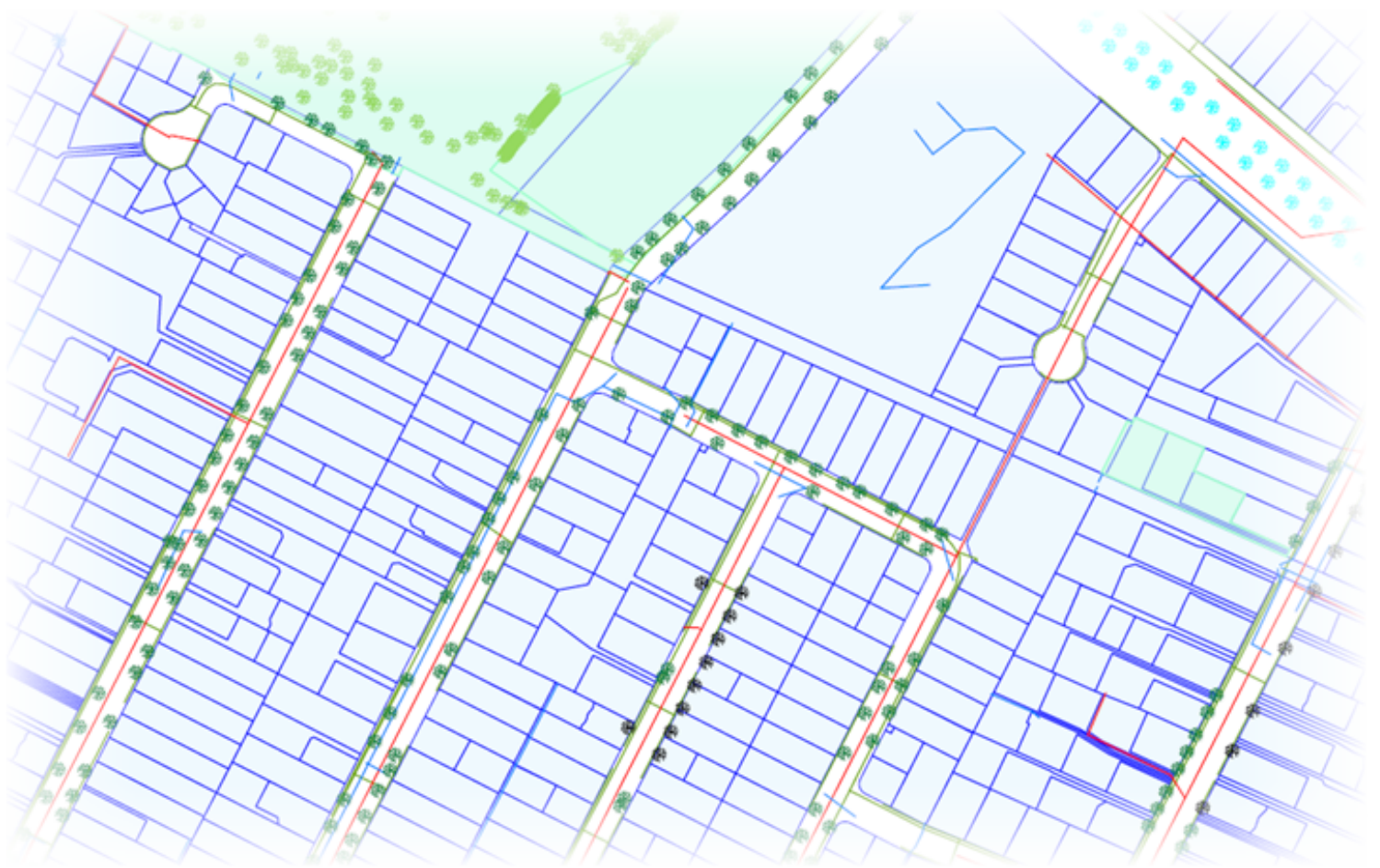


Land Information Memorandum



Property address:
1 Kaioruru Lane

LIM number: 70227884
Page 1

Christchurch City Council
53 Hereford Street, PO Box 73015
Christchurch 8154, New Zealand
Tel 64 3 941 8999
Fax 64 3 941 8984
www.ccc.govt.nz

Application details

Please supply to ADDINGTON LAW CENTRE
 PO BOX 9376
 TOWER JUNCTION
 CHRISTCHURCH 8149

Client reference 18795.1 TRIP

Phone number (03) 338-0330

Fax number (03) 338-2300

Date issued 16 December 2019

Date received 12 December 2019

Property details

Property address 1 Kaioruru Lane

Valuation roll number 23862 50412

Valuation information Capital Value: \$220000
 Land Value: \$220000
 Improvements Value: \$0
Please note: these values are intended for Rating purposes

Legal description Lot 11 DP 418001

Existing owner Christopher James Beavon
 7 Conie Glen Lane
 Christchurch 8042

Council references

Debtor number 3173850

Rate account ID 73160329

LIM number 70227884

Property ID 1161555

Property address:
1 Kaioruru Lane

LIM number: 70227884
Page 2

Christchurch City Council
53 Hereford Street, PO Box 73015
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Document information

This Land Information Memorandum (LIM) has been prepared for the purpose of section 44A of the Local Government Official Information and Meetings Act 1987 (LGOIMA). It is a summary of the information that we hold on the property. Each heading or "clause" in this LIM corresponds to a part of section 44A.

Sections 1 to 10 contain all of the information known to the Christchurch City Council that must be included under section 44A(2) LGOIMA. Any other information concerning the land as the Council considers, at its discretion, to be relevant is included at section 11 of this LIM (section 44A(3) LGOIMA).

The information included in this LIM is based on a search of Council records only and there may be other information relating to the land which is unknown to the Council. Council records may not show illegal or unauthorised building or works on the property. The applicant is solely responsible for ensuring that the land is suitable for a particular purpose.

If there are no comments or information provided in any section of this LIM this means that the Council does not hold information on the property that corresponds to that part of section 44A.

A LIM is only valid at the date of issue as information is based only upon information the Council held at the time of that LIM request being made.

Property file service

This Land Information Memorandum does not contain all information held on a property file. Customers may request property files by phoning the Council's Customer Call Centre on (03) 941 8999, or visiting any of the Council Service Centres. For further information please visit www.ccc.govt.nz.

To enable the Council to measure the accuracy of this LIM document based on our current records, we would appreciate your response should you find any information contained therein which may be considered to be incorrect or omitted. Please telephone the Customer Call Centre on (03) 941 8999.

A search of records held by the Council has revealed the following information:

1. Special features and characteristics of the land

Section 44A(2)(a) LGOIMA. This is information known to the Council but not apparent from the district scheme under the Town and Country Planning Act 1977 or a district plan under the Resource Management Act 1991. It identifies each (if any) special feature or characteristic of the land concerned, including but not limited to potential erosion, avulsion, falling debris, subsidence, slippage, alluvion, or inundation, or likely presence of hazardous contaminants.

(For enquiries, please phone (03) 941 8999 or visit www.ccc.govt.nz.

| Borelog/Engineer Report Image Available

Borelog/Engineer Report Image Available

| Land Instability

Maps prepared for the Banks Peninsula District Council (prior to amalgamation with the Christchurch City Council in 2006) show that this property or part of this property is in an area of low/moderate and/or moderate/high risk for land instability.

| Consultant Report Available

Council holds indicative information that this property may be subject to risk from geological hazards. These may be but not limited to potential erosion (eg cliff collapse, tunnel gully erosion, slip/sheet erosion, rockfall), falling debris (eg boulder rolls, rockfall), subsidence, slippage (eg slope instability) or inundation. Information on the hazards may be found by calling 03 9418999. Council may require site-specific investigations before granting future sub-division or building consent for the property depending on the hazard.

| Consultant Report Continued

There are a number of Consultant reports on the Port Hills which can be found on the Councils website: <http://www.ccc.govt.nz/environment/land/slope-stability/port-hills-gns-reports/>. These consultant reports may or may not reference to information about your individual property.

| Sea Spray Zone

This property is in the sea spray zone as defined by NZS 3604 2011.

| Potential for Erosion

Records Indicate that this property may be susceptible to erosion. Type of Erosion: Unknown Severity of Risk: Slight to Moderate

| Fill

This property is located in an area known to have been filled. The year the fill occurred is 2009. The filling was, according to the Councils records carried out in a controlled manner and comprises Engineered Fill.

Related information

| There is a sub division fill report attached covering this property.

2. Private and public stormwater and sewerage drains

Section 44A(2)(b) LGOIMA. This is information about private and public stormwater and sewerage drains as shown in the Council's records.

(For stormwater and sewerage enquiries, please phone (03) 941 8999 or visit www.ccc.govt.nz.

Related information

- 1 No up-to-date drainage plan is available for the development of this site. However, the installation of a water connection along with sewer and stormwater drains is checked by the Council prior to the issue of a Code Compliance Certificate.

