# ENGINEERING REPORT

## Site Development and New Shed

## Nile Head Station, Port Hardy,

## D'Urville Island

Prepared by:

**Swanney Geotechnical and Civil Engineering**

**October 2012**

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Swanney Geotechnical and Civil Engineering
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# 1. Introduction

It is proposed to develop the site of the original farm homestead and building at Nile Head Station, Moki Bay, Port Hardy (NL133/84 Rangitoto 6B2A Block). At present the only structure present is a Lockwood-type four bedroom house from about the 1970's. Development the site is to comprise construction a new three-bay utility shed, installation of a new wastewater system to replace the existing system and constructing a low retaining wall to support the bank along the top of the foreshore.

Swanney Geotechnical and Civil Engineering have been engaged to carry out an investigation of the site and prepare a design report covering the shed foundation works, the new wastewater system and the timber retaining wall.

# 2. Site Description

## *2.1 Site and Surroundings*

The site is located at Moki Bay, Port Hardy. This is the site of the original Nile Head Station farm buildings. All of the original farm buildings are gone with the only building present a four bedroom 1970's house.

The site is located on the gently sloping infilled base of a gully feature directly above the beach at the north end of Moki Bay. The area is approximately 150m wide at the beach frontage, and approximately 100m narrowing to the west as it heads into the gully. A small creek discharging from the gully passes down the north side of the site. The existing house is at the south end of the site. Around the flat area in the base of the gully the terrain is regenerating bush covered moderately to steeply sloping ground.

## *2.2 Geological Setting*

The geology of the site is described in the 1:250,000 Wellington Geological Map (Map 10 of the QMap series) produced by the Institute of Geological and Nuclear Sciences. The area is mapped as underlain by Greville Formation sandstone/siltstone. This material is exposed within the track cuts on the steeper ground west of the building site. Across the gently sloping ground are permeable alluvial sands and gravels originating from the catchments above and some marine sands adjacent to the beach and small creek.

# 3. Site Investigation

The site investigation comprised a review of the geological map of the area, a walkover inspection of the site, test pits at each end of the proposed wastewater irrigation area and six Scala Penetrometer tests – three around the existing house and three at the proposed location of the new shed. The height of the bank at the top of the beach was measured via dumpy

level. The site investigation was carried out on the 31st August 2012.The locations of the tests are shown on the appended site plan.

# 4. Geotechnical Assessment

## 4.1 Subsurface Conditions

The subsurface conditions at the building site were assessed by inspection of the cuts associated with the farm tracks immediately above the site, two test pits and six Scala Penetrometer tests. The accessway cuts have exposed typically minimal colluvial/residual soil overlying deeply weathered fractured siltstone and sandstone basement rock. Colluvial soils were light brown, dry, stiff, clayey silt with some angular gravels.

The two test pits where located on the moderately sloping (10°~20°) ground at the base of the steeper slopes where they transition into the flat gully base. These pits both encountered 500mm of gravelly topsoil overlying silts and gravels.

The results of the six Scala Penetrometer tests indicated consistent loose to medium dense ground extending down for the full depth of the tests (2.8m maximum). Based on the soils exposed in the test pits, this is inferred to be silty sands and gravels.

## 4.2 Groundwater

The groundwater is present at relatively shallow depth across the site. It is approximately 0.5m bgl adjacent to the creek on the north side of the site and estimated to be 0.5m – 1.0m deep on the south side. Seepages were evident discharging out of the bank onto the top of the beach. At the proposed shed site the depth to groundwater was estimated to be ~600mm bgl. No groundwater was evident in the test pits on the moderately sloping ground where the wastewater is to be irrigated.

## 4.3 Slope Stability

The site is not identified as a slope stability hazard area in the Marlborough District Councils' D'Urville Island Hazards Map – 80.

The risk of the identified shed site being affected by slips from the steeper land behind the site is considered low. Any over-steepening of the slope directly behind the shed site as part of the development should be minimised.

## 4.4 Seismicity

No active faults are shown passing beneath the site in the IGNS New Zealand Active Faults Database. The 1:250,000 Wellington Geological Map does show a mapped fault

passing through the south end of Moki Bay. This will require no specific additional measures to be taken for the site development.

# 5. Shed Building Site

The site for the new 12m x 14m shed is relatively flat, with approximately 500mm fall across the footprint. The Scala penetrometer tests indicate consistent loose to medium dense ground extending down to at least 2.6m. It is recommended that the full area of the building and an additional 1.0m around the outside be excavated out to 1.2m depth and granular fill compacted in layers to bring back up to underside of slab level. The excavated material may be suitable for re-use if the fines content is low. The local weathered rock would be suitable. Compaction can be achieved via track rolling with the 20t digger on site in thin layers (maximum 200mm). Shallow foundations designed with an allowable bearing capacity of 100kPa will be suitable on the prepared pad.

Stormwater from the shed is to be discharged to the small creek to the north.

# 6. Water and Wastewater Management

## *6.1 Water Supply*

The water supply for the new dwelling will be from roof collection and/or a feed from the creek to the west of the site.

## *6.2 Wastewater Site and Soil Evaluation*

The wastewater system is to comprise a septic tank discharging via a pumped low pressure effluent disposal (LPED) system onto the gently to moderately sloping ground west of the new shed via shallow 200mm x 200mm trenches. The system is to collect wastewater from the existing house and the new shed. The old existing septic tank system on the house is to be decommissioned.

