



Managed Design
and Construction

30 June 2021
Terra MDC Limited
82 Bond Street,
Central City
Dunedin 9016
New Zealand

Ph/Fax: +64 (0) 3 477 0090
Mob: +64 (0) 220 737 480
E-mail: james.molloy@terramdc.co.nz
Web: www.TerraMDC.co.nz

For attention: Chris Adams
For GTJM Property
(by email only)

Project Reference: 202106304

Dear, Chris

**RE: Preliminary Geotechnical Assessment of Land for the Proposed Subdivision
at 336 Portobello Rd, Dunedin**

This report has been prepared as a preliminary geotechnical assessment, providing a summary of the likely ground conditions and land hazards along with identifying the likely design and construction issues in subdividing and developing the above site. It is understood the intention is to subdivide the north end of the property into 12 Lots with a proposed new road alignment from Portobello Rd along the northern boundary. A concept subdivision layout plan has been provided by Terramark (Ref: 12178 attached).

The data provided and the findings of this report are based upon a site walkover and shallow ground investigation completed on 21st of June 2021 by Terra MDC. Reference is also made to the databases from Otago Regional Council (ORC) for hazards and Dunedin City Council (DCC) for land information and the Geological and Nuclear Sciences (GNS) for information on geology and active faults in the region.

The ground investigation, comprising three Scala Penetrometers (SP01 – SP03), and ten machine excavated test pits (TP01 – TP10) were undertaken. The investigation information along with a number of photos taken during the site visit are attached for your reference. It is considered that the preliminary ground investigation and design assumptions will require to be verified, possibly with additional specific ground investigation, by a suitably qualified engineer during the detailed design for the new access and subdivision development and then during the construction phase to confirm the observations and recommendations made in this initial assessment.

Observations around the Property and Immediate Environs:

The proposed subdivision has a total area of 1.5737 ha and is zoned as *Township and Settlement*¹. The subdivision is bounded by developed residential properties to the north, east and west boundaries and by the remaining area of the existing property to the south which is zoned as *Rural Residential* 2. There is a DCC – ‘Significant Natural Landscape Overlay’ situated over the southern area of the existing property which encroaches the southern boundary of the proposed subdivision. The site is currently used as farmland for grazing stock with some tree clearance under way on the lower flanking slopes.

The site is currently accessed via a narrow driveway from Portobello Rd in the northwest corner of the site. It is noted the driveway entrance lies within DCC road reserve. The driveway has an asphalt surface up to the neighbouring property of 335 Portobello Rd. There is a 2.0m to 2.5m high steeply hand stacked rock faced wall supporting a section of the slope above the driveway in this area. The driveway is then gravel surfaced which runs into an unsurfaced farm track midway along the northern boundary. There are two farm tracks diverting from the driveway midway along the northern boundary which provides access to the southwest area and the existing house

¹ DCC District Plan Map: <http://apps.dunedin.govt.nz/WebMaps/RatesMap/>

situated in the centre of the site. There are boundary fences running along the north and east boundaries as well as several farm fences running through the site.

The site is situated on a northerly facing hill slope with an approximate gradient of 15° to 20°. Steeper sections of 20° to 25° slopes and locally up to 40° are found along the driveway alignment and where farm tracks and the existing house platform have been cut into the slope. There are also incised steeper slopes running into northerly flowing gullies outside the east and west boundaries of the site.

The terrain is typically covered in thick grass with occasional areas of small bushes. There are several large trees surrounding the existing house and running along the northeast farm track. There are also a number of large tree stumps below the existing house area and further up the northeast farm track.

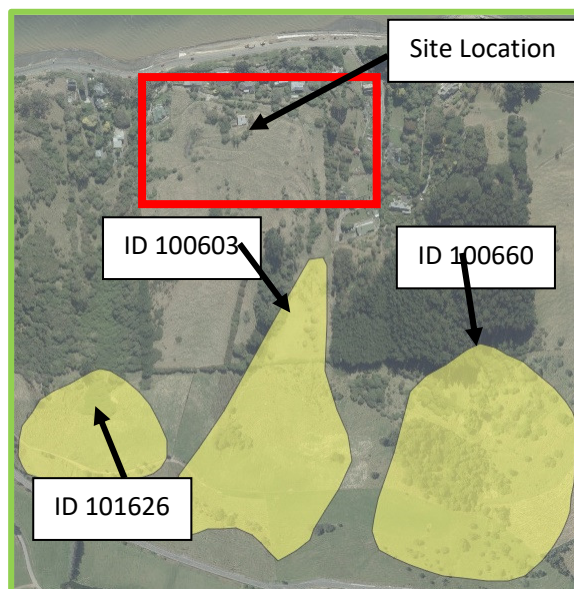
There are private watermain pipes running down the slope through the centre of the property. There are overhead powerlines and power poles running through the site between the east and west boundaries. It is unknown where the existing underground wastewater and stormwater pipes run from the existing house. There are no further reported underground or overhead services within the vicinity of the site.

Review of Geological Hazards and Other Information:

The underlying bedrock geology of the site is noted to be in the Dunedin Volcanics Group ² formed during the second main eruptive phase. The bedrock is described as extensive flows of trachybasalt, basalt, phonolite, and dolerite comprising olivine minerals. The underlying geology is anticipated to be overlain by a mantle of loess typically c.1.0m and to 3.0m thick.