3. Drinking Water Supply

Section 44A(2)(ba) and (bb) LGOIMA. This is information notified to the Council about whether the land is supplied with drinking water, whether the supplier is the owner of the land or a networked supplier, any conditions that are applicable, and any information the Council has about the supply.

Please note the council does not guarantee a particular water quality to its customers. If you require information on current water quality at this property please contact the Three Waters & Waste Unit.

(For water supply queries, please phone (03) 941 8999 or visit www.ccc.govt.nz.

Water Supply

There is either a water meter not in use or no water connection to this property. Christchurch City Council is the networked supplier of water to this property. An application can be made to the Christchurch City council for a water connection. The conditions of supply are set out in the Christchurch City Council Water Supply, Wastewater & Stormwater Bylaw (2014), refer to www.ccc.govt.nz.

Christchurch City Council is the networked supplier of water to this property. This property can be connected to the Christchurch City Council Water Supply. The conditions of supply are set out in the Christchurch City Council Water Supply, Wastewater & Stormwater Bylaw (2014), refer to www.ccc.govt.nz.

Related information

- 1 No up-to-date drainage plan is available for the development of this site. However, the installation of a water connection is checked by the Council prior to the issue of a Code Compliance Certificate.

4. Rates

Section 44A(2)(c) LGOIMA. This is information on any rates owing in relation to the land.

(For rates enquiries, please phone (03) 941 8999 or visit www.ccc.govt.nz.

(a) Annual rates

Annual rates to 30/06/2020: \$ 1,197.27

	Instalment Amount	Date Due
Instalment 1	\$ 299.29	15/08/2019
Instalment 2	\$ 299.29	15/11/2019
Instalment 3	\$ 299.29	15/02/2020
Instalment 4	\$ 299.40	15/05/2020

Rates owing as at 16/12/2019: \$ 0.00

(b) Excess water charges

\$ 0.00

(For water charge enquiries, please phone (03) 941 8999 or visit www.ccc.govt.nz.

(c) Final water meter reading required?

No Reading Required

(To arrange a final water meter reading, please phone (03) 941 8999 or visit www.ccc.govt.nz.

5. Consents, certificates, notices, orders, or requisitions affecting the land and buildings

Section 44A(2)(d) LGOIMA. This is information concerning any consent, certificate, notice, order, or requisition, affecting the land or any building on the land, previously issued by the Council.

Section 44A(2)(da) LGOIMA. The information required to be provided to a territorial authority under section 362T(2) of the Building Act 2004. There is currently no information required to be provided by a building contractor to a territorial authority under section 362T(2) of the Building Act 2004. The Building (Residential Consumer Rights and Remedies) Regulations 2014 only prescribed the information that must be given to the clients of a building contractor.

(For building enquiries, please phone (03) 941 8999, email EPADutyBCO@ccc.govt.nz or visit www.ccc.govt.nz.

(a) Consents

(b) Certificates

Note: Code Compliance Certificates were only issued by the Christchurch City Council since January 1993.

(c) Notices

1 Ministry of Business, Innovation & Employment Foundation Design

Some properties have experienced land damage and considerable settlement during the sequence of Canterbury earthquakes. While land in the green zone is still generally considered suitable for residential construction, houses in some areas will need more robust foundations or site foundation design where foundation repairs or rebuilding are required. Most properties have been assigned a technical category. Details of the MBIE guidance can be found at www.building.govt.nz/

(d) Orders

(e) Requisitions

6. Certificates issued by a building certifier

Section 44A(2)(e) LGOIMA. This is information notified to the Council concerning any certificate issued by a building certifier pursuant to the Building Act 1991 or the Building Act 2004.

(For building enquiries, please phone (03) 941 8999, email EPADutyBCO@ccc.govt.nz or visit www.ccc.govt.nz.

7. Weathertightness

Section 44A(2)(ea) LGOIMA. This is information notified to the Council under section 124 of the Weathertight Homes Resolution Services Act 2006.

(For weathertight homes enquiries, please phone (03) 941 8999 or visit www.ccc.govt.nz.

If there is no information below this means Council is unaware of any formal Weathertight Homes Resolution Services claim lodged against this property.

8. Land use and conditions

Section 44A(2)(f) LGOIMA. This is information relating to the use to which the land may be put and conditions attached to that use. The planning information provided below is not exhaustive and reference to the Christchurch District Plan and any notified proposed changes to that plan is recommended: <https://ccc.govt.nz/the-council/plans-strategies-policies-and-bylaws/plans/christchurch-district-plan/>.

There maybe some provisions of the Christchurch City Plan or Banks Peninsula District Plan that affect this property that are still operative.

(For planning queries, please phone (03) 941 8999, email DutyPlanner@ccc.govt.nz or visit www.ccc.govt.nz.

Regional plan or bylaw

There may be objectives, policies or rules in a regional plan or a regional bylaw that regulate land use and activities on this site. Please direct enquiries to Canterbury Regional Council (Environment Canterbury).

(a) (i) Christchurch City Plan & Banks Peninsula District Plan

Banks Peninsula District Plan Coastal Hazards

The subdivision provisions of the Banks Peninsula District Plan relating to coastal hazards still apply and are included in this table (<https://ccc.govt.nz/news-and-events/public-notice/show/88>).

(ii) Christchurch District Plan

Sites of Ngai Tahu Cultural Significance

Property or part of property within the Nga Turanga Tupuna overlay which is operative.

Remainder Slope Instability Management Area

Property or part of property within the Christchurch District Plan Remainder of Port Hills and Banks Peninsula Slope Instability Management Area overlay.

Development Constraint Conditions

Council records show there is a specific condition on the use of this site: Specific Foundation Design Required

Development Constraint Conditions

Council records show there is a specific condition on the use of this site: Subdivision Consent conditions

Development Constraint Conditions

Council records show there is a specific condition on the use of this site: Consent Notice

District Plan Zone

Property or part of property within the Residential Small Settlement Zone which is operative.

(b) Resource consents

If there are any land use resource consents issued for this property the Council recommends that you check those resource consents on the property file. There may be conditions attached to those resource consents for the property that are still required to be complied with.

- I RMA/2005/3088 - Subdivision Consent
SUBDIVISION & LAND USE CONSENT - Historical Reference RMA92004979
Status: Cancelled
Applied 09/09/2005

- I RMA/2006/946 - Subdivision Consent
FEE SIMPLE SUBDIVISION CONSENT APPLICATION - 50 ADDITIO NAL ALLOTMENTS s223 issued 29/5/09 LT 418001
s224 issued 8/7/09 - Historical Reference RMA92004981
Status: Processing complete
Applied 13/04/2006
Granted 18/07/2007
Decision issued 18/07/2007

Related information

- I The Council system shows a Development Constraint/Ongoing Condition Consent notices for this property. The consent notice should be registered against the record of title for the property and a search of that title and the consent notice will provide details in respect of the constraint / condition. If a search of the title does not record the consent notice or the consent notice is not clear then we suggest you contact the duty planner by either calling 941 8999 or emailing DutyPlanner@ccc.govt.nz. The consent notices are as follows:
 - 1 Stormwater to be routed through retention tank.
 - 2 A sediment and erosion control plan must be submitted at the time of building consent.
 - 3 Specific foundation design required.
 - 4 Engineering investigation and design shall include design of drainage and retaining structures.

- I The Development Constraint conditions for this property are as follows:
 - Sub Division Conditions - Accidental Discovery Protocol: See TRIM 08/144968 regarding protocol in the event of discovery of suspected cultural remains.
 - Sub Division Conditions - engineering/geotechnical investigation.
 - Building Consent Conditions - engineering/geotechnical investigation.

9. Other land and building classifications

Section 44A(2)(g) LGOIMA. This is information notified to the Council by any statutory organisation having the power to classify land or buildings for any purpose.

(For land and building enquiries, please phone (03) 941 8999 or visit www.ccc.govt.nz.

Please refer to Section 1 for details

10. Network utility information

Section 44A(2)(h) LGOIMA. This is information notified to the Council by any network utility operator pursuant to the Building Act 1991 or the Building Act 2004.

(For network enquiries, please phone (03) 941 8999 or visit www.ccc.govt.nz.

! **None recorded for this property**

11. Other information

Section 44A(3) LGOIMA. This is information concerning the land that the Council has the discretion to include if it considers it to be relevant.

(For any enquiries, please phone (03) 941 8999 or visit www.ccc.govt.nz.

(a) Kerbside waste collection

- | Your recycling is collected Fortnightly on the Week 1 collection cycle on a Tuesday. Please leave your recycling at the Kerbside by 6:00 a.m. Your nearest recycling depot is the Port Levy Collection Point.
- | Your refuse is collected Fortnightly on the Week 1 collection cycle on a Tuesday. Please leave your rubbish at the Kerbside by 6:00 a.m. Your nearest rubbish depot is the Port Levy Collection Point.
- | Your organics are collected Weekly on Tuesday. Please leave your organics at the Kerbside by 6:00 a.m.