The proposed disposal area is considered adequately stable to accept the discharge of effluent.

Two test pits have been excavated at the proposed disposal field. The 700mm deep pits exposed a 500mm depth of topsoil overlying gravelly silts/silty gravels.

Test Pit 1

| | |
|---|---|
| 0 – 500mm | Gravelly silty TOPSOIL |
| 500mm – 700mm | Medium brown gravelly SILT<br>Dry to moist. Firm. (Colluvium) |

Test Pit 2

| | |
|---|---|
| 0 – 500mm | Silty TOPSOIL with some gravels |
| 500mm – 700mm. | Medium brown silty GRAVEL. Angular. Dry to moist. Firm. (Colluvium) |

There are no watercourses crossing or immediately adjacent to this area.

The soil category in terms of AS/NZS 1547:2012 of the near surface soils (less than 700mm) have been assessed as category 3 (moderately drained).

## 6.3 Proposed Wastewater Management System

For on-site disposal of primary treated wastewater within the soils identified, shallow irrigation (LPED) is considered the most suitable option. The disposal field is to be dose loading via a submersible pump. Installing a shallow irrigation disposal field will involve minimal ground disturbance and will give a good distribution of effluent.

Design parameters for the system:

| | |
|---|---|
| Equivilent population (4 bdrm house + shed) | 10 persons |
| Design flow rate (creek/roof supply: 180l/p/day) | 1800l/day |
| Minimum septic tank size (primary chamber) | 4000 litre |
| Design Irrigation rate (category 3 soil) | 4.0mm/day |
| Irrigation area | 450m² |

The system to be used is a partitioned concrete septic tank (minimum first chamber size 4000l, recommend 5000l total) with an outlet filter between first and second chamber (Orenco, Zabel or similar approved) and the pump in the second chamber. A single septic tank of 4000 litres and a separate pump out chamber of 1000 litres is an alternative option. A Davey D42 A/B submersible drainage pump or similar approved with float switches is to dose-load the field.

The disposal field is approximately 60m from the tanks. The mainline is to be 30mm PE pipe. The disposal field is to be split with a central 50mm PVC manifold with 50/25 tees each side to the distribution lines. Seven trenches at 1.5m centres and 22m each side of the manifold will provide the 450m² area required. A 100% reserve area is to be kept available to the west of the disposal field.

The shallow subsurface disposal trenches are to be 200mm deep by 200mm wide. Effluent is to be dose-loaded into the trenches via drilled 25mm diameter PVC distribution pipe within either 65mm of 100mm diameter drainage coil. Squirt holes to be 3mm and spaced at 2.0m centres. The trench is filled with clean drainage chip (max. 15mm) with 50mm topsoil capping. The system will be operating under approximately 30m head. The design is detailed on the appended plan.

The full system is to be test-run with clean water prior to the drainage coil being sleeved over the distribution pipes to check uniformity of flows.

### *6.4 Stormwater Disposal*

Stormwater from the roof of the shed and any hardstanding areas is to be collected, piped and discharged into the small creek to the north.

## 7.0 Site Development

The proposed development of the site is to include the new shed and wastewater system, a new low timber wall to support the bank along the top of the beach, concrete steps and a access ramp down to the beach and gravelled roads/paths around the site. The new tracks around the site are to be gravelled (ie. permeable)

For the proposed retaining wall along the base of the bank leading down to the beach, it is recommended that the height of the wall be restricted to 1.0m. The bank ranges in height from ~1.0m adjacent to the creek at the north end of the beach up to ~2.1m in front of the house and slopes at an average of ~45°. It is intended that the base of the bank be trimmed back by approximately 600mm to accommodate the wall, with the backfill behind the wall merged into the natural ground profile above.

As discussed during the site investigation, the preferred approach of the client for the wall is driven square timber posts with timber horizontal lagging and a capping plank. Along the alignment of the wall the ground conditions are anticipated to be largely straight sand, although there are some boulders strewn along the bank. It is not clear whether these boulders have been placed to limit erosion of the bank or are naturally present. If they are present as 'floaters' within the sand they could make driving piles difficult. Test driving some piles is recommended.

The proposed design for the wall is appended. The extent of the wall and location of the steps and accessramp is shown on the appended site plan.

Being located at the top of the beach, there is potential for storm surges to lead to erosion at the base of the wall. The installation of a concrete ground beam along the length of the wall will assist in minimising the potential for this to happen. The wall should be monitored to ensure any erosion is not adversely affecting the integrity of the wall.

## 8. Limitations

The recommendations in this report are based on a site investigation and review of geological literature. This report does not purport to completely describe all the site

characteristics and properties. The nature and continuity of the ground has been inferred using experience and judgement and it must be appreciated that actual conditions could vary from the assumed model.