The ORC Hazards database notes there to be an active debris-dominated alluvial fan hazard which runs from the western gully and encompasses the western and northern area of the site. A debris-dominated alluvial fan is determined where narrow and steep gullies are choked by landslide debris causing widespread sediment deposition and potential flooding. These events are only likely to occur during heavy and prolonged rain events. It is considered that a significant land slippage during a flood event within the gully would need to occur to cause alluvial debris deposition within the site, albeit long term erosion on bare soils may occur as minor sediment discharges over time.

There are three mapped landslide hazards approximately 100m and 300m south or upslope of the site. The mapped landslide areas are situated at the head of the gullies and partway along the slopes which flank the east and west sides of the site.



The areas are defined by the topographical features such as very steep gully slopes which are likely the result of landslide activity. The landslide movement is assumed to be complex with a medium sensitivity and the initiation of the slide likely to be prehistoric.

There is no recent information or monitoring undertaking of the landslide areas with no reported damages to the below residential properties at Portobello Rd. It is considered the centre of the site is a sufficient distance away from the flanking gullies where it will not be affected by movement within the mapped landslide areas. The east and west sides of the site, where situated on the steeper >20 degree gully slopes are considered to be at a possible risk of the mapped landslide areas.

Figure 1: Proximity of the site to the mapped historical Landslide Hazards.

² GNS Geology Webmaps: <http://data.gns.cri.nz/geology/>

The ORC Hazards database ³ notes that the site lies on an area with low to nil susceptibility to liquefaction during seismic shaking with intensity comparable to that of a 1:100year earthquake. The site is categorised as Domain 'A', which is described as ground underlain by rock or firm sediments.

The nearest active fault to the site is the Titri Fault which is approximately 14 Km west of the site. The site lies within an area where seismic shaking ⁴ from an Alpine Fault Magnitude 8.0 (1:100 year) event can expect damage representative of Modified Mercalli Intensity (MMI) of 5. The requirements of NZSL 1170 'Structural Design Actions' would prevail in any structural design. The site lies in what is determined as being Class 'B', 'shallow rock' per NZS:1170-Part 5.

Geotechnical Investigation:

The site investigation was carried out along the proposed road alignment, and within several of the proposed Lots. The test pits were backfilled with the arisings and lightly compacted. Where the test pits are encountered in future earthworks or foundations they will require to be excavated and backfilled with engineering fills or mass concrete.

The test pit and Scala Penetrometer results determined the ground conditions to be typically four soil types;

- Topsoil, comprising a dark brown silt with occasional roots.
- Fills, comprising mottled dark brown clayey silt with some gravels and cobbles.
- Loess, comprising a mottled grey and orange brown silty clay.
- Weathered volcanic's, comprising dark brown and grey clayey silt. (Tuff)

Topsoil was encountered throughout the site typically as a 0.25m to 0.3m thick layer. Thin layers of topsoil are anticipated to be overlying areas of fill which would overlie the original topsoil.

Fills were encountered at 0.3m to 0.7m depth in the lower northwest area of the site and 0.4m depth below the existing house building platform, which will also have thicker layers of fills used to form the outer slopes of the platform. The fills comprised of what appeared to be locally excavated soil with minor gravel and cobbles throughout. All fills are noted to be soft and are overlying the original topsoil.

The natural ground was encountered as a loessial soil throughout the site. The loess was typically encountered with an upper stratum which was soft with moderate to high plasticity and in a damp condition. Infilled cracks were also recorded within the upper stratum of loess in several test pits. The Scala Penetrometer testing determined the loess to have a firm becoming stiff stratum at >0.9m below ground level. Loess is known to be an erodible soil which may also undergo 'tunnel gully' or subsurface erosion.

The volcanic bedrock geology was encountered as a weathered tuff at 0.9m to 1.6m below ground level. The weathered tuff was typically stiff to hard and in a dry condition.

Groundwater was encountered as a slow and steady seepage at TP02 and a slight seepage at TP06. However, a persistent groundwater table was not encountered in the test pits and deeper borehole investigations would be required to determine this or as a shallow perched water-table found in the loess and volcanic soil horizon.

Geotechnical Assessment:

An initial geotechnical assessment has been undertaken to provide general advice on the driveway access, now Lots, earthworks fill and potential site issues and geological hazards. Reference is made to the proposed subdivision plan provided by Terramark. It is considered in general that the site will be suitable for the proposed sub-division with appropriate engineering and detailing to fully support this development, with further specific investigation undertaken as the design progresses from concept into detailed design.

The proposed road access will require earthworks comprising excavation and engineering filling to form a suitable road gradient and width. Retention will likely be required in several upslope locations of the road as well

³ ORC Web-Hazard Maps <http://hazards.orc.govt.nz/IntraMaps80>

⁴ Opus – Seismic Risk in Otago Region, May 2005

replacement of the existing stacked rock retaining wall in the northwest area of the site. The current access within the DCC Road Reserve area is a narrow roadway with a number of old retaining walls and over steep slopes, so consideration should be given to improving this to a more modern and reliable accessway, including developing appropriate sight distances for approaching and departing traffic off Portobello Road.

