To:	[redacted] (RCP)				
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From:	[redacted] [redacted]				
Date:	10th August 2023	**BTW Job Number:**	230129	**Client Reference**	NTVC

Subject: North Taranaki Visitors Centre Water Resources Preliminary Design

INTRODUCTION

BTW Company Ltd (BTW) has been engaged by, RCP Ltd, on behalf of their client, Te Kotahitanga o Te Atiawa, to provide water resources design services for the proposed North Taranaki Visitor Centre upgrade within Te Papakura o Taranaki (previously known as Egmont National Park).

The new visitor centre facilities will be located in the general vicinity of the existing visitor centre carparks and facilities, which are jointly situated on Part Egmont National Park Survey Office Plan 10039, Part Section 2 Block XIV Egmont SD, and New Plymouth District Council (NPDC) road reserve. Refer Figure 1 for an aerial image. The developed areas and clearings in this location will be hereafter referred to as 'the site'.

Figure 1: Recent aerial image of existing visitor centre area and land boundaries

The proposed Visitor Centre facility includes a public Visitor Centre and DoC offices, karanga, Whare Manaaki, Café, outdoor courtyard, and spaces for plant and services.

The water resources infrastructure requires investigation to determine whether reuse, replacement or upgrades are appropriate.

The scope of this report will include the following:

- Preliminary design of on-site wastewater disposal
- Preliminary design of on-site water supply
- Stormwater management infrastructure recommendations.

DESIGN OBJECTIVES

The objectives of the water resources design are outlined below:

- Develop a technically sound and workable three waters system for the site's development that provides an appropriate level of service while working with other urban design elements of the development.
- Achieve excellent sustainable and environment outcomes through incorporation of water sensitive design elements into the built environment where economically feasible.
- Design a stormwater system that meets the NPDC level of protection and level of service requirements (as defined within NZS4404) and the requirements of the New Zealand Building Code.
- Give effect to Te Mana o te Wai by prioritising the health and wellbeing of the receiving water bodies and freshwater ecosystems by designing a stormwater management system that is consistent with this approach.
- Provide water resources infrastructure that aligns with cultural requirements and expectations.
- Consider water sensitive design objectives and considers water resource management in parallel with the ecology of a site, best practice urban design, and community values.
- Define the location, layout and size of the required infrastructure to support the resource consent application for detailed design during the engineering approval phase of the development.

"Tiakina te wai, hei oranga te katoa"

Safe water every day for everyone

BACKGROUND

Preliminary Architectural Design

BTW have been supplied the preliminary architectural drawings (Value Engineering (VE), version 2023 06 30a) from Tāmaki Makaurau Office Architecture (TOA), who have been engaged for architectural design of the proposed visitor centre.

The preliminary design drawings show a single storey building containing DoC visitor centre facilities, restrooms, a café, and a Whare Manaaki (hospitality area) situated in the approximate location of the current visitor centre. Refer Figure 2 for details.

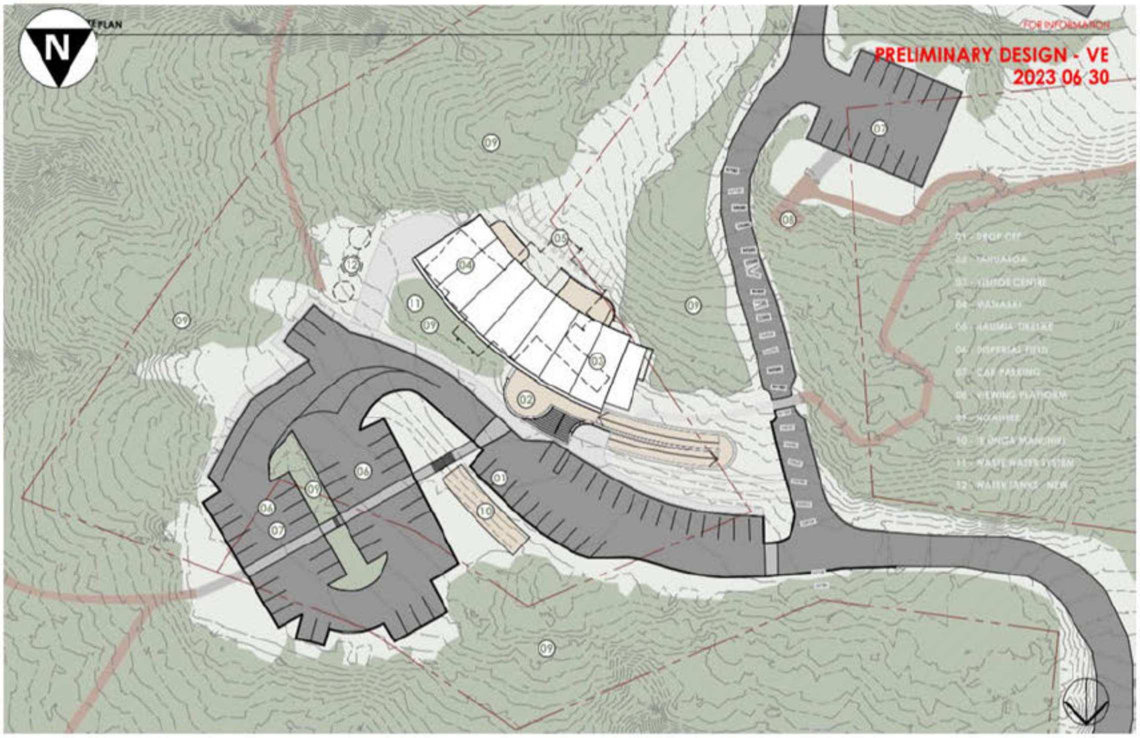

Figure 2: Preliminary layout plan (TOA Preliminary Design Drawings - VE)

The preliminary floor plan shows the building will contain ten (10) toilets, three (3) showers, a commercial kitchen, staff kitchenette and an overnight kitchen within the Whare Manaaki. Refer Figure 3 for a floor plan of the proposed building. A courtyard and terrace are proposed for the southern side of the building and a Tahuaroa with stairs and a ramp is proposed for the northern side.

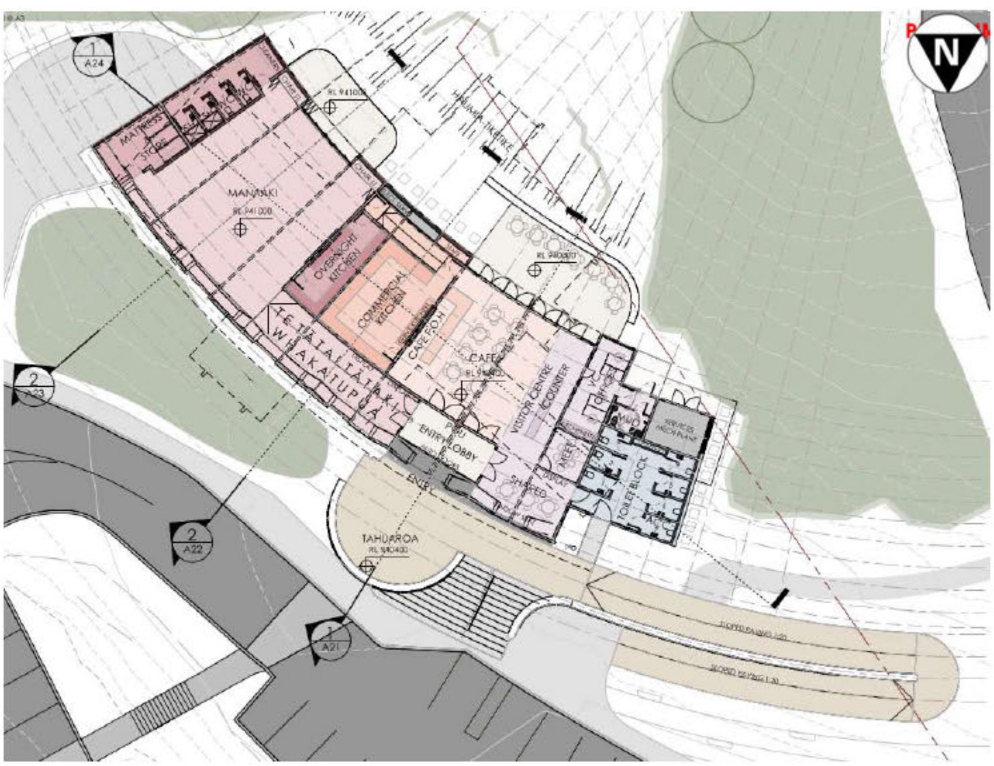

Figure 3: Floor plan of proposed new visitor centre building (TOA Preliminary Design Drawings - VE)

The new visitor centre building is intended to provide functional spaces for both DoC and Te Atiawa, and will provide facilities for tourism, DoC operations, and large functions. The building has been designed to accommodate up to 132 people utilising a conference seating format in the Whare Manaaki. This area can also be used for overnight stays for up to 40 people. In addition to this, there will be a DoC visitor centre, a café with an on-site commercial kitchen, and public toilets.

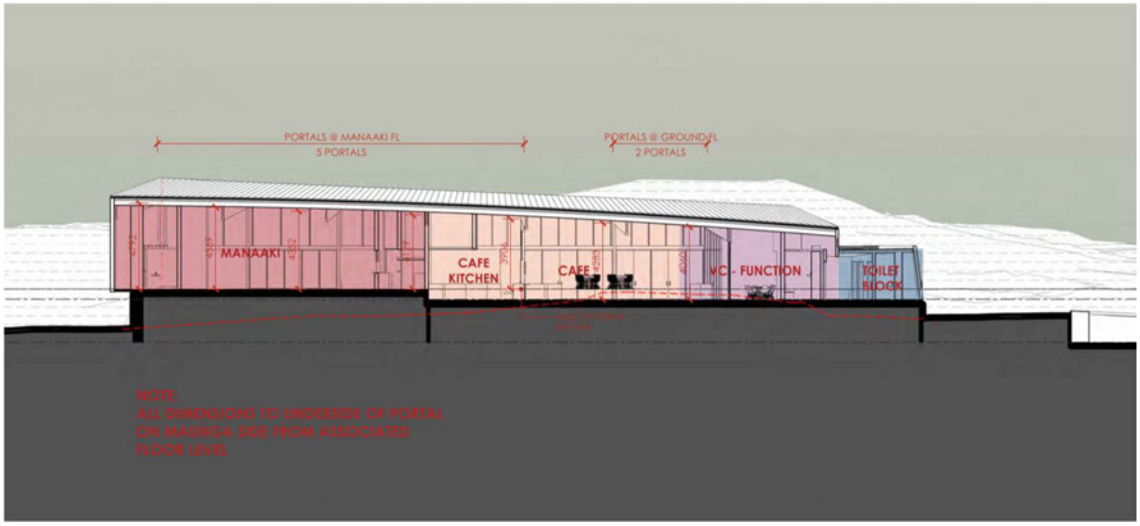

Figure 4: Elevation view of the building, facing Taranaki Mounga (TOA Preliminary Design Drawings - VE)

Soil Classification

Preliminary geotechnical investigations were undertaken by BCD Group in February and May 2023, comprising hand auger boreholes, machine auger boreholes, shear vane testing, scala penetrometer testing and SPT testing. BTW have been supplied with the Geotechnical Assessment Report (GAR) dated 4th July 2023. Refer Figure 5 for testing locations.

