REPORT

Tonkin+Taylor

Geotechnical Completetion Report

Millwater Subdivision - Arrans Hill Precinct 5 - Stage 2

Prepared for
WFH Properties Ltd
Prepared by
Tonkin & Taylor Ltd
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Executive summary

Tonkin & Taylor Ltd (T+T) was engaged by WFH Properties Ltd to monitor and provide earthworks certification for the 66 No. Residential Lots contained within Stage 2 of Arrans Hill Precinct 5 at the Millwater Subdivision in Silverdale. Stage 2 comprises Residential Lots 79 to 142, Reserve Lots 501, 502, 700, 801 and 802, and Road Lot 901(part of Godfrey Drive) as shown on the Woods Final Surface As–Built Plan (Woods Ref 37502–05-100–AB) in Appendix A.

Previous geotechnical investigation work across the subdivision was undertaken by T+T and reported in:

a 2000 and 2001 Preliminary feasibility reporting (Ref. 1 and 2).

b 2003 Major reconnaissance report covering land in the Silverdale North and Orewa West areas (Ref. 3).

c March 2013 Geotechnical Investigation Report for the North Bridge to Grand Drive (Ref. 4).

d December 2015 Geotechnical Investigation Report for Arrans Hill Precinct 5 (Ref. 5).

Woods Ltd (Woods) undertook the engineering design for Stage 2 and the overall subdivision.

Subdivision earthworks commenced from February 2018 through to January 2020 under the control of Hick Bros Civil Construction Ltd (Hicks). Civil earthworks and construction for the residential Lots were under the control of JG Civil Ltd (JGCL) and were undertaken progressively from January 2020 through to completion in August 2020.

Key Stage 2 earthworks components included:

a Stripping of vegetation, organic materials and topsoil to stockpile.

b Installation of subsoil drains.

c Subsoil undercut at the base of Reinforced Earth Slopes 4 and 5 as shown on Woods Cut & Fill As-Built Plans (Woods Ref 37502–02–120) in Appendix A.

d Construction of Palisade Walls 1, 2 and 3 underneath Walls 4A and 4B at the southern end of the stage, as shown on T+T Drawings 21854.0031–AHP5S2–113 to 115 in Appendix B.

e Construction of Reinforced Earth Slopes 2, 3, 4, 5 and 9 as shown on T+T Drawings 21854.0031–AHP5S2–101 in Appendix B.

f Construction of part of the Shear Key 1 and all of Shear Key 2 as shown on T+T Drawings 21854.0031–AHP5S2–101 in Appendix B.

g Construction of Mass Block Walls 4A and 4B along the southern boundary of the stage as shown on T+T Drawings 21854.0031–AHP5S2–101 in Appendix B.

h Construction of Keystone Block Wall 10 at the south western corner of the stage as shown on T+T Drawings 21854.0031–AHP5S2–101 in Appendix B.

i Cut to fill earthworks across Stage 2 as shown on Woods Cut & Fill As–Built Plans (Woods Ref 37502–02–110-AB to –115–AB) in Appendix A.

Key Stage 2 civil works components included:

a Minor cut to fill earthwork across parts of the site as part of Lot development.

b Installation of roading and services.

c Construction of 2 No. pedestrian staircases.

Overall subdivisional soil types are highly expansive (Site class H), based on laboratory testing undertaken in accordance with AS 2870:2011 (Ref. [7]). Due to this classification, soils lie outside the definition of good ground within NZS 3604:2011 (Ref. [8]). Building foundations will require either specific foundation design for expansive soils or foundation design in accordance with AS 2870:2011 (Ref. [7]).

Subject to geotechnical constraints outlined in Section 3, and CSIRO recommendations outlined in the Appendices relating to expansive soils foundation design and home owner maintenance, all the residential Lots within Stage 2 are considered to have a building platform area that is generally suitable for domestic residential development subject to specific geotechnical assessment and foundation design due to the presence of expansive soils and where Lots contain, or are adjacent to, land with slopes steeper than 1 in 4 (V:H).

Foundation design for residential development should proceed in accordance with Sections 6.5 to 6.12 of this report.

1 Introduction

1.1 General

Tonkin & Taylor Ltd (T+T) was engaged by WFH Properties Ltd to monitor and provide earthworks certification for the 66 No. Residential Lots contained within Stage 2 of Arrans Hill Precinct 5 at the Millwater Subdivision in Silverdale. Stage 2 comprises Residential Lots 79 to 142, Reserve Lots 501, 502, 700, 801 and 802, and Road Lot 901 (part of Godfrey Drive) as shown on the Woods Final Surface As–Built Plan (Woods Ref 37502–02-100–AB) in Appendix A.

Previous geotechnical investigation work across the subdivision was undertaken by T+T and reported in:

a 2000 and 2001 Preliminary feasibility reporting (Ref. 1 and 2).

b 2003 Major reconnaissance report covering land in the Silverdale North and Orewa West areas (Ref. 3).

c March 2013 Geotechnical Investigation Report for the North Bridge to Grand Drive (Ref. 4).

d December 2015 Geotechnical Investigation Report for Arrans Hill Precinct 5 (Ref. 5).

The scope of work covered by this geotechnical completion report includes:

a Review of geotechnical investigation reporting for the site;

b Monitoring and certification of earthworks operations in compliance with NZS 4431:1989 (Ref. 6), including undercuts, 2 No. shear keys and construction of 5 No. reinforced earth slopes (Reinforced Earth Slopes 2, 3, 4, 5 and 9);

c Monitoring and certification of construction of 3 No. Palisade Walls (Palisade Walls 1, 2, and 3), 2 No. Mass Block Walls (Walls 4A and 4B), and Keystone Block Wall 10;

d Assessment of soils for expansive conditions in accordance with AS 2870:2011 (Ref. 7);

e Certification of completed Lots for residential development in accordance with NZS 3604:2011 (Ref. 8).

Woods Ltd (Woods) undertook subdivision engineering design and civil works construction observations. As–built plans showing final contours and cut and fill depths have been prepared by Woods and are attached in Appendix A.

1.2 Description of subdivision

The Millwater subdivision is situated to the north of the Silverdale Township, and west of the Metro Park East reserve area, and comprises approximately 260 hectares. The subdivision is bound to the south and west by Wainui Road, to the north by the Orewa Estuary and to the east by the Orewa Estuary and Millwater Parkway. The original site comprised a mix of farm properties and associated dwellings and existing residential developments.

The Arrans Hill Precinct 5, Stage 2 area of the Millwater subdivision is located within what is known as Precinct 5 in the Orewa West Structure Plan. Arrans Hill Precinct 5 area is bound by State Highway 1 to the west, Grand Drive to the north, Arran Drive to the east, and the Orewa estuary to the south. The situation of Arrans Hill Precinct 5 and Stage 2 is shown on T+T Drawing 21854.0031–AHP5S2–100 in Appendix B.

Pre-development gradients within the Stage 2 were gentle to moderately steep (1 in 3, to 1 in 5 (V:H)) dipping north and south. Post-development gradients have generally reduced the angle of the slope within the Lots to a gentle gradient (1 in 10, to 1 in 3 (V:H)). In order to form more level building platforms, steep reinforced earth slopes of up to 1 in 2 (V:H) have been constructed as shown on T+T Drawing 21854.0031–AHP5S2–101 in Appendix B.

1.3 Geological setting

Published geological mapping and information indicates the Arrans Hill Precinct 5 area is underlain by East Coast Bays Formation (ECBF) materials (Figure 1.1). In addition to the ECBF materials, our investigations identified the presence of alluvial and colluvial materials on site along the stream margins (Ref. 4 and 5).

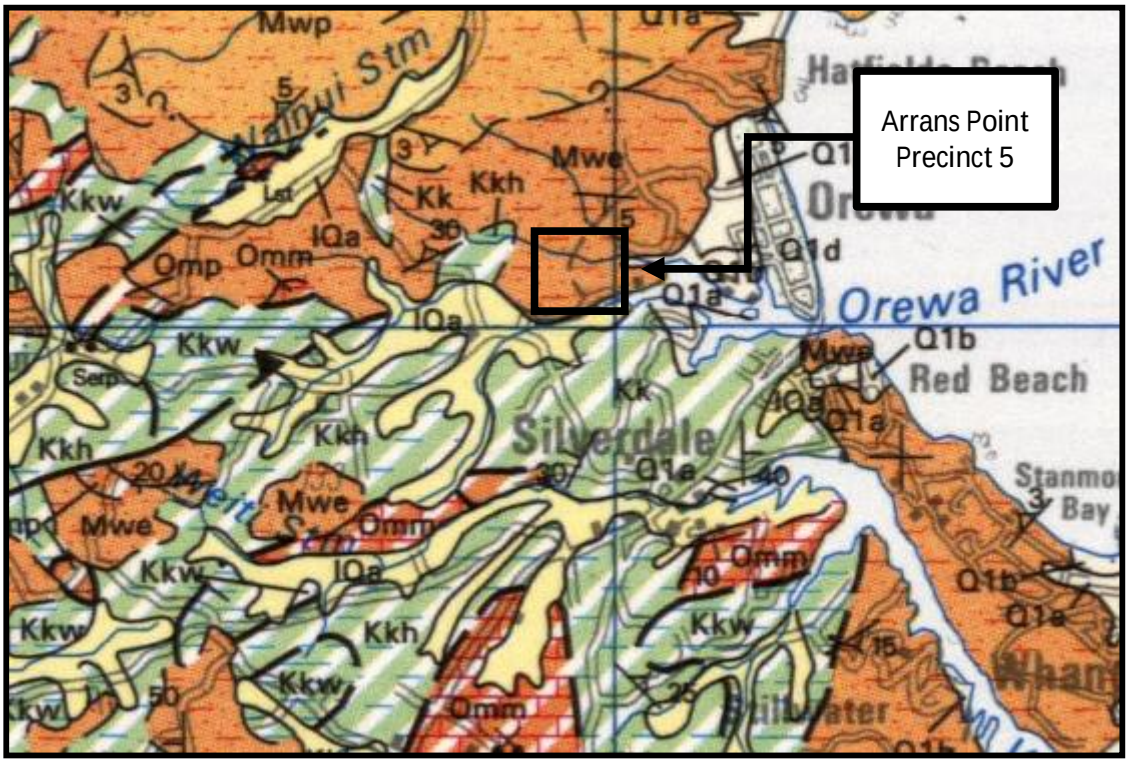

Figure 1.1: Local Geology (from Edbrooke)

Summary descriptions of geological units in the Arrans Point area (after Kermode 1991) are as follows:

a) East Coast Bays Formation

Alternating sandstone and mudstone with variable volcanic content (volcanic-poor lower in the sequence and mixed volcanic content higher) and interbedded volcaniclastic grit beds. This material typically shows a well-developed weathering profile of clay, silt or sand depending on the parent lithology.

b) Pleistocene Age Alluvium and Colluvium

Alluvium and Colluvium are generally observed on the lower slopes, along the edges of the tidal tributaries of the Orewa River on the southern and eastern boundary of the site. In places, it is locally discontinuous or absent.

The alluvial deposits are typically very thinly to very thickly bedded, yellow-grey to orange-brown, angular to well rounded, mixed sizes (usually graded, coarse becoming fine upwards) of mud, sand and gravel, comprising rock fragments and weathered rock residue from the hinterland. They include some beds of black, humus-rich clay and white, pumice silt.

Colluvium closely resembles the undisturbed residual soil materials, comprising a mix of clayey silts and silts, but is often of lesser strength due to the deformation and disturbance that has occurred during transportation down-slope.

Geological cross-sections through the Arrans Hill Precinct 5 Stage 2 area, based on site investigations and observations during construction, are enclosed as T+T Drawings 21854.0031–AHP5S2–103 to –105 in Appendix B.

Fill material placed across the site to form the final design profile typically comprised site-won East Coast Bays Formation materials.

2 Earthworks operations

2.1 Contractors and plant

Bulk earthworks were undertaken by Hick Bros Civil Construction Ltd (Hicks). Various areas of soft and/or wet materials were encountered during the works and were undercut and replaced with engineered fill. Much of this undercut material was considered suitable for re-use as engineered fill if conditioned appropriately. Accordingly, mixing of the cohesive fill materials with lime/cement to facilitate fill placement and compaction was undertaken by Hiway Stabilizers Ltd (Hiway) under Hicks' control.

Construction of the 3 No. palisade walls, 2 No. mass block walls, and 1 No. keystone block wall was undertaken by ICB Retaining and Construction Ltd (ICB), also under Hicks' control.

Civil works construction was completed by JG Civil Ltd (JGCL).

Various earthworks equipment was used to undertake the works, comprising motor scrapers, articulated dump trucks, tractors and discs, sheepsfoot compactors, padfoot rollers, and several 12 to 35 tonne excavators. This plant generally carried out all construction earthworks.

Specialist contractors and plant were brought on site for pavement construction. Certification of the pavement construction is beyond the scope of this report.

2.2 Construction programme

Subdivision earthworks commenced from February 2018 through to January 2020 under Hicks' control. Civil earthworks and construction for the residential Lots were under JGCL's control and were undertaken progressively from January 2020 through to completion in August 2020.

Key Stage 2 earthworks components included:

a Stripping of vegetation, organic materials and topsoil to stockpile.

b Installation of subsoil drains.

c Subsoil undercut at the base of Reinforced Earth Slopes 4 and 5 as shown on Woods Cut & Fill As-Built Plans (Woods Ref 37502–02–120-AB) in Appendix A.

d Construction of Palisade Walls 1, 2 and 3 underneath Walls 4A and 4B at the southern end of the stage, as shown on T+T Drawings 21854.0031–AHP5S2–113 to 115 in Appendix B.

e Construction of Reinforced Earth Slopes 2, 3, 4, 5 and 9 as shown on T+T Drawings 21854.0031–AHP5S2–101 in Appendix B.

f Construction of part of the Shear Key 1 and all of Shear Key 2 as shown on T+T Drawings 21854.0031–AHP5S2–101 in Appendix B.

g Construction of Mass Block Walls 4A and 4B along the southern boundary of the stage as shown on T+T Drawings 21854.0031–AHP5S2–101 in Appendix B.

h Construction of Keystone Block Wall 10 at the south western corner of the stage as shown on T+T Drawings 21854.0031–AHP5S2–101 in Appendix B.

i Cut to fill earthworks across Stage 2 as shown on Woods Cut & Fill As–Built Plans (Woods Ref 37502–02–110-AB to –115–AB) in Appendix A.

Key Stage 2 civil works components included:

a Minor cut to fill earthwork across parts of the site as part of Lot development.

b Installation of roading and services.

c Construction of 2 No. pedestrian staircases.

The earthworks, undercuts, shear keys, mass bock walls, keystone blocks walls, palisade walls, reinforced earth slopes and subsoil drainage as–built plans are included in Appendix A and Appendix B.

2.3 Compaction control

Compaction control criteria, consisting of maximum allowable air voids and minimum allowable shear strengths, were used for cohesive fill control. The Technical Specification included in our Geotechnical Investigation Report (Ref. 4 and 5) included the following requirement for the subdivisional earthworks:

Minimum Shear Strength and Maximum Air Voids Method

Minimum Undrained Shear Strength (Measured by insitu vane – IANZ calibrated)

General fills:

Average value not less than	140 kPa
Minimum single value	110 kPa

High Strength Structural fills (Undercuts & Reinforced Earth Fill Slopes):

Average value not less than	150 kPa
Minimum single value	120 kPa

Maximum Air Voids Percentage (as defined in NZS 4402:1986)

General fills:

Average value not more than	10%
Maximum single value	12%

High Strength Structural fills (Undercuts & Reinforced Earth Fill Slopes):

Average value not more than	8%
Maximum single value	10%

The average corrected shear strength value was determined over any ten consecutive tests.

