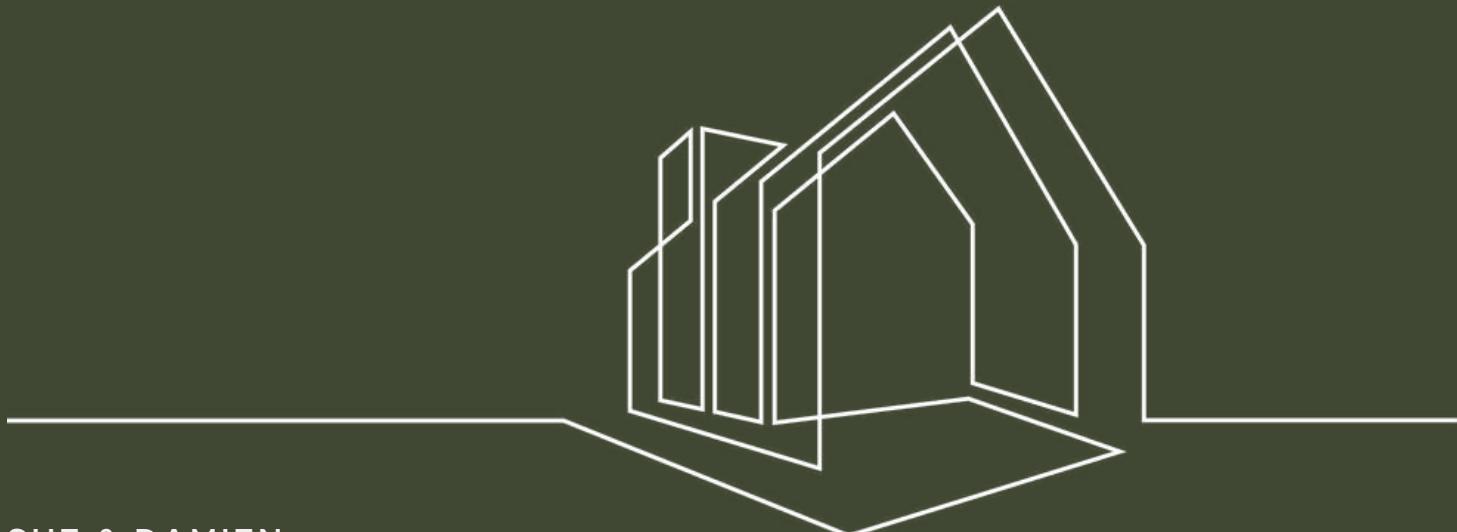


LAND COVENANTS & CONSENT NOTICES



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View Instrument Details



Instrument No 9967413.1
Status Registered
Date & Time Lodged 09 February 2015 14:53
Lodged By Wakeman, Rupert George
Instrument Type Easement Instrument



Affected Computer Registers	Land District
673449	North Auckland
673450	North Auckland
673451	North Auckland
673452	North Auckland
673453	North Auckland
673454	North Auckland
673455	North Auckland
673456	North Auckland

Annexure Schedule: Contains 7 Pages.

Grantor Certifications

- I certify that I have the authority to act for the Grantor and that the party has the legal capacity to authorise me to lodge this instrument
- I certify that I have taken reasonable steps to confirm the identity of the person who gave me authority to lodge this instrument
- I certify that any statutory provisions specified by the Registrar for this class of instrument have been complied with or do not apply
- I certify that I hold evidence showing the truth of the certifications I have given and will retain that evidence for the prescribed period

Signature

Signed by Rupert George Wakeman as Grantor Representative on 09/02/2015 02:51 PM

Grantee Certifications

- I certify that I have the authority to act for the Grantee and that the party has the legal capacity to authorise me to lodge this instrument
- I certify that I have taken reasonable steps to confirm the identity of the person who gave me authority to lodge this instrument
- I certify that any statutory provisions specified by the Registrar for this class of instrument have been complied with or do not apply
- I certify that I hold evidence showing the truth of the certifications I have given and will retain that evidence for the prescribed period

Signature

Signed by Rupert George Wakeman as Grantee Representative on 09/02/2015 02:51 PM

*** End of Report ***

Easement instrument to grant easement or *profit à prendre*, or create land covenant

(Sections 90A and 90F Land Transfer Act 1952)

Grantor

JOHN DAVID THOMAS WILLIAMSON and MARGARET ALISON WILLIAMSON

Grantee

JOHN DAVID THOMAS WILLIAMSON and MARGARET ALISON WILLIAMSON

Grant of Easement or *Profit à prendre* or Creation of Covenant

The **Grantor** being the registered proprietor of the servient tenement(s) set out in Schedule A **grants to the Grantee** (and, if so stated, in gross) the easement(s) or *profit(s) à prendre* set out in Schedule A, **or creates** the covenant(s) set out in Schedule A, with the rights and powers or provisions set out in the Annexure Schedule(s)

Schedule A

Continue in additional Annexure Schedule, if required

Purpose (Nature and extent) of easement; <i>profit</i> or covenant	Shown (plan reference)	Servient Tenement (Computer Register)	Dominant Tenement (Computer Register) or in gross
Land Covenant	N/A	673449	673450 – 673456
		673450	673449, 673451 – 673456
		673451	673449, 673450, 673452 – 673456
		673452	673449 - 673451, 673453 – 673456
		673453	673449 - 673452, 673454 – 673456
		673454	673449 - 673453, 673455, 673456
		673455	673449 - 673454, 673456
		673456	673449 - 673455

Easements or profits à prendre rights and powers (including terms, covenants and conditions)

Delete phrases in [] and insert memorandum number as required; continue in additional Annexure Schedule, if required

Unless otherwise provided below, the rights and powers implied in specified classes of easement are those prescribed by the Land Transfer Regulations 2002 and/or Schedule Five of the Property Law Act 2007

The implied rights and powers are hereby [varied] [negated] [added to] or [substituted] by:

[Memorandum number _____, registered under section 155A of the Land Transfer Act 1952]

[the provisions set out in Annexure Schedule]

Covenant provisions

Delete phrases in [] and insert Memorandum number as required; continue in additional Annexure Schedule, if required

The provisions applying to the specified covenants are those set out in:

[Memorandum number _____, registered under section 155A of the Land Transfer Act 1952]

[Annexure Schedule]

Annexure Schedule

Page 3 of 7 Pages

*Insert instrument type***Easement***Continue in additional Annexure Schedule, if required*

Covenant Provisions

BACKGROUND

- A. The Grantee intends that the Servient Tenements be subject to a general scheme applicable to and for the benefit of the Dominant Tenements ("Scheme").
- B. The Grantee intends this Instrument shall be and remain registered against the identifier to the Servient Tenements to give effect to the Scheme so that:
 - (i) Owners or occupiers for the time being of the Servient Tenement shall be bound by the provisions of this Instrument; and
 - (ii) Owners of occupiers for the time being of the Dominant Tenements can enforce the observance of the provisions of this Instrument by the owners or occupiers for the time being of the Servient Tenements.

1. DEFINITIONS AND INTERPRETATION**Definitions**

- 1.1 In this Instrument, unless the context requires otherwise:

"Covenants" means the covenants contained in this Instrument;

"Deposited Plan" means the plan so described in Annexure Schedule 1 of the Instrument;

"Dominant Tenements" means those parcels of land so described in Annexure Schedule 1 of this Instrument;

"Grantee" shall include and bind:

- (a) The person executing this Instrument as Grantee; and
- (b) All the Grantees for the time being under this Instrument; and
- (c) Where applicable, all respective executors, administrators, successors, assigns and successors in title of each Grantee, and if more than one jointly and severally;

"Grantor" shall include and bind:

- (a) The person executing this Instrument as Grantor; and
- (b) All the Grantors for the time being under this Instrument; and
- (c) Where applicable, all respective executors, administrators, successors, assigns and successors in title of each Grantor, and if more than one jointly and severally;

"Instrument" means this Instrument and includes all the annexure schedules incorporated within this Instrument;

Annexure Schedule

Page 4 of 7 Pages

*Insert instrument type***Easement***Continue in additional Annexure Schedule, if required*

“Lot” means each of the Servient Tenements;

“Servient Tenements” means those parcels of land so described in Annexure Schedule 1 of this Instrument;

“Working Day” means any day of the week other than:

- (a) Saturday, Sunday, Waitangi Day, Good Friday, Easter Monday, Anzac Day, the Sovereign’s Birthday and Labour Day; and
- (b) A day in the period commencing on the 24th of December in any year and ending on the 5th of January the following year, both days inclusive; and
- (c) The day observed as the anniversary of any province in which the Lot is situated.

INTERPRETATION

1.2 In this Instrument, unless the context indicates otherwise:

- (a) All monetary amounts are stated and are payable in New Zealand dollars;
- (b) Singular words include the plural and vice versa and words importing one gender include the other gender;
- (c) References to any “**party**” mean a party to this Instrument and include the successors, executors, administrators and permitted assigns (as the case may be) of that party;
- (d) References to clauses in this Instrument (unless stated otherwise);
- (e) References to a “**person**” include an individual, firm, company, corporation or unincorporated body of persons, any public, local authority, any government and any agency of any government or of any such authority;
- (f) Headings appear as a matter of convenience and do not affect the construction of this Instrument;
- (g) A reference to an enactment or any regulations is a reference to that enactment or those regulations as amended, or to any enactment or regulations substituted for them;
- (h) Any obligation on the Grantor to do anything shall be deemed also to be an obligation to suffer, permit and or cause that thing to be done;
- (i) Any obligation on the Grantor not to do anything shall be deemed also to be an obligation not to suffer, permit and or cause that thing to be done;
- (j) An obligation by two or more persons binds those persons jointly and severally.

2. GENERAL COVENANTS

2.1 The Grantor covenants and agrees:

- (a) To observe and perform all the Covenants at all times; and

Annexure Schedule

Page 5 of 7 Pages

*Insert instrument type***Easement***Continue in additional Annexure Schedule, if required*

- (b) The Covenants shall run and bind the Servient Tenements for the benefit of Dominant Tenements to the intent that each of the Covenants will be forever appurtenant to the Dominant Tenements subject to clause 5 of this Instrument.

2.2 The Grantor covenants and agrees:

- (a) To pay the Grantee's legal costs (as between solicitor and client) of and incidental to the enforcement or attempted enforcement of the Grantee's rights, remedies and powers under this Instrument;
- (b) To indemnify the Grantee against all claims and proceedings arising out of a breach by the Grantor of any of its obligations set out in this Instrument.

3. COVENANTS**Covenants relating to improvements**

3.1 The Grantor covenants and agrees that:

- (a) The Grantor will not erect or permit to be erected or placed on the Lot:
- (i) Any dwellinghouse having a floor area of less than 200 square metres (excluding decks and patios);
 - (ii) Any dwellinghouse with garage or carport facilities for less than two vehicles;
 - (iii) A relocatable or secondhand building;
 - (iv) Any building which is clad with secondhand materials, flat fibrolite or unrelieved shething;
 - (v) Any building utilising roofing materials other than tiles (clay, ceramic, concrete, decromastic, pre-coated pressed steel), cedar, slate or bitumen shingles or painted long run pressed steel).
- (b) The Grantor will not use or permit or suffer the use on the Lot of any temporary structure, garage, shed, hut, tent, caravan or other vehicle or uncompleted dwellinghouse for any kind of temporary or permanent human habitation.
- (c) The Grantor will not cause or permit any rubbish to accumulate or to be placed on the Lot nor cause or permit on the Lot any grass or weeds to grow to a height exceeding 15 centimetres or to any height that may be unsightly or unsafe or which may attract rodents or other pests.
- (d) The Grantor must not use the Lot or allow the Lot to be used for any light engineering purpose on a commercial basis.

4. BREACH OF COVENANTS

- 4.1 The Grantor and Grantee covenant and agree that if the Grantor breaches or fails to observe part of or any of the Covenants, then without prejudice to any other liability which the Grantor may have to the Grantee or any person or persons having the benefit of the Covenants, the Grantor, upon written demand being made by the Grantee or any person or persons having the benefit of the Covenants will:

Annexure Schedule

Page 6 of 7 Pages

*Insert instrument type***Easement***Continue in additional Annexure Schedule, if required*

- (a) Cease any activity which is in breach or non-observance of the Covenants and otherwise rectify the breach or non-observance;
- (b) Pay the person making such demand as liquidated damages the sum of \$250.00 (Two Hundred and Fifty Dollars) (adjusted annually by movements in the Consumer Price Index (All Groups) published by Statistics New Zealand ("the Index") from 1 January 2011) per day for every day that such breach or non-observance continues after the date upon which written demand has been made,

provided however that the Grantor will only be liable for breaches of the Covenants which occur while the Grantor is the registered proprietor of the Lot in respect of which a breach or non-observance occurs.

- 4.2 If Statistics New Zealand ceases to calculate or publish the Index, or if it materially changes the basis of assessment for the Index, an alternative index that in the opinion of an expert most clearly reflects changes in the cost of living must be substituted for the Index. Such expert is to be appointed by the President for the time being of the New Zealand Law Society.

5. EXPIRY OF COVENANTS

- 5.1 The Covenants shall expire and be of no further effect on 31 December 2064.

6. GENERAL**Waiver**

- 6.1 No exercise or failure to exercise or delay in exercising any right or remedy by a party shall constitute a waiver by that party of that or any other right or remedy available to it.

Partial Invalidity

- 6.2 If any provision of this Instrument or its application to any party or circumstance is or becomes invalid or unenforceable to any extent, the remainder of this Instrument and its application shall not be affected and shall remain enforceable to this greatest extent permitted by law.

Notices

- 6.3 Any notice required to be served on any party under this Instrument shall be served in the manner prescribed in Part 7 of the Property Law Act 2007 for the type of notice being served.

Governing Law

- 6.4 This Instrument shall be governed by New Zealand law, and the parties submit to the non-exclusive jurisdiction of the courts of New Zealand.

Annexure Schedule

Page 7 of 7 Pages

Insert instrument type

Easement

Continue in additional Annexure Schedule, if required

To: The District Land Registrar

Please have the Covenants noted on the register for the Dominant Tenement.

Solicitor for the Grantor/Grantee

View Instrument Details



Instrument No 9909402.4
Status Registered
Date & Time Lodged 19 December 2014 10:47
Lodged By Wakeman, Rupert George
Instrument Type Consent Notice under s221(4)(a) Resource Management Act 1991



Affected Computer Registers	Land District
673450	North Auckland
673451	North Auckland
673452	North Auckland
673453	North Auckland
673454	North Auckland
673455	North Auckland
673456	North Auckland

Annexure Schedule: Contains 118 Pages.

Signature

Signed by Rupert George Wakeman as Territorial Authority Representative on 19/12/2014 10:38 AM

*** End of Report ***

IN THE MATTER of the Resource Management Act 1991 ("the Act")

A N D

IN THE MATTER of a subdivision consent as evidenced by Land Transfer Plan No. 481012

A N D

IN THE MATTER of a Consent Notice issued pursuant to Section 221 of the Act by **WHANGAREI DISTRICT COUNCIL** ("the Council")

IT IS HEREBY CERTIFIED that the following conditions to be complied with on a continuing basis by the subdividing owner and subsequent owners were imposed by the Council as conditions of approval for the subdivision as effected by Land Transfer Plan No. 481012 ("the plan")

1. Any development undertaken on Lots 2 through 8 on the plan shall comply with the restrictions and recommendations identified in the engineering site suitability report ref: 12037 compiled by Cook Costello Ltd dated 5 September 2013, a copy of which is attached hereto, unless an alternative engineering report prepared by a suitably experienced chartered professional engineer ("CPE") is approved in writing by the Council.
2. At the time of application for a building consent for any building to be constructed on lots 2, 3, 4, 5, 7 and 8 on the plan suitable evidence/design shall be provided to illustrate that stormwater attenuation will be provided for all impervious surfaces to ensure compliance with Chapter 4, and more specifically Section 4.11 of the Council's Environmental Engineering Standards 2010, to the satisfaction of the Council's Senior Environmental Engineering Officer.
3. The owners of Lots 2 through 7 on the plan shall be made aware that the common water tanks constructed as part of subdivision works within the southern portion of the avocado orchard on Lot 6 on the plan are for the purposes of fire fighting water supply and must be maintained full with a minimum water volume of 45m³ in accordance with the New Zealand Fire Service Firefighting Water Supplies Code of Practice SNZ PAS 4509:2009.
4. The owners of Lot 8 on the plan shall be made aware that at the time of the application for a building consent for a residential dwelling to be constructed on such property that an individual water tank shall be constructed for the purposes of fire fighting water supply and must be maintained full with a minimum water volume of 45m³ (or 7m³ if a domestic sprinkler system has been installed) in accordance with the New Zealand Fire Service Firefighting Water Supplies Code of Practice SNZ PAS 4509:2009.

- 2 -

5. The owners of Lots 2 through 8 on the plan shall be responsible to ensure that any further development of each lot including building sites, earthworks, drainage works, effluent disposal fields & vehicle access formations will be undertaken in such a manner that will not result in the obstruction or diversion of any existing overland flow path unless a specific design has been done by an independently qualified person ("IQP") or CPE which mitigates potential adverse flooding effects on any neighbouring properties created by the obstruction or diversion and is approved in writing by the Council's Senior Environmental Engineering Officer.
Note: Overland flow paths are to be assessed in accordance with Section 4.9 of the Council's Environmental Engineering Standards 2010 Edition and are to be certified by an IQP/CPE.
6. All buildings (including water tanks) constructed within Lots 2 through 5 and Lots 7 and 8 on the plan are to be located within the areas marked as follows:

Lot 2 within that part marked on the plan with the letter "V";
Lot 3 within that part marked on the plan with the letter "W";
Lot 4 within that part marked on the plan with the letter "X";
Lot 5 within that part marked on the plan with the letter "Y";
Lot 7 within that part marked on the plan with the letter "Z";
Lot 8 within that part marked on the plan with the letters "AB".
7. Future owners of Lot 6 on the plan ("Lot 6") are advised of the recommendations contained within the Contaminated Land Management Preliminary Site Investigation Report prepared by Cook Costello Ltd dated 5 September 2013 (Project No: 12037), a copy of which is attached hereto. This report recommends a 2m perimeter precautionary management area (i.e. excluding produce cultivation and harvesting, and restriction of access by children) from the woolshed building and stockyard within Lot 6.
8. All buildings constructed within Lot 6 are to be located within area marked on the plan with the letters "AA". Although water tanks may be located outside of the designed building area identified as AA on this lot.
Note: The balance of Lot 6 therefore forms the area subject to a "no residential unit" restriction.

DATED at Whangarei this 11th day of December 2014

SIGNED for WHANGAREI DISTRICT COUNCIL
pursuant to the authority of the Council given pursuant to the
Local Government Act 2002 and the Resource Management
Act 1991

RG Juckes

Authorised Signatory



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SITE SUITABILITY REPORT

*626 Maunu Road (S.H.14), Maunu
Proposed subdivision of Lot 1 DP
174535*

For J.D. and M.A. Williamson



cook | costello

Consulting Engineers

05 September 2013

Project Number: 12037

J.D. and M.A. Williamson

628 Maunu Road (SH14), Maunu

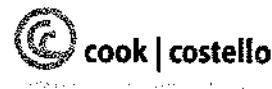


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J.D. and M.A. Williamson
626 Maunu Road (SH14), Maunu



1. INTRODUCTION

Cook Costello Ltd has been briefed to provide a subdivision suitability report for a proposed 8 lot subdivision at 626 Maunu Road (State Highway 14), Maunu. The proposed subdivision intends to create seven new allotments (proposed Lots 2 to 8) from the existing Lot 1 DP174535. Proposed Lot 1 will contain the existing dwelling. The report considers the following aspects of the subdivision development:

- Existing stability of the site
- Effects on stability of the development
- Building foundations and building suitability
- On-site wastewater management
- Stormwater management
- Potable water supply and fire fighting requirements
- Access suitability

A site plan at 1:2000 is attached in Appendix 1 showing the existing and proposed property boundaries. Four site suitability plans at 1:500 are also included in Appendix 1 showing possible building platforms, effluent fields and site investigation details within the proposed lots. A standard detail for a wastewater dose loaded LPED irrigation system is also included in Appendix 1.

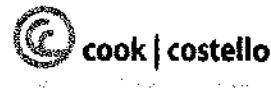
Cook Costello has also completed a National Environmental Standards (NES) report assessing the Ministry for the Environment (MFE) guidelines which should be read in conjunction with this report.

1.1. Relevant Documentation

- AS/NZS 1547:2012 – On-site domestic wastewater management.
- AS2870:2011 – Construction of residential slabs and footings.
- NZS 3604:2011 – Timber framed buildings.
- NZS 4402:1986 – Methods of testing soils for civil engineering purposes.
- SNZ PAS 4509:2008 – New Zealand Fire Service firefighting water supplies code of practice.
- NZ Building Code: B1/VM4

Good Ground – means any soil or rock capable of permanently withstanding an ultimate bearing pressure of 300kPa (i.e. an allowable bearing of 100kPa using a factor of safety of 3.0) but excludes;

J.D. and M.A. Williamson
626 Maunu Road (SH14), Maunu



- a) Potentially compressible ground such as topsoil, soft soils such as clay which can be moulded easily in the fingers, and uncompacted loose gravel which contains obvious voids,
- b) Expansive soils being those that have a liquid limit of more than 50% when tested in accordance with NZS4402 Test 2.2 and a linear shrinkage of more than 15% when tested from the liquid limit in accordance with NZS 4402 Test 2.6 and,
- c) Any ground which could foreseeably experience movement of 25mm or greater for any reason including one or a combination of the following: land instability, ground creep, subsidence, seasonal swelling and shrinking, frost heave, changing ground water level, erosion, dissolution of soil in water, and effects of tree roots.
- Whangarei District Council Land Resources and Hazard maps (2013).
- GNS Science (Institute of Geological & Nuclear Sciences) 1:250,000 Geological Map 2 – Geology of the Whangarei Area.
- Northland Regional Council – Regional Water and Soil Plan for Northland

2. SITE DESCRIPTION

The property is located in Maunu on the northern side of State Highway 14, 150m east of the intersection of State Highway 14 and Golf Harbour Drive. The property is approximately 500m east of Sherwood Park Golf Club. The legal description of the lot to be subdivided is Lot 1 DP 174535 and has a total area of 4.0260ha.

The site predominately is flat to rolling having gentle slopes of 1-2° with an isolated mound on the eastern side of proposed Lot 7 which spreads down into proposed Lot 6. The north western corner of the property in proposed Lot 8 is also slightly elevated above the adjacent land. Proposed Lots 2, 3 and 4 are situated to the south of the property and have a gentle slope of 1° - 2° grading down to the road. These lots each have a proposed area of 2500m² and situate the proposed building platforms in the middle to northern part of the lots. Proposed Lot 5 is situated directly north of proposed Lot 4 with the existing farm house to the north and the avocado orchard to the west. It has a proposed area of 2500m² and gently grades north at a slope of 1° - 2°. Proposed Lot 6 has an area of 2.3077ha and is split up into two main portions. Portion one, to the south, is surrounded by proposed Lots 2 to 7 and the majority is currently an avocado orchard apart from the northern section, which is where the proposed development of the lot is planned, having a gentle slope of 1° - 2°. Portion two is the northern part of the property and is also currently an avocado orchard. Portion two has not been considered as part of our investigations as no building platform is proposed in this portion of proposed Lot 6. Proposed Lot 7 has a proposed area of 2500m² and is situated west of the existing house. Proposed Lot 7 has a large mound on the eastern edge which spreads down into proposed Lot 6. The remainder of proposed 7 is gentle sloping predominately having grades of 1° - 2°. Proposed Lot 8, having an area of 2183m², is situated in the most northern part of the property north of the existing stone wall. It is proposed that a building platform be situated in the eastern part of this lot having existing grades of between 5° - 10°. Proposed Lot 1 contains the existing dwelling and has not been assessed as part of this report.

Maunu has fertile, well drained soils which are conducive for horticulture activities. By retaining the horticulture aspect within the subdivision the feeling of the area will be maintained and this will give the proposed Lots a sense of rural living and privacy. This will make this subdivision an attractive place to live.

J.D. and M.A. Williamson
626 Maunu Road (SH14), Maunu

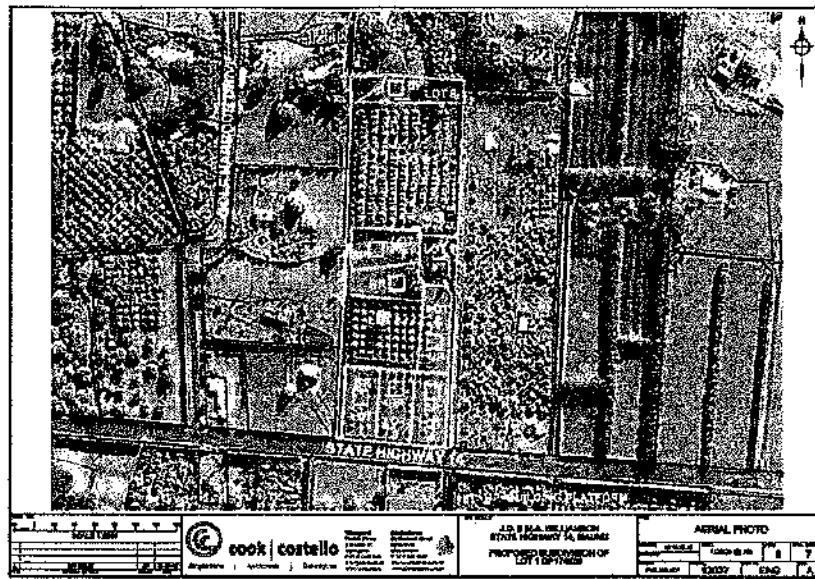
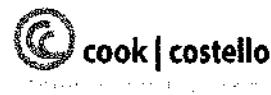


Figure 1: Cook Costello cad file with aerial photograph imported showing the 8 lot subdivision of Lot 1 DP174535 highlighted and location of the proposed building platforms.

Proposed Lots 2 – 5 and 7 – 8 are mainly covered with pasture with a few scattered avocado trees. The majority of proposed Lot 6 is an avocado orchard. No evidence of accelerated surface creep, deep-seated instability or slippage was observed within the site.

Whangarei District Council planning maps indicate that the proposed subdivision is zoned as Urban Transition Environment. The entire proposed subdivision is mapped as Low instability Hazard. There is no Flood Susceptibility Hazard mapped. See figure 2 below.

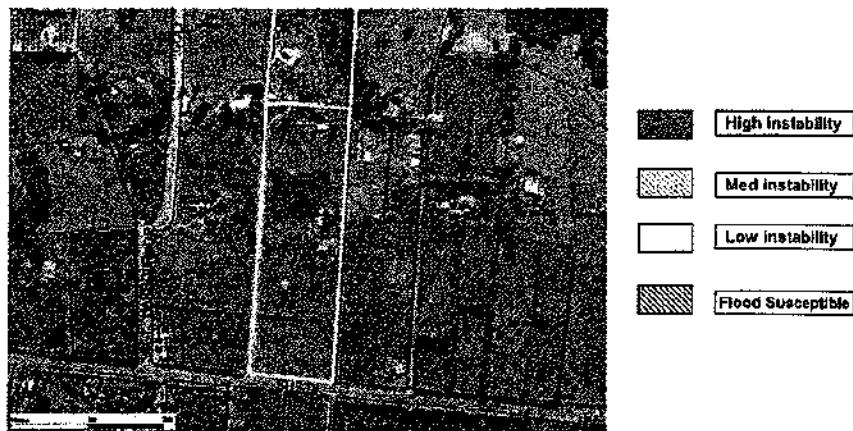


Figure 2: WDC GIS hazard map (2013)

J.D. and M.A. Williamson
626 Maunu Road (SH14), Maunu



No permanent or ephemeral watercourses were observed on site. A stream runs approximately 120m north of the subdivision. The site appears to be well draining with no ground water encountered during soil investigations. According to the WDC GIS maps the land is situated above an aquifer.

Whangarei District Council planning maps indicate all proposed lots have Medium Effluent Unsuitability with Medium Effluent Disposal Potential.

3. GEOLOGY

The soil type in the area is defined on NZMS290 Sheet Q06/07 Hukerenui - Whangarei (SOILS) as Maunu silt loam + Maunu bouldery silt loam (MU + MUb), well to moderately well drained soils of the rolling and hilly land.

The rock type in the area is defined on NZMS290 Sheet Q06/07 Hukerenui - Whangarei (ROCK TYPES) as Basalt with Scoria (F61); flows and cones of glassy and very fine to medium grained crystalline basalt, dense or vesicular, interbedded with scoria (B1) in places, moderately fractured; hard to very hard. Weathered to soft brown clay to depths of 10m.

The Institute of Geological and Nuclear Sciences Geology of the Whangarei Area defines the geology of the site as KERIKERI VOLCANIC GROUP Basalt flows (Qvb).

Site observation of paddock boulders, and the soils texture and colour encountered during borehole investigations, indicate volcanic material covers the site. Large boulders are visible on the surface and in many cases were the cause for the end of borehole investigation. The lay of the land is predominately very gently graded with a large mound on proposed Lot 7 which spreads down into proposed Lot 6. The large mound is probably due to large boulders under the surface with silt and volcanic ash being eroded away around the extents of this mound. Another possibility is volcanic lava flows pushing up through the earth's surface forming a volcanic cone. Proposed Lot 8 is also slightly elevated in the north west corner above the adjacent ground.

4. SITE INVESTIGATIONS

Geotechnical field investigations were carried out on the 25th of July, 2013. These investigations comprised of:

- Visual inspections and walkover.
- Eight hand augered boreholes (BH) with shear vane measurements to identify subsurface soil properties.
- Fifteen dynamic cone scale penetrometer tests (SP) to confirm bearing pressures and uniformity of the soil.

The location of all field investigations are shown on the site suitability plans attached as Appendix 1.

The results of all field investigations are attached as Appendix 2.

4.1. Borehole Results

4.1.1. Subsoil

BH1 was located at the building platform within proposed Lot 8 on the 5° slope in the north west corner and identified approximately 50mm of topsoil overlying moist, friable, highly plastic, stiff, moderately sensitive, reddish brown silty CLAY with traces of gravel to 20mm to a depth of 1.3m, overlaying moist, friable, highly plastic, very stiff, moderately sensitive to non-sensitive, reddish brown with very minor black speckles/mottling silty CLAY with traces of sand/very weak gravel to 5mm to a depth of 2.2m. End of bore at 2.2m as hit rock. The ground water was not encountered.

BH2 was located at the proposed effluent disposal location for proposed Lot 8 on the flat and identified approximately 100mm of topsoil overlying moist, friable, highly plastic, hard, moderately sensitive, brown silty CLAY with traces of gravel to 10mm to a depth of 1.25m. End of bore at 1.25m as too hard to continue. The water table was not encountered.

BH3 was located at the building platform within proposed Lot 7 on the flat west of the mound and identified approximately 100mm of topsoil overlying moist, friable, highly plastic, very stiff, moderately sensitive, brown silty CLAY with traces of sand and minor roots to a depth of 1.0m, overlaying moist, friable, highly plastic, hard, moderately sensitive, brown with very minor black silty CLAY with traces of sand and minor hard black gravel to 5mm to a depth of 1.8m overlaying moist, friable, highly plastic, hard, moderately sensitive, brown to orangey brown silty CLAY with traces of sand/gravel to a depth of 2.5m. End of bore at 2.5. The water table was not encountered.

BH4 was located at the building platform within proposed Lot 6 on the flat and identified approximately 100mm of topsoil overlying moist, friable, highly plastic, very stiff to hard, insensitive to moderately sensitive, orangey brown silty CLAY with traces of sand/gravel to a

depth of 1.1m, overlaying moist, friable, highly plastic, very stiff, sensitive, orangey brown silty CLAY with minor sand/gravel to 20mm to a depth of 1.6m. End of bore at 1.6m as too hard to continue. The water table was not encountered.