## 10. References

Worley Consultants Ltd *Assessment of Slope Stability at Building Sites*, BRANZ Study Report SR4, (1987)

New Zealand Geotechnical Society (2003): *Field Description of Soils and Rocks*

Institute of Geological and Nuclear Sciences (2000) *1:250,000 Geological Map 10 – Wellington*

Marlborough District Council (2005) *Guidelines for new on-site wastewater management systems* and *Plan Change 7: On-site discharges of Domestic Wastewater*

Standards New Zealand AS/NZS 1547:2012 *On-site domestic wastewater management*

Prepared by Jeff Swanney

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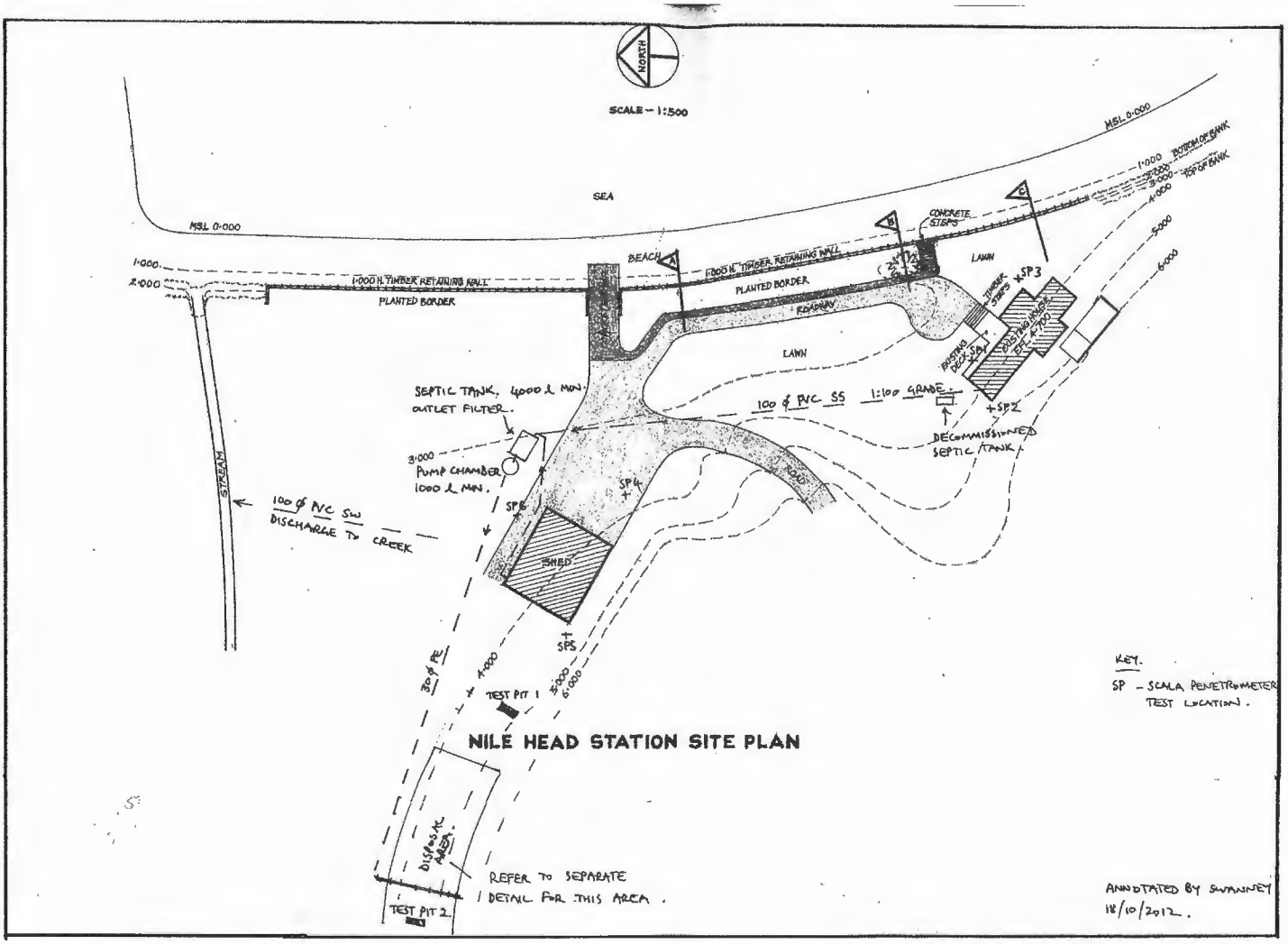
Appended: Annotated Site Plan
Design Sketches for retaining wall and wastewater system
Scala Penetrometer results sheets
Certificate of Professional Opinion