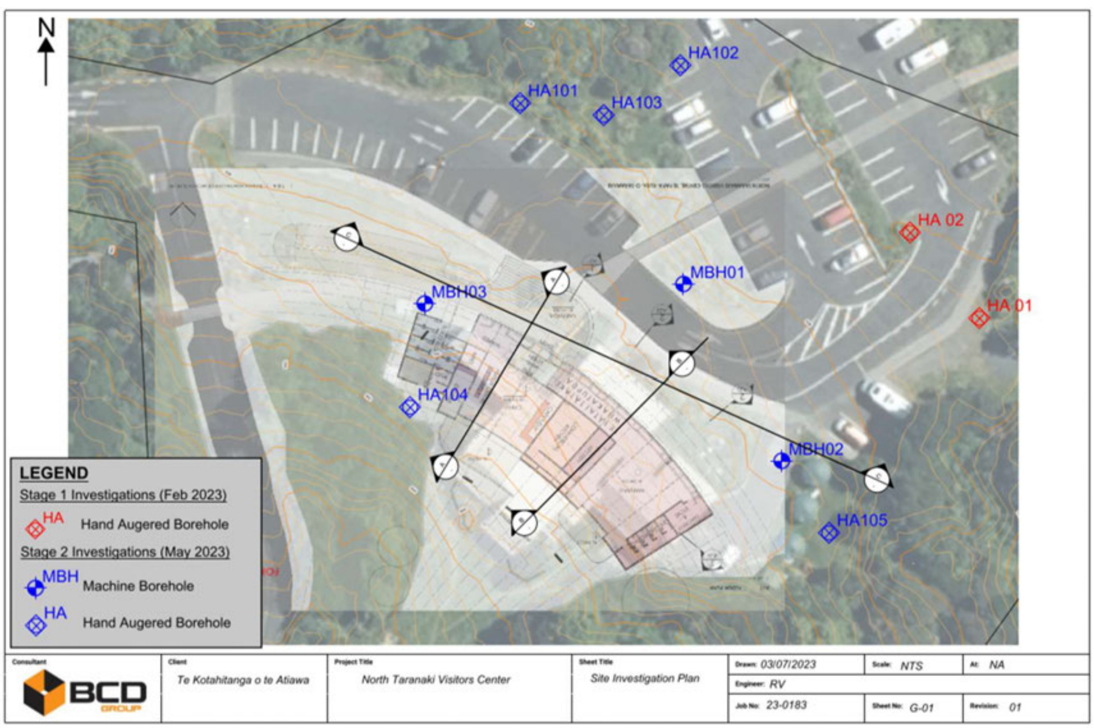

Figure 5: Geotechnical Testing Locations (BCD GAR, 4th July 2023)

A review of historical imagery and information supplied by RCP, and publicly available imagery indicated that development of the site began in 1892, including cut/fill earthworks to form roads, building platforms and parking. The development has generally been limited to the clearing which is currently visible on site. The current visitor centre was constructed in 1977, and the site has generally remained similar in layout since then, with some infrastructure upgrades carried out circa 2009-2010. Refer Appendix A for historically imagery.

The testing confirmed the presence of the Maero Debris Flows geological unit along with uncontrolled fill material of varying depths in several locations, consistent with the observations of historical images. Refer Figure 6 for a cross-section of soils at the building platform.

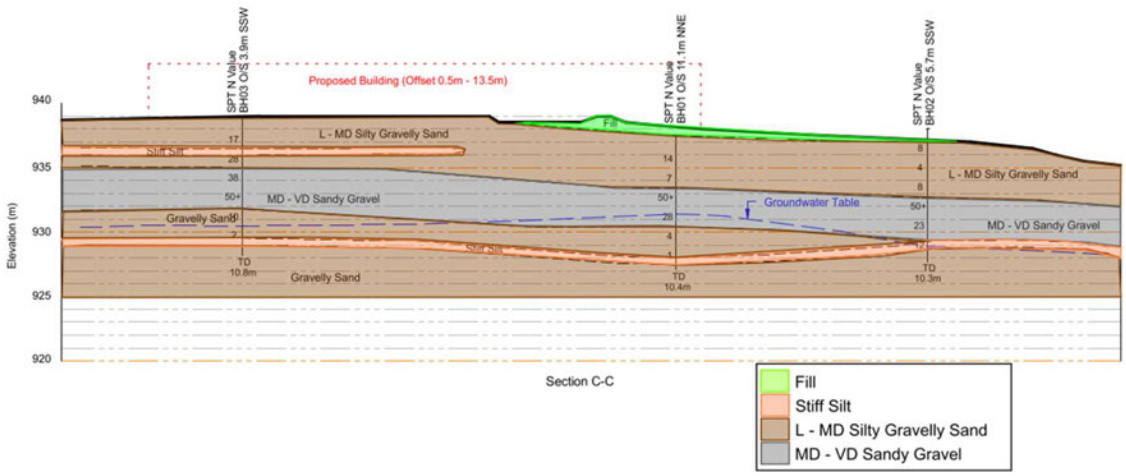

Figure 6: Geotechnical cross section, north-west to south-east (BCD GAR, 4th July 2023)

Groundwater was typically encountered at depths ranging from 6 m to 9 m below existing ground level (BEGL). Groundwater was encountered at 2.4 m BEGL in a singular location although it is noted in the BCD GAR that this appear to be an outlier and is not representative of the overall site groundwater table. The groundwater table at the building is indicated in Figure 6.

In terms of Table 5.1 of AS/NZS 1547:2012 (On-Site Domestic Wastewater Management) the in-situ soil is classified as a category 2 silty sand. Further targeted investigation around the proposed wastewater dispersal field should be undertaken to confirm the soil classification and other ground constraints such as extent of historic fill, groundwater depth and underlying confining layers during detailed design.

Existing Site Information

NPDC property information was requested, which provided details relating to the existing wastewater treatment system on the site. Building consent 105852P, property ID 027693 provides information on the recent infrastructure upgrades undertaken in 2009/2010. As-built drawings of this redevelopment were supplied by RCP.

WASTEWATER SERVICING ASSESSMENT

A preliminary wastewater design was undertaken using a mixture of information provided by RCP, DOC and TOA, and estimates by BTW engineers. The aim of this design is to provide a wastewater disposal system of sufficient capacity to accommodate peak flows along with average monthly flows.

This wastewater assessment also includes the "Camp House" DOC accommodation facility, which currently discharges wastewater to the existing dispersal field south of the existing visitor centre. The wastewater discharge from the Camp House will need to be accounted for in the design of future wastewater infrastructure.

Existing Infrastructure

The current wastewater infrastructure services both the visitor centre and the 'Camp House' DOC accommodation and was installed around 2009/2010. The wastewater is initially treated within a Hynds Submerged Aeration Filtration (SAF) commercial wastewater treatment plant situated adjacent to the visitor centre, providing tertiary treatment in the form of UV disinfection. The dispersal field is located southwest of the existing visitor centre, approximately 50 m upslope from it. This infrastructure was installed circa. 2010. See Figure 7 and Appendix B for details.

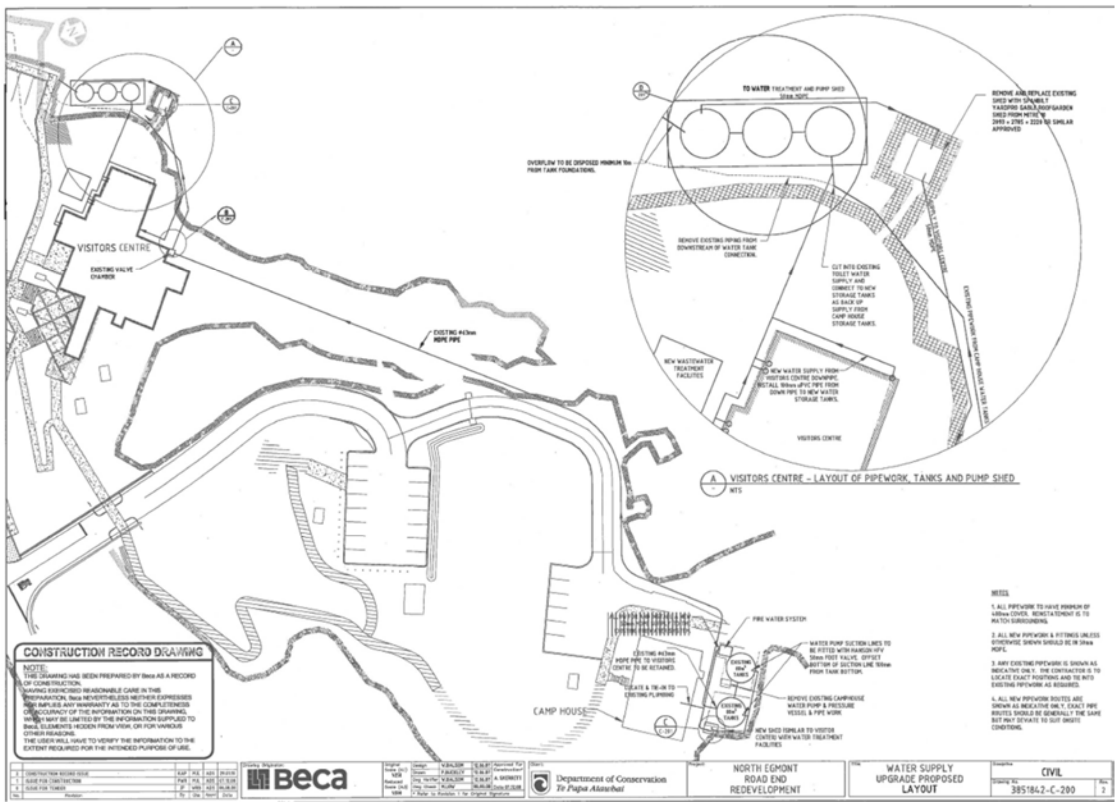

Figure 7: Existing wastewater system plan (Beca drawing 3851842-C-200 rev. 2)

Initial consultation with DoC staff and maintenance staff indicated that the existing system has been operating without known issues. Site observations from BTW field staff observed that vegetation growth (*carex geminata*) is thriving on the surface of the existing wastewater disposal field[1]. These typically indicate saturated hydric soil conditions and likely surface water ponding which are generally unsuitable conditions for effective wastewater disposal. This may indicate the existing system is possibly undersized or underperforming, or stormwater may be ponding on the surface.

[1] Refer BTW Ecological Constraints and Opportunities Memo

Figure 8: Wetland vegetation feature in the vicinity of the existing wastewater treatment soakage trenches, upslope of the existing building.

A 100 mm diameter uPVC pipe connects the Camp House sewage to the existing wastewater treatment system, which was installed circa 2009/2010. This pipe along with other existing pipelines may be able to be reused for the redevelopment upon confirmation of condition through a CCTV inspection.