Compaction control criteria consisting of minimum allowable Clegg Impact Values and minimum allowable in–situ dry density were used for cohesionless fill control. The Technical Specification included in our Geotechnical Investigation Report (Ref. 4 and 5) included the following requirement for the subdivisional earthworks:

Minimum Clegg Impact Value and Minimum In Situ Dry Density Method

Minimum Clegg Impact Value (Measured by Clegg Impact Hammer – IANZ calibrated)

General fills:

Average value not less than	20
Minimum single value	18

Minimum In-Situ Dry Density Percentage (as defined in NZS 4402:1986)

General fills:

Average value not less than	95%
Minimum single value	90%

The average Clegg Impact value was determined over any ten consecutive tests.

Regular in situ density, strength and water content tests were carried out on the filling at, or in excess of, the frequency recommended by NZS 4431:1989 (Ref. 6). Test results are contained in Appendix F.

Quality Control (QC) testing showed that the results for the filling were consistently meeting the required undrained shear strength, Clegg Impact value, density and air voids criteria, demonstrating that the water content of placed fill was consistently at, or close to, optimum. To the best of our knowledge, any problems encountered were rectified, where required, by close monitoring of the selection of borrow materials, discing and remixing of the available soil types and minor reworking.

3 Geotechnical development works

3.1 Subsoil drainage

A network of subsoil drains has been installed across Arrans Hill Precinct 5, Stage 2 during bulk earthworks along existing gullies and as part of the shear key, reinforced earth slopes, mass block walls and keystone block wall construction. The subsoil drains installed were excavated into the underlying soil and rock to intercept groundwater and springs. Details for the subsoil drains installed as part of the shear keys, reinforced earth slopes, mass block walls, and keystone block wall are outlined in Sections 3.3, 3.4, 3.6, and 3.7 respectively.

The subsoil drains outlet into a tributary of the Orewa River, as shown on the Woods Undercut And Subsoil Drain As–Built Plan (Woods Ref 37502–02–120–AB) in Appendix A and on T+T Drawing 21854.0031–AHP5S2–102 in Appendix B.

3.2 Undercuts

Multiple undercuts were excavated across Stage 2 due to discovery of unsuitable subgrade materials (i.e. soft and wet soil). Undercuts 0.6 to 1m deep were excavated to expose more competent soils (minimum shear strength of 75kPa). The undercut was replaced with engineered, compacted fill, placed in accordance with the bulk earthworks specification (Section 2.3 above).

Undercuts 1 and 3 were completed along the base of Reinforced Earth Slopes 4 and 5 to ensure competent foundation material for the reinforced earth slopes.

The extent of the undercut areas is shown on the Woods Undercut And Subsoil Drain As–Built Plan (Woods Ref 37502–02–120–AB) in Appendix A.

3.3 Shear keys

Based on stability analyses undertaken as part of the investigation reporting, shear keys were identified as being required across Arrans Hill Precinct 5 to provide satisfactory factors of safety against instability for the finished development of Stage 2.

Two Shear Keys, (i.e. Shear Key 1 and Shear Key 2), were excavated within Stage 2 during the bulk earthworks at the locations shown on the T+T Drawing 21854.0031–AHP5S2–101, included in Appendix B. Excavations for the Shear Keys were inspected and mapped by an Engineering Geologist to check that the key base had been extended sufficiently into the competent underlying ECBF rock materials, and that there were no apparent adverse structural features or lower strength materials exposed within the base and sides of the excavation. Any areas of suspect ground, including areas of identified land-slippage, were removed under the instruction of our site Engineering Geologist and replaced with well compacted engineered fill, placed in accordance with the bulk earthworks specification (Section 2.3 above).

The shear key long–sections for Shear Keys 1 and 2 were developed based on the mapping undertaken and is included in Appendix B (T+T Drawings 21854.0031–AHP5S2–130 and –135). The long–sections show the materials exposed within the side of the shear key excavation and relevant geological structural information mapped during our inspections.

Following completion of the shear key excavation, drainage blankets were placed along the rear face of the key, and comprised the following:

a 160mm diameter perforated Hiway grade Nexus drain pipe. This was run along the base of the rear of the excavations and discharges into the Orewa estuary at several locations (as per the Woods As–Built plans 37502–02–120–AB). Additional Novaflo pipes were also installed along mid-height benches where appropriate and connected into the key drainage outlet system.

b A minimum 300mm thick layer of SAP 50 was placed across the entire rear face, and extended to within 2m of the top of the key.

c Bidim A19 geotextile filter cloth was placed over the surface of the SAP 50 scoria to prevent contamination of the drainage aggregate with overlying bulk earthworks materials.

The rear face drainage blanket was extended up to at least 1 metre above the soil / rock interface to intercept perched groundwater flows which typically flows along this interface.

Ground conditions exposed during shear key construction were generally as anticipated from the design stage of the development. The slope stability analysis results from the original design phase are discussed in Section 4.

3.4 Reinforced earth slopes

Reinforced Earth Slopes 2, 3, 4, 5, and 9 were constructed during bulk earthworks phase of the development of Stage 2.

The foundations of Reinforced Earth Slopes 4 and 5 are composed of engineered fill material from an undercut. The foundations of Reinforced Earth Slopes 2, 3 and 9 are composed of engineered fill material from Shear Keys 1 and 2. The undercut and shear keys are described further in Sections 3.2 and 3.3, and presented on T+T Drawing 21854.0031-124 to 126 in Appendix B.

The reinforced earth slopes comprise horizontally laid biaxial geogrids placed at 0.5m (vertical) intervals within the engineered, compacted earth fill. The grids extend up to within 1.5 (vertical) metres of the slope crest. The geogrid has been placed at various lengths between 2 to 4m long, starting at the face of the slope.

Typical cross–sections of the reinforced earth slopes are shown on T+T Drawings 21854.0031–AHP5S2–123 to –125 in Appendix B.

The placement of the geogrid allows steeper finished gradients than is possible with bulk fills and will minimise risk of instability across the face of the slope, particularly where finished gradients across the slopes are up to 1 in 2 (V:H).

Construction of the slope comprised the following:

d place drainage pipes and scoria blanket as required;

e placement and compaction of fill, or excavation within natural ground, to the required levels;

a placement of the geogrid, ensuring that the grid is held tightly in place;

b spreading of fill across the surface of the geogrid with lightweight plant;

c compaction and placement of further fill up to the level of the next grid layer.

The fill was placed and compacted beyond the limit of the final slope face and then trimmed back to ensure full compaction of the slope face was achieved.

Subsoil drains installed as part of the reinforced earth slope construction comprised the following:

a 160mm diameter perforated Hiway grade Nexus drainpipes installed along the base of the rear of the reinforced soil block.

b A minimum of 300mm cover of SAP50 scoria placed over the top of the Nexus pipe and across the entire rear face of the reinforced soil block, to within 2.0 metres of the ground surface (at time of construction).

c Bidim A19 geotextile filter-cloth placed over the surface of the SAP50 scoria prior to placement of the reinforced soil to prevent contamination of the drainage aggregate with overlying bulk earthworks materials.

The slopes have been designed to accommodate surcharge of up to 10kPa distributed load at the crest of the slopes.

The slope faces will be subject to a planting covenant and Building Limitation Zone preventing construction within this area. Protection of the geogrids from damage also precludes construction across the slope faces and immediately adjacent to the slope crest. Accordingly, a Building Limitation Zone has been applied across the slopes (See Sections 5.4).

3.5 Palisade walls

Three Palisade Walls were constructed within Stage 2 to provide satisfactory factors of safety against slope instability, shown on T+T Drawing 21854.0031–AHP5S5–112 in Appendix B. Palisade Walls 1, 2 and 3 were constructed along the southern boundary of the site beneath Mass Block Walls 4A and 4B.

The as-built construction details for Palisade Walls 1, 2 and 3 are listed in Table 3.1 below.

Table 3.1: Summary of palisade wall construction details

Wall number	Pile length (m)	Steel pile details	Pile centre spacing (m)	Pile hole diameter (mm)	Concrete strength (MPa)
Palisade Wall 1	6	250UC73	1.8	600	20
Palisade Wall 2	6	310UC97	1.0	600	20
Palisade Wall 3	9	310UC97	1.5	600	20

Drilling for the palisade wall pile bores was inspected and logged by a T+T Engineering Geologist or Geotechnical Engineer to check that the base of the piles had been extended sufficiently to the target material.

Ground conditions exposed during construction of Palisade Walls 1,2 and 3 were generally as anticipated from the design stage of the development. The slope stability analysis results from the original design phase are discussed in Section 4.

3.6 Mass block walls

Two geogrid reinforced segmental mass block walls (i.e. Mass Block Walls 4A and 4B) were constructed within Stage 2.

The mass block retaining walls comprise uniaxial High Density Polyethylene (HDPE) geogrids placed at a maximum of 1.0m (vertical) intervals within the well compacted engineered fill (i.e. hardfill and cohesive fill), placed in accordance with the bulk earthworks specification (Section 2.3 above). The grids for Walls 4A and 4B extend up to within 0.5m of the ground surface.

The walls have been designed to accommodate a maximum 10kPa surcharge, although development immediately behind/above the wall is likely to be precluded by Council planning rules.

Construction of the Mass Block retaining walls comprised the following:

a placement and compaction of fill to the required levels;

b placement of the Screen Block units, including starter sections of geogrids cast into the blocks at the appropriate levels;

c placement of the geogrid and connection to the starter sections using a “Bodkin” joint, ensuring that the grid is held tightly in place;

d spreading of fill across the surface of the geogrid with lightweight plant;

e compaction and placement of further fill up to the level of the next grid layer.

Typical cross–sections of the geogrid reinforced segmental block walls are shown on T+T Drawings 21854.0031–AHP5S2–116 to –122, and –126 in Appendix B.

Drainage of the mass block comprises the following:

a A drainage blanket was installed at the rear of the reinforced block of soil which comprises a minimum 300mm thickness of SAP50 scoria, covered in Bidim A19 geotextile filter cloth.

b A 160mm diameter perforated Nexus pipe along the back face of the wall and base of the rear of the reinforced soil block provides a discharge outlet for any groundwater captured in the drainage blanket.

c The drainage pipes from behind the walls outlet into a tributary of the Orewa River as shown on the Woods As–Built plans 37502–02–120–AB in Appendix A.

Certification of these walls, in accordance with the relevant Engineering Approval or Approved Building Consent, is to be supplied under separate cover.

3.7 Keystone block wall

One geogrid reinforced segmental keystone block walls (i.e. Keystone Block Wall 10) was constructed within Stage 2.

The Keystone Block retaining wall comprise uniaxial High Density Polyethylene (HDPE) geogrids placed at a maximum of 0.4m (vertical) intervals within the well compacted engineered fill (i.e. hardfill and cohesive fill), placed in accordance with the bulk earthworks specification (Section 2.3 above). The grids for Wall 10 extend up to within 0.3m of the ground surface. For the section of wall retaining less than 1m, the reinforced block is backfilled with no fines concrete (i.e. no geogrid reinforcement).

The walls have been designed to accommodate a maximum 10kPa surcharge, although development immediately behind/above the wall is likely to be precluded by Council planning rules.

Construction of the Keystone Block retaining walls comprised the following:

a placement and compaction of fill to the required levels;

b placement of the Allan Block units;

c placement of the geogrid, ensuring that the grid is held tightly in place;

d spreading of fill across the surface of the geogrid with lightweight plant;

e compaction and placement of further fill up to the level of the next grid layer.

Typical cross–sections of the keystone block walls are shown on T+T Drawings 21854.0031–AHP5S2–110 in Appendix B.

Drainage of the keystone block wall comprises the following:

a A drainage blanket was installed at the rear of the reinforced block of soil which comprises a minimum 300mm thickness of SAP50 scoria, covered in Bidim A19 geotextile filter cloth.

b A 160mm diameter perforated Nexus pipe along the back face of the wall and base of the rear of the reinforced soil block provides a discharge outlet for any groundwater captured in the drainage blanket.

c The drainage pipes from behind the walls link to subsoil drainage network and outlet into a tributary of the Orewa River as shown on the Woods As–Built plans 37502–02–120–AB in Appendix A.

Certification of these walls, in accordance with the relevant Engineering Approval or Approved Building Consent, is to be supplied under separate cover.

4 Stability analysis

Observations and monitoring were undertaken during bulk earthworks construction to confirm that the ground conditions exposed were consistent with the assumptions made in the stability analyses.

We are satisfied that the design stability analyses remain valid for the completed works on the following basis:

a the exposed ground conditions generally conform to those assumed for design;

b the as-built profiles match design levels;

c the earthworks monitoring shows compliance with specified criteria, upon which fill properties have been based.

5 Project evaluation / building design considerations

5.1 General

Ground conditions within the Arrans Hill Precinct 5 Stage 2 area straddle a range of "design conditions" including cut ground, filled ground, expansive soils and constructed slopes up to 1 in 2 (V:H). The following sections set out relevant geotechnical design recommendations.

5.2 Post earthworks investigations

Following the completion of earthworks operations, T+T have undertaken supplementary fieldwork to confirm the consistency of the natural subsoils and engineered fill. From the investigations, we confirm that the subsoils are considered to have a geotechnical ultimate bearing capacity of 300kPa, as required by NZS 3604:2011 (Ref. 8). This corresponds to a factored (Ultimate Limit State) bearing capacity of 150kPa and working (Serviceability Limit State) bearing capacity of 100kPa. Associated borehole logs and site plan (T+T Drawing 21854.0031–AHP5S2–141) are attached in Appendix F and Appendix B, respectively.

5.3 Bearing capacity for building foundations

From the investigation described in Section 5.2, we consider that all filled and natural ground within the site is assessed as generally having a geotechnical ultimate bearing capacity of 300kPa, as required by NZS 3604:2011 (Ref. 8). This corresponds to a factored (Ultimate Limit State) bearing capacity of 150kPa and working (Serviceability Limit State) bearing capacity of 100kPa.

Due to the presence of expansive soils, foundation conditions fall outside the definition of "good ground" contained in NZS 3604:2011 (Ref. 8). Due allowance should be made for expansive soils, as discussed in Section 5.12.

Where a geotechnical ultimate bearing capacity greater than 300kPa is required to support any dwelling constructed outside the scope of NZS 3604:2011 (Ref. 8), further specific site investigation and design of foundations will be required.

5.4 Building limitation zones

5.4.1 Reinforced earth slopes

The steep slope across Lots 86 to 142 have been constructed as Reinforced Earth Slopes 2, 3, 4 and 5, with face gradients of up to 1 in 2 (V:H). Reinforced Earth Slope 9 has also been constructed below Godfrey Drive. Construction within the flatter parts of these Lots is intended, and a Building Limitation Zone (i.e. "No-Build Zone") has been developed across the steeper sections of the Lots to ensure that the reinforcement of the slopes is not detrimentally affected by future development. The extent of the Building Limitation Zones associated with the RE Slopes are shown on T+T Drawing 21854.0031–AHP5S2–140 (Building Limitation Plan) in Appendix B. Excavation, fill placement and/or construction within this zone is not permitted.

We understand that slope protection, in the form of "Enkamat" or "Geocells" have been anchored to the face of the Reinforced Earth Slopes 2, 3, 4, and 5 to function as a protective reinforcing layer for the topsoil and plant root system. Reinforced Earth Slope 9 has been mulched and planted only. The "Enkamat" or "Geocells" have been anchored to a "deadman" which is located within the Lot at the top of the slope. To ensure the anchor points are not damaged, a no-build zone extending 1m from the anchor points into the Lots has been delineated. This is shown on the Woods Reinforced Earth Batter & Slope Stabilisation Plan (Woods Ref 37502–02–140–AB) in Appendix A and T+T Drawing 21854.0031–AHP5S2–140 (Building Limitation Plan) in Appendix B .

Vegetation on slopes that are 1 in 4 (V:H) or steeper is recommended to reduce the potential for shallow slope instability and to minimise surface erosion. Where gradients are 1 in 4 (V:H) or steeper, there is potential for minor shallow creep of the topsoil layer. However, such creep is considered unlikely to detrimentally affect the global stability of the slope.