NILE HEAD STATION SITE PLAN

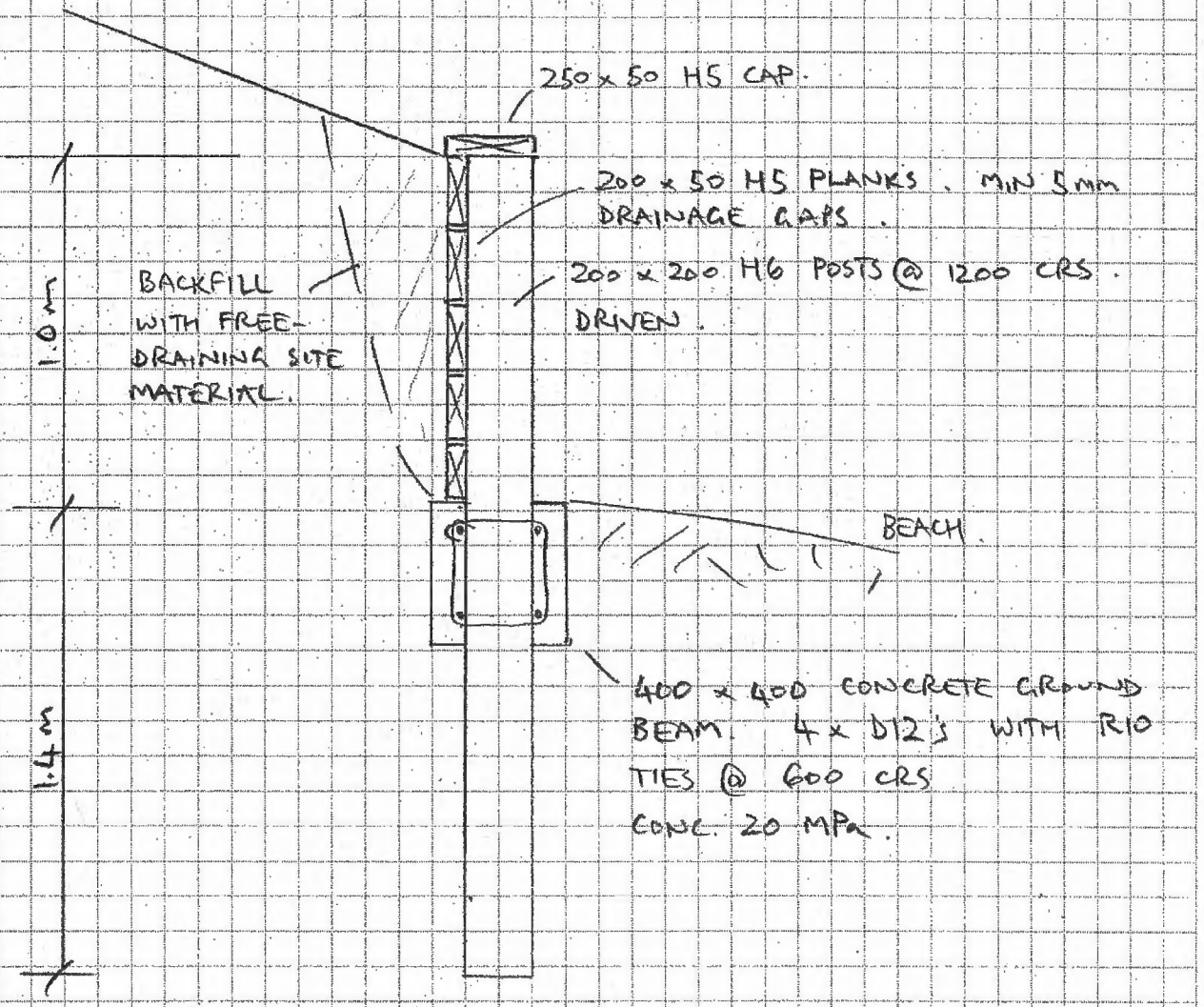
ANNOTATED BY SWANNEY
18/10/2012.

**Swanney**
Geotechnical and Civil Engineering

Client: PITAPISCES ENTERPRISES. Date: 18 OCT 2012.

Project: NILE HEAD STATION. Job No. 1566

Subject: TIMBER RETAINING WALL. By: JS Page: 1.



**Swanney**
Geotechnical and Civil Engineering

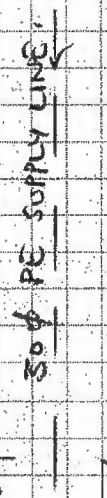
Client: PITAPISCES ENTERPRISES LTD. Date: 18 OCT 2012

Project: NILE HEAD STATION Job No. 1566

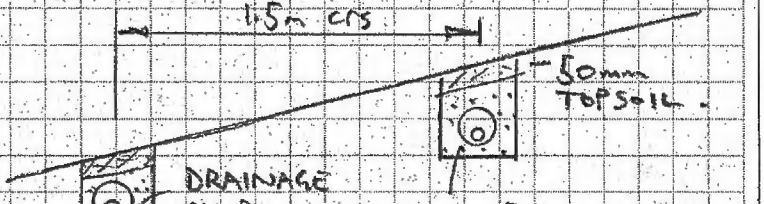
Subject: WASTEWATER By: JS Page: 2.

SEPTIC TANK 4000 ℓ MIN.
WITH APPROVED OUTLET FILTER.

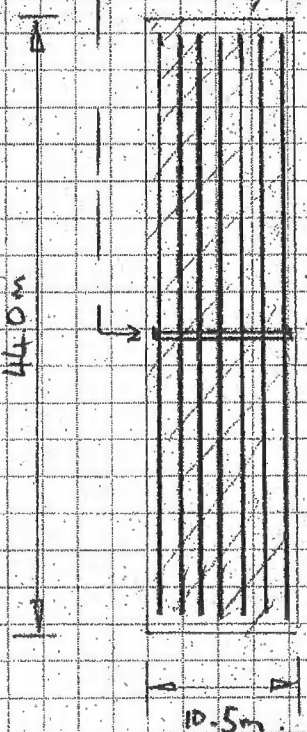
PUMP CHAMBER 1000 ℓ
DAVEY D42 A/B PUMP.