BH5 was located at the building platform within proposed Lot 5 and identified approximately 100mm of topsoil overlying moist, friable, highly plastic, very stiff, moderately sensitive, orangey brown silty CLAY to a depth of 1.0m, overlaying moist, friable, highly plastic, very stiff, moderately sensitive to sensitive, orangey brown with minor grey silty CLAY with traces of sand/gravel to 5mm with gravel getting larger with depth to 20mm to a depth of 1.7m. End of bore at 1.7m as hit rock. The water table was not encountered.

BH6 was located south of the building platform at the approximate effluent disposal site within proposed Lot 2 and identified approximately 200mm of topsoil overlying moist, friable, highly plastic, hard, orangey brown with minor purple silty CLAY with minor weak gravel to 20mm to a depth of 0.9m. End of bore at 0.9m as hit rock. The water table was not encountered.

BH7 was located at the building platform within proposed Lot 3 and identified approximately 200mm of topsoil overlying moist, friable, highly plastic, very stiff, moderately sensitive, orangey brown silty CLAY with some shallow charcoal to a depth of 1.3m, overlaying moist, friable, highly plastic, very stiff, sensitive, orangey brown with some reddy orange silty CLAY with some sand/extremely weak gravel to a depth of 2.1m overlaying very moist to wet, friable, highly plastic, very stiff, sensitive, orangey brown with minor reddy brown silty CLAY with some sand/extremely weak gravel to 20mm to a depth of 2.2m. End of bore at 2.2m as hit rock. The water table was not encountered.

BH8 was located at the building platform within proposed Lot 4 and identified approximately 100mm of topsoil overlying moist, friable, highly plastic, very stiff to hard, moderately sensitive, orangey brown silty CLAY to a depth of 1.6m, overlaying moist, friable, highly plastic, stiff to very stiff, moderately sensitive, orangey brown very silty CLAY with traces of sand/gravel to a depth of 2.5m. End of bore at 2.5m. The water table was not encountered.

The boreholes are consistent with the geological description of the site.

4.1.2. Shear Strength

Shear strengths were measured at 0.5m intervals during Boreholes to determine the soils in-situ shear strength properties with a summary of the results and associated soil sensitivities shown in Table 1 below.

Depth (m)	BH1 (max/ residual kPa)	BH1 Soil Sensitivity	BH2 (max/ residual kPa)	BH2 Soil Sensitivity	BH3 (max/ residual kPa)	BH3 Soil Sensitivity	BH4 (max/ residual kPa)	BH4 Soil Sensitivity
0.5	>248	-	226/69	3.3	152/44	3.5	219/124	1.8
1.0	99/28	3.5	202/65	3.1	244/88	2.8	191/55	3.6
1.5	163/103	1.6	-	-	>248	-	141/21*	6.7
2	141/46	3.1	-	-	216/71	3.0	-	-
2.5	-	-	-	-	177/83	2.1	-	-
Depth (m)	BH5 (max/ residual kPa)	BH5 Soil Sensitivity	BH6 (max/ residual kPa)	BH6 Soil Sensitivity	BH7 (max/ residual kPa)	BH7 Soil Sensitivity	BH8 (max/ residual kPa)	BH8 Soil Sensitivity
0.5	195/53	3.7	>248*	-	150/53	2.8	205/60	3.4
1.0	127/41	3.1	-	-	180/60	3.0	173/71	2.4
1.5	140/21*	6.7	-	-	219/53	4.1	205/71	2.9
2	-	-	-	-	138/25	5.5	129/50	2.6
2.5	-	-	-	-	-	-	95/35	2.7

Table 1: Shear strengths and soil sensitivity (*=inaccurate due to gravel)

BH1 Soil Strength - The shear strength of the soil at BH1 is stiff to hard. The soil sensitivity is insensitive, normal to moderately sensitive.

BH2 Soil Strength - The shear strength of the soil at BH2 is hard. The soil sensitivity is moderately sensitive.

BH3 Soil Strength - The shear strength of the soil at BH3 is very stiff to hard. The soil sensitivity is moderately sensitive.

BH4 Soil Strength - The shear strength of the soil at BH4 is very stiff to hard. The soil is insensitive, normal to moderately sensitive.

BH5 Soil Strength - The shear strength of the soil at BH5 is very stiff. The soil is moderately sensitive.

BH6 Soil Strength - The shear strength of the soil at BH6 is hard.

BH7 Soil Strength - The shear strength of the soil at BH7 is very stiff to hard. The soil is moderately sensitive to sensitive.

BH8 Soil Strength - The shear strength of the soil at BH8 is stiff to hard. The soil is moderately sensitive.

4.2. Scala Penetrometer Results

Fifteen dynamic cone scala penetrometer tests (SP) were undertaken at the site to determine the inferred allowable bearing capacity to assist in the design of foundations for the proposed development. Seven tests were carried out from existing ground level adjacent to the boreholes and eight were taken from the base of each borehole. The site plan attached in Appendix 1 shows the location of these.

SP1 was located adjacent to BH1 and taken to a depth of 2.35m. SP1 indicated an allowable bearing capacity of 95kPa between depths of 0.95-1.10 but otherwise had an allowable bearing capacity in excess of above 100kPa. (Lot 8)

SP2 was undertaken from the base of BH1 from 2.2m to a depth of 4.11m. SP2 indicated an allowable bearing capacity in excess of 32kPa. (Lot 8)

SP3 was undertaken from the base of BH2 from 1.25m to a depth of 2.06m. SP3 indicated an allowable bearing capacity in excess of 100kPa throughout. (Lot 8)

SP4 was located adjacent to BH3 and taken to a depth of 1.41m. SP4 indicated an allowable bearing capacity in excess of 100kPa at normal foundations depths. (Lot 7)

SP5 was undertaken from the base of BH3 from 2.5m to a depth of 5.22m. SP5 indicated an allowable bearing capacity in excess of 55kPa. (Lot 7)

SP6 was located adjacent to BH4 and taken to a depth of 1.72m. SP6 indicated an allowable bearing capacity in excess of 100kPa at normal foundations depths. (Lot 6)

SP7 was undertaken from the base of BH4 from 1.6m to a depth of 1.86m. SP7 indicated an allowable bearing capacity in excess of 78kPa. (Lot 6)

SP8 was located adjacent to BH5 and taken to a depth of 1.93m. SP8 indicated an allowable bearing capacity in excess of 100kPa at normal foundations depths. (Lot 5)

SP9 was undertaken from the base of BH5 from 1.7m to a depth of 2.37m. SP9 indicated an allowable bearing capacity in excess of 40kPa. (Lot 5)

SP10 was located adjacent to BH6 and taken to a depth of 0.77m. SP10 indicated an allowable bearing capacity in excess of 100kPa at normal foundations depths. (Lot 2)

SP11 was undertaken from the base of BH6 from 0.9m to a depth of 1.01m. SP11 indicated an allowable bearing capacity in excess of 100kPa throughout. (Lot 2)

SP12 was located adjacent to BH7 and taken to a depth of 1.54m. SP12 indicated an allowable bearing capacity in excess of 100kPa at normal foundations depths. (Lot 3)

SP13 was undertaken from the base of BH7 from 2.2m to a depth of 2.72m. SP13 indicated an allowable bearing capacity in excess of 100kPa throughout. (Lot 3)

SP14 was located adjacent to BH8 and taken to a depth of 1.44m. SP14 indicated an allowable bearing capacity in excess of 100kPa at normal foundations depths. (Lot 4)

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SP15 was undertaken from the base of BH8 from 2.5m to a depth of 4.58m. SP15 indicated an allowable bearing capacity in excess of 26kPa throughout. (Lot 4)

At all locations within the property an inferred allowable bearing capacity in excess of 100kPa is available at normal shallow foundation depths. However at proposed Lots 5 – 8 the allowable bearing capacity is not achieved at depths below normal foundation depths.

Laboratory testing of soil samples from the site were not undertaken. Atterberg Limits and Linear Shrinkage tests at other sites on similar basalt derived soils of the Puhipuhi-Whangarei Volcanic Field have previously been undertaken. These tests have determined liquid limits in excess of 50% in each case, ranging up to 88%, and have determined linear shrinkage in excess of 15% in each case, ranging up to 24%. These results exceed the NZ Building Code threshold value for the definition of Good Ground, described in Section 1.1 of this report, and indicate that the soil has an extremely high shrinkage potential. The soils at this subdivision are expected to behave similarly.

At proposed Lots 2, 3 and 4 there is an inferred shallow depth to rock at the effluent field locations.

5. SITE STABILITY

The Kerikeri Volcanics are at ground surface over a significant proportion of the Maunu area. They are predominantly basaltic. The lavas erupted sub-aerially and are inferred to be intra-plate. They consist of tuffs, scoria cones and ridge-top remnants and flows, constrained by modern topography. They are up to 80m thick and tend to be very well drained. Kerikeri basalts overlie blue clays, sands and greywacke gravels. They are of Plio-Pleistocene age (around 2-4 million years). Land underlain by extrusive rock of the Kerikeri Volcanics can be steep but tends to be stable. The site is considered to be consistent with the above geological description. No recent or relic land instabilities were observed at the site. This site therefore is considered as presently stable.

6. FOUNDATIONS

The surficial soils observed during the field investigations are considered to be very stiff, highly plastic and highly expansive and are likely to be subject to shrink swell effects. The soils are interpreted as Class H in accordance with AS2870 for highly expansive soils. The allowable bearing capacity is inferred as in-excess of 100kPa at normal foundation depth of 0.45m – 0.6m below ground level, which is an ultimate bearing capacity of 300kPa and a dependable bearing capacity of 150kPa with a strength reduction factor of 0.5.

It is considered that the proposed building sites do not meet the requirements for Good Ground as defined in the New Zealand Building Code. Any foundations will therefore require specific design by a suitably qualified Chartered Professional Engineer with consideration given to the expansive nature of the soils.

The soil investigations indicate that there is an overlying firm layer below the topsoil down to between 1.6m - 2.2m. Below this solid crust the soil weakens considerably as recorded in the scalpel penetrometer tests taken at the bottom of the boreholes which is likely attributed to an increased moisture content with depth. Therefore due to the expansive soils and reduction in bearing capacity with depth it is recommended that shallow foundations be used. A slab on grade floor system (stiffened or rib raft) would be suitable. Alternatively shallow timber piles and subfloor is considered appropriate.

Cut/fill operations greater than 400mm for proposed Lots 5 and 6, and 600mm for proposed Lots 7 and 8 will need to be taken into account when the foundation is designed by a suitably qualified Chartered Professional Engineer to check the differential bearing in the underlying layers.

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7. EFFLUENT TREATMENT AND DISPOSAL SYSTEM

The proposed design of the effluent treatment and disposal system is in accordance with the standard AS/NZS 1547:2012 for onsite domestic wastewater management.

The proposed dwellings will likely be serviced by roof water supply and it is assumed that standard water reduction fixtures will be in use, resulting in a daily flow rate of 145 L/person/day. Were water supply serviced by ground bore without reduction fixtures the daily flow rate is 200 L/person/day and the disposal field sizing's given below should be adjusted accordingly. The minimum separation distance of 20m between an effluent field and a ground water bore will need to be considered between adjacent lots before any ground water bore is installed.

For design purposes a four bedroom dwelling is assumed. The design occupancy for a 4 bedroom dwelling is 7 persons giving a design daily flow rate of 1015 L/day for disposal system treatment.

Several ground water bores are indicated in vicinity of the disposal fields with the nearest being in excess of 80m distance to the east of the proposed Lot 8 effluent field (See Figure 3 below). A permanent watercourse is located 120m north of the proposed subdivision. Otherwise no other surface water courses are present. During ground investigations no water tables were encountered however it needs to be noted that the subdivision is situated over an aquifer.

A minimum reserve area of 30% for application of secondary treated wastewater and 100% for application of primary treated wastewater is required by the Northland Regional Council Water and Soil Plan.

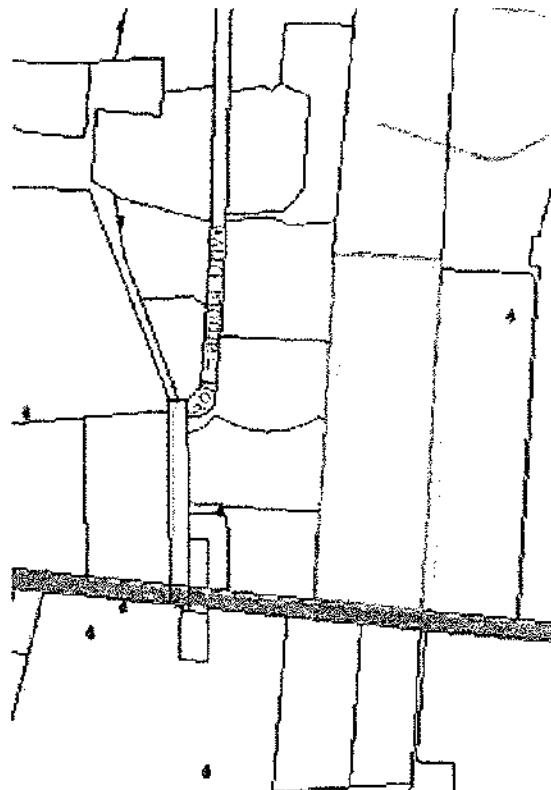


Figure 3: NRC GIS mapped ground water bores

7.1. Proposed Lots 2, 3 and 4

The friable volcanic derived silty clay soils at the proposed Lots 2, 3 and 4 disposal fields behave as a clay loam and therefore have an effluent disposal category of 4, being moderately structured with an indicative permeability K_{sat} of 0.5 - 1.5 m/day.

Proposed Lots 2, 3 and 4 are shown to have a proposed disposal field location towards the southern edge of the proposed site. The slope configuration here is linear planar with gentle slopes of 1° - 2° sloping down from north to south.

At this proposed disposal field location there is a site constraint of shallow rock. Due to the inferred shallow depth of rock shown in BH6, and a minimum depth to groundwater separation requirement of 1.2m for primary treated effluent disposal, it is recommended the proposed method for effluent disposal for proposed Lots 2, 3 and 4 to be the pressure compensative dripper irrigation system, which requires secondary treatment effluent. Secondary treated effluent reduces the minimum depth to groundwater to 0.6m.

This method utilises a low-pressure network of 16mm diameter pipe with spaced, self-compensating drippers providing a uniform distribution of the wastewater to the area. For subsurface irrigation the drip line is laid approximately 100mm below the ground surface. An adequate topsoil layer is present at the disposal field for this disposal method and slope without the requirement for further media to be brought in and spread.

The secondary treatment system will be required to produce effluent of a quality meeting or exceeding the requirements of secondary treated effluent (<20g/m³ BOD₅ and <30g/m³ SS). This can be achieved using an aerated treatment plant, by use of a recirculating sand filter or other certified secondary treated system.

Form EES-SEW1 attached in Appendix 3.

7.1.1. Proposed Lots 2, 3 and 4 - Pressure Compensating Dripper Irrigation

$$Q = 145 \text{ litres/person/day} \times 7 \text{ persons} = 1015 \text{ litres/day}$$

DIR slope adjustment = 0%

DIR = 3.5mm/day

Line spacing (max) = 1m

Field area = 1015 litres/day / 3.5 mm/day = 290m²

Reserve area = 30% of field area = 90m²

Total field area = 380m²

7.1.2. Proposed Lots 2, 3 and 4 - Site Specific Mitigation Measures

The recommended location for the effluent disposal field is shown on the site plan attached in Appendix 1. Specific mitigation measures are recommended for on-site wastewater systems utilising a secondary treatment system as detailed above should adhere to the following recommendations:

1. The system shall be constructed by a registered drainlayer.
2. The secondary treatment system and the accompanying effluent disposal field shall have a minimum separation distance of 3m from buildings and 1.5m from boundaries. The secondary treatment system and the accompanying effluent disposal field shall have a minimum separation distance of 15m from watercourses and surface water. Groundwater and surface water clearance has been confirmed to be in excess of the NRC RWSP for secondary treated effluent.
3. A maximum distance of 1.0m between the irrigation lines in clay soils to provide an effective even distribution of effluent over the whole of the design area.
4. The irrigation area shall have an adequate depth of natural good quality topsoil (or imported topsoil if necessary) to store the applied effluent and to support the growth of vegetation to maximise evapotranspiration.

5. It is recommended the land application areas are to be planted with suitable high water use vegetation to aid in evapotranspiration. The proposed disposal field site is north facing, unshaded and exposed. These attributes provide good potential for effluent disposal in part by evapotranspiration (ETS). See Appendix 4.
6. A reserve area of 30% is to be set aside for the future extension of the land application area in accordance with NRC RWSP.
7. If final house plans are for other than a 4 bedroom dwelling using standard water reduction fittings then effluent disposal design calculations will require revising. In any case there is sufficient space at the site for extension of the disposal field.
8. A service agreement between the property owner and the supplier of the treatment plant shall be entered into to ensure effective ongoing operation and performance. A maintenance strategy and contract for the system shall be put into place, which will include programmed inspections and maintenance of both secondary treatment systems and application areas.

7.2. Proposed Lots 5 and 6

The friable volcanic derived silty clay soils at the proposed Lots 5 and 6 disposal fields behave as a clay loam and therefore have an effluent disposal category of 4, being moderately structured with an indicative permeability K_{sat} of 0.5 - 1.5 m/day.

Proposed Lot 5 is shown to have a proposed disposal field location towards the northern edge of the lot. The slope configuration here is linear planar with gentle slopes of 1° - 2° sloping down from south to north.

Proposed Lot 6 is shown to have a proposed disposal field location towards the western edge of the lot. The slope configuration here is linear planar with gentle slopes of no more than 5° sloping down from north to south.

Due to the soils, topography and depth to ground water most land application method are appropriate. Calculations for primary treated effluent disposal have been shown below for which either conventional trench or low pressure effluent disposal as methods are appropriate. Refer to Appendix 1 sheet 7 for more details of the LPED system.

Form EES-SEW1 attached in Appendix 3.

7.2.1. Proposed Lots 5 and 6 - Conventional Bed Option

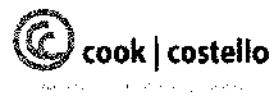
$$Q = 145 \text{ litres/person/day} \times 7 \text{ persons} = 1015 \text{ litres/day}$$

$$\text{DLR Conservative} = 10 \text{ mm/day}$$

$$\text{Bed Width} = 1.25 \text{ m}$$

$$\text{Bed Length} = 1015 \text{ litres/day} / (10 \text{ mm/day} \times 1.25 \text{ m}) = 81 \text{ m}$$

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Maximum individual bed length = 20m
Number bed rows = 81 / 20 = 4
Bed spacing (centre to centre) = 2.25m min
Field area = 20m x 2.25m x 4 = 180m²
Reserve area = 100% of field area = 180m²
Total field area = 360m²

7.2.2. Proposed Lots 5 and 6 - Low Pressure Effluent Distribution Option (LPED)

Q = 145 litres/person/day x 7 persons = 1015 litres/day
DIR = 3mm/day
Slope Adjustment for DIR = 0
Trench Dimensions = 200 x 200mm
Trench spacing (min) = 1m
Field area = 1015 litres/day / 3 mm/day = 338m²
Reserve area = 100% of field area = 338m²
Total field area = 676m²

7.2.3. Proposed Lots 5 and 6 - Site Specific Mitigation Measures

The recommended location for the effluent disposal field is shown on the site plan attached in Appendix 1. Specific mitigation measures are recommended for on-site wastewater systems utilising a primary treatment system as detailed above should adhere to the following recommendations:

1. The system shall be constructed by a registered drainlayer.
2. The primary treatment system shall be fitted with an appropriately sized outlet filter. The outlet filter shall be checked and flushed periodically, initially at 6 monthly intervals as a minimum until the performance history is established.
3. The primary treatment system and the accompanying effluent disposal field shall have a minimum separation distance of 3m from buildings and 1.5m from boundaries. The primary treatment system and the accompanying effluent disposal field shall have a minimum separation distance of 20m from watercourses and surface water. Groundwater and surface water clearance has been confirmed to be in excess of the NRC RWSP for secondary treated effluent.
4. A minimum distance of 1.0m between trenches (wall to wall).
5. The irrigation area shall have an adequate depth of natural good quality topsoil (or imported topsoil if necessary) to store the applied effluent and to support the growth of vegetation to maximise evapotranspiration.

6. It is recommended the land application areas are to be planted with suitable high water use vegetation to aid in evapotranspiration. The proposed disposal field site is north facing, unshaded and exposed. These attributes provide good potential for effluent disposal in part by evapotranspiration (ETS). See Appendix 4.
7. Sequenced dose loading of the disposal trenches by pump or siphon is required to extend the field life. A pumped system will most likely be required due to insufficient fall for a siphon system.
8. A reserve area of 100% is to be set aside for the future extension of the land application area in accordance with NRC RWSP.
9. If final house plans are for other than a 4 bedroom dwelling using standard water reduction fittings then effluent disposal design calculations will require revising. In any case there is sufficient space at the site for extension of the disposal field.
10. If the final disposal field is not sited within the plateau with slope less than 5° or if the soils encountered are inconsistent with those described then the effluent disposal design will require revision by a suitably qualified Chartered Professional Engineer.

7.3. Proposed Lot 7

The friable volcanic derived silty clay soils at the proposed Lot 7 disposal fields behave as a clay loam and therefore have an effluent disposal category of 4, being moderately structured with an indicative permeability K_{cat} of 0.5 - 1.6 m/day.

Proposed Lot 7 is shown to have a proposed disposal field location towards the eastern edge of the proposed site. This proposed disposal field is shown located on a large mound with a slope for 2/3rd of the effluent field being less than 10° with the remaining 1/3rd being less than 15°.

Due to the slope and the required pumping up to the effluent field, it is recommended the proposed method for effluent disposal for proposed Lot 7 to be the pressure compensative dripper irrigation system which requires secondary treatment effluent.

This method utilises a low-pressure network of 16mm diameter pipe with spaced, self-compensating drippers providing a uniform distribution of the wastewater to the area. For sub-surface irrigation the drip line is laid approximately 100mm below the ground surface. An adequate topsoil layer is present at the disposal field for this disposal method and slope without the requirement for further media to be brought in and spread.

The secondary treatment system will be required to produce effluent of a quality meeting or exceeding the requirements of secondary treated effluent (<20g/m³ BOD₅ and <30g/m³ SS). This can be achieved using an aerated treatment plant, by use of a recirculating sand filter or other certified secondary treated system.

Form EES-SEW1 attached in Appendix 3.

7.3.1. Proposed Lot 7 - Pressure Compensating Dripper Irrigation

$$Q = 145 \text{ litres/person/day} \times 7 \text{ persons} = 1015 \text{ litres/day}$$

$$DIR = 3.5 \text{ mm/day}$$

$$DIR \text{ slope adjustment } 2/3^{\text{rd}} \text{ area} = 3.5 \text{ mm/day} \times 0.8 \text{ (for slope between 10\%-20\%)} = 2.8 \text{ mm/day}$$

$$DIR \text{ slope adjustment } 1/3^{\text{rd}} \text{ area} = 3.5 \text{ mm/day} \times 0.5 \text{ (for slope between 20\%-30\%)} = 1.75 \text{ mm/day}$$

$$\text{Line spacing (max)} = 1 \text{ m}$$

$$\text{Field area} = 1015 \times 2/3^{\text{rd}} \text{ litres/day} / 2.8 \text{ mm/day} = 242 \text{ m}^2$$

$$\text{Field area} = 1015 \times 1/3^{\text{rd}} \text{ litres/day} / 1.75 \text{ mm/day} = 193 \text{ m}^2$$

$$\text{Total Field area} = 435 \text{ m}^2$$

$$\text{Reserve area} = 30\% \text{ of field area} = 131 \text{ m}^2$$

$$\text{Total field area} = 566 \text{ m}^2$$

7.3.2. Proposed Lot 7 - Site Specific Mitigation Measures

The recommended location for the effluent disposal field is shown on the site plan attached in Appendix 1. Specific mitigation measures are recommended for on-site wastewater systems utilising a secondary treatment system as detailed above should adhere to the following recommendations:

1. The system shall be constructed by a registered drainlayer.
2. The secondary treatment system and the accompanying effluent disposal field shall have a minimum separation distance of 3m from buildings and 1.5m from boundaries. The secondary treatment system and the accompanying effluent disposal field shall have a minimum separation distance of 15m from watercourses and surface water. Groundwater and surface water clearance has been confirmed to be in excess of the NRC RWSP for secondary treated effluent.
3. A maximum distance of 1.0m between the irrigation lines in clay soils to provide an effective even distribution of effluent over the whole of the design area.
4. The irrigation area shall have an adequate depth of natural good quality topsoil (or imported topsoil if necessary) to store the applied effluent and to support the growth of vegetation to maximise evapotranspiration.
5. It is recommended the land application areas are to be planted with suitable high water use vegetation to aid in evapotranspiration. The proposed disposal field site is north facing, unshaded and exposed. These attributes provide good potential for effluent disposal in part by evapotranspiration (ETs). See Appendix 4.
6. A reserve area of 30% is to be set aside for the future extension of the land application area in accordance with NRC RWSP.

7. If final house plans are for other than a 4 bedroom dwelling using standard water reduction fittings then effluent disposal design calculations will require revising. In any case there is sufficient space at the site for extension of the disposal field.
8. A service agreement between the property owner and the supplier of the treatment plant shall be entered into to ensure effective ongoing operation and performance. A maintenance strategy and contract for the system shall be put into place, which will include programmed inspections and maintenance of both secondary treatment systems and application areas.

7.4. Proposed Lot 8

The friable volcanic derived silty clay soils at the proposed Lot 8 disposal fields behave as a clay loam and therefore have an effluent disposal category of 4, being moderately structured with an indicative permeability K_{sat} of 0.5 - 1.5 m/day. However due to the area being very shaded the adjusted soil category of 5 with an indicative permeability K_{sat} of 0.12 - 0.5 m/day has been adopted.

Proposed Lot 8 is shown to have a proposed disposal field location towards the north eastern edge of the lot. The slope configuration here is linear planar with gentle slopes of 1° - 2° towards the east.

Due to the soils, topography, depth to ground water and space available the primary treated conventional bed option for effluent disposal has been considered with calculations shown below. Refer to Appendix 1 sheet 7 for more details of the Conventional Bed system.

Form EES-SEW1 attached in Appendix 3.

7.4.1. Proposed Lot 8 - Conventional Bed Option

$$Q = 145 \text{ litres/person/day} \times 7 \text{ persons} = 1015 \text{ litres/day}$$

$$\text{DLR Conservative} = 5 \text{ mm/day}$$

$$\text{Bed Width} = 2.5 \text{ m}$$

$$\text{Bed Length} = 1015 \text{ litres/day} / (5 \text{ mm/day} \times 2.5 \text{ m}) = 81 \text{ m}$$

$$\text{Maximum individual bed length} = 20 \text{ m}$$

$$\text{Number bed rows} = 81 / 20 = 4$$

$$\text{Bed spacing (centre to centre)} = 3.5 \text{ m min}$$

$$\text{Field area} = 20 \text{ m} \times 3.5 \text{ m} \times 4 = 280 \text{ m}^2$$

$$\text{Reserve area} = 100\% \text{ of field area} = 280 \text{ m}^2$$

$$\text{Total field area} = 560 \text{ m}^2$$

7.4.2. Proposed Lot 8 - Site Specific Mitigation Measures

The recommended location for the effluent disposal field is shown on the site plan attached in Appendix 1. Specific mitigation measures are recommended for on-site wastewater systems utilising a primary treatment system as detailed above should adhere to the following recommendations:

1. The system shall be constructed by a registered drainlayer.
2. The primary treatment system shall be fitted with an appropriately sized outlet filter. The outlet filter shall be checked and flushed periodically, initially at 6 monthly intervals as a minimum until the performance history is established.
3. The primary treatment system and the accompanying effluent disposal field shall have a minimum separation distance of 3m from buildings and 1.5m from boundaries. The primary treatment system and the accompanying effluent disposal field shall have a minimum separation distance of 20m from watercourses and surface water. Groundwater and surface water clearance has been confirmed to be in excess of the NRC RWSP for secondary treated effluent.
4. A minimum distance of 1.0m between trenches (wall to wall).
5. The irrigation area shall have an adequate depth of natural good quality topsoil (or imported topsoil if necessary) to store the applied effluent and to support the growth of vegetation to maximise evapotranspiration.
6. Sequenced dose loading of the disposal trenches by pump or siphon will be required to extend the field life. There is to be two distribution pipes per bed.
7. A reserve area of 100% is to be set aside for the future extension of the land application area in accordance with NRC RWSP.
8. If final house plans are for other than a 4 bedroom dwelling using standard water reduction fittings then effluent disposal design calculations will require revising. In any case there is sufficient space at the site for extension of the disposal field.
9. If the final disposal field is not sited within the plateau with slope less than 5° or if the soils encountered are inconsistent with those described then the effluent disposal design will require revision by a suitably qualified Chartered Professional Engineer.

8. STORMWATER MANAGEMENT

Currently the site drainage is by general surface runoff following the natural topography of the site. The site geology and ground investigations indicate well drained soils and there are no defined watercourses on the site.

All stormwater created from the newly formed impermeable surfaces should be collected and conveyed away from the habitable areas. Scour protection is required at outlets and overflow from storage tanks. It is also recommended that cut and fill batter slopes be replanted with suitable vegetation to reduce the potential for erosion post development.

8.1. Stormwater attenuation

Whangarei District Council requires attenuation of stormwater runoff in certain circumstances.

For proposed Lots 2 – 5 and 7 – 8, because they are less than one hectare in size, WDC requires that the stormwater runoff from the developed site is to be less than 80% of the existing site including an allowance of 20% for climate change for a 100 year rainfall event. This rule will also apply to proposed Lot 6 if development creates more than 2% impervious areas within the lot, including right of ways, roofs, hardstanding areas and driveways. The most convenient means to achieve this is to collect roof runoff from the buildings and direct to a storage tank. Once the storage tank is full, overflow the runoff into an attenuation tank. This method can also be used to compensate for other impervious surfaces which cannot be readily collected and attenuated (i.e. driveways, paved areas, paths).

Specific design of stormwater attenuation will be required once the layout and final configuration of the development is established and can be detailed at the building consent stage of development. Stormwater attenuation design shall be in accordance with WDC Environmental Engineering Standards 2010.

9. WATER SUPPLY

There is currently no potable water supply available to these lots. The nearest potable water supply in the area is approximately 400m from the proposed subdivision to the east along S.H.14 (where the urban area finishes). Many of the surrounding residents currently with no potable water supply obtain water via on-site rainwater capture. The viability of bore water supply at the site has not been specifically investigated though it is considered very possible as the subdivision is situated above an aquifer and there are several existing bores in the surrounding area with two within 100m of the proposed subdivision.

The most convenient method of potable water supply for new households is by means of individual household on-site rainwater harvesting. The use of rainwater harvesting has the added benefit of contributing to stormwater retention and minimising the impact of post development stormwater runoff. This can provide significant benefits to the design and operations of downstream stormwater systems.

It is important to ensure that the rainwater tanks are sized correctly to suit the household needs. Generally, the larger the tank, the more reliable and effective it is in conserving water or managing stormwater. The water tank size will depend on the volume of water needed, the amount of rainfall in the area, the area of the collection surface, and the security of the supply needed. The specific sizing and details of rainwater tanks will be household specific.

It is presumed that the UTE zoning will be a part of the rural fire district and the SNZ PAS 4509:2008 New Zealand Fire Service Firefighting Water Supplies Code of Practice is a guideline only for fire fighting in a rural district and does not pose compliance requirements. However it is recommended that firefighting be considered by the owner during site development. Appropriate couplings or tank manhole access more than 6m from a combustible source is recommended. Current guidelines recommend 45m³ designated firefighting storage volume within 90m of a dwelling or this can be reduced to 7m³ with an approved sprinkler system installed.

10. VEHICLE ACCESS

Vehicle access onto proposed Lots 2 to 8 is proposed via a ROW off Golf Harbour Drive. Access to proposed Lot 1 which contains the existing dwelling will utilise the existing driveway that services the entire existing property at present.