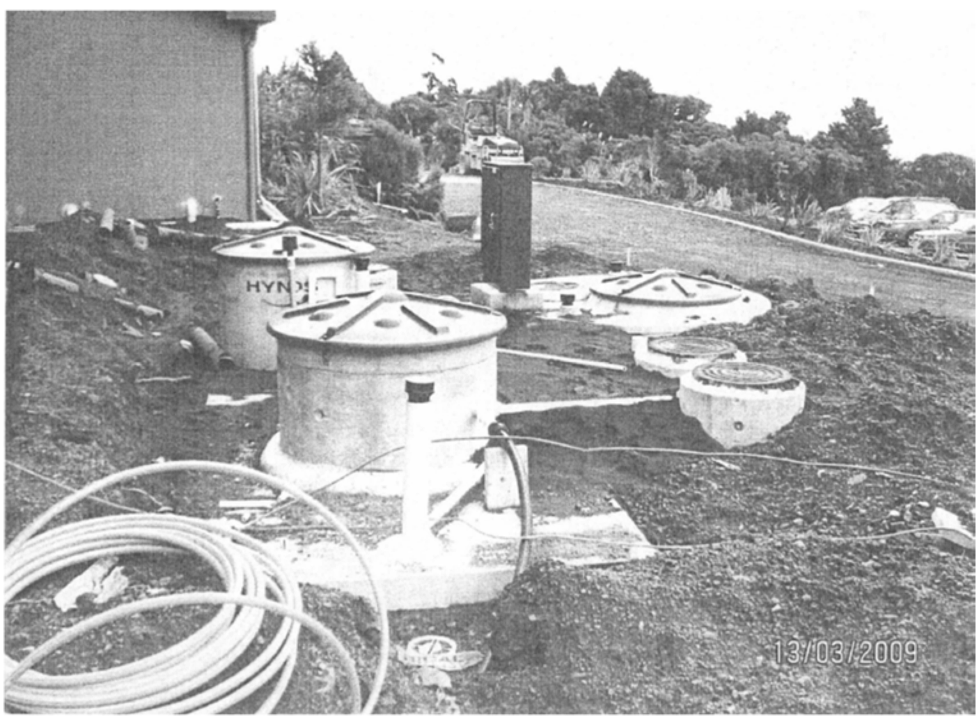

Figure 9: Hynds SAF wastewater treatment system installed in front of existing visitor centre (photo taken prior to backfill, from 2009 building consent)

Design Considerations

On-site infrastructure is required to collect, treat and dispose of the wastewater generated by the new proposed system. Key design considerations have been summarised below:

- The proposed visitor centre introduces new activities that will increase wastewater generation and demand on the existing infrastructure.
- Site observations from BTW field staff observed vegetation growth (*carex geminata*), indicating hydric soil conditions and likely surface water ponding which are generally unsuitable for wastewater disposal. This may indicate the existing system is possibly undersized or underperforming, or stormwater may be ponding on the surface.
- Client feedback has identified cultural preference for the wastewater disposal system to be discharged downslope of the visitor centre.
- The site has several topographical constraints for development of a land application system including:
  - Highly valued receiving environment,
  - Steeply sloped site,
  - Limited 'cleared' footprint free of high value vegetation.
- Significant historic land modifications including engineered and uncontrolled fill resulting in some areas being unsuitable for wastewater disposal due to fill.
- The NPDC Egmont Road Carpark Traffic Impact Assessment (AMTANZ Ltd, 2020)[2] included traffic survey data from tube counters at Rahiri Cottage (2187 Egmont Road) and information relevant to the number of visitors and users associated with wastewater demand:
  - Traffic flows over the 2019/2020 Christmas period averaged 2,800 vehicles/week over a two-week period, peaking at approximately 600 vehicles/day.
  - Visitor growth rate forecast at approximately 8.3% per annum[3].
- The multi-day duration of peak user numbers and flow periods (i.e. Christmas/New Year's) results in attenuation / buffering design being ineffective and not recommended.
- Staff have advised that the existing Hynds SAF treatment system is a modular treatment system which could be expanded.

Wastewater Demand Assessment

Several facility usage scenarios were utilised to estimate wastewater demands as outlined below:

1. High public visitor numbers in addition to a major daytime event at Whare Manaaki,
2. High public visitor numbers in addition to a major day and night event at Whare Manaaki,
3. Extreme public visitor numbers (e.g. Christmas/New Year period). No event at Whare Manaaki.

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[2] Egmont Rd Car Park Traffic Impact Assessment, AMTANZ Ltd, 2020. Produced for NPDC, supplied by Andrew Skerrett (AMTANZ) to project team on 26/05/2023.

[3] Estimated from Figure 15 (January traffic growth rate from 2016-2019) of Egmont Rd Car Park Traffic Impact Assessment (AMTANZ, 2020)

A table in Appendix B details assumptions used to determine the amount of wastewater demand in each scenario. Table 1 provides a summary of the amount of wastewater produced.

Table 1: Summary of peak wastewater demand of different scenarios.

	Total wastewater produced (Litres per day)
Scenario 1 – Whare Manaaki day and night event, high public visitor numbers	22,975[4]
Scenario 2 – Whare Manaaki day event only, high public visitor numbers	22,900[5]
Scenario 3 – No event, extreme public visitor numbers	22,930

The three scenarios reviewed all generated a relatively consistent wastewater demand. The estimated demand is considerably higher than the capacity of the existing system (8,000 m^3/day). Approximately one third of the increased flows are attributed to the Whare Manaaki. The estimated number of park visitors correlates well with the information within the traffic survey.

It is recommended that the project team review and provide input into the wastewater demand estimate to confirm the estimated loadings.

Wastewater Treatment System Design

Preliminary design has been undertaken to define the location, layout and size of the required wastewater management infrastructure for stakeholder review and consideration.

An advanced secondary treatment system is proposed to provide a high level of treatment allowing increased loading rates and reducing the area requirements of the land application field.

The application area proposed to be located beneath the pavement of the existing carpark as insufficient footprint is available within the existing non forested footprint to locate effluent disposal infrastructure.

An advanced AES (Advanced Enviro-Septic) treatment system has been proposed for the site. The AES is a simple, non-mechanical septic system that treats septic tank primary effluent to secondary or advanced secondary quality. Unlike most conventional systems it can be installed under hardstand areas, is a passive system which is non reliant on mechanical systems and is capable of handling daily and seasonal load variations. The system does not require power, pumps or electronics and has low ongoing maintenance costs.

A design loading rate of 50 mm/day has been adopted for this site for the category 2 soils (Table 5.2, AS/NZS 1547:2012).

The AES system requires upstream primary treatment. Preliminary calculations indicate a septic tank with approximately 36,000L capacity will be required to accommodate the peak daily demand and solids and scum build-up.

A disposal field(s) of minimum 460 m^2 will be required to discharge the effluent to ground.

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[4] Assume total 190 Whare Manaaki visitors, 40 who will stay overnight. TOA Email 25/05/23

[5] Assuming 210 Whare Manaaki visitors in lecture style seating. TOA Email 25/05/23

The wastewater design standards require a 100% reserve to be able to be established onsite. A 100% reserve area for the disposal bed will also be able to be provided within the remaining pavement areas of the lower carpark and in the area of the existing wastewater system.

Alternative Options Considered

Several alternate system designs were considered and explored that were not preferred at the time of publication due to various site constraints. These are outlined below.

- Expanding the existing modular system and installing a conventional trench or disposal bed within lower green space areas.
- Installation of dripper lines land application system within green space and extending into the national park
- Installation of rapid infiltration pit or other specific infrastructure with high loading rates reducing the size of the land application area.
- Separating the Camp House system to reduce the size of the visitor centre system. The existing treatment plant could be reused.

These options can be revisited in future should further information become available.

WATER SERVICING ASSESSMENT

Existing Infrastructure

Three (3) 30,000 L water tanks are present to the east of the existing visitor centre. These currently capture roof runoff for treatment and water supply for the existing visitor centre. The existing roof area of the visitor centre is approximately 560 m^2 (to be confirmed by site assessment), and it assumed all of this currently supplies the water tanks adjacent to the visitor centre.

A water treatment system and pump are located within a proprietary steel shed adjacent the water tanks. The as-built drawings from 2010 indicate the current pump is a Grundfos CH4-60 PC22, which is capable of providing up to 53 L/min at 200 kPa[6].

There are two 80,000 L water tanks at the Camp House which source water both from roof runoff from the Camp House and a weir within a nearby stream. These tanks supply the Camp House accommodation facilities, including a fire sprinkler system. The Camp House tanks are capable of supplying the visitor centre via a slow manually operated gravity feed if required, and this has been utilised during dry periods in recent summers. Refer Figure 10 for arrangement details.

Communications with DoC staff[7] have indicated water supply shortages at the Visitor Centre during summer periods in the past five years. These shortages were mitigated by DoC by utilising water tanker trucks, providing portable toilets for visitors, and filling the Visitor Centre tanks from the Camp House Tanks.

Historically, some water shortages were attributed to freedom campers taking large volumes of water, and this has since been mitigated through the use of security fittings on exterior taps.

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[6] https://mcquinnpumps.co.nz/wp-content/uploads/2014/06/Grundfos_CH_Discontinued.pdf, accessed 26/05/2023.

[7] Email communications between BTW and DOC Supervisor (Michael Dickson) between 27th July 2023 and 8th August 2023.

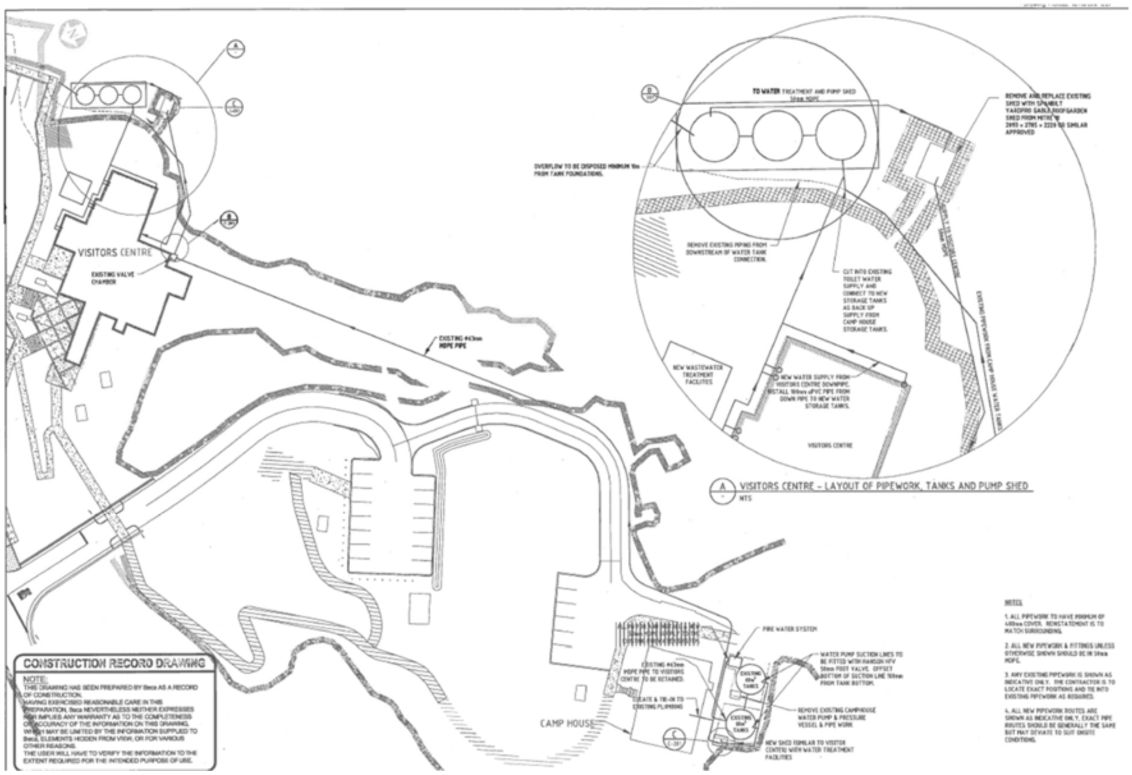

Figure 10: Water supply upgrade layout drawing (Beca drawing 3851842-C-200, rev. 2)

Water Supply Demand Assessment

A water supply demand assessment was carried out for the Visitor Centre facility only as the Camp House system functions independently.

Water is required to supply toilets and showers, a commercial kitchen/café, overnight kitchen within the Whare Manaaki, water fountain/s, and some outdoor usage (e.g. car and building cleaning).