TRENCH DETAIL




25 mm PVC DISTRIBUTION LINE. 3mm SQUIRT HOLES @ 2.0m CRS. NESTED IN 100 ϕ or 65 ϕ DRAINAGE COIL.

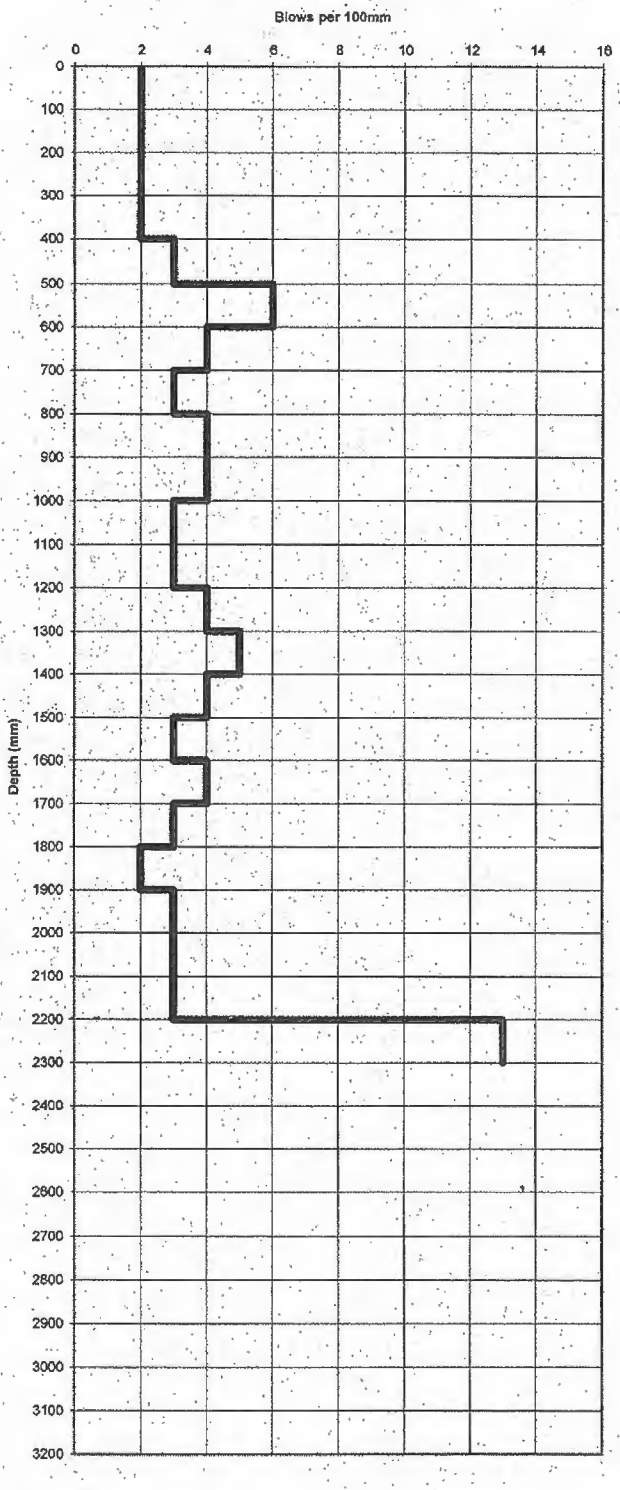



7 TRENCHES 22.0m EACH SIDE OF MANIFOLD @ 1.5m CRS.

50mm ϕ PVC CENTRAL MANIFOLD. 50/25 TEES FOR DISTRIBUTION LINES

PE

## SP1

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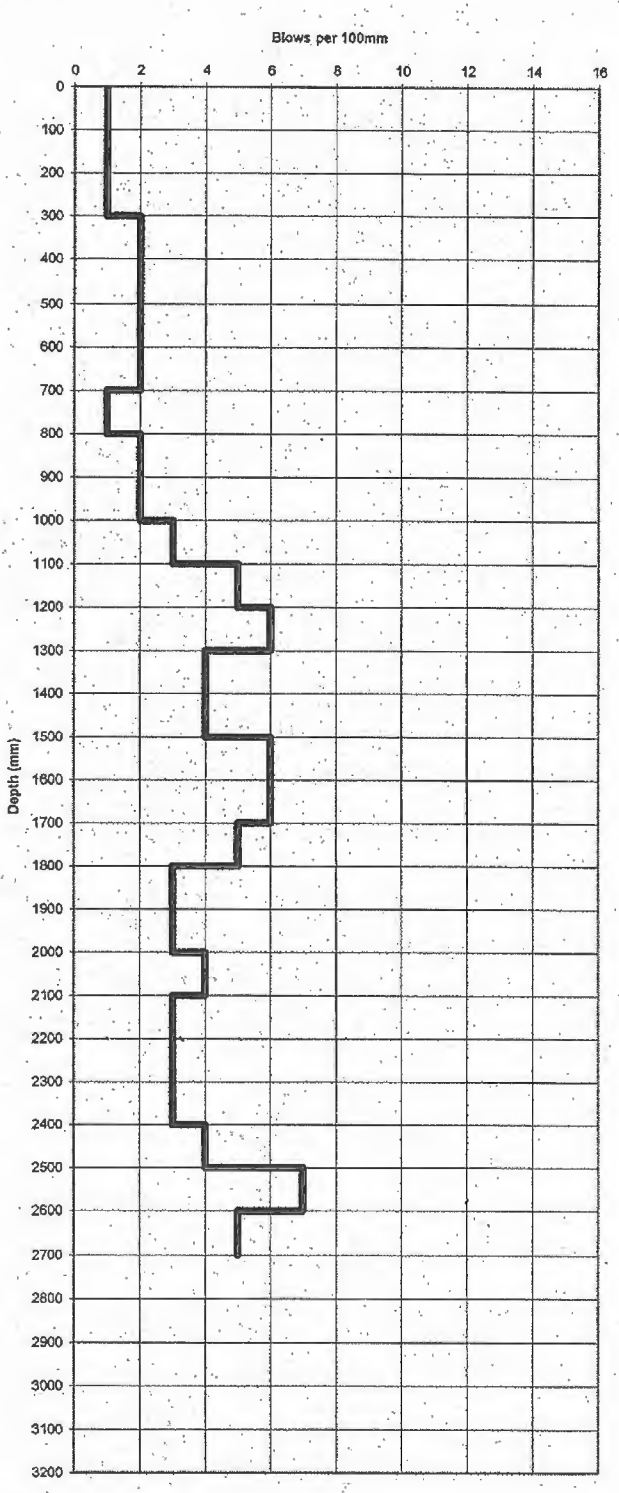


