

GEOTECHNICAL INVESTIGATION REPORT Gallina Nominees, Heinz Wattie Pension Fund, and Brookside Road Residential Ltd

BROOKSIDE ROAD PLAN CHANGE, ROLLESTON

GEOTECHNICAL INVESTIGATION REPORT

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SUMMARY

The purpose of the geotechnical investigation reported herein was to determine the subsoil conditions beneath the subject site as they may affect future residential development, with particular regard to foundation design considerations, and to determine the suitability of the subject site for the residential development, in support of a submission to generally rezone the area from rural "Outer Plains" to "Living Z".

It is understood that it is proposed to request a plan change to the Operative District Plan seeking to rezone the above properties from rural "Outer Plains" to "Living Z", to enable subdivision of the site to create new residential lots, with a minimum net density of 12 households per hectare.

The approximate location and extent of the subject site is shown on the appended Fraser Thomas Ltd drawing G01082-01.

The subsoil information, presented in Appendix A of this report, indicates that the subject site is, in general, underlain by soils inferred to be alluvial sediments (sandy gravels) of Late Pleistocene age.

Foundation design recommendations are presented in Sections 9.0 and 10.0 of this report.

In general terms and within the limits of the investigation as outlined and reported herein, no unusual problems, from a geotechnical perspective, are anticipated with residential development at the subject site.

The site is, in general, considered suitable for its intended use, with satisfactory conditions for future residential building development, subject to the recommendations and qualifications reported herein, and provided the design and inspection of foundations are carried out as would be done under normal circumstances in accordance with the requirements of the relevant New Zealand Standard Codes of Practice.

BROOKSIDE ROAD PLAN CHANGE, ROLLESTON

GALLINA NOMINEES, HEINZ WATTIE PENSION FUND, AND BROOKSIDE ROAD RESIDENTIAL LTD

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BROOKSIDE ROAD PLAN CHANGE, ROLLESTON

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1.0 INTRODUCTION

This report presents the results of a geotechnical investigation and appraisal undertaken for the proposed rezoning of the site at Brookside Road, Rolleston. The subject site (approximately 110 ha) comprises the following properties:

- 1. Lot 1 DP 82068; approx. 44.0 ha
- 2. Lot 1 DP 72132; approx. 9.45 ha
- 3. Lot 2 DP 72132; approx. 10.0 ha
- 4. Lot 3 DP 20007 approx. 24.47 ha
- 5. Lot 4 DP 20007; approx. 21.85 ha.

It is understood that it is proposed to request a plan change to the Operative Selwyn District Plan seeking to rezone the above properties from rural "Outer Plains" to "Living Z", to enable subdivision of the site to create new residential lots, with a minimum net density of 12 households per hectare.

The subject site is located between Brookside Road (to the north), Dunns Crossing Road (to the south-west) and Edwards Road (to the north-east). Existing rural properties abut the southern and south-western site boundaries.

The approximate location and extent of the subject site is shown on the appended Fraser Thomas Ltd drawing G01082-01.

The subsurface conditions underlying the subject site have been investigated by means of thirty machine excavated test pits and associated Dynamic Cone Penetrometer (DCP) scala tests and a review of existing water bore well logs.

A visual appraisal of the site and a study of geological maps have also been undertaken.

The purpose of the geotechnical investigation reported herein was to determine the subsoil conditions beneath the subject site as they may affect future residential development, with particular regard to foundation design considerations, and to determine the suitability of the subject site for the residential development, in support of a submission to generally rezone the area from rural "Outer Plains" to "Living Z".

2.0 PREVIOUS REPORTS

A previous report titled "Review of liquefaction hazard information in eastern Canterbury, including Christchurch City and parts of Selwyn, Waimakariri and Hurunui Districts", dated December 2012, was prepared by the Institute of Geological and Nuclear Sciences Limited (GNS Science) for the Environment Canterbury Regional Council.

The December 2012 report was prepared in order to determine the parts of the Canterbury area which may be susceptible to the damaging effects of liquefaction induced ground deformations and areas where liquefaction induced damage is unlikely to occur.

Figure 2.1 presented in the December 2012 report, indicates that the subject site is sited in the zone where the December 2012 report indicates that damaging liquefaction induced ground deformation is considered to be "unlikely". The December 2012 report goes on to state the following with regard to the zone which the subject site is located within:

"...in this area there is little or no likelihood of damaging liquefaction occurring during strong ground shaking. This assessment area consists of the western part of the project area, and most of Banks Peninsula. Within this area, investigations in most cases can be designed primarily for other geotechnical hazards. Liquefaction however must at least be considered by the geotechnical professional in all cases."

3.0 SUMMARY OF 2010/2011 DAMAGING CANTERBURY EARTHQUAKE EVENTS

The Canterbury region has been subjected to significant seismic activity over the period September 2010 to June 2011 and beyond.

The significant damaging earthquake events are considered to be the following:

- (a) 4 September 2010 (Moment Magnitude (M_w 7.1, epicentre depth = 11km),
- (b) 22 February 2011 (M_w 6.2, epicentre depth = 5km),
- (c) 13 June 2011 (M_w 6.0, epicentre depth = 6km),
- (d) 23 December 2011 (M_w 5.9, epicentre depth = 6km).

The cyclic loading associated with these earthquake events has resulted in significant land deformation and associated building damage throughout some areas of the Canterbury region.

4.0 GEOLOGY

In assessing the geology of the site, reference has been made to the Institute of Geological & Nuclear Sciences Geological Map 16, scale 1:250,000, "Christchurch".

This map indicates that the site is likely to be underlain by "brownish grey river alluvium", inferred to be of the Late Pleistocene Age.

The results of the machine excavated test pit investigations reported herein, in general, indicate that the surficial soils underlying the site are likely to comprise alluvial sediments of Late Pleistocene Age.

5.0 PROPOSED DEVELOPMENT

As discussed in Section 1.0 of this report, The subject site (approximately 110 ha) comprises the following properties:

- (a) Lot 1 DP 82068; approx. 44.0 ha
- (b) Lot 1 DP 72132; approx. 9.45 ha
- (c) Lot 2 DP 72132; approx. 10.0 ha
- (d) Lot 3 DP 20007 approx. 24.47 ha
- (e) Lot 4 DP 20007; approx. 21.85 ha.

It is understood that it is proposed to request a plan change to the Operative Selwyn District Plan seeking to rezone the above properties from rural "Outer Plains" to "Living Z", to enable subdivision of the site to create new residential lots, with a minimum net density of 12 households per hectare.

6.0 FIELD INVESTIGATION

6.1 GENERAL

The field investigation comprised a visual appraisal, thirty machine excavated test pits and associated Dynamic Cone Penetrometer (DCP) scala tests.

The approximate locations of the investigation test positions are shown on Fraser Thomas Ltd drawing G01082-01.

6.2 RESULTS OF VISUAL APPRAISAL

A visual appraisal of the subject site was undertaken by a Fraser Thomas Ltd engineering geologist on 8 and 12 October 2021.

The subject site is located between Brookside Road (to the north), Dunns Crossing Road (to the south-west) and Edwards Road (to the north-east). Existing rural properties abut the southern and south-western site boundaries.

The approximate location and extent of the subject site is shown on the appended Fraser Thomas Ltd drawing G01082-01.

The topography within the subject site is generally flat.

The majority of the site comprises paddocks vegetated with grass.

Four existing single storey dwellings are located across the site. The dwellings all generally comprise light timber frame construction with mixed concrete brick and timber cladding, profiled metal roofs and generally appear to have suspended timber floors supported on shallow piles.

Each of the dwellings have detached garages and sheds, generally clad with profiled metal or stucco.

Seven existing poultry sheds, approximately 100m long, are located in the north-eastern part of the site (within Lots 3 and 4, DP 200007). Several ancillary buildings associated with the poultry sheds are also present in this part of the site.

An existing stockpile, overgrown with grass, inferred to comprise soil of unknown origin, was observed located along the western boundary of Lot 3, DP 20007.

Localised depressions and hummocky surface features, observed in the vicinity of the south-western ends of two poultry sheds, are inferred to be indicative of previously backfilled farm pits. Excavations of these features revealed building debris (including possible ACM), metal, glass bottles and animal bones.

The approximate inferred locations and extent of the existing structures and other site features are shown on drawing G01082-01.

It is understood, from conversations with the property owner, that a former 'offal pit' is located in the north-western corner of Lot 1, DP 72132. The offal pit is understood to have been backfilled with non-engineered fill material.

The approximate inferred location of the 'offal pit' is shown on drawing G01082-01.

An existing shallow water race generally extends through the south-western part of the site, and generally along the north-eastern boundaries of Lots 1 and 2 DP 72132. The water race banks are generally subvertical and approximately 0.8 m in vertical height. The water race ranges between approximately 6 m and 10 m wide. The water race banks are unretained, and generally vegetated. No obvious signs of any significant instability of the water race banks was observed, at the time of the investigation reported herein.

A review of historical aerial photographs indicate that the current path of the water race was established sometime before 1974. Aerial photography, from 1962, indicates that the water race originally crossed the south-western corner of Lot 3, DP 20007, at a different location to its present course. The original path of the water race, in this location, appears to have been backfilled, likely as part of poultry shed construction. The nature of the material placed to backfill this part of the water race is not reliably known. The approximate inferred location and extent of the existing water race, and the inferred 'backfilled' section, are shown on drawing G01082-01.

No obvious signs of any significant ground deformation, that could be attributed to liquefaction induced ground movement, were observed within the subject site, at the time of the investigation reported herein.

6.3 MACHINE EXCAVATED TEST PIT INVESTIGATION

Thirty machine excavated test pits, numbered TP1 to TP30 inclusive, were put down at the site, in order to determine the nature and extent of the subsoils underlying the site.

The test pits were inspected and logged by a qualified Fraser Thomas engineering geologist.

The test pits were excavated to depths ranging between approximately 1.5 m and 5.0 m below the ground surface existing at the time of the investigation reported herein (i.e. the existing ground surface).

The logs of Test Pits TP1 to TP30 inclusive are presented in Appendix A of this report.

Dynamic Cone Penetrometer (DCP) scala tests were carried out, from the existing ground surface, at the locations of Test Pits TP1, TP4, TP12, TP18, TP19, TP20, TP21, TP22, TP23 and TP30, in order to determine the consistency of the cohesionless soils encountered in the test pits.

The results of the DCP scala tests are also presented in Appendix A of this report.

The approximate locations of Test Pits TP1 to TP30 inclusive are shown on drawing G01082-01.

7.0 SUBSURFACE CONDITIONS

7.1 GENERAL

The subsoil information, presented in Appendix A of this report, indicates that the subject site is, in general, underlain by soils inferred to be alluvial sediments (sandy gravels) of Late Pleistocene Age.

It has been assumed that even though the various subsoil strata (depths, thicknesses, and locations of groundwater levels) have been determined only at the locations and within the depths of the various test positions recorded herein, these various subsurface features can be projected between the various test positions. Even though such inference is made, no guarantee can be given as to the validity of this inference or of the nature and continuity of these various subsurface features.

7.2 TOPSOIL

A surficial layer of topsoil, generally comprising gravelly silts, was encountered to a depth of between approximately 0.2 m and 0.3 m below the existing ground surface, at the locations of the test pits.

7.3 FARM PIT BACKFILL MATERIAL

As discussed in Section 6.2 of this report, localised depressions and hummocky surface features, inferred to be indicative of previously backfilled farm pits, were observed in the southern part of the Lot 3, DP 20007. Test Pits TP10 and TP13 were put down in the farm pit backfill material.

Material, generally comprising building debris (including possible ACM), metal, glass bottles and animal bones, was encountered, to depths ranging between approximately 0.8 m and 1.3 m below the existing ground surface.

Due to its nature, the backfill material is inferred to be non-engineered.

An 'offal pit' is also understood to be located in the north-western corner of Lot 1, DP 72132. The offal pit is understood to have been backfilled with non-engineered fill material.

7.4 ALLUVIAL SEDIMENTS

The results of the machine excavated test pit investigation reported herein indicate that the surficial topsoil at the site is generally underlain by a layer of material, generally comprising sandy gravels. These soils were generally encountered at depths ranging between approximately 0.2 m and 0.3 m below the existing ground surface, at the locations of the test pits. The sandy gravels were encountered to the extent of the test pits.

The results of the DCP tests undertaken in the sandy gravels, at the locations of the test positions, generally obtained DCP blow counts of between approximately 4 and greater than 25 blows per

50 mm penetration, corresponding to a SPT 'N' value of generally greater than 50, corresponding to a very dense consistency.

The logs of existing water bore well logs, presented in Appendix A of this report, put down in the vicinity of the subject site, have also been sourced from Environment Canterbury records.

The existing water bore logs indicate that sandy gravels are generally located at shallow depths, which is consistent with the subsoil conditions encountered at the subject site. The bore logs indicate that these sandy gravels generally extend to depths in excess of approximately 80 m below the ground surface. Based on the foregoing, it is, in our opinion, likely that the gravel soils underlying the site extend to significant depths below the existing ground surface.

The approximate locations of the existing water bore wells are shown on drawing G01082-01.

7.5 GROUNDWATER

Groundwater was not encountered during the investigations reported herein. However, based on information obtained from the existing water bore logs in the vicinity of the subject site, the groundwater level is inferred to be at a depth in excess of approximately 10 m below the existing ground surface, for analysis purposes.

8.0 LIQUEFACTION POTENTIAL ASSESSMENT

8.1 GENERAL

Liquefaction is defined as the phenomenon that occurs when soils are subject to a sudden loss in shear stiffness and strength associated with a reduction in effective stress due to cyclic loading (i.e. ground shaking associated with an earthquake).

The two main effects of liquefaction on soils are:

- (a) Consolidation of the liquefied soils,
- (b) Reduction in shear strength within the liquefied soils.