The daily water usage was estimated to understand the average annual water demand requirement for the visitor centre. A total of 110,000 annual visitors was used as the basis of the demand calculations as this appeared to be the peak visitor numbers per year so far[8]. It was estimated that Whare Manaaki events would occur up to a maximum of three times per week, with a peak average of 100 visitors per event. The total annual water demand was distributed proportionately based on historical monthly visitor number records as a percentage of the total annual visitors[9], indicating peak visits between November and April.

The predicted average daily and annual water usage is summarised in Table 2. Full calculations are provided in Appendix C.

Table 2: Summary of average estimated water demands

	Total Daily Demands (Litres per day)	Total Annual Demands (Litres)
Public Visitor, Staff Water Usage	2,870	1,050,000
Whare Manaaki Usage	2,786	1,016,000

[8] https://www.mbie.govt.nz/dmsdocument/16181-taranaki-crossing-business-case-pdf, accessed 08/05/2023.

[9] Based on historical visitor data from accessed via NPDC Building consent 105852P, property ID 027693. Supplied by NPDC, original source of data DOC.

	Total Daily Demands (Litres per day)	Total Annual Demands (Litres)
Outdoor Usage	92	36,000
Totals	*5,600*	*2,044,000*

It is estimated Whare Manaaki will almost double the water demand pending confirmation of the size and frequency of events that will be held.

It is assumed that water supply to campervans will not be permitted.

It is recommended that the project team review and provide input into the water supply demand estimates to confirm the estimated loadings.

Water Supply and Storage Design

The preferred water supply for the upgraded facility will be via rainwater harvesting from the building roof.

The nearest Taranaki Regional Council (TRC) monitored rainfall data site is adjacent to the visitor centre, and the meteorological instruments are visible approximately 40 m to the west of the building. The rainfall data from 1990 to 2021 was provided by TRC and this was utilised in the design.

For preliminary design purposes it has been assumed the main building roof indicated in the TOA Preliminary Design – VE version will be able to be utilised for rainfall capture (excluding the toilet block area. This was measured to be 637 m^2 – an approximate 14% increase in roof area from the existing visitor centre. The Camp House water supply has not been included in this assessment. It has been assumed that 90% of rainfall is able to be captured by the system.

The assessed water supply requirements have been compared to the potential monthly rainwater harvest volumes for the site. Table 3 shows available roof water harvest potential and water demand over a 12-month period, based on the roof area of the proposed visitor centre. The average daily water usage has been estimated using similar assumptions to the estimated wastewater usage, and the average daily water usage has been distributed throughout a year using historical monthly visitor numbers (refer Appendix C).The monthly supply and demand is plotted in the column chart in Figure 11.

Table 3: Calculated Average Monthly Rainfall and Water Consumption

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Days per month	31	29	31	30	31	30	31	31	30	31	30	31
North Egmont Average Monthly Rainfall (mm)	394.7	372.3	417.3	509.1	652.5	693.9	677.5	679.8	666.6	754.4	497.5	563.1
Monthly Harvest (litres)	**226,282**	**213,440**	**239,238**	**291,867**	**374,078**	**397,813**	**388,411**	**389,729**	**382,162**	**432,498**	**285,217**	**322,825**
Monthly Average Day Usage (litres)	282,392	203,031	239,645	233,122	109,091	122,378	159,383	110,053	121,897	134,222	161,096	211,629
Total Monthly Consumption (litres)	**282,392**	**203,031**	**239,645**	**233,122**	**109,091**	**122,378**	**159,383**	**110,053**	**121,897**	**134,222**	**161,096**	**211,629**
Monthly Surplus/Shortage (litres)	**- 56,110**	**10,408**	**- 407**	**58,745**	**264,987**	**275,435**	**229,028**	**279,676**	**260,265**	**298,276**	**124,120**	**111,197**

It is shown that generally throughout the wetter months the total available water supply from rainwater harvesting is significantly greater than the total monthly consumption. During drier months (January - April), water consumption is roughly equivalent and/or exceeds supply.

Additional water supply is also required to meet emergency storage requirements and accommodate the additional visitors during the drier months. A minimum 96 hours' average demand of untreated storage is recommended by Taumata Arowai within their Drinking Water Acceptable Solution for Roof Water Supplies.

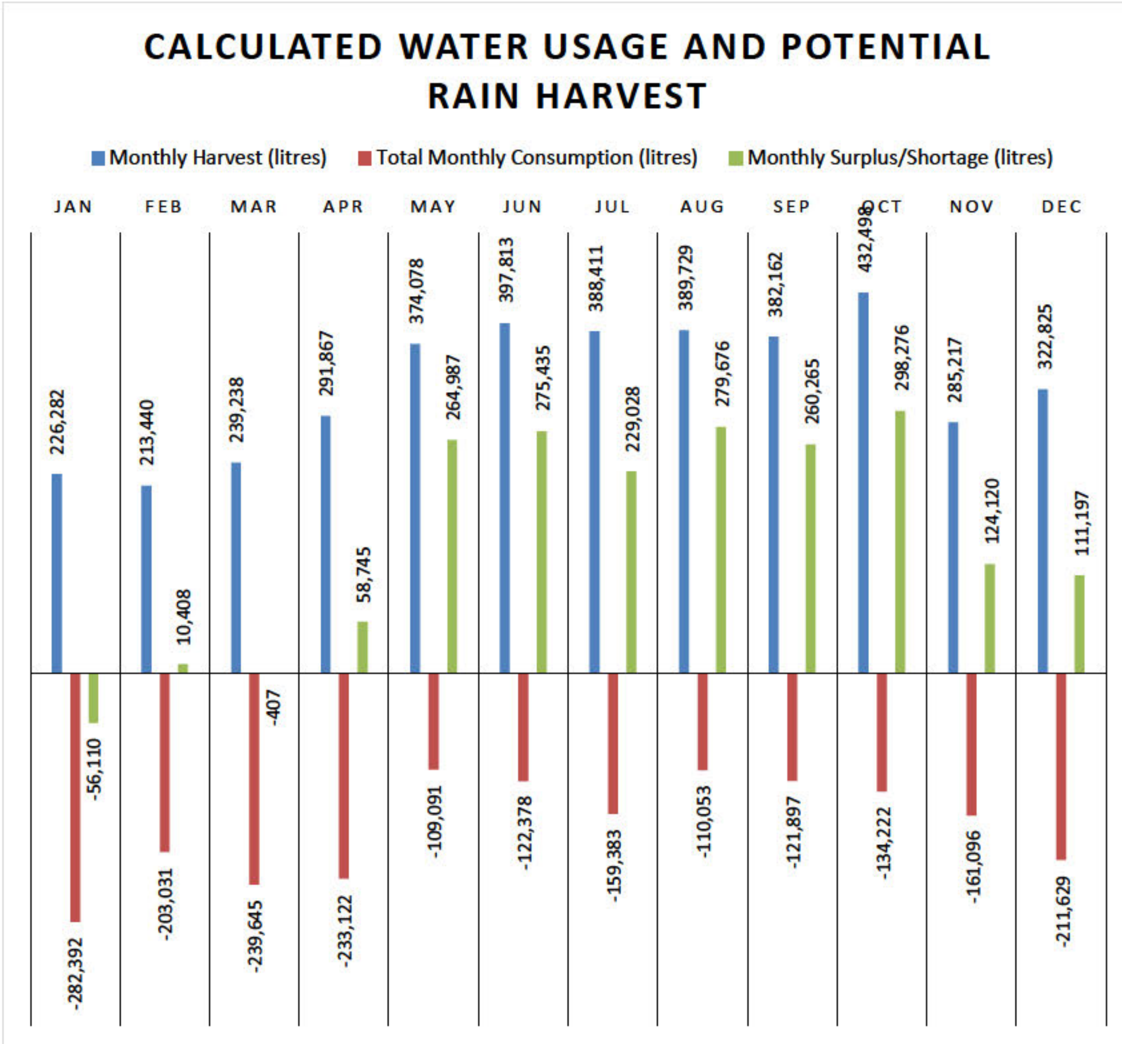

Figure 11: Calculated future water consumption and potential rain harvest and consumption

The water balance results presented utilise historical rainfall records and existing visitor centre numbers. The effects of climate change are expected to result in longer dry periods between rainfall events. The anticipated number of visitors and users to the visitor centre is also likely to increase. To avoid possible future water shortages, it is recommended that water reduction measures are considered within the detailed design.

The estimated increase in water demand from the new visitor centre will need to be ascertained through further consultation with stakeholders. Additional water supply storage can buffer periods of supply shortages, which is likely due to forecasted increased visitor volumes and possible longer dry periods.

It is assumed for this assessment that the feed from the Camp House to the existing visitor centre will not be able to be used due to future climate change and potential increased visitor numbers at the Camp House.

An additional 30,000 L water tank is proposed for the Visitor Centre adjacent to the existing tanks, increasing the total potable water storage on site to 120,000 L, providing approximately 4-5 days of peak water usage.

Potable Water Treatment and Conveyance System

The existing water treatment facility, sample testing and maintenance procedures will need to be assessed in accordance with Taumata Arowai guidelines[10], and upgrades may be required. This likely includes fitting of leaf diverters to downpipes, first flush diversion and upgrade of the existing water treatment plant and pump. This will be reviewed further during future design phases.

Fire Water Supply

The fire water classification under SNZ PAS 4509:2008 New Zealand Fire Service Firefighting Water Supplies Code of Practice is FW3 however sprinklers are proposed to be installed in the new building reducing the Fire Water classification to FW2. Under this scenario, the minimum fire water storage requirement is 45,000 L within 90 m, which will be achieved through the provision of two (2) proposed 25,000 L concrete tanks beneath the existing staff parking area/driveway.

The historic as-built drawings (Figure 10) identify two (2) 80,000L water storage tanks providing a total of 160,000L of storage on site at the Camp House, 120 m upslope from the existing visitor centre. The Camp House uses these tanks for fire sprinkler water supply and for the guest accommodation. There is no existing fire water conveyance from the Camp House to the visitor centre. The option of utilising these tanks for fire water at the Visitor Centre was considered and discarded upon consultation with the project team and DoC.

The firefighting access to the building has been assessed to be suitable, with vehicular access to within 90 m of buildings, and the proposed carpark upgrades (Refer BTW Preliminary Design Drawings and Traffic Impact Assessment) will improve manoeuvring for fire appliances. The firefighting response time would be significant as the nearest fire station is located in Inglewood, 18.5 km away by road (22 minutes away according to Google Maps). Consultation with Fire and Emergency NZ is recommended.

A Fire Engineer and a Hydraulics Engineer have been engaged on this project and have provided information on general points of coordination. Further design and assessment will be provided once fire storage and supply requirements have been confirmed.

STORMWATER MANAGEMENT

Catchment Assessment

The site is situated within the upper reaches of both the Waiwhakaiho and Waiongana Catchments. The Waiwhakaiho Catchment has an area of 14,528 ha, while the Waiongana Catchment has an area of 15,893 ha. The site is located approximately 3,950 m from the summit of Taranaki Maunga, surrounded by steeply sloping terrain with heavy native bush cover.

The site is situated relatively close to the headwaters of both the Waiwhakaiho River and the Waiongana Stream, which originate in the upper slopes of Taranaki Maunga. These waterways traverse through high value native bush within Te Papakura o Taranaki, then pass through primarily agricultural land prior to discharging in the Tasman Sea. Both waterways support a wide variety of valued freshwater flora and fauna, and are also culturally, economically, socially and historically significant to Māori.

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[10] Taumata Arowai Drinking Water Acceptable Solution for Roof Water Supplies, October 2022.