*Test 6.5.2 NZS4402 Determination of the penetration resistance of a soil*

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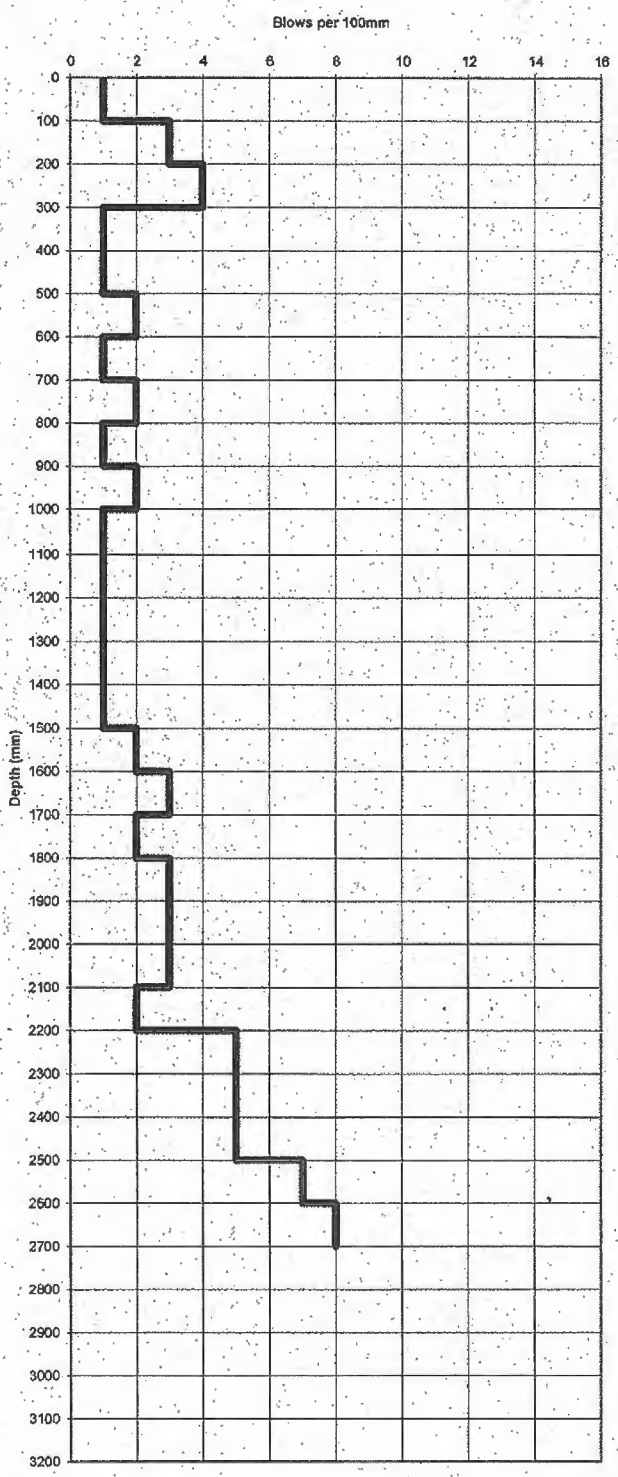
| | | | |
|---|---|---|---|
| **Client:** | Nile Head Station | **SCALA PENETROMETER TESTS** | |
| **Location:** | Port Hardy | **Date:** | 1-Oct-12 |
| **Tester:** | J Swanney | **Job No.** | 1556 |

## SP3

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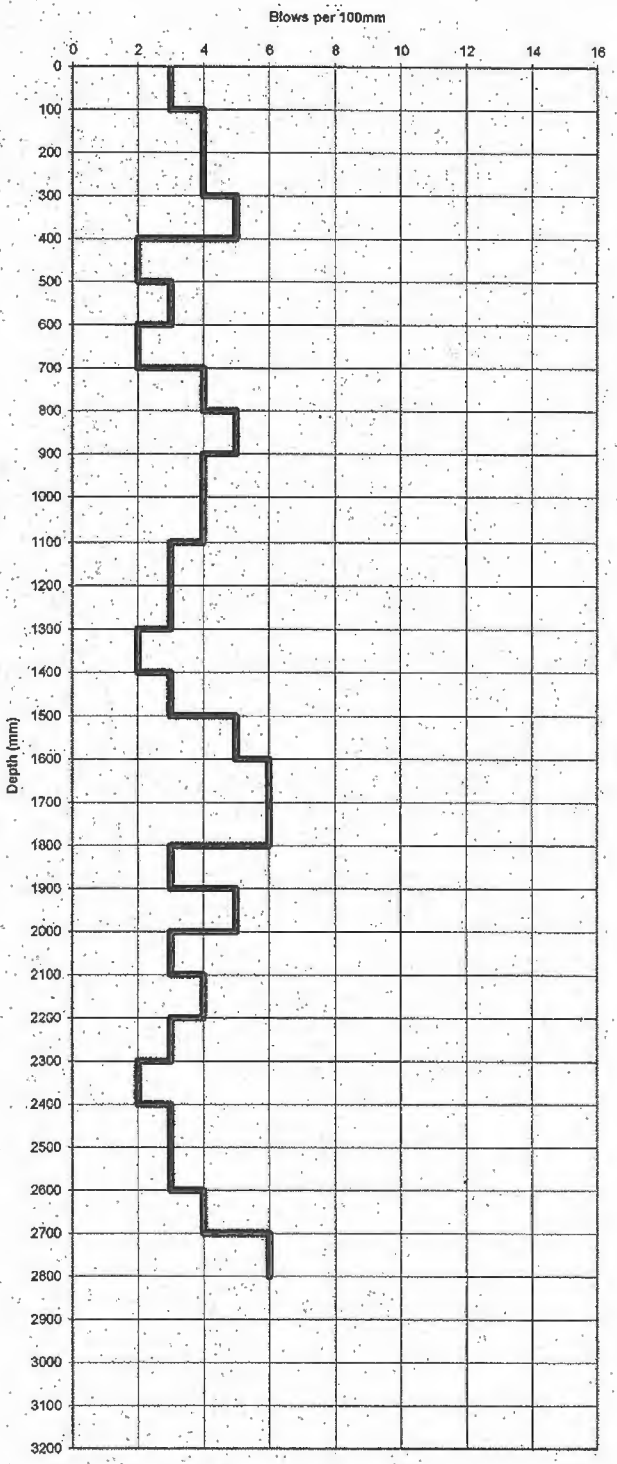


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| | | | |
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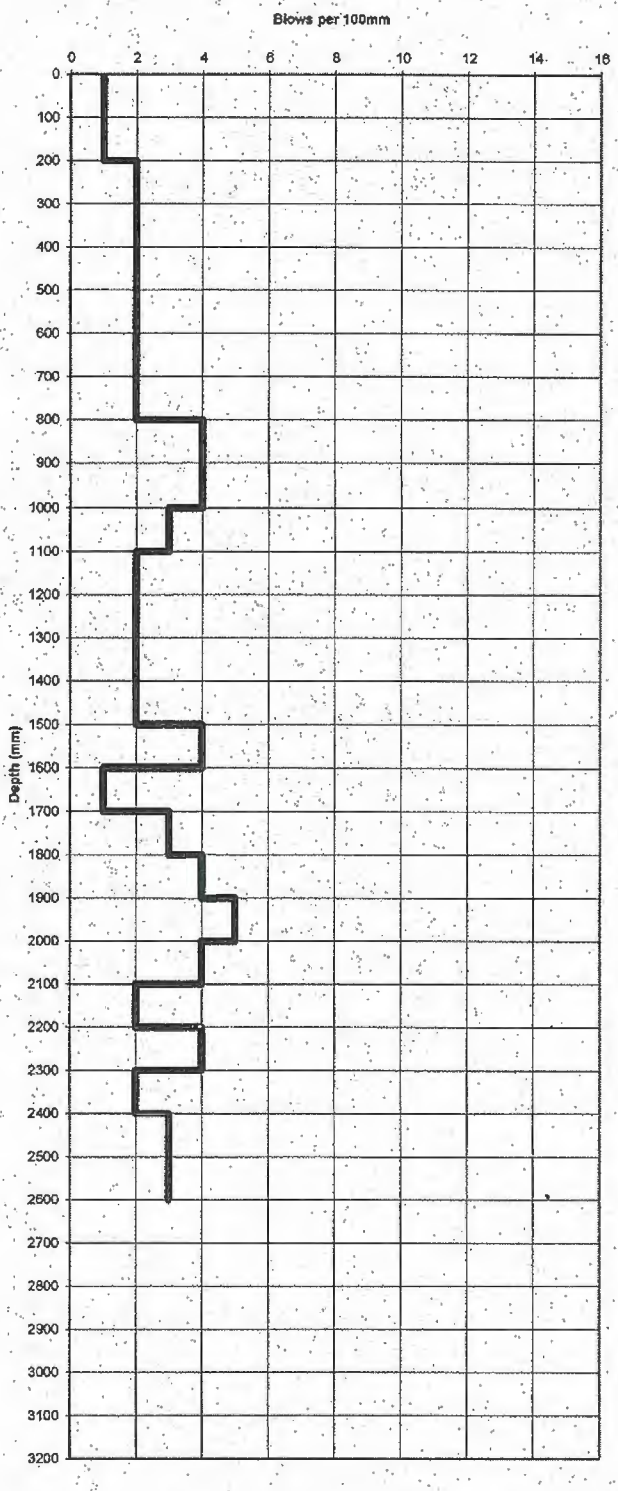
| **Location:** | Port Hardy | **Date:** | 1-Oct-12 |
| **Tester:** | J Swanney | **Job No.** | 1556 |

