelandiae*) and low growing koromiko (*Veronica* sp.) to create a matrix of refugia for ground dwelling herpetofauna. The canopy of kamahi (*Pterophylla racemosa*), tōtara kōtukutuku (*Podocarpus laetus*) and tōī (*Cordyline indivisa*) provide abundant refugia and food resources in their bark, foliage and well-established epiphytes for arboreal geckos. Fruiting *Coprosma* spp, along with puka (*Griselinia lucida*) and māhoe (*Melicytus ramiflorus*) comprise the sapling tier, providing food resources in the form of berries. Beyond the bush edge, within the forested area, swamp astelia (*Astelia grandis*) dominates the ground tier with some wheki (*Dicksonia squarrosa*) and kiokio dispersed among rotting tree trunks and fallen branches, leaf litter and some stones. Abundant insects were noted within the ground habitat. Overall, this area provides high value habitat for both skinks and arboreal geckos (Figure 1: red hashed areas).

Plate 1: Forest edge (left) and established plantings (right) showing potential lizard habitat within the proposed clearance area. These are surrounded by mown grass, comprising the majority of low-value habitat in vegetation removal area.

The front of the existing building is three discreet areas of vegetation within the clearance footprint, each with suitable habitat for skinks despite their isolation from contiguous forested areas. Toetoe, kiokio and harakeke dominated the vegetation in these areas, with shrubs providing limited fruit fall. These areas provide moderate value habitats for ground dwelling skinks (Figure 1: orange hashed areas).