The proposed Lots will also require excavation and levelling off for the ground to form suitable building platforms and driveways. The subsequent development of each individual Lot for housing will require further investigation and design inputs on a case by case basis. The earthworks and building works will require to be constructed and certified to meet the various specific criteria with the following specification.

- NZS4431-1989: Code of Practice for Earth fill for Residential Development.
- NZS4404-2010: Land Development and Subdivision Engineering.
- NZS3604-2013: Timber Framed Structures
- Dunedin City Council requirements
- The developer's specific engineering specification and drawings.

Suitability of Soils for the Proposed Access Road, Foundations and Retaining Walls:

The site is situated on a steep slope which has had shallow earthworks undertaken to form the existing farm tracks and house platform. The existing earthworks are likely formed from localised cut to fill which has been pushed over the original ground with no engineering compaction. Further filling has been identified within the lower northwest area and is considered that shallow fills may present throughout the lower area of the site. These are not considered suitable for supporting future driveways or building platform and will require to be re-engineered or new fills utilised to replace those unsuitable fills which are removed.

All earthworks fill required for the proposed access road and potential building platforms shall be constructed using engineering fills comprising of site won cohesive soil or an imported granular fill. All fills will require their engineering characteristics to be defined depending on source and type of fill along with proposed end use. The earthworks and building works will require to be constructed and certified.

The topsoil and any existing fill is not considered suitable to supporting house foundations or driveways or for reuse other than as landscaping spoils or topsoil for site cover. Therefore, these soft soils shall be removed from beneath any subgrades, foundations and where any engineering fills are to be placed. The existing farm tracks are not considered suitable for directly constructing paved driveways upon due to their current state. The unconsolidated fills are unsuitable to supporting trafficking loads and will require to be removed and replaced with granular engineering fills and then surfaced with suitable pavement layers.

The loessial soils have a soft upper stratum which has an appearance of being historically disturbed or poorly consolidated. The upper stratum is noted to have a moderate to high plasticity and may potentially be an expansive soil. This means the soil is susceptible to volume change with variable moisture condition, i.e. shrinking and swelling. The soils will shrink over dryer periods which will cause cracks to form up to the surface and cause voids and settlement of foundations.

The natural soils are considered suited for supporting foundations of residential buildings where a firm to stiff strata is encountered, this is typically encountered at >0.9m below existing ground level. This would be determined as having an allowable bearing pressure $Q_a > 100\text{kPa}$ for house foundation and is defined as 'Good Ground' in accordance with NZS3604:2011 'Timber Framed Buildings'. The assumption is based upon foundations being those typically suitable for one or two storey residential buildings, using either shallow piled, reinforced concrete strip, or rafted slab foundations, all designed as per NZS3604. A site-specific investigation to verify the minimum depth of foundations will be required once final house locations are determined and a detailed design is available for each individual property (Lot).

The soft loess is a difficult soil to reuse as engineering fill unless carefully controlled during construction. Notably where it is used as an engineering fill and these are compacted in an over dry state, the fill is likely to have a high air voids content. Whilst the fill may appear compacted the fill is vulnerable to wetting and subsequent collapse. These issues can lead to construction and long-term performance problems with any engineering fill.

It may be worthwhile considering the introduction of an imported low quality granular fill and mixing this with the site won soils to produce a more homogeneous and denser cohesive type fill. Alternatively, the soils may be cement or lime modified to produce a more consistent soil strength and stiffness for driveway sub-grades. This soils mixing may also be undertaken insitu on the shallow transition zones in order to provide a reliable sub-grade for the access which would be a benefit by reducing the necessary thicknesses of the underlying capping and pavement layers.

Shallow cut to fill transitions are also vulnerable to moisture changes and consolidation due to trafficking and repeated drying and wetting cycles. These should have deeper transition layers built in to provide a reliable uniform foundation thickness beneath any road or building foundations.

It is anticipated that all soft spots would be determined by visual inspection, insitu testing and proof rolling. Soft spots will be rectified by removal and replaced with suitably selected and compacted engineering fill. Any soft spoils from the development excavations could be used elsewhere as landscape fills.

All earthwork fills shall be benched in where natural side slopes are steeper than 1V:5H. It is recommended that all permanent cut or filled slopes formed in clayey or poor quality granular engineering fills are constructed no steeper than 1V:2.75H (<20°). Steeper filled slopes may be formed from higher quality granular engineering fills such as hard durable crushed quarry fills, and these would be assessed based upon their merits, size of slopes and type of aggregates. Landscape slopes shall be formed no steeper than 1V:3H. All exposed batters and landscape fill areas will require to be covered with a minimum 0.15m thick layer of topsoil and grass seeded for erosion protection.

It is recommended any new retaining walls are designed as gabions, timber pole or timber crib retaining wall. The retaining wall foundations will require to be embedded into or founded upon 'Good Ground'. Retaining walls shall be constructed with appropriate back of wall drainage and backfilled with imported granular engineering fill. All retaining walls >1.5m high or surcharged by slopes and driveway loads shall be designed and certified by a suitably qualified engineer with slope stability analysis undertaken too.

When a final access road and Lot layout design, including the earthworks, has been completed it is recommended bulk soil samples are recovered from the site and undergo laboratory testing for determining its characteristics as an engineered fill. The tests will determine the maximum dry density (MDD) and optimum moisture content (OMC) relationship plus soils plasticity plus the natural and remoulded shear strength.

The engineering fills will typically require to be compacted to >95% of the MDD with the moisture content typically within the range of -2% and +1% of the OMC. Moisture conditioning may be necessary, and it would be prudent to check for shear strength in early earthworks trials too. It is recommended that the compaction achieves <10% air voids to prevent vulnerability to moisture induced settlement. Specific enhanced compaction criteria may be required for building foundations. All engineering fill >0.5m thickness shall be monitored and certified by a suitably qualified engineer.

It is considered that the initial ground investigation and design assumptions will require to be verified by further specific investigation for final access road earthworks and retaining wall designs to confirm the above prior to submitting any resource or building consent applications.

Groundwater and Drainage:

The site has not been fully assessed for soakage design or groundwater control. As a minimum, all upslope areas of building platforms, building foundations and driveways will have appropriate subsoil drainage constructed to prevent underground water flows affecting these areas. Localised seepages may also be encountered throughout the site and shall also be diverted with appropriate subsoil drainage.

The loessial soils are erodible and possibly dispersive which can lead to significant tunnel gullying and scouring where left exposed to overland water flows. Therefore, appropriate swale drainage shall be constructed to intercept overland water flows. Where low spots occur during site development, they shall be re-contoured to remove the possibility of surface ponding. Due to the soils having fine silt and clay particles, all subsoil drainage shall be protected with appropriate geo-filter fabrics to reduce soil mobilisation through into the more porous filter aggregates.

Due to the steep sloping topography of the site and the proximity of the Lots it is not recommended to construct attenuating stormwater ponds or septic soakage pits. A piped stormwater and foul drainage system should be adopted and connected to approved DCC infrastructure.

Liquefaction Potential:

The site topography, potential depth to groundwater table and the typical soils reported and observed determine the site to have an overall 'low' potential for liquefaction to occur. Should any subsequent specific investigations at any house platform location reveal a higher persistent water table and/or layers of weak or loose, fine grained and non-cohesive soils, then that specific site should be reappraised for liquefaction potential and the house foundations and earthworks design adjusted accordingly.

Land Stability:

There is a number of section of over steepened slopes above the driveway in the northwest area of the site that has slumped and is undermining the fence posts above. The slippage is likely due to the steep bank suffering ongoing erosion and wetting causing the soils to become too weak to support the slope angle. The two power poles on the northwest side of the site were noted to be leaning forward. This either due to ongoing soils creep or shallow embedment within the soft upper stratum of loess. As there were no signs of undulating ground surrounding the area, the leaning pole is likely due to shallow embedment.

There is no further evidence of land slumping or slippages throughout the upper areas and east side of the site. However, it is noted that these soils on steep slopes typically >20 degrees, can become susceptible to land slippage when saturated during periods of high ground water levels or where they are formed over steep. Slope stability will also be affected by increase in filled slope gradient, surcharging of the slope and large sustained seismic events.

There are recorded historical large landslides further upslope out with the site and appropriate hazard assessment should be given to whether these landslides present an issue to the proposed development were there to be any development undertaken on those landslides by others.

Specific geotechnical analysis may be required where engineered slopes are to be formed steeper than the recommended gradients or higher than 2.5m to 3.0m vertical height. Where slopes are to be over steep then retention should be considered, with specific engineering design required.

Potential Construction Issues:

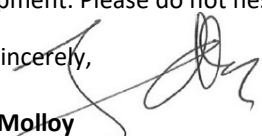
Due to the steep topography of the site and the loess potentially being a dispersive soil, the earthworks will possibly have issues with sediment migration during prolonged rain events which may affect the neighbouring properties. Sediment and erosion control measures must be in place prior to any earthwork's construction to prevent uncontrolled sediment migration onto the neighbouring properties. Staged earthworks may also be required to prevent long term exposure to the loessial soils.

Tree roots will be encountered across the centre, lower north, and eastern areas of the site where trees and tree stumps are present. Where the tree stumps lie within the building footprint, the stumps and large root boles shall be fully grubbed out and the voids backfilled with engineering fills.

A detailed site earthworks plan of the access road and retaining walls should consider the recommendations made in this report and the final design shall be reviewed by a geotechnical engineer. Any future detailed or complex design and individual Lot development will require further investigation or testing to verify the assumptions made in this report.

I trust this report provides sufficient information to continue with the envisaged residential sub-division and development. Please do not hesitate to contact the undersigned if you need further clarification.

Yours sincerely,



James Molloy
For Terra MDC Ltd

Enclosures:

- Plates 1 to 5 from Site Reconnaissance
- Site Investigation Location Plan
- Test Pit and Scala Penetrometer logs
- Terramark subdivision layout plan 12178



Plate 1: View of the driveway entrance with stacked rock retaining wall in the background.



Plate 2: View of the mid area of the site looking up at the existing house.



Plate 3: View looking east along the existing farm track from the midpoint of the proposed road alignment.

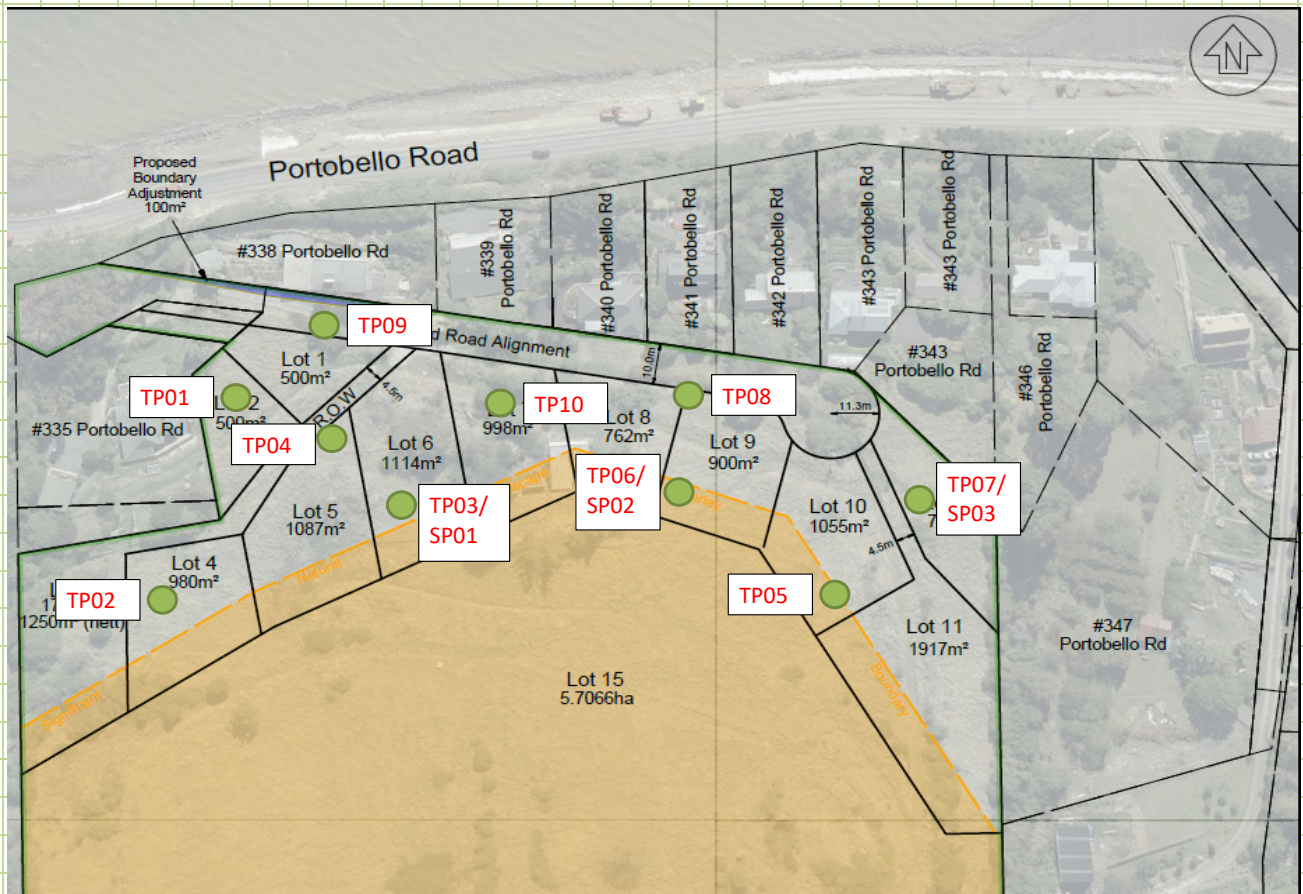


Plate 4: View looking southeast over the eastern area of the site.



Plate 5: View looking southwest over the western area of the site.

PROJECT: 336 Portobello Rd	CLIENT: GTJM Property Ltd	SHEET	1	OF	1
PROJECT No: 202106304	SKETCH BY: Regan Lord	DATE: 21/06/2021			
SUBJECT: Site Investigation Location Plan					



- Key**
- Test Pit
 - Scala Penetrometer

Refer to test pit and scala logs for ground information

Contract Title: 336 Portobello Rd
 Contract No.: 202106304
 Date: 21/06/2021

Logged By: Regan Lord

Client: GTJM Property Ltd
 Weather: Sunny & clear
 Excavator: 7T excavator (Hyundai 70cr-9)

Water @	Depth	Soils Description	TRIAL PIT No. TP01
Dry	0.0m—0.7m	Mottled grey and dark brown silty CLAY with minor coarse gravel and cobbles. Soft and in damp condition (Fill)	
	0.5m		
	0.7m—0.9m	Dark brown SILT. Soft and in damp condition. (Original topsoil)	
	0.9m—1.4m	Mottled grey and orange brown silty CLAY. Soft becoming firm with moderate plasticity and in dry to damp condition.	
	1.0m		
	1.5m	End of Test Pit at 1.4m	
	2.0m		
	2.5m		
	3.0m		
		Note: Hole stable and dry. 3 photos. Backfilled with arisings.	



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Logged By: Regan Lord

Client: GTJM Property Ltd
 Weather: Sunny & clear
 Excavator: 7T excavator (Hyundai 70cr-9)

Water @	Depth	Soils Description	TRIAL PIT No. TP02
Slow steady seepage at 0.5m	0.0m—0.25m	Dark brown topsoil with rootlets. Soft and in damp condition.	
	0.25m—1.3m		
	0.5m		
	1.0m		
	1.5m		
	2.0m		
	2.5m		
3.0m			
	End of Test Pit at 1.3m		
	Note: Hole stable and dry. 3 photos. Backfilled with arisings.		



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Logged By: Regan Lord

Client: GTJM Property Ltd
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Water @	Depth	Soils Description	TRIAL PIT No. TP03			
Dry	0.0m—0.3m	Dark brown topsoil with rootlets. Soft and in damp condition. Mottled grey and orange brown silty CLAY. Soft becoming firm with moderate plasticity and in damp condition. Large infilled cracks to 0.9m				
	0.3m—1.6m					
	0.5m					
	1.0m					
	1.5m	Dark brown and grey clayey SILT. Stiff becoming hard and in dry to damp condition. (Weathered Tuff) End of Test Pit at 1.75m				
	1.6m—1.75m					
	2.0m					
	2.5m					
	3.0m					
	Note: Hole stable and dry. 3 photos. Backfilled with arisings. Bag Sample at 1.0m—1.5m.					



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Water @	Depth	Soils Description	TRIAL PIT No. TP04
Dry	0.0m—0.25m	Dark brown topsoil with rootlets. Soft and in damp condition.	
	0.25m—0.4m	Mottled grey and orange brown silty CLAY. Soft with moderate plasticity and in damp condition.	
	0.5m	End of Test Pit at 0.4m	
	1.0m		
	1.5m		
	2.0m		
	2.5m		
	3.0m		
Note: Hole stable and dry. 2 photos. Backfilled with arisings.			



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Water @	Depth	Soils Description	TRIAL PIT No. TP05		
Dry	0.0m—0.3m	Dark brown topsoil with rootlets. Soft and in damp condition. Mottled grey and orange brown silty CLAY. Soft becoming firm with moderate plasticity and in damp condition.			
	0.3m—1.2m				
	0.5m				
	1.0m	Dark brown and grey clayey SILT. Stiff becoming hard and in dry to damp condition. (Weathered Tuff) End of Test Pit at 1.4m			
	1.2m—1.4m				
	1.5m				
	2.0m				
	2.5m				
	3.0m				
	Note: Hole stable and dry. 3 photos. Backfilled with arisings.				



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Water @	Depth	Soils Description	TRIAL PIT No. TP06
Slight seepage at 0.4m	0.0m—0.25m	Dark brown topsoil with rootlets. Soft and in damp condition. Mottled grey and orange brown silty CLAY. Soft with high plasticity and in damp to wet condition. Large infilled cracks to 0.7m.	
	0.25m—1.05m		
	0.5m		
	1.0m		
	1.05m—1.3m	Dark orange brown silty CLAY. Firm to stiff with moderate plasticity and damp condition.	
	1.5m	End of Test Pit at 1.3m	
	2.0m		
	2.5m		
	3.0m		
	Note: Hole stable and dry. 5 photos. Backfilled with arisings.		



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Water @	Depth	Soils Description	TRIAL PIT No. TP07
Dry	0.0m—0.3m	Dark brown topsoil with rootlets. Soft and in damp condition. Mottled grey and orange brown silty CLAY. Soft becoming firm with moderate to high plasticity and in damp condition.	
	0.3m—0.9m		
	0.5m	Dark brown and grey clayey SILT. Stiff becoming hard and in dry to damp condition. (Weathered Tuff)	
	0.9m—1.25m		
	1.0m		
	End of Test Pit at 1.25m		
	1.5m	Note: Hole stable and dry. 3 photos. Backfilled with arisings.	
	2.0m		
	2.5m		
	3.0m		

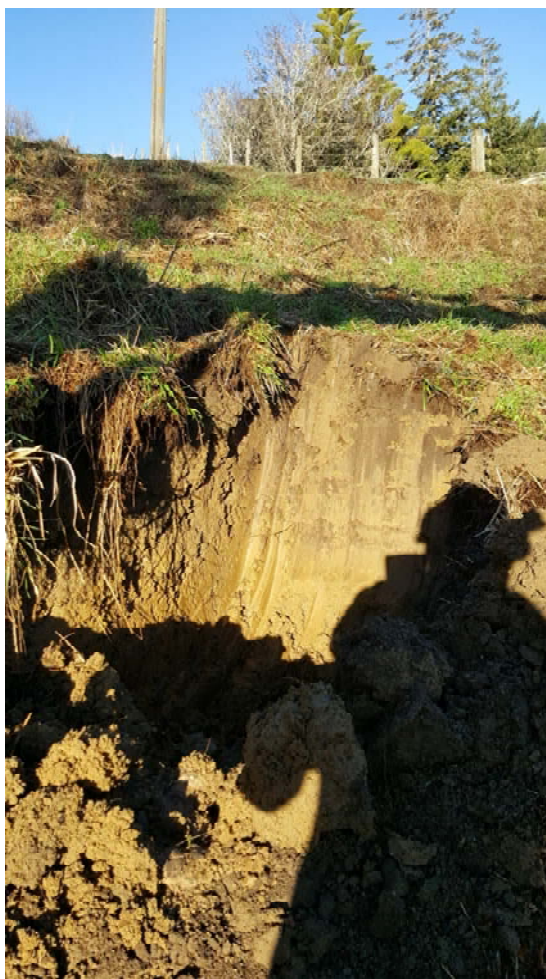


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Water @	Depth	Soils Description	TRIAL PIT No. TP08
Dry	0.0m—0.25m	Dark brown topsoil with rootlets. Soft and in damp condition.	
	0.25m—0.8m	Mottled grey and orange brown silty CLAY. Soft with moderate to high plasticity and in damp condition.	
	0.5m		
		End of Test Pit at 0.8m	
	1.0m		
	1.5m		
	2.0m		
2.5m			
3.0m			
Note: Hole stable and dry. 2 photos. Backfilled with arisings.			



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Water @	Depth	Soils Description	TRIAL PIT No. TP09
Dry	0.0m—0.3m	Dark brown clayey SILT with minor coarse gravel. Soft and in damp condition. (Fill)	
	0.3m—0.5m	Dark brown SILT Soft and in damp condition. (Original topsoil)	
	0.5m—1.0m	Mottled grey and orange brown silty CLAY. Soft with moderate plasticity and in damp condition.	
	0.5m		
	1.0m	End of Test Pit at 1.0m	
	1.5m		
	2.0m		
	2.5m		
	3.0m		
Note: Hole stable and dry. 1 photo. Backfilled with arisings.			



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Client: GTJM Property Ltd
 Weather: Sunny & clear
 Excavator: 7T excavator (Hyundai 70cr-9)

Water @	Depth	Soils Description	TRIAL PIT No. TP10
Dry	0.0m—0.4m	Dark brown clayey SILT with roots throughout. Soft and in damp condition. (Fill)	
	0.4m—0.6m	Dark brown SILT Soft and in damp condition. (Original topsoil)	
	0.5m		
	0.6m—1.4m	Mottled grey and orange brown silty CLAY. Soft with moderate plasticity and in damp condition.	
	1.0m		
	1.5m	End of Test Pit at 1.4m	
	2.0m		
	2.5m		
	3.0m		
		Note: Hole stable and dry. 3 photos. Backfilled with arisings.	



Scala Penetrometer Test Results



Project: 336 Portobello Rd
Job Number: 202106304

Tested: R.L.
Checked: J.M.

As per Site Investigation Location

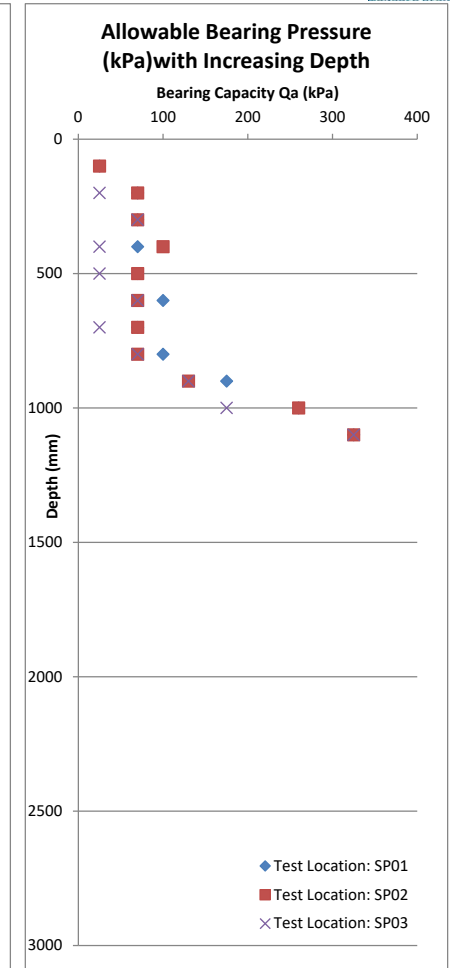
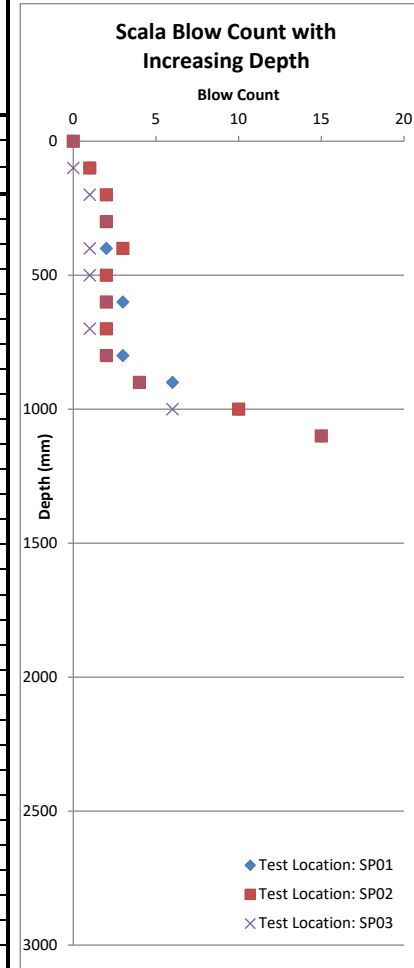
Location : Plan

Date: 21/06/2021

Client : GTJM Property Ltd

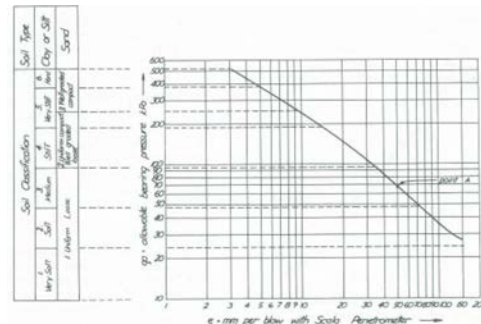
Refusal = 12 > 10 or 1 > 50

Test Location: SP01				Test Location: SP02				Test Location: SP03				Test Location:			
Depth	No.	Equiv.	Q _a	Depth	No.	Equiv.	Q _a	Depth	No.	Equiv.	Q _a	Depth	No.	Equiv.	Q _a
(mm)	Blows	CBR%	(kPa)	(mm)	Blows	CBR%	(kPa)	(mm)	Blows	CBR%	(kPa)	(mm)	Blows	CBR%	(kPa)
0	0	0	#N/A	0	0	0	#N/A	0	0	0	#N/A	0			#N/A
100	1	2	25	100	1	2	25	100	0	0	#N/A	100			#N/A
200	2	4	70	200	2	4	70	200	1	2	25	200			#N/A
300	2	4	70	300	2	4	70	300	2	4	70	300			#N/A
400	2	4	70	400	3	6	100	400	1	2	25	400			#N/A
500	2	4	70	500	2	4	70	500	1	2	25	500			#N/A
600	3	6	100	600	2	4	70	600	2	4	70	600			#N/A
700	2	4	70	700	2	4	70	700	1	2	25	700			#N/A
800	3	6	100	800	2	4	70	800	2	4	70	800			#N/A
900	6	13	175	900	4	8	130	900	4	8	130	900			#N/A
1000	10	23	260	1000	10	23	260	1000	6	13	175	1000			#N/A
1100	15	36	325	1100	15	36	325	1100	15	36	325	1100			#N/A
1200			#N/A	1200			#N/A	1200			#N/A	1200			#N/A
1300			#N/A	1300			#N/A	1300			#N/A	1300			#N/A
1400			#N/A	1400			#N/A	1400			#N/A	1400			#N/A
1500			#N/A	1500			#N/A	1500			#N/A	1500			#N/A
1600			#N/A	1600			#N/A	1600			#N/A	1600			#N/A
1700			#N/A	1700			#N/A	1700			#N/A	1700			#N/A
1800			#N/A	1800			#N/A	1800			#N/A	1800			#N/A
1900			#N/A	1900			#N/A	1900			#N/A	1900			#N/A
2000			#N/A	2000			#N/A	2000			#N/A	2000			#N/A
2100			#N/A	2100			#N/A	2100			#N/A	2100			#N/A
2200			#N/A	2200			#N/A	2200			#N/A	2200			#N/A
2300			#N/A	2300			#N/A	2300			#N/A	2300			#N/A
2400			#N/A	2400			#N/A	2400			#N/A	2400			#N/A
2500			#N/A	2500			#N/A	2500			#N/A	2500			#N/A
2600			#N/A	2600			#N/A	2600			#N/A	2600			#N/A
2700			#N/A	2700			#N/A	2700			#N/A	2700			#N/A
2800			#N/A	2800			#N/A	2800			#N/A	2800			#N/A
2900			#N/A	2900			#N/A	2900			#N/A	2900			#N/A
3000			#N/A	3000			#N/A	3000			#N/A	3000			#N/A



Note: CBR % and Allowable Bearing Capacity are a correlation taken from M.J. STOCKWELL (1977), 'Determination of allowable bearing pressure under small structures'

Recorded Blows / 100mm	Q _a (kPa) - from chart	Recorded Blows / 100mm	Q _a (kPa) - from chart
1	25	11	9.09
2	50.00	12	8.33
3	33.33	13	7.69
4	25.00	14	7.14
5	20.00	15	6.67
6	16.67	16	6.25
7	14.29	17	5.88
8	12.50	18	5.56
9	11.11	19	5.26
10	10.00	20	5.00





NUMBER OF LOTS, AREAS, DIMENSIONS & DETAILS ARE SUBJECT TO TOPOGRAPHIC SURVEY, RESOURCE CONSENT, DETAILED ENGINEERING DESIGN & FINAL SURVEY

Portobello Road

Proposed Boundary Adjustment 100m²

#338 Portobello Rd

#339 Portobello Rd

#340 Portobello Rd

#341 Portobello Rd

#342 Portobello Rd

#343 Portobello Rd

#343 Portobello Rd

#346 Portobello Rd

#347 Portobello Rd

#348 Portobello Rd

Proposed Road Alignment

Lot 1 500m²

Lot 2 500m²

Lot 3 1701m²
1250m² (nett)

Lot 4 980m²

Lot 5 1087m²

Lot 6 1114m²

Lot 7 998m²

Lot 8 762m²

Lot 9 900m²

Lot 10 1055m²

Lot 11 1917m²

Lot 12 772m²

Lot 15 5.7066ha

R.O.W.

4.5m

10.0m

11.3m

4.5m

Significant

Natural

Landscape

Overlay

Boundary

Preliminary Concept Plan Version 2

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336 Portobello Rd
Dunedin

GTJM Property Ltd

Multiple

1:1000 |

VISION.