5.4.2 Vegetated reinforced earth batter – Lots 79 to 80

During initial investigations it was found part of the western boundary of Stage 2 did not have an adequate factor of safety to prevent instability. To ensure the stability of the slope, a no-build zone has also been delineated on the western site boundary across Lots 79 to 80, where a Vegetated Reinforced Earth batter has been constructed. The Vegetated Reinforced Earth batter extends from Stage 2 to the north into Stage 5. The extent of the Building Limitation Zones along the Stage 2 western boundary is shown on T+T Drawing 21854.0031–AHP5S2–140 (Building Limitation Plan) in Appendix B.

5.4.3 Western stage boundary - Lots 82 to 84

The western end of Lots 82 to 84 contain an apparent gully feature with a maximum gradient of 1 in 2 (V:H). The steep gradient of this slope does not meet the normally applied factor of safety for fill slope against instability. A building limitation zone has been delineated within Lots 82-84 2m above the crest of the gully slope.

Construction in the areas designated as Building Limitation Zones, as shown on T+T Drawing 21854.0031–AHP5S2–140 (Building Limitation Plan) in Appendix B, do not meet the normally applied minimum factor of safety and construction in those areas is not recommended. Any construction in the areas indicated will require specific investigation and design.

5.4.4 Keystone Block Wall 10

A Building Limitation Zone has been developed adjacent to Keystone Block Wall 10 to protect the wall from damage to the mass stabilised earth behind/above the wall, and undercutting the toe embedment in front of the walls. Lot 84 within Stage 2 affected by the building limitations related to Keystone Block Wall 10. The extent of the Building Limitation Zone associated with Keystone Block Wall 10 is shown on T+T Drawing 21854.0031–AHP5S2–140 (Building Limitation Plan) in Appendix B.

5.5 Settlement

From our inspections during earthworks operations, the results of compaction quality control testing, and post construction survey monitoring, we consider that differential settlement induced by self-weight of engineered fill should now be largely complete. Further settlements should be within normally accepted design tolerances of 25mm, as outlined in NZS 3604:2011 (Ref. [8]), with respect to conventional building development.

In order to minimise the risk of ground settlements exceeding 25mm, NZS 3604:2011 (Ref. [8]) allows a maximum fill surcharge of 600mm over the building platform during future development. Filling in excess of this thickness should be subject to specific foundation design and assessment.

5.6 Earthworks and retaining walls

All earthworks and retaining wall construction on the lots should comply with all requirements of the Resource Management Act (1991), the Building Act (2004) and the Auckland Unitary Plan.

All temporary and permanent cuts exceeding 1.5m in height, including cuts to be retained, should be specifically investigated by a suitably qualified geotechnical professional to confirm that the stability of the subject (or adjacent) Lot is not detrimentally affected. Retaining walls greater than 1.5m in

height should be specifically investigated and designed by a Chartered Professional Engineer practising in geotechnical engineering.

Fill greater than 0.6m thick, and all fill proposed to be beneath structures (including hardstanding areas), should meet the requirements of NZS 4431:1989 – Code of Practice for Earthfill for Residential Development, and should include adequate stripping, benching, and underdrainage.

All fills greater than 0.6m thickness should be investigated and designed by a Chartered Professional Engineer practising in geotechnical engineering or by an experienced Engineering Geologist. The Engineer should consider the effect of the earthworks on global stability, i.e. the effect of the works on the stability of the lot and on the stability adjacent lots.

Due to the relatively shallow grades across most of the Stage 2 Lots, it is not anticipated that significant retaining walls will be required. However, if walls are required, then retaining wall design will be dependent on the site specific requirements. For preliminary retaining wall design, we recommend the use of the following geotechnical design parameters for the retained soils:

- $\gamma = 18\ kN/m^3$,
- $c' = 0\ kPa$,
- $Ø' = 30°$,
- $K_a = 0.30$,
- $K_p = 3.33$,

We recommend an undrained shear strength, "Su", of 50kPa for the embedment soil (subject to confirmation during construction).

These values are based on level ground above and below the wall and will require appropriate amendment to allow for slope, traffic and other surcharges or toe slopes and the specific lot geometry and development requirements, as applicable.

All retaining walls should include a layer of free draining granular fill (with geotextile over the top) immediately behind the wall covered with a 0.3m thick (minimum) compacted clay fill cap, with intercepted groundwater seepage piped into the reticulated stormwater system.

5.7 Subsoil drainage

Following undercutting during bulk earthworks, groundwater subsoil drainage was installed at select locations using Nexus subsoil drains covered in scoria and geotextile cloth to permanently handle ground water flows.

The extent of the subsoil drainage systems are shown on the Woods Undercut And Subsoil Drain As–Built Plan (Woods Ref 37502–02–120–AB) in Appendix A, and on T+T Drawing 21854.0031–AHP5S2–102 in Appendix B.

This subsoil drainage system is relatively deep and located so that it is unlikely to be encountered during future residential site development and is expected to be maintenance free. Any deep excavations should take account of the presence of these subsoil drains. If a drain is encountered, damaged, or identified as defective, repairs should be observed by a Chartered Professional (Geotechnical) Engineer familiar with this report, and notified to Auckland Council.

5.8 Stormwater

Public stormwater services have been installed within Arrans Hill Precinct 5, Stage 2. Stormwater and runoff from roofs, decks and paved areas, together with discharges from future retaining wall

drains and other subsoil drainage, must be connected directly into the public stormwater drainage network.

5.9 Service lines

Trench backfill has been compacted to minimise potential for future settlements. However, where building envelopes lie adjacent to or across service lines, all foundations should extend and be founded below the 45 degree zone of influence line from pipe inverts. This requirement is to avoid excessive pipe surcharges, and to allow for future maintenance of the system without detrimentally affecting adjacent structures. Subject to approval from Auckland Council, foundations may extend and bridge over service lines provided specific foundation design is undertaken.

A copy of the Stormwater, Wastewater and Watermain As–Built Plans (Woods Ref 37502–02–300–AB to –306–AB, –400–AB to –406–AB and –600–AB to –602–AB) are included in Appendix A.

5.10 Road subgrades

Based on the fill monitoring and site observations during development, filled and natural ground within the road and vehicle access Lots is considered generally suitable for the proposed residential pavements. Subgrade strength testing was carried out following excavation to formation levels along the road alignments. These subgrade test results were passed on to Woods for use in their pavement design. All road subgrades have been lime and cement stabilised to assist in pavement strengths, and to minimise the impact of expansive soils on road pavements.

For future road construction in other parts of the Arrans Hill Precinct 5, Stage 2 development, within natural ground, a design CBR of 2% is considered appropriate while, within engineered fill areas, a design CBR of 7% is appropriate.

5.11 Topsoil

Following completion of topsoil spreading and grassing, topsoil depths were measured in a representative number of the Lots and these are shown on T+T Drawing 21854.0031–AHP5S2–142 attached in Appendix B. Due to variations in placement depths and earth worked surface levels, topsoil depths may vary from those recorded.

5.12 Expansive soils

5.12.1 General

Expansive soils (or “reactive soils” using Australian terminology) are clay soils that undergo appreciable volume change upon changes in moisture content. The reactivity and the typical range of movement that could be expected from soils underlying any given building site depend on the amount of clay present, clay mineral type, and proportion, depth and distribution of clay throughout the soil profile. Moisture changes tend to occur slowly in clays and produce swelling upon wetting and shrinkage upon drying.

Apart from seasonal moisture changes (wet winters / dry summers) other factors that can influence soil moisture content include:

a Influence of garden watering and site drainage;

b The presence of large trees (especially fast growing Australian species such as eucalyptus) close to building envelopes, and;

c Initial soil moisture conditions at construction time.

Visually, the surfaces of expansive soils are noted for developing extensive cracking during dry periods (especially late summer through autumn in Auckland) and can be locally identified by this feature when sites are excavated and left for a week or two to dry out. Further information on expansive soils is given in Appendix D and Appendix E of this report.

The shrink swell test (AS1289.7.1.1:2003) was developed to provide site soil classes that allow structural designers to adopt the standard foundation design solutions set out in AS2870:2011. Unfortunately, the test has been shown to be unreliable in Auckland soils (Ref. [9]). Within this report we have continued to assess the soils in terms of AS2870:2011 but note that the test used to assess the sub soil class is unreliable and must be used with caution.

Please note on 28 November 2019 MBIE updated the site soil classes and characteristic ground movement at ground surface for expansive soils outlined in AS2870:2011. The soil behaviour in this report has been described using the most recent site soil classes, though some reference is made to site soil classes defined in AS 2870:2011.

5.12.2 General Site Assessment

To assess for the presence of expansive soils within Stage 2 of the development, representative soil samples were retrieved from near surface strata and tested by Geotechnics Ltd to determine soil liquid limit and linear shrinkage in accordance with NZS 3604:2011 (Section 17.1.1), and swell and shrinkage characteristics in accordance with AS 1289.7.1.1:2003.

Based on liquid limit and linear shrinkage testing in accordance with NZS3604:2011 (Section 17.1.1) the soils at the site lie outside the definition of "good ground". According to Section 17.1.5 of NZS 3604:2011, sites with expansive soils need to be classified into one of the classes set out in AS 2870:2011.

In terms of AS 2870:2011 (Ref. [7]), with the MBIE expansive soils site soil class amendments, and based on previous experience with similar material, both the residual soils and the engineered fill present are considered to lie within Site Class H (highly expansive) with characteristic surface movements anticipated to be in the range of 44mm to 78mm.

On this basis foundation design may be carried out in accordance with AS 2870, or in accordance with NZS 3604, provided that in the latter case the minimum foundation depth below cleared ground level following topsoil removal and benching of building platform areas is 750mm.

Alternately a specific foundation and structural design may be undertaken by a suitably experienced Chartered Professional Engineer familiar with the contents of this report and responsible for design of structural elements (including foundations) of the building. Reference should be made to AS 2870:2011 (Ref. [7]) for assistance.

5.12.3 Advice for Construction

The expansive soil classifications given in our report as per AS 2870 are an indication of the potential of the soil to shrink and swell. Moisture conditions onsite before, during and after construction can all influence the actual magnitude of shrink swell. If construction is planned during late spring - mid autumn the near-surface soil may be very dry. In order to minimise the risk of damaging swelling occurring following construction, consideration should be given to covering the cleared site immediately after site stripping to minimise moisture loss from the soil. Additionally, the exposed subgrade may be wetted up the night before casting the floor slab to assist with maintaining adequate soil moisture.

It is common knowledge that a wide range of tree and shrub species have high groundwater demands during the summer months. The effects of such demands on expansive soils can be

substantial and can lead to differential building settlements well in excess of 25mm, with resulting cracking in wall panels and floor slabs.

Accordingly, it is a good housekeeping measure to ensure that high water demand species (such as gum, willow, cypress etc) are not planted in the vicinity of buildings. Minimum recommended distances vary with tree species and specialist advice should be obtained.

6 Statement of professional opinion as to the suitability of land for building development

I, Mr A.P. Stiles of Tonkin & Taylor Ltd, P O Box 5271, Wellesley St, Auckland, hereby confirm that:

6.1 I am a Chartered Professional Engineer experienced in the field of geotechnical engineering and an authorised representative of Tonkin + Taylor who was retained by WFH Properties Ltd as the Geotechnical Engineer on Arrans Hill Precinct 5 Stage 2 (comprising Residential Lots 79 to 142, Reserve Lots 501, 502, 700, 801 and 802, and Road Lot 901) of the Millwater Residential Subdivision Development off Arran Drive in Silverdale. Inspection and observation of the works have been carried out during construction by either myself or staff acting under my direction.

6.2 The extents of investigations are described in Tonkin & Taylor Ltd Geotechnical Investigation Report for Arrans Hill Precinct 5 Ref. No. 21854.0031 dated December 2015. The conclusions and recommendations of those documents have been re-evaluated in the preparation of this report. Details of all earthworks control tests performed are enclosed (Appendix F).

6.3 The Contractor has confirmed that the work undertaken has been completed in accordance with the drawings, specifications and any variations issued and is consistent with the inspections and observations carried out by Tonkin & Taylor Ltd. Complete Construction Certificates have been provided by the Contractors and are presented in Appendix C. Tonkin & Taylor Ltd accepts no liability for any errors or omissions represented by those documents.

6.4 On the basis of our observations and inspections together with the information supplied by others, including the Contractor's Construction Certificates, it is my professional opinion, not to be construed as a guarantee that:

6.4.1 The earth fills shown on the attached Woods drawings, Project No 37502, Millwater, Arrans Hill Precinct 5 Stage 2, Drawing Numbers 37502–02–100–AB to –102–AB, –110–AB to –115–AB and –120–AB, have been generally placed in compliance with NZS 4431:1989 (Ref. [6]).

6.4.2 The completed earthworks give due regard to land slope and foundation stability considerations.

6.5 For Lots 79 to 142, inclusive:

6.5.1 Foundation design

The filled and natural ground within residential Lot boundaries is considered generally suitable for the erection thereon of light timber framed, flexibly clad residential buildings subject to clauses 6.5.2 to 6.5.6.

6.5.2 Bearing capacity

Foundation design for these Lots should limit geotechnical ultimate bearing capacity to 300kPa (factored (ULS) 150kPa, working (SLS) 100kPa). This is as specified in NZS 3604:2011 (Ref. [8]).

6.5.3 Expansive soils

Due to the presence of expansive clay soils, foundation soils lie outside the definition of 'good ground' in NZS 3604:2011 (Ref. [8]). Soils are considered to lie in within Site Class H (highly expansive) as defined in AS 2870:2011 with 28 November 2019 MBIE amendments (Ref. [7]) with anticipated characteristic surface ground

movements of 44-78mm. Clause 6.6.3.1 of this Geotechnical Completion Report may be used for expansive soil foundation design on this subdivision:

6.5.3.1 Specific foundation design for expansive soils

Specific foundation design should be undertaken by a Chartered Professional Engineer familiar with the contents of this report and responsible for design of structural elements (including foundations) of the building.

The minimum specific design requirements set for expansive soils within this clause are:

i) Minimum foundation embedment of 750mm following topsoil removal and benching of building platform areas to finished ground levels;

ii) Four bar steel reinforcing cages should be used;

iii) For buildings having brittle exterior cladding, for example brick veneer, stucco plaster, solid plaster, block work, styrofoam type cladding or sprayed plaster over harditex systems etc, the potential effects of seasonal ground movements need to be considered by the building designer.

The above minimum requirements within this clause may be superceded if individual engineers are able to demonstrate their specific design solutions are applicable to site soil conditions to the satisfaction of Auckland Council. Specific design may be undertaken by first principles or by reference to AS 2870:2011 (Ref. [7]), Section 4 and related documents.

6.5.4 Floor Slab Construction

Slab on grade construction is expected to be relatively straightforward across the subdivision, but problems can occur with slab construction on shrink/swell sensitive soils. In soils which become desiccated in summer, subsequent capillary moisture rise may cause dry soils to wet up and swell, causing slab uplift and building distress. Alternatively, construction during winter may result in subgrade soils with high moisture contents drying out through summer, with subsequent soil shrinkage and possible building deformation.

The structural engineer should take likely construction timeframes into account and confirm that their design and construction methodologies will accommodate the soil shrinkage or swelling that may occur.

The Contractor should ensure that the ground beneath the floor slab areas is suitably conditioned to ensure that the subgrade is neither too dry nor too wet prior to hardfill placement and concrete pouring to avoid undue shrink or swell movements.

6.5.5 Building maintenance – Owner's responsibility

The owner is responsible for maintenance of the building and site and should be familiar with the performance and maintenance requirements set out in CSIRO sheet BTF18 Foundation Maintenance and Footing Performance: A Home Owner's Guide. A copy of this sheet is included in Appendix E.