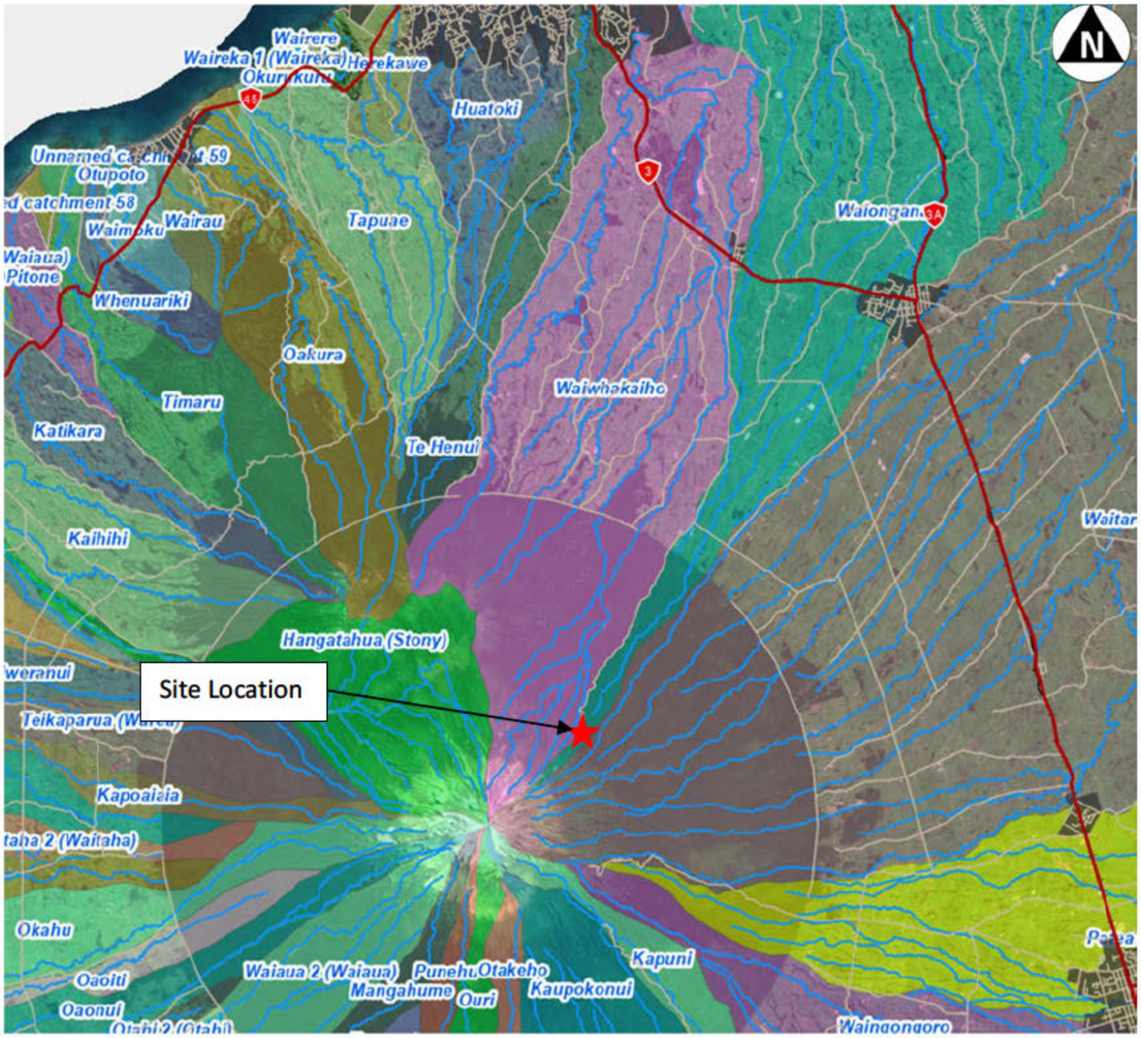

Figure 12: Overall catchment plan

The Taranaki Regional Council GIS with 10 m LiDAR contours overlaid (Figure 13) shows the topography of the area surrounding the site. The site appears to receive minimal overland flow from uphill of the site due to its location on a prominent ridgeline. The area is steeply sloped, with much of the up-catchment runoff diverted to an unnamed tributary of the Camp Stream to the west, and an unnamed tributary of the Mangaoraka Stream to the east. Much of the precipitation from the site will contribute to the headwaters of the Waiongana Stream, directly downstream from the site. Refer Figure 13 for a summary of overland flow paths near the site.

Figure 14 shows the current overland flow paths within the site, showing a portion of runoff diverted towards Egmont Road and bush to the west, and the remainder diverted towards the bush on the northern and eastern boundaries. Existing stormwater infrastructure such as sumps, pipes, rain gardens and swales provide modified flow paths for minor events, however during major storm events, stormwater flow can be expected to follow these overland flow paths.

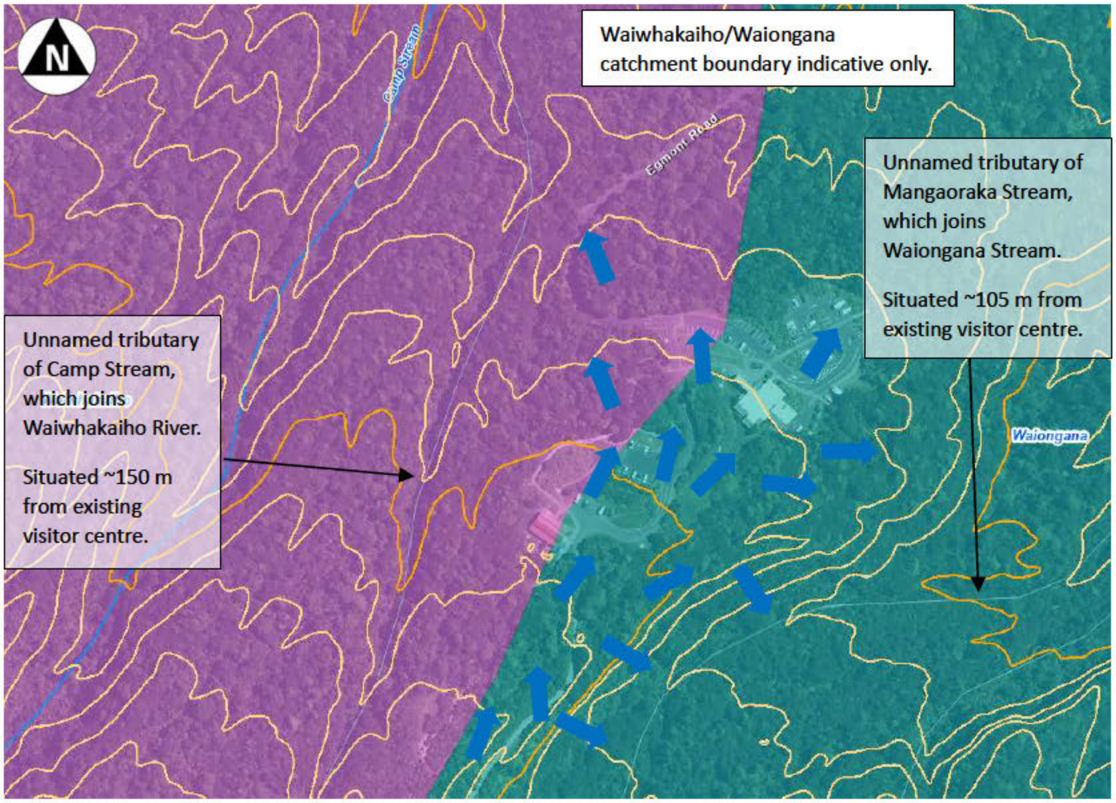

Figure 13: Overland flow paths around site shown with blue arrows. Catchment shown indicatively, 10 m TRC LiDAR contours shown. (Source: TRC GIS)

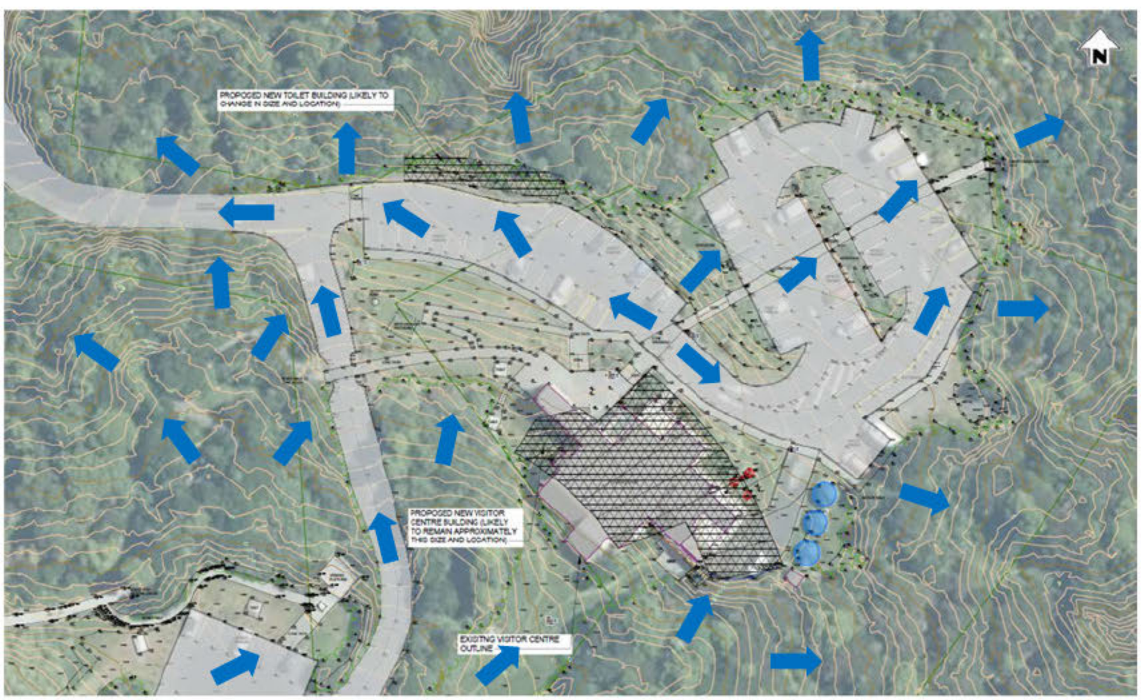

Figure 14: Detailed overland flow paths within site. Contours from McKinlay survey T-230208, 24/02/2023.

Existing Infrastructure

According to the as-built drawings from the 2009/2010 redevelopment, several stormwater management features were installed, including rain gardens, vegetative filter strips, a piped overflow system, swales, and rainwater tanks capturing roof runoff from buildings (refer Figure 15). These would be providing several functions, including water quality treatment of pavement runoff, flow attenuation, and providing soakage for groundwater recharge.