Site distances required for the ROW servicing the proposed 7 Lots (Lots 2-8) is required to be 55m for a vehicle entrance off a local road with a speed environment of 60km/hr. As shown on the site plan the subdivision has in excess of 80m. The site distance for proposed Lot 1 will stay as current and there is plenty of site distance in both directions.

J.D. and M.A. Williamson
526 Maunu Road (SH14), Maunu



All right of ways are to be constructed to the WDC environmental Engineering Standards and as stated in section 8.1 may require stormwater attenuation if the total right of way area exceeds more than 2% of existing area of Lot 1 DP174535.

11. POWER AND TELECOMMUNICATIONS

The proposed development can be adequately serviced with power and telecommunications. Existing telecommunications and power infrastructure are located on State Highway 14 and Golf Harbour Drive. It is considered that this can be extended where necessary to service the development. Further confirmation from the appropriate service providers will be required at the design stage of the project.

12. CONCLUSIONS AND RECOMMENDATIONS

Geotechnical investigations indicate that the proposed building sites are presently stable. Development will need to be carried out in accordance with proper engineering practice and the following guidelines:

12.1. Building Sites

1. The founding soils do not meet the New Zealand Building Code definition of Good Ground due to their highly to extremely expansive properties and foundations will require specific design by a Chartered Professional Engineer.
2. Conventional slab on grade or similar timber pile foundations are considered suitable for use at the site. A dependable bearing capacity of 150KPa is available for design of shallow foundations.
3. All earthworks shall be designed to have a net stabilising effect. Future development of the site may include earthworks which may involve cuts and filling. As a minimum earthworks shall be conducted as outlined in section 6 of this report.
4. Controlled fill and any replacement fill at the site is to be suitably compacted and tested to NZS 4431 by a suitably qualified Chartered Professional Engineer.
5. Cut/fill operations greater than 600mm will need to be designed by a suitably qualified Chartered Professional Engineer to check the limits of differential bearing strength in the underlying layers.

12.2. Wastewater Disposal for Proposed Lots 2, 3 and 4

1. All wastewater resulting from future development within the proposed Lots 2, 3 and 4 shall be treated via an on-site secondary treatment system as detailed in section 7 of this report. The recommended location for the effluent disposal field is shown on the attached site plan.
2. Disposal shall be via sub-surface drip irrigation. For a 4 bedroom dwelling with standard water reduction fittings the area required for irrigation is 290m². Dripper lines shall be laid to follow land contours with 1m spacing between adjacent dripper lines.
3. A reserve area of 90m² shall be set aside for future extensions.

12.3. Wastewater Disposal for Proposed Lots 5 and 6

1. All wastewater resulting from future development within the proposed Lots 5 and 6 shall be primary treated by septic tank and disposed by conventional bed or LPED as detailed in section 7 of this report. The recommended location for the effluent disposal field is shown on the attached site plan.

2. For a 4 bedroom dwelling with standard water reduction fittings the conventional trench disposal area is 180m² plus an additional 180m² reserve area. 1.25m trenches are proposed with a 1m wall to wall spacing. The maximum bed length is 20m. Alternatively disposal by LPED requires a 338m² field area plus an additional 338m² reserve area. The proposed LPED line spacing is 1m. It is recommended that the disposal is sequence dose loaded.
3. If the ground encountered during construction differs from that described in this report within proposed Lots 5 and 6, input from a suitably qualified Chartered Professional Engineer shall be required to confirm the design.

12.4. Wastewater Disposal for Proposed Lot 7

4. All wastewater resulting from future development within the proposed Lot 7 shall be treated via an on-site secondary treatment system as detailed in section 7 of this report. The recommended location for the effluent disposal field is shown on the attached site plan.
5. Disposal shall be via sub-surface drip irrigation. For a 4 bedroom dwelling with standard water reduction fittings the area required for irrigation is 435m². Dripper lines shall be laid to follow land contours with 1m spacing between adjacent dripper lines.
6. A reserve area of 131m² shall be set aside for future extensions.

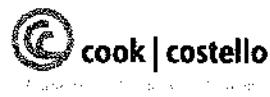
12.5. Wastewater Disposal for Proposed Lot 8

4. All wastewater resulting from future development within the proposed Lot 8 shall be primary treated by septic tank and disposed by conventional bed as detailed in section 7 of this report. The recommended location for the effluent disposal field is shown on the attached site plan.
5. For a 4 bedroom dwelling with standard water reduction fittings the conventional trench disposal area is 280m² plus an additional 280m² reserve area. 2.5m beds are proposed with a 1m wall to wall spacing. The maximum bed length is 20m. It is recommended that the disposal is sequence dose loaded with two distribution pipes per bed.
6. If the ground encountered during construction differs from that described in this report within proposed Lot 8, input from a suitably qualified Chartered Professional Engineer shall be required to confirm the design.

12.6. Stormwater

1. All storm water resulting from development works shall be collected and piped away from the building sites and away from slopes in the vicinity of these structures to ensure that

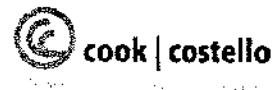
J.D. and M.A. Williamson
626 Maunu Road (SH14), Maunu



the concentrated stormwater does not have a detrimental effect on slope stability. The outlets shall be scour protected.

2. Subject to development plane stormwater attenuation may be required on Lot 6 if the impervious surface exceeds 2%, or approximately 385m² of roof and paving. Rainwater harvesting does allow offset of some of the attenuation volume.
3. All lots under 1 hectare will require stormwater attenuation to be designed at building consent stage as per section 8.1.

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626 Maunu Road (SH14), Maunu



13. LIMITATIONS

This report has been prepared for the benefit of J.D. & M.A. Williamson as our client with respect to site suitability for subdivision and for Whangarei District Council approval of the proposal as defined in the brief. It shall not be relied upon for any other purpose. The reliance by other parties on the information or opinions contained in this report shall, without our prior review and agreement in writing, be at such parties' sole risk.

Opinions and judgments expressed herein are based on our understanding and interpretation of current regulatory standards, and should not be construed as legal opinions. Where opinions or judgments are to be relied on they should be independently verified with appropriate legal advice. Any recommendations, opinions, or guidance provided by Cook Costello Ltd in this report are limited to technical engineering requirements and are not made under the Financial Advisers Act 2008.

Recommendations and opinions in this report are based on data from eight hand augered borehole with in-situ shear vane tests and fifteen scalars penetrometer tests undertaken at the building platform within proposed Lots 3 to 8 and the proposed effluent disposal locations on proposed Lots 2 and 8. The nature and continuity of subsoil conditions away from the borehole and scalars are inferred and it must be appreciated that actual conditions could vary considerably from the assumed model.

During excavation and construction the site should be examined by an Engineer or Engineering Geologist competent to judge whether the exposed subsoils are compatible with the inferred conditions on which the report has been based. It is possible that the nature of the exposed subsoils may require further investigation and the modification of the design based on this report. In any event it is essential that the firm is notified if there is any variation in subsoil conditions from those described in the report as it may affect the design parameters recommended in the report.

Cook Costello Ltd. have performed the services for this project in accordance with the standard agreement for consulting services and current professional standards for environmental site assessment. No guarantees are either expressed or implied.

There is no investigation which is thorough enough to preclude the presence of materials at the site which presently, or in the future, may be considered hazardous. Because regulatory evaluation criteria are constantly changing, concentrations of contaminants present and considered to be acceptable now may in the future become subject to different regulatory standards which cause them to become unacceptable and require further remediation for this site to be suitable for the existing or proposed land use activities.

A J Parker
Engineering Technician
NZDE

REVIEWED BY:

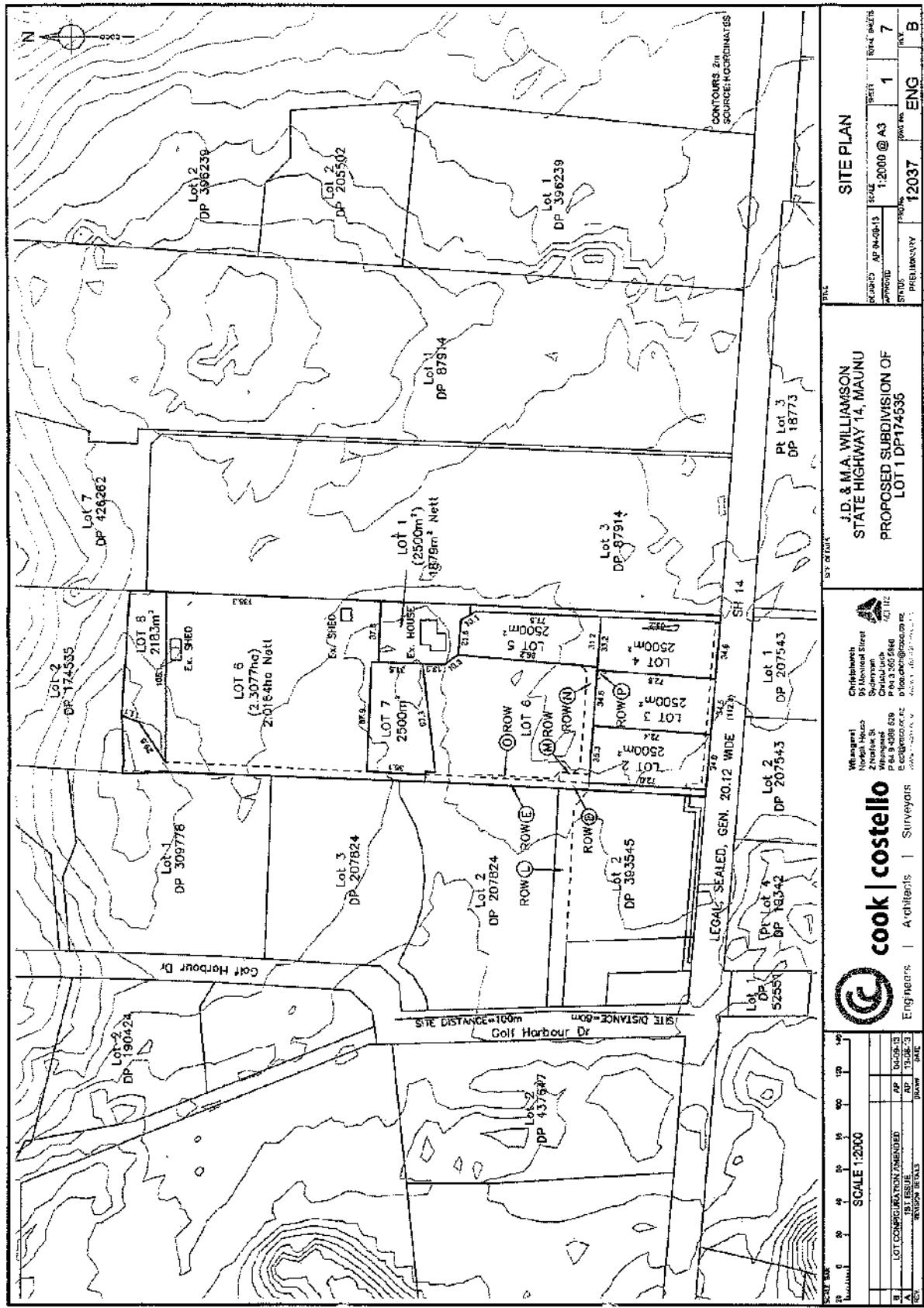
A E Tonks
Engineer
BE (Esc), GIPENZ, IQP (WDC 024)

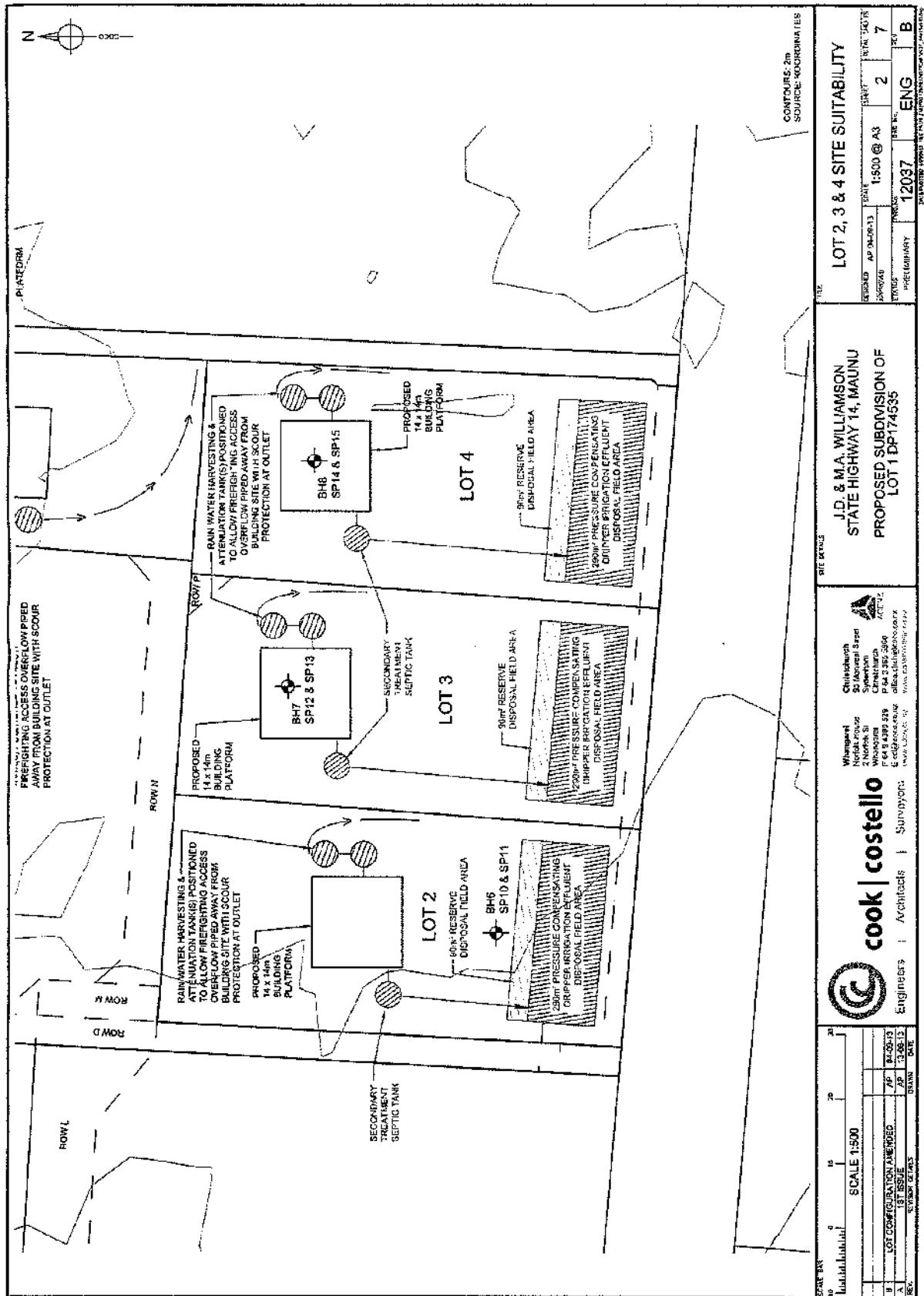
A S MacPherson
Chartered Professional Engineer
BE Civil (hons), CPEng, MIPENZ, IntPE(NZ)

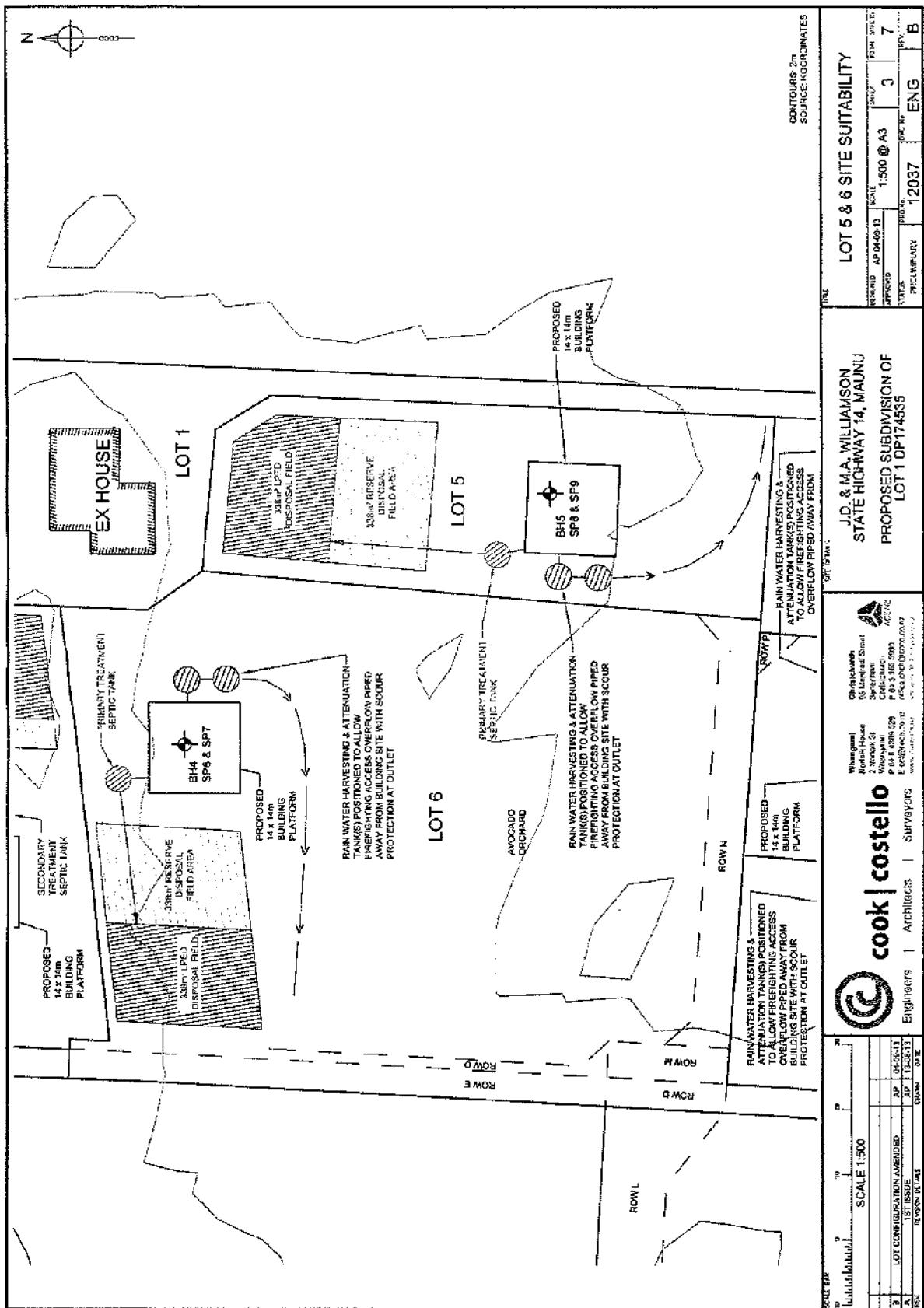
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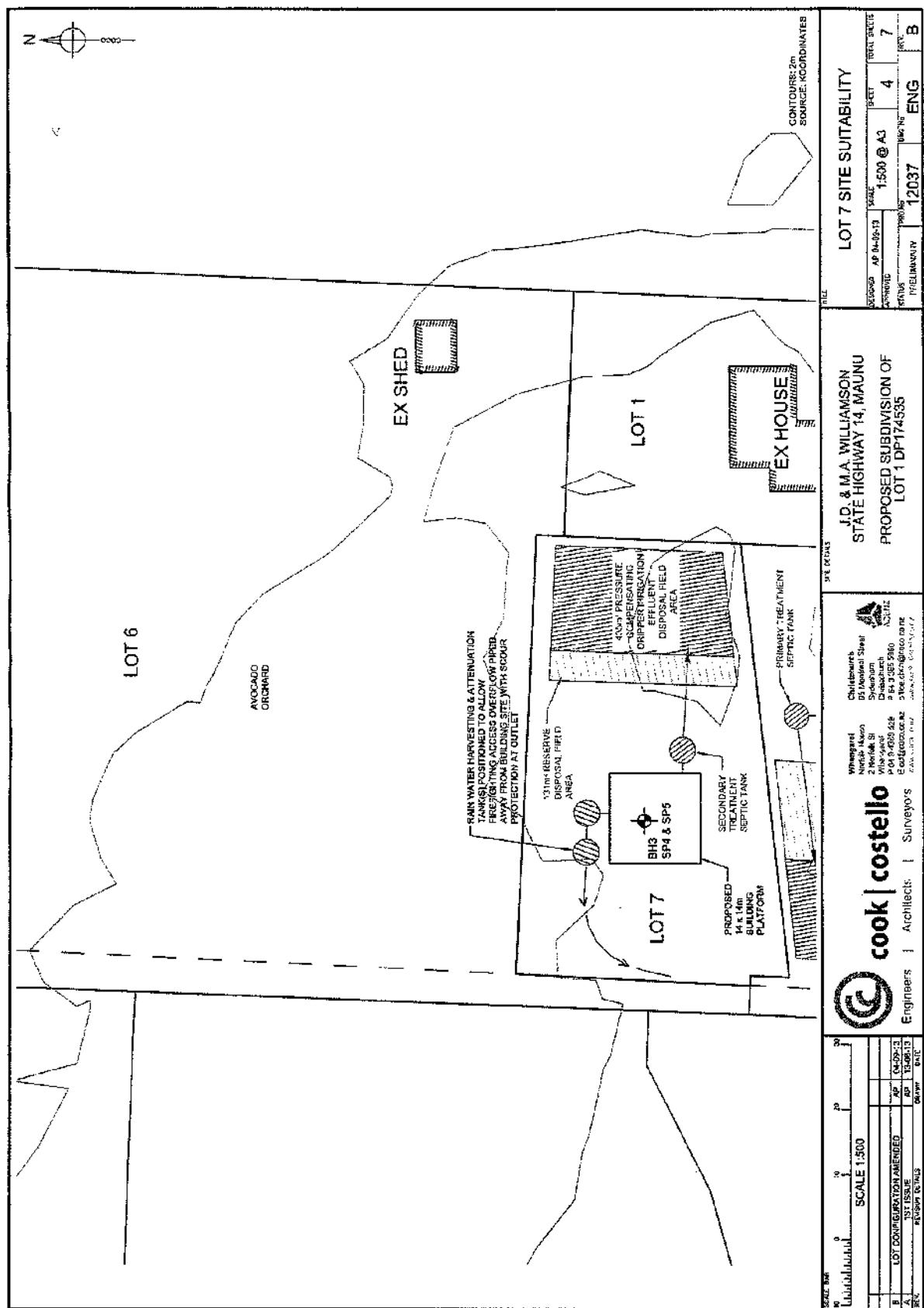


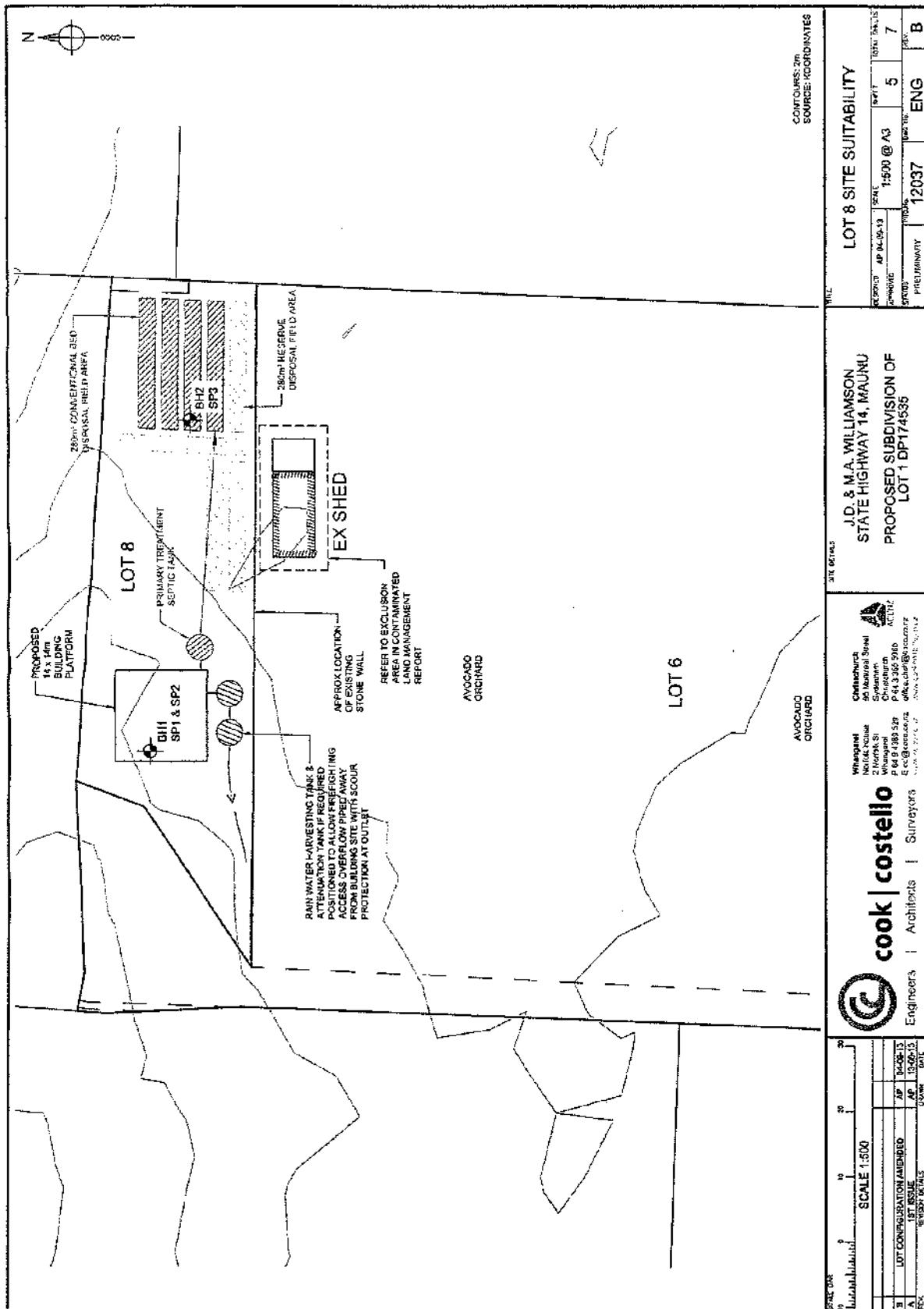
14. APPENDIX 1: SITE PLAN AND LOCATION



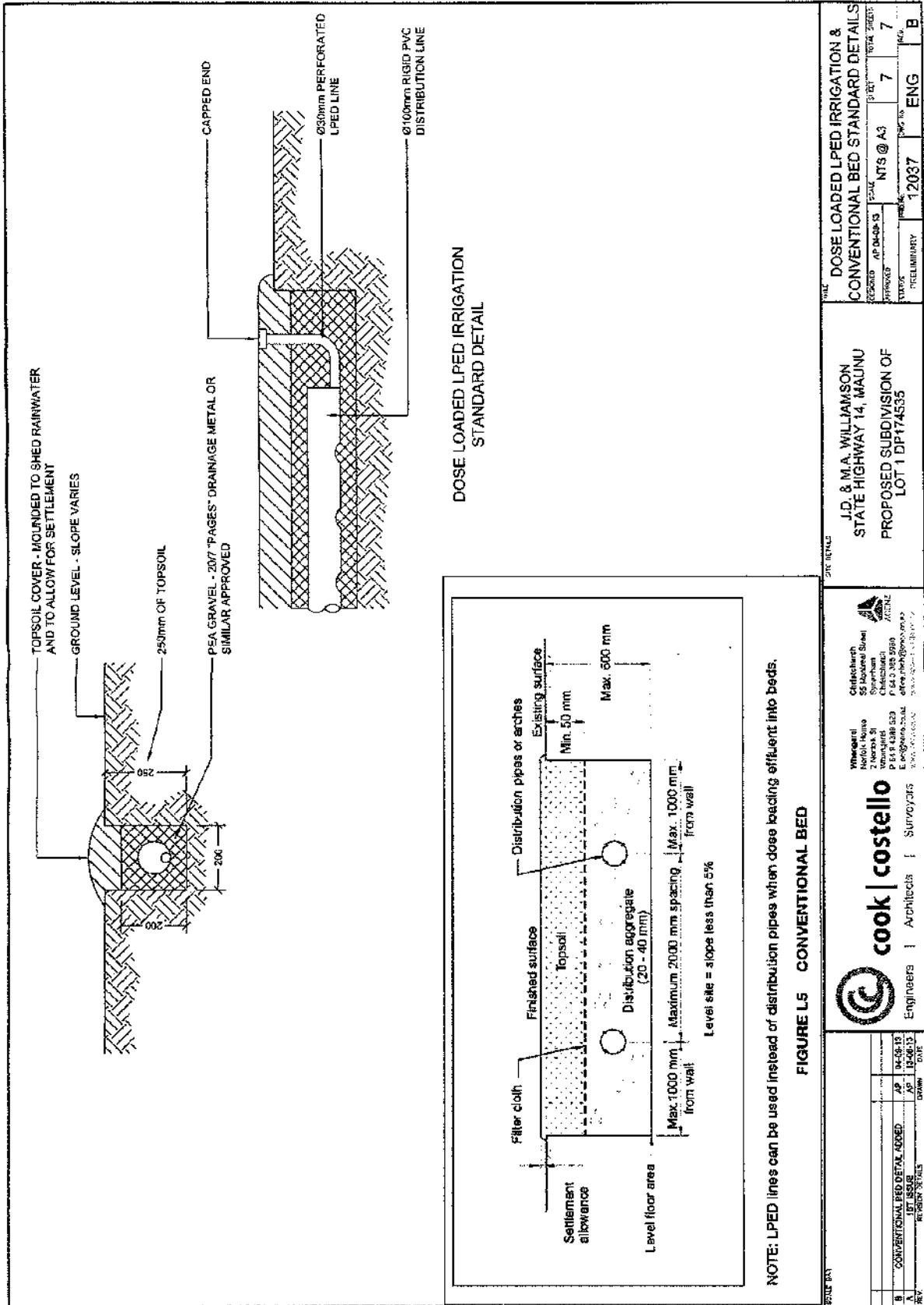












NOTE: LPED lines can be used instead of distribution pipes when dose loading effluent into beds.