## SP5

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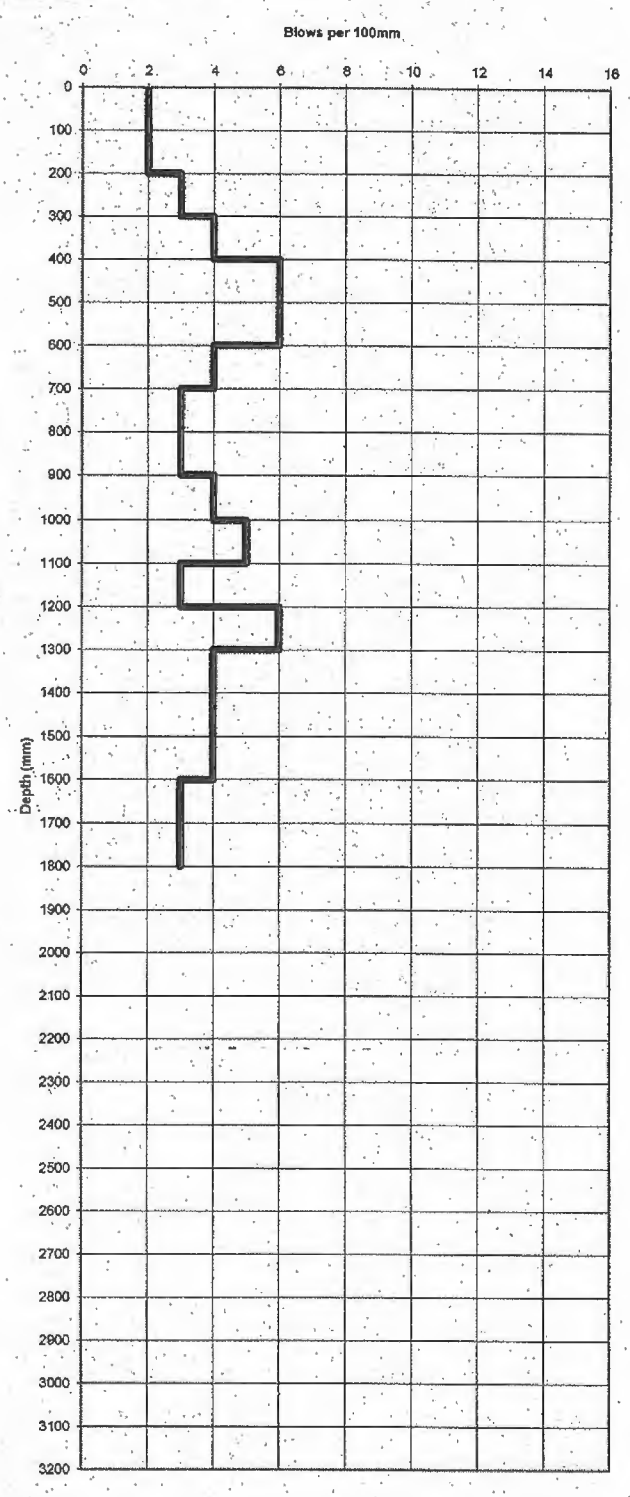


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| **Location:** | Port Hardy | **Date:** | 1-Oct-12 |
| **Tester:** | J Swanney | **Job No.** | 1556 |

swanney

GEOTECHNICAL AND CIVIL ENGINEERING

PO Box 828, NELSON



18 October 2012

## Opinion as to Land Stability

**Description:** Proposed new shed, Nile Head Station, Port Hardy

NL133/84 Rangitoto 6B2A Block

**For:** Pitapisces Enterprises Ltd

I, Jeffrey James Swanney, hereby confirm that I am experienced in the field of soils engineering and more particularly land and foundation stability and am formally recognized by the Marlborough District Council. I am familiar with and understand the purpose of the Marlborough District Council's geo-technical reporting standards. This professional opinion is furnished to the Marlborough District Council in support of the application for resource consent for land disturbance, natural hazards and domestic wastewater discharge. A site investigation report, 'Engineering Report - Proposed Site Development and New Shed, Nile Head Station, Port Hardy, D'Urville Island' dated Oct 2012 is attached.

Site investigations have been carried out by myself and are described in our site investigation report. The following professional opinion is based on the assumption that the data obtained from these investigations is representative of the whole area under consideration. In my professional opinion having examined the site it is reasonable for Council to assume that the data referred to above is representative of the whole area under consideration.

In my professional opinion and having regard to the specifics of the site which I have investigated to the extent that acceptable engineering practices require giving due regard to acceptable engineering principles and practices for land slope and foundation stability, the identified building platform is considered suitable for lightweight timber construction provided that the recommendations given in our report dated Oct 2012 are followed.

18/10/2012.

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