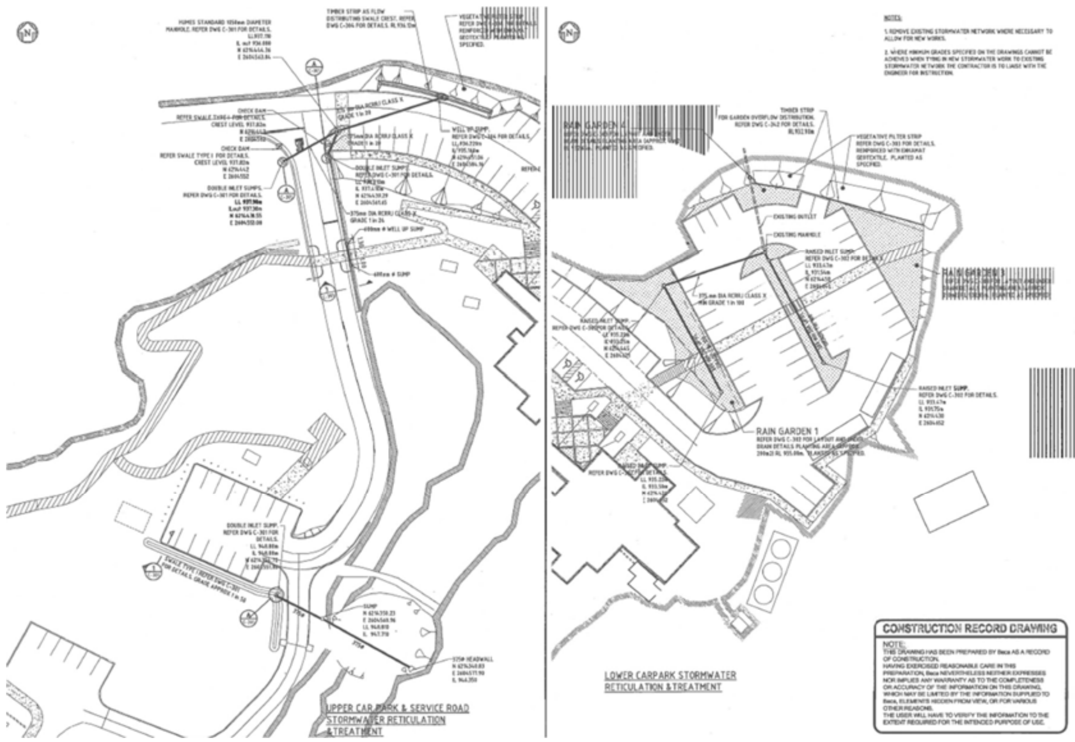

Figure 15: Existing stormwater management components (Beca drawing 3851842-C-300 rev. 2)

Design Considerations

The design considerations for the future stormwater upgrades are as follows:

- The proposed visitor centre upgrade may increase the impervious area of the site due to an increase in size of the new building and the associated carpark and roading upgrades. The exact dimensions will need to be confirmed in future design stages, and their impact mitigated.
- The majority of the existing roof of the visitor centre is utilised for rainwater capture and reuse. This is also proposed for the new visitor centre which will have a slightly larger footprint.
- The site has several topographical and environmental constraints for development.
- The natural soils are expected to be highly permeable and suited for discharge of stormwater runoff via soakage.
- Significant historic land modifications including engineered and uncontrolled fill resulting in some areas being unsuitable for soakage due to site stability concerns or inadequate soakage rates.
- Protecting the receiving environment from pollution from wastewater or contaminated stormwater is paramount. Water quality treatment to be provided for runoff from hardstand areas.
- Preventing stormwater ingress into on-site wastewater disposal system to prevent mixing of clean/dirty water.

- Preventing stormwater sheeting into foundation of proposed visitor centre, likely through swales/cut off drains uphill from the proposed visitor centre. Details of the cut off drainage system shall be provided with future design phases.
- Mitigating scour effects from any new point discharges of stormwater through either outlet protection or eliminating point discharge.
- Preventing vehicle traffic and parking over stormwater devices not designed for vehicle loading (vegetated filter strips, swales and rain gardens), reducing their treatment efficiency. This is apparent in recent images of the site where limited grass growth occurs in areas where vehicles are likely to track over or park.

Much of the existing stormwater infrastructure on the site appears to have been designed and installed relatively recently (circa 2009/2010). To minimise cost and environmental impact from construction, we would look to retain and optimise the existing infrastructure where possible. We will look to assess these and undertake developed design in coordination with other parties (e.g. architectural, landscape design, traffic engineering).

The BTW Water Sensitive Design and Te Aranga Design Principles Opportunities Memo (dated 31/05/2023) provides ideas and opportunities to implement current best practice in the developed/detailed design.

DISCUSSION

The preliminary stormwater, wastewater and water supply design has been guided by a mixture of information provided by the wider project team, and estimates based on publicly available information. The sources and assumptions have been outlined in this memo.

The sizing of the wastewater system is primarily governed by the peak flows, which have a high correlation to several factors where the design population is yet to be clearly defined. The key points would be the expected future peak daily public visitor numbers (which would influence public toilet usage) and the expected peak daily café visitor numbers.

The water supply requirements are primarily governed by the average daily/monthly visitor numbers, average daily/monthly café visitors, and frequency and magnitude of events at the Whare Manaaki.

Public visitor numbers have been approximated based on historical visitor data from the past two decades and expected growth. Little data is available on the frequency of the operation of the Whare Manaaki which has reasonable implication on water demand and wastewater generation volumes.

Flow meters on the existing water and wastewater system would provide baseline data for comparison against design assumptions, particularly if overlaid with traffic count data. If available, it would be beneficial to access historical data from these systems to calibrate future demand.

RECOMMENDATIONS

This preliminary design report outlines the proposed water resources strategy in accordance with the design objectives to service to the proposed development. An engineering layout plan is attached providing preliminary location, layout and size of the required infrastructure for stakeholder feedback.

Specific recommendations from the preliminary assessment are summarised below:

- A new wastewater system will be required for the visitor centre upgrade, comprising a primary and advanced secondary treatment system. This will comprise a septic tank and trafficable disposal field beneath the pavement of the lower carpark. This will allow for effluent disposal downslope of the proposed visitor centre, while minimising vegetation clearance.
- Additional water storage will be required due to existing water shortage issues and the increase in water demand due to the provision of the Whare Manaaki and to provide resilience against climate change.
- The water collection and treatment system should be designed in accordance with the Taumata Arowai acceptable solution. This includes leaf diverters, first flush diversion on the collection system and a dual filtration and UV treatment system. The existing water pump and treatment system will likely require upgrade or replacement.
- The fire water storage requirement will be a minimum of 45,000 L on site, assuming the proposed Visitor Centre will contain sprinklers. Two (2) 25,000 L underground concrete tanks are proposed. Co-ordination will be required with building hydraulics and fire engineering specialists for detailed design. Consultation with FENZ is recommended.
- We recommend considering water usage reduction measures to reduce the demand on water resources, reduce life cycle cost and mitigate against climate change. Measures for consideration could include:
  - Implementing water reduction fixtures such as 6/3 L flush toilets and water saving shower heads.
  - Reuse of treated effluent for toilet flushing (accounts for approximately 60% water usage).
  - Greywater recycling and reuse.
- Peak water resource demands could be controlled by implementing user demand management. Examples would include:
  - Scheduling Whare Manaaki events during non-peak visitor periods (i.e. Christmas/New Year period, peak season weekends etc.),
  - Placing controls on visitor demand[11].
- Further guidance should be provided from the project team regarding anticipated future growth in visitor numbers to inform infrastructure design requirements.
- It would be beneficial to access historical flow data (if available) from the existing water and wastewater systems along with detailed traffic/visitor counts to calibrate future demand estimates. Future flow monitoring in conjunction with traffic/visitor counts is recommended if historical data is not available.
- Further investigations will be required into the condition of the existing three waters infrastructure on the site where reuse is possible, including CCTV inspection of existing pipes. The installation of a flow meter on the existing water supply system would provide baseline data for comparison against design assumptions, particularly when overlaid with traffic count data. We would look to retain existing infrastructure where practical, working in conjunction with others in the design team.

We recommend review of the assumptions and inputs to calculate peak demands by project stakeholders to confirm alignment with the project team expectations.

[11] Options for demand management discussed in BTW Traffic Impact Assessment.

We look forward to further discussion with the project team around water sensitive design principles and Te Aranga design principles and how these can be incorporated into the water resources design and project as a whole.

DISTRIBUTION

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Yours sincerely,

[redacted]

Civil and Environmental Engineer, BE (Hons), MEngNZ

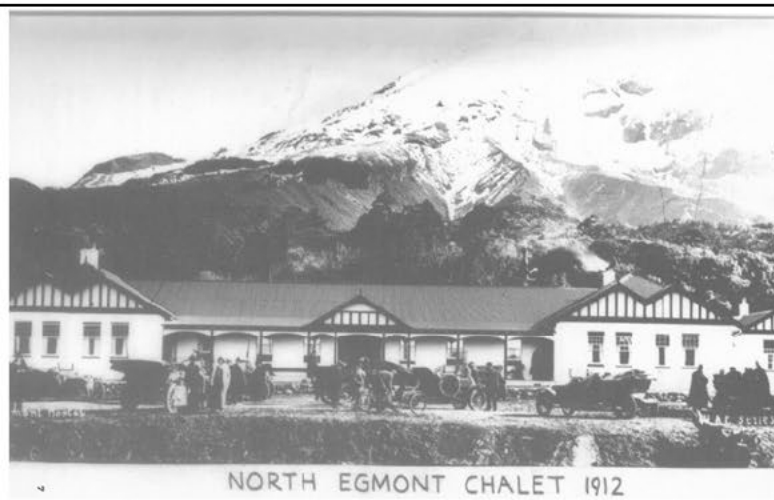
Reviewed by:

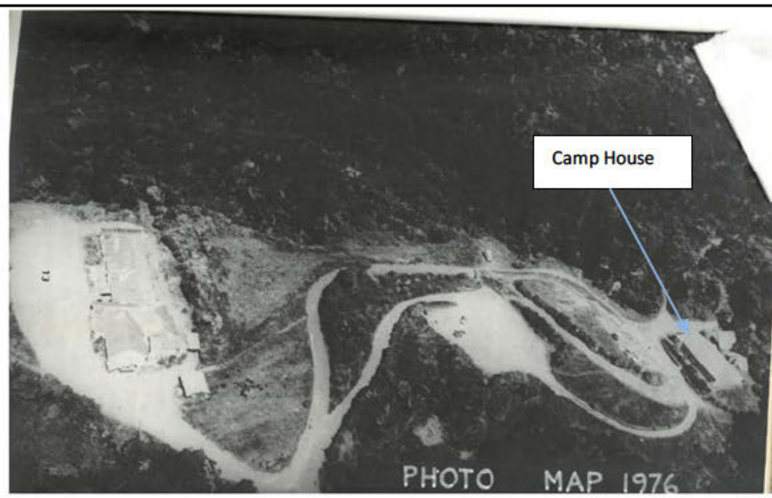
[redacted]

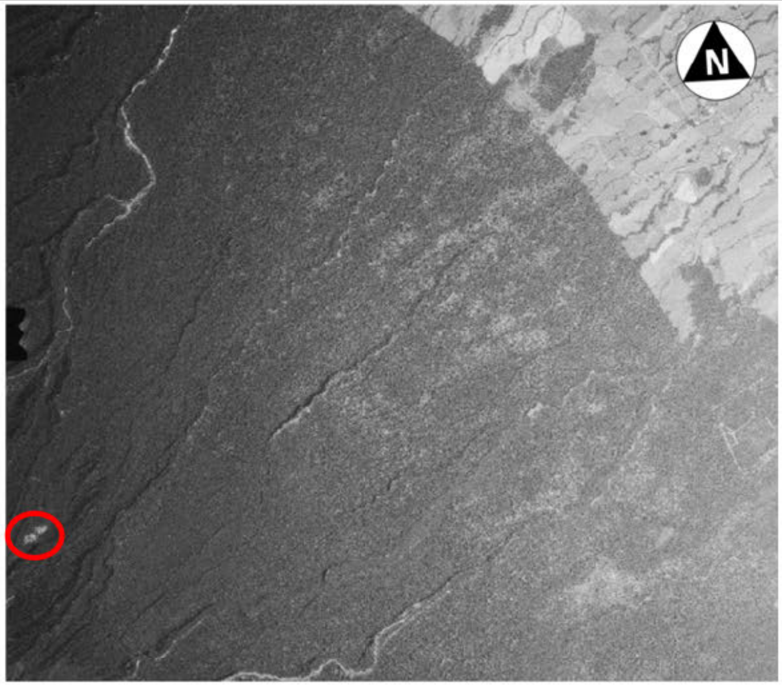
[redacted]