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15. APPENDIX 2: SITE INVESTIGATIONS



Geocivil Ltd
2 Norfolk Street
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TEST REPORT

Lab Job No: 8020-907
Your ref.: 12037
Date of Issue: 07-08-2013
Date of Re-issue: -
Page: 1 of 25

Test Report

No.13-98

PROJECT: Williamson Subdivision, Maunu
CLIENT: Cook Costello Ltd
2 Norfolk Street
Whangarei
ATTENTION: Aaron Parker
INSTRUCTIONS: Augerholes where required (not accredited)
Hand Held Shear Vane Test
Determination of the penetration resistance using a dynamic cone (sca)la
Penetrometer
TEST METHOD: NZGS December 2005 (not accredited)
NZGS: August 2001
NZS 4402: 1988 Test 6.5.2
SAMPLING METHOD: N/A
TEST RESULTS: As Per Laboratory Sheets attached

D.Krissansen

Laboratory Manager

S.Kokich

Approved Signatory



Tests indicated as
not accredited are outside
the scope of the
laboratory's accreditation

-CPT - Aggregates - Soil - Roading-
This report shall not be reproduced except in full, without written approval of the laboratory



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AUGERHOLE LOG AND TEST SHEET
NZGS December 2005

Lab Job No.: 8020-907
Client: Cook Costello Ltd
Job: Williamson Subdivision
Location: Maunu
Augerhole No.: BH1
Drilling Method: Hand
Driller: S.K

REF: 12037
Report No.: 13-98
Logger: G.R
Date: 25/07/2013
Checked: *D.K.*
Date: 8/8/13
Page: 2 of 25

Soil Description	Legend	Soil Symbol	Depth (m)	Water Level	Vane Shear Strength maximum/residual corrected kPa	Soil Sensitivity	Sample Number	Other Tests
TOPSOIL, moist, friable, some roots, highly plastic, reddish brown.		OH	0					
Silty CLAY, traces gravel to 20mm, minor roots, moist, friable, highly plastic, reddish brown. Hard		CH	-0.5		>248			
Silty CLAY, traces gravel to 20mm, moist, slightly friable, highly plastic, reddish brown. Stiff moderately sensitive		CH	-1		99/28	3.5		
Silty CLAY, traces sand/very weak gravel to 5mm, moist, friable, highly plastic, reddish brown with very minor black speckles/mottling. Very stiff, moderately sensitive to non sensitive		CH	-1.5		163/103	1.6		
Very silty CLAY, traces sand/weak gravel to 5mm, moist, slightly friable, highly plastic, reddish brown. E.O.B hit rock.		CH	-2		141/46	3.1		
Remarks:					Topsoil	Sand		
					Hill	Gravel		
					Clay	Peat		
					Silt	Rock		



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DYNAMIC CONE (SCALA) PENETROMETER
NZS 4402 : 1988 Test 6.5.2

Lab Job No: 8020-907
Client: Cook Costello Ltd
Job: Williamson Subdivision
Location: Next to BH1
Start Depth (m): 0

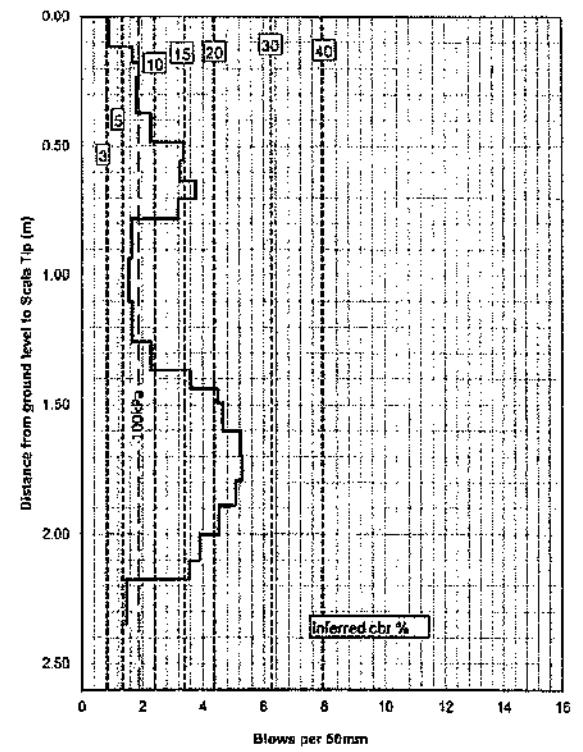
Scala No: SP1
Ref: 12037
Report No: 13-98
Page: 3 of 25

The lines are the suggested correlation of CBR values based on Figure 5.3. Correlation of Dynamic Cone Penetration and CBR AUSTROADS (2004) "Pavement Design - a guide to the design of road Pavements"

(This comment is excluded from endorsement.)

No.	Tip to ref (cm)	mm / blow	Blows / 50mm	Blows / 300mm	Total Blows	depth (m)
0	114.9	0	0	0	0	0.00
2	103.3	58	1	5	2	0.12
2	97.2	31	2	10	4	0.18
2	91.8	27	2	11	6	0.23
5	77.5	26	2	11	11	0.37
5	68.7	22	2	14	16	0.48
5	65.2	16	3	20	21	0.68
5	51.4	16	3	18	26	0.84
5	44.7	15	4	22	31	0.70
5	36.8	16	3	15	38	0.78
5	21.3	31	2	10	41	0.94
5	4.6	33	2	9	46	1.10
5	103.8	0	0	0	49	1.10
5	59.4	31	2	10	51	1.26
5	78.3	22	2	14	65	1.37
2	71.3	14	4	21	67	1.44
5	55.7	17	4	27	68	1.49
10	54.9	11	5	28	78	1.60
10	45.3	10	5	31	86	1.70
10	35.8	10	5	32	88	1.78
10	25.0	10	5	30	105	1.86
10	14.8	11	5	27	115	2.00
5	4.5	13	4	23	124	2.10
0	104.4	0	0	0	124	2.10
5	27.3	14	4	21	129	2.18
5	20.1	34	1	9	154	2.35

Scala Penetrometer Results



Recorded By: S.K / G.R
Date: 25/07/2013
Checked by: P/B/13
Date: 8/8/13

Note: All readings taken below 1.5m from start depth are outside the scope of this test



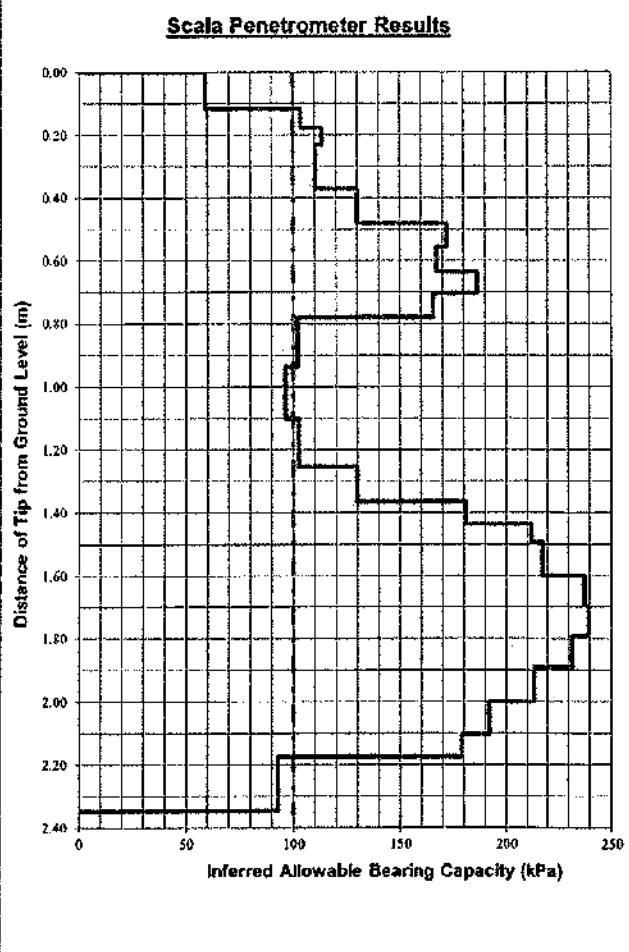
Consulting Engineers

cook | costello**DYNAMIC CONE (SCALA) PENETROMETER**

Test 23 / NZS 4402 : 1988 Test 6.5.2

Job: 12037	Tested by: S.K.	
Client: Williamson	Logged by: G.R.	
Date: 25/07/2013	Checked:	
Location: Next to BH1	Date Checked:	
Scala No.: SP1	Ground Level (m):	0
Page: 1	Required Allowable kPa:	100

No.	Tip to soil (cm)	Total Blows	mm / blow	kPa	depth (m)
0	114.0	0	0	0	0.0
2	103.3	2	58	59	0.12
2	57.2	4	31	103	0.18
2	91.8	6	27	113	0.23
5	77.8	11	28	110	0.37
5	56.7	16	22	130	0.48
5	59.2	21	18	172	0.56
5	51.4	26	16	187	0.84
5	44.7	31	13	187	0.70
5	36.8	36	16	156	0.78
5	21.3	41	31	102	0.51
5	4.8	46	33	95	1.10
0	104.8	46	0	95	1.10
5	89.4	51	31	103	1.26
5	78.3	56	22	130	1.37
5	71.3	61	14	181	1.44
5	56.7	66	11	212	1.49
10	54.9	76	11	218	1.56
10	45.3	86	10	238	1.70
10	35.8	96	10	240	1.79
10	25.9	106	10	232	1.89
10	14.8	116	11	213	2.00
5	4.5	124	13	192	2.16
0	104.4	124	0	192	2.10
5	87.3	128	14	179	2.18
5	80.1	134	34	93	2.36



Line is the suggested correlation of e (mm/blow) and Bearing Pressure after
STOCKWELL REF: NZ ENGINEERING (32,5) 16 June 1977



DYNAMIC CONE (SCALA) PENETROMETER

NZS 4402 :1988 Test 6.5.2

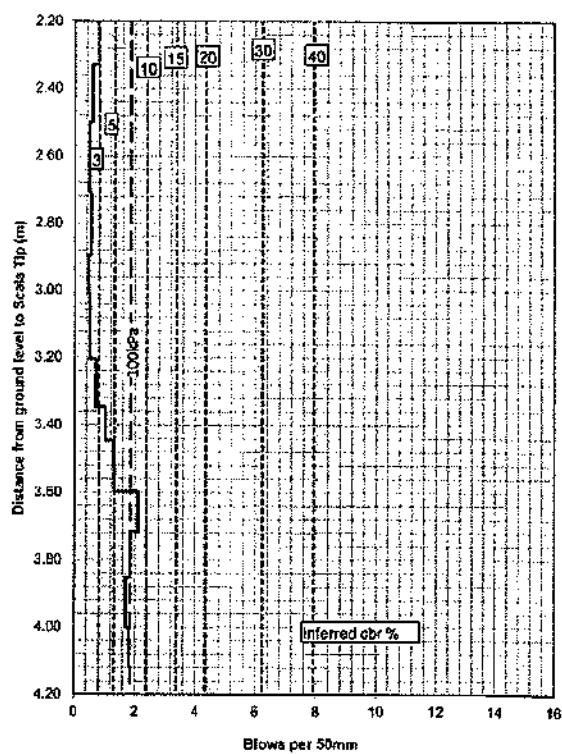
Lab Job No: 8020-807
Client: Cook Castello Ltd
Job: Williamson Subdivision
Location: Base of BH1
Start Depth (m): 2.2

Scala No: SP2
Ref : 12037
Report No: 13-98
Page: 4 of 25

2 Norfolk Street
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The lines are the suggested correlation of CBR values based on Figure 5.3, Correlation of Dynamic Cone Penetration and CBR. Austroads (2004) "Pavement Design - a guide to the design of road pavements".

{ This content is excluded from endorsement }



Recorded By: S.K/G.R
Date: 25/07/2013
Checked by: *D.P.*
Date: 6/8/13

Note: All readings taken below 1.5m from start depth are outside the scope of this test

SP2
8020-907,CCL 12037, Williamson Subdivision, SH14 Whangarei, 5-8-13
8/08/2013

issue 2


S. Kokich
Approved Signatory



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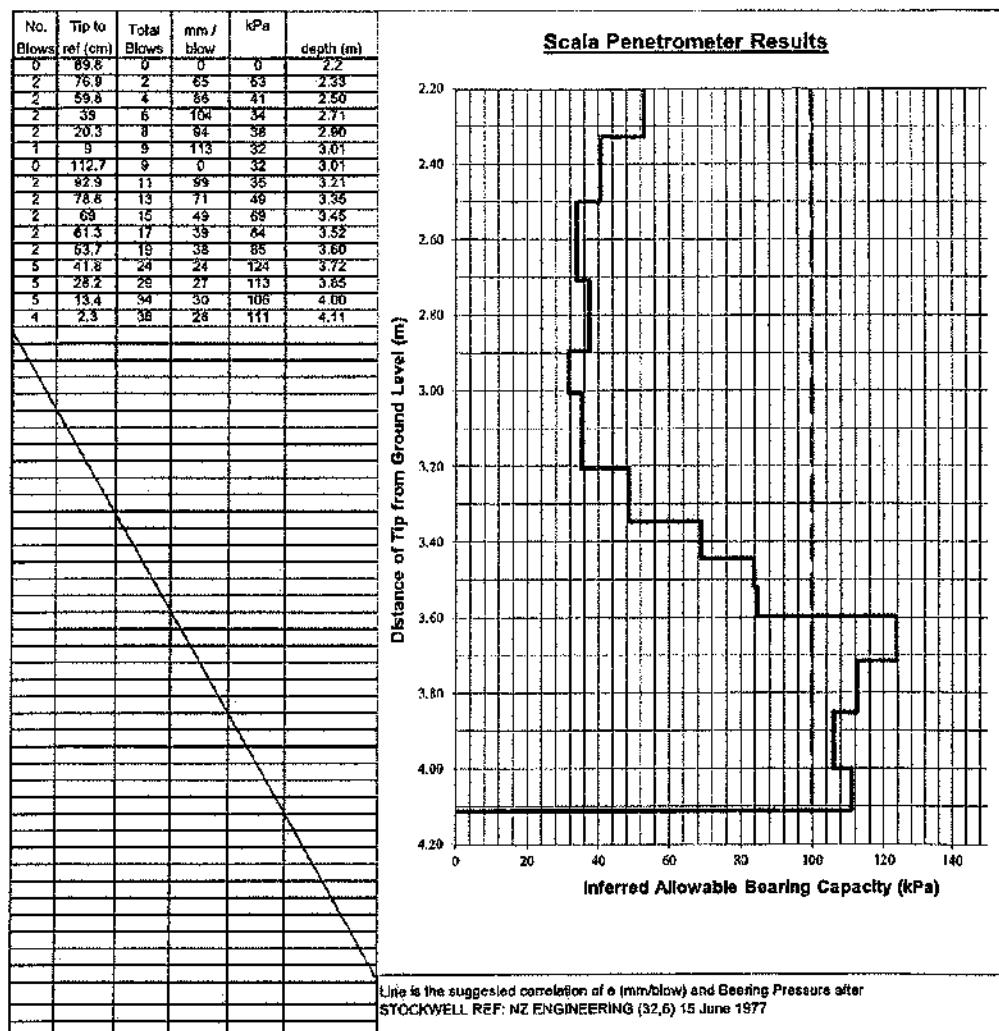
cook | costello

Norfolk House
2 Norfolk Street
Whangarei
P 64 9 4389529
F 64 9 4304282
E ccl@coco.co.nz

DYNAMIC CONE (SCALA) PENETROMETER

Test 23 / NZS 4402 : 1988 Test 6.5.2

Job: 12037	Tested by: S.K.
Client: Williamson	Logged by: G.R.
Date: 25/07/2013	Checked:
Location: Base of BH1	Date Checked:
Scala No.: SP2	Ground Level (m): 2.2
Page: 2	Required Allowable kPa: 100





2 Norfolk Street
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AUGERHOLE LOG AND TEST SHEET
NZGS December 2005

Lab Job No.: 8020-907
Client: Cook Costello Ltd
Job: Williamson Subdivision
Location: Maunu
Augerhole No.: BH2
Drilling Method: Hand
Driller: S.K

REF: 12037
Report No.: 13-98
Logger: G.R
Date: 25/07/2013
Checked: *D.J. J. 8/7/13*
Date: 8/7/13
Page: 5 of 25

Soil Description	Legend	Soil Symbol	Depth (m)	Water Level	Vane Shear Strength: maximum/ residual corrected kPa	Soil Sensitivity	Sample Number	Other Tests
TOPSOIL, moist, friable, highly plastic, dark brown, some roots. Silty CLAY, moist, friable, highly plastic, brown.	OH	CH	0					
Silty CLAY, moist, friable, highly plastic, traces weak gravel to 10mm, brown. Hard, moderately sensitive		CH	-0.5		226/69	3.3		
E.O.B too hard			-1		202/65	3.1		
-1.25								
Remarks:						Topsoil	Send	
						Fill	Gravel	
						Clay	Peat	
						Silt	Rock	

BH2
8020-907, CCL 12037, Williamson Subdivision, SH14 Whangarei, 5-8-13
8/08/2013 issue 2

S.Kokich
Approved Signatory

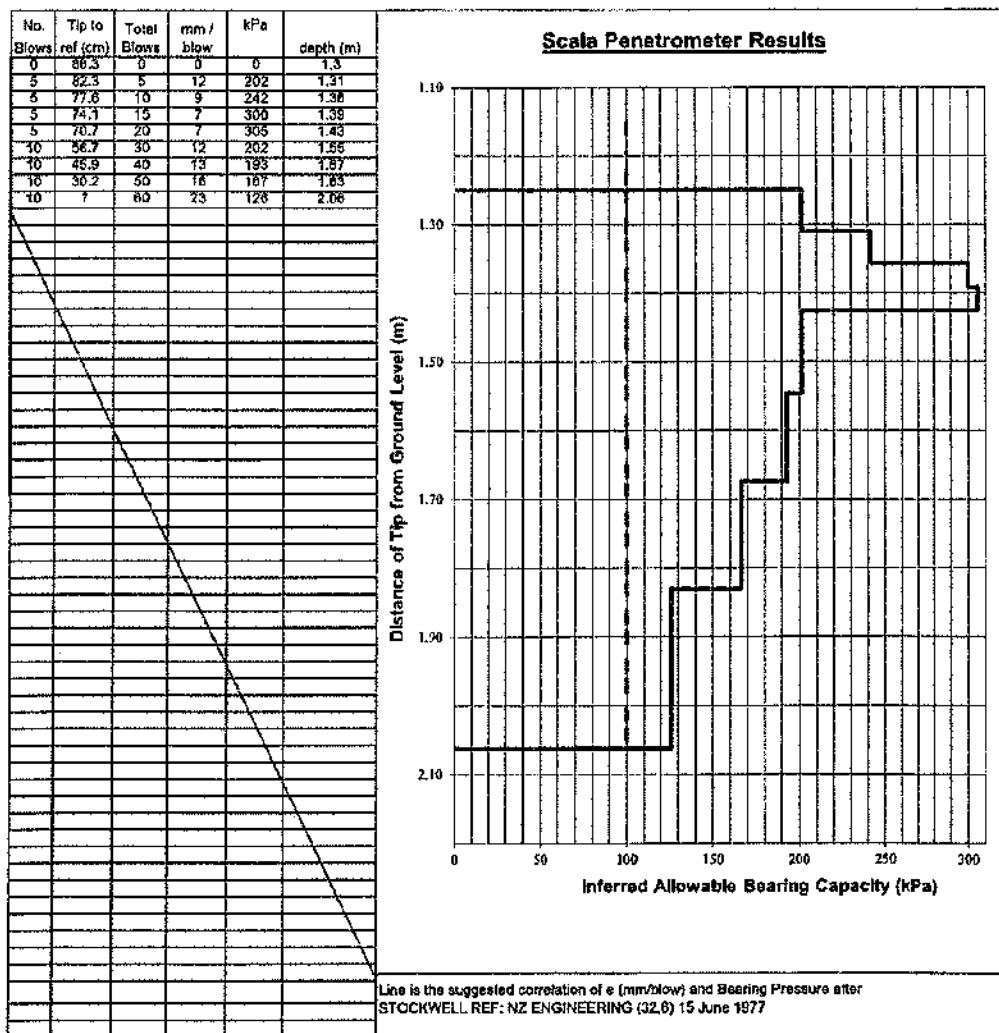


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Test 23 / NZS 4402 : 1988 Test 6.5.2

Job: 12037	Tested by: S.K.	
Client: Williamson	Logged by: G.R.	
Date: 25/07/2013	Checked:	
Location: Base of BH2	Date Checked:	
Scala No.: SP3	Ground Level (m):	1.25
Page: 3	Required Allowable kPa:	100





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Whangarei
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E: info@geocivil.co.nz

AUGERHOLE LOG AND TEST SHEET
N2GS December 2005

Lab Job No.:	8020-907
Client:	Cook Costello Ltd
Job:	Williamson Subdivision
Location:	Maunu
Augerhole No.:	BH3
Drilling Method:	Hand
Driller:	S.K.

REF: 12037
Report No.: 13-98
Logger: G.R
Date: 25/07/2013
Checked: *D*
Date: *8/8/13*
Page: 7 of 25

6H3
8020-907,CCL 12037, Williamson Subdivision, SH14 Whangarei, 5-8-13
7/08/2013 issue 2

✓
S.Kokich
Approved Signatory



Consulting Engineers

cook | costello

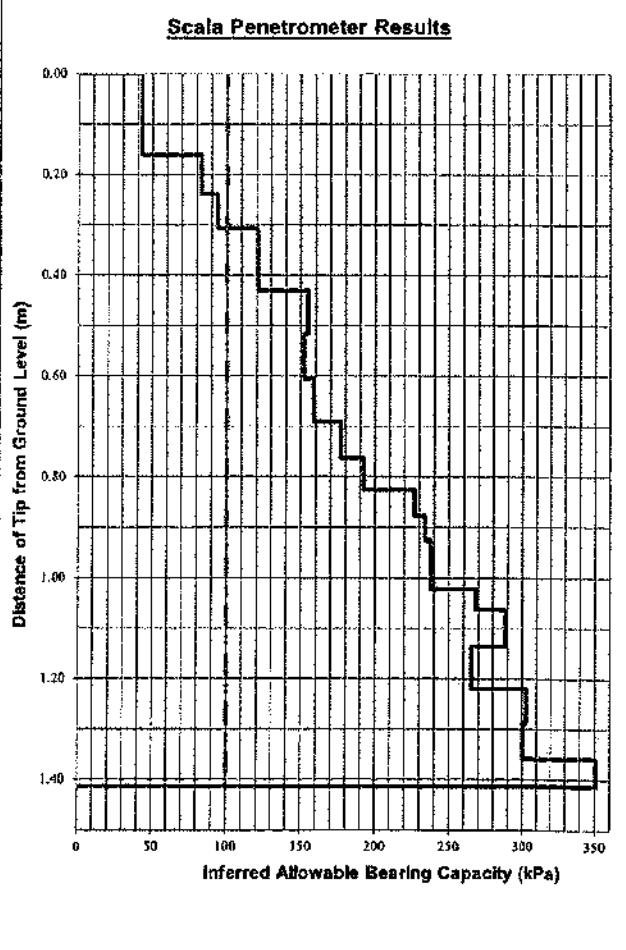
DYNAMIC CONE (SCALA) PENETROMETER

Test 23 / NZS 4402 : 1988 Test 6.5.2

Job: 12037 Tested by: S.K.
Client: Williamson Logged by: G.R.
Date: 25/07/2013 Checked:
Location: Next to BH3 Date Checked:
Scala No.: SP4 Ground Level (m):
Page: 4 Required Allowable kPa:

Norfolk House
2 Norfolk Street
Whangarei
P 64 9 4389529
F 64 9 4304282
E ccl@coco.co.nz

No. Blows	Tip to ref (cm)	Total Blows	mm / blow	kPa	depth (m)
0	115.0	0	0	0	0.0
2	99.3	2	81	43	0.16
2	91.5	4	38	83	0.24
2	84.7	6	34	94	0.31
5	72.4	11	25	121	0.43
5	53.7	16	17	155	0.62
5	54.8	21	16	152	0.61
5	46.4	26	17	159	0.69
5	39.2	34	14	177	0.76
5	32.8	38	13	193	0.83
5	27.7	41	10	227	0.88
5	22.8	46	10	234	0.93
10	13.2	56	10	238	1.02
0	112.8	56	0	238	1.02
5	108.7	51	6	268	1.06
10	101.3	71	7	285	1.14
10	93	81	8	268	1.22
10	86.1	91	7	303	1.29
10	79.1	101	7	300	1.36
10	73.6	111	6	351	1.41



Line is the suggested correlation of e (mm/blow) and Bearing Pressure after STOCKWELL REF: NZ ENGINEERING (32.6) 15 June 1977



2 Norduk Street
Whangarei
P: 09 438 4417
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DYNAMIC CONE (SCALA) PENETROMETER

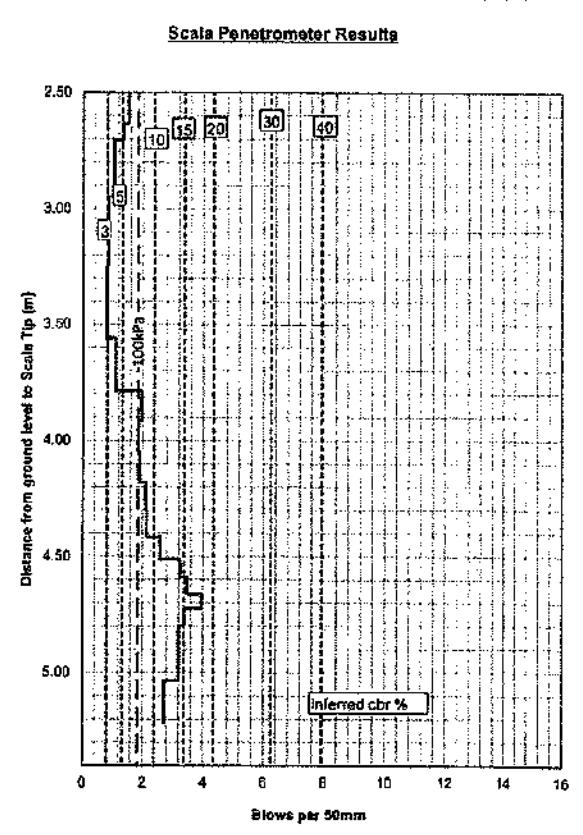
NZS 4402 :1988 Test 8.5.2

Lab Job No: 8020-907
Client: Cook Costello Ltd
Job: Williamson Subdivision
Location: Base of BH3
Start Depth (m): 2.5

Scale No: SPS
Ref: 12037
Report No: 13-98
Page: 9 of 25

The lines are the suggested correlation of CBR values based on Figure 5.3, Correlation of Dynamic Cone Penetration and CBR. Austroads (2004) 'Pavement Design - a guide to the design of road pavements'.

This comment is excluded from endorsement



Recorded By: S.K / G.R
Date: 25/07/2013
Checked by: D
Date: 25/07/2013

Note: All readings taken below 1.5m from start depth are outside the scope of this test

SP5
8020-507,CCL 12037,Williamson Subdivision,SH14 Whangarei,5-8-13
8/08/2013

issue 2


S. Kokich
Accredited Steeplechase



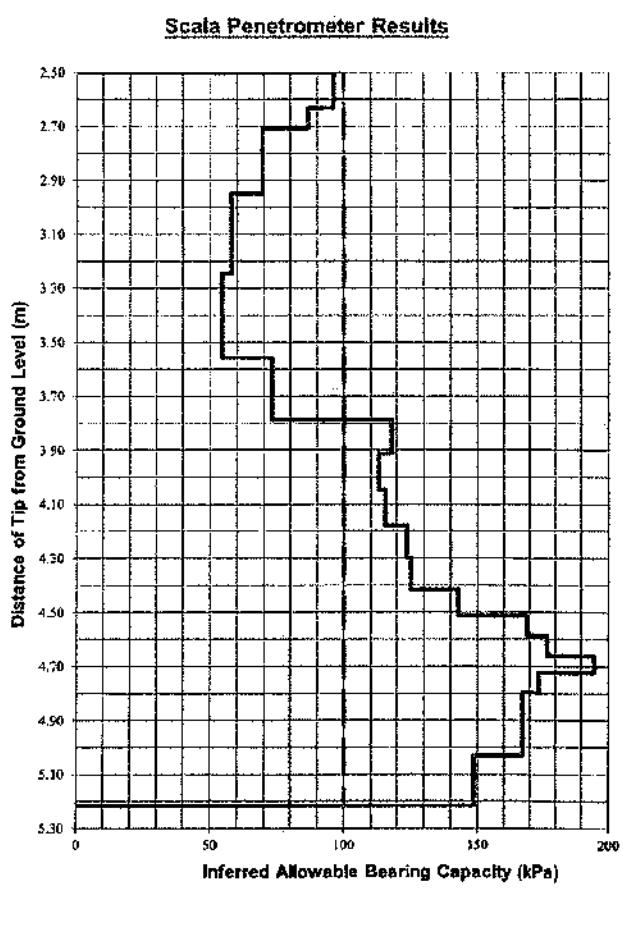
Consulting Engineers

cook | costello**DYNAMIC CONE (SCALA) PENETROMETER**

Test 23 / Nzs 4402 : 1988 Test 6.5.2

Job: 12037	Tested by: S.K.	
Client: Williamson	Logged by: G.R.	
Date: 25/07/2013	Checked:	
Location: Base of BH3	Date Checked:	
Scala No.: SP5	Ground Level (m):	2.5
Page: 5	Required Allowable kPa:	100

No.	Tip to Blows ref (cm)	Total Blows	mm / blow	kPa	depth (m)
0	60.4	0	0	0	2.5
2	73.8	2	33	96	2.57
2	67.2	4	33	96	2.63
2	59.8	6	37	87	2.71
5	35.5	11	49	70	2.95
5	6	16	59	56	3.24
0	110.6	16	6	58	3.24
5	79.2	21	63	55	3.56
5	66.4	26	46	73	3.78
3	43.7	31	26	118	3.91
5	30.2	36	27	113	4.05
5	17.1	41	26	116	4.18
5	5.2	46	24	124	4.30
0	94.2	48	0	124	4.30
5	82.5	51	23	125	4.42
5	72.8	56	18	143	4.51
5	65.1	61	15	169	4.59
5	57.9	66	14	177	4.65
5	51.6	71	13	195	4.72
5	44.2	76	15	174	4.80
5	36.4	81	16	167	4.88
10	20.8	91	16	167	5.03
10	2.4	101	18	149	5.22



Line is the suggested correlation of e (mm/blow) and Bearing Pressure after
STOCKWELL. REF: NZ ENGINEERING (32.6) 15 June 1977



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AUGERHOLE LOG AND TEST SHEET
NZG6 December 2005

Lab Job No.: 8020-907
Client: Cook Costello Ltd
Job: Williamson Subdivision
Location: Maunu
Augerhole No.: BH4
Drilling Method: Hand
Driller: S K

REF: 12037
Report No.: 13-98
Logger: G.R
Date: 25/07/2013
Checked: *8/8/13*
Date: *8/8/13*
Page: 10 of 25

Soil Description	Legend	Soil Symbol	Depth (m)	Water Level	Vane Shear Strength maximum/residual corrected kPa	Soil Sensitivity	Sample Number	Other Tests
TOPSOIL, some roots, moist, friable, highly plastic, dark brown,		OH	0					
			-					
		CH	-0.5		219/124	1.8		
			-					
			-1.0		191/55	3.5		
			-					
		CH	-1.5		141/21*	6.7		
			-					
			-2.0					
			-					
			-					
			-					
E.O.B too hard								
E.O.B			2.5					
Remarks:	* Inaccurate due to gravel					Topsoil	Sand	
						Fill	Gravel	
						Clay	Peat	
						Silt	Rock	

BH4
8020-907,CCL 12037,Williamson Subdivision,SH14 Whangarei,5-8-13
8/08/2013 issue 2


S. Kakich
Approved Signatory



DYNAMIC CONE (SCALA) PENETROMETER

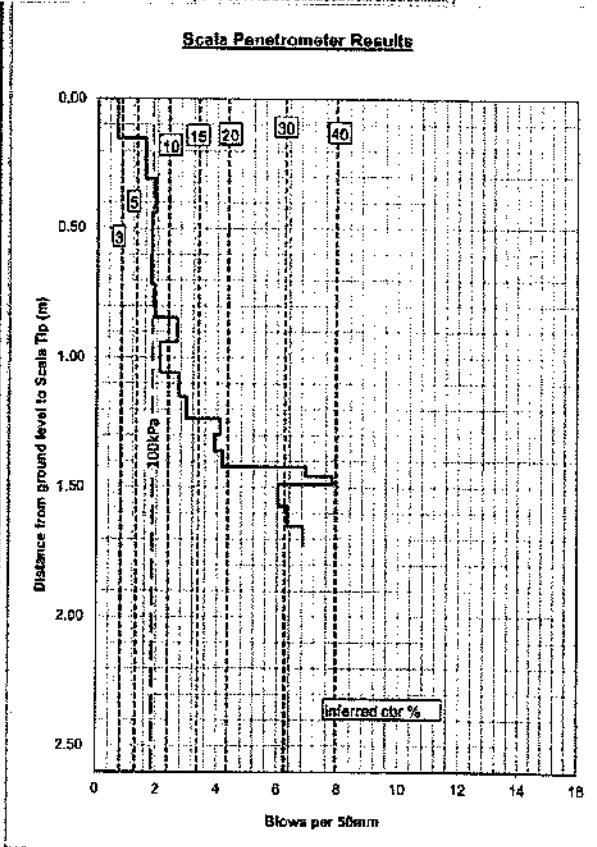
2 Norfolk Street
Whangarei
P: 09 438 4417
E: info@geocivit.co.nz

Lab Job No: 8020-807
Client: Cook Costello Ltd
Job: Williamson Subdivision
Location: Next to SH4
Start Depth (m): 0

Scala No: SP6
Ref: 12037
Report No: 13-98
Page: 11 of 25

The lines are the suggested correlation of CBR values based on Figure 5.3, Correlation of Dynamic Cone Penetration and CBR. AUSTRALIANS (2004) "Pavement Design - a guide to the design of road Pavements".
(This comment is excluded from endorsement 1)

No. Blows	Tip to ref (cm)	mm/ blow	blows / 50mm	Blows / 300mm	Total Blows	depth (m)
0	112.0	0	8	8	8	0.00
2	98.4	77	1	4	2	0.15
3	83.7	31	2	10	7	0.31
5	66.8	28	2	12	12	0.44
8	46	28	2	11	17	0.55
5	42.1	28	2	11	22	0.72
5	39.1	26	2	12	27	0.65
5	19.7	18	3	18	32	0.94
5	7.8	23	2	13	37	1.05
6	101.4	0	0	0	57	1.06
5	68.2	18	3	16	42	1.16
5	59.6	17	3	18	47	1.24
5	53.7	12	4	26	52	1.30
5	77.3	13	4	23	57	1.36
5	73.3	12	4	25	52	1.42
5	67.7	7	7	42	61	1.46
5	64.5	6	8	47	72	1.49
10	26.2	8	6	36	82	1.57
10	48.3	6	8	38	92	1.65
10	41	7	7	41	102	1.72



Recorded By: S.K / G.R
Date: 25/07/2013
Checked by: *D.P.K*
Date: *28/7/13*

Note: All readings taken below 1.5m from start depth are outside the scope of this test.