(b) Other

| Community Board

Property located in Banks Peninsula Community Board.

| Guest Accommodation

Guest accommodation (including whole unit listings on Airbnb; BookaBach; etc.) generally requires a resource consent in this zone when the owner is not residing on the site. For more information, please refer to: <https://ccc.govt.nz/providing-guest-accommodation/>.

| Electoral Ward

Property located in Banks Peninsula Electoral Ward

| Listed Land Use Register

Hazardous activities and industries involve the use, storage or disposal of hazardous substances. These substances can sometimes contaminate the soil. Environment Canterbury identifies land that is used or has been used for hazardous activities and industries. This information is held on a publically available database called the Listed Land Use Register (LLUR). The Christchurch City Council may not hold information that is held on the LLUR Therefore, it is recommended that you check Environment Canterbury's online database at www.llur.ecan.govt.nz

| Spatial Query Report

A copy of the spatial query report is attached at the end of this LIM. The spatial query report lists land use resource consents that have been granted within 100 metres of this property.



BGL 1129/43

20 April 2009

Attention: Chris Johnson
Opus International Consultants Ltd
PO Box 1482
CHRISTCHURCH
Fax: 365 7858

Dear Sir

Re: **BLACK ROCK ESTATE – SUBDIVISION WORKS COMPLETION**

1. Introduction

Further to construction works for Black Rock Estate subdivision between Hays and Church Bays, I have prepared the following earthworks completion report. In terms of the consent conditions I record that I am a suitably experienced engineering geologist with more than 35 years experience in earthworks on Banks Peninsula, and that I regularly inspected the various parts of the site during works construction. I provided the original overview of geological and geotechnical aspects for the subdivision proposal, and I have conducted additional site-specific investigations at appropriate stages during the project for design and construction purposes.

Subdivision site works have been designed and supervised by Opus International Consultants Ltd as managers to the project, and it is my opinion that these works have been completed by the respective contractors to a suitable standard. The land remains stable, slopes and excavated batters have been retained or grassed where necessary, and stormwater control has enhanced long-term security of the 49-lot residential development. I am satisfied that with suitable engineering of individual dwelling sites and related access each building lot will remain stable, and that there are no long-term geotechnical issues with any part of the subdivision.

2. Subdivision Engineering Geology

The small peninsula between Hays Bay and Church Bay displays complex bedrock geology, with basal Allandale Rhyolite overlain by Lyttelton Group basalt flows derived from a more westerly source. A previously unrecognised "volcanic conglomerate" unit overlies these rocks, and represents an ~7Ma old debris flow and alluvial fan deposit infilling an eroded channel. It is overlain by Diamond Harbour Basalt, which is preserved only on the highest part of the peninsula and has a ~1m thick tephra (= red ash) unit at its base.

The site is blanketed by a variable thickness of Late Quaternary (<0.5Ma old) airfall loess and mixed loess-volcanic colluvium deposits. The thickest airfall loess deposits occur on Lots 2 to 6 inclusive, and extend to depths greater than 3m over *in situ* volcanic conglomerate. Mixed loess-volcanic colluvium to depths locally up to 3m overlies the eroded bedrock surface in the central and southern parts of the subdivision, with two stages of accumulation evident near the head of Roadway 1 where the colluvial deposits are thickest.

Beach deposits consisting of broken shell fragments and sands occur in Hays Bay, and are partly preserved on Lots 35-39. Silts derived from loess erosion have been identified behind the beach deposits, and are mostly sourced from the watercourse close to the Lot 46 boundary. Tunnel-gully features are also present in the loessial soils on the south side of Road 1 and Marine Drive, particularly on Lots 52, 50, 49 and 46, but stormwater control measures completed during development have effectively controlled this type of erosion.

Although the bedrock geology is unusually complex for Banks Peninsula, the soil (loess) types and rock weathering profiles are typical and have been addressed by various construction methods as summarised in this report. No landslips have been identified within the subdivision footprint, and erosion in the loessial soils has been controlled by stormwater interception measures, the use of silt fences and swales during construction, and rapid establishment of grass cover on bare ground as well as the use of concrete cutoff drains. No immediate rockfall hazard exists on the property, although some detached or loosened basalt blocks are present in outcrop and will require consideration during individual lot development or building construction.

3. Geotechnical Considerations

The following geotechnical factors were identified and considered in design of the various earthworks components for the Black Rock Estate development:

- The Allandale Rhyolite unit is exposed in the south-eastern part of the subdivision, and also in cut batters along Marine Drive above Lots 47 and 49. It is a generally fresh to slightly weathered strong to very strong rock with widely spaced (>2m) joints, and no stability or other issues as a foundation material. In the top 2m beneath volcanic conglomerate on rights-of-way G and H the contact zone shows moderately to highly weathered bedrock, but this is not a stability concern. No testing of the Allandale Rhyolite was undertaken for this project.
- Lyttelton Group basalts are exposed around the Hays Bay foreshore, and in outcrop at the western end of right-of-way G. There is minimal continuous exposure of this unit within the subdivision footprint, but jointed and rubbly lava types are expected with some ash layers. No rock testing was necessary, but fracture-controlled seepage has been identified near the head of right-of-way G requiring control measures.

- The volcanic conglomerate unit was only identified as a separate and distinctive unit during bulk excavation of Roadway 1, having originally been mapped as variably weathered Lyttelton Group basalt. It contains subangular to subrounded pebbles, gravels and boulders of older rock types (mostly Lyttelton Group basalts) in a coarse sandy matrix that is weakly to strongly indurated (Schmidt Hammer UCS range 15-30MPa). Fresh to slightly weathered basalt boulders display UCS values greater than 250 MPa from point-load testing, and the most important aspect of this volcanic conglomerate unit is the rare occurrence of sub-horizontal bedding and the almost complete absence of any jointing. A silty sand unit within the volcanic conglomerate at Roadway 1 foundation level was recognised as potentially erodible by slaking, and was shotcreted on my instruction. The engineered boulder facing wall along Roadway 1 was designed by Opus following my guidelines, and has been built to a satisfactory standard with appropriate drainage measures.
- A 1-3m thick purplish weathered volcanic conglomerate unit has been recognised at the interface between mixed loess-volcanic colluvium and the fresher volcanic conglomerate, and this behaves as a stiff to very stiff gravelly clayey silt. For design purposes it has been assigned similar cohesion and friction angles to the mixed colluvium, these being $c' = 10\text{kPa}$ and $\phi' = 35^\circ$ which have been assumed in various analyses. In my opinion these are realistic values based on experience with Banks Peninsula soils, and compare with structural fill from crushed basalt having conservatively assumed $c' = 0$ and $\phi = 40^\circ$ parameters.
- The *in situ* loess and the loess-colluvium units are typical Port Hills loess soils, being described as yellow-brown clayey silts with some fine sand and/or gravel. Presence of tunnel-gully features confirms the erodible nature of these soils, and control of stormwater and/or seepage is the principal requirement. For analysis purposes the soil strength parameters have been assumed as $c' = 5\text{kPa}$ and $\phi' = 28^\circ$, which is typical of Port Hills loess in this locality, and for compacted loess the adopted values were $c' = 5\text{kPa}$ and $\phi' = 30^\circ$. The slight increase in friction is attributed to the densification achieved by compaction, testing indicating that routinely 100-110% of standard compaction was achieved using the dynamic sheepsfoot compactor.
- Non-engineered fill materials were normally removed from the site, and weak ground was identified by Scala penetrometer testing prior to its undercutting and removal. To my knowledge no gabion walls were constructed on non-engineered fill, and the clear instruction to the contractors was the need to ensure adequate compaction (>90% of standard) of clean fill. In areas where filling was undertaken on sloping ground in loess soils, topsoil removal and benching to key-in fill was routinely undertaken prior to compaction to ensure long-term stability.

In my opinion realistic engineering design of retention and facing structures has been undertaken consistent with the specific site conditions, and control of stormwater and/or seepage has been a priority to ensure site security. Opus hold the relevant design and analysis methods used for specific works, and also the as-built drawings. It is entirely appropriate to use generic soil and rock strength parameters of this nature because of the extent of material exposure and the regular assessment of site conditions that was carried out.

4. Subdivision Roading Network – Roadway 1

Roadway 1 (Lot 53) is approximately 300m long and is to be vested in Council, being the only public road on the subdivision. Roadway 1 begins at Marine Drive and terminates in a turnaround area, providing gated access to rights-of-way A, B-C, C-D and J. The first 120m from Marine Drive involved engineered filling onto loessial soils, whilst the remaining 180m is largely in cut into volcanic conglomerate with fill retention by means of a gabion wall up to 7m high at its western end supporting compacted crushed rock and loess.

The cut batter in volcanic conglomerate exposed along Roadway 1 has been faced with a basalt rock wall up to 3m in height, and drainage measures have been incorporated behind the block wall as well as a concrete cutoff on the slope above for most of this length. In the turnaround area an engineered "poly-block" wall faced with basalt has been constructed on an intermediate bench and founded on volcanic conglomerate in order to retain mixed loess-volcanic colluvium upslope. Opus have been responsible for design of both cut and fill retention, and for construction supervision: Bell Geoconsulting Ltd has provided technical input to establish design parameters, and I have inspected foundations on site wherever practicable during construction.