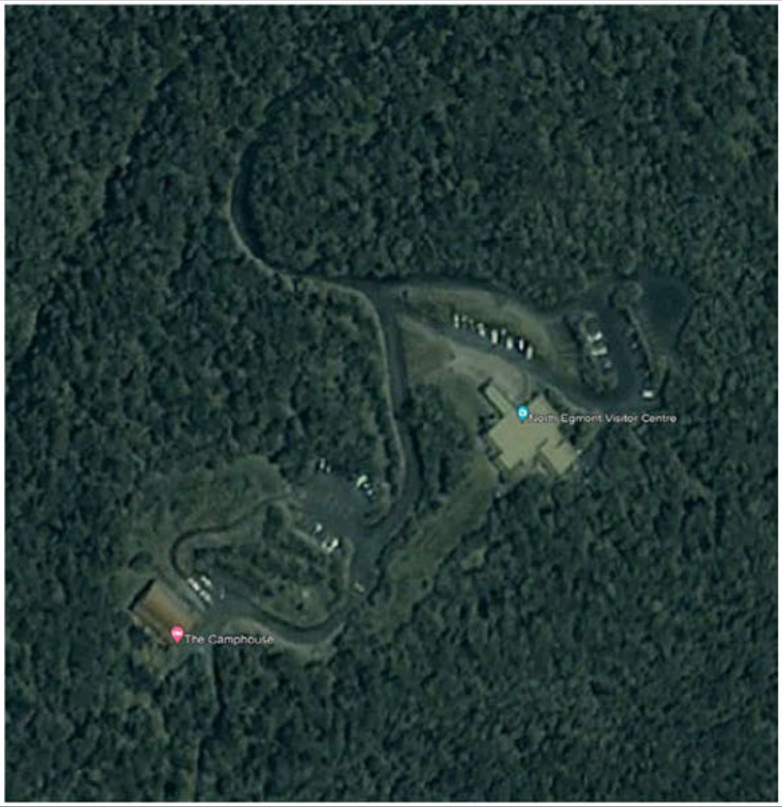
Civil Team Leader, BE (Hons), CPEng, CMEngNZ

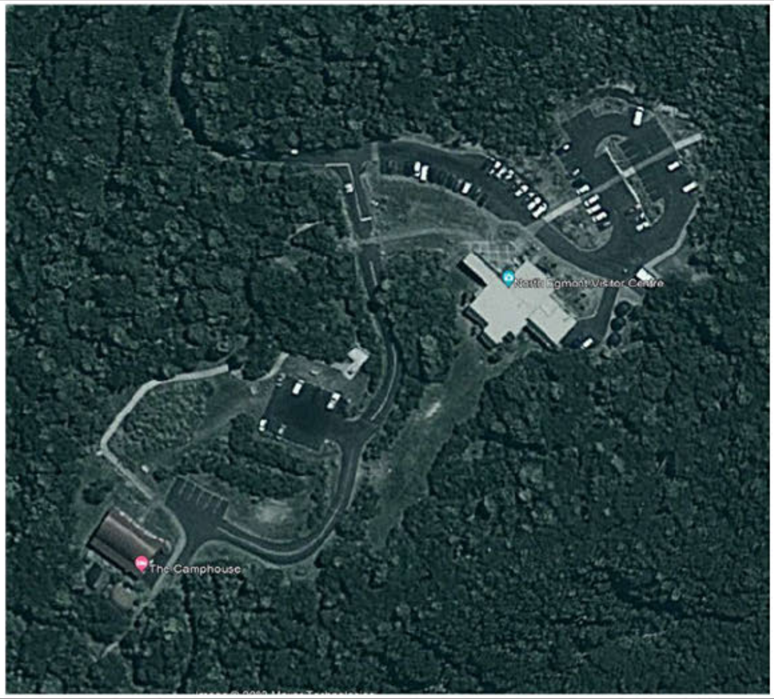
APPENDIX A HISTORICAL IMAGERY

Date, Source	Description	Image
Scanlan, A.B. 1980 "History in place names." In: Egmont National Park Handbook, pp. 14-15 Pages supplied by RCP	Excerpt from book. First construction on the site occurred in 1891.	**North Egmont Chalet:** At the 936-metre level is near the end of the road from Egmont Road. Was officially opened by the Governor, Lord Islington, in 1912. The building was enlarged and improved in 1929. **Old House (North Egmont):** Close to North Egmont Chalet, was the first camphouse constructed on Mount Egmont, being officially opened on 28 January, 1892. It was built of material from the military barracks erected on Marsland Hill, New Plymouth, in 1855, and sledged to the site in 1891.
1912 Provided by RCP	Photo of historic chalet on lower carpark. Large amount of vegetation clearance apparent.	
1930s Puke Ariki	Historic chalet still present. Minor building additions, steps appear to have been added between the upper and lower areas.	 https://collection.pukeariki.com/objects/113189/north-egmont-mountain-house

Date, Source	Description	Image
1965 Retrolens	Visitor centre clearing visible. Unable to see further detail on image.	 https://files.interpret.co.nz/Retrolens/Imagery/SN1889/Crown_1889_5074_7/Med.jpg
1976 Supplied by RCP	Approximate current clearing visible. Additional roadways to upper carpark and historic chalet present.	

Date, Source	Description	Image
1982 Retrolens	Visitor centre clearing visible, possibly some bush regenerated since 1965. Unable to see further detail on image.	 https://files.interpret.co.nz/Retrolens/Imagery/SN8003/Crown_8003_E_1/Med.jpg
01/04/2001 Google Earth Pro	Existing visitor centre building shown, footprint larger than present-day Possible earthworks/vegetation removal being undertaken in lower carpark area?	

Date, Source	Description	Image
09/02/2005 Google Earth Pro	Existing visitor centre shown. Parts of building/structure appear to have been removed since 2001. Main entrance narrower, bypass road to lower carpark present.	
09/02/2005 Google Earth Pro	Similar to 2007	

<table>
<tr><th>Date, Source</th><th>Description</th><th>Image</th></tr>
<tr><td>08/03/2012
Google Earth Pro</td><td>First aerial image of present-day layout.</td><td>
</td></tr>
<tr><td>09/03/2018
Google Earth Pro</td><td>Aerial image showing significant amount of illegal parking within lower carpark (circled in red)</td><td>
</td></tr>
</table>

Date, Source	Description	Image
07/03/2022 Google Earth Pro	Present day layout of visitor centre, buildings, roads and carparks.	

APPENDIX B WASTEWATER DEMAND ESTIMATE

General Assumptions:

- Freedom camping will be prohibited in the near future
- Assumed 110,000 public visitors per year – increasing visitors may require upgrade of infrastructure at later date.
- Assumed all laundry will be washed offsite.

User Category	User Type	Annual data	Wastewater Usage[12]	Scenario 1 – Whare Manaaki day and night event, high public visitor numbers		Scenario 2 – Whare Manaaki daytime event, high public visitor numbers		Scenario 3 – No event, extreme public visitor numbers		Considerations/Assumptions
				People per day	Wastewater per day (L)	People per day	Wastewater per day (L)	People per day	Wastewater per day (L)	
Visitor Centre and National Park visitors	Day walkers, overnight/multi-day trampers, sightseeing/snowfall visitors.	2017 – 110,000[13] 2018 – 101,090 2019 – 100,230 2020 – 71,319 2021 – 52,027 2022 – 52,401 2023 ytd - 36,731[14]	Toilets, hand washing 10 L/person/day	550	5,500	550	5,500	1250	12,800	Average annual visitors per day is approximately 300 people per day, given annual visitor numbers of 110,000. Assume peaking factor of x5 for high public visitor numbers, x10 for extreme public visitor numbers[15]. Café visitors have been subtracted from total visitors.
DOC Staff	Visitor centre staff, supervisor, rangers.	N/A	Toilets, hand washing, showers 60 L/person/day	5	300	5	300	5	300	Assumed maximum number of staff per day.
Whare Manaaki	Day only	N/A	Food preparation, toilets, hand wash 25 L/person/day	150	6,000	210	8,400	-	-	Informed by TOA of maximum capacity 210 with lecture style seating, otherwise 190. Maximum 40 people for overnight stays.
	Day and night	N/A	Food preparation, toilets, hand wash. 65 L/person/day	40	2,600	-	-	-	-	Informed by TOA of maximum design accommodation for 40 people.
Café visitor	Buy coffee/food, sit in cafe for 0.5 hours – 1.5 hours.	TBC	Food preparation, toilets, hand wash 25 L/person/day	200	5,000	200	5,000	250	6,250	Informed by TOA of maximum capacity of 40 people. Assumed open from 8:30am – 4pm (brunch/lunch/afternoon tea), 5 people per seat per day on peak da. Assume increase of café visitors by 25% on extremely busy day.
Café staff	Hospitality staff	N/A	Toilets, hand washing 35 L/person/day	5	175	5	175	8	480	Estimation of staff numbers based on number of visitors. We assume café staff will not typically use showers.

[12] Wastewater production figures sourced from Auckland Council GD06. These estimates were cross-checked against Auckland Regional Council TP58 and AS/NZS:1547:2012.
[13] From Taranaki Crossing Business Case https://www.mbie.govt.nz/dmsdocument/16181-taranaki-crossing-business-case-pdf
[14] 2018-2023 visitor numbers supplied by DOC via RCP 16/05/2023
[15] Correlated with AMTANZ (2020) data of peak 600 vehicle movements per day during 2019/2020 Christmas/New Year's period, one bus sighted parked at visitor centre on 30/12/2019. 300 cars x 2.0 people per car + 1 bus x 50 people per bus = 650 people per day maximum. Traffic control is likely in place limiting vehicles to one in and one out, due to it being in place on 50 occasions in 2019, reducing visits by an unknown quantity compared to if a public shuttle was readily available.

User Category	User Type	Annual data	Wastewater Usage[12]	Scenario 1 – Whare Manaaki day and night event, high public visitor numbers		Scenario 2 – Whare Manaaki daytime event, high public visitor numbers		Scenario 3 – No event, extreme public visitor numbers		Considerations/Assumptions
				People per day	Wastewater per day (L)	People per day	Wastewater per day (L)	People per day	Wastewater per day (L)	
Camp House visitors	Overnight stay at 'Camp House' DOC hut facility.	N/A	Kitchen, toilets, showers, hygiene. 100 L/person/day	34	3,400	34	3400	34	3400	DOC websites indicates there are 34 beds available for booking at Camp House, and kitchen, shower and toilet facilities are available. Assumed 100% occupancy during high visitor periods.
TOTALS					**22,975**		**22,775**		**22,930**	

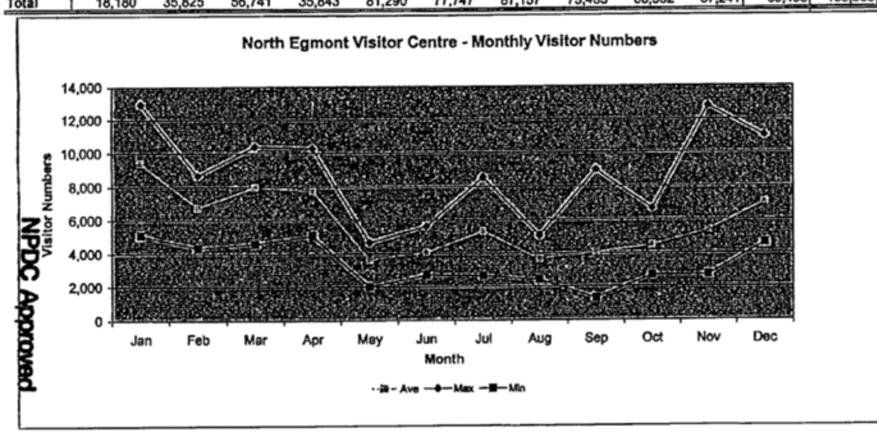
APPENDIX C WATER DEMAND ESTIMATE

Historical Visitor Number Records

Located within NPDC Building consent 105852P, property ID 027693. Supplied by NPDC in property data request, original source of data DOC.

North Egmont Visitor Centre - Visitor Number Records

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Ave	Max	Min
Jan		7329	8250	5092	12951	9965	12252	6414	11499	10797	9,394	12,951	5,092
Feb		4884	5316	4343	8268	7111	8672	8500	6063	7630	6,754	8,672	4,343
Mar		4589	5000		9422	8785	10065	10387	9015	6513	7,972	10,387	4,589
Apr		5060	5500		9893	8315	10280	8879	8181	5928	7,755	10,280	5,060
May			2000		3495	4667	4453	4009	3467	3314	3,629	4,667	2,000
Jun			2700		5613	4022	3745	4293	3979	4145	4,071	5,613	2,700
Jul	2645		3755		6141	6159	8543	6925	4073	4177	5,302	8,543	2,645
Aug	2399		5044		3993	4436	4001	3418	3048	2952	3,661	5,044	2,399
Sep	1900	1294	8976		4811	5006	3773	3864	2061	4811	4,055	8,976	1,294
Oct	2957	3200	2855	6640	4472	5486	4949	4333	4650	5304	4,465	6,640	2,655
Nov	3334	2688	2945	12797	5833	5860	5429	5623	4895	4182	5,359	12,797	2,688
Dec	4945	6781	4600	6971	6398	7935	10995	6840	7451	7488	7,040	10,995	4,600
Total	18,180	35,825	56,741	35,843	81,290	77,747	87,157	73,485	68,382	67,241	69,458	105,565	40,065



NPDC Approved
04 JAN 2009

PROJECT: NTVC
JOB NUMBER: 230129
LOCATION: 2679 Egmont Road
SITE: North Taranaki Visitor Centre

DESIGNED: [redacted] DATE: 09/08/2023
CHECKED: [redacted] DATE: 09/08/2023

BTWCOMPANY
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Sizing of Storage Tanks for New Visitor Centre (excluding Camp House)

Design Parameters:
Refer wastewater design for usage assumptions per person per day

Public Visitor, Staff Water Usage
Average public visitor numbers - 110,000 per year, 301 per day - assume 15% visit café, 40% use restroom

Average daily public wastewater use:	2,333	L/day	Assuming 10L per restroom user and 25L per café user
Average daily staff wastewater	510	L/day	Assuning 60L for each of 5x DOC staff and 35L for each of 6x café staff.

Whare Manaaki Water Usage
Assume 3 events per week at Whare Manaaki, 100 people per visit

Average weekly water use	19,500	L/week	Assuming 65 L per visitor
Average daily water use	2,786	L/day	

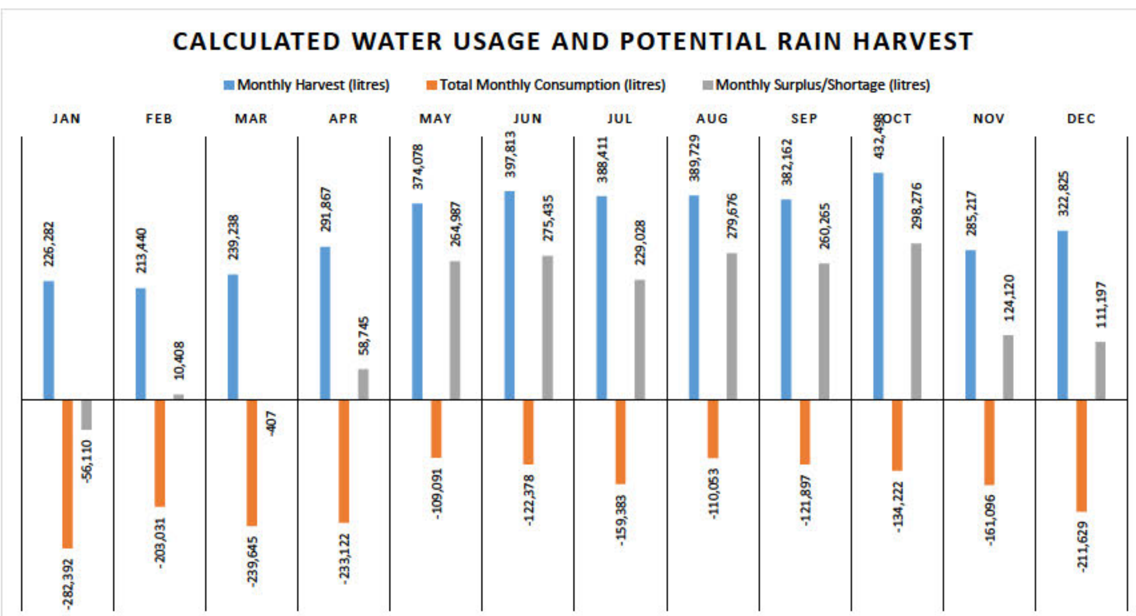
Outdoor water requirements:

Water fountain	75	litres/day	Assuming 1/4 of 110,000 visitors take 1L each
Car cleaning	8	litres/day	Assuming 50L/clean, 5x a month
Exterior window cleaning	8	litres/day	Assuming 500L per clean, once every 2 months
Total outdoor water usage	92	litres/day	

Total average daily water usage	5,720	L/day
Average annual water requirement	**2,087,939**	**L/year**

Potential Rain Harvest

Average Monthly Potential Rain Harvest	328,630	litres/month
Total Annual Average Potential Rain Harvest	**3,943,559**	**litres/year**



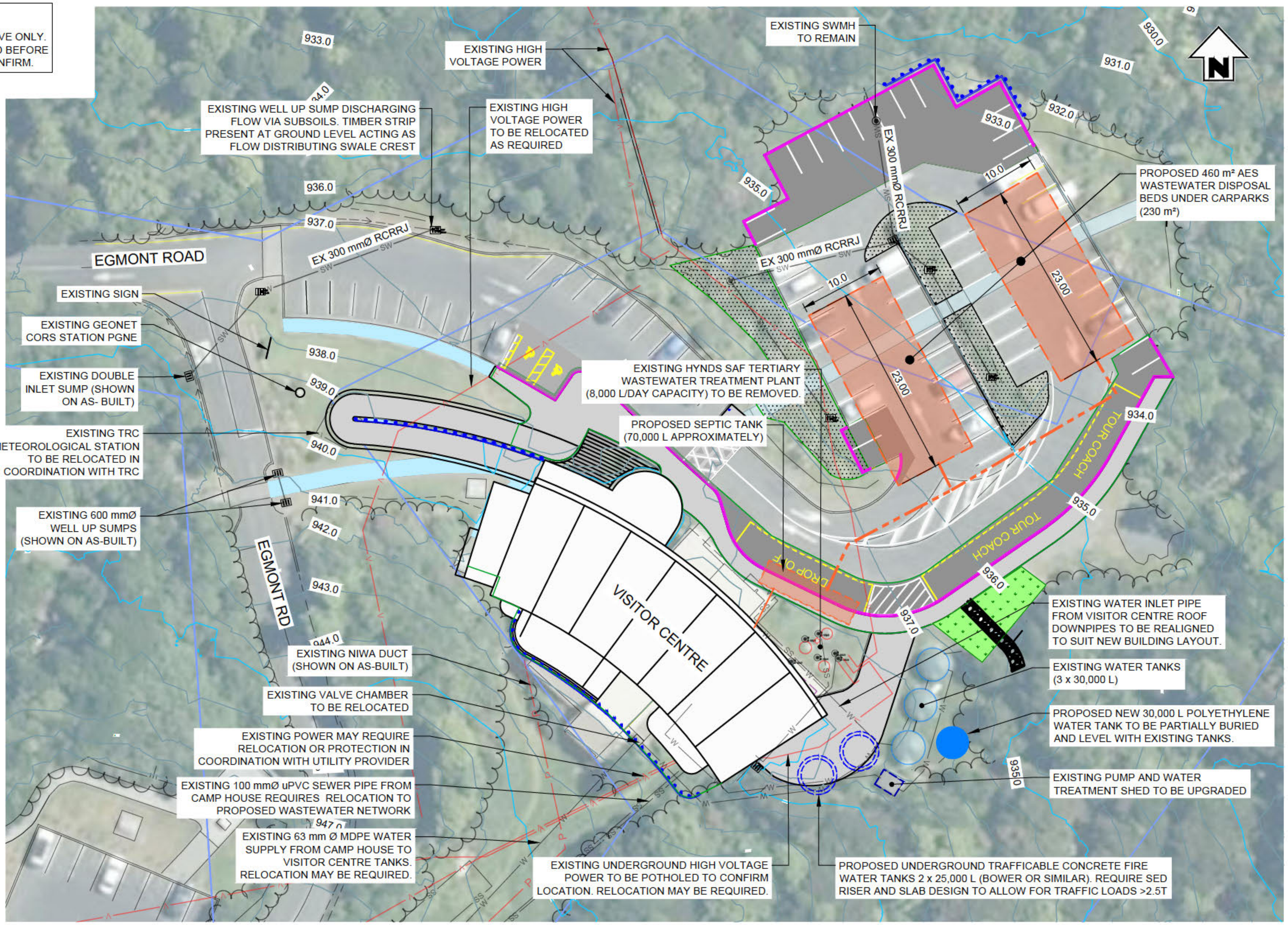
APPENDIX D PRELIMINARY ENGINEERING DRAWINGS

GENERAL NOTES

1. EXISTING SERVICES SHOWN ON THE PLAN ARE INDICATIVE ONLY.
2. INFORMATION SOURCED FROM HISTORIC AS-BUILTS AND BEFORE U DIG SERVICES. SITE INVESTIGATION REQUIRED TO CONFIRM.

LEGEND

	EXISTING	PROPOSED
BOUNDARIES		
FLUSH NIB KERB		
EDGE OF SEAL		
POWER	V	
SEWER	SS	
WATER	W	W
TREE DRIP LINE		
STORMWATER	SW	
NIWA DUCT	P	
BOTTOM OF BANK		
SUBSOIL DRAIN		
MANHOLE		
SUMP		
BUILDING		
FOOTPATH		
RAINGARDEN		
ASPHALT / CHIPSEAL		
UNDERGROUND TANK		
WATER TANK		
SEPTIC TANK		



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.

ISSUED FOR APPROVAL

BTW COMPANY

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ENVIRONMENT

NO	DATE	BY	CHKD	APPR	OPER	DESCRIPTION
A	11/08/23	KA	SH	SH		ISSUED FOR APPROVAL

REVISIONS — NUMBER — TITLE — REFERENCE DRAWINGS

GENERAL NOTES
1. Coordinates in terms of : NA
2. Elevations in terms of : NA
3. Contour interval is : 2m

TE KOTAHITANGA O TE AT/AWA

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
THREE WATERS LAYOUT PLAN

ORIGINAL SIZE	DRAWING No	SHEET	REVISION
A3	230129-03	C07	A

File Name: C:\12d\S\data\BTW12D\230129 - RCP_572407 Drawings\230129-03 Nth Taranaki Visitor Centre _ Preliminary Design.dwg - C07 Plot Date: 11/08/2023 Plot Time: 11:21