SP6
8020-907, CCL 12037, Williamson Subdivision, SH14 Whangarei, 5-8-13
8/08/2013

LESSON 7

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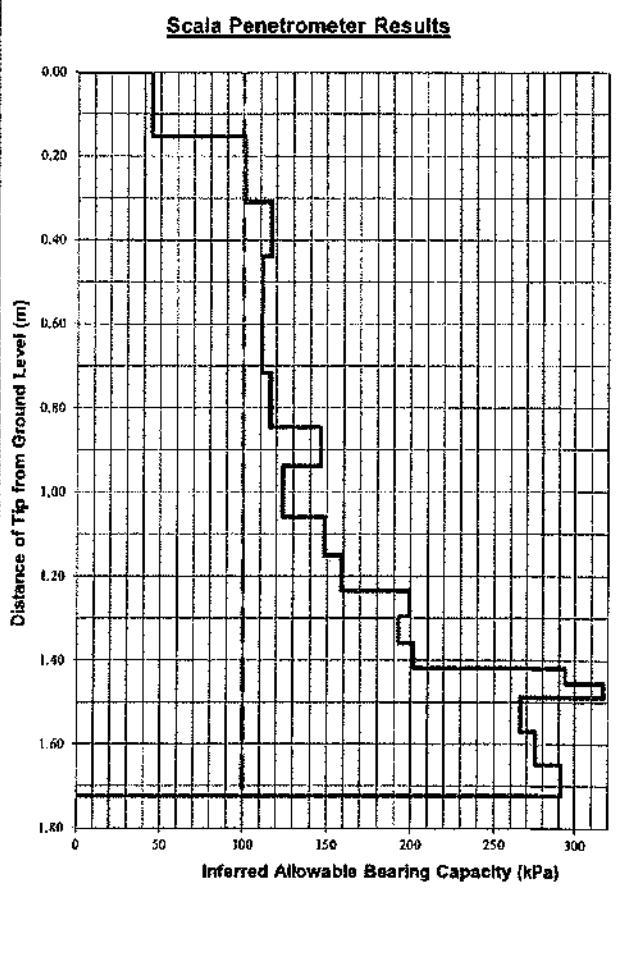
cook | costello

DYNAMIC CONE (SCALA) PENETROMETER

Test 23 / NZS 4402 : 1988 Test 6.5.2

Job: 12037	Tested by: S.K.	
Client: Williamson	Logged by: G.R.	
Date: 25/07/2013	Checked:	
Location: Next to BH4	Data Checked:	
Scala No.: SP6	Ground Level (m):	0
Page: 6	Required Allowable kPa:	100

No.	Tip to rel (cm)	Total Blows	mm / blow	kPa	depth (m)
0	113.7	0	0	0	0.0
2	98.4	2	77	45	0.15
5	82.7	7	31	101	0.31
6	69.8	12	28	117	0.44
5	58	17	28	111	0.58
5	42.1	22	28	111	0.72
5	29.1	27	26	116	0.85
5	15.7	32	19	146	0.94
5	7.8	37	24	124	1.06
0	107.4	37	0	124	1.06
5	98.2	42	18	149	1.15
5	83.8	47	17	159	1.24
5	83.7	52	12	159	1.30
5	77.3	57	13	183	1.36
5	71.3	62	12	202	1.42
5	67.7	67	7	294	1.46
5	64.5	72	6	317	1.49
10	56.2	82	8	266	1.57
10	48.3	92	8	275	1.65
10	41	102	7	281	1.72



Line is the suggested correlation of e (mm/blow) and Bearing Pressure after
STOCKWELL REF: NZ ENGINEERING (32.6) 15 June 1977



DYNAMIC CONE (SCALA) PENETROMETER

NZS 4402:1988 Test 6.5.2

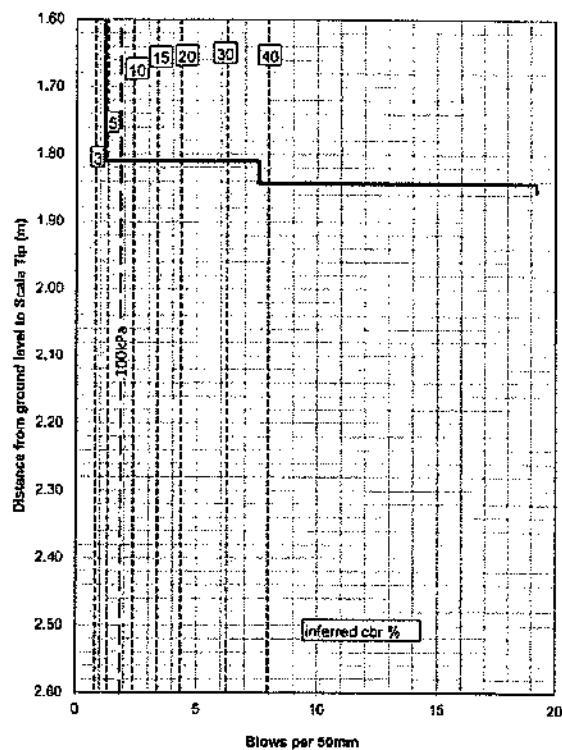
Lab Job No: 8020-907
Client: Cook Costello Ltd
Job: Williamson Subdivision
Location: Base of BH4
Start Depth (m): 1.6

Scale No: SP7
Ref: 12037
Report No: 13-08
Page: 12 of 25

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The lines are the suggested correlation of CBR values based on Figure 5.3, Correlation of Dynamic Cone Penetration and CBR. AUSTROADS (2004) "Pavement Design - a guide to the design of road Pavements".
(This comment is excluded from endorsement).

{ This comment is excluded from endorsement }



Recorded By: S.K / G.R
Date: 25/07/2013
Checked by: S / S / 3
Date:

Note: All readings taken below 1.5m from start depth are outside the scope of this test

SP7
8020-907,CCL 12037,Williamson Subdivision,SH14 Whangarei,5-8-13
8/08/2013 Issue

1630


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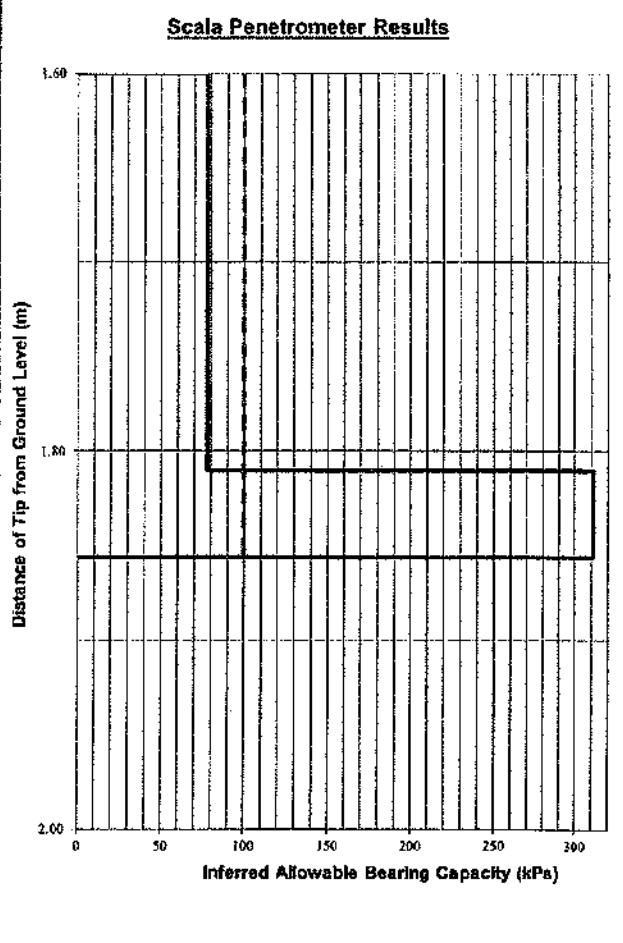
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E ccl@coco.co.nz

DYNAMIC CONE (SCALA) PENETROMETER

Test 23 / NZS 4402 : 1988 Test 6.5.2

Job: 12037 Tested by: S.K.
Client: Williamson Logged by: G.R.
Date: 26/07/2013 Checked:
Location: Base of BH4 Date Checked:
Sala No.: SP7 Ground Level (m):
Page: 7 Required Allowable kPa:



Line is the suggested correlation of c (mm/blow) and Bearing Pressure after STOCKWELL REF: NZ ENGINEERING (32.6) 15 June 1977



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AUGERHOLE LOG AND TEST SHEET

NZGS December 2005

Lab Job No.:	8020-907
Client:	Cook Costello Ltd
Job:	Williamson Subdivision
Location:	Maunu
Augerhole No.:	BH5
Drilling Method:	Hand
Driller:	S.K.

REF: 12037
Report No.: 13-88
Logger: G.R
Date: 25/07/88
Checked: *8*
Date: *8*
Page: 13 of 2

BHS
8020-907,CCL 12037,Williamson Subdivision,SH14 Whangarei,5-8-13
7/08/2013 Issue 2


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Approved Signatory



DYNAMIC CONE (SCALA) PENETROMETER
NZS 4402 :1988 Test 6.5.2

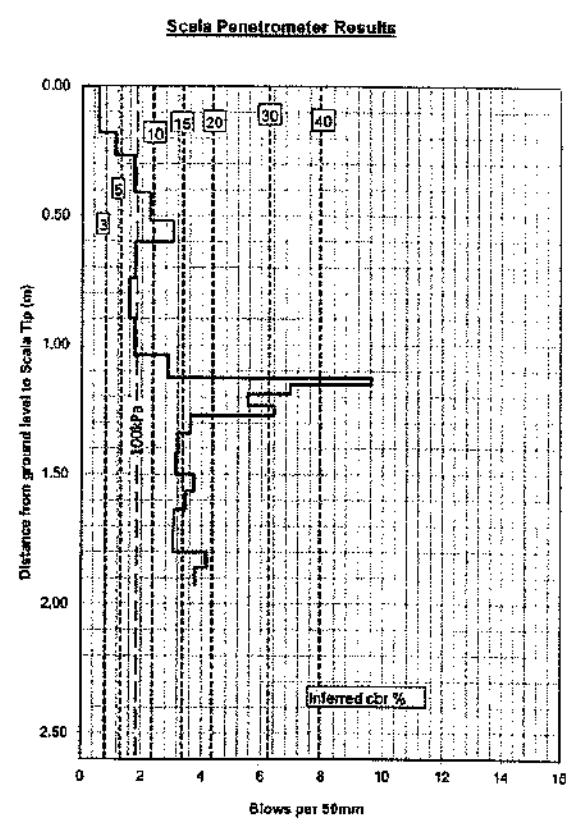
2 Norfolk Street
Whangarei
P: 09 438 4417
E: info@geocivil.co.nz

Lab Job No: 8020-807
Client: Cook Costello Ltd
Job: Williamson Subdivision
Location: Next to BHS
Start Depth (m): 0

Scal No: SP8
Ref : 12037
Report No: 13-88
Page: 14 of 25

The lines are the suggested correlation of CBR values based on Figures 5.3, Correlation of Dynamic Cone Penetrometer and CBR AUSTROADS (2004) "Pavement Design - a guide to the design of road Pavements".

(This comment is excluded from endorsement.)



Recorded By: S.K / G.F
Date: 25/07/20
Checked by: D.H
Date: 8/8/11

Note: All readings taken below 1.5m from start depth are outside the scope of this test.

SP8
8020-907,CCL 12037,Williamson Subdivision,SH14 Whangarei,5-8-13
8/08/2013

300000

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Approved Signature



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DYNAMIC CONE (SCALA) PENETROMETER

Test 23 / NZS 4402 : 1988 Test 6.5.2

Job: 12037

Tested by: S.K.

Client: Williamson

Logged by: G.R.

Date: 25/07/2013

Checked:

Location: Next to BHS

Date Checked:

Scala No.: SP8

Ground Level (m):

0

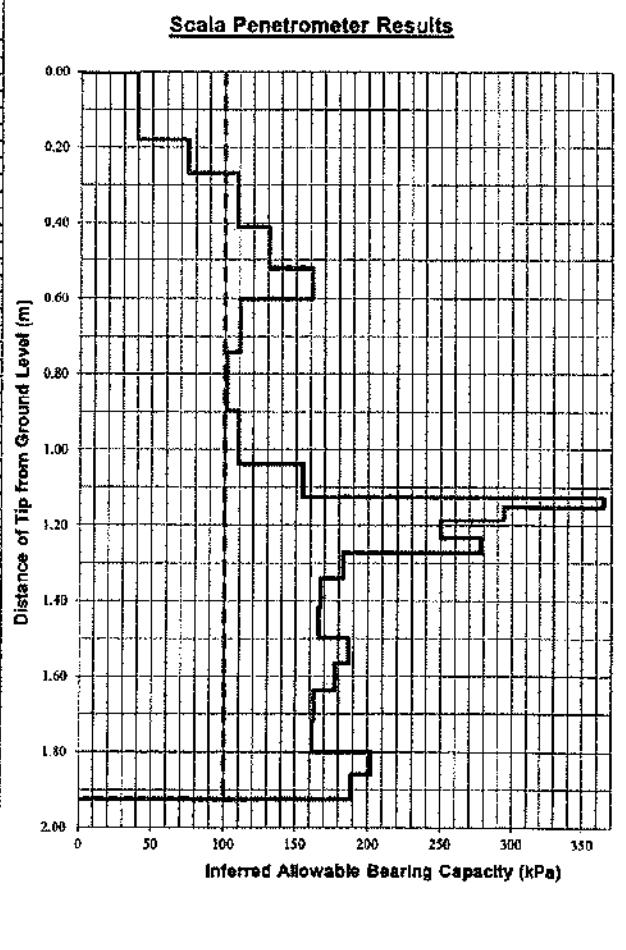
Page: 8

Required Allowable kPa:

100

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No.	Tip to ref (cm)	Total Blows	mm / blow	kPa	depth (m)
0	115	0	0	0	0.0
2	97.1	2	50	39	0.16
2	88.2	4	45	75	0.27
5	74	9	28	105	0.41
5	63	14	22	131	0.52
5	54.8	19	16	161	0.60
5	49.8	24	28	110	0.74
5	25.2	29	31	101	0.90
5	11.1	32	28	110	1.04
0	115.7	34	0	110	1.04
5	107	35	17	155	1.13
5	104.4	44	5	365	1.15
5	100.8	49	7	264	1.19
5	96.3	54	9	250	1.23
5	92.4	58	8	278	1.27
5	85.5	64	14	163	1.34
5	77.7	69	16	167	1.42
5	69.8	74	16	168	1.50
5	63.1	78	13	187	1.57
5	55.9	84	14	177	1.64
5	47.8	89	16	163	1.72
5	39.6	94	16	161	1.80
5	31.4	99	12	202	1.86
5	27	104	13	189	1.93



Line is the suggested correlation of e (mm/blow) and Bearing Pressure after STOCKWELL REF: NZ ENGINEERING (32.6) 15 June 1977



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DYNAMIC CONE (SCALA) PENETROMETER

NZS 4402 :1988 Test 6.5.2

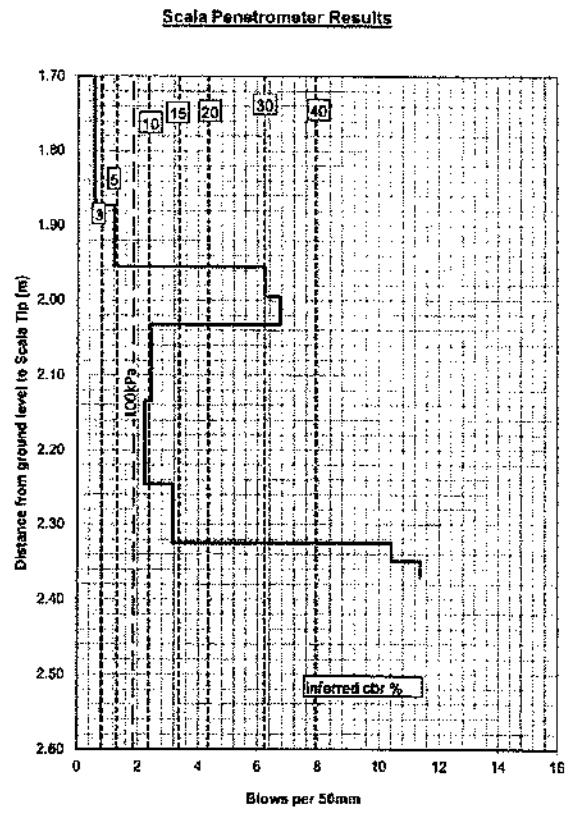
Lab Job No: 8020-907
Client: Cook Costello Ltd
Job: Williamson Subdivision
Location: Base of BH5
Start Depth (m): 1.7

Scal No: SP8
Ref: 12037
Report No: 13-98
Page: 15 of 26

The lines are the suggested correlation of CBR values based on Figure 5.3, Correlation of Dynamic Cone Penetration and CBR AUSTROADS (2004) "Pavement Design - a guide to the design of road Pavements"

(This comment is excluded from endorsement.)

No. Elevs	Tip to zaf (cm)	mm / blow	blows / 50mm	Blows / 300mm	Total Blows	depth (m)
0	53.7	0	0	0	0	1.70
2	36.4	67	1	3	2	1.82
2	26.2	41	1	7	4	3.85
5	24.2	8	5	38	9	2.00
5	20.5	7	2	41	14	2.03
5	10.3	20	2	15	19	2.13
0	115.1	0	0	0	19	2.15
5	103.9	22	2	13	24	2.24
5	98	18	3	19	29	2.33
5	93.8	5	10	82	34	2.35
5	61.4	4	11	68	39	2.37



Recorded By: S.K / G.R
Date: 25/07/2001
Checked by: D.P.
Date: 25/07/2001

Note: All readings taken below 1.5m from start depth are outside the scope of this test.

SP9
8020-907, CCL 12037, Williamson Subdivision, SH14 Whangarei, 5-8-13
8/08/2013

Lemma 1


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DYNAMIC CONE (SCALA) PENETROMETER

Test 23 / Nzs 4402 : 1988 Test 6.5.2

Job: 12037

Tested by: S.K.

Client: Williamson

Logged by: G.R.

Date: 25/07/2013

Checked:

Location: Base of BH5

Date Checked:

Scala No.: SP9

Ground Level (m):

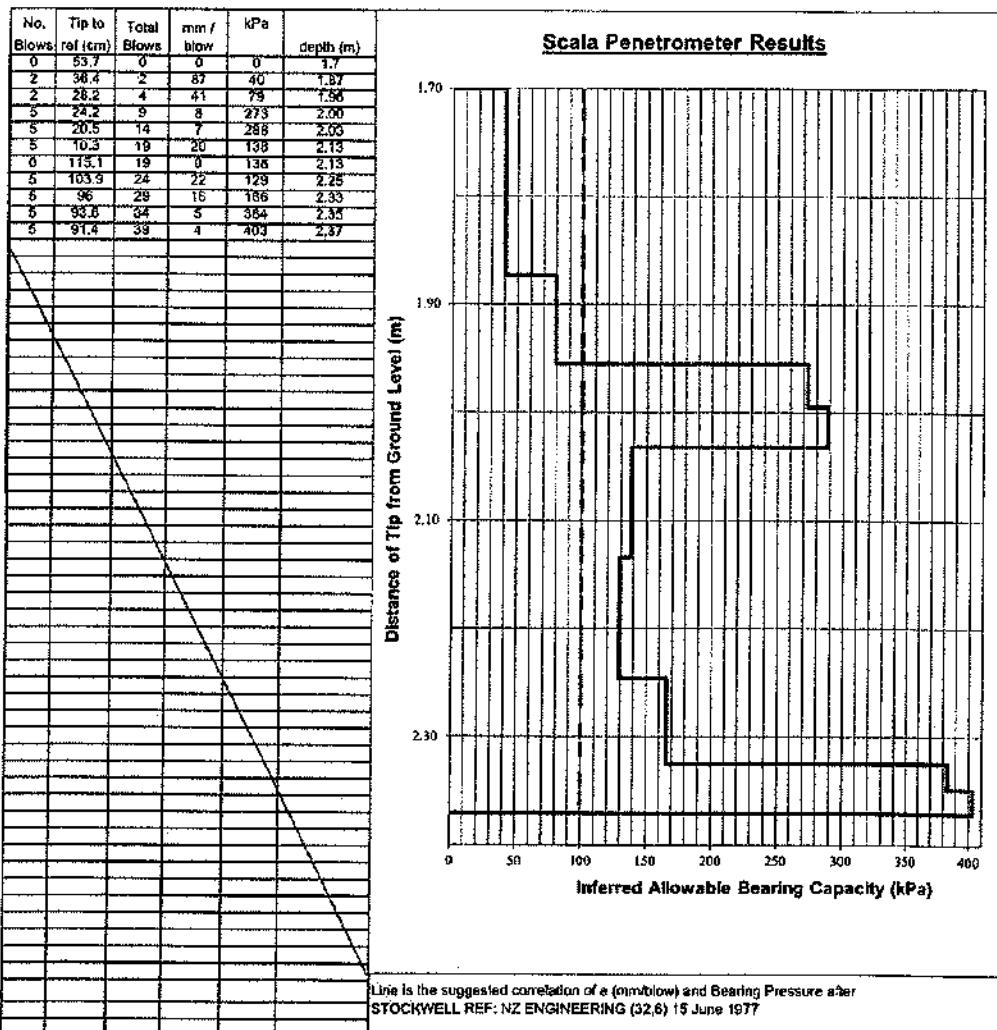
1.7

Page: 9

Required Allowable kPa:

100

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AUGERHOLE LOG AND TEST SHEET
NZGS December 2005

Lab Job No.: 8020-907
Client: Cook Costello Ltd
Job: Williamson Subdivision
Location: Maunu
Augerhole No.: BH6
Drilling Method: Hand
Driller: S.K

REF: 12037
Report No.: 13-58
Logger: G.R
Date: 25/07/2013
Checked: *S.K*
Date: 25/07/2013
Page: 16 of 25

Soil Description	Legend	Soil Symbol	Depth (m)	Water Level	Vane Shear Strength maximum/residual corrected kPa	Soil Sensitivity	Sample Number	Other Tests
TOPSOIL, some roots, moist, friable, highly plastic, dark brown,		OH	0					
Silty CLAY, moist, friable, highly plastic, orangey brown		CH	-					
Silty CLAY, minor weak gravel to 20mm, moist, friable, highly plastic, orangey brown with minor purple, hard		CH	-0.5		>248*			
Silty CLAY, moist, friable, highly plastic, orangey brown		CH	-					
E.O.B		CH	-0.9					
E.O.B								
Remarks: * Gravelly		Topsoil			Sand			
		Fill			Gravel			
		Clay			Peat			
		Silt			Rock			



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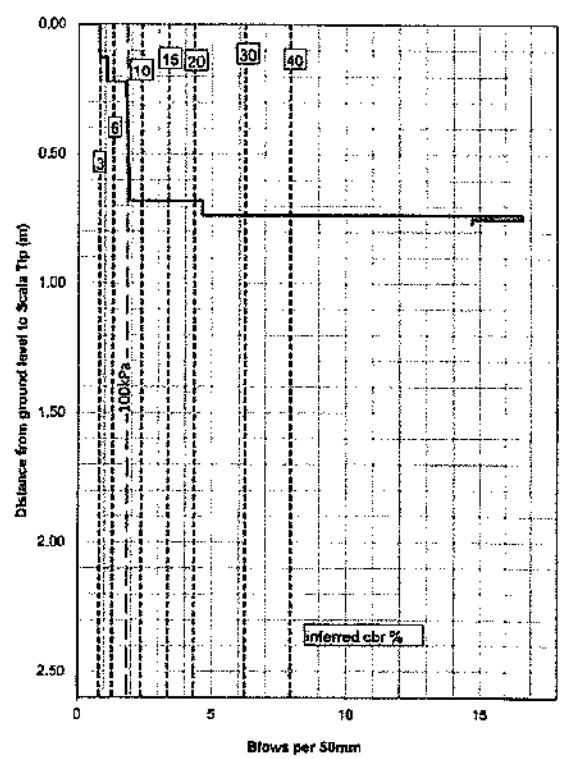
DYNAMIC CONE (SCALA) PENETROMETER

NZS 4402:1988 Test 6.5.2

Lab Job No: 8020-907
Client: Cook Costello Ltd
Job: Williamson Subdivision
Location: Next to BH6
Start Depth (m): 0

Scale No: SP10
Ref: 12037
Report No: 13-98
Page: 17 of 25

The lines are the suggested correlation of CBR values based on Figure 5.3, Correlation of Dynamic Cone Penetration and CBR. AUSTRALIA (2004) "Pavement Design - a guide to the design of road Pavements".
(This comment is excluded from endorsement)



Recorded By: S.K / G.R
Date: 25/07/2013
Checked by: *D.M.*
Date: 25/07/2013

Note: All readings taken below 1.5m from start depth are outside the scope of this test.

SP10
8020-907,CCL 12037,Williamson Subdivision,SH14 Whangerei,5-8-13
8/08/2013

3551c 2


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Approved Signatory



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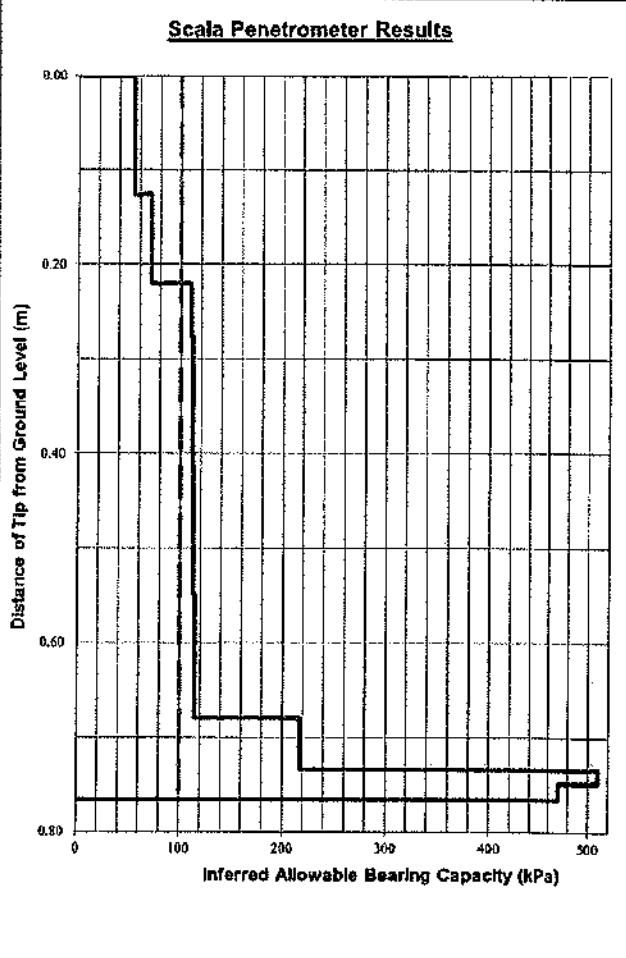
DYNAMIC CONE (SCALA) PENETROMETER

Test 23 / NZS 4402 : 1988 Test 6.5.2

Job: 12037 Tested by: S.K.
Client: Williamson Logged by: G.R.
Date: 25/07/2013 Checked:
Location: Next to BH6 Date Checked:
Secta No.: SP10 Ground Level (m): 0
Page: 10 Required Allowable kPa: 100

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No. Blows	Tip to ref (cm)	Total Blows	mm / blow	kPa	depth (m)
8	114.8	0	0	0	0.0
2	102.2	2	63	54	0.13
2	92.8	4	47	71	0.22
2	87.2	6	28	110	0.29
5	73.5	11	27	112	0.41
5	60	16	27	113	0.55
5	46.8	21	26	115	0.68
6	41.4	26	16	216	0.73
5	36.9	31	3	510	0.75
5	36.2	36	3	471	0.77



Line is the suggested correlation of a (mm/blow) and Bearing Pressure after STOCKWELL REF: NZ ENGINEERING (32.6) 15 June 1977



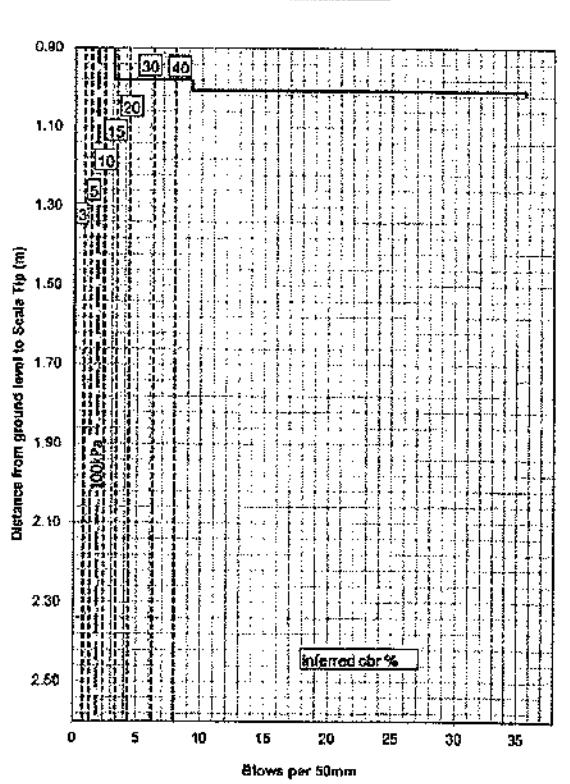
DYNAMIC CONE (SCALA) PENETROMETER

NZS 4402 :1988 Test 6.5.2

Lab Job No: 8020-807
Client: Cook Costello Ltd
Job: Williamson Subdivision
Location: Base of BH6
Start Depth (m): 0.9

Scala No: SP11
Ref: 12037
Report No: 13-98
Page: 18 of 25

2 Norfolk Street
Whangarei
P: 09 438 4417
E: info@geocivil.co.nz



Recorded By: S.K / G.R
Date: 25/07/2013
Checked by: *D. S. R. / 12/7*
Date:

Note: All readings taken below 1.5m from start depth are outside the scope of this test.