6.5.6 Retaining walls / Earthworks

No earth cuts and/or retaining wall construction in excess of 1.5 metres height, and no earthworks involving fills in excess of 600mm depth, or fill below the influence zone of foundations, should take place on these Lots unless endorsed by a suitable design undertaken by a Chartered Professional (Geotechnical) Engineer familiar with the contents of this report and responsible for design of structural elements of the building.

Development within Lot 84 should comply with the Building Limitation Zones shown on T+T Drawing 21854.0031–AHP5S2–140 in Appendix B set to protect Wall 10.

6.6 For Lots 86 to 142, inclusive:

6.6.1 These Lots contain a "Building Limitation Zone" relating to the reinforced earth slopes which forms the 1 in 2 (V:H) slopes along the Lot boundaries. The Building Limitation Zone is shown on T+T Drawing 21854.0031–AHP5S2–140 in Appendix B. Excavation, filling and/or construction within this zone is not to be undertaken, to ensure stability of the slopes is not compromised.

6.6.2 The presence of geogrids within the reinforced earth slopes is brought to the attention of future building and services designers. The topmost grid is located less than 1 metre below the surface at the top of the slope, and does not generally extend more than 2 metres back from the crest of the slope. It is not expected that the grids will be encountered during future development of this Lot, however, the presence of the grids should be recognized. Any exposure and/or damage and subsequent repair to the grids during any future development must be observed and certified by a Chartered Professional Engineer (Geotechnical) familiar with the contents of this report.

6.6.3 Design of the reinforced earth slopes have assumed a maximum distributed load of 10kPa (dead plus live loads) up to the edge of the Building Limitation Zone.

6.6.4 Any cut or fill walls greater than 1.5m retained height, or of any height within 2m of the Building Limitation Zone shown on T+T Drawing 21854.0031–AHP5S2–140 in Appendix B, will require a geotechnical assessment, as a minimum, to ensure stability of the subject or adjacent Lot is not detrimentally affected.

6.6.5 Development outside of the Building Limitation Zone may proceed in accordance with the recommendations outlined in Sections 6.5.

6.7 For Lots 79 to 80, inclusive:

6.7.1 These Lots contain a "Building Limitation Zone" relating to the slope stability along the Stage 2 western boundary. A Vegetated Reinforced Earth batter has been constructed along the Lot boundaries. The Building Limitation Zone is shown on T+T Drawing 21854.0031–AHP5S2–140 in Appendix B. Excavation, filling and/or construction within this zone is not to be undertaken, to ensure stability of the slopes is not compromised.

6.7.2 Development outside of the Building Limitation Zone may proceed in accordance with the recommendations outlined in Sections 6.5.

6.8 For Lots 82 to 84, inclusive:

6.8.1 These Lots contain a "Building Limitation Zone" relating to the slope stability of an unreinforced fill slope along the Stage 2 western boundary on the eastern edge of a gully feature. The Building Limitation Zone is shown on T+T Drawing 21854.0031–

AHP5S2–140 in Appendix B. Excavation, filling and/or construction within this zone is not to be undertaken, to ensure stability of the slopes is not compromised.

6.8.2 Development outside of the Building Limitation Zone may proceed in accordance with the recommendations outlined in Sections 6.5.

6.9 Underfill (Subsoil) drainage

Underfill (Subsoil) drains have been installed during subdivisional development in the locations shown on the Woods Undercut And Subsoil Drain As–Built Plan (Woods Ref 37502–02–120–AB) in Appendix A, and on T+T Drawing 21854.0031–AHP5S2–102 in Appendix B. These drains are considered to be maintenance free. This drainage system is relatively deep and located so that it is unlikely to be encountered during future residential site development. Although future works are unlikely to encounter the drains, their location should be considered prior to designing deep foundations and, if damaged, repairs should be observed by a Chartered Professional (Geotechnical) Engineer familiar with this report, and notified to Auckland Council.

6.10 Stormwater and Sanitary Sewer Lines

Where building envelopes lie adjacent to or across service lines, all foundations should extend and be founded below the 45 degree zone of influence line extending from pipe inverts. This requirement is to avoid excessive pipe surcharges, and to allow for future maintenance of the system without detrimentally affecting adjacent structures. Subject to approval from Auckland Council, foundations may extend and bridge over service lines provided specific foundation design is undertaken. A copy of the stormwater and sanitary sewer as–built plans are included in Appendix B.

6.11 Road and Access Lots

Based on the fill monitoring and site observations undertaken during site development, the filled and natural ground within Arrans Hill Precinct 5 Stage 2 is considered generally suitable for residential road and accessway construction. Scala penetrometer testing should be undertaken when road subgrades have been prepared to confirm subgrade strengths. Subject to such subgrade testing, for future road construction in other parts of the Stage 5 development, within natural ground, a design CBR of 2% is considered appropriate, while within engineered fill areas, a design CBR of 7% is appropriate.

6.12 Unexpected ground conditions

Our assessment is based on interpolation between borehole positions, site observations and periodic earthworks control visits. Local variations in ground conditions may occur. Although unlikely, unfavourable ground conditions may be encountered during site benching and footing excavations. It is important that we be contacted in this eventuality, or in the event that any variation in subsoil conditions from those described in the report are found. Design assistance is available as required to accommodate any unforeseen ground conditions present.

This suitability statement relates to the general suitability of the site; it does not remove the need for specific site investigation, design and inspection as required by the Building Code, NZS 3604:2011 and NZS 4431:1989.

7 Applicability

This report has been prepared for the exclusive use of our client WFH Properties Ltd, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Tonkin & Taylor Ltd

Report prepared by:	Authorised for Tonkin & Taylor Ltd by:
	
.....	.....
James Smith	Andrew Stiles
Engineering Geologist	Project Director

JASM
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8 References

1 Tonkin & Taylor Ltd., October 2001. Stoney Block, T+T Ref. 18214.

2 Tonkin & Taylor Ltd., May 2001. Silverdale Blocks, Silverdale, Geotechnical Issues – Future Medium Density Development, T+T Ref. 18213.

3 Tonkin & Taylor Ltd., November 2003. Silverdale North and Orewa West Blocks, Silverdale, Geotechnical Issues – Future Medium Density Development, T+T Ref. 20914.

4 Tonkin & Taylor Ltd., March 2013. Millwater – North South Link, North Bridge to Grand Drive, Geotechnical Investigation Report, T+T Ref. 21854.012.

5 Tonkin & Taylor Ltd., December 2015. Millwater Subdivision Arrans Hill – Precinct 5 – Geotechnical Investigation Report, T+T Ref. 21854.0031.

6 New Zealand Standards, 1989. NZS 4431:1989 Code of Practice for Earth Fill for Residential Development.

7 Standards Australia, 2011. AS 2870:2011 Residential slabs and footings.

8 New Zealand Standards, 2011. NZS 3604:2011 Timber Framed Buildings.

9 Rogers, N. et al. 2020. The Shrink Swell Test: A Critical Analysis. *New Zealand Geomechanics News, June 2020.*

Appendix A: Woods drawings

Wood and Partners Consultants Ltd

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1023
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Fax: 09 379 0600
Web: www.woods.co.nz

37502 Arran Hill Precinct 5 Stage 2

Document Issue Sheet

Issue No: 47

Date: 28 Aug 2020

Issue Notes:

Issued By: Kendall Reid

Drawings

Drawing No.	Title	Revision	Renditions	Issue Reason
37502-02-100- AB	FINAL CONTOURS	1	zip	For Information
37502-02-110-AB	CUT FILL CONTOURS	1	zip	For Information
37502-02-120-AB	SUBSOILS	1	zip	For Information
37502-02-1300-AB	WALLS	-	zip	For Information
37502-02-140-AB	SLOPE	1	zip	For Information
37502-02-200-AB ROADING	ROADING	-	zip	For Information
37502-02-250-AB RESERVE	RESERVE	-	zip	For Information
37502-02-300-AB	STORMWATER	1	zip	For Information
37502-02-400-AB	SEWER	1	zip	For Information
37502-02-600-AB WATERMAIN	WATERMAIN	-	zip	For Information

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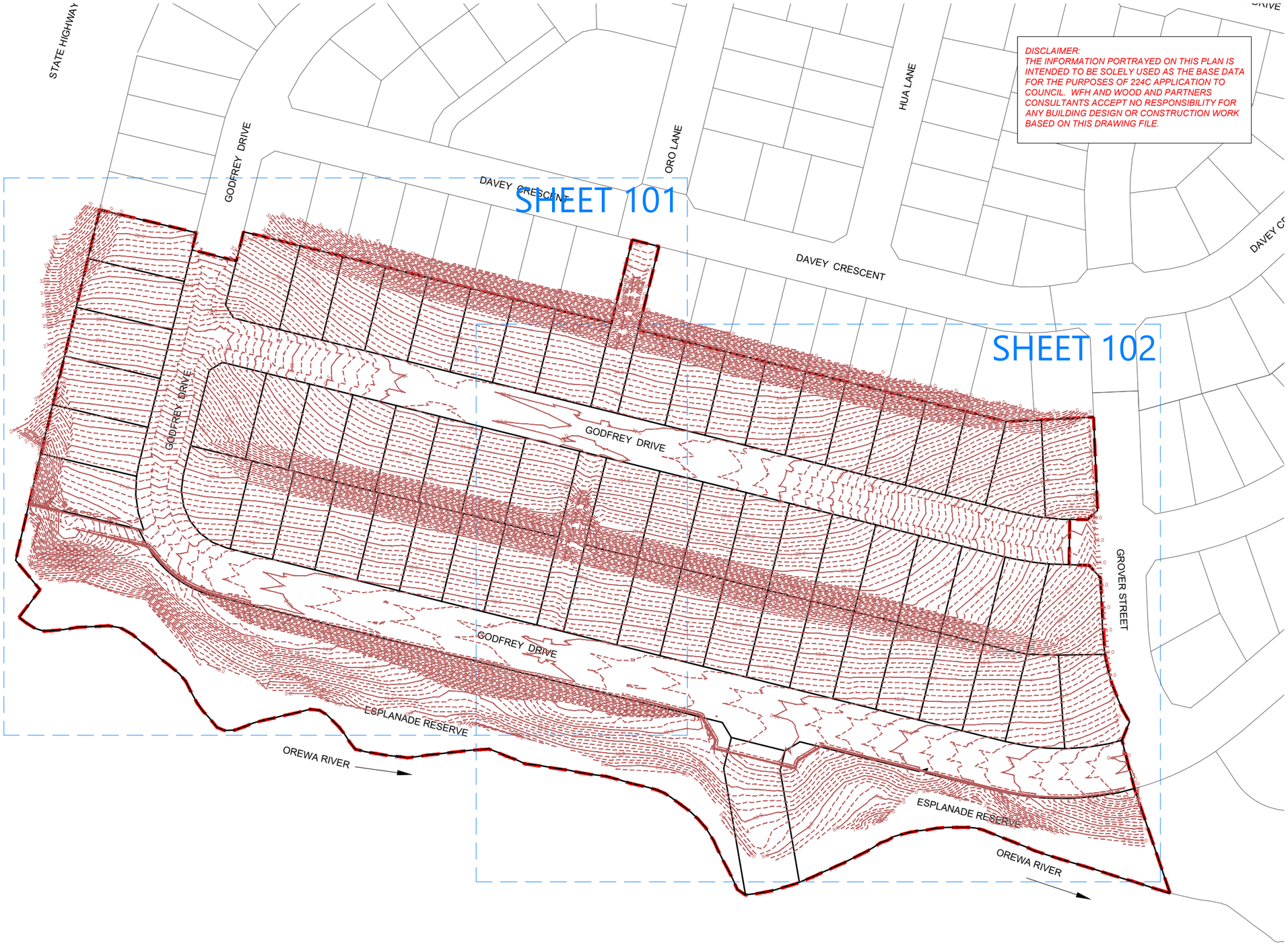
Nigel Low (Fulton Hogan Land Development Ltd		By Download	1



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THE INFORMATION PORTRAYED ON THIS PLAN IS INTENDED TO BE SOLELY USED AS THE BASE DATA FOR THE PURPOSES OF 224C APPLICATION TO COUNCIL. WFH AND WOOD AND PARTNERS CONSULTANTS ACCEPT NO RESPONSIBILITY FOR ANY BUILDING DESIGN OR CONSTRUCTION WORK BASED ON THIS DRAWING FILE.

WOODS
EST.1970

NOTES

1. NEW CONTOURS ARE AT 0.25m INTERVALS

LEGEND

- CONTOURS MAJOR
- CONTOURS MINOR
- STAGE BOUNDARIES
- LOT BOUNDARIES

REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	KR	17/08/20
2	ISSUED FOR 224c	KR	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	SK	
CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

N

WFH PROPERTIES

ARRAN HILL PRECINCT 5 STAGE 2

FINAL CONTOUR
ASBUILT PLAN
SHEET 1 OF 3

STATUS	AS-BUILT	REV
SCALE	1:1500 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-100-AB	

I certify that these As-built Plans are an accurate record of the works undertaken and that:

- The coordinates (X,Y) are in terms of NZTM on NZGD2000
- The Levels (Z) are in terms of Auckland Vertical Datum 1946 (MSL) LINZ datum

Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates

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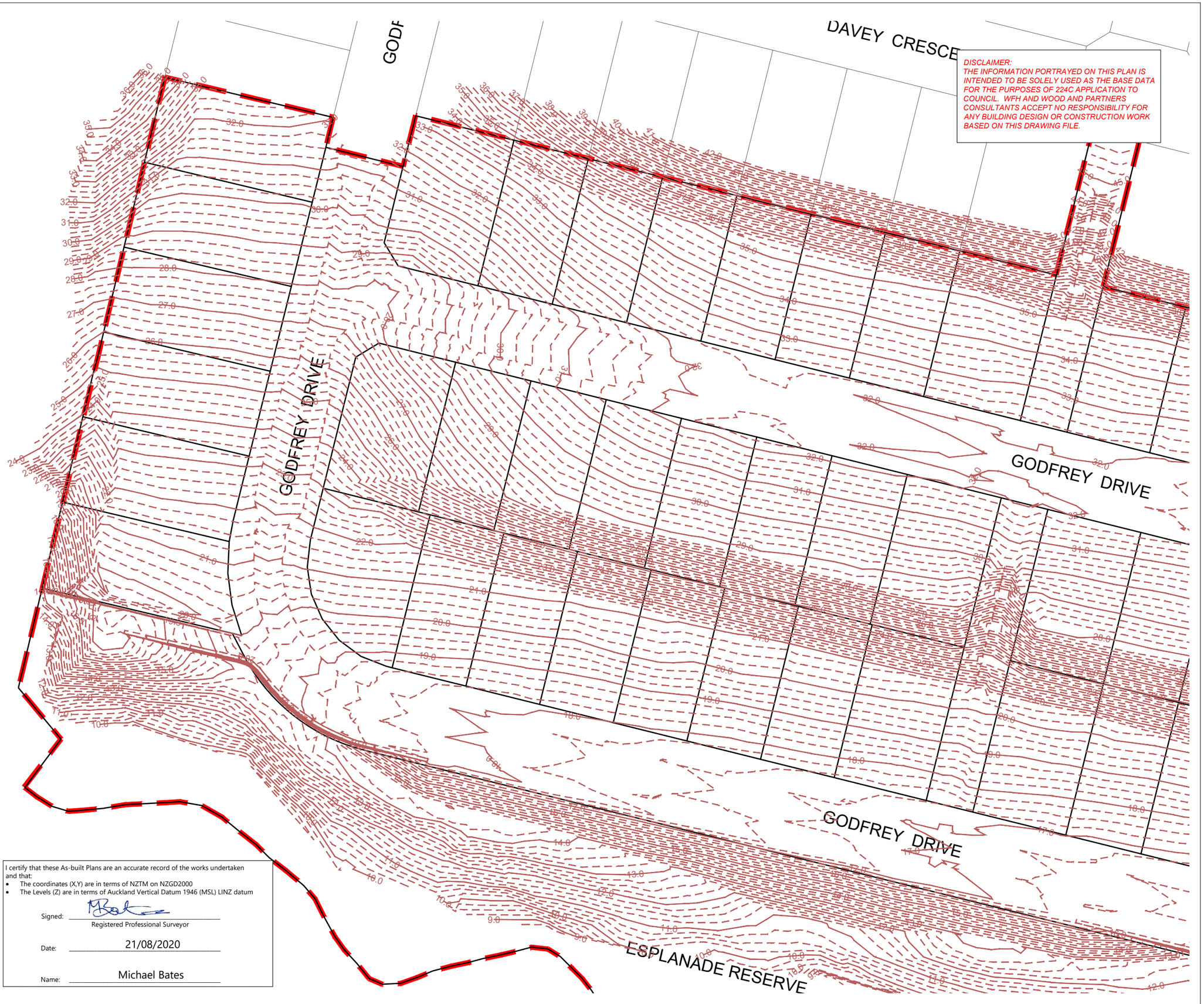