Liquefaction is considered to occur when the soils reach a condition of "zero effective stress". It is considered that only "sand like" soils can reach a condition of "zero effective stress" and therefore only "sand like" soils are considered to be liquefiable.

An indication that the underlying soils have been subject to liquefaction is the surface expression of ejected sand and water. This occurs as a result of the dissipation of excess pore water pressures generated within the liquefied soils as a result of the cyclic loading.

It should be noted that cohesive type materials or "clay like" soils are unlikely to be subject to liquefaction, as these soils (due to their nature) are unlikely to develop sufficient excess pore water pressures during cyclic loading to reach a condition of zero effective stress, i.e. the point of liquefaction.

However, "clay like" soils do develop some excess pore water pressures during cyclic loading which can result in consolidation settlement and a temporary reduction of the shear strength (i.e. softening) of the soils. Sensitive "clay like" soils are in particular susceptible to softening as a result of cyclic loading.

A liquefaction potential assessment has been undertaken for the soils underlying the subject site.

8.2 METHOD OF ANALYSIS

The New Zealand Geotechnical Society released Guidelines, in 2016, with the objective of summarising current best practice in earthquake geotechnical engineering with a focus on New Zealand conditions. The main purpose of the Guidelines is to promote consistency of approach to everyday engineering practice in New Zealand and, thus, improve geotechnical earthquake aspects of the performance of the built environment.

The Guidelines consists of six modules (identified as Modules 1 to 6 inclusive).

"Module 3: Identification Assessment and Mitigation of Liquefaction Hazards" of the Guidelines provides guidance on the identification of liquefaction hazards, and also provides details regarding different methodologies for determining theoretical liquefaction triggering.

The Module 3 guideline suggests a three-step process for the liquefaction assessment of sites, generally being:

- (i) Step 1: Assessment of liquefaction susceptibility,
- (ii) Step 2: Triggering of liquefaction,
- (iii) Step 3: Consequences of liquefaction.

The Module 3 guideline refers to the methods suggested by "Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils", dated October 2001. The guideline, among others, also refers to papers by Youd et al; Seed; Idriss; Boulanger; Robertson and Bray.

A liquefaction potential assessment of the soils underlying the subject site has been undertaken using the methods suggested by the Module 3 guideline.

8.3 ASSESSMENT OF LIQUEFACTION SUSCEPTIBILITY

The following soils are generally considered to be susceptible to liquefaction:

- (a) Young (typically Holocene age) alluvial sediments (typically fluvial deposits laid down in a low energy environment) or man-made fills,
- (b) Poorly consolidated/compacted sands and silty sands,
- (c) Areas with a high groundwater level.

As discussed in Section 4.0 of this report, the geological map for the Christchurch area indicates that the site is likely to be underlain by "brownish grey river alluvium" inferred to be of Late Pleistocene age.

As discussed in Section 7.4 of this report, the results of the machine excavated test pit investigations, and our review of existing water bore well logs, indicate the site is generally underlain by very dense sandy gravels (encountered at shallow depths).

As discussed in Section 7.5 of this report, the groundwater level is inferred to be at a depth in excess of approximately 10 m below the existing ground surface, for analysis purposes.

Based on the foregoing, given the nature, age and consistency of the sediments underlying the subject site, i.e. unsaturated very dense sandy gravels of Late Pleistocene age, it is our opinion that the upper soils underlying the site are unlikely to be susceptible to liquefaction in response to a future large earthquake event and that the risk of any significant liquefaction induced ground deformation occurring at the site, in response to a large earthquake event, is considered to be low.

It is therefore our opinion that the subject site, for foundation design purposes, should be assumed to be within Foundation Technical Category 1 (TC1), as defined by the MBIE guidance document, and that it is unlikely that liquefaction induced ground deformation could occur within the area in response to a large earthquake event, and that the ground settlements within the area in response to seismic loading should be considered to be "within normally accepted tolerances" as defined by the MBIE December 2012 guidance document.

It should also be noted that our assessment of the liquefaction susceptibility of the soils underlying the subject site is consistent with the assessment provided in the GNS Science report, dated December 2012. As discussed in Section 2.0 of this report, Figure 2.1, presented in the December 2012 report, indicates that the subject site is sited within zone where damaging liquefaction induced ground deformation is considered to be "unlikely".

9.0 FOUNDATION DESIGN CONSIDERATIONS

9.1 GENERAL

It is our opinion that the soils underlying the subject site will exhibit only a low compressibility under the relatively light static foundation loads associated with a residential building development constructed in accordance with the requirements of NZS 3604: 2011, New Zealand Standard, Timber Framed Buildings.

It is, therefore, our opinion that settlement should not present a problem for future proposed residential development at the site, providing the inspection and design of foundations are carried out in accordance with the requirements of the relevant New Zealand Standard Codes of Practice, and in accordance with the recommendations presented in this report.

9.2 THE RISK OF THE PROPOSED DEVELOPMENT BEING ADVERSELY AFFECTED BY GROUND DEFORMATIONS ASSOCIATED WITH LIQUEFACTION

As discussed in Section 8.3 of this report, it is our opinion that the subject site, for foundation design purposes, should be assumed to be within Foundation Technical Category 1 (TC1), as defined by the MBIE guidance document, and that it is unlikely that liquefaction induced ground deformation could occur within the area in response to a large earthquake event, and that the ground settlements within the area in response to seismic loading should be considered to be "within normally accepted tolerances" as defined by the MBIE December 2012 guidance document.

Based on the foregoing, it is our opinion that an appropriate foundation solution for the site conditions would be a shallow foundation system designed in accordance with the requirements of NZS 3604: 2011, New Zealand Standard, Timber Framed Buildings (as modified by B1/AS1), founded in the underlying alluvial sediments.

Fraser Thomas Ltd should be engaged to inspect any foundation excavations, prior to the placement of any foundation materials, in order to confirm that the excavations are founded in competent alluvial sediments.

9.3 AREA INFERRED TO BE OVERLAIN BY STOCKPILE MATERIAL

As discussed in Section 6.2 of this report, an existing stockpile of material, overgrown with grass, inferred to comprise soil of unknown origin, was observed located along the western boundary of Lot 3, DP20007.

The approximate inferred location and extent of the existing stockpile is shown on drawing G01082-01.

There is in our opinion a risk, if the stockpile material is not appropriately removed from the site, that foundations and floors underlain by stockpile material may be subject to differential movement.

It is therefore recommended that any foundation excavations associated with any new structure be founded beneath any surficial stockpile material into the underlying natural alluvial sediments. It is also recommended that any surficial stockpile material be undercut from beneath the footprint of any proposed building.

It is recommended that Fraser Thomas Ltd be engaged to inspect, in particular, any foundation excavations and building subgrades located within the area inferred to be underlain by stockpile material, as shown on drawing G01082-01, in order to confirm that stockpile material has been removed from beneath the footprint of any proposed new building.

9.4 NON-ENGINEERED FILL MATERIAL

As discussed in Section 6.2 of this report, localised depressions and hummocky surface features, inferred to be indicative of previously backfilled farm pits, were observed in the southern part of the Lot 3, DP 20007. Test Pits TP10 and TP13 were put down in the farm pit backfill material.

Material, generally comprising building debris (including possible ACM), metal, glass bottles and animal bones, was encountered, to depths ranging between approximately 0.8 m and 1.3 m below the existing ground surface.

Due to its nature, the backfill material is inferred to be non-engineered.

An 'offal pit' is also understood to be located in the north-western corner of Lot 1, DP 72132. The offal pit is understood to have been backfilled with non-engineered fill material.

As discussed in Section 6.2 of this report, aerial photography, from 1962, indicates that the water race originally crossed the south-western corner of Lot 3, DP 20007, at a different location to its present course. The original path of the water race, in this location, appears to have been backfilled, likely as part of poultry shed construction. The nature of the material placed to backfill this part of the water race is not reliably known.

The approximate inferred location and extent of the backfilled farm pits, and the inferred 'backfilled' section of abandoned water race, are shown on drawing G01082-01.

There is, in our opinion, a risk that foundations founded on or within non-engineered fill material may be subject to differential settlement which may adversely affect any future proposed building development. It is therefore recommended that foundations located in this area be founded beneath any non-engineered fill material into competent natural ground or engineered fill.

Alternatively, the non-engineered fill material should be appropriately undercut/removed from site, as part of any proposed subdivisional earthworks.

Fraser Thomas Ltd should be engaged to inspect any foundation or undercut excavations, prior to the placement of any foundation of fill materials, in order to confirm that the excavations are founded in competent natural ground or engineered fill.

9.5 SHALLOW FOUNDATIONS LOCATED IN CLOSE PROXIMITY TO THE EXISTING WATER RACE AT THE SITE

As discussed in Section 6.2 of this report, an existing shallow water race generally extends through the south-western part of the site, and generally along the north-eastern boundaries of Lots 1 and 2 DP 72132. The approximate inferred location and extent of the existing water race, as it affects the subject site, is shown on the appended drawing G01082-01.

Recent alluvial sediments are likely to have been deposited in the base of the water race, and also possibly in the immediate vicinity of the water race.

Due to the likely variable nature of recent alluvial sediments and the likely presence of highly compressible sediments, there is, in our opinion, a risk that shallow building foundations founded on recent alluvial sediments may be subject to differential settlement.

In order to mitigate the risk of any proposed future shallow foundations being adversely affected by the settlement of recent alluvial sediments, it is recommended, unless further specific investigation and appraisal works are undertaken by a Chartered Professional Engineer experienced in geotechnical engineering, that shallow foundations associated with any proposed future dwellings at the site, be located no closer than a horizontal distance of 5 m from the crest of any water race side slopes at the site.

It should be noted, should the site be subject to residential development, that the subdivisional earthworks would likely involve the stripping of the water race and the backfilling of the water race with engineered fill material. Providing the earthworks are undertaken appropriately, the backfilling of the water race would result in the removal of the requirement for any horizontal offset from the water race, for shallow foundation design purposes.

10.0 ALLOWABLE FOUNDATION BEARING PRESSURES

10.1 GENERAL

In this section of the report, ultimate bearing capacity values and strength reduction factors are provided in order to allow calculation of design (dependable) foundation bearing capacities, in accordance with the limit state design methods outlined in AS/NZS 1170: 2002, Structural Design Actions, by applying the appropriate strength reduction factors, as provided in this report, and the factored load combinations required by AS/NZS 1170. Allowable foundation bearing pressures are also provided, based on conventional factors of safety, for cases where unfactored load combinations are being considered.

10.2 SHALLOW PAD OR BEAM FOUNDATIONS

A minimum ultimate static bearing capacity value for vertical loading of 300 kPa is recommended for shallow concrete pads or beam foundations, founded in the underlying alluvial sediments. It is recommended that a strength reduction factor (Φ_{bc}) of 0.5 be adopted for limit state design in

accordance with the requirements of AS/NZS 1170, resulting in a design (dependable) bearing capacity value of 150 kPa.

If unfactored load combinations are to be considered, the allowable foundation bearing pressures presented in Table 1 are recommended for shallow concrete pads or beam foundations, founded in the underlying alluvial sediments.

TABLE 1: ALLOWABLE FOUNDATION BEARING PRESSURES FOR SHALLOW CONCRETE PADS OR BEAM FOUNDATIONS FOUNDED IN THE UNDERLYING ALLUVIAL SEDIMENTS

Load Case	Factor of Safety	Allowable Bearing Pressure (kPa)
Dead Load and Permanent Live Load	3.0	100
Dead plus Live plus Transient Load	2.0	150

11.0 EXISTING SERVICE LINES

It is recommended that the location and depth of any buried services should be verified at the site prior to the commencement of foundation construction.

It is expected that any service line trenches would have been backfilled by conventionally acceptable means, which did not involve specific compaction. It would therefore be expected that some consolidation settlement of the service trench backfill could occur, which could result in lateral and vertical deformation of the undisturbed ground on each side of the trench backfill. The deformation is caused by the soil wedge behind the side wall of the trench moving downwards and inwards with time, towards the trench backfill as the backfill consolidates. The geometry of the soil wedge defines the theoretical zone of influence of the service trench backfill.

Due to the risk of consolidation settlement of the trench backfill occurring, it is recommended that, if any foundations of any proposed new building are located within the zone of influence of any existing service line, either the trench backfill be excavated and replaced with compacted hardfill or the foundations and floor of the proposed new building be designed to span across the trench backfill and the adjacent zone of influence.

The zone of influence is defined by a theoretical line projecting upwards in both directions from the centreline of the pipeline at the invert level of the pipeline at an angle of 45° to the vertical. The zone of influence is defined by the zone between the intersection point of the theoretical line and the ground surface on each side of the pipeline.

12.0 DEVELOPMENTAL EARTHWORKS

It is recommended that, unless the stability of any developmental earthworks (i.e. constructed for an access driveway, building platform or landscaping) is considered in detail by a chartered professional engineer experienced in geotechnical engineering, and particularly slope stability considerations, permanent fill end and cut slopes should be constructed to a maximum batter slope of 26° (1V:2H) with maximum batter heights of approximately 1.0 m. Any proposed higher permanent batter slopes should be subject to specific stability appreciation so as to determine stable limiting batter slopes.

It is recommended that any temporary excavated slopes be constructed to a maximum batter slope of 45° (1V:1H), with a maximum batter height of approximately one meter. It is recommended that any temporary excavation slopes not be left unsupported for a period exceeding one month. It is also recommended that stormwater run-off be diverted away from the crest of any proposed temporary excavation slopes.

13.0 STORMWATER AND EFFLUENT DISPOSAL

It is understood that issues relating to stormwater discharge and effluent disposal will be addressed by others.

14.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations should be read together and not be taken in isolation.

14.1 CONCLUSIONS

Our conclusions based on the field data obtained from the site and as presented in this report, our visual appraisal of the site, our study of the geological maps relating to the area and our professional judgement and opinions, are as follows:

(a) In general terms and within the limits of the investigation as outlined and reported herein, no unusual problems, from a geotechnical perspective, are anticipated with residential development at the subject site.