During the early stages of construction a total of 24 Scala penetrometer tests were conducted by Morris Contractors Ltd along the alignment of Roadway 1, and undercutting up to 450mm resulted for ground at foundation level having an "e" value greater than 12mm/blow ($q_a < \sim 180\text{kPa}$). This material was replaced by compacted layers of crushed AP65 basalt sourced from right-of-way BC excavation, and an *in situ* dry density of $2150 \pm 60 \text{ kg/m}^3$ confirmed by nuclear densometer testing of 36 sites at sub-grade level. A further 18 tests for the gabion wall compacted fill foundation gave *in situ* dry densities in the range $2120 \pm 35 \text{ kg/m}^3$ for crushed basalt materials.

It is my understanding that all fill along Roadway 1 has been engineered to a suitable compaction standard, and that necessary drainage measures have been incorporated into the reinforced backfill behind the gabion wall. All relevant design and as-built data are held by Opus for the cut and fill batters on Roadway 1, and for the engineered "poly-block" wall on the uphill side. The concrete cutoff drain across the lower part of Lots 12, 13 and 14 ensures control of overland flow above the 3m high facing-rock wall on Roadway 1.

5. Subdivision Roading Network – Rights of Way B-C & C-D

Rights-of-way B-C and C-D were the first completed as part of Stage 1, and required excavation to provide suitable crushed basalt filling for construction. Both were excavated into volcanic conglomerate bedrock from the end of Roadway 1, and then the Diamond Harbour Basalt along the upper part of right-of-way B-C provided the bulk fill utilised on site as AP65 and AP150. The following are noted with respect to completion of rights-of-way B-C and C-D:

- The volcanic conglomerate has been faced with basalt boulders to form a block wall, appropriate drainage has been provided, and the thin silty sand unit was either excavated or shotcreted. Up to 2m of volcanic conglomerate beneath the Diamond Harbour basalt has been cut at 4V:1H and left without rock facing. Provision has been made for occasional block fretting onto a topsoiled and vegetated verge area.
- Jointing within the Diamond Harbour Basalt unit exposed on the two rights-of-way shows cooling fractures, which will allow occasional block release from the sub-vertical faces. This will be exacerbated by fretting and slaking in the underlying red ash unit, but is not considered an issue because of the provision of a catch verge area. Maintenance of the cut batters on the two rights-of-way will be required occasionally.
- An engineered gabion wall provides support for right-of-way B-C near the junction of the two roads, and drainage measures have been incorporated as shown on the relevant Opus drawings. Foundations for right-of-way C-D are entirely in weathered conglomerate, whilst the upper part of right-of-way B-C (from the tight ~135° corner) has been excavated up to 4m into unweathered Diamond Harbour Basalt.
- Mixed loess and crushed volcanic conglomerate used for fill on rights-of-way B-C and C-D gave compacted dry densities for 12 tests in the range $1905 \pm 45 \text{ kg/m}^3$, this being between 100 and 105% of standard (1.86 t/m^3). Dry densities of $2170 \pm 20 \text{ kg/m}^3$ were obtained for six samples of crushed rock fill on right-of-way B-C, this being between 92 and 96% of standard (2.29 t/m^3). Independent Civil Laboratory Limited reported 14 dry density test results in the range $2200 \pm 80 \text{ kg/m}^3$ for the upper part of right-of-way B-C.

From data provided via the contractor and independent testing, there are no geotechnical concerns with the extent of fill compaction on rights-of-way B-C or C-D. Both alignments are cut into bedrock, and apart from occasional fretting of small blocks from sub-vertical cut faces there are no stability issues. The gabion wall near the junction of the two roads has been engineered to an acceptable standard, and Opus have relevant as-built drawings. All earthwork construction has been completed in accordance with NZS 4431.

6. Subdivision Roading Network – Rights-of-Way A, E-F, G, H, J & I

Right-of-way A accesses Stage 2 of the subdivision, and right-of-way I gives access to Lots 9 to 15 from the end of A. Right-of-way A was effectively cut into *in situ* loess soils, with some weathered conglomerate exposed near the Roadway 1 intersection. A total of 24 tests reported by the contractor for right-of-way I gave compacted dry densities in the range $1905 \pm 45 \text{ kg/m}^3$ for mixed loess and crushed volcanic conglomerate fill material. This corresponds to 100-105% of the standard compaction value of 1.86 t/m^3 . There are no concerns regarding stability of cut or fill batters on either right-of-way, with only minor fretting as a possibility on rare steep faces up to about 2m high.

Rights-of-way G, H and J have been formed by cutting into natural ground, and minimal fill placement has occurred except on some fill batters, at the intersection of right-of-way J with Roadway 1, and on the lowest part of right-of-way G where significant engineered filling has taken place. The engineered filling on the lowest part of right-of-way G occurred to depths in excess of 2m, with compaction in layers and routine testing to confirm performance. A total of 48 nuclear densometer tests were conducted by the contractor on this part of the site, also known as the "Lower Stockpile Area", and a dry density of $1700 \pm 90 \text{ kg/m}^3$ was achieved, being 100-111% of the laboratory-determined standard of 1.61 t/m^3 for this gravelly loess material.

Volcanic conglomerate and weathered Allandale Rhyolite are exposed in faces cut at 4V:1H on right-of-way H, and the depth of loess-colluvium cover is mostly less than 1m. This material has been battered back at 1V:1H for short-term stability, on the understanding that further site modification will occur during dwelling construction. Lyttelton Volcanics are exposed at the head of right-of-way G, and a 2m high face in slightly to moderately weathered basalt outcrops in a steep cut. There are no stability concerns with any of the rights-of-way G, H or J, although as noted elsewhere minor fretting is to be expected from time to time as the cut faces are not supported or rock-faced.

Construction of right-of-way E involved benching and compaction of fill, whilst a combination of cut and fill was used on right-of-way F. Cut batters on right-of-way F have largely been formed in *in situ* loess up to 1.8m thick overlying weathered volcanic conglomerate, and only limited rock support has been applied to the weathered volcanic conglomerate as residential development will result in further engineered cutting and filling. No compaction data for right-of-way E-F has been sighted, but the earthworks have been completed in a professional manner and shaped batters grassed as required. A total of 25 tests by Independent Civil Laboratory Limited on the kerb line for rights-of-way E and F gave dry densities in the range $2150 \pm 130 \text{ kg/m}^3$, consistent with other test data for similar materials elsewhere on the subdivision.

I am satisfied that earthworks and fill construction has been completed for Stages 2 and 3 in accordance with NZS 4431 requirements.

7. Individual Building Lots

Details of foundation materials, presence or absence of filling, and any other relevant data for individual building lots are provided in Appendix One to this report. Opus Drawing 6/2328/6/8604/Sheet 5 is also attached, and shows the extent of engineered and non-engineered filling, as well as subsurface and surface drains within the subdivision footprint. A separate set of as-built plans has been or is being provided by Opus International Consultants Limited. In summary, the following are to be recorded:

- The only lots on which significant non-engineered filling has taken place are 36, 37, 38 and 39, where the construction settling pond area adjacent to the Hays Bay boundaries was backfilled. This area of non-engineered filling with gravelly silts (to a depth of approximately 1.5m onto shelly beach deposits) extends ~10-12m into each building lot.
- The balance of Lots 35 to 39 inclusive comprise engineered filling that has been subsequently shaped into a series of "fingers" because of Council planning requirements. The compacted fill materials consisted of mixed loess and volcanic conglomerate, for which a maximum dry density of 1.61 t/m^3 was determined by laboratory testing. Nuclear densometer test results gave 100-111% of standard dry density, and measured densities in the range $1700 \pm 90 \text{ kg/m}^3$ for a total of 48 tests.
- Non-engineered filling is probably present on Lot 1, where the existing house served as the site office during construction. No earthworks or investigations were undertaken on Lot 1, however, and any further site development would require specific engineering design. It is possible that minor quantities of non-engineered filling are present on Lot 34, but again the existing house site and lot were not investigated or modified during subdivision construction.
- Site-specific engineering design of all dwelling foundations, retention, access and drainage are required for the 49 building lots at Black Rock. This is due to the variable nature of foundation conditions, and to the often steep side-slopes involved. Minor non-engineered materials up to 300mm thick will be present with topsoil on a number of lots, where the engineered fill has been "feathered out" onto natural ground.
- It is my expectation that the design engineer will undertake, or require to be undertaken, site-specific investigation of each lot within the building footprint and adjacent ground to verify design parameters. It is further expected that excavations will be assessed by a competent geotechnical professional (engineer or engineering geologist) during the construction process, with appropriate certification to Council.

- During the early stages of subdivision a diesel spill occurred on Lot 2, and was investigated and remediated by Pattle Delamore Partners Ltd. I have sighted relevant reports, and note recent confirmation that no petroleum hydrocarbons are now present in natural soils at this site. This is not a geotechnical matter, but reference should be made to the PDP documentation process through Opus or the contractors.