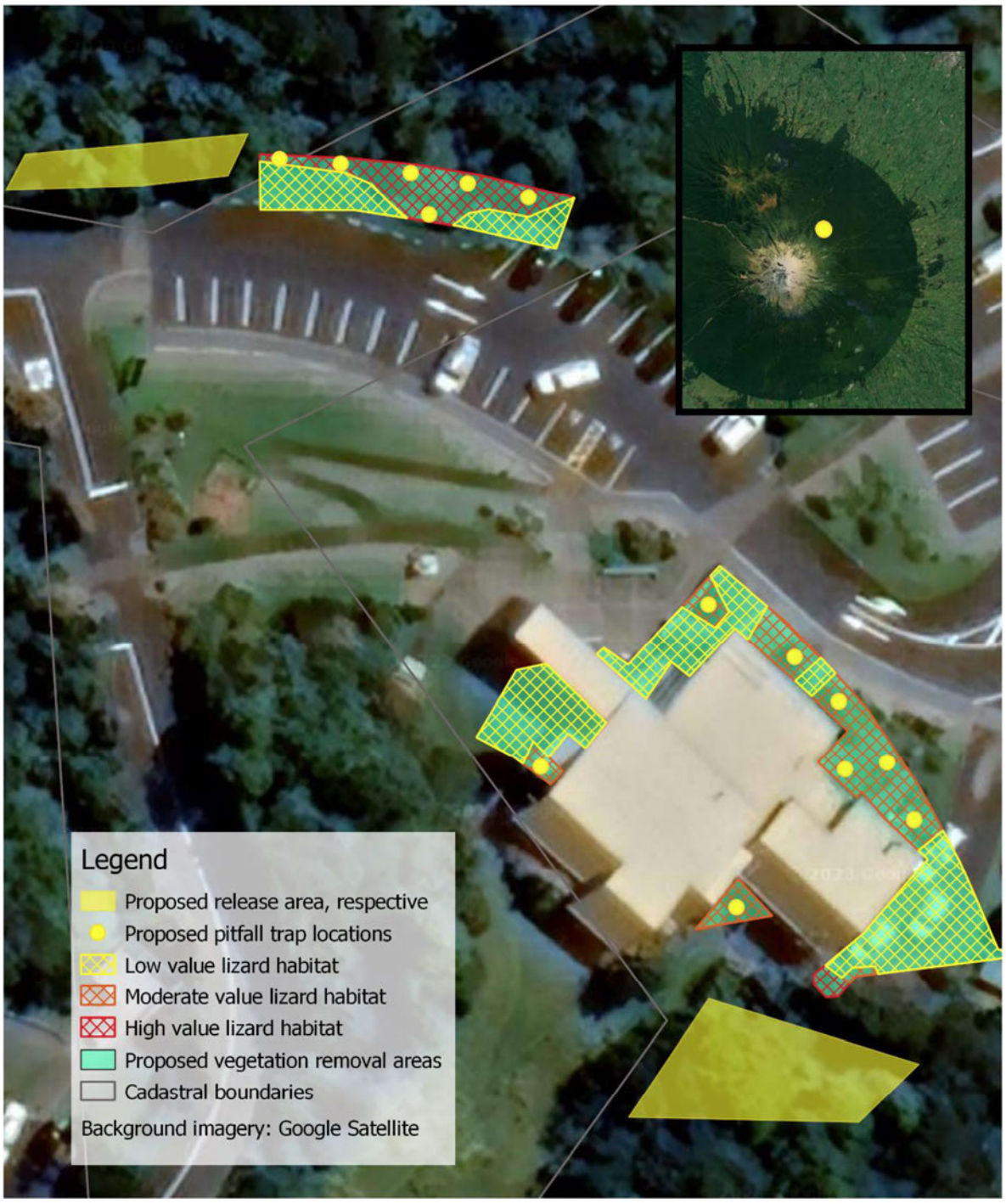


Figure 1. Vegetation clearance areas, potential lizard habitat identification and proposed pitfall trap and release location at North Egmont Visitor Centre, Taranaki

Data credit: LINZ
Date 17/06/23
Created by: SR

0 7.5 15 22.5 30 m

Mounga Ecology

The vegetation proposed for clearance along the back of the existing building is in closer proximity to contiguous bush areas, and provides refugia and food resources in the form of toetoe, harakeke and frequent kiokio, along with fruiting shrubs including coprosma species.

Low value habitat is characterised by mown grass adjacent to the margins of restoration planting (report cover photograph) described above, and high value habitat north of existing access (Plate 2). Within the low value habitat small, isolated tussocks (Plate 6) with mown grass surrounding them are unlikely to support lizard populations; however, it is possible that individual lizards may utilise these areas for refuge or foraging.

Vegetation proposed to be cleared at the site was assessed as having overall moderate ecological value.

3. Legislative requirements

3.1 Wildlife Act (1953)

Indigenous lizards are protected by the Wildlife Act (1953) and their habitats are protected under the Resource Management Act (1991). Before lizards may be caught, handled and/or relocated a Wildlife Act Authority must be applied for and approved by the Department of Conservation.

3.2 Resource Management Act (1991)

This project is authorised under the RMA through the Resource Consenting process. The RMA is the primary environmental legislation in New Zealand that is used to sustainably manage natural and physical resources including vegetation and wildlife (Wildlands, 2019). Sections 30 and 31 of the RMA provision for district and regional councils to protect and maintain indigenous biodiversity.

4. Summary of proposed lizard management approach

Due to the reasonably small size of the vegetation clearance and earthworks area (*c.*444 m²) of which the majority is low-value lizard habitat (*c.*258 m²) leaving only *c.*186 m² of moderate and high value habitat, the lizard management approach shall be undertaken as follows:

1. Preparation of the LMP and WAA application and submission to the Department of Conservation for review and approval.
2. Following approval of the LMP and WAA application, the LMP shall be implemented in full accordance with the approved version of this LMP.
3. A post-salvage report shall be prepared and submitted to Taranaki Regional Council and DOC.
4. Amphibian and Reptile Distribution Scheme records shall be submitted to DOC.

5. Lizard values

5.1 Previous assessments

A site assessment for potential lizard habitat values was carried out on 31 May 2023 and a memo prepared by Mounga Ecology Ltd was provided to the client with the findings. Areas of forest, scrubland, deep leaf litter, rotting logs and large tussocks were visually assessed and identified as potential lizard habitat. Sub-canopy and canopy vegetation was identified as representing potential arboreal gecko habitat, and the overall assessment for potential lizard habitat value was high.

5.2 Lizard survey

Desktop assessment

A search of the herpetofauna database was undertaken to determine what lizard species are known to be present on Mt Taranaki, *i.e.*, within 10 km of the site. Table 1 provides a list of lizard species that have either been recorded or are very likely to be present within this radius of the project site, and assesses the likelihood of their presence within the identified potential habitats in the vegetation clearance area at North Egmont Visitor Centre.