The site is, in general, considered suitable for its intended use, with satisfactory conditions for future residential building development, subject to the recommendations and qualifications reported herein, and provided the design and inspection of foundations are carried out as would be done under normal circumstances in accordance with the requirements of the relevant New Zealand Standard Codes of Practice.

In arriving at this conclusion and expressing this opinion, reliance has been based on the various topographical data as discussed herein and on subsoil information which has only been obtained at the locations and within the depths of the test positions reported herein. It has been assumed that this subsoil information can be projected between the various test positions. Even though such inference is made and forms the basis of the conclusions and opinions expressed herein, no guarantee can be given as to the validity of this inference or of the nature and continuity of the subsoils underlying the proposed subdivision.

- (b) The purpose of the geotechnical investigation reported herein was to determine the subsoil conditions beneath the subject site as they may affect future residential development, with particular regard to foundation design considerations, and to determine the suitability of the subject site for the residential development, in support of a submission to generally rezone the area from rural "Outer Plains" to "Living Z".
- (c) The results of the machine excavated test pit investigation reported herein indicate that the surficial topsoil at the site is generally underlain by a layer of material, generally comprising sandy gravels. These soils were generally encountered at depths ranging between approximately 0.2 m and 0.3 m below the existing ground surface, at the locations of the test pits. The sandy gravels were encountered to the extent of the test pits.

The results of the DCP tests undertaken in the sandy gravels, at the locations of the test positions, generally obtained DCP blow counts of between approximately 4 and greater than 25 blows per 50 mm penetration, corresponding to a SPT 'N' value of generally greater than 50, corresponding to a very dense consistency.

The logs of existing water bore well logs, presented in Appendix A of this report, put down in the vicinity of the subject site, have also been sourced from Environment Canterbury records. The existing water bore logs indicate that sandy gravels are generally located at shallow depths, which is consistent with the subsoil conditions encountered at the subject site. The bore logs indicate that these sandy gravels generally extend to depths in excess of approximately 80 m below the ground surface. Based on the foregoing, it is, in our opinion, likely that the gravel soils underlying the site extend to significant depths below the existing ground surface.

- (d) Groundwater was not encountered during the investigations reported herein. However, based on information obtained from the existing water bore logs in the vicinity of the subject site, the groundwater level is inferred to be at a depth in excess of approximately 10 m below the existing ground surface, for analysis purposes.
- (e) Given the nature, age and consistency of the sediments underlying the subject site, i.e. unsaturated very dense sandy gravels of Late Pleistocene age, it is our opinion that the upper soils underlying the site are unlikely to be susceptible to liquefaction in response to a future large earthquake event and that the risk of any significant liquefaction induced ground deformation occurring at the site, in response to a large earthquake event, is considered to be low.

It is therefore our opinion that the subject site, for foundation design purposes, should be assumed to be within Foundation Technical Category 1 (TC1), as defined by the MBIE guidance document, and that it is unlikely that liquefaction induced ground deformation could occur within the area in response to a large earthquake event, and that the ground settlements within the area in response to seismic loading should be considered to be "within normally accepted tolerances" as defined by the MBIE December 2012 guidance document.

(f) It is our opinion that the soils underlying the subject site will exhibit only a low compressibility under the relatively light static foundation loads associated with a residential building development constructed in accordance with the requirements of NZS 3604: 2011, New Zealand Standard, Timber Framed Buildings. It is, therefore, our opinion that settlement should not present a problem for future proposed residential development at the site, providing the inspection and design of foundations are carried out in accordance with the requirements of the relevant New Zealand Standard Codes of Practice, and in accordance with the recommendations presented in this report.

14.2 RECOMMENDATIONS

Our recommendations based on the field data obtained from the site and as presented in this report, our visual appraisal of the site, our study of the geological maps relating to the area and our professional judgement and opinions, are as follows:

- It is our opinion that an appropriate foundation solution for the site conditions would be a shallow foundation system designed in accordance with the requirements of NZS 3604:
 2011, New Zealand Standard, Timber Framed Buildings (as modified by B1/AS1), founded in the underlying alluvial sediments.
 - Fraser Thomas Ltd should be engaged to inspect any foundation excavations, prior to the placement of any foundation materials, in order to confirm that the excavations are founded in competent alluvial sediments.
- (b) There is in our opinion a risk, if the stockpile material is not appropriately removed from the site, that foundations and floors underlain by stockpile material may be subject to differential movement. It is therefore recommended that any foundation excavations associated with any new structure be founded beneath any surficial stockpile material into the underlying natural alluvial sediments. It is also recommended that any surficial stockpile material be undercut from beneath the footprint of any proposed building.
 - It is recommended that Fraser Thomas Ltd be engaged to inspect, in particular, any foundation excavations and building subgrades located within the area inferred to be underlain by stockpile material, as shown on drawing G01082-01, in order to confirm that stockpile material has been removed from beneath the footprint of any proposed new building.
- (c) There is, in our opinion, a risk that foundations founded on or within non-engineered fill material may be subject to differential settlement which may adversely affect any future proposed building development. It is therefore recommended that foundations located in this area be founded beneath any non-engineered fill material into competent natural ground or engineered fill. Alternatively, the non-engineered fill material should be appropriately undercut/removed from site, as part of any proposed subdivisional earthworks. The approximate inferred location and extent of the backfilled farm pits, and the inferred 'backfilled' section of abandoned water race, are shown on drawing G01082-01.

Fraser Thomas Ltd should be engaged to inspect any foundation or undercut excavations, prior to the placement of any foundation of fill materials, in order to confirm that the excavations are founded in competent natural ground or engineered fill.

(d) As discussed in Section 6.2 of this report, an existing shallow water race generally extends through the south-western part of the site, and generally along the north-eastern boundaries of Lots 1 and 2 DP 72132. The approximate inferred location and extent of the existing water race, as it affects the subject site, is shown on the appended drawing G01082-01.

In order to mitigate the risk of any proposed future shallow foundations being adversely affected by the settlement of recent alluvial sediments, it is recommended, unless further specific investigation and appraisal works are undertaken by a Chartered Professional Engineer experienced in geotechnical engineering, that shallow foundations associated with any proposed future dwellings at the site, be located no closer than a horizontal distance of 5 m from the crest of any water race side slopes at the site.

It should be noted, should the site be subject to residential development, that the subdivisional earthworks would likely involve the stripping of the water race and the backfilling of the water race with engineered fill material. Providing the earthworks are undertaken appropriately, the backfilling of the water race would result in the removal of the requirement for any horizontal offset from the water race, for shallow foundation design purposes.

(e) A minimum ultimate static bearing capacity value for vertical loading of 300 kPa is recommended for shallow concrete pads or beam foundations, founded in the underlying alluvial sediments. It is recommended that a strength reduction factor (Φ_{bc}) of 0.5 be adopted for limit state design in accordance with the requirements of AS/NZS 1170, resulting in a design (dependable) bearing capacity value of 150 kPa.

If unfactored load combinations are to be considered, the allowable foundation bearing pressures presented in Table 1 are recommended for shallow concrete pads or beam foundations, founded in the underlying alluvial sediments.

(f) It is recommended that the location and depth of any buried services should be verified at the site prior to the commencement of foundation construction.

Due to the risk of consolidation settlement of the trench backfill occurring, it is recommended that, if any foundations of any proposed new building are located within the zone of influence of any existing service line, either the trench backfill be excavated and replaced with compacted hardfill or the foundations and floor of the proposed new building be designed to span across the trench backfill and the adjacent zone of influence.

- (g) It is recommended that, unless the stability of any developmental earthworks (i.e. constructed for an access driveway, building platform or landscaping) is considered in detail by a chartered professional engineer experienced in geotechnical engineering, and particularly slope stability considerations, permanent fill end and cut slopes should be constructed to a maximum batter slope of 26° (1V:2H) with maximum batter heights of approximately 1.0 m. Any proposed higher permanent batter slopes should be subject to specific stability appreciation so as to determine stable limiting batter slopes.
- (h) It is recommended that any temporary excavated slopes be constructed to a maximum batter slope of 45° (1V:1H), with a maximum batter height of approximately one meter. It is recommended that any temporary excavation slopes not be left unsupported for a period exceeding one month. It is also recommended that stormwater run-off be diverted away from the crest of any proposed temporary excavation slopes.

15.0 LIMITATIONS

The professional opinion expressed herein has been prepared solely for, and is furnished to our client, Gallina Nominees, Heinz Wattie Pension Fund, and Brookside Road Residential Ltd, and Selwyn District Council for their purposes only with respect to the particular brief given to us, on the express condition that it will not be relied upon by any other person or for any other purposes without our prior written agreement, and relates to the conditions that exist up to and at the time of this report.

No liability is accepted by this firm or by any principal, or director, or any servant or agent of this firm, in respect of the use of this report by any other person, and any other person who relies upon any matter contained in this report does so entirely at its own risk. This disclaimer shall apply notwithstanding that this report may be made available to any person by any person in connection with any application for permission or approval, or pursuant to any requirement of law.

This report does not comment on stormwater management, flooding, root effects and land uses outside the specific site, which may be required to be assessed to complete a foundation design for building consent application purposes.

Notwithstanding the foregoing, if the circumstances at the subject site change with respect to topography or the proposed development concept, or the buildings are subject to further damaging earthquakes, or if a period of more than three years has elapsed since the date of this report, this report should not be used without our prior review and written agreement.

The conclusions and recommendations expressed herein should be read in conjunction with the remainder of this report and should not be referred to out of context with the remainder of this report.

Report prepared by: FRASER THOMAS LTD.

S P GLADWIN

Engineering Geologist

Report reviewed and approved by:

M V REED
Director

Chartered Professional Engineer

 $J: \c Left Series \c CH01082-Brookside\ Road\ Plan\ Change \c Geotechnical \c Reports \c ROLLESTON\ Brookside\ Plan\ Change\ REPORT\ 211011\ SG. doc$

Machine Excavated Test Pits



BOREHOLE AND TEST PIT LOGS SYMBOLS AND TERMS

SYMBOLS AND ABBREVIATIONS

Wf Field water content RI Reduced Level Wp Plastic limit (%) EOH End of Hole WL Liquid Limit (%) Shear vane test result RQD Rock Quality Designation UTP Unable to Penetrate SG Specific Gravity

SPT Standard Penetration Test SG Specific Gravity

No. CRT blows as 200 and an about its SPT Standard Penetration Test SF Percentage fines (<75 microns)

N SPT blows per 300mm penetration
35/90 35 blows per 90mm penetration after seating for SPT

SPT blows per 90mm penetration after seating for SPT

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SPT blows per 90mm penetration after seating for SPT

SPT blows per 90mm penetration after seating for SPT

SPT blows per 90mm penetration after seating for SPT

(s) Inclusive of seating blow count for SPT

CONS Consolidation test COMP COMP COMPACTION TO COMP

GWL Ground Water Level UCS Unconfined Compressive Strength k Permeability coefficient (m/s)

LS Linear Shrinkage (%)
OC Organic Content (%)

SOIL **CONSISTENCY TERMS RELATIVE DENSITY** Non-cohesive SPT "N" Value Cohesive TOPSOIL **Undrained Shear** COBBLES Description Description Strength (kPa) BOULDERS <4 CLAY Very Soft <12 Very Loose 4 - 10 Soft 12 - 25 Loose SILT PEAT 10 - 30 Firm 25 - 50 Medium Dense 30 - 50 Stiff 50 - 100 Dense SAND > 50 Very Stiff 100 - 200 Very Dense GRAVEL Hard >200

ROCK		STRENGTH		WEATHERING	
LIMESTONE	RYHOLITE	Description	Unconfined	UW - Unweathered (fresh	rock)
EIMEGTONE	+++++ +++++	Description	Compressive Strength MPa	SW - Slightly Weathered	
MUDSTONE	ANDESITE	MW - Moderately Weather	red		
		Very Weak	1 - 5	HW - Highly Weathered	
SANDSTONE	BASALT	Weak	5 - 20	CW - Completely Weathe	red
CONGLOMERATE		Moderately Strong	20 - 50	RS - Residual Soil	
		Strong	50 - 100		
BRECCIA		Very Strong	100 - 250	SPACING OF DISCO	NTINUITIES
		Extremely Strong	> 250	Term	Aperture (mm)
		, ,		Very widely spaced	>2000
				Widely spaced	600 to 2000
				Moderately widely spaced	200 to 600
				Closely spaced	60 to 200
				Very closely spaced	20 to 60
				Extremely closely spaced	<20

Notes

^{1.} Based on New Zealand Geotechnical Society "Field Description of Soil and Rock, Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes" December 2005

^{2.} Composite soil types are signified by combined symbols



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- 4.0 -									4.0						
- 4.2 -									4.2						
- 4.4 -									4.4						
- 4.6 -									4.6						
- 4.8 -									4.8						
									<u> </u>			Ш			
Profile	e:								Excava		vieth	od:			
Remarks: 1. Groundwater not encountered on 8/10/2021. 2. Test pit side walls stable throughout. Datum:													1.		
			1 /d .						Datum:						



Hole No:

Project No: Project: Gallina Nominees, Heinz Wattie Pension CH01082 Fund, and Brookside Road Residential Ltd						:	Shea	ır Van	ne: [Date	Excav	ated	l: L	.ogg	ed E	y:	Che	cked	l By:	
CH0	1082	Brookside Road Plan Ch		sident	iai Lt	a					08	/10/20	21		۲	(T				
Ĺ			<u> </u>	u	Und	raine	She	ar S	trengt	th (k	Pa)	Ĺ	Dyı	nami	c Cc	ne F	enet	romet	er	rter
Depth (m)		Description of Strata	Geological Unit	Graphic Log	ı	ane read Shear Va			as per BS sidual Sh			Depth (m)	Te	est Met		ZS 4402 ows / 50		Test 6.5.2	2	Groundwater
Dep			Geo	<u>ა</u> _	04	_		-	-200	1	lues	Dep	2	4				14 1	16	Grou
-	SILT, gravel	y (fine to coarse), some sand (fine to	S/L	r_LS.m rm.m.m																
- 0.2 -		k brown, dry, rootlets [TOPSOIL]		0000								- 0.2 -								
- 0.4 -	sandy (fine	ne to coarse, subrounded greywacke), o coarse), some cobbles, yellowish		0000								- 0.4 -								
- 0.6 -	brown to gre	eyish brown, dense, moist SEDIMENTS]		0000							-	- 0.6 -								
- 0.8 -		•		0000							-	- 0.8 -								
- 1.0 -											ŀ	- 1.0 -								
- 1.2 -				0000								- 1.2 -								
- 1.4 -				3000							F	- 1.4 -								
- 1.6 -											F	- 1.6 -								
- 1.8 –			ments								F	- 1.8 -								
- 2.0 -	1.	9 m - 2.0 m: Lense of GRAVEL (fine to medium)	Alluvial Sediments	0000							ļ	- 2.0 -								
- - 2.2 -		luvial	0000								- 2.2 -								GWNE	
- - 2.4 -		lne Al	0000								- - 2.4 -								<u>ن</u>	
- - 2.6 -			Pleistocene								-	- - 2.6 -								
- - 2.8 -			e Plei								ŀ	- - 2.8 -								
- 3.0 -			Late	0000							Ŀ	- 3.0 -								
-	GRAVEL (fire	ne to coarse, subrounded greywacke),									F									
- 3.2 - -	boulders, ye	o coarse), some cobbles, trace llowish brown to greyish brown,		0000							F	- 3.2 -								
- 3.4 -	dense, mois	t		30000							ļ	- 3.4 -								
- 3.6 - -				0000							ļ	- 3.6 -								
- 3.8 -				0000								- 3.8 -								
- 4.0 -											ļ	- 4.0 -								
- 4.2 -				0000								- 4.2 -								
- 4.4 -	EOTP: 4.40 n	TARGET DEPTH		0000							ŀ	- 4.4 -								
- 4.6 -											ŀ	- 4.6 -								
- 4.8 -											_	- 4.8 -								
Profile	e:							<u> </u>				Exca	/atio	n Me	etho	d:				
		- Contract																		
												Rema								
				#								1. Grou 2. Test							021.	
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				7								Datur	n:							
				200							-	Coord	linat	es.						
												2001	al	JJ.						



Hole No:

	oject No: Project: Gallina Nominees, Heinz Wattie Pension 01082 Fund, and Brookside Road Residential Ltd							S	Shea	ar V	ane:	Date	Excav	ated	l: L	-og(ged	Ву:	Ch	ecke	d By:
CH0	1082	Fund, and Brookside Roa Brookside Road Plan Cha		sident	iai L	_td		ŀ				08	3/10/20	21			KT				
		BIOOKSIQE ROAU FIAII CIIA		1	_																1
Ε			Geological Unit	ပ္	Und	drair	ned	She	ar S	Stren	gth	(kPa)	Œ	Dy	nam	ic C	one	Pene	trom	eter	Groundwater
Depth (m)		Description of Strata	logi	Graphic Log		Vane i					BS 13 Shear		Depth (m)	Te	est Me				, Test 6.	5.2	λpu
Jep		·	ieol U	Gra	╹			_	-		- 1		Эер					50mm)		40	rom
			_	W.		- 20	100	- 1		200		Values	_	2	4	6	8	10 1	2 14	16	G
ا ۾ ا	SILT, gravel	y (fine to coarse), some sand (fine to	1/S	r_LS.m.																	
0.2		k brown, dry, rootlets [TOPSOIL]											- 0.2 - -								
0.4	GRAVEL (fire	ne to coarse, subrounded greywacke),	,,	0000									- 0.4 -								
0.6	boulders, ve	o coarse), some cobbles, trace llowish brown to greyish brown,	ents	0000									0.6								
	dense, mois	t, some rootlets	ği İ	30000																	
0.8	[ALLUVIAL	SEDIMENTS]	a Se	000									- 0.8 - -								ш
- 1.0 -			lluvi										- 1.0 -								GWNE
1.2			Late Pleistocene Alluvial Sediments										 - 1.2 -								0
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1.4			leist	00000									- 1.4 -								
- 1.6 -			lte P	0000									– 1.6 –								
- 1.8 -			e	0000									 - 1.8 -								
- " -				0000									-								
2.0	EOTP: 2.00 m	TARGET DEPTH		• 0	İ								- 2.0 -								
- 2.2 -													- 2.2 -								
 - 2.4 -													 - 2.4 -								
- 2.6 -													– 2.6 –								
- 2.8 -													- 2.8 -								
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F 3.0 7													- 3.0 -								
- 3.2 -													- 3.2 -								
3.4													- 3.4 -								
- 3.6 -													 - 3.6 -								
[^{3.0}]													- 3.0 -								
- 3.8 -													- 3.8 -								
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- 4.2 - 													- 4.2 -								
- 4.4 -													- 4.4 -								
4.6													4.6								
 																					
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Profile			<u> </u>	ı			-						Exca	/atio	n M	etho	od:				
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													Dame	-l ·							
													Rema 1. Grou			ot end	count	ered o	n 8/10/	2021.	
			4										2. Test								
			V V																		
				HA.																	
				No.																	
			4																		
													Datur	n·							
			10/6	1									Datul	••							
			- 2	1	1								Coord	linat	es:						



Hole No:

TP8

Project No: Project: Gallina Nominees, Heinz Wattie CH01082 Fund, and Brookside Road Res			e Pens	ension Shear Vane: Da					ated:	Logge	ed By:	Checked By:		
CH01	1082	Brookside Road Plan Cha		sidenti	iai Liu			0	8/10/20	21	K	т.		
m)	•		cal	ic	Undrained	Shea	r Strengt	h (kPa)	m)	Dyna	amic Co	ne Pene	tromete	r afer
Depth (m)		Description of Strata	logi Unit	Graphic Log	Vane readin Shear Vane		cted as per BS Residual Sh		Depth (m)	Test		S 4402:1988, ws / 50mm)	Test 6.5.2	Groundwater
Del			Geological Unit	G	-50	-150	-200	Values	Del	2			2 14 16	Grou
- 0.2	SILT, gravell coarse), dar	ly (fine to coarse), some sand (fine to k brown, dry, rootlets [TOPSOIL]	T/S	2006年 2007年 3007年 3006年					- 0.2 -					
- 0.4 -	GRAVEL (fire	ne to coarse, subrounded greywacke), to coarse), some cobbles, trace	"						- 0.4 -					
0.6	boulders, ye	llowish brown to greyish brown,	ment	0000					0.6					
0.8	dense, mois	t, some rootlets SEDIMENTS]	Sedii	0000					0.8					
- - 1.0 -			Late Pleistocene Alluvial Sediments	00000					1.0					GWNE
 - 1.2 -			ne Al	0000					- 1.2 -					ő
- - 1.4 -			stoce	0000					- - 1.4 -					
			Pleis	0000					-					
- 1.6 - 			Late						- 1.6 -					
- 1.8 - 				00000					- 1.8 - 					
- 2.0 - 	EOTP: 2.00 m	TARGET DEPTH		00.					- 2.0 -					
2.2									2.2					
- 2.4 -									- 2.4 -					
2.6									2.6					
- 2.8 -									- 2.8 -					
3.0									3.0 -					
- - 3.2 -									- 3.2 -					
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- 3.4 -									- 3.4 -					
- 3.6 - 									- 3.6 - 					
- 3.8 - 									- 3.8 -					
4.0									- 4.0 -					
- 4.2 -									- 4.2 -					
4.4									4.4					
4.6									4.6					
4.8									4.8					
									-					
Profile):	di di	n	P- 45-11	ı				Exca	/ation	Method	1:		
									Rema	rks:				
									1. Grou	ndwate	not enco	untered or le through	1 8/10/202	21.
		All and the second seco	*						2. 1031	pit slue	rrano sidi	io unough	Jul.	
		THE PARTY OF THE P												
		THE WAY WELL												
			The same	-										
			7											

Datum:



Hole No:

TP9

_	ect No:	Project: Gallina Nominees, Heinz Fund, and Brookside Roa	Wattie	e Pens	ion	44		Sh	ear	Vane	e: Date	Excav	ated:	Lo	ogge	d By	y:	Cho	ecke	d By:
CH0	1082	Brookside Road Plan Cha		siueiii	IAI L	-tu					30	3/10/20	21 KT							
Depth (m)		Description of Strata	Geological Unit	Graphic Log	•		eadings o	correc	ted as	per BS dual She		Depth (m)	-	st Metho	od: NZS (Blov		:1988, nm)	Test 6.5	5.2	Groundwater
- 0.2 -		ly (fine to coarse), some sand (fine to k brown, dry, rootlets [TOPSOIL]	S/L	2 44 124 144				Ť		•		0.2 -								
- 0.4 0.6 1.0 1.4 1.8 1.8 2.0 2.2 2.4 2.4 2.4 2.4	GRAVEL (fins sandy (fine boulders, yed dense, mois [ALLUVIAL	ne to coarse, subrounded greywacke), to coarse), some cobbles, trace ellowish brown to greyish brown, st, some rootlets SEDIMENTS]	Late Pleistocene Alluvial Sediments	$\begin{array}{c} B_{1} \otimes \mathcal{N}_{1} \otimes \mathcal{N}_{2} \otimes \mathcal{N}_{3} \otimes \mathcal{N}_{4}								- 0.4 0.6 0.8 1.0 1.4 1.8 1.8 2.0 2.2 2.4								GWNE
 - 2.6 -												2.6 - - 2.6 -								
- 2.8 - 3.0 -												- 2.8 - - 3.0 -								
3.2 -												- 3.2 -								
- 3.4 -												- 3.4 -								
3.6												3.6								
- 3.8 - -												- 3.8 - -								
- 4.0 - 												- 4.0 - 								
- 4.2 - -												- 4.2 - 4.4 -								
- 4.4 - 4.6 -												4.4								
- 4.8 -												- 4.8 - - 4.8 -								
Profile	e:	Lucia de la companya				<u> </u>						Excav	ation	ı Me	thoc	l:				<u> </u>

AND THE PROPERTY OF

Remarks:

Groundwater not encountered on 8/10/2021.
 Test pit side walls stable throughout.

Datum:



Hole No:

TP10

Project No: Project: Gallina Nominees, Heinz CH01082 Fund, and Brookside Ro			Watti	e Pens	sion	Shea	r Vane	e: Date	Excav	ated:	Log	ged B	y:	Checked By:		
CH0	1082	Brookside Road Plan Ch		Sideiit	iai Liu			08	3/10/202	21		KT				
(m) r		D	Geological Unit	ohic g	Undrained S				(m) r					romete	ā	
Depth (m)		Description of Strata	seologi Unit	Graphic Log	Shear Vane	•	sidual Shea	ar Vane Values	Depth (m)	2		Blows / 50		14 16	rounc	
	SAND, som	e gravel (fine to coarse), brown and			100	150	500	values		2	4 6	8 1	0 12	14 16	, 6	
- 0.2 - - 0.4 -	cinderblocks	wn, dry, rootlets, containing concrete s, cow ribs, sheep bones, chicken							- 0.2 - 0.4 -							
0.6	Skulls [NON	ENGINEERED FILL]	Ī						- 0.6 -							
- 0.8			"						- 0.8 -							
- 1.0 -									- 1.0 - -							
- 1.2 -	CBAVEL (fix	no to coorgo, subrounded grouweeke)							- 1.2 - 						GWNE	
- 1.4 - - 1.6 -	sandy (fine t	ne to coarse, subrounded greywacke), to coarse), some cobbles, trace flowish brown to greyish brown,	uvial	00000					- 1.4 - - 1.6 -							
 - 1.8 -	dense, mois	t, some rootlets SEDIMENTS]	Pleistocene Alluvial Sediments						 - 1.8 -							
2.0			Pleistoc						2.0							
- 2.2 -			Late F	0000					- 2.2 - 							
- 2.4 - - 2.6 -	EOTP: 2.50 n	1 TARGET DEPTH		3000					- 2.4 - - 2.6 -							
- 2.8 -									2.8 -							
3.0									- - 3.0 -							
- 3.2 -									- 3.2 - 							
- 3.4 - -									- 3.4 - - 3.6 -							
- 3.6 - - 3.8 -									- 3.8 -							
- - 4.0 -									 - 4.0 -							
4.2									- 4.2 -							
- 4.4 - 									- 4.4 - 							
- 4.6 - 4.8 -									- 4.6 - - 4.8 -							
									-		NA - 42					
Profile	e:				Excav	ation	Meth	od:								
Zhior									Rema	rks:						

Groundwater not encountered on 8/10/2021.
 Test pit side walls stable throughout.