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WOODS
EST.1970

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DESIGNED	MB	
DRAWN	SK	
CHECKED	AC	
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WFH PROPERTIES

ARRAN HILL PRECINCT 5 STAGE 2

FINAL CONTOUR
ASBUILT PLAN
SHEET 2 OF 3

STATUS	AS-BUILT	REV
SCALE	1:750 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-101-AB	

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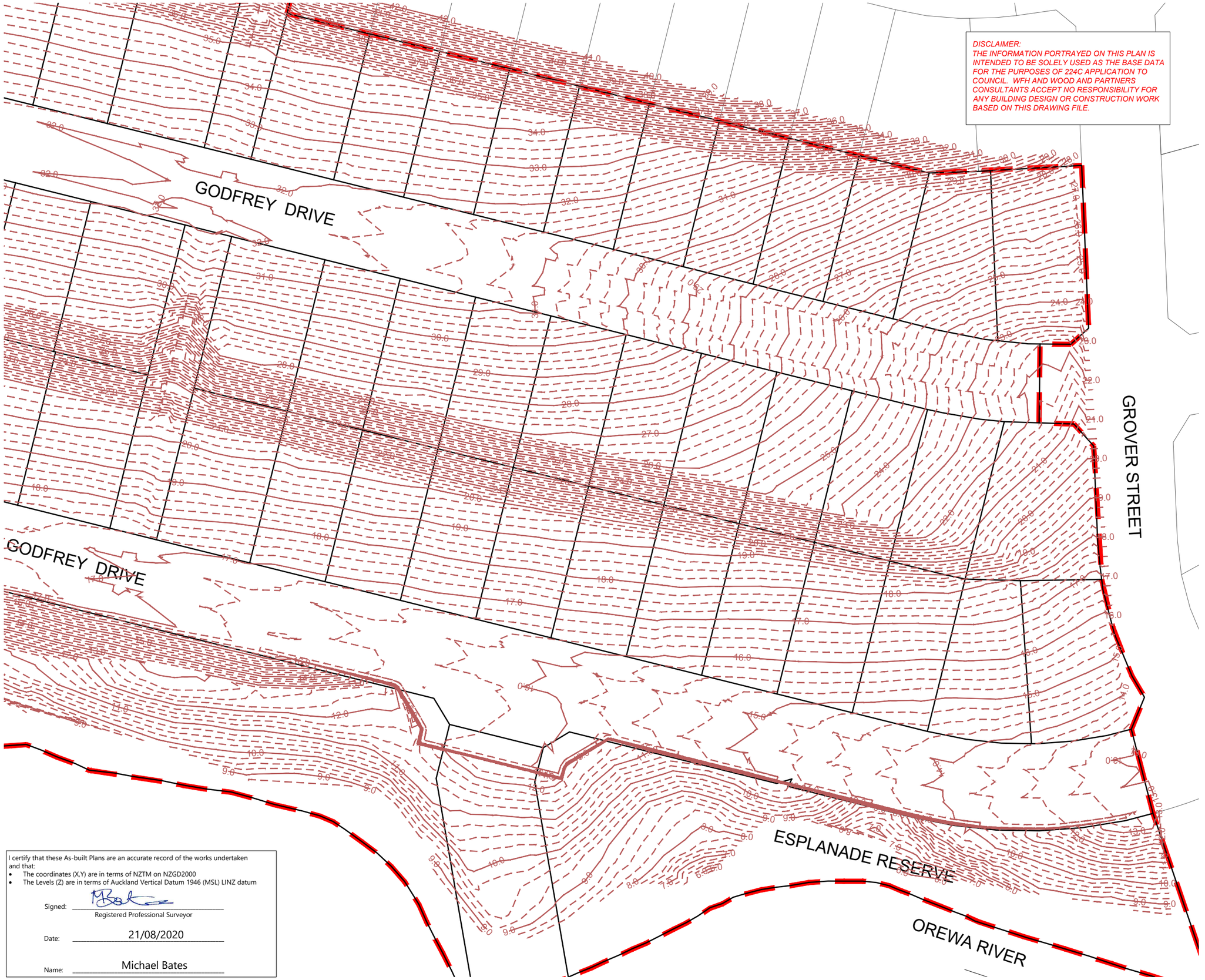

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WOODS
EST.1970

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- LOT BOUNDARIES

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CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

N

WFH PROPERTIES

ARRAN HILL PRECINCT 5 STAGE 2

FINAL CONTOUR
ASBUILT PLAN
SHEET 3 OF 3

STATUS	AS-BUILT	REV
SCALE	1:750 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-102-AB	

C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2_326\DRAWINGS\SURV\ASBUILTS\37502-02-100-FINAL CONTOURS.DWG,
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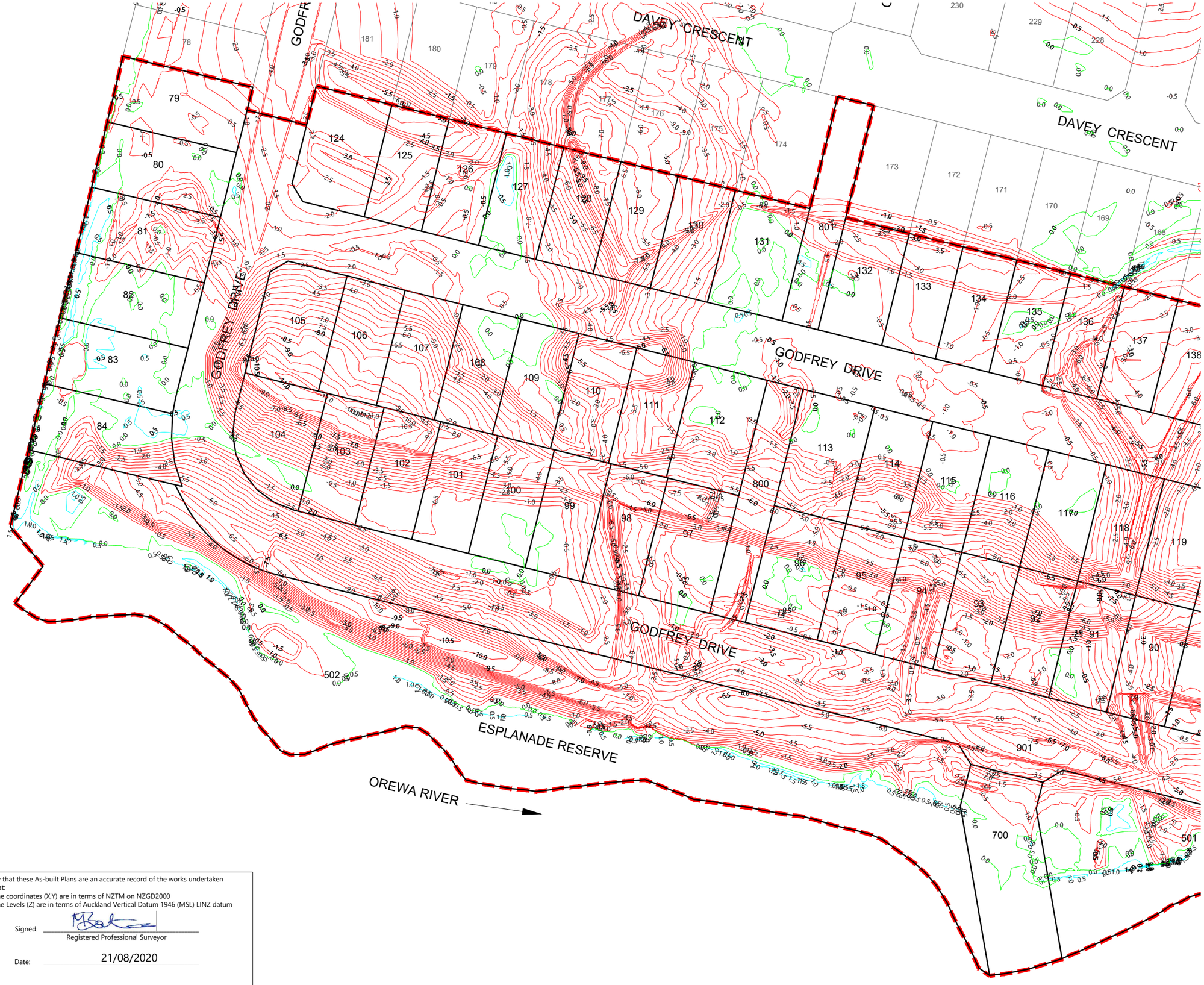


I certify that these As-built Plans are an accurate record of the works undertaken and that:

- The coordinates (X,Y) are in terms of NZTM on NZGD2000
- The Levels (Z) are in terms of Auckland Vertical Datum 1946 (MSL) LINZ datum

Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates

WOODS
EST.1970

DISCLAIMER:
THE INFORMATION PORTRAYED ON THIS PLAN IS INTENDED TO BE SOLELY USED AS THE BASE DATA FOR THE PURPOSES OF 224C APPLICATION TO COUNCIL. WFH AND WOOD AND PARTNERS CONSULTANTS ACCEPT NO RESPONSIBILITY FOR ANY BUILDING DESIGN OR CONSTRUCTION WORK BASED ON THIS DRAWING FILE.

NOTES

1. CONTOURS ARE AT 0.5 METRE INTERVALS

LEGEND

- ZERO CONTOUR
- CUT CONTOUR
- FILL CONTOUR
- STAGE BOUNDARIES
- LOT BOUNDARIES

REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	MRB	13/08/20
2	ISSUED FOR 224c	KR	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	T&T	
DRAWN	MRB	
CHECKED	MB	
APPROVED		WOODS.CO.NZ

N

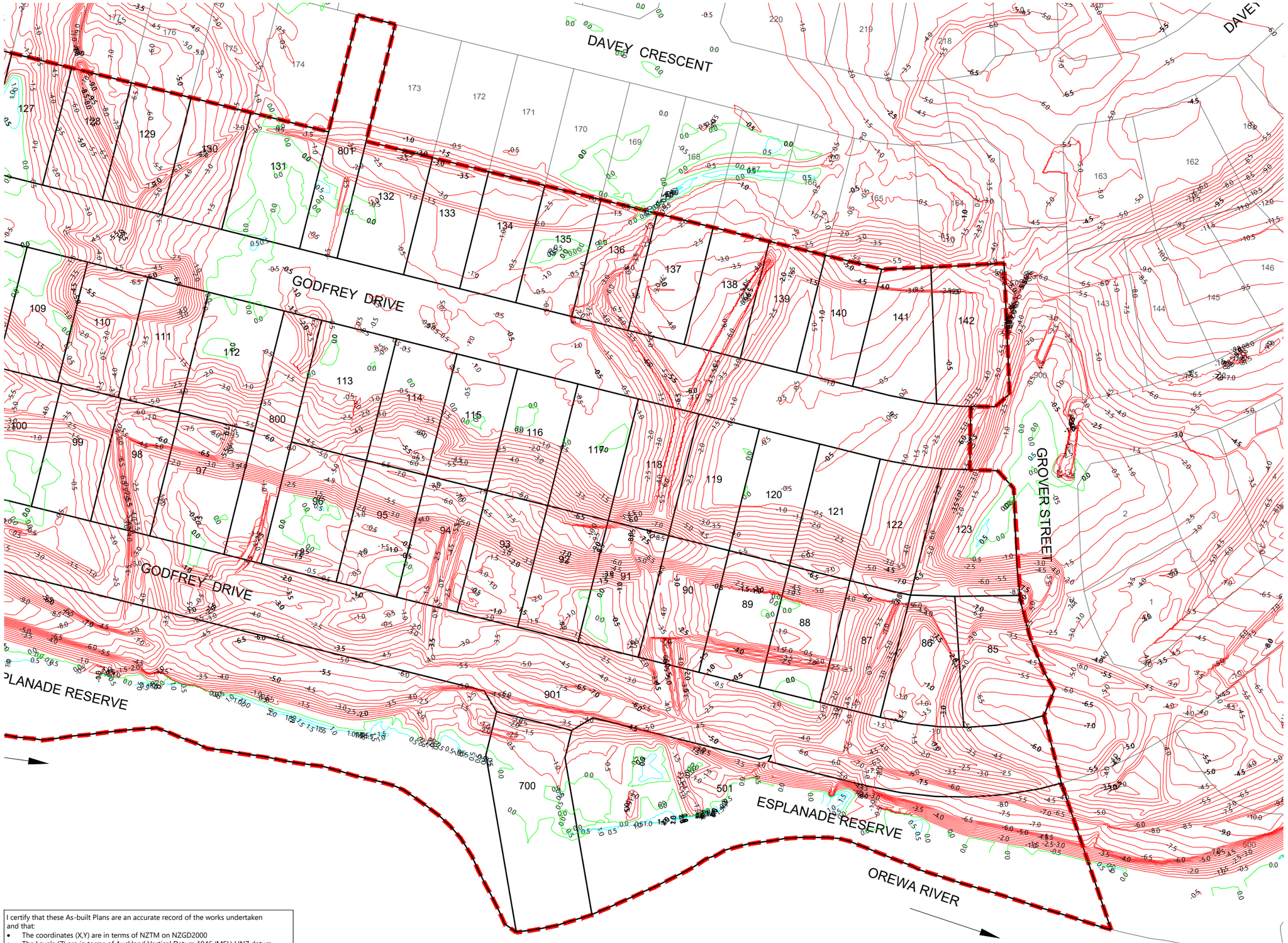
WFH PROPERTIES

ARRAN HILL PRECINCT 5 STAGE 2

CUT & FILL AS-BUILT
ORIGINAL TO LOWEST SURFACE
SHEET 1 OF 2

STATUS	AS-BUILT	REV
SCALE	1:1000 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-110-AB	

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2_326\DRAWINGS\SURVASBUILTS\37502-02-110-CUT FILL CONTOURS.DWG



WOODS
EST.1970

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NOTES

1. CONTOURS ARE AT 0.5 METRE INTERVALS

LEGEND

- ZERO CONTOUR
- CUT CONTOUR
- FILL CONTOUR
- STAGE BOUNDARIES
- LOT BOUNDARIES

REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	MRB	13/08/20
2	ISSUED FOR 224c	KR	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	T&T	
DRAWN	MRB	
CHECKED	MB	
APPROVED		WOODS.CO.NZ

N

WFH PROPERTIES

ARRAN HILL PRECINCT 5 STAGE 2

CUT & FILL AS-BUILT
ORIGINAL TO LOWEST SURFACE
SHEET 2 OF 2

STATUS	AS-BUILT	REV
SCALE	1:1000 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-111-AB	

I certify that these As-built Plans are an accurate record of the works undertaken and that:

- The coordinates (X,Y) are in terms of NZTM on NZGD2000
- The Levels (Z) are in terms of Auckland Vertical Datum 1946 (MSL) LINZ datum

Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2.32b\DRAWINGS\SURVASBUILTS\37502-02-110-CUT FILL CONTOURS.DWG

DISCLAIMER:
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NOTES

1. CONTOURS ARE AT 0.5 METRE INTERVALS

LEGEND

- ZERO CONTOUR
- CUT CONTOUR
- FILL CONTOUR
- STAGE BOUNDARIES
- LOT BOUNDARIES

REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	MRB	13/08/20
2	ISSUED FOR 224c	KR	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	T&T	
DRAWN	MRB	
CHECKED	MB	
APPROVED		WOODS.CO.NZ

ARRAN HILL PRECINCT 5 STAGE 2

CUT & FILL AS-BUILT
LOWEST TO FINAL SURFACE
SHEET 1 OF 2

STATUS	AS-BUILT	REV
SCALE	1:1000 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-112-AB	

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- The Levels (Z) are in terms of Auckland Vertical Datum 1946 (MSL) LINZ datum

Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2_326\DRAWINGS\SURVASBUILTS\37502-02-110-CUT FILL CONTOURS.DWG

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- The Levels (Z) are in terms of Auckland Vertical Datum 1946 (MSL) LINZ datum

Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates

WOODS
EST.1970

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NOTES

1. CONTOURS ARE AT 0.5 METRE INTERVALS

LEGEND

- ZERO CONTOUR
- CUT CONTOUR
- FILL CONTOUR
- STAGE BOUNDARIES
- LOT BOUNDARIES

REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	MRB	13/08/20
2	ISSUED FOR 224c	KR	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	T&T	
DRAWN	MRB	
CHECKED	MB	
APPROVED		WOODS.CO.NZ

N

WFH PROPERTIES

ARRAN HILL PRECINCT 5 STAGE 2

CUT & FILL AS-BUILT
LOWEST TO FINAL SURFACE
SHEET 2 OF 2

STATUS	AS-BUILT	REV
SCALE	1:1000 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-113-AB	

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2_226\DRAWINGS\SURV\ASBUILTS\37502-02-110-CUT FILL CONTOURS.DWG

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- The Levels (Z) are in terms of Auckland Vertical Datum 1946 (MSL) LINZ datum

Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates

WOODS
EST.1970

DISCLAIMER:
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NOTES

1. CONTOURS ARE AT 0.5 METRE INTERVALS

LEGEND

- ZERO CONTOUR
- CUT CONTOUR
- FILL CONTOUR
- STAGE BOUNDARIES
- LOT BOUNDARIES

REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	MRB	13/08/20
2	ISSUED FOR 224c	KR	21/08/2020

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	T&T	
DRAWN	MRB	
CHECKED	MB	
APPROVED		WOODS.CO.NZ

N

WFH PROPERTIES

ARRAN HILL PRECINCT 5 STAGE 2

CUT & FILL AS-BUILT
ORIGINAL TO FINAL SURFACE
SHEET 1 OF 2

STATUS	AS-BUILT	REV
SCALE	1:1000 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-114-AB	

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2.326\DRAWINGS\SURVAS BUILTS\37502-02-110-CUT FILL CONTOURS.DWG

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Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates

WOODS
EST.1970

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NOTES

1. CONTOURS ARE AT 0.5 METRE INTERVALS

LEGEND

- ZERO CONTOUR
- CUT CONTOUR
- FILL CONTOUR
- STAGE BOUNDARIES
- LOT BOUNDARIES

REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	MRB	13/08/20
2	ISSUED FOR 224c	KR	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	T&T	
DRAWN	MRB	
CHECKED	MB	
APPROVED		WOODS.CO.NZ

N

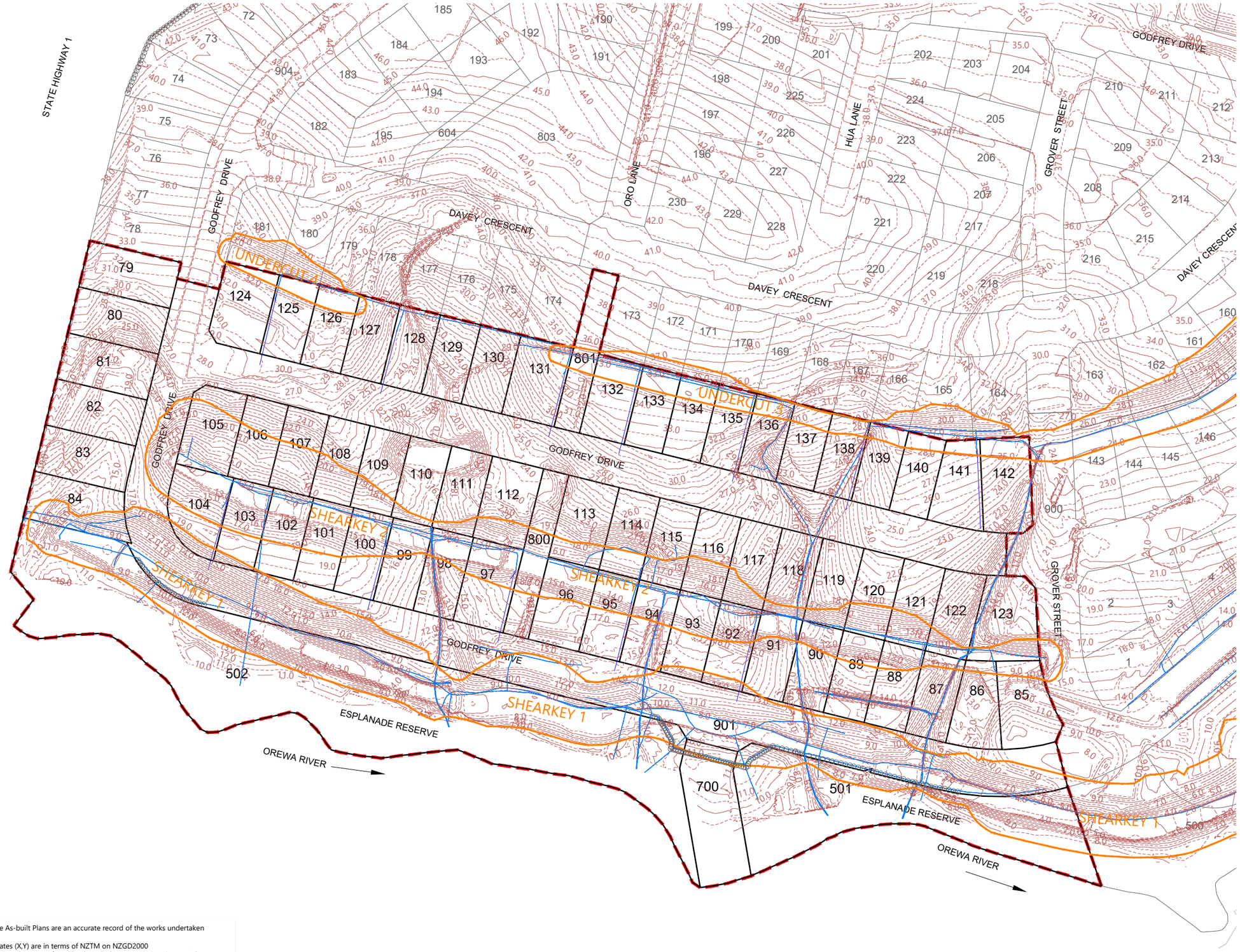
WFH PROPERTIES

ARRAN HILL PRECINCT 5 STAGE 2

CUT & FILL AS-BUILT
ORIGINAL TO FINAL SURFACE
SHEET 2 OF 2

STATUS	AS-BUILT	REV
SCALE	1:1000 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-115-AB	

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2_326\DRAWINGS\SURVEY\ASBUILTS\37502-02-110-CUT FILL CONTOURS.DWG



NOTES

1. CONTOURS ARE AT 0.5 METRE INTERVALS
2. SUBSOIL DATA SUPPLIED BY CONTRACTOR

LEGEND

- NOVACOIL 150Ø SUBSOIL DRAINS
- UPVC 150Ø SUBSOIL DRAINS
- EXISTING STORMWATER DRAINAGE
- NEW STORMWATER DRAINAGE
- STAGE BOUNDARIES
- LOT BOUNDARIES
- CONTOURS
- SHEAR KEY & UNDERCUT AREAS
- PALISADE WALL PILE AT BOTTOM OF SHEARKEY

DISCLAIMER:
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- The Levels (Z) are in terms of Auckland Vertical Datum 1946 (MSL) LINZ datum

Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates

REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	KR	17/08/20
2	ISSUED FOR 224c	KR	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	T&T	
DRAWN	SK	
CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

ARRAN HILL PRECINCT 5 STAGE 2

SHEAR KEY, UNDERCUT AND SUBSOIL DRAIN ASBUILT SHEET 1 OF 1

STATUS	AS-BUILT	REV
SCALE	1:1500 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-120-AB	

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2_326\DRAWINGS\SURV\ASBUILTS\37502-02-120-SK UC & SUBSOIL.DWG

WOODS
EST.1970

LEGEND:

- BOUNDARY
- SLOPE STABILISATION DEVICE
- TOP OF BANK
- BOTTOM OF BANK
- FENCE
- TOP OF WALL
- BOTTOM OF WALL
- DEADMAN

NOTES:

1. *DEADMAN LOCATION PROVIDED BY CONTRACTOR. LOT OWNER TO LOCATE AND PROTECT DEADMAN POSITION PRIOR TO ANY WORKS.*
2. *THE DIMENSIONS PROVIDED ARE A BEST FIT APPROXIMATION BASED ON LOCATIONS PROVIDED BY THE CONTRACTOR.*

DISCLAIMER:
THIS DRAWING IS INTENDED TO BE SOLELY USED AS THE BASE DATA FOR THE PURPOSES OF THE CLIENT. WOODS ACCEPT NO RESPONSIBILITY FOR ANY SUBSEQUENT WORKS CARRIED OUT IN THIS AREA.

REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	KR	17/08/20
2	ISSUED FOR 224c	KR	24/08/20

SURVEYED	CONTRACTOR	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	T&T	
DRAWN	SK	
CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

N

WFH PROPERTIES

ARRAN HILL PRECINCT 5 STAGE 2

REINFORCED EARTH BATTER & SLOPE STABILISATION PLAN

STATUS	ASBUILT	REV
SCALE	1:1500 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-140-AB	

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Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates

DISCLAIMER:
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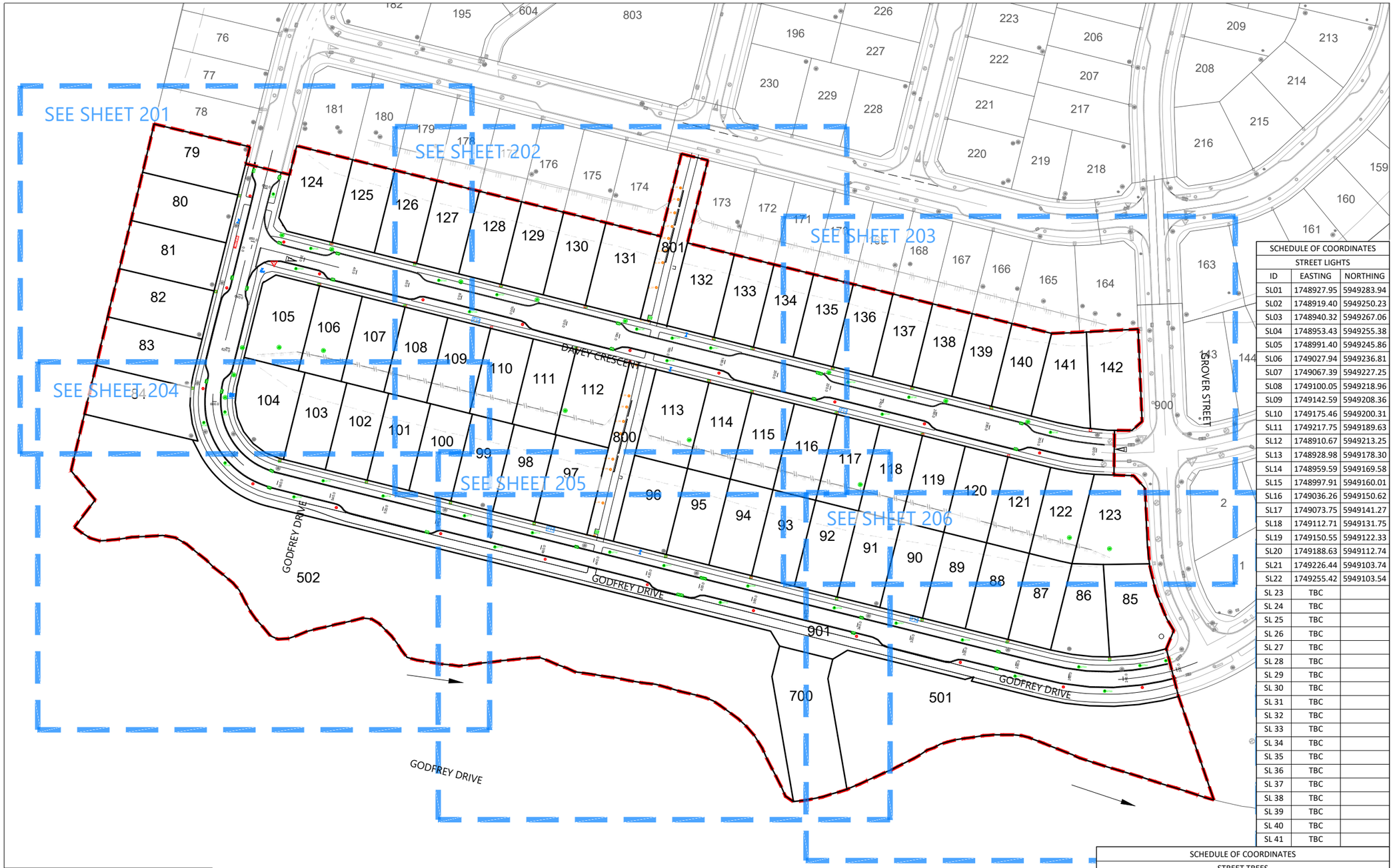
Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2_326\DRAWINGS\SURVASBUILTS\37502-02-140-SLOPE.DWG



NOTES

1. ALL WORKS AND MATERIALS COMPLY WITH AC STANDARDS FOR ENGINEERING DESIGN AND CONSTRUCTION ISSUE NOV 2005.
2. ALL ROADS HAVE BEEN CONSTRUCTED IN ACCORDANCE WITH APPROVED ENGINEERING PLANS.
3. ALL FINISHED ROAD SURFACES ARE ASHPHALT CONCRETE 30mm THICK.
4. ALL FOOTPATHS ARE 100mm THICK BRUSHED CONCRETE OR EXPOSED AGGREGATE AS NOTED.
5. ALL PIPE CROSSINGS UNDER ROADS HAVE BEEN HARDFILL BACKFILLED.
6. ASBUILT DATA HAS BEEN SOURCED FROM A COMBINATION OF WOODS SURVEY DATA AND CONTRACTOR RECEIVED DATA.