I remain satisfied that each of the 49 residential building lots on the Black Rock subdivision is suited to dwelling construction, and that long-term site stability has been enhanced by the subdivision construction process.

8. Seepage Control Measures

As part of the subdivision construction process naturally occurring seepages have been addressed by appropriate design and construction measures. In summary, the following works have been carried out:

- The former water supply well excavated into rhyolite bedrock on Lot 42 has been securely capped, and its position recorded for reference. About 1m of free-draining gravels was placed into the base of the ~3.5m deep well, and a novaflo outlet led into a pipe for conveyance of water to right-of-way G further downslope. The upper part of the well was then back-filled for security with compacted gravelly silts as per instructions from Opus to the contractor.
- On the lower part of right-of-way G opposite and up-gradient from Lot 54 (utilities) seepage sourced from the watercourse on Lot 46 was causing heaving of the compacted fill, and a subsoil drainage blanket ~500mm thick with novaflo outlets was placed inside a geotextile fabric. This will ensure long-term drainage beneath this part of right-of-way G, and is a direct result of the attempt by others to force the watercourse against the rhyolite bedrock on the south-western side of the gully.
- At the western end of right-of-way G a small spring sourced in fractured Lyttelton Group basalt continued to discharge seepage during the construction project. This has now been intercepted by a 300mm deep boulder drain along the western part of Lot 36 and led to a new outlet some 35m downslope at the back of the Hays Bay beach. No long-term issues are anticipated, but this seepage must be accommodated during any residential construction on Lot 36.
- Near the intersection of right-of-way J with Roadway 1 a continuous seep has been collected by a subsoil drain and led to the stormwater system beneath right-of-way J. Opus were responsible for this design, and I inspected the site and confirmed the suitability of the measures used for long-term seepage control. The source of the seep has not

been identified, but it is most probably from fractured bedrock or colluvial material on or near Lot 32.

- A similar drainage measure from an intermittent seep on right-of-way E-F near the "hammerhead" structure has been intercepted and led to the stormwater sump below right-of-way E. This was precautionary, but is considered appropriate in the circumstances.
- Two >1m deep eroded gullies in loess-colluvium are present on Lots 50, 49 and 46 from past uncontrolled discharge of a now-removed culvert beneath Marine Drive. During construction novaflor drains were placed into these erosion features to control any seepage that might be present. These have since been led to the water table at the head of right-of-way H, although continued flow is considered most unlikely.
- A 100mm diameter pipe has been placed beneath the walkway close to the Lot 49/Lot 50 boundary to control intermittent seepage from Marine Drive beyond the limit of reconstruction during this project. The pipe discharges at the ground surface, and any flow should be controlled during development on this part of Lot 49 (if such occurs).
- Pipes have similarly been placed beneath the walkway constructed on Lot 52 (reserve to vest in Council) for runoff control, and discharge to grass. A substantial (1m deep) tunnel-gully is present on Lot 52 to the west of the walking path, but its source has been cut off by construction of earthworks at the head (western end) of Roadway 1.

I am satisfied that measures undertaken to control seepages identified during construction are realistic geotechnically, and responsible as part of a long-term site management strategy. Any seepage control measures disturbed during future construction should be reinstated or otherwise engineered.

9. Conclusions

1) Earthworks to form the Black Rock Estate subdivision access have been carried in a competent manner, and in my opinion satisfy the requirements of NZS 4431: compaction standards achieved using different site materials are adequate, and I have sighted all relevant test data to confirm this opinion.

2) Cut batters have been formed at 4V:1H in the bedrock, specifically volcanic conglomerate and Diamond Harbour Basalt: outcrop of Lyttelton Group basalt and Allandale Rhyolite is relatively restricted within the subdivision footprint, and exposures are restricted to a few excavated faces less than 2m high.

3) Along Roadway 1, and for part of right-of-way B-C, the exposed volcanic conglomerate unit has been faced with a basalt boulder wall up to 3m high for

face protection and landscaping purposes: drainage measures have been included behind the wall, and a cutoff placed above for overland flow control.

4) A 3m high "poly-block" wall was constructed on an intermediate bench on the northern side of the Roadway 1 turnaround, being founded on a bench formed in volcanic conglomerate: this wall was designed by Opus to retain colluvium, and has since been faced with basalt for landscaping purposes.

5) Fill batters have either been formed in natural ground or retained by gabion walls where appropriate: all walls have been engineered by Opus and their construction supervised, with appropriate compaction control of foundation materials and drained backfill placement.

6) Engineered filling has been carried out on access roadways and some building lots, and the only non-engineered fill placed during this project was onto Lots 36 to 39 in the construction settling pond area: fills have been benched and compacted in accordance with accepted earthworks practice.

7) Seepage control measures have been implemented at several sites, mostly to intercept natural spring discharges: where appropriate, discharge has been led to the stormwater system constructed during subdivision, and it is stressed that any future disturbance of subsoil drainage must be suitably engineered.

8) I remain satisfied that all 49 building lots on Black Rock Estate subdivision are suitable for residential construction, subject to site-specific engineering design of foundations, retention and drainage: earthworks completion and related drainage measures have ensured long-term site security.

I trust that the above completion report is sufficient for your immediate needs. Do not hesitate to contact me if you require anything further, but it is my understanding that Opus holds all relevant drawings and documentation.

Yours sincerely



DAVID H BELL (Director)

APPENDIX ONE

Summary of Individual Lots **Black Rock Estate Subdivision**

STOWE PROPERTIES LIMITED

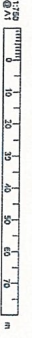
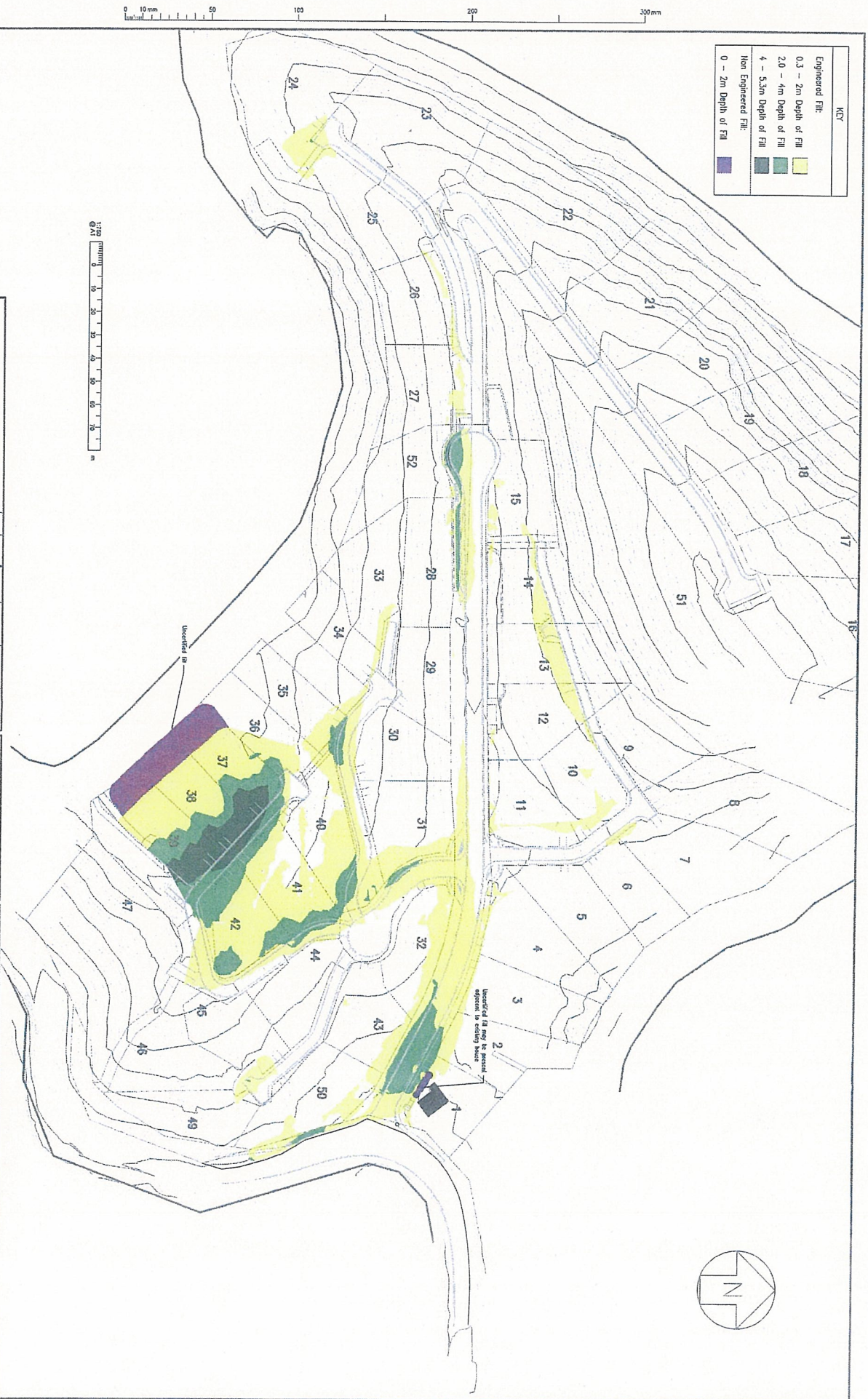
To Accompany BGL Report 1129/43 dated 20 April 2009

SPECIFIC NOTES

1. Foundation conditions (*) refer to dominant rock and/or soil type identified.
2. Site-specific investigation and design is to be required for each dwelling.
3. Nature & extent of filling (**) refers to building lots where type of fill is known.
4. Non-engineered filling in construction settling pond area (Lots 36-39).
5. Other sites engineered with compacted fill materials meeting NZS 4431.
6. Up to 300mm of topsoil and related materials may have been placed on lots.
7. Lot boundaries derived from Connell Wagner Ltd Plan A384/SU03/RevM.
8. Extent of filling and other works shown on Opus Dwg 6/2328//6/8604/Sheet 5.