Table 1 below provides a list of all lizard species that are confirmed as present on Mount Taranaki via the DOC Herpetofauna Database, along with habitat preferences (van Winkel, Baling & Hitchmough, 2018) and the likelihood of it being present at North Egmont Visitor Centre. This list is not exhaustive and other species that are known to the Taranaki region may also be present on the Mounga and/or known of anecdotally.

Species	Threat Classification	Preferred habitat	Likelihood of being present at the site
Skinks			
Glossy brown skink (*O. zelandicum)*	At Risk – Declining	Littoral zone, boulder beaches, shingle riverbeds, grassland and wetlands, densely vegetated scrubland and damp forests	Moderate
Copper skink (*O. aeneum)*	At Risk - Declining	Grassland, leaf litter, shrub/scrublands, forest, rocky and woody debris	Moderate
Ornate skink (*O. ornatum)*	At Risk - Declining	Grassland, leaf litter, shrub/scrublands, forest, rocky and woody debris	Low
Geckos			
Forest gecko (*Mokopirirakau granulatus*)	At Risk - Declining	Forest, scrub/shrublands, rock outcrops	Moderate
Elegant gecko (*Naultinus* elegans)	At Risk - Declining	Forest, scrub/shrublands, tussock grassland	Low

Pre-salvage Lizard Surveys

At the time of preparing this LMP (winter 2023), no formal surveys have been undertaken at the immediate site (either passive or active). This is due to the requirement for surveys to be undertaken during the warmer months when lizards are active and detectable. However, due to the high value habitat within the proposed vegetation removal area and the known presence of several lizard species on the mounga, it is recommended that a WAA application is submitted as quickly as possible to avoid potential project delays.

The methods in the Section 7.1 will be applied ahead of vegetation removal to avoid, minimise and mitigate potential adverse effects to resident lizards.

6. Potential effects on lizards

6.1 Effects management (avoid, remedy, mitigate)

There are a range of known adverse effects on lizards that result from habitat removal. These effects include injury, mortality, displacement, increased inter- and intra-specific competition and increased vulnerability to predation.

Injury and mortality can occur during vegetation removal, particularly when heavy machinery is used to either scrape ground vegetation back or mulch trees and shrubs to the ground. Displacement can occur when lizards are left at the impact site (*i.e.,* evade capture during the pre-clearance salvage) with no habitat to take refuge in, or when they are relocated into new sites that are already at carrying capacity or simply unsuitable to receive lizards. Inter and intra-specific competition for resources (food, habitat, mates) can occur when lizards are relocated into novel sites that already contain moderate numbers of lizards. Displacement and competition can also render lizards more vulnerable to predation.

Avoiding these effects is not possible as the vegetation must be removed. Therefore, they should be mitigated with an aim of ensuring a no-net-loss of lizards. Of the fairly small size (*c.*444 m²) of the clearance area, only 186 m² are moderate-high value for lizard habitat. Therefore, a pre-clearance lizard salvage will mitigate the adverse effects on a proportion (amount unknown) of the lizard population. Pending the number of lizards that are caught and relocated prior to clearance, additional during-clearance salvage efforts may also be undertaken (*i.e.,* tree felling and ground vegetation scrape-back).

It is widely acknowledged that a proportion of resident lizards will always remain uncaptured, and these effects should be mitigated in other ways, such as habitat restoration, pest animal control or through compensatory measures such as undertaking research that will improve knowledge and management practices in lizard mitigation. Section 7 below discusses the proposed approach to ensure that if they are present, the adverse effects on native lizards will be appropriately mitigated.

7. Management Strategy

7.1 **Pre-Salvage Site Preparation**

Before lizard salvage begins, it is recommended that a silt fence be erected around the northern clearance boundary of the salvage area to separate it from contiguous habitat with a hard barrier. The purpose of this is to prevent any lizards present in surrounding vegetation from entering the salvage site whilst we are trying to remove as many as possible from the area. Due to the isolation of the other areas proposed for removal, an exclusion fence is not required as it is unlikely lizards with re-inhabit the area being salvaged in the short time period.