SCHEDULE OF COORDINATES		
STREET LIGHTS		
ID	EASTING	NORTHING
SL01	1748927.95	5949283.94
SL02	1748919.40	5949250.23
SL03	1748940.32	5949267.06
SL04	1748953.43	5949255.38
SL05	1748991.40	5949245.86
SL06	1749027.94	5949236.81
SL07	1749067.39	5949227.25
SL08	1749100.05	5949218.96
SL09	1749142.59	5949208.36
SL10	1749175.46	5949200.31
SL11	1749217.75	5949189.63
SL12	1748910.67	5949213.25
SL13	1748928.98	5949178.30
SL14	1748959.59	5949169.58
SL15	1748997.91	5949160.01
SL16	1749036.26	5949150.62
SL17	1749073.75	5949141.27
SL18	1749112.71	5949131.75
SL19	1749150.55	5949122.33
SL20	1749188.63	5949112.74
SL21	1749226.44	5949103.74
SL22	1749255.42	5949103.54
SL 23	TBC	
SL 24	TBC	
SL 25	TBC	
SL 26	TBC	
SL 27	TBC	
SL 28	TBC	
SL 29	TBC	
SL 30	TBC	
SL 31	TBC	
SL 32	TBC	
SL 33	TBC	
SL 34	TBC	
SL 35	TBC	
SL 36	TBC	
SL 37	TBC	
SL 38	TBC	
SL 39	TBC	
SL 40	TBC	
SL 41	TBC	

SCHEDULE OF COORDINATES						
STREET TREES						
ID	EASTING	NORTHING		ID	EASTING	NORTHING
ST01	391451.63	831944.26		ST19	391105.05	832010.50
ST02	391442.16	831942.31		ST20	391096.99	832025.16
ST03	391429.41	831932.71		ST21	391104.64	832029.20
ST04	391419.75	831941.40		ST22	391120.95	832109.49
ST05	391396.40	831937.59		ST23	391129.76	832082.30
ST06	391376.85	831950.51		ST24	391135.08	832089.84
ST07	391352.41	831956.22		ST25	391182.26	832078.97
ST08	391329.61	831961.42		ST26	391193.76	832067.65
ST09	391297.75	831968.86		ST27	391203.68	832074.08
ST10	391287.73	831962.64		ST28	391255.22	832062.39
ST11	391266.80	831975.81		ST29	391268.30	832059.34
ST12	391246.84	831980.36		ST30	391266.54	832051.01
ST13	391218.33	831986.94		ST31	391282.51	832055.99
ST14	391204.63	831981.47		ST32	391333.10	832044.36
ST15	391193.27	831992.73		ST33	391345.89	832032.82
ST16	391163.27	831999.44		ST34	391355.59	832039.24
ST17	391141.16	832004.61		ST35	391407.77	832027.33
ST18	391130.54	831998.50				

LEGEND

- STREET LIGHT
- STREET LIGHT - POSITIONS TBC
- ROAD NAME SIGN
- CATCH PIT/BERM SUMP
- STORMWATER MANHOLE
- GIVE WAY SIGN
- STREET TREE
- SS MANHOLE
- WATER SLUICE VALVE
- WATER FIRE HYDRANT
- POWER BOX
- TELECOM PLINTH
- FENCE
- TOP OF BANK
- BOTTOM OF BANK

I certify that these As-built Plans are an accurate record of the works undertaken and that:

- The coordinates (X,Y) are in terms of NZTM on NZGD2000
- The Levels (Z) are in terms of Auckland Vertical Datum 1946 (MSL) LINZ datum

Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates

REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	KR	23/07/20
2	ISSUED FOR 224c	KR	21/08/20

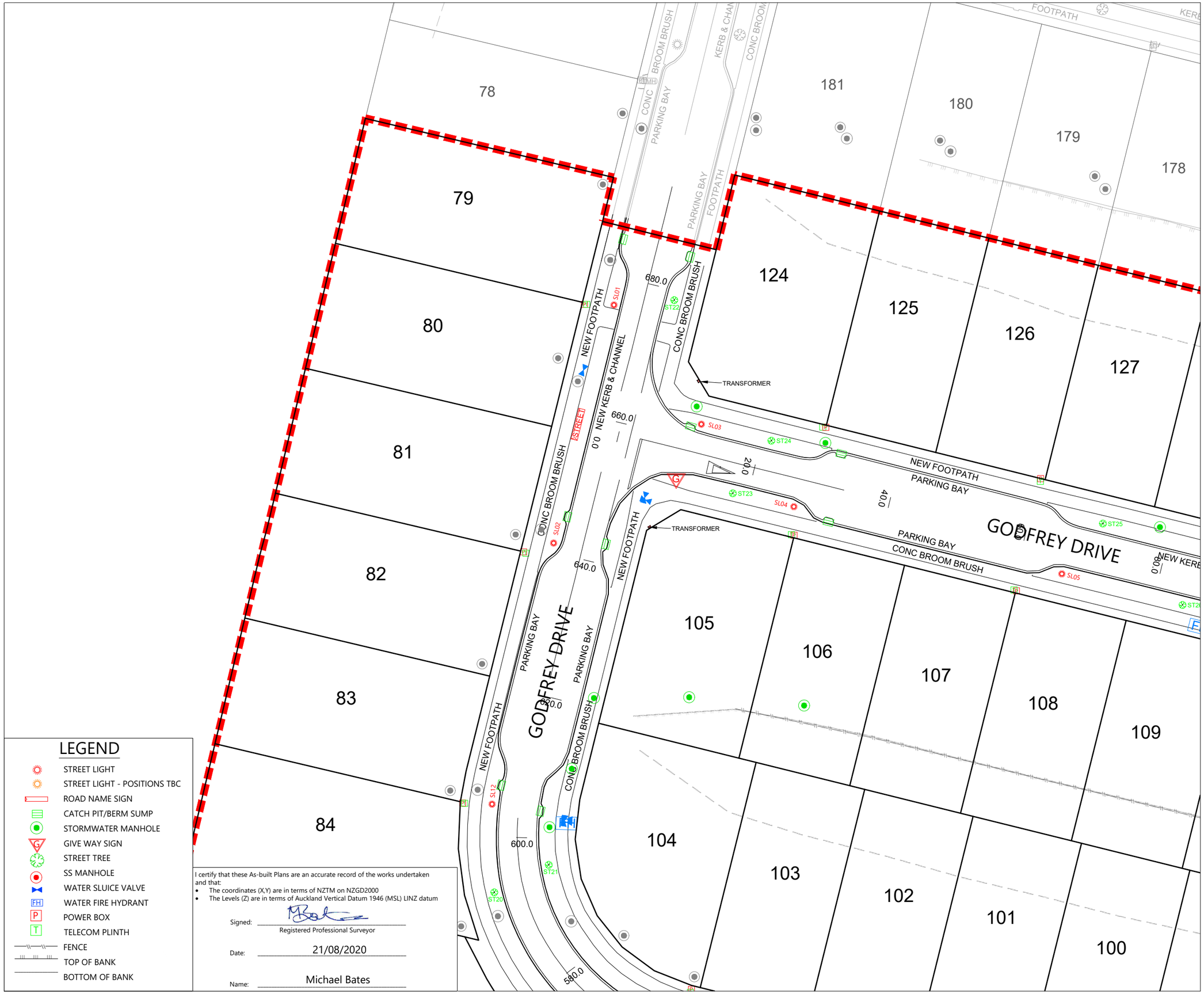
SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	SK	
CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

ARRAN HILL PRECINCT 5 STAGE 2

ROADING AS-BUILT OVERALL LAYOUT SHEET 1 OF 7

STATUS	AS-BUILT	REV
SCALE	1:1500 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-200-AB	

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2_326\DRAWINGS\SURVASBUILTS\37502-02-200-ROADING PLANS.DWG



LEGEND

- STREET LIGHT
- STREET LIGHT - POSITIONS TBC
- ROAD NAME SIGN
- CATCH PIT/BERM SUMP
- STORMWATER MANHOLE
- GIVE WAY SIGN
- STREET TREE
- SS MANHOLE
- WATER SLUICE VALVE
- WATER FIRE HYDRANT
- POWER BOX
- TELECOM PLINTH
- FENCE
- TOP OF BANK
- BOTTOM OF BANK

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Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates

WOODS
EST.1970

NOTES

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4. ALL FOOTPATHS ARE 100mm THICK BRUSHED CONCRETE OR EXPOSED AGGREGATE AS NOTED.
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REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	KR	23/07/20
2	ISSUED FOR 224c	KR	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	SK	
CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

N

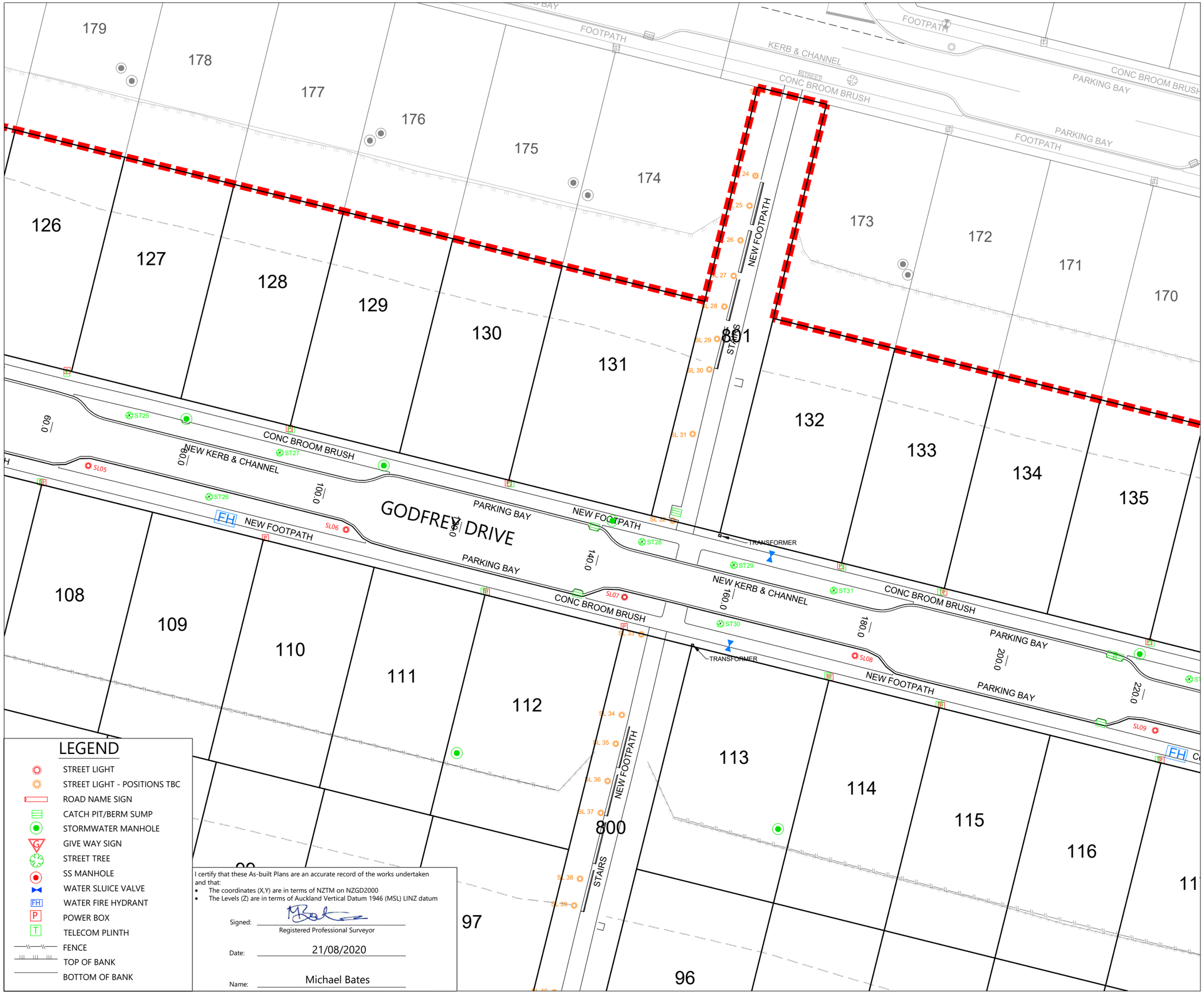
WFH PROPERTIES

ARRAN HILL PRECINCT 5 STAGE 2

ROADING AS-BUILT
SHEET 2 OF 7

STATUS	AS-BUILT	REV
SCALE	1:500 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-201-AB	

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2_326\DRAWINGS\SURV\ASBUILTS\37502-02-200-ROADING PLANS.DWG



LEGEND

- STREET LIGHT
- STREET LIGHT - POSITIONS TBC
- ROAD NAME SIGN
- CATCH PIT/BERM SUMP
- STORMWATER MANHOLE
- GIVE WAY SIGN
- STREET TREE
- SS MANHOLE
- WATER SLUICE VALVE
- WATER FIRE HYDRANT
- POWER BOX
- TELECOM PLINTH
- FENCE
- TOP OF BANK
- BOTTOM OF BANK

I certify that these As-built Plans are an accurate record of the works undertaken and that:

- The coordinates (X,Y) are in terms of NZTM on NZGD2000
- The Levels (Z) are in terms of Auckland Vertical Datum 1946 (MSL) LINZ datum

Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates

NOTES

1. ALL WORKS AND MATERIALS COMPLY WITH AC STANDARDS FOR ENGINEERING DESIGN AND CONSTRUCTION ISSUE NOV 2005.
2. ALL ROADS HAVE BEEN CONSTRUCTED IN ACCORDANCE WITH APPROVED ENGINEERING PLANS.
3. ALL FINISHED ROAD SURFACES ARE ASHPHALT CONCRETE 30mm THICK.
4. ALL FOOTPATHS ARE 100mm THICK BRUSHED CONCRETE OR EXPOSED AGGREGATE AS NOTED.
5. ALL PIPE CROSSINGS UNDER ROADS HAVE BEEN HARDFILL BACKFILLED.
6. ASBUILT DATA HAS BEEN SOURCED FROM A COMBINATION OF WOODS SURVEY DATA AND CONTRACTOR RECEIVED DATA.

REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	KR	23/07/20
2	ISSUED FOR 224c	KR	21/08/20

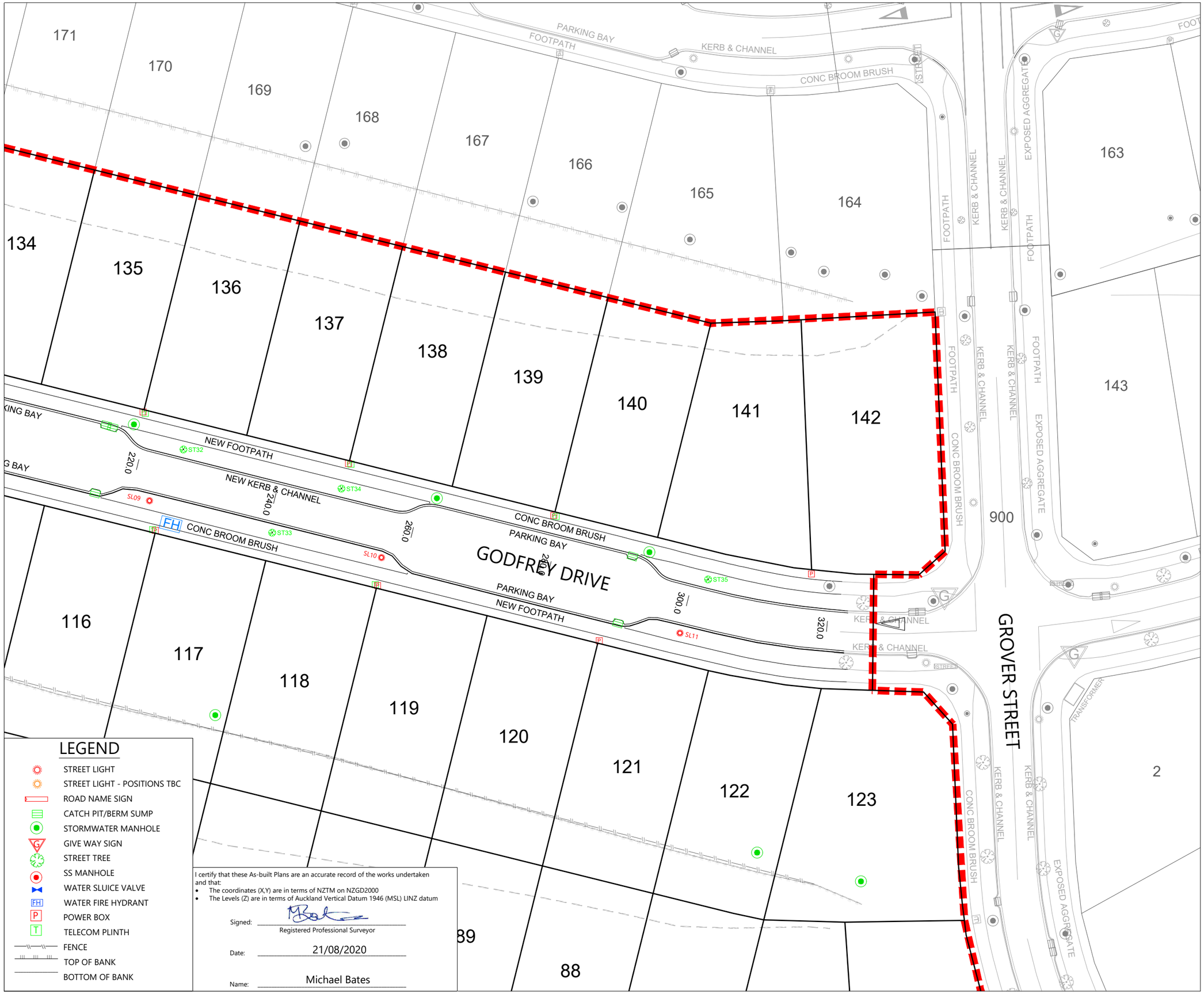
SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	SK	
CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