<u>Lot No</u>	<u>Lot Foundations*</u>	<u>Filling**</u>	<u>Other Comments</u>
1	In situ loess & non-engineered fill	Non-engineered	Existing building
2	In situ loess	None	Refer PDP reports
3	In situ loess	None	Staging area
4	In situ loess	None	Fill storage area
5	In situ loess	None	Fill storage area
6	In situ loess	None	Fill storage area
7	In situ loess	None	Staging area
8	In situ loess & basalt bedrock	None	Shaping & topsoil
9	Loess-colluvium & bedrock	None	Shaping & topsoil
10	In situ loess	None	Some fill storage
11	In situ loess & conglomerate	None	Fill storage area
12	In situ loess & conglomerate	None	Shaping above "I"
13	In situ loess & conglomerate	None	Shaping above "I"
14	Loess-colluvium & conglomerate	None	Basalt above "I"
15	Mixed colluvium & conglomerate	None	Basalt upslope
16	Mixed colluvium & basalt	None	Extensive rock
17	Mixed colluvium & basalt	None	Extensive rock
18	Mixed colluvium & basalt	None	Extensive rock
19	Mixed colluvium & basalt	None	Extensive rock
20	Mixed colluvium & basalt	None	Extensive rock
21	Mixed colluvium & basalt	None	Extensive rock
22	Mixed colluvium & basalt	None	Extensive rock
23	Colluvium, basalt & conglomerate	None	Bedrock at $\leq 1m$
24	Mixed colluvium & basalt	None	Bedrock at $\leq 2m$
25	Colluvium, basalt & conglomerate	None	Bedrock at $\leq 3m$
26	Colluvium, basalt & conglomerate	None	Bedrock at $\leq 3m$
27	Colluvium, basalt & conglomerate	None	Bedrock at $\leq 3m$
28	Mixed colluvium & conglomerate	None	Access from "F"
29	Loess-colluvium & conglomerate	None	Access from "F"
30	Loess-colluvium & conglomerate	None	Access from "E"
31	Loess-colluvium & conglomerate	Minor engineered	Access from "E"
32	Loess-colluvium & conglomerate	Minor engineered	Access from "J"
33	Colluvium, basalt & conglomerate	None	Access from "F"
34	Colluvium, basalt & conglomerate	Not accessed	Existing house
35	Colluvium, basalt & rhyolite	None	Shaping & topsoil
36	Colluvium, basalt, beach & fill	Engineered & Non-engineered (= pond)	
37	Engineered filling (+ beach)	Engineered & Non-engineered (= pond)	
38	Engineered filling (+ beach)	Engineered & Non-engineered (= pond)	
39	Engineered filling (+ beach)	Engineered & Non-engineered (= pond)	
40	Colluvium, basalt & conglomerate	Minor engineered	Shaping & topsoil
41	Colluvium & conglomerate	Minor engineered	Shaping & topsoil
42	Colluvium & conglomerate	Minor engineered	Shaping & old well
43	Colluvium & conglomerate	None	Shaping & topsoil
44	Colluvium & conglomerate	None	Shaping & topsoil
45	Colluvium & rhyolite	None	Bedrock at $\leq 2m$
46	Loess-colluvium & rhyolite	None	Watercourse
47	Rhyolite & loess-colluvium	None	Access from "G"
48			None on plan
49	Loess-colluvium & rhyolite	None	Access from "H"
50	Loess-colluvium & conglomerate	None	Old eroded gullies

KEY	
Engineered Fill:	
0.3 - 2m Depth of Fill	
2.0 - 4m Depth of Fill	
4 - 5.5m Depth of Fill	
Non Engineered Fill:	
0 - 2m Depth of Fill	



NO.	REVISED	DATE	BY	CHECKED	DATE
1			DAVID	DAVID	01/03
2			DAVID	DAVID	01/03
3			DAVID	DAVID	01/03
4			DAVID	DAVID	01/03
5			DAVID	DAVID	01/03
6			DAVID	DAVID	01/03
7			DAVID	DAVID	01/03
8			DAVID	DAVID	01/03
9			DAVID	DAVID	01/03
10			DAVID	DAVID	01/03
11			DAVID	DAVID	01/03
12			DAVID	DAVID	01/03
13			DAVID	DAVID	01/03
14			DAVID	DAVID	01/03
15			DAVID	DAVID	01/03
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38			DAVID	DAVID	01/03
39			DAVID	DAVID	01/03
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41			DAVID	DAVID	01/03
42			DAVID	DAVID	01/03
43			DAVID	DAVID	01/03
44			DAVID	DAVID	01/03
45			DAVID	DAVID	01/03
46			DAVID	DAVID	01/03
47			DAVID	DAVID	01/03
48			DAVID	DAVID	01/03
49			DAVID	DAVID	01/03
50			DAVID	DAVID	01/03
51			DAVID	DAVID	01/03
52			DAVID	DAVID	01/03

STOWE PROPERTIES LIMITED

Christchurch Civil Engineering
 PO Box 1422, The Arcade
 Christchurch, New Zealand
 Tel: +64 3 366 5900
 Fax: +64 3 366 5901

DATE	17/30 (A1)	DATE	16/04/09 @ 12:00	DATE	04/04/10
SCALE	1:750 (A1)	SCALE	1:1200	SCALE	1:1200
PROJECT	STOWE PROPERTIES LIMITED BLACK ROCK SUBDIVISION DEPTHS OF FILL - AS BUILT	PROJECT	STOWE PROPERTIES LIMITED BLACK ROCK SUBDIVISION DEPTHS OF FILL - AS BUILT	PROJECT	STOWE PROPERTIES LIMITED BLACK ROCK SUBDIVISION DEPTHS OF FILL - AS BUILT
CLIENT	STOWE PROPERTIES LIMITED	CLIENT	STOWE PROPERTIES LIMITED	CLIENT	STOWE PROPERTIES LIMITED
NO.	04/04/100	NO.	8804	NO.	5
REVISED		REVISED		REVISED	
DATE		DATE		DATE	
BY		BY		BY	
CHECKED		CHECKED		CHECKED	
DATE		DATE		DATE	

APPENDIX I.**STATEMENT OF PROFESSIONAL OPINION ON THE SUITABILITY OF LAND FOR BUILDING CONSTRUCTION**

ISSUED BY: David Bell B.Sc (Hons) (N.S.W) M.Aus.I.M.M
(Engineer)

TO: Stowe Properties Limited
(Developer)

TO BE SUPPLIED TO: Christchurch City Council
(Territorial authority)

IN RESPECT OF: Black Rock Subdivison RMA 92004981
(Description of Infrastructure/land development)

AT: Hays Bay

David Bell (Address) of

Bell Geoconsulting Ltd PO Box 31-031 CHCH
(Name and address of firm) 81044

Hereby confirm that:

1. I am a suitably qualified and experienced geotechnical engineer and was retained by the developer as the geotechnical engineer on the above development.
2. The extent of my inspections during construction, and the results of all tests carried out are as described in my Geotechnical Completion Report, dated 18 & 20 April 2009
3. In my professional opinion, not to be construed as a guarantee, I consider that (*delete as appropriate*):
 - ✓ (a) the earthfills shown on the attached Plan No opus 6/2328/6/8604 sht. 5. have been placed in compliance with the requirements of the Christchurch City Council and my specification.
 - ✓ (b) the completed works give due regard to land slope and foundation stability considerations.
 - (c) the original ground not affected by filling is suitable for the erection thereon of buildings designed according to NZS 3604 provided that:

(i) _____

(ii) _____

PART 4: GEOTECHNICAL REQUIREMENTS

(d) the filled ground is suitable for the erection thereon of buildings designed according to NZS 3604 provided that:

- (i) _____
- (ii) _____

(e) The original ground not affected by filling and the filled ground are suitable for the construction of a development ~~subdivision~~ and are not subject to erosion, subsidence or slippage in accordance with the provisions of Section 106 of the Resource Management Act 1991 provided that:

- (i) specific foundation design of each dwelling site
- (ii) associated investigation & interpretation

NOTE: The sub-clauses in Clause 3 may be deleted or added to as appropriate.

4. This professional opinion is furnished to the territorial authority and the developer for their purposes alone, on the express condition that it will not be relied upon by any other person and does not remove the necessity for the normal inspection of foundation conditions at the time of erection of any building.

5. This certificate shall be read in conjunction with my geotechnical report referred to in Clause 2 above, and shall not be copied or reproduced except in conjunction with the full geotechnical completion report.

6. I / My practice holds professional indemnity insurance in the sum of \$ 2,000,000
(Minimum amount of insurance shall be commensurate with the current amounts recommended by IPENZ, ACENZ, TNZ, INGENIUM.)

(Signature of engineer) Date: 21/04/2009

Qualifications and experience

BSc (Hons) MAusIMM
Engineering geologist



BGL 1129/42

18 April 2009

Attention: Chris Johnson
Opus International Consultants Ltd
PO Box 1482
CHRISTCHURCH
Fax: 365 7858

Dear Sir

Re: **BLACK ROCK ESTATE – MARINE DRIVE WORKS COMPLETION**

1. Introduction

Further to the conclusion of works in relation to the widening and realignment of Marine Drive in the vicinity of Black Rock Estate subdivision, and the construction of the walkway below part of Marine Drive, I have prepared the following earthworks completion report. In terms of the consent conditions I record that I am a suitably experienced engineering geologist with more than 35 years experience in earthworks on Banks Peninsula, and that I supervised and regularly inspected the various sites during construction. It is my opinion that all works have been completed by the respective contractors to a suitable standard, and that the stability and long-term performance of Marine Drive has been enhanced by these works.

2. Alignment Description

The portion of Marine Drive adjacent to the Black Rock Estate totals some 350m in length, of which about 150m has been widened, realigned and/or reconstructed to meet the requirements of Christchurch City Council. The alignment engineering geology is variable, with the south-western 100m cut into rhyolite bedrock and a volcanic conglomerate is exposed opposite the entrance to the subdivision. Loess cover varying from less than 0.5m to more than 4.0m thick is draped over bedrock along this part of the road reserve, and sidecast non-engineered fill extends for ~150m from the south-western limit of the subdivision towards Diamond Harbour above most of the walkway.

For a distance of approximately 150m Marine Drive has been reconstructed, lowered and/or widened, with the replacement of unsatisfactory fill that was associated with prior removal of a culvert by Banks Peninsula District Council. The walkway has been constructed at the base of the sidecast fill with minimal ground disturbance and reinstatement by rock support. The footbridge across the waterway has been designed and installed with supervision by Opus staff.

3. Marine Drive Realignment

The approximate 150m long segment of Marine Drive adjacent to the entrance to Black Rock Estate subdivision has been reconstructed as follows:

- Widening has taken place by excavation into volcanic conglomerate bedrock and loess soils locally exceeding 4m in thickness back to the road reserve boundary. Cut batter support has been provided by an ~25m long Permacrib wall where the loess soil thickness exceeds 2.0m, and this wall has been designed by Phi Group NZ Limited of Auckland with a producer statement provided by Geotek Services Ltd. Drainage provision has been made on the top of the wall to collect and discharge overland flow from the property above.
- On the Diamond Harbour side of the Permacrib wall a cut bench has been formed at mid-height in the ~4m loess face over a distance of about 25m. The lower face has been covered by MacMat-R according to the manufacturer's installation procedures and is to be grassed, with a concrete cutoff constructed on the intermediate bench. The upper part has been left as a vertical cut in loess soils, retained by an engineered timber pole wall over some 8m, and protected from erosion by a cutoff drain constructed on the property above. Only minor fretting of the loess is to be anticipated, requiring periodic maintenance.
- Elsewhere cut faces have been formed in natural ground at 4V:1H or steeper, with a concrete cutoff drain above the loess face that is up to 2m high. A 1.0-1.5m wide grassed berm has been formed at the base of the cut faces, which are in volcanic conglomerate and loess, and this will collect any fretted material from the faces in the longer term. The volcanic conglomerate has a moderately weak (~10MPa) matrix supporting boulders up to ~0.5m in size, and minor fretting due to wetting and drying is to be expected from the exposed faces.

The road has been lowered by up to 1m around the bend in Marine Drive, with services relocation as required. Foundations and fill batter retention are discussed in the following section of this report.

4. Marine Drive Reconstruction

For the 150m long section of Marine Drive that was reconstructed after the realignment described above, the following foundation and fill retention works have been completed:

- A major backfilled cavity in poor quality fill on the Charteris Bay side of the realigned corner was excavated to expose in situ loess soils at depths between about 1.5 and 3.0m. Scala penetrometer surveys were then conducted and material having an "e" value less than 12 mm/blow

(approximate $q_a < 180\text{kPa}$) was excavated by undercutting. Engineered fill comprising site AP150 and AP65 crushed basalt was then placed in layers and the road rebuilt to the required grade prior to sealing. Compacted dry densities in the range $2100 \pm 60 \text{ kg/m}^3$ were achieved for the basecourse and gabion wall foundations, as measured by the contractor and confirmed by Independent Civil Laboratory Limited.

- An engineered gabion basket wall designed by Opus has been built for a length of some 40m adjacent to this area of new filling, and all non-engineered fill behind and below the wall was removed from the road foundations under my direction. This widened and realigned section of Marine Drive can be expected to perform satisfactorily in the long-term given the standard of works completed, and the stormwater control measures that have been implemented.
- It was found during construction that runoff from an existing driveway above Marine Drive was bypassing the stormwater control system, and this has been remedied separately by construction of a grated slot drain. Similar problems have been identified with a steep drive on the Charteris Bay side of the gabion wall, and water has been observed flowing across the roadway towards the watercourse near the Lot 46 boundary. It is recommended that a grated slot drain be built to control runoff from this driveway as part of Council's road maintenance.

It is my opinion that the earthworks carried out during reconstruction of Marine Drive near the Black Rock access intersection have been completed in accordance with all relevant standards, and that unsatisfactory filling and drainage issues associated with the original road have been remediated.

5. Walkway Construction

The walkway connecting the gabion wall to Marine Drive at the south-western end of the Black Rock subdivision has been constructed with my design input, and as noted previously the bridge crossing was independently engineered by Opus. The following are noted with respect to walkway completion:

- Walkway earthworks have involved minimal disturbance of the existing non-engineered fill batter below Marine Drive, with particular care being taken to reinstate support using unweathered basalt boulders derived from within the subdivision footprint. Vertical and horizontal grades on the walkway have been adjusted to ensure minimal excavation into the road batter fill, and drainage, topsoiling and oversowing have been implemented for long-term security of walkway cut and fill batters.
- The walkway bridge is founded onto concrete plinths at either end, and these are independent of the rock protection measures adjacent to the watercourse near the Lot 46 boundary. I am satisfied that the bridge

abutment construction has been carried out in a competent manner by Calcon staff, and that the blocks interlock sufficiently for long-term security of the walkway. Opus is to independently confirm design and supervision of the bridge construction to Council's requirements.

I am satisfied that walkway construction has not in any way affected long-term stability of the non-engineered fill supporting Marine Drive, and in fact the additional basalt boulder support placed at the toe of the fill batter will improve its security. I draw attention to potential uncontrolled stormwater discharge from the driveway above the watercourse affecting the stability of this part of the Marine Drive fill batter, and consequentially the carriageway itself.

6. Conclusions

- 1) Earthworks to realign and widen Marine Drive adjacent at the access point for Black Rock Estate subdivision have been completed in a competent manner and meet all relevant standards: upslope cutoff drain construction has further improved long-term stormwater control and route security.
- 2) Cut batters in bedrock (= volcanic conglomerate), and in loess soils less than 2.0m high, have been formed at 4V:1H or steeper without retention and an upslope cutoff formed above the loess: an ~25m engineered and certified Permacrib wall has been placed where the loess is greater than 2.0m thick.
- 3) A 25m long section of thick loess (~4m high face) to the east has been formed with an intermediate cutoff drain, and MacMat-R facing of the lower batter for long-term grassing: partial timber pole wall retention of the upper face has been carried out, and an upslope concrete cutoff drain installed.
- 4) The foundations of Marine Drive have been rebuilt during realignment, with compacted crushed basalt and/or gabion basket walls used for retention: all weak loess material or non-engineered fill beneath the carriageway has been removed and replaced with suitably engineered materials.
- 5) The walkway below Marine Drive has been completed in such a way that there has been no effect on the long-term stability of the non-engineered fill supporting the carriageway: I have overseen walkway construction, whilst the bridge across the watercourse was designed and supervised by Opus.
- 6) All relevant design and as-built drawings are held by Opus International Consultants Ltd, who acted as managers for the project and carried out design and construction supervision: Opus also hold the producer statement relating to the Permacrib wall and related information.
- 7) As with all earthworks projects visual observation of performance should be carried out of both the road and the walkway, with maintenance or other

measures if or where required: in my opinion the works completed have significantly improved the long-term security of this part of Marine Drive.