SP11
8020-907, CCL 12037, Williamson Subdivision, SH14 Whangarei, 5-8-13
8/08/2013 issue 2


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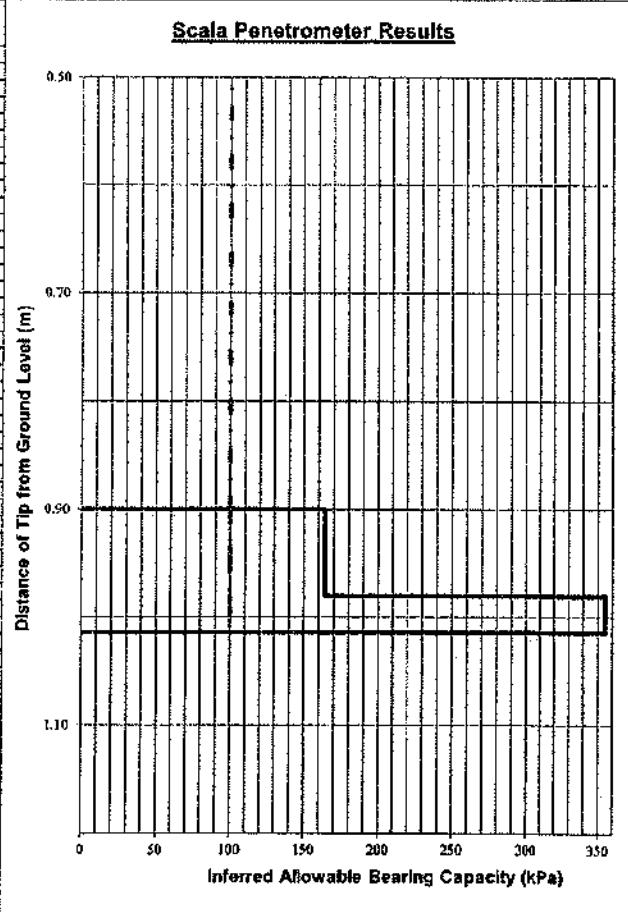
cook | costello

DYNAMIC CONE (SCALA) PENETROMETER

Test 23 / NZS 4402 : 1988 Test 6.5.2

Job: 12037 Tested by: S.K.
Client: Williamson Logged by: G.R.
Date: 25/07/2013 Checked:
Location: Base of BH6 Date Checked:
Sect No.: SP11 Ground Level (m): 0.9
Page: 11 Required Allowable kPa: 100

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Line is the suggested correlation of a (mm/blow) and Bearing Pressure after
STOCKWELL REF: NZ ENGINEERING (32,6) 15 June 1977



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P: 09 438 4417
E: info@geocivil.co.nz

AUGERHOLE LOG AND TEST SHEET
NZGS December 2005

Lab Job No.: B020-907
Client: Cook Costello Ltd
Job: Williamson Subdivision
Location: Maunu
Augerhole No.: BH7
Drilling Method: Hand
Driller: S.K

REF: 12037
Report No.: 13-98
Logger: G.R
Date: 25/07/2013
Checked: *✓*
Date: 8/8/13
Page: 19 of 25

BH7
8020-907,CCL 12037,Williamson Subdivision,SH14 Whangarei,5-8-13
8/08/2013 issue 2


S. Kokich
Approved Signatory



DYNAMIC CONE (SCALA) PENETROMETER
NZS 4402:1988 Test 6.5.2

2 Norfolk Street
Whangarei
P: 09 438 4417
E: info@geocivil.co.nz

Lab Job No: 8020-907
Client: Cook Costello Ltd
Job: Williamson Subdivision
Location: Next to BH7
Start Depth (m): 0

Scale No: SP12
Ref: 12037
Report No: 13-88
Page: 20 of 25

The boxes are the suggested correlation of CDR values based on Figure 5.3, Correlation of Dynamic Cone Penetration and CDR AUSTROADS (2004) "Pavement Design - a guide to the design of road Pavements"

{ This comment is excluded from endorsement }

No.	Tip to ref (cm)	mvf / Blow	Blows / 50mm	Blows / 300mm	Total Blows	depth (m)
0	111	0	0	0	0	0.00
2	97.0	65	5	2	0.13	
2	88.2	49	1	6	0.23	
2	78.5	50	1	5	0.33	
2	68.9	42	1	7	0.41	
2	52.8	34	1	5	0.58	
5	41.2	23	2	13	0.70	
5	32.5	19	3	17	0.79	
5	25.3	14	3	21	0.86	
5	19.3	12	4	25	0.92	
5	13.9	11	5	28	0.97	
0	103.7	0	0	0	0.98	
5	98.5	9	5	33	1.03	
5	94	9	6	33	1.04	
5	89.5	9	6	44	1.11	
5	83.4	8	8	38	1.15	
10	77.8	8	7	39	1.22	
10	70.7	7	7	42	1.30	
10	63.4	7	7	44	1.36	
10	57.5	8	6	49	1.42	
10	51.8	6	8	50	1.48	
10	45.9	6	8	51	1.54	
10	40.6	6	8	52	1.60	
10	35.3	6	8	53	1.66	
10	30.0	6	8	54	1.72	
10	24.7	6	8	55	1.78	
10	19.4	6	8	56	1.84	
10	14.1	6	8	57	1.90	
10	8.8	6	8	58	1.96	
10	3.5	6	8	59	2.02	
10	-1.3	6	8	60	2.08	
10	-6.6	6	8	61	2.14	
10	-11.3	6	8	62	2.20	
10	-16.0	6	8	63	2.26	
10	-20.7	6	8	64	2.32	
10	-25.4	6	8	65	2.38	
10	-30.1	6	8	66	2.44	
10	-34.8	6	8	67	2.50	
10	-39.5	6	8	68	2.56	
10	-44.2	6	8	69	2.62	
10	-48.9	6	8	70	2.68	
10	-53.6	6	8	71	2.74	
10	-58.3	6	8	72	2.80	
10	-63.0	6	8	73	2.86	
10	-67.7	6	8	74	2.92	
10	-72.4	6	8	75	2.98	
10	-77.1	6	8	76	3.04	
10	-81.8	6	8	77	3.10	
10	-86.5	6	8	78	3.16	
10	-91.2	6	8	79	3.22	
10	-95.9	6	8	80	3.28	
10	-100.6	6	8	81	3.34	
10	-105.3	6	8	82	3.40	
10	-110.0	6	8	83	3.46	
10	-114.7	6	8	84	3.52	
10	-119.4	6	8	85	3.58	
10	-124.1	6	8	86	3.64	
10	-128.8	6	8	87	3.70	
10	-133.5	6	8	88	3.76	
10	-138.2	6	8	89	3.82	
10	-142.9	6	8	90	3.88	
10	-147.6	6	8	91	3.94	
10	-152.3	6	8	92	4.00	
10	-157.0	6	8	93	4.06	
10	-161.7	6	8	94	4.12	
10	-166.4	6	8	95	4.18	
10	-171.1	6	8	96	4.24	
10	-175.8	6	8	97	4.30	
10	-180.5	6	8	98	4.36	
10	-185.2	6	8	99	4.42	
10	-189.9	6	8	100	4.48	
10	-194.6	6	8	101	4.54	
10	-199.3	6	8	102	4.60	
10	-204.0	6	8	103	4.66	
10	-208.7	6	8	104	4.72	
10	-213.4	6	8	105	4.78	
10	-218.1	6	8	106	4.84	
10	-222.8	6	8	107	4.90	
10	-227.5	6	8	108	4.96	
10	-232.2	6	8	109	5.02	
10	-236.9	6	8	110	5.08	
10	-241.6	6	8	111	5.14	
10	-246.3	6	8	112	5.20	
10	-251.0	6	8	113	5.26	
10	-255.7	6	8	114	5.32	
10	-260.4	6	8	115	5.38	
10	-265.1	6	8	116	5.44	
10	-269.8	6	8	117	5.50	
10	-274.5	6	8	118	5.56	
10	-279.2	6	8	119	5.62	
10	-283.9	6	8	120	5.68	
10	-288.6	6	8	121	5.74	
10	-293.3	6	8	122	5.80	
10	-298.0	6	8	123	5.86	
10	-302.7	6	8	124	5.92	
10	-307.4	6	8	125	5.98	
10	-312.1	6	8	126	6.04	
10	-316.8	6	8	127	6.10	
10	-321.5	6	8	128	6.16	
10	-326.2	6	8	129	6.22	
10	-330.9	6	8	130	6.28	
10	-335.6	6	8	131	6.34	
10	-340.3	6	8	132	6.40	
10	-345.0	6	8	133	6.46	
10	-349.7	6	8	134	6.52	
10	-354.4	6	8	135	6.58	
10	-359.1	6	8	136	6.64	
10	-363.8	6	8	137	6.70	
10	-368.5	6	8	138	6.76	
10	-373.2	6	8	139	6.82	
10	-377.9	6	8	140	6.88	
10	-382.6	6	8	141	6.94	
10	-387.3	6	8	142	7.00	
10	-392.0	6	8	143	7.06	
10	-396.7	6	8	144	7.12	
10	-401.4	6	8	145	7.18	
10	-406.1	6	8	146	7.24	
10	-410.8	6	8	147	7.30	
10	-415.5	6	8	148	7.36	
10	-420.2	6	8	149	7.42	
10	-424.9	6	8	150	7.48	
10	-429.6	6	8	151	7.54	
10	-434.3	6	8	152	7.60	
10	-439.0	6	8	153	7.66	
10	-443.7	6	8	154	7.72	
10	-448.4	6	8	155	7.78	
10	-453.1	6	8	156	7.84	
10	-457.8	6	8	157	7.90	
10	-462.5	6	8	158	7.96	
10	-467.2	6	8	159	8.02	
10	-471.9	6	8	160	8.08	
10	-476.6	6	8	161	8.14	
10	-481.3	6	8	162	8.20	
10	-486.0	6	8	163	8.26	
10	-490.7	6	8	164	8.32	
10	-495.4	6	8	165	8.38	
10	-500.1	6	8	166	8.44	
10	-504.8	6	8	167	8.50	
10	-509.5	6	8	168	8.56	
10	-514.2	6	8	169	8.62	
10	-518.9	6	8	170	8.68	
10	-523.6	6	8	171	8.74	
10	-528.3	6	8	172	8.80	
10	-533.0	6	8	173	8.86	
10	-537.7	6	8	174	8.92	
10	-542.4	6	8	175	8.98	
10	-547.1	6	8	176	9.04	
10	-551.8	6	8	177	9.10	
10	-556.5	6	8	178	9.16	
10	-561.2	6	8	179	9.22	
10	-565.9	6	8	180	9.28	
10	-570.6	6	8	181	9.34	
10	-575.3	6	8	182	9.40	
10	-579.0	6	8	183	9.46	
10	-583.7	6	8	184	9.52	
10	-588.4	6	8	185	9.58	
10	-593.1	6	8	186	9.64	
10	-597.8	6	8	187	9.70	
10	-602.5	6	8	188	9.76	
10	-607.2	6	8	189	9.82	
10	-611.9	6	8	190	9.88	
10	-616.6	6	8	191	9.94	
10	-621.3	6	8	192	1.00	
10	-626.0	6	8	193	1.06	
10	-630.7	6	8	194	1.12	
10	-635.4	6	8	195	1.18	
10	-640.1	6	8	196	1.24	
10	-644.8	6	8	197	1.30	
10	-649.5	6	8	198	1.36	
10	-654.2	6	8	199	1.42	
10	-658.9	6	8	200	1.48	
10	-663.6	6	8	201	1.54	
10	-668.3	6	8	202	1.60	
10	-673.0	6	8	203	1.66	
10	-677.7	6	8	204	1.72	
10	-682.4	6	8	205	1.78	
10	-687.1	6	8	206	1.84	
10	-691.8	6	8	207	1.90	
10	-696.5	6	8	208	1.96	
10	-701.2	6	8	209	2.02	
10	-705.9	6	8	210	2.08	
10	-710.6	6	8	211	2.14	
10	-715.3	6	8	212	2.20	
10	-719.0	6	8	213	2.26	
10	-723.7	6	8	214	2.32	
10	-728.4	6	8	215	2.38	
10	-733.1	6	8	216	2.44	
10	-737.8	6	8	217	2.50	
10	-742.5	6	8	218	2.56	
10	-747.2	6	8	219	2.62	
10	-751.9	6	8	220	2.68	
10	-756.6	6	8	221	2.74	
10	-761.3	6	8	222	2.80	



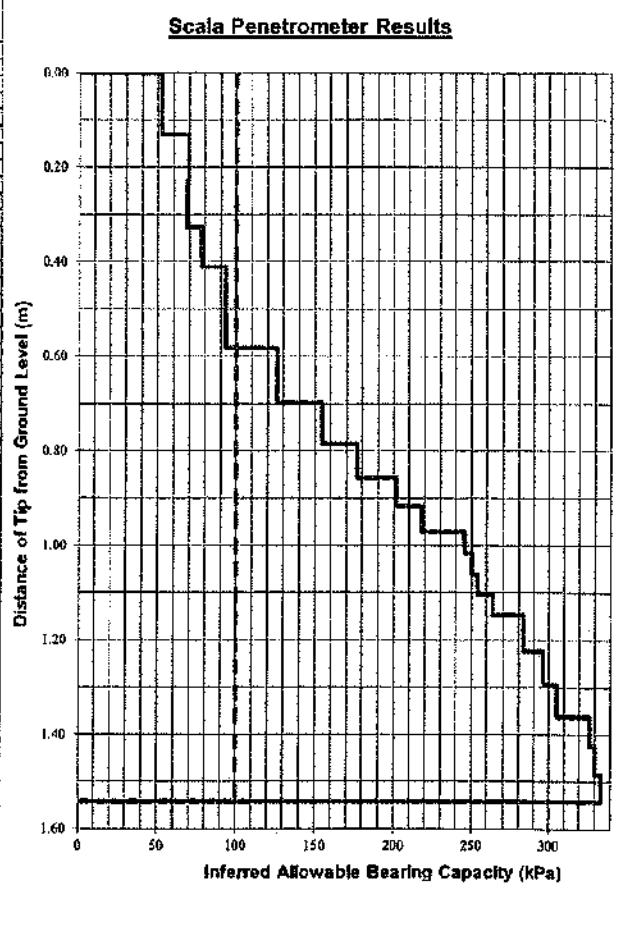
cook | costello

DYNAMIC CONE (SCALA) PENETROMETER

Test 23 / Nzs 4402 : 1988 Test 6.5.2

Job: 12037	Tested by: S.K.	
Client: Williamson	Logged by: G.R.	
Date: 25/07/2013	Checked:	
Location: Next to BH7	Date Checked:	
Scala No.: SP12	Ground Level (m):	0
Page: 12	Required Allowable kPa:	100

No.	Tip to ref (cm)	Total Blows	mm / blow	kPa	depth (m)
0	111	0	0	0	0.0
2	87.9	2	68	52	0.13
2	58.2	2	49	70	0.23
2	78.3	6	50	69	0.33
2	69.9	8	42	78	0.41
5	52.8	13	34	93	0.58
5	41.2	18	23	126	0.76
6	32.6	23	17	155	0.76
5	25.3	28	14	177	0.88
5	19.3	33	12	202	0.92
5	13.9	38	11	218	0.97
6	103.1	38	0	218	0.97
5	98.5	43	9	248	1.02
5	94	48	9	250	1.08
5	89.6	53	9	254	1.11
5	85.4	58	8	263	1.15
10	77.8	68	8	263	1.22
10	70.7	76	7	297	1.30
10	63.9	88	7	305	1.36
10	57.8	98	6	327	1.42
10	51.8	108	6	330	1.48
10	45.9	118	6	334	1.54



Line is the suggested correlation of e (mm/blow) and Bearing Pressure after
STOCKWELL REF: NZ ENGINEERING (32.6) 15 June 1977



DYNAMIC CONE (SCALA) PENETROMETER

NZS 4402 :1968 Test B.5.2

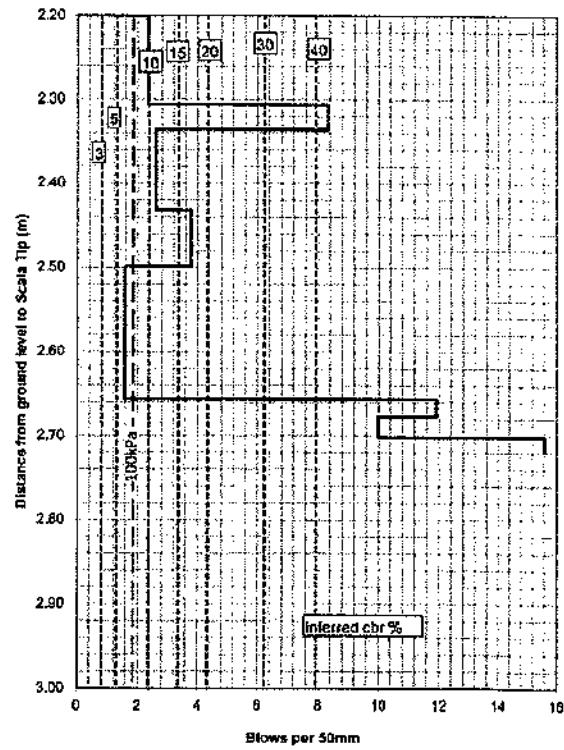
Lab Job No: 8020-907
Client: Cook Castello Ltd
Job: Williamson Subdivision
Location: Base of BH7
Start Depth (m): 2.2

Scal No: SP13
Ref: 12037
Report No: 13-98
Page: 21 of 25

The lines are the suggested correlation of CBR values based on Figure 5.3, Correlation of Dynamic Cone Penetration and CBR. AUSTROADS (2004) "Pavement Design - a guide to the design of road Pavements".
(This comment is excluded from endorsement).

This comment is excluded from endorsement.

Scala Penetrometer Results



Recorded By: S.K / G.R
Date: 25/07/2013
Checked by: *[Signature]*
Date: 28/07/2013

Note: All readings taken below 1.5m from start depth are outside the scope of this test.

SP13
802D-907,CCL 12037,Williamson Subdivision,SH14 Whangarei,5-8-13
8/08/2013 Issue 2

ISSUE 2


S. Kakich
Approved Executive



ରୋଗଶିଳ୍ପୀ ପ୍ରକାଶନ

cook | costello

DYNAMIC CONE (SCALA) PENETROMETER

Test 23 / NZS 4402 : 1988 Test 6.5.2

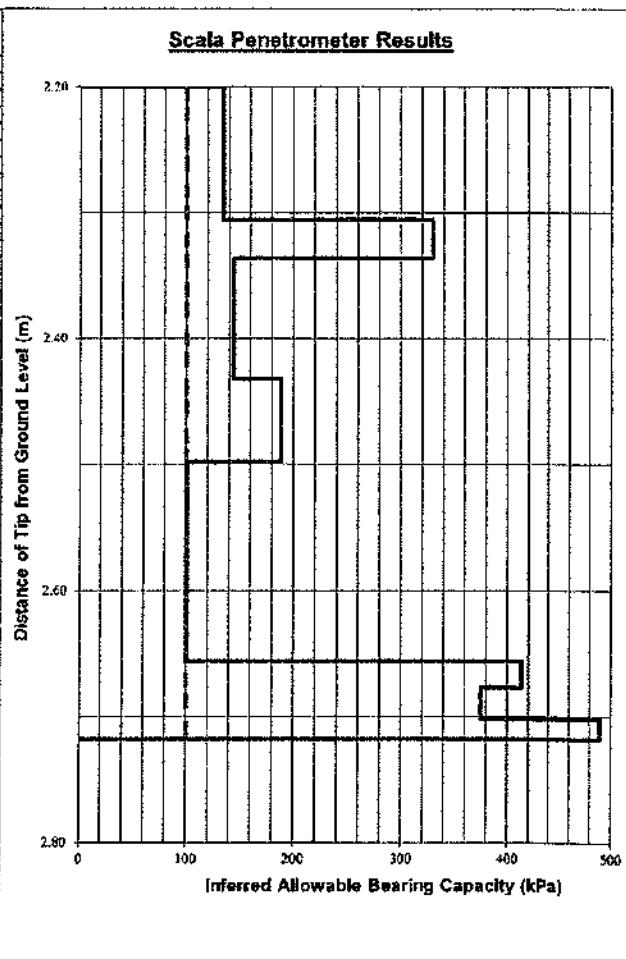
Job: 12037
Client: Williamson
Date: 25/07/2013
Location: Base of BHZ

ScalA No: SP13

Tested by: S.K.
Logged by: G.R.
Checked:
Date Checked:
Ground Level (m): 2.2
Required Allowable kPa: 100

Norfolk House
2 Norfolk Street
Whangarei
P 64 9 4389529
F 64 9 4304282
E ccl@coco.co.nz

No. Blows	Tip to ref (cm)	Total Blows	mm / blow	kPa	depth (m)
0	84	0	0	0	2.2
5	73.4	5	21	134	2.31
5	70.4	10	6	330	2.34
5	60.8	15	19	144	2.43
5	54.2	20	13	189	2.50
5	36.4	25	32	100	2.56
5	36.3	30	4	414	2.59
6	33.8	35	6	375	2.70
5	32.2	40	3	480	2.72



Line is the suggested correlation of e (mm/blow) and Bearing Pressure after STOCKWELL. REF: NZ ENGINEERING (32,6) 15 June 1977



2 Norfolk Street
Whangarei
P: 09 438 4417
E: info@geocivil.co.nz

AUGERHOLE LOG AND TEST SHEET
NZGS December 2005

Lab Job No.: 8020-907
Client: Cook Costello Ltd
Job: Williamson Subdivision
Location: Maunu
Augerhole No.: BH8
Drilling Method: Hand
Driller: S.K

REF: 12037
Report No.: 13-98
Logger: G.R
Date: 25/07/2013
Checked: *D. Kokich*
Date: 8/8/13
Page: 22 of 25

Soil Description	Legend	Soil Symbol	Depth (m)	Water Level	Vane Shear Strength maximum/residual corrected kPa	Soil Sensitivity	Sample Number	Other Tests																
TOPSOIL, some roots, moist, friable, highly plastic, dark brown,		OH	0																					
Silty CLAY, moist friable highly plastic, orangey brown, very stiff to hard, moderately sensitive		CH	-0.5		205/60	3.4																		
		CH	-1.0		173/71	2.4																		
		CH	-1.5		205/71	2.9																		
Very Silty CLAY, traces sand/gravel, moist, friable, highly plastic orangey brown, stiff to very stiff, moderately sensitive		CH	-2.0		129/50	2.6																		
E.O.B			2.5		95/35	2.7																		
Remarks:																								
<table border="1"> <tr> <td>Topsoil</td> <td></td> <td>Sand</td> <td></td> </tr> <tr> <td>Fill</td> <td></td> <td>Gravel</td> <td></td> </tr> <tr> <td>Clay</td> <td></td> <td>Peat</td> <td></td> </tr> <tr> <td>Silt</td> <td></td> <td>Rock</td> <td></td> </tr> </table>									Topsoil		Sand		Fill		Gravel		Clay		Peat		Silt		Rock	
Topsoil		Sand																						
Fill		Gravel																						
Clay		Peat																						
Silt		Rock																						



DYNAMIC CONE (SCALA) PENETROMETER
NZS 4402:1988 Test 6.5.2

2 Norfolk Street
Whangarei
P: 09 438 4417
E: info@geocivil.co.nz

Lab Job No: 8020-907
Client: Cook Costello Ltd
Job: Williamson Subdivision
Location: Next to BH0
Start Depth (m): 0

Scale No: SP14
Ref: 12037
Report No: 13-96
Page: 23 of 25

The fines aid the suggested correlation of CBR values based on Figure 5.3, Correlation of Dynamic Cone Penetration and CBR. AUSTRROADS (2004) "Pavement Design - a guide to the design of road pavements".

(This comment is excluded from endorsement.)

No.	Tip ID	mm / blow	Blows / 50mm	Blows / 300mm	Total Blows	depth (m)
0	115	0	0	0	0	0.00
1	103.6	57	1	5	2	0.11
2	85.8	39	1	5	4	0.19
3	85.7	36	1	8	6	0.26
4	73.5	30	2	18	11	0.42
5	62	23	2	13	16	0.55
6	52	20	3	15	21	0.63
7	43.5	17	3	18	26	0.72
8	33.8	15	3	19	31	0.79
9	28.8	14	4	21	36	0.86
10	22.9	12	4	25	41	0.92
11	17.4	11	5	27	48	0.98
12	12.7	9	5	32	51	1.03
13	117.4	0	0	0	53	1.05
14	112.2	10	5	35	59	1.08
15	108	6	6	38	61	1.12
16	103.6	6	6	39	65	1.16
17	95.1	5	6	34	76	1.25
18	88.2	7	7	43	86	1.32
19	51.9	6	8	48	88	1.38
20	78	6	8	51	100	1.44
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cook | costello

DYNAMIC CONE (SCALA) PENETROMETER

Test 23 / NZS 4402 : 1988 Test 6.5.2

Job: 12037

Client: Williamson

Date: 25/07/2013

Date: 25/07/2013

Location: Next to

File No.: SP-

Tested by: S.K.

Logged by: G.R

Checked ✓

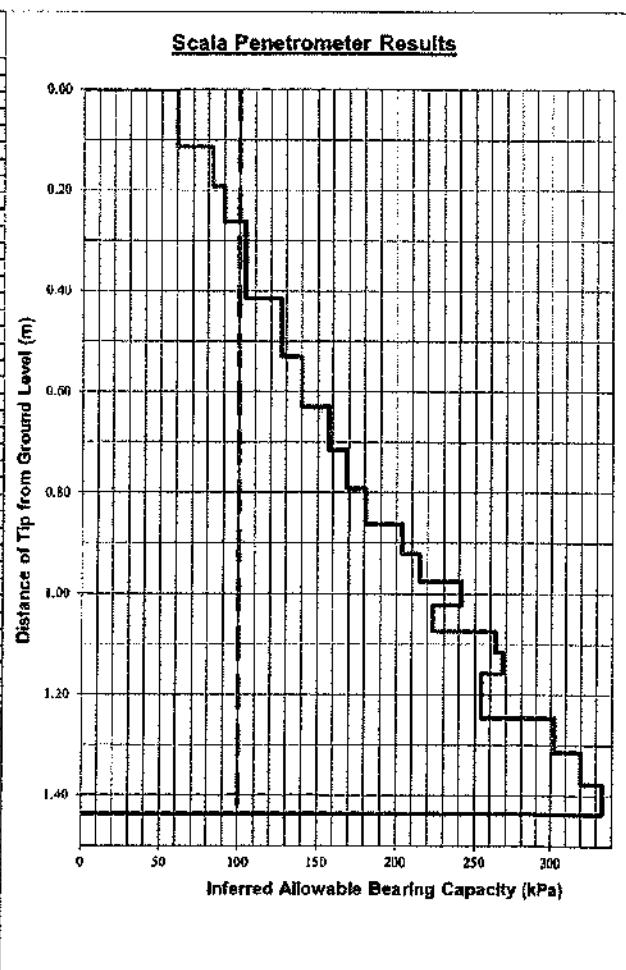
Checked.

Date Checked:

1

100

No. Blows	Tip to ref (cm)	Total Blows	mm / blow	kPa	depth (m)
0	115	0	0	0	0.0
2	103.6	2	57	60	0.11
2	88.8	4	39	83	0.18
2	88.7	6	38	90	0.26
5	73.5	11	30	104	0.42
5	62	16	23	127	0.53
5	52	21	26	140	0.63
5	43.5	26	17	157	0.72
5	33.6	31	15	169	0.79
5	28.6	36	14	181	0.86
5	22.9	41	12	204	0.92
5	17.4	46	11	215	0.98
5	12.7	51	9	242	1.02
0	137.4	51	0	242	1.02
5	112.2	56	10	224	1.08
5	108	51	8	263	1.12
5	103.9	46	8	268	1.16
10	85.1	76	9	264	1.25
10	88.2	86	7	303	1.32
10	81.8	96	6	320	1.38
10	76	106	6	334	1.44



Line is the suggested correlation of e (mm/blow) and Bearing Pressure after STOCKWELL REF: NZ ENGINEERING (32.6) 15 June 1977



DYNAMIC CONE (SCALA) PENETROMETER

NZS 4492 :1988 Test 6.5.2

2 Norfolk Street
Whangarei
P: 09 438 4417
E: info@geocivil.co.nz

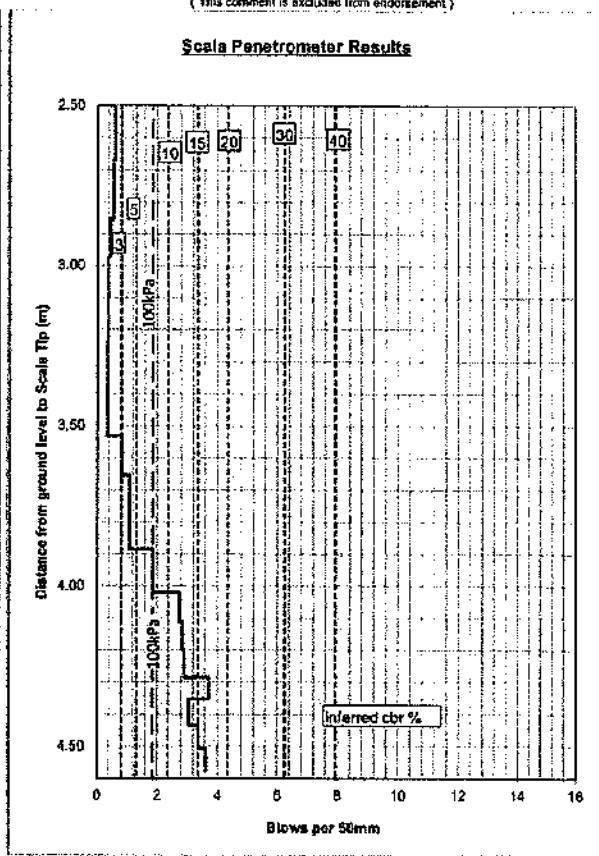
Lab Job No: 8020-907
Client: Cook Costello Ltd
Job: Williamson Subdivision
Location: Base of BH8
Start Depth (m): 2.5

Scale No: SP15
Ref: 12037
Report No: 13-98
Page: 24 of 25

The lines are the suggested correlation of CBR values based on Figure 5.3, Correlation of Dynamic Cone Penetration and CBR. AUSTROADS (2004) "Pavement Design - a guide to the design of road pavements".
(This comment is excluded from endorsement.)

THE CONVENTION TO ENFORCE INTERNATIONAL

No. Blows	Tip to soil (cm)	mm / blow	blows / 50mm	Blows / 300mm	Total Blows	depth (m)
0	53.8	6	0	0	0	2.50
2	36.8	5	1	4	2	2.67
2	18.3	5	3	3	4	2.56
1	6.7	115	0	3	5	2.97
0	52.4	6	0	0	5	2.07
2	55.4	135	0	2	7	3.24
2	38.3	146	0	2	9	3.03
2	24.1	61	1	5	11	3.83
5	26	3	5	16	36	3.68
0	106.5	0	0	0	16	3.89
5	83	27	2	11	21	4.02
5	65.0	18	3	16	26	4.11
5	75.1	18	3	17	31	4.20
5	66.5	17	3	17	36	4.29
5	58.5	13	4	22	41	4.35
5	51.8	16	3	18	46	4.43
5	44.2	15	3	20	51	4.51
5	37.3	14	4	22	56	4.58



Recorded By: S.K/G.R
Date: 25/07/2013
Checked by: *D.V.G.*
Date: 8/8/13

Note: All readings taken below 1.5m from start depth are outside the scope of this test.

SP15
8020-907,CCL 12037,Williamson Subdivision,SH14 Whangarei,5-8-13
9/08/2013 issue 2

issue 2

S. Kokich
Approved Elmerian



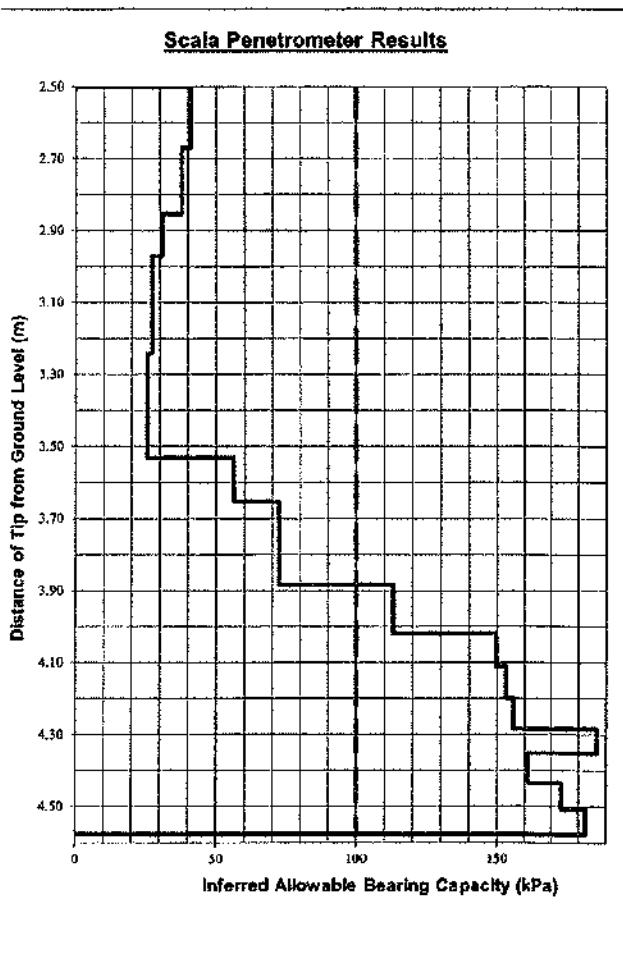
consulting engineers

cook | costello**DYNAMIC CONE (SCALA) PENETROMETER**

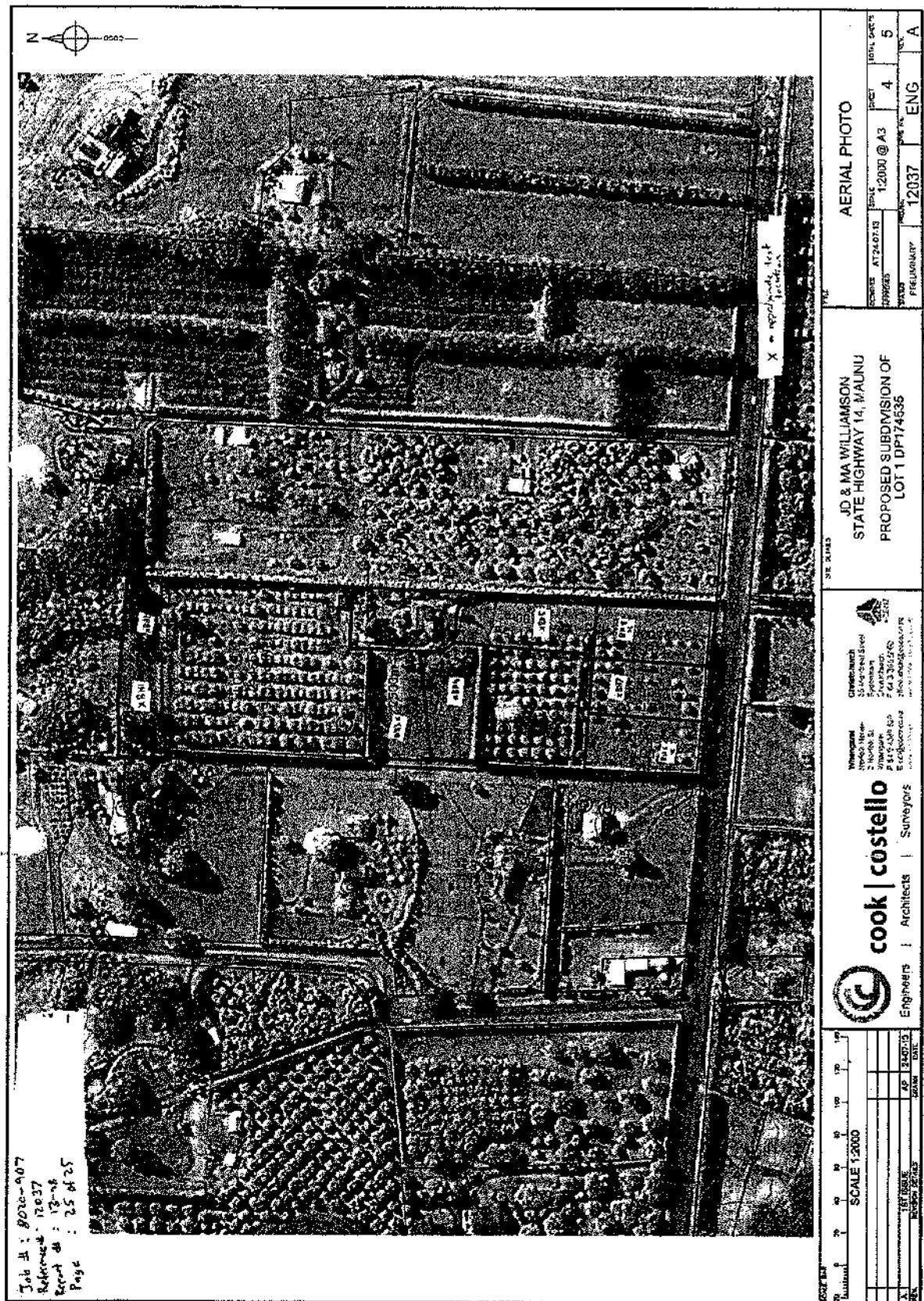
Test 23 / NZS 4402 : 1988 Test 6.5.2

Job: 12037	Tested by: S.K.	
Client: Williamson	Logged by: G.R.	
Date: 26/07/2013	Checked:	
Location: Base of BHE	Date Checked:	
Scale No.: SP15	Ground Level (m):	2.5
Page: 15	Required Allowable kPa:	100

No.	Tip to ref (cm)	Total Blows	mm / blow	kPa	depth (m)
0	53.6	0	0	0	2.5
2	38.9	2	65	41	2.67
2	78.3	4	93	38	2.86
1	6.7	5	116	31	2.97
0	92.4	5	0	31	2.97
2	65.4	7	136	27	3.24
2	38.3	9	146	26	3.53
2	24.1	11	61	56	3.65
5	1	16	46	72	3.89
0	106.5	16	0	72	3.89
6	93	21	27	113	4.02
5	83.9	26	18	150	4.11
5	75.1	31	18	153	4.20
5	68.5	38	17	155	4.29
5	55.8	41	13	187	4.35
5	51.0	46	16	161	4.43
5	44.2	51	15	174	4.51
5	37.3	66	14	183	4.58



Line is the suggested correlation of a (mm/blow) and Bearing Pressure after
STOCKWELL REF: NZ ENGINEERING (32.6) 15 June 1977



J.D. and M.A. Williamson
626 Maunu Road (SH14), Maunu



16. APPENDIX 3: ON-SITE WASTEWATER FORM EES-SEW1

WHANGAREI DISTRICT COUNCIL

Forum North · Private Bag 8023 · Whangarei 0148 · New Zealand
 Telephone (09) 439 4200 · 0800 WDC INFO · 0800 932 463 · Facsimile (09) 438 7632
 Website <http://www.wdc.govt.nz> · E-mail mailroom@wdc.govt.nz



Creating the ultimate living environment

Form EES-SEW1**On-Site Wastewater Disposal Investigation/Site Evaluation Checklist for Resource Consent Application**

This form is to be read in conjunction with AS/NZS 1547:2000 (or any amendments as applicable), and, in particular with Part 4: Means of Compliance

Part A - Contact Details**1 applicant**

Name J. D. and M. A. Williamson

Property Address State Highway 14, Maunu

Lot/DP Number LOT 1, DP174535 - Proposed Lots 2-8

2 Consultant/Site Evaluator

Site Evaluator
Name

Aaron Parker

Company Name

Cook Castello Ltd

Postal Address

2 Norfolk St, Whangarei 0110

Business Phone 09 4389529

Fax

Mobile _____ Email aaronp@coco.co.nz

IQP Registered²⁵ (See note 1 below)

Yes No If no, details of suitably registered IQP who will countersign the report are to be supplied below

Name of IQP who is Countersigning
Report

Adrian Tonks

Company Name

Cook Castello Ltd

Postal Address

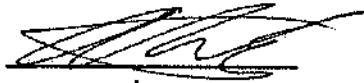
2 Norfolk St, Whangarei 0110

Business Phone 09 4389529

Fax

Mobile 021 891 401

Email Adrian@coco.co.nz


IQP024
20/8/2013

²⁵ It is a requirement that the Evaluator be IQP registered to carry out on-site effluent investigations/designs. If not, then evaluation/design will need to be counter-signed by a suitably registered IQP

Part B - Site and Soil Evaluation**1 Desk Study**

Requirements (✓ appropriate box)

Please complete all options. (If more than one option applies to land under consideration, please clarify with supporting information)

WDC Requirement	Applies to Lot(s)	Comments
1 Hazard maps/GIS hazard layer - stability		
<input checked="" type="checkbox"/> Low instability risk	All Lots	
<input type="checkbox"/> Medium instability risk		
<input type="checkbox"/> High instability risk		
2 GIS hazard layer - effluent on slope stability		
<input type="checkbox"/> Low disposal potential		
<input checked="" type="checkbox"/> Moderate disposal potential	All Lots	
<input type="checkbox"/> High disposal potential		
3 GIS hazard layer - effluent suitability		
<input checked="" type="checkbox"/> Medium unsuitability	All Lots	
<input type="checkbox"/> High unsuitability		
4 GIS hazard layer - flood susceptibility		
<input type="checkbox"/> Is flood susceptible		
<input type="checkbox"/> Is partially flood susceptible		
<input checked="" type="checkbox"/> Is not flood susceptible	All Lots	
5 GIS land resources layer - streams		
Are there streams on or adjacent to land under investigation?	<input checked="" type="checkbox"/> Yes	Lot 8 120m north of Lot 8
	<input type="checkbox"/> No	
6 GIS land resources layer - aquifers at risk		
Is land situated over or adjacent to aquifer?	<input checked="" type="checkbox"/> Yes	All Lots No water tables encountered during field investigations
	<input type="checkbox"/> No	
7 Annual rainfall (HIRDS)		
	1585 mm / Yr WRENZ	

Important Note

It is to be noted that all information obtained off WDC GIS/Hazard Maps is to be taken as a guide only.

All information obtained from the above sites is to be confirmed by a specific site investigation as localised conditions could vary substantially. However, should the above data checks indicate the potential for a hazard/non-complying activity etc, this must be further investigated to confirm/deny the indicated situation.

2 On-Site Evaluation**a Determination of Soil Category (refer table 4.1.1 AS/NZS 1547:2000) (✓ appropriate box)**

Soil Category	Structure	Applies to lot(s)	Comments
1 Gravels & Sands	<input type="checkbox"/> Structureless (massive)		
2 Sandy loams	<input type="checkbox"/> Weakly Structured		
	<input type="checkbox"/> Massive		
3 Loams	<input type="checkbox"/> High/Moderate structured		
	<input type="checkbox"/> Weakly structured or Massive		
4 Clay loams	<input checked="" type="checkbox"/> High/moderate structured	<i>Lots 2-7</i>	<i>Refers to suitability report & Bore logs.</i>
	<input type="checkbox"/> Weakly structured		
	<input type="checkbox"/> Massive		
5 Light days	<input checked="" type="checkbox"/> Strongly structured	<i>Lot 8</i>	<i>Used this category as the lot is shaded.</i>
	<input type="checkbox"/> Moderately structured		
	<input type="checkbox"/> Weakly structured or massive		
6 Medium to heavy days	<input type="checkbox"/> Strongly structured		
	<input type="checkbox"/> Moderately structured		
	<input type="checkbox"/> Weakly structured or massive		

Notes

Refer 4.1 A4 – Soil Assessment AS/NZS 1547:2000 for assessment criteria.

Details of the method used to determine soil type etc are to be clearly stated, along with positions of boreholes/test pits etc clearly marked on a site plan. Bore logs are to be provided. Photos should be included.

The site plan should also clearly show the intended area for effluent disposal, along with any site features such as drains, water bores, overland flows etc, along with separation distance achieved.

On-Site Evaluation Continued

b Site Characteristics for Proposed Disposal Area: (if there is a marked difference between sites, please fill in a separate form for each site and clearly note which site the assessment applies to) (✓ appropriate box)

Details	Applies to Site/s
---------	-------------------

1 Flooding potential to proposed field and reserve field (refer note 1 below)

<input checked="" type="checkbox"/> Fields will not flood, or	All Lots
---	----------

Fields will flood in:

<input type="checkbox"/> 20% AEP event	
<input type="checkbox"/> 5% AEP event	
<input type="checkbox"/> 1% AEP event	

2 Surface water separation to proposed field and reserve field (refer note 2 below)

<input checked="" type="checkbox"/> Main/reserve disposal field comply with NRC rules	All Lots
<input type="checkbox"/> Main/reserve disposal field do not comply with NRC rules	

3 Winter ground water separation to proposed field and reserve field (refer note 3 below)

<input checked="" type="checkbox"/> Main and reserve disposal field comply with NRC rules	All Lots
<input type="checkbox"/> Main and reserve disposal field do NOT comply with NRC rules	

4 Slope of ground of proposed field and reserve field (refer note 4 below)

Description Lot 1-6 & Lot 8 = $P-2^\circ$, Lot 7 = $10^\circ - 15^\circ$

5 Shape of ground of proposed field and reserve field (refer note 5 below)

<input type="checkbox"/> Waxing divergent	<input checked="" type="checkbox"/> Linear divergent Lot 7	<input type="checkbox"/> Waning divergent
<input type="checkbox"/> Waxing planar	<input checked="" type="checkbox"/> Linear planar Lots 1-6 & 8	<input type="checkbox"/> Waning planar
<input type="checkbox"/> Waxing convergent	<input type="checkbox"/> Linear convergent	<input type="checkbox"/> Waning convergent

Comments

6 Intended water supply source	Applies to Site/s
<input type="checkbox"/> Public supply	
<input checked="" type="checkbox"/> Rainwater	All Lots
<input type="checkbox"/> Bore	

7 Proposed method of disposal and recommended Daily Loading rate (DLR) (refer note 6 below)

Description Lots 1-3 by Drip Irrigation @ 3.5mm/day

Lots 5-6 by Conventional Trough or LPED @ 3.0mm/day

Lot 7 by Drip Irrigation @ 2.8mm/day ($\frac{2}{3}$) & 1.75mm/day ($\frac{1}{3}$).

Lot 8 by conventional Bed @ 5.0mm/day

Peak Loading factored in? (refer note 6 below) Yes No Comments Residential

8 Site Exposure (refer note 7 below)	Description	Applies to Site/s
Site/s aspect	North	All Lots

Note // Lot 8
Corner.

shaded in North East

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Pre-dominant wind direction		
Presence of shelter belts	East & Part of West	All lots
Presence of topographical features or structures		

9 Proximity of water bores. (include adjacent properties). (refer note 9 below)

80m (from Lot 8) to East
100m (from Lot 2) to West

10 Visible evidence of slips/instability (refer note 8 below)

No

11 Total suitable area available for type of effluent disposal proposed (including reserve area)

In excess of the required areas as shown in the suitability report.

12 Setback areas proposed (if any) (refer note 10 below)

Building min. 3m, Property Boundaries min 1.5m, Water bodies min 2m if primary treated & otherwise 1.5m.

Notes

- If the WDC hazard maps/GIS indicate a flooding susceptibility on the site being evaluated, an on-site evaluation is to be carried out to determine the effects from 20%, 5% and 1% AEP storm events. This evaluation is to include all calculations to substantiate conclusions drawn. If necessary, include a detailed contour plan and photos.
- NRC Water & Soil plan defines surface water as 'All water, flowing or not, above the ground. It includes water in continually or intermittently flowing rivers, artificial watercourses, lakes and wetlands, and water impounded by structures such as dams or weirs but does not include water while in pipes, tanks, cisterns, nor water within the Coastal Marine Area'. By this definition, separation (complying with NRC rules) is to be maintained by both the proposed disposal and reserve areas from any overland flowpaths and/or swale drains etc or R/C will be required from NRC. Surface water is to be clearly marked on each site plan, showing the extent of a 1% AEP storm event, and detailing separation distances to main/reserve disposal areas.
- Positions of test borehole/s to be shown, and bore logs to be provided. Separation (complying with NRC rules) is to be maintained by both the proposed disposal and reserve areas from winter ground water level or R/C will be required from NRC. If the investigation is done outside of the winter period, allowance is to be made in determining the likely winter level.
- Slopes of ground are to be compared with those recommended maximums for type of system proposed (refer Appendix 4.2B AS/NZS 1547:2000). Designs exceeding those maximums will require specific design to justify the proposal, and may also need Resource Consent from NRC.
- Shape of ground is important as it will determine whether there is potential for concentrated overland flows from the upper slopes and also if effluent might be concentrated at base of slope if leaching occurs. Refer Figure 4.182 AS/NZS 1547:2000.
- The proposed system (for residential developments) should be sized to accommodate an average 3 bedroom house with 5 people. Sites in holiday areas need to take peak loading into effect in determining daily volumes. The design must state what DLR was used to determine area necessary (including reserve area). If ground conditions are marginal for type of disposal proposed, then a soil permeability test utilising the constant head method is to be carried out across the proposed disposal area. Refer Appendix 4.1F AS/NZS 1547:2000.
- The site aspect is important as a north-facing site that is not sheltered from wind and sun by shelterbelts or other topographical features or structures will perform far better than a south-facing site on the lee of a hill that is shaded from wind and sun etc
- If any effluent disposal area (including any reserve area) proposed has or is adjacent to areas that show signs of instability, then a full report from a CPEng (Geotech) will be required to justify the viability of the area for effluent disposal.
- If there are any water bores on the subject property or adjacent properties then a site plan will be required showing bore positions in relation to any proposed effluent field(s).
- If setback areas are proposed to mitigate effects, the extent and position/s need to be shown on a site plan.

17. APPENDIX 4: SUITABLE PLANT SPECIES FOR ETS

KEY:

HEIGHT	DURABILITY
1. Around 1 metre or lower	A. Very hardy
2. Around 2 metres	B. Hardy
3. Above 3 metres	C. Soft

Trees - General

Should preferably be evergreens although some deciduous trees offer very good transpiration, e.g.

Elms, 3A
American Oaks, 3A
Birch, 3A
Shrubby Pussy Willow, Bitter Willow 3A
Hydrangea, 2A
Catalpa, 3B

Fringe Trees

KawaKawa, 3A
Geniostoma, 3A
Hibiscus (various indigenous and exotic), 1-2B
Catalpa, 3B
Karaka, 3A
Pukatea (for very wet conditions), 3A
Kohekohe, 3A
Puka (Meryta), 3B
Puriri, 3A
Makomako, 3A
Lemonwood (Pittosporus), 3A
Parapara, 3C

(Shelter at least for initial establishment may be very important)

Plants and Evergreens

Canna, 1B
Taro, 1C
Aralias, 1-2B
Rhubarb, 1A
Rock Lily (Arthropodium), 1B
Rangiora, 2A
Fuchsia, 2A
Philodendrons (large range), 1C
Flax (Phormium tenax), 2A
Agapanthus, 1B
Kaka Beak (Clitandrus), 1-2A
Swan Plant, 2-3A
Gunneras (larger varieties), 1-2A
Geraniums (large range), 1A

Begonias (large range of species), 1C
-very useful as an underplant in sheltered places

Grasses

Paspalum (will tolerate extreme wet and dry)
Poa species
Crested Dogs Tail (Cynosurus cristatus)
Yorkshire Fog (if fairly regularly wet)
Canary Reed Grass (Phalaris Arundinacea)

Ground Covers

Mercury Bay Weed (Dichondra) could be useful on light soils
Yellow clovers (or pseudo clovers) - good where extra wet



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Contaminated Land Management Preliminary Site Investigation Report

For J.D. and M.A. Williamson



cook | costello

5 September 2013

Project Number: 12037

Location: 626 Maunu Road (S.H.14), Maunu.

Proposed subdivision of Lot 1 DP 174535

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Table 1: Potential Hazardous Activity or industry List and Findings5

Report Checklist

Summary contaminated sites report checklist					
Indicates the reports contained in this document					
Report section(s) and information to be presented	SGI	ENR	RAN	SVN	Man
Executive summary	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Scope of work	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Site identification	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Site history	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Site condition and surrounding environment	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Geology and hydrology	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sampling and analysis plan and sampling methodology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Field quality assurance and quality control (QA/QC)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Laboratory QA/QC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
QA/QC data evaluation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Basis for guideline values	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Results	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Site characterisation	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Remedial actions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Validation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Site management plan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ongoing site monitoring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Conclusions and recommendations	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1. EXECUTIVE SUMMARY

The proposed 8 lot subdivision (refer to Appendix 5) at 626 Maunu Road (S.H.14), Maunu has necessitated a site contamination assessment under the National Environmental Standard Regulation 2011 due to orchard and sheep farming activities taking place at the site. The associated activities of orchard operations and sheep farming may lead to potentially hazardous land contamination.

The scope considered by this report is to ascertain from site history whether activities from the Hazardous Activities and Industries List (HAIL Oct 2011) have occurred on site, to assess the likelihood of soil contamination from these activities and if present to assess risk to human health.

From the preliminary site investigation it is considered that through management techniques it is highly unlikely that the proposed new land use will pose a risk to human health.

2. SCOPE OF WORK

The scope of work is a Primary Site Investigation to ascertain whether it is more likely than not that an activity or industry described in HAIL is being or has been undertaken on the site. This is undertaken through desktop study, interview and site walkover. In the event that HAIL activities have been undertaken the likelihood, location and extent of contaminants of concern and potential risk to human health shall be assessed and further investigation be identified.

3. SITE IDENTIFICATION

The property is located on the northern side of State Highway 14, Maunu 150m east of the intersection of State Highway 14 and Golf Harbour Drive. The property is approximately 500m east of Sherwood Park Golf Club. The legal description of the lot to be subdivided is Lot 1 DP 174535 and totals 4.0260ha.

The site is in a tidy and general well-manicured condition. The property has been used for growing avocados and grazing a small number of sheep over the past 10 years. The current occupier of the existing residence operates dog boarding kennels (on a small scale) to the north of the existing dwelling.

From the aerial photo records (refer to Appendix 1) it appears that the property was used for grazing between 1940 and 2005. The small shearing shed in the north of the property was built between 1942 and 1961.

No areas of staining or plant stress that may indicate contamination were observed.

4. SITE HISTORY

The property has not changed ownership in the past 29 years. A site history has been established by talking to the present land owner, Mr John Williamson. He has completed the pre-lodgement questionnaire (refer to Appendix 2) and the Cook Costello site specific questionnaire below:

Cook Costello Site Specific Questionnaire

1. How did you treat your sheep for flystrike, worms, footrot, etc?
Any sheep that have any of those ailments are treated individually: Flystrike the animal has the affected area shorn and then has flystrike dressing (Maggio) applied to the affected area: Worm is hand drenched with a propriety product and any footrot just has the affected foot trimmed.
2. Did you spray or dip sheep on site and if so where?
We do not spray or dip sheep on site and have not in the 27 years we have owned the property.
3. Was the woolshed area used as a spray race?
During the time we have owned the property the woolshed has not been used as a spray race.
4. What was the barrel by the shed used for?



The drum has been in the same place since we have owned the place. It may have been used to collect or store rainwater as it was on a stand.

5. Where did you store, fill and washout agrichemicals?
We have used very few agrichemicals. Roundup is regularly used as a herbicide and the knapsack sprayer is filled and cleaned on the metalled area next to the dog kennels. We occasionally have sprayed the avocados using an airblast sprayer on the tractor hydraulics. We have only used a mixture of copper and excel oil as a fungi treatment, applied at low rates and sprayed directly on to the trees. It was applied as Kocide at recommended rates (250gram/100 litres) and sprayed at 150 litres per ha direct to the trees using the airblast sprayer. The excel oil is primarily a spreader for the spray but does have a very mild insecticide effect. We have not done this for three years and there is highly unlikely to be any soil residual. Filling and cleaning the sprayer has been done on the metalled area beside the dog kennels and this area will not be a residential building site.
6. Did you store bulk fertiliser (if so how and where - nitrogen and potassium and commonly used of Avocados, so is treating with iron and/or zinc)?
Bulk fertiliser is not stored on the property. Fertiliser is bought as required in 40kg bags and applied soon after purchase. The avocado mix is NPK of 12.5:14 and applied at about 400 grams per tree twice a year directly to the base of the tree. We have approximately 260 trees. We also occasionally broadcast, using a spreader towed behind the quad bike, approximately 80kg of urea (NPK 42.0:0) to the 1.5 ha of grass on the property.
7. Did you store bulk pesticides (if so how and where)?
We don't use pesticides.

8. Were fertilisers or sprays applied through the irrigation system?
We don't apply fertiliser or sprays through the irrigation system.
9. Does the site receive sprays from neighbouring farms or does the shelter belt stop that?
We do not receive sprays from neighbours and our shelter prevents any drift from us to them.
10. Any other information that may help identify any risk to human health.
Overall we have had a very low chemical input system over the 27 years we have owned the property. We believe that it is highly unlikely to be any soil residual or containments that could risk human health.

From the questionnaires Mr Williamson has confirmed that no persistent chemicals have been used on the property over that period. Copper and Excel Oil insecticides have been used to treat the avocados. A normal fertilisation program has been carried out to assist the health and production of the avocados. He was not aware, nor saw evidence of, any hazardous activities occurring on the site prior purchasing the property.

According to the product data sheets for excel oils the main hazard is in the application and one should avoid skin and eye contact and avoid breathing spray mist. The product is rapidly biodegradable. Biodegradation is possible within 90-120 days in aerobic environments at temperatures above 21 degrees C.

The application rates of copper, urea, nitrogen and potassium used on this site is not likely to present a risk to human health. Filling and cleaning the sprayer has been done in a controlled manner on the metalled area north of the dog kennels beside the shed that will remain in proposed Lot 6. Due to the products used, the low volume and time since and between application, it is unlikely that this area would present a risk to human health. This area will not be a residential building site and as it is access to the existing shed it is unlikely to be used for production of produce for human consumption.

Roundup (Glyphosate) has a United States Environmental Protection Agency (EPA) Toxicity Class of III for oral and inhalation exposure. Thus, the EPA requires that products containing glyphosate carry a label that warns against oral intake, mandates the use of protective clothing, and instructs users not to re-enter treated fields for at least 4 hours. Glyphosate does not bioaccumulate in animals. It is excreted in urine and faeces. It breaks down variably quickly depending on the particular environment and therefore is considered a low risk to human health.

Nitrogen and potassium are necessary to produce large high quality fruit. A balanced fertilizer is generally used after trees begin to bear fruit to provide the needed nitrogen and potassium. Avocados trees also need to be treated for iron and zinc deficiencies occasionally – but not in this case.

These findings have been summarised on the table below:

Activity or Industry	Hazardous Substances	Interview Response	Inspection & Desktop Study
Agrichemicals filling, storing or washing out tanks for agrichemical application.	Arsenic, lead, copper, organochlorine pesticides, organophosphate pesticides, herbicides, fungicides, carbamates, and synthetic pyrethroids	Williamson: Occasional direct spraying of copper and excel oil. Filling and washing of spray pack on gravel in front of existing shed on proposed lot 6.	No evidence observed or indicated
Fertiliser bulk storage	Calcium phosphate, calcium sulphate, copper chloride, sulphur, sulphuric acid, molybdenum, selenium, boron, cadmium, nitrates, ammonia	Williamson: Fertiliser mix 12.5:14 and applied directly to the base of the trees, twice a year. Grass was fertilised with Urea.	No evidence observed or indicated
Livestock dip or spray race operations	Arsenic, organochlorines and organophosphates, carbamates, and synthetic pyrethroids.	Williamson: activity not undertaken	No suspected dip site identified. Spray race operation were potentially undertaken near small stockyards and woolshed, but not undertaken in the past 27 years.
Persistent pesticide bulk storage or use	Arsenic, lead, copper, mercury, organochlorines and organophosphates, carbamates, and synthetic pyrethroids	Williamson: activity not undertaken	No evidence observed or indicated
Bulk storage of petroleum or petrochemicals above or below ground	Hydrocarbons, including BTEX, PAHs, solvents, lead	Williamson: activity not undertaken	No above or below ground fuel storage tank observed
Storage tanks or drums for fuel, chemicals or liquid waste	Wide range of chemicals, biological hazards	Williamson: activity not undertaken	No evidence observed or indicated
Any land that has been subject to the migration of hazardous substances from adjacent land in sufficient quantity that it could be a risk to human health or the environment			No significant hazardous activities adjacent or upstream of the site
Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment			No evidence observed or indicated

Table 1: Potential Hazardous Activity or Industry List and Findings

Historic aerial photographs from 1942 have been attached and this confirms the time of the above statements and shows that the land was used for grazing between 1942 and 2005 with very little change in land use evident over that time.

5. SITE CONDITION AND SURROUNDING ENVIRONMENT

Surrounding Environment

The property boundary is located in a well-established horticulture production area. Refer to the aerial photo below.



Many of the surrounding properties are actively producing and selling produce for human consumption (predominantly avocados and citrus). Refer to the surrounding site photos below.

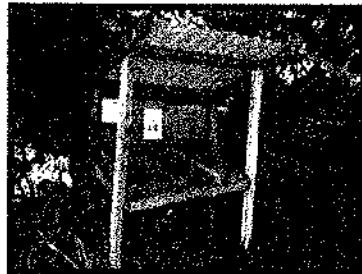
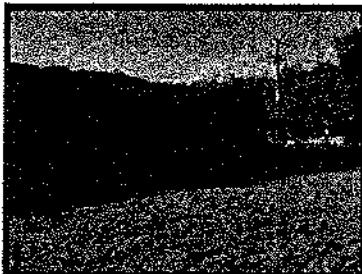


Photo taken of typical on site sales stall.



Photo taken of an orchard across Maunu Road of recently pruned Avocado trees.



Stone walls and shelter belts are common on site and in the surrounding area.



The adjacent properties to the west are small lifestyle blocks that are currently used predominantly to graze sheep.



Photo taken of neighbours grazing paddock just west of the site.



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The adjacent property to the east has recently been an orchard but is currently not used to the same scale. The sales building is now used for selling books.



Photo taken of the existing shed on adjacent property to the east.



Photo taken from the eastern boundary of the site through a gap in the shelter belt looking south-east across the adjacent property.

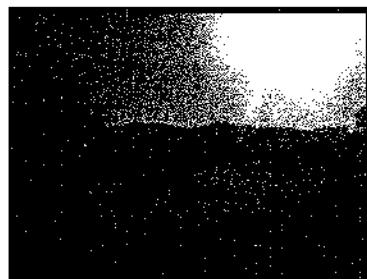


Photo taken from the road of the adjacent property to the east.



Photo taken from the road reserve at the access to the adjacent property to the east.

There is evidence that the neighbouring site to the east may have had more intensive horticultural activities or greenhouses in the past, located in the northwest corner of the site. Migration of contaminants from this area is not likely due to the shelter belt and the topography of the site. The land is falling away from the site towards the stream to the north.

Site Condition

The site has an existing residence, small sheds and kennels located just north of the existing house.

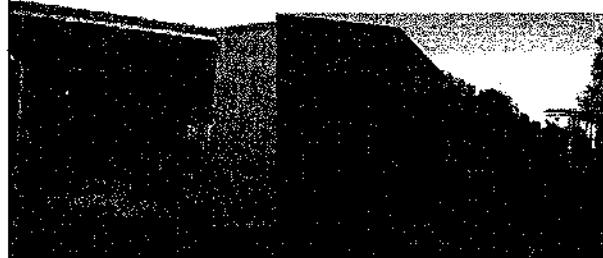


Photo taken of existing shed. Gravel area in front of shed used for washout and filling of spray packs. This shed will be within Lot 6 and will continue being used to store equipment used to manage the avocado orchard.

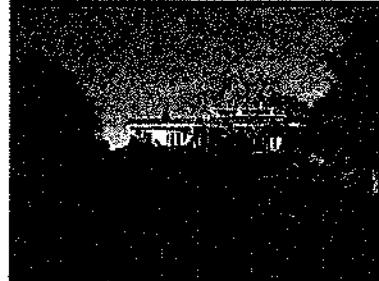


Photo taken of house - looking south.

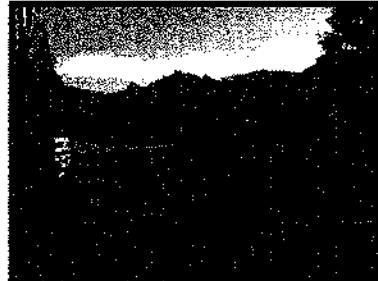
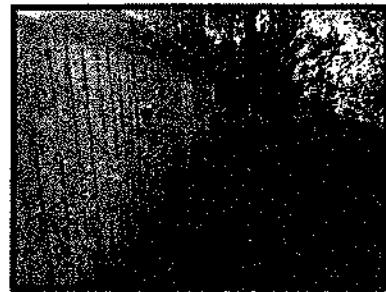
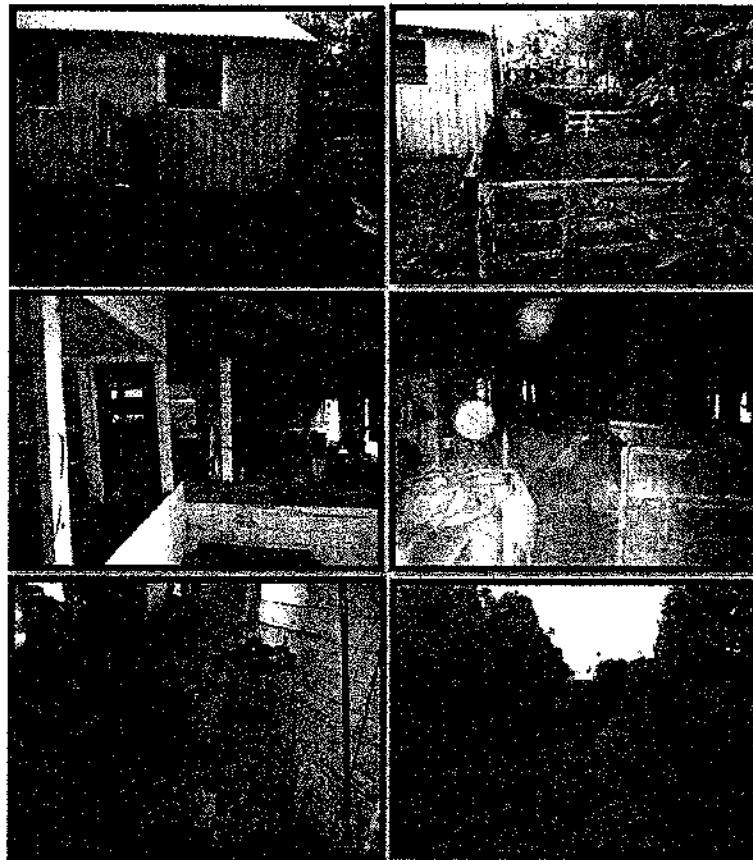


Photo taken north of existing house - looking south.

The historic small woolshed is constructed with timber and long run iron. Alongside this building there is a small stockyard with races in and out of the shed. The size of the stockyard would only be suitable for a small number of sheep and not a large scale commercial operation. It is possible that the races or stockyards were used for spraying stock in the past but this has not occurred in the last 27 years under the present owner.



Photos taken of woolshed at the north of the property.



Photos taken of woolshed at the north of the property.

6. GEOLOGY AND HYDROLOGY

The soil type in the area is defined on NZMS290 Sheet Q06/07 Hukerenui - Whangarei (SOILS) as Maunu silt loam + Maunu bouldery silt loam (MU + MUB), well to moderately well drained soils of the rolling and hilly land.

The rock type in the area is defined on NZMS290 Sheet Q06/07 Hukerenui - Whangarei (ROCK TYPES) as Basalt with Scoria (F6); flows and cones of glassy and very fine to medium grained crystalline basalt, dense or vesicular, interbedded with scoria (B1) in places, moderately fractured; hard to very hard. Weathered to soft brown clay to depths of 10m.

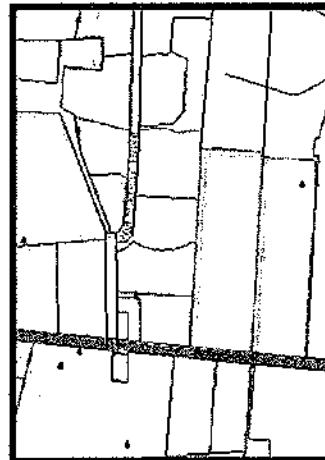
The Institute of Geological and Nuclear Sciences Geology of the Whangarei Area defines the geology of the site as KERIKERI VOLCANIC GROUP Basalt flows (Qvb).

Site observation of paddock boulders, and the soils texture and colour encountered during borehole investigations, indicate volcanic material covers the site. Large boulders are visible on the surface and in many cases was the cause for the end of borehole investigations.

The site predominately is flat to rolling having gentle slopes of 1-2° with an isolated mound on proposed Lots 7 spreading into Lot 6 and the north western corner of the proposed lot 8 is also slightly elevated. The southern end of the property has a gentle slope grading down to SH14, the middle portion and northern end of the property has a gentle slope grading down to north-eastern boundary of proposed lot 6.

The site has free draining shallow soils overlying basalt rock. There are no ephemeral watercourses or cut drainages routes on site and the owner confirmed that an extremely heavy rainfall event was required to cause any surface ponding. Only the southern side of Maunu road has a road side drain and this is separated from the site by the road formation. A cut drain and watercourse can be seen on aerial photos about 200m north of the site. This appears to have been formalised in the 1960s (see the aerial photos 1961 & 1970).

No ground water bores are identified on the Northland Regional Council GIS maps within this property but they are located on neighbouring properties. Bores are identified some 80-100m to the west and east of the site. The property is situated over a large aquifer and ground water collection is common in the area. The low levels of potential contaminants used on site are unlikely to migrate into existing water sources.



Water Bores Locations - Northland Regional Council GIS maps

7. BASIS FOR GUIDELINE VALUES

Ministry for the Environment – Environmental Guideline Value Database provides an appropriate source of guideline values for the parameters listed in Table 1: *Potential Hazardous Activity or Industry List and Findings*.

8. SITE CHARACTERISATION

Orchard Activities:

A small orchard is present on the subject property, however due to the absence of persistent chemicals spraying this activity has not created a risk of land contamination.

Products used have low toxicity. Spray residue is most likely to have been deteriorated by microbial activity and weathering since that time.

Migration of contaminants from the neighbouring properties is unlikely due to the slope of the site, the geology and the property being surrounded by shelter belts.

The gravel area in front of shed in the south east corner of proposed Lot 6 has been used for washout and filling of spray packs required to manage this small operation. This shed will be within Lot 6 and will continue being used to store equipment used to manage the avocado orchard. This area will not be a residential building site. It provides access to the existing shed. Therefore while this access is needed it is most unlikely to be used for production of produce for human consumption.

The human and ecological risk is considered very low.

Livestock Management:

As it is possible that the woolshed, races or stockyards were used for spraying stock in the past and low levels contamination by Arsenic, Copper and Lead may be present in vicinity of the woolshed and stockyards. Therefore, we would recommend a 2m precautionary management area around the perimeter of the existing woolshed and stockyard. Future owners of proposed lot 6 should avoid locating gardens and harvesting produce from the recommended precautionary management area to protect the produce consumption pathway. The recommended precautionary management area relates to the harvesting of produce for human consumption. Continued use of the yards for stock handling and the incidental grazing that may occur is unlikely to pose a long term exposure risk to human health through consumption of animal products so long as this area remains a small proportion of their grazing range.

The oral pathway is of particular concern with children as they are more likely to ingest soil than adults. The stockyards and woolshed would likely present an attractive exploration and play area for children and this will require active management by their guardians. The stone wall north of the shed (the proposed boundary line between proposed lots 6 & 8) will provide a practical barrier/separation between residential and rural activities.

Within this context of a rural lifestyle block that will become Lot 6 and with land occupiers adequately informed, the risk to human health is very low. This does not hold true were the land use greatly intensified, for instance high density residential. While the land is used as a rural lifestyle block, we do not believe site remediation is necessary. The stockyards provide a useful facility for livestock management and with adequate awareness can continue to be used without posing risk to human health, principally by limiting exposure.

If at a time when the woolshed and yards were no longer required and was to be removed/demolished then site remediation would be advised at that time. This could be achieved by testing to confirm that contaminates are below the levels that would cause a risk to human health or removing the woolshed building and stockyard, with both materials and stripped soil disposed of at an appropriate landfill.

9. CONCLUSION & RECOMMENDATIONS

The preliminary site investigation finds:

Orchard Activities:

- A small orchard is present on the subject property, however due to the absence of persistent chemicals spraying this activity has not created a risk of land contamination. Were spray residue present in the soil, then it is most likely to deteriorate by microbial activity and weathering over time.
- Migration of contaminates from the neighbouring properties is unlikely due to the slope of the site, the geology and the property being surrounded by shelter belts.
- The gravel area in front of shed in the south east corner of proposed Lot 6 has been used for washout and filling of the spray packs required to manage this small operation. The products used have low toxicity and low volume and therefore unlikely to create a risk to human health. This shed will be within Lot 6 and will continue being used to store equipment associated with managing the avocado orchard. This area will not be a residential building site. It provides access to the existing shed and therefore is most unlikely to be used for production of produce for human consumption.
- The human and ecological risk is considered very low.

Livestock Management:

- That the subject land is most unlikely to have been subject to contamination in the past 27 years.
- No dip sites were identified within the site.
- Low level contamination by Arsenic, Copper and Lead may be present in vicinity of the woolshed and stockyards, though not elsewhere on site.
- We recommend a produce precautionary management area with a 2m offset from the perimeter of the woolshed building and stockyard.
- Within the context of the existing rural lifestyle land use it is considered that the risk to human health can be adequately contained through management practices. Risk is associated with produce sourced from the potentially contaminated area and this then making up a significant proportion of a person's dietary intake. This risk can be managed by excluding produce cultivation and harvesting from the contaminated area. Risk is also associated with the oral pathway and is of particular concern for children. This risk can be adequately managed by locating a future dwelling away from the contaminated area and through restricting access by children to the stockyard and woolshed.
- Incidental grazing by livestock within the yards and their surrounds is unlikely to pose a risk to human health through consumption of the animal products subject to this effected area being a proportionally minor part of the grazing range.
- While practical options do exist to remediate any possible contaminated ground, it is acknowledged that the stockyards do equip the property with a useful facility and due to the possible low levels of contamination and achievable management options, ground remediation is optional and use of the yards may continue.
- The area around the woolshed building and stockyard may be subject to low level contamination, however through management of exposure routes and pathways the risk can be managed to acceptable levels.
- Uncertainty could be removed if desired by soil testing or removal.
- The human and ecological risk is considered very low.

10. LIMITATIONS

This report has been prepared for the benefit of J.D. & M.A. Williamson as our client with respect to Contaminated Land Management Preliminary Site Investigation. It shall not be relied upon for any other purpose. The reliance by other parties on the information or opinions contained in this report shall, without our prior review and agreement in writing, be at such parties' sole risk.

Opinions and judgments expressed herein are based on our understanding and interpretation of current regulatory standards, and should not be construed as legal opinions. Where opinions or judgments are to be relied on they should be independently verified with appropriate legal advice.

The nature and continuity of subsoil conditions is inferred and it must be appreciated that actual conditions could vary considerably from the assumed model.

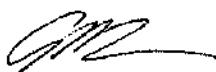
During excavation and construction the site should be examined by an Engineer or Engineering Geologist competent to judge whether the exposed subsoils are compatible with the inferred conditions on which the report has been based. It is possible that the nature of the exposed subsoils may require further investigation and the modification of the design based on this report.

Cook Costello Ltd would be pleased to provide this service to J.D. & M.A. Williamson and believe that the project would benefit from such continuity. In any event it is essential that the firm is contacted if there is any variation in subsoil conditions from those described in the report as it may affect the design parameters recommended in the report.

Cook Costello Ltd. have performed the services for this project in accordance with the standard agreement for consulting services and current professional standards for environmental site assessment. No guarantees are either expressed or implied.

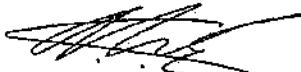
There is no investigation which is thorough enough to preclude the presence of materials at the site which presently, or in the future, may be considered hazardous. Because regulatory evaluation criteria are constantly changing, concentrations of contaminants present and considered to be acceptable now may in the future become subject to different regulatory standards which cause them to become unacceptable and require further remediation for this site to be suitable for the existing or proposed land use activities.

Yours faithfully



Guy McGregor
Registered Professional Surveyor
BSurv, MNZIS, WDC IOP 002

Reviewed By:



Adrian Tonks
Engineer
BE (Esc), GIPENZ, JQP (WDC 024)

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11. APPENDIX 1: HISTORIC AERIAL PHOTOS

1942



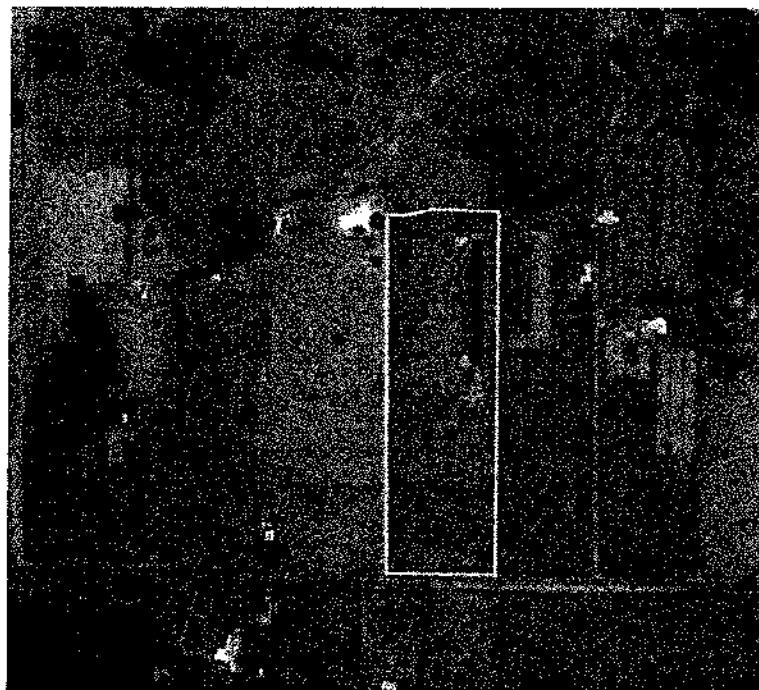
1961



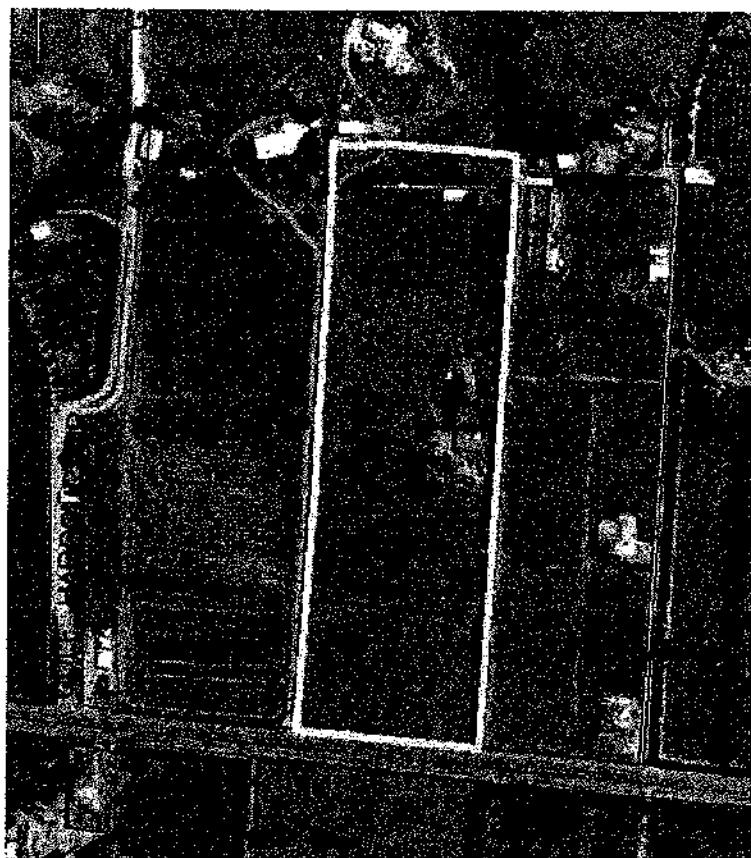
1970



1979



1998



Recent
(WDC GIS
2002-2004)



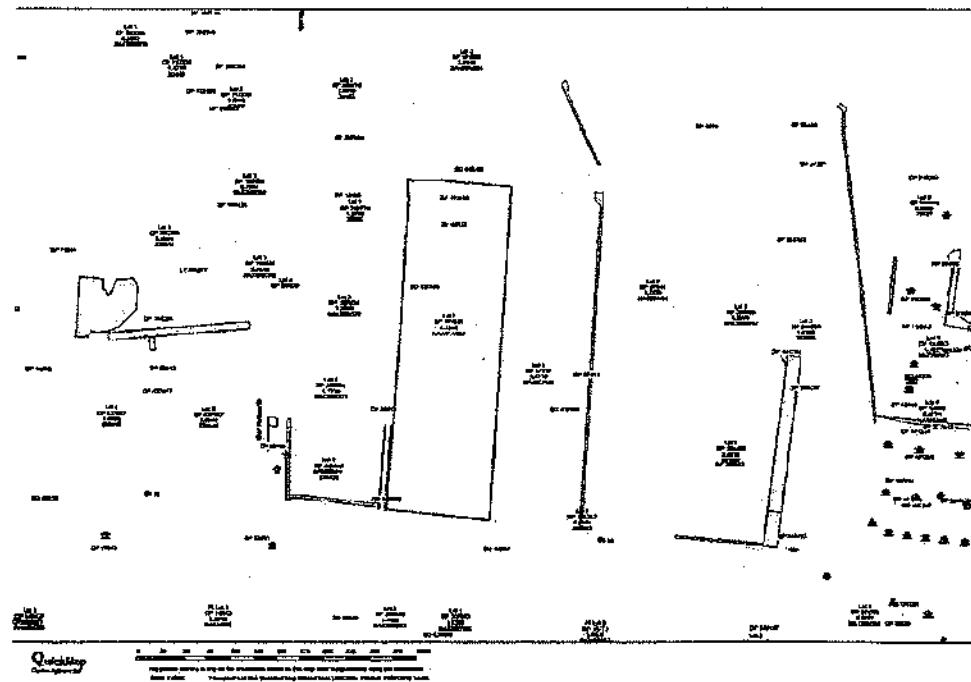
WDC GIS S.H. 2008



Recent (Google Maps)



Quick Maps Boundary information



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12. APPENDIX 3: HAIL CHECKLIST

Private Bag 9023 | Whangarei 0148 | New Zealand
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 W: www.wdc.govt.nz | E: mailroom@wdc.govt.nz



Hazardous Activities and Industries List (HAIL) Checklist

		Yes	No
A Chemical manufacture, application and bulk storage			
Agrichemicals including commercial premises used by spray contractors for filling, storing or washing out tanks for agrichemical application	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Chemical manufacture, formulation or bulk storage	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Commercial analytical laboratory sites	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Corrosives including formulation or bulk storage	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Dry-cleaning plants including dry-cleaning premises or the bulk storage of dry-cleaning solvents	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Fertiliser manufacture or bulk storage	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Gasworks including the manufacture of gas from coal or oil feedstocks	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Livestock dip or spray race operations	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Paint manufacture or formulation (excluding retail paint stores)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Persistent pesticide bulk storage or use including sport turfs, market gardens, <u>orchards</u> , glass houses or spray sheds	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Pest control including the premises of commercial pest control operators or any authorities that carry out pest control where bulk storage or preparation of pesticide occurs, including preparation of poisoned baits or filling or washing of tanks for pesticide application	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Pesticide manufacture (including animal poisons, insecticides, fungicides or herbicides) including the commercial manufacturing, blending, mixing or formulating of pesticides	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Petroleum or petrochemical industries including a petroleum depot, terminal, blending plant or refinery, or facilities for recovery, reprocessing or recycling petroleum-based materials, or bulk storage of petroleum or petrochemicals above or below ground	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Pharmaceutical manufacture including the commercial manufacture, blending, mixing or formulation of pharmaceuticals, including animal remedies or the manufacturing of illicit drugs with the potential for environmental discharges	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Printing including commercial printing using metal type, inks, dyes, or solvents (excluding photocopy shops)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Skin or wool processing including a tannery or fellmongery, or any other commercial facility for hide curing, drying, scouring or finishing or storing wool or leather products	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Storage tanks or drums for fuel, chemicals or liquid waste	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Wood treatment or preservation including the commercial use of anti-sapstain chemicals during milling, or bulk storage of treated timber outside	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
B Electrical and electronic works, power generation and transmission			
Batteries including the commercial assembling	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Electrical transformers including the manufacturing	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Electronics including the commercial manufacturing	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Power stations	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
C Explosives and ordnances production, storage and use			
Explosive or ordinance production, maintenance, dismantling, disposal, bulk storage or re-packaging	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Gun clubs or rifle ranges, including clay targets clubs that use lead munitions outdoors	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Training areas set aside exclusively or primarily for the detonation of explosive ammunition	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

		Yes	No
D Metal extraction, refining and reprocessing, storage and use			
Abrasive blasting including abrasive blast cleaning (excluding cleaning carried out in fully enclosed booths) or the disposal of abrasive blasting material	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Foundry operations including the commercial production of metal products by injecting or pouring molten metal into moulds	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Metal treatment or coating including polishing, anodising, galvanising, pickling, electroplating, or heat treatment or finishing using cyanide compounds	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Metalliferous ore processing including the chemical or physical extraction of metals, including smelting, refining, fusing or refining metals	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Engineering workshops with metal fabrication	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
E Mineral extraction, refining and reprocessing, storage and use			
Asbestos products manufacture or disposal including sites with buildings containing asbestos products known to be in a deteriorated condition	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Asphalt or bitumen manufacture or bulk storage (excluding single-use sites used by a mobile asphalt plant)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Cement or lime manufacture using a kiln including the storage of wastes from the manufacturing process	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Commercial concrete manufacture or commercial cement storage	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Coal or coke yards	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Hydrocarbon exploration or production including well sites or flare pits	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Mining industries (excluding gravel extraction) including exposure of faces or release of groundwater containing hazardous contaminants, or the storage of hazardous wastes including waste dumps or dam tailings	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
F Vehicle refuelling, service and repair			
Airports including fuel storage, workshops, washdown areas, or fire practice areas	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Brake lining manufacturers, repairers or recyclers	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Engine reconditioning workshops	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Motor vehicle workshops	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Port activities including dry docks or marine vessel maintenance facilities	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Railway yards including goods-handling yards, workshops, refuelling facilities or maintenance areas	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Service stations including retail or commercial refuelling facilities	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Transport depots or yards including areas used for refuelling or the bulk storage of hazardous substances	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
G Cemeteries and waste recycling, treatment and disposal			
Cemeteries	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Drum or tank reconditioning or recycling	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Landfill sites	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Scrap yards including automotive dismantling, wrecking or scrap metal yards	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Waste disposal to land (excluding where biosolids have been used as soil conditioners)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Waste recycling or waste or wastewater treatment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
H Any land that has been subject to the migration of hazardous substances from adjacent land in sufficient quantity that it could be a risk to human health or the environment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
I Any other land that has been subject to the intentional or accidental release of a hazardous substance in sufficient quantity that it could be a risk to human health or the environment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

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12037: 626 Maunu Road - Williamson



13. APPENDIX 4: PRE – LODGEMENT QUESTIONNAIRE

J. D. T + M. A. WILLIAMS

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NES Contaminated Soils – Pre-lodgement Questionnaire

A Resource Management Act Regulation entitled National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health ('NES') came into force from 1 January 2012. The NES controls changes to the use of land where the use might introduce a risk to the health of people using the land, or where activities such as subdivision and earthworks are intended to be undertaken on sites where it is likely that past uses have contaminated the soil. Your application cannot be processed by Council without knowing whether or not this Regulation applies.

You will need to determine whether it is more likely than not, that the site of your activity will take place on land that either currently is, or has previously been, used for an activity that may potentially contaminate the soil. A list of those activities considered to contaminate the soil is called the Hazardous Activities and Industries List ('HAIL') and information regarding the Regulation is available on the website <http://www.mfe.govt.nz/laws/standards/contaminants-in-soil/>. A brochure with general information on the NES for landowners and developers can also be obtained through this website. Hard copies are available at Council's Customer Service Centre.

Does the NES apply to the piece of land and activity you are proposing under this consent application?

The following table asks a number of questions to determine whether the regulations are applicable. Please answer the following questions and provide evidence where appropriate (i.e. old aerial photographs, written correspondence from previous land owners confirming previous uses etc)

Question	Comments	
How long have you owned/occupied the piece of land to which this application applies (or larger area that included the subject property?)	We bought the land in 1986 - so 27 years now.	
What is the current use of the piece of land to which this application applies?	Avocado growing & sheep. No insecticides used only Cu + B feed on natural fertiliser	
Question	Answer (✓)	Comments
Is an activity described on the HAIL currently being undertaken on the piece of land to which this application applies? Please refer to the attached HAIL checklist!	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Has an activity described on the HAIL ever been undertaken on the piece of land to which this application applies? Please refer to the attached HAIL checklist!	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Is it more likely than not that an activity described on the HAIL is being or has been undertaken on the piece of land to which this application applies?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Are you aware of any activities listed in the HAIL that are currently being, or have been undertaken in the vicinity of the piece of land to which this application applies?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
If 'No' to all of the above, you will not need to fill out the following sections as the NES is not applicable to your proposed activity.		
If 'Yes' to any of the above, then the NES may apply. Please check the five activities to which the NES applies:		



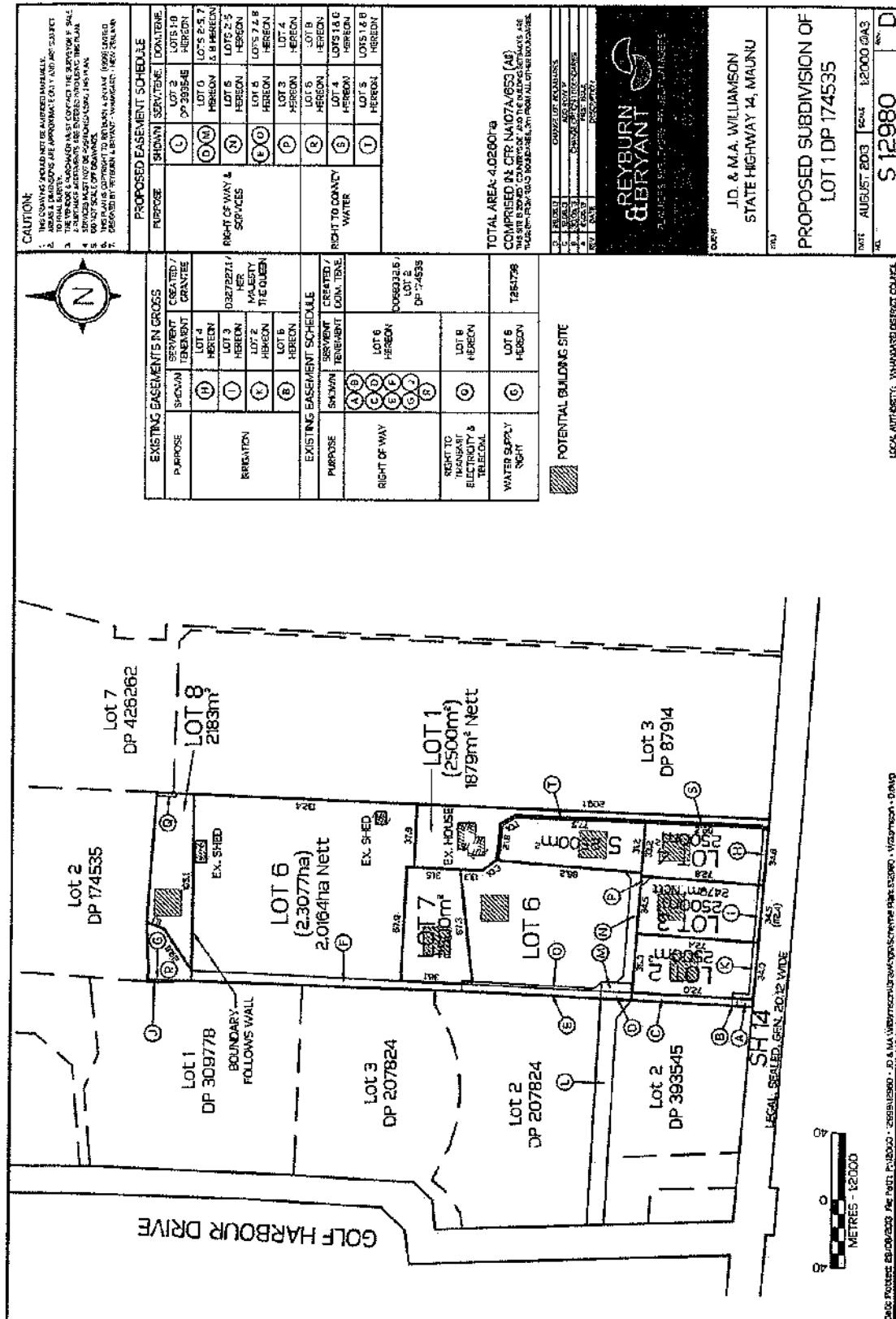
Question	Answer (✓)	Comments
Does the activity you are proposing involve removing or replacing a fuel storage system or parts of it?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Does the activity you are proposing involve sampling soil?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Does the activity you are proposing involve disturbing soil?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Does the activity you are proposing involve the subdivision of land?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Does the activity you are proposing involve changing the use of the land?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
<p>If 'Yes' to any of the above activities, then the NES for Assessing and Managing Contaminants in Soil to Protect Human Health is likely to apply. You will need to assess the permitted activity criteria provided in Regulation 8(1) – 8(4) of the NES.</p> <p>Please note that in accordance with Regulation 5(8) if the piece of land on which your proposed activity is to take place is considered production land (as defined in section 2 of the Resource Management Act 1991) the regulations only apply if you want to:</p> <ul style="list-style-type: none"> • remove or replace a fuel storage system • sample or disturb <ul style="list-style-type: none"> • soil under existing residential buildings on the piece of land • soil used for the farmhouse garden or other residential purposes in the immediate vicinity of existing residential buildings • soil that would be under proposed residential buildings on the piece of land • soil that would be used for the farmhouse garden or other residential purposes in the immediate vicinity of proposed residential buildings • subdivide the land in a way that causes the piece of land to stop being production land • change the use of the piece of land in a way that causes the piece of land to stop being production land. 		

If you have any questions regarding the application of the NES to your consent application please contact Council's Duty Planner on 09 430 4200.

Contaminated Land Management PSI
12037: 626 Maunu Road - Williamson



14. APPENDIX 5: REYBURN AND BRYANT SCHEME PLAN



STATEMENT OF PASSING OVER

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