ARRAN HILL PRECINCT 5 STAGE 2

ROADING AS-BUILT
SHEET 3 OF 7

STATUS	AS-BUILT	REV
SCALE	1:500 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-202-AB	

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2.326\DRAWINGS\SURV\ASBUILTS\37502-02-200-ROADING PLANS.DWG



LEGEND

- STREET LIGHT
- STREET LIGHT - POSITIONS TBC
- ROAD NAME SIGN
- CATCH PIT/BERM SUMP
- STORMWATER MANHOLE
- GIVE WAY SIGN
- STREET TREE
- SS MANHOLE
- WATER SLUICE VALVE
- WATER FIRE HYDRANT
- POWER BOX
- TELECOM PLINTH
- FENCE
- TOP OF BANK
- BOTTOM OF BANK

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Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates

WOODS
EST.1970

NOTES

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REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	KR	23/07/20
2	ISSUED FOR 224c	KR	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	SK	
CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

N

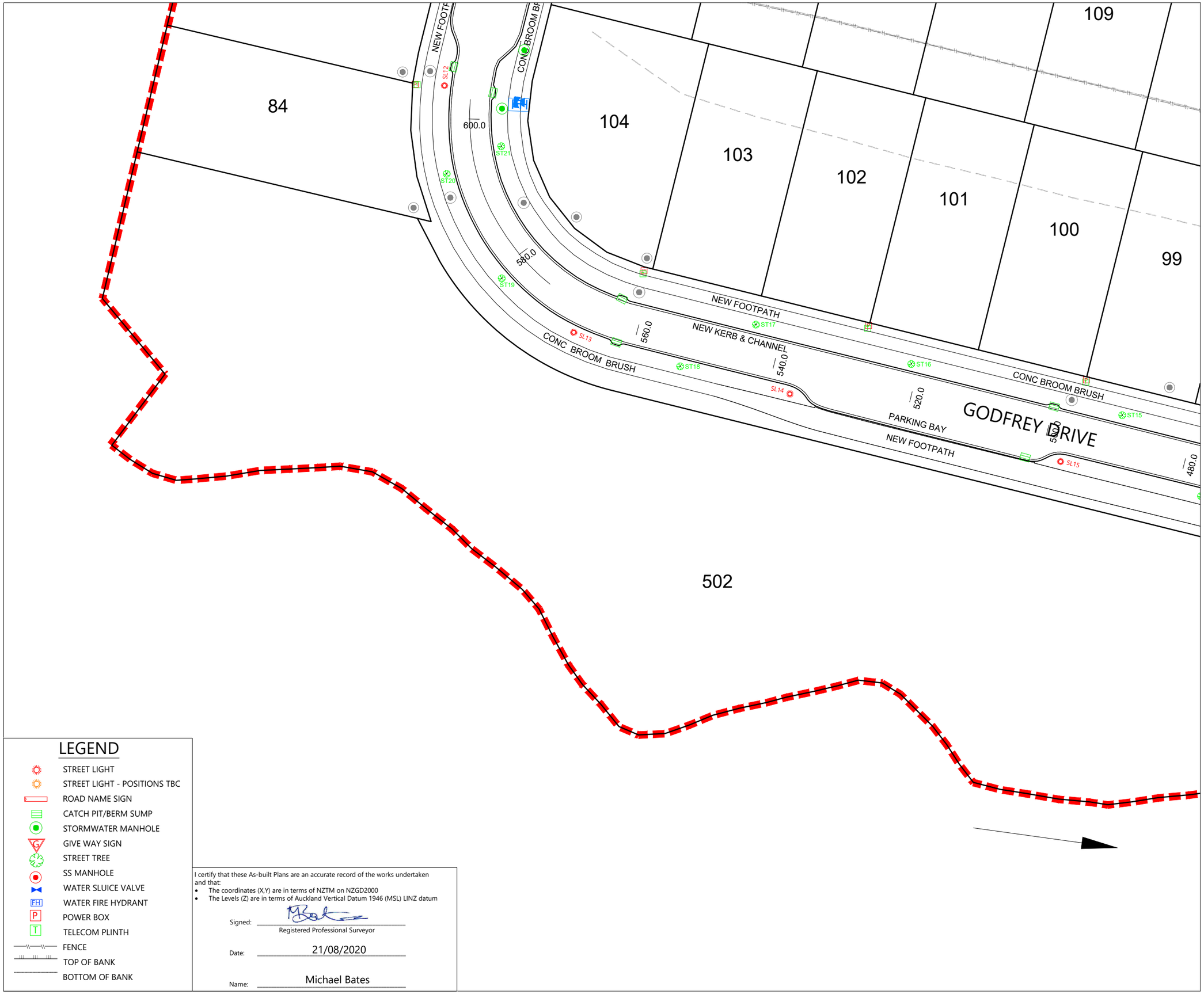
WFH PROPERTIES

ARRAN HILL PRECINCT 5 STAGE 2

ROADING AS-BUILT
SHEET 4 OF 7

STATUS	AS-BUILT	REV
SCALE	1:500 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-203-AB	

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2_326\DRAWINGS\SURVYASBUILTS\37502-02-200-ROADING PLANS.DWG



LEGEND

- STREET LIGHT
- STREET LIGHT - POSITIONS TBC
- ROAD NAME SIGN
- CATCH PIT/BERM SUMP
- STORMWATER MANHOLE
- GIVE WAY SIGN
- STREET TREE
- SS MANHOLE
- WATER SLUICE VALVE
- WATER FIRE HYDRANT
- POWER BOX
- TELECOM PLINTH
- FENCE
- TOP OF BANK
- BOTTOM OF BANK

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- The Levels (Z) are in terms of Auckland Vertical Datum 1946 (MSL) LINZ datum

Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates

WOODS
EST.1970

NOTES

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5. ALL PIPE CROSSINGS UNDER ROADS HAVE BEEN HARDFILL BACKFILLED.
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REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	KR	23/07/20
2	ISSUED FOR 224c	KR	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	SK	
CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

N

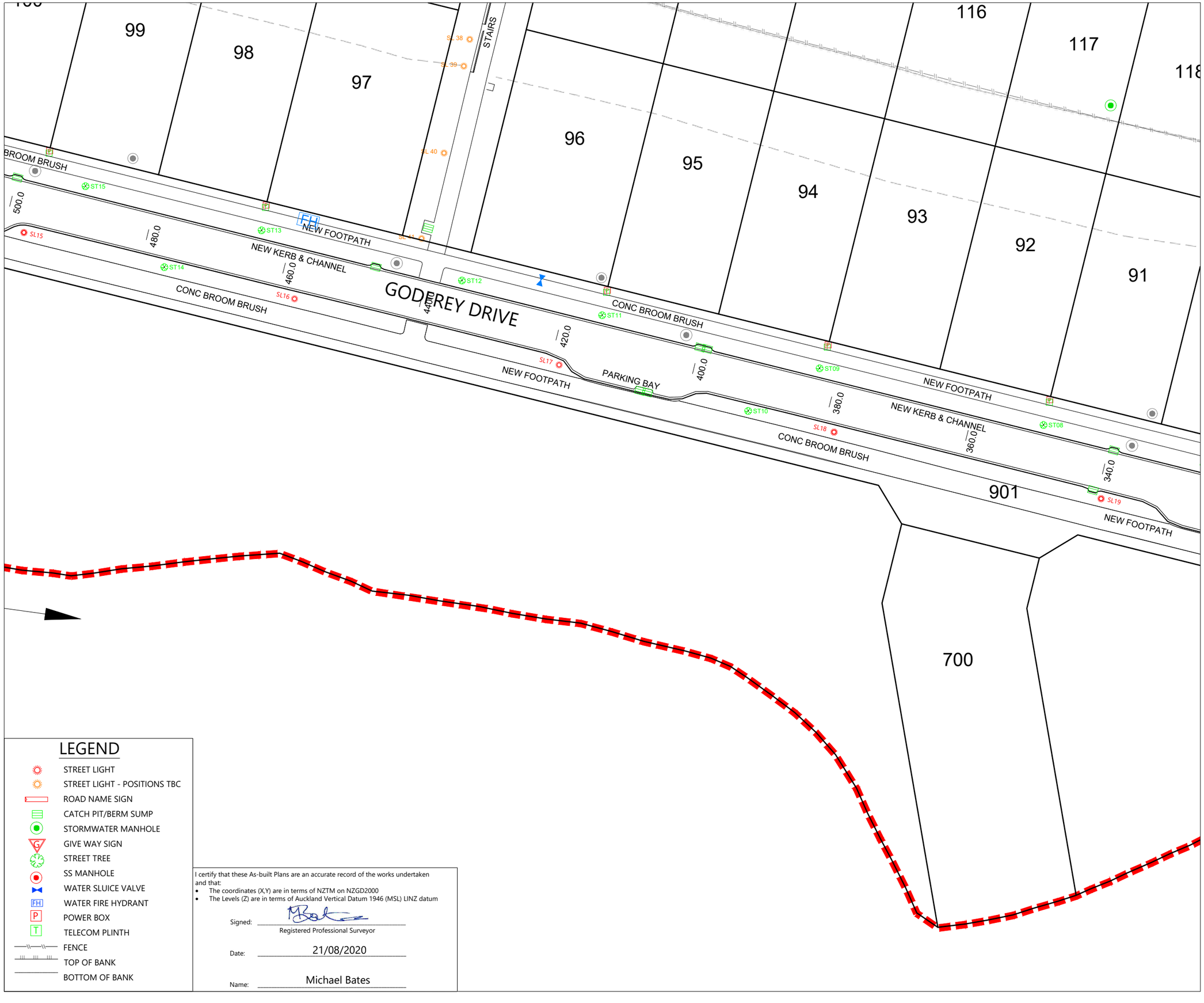
WFH PROPERTIES

ARRAN HILL PRECINCT 5 STAGE 2

ROADING AS-BUILT
SHEET 5 OF 7

STATUS	AS-BUILT	REV
SCALE	1:500 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-204-AB	

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2.326\DRAWINGS\SURV\ASBUILTS\37502-02-200-ROADING PLANS.DWG



LEGEND

- STREET LIGHT
- STREET LIGHT - POSITIONS TBC
- ROAD NAME SIGN
- CATCH PIT/BERM SUMP
- STORMWATER MANHOLE
- GIVE WAY SIGN
- STREET TREE
- SS MANHOLE
- WATER SLUICE VALVE
- WATER FIRE HYDRANT
- POWER BOX
- TELECOM PLINTH
- FENCE
- TOP OF BANK
- BOTTOM OF BANK

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Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates

WOODS
EST.1970

NOTES

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REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	KR	23/07/20
2	ISSUED FOR 224c	KR	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	SK	
CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

N

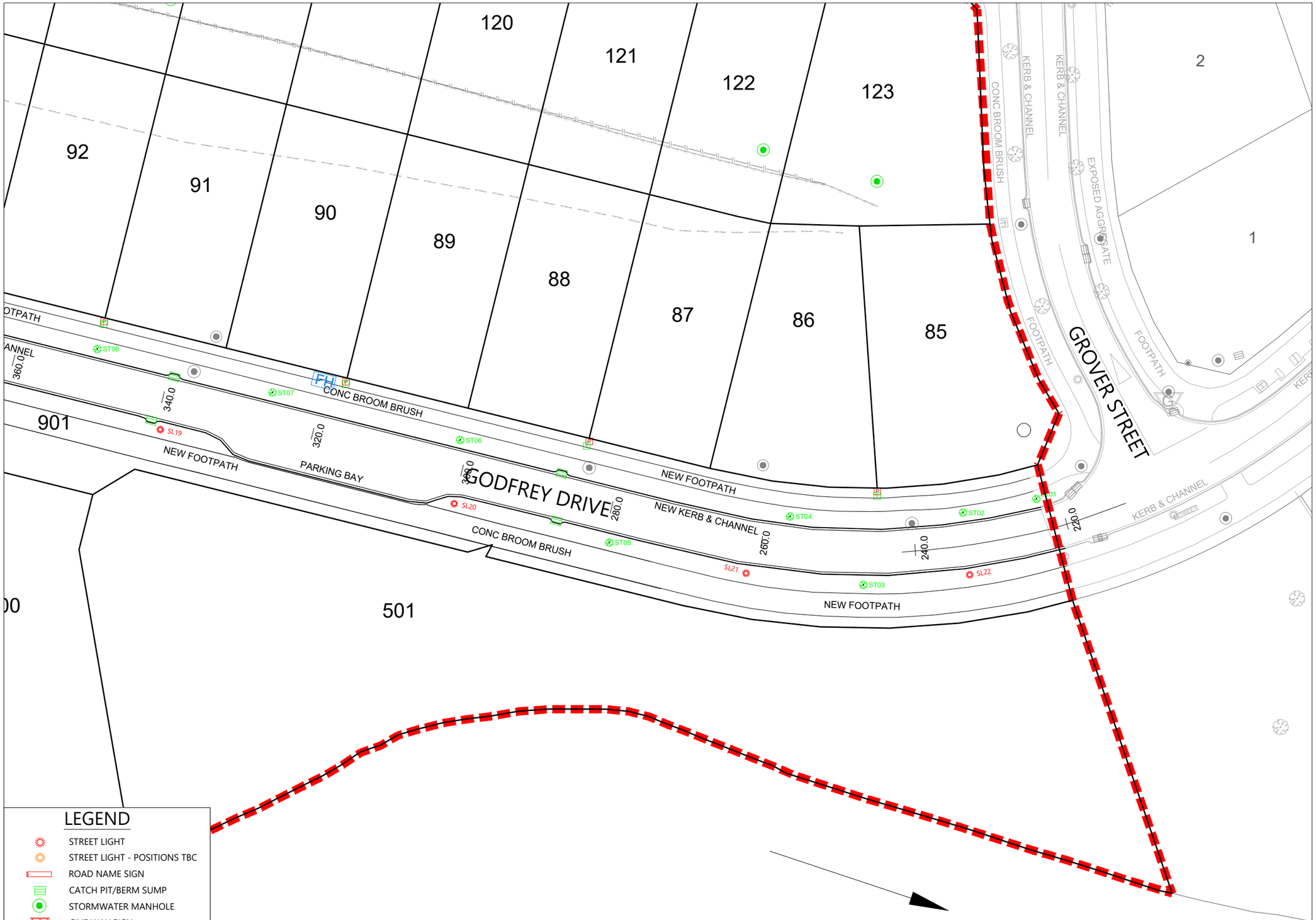
WFH PