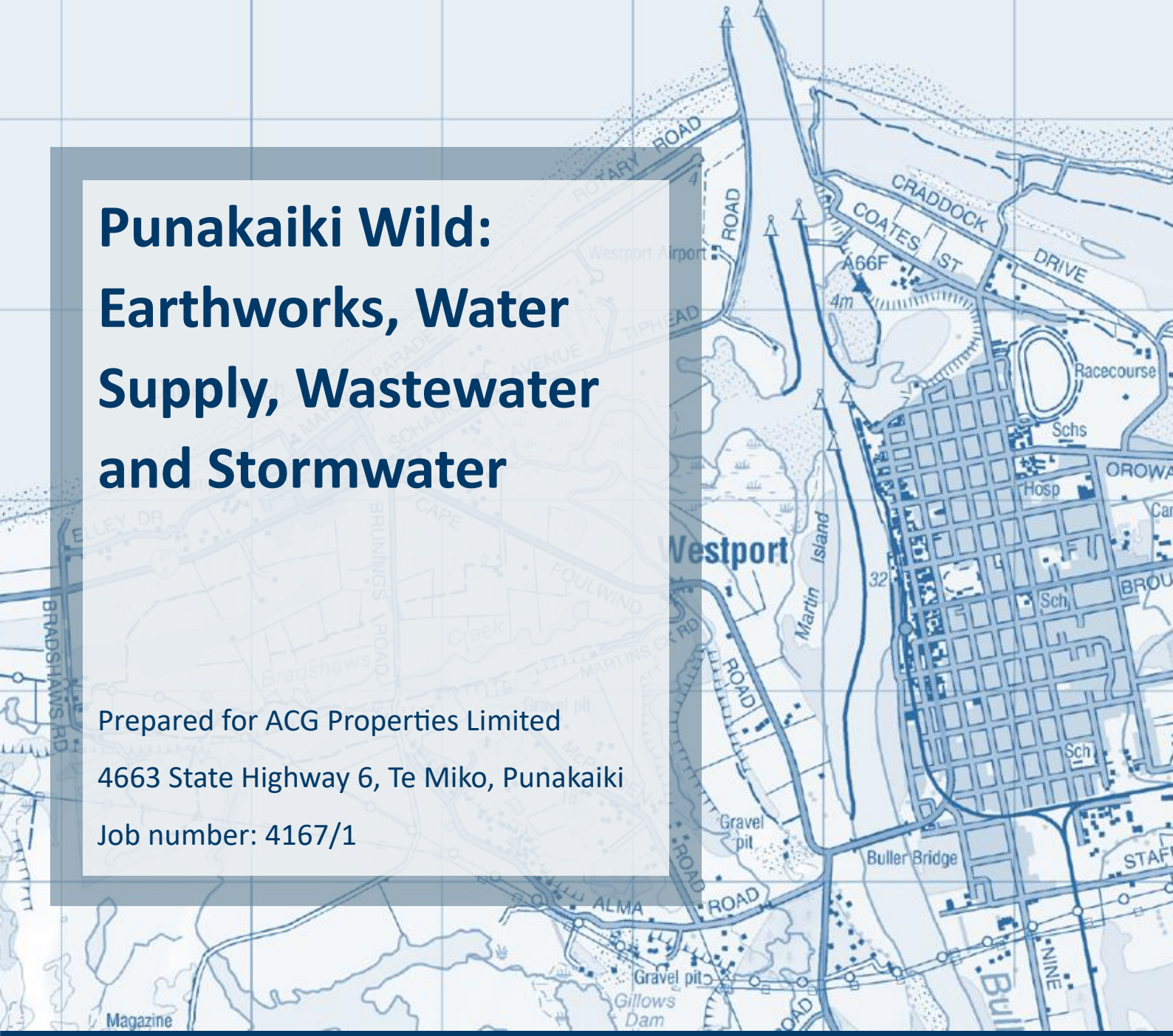
Punakaiki Wild: Earthworks, Water Supply, Wastewater and Stormwater

Prepared for ACG Properties Limited

4663 State Highway 6, Te Miko, Punakaiki

Job number: 4167/1



Chris J Coll Surveying Limited

Authorised by: Stuart Challenger

CHRIS J COLL

SURVEYING

LTD

SURVEYORS | PLANNERS | ENGINEERS

Contents

1. Introduction

1.1. Scope of Work

ACG Properties Limited are proposing to establish and operate luxury visitor accommodation, including a lodge, cabins, and workers accommodation at 4663 and 4671 State Highway 6, Te Miko, Punakaiki. Town Planning Group, on behalf of ACG Properties Ltd, have engaged Chirs J Coll Surveying Ltd to address issues related to Earthworks, Water Supply, Wastewater and Stormwater.

1.2. Limitations

This report has been prepared for ACG Properties Limited in relation to the earthworks, water supply, wastewater and stormwater for the proposed development of Punakaiki Wild.

This report provides details of a preliminary site inspection undertaken on 6 November 2024, geotechnical assessment of the soil conditions, consisting four hand augers on site on 28 March 2025, a review of LiDAR and drone survey across the site and proposed development plans.

This report is valid for two years from the date of signing. Professional comments and recommendations made in this report are based on the review of our site inspection and the other information provided.

Professional care was taken during site inspection and investigation of subsurface features and conditions. However, it may be that pertinent subsoil strata and features/conditions are present on the site that were not identified given the limited investigation of the site and the information available at the time the report was prepared. No warranty is included, either explicit or implicit, that actual conditions across the entire site will conform to the assessment provided in the report.

Any future changes to the site and its surroundings (such as but not limited to significant seismic events), relevant laws or regulations and guidelines (such as but not limited to the New Zealand Building Code) or detection of subsurface features not formerly identified may necessitate revision of our site suitability recommendations and, should any of these occur, this report can no longer be used for the purpose for which it was prepared. In such instances, we recommend that Chris J Coll Surveying Limited be contacted regarding this report for confirmation that findings and recommendations are still applicable.

This report has been prepared for the exclusive use of ACG Properties Limited, and it may not be relied on for any other purpose or by any person other than ACG Properties Limited without our prior written agreement. Neither Chris J Coll Surveying Limited nor any of its employees accept any liability with respect to this report and its use by any persons, company, or organisation other than Buller District Council. Chris J Coll Surveying Limited does not authorise or contemplate this report being used by any other party for any other purpose.

2. Site Description

2.1. Legal description

The site is at the western side of State Highway 6 midway between Greymouth and Westport, about 2.2 km north of the Pororari River Bridge on the northern side of Punakaiki. It has a legal description of Pt Section 1 Blk IX Brighton SD with the addresses of 4663 and 4671 State Highway 6, Paparoa National Park, Punakaiki.

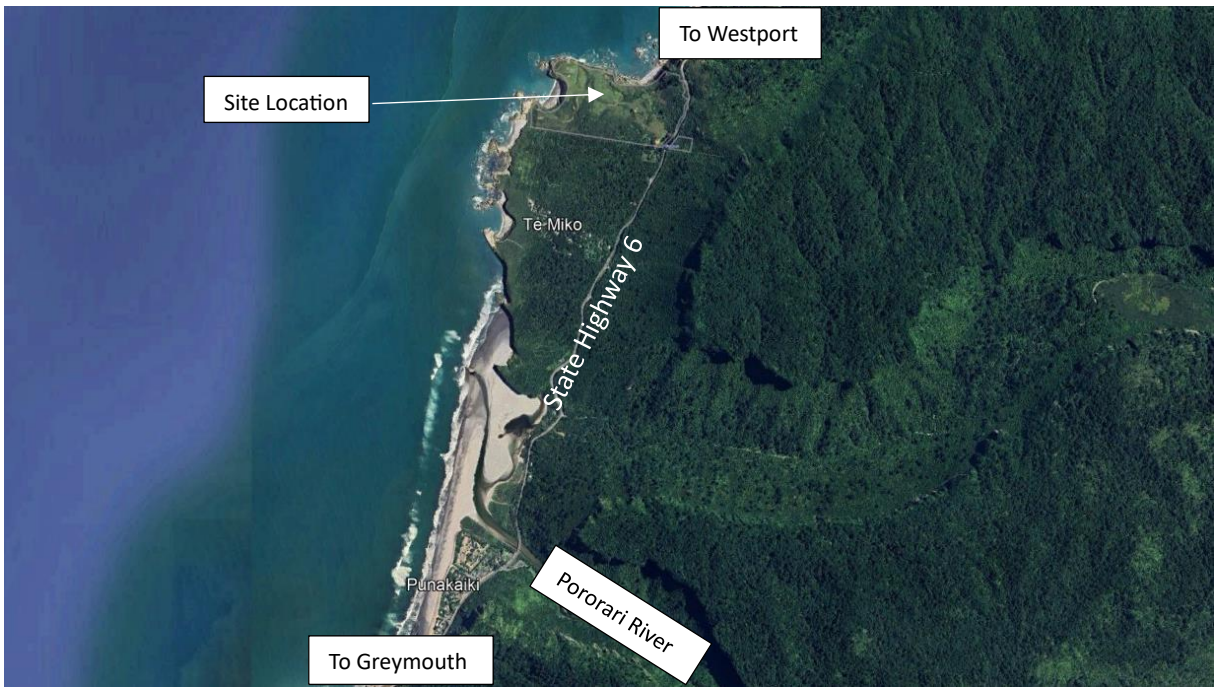


Figure 1. Site Location

2.2. Site Geology

The majority of the site is shown in the New Zealand Geological Map[1], as being underlain by Paleogene sedimentary rocks (Fossil Creek Formation, Island Sandstone and Little Totara Sandstone) described as Shallow marine sand and sandstone. Toward the western end there is a band of Late Pleistocene shoreline deposits, consisting of Marine sand and gravel, extending into the property.

Figure 2. Geological Map of the Area(1).

[1] Geology 2.0.0 (gns.cri.nz)

3. Earthworks

The site covers an area of almost 22 Ha (220,000m²), the largest contributor to earthworks is roading which is estimated to result in about 6,000m² of exposed ground. The buildings and services are estimated to result in about 3,000m² of exposed ground. There will be no site contouring, and no other major earthworks are envisaged. The total estimated area of exposed ground (assuming that all works were to occur simultaneously) is about 9,000m², which is just over 4% of the total site area.

3.1. Factors Influencing Erosion

The factors that influence the amount of erosion on sites are:

1. Rainfall intensity
2. Ground Cover
3. Soil Characteristics
4. Topography
5. Duration of soil exposure

3.1.1. Rainfall Intensity

Rainfall intensity, duration and frequency are the main factors that determine the volume of runoff at a given site. The potential for soil particles to become detached and transported becomes greater as these factors increase. From HIRDS V4 historical data, the site has a 10 minute, 10 year rainfall intensity of 92.8mm/hr. This intensity rainfall has potential to create significant erosion, however, there are few signs of erosion visible on the site, which is most likely as the site is covered with a good swath of grass and scrub in the gullies.

In order that the high rainfall intensity that can occur on the site, does not cause erosion and consequent sediment transportation, the working areas are to be kept to the minimum size . This can be achieved by clean water diversion channels above the site, and by dividing each earthworks site into small areas by installing cut-off drains.

3.1.2. Ground Cover

The majority of the site is grassed, with small patches of regenerating native shrub and flax in the gullies. There are some patches of gorse, but these cannot be counted on as providing any protection against erosion, as these, and other weeds, will be removed as the site is developed. Areas that are not proposed for development are to be maintained with grass cover so that these areas act as vegetative filter strips should any sediment escape the earthworks areas.

3.1.3. Soil Characteristics

Hand auger tests show that the site typically has a layer of 2-300mm of silty sandy topsoil over various layers of sandy silts and silty sands. The organic matter in the topsoil helps reduce runoff and erosion, however once this is removed, because of the sand content in the underlying soils and the fact that they are moist, they are considered to be prone to erosion. Because of this it is necessary that the area of exposed ground is kept to a minimum, which will require that a staged approach to site development is undertaken.

3.1.4. Topography

The site rises from about 15m, above the sea cliffs, to about 115m at the State Highway, over a distance of about 700m, so an average slope of about 1 in 7 or 8°. In the middle of the site, the topography is more gentle and is classified as rolling with an average slope of about 2°. The site is steeper at the top and bottom, with slopes up to about 22°.

There are not anticipated to be any earthworks in the steeper areas in the lower part of the site. At the top of the site, where the State Highway entrance is to be formed there will be a large, exposed area of ground, on a steeper part of the site. Specific erosion and sediment control measures will be used for this area.

3.1.5. Duration of the soil exposure

The duration of soil exposure to potential erosion is complex, but in simple terms, the longer an earthworks site is exposed, the greater the chance that it will be subject to rainfall. The sequencing of works will be developed to minimise the area of exposed ground, with rehabilitation occurring as soon as practical.

3.2. Control Practices

As on the majority of the site, the grades are low and the earthworks are minimal, the main form of erosion and sediment control will be by keeping the earthworks areas small, diversion of clean water run-on, by creating temporary bunds on the up-hill side of any earthworks site and maintaining the vegetation around the earthworks site.

This will reduce the amount of water flowing across the site, which will reduce the potential for erosion. By maintaining the vegetation around the earthworks site, the water that flows off the earthworks site will have to pass through the vegetation, which because it is relatively flat will act as a vegetative filter strip and ensure that any sediment in the flow does not leave the site.

The largest earthworks area will be the road formation. At the entrance from the State Highway, the steeper grades would increase the velocity of any flow from the earthworks site. Rather than rely on the vegetation to trap the sediment, silt fences will be erected on the downstream side of the earthworks. The exact position of the fences will depend on the progress of works, and it may require that the fences are moved as the work progresses, with the aim of the sediment fences being to ensure that the minimum area is exposed to potential water run-on.

For the remainder of the roading, earthworks areas will be kept small by installing ‘stabilised entrances’ along the road route to divide the road into smaller areas. The runoff from the ‘stabilised entrances’ will discharge to vegetive filter strips, where this is practical, and where it is not practical, silt fences will be erected at the discharge points.

A preliminary sediment control plan is attached in Appendix A, note that sediment control plans are living documents and need to be adjusted as works progress.

4. Water Supply

It is proposed that water is supplied from the Buller District Council untreated supply. It is understood that the raw water is slightly high in pH and rich in minerals, particularly hardness ions and the bacterial content of the raw water is relatively high. It will be necessary that the water is treated to comply with the Taumata Arowai drinking water quality assurance rules. To achieve compliance, it is proposed that the water first go through a water softener followed by two stage cartridge filtration, 20µm followed by 5µm, and finally UV disinfection.

The peak flow within the development is anticipated to be in the order of 40m³/day, however with the buffer storage that the tanks will provide, the peak flow from the Council supply is expected to be about 18m³/day or 0.21L/s.

Discussions are still to be finalised with the New Zealand Fire Service regarding the most appropriate means of addressing the firefighting water supply for the site. Options being explored are to have sprinklers in all of the new buildings and three fire hydrants at the centre of the 130m radius circles on the following Figure.