Datum:



Hole No:

TP11

Project No: CH01082		Fund, and Brookside Roa	roject: Gallina Nominees, Heinz Wattie Pension Fund, and Brookside Road Residential Ltd Brookside Road Plan Change								İ	Excav	d: Logged By:				Ch	ed By:		
Depth (m)		Description of Strata	Geological Clubs	Graphic Log	•		adings co	orrecte		er BS 1: al Shea 	(kPa)	Depth (m)	Dynamic Cone Pen Test Method: NZS 4402:198 (Blows / 50mm) 2 4 6 8 10						Groundwater	
- 0.2 0.4 0.6 1.0 1.4 1.6 1.6 1.6 1.8 2.0 2.2 2.4 2.6 3.4 3.6 3.8	coarse), dar GRAVEL (fin sandy (fine boulders, ye dense, mois [ALLUVIAL	ly (fine to coarse), some sand (fine to k brown, dry, rootlets [TOPSOIL] ne to coarse, subrounded greywacke), to coarse), some cobbles, trace illowish brown to greyish brown, it, some rootlets [SEDIMENTS]	Late Pleistocene Alluvial Sediments T/S Ge	9		09-		150			Values	- 0.2 0.4 0.6 1.0 1.4 1.6 1.8 2.0 2.2 2.6 3.4 3.6 3.6 3.8 3.6 3.8 3.8 3.8 3.8 3.8 3.8	2	4	6	3 10	12	14	16	GWNE
- 4.2 — - 4.4 — - 4.6 — - 4.8 —												- 4.2 - - 4.4 - - 4.6 - - 4.8 -								
Profile:											Rema 1. Groun 2. Test p	rks:	er not	encoi	untere			/2021		

Datum:



Hole No:

TP12

Proje CH0	ect No: 1082	Project: Gallina Nominees, Heinz Fund, and Brookside Roa Brookside Road Plan Cha	d Res	e Pens sident	sion ial Ltd	Sh	ear Var	ne: Da	08/10/20		Logged By:	Checke	d By:
Depth (m)		Description of Strata	Geological Unit	Graphic Log	Undrained S Vane readings Shear Vane	correct		S 1377	ے ا		amic Cone Pene t Method: NZS 4402:198t (Blows / 50mm)		Groundwater
- 0.2 0.4 1.0 1.6 1.8 1.6 1.8 2.0 2.4 2.6 3.2 3.4 3.6 3.8 3.6 3.8 3.8 4.2 4.4 4.5 4.6 4.8 4.8 4.8 4.8	coarse), dai GRAVEL (fin sandy (fine boulders, ye dense, mois [ALLUVIAL	ly (fine to coarse), some sand (fine to k brown, dry, rootlets [TOPSOIL] ne to coarse, subrounded greywacke), to coarse), some cobbles, trace ellowish brown to greyish brown, st, some rootlets SEDIMENTS] 0.8 m - 0.9 m: SAND (fine to medium)	Late Pleistocene Alluvial Sediments T/S	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$					- 0.2			15	GWNE
Profile	e:								Rema 1. Grou 2. Dyna perform	arks: indwate amic Co ned from pit side	r not encountered cone Penetrometer (In ground surface. walls stable through	OCP) test	



Hole No:

Project No: CH01082		Project: Gallina Nominees, Heinz Fund, and Brookside Roa Brookside Road Plan Cha	d Res	Pens eident	sion ial Ltd	Shear Vane: Date Excava 08/10/202					Lo	gge KT	d By	:	Checked By:		
Ê			<u> </u>	υ	Undrained S	hear Strength (kPa)			<u>E</u>	Dyna	amic	Con	e Pe	netr	ometer	iter	
Depth (m)		Description of Strata	logic Jnit	Graphic Log	Vane readings		as per BS esidual She		ફ	Tes	t Method		4402:19 s / 50mr		est 6.5.2	Groundwater	
Dep			Geological Unit	g L	-20	051	00 7	Values	Depth	2	4 6				14 16	Grou	
- 0.2 -	SILT, gravel coarse), dar	ly (fine to coarse), some sand (fine to k brown, dry, rootlets [TOPSOIL/FILL]	S/L						- 0.2 -								
- 0.4 -	GRAVEL (fir	ne to coarse), sandy (fine to coarse),	_						0.4								
- 0.6 -	rubbish com	prangey brown, dry, rootlets, containing prising plastic push chair, clothes,	≣						0.6							l l	
- 0.8 -	metal, conc asbestos co	ete fragments, glass bottles, potential ntamination		XXX					0.8							GWNE	
- 1.0 -			cene Ts						1.0								
- 1.2 -	GRAVEL (fir	ne to coarse, subrounded greywacke), to coarse), some cobbles, trace	e Pleistocene Alluvial Sediments	0000					1.2								
- 1.4 -	boulders, ye dense, mois	llowish brown to greyish brown, t, some rootlets SEDIMENTS]	Late P A Sec						1.4								
- 1.6 -		TARGET DEPTH							1.6								
- 1.8 -	}								1.8								
- 2.0 -	}								_ 2.0 _								
- 2.2 -									2.2								
- 2.4 -									2.4								
- 2.6 -									2.6								
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- 4.0 -									4.0								
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- 4.2 -									- 4.2 -								
- 4.4 -									- 4.4 -								
- 4.6 -									- 4.6 -								
- 4.8 -									- 4.8 -								
Profi	e:			I	<u> </u>	-	•		Excava	ation	Met	hod	: : : :				
									Remar 1. Groun 2. Test pi	dwate it side	walls :				l/10/2021. t.		



Hole No:

TP14

Proje CH0	Project No: Project: Gallina Nominees, Heinz W CH01082 Fund, and Brookside Road Brookside Road Plan Char				sion ial Ltd	Shear	· Vane:	İ	Excavat 3/10/2021		ogged KT	І Ву:	Chec	ked By:
Depth (m)		Description of Strata	Geological Unit	Graphic Log	Undrained SI Vane readings Shear Vane 00 01	corrected a	s per BS 13 dual Shear	177	Depth (m)		nod: NZS 4 (Blows	1402:1988, / 50mm)	tromete , Test 6.5.2	oundwa
- 0.2 -	SILT, gravel coarse), dar	ly (fine to coarse), some sand (fine to k brown, dry, rootlets [TOPSOIL]	S/L	E TS TE					- 0.2 -					
- 0.2	GRAVEL (fine sandy (fine boulders, ye dense, mois [ALLUVIAL	ne to coarse, subrounded greywacke), to coarse), minor cobbles, trace ellowish brown to greyish brown, st, some rootlets SEDIMENTS]	Late Pleistocene Alluvial Sediments 7) いくかつきのいかからのいかからのいかからのは、かいまたのできません。 そのできない かいまた かい かいまた かい かいまた かい かいまた かい かいまた かい かいまた かい かい かい かい かい かい かい かい かい かい かい かい かい					- 0.2					GWNE
4.2									4.2					
- 4.4 - - 4.6 -									- 4.4 - - 4.6 -					
- 4.8 -									- 4.8 - 					
Profile	ə:	Sent to age of		*					Excavat Remark	s:				
									1. Grounds 2. Test pit					21.

Datum:



Hole No:

TP15

	roject No: Project: Gallina Nominees, Heinz Wattie Pension H01082 Fund, and Brookside Road Residential Ltd							hear	Vane	: Date	Excav	ated:	Lo	gge	By:	Ch	ecke	d By:
CH0	1082	Brookside Road Plan Cha	ia Kes ange	siaent	iai Lto					08	3/10/20	21		KT				
Depth (m)		Description of Strata	Geological Unit	Graphic Log	Van	ined se reading	js corre		per BS 1		Depth (m)	_	st Metho	d: NZS	e Pend 4402:198 / 50mm)		.5.2	Groundwater
- 0.2 -	SILT, some rootlets [TO	sand (fine to coarse), dark brown, dry, PSOIL]	S/L	2 44 124 144							0.2 -							
- 0.4 0.6 1.0 1.4 1.6 1.8 2.0 2.2 2.4 2.4 2.4	GRAVEL (fire sandy (fine to boulders, yed dense, mois [ALLUVIAL sand)	ne to coarse, subrounded greywacke), to coarse), minor cobbles, trace ellowish brown to greyish brown, st, some rootlets SEDIMENTS]	Late Pleistocene Alluvial Sediments	က ၂၇ ႏွစ္ ေလ ႏွစ္ ေလ ႏွစ္ ေလ ႏွစ္ ေလ ႏွစ္ ေလ ႏွစ္ ေလ ႏွစ္ ေလ ႏွစ္ ေလ ႏွစ္ ေလ ႏွစ္ ေလ ႏွစ္ ေလ ႏွစ္ ေလ ႏွစ္ ေလ ခု လ ေတြ ေတြ ေတြ ေတြ ေတြ ေတြ ေတြ ေတြ ေတြ ေတြ							- 0.4							GWNE
2.6											- 2.6 - - 2.8 -							
- 2.8 - 3.0 -											- 2.8 - 3.0 -							
3.2											- 3.2 -							
- 3.4 - - 3.6 -											- 3.4 - - 3.6 -							
3.8											- 3.8 -							
- 4.0 -											 - 4.0 -							
4.2											- 4.2 -							
- 4.4 -											- 4.4 - -							
- 4.6 - - 4.8 -											- 4.6 - - 4.8 -							
Profile	e:				· · · ·	•		·	'		Excav	ation	Met	hod:				1

Remarks:

Groundwater not encountered on 8/10/2021.
 Test pit side walls stable throughout.

Datum:



Hole No:

TP16

	roject No: Project: Gallina Nominees, Heinz Wattie Pens H01082 Fund, and Brookside Road Residenti							Shea	r Vane	İ	Excav		: L	.ogg	ed E	By:	CI	heck	ed	Ву:
0		Brookside Road Plan Ch								30	3/10/20	21		ŀ	Υ Τ					
Depth (m)		Description of Strata	Geological Unit	Graphic Log	•		dings co	rrected a	rength s per BS 13 idual Shear	377	Depth (m)			hod: Ni (Bk	one F ZS 440 ows / 50	2:1988 0mm)	l, Test 6		•	Groundwater
- 0.2 -	SILT, some rootlets [TO	sand (fine to coarse), dark brown, dry, PSOIL]	S/1	S TAT P TS TAT P TAT							- 0.2 -									
- 0.4 0.6 1.0 1.2 1.4 1.6 1.8 2.2 2.4 2.6 2.8 - 2.8	greywacke) cobbles, yel	edium to coarse, subrounded , some sand (fine to coarse), some lowish brown to greyish brown, dense, e rootlets [ALLUVIAL SEDIMENTS]	Late Pleistocene Alluvial Sediments	२० ४ ८४०० १० ४०३०० १० ४८३०० १० ४८४०० १० ४८४०० १० ४८४०० १० ४८४० १० ४८४० १० ४८४० १० ४८४० १० ४८४० १० ४८४० १० ४८४० १० ४८४०० १० ४८४०० १० ४८४०० १० ४४४०० १० ४४४०० १० ४४४०० १० ४४४०० १० ४४४०० १० ४८४०० १० ४८४०० १० ४८४०० १० ४८४०० १० १० ४८४० १० ४८४० १० ४८४० १० ४८४० १० ४८४० १० ४८४० १० ४८४० १० ४८४० १० ४८४० १० ४८४० १० ४८४० १० ४८४० १० ४८४० १० ४८४							- 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 1.8 1.2 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 - 1.8									GWNE
- 3.0 - -				00000							- 3.0 - 									
- 3.2 - 3.4	EOTP: 3.20 n	1 TARGET DEPTH									- 3.2 - 3.4 -									
3.6											3.4									
3.8 -											3.8 -									
4.0											- 4.0 -									
- 4.2 -											- 4.2 -									
4.4											4.4									
4.6											4.6									
- 4.8 - -											- 4.8 -									
Profile	e:		1	1	I	<u> </u>		<u> </u>	<u> </u>		Exca	/atior	n Me	etho	d:				<u>: L</u>	

Remarks:

Groundwater not encountered on 8/10/2021.
 Test pit side walls stable throughout.

Datum:



Hole No:

TP17

	ect No: 1082	Project: Gallina Nominees, Heinz Fund, and Brookside Roa Brookside Road Plan Ch	sion ial L	td	;	Shea	ır Vane	İ	Excav 8/10/20		Lo	gged KT	d By:	CI	necke	ed By:		
Depth (m)		Description of Strata	Geological Unit	Graphic Log	• 1	/ane rea Shear V	dings co	rrected a	trength as per BS 1 sidual Shea	1377	Depth (m)		t Metho	d: NZS 4	e Pene 4402:198 / 50mm)	38, Test 6	6.5.2	Groundwater
0.2 -	SILT, trace of rootlets [TO	gravel (fine to coarse), dark brown, dry, PSOIL]	Z/Z	S TAN T TS TAN T TAN							- 0.2 -							
- 0.4 - - 0.6 -	sandy (fine boulders, ye	ne to coarse, subrounded greywacke), to coarse), minor cobbles, trace ellowish brown to greyish brown, st, some rootlets	ş2	000000000000000000000000000000000000000							- 0.4 - - 0.6 -							
- 0.8 -	[ALLUVIAL	SEDIMENTS]	Late Pleistocene Alluvial Sediments	00000							- 0.8 -							
- 1.0 -			vial Se	0000							- 1.0 1.2 -							GWNE
- 1.2 - - 1.4 -			ne Allu								1.4							9
 - 1.6 -			istoce	00000							- 1.6 -							
- 1.8 -			ate Ple	0000							1.8							
2.0			ت								2.0							
2.2				0000							_ 2.2 _							
- 2.4 -	EOTP: 2.30 n	n TARGET DEPTH									- 2.4 -							
- 2.6 - 											- 2.6 -							
- 2.8 -											- 2.8 -							
- 3.0 3.2 -											- 3.0 - - 3.2 -							
- 3.4											3.4							
- 3.6 -											3.6							
- 3.8 -											- 3.8 -							
4.0											4.0							
4.2											- 4.2 -							
4.4											4.4							
4.6											4.6							
- 4.8 - 											- 4.8 -							
Profile	e:			1		<u> </u>	<u>: </u>	<u>: </u>			Excav	ation	Met	hod:				1

Remarks:

Groundwater not encountered on 8/10/2021.
 Test pit side walls stable throughout.