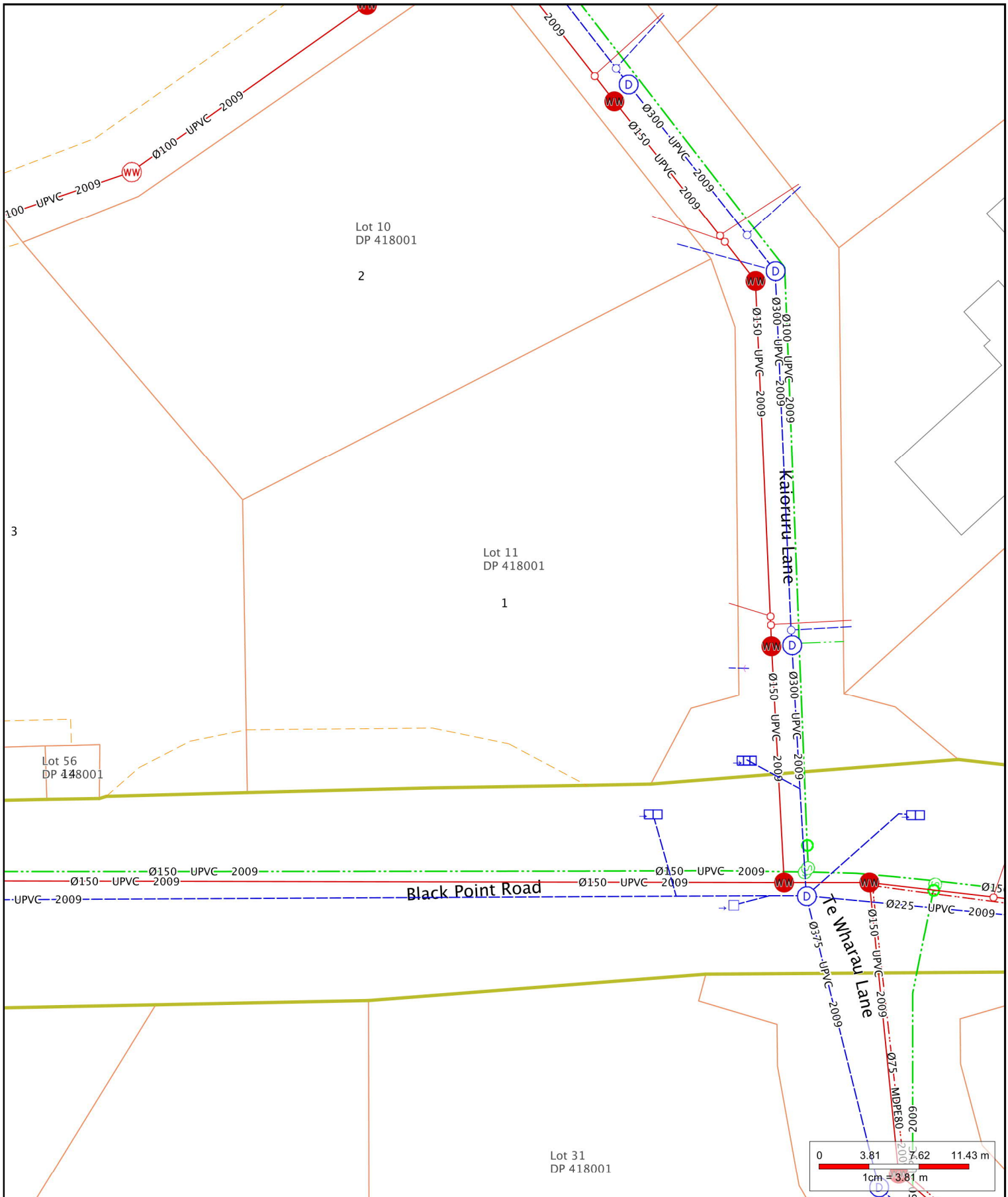
8) It must be accepted that natural erosion will now occur on newly-formed cut faces that have not been protected by other measures, but that the effects of this will be less than minor in the long-term: all reasonable measures have been undertaken to ensure long-term stability and security of the new works.

I trust that the above completion report is sufficient for your immediate needs. Do not hesitate to contact me if you require anything further, but it is my understanding that Opus holds all relevant drawings and documentation.

Yours sincerely



















































































A handwritten signature in black ink, appearing to read 'David H Bell', written in a cursive style.

DAVID H BELL (Director)




1 : 381 on A4
 16/12/2019 9:32:31 AM

 ph: 941-8300 fax: 941-8385
 Accuracy not guaranteed. Onsite verification required. Display of data scale dependent, full detail available at 1:500.
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Private Drainage		Wastewater		Stormwater	
Standard Infrastructure  Bio Gas  Condensate Trap  End Cap  Inlet  Outlet  Valve  Main  Cable	Water Intake/Supply  Inlet  Meter  Outlet  Pump  Restrictor  Valve  Air Release  Butterfly  Flow restriction  Gate  Pressure Activated  Sluice  Valve  Reservoir  Structure  Lateral  Main  Sub Main	 End Cap  Valve  Air Gap Separator  Vent  Eye  Eye (Vertical)  Outfall  Pump  Junction  Access  Flush Manhole  Inspection Point  Standard Manhole  Trap  Vented Manhole  Lateral  Main  Pressure Main	 Lateral Fitting  Local Pressure  Control Panel  Boundary Kit  Tank System  Site  Vacuum Chamber  Vacuum Breather Stormwater  Bend  Change  Eye  Flow Restriction  Inlet  Dome Sump  Double Sump  Gross Debris Trap	 Inlet  Inlet Headwall  Pipe End  Silt Trap  Single Sump  Soak Pit  Triple Sump  Junction  Standard Manhole  Outlet  Pump  Structure  Basin  Lateral  Main  Lateral Fitting  Double Sump	All services  Pipe Protection  Abandoned  Proposed  Out of service Landbase  Easement

1 Kaioruru Lane Land Use Consents



**1 Kaioruru Lane
Subdivision Consents**



Land Use Resource Consents within 100 metres of 1 Kaioruru Lane

Note: This list does not include subdivision Consents and Certificates of Compliance issued under the Resource Management Act.

14 Te Wharau Lane

RMA/2017/2618

Construct dwelling with attached garage

Processing complete

Applied 26/10/2017

Decision issued 07/02/2018

Granted 07/02/2018

319 Marine Drive

RMA/2019/1901

Proposed New Boat Shed

On hold - processing suspended by applicant

Applied 22/08/2019

7 Kaioruru Lane

RMA/2017/2022

Construct a new dwelling with detached garage

Not accepted for processing

Applied 24/08/2017

Not accepted for processing 11/09/2017

RMA/2017/2268

Earthworks associated with the construction of a residential dwelling with a detached garage

Processing complete

Applied 15/09/2017

Decision issued 18/10/2017

Decision issued 18/10/2017

Granted 17/10/2017

8 Kaioruru Lane

RMA/2018/2336

To Construct a New residential unit

Processing complete

Applied 25/09/2018

Decision issued 25/10/2018

Granted 25/10/2018

9 Te Wharau Lane

RMA/2014/3256

Single storey dwelling and retrospective earthworks - Historical Reference RMA92027959

Processing complete

Applied 05/12/2014

Decision issued 20/01/2015

Granted 20/01/2015

Data Quality Statement

Land Use Consents

All resource consents are shown for sites that have been labelled with an address. For sites that have been labelled with a cross (+) no resource consents have been found. Sites that have no label have not been checked for resource consents. This will be particularly noticeable on the margins of the search radius. If there are such sites and you would like them included in the check, please ask for the LIM spatial query to be rerun accordingly. This will be done free of charge although there may be a short delay. Resource consents which are on land occupied by roads, railways or rivers are not, and currently cannot be displayed, either on the map or in the list. Resource consents that relate to land that has since been subdivided, will be shown in the list, but not on the map. They will be under the address of the land as it was at the time the resource consent was applied for. Resource consents that are listed as Non-notified and are current, may in fact be notified resource consents that have not yet been through the notification process. If in doubt. Please phone (03)941 8999.

The term "resource consents" in this context means land use consents. Subdivision consents and certificates of compliance are excluded.

Subdivision Consents

All subdivision consents are shown for the sites that have been labelled with consent details. For Sites that have been labelled with a cross (+) no records have been found. Sites that have no label have not been checked for subdivision consents. This will be particularly noticeable on the margins of the search radius. If there are such sites and you would like them included in the check, please ask for the LIM spatial query to be rerun accordingly. This will be done free of charge although there may be a short delay.

The term "subdivision consents" in this context means a resource consent application to subdivide land. Non subdivision land use resource consents and certificates of compliance are excluded.

This report will only record those subdivision applications which have not been completed i.e once a subdivision has been given effect to and the new lots/properties have been established the application which created those lots will not be shown

All subdivision consent information is contained on the map and no separate list is supplied