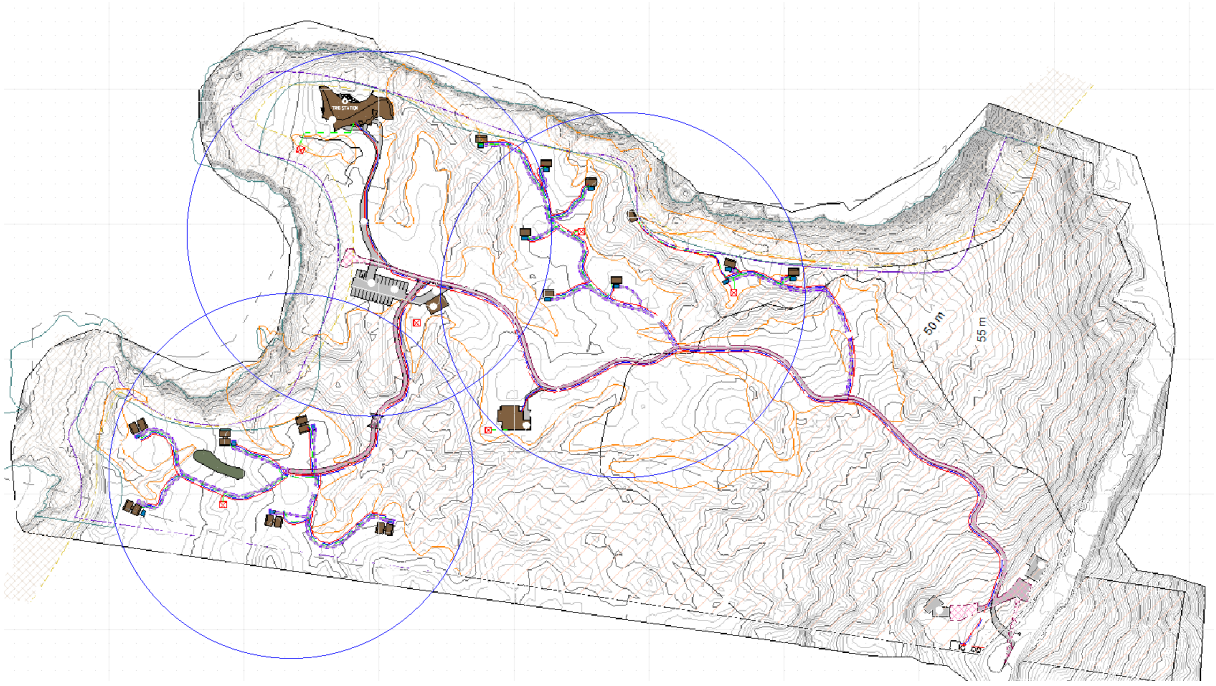


Figure 3. Fire Hydrant locations for sprinklered buildings

This option would require that a 100mm diameter water main comes from the water tanks near the entrance to each of the hydrants. The potable water supply would come off the 100mm dia. mains. The alternative being investigated is to have clusters of three water tanks for fire fighting at the five locations centred on the 90m radius circles in the following figure.

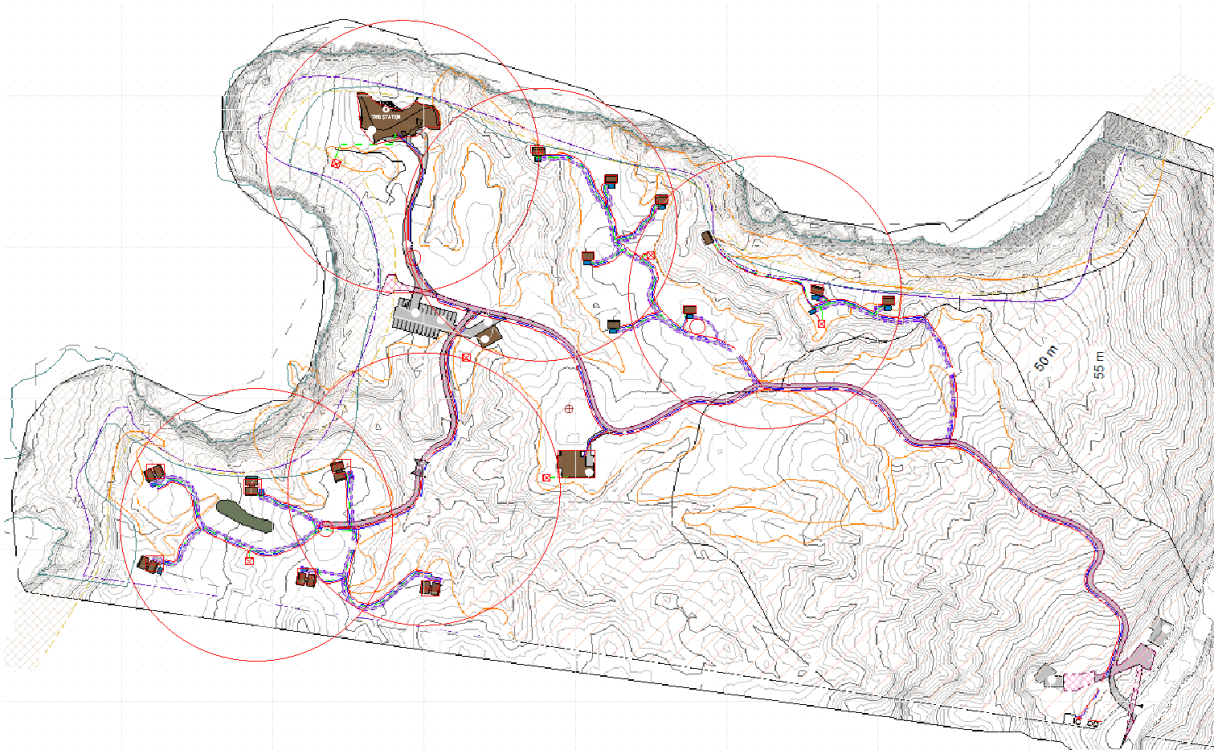


Figure 4. Clustered water tank locations

5. Wastewater

5.1. Design Philosophy

A preliminary assessment of the site was undertaken in November 2024, comprising of a site walkover and a desktop review. The desktop review showed that the site was most likely underlain by sedimentary rock, which would create a limiting layer for wastewater infiltration. The site walkover showed that there were some areas of exposed sands which had cemented layers, which would also be limiting layers for wastewater infiltration. Wastewater receives treatment as it passes through the soil matrix, once it reaches a limiting layer, which is normally where a perched water table will occur, it can travel through the water without receiving any further treatment. This can lead to partially treated (contaminated) water leaving the site. To ensure that the effluent receives adequate treatment before it reaches a limiting layer, it was proposed that the effluent be treated to a secondary standard and then discharged via sub-surface drip irrigation. It is intended that the site have a minimal power usage, so a secondary treatment system that does not require power, the Biorock-S On-site Domestic Wastewater Treatment system, with a gravity dosing system to sub-surface drip irrigation, was proposed.

Subsequent to the preliminary assessment hand augers were undertaken across the site in March 2025 and site levels were reviewed. To operate the Biorock system via gravity requires the outlet of the treatment plant to be about 2m below the surface. A gravity dosing system to a subsurface drip irrigation system requires about 5m head from the dosing chamber to the irrigation lines, so a total of 7m elevation difference is required to operate this without pumps. This may not be available in all locations without placing the land application field close to waterways.

The hand augers showed that the majority of the site was underlain by various layers of silts and sandy silts. The soils were assessed as having minimal clays, as it was not possible to form a ribbon longer than 20mm, so the soils are classified as a silty sandy loam with an assessed soil category of 3.

Discharging to a category 3 soil can be undertaken via a bed or trench, so an alternative secondary treatment system, which does not require power and can operate at a low head was investigated.

5.2. On-site Wastewater Treatment and Land Application Description

As stated above, because of the suspected limiting soil horizons, we recommend that the effluent is treated to secondary standard prior to discharge to ensure no un-treated effluent enters perched groundwater. This section provides the on-site wastewater treatment and disposal design methodology which has been prepared in accordance with AS/NZS1547: 2012 On-site domestic wastewater management.

5.2.1. System Overview

We propose that the influent will undergo primary treatment through septic tanks prior to receiving secondary treatment by an Advanced Enviro-Septic (AES) treatment system. The treated effluent will be discharged to a land application bed designed for a category 3 soil.

The AES system is a passive aerobic proprietary trench treatment system and underwent testing at the On-site Effluent Treatment – National Testing Programme (OSET – NTP) in Rotorua in 2016/2017. The system underwent 17 benchmarking tests and was considered to meet the secondary effluent quality requirements of AS/NZS1547: 2012 at the test flow rate of 1,000L/day.

This design methodology has been chosen due to the minimal maintenance characteristics, no mechanical parts, and to ensure a high treatment quality. Several of these systems have been installed on the West Coast, and where necessary, have been granted resource consent from the West Coast Regional Council.

5.2.2. AES Secondary Treatment Plant

The AES system is a simple passive treatment system with minimal maintenance requirements. Effluent discharged from the septic tank undergoes a high level of treatment, prior to discharging to land in an aerated sand bed. The AES does not require any pumps, along with having an outlet invert that reduces the need for deep trench excavations.

The AES system shall be installed by a licenced drainlayer and an approved AES installer.

5.2.3. Land Application Bed

From AS/NZS1547: 2012 Table L1 using a weakly structured Loam, of a category 3 nature, the Design loading rate (DLR) for trenches and beds for secondary treated effluent is 30mm/day. In order that resource consent is not required, the discharge for each system will be limited to less than 2000L/day. As the units will have water reduction features a flow rate of 150L/person/day is used. The family units will have an occupancy of 6 people, so the system is designed for a total of 12 people, or two family units.

The design flow from 12 people at 150L/person/day is 1800L. For a daily flow of 1800L discharging to a bed on category 3 soils, an area of 1800/30 = 60m² is required. From the AES design calculator, the required bed is 18.6m in length and 2.33m in width, which comprises of 3 rows of six lengths of AES pipes, including a 1.43m wide extension on one side, giving a total area of 60m². Note that the actual layout will vary for each system, as it will be designed to fit within the land contours, which may not allow for an 18.6x2.33 rectangle.

5.2.4. Effluent Quality

The proposed septic tank, AES and land treatment via land application bed will ensure a high-quality effluent. The following sections provide the expected treatment quality outcomes.

Total Suspended Solids (TSS)

OSET trials on the AES system in 2016/2017 indicated a median TSS in the effluent post AES treatment of 3mg/L with a standard deviation of 3.1mg/L. Therefore, the TSS entering the soil matrix will be very low and will not cause soil pore blockages.

Biological Oxygen Demand (BOD)

A healthy soil environment can assimilate up to 150kg BOD/ha/day. The AES secondary treatment effluent biochemical oxygen demand BOD quality is expected to be below 5mg/L based on the results gained at the ONSET - NTP trial (median of 2mg/L with a standard deviation of 1.5mg/L). A discharge of 5mg/L BOD with a dose of 38,210L/day is a discharge of 0.191kg/day. This will be discharged over an area of 764m² ($764x10^{-5}$ Ha), so is an application rate of 25kg/Ha/day which is 1/6 of the soils assimilation rate.

It is unlikely that the proposed low BOD loading rate will cause any significant effects on soils as the proposed application rate will allow the breakdown of organic material under aerobic conditions. The low BOD application rate will mitigate the build-up of organic material.

Therefore, the effects of BOD from the discharge on the soil will be less than minor.

Microbial Contaminants

The secondary treatment plant (AES system) will typically have a median discharge faecal coliform quality of around 2,260cfu/100mL (as per OSET – NTP testing results). Protection of underlying groundwater is further provided by the underlying soil profile.

The main mechanisms that operate within the soil matrix to ensure pathogen removal are filtration, adsorption, and natural attrition. Results from numerous studies show virus reductions of 99.99% through 0.6m of 0.12mm diameter sand and bacteria reductions of 99.998% through 0.9m of 0.15mm diameter dune sand, with 92% to 97% reduction occurring in the top one centimetre. In addition, Rubin (2009) (an author of many USEPA publications) in decentralised wastewater workshops in NZ stated that they conservatively use one log reduction of bacteria per 150mm of travel through the soil and subsoils. Based on the elevation difference between the AES bed and the underlying highest seasonal groundwater and the lateral distance to any surface water, a high level of pathogen removal will be achieved through the soil matrix prior to potentially reaching groundwater and any surface waterways.

The above studies relate to LPED systems which is considered an appropriate comparison for the proposed AES treatment and absorption trench disposal system.

5.2.5. Statutory Assessment

The proposed wastewater discharge was assessed in terms of the West Coast Regional Council Land and Water Plan rule 79 and provided that a minimum of 50m separation can be maintained from any water body or 20m separation from any drain, then the system is considered to comply with the permitted activity status and resource consent is not required.

6. Stormwater

The site has an area of 22 hectares, the proposed development will change about 0.9 hectares, turning it from grass land to roads or roofs. This represents a change in land use to about 4% of the site.

The Buller District Council have requested a "*Stormwater Management Plan to demonstrate that discharge from this development will be maintained at pre-development levels".*

The reason why discharges should be kept at pre-development levels is so that there are no adverse effects on the receiving environment. This development is on a small headland, and the receiving environment is the sea. Should flows increase due to the proposal, there will be no adverse effect on the sea. While the request in 99% of cases is a valid one, it is contended that in this particular case, as there will be no adverse effect, it is not relevant.

Whilst any increase in flows due to the proposal are not considered relevant, what is considered relevant, is to ensure that the individual stormwater discharges do not cause erosion or localised ponding of water. The discharge from the roads will be to roadside swales. These will be developed as the roads are constructed and in conjunction with the erosion and sediment controls. Throughout the ongoing development of the erosion and sediment control, appropriate discharge locations and any additional controls will be identified, i.e. whether rip rap erosion protection at the head of any gullies is necessary.

Where the buildings are to be erected, the site is gently rolling, with a general fall toward the coast. The buildings will all be located on high points to ensure that there is no likelihood of any water ponding around the dwellings, so that the finished floor heights above the surrounding ground in NZS3604 are considered appropriate. The discharge from any roofs will be to a soak pit designed in accordance with NZBC E1/VM1 with an overflow to a nearby gully.

As the discharges will be to sea and as it is not proposed to create any new titles, no easements are required.

7. Conclusions and Recommendations

Chris J Coll Surveying Limited have undertaken an assessment of Earthworks, Water Supply, Wastewater and Stormwater for a proposed development at 4663 State Highway 6 Te Miko, Punakaiki.

A generic earthworks and sediment control plan has been developed. This plan is a living document, and measures will be modified as work progresses to suit the areas of earthworks.

Following a further site investigation, the preliminary wastewater treatment and land application is considered not the most appropriate for the site. It is now proposed that a series of AES Systems are used with each system designed to cater or up to 12 people (maximum discharge of less than 2,000L/day). The land application beds will be located a minimum of 50m from any water body and 20m from any drain. As such the systems will comply with the permitted activity status of Rule 69 of the WCRC Land and Water Plan and no resource consent is required.

Stormwater is to be managed on site via a combination of swales from the road discharges, and soakage pits with overflows to gullies for the roof water.

If you require any more information or would like us to undertake further testing or clarification of the design, please contact me on (03) 789 8425.

Prepared by:	Signature:	Date:
Stuart Challenger Civil & Environmental Engineer BE NatRES, BSc, CMEngNZ, CPEng		9 April 2025

Reviewed by:

Jan Coll Engineering Associate & Office Manager MS+SNZ, REA, NZCE(Civil)		10 April 2025

Date issued: 11th April 2025

Appendix A. Site Investigation Records

CHRIS J COLL SURVEYING LTD

INVESTIGATION LOG

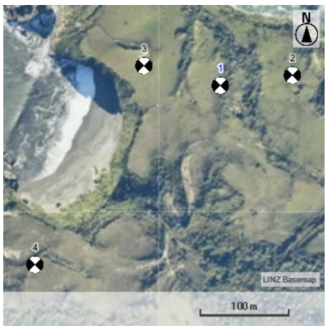
HOLE NO.: 1

CLIENT: ACG Properties Limited
PROJECT: Punakaiki Wild
JOB NO.: 4167

SITE LOCATION: 4663 State Highway 6, Paparoa National Park, Punakaiki
TEST DATE: 28/03/2025
CO-ORDINATES: 1463001mE, 5339488mN
ELEVATION: Ground
LOGGED BY: SCC

MATERIAL DESCRIPTION	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 100mm) 2 4 6 8 10 12 14 16 18	WATER
Silty sandy TOPSOIL; brown . Moist; some iron staining.		0.0	TS		
SILT, with some sand; light brown. Moist; sand, fine.		0.2			
Silty SAND; grey . Moist; sand, fine. 0.9m - 1.2m: SAND, with some silt. Sand, fine to medium; increase in sand content.		0.4 0.6 0.8 1.0			Groundwater Not Encountered
SILT, with some sand; orange. Moist to wet; sand, fine.		1.2 1.4			
SILT, with minor sand; grey . Wet to saturated; Hole collapse.		1.6			
End Of Hole: 1.70m					

PHOTO(S)



REMARKS

WATER
- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE
- [x] Hand Auger
- [ ] Test Pit

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CHRIS J COLL SURVEYING LTD

INVESTIGATION LOG

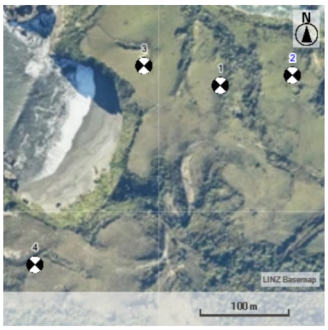
HOLE NO.: 2

CLIENT: ACG Properties Limited
PROJECT: Punakaiki Wild
JOB NO.: 4167

SITE LOCATION: 4663 State Highway 6, Paparoa National Park, Punakaiki
TEST DATE: 28/03/2025
CO-ORDINATES: 1463081mE, 5339501mN
ELEVATION: Ground
LOGGED BY: SCC

MATERIAL DESCRIPTION	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 100mm)	WATER
Silty sandy TOPSOIL; black . Moist; sand, fine.		0.0	TS	2 4 6 8 10 12 14 16 18	Groundwater Not Encountered
Sandy SILT; brownish orange. Moist; sand, fine; 5mm iron nodules.		0.2 0.4 0.6			
SAND, with some silt; white. Moist; sand, fine to medium.		0.8			
SILT, with some sand; orange . Moist; sand, fine.		1.0 1.2			
End Of Hole: 1.30m		1.4 1.6			

PHOTO(S)



REMARKS

WATER
- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE
- [x] Hand Auger
- [ ] Test Pit

CHRIS J COLL SURVEYING LTD

INVESTIGATION LOG

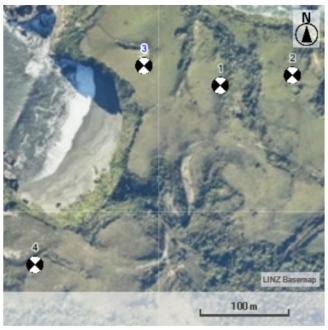
HOLE NO.: 3

CLIENT: ACG Properties Limited
PROJECT: Punakaiki Wild
JOB NO.: 4167

SITE LOCATION: 4663 State Highway 6, Paparoa National Park, Punakaiki
TEST DATE: 28/03/2025
CO-ORDINATES: 1462917mE, 5339508mN
ELEVATION: Ground
LOGGED BY: SCC

MATERIAL DESCRIPTION	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 100mm) 2 4 6 8 10 12 14 16 18	WATER
SAND; orange . Firm to very stiff; dry; sand, fine to coarse; Could auger no deeper, possible iron pan.		0.2			Groundwater Not Encountered
End Of Hole: 0.35m		0.4			
		0.6			
		0.8			
		1.0			
		1.2			
		1.4			
		1.6			

PHOTO(S)



REMARKS

WATER
- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE
- [x] Hand Auger
- [ ] Test Pit

CHRIS J COLL SURVEYING LTD

INVESTIGATION LOG

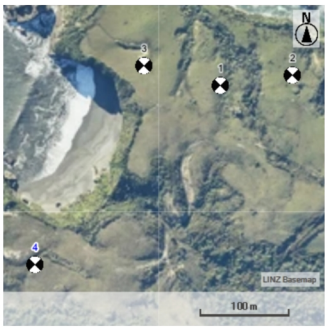
HOLE NO.: 4

CLIENT: ACG Properties Limited
PROJECT: Punakaiki Wild
JOB NO.: 4167

SITE LOCATION: 4663 State Highway 6, Paparoa National Park, Punakaiki
TEST DATE: 28/03/2025
CO-ORDINATES: 1462800mE, 5339286mN
ELEVATION: Ground
LOGGED BY: SCC

MATERIAL DESCRIPTION	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 100mm)	WATER
Silty sandy TOPSOIL; black . Moist.		0.2	TS	2 4 6 8 10 12 14 16 18	Groundwater Not Encountered
Silty SAND; red . Wet; iron intrusion.		0.4			
Sandy SILT; brown . Wet; sand, fine; Hole collapse.		0.6			
End Of Hole: 0.80m		0.8			
		1.0			
		1.2			
		1.4			
		1.6			

PHOTO(S)



REMARKS

WATER
- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE
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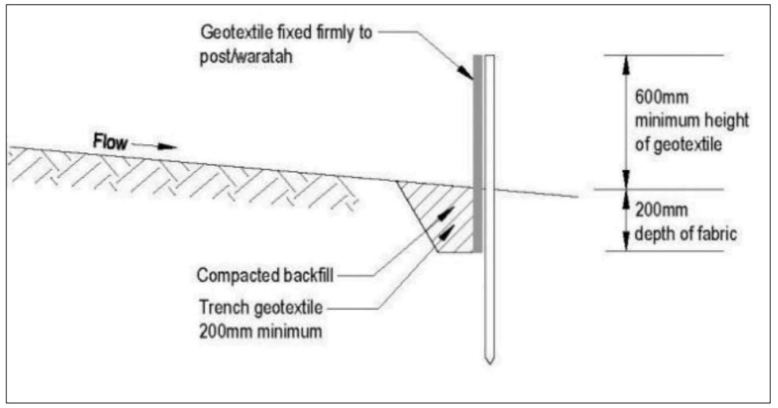
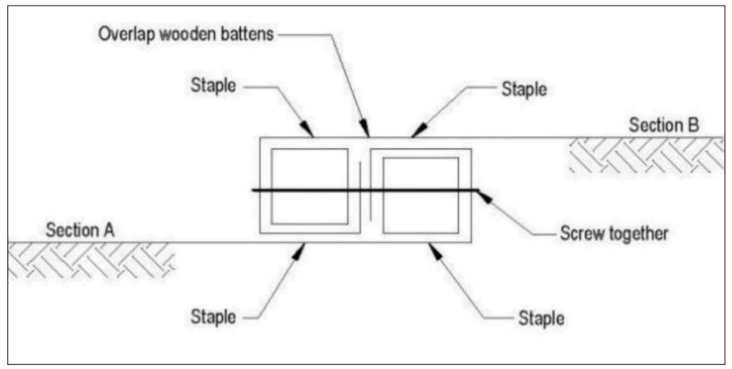
- [ ] Test Pit

Appendix B. Erosion and Sediment Control Plan

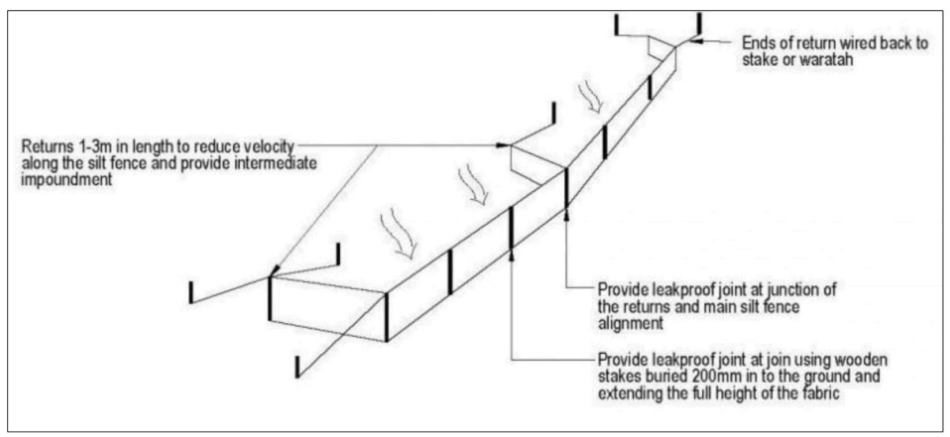


SILT FENCE CROSS SECTION

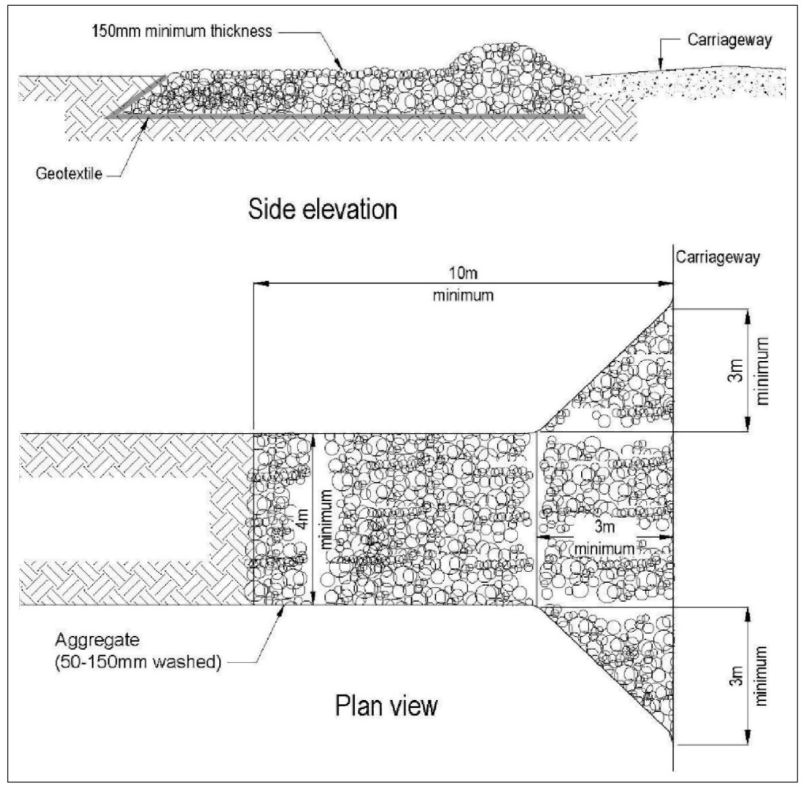


SILT FENCE STANDARD FABRIC JOINT

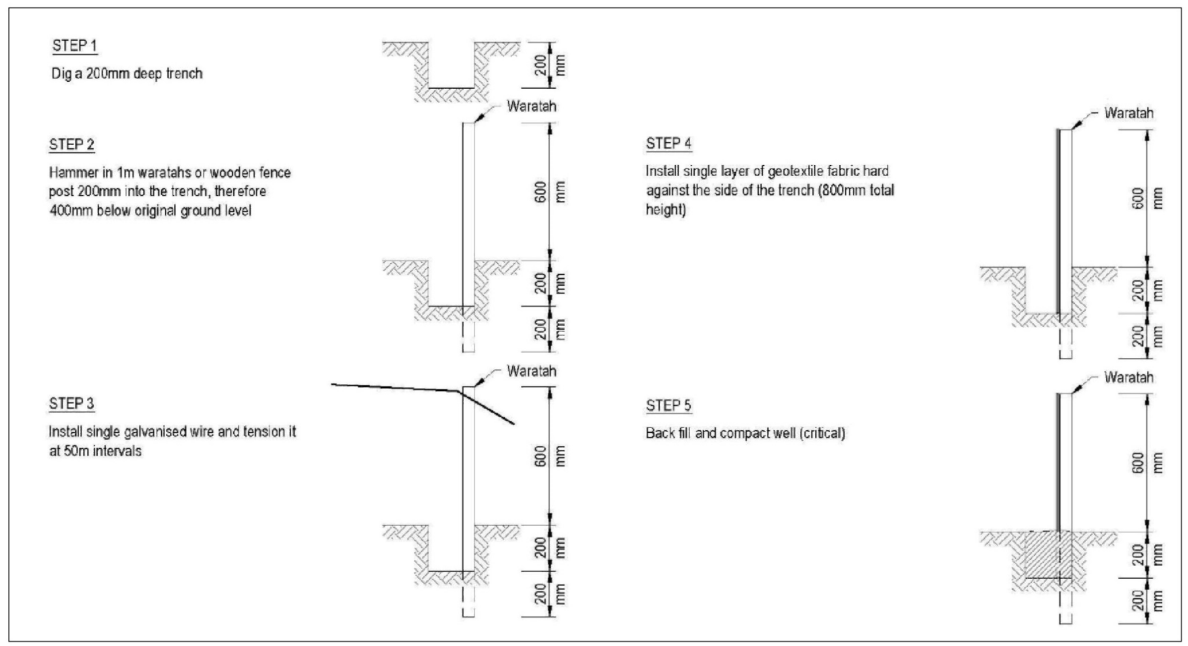
SILT FENCE ELEVATION



SILT EFENCE WITH RETURNS AND SUPPORT WIRE



STABILISED SITE ENTRANCE



SILT FENCE INSTALLATION

NOTES

1. Contractors to verify all dimensions and the location of all underground services on site prior to commencing work.
2. Unless noted otherwise, all work shall be undertaken in accordance with the NZBC and any relevant Territorial Authority Engineering Standards and Specifications as a minimum standard.

GENERAL EROSION SEDIMENT NOTES:

1. ALL EROSION AND SEDIMENT CONTROL MEASURES MUST BE INSTALLED IN ACCORDANCE WITH THE ENVIRONMENT CANTERBURY EROSION AND SEDIMENT CONTROL TOOLBOX FOR CANTERBURY & COMPLY WITH ALL RESOURCE CONSENT CONDITIONS RELATING TO THE PROJECT.
2. EROSION AND SEDIMENT CONTROL MEASURES TO BE INSTALLED PRIOR TO COMMENCEMENT OF EARTHWORKS.
3. ALL PERSONNEL INCLUDING SUB-CONTRACTORS, MUST BE FAMILIAR WITH ALL RELEVANT CONSENT AND PLAN REQUIREMENTS. A COPY OF THE EROSION AND SEDIMENT CONTROL PLAN MUST BE KEPT ON SITE AT ALL TIMES.
4. ALL EROSION AND SEDIMENT CONTROL STRUCTURES ARE TO BE INSPECTED EACH WORKING DAY AND MAINTAINED IN GOOD WORKING ORDER. THE EFFECTIVENESS OF THE MEASURES IS TO BE REVIEWED IMMEDIEALITY AFTER ANY SIGNIFICANT RAIN.
5. IF NECESSARY, SEDIMENT CONTROL MEASURES MUST BE ALTERED TO PREVENT EXCESS SEDIMENT DISCHARGING OFF SITE.

DUST CONTROL NOTES:

1. THE CONTRACTOR IS TO HAVE ACCESS TO A SUITABLE WATER SUPPLY ONSITE TO BE USED TO MITIGATE DUST. WHERE APPROPRIATE CONTROL DUST BY SPRAYING WATER LIGHTLY ON EXPOSED AREAS OF SOIL.
2. NATURAL OR CONSTRUCTED WIND BREAKS OR BARRIERS CAN REDUCE WIND VELOCITY THROUGH A SITE AND THEREFORE REDUCE THE POSSIBILITY OF SUSPENDED PARTICLES. WIND BREAKS CAN COMPRISE OF TREES OR SHRUBS LEFT IN PLACE DURING SITE CLEARING OR CONSTRUCTED BARRIERS SUCH AS A WIND FENCE, TARP CURTAIN, HAY BALES, CRATE WALL OR SEDIMENT FENCE.
3. STABILISED MATRIX CHEMICALS ARE A QUICK AND EFFECTIVE METHOD TO PROVIDE MEDIUM TERM SOLUTIONS TO DUST CONTROL. THIS METHOD REQUIRES THE SPREADING OF CHEMICALS TO GLUE SMALLER SOIL PARTICLES TOGETHER, TO FORM LARGER WIND RESISTANT PARTICLES. THERE ARE VARIOUS DUST SUPPRESSANT CHEMICALS AVAILABLE, HOWEVER ONLY CHEMICALS THAT HAVE BEEN GRANTED A GLOBAL RESOURCE CONSENT BY ECAN SHALL BE USED ON THIS SITE.

STOCKPILE NOTES:

1. STOCKPILE LOCATIONS TO BE CONFIRMED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
2. STOCKPILES WILL NEED TO BE MOISTENED BY IRRIGATION OR STABILISED USING POLYMER CHEMICAL DUST SUPPRESSANTS OR VEGETATION UNTIL THEY ARE CONSOLIDATED TO A SUFFICIENT DEGREE TO PREVENT EROSION OR DUST.
3. THE SIDE SLOPE WILL BE KEPT TO A MINIMUM BUT WILL NOT BE GREATER THAN THE NATURAL SLUMP ANGLE OF THE DRY MATERIAL.

VEHICLE ACCESS NOTES:

1. ANY TRACKING OF MATERIAL MUST BE AVOIDED AND IF THIS DOES OCCUR IT MUST BE CLEANED UP AS SOON AS POSSIBLE.
2. SHAKER RAMPS CAN BE USED PROVIDED THEY ARE A MINIMUM OF 5 M LONG TO ALLOW AT LEAST ONE FULL REVOLUTION OF A TRUCK TYRE. THE SHAKER RAMP MUST BE DEEP ENOUGH SO THAT THE MATERIAL DROPPED FROM ONE VEHICLE IS NOT PICKED UP BY THE NEXT.

CHRIS J COLL SURVEYING LTD
Licensed Cadastral Surveyors, Resource Management Consultants

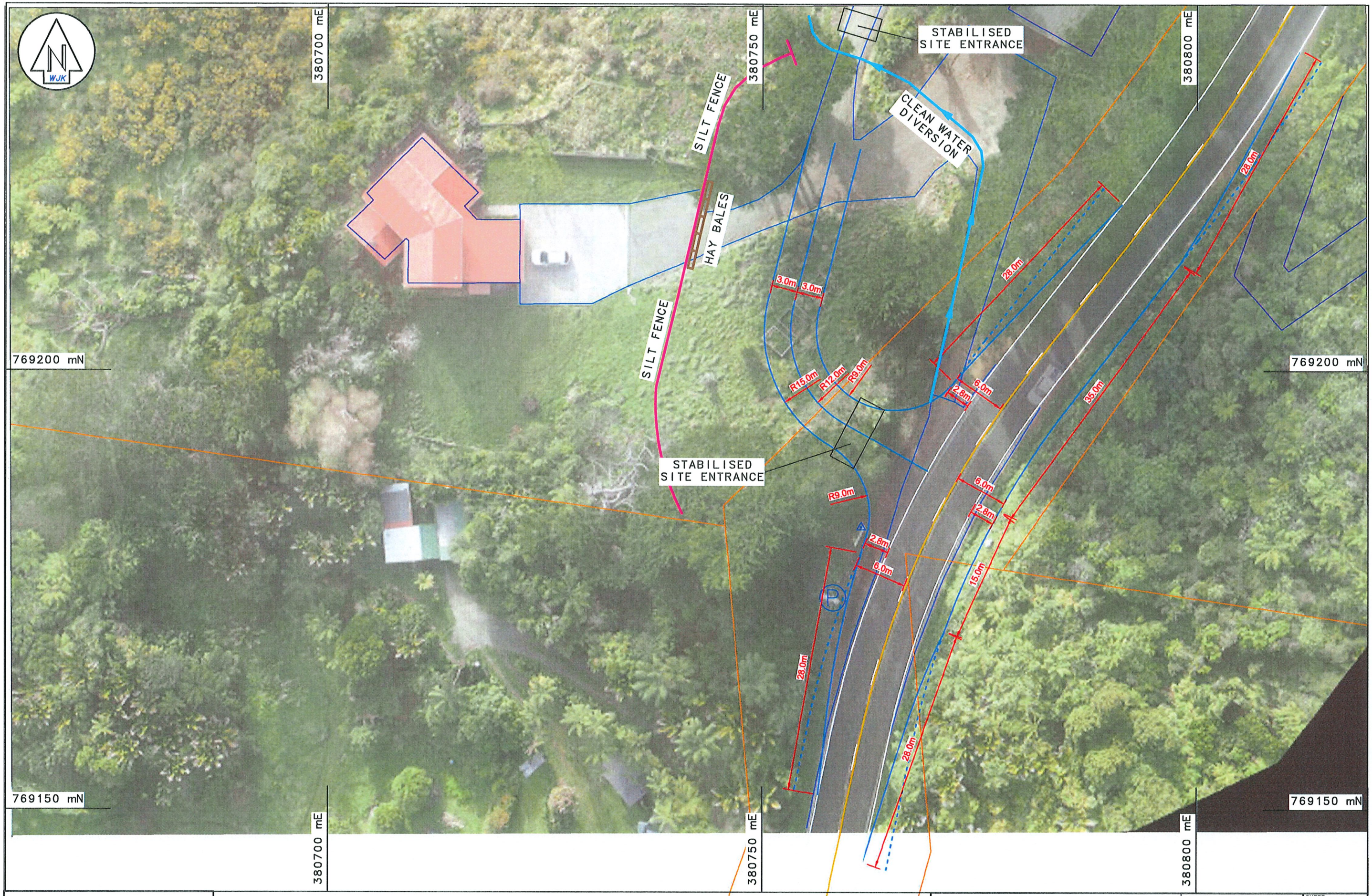
Erosion and Sediment Control Measures Typical Details

Prepared for:- ACG Properties Limited

I, Christopher John Coll of Westport, being a person entitled to practise as a Licensed Cadastral Surveyor, certify the accuracy of this plan. This plan has been prepared by me or has been prepared under my direction, this 4th day of April 2025. Signature .....