Datum:



Hole No:

TP18

CH0	ect No: 1082	ial Ltd	She	ear Van	ie: Date	Excav 8/10/20		Log	gged KT	Ву:	Che	cke	d By:			
Depth (m)		Description of Strata	Geological Unit	Graphic Log	Vane readings of Shear Vane	correcte		1377	Depth (m)		Method:	: NZS 44 (Blows /	02:1988,	trome: , Test 6.5.	2	Groundwater
- 0.2 -	SILT, some rootlets [TO	sand (fine to coarse), dark brown, dry,	S/L	r_LS.m.					- 0.2 -	2 2 3 2	\square					
- 0.4 0.8 1.0 1.4 1.6 1.8 2.0 2.4 2.6 3.0 3.2 3.4 3.8 3.8 3.8 4.0 4.2 4.6 4.8 - 4.8 4.8 - 4.8	GRAVEL (m greywacke), cobbles, yel moist, some	edium to coarse, subrounded some sand (fine to coarse), some lowish brown to greyish brown, dense, e rootlets [ALLUVIAL SEDIMENTS]	Late Pleistocene Alluvial Sediments	\$\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\					- 0.4 0.6 1.0 1.2 1.4 1.6 1.8 2.2 2.4 2.6 3.2 3.6 3.8 3.8 3.8 3.8 3.8 4.2 4.4 4.8					150		GWNE
Profile	e:								Exca	vation	Meth	iod:			<u> </u>	
							2. Dyna perform	arks: indwater amic Cor ned from pit side v	ne Pen n groun	netromo nd surfa	eter (Di	CP) tes				

Datum:



Hole No:

TP19

Project No: Project: Gallina Nominees, Heinz Wattie Pens CH01082 Fund, and Brookside Road Resident				ion		She	ear Va	ne: Date	Exca	vated:	Logged By:	Checke	d By:	
CH0	1082	Fund, and Brookside Roa Brookside Road Plan Cha		sident	iai Ltd				08	8/10/20	21	KT		
Ê	-		<u>a</u>	ပ	Undrain	ed S	hear	Stren	gth (kPa)	Ê	Dyn	amic Cone Pene	trometer	ater
Depth (m)		Description of Strata	Geologica Unit	Graphic Log	Vane re			ed as per	BS 1377 Shear Vane	Depth (m)	Tes	st Method: NZS 4402:1988 (Blows / 50mm)	, Test 6.5.2	ndwa
Dep			Geo	g 1	20	9	150	500	Values	Dep	2	4 6 8 10 12	2 14 16	Groundwater
	SILT, some	sand (fine to coarse), dark brown, dry,	S/L	r_LS.m.							1 1			
- 0.2 -	rootlets [TO			2000 S T T T						- 0.2 -	2 2			
0.4	sandy (fine	ne to coarse, subrounded greywacke), to coarse), minor cobbles, trace		0000						0.4 -		5 5		
- 0.6 - 		ellowish brown to greyish brown, st, some rootlets								- 0.6		6 6 6		
0.8		SEDIMENTS]	1	0000						0.8 -		6 6 5		
- 1.0 -		edium to coarse, subrounded , some sand (fine to coarse), some								1.0 -		10		
- 1.2 -	cobbles, yel	lowish brown to greyish brown, dense,	ments	0000						1.2 -				
- 1.4 -		/ ne to coarse, subrounded greywacke),	Sedii							1.4 -				ш
1.6	sandy (fine	to coarse), minor cobbles, trace	luvial	00000						1.6 -				GWNE
- 1.8 -	dense, mois	ellowish brown to greyish brown, st	ne A	0000						1.8 -				
2.0			istoce	00000						2.0 -				
2.2			Late Pleistocene Alluvial Sediments	0000						2.2				
2.4			La							2.4 -				
2.6				0000						2.6				
2.8										2.8				
3.0				0000						3.0 -				
3.2	FOTP: 3 20 n	n TARGET DEPTH		0000						3.2				
3.4	2011 : 0:2011	THROEF BEI III								3.4				
3.6										3.6				
3.8										3.8 -				
4.0										4.0 -				
- 4.2 -										- 4.2 -				
4.4 -										4.4				
- - 4.6 -										- - 4.6 -				
- - 4.8 -										4.8				
										-				
Profile	e:	- Carana	Table 1	2						Exca	vation	Method:		
			3	1						Rema	arks:			
										1. Grou	ındwate	er not encountered o one Penetrometer (D	n 8/10/2021.	
				2/2/19						perforn	ned fror	n ground surface. walls stable through	,	
				1										
				1										
			1	7						Datur	m:			



Hole No:

Project No: Project: Gallina Nominees, Heinz Wattie Pe CH01082 Fund, and Brookside Road Reside Brookside Road Plan Change					sion ial Ltd	Sł	near \	Vane		Excav 3/10/20			ed By:	Che	ecke	d By:
Depth (m)		Description of Strata	Geological Unit	Graphic Log	Vane readings Shear Vane	correc	cted as p Residu	er BS 1	1377 ar Vane	Depth (m)			(S 4402:198 ws / 50mm)	8, Test 6.5	.2	Groundwater
- 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 - 1.8 - 1.	rootlets [TO GRAVEL (fin sandy (fine boulders, ye dense, mois [ALLUVIAL	gravel (fine to coarse), dark brown, dry,	Late Pleistocene Alluvial Sediments T/S Geologi Unit	\\\ \sigma_{\alpha} \sigma_{\a						- 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 1.6 2.2 2.4 2.6 3.2 3.4 3.6 3.2 3.4 3.6 3.8 4.2 4.6 4.8 4.6 4.8 4.6 4.8 4.6 4.8 4.6 4.8 4.8 4.8 4.8 4.8 4.8	vation irks: nmiwcce end from	(Blo	ws / 50mm) 8 10 1 8 10 1 d: d: suntered contents of the c	2 14 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	16	GWNE
								Datur		es:						



Hole No:

	Project No: Project: Gallina Nominees, Hein CH01082 Fund, and Brookside R Brookside Road Plan C			e Pens sident	sion ial Ltd	Shear Vane:	11/10/2		Logged By:	Checke	d By:
Depth (m)		Description of Strata	Geological Unit	Graphic Log	l	hear Strength (I	ء 5		amic Cone Penet at Method: NZS 4402:1988, (Blows / 50mm)	Test 6.5.2	Groundwater
- 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 1.6 1.8 1.6 1.8 1.8 1.8 1.8 1.8 1.8 1.8 -	GRAVEL (fine boulders, ye dense, mois [ALLUVIAL] GRAVEL (mgreywacke), cobbles, yel moist GRAVEL (fine sandy (fine boulders, yed dense, mois dense, mois dense, mois dense, mois dense, mois dense, mois dense de	ne to coarse, subrounded greywacke), to coarse), minor cobbles, trace ellowish brown to greyish brown, st, some rootlets SEDIMENTS] redium to coarse, subrounded, some sand (fine to coarse), some lowish brown to greyish brown, dense, ne to coarse, subrounded greywacke), to coarse), minor cobbles, trace ellowish brown to greyish brown,	Late Pleistocene Alluvial Sediments T/S	ీన ఆ ఆ సింద్రి కొర్పించిన విర్యాత్రికారు. మార్వి కొర్పిన కొర్పిన కొర్పిన ప్రక్రి కొర్పిన కొర్పిన ప్రక్రి కొర్పి ఏలిన కొర్పిన ప్రక్రి కొర్పిన కొర్పిన కొర్పిన కొర్పిన కొర్పిన కొర్పిన కొర్పిన కొర్పిన కొర్పిన కొర్పిన కొర్పిన క ఏలిన కొర్పిన కొర్పిన కొర్పిన కొర్పిన కొర్పిన కొర్పిన కొర్పిన కొర్పిన కొర్పిన కొర్పిన కొర్పిన కొర్పిన కొర్పిన క ఏకి కొర్పిన కొర్పిన కొర్పిన కొర్పిన కొర్పిన కొర్పిన కొర్పిన కొర్పిన కొర్పిన కొర్పిన కొర్పిన కొర్పిన కొర్పిన కొ			- 0.4 - 0.6 - 0.8 - 1.0 - 1.2 - 1.4 - 1.6 - 1.8 - 2.0 - 2.4 - 2.4 - 2.6 - 2.8 - 3.0 - 3.4 - 3.4 - 3.8 - 3.8				GWNE
- 4.2 - - 4.4 - - 4.6 - - 4.8 - - Profile	: :						- 4.2 - 4.4 4.6 4.8	- - - - - - - - avation	ı Method:		
							1. Gi 2. Dy perfc 3. Te	namic Co rmed fron st pit side	er not encountered or one Penetrometer (Di n ground surface, walls stable through	CP) test	



Hole No:

	esident	ial Ltd	Shea	r Van	İ	Excav			jed By: <t< th=""><th>Check</th><th>red By:</th></t<>	Check	red By:
Geological Unit	Graphic Log	Vane readings of Shear Vane	orrected a	as per BS sidual She	1377	Depth (m)	-	Method: N	ZS 4402:1988 ows / 50mm)	, Test 6.5.2	Groundwater
Late Pleistocene Alluvial Sediments T/S						- 0.4 0.6 0.8 1.0 1.2 1.6 1.8 1.6 1.8 1.6 1.8 1.6 1.8 - 1.8					GWNE
3 /30	THE STATE OF THE S			<u>i</u>		Excav	ation	Metho	iiiiii id:	1111	: I
						1. Grour 2. Dynai perform 3. Test p	ndwater mic Cor ed from hit side v	ne Pene ground walls sta	rometer (D surface.	CP) test	1.
	Road Re Change Geological IIII	Late Pleistocene Alluvial Sediments	Late Pleistocene Alluvial Sediments	Change Poleistocene Alluvial Sediments Poleistocene Alluvial Sedime	Sediments Change Polestocene Alluvial Sediments Change	Some number The property of the property	Road Residential Ltd Change Jundamed Shear Strength (kPa) (E)		Road Residential Ltd Change 11/10/2021	Road Residential Ltd Change Undrained Shear Strength (kPa) Vance makings corrected as part its 1377 Shear Vance On Residual Shear Value of Residual S	Road Residential Ltd Change 11/10/2021 KT 11/10/2021 KT



Hole No:

	Project No: Project: Gallina Nominees, Heinz Wattie Pension Fund, and Brookside Road Residential Ltd						near V	ane: Date	Exca	vated:	Logged By:	Checke	d By:
CH0 ²	1082	Fund, and Brookside Roa Brookside Road Plan Cha		sident	ial Ltd			1	1/10/20)21	KT		
m)			cal	ပ္	Undrained S	Shea	r Stren	gth (kPa)	Œ Œ	Dyna	amic Cone Pene	rometer	ater
Depth (m)		Description of Strata	Jogi	Graphic Log	Vane readings Shear Vane			BS 1377 Shear Vane	Depth (m)	Test	t Method: NZS 4402:1988, (Blows / 50mm)	Test 6.5.2	ndw
Dek			Geological Unit	_ გ	.50	-150 (-200	Values	Dek	2		14 16	Groundwater
0.2 -	SILT, some rootlets [TO	sand (fine to coarse), dark brown, dry,	T/S	T. TS T.					- 0.2 -	1 1 2			
- - 0.4 -		edium to coarse, subrounded		2000					- 0.4 -	2	5 5		
- 4	greywacke),	some sand (fine to coarse), some		0000					-		4 5 6		
- 0.6 - 	moist	owish brown to greyish brown, dense,							- 0.6 -		5 12 5 7		
- 0.8 - 	[ALLUVIAL	SEDIMENTS]	nents	0000					- 0.8 -		8 :	15	
- 1.0 - -			Sedin	30000					- 1.0 -			$\prod \prod$	
_ 1.2 _			Nial (0000					- 1.2 -				
- 1.4 -	GRAVEL (fir	ne to coarse, subrounded greywacke),	e Allu	0000					- 1.4 -				
_ 1.6 _	boulders, ye	o coarse), minor cobbles, trace llowish brown to greyish brown,	necen						1.6				GWNE
- 1.8 -	dense, mois	t, some rootlets	ate Pleistocene Alluvial Sediments						1.8				Ö
 - 2.0 -			Late	0000					- 2.0 -				
- - 2.2 -									- 2.2 -				
- - 2.4 -									- 2.4 -				
- - 2.6 -	EOTP: 3.20 m	TARGET DEPTH		20°%0					- 2.6 -				
 - 2.8 -									- 2.8 -				
- - 3.0 -									- 3.0 -				
ŀ ┤									- 3.2 -				
- 3.2 - 													
- 3.4 - -									- 3.4 -				
- 3.6 - 									- 3.6 - 				
- 3.8 - 									3.8 -				
- 4.0 -									- 4.0 -				
- 4.2 -									- 4.2 -				
_ 4.4 _									4.4 -				
4.6									4.6				
4.8									4.8				
Due file											Mathada		
Profile) .	War Call	25 4 %	- Service	l				Exca	vation	Method:		
									Rema	arks:			
									1. Grou	ındwateı	r not encountered or ne Penetrometer (De	8/10/2021.	
			A V						perforn	ned from	n ground surface. walls stable through		
		2 Mm	À	177					0. 1001	pit oldo	Traile stable all sage.	741.	
		34		W.									
				Val.									
				1									
			M										
									Datur	m:			
		Carlotte Contract	- S - St										
1			N. S.	X					0	dinata			



Hole No:

TP24

	roject No: Project: Gallina Nominees, Heinz Wat H01082 Fund, and Brookside Road R Brookside Road Plan Change			e Pens sident	sion ial Ltd	She	ear Var	ne: [08/10/2		d:	Log	gge KT	d By	/ :	Ch	ecke	ed By:
Depth (m)		Description of Strata	Geological Unit	Graphic Log	Vane readings Shear Vane	correcte		S 1377 near Va	=			lethod	d: NZS (Blows	10 Pe	1988, inm)		5.2	Groundwater
- 02	SILT, trace (gravel (fine to coarse), dark brown, dry,	S/1	r_L2.m.					- 02	-		T		T				
- 0.2 0.4 0.6 1.0 1.2 1.4 1.6 1.8 2.0 2.4 2.6 2.8 3.0 3.2 3.4 - 3.4	rootlets [TO GRAVEL (fin sandy (fine boulders, ye dense, mois [ALLUVIAL	PSOIL] ne to coarse, subrounded greywacke), to coarse), minor cobbles, trace ellowish brown to greyish brown, st, some rootlets SEDIMENTS]	Late Pleistocene Alluvial Sediments T/5	$\begin{array}{cccccccccccccccccccccccccccccccccccc$					- 0.2 - 0.4 - 0.6 - 0.8 - 1.0 - 1.2 - 1.4 - 1.6 - 1.8 - 2.0 - 2.4 - 2.6 - 2.8 - 3.0 - 3.2 - 3.4									GWNE
- 3.6 - - 3.8 -									- 3.6 - 3.8	- - - -								
- 4.0 -									- 4.0	-								
- 4.2 - 4.4 -									- 4.2 - - 4.4	- - -								
- 4.6 -									- - 4.6	-								
4.8									4.8	_								
Profile	ə :		<u> </u>						Exc	avati	on N	/leti	hod	:	11			
				Gardina Control of the Control of th					Rem 1. Gro 2. Tes	oundw	ater r						2021.	

Datum:



Hole No:

TP25

	ect No:	Project: Gallina Nominees, Heinz Fund, and Brookside Roa	sion ial I td	Shear Vane:	Date	Excavate	d: Logged By:	Checked By:		
CH0	1082	Brookside Road Plan Cha	iai Ltu		08/	/10/2021	KT			
Depth (m)		Description of Strata	Geological Unit	Graphic Log	l	near Strength corrected as per BS 13 Residual Shear	77	_	ynamic Cone Pene Test Method: NZS 4402:1988 (Blows / 50mm) 2 4 6 8 10 1:	TO .
- 0.2 -	SILT, gravel coarse), dar	ly (fine to coarse), some sand (fine to k brown, dry, rootlets [TOPSOIL]	S/1	LS T. T. T. T. T. T. T. T. T. T. T. T. T.		7		- 0.2 -		
- 0.4 0.6 0.8 1.0 1.2 1.6 1.8 1.6 1.8 1.6 1.8 1.6 1.8 1.6 1.8 - 1.8 - 1.	GRAVEL (fine sandy (fine brown to gre rootlet [ALL	ne to coarse, subrounded greywacke), to coarse), some cobbles, yellowish eyish brown, dense, moist, some UVIAL SEDIMENTS] 2.0 m - 2.1 m: Gravel (fine to medium)	Late Pleistocene Alluvial Sediments	$\frac{1}{2} \left\{ \frac{1}{2} \left(\frac{1}{2} \right) \right) \right) \right) \right)}{1} \right) \right) \right) \right) \right) \right) \right\} \right\} \right\} \right\} \right\} \right\} \right\} \right\} \right\} \right\} \right\} \right\} \right\} $				- 0.4		GWNE
- 4.4 - - 4.6 - - 4.8 - 4.8 -								- 4.4 - - 4.6 - - 4.8 -		
Profile	e:			<u> </u>		Excavati	on Method:	<u> </u>		
		(SAC) in the sacration of the sacration		- 1	Remarks 1. Groundwa	: ater not encountered o	n 8/10/2021.			

2. Test pit side walls stable throughout.

Datum:



Hole No:

TP26

Proje	ect No: 1082	Project: Gallina Nominees, Heinz Fund, and Brookside Ros Brookside Road Plan Ch	ad Re	e Pens sident	sion ial L	.td		Sh	ear '	Vane	i	Excav		i: L		ged I	 Зу:	CI	neck	ed By:
Depth (m)		Description of Strata	Geological G	Graphic Log	•		adings c	orrecte	ed as p	er BS 13 ual Shear	(kPa)	Depth (m)	Dy		hod: N	NZS 440 lows / 5	02:1988 60mm)			Groundwater
- 0.2 -	SILT, trace of rootlets [TO	gravel (fine to coarse), dark brown, dry, PSOIL]	1/8	S TATE T TS TATE T TATE								- - 0.2 -								
- 0.2 0.4 0.6 1.0 1.2 1.4 1.6 1.8 1.6 1.8 - 1.8	rootlets [TO GRAVEL (fin sandy (fine boulders, ye dense, mois [ALLUVIAL		Alluvial Sediments T/S	r_ms.r.								- 0.2 0.4 0.6 1.2 1.4 1.6 1.8 1.6 2.2 2.4 2.6 3.4 3.6 3.4 3.6 3.8 3.8 3.8 3.8 3.8 3.8 3.8 3.8 3.8								GWNE
- 4.2 - 4.4 -												- 4.2 - 4.4 -								
- 4.6 -												- 4.6 -								
- 4.8 - 												- 4.8 - 								
Profile	e:					•	•	•				Excav	/atio	n Me	etho	d:				1

Remarks:

Groundwater not encountered on 8/10/2021.
 Test pit side walls stable throughout.

Datum:



Hole No:

TP27

_	ect No:	Project: Gallina Nominees, Heinz Fund, and Brookside Roa	Wattie	Pens	sion	td	1	Shea	ar Van	e: Date	Excav	ated	l: L	-ogg	jed	By:	T	Che	ecke	ed By:
CH0	1002	Brookside Road Plan Cha		Jucin	.u. L	ıu				11	1/10/20	21			KT					
Depth (m)		Description of Strata	Geological Unit	Graphic Log	•	/ane rea Shear V	dings cor ane (rected	Strength l as per BS esidual She	1377	Depth (m)	-		thod: N	NZS 44 lows / :	02:19	188, Te	est 6.5	5.2	Groundwater
- 0.2 -	SILT, trace of rootlets [TO	gravel (fine to coarse), dark brown, dry, PSOIL]	S/1	S TS TS TS TS TS TS TS TS TS TS TS TS TS							- 0.2 -									
- 0.4 - - 0.6 - - 0.8 - - 1.0 -	sandy (fine boulders, ye dense, mois	ne to coarse, subrounded greywacke), to coarse), minor cobbles, trace ellowish brown to greyish brown, st, some rootlets SEDIMENTS] 0.6 m - 0.7 m: SAND, gravelly (fine)	Late Pleistocene Alluvial Sediments								- 0.4 - - 0.6 - - 0.8 - - 1.0 -									GWNE
- 1.2 - - 1.4 -		0.0 III - 0.7 III. SAND, gravelly (IIIIe)	ocene Alluv								- 1.2 - - 1.4 -									GW
- 1.6 - - 1.6 -			ate Pleisto	000000000000000000000000000000000000000							1.6 - - 1.8 -									
- 1.8 - 2.0 -											- 1.8 - - 2.0 -									
- 2.2 -	EOTP: 2.10 n	1 TARGET DEPTH									- 2.2 - - 2.4 -									
- 2.4 - 2.6 -											- 2.4 - - 2.6 -									
- 2.8 -											2.8									
- 3.0											- 3.0 3.2 -									
- 3.4 -											- 3.4 -									
- 3.6 - - 3.8 -											- 3.6 - - 3.8 -									
- 4.0 -											- 4.0 -									
- 4.2 - - - 4.4 -											- 4.2 - - 4.4 -									
- 4.6 - - 4.8 -											- 4.6 - - 4.8 -									
Profile	e:					<u> </u>	<u> </u>	<u> </u>			Excav	atio	n M	etho	od:		Ш			

Remarks:

Groundwater not encountered on 8/10/2021.
 Test pit side walls stable throughout.

Datum:



Hole No:

TP28

Proje CH01	ect No: 1082	Project: Gallina Nominees, Heinz Fund, and Brookside Roa Brookside Road Plan Cha	id Res	e Pens sident	sion ial L	td	5	She	ar Va	ne: D		Excava /10/202		: L		jed I	Ву:	CI	necke	ed By:
Depth (m)		Description of Strata	Geological Unit	Graphic Log	\	ane read	lings con	rected	Streng I as per B esidual S	S 1377	ne	Depth (m)			hod: Ni (Blo	ZS 440 ows / 5	02:1988 60mm)	etron 3, Test 6		Groundwater
- 0.2 -	SILT, trace of rootlets [TO	gravel (fine to coarse), dark brown, dry, PSOIL]	S/1	S A TS A A A A							-	- 0.2 -								
- 0.4 1.0 - 1.2 - 1.4 - 1.6 - 1.8 - 1.	sandy (fine boulders, ye dense, mois [ALLUVIAL	ne to coarse, subrounded greywacke), to coarse), minor cobbles, trace ellowish brown to greyish brown, st, some rootlets SEDIMENTS] 0.6 m - 0.7 m: SAND, gravelly (fine)	Late Pleistocene Alluvial Sediments	$\begin{array}{llllllllllllllllllllllllllllllllllll$								- 0.4			*tho	d:				GWNE
											i	Remar 1. Groun 2. Test p	dwate)/2021	

Datum:



Hole No:

TP29

Proje CH0	ect No: 1082	Project: Gallina Nominees, Heinz Fund, and Brookside Roa Brookside Road Plan Cha	d Res	e Pens sident	sion ial Ltd	Shear Van	İ	Excava			ed By:	Check	ed By:
Depth (m)		Description of Strata	Geological Unit	Graphic Log	Vane readings of Shear Vane	near Strengtl corrected as per BS Residual She	1377	Depth (m)	-	Method: Na (Blo	one Pener 2S 4402:1988, ows / 50mm) 8 10 12		Groundwater
- 0.2 -	SILT, trace (gravel (fine to coarse), dark brown, dry, PSOIL]	T/S	S TS TS TS TS TS TS TS TS TS TS TS TS TS				- 0.2 -					
- 0.2	GRAVEL (fin sandy (fine boulders, ye dense, mois [ALLUVIAL	ne to coarse, subrounded greywacke), to coarse), minor cobbles, trace ellowish brown to greyish brown, st, some rootlets SEDIMENTS] 1.1 m - 1.2 m: Orangey brown lense	Late Pleistocene Alluvial Sediments T	-W				- 0.2					GWNE
- 4.6 - 4.8 -								- 4.6 - - 4.8 -					
Profile	e:							Excav	ation	Metho	d:		
									ndwater		ountered or		ı.

Datum:



Hole No:

Proje CH0	ect No: 1082	Project: Gallina Nominees, Heinz Fund, and Brookside Roa Brookside Road Plan Cha	d Res	e Pens sident	sion ial Ltd	She	ar Van	e: Date	e Exca		d:	Lo	gge K	d B	y:	Che	cked	d By:
Ê			cal	ပ္	Undrained SI	near	Strengt	h (kPa)	Œ	D	ynaı	mic	Cor	ne Po	enet	rome	ter	ater
Depth (m)		Description of Strata	Geological Unit	Graphic Log	Vane readings of Shear Vane		d as per BS Residual She		Depth (Test N	Metho		3 4402: /s / 50r		Гest 6.5.	2	Groundwater
- De			99	ອັ	-50	150	-200	Values	Pe	:	2 4	4 6	3 8	3 10	12	14	16	Grot
- 0.2 -	SILT, trace of rootlets [TO	gravel (fine to coarse), dark brown, dry, PSOIL]	S/L	FTS.m.					- 0.2 -	1							30>>	
- 0.4	GRAVEL (fin	ne to coarse, subrounded greywacke),	س س	00000					0.4									
- 0.6	sandy (fine boulders, ye	to coarse), minor cobbles, trace ellowish brown to greyish brown,	Sediments	0000					0.6									
- 0.8	dense, mois	st, some rootlets SEDIMENTS]	Sedi	0000					- 0.8 -									
- 1.0 -	[/ KEEO V II KE	025.m2.vv0j	Alluvial	0000					1.0 -									GWNE
		1.1 m - 1.2 m: Orangey brown lense	ne A	0000					1.2	-								Ø
- 1.2 -			Pleistocene	0000					} .]								
- 1.4 -			Ple:	0000					1.4 -									
- 1.6 -			Late	0000					1.6 -									
- 1.8 -	FOTD 0.00	- TAROET DERTH		0000					1.8 -									
- 2.0 -	EOTP: 2.00 m	n TARGET DEPTH							2.0 -	1								
- 2.2 -									2.2 -	}								
- 2.4 -									- 2.4 -	-								
- 2.6 -									- 2.6 -	-								
- 2.8 -									2.8 -									
- 3.0									3.0 -									
- 3.2									3.2 -									
- 3.4 -									3.4 -									
- 3.6									3.6									
- 3.8 -									- 3.8 -									
- 4.0 -									4.0 -									
- 4.2 -									4.2	1								
									- 4.4 -	-								
- 4.4 -									ļ	-								
- 4.6 -									- 4.6 -									
- 4.8 -									4.8 -									
Profile	e:				<u> </u>		•	'	Exca	vati	on I	Met	hod	: :	<u></u>		<u></u>	
			7						Rema 1. Grot 2. Dyn	undw amic	ater Con	e Pe	netro	mete	er (DC			
									perform 3. Test	: pit si						ut.		
									Coor	dina	ates	5 :						

ECan Borehole Logs

Borelog for well M36/7538 page 1 of 2

Grid Reference (NZTM): 1547229 mE, 5171000 mN

Location Accuracy: 50 - 300m

Ground Level Altitude: 48.8 m +MSD Accuracy: < 0.5 m

Driller: McMillan Drilling Ltd

Drill Method: Rotary Rig Borelog Depth: 42.0 m Drill Date: 07-Jan-2004



Scale(m)	Water Level	Depth(m)		Full Drillers Description	Formation Code
-		0.30m		Earth	
		0.30m	0::0::0::	Earth Dev conduction	
			0.00	Ory sandy gravels	
			20.00		
			D.: O.: 10:::0		
			1.0:0::0:		
11			1.0.0		
			2.00.0		
Ш			10:0::0::		
		3.40m)OOd		
- 11		3.40m	0:0:0	Dry sandy gravels	
Н				Moist sandy gravels with clay	
			.000		
Ш			0:.0:.0:		
			.0:.0::0		
			0::0::0:		
			0::0::0:		
			0::0::0::		
			0::0::0:		
			0::0::0::		
			.0:.0::0		
0			0::0::0::		
			0::0::0:		
			0.00.		
			0:.0::0:		
			.0.0.0		
			0::0::0:		
П			0::0::0:		
			0::0::0:		
H			.0.0.0		
			0::0::0::		
H			0::0::0:		
			2		
_			:0::0::0		
5					
			0::0::0::		
H			0::0::0		
			0::0::0:		
			0::0::0:		
		18.00m	0::0::0:		
		18.00m	0::0::0::	Moist sandy gravels with clay	
				Wet olaybound sandy gravels	
			0::0::0		
			0:.0::0::		
0					
П			0::0::0		
			0::0::0:		
1.1			11 (1)		

Grid Reference (NZTM): 1548208 mE, 5171090 mN

Location Accuracy: 50 - 300m

Ground Level Altitude: 50.4 m +MSD Accuracy: < 2.5 m

Driller: Smith, J R & I G Drill Method: Cable Tool

Borelog Depth: 34.0 m Drill Date: 20-Jul-1985



Scale(m)	Water Level	Depth(m)		Full Drillers Description	Formation Code
		3.00m		Small layer of clay	
- - - -		3.00m _	00=000 00000 0=0000 000000 000000	Free gravel with some olay	
- 11		9.00m	00=000		
. 1		2.6	No Log No Log No	Not logged	
0		10.00m	O O O O O	Big rough gravel	-
		11.00m	200000		
		12.00m	000000000000000000000000000000000000000	Free smaller grave)	
		72.00111	000000	Free gravel, some traces of clay and a few big stones	
5		15.00m	000000		
		18.00m	000000	More big stones with traces of clay	
0			200000 200000 200000 200000 200000 2000000	More big rough stones	
5		200	200000 200000 200000 200000		
7		27.00m	6::6::6:: ::0::0::0 5::0::0::	Small grevel with some play and more sand	
.0		30.00m	00000000 00000000 00000000 00000000 0000	Free smooth gravel, some or	

Grid Reference (NZTM): 1548408 mE, 5170591 mN

Location Accuracy: 50 - 300m

Ground Level Altitude: 47.2 m +MSD Accuracy: < 2.5 m

Driller: A M Bisley & Co Drill Method: Driven Pipe

Borelog Depth: 36.3 m Drill Date:



1	Vster evel Depth(r		Full Drillers Description	Formation Code
5	6.09m	00000000 00000000 00000000 00000000 0000	Grey and Brown grave!	
		000000	Grey gravel, claybound	111111
		000000		
		000000		
		0000000		
0.		200000		
+		000000		
H		000000		
H		000000		
Н		000000		
5		0000000		
		000000		
	17.10m	200000		
	1,11,24	000000000	Grey and Brown gravel	
T .		000000000		
	19,20m	000000000	Compacted Grey and Brown grave	
0.		000000000		
H	21,00m	00000000	Grey and Brown gravel with some clay	
- H		000000	2.0, 2.0.0 0.0.0 2.0.0 0.0.0 0.0.0 0.0,	
Н		0=0000		
Ш	23.79m	8666686	Grey and Brown gravel	
5	22.22	00000000	Grey and blown graver	
	25.29m	000000000	Grey and Brown gravel, loose	
		000000000		
Ħ		000000000		
4		0000000000		
		000000000		
10	30 50m	000000000		
Н		000000000	Grey and Brown grave), dirty and tight	
	31.70m	888686888	Grey and Brown grave!	
		000000000	7-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1	
. 1		000000000		
35)000000000)000000000)000000000		
H	36:29m	000000000		

Grid Reference (NZTM): 1548878 mE, 5170491 mN

Location Accuracy: 50 - 300m

Ground Level Altitude: 45.1 m +MSD Accuracy: < 2.5 m

Driller: Dynes Road Drilling Drill Method: Cable Tool

Borelog Depth: 33.5 m Drill Date: 01-Dec-1995



Scale(m)	Water Level	Donth(m)		Full Drillers Description	Formation Code
Scale(III)	Level	Depth(m)	ισσοροσορορι	Small medium gravel	Code
		4.30m	00000000000000000000000000000000000000	Small medium gravei	
5		4.50m _	500060000 500000000 500000000 500000000 500000000	Small medium gravel silt bound	
10		12.30m _	000000000 000000000 000000000 00000000	Small medium gravel sandy	
15		16.79m	0.0.0.0.0 0.0.0.0.0 0.0.0.0.0 0.0.0.0.0		
Щ		10.79m	0.0.0.0.0.0	Small medium gravels wet Yellow silt	
		10.00	0.0.0	enough water to keep sand pump going	
20		18.00m _		Small medium gravel sandy silt	
25		26.00m _	6.6.6.6.6.6.6.6.6.6.6.6.6.6.6.6.6.6.6.	Small medium gravel sandy	
30		20.50		Small medium gravel small amount sand gravel stained	
		30.50m _	100000000000	Small clean open gravel	
		31.40m	20000000000000000000000000000000000000	Small gravel open clean	
Н		33.50m	000000000000000000000000000000000000000		

Borelog for well BX23/0144

Grid Reference (NZTM): 1548829 mE, 5170152 mN

Location Accuracy: 10 - 50m

Ground Level Altitude: m +MSD Accuracy:

Driller: McMillan Drilling Ltd Drill Method: Rotary/Percussion

Borelog Depth: 88.0 m Drill Date: 07-Dec-2012



Scale(m)	Water	Depth(m)		Full Drillers Description	Formation Code
		0.30m	0::0::0	EARTH	
				Moist Sandy GRAVELS	
17					
- 111			2.0.0		
H			.0:0:		
		10.00m	1.0.0		
Н		10.00m	0:0:0:	Claybound Sandy GRAVELS	
			00.0.	12,23212 1213, 2,31,122	
			.0::0::0		
- 17					
8			0:.0:.0:		
0			.000		
			.0.0.0		
-			0:0:0:		
- 11					
			000		
-			0:0::0:		
			00.0.		
1			.0::0::0		
- 11					
-			000.:		
			.000		
35			.0.0.0		
			0:0:0:		
17			.000		
			2. 2		
H			000		
			0::0::0:		
100					
			0::0::0:		
Ш					
- 11		51.00m	0.0.0	Commence of the Commence of th	
53		25/	000000	Medium Size Free GRAVELS	
		54.00m	NANANA	The second section of the second seco	
			F 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Claybound GRAVELS, Minor Sand	
н			α		
- 1					
11		51,00m	0=0=0=0=0	Waterbearing Sandy Moderately	
			0.0.4	Sorted Freeish Steined GRAVELS	
			0::0::		
			0::0::0		
8			.00		
201		59.00m		Chickwall COMME Could provide the	
70			0-0-4	Claybound GRAVELS with some sand	
			=0=0=		
Щ			0 = 0 = 0		
			エアド		
		22.32	_0_0_		
H		78.00m	8	Weterbasses Sandy Madagetaly	
			0.0.0	Waterbearing Sandy Moderately Sorted Freeish GRAVELS	
		82.00m T	::0::0::	Sevent treated and the	
		02:00M	000	Waterbearing Sandy Moderately/Well	
				Sorted Free Stained Coarse GRAVELS	
100					
		87.20m			

Grid Reference (NZTM): 1548229 mE, 5169063 mN

Location Accuracy: 2 - 15m

Ground Level Altitude: 38.4 m +MSD Accuracy: < 0.5 m

Driller: Smiths Welldrilling Drill Method: Rotary Rig

Borelog Depth: 29.0 m Drill Date: 25-Sep-1999



Scale(m)	Water Level	Depth(m)	Full Drillers Description	Formation Code
		0.20m	100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Soil	RI
Ц		0.20m	000000	Soil Standard arrange	RI RI
П			000000	Claybound gravel	RI
Ц					
			000000		
Ц			000000		
			000000		
Н			000000		
5		5.00m	Donio	Claybound gravel	RI
		5.00m	000	Claybound gravel Claybound sandy gravel	RI
H			0.0.0	,,	
			<u></u>		
H			0::0::0::		
H			1.0.0.0		
			000		
П					
10			1.0.0.0		
·~ П			0.0.0.		
Ш					
П			000		
Ш			<u> </u>		
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Ц			l:.0∵o∴0		
					
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15			<u></u>		
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н			0000		
			1.0.0.0		
			0.0.0.		
			000		
20			0:.0::0:		
Н			<u>oo.:o</u>		
			0::0::0::		
Н		22.00m 22.00m		Claybound sandy gravel	RI
		22.00M		Free sandy gravel	BR?
Н			.: :::::::::::::::::::::::::::::::::::		
		24.00m			
Н		24.00m	0.0.0.	Free sandy gravel	BR?
25				Claybound sandy gravel	LI-1
			000		
			7.7.7.		
			<u> </u>		
			0::0::0		
		27.50m			
		27.50m	[[o::Ø::o::	Claybound sandy gravel Free stained sandy gravel	LI-1 LI-1
				riee stained sandy gravei	LI-1
		29.00m			

Grid Reference (NZTM): 1547536 mE, 5169315 mN

Location Accuracy: 2 - 15m

Ground Level Altitude: 44.7 m +MSD Accuracy: < 2.5 m

Driller: McMillan Drilling Ltd Drill Method: Rotary/Percussion

Borelog Depth: 81.3 m Drill Date: 24-Jun-2003



Wate Scale(m) Leve)	Full Drillers Description	Formation Code
П	0.40m		Earth	
3.47	1.50m	0.0.0.	Grey sandy gravels	
H 3.47		00	Claybound sandy gravels	
 	L	$ \cdot \circ \cdot \cdot \circ \cdot \circ $		
		1.0.0		
ПІ		000		
H I		1.0.0.0		
 \	7	0.0.0		
11.95		00.0.4		
11.55		0.000		
16		1.0.0.0		
'° H		000		
	19.00m			
Н	13.00111	0.0.0.	Moderately sorted grey sandy gravels	
- 1		100	and clay	
- 1		1:00:00:01		
П		1.0.0		
- 1		1000.1		
н				
- 1		1.0.0.0		
		7. 7. 7. 7.		
П		00.0.1		
		.00.0		
33		1.0.0.01		
		0.50000		
Ц	36.50m			
	30.50m	 	Moderate to well sorted stained grey	
			sandy gravels	
Н		1:0::0::0:	, ,	
		D		
Ц				
		10.1001		
		D::0::0::0		
Н		0.0.0		
49	49.00m	7:0::U::U		
		0::0::0::	Moderate to poorly sorted brown and	
			grey sandy gravels	
		hi a did		
	54.50m	D::0::0::d		
H		0::0::0::	Moderately sorted brown and grey	
			stained sandy gravels	
		1.0.0		
		h::0::0		
		1:0::0::0:		
H				
		P O O O		
65		10:0::0::		
	67.00m	1:0::0::0::0		
	07.00111	0	Moderate to poorly sorted brown and	
Н			grey sandy gravels	
		1:0::0::0:		
Н	71.50m	7	Madamble and advantation of a section	
		D::0::0::	Moderately sorted grey stained sandy	
			gravels	
П	ı	B:::::::::::::::::::::::::::::::::::::		
		5.00.00.00		
Н		10:0:0:0:		
	81.25m	(2.5.1.7.7.7.7.7.7.7.7.7.7.7.7.7.7.7.7.7.7		
_				

Borelog for well M36/7225 page 1 of 2

Grid Reference (NZTM): 1547716 mE, 5170325 mN

Location Accuracy: 2 - 15m

Ground Level Altitude: 45.7 m +MSD Accuracy: < 0.5 m

Driller: McMillan Drilling Ltd Drill Method: Rotary/Percussion

Borelog Depth: 60.0 m Drill Date: 25-Sep-2002



Scale(m)	Water Level	Depth(m)		Full Drillers Description	Formation Code
П		0.20m	0.0.0	Earth and gravels	
Ц		0.20m		Earth and gravels	
			[.000]	Sandy gravels	
Н		2.20m	D.: 0.: 10::1		
		2.20m	0::0::0::	Sandy gravels Moist claybound sandy gravels	
Н			0.0.0	most daybound sandy gravers	
Ц	4.44—				
- 11	4.44 Y		0::0::0::		
5	4.44		0.0.0		
П			00		
Ш			0::0::0:		
					
H			00.0.		
- 1			1.0::0::0		
- 1			<u></u>		
10			00.0.1		
			000		
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			0::0::0:		
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15		15.00m	7.7.0.		
15		15.00m	00000000	Moist claybound sandy gravels	
			000000000	Water-bearing gravels	
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Н		23.00m _ 23.00m	20020000	Water-bearing gravels	
		23.00m	00.0.	Claybound sandy gravels	
Н			1:0::0::0		
25			\(\frac{1}{2}\)		
			<u> </u>		
			0::0::0		
		26.50m _ 26.50m	00000	Claybound sandy gravels	
H		20.00111	200000	Free large iron stained gravels	
			200000		
			200000		
		29.00m _	POGGGG	Froe large iron stained assurab	
		29.00m	* 11 1 = 1 1C 3C 3	Free large iron stained gravels	I

Grid Reference (NZTM): 1548158 mE, 5169498 mN

Location Accuracy: 2 - 15m

Ground Level Altitude: 41.1 m +MSD Accuracy: < 2.5 m

Driller: McMillan Drilling Ltd Drill Method: Rotary/Percussion

Borelog Depth: 25.2 m Drill Date: 25-Apr-1996



Scale(m)	Water Level	Depth(m)		Full Drillers Description	Formation Code
		0.30m _		Earth	
			0::0::0::	Grey sandy gravels	
П			[:0::0::0]		
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		6.09m	p::0::0::4		
		0.00	0:0::0::	Moist sandy gravels	
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10)::0::0::0		
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Ц			:.0::0::0		
		11.40m	<u> </u>	Moist sandy claybound gravels	
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		12.60m	0.000	Water-bearing lightly stained sandy	
Н				gravels	
			D. O. O. O.		
15		45.40	\······		
		15.40m	0::0::0::	Water-bearing Brown stained sandy	
H			0.00	gravels	
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25		25.20m			