The silt fence should be constructed with durable polythene buried at least 200mm to prevent skinks from burrowing beneath the fence. The fence should remain in place until all vegetation has been completely removed from the clearance and earthworks area, preferably until works and rehabilitation planting have been completed.

Spotlighting

Spotlighting will be carried out during fine, clear and still weather within 24hrs prior to felling potential arboreal gecko habitat, which includes the canopy trees north of the existing carpark access. The trees will either be sectioned and relocated into the bush, or if this is not possible, be searched after dusk using a LED headlamp to look for geckos to ensure no animals are present post-felling. The surrounding vegetation clearance area will also searched during the survey and any sign will be documented, tree tagged so precautions can be taken during removal. A minimum of four-person search hours will be undertaken.

Visual Survey

Prior to dusk on the same evening of spotlighting (fine, clear and still weather during daylight savings months), a minimum of two-person search hours will be undertaken carrying out visual inspections. These inspections involve walking slowly and quietly around the perimeter of the clearance area and through the interior, searching for diurnal basking lizards.

7.2 Lizard Salvage

Lizard salvage will involve the following capture and relocation techniques:

- Pitfall trapping (live capture)
- Hand-searching (destructive)
- Raking
- Supervision of clearance (manual and machine-assisted)

7.2.1 Pitfall trapping

A network of pitfall traps will be installed in transects throughout the two main salvage areas (represented by yellow dots on Figure 1) that will be subject to vegetation clearance and/or

earthworks. Pitfall traps will be installed in 5m spacings, with the transects 5m apart to ensure that a pitfall trap is located within the home range of every individual lizard in the area, if possible

Pitfall traps consist of a four-litre bucket that is dug into the ground so that the lip of the bucket sits flush with the soil surface (or slightly below). Buckets have small puncture holes at the base to allow water to drain through (ensuring lizards won't drown in case of heavy rain). Two sticks are laid over the top of the bucket in a 't' before placing a square piece of plywood over the top. This creates a very narrow entry for lizards, to the exclusion of larger predators such as mice, mustelids and cats. Plywood will be anchored down using a heavy rock or weedmat pegs.

Upon installation, traps will be filled completely to the brim with vegetation and sticks and left *in-situ* for at least two weeks. This timeframe will allow lizards to become familiar with the novel item and freely enter and exit. After two weeks the traps will be activated: vegetation and sticks will be removed, leaving only a small amount at the bottom, baited with some fresh banana and then covered with the plywood lid.

Traps will be inspected daily (always within 24 hours of setting) for lizards. Lizards will be removed for processing and relocation, before having fresh bait added and re-set. Lizard trapping will be undertaken for a minimum of five days, and shall continue until no lizards have been caught for two consecutive days (to a maximum of 15 trapping days).

7.2.2 Hand-searching

Each day that traps are inspected, active hand-searching will also be undertaken. This broadly involves lifting and inspecting beneath everything that may represent potential habitat for lizards such as rocks and rotting logs. All potential refuges within the footprint will be inspected throughout the trapping week.

7.2.3 Raking

Hand-searching will be supported by a raking technique. A garden rake will be used to directionally guide lizards through the leaf litter towards pitfall traps.

7.2.4 Supervision of clearance

If any species with a threat status classified as 'At Risk' (or higher), or if more than 10 'Not Threatened' lizards are caught during the lizard salvage, then the herpetologist should also be present for tree felling and/or the scraping back of ground vegetation and topsoil layers.

7.3 Lizard Handling

All lizards that are caught during any phase of the lizard salvage will be handled in accordance with best practise. Measurement information will be taken that includes snout-to-vent length (SVL), vent-to-tail length (VTL), age class (juvenile, sub-adult, adult) and any relevant notes.

Lizards will be placed into a hard container that is ventilated, filled with leaf litter and stored in the shade. Lizards will be released twice daily: once following the daily inspection of all traps at the end of each trapping day into the release area.

7.5 Lizard Release

Lizards may only be released into areas of habitat that fulfill a specific set of criteria. Habitats must be of equal or superior value, should ideally be located nearby (within 500m) of the capture site, be protected from future development and contain a resident population of all the same species that are being relocated.

As it remains unknown which indigenous lizard species will be caught during the salvage, it is critical to select a relocation area that is as close to the capture site as possible. Fortunately, the lizard salvage site is contiguous with uninterrupted forest and therefore any lizards caught will simply be relocated into the adjacent forest. The lizard barrier fence shall remain in-situ until the site works is complete to minimize the likelihood of lizards trying to return to their capture site.

Lizards will be released into created lizard refuges. Material will be gathered from the wider forest to create complex and protective habitats that are immediately free from competition with resident lizards. These refuges should be constructed in number and size to support the number of lizards being relocated. No more than five lizards should be released into a single constructed refuge (approximately 2x2m), which should have a range of materials including deadwood, leaf litter, soil, rocks and any other materials to create complexity and attract invertebrates. If arboreal geckos are found during salvage, they will be released into constructed refuges at the base of a tree of the same species that it was found on *(i.e.*, if it is detected on a tōtara, it will be relocated into a tōtara).

7.6 Vegetation Management

Vegetation that is felled should be distributed throughout adjacent forest habitats to break down over time and provide habitat and food resources for local wildlife. No vegetation should be mulched or taken offsite, and to the greatest degree possible, soils, leaf litter and debris should all be carefully redistributed throughout the surrounding forest floor. The project herpetologist shall guide this process to ensure that all captured lizards are relocated *with* their habitats into the adjacent forest to the greatest degree possible.

8. Seasonality

Lizard surveys and salvages can only be undertaken during the official 'lizard season' which runs between October and April when temperatures are suitable for daily foraging activity. In some situations, it may be possible to extend lizard work into the month of May if weather conditions permit; however, this may only be approved at the discretion of the project herpetologist and should not be an expectation of the applicant. Project schedules must be programmed to reflect this requirement.

9. Contingencies, triggers and adaptive management

It is anticipated that glossy brown skink, copper skink, ornate skink and/or forest gecko are the species that are most likely to be present, due to the existing records for these species on the mounga.

All four of these species are classified as 'At Risk-Declining' (Hitchmough *et al.*, 2021), therefore if either of any of these species are detected, or if >10 individuals of a 'Not Threatened' species (*i.e.*, northern grass skink) are found during salvage the following shall occur:

1. Lizard salvage will continue until no further individuals have been found for a minimum of two trapping days.
2. Supervision by a herpetologist (or experienced ecologist under the supervision of the project herpetologist) of tree felling and/or the scrape-back of ground vegetation and topsoil shall be undertaken.
3. Habitat creation and/or enhancement will be undertaken at the release site along with the installation or enhancement of pest animal control efforts, if required.
4. Any other activity as recommended by the Department of Conservation's Technical Specialists (Herpetology).

In the event that a rare or Threatened species was detected during the salvage, works would be required to stop whilst advice was sought from the Department of Conservation.

In some instances, logistical challenges and project delays make it important for the appointed project herpetologist to have the ability to make appropriate minor adaptations to the strategy described in this LMP. If required, the herpetologist shall inform the local DOC office of the adaptation being made along with the rationale/justification.

10. Information Gaps and Recommendations

This LMP acknowledges that there are information gaps. A pre-salvage survey has not been undertaken; however, a very conservative approach is being taken as it is quite likely that lizards are present due to the high value habitat surrounding the subject site and known presence of lizards in the wider landscape

Five species are known to be present in vegetation and habitats throughout Mount Taranaki; however, the lack of records is most likely due to limit survey activity having been undertaken to gain such records.

Contiguous habitats are available to facilitate relocating any captured lizards into the same wider population. Therefore, some of the more complex considerations of LMPs around pest animal control, interspecific and intraspecific competition are not considered in this LMP, as lizards will be removed and relocated within their wider home ranges and/or populations. In their novel areas they will face the same competitive and predatory threats as they do in their capture locations. Therefore, this is considered to be a very straight-forward LMP process.

To mitigate the removal of *c.* 444m² of potential lizard habitat, an Ecological Management Plan (EMP) is also being prepared to guide the site remediation process. If this LMP is implemented in full, by an experienced and qualified herpetologist it is anticipated that the potential adverse effects to indigenous lizards (if present) will be adequately mitigated.

Acknowledgments

We thank [redacted] of BTW Company Ltd for liaison and project background.

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APPENDIX 1 – SITE PHOTOS

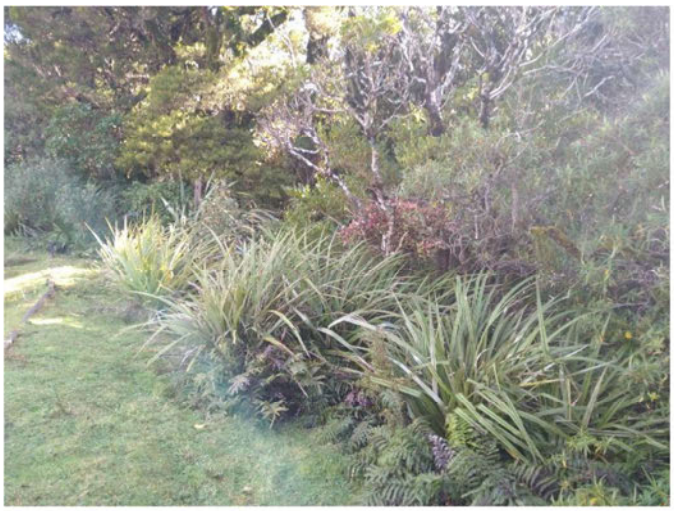

Plate 2: High value habitat for ground dwelling herpetofauna that is contiguous with wider forest; situated north of existing access to carpark.

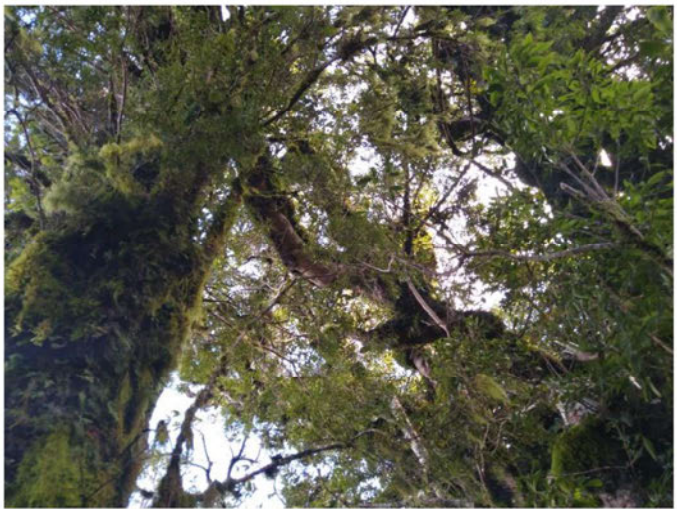

Plate 3: High value habitat for arboreal gecko in same area as Plate 1.

Plate 4: Understory vegetation within forested area provides high value habitat.

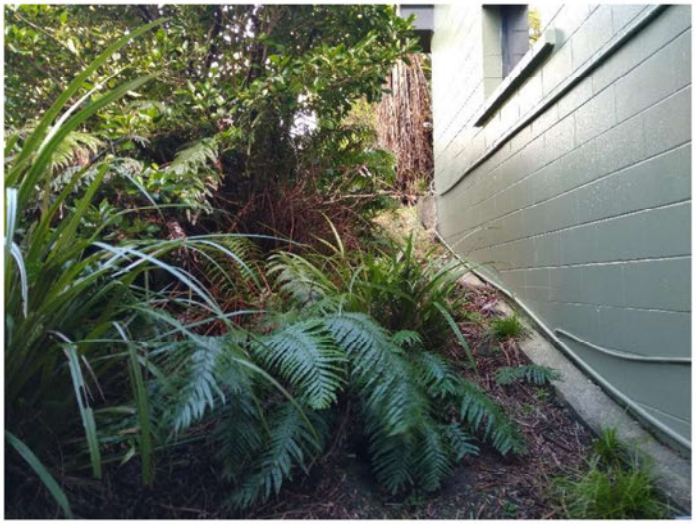

Plate 5: Discrete area of restored indigenous vegetation providing moderate value for ground dwelling lizards.

Plate 6: Low value lizard habitat due to isolation and lack of food resources.

Plate 7: Fruiting *Coprosma* sp. provide food source for herpetofauna throughout vegetation proposed for removal.