DRAWN	WARREN KEOGHAN.
CHECKED	CHRIS J COLL.
DATE	APRIL 2025.
REF	4167 - ACG Properties Ltd
SCALES	N.T.S

SHEET 1



CHRIS J COLL SURVEYING LTD

Licensed Cadastral Surveyors, Resource Management Consultants

Erosion and Sediment Control Measures Typical Details

Prepared for:- ACG Properties Limited

I, Stuart Challenger of Westport,
being a person entitled to practise as a Chartered Professional Engineer,
certify the accuracy of this plan.
This plan has been prepared by me or has been prepared under my direction,
this 4th day of April 2025. Signature .....

DRAWN	WARREN KEOGHAN.
CHECKED	CHRIS J COLL.
DATE	APRIL 2025
REF	4167 -Access
SCALES	1:400 (A3)

SHEET 2

SHEET 2 OF 2

Appendix C. AED design Calculator

Environmenttechnology wastewater treatment

Environment Technology (Et) Ph: 03 970 7979
Email: info@et.nz www.et.nz

Et Nelson warehouse: 105 Pascoe St, Annesbrook, Nelson 7011

PS2

AES Design Calculator - Residential* Schedule of Materials

AES

For use by wastewater system designers for sizing of AES wastewater treatment systems receiving residential strength wastewater. To be supplied to ET with Design / Construction drawings for peer review, then for a digital signature by ET and your submission to Consenting Authorities for construction consent.

Supply of AES components is based on an ET reviewed and digitally signed Calculator and construction drawings. Any changes to the design during the consent process must be reviewed by ET.

Site Address	4663 State Highway 6, Te Miko, Punakaiki				
Client Name	ACG Properties Ltd	Client Email	daniel@townplanning.co.nz		
Designed By	Stuart Challenger	Designer Phone #	027 231 0913	Designer AES Cert. #	NZ00394
Installer		Installer Phone #		Installer AES Cert. #	
Council Area	Buller District Council	Drainlayer Licence #		Date	

Receiving soil category, surface waters, depth to water tables & all other site constraints are addressed by the Designer in the accompanying information.

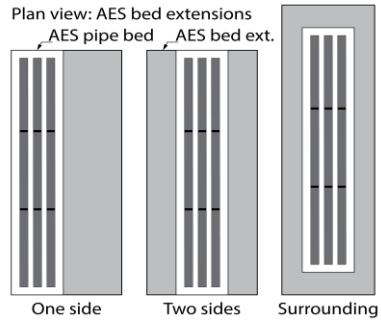
from the System designer's site and soil data. Enter data in light blue fields.		NOTES
Number of bedrooms	6	>> Enter "NA" if this design is for a campground, office, cafe etc without bedrooms.
Number of people	12	>> Enter "1" here if entering total daily design flow below and not a per person amount.
Daily wastewater design flow allowance per person (L/d)	150	
Loading rate for AES pipes (L/m AES pipe/d)	38.0	>> Standard rate is 38 L/m AES pipe/d per OSET-NTP testing . Please justify if not using standard rate in Designers notes below
Do you want to use cut AES pipes - eg, 3.5 AES pipes per row? Y or N	n	
AES bed - No. of rows of AES pipes	3	>> Longer AES beds increase contact area with surrounding soil.
Soil Category (per AS/NZS 1547) from site & soil evaluation	3	
Design Loading Rate (DLR) based on soil category (mm/day)	30	>> Soil conditioning may be necessary. Ref AS/NZS 1547/ TP58/ GD06 & Notes below.
Sand depth beneath AES pipes (mm)	300	>> Standard 300mm achieves 3.5Log reduction for FC**; increase sand depth to further reduce FC. Total expected FC reduction through AES system in this design: 3.5Log***
Is there a pump between the septic tank and the AES bed? Y or N	n	>> Ensure there is 50mm min. fall between septic tank and AES pipes, and pipework laid at 1:100 min.
Is this property/ disposal site sloping? Y or N	y	>> Ensure subsurface & surface water is diverted away from AES bed.
Is this design vented to the building terminal vent (TV)? Y or N	N	
Diameter of high vent (mm)	100	>> 65mm, 80mm or 100mm, to be supplied with AES components.
Is sampling of the treated effluent required? Y or N	N	
Distribution Box required Y or N	n	Number of ports required, including inlet port, and port for air vent if so designed.

Designers notes (Editable)

- Scarification of receiving surface is required in soil with elevated clay contents in Cat 4,5,6. In addition refer to AS/NZS 1547.2012, TP58 and GD06 (draft) Always excavate and scarify parallel to the site slope and the rows of AES pipe.

- All sloping sites require special consideration regarding design of AES bed, sand extensions, surface water and construction methods as per AS/NZS 1547.

- Drainlayers are reminded to practice good construction techniques as per AS/NZS 1547 and as provided on AES installation instructions supplied with components.



AES Bed Design Calculator Outcomes		AES Bed dimensions		
Daily design flow (Q)	1800.00 L/d		AES Pipe Bed	AES Bed Extension
Min. length of AES pipe rows	15.79 m	Length (m)	18.60	18.60
No. of 3m AES pipes per row	6.00 lths	Width (m)	1.8	1.43
Total volume of AES pipes/		Sand Depth (m)	0.75	0.15
total potential buffer capacity	3816.00 L	Area (m^2)	33.48	26.52

For 'Surrounding' extension or to increase bed length/ decrease width, enter "Y", otherwise leave blank.	n	If 'Y' enter required width (m) of AES bed, otherwise leave blank. Bed length will calculate automatically.	

	Length (m)		Width (m)		Minimum AES footprint required 60m2	
The dimensions of this AES bed are:	18.6	x	3.23	=	60.0	m2 total

Total expected FC reduction through AES system in this design: 3.5Log***

AES Bed Schedule of Materials

AES 3m length pipes required	18	lengths
AES couplings required	15	ea
AES offset adaptors	6	ea
100mm vent cap with mesh	1	ea
Vent cowl for high vent	1	ea - 100mm diam.
TV inspection not required		
Sample port not required		
Distribution box not required		
Total AES System Sand **Solid Measure** (guide only)	25.3	m^3

ET Signature box - ET Use Only

Producer Statement PS-2 Design Review - approved by ET.
NOTE: - This design review does not include review of the Site and Soil assessment by the Designer

To be used as a guide only. This AES Design Calculator is an aid to calculate the AES components and their configuration. (Some single AES row layouts may be over-estimated by one coupling. Et will advise if this has occurred when doing the Design Review. Site and Soil conditions as specified in NZS1547:2012 are calibrated by a **Qualified Designer**. Environment Technology accepts no responsibility for this soil evaluation and the subsequent loading calculations or the DLR entered by the designer in this calculator.

AES pipes can be cut to length on site. AES pipes are supplied in 3 metre lengths only.

Reviewed by:		9/04/2025 19:09
Data entry by:		Job:

Open PDF in Adobe Acrobat; hover over signature

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Click on signature in PDF to view signature validation

* Residential Effluent is classed as having less than 300mg/L BOD5 plus 350mg/L TSS, a combined total of 650mg/L prior to entering the septic tank, or a combined total of BOD + TSS of < 350mg/L prior to entering the AES bed and not including Industrial Effluent. Contact Et for assistance with high strength , abnormal ph or other parameter influent.

** AES-38 single pass system achieved 3.5 log reduction for Fecal Colliform (FC) in OSET-NTP Trial 12, 2016-17 benchmarking period.

*** Microbial removal rates through medium sand - Pang (2009). *Microbial Removal Rates in Subsurface Media Estimated From Published Studies of Field Experiments and Large Intact Soil Cores*

For Design Review: -Email this Design Calculator along with a complete construction drawings to: - **design@et.nz**

AES Components Order- Email a signed AES Design Calculator **and** a copy of the Council Consented Construction plans to: - **info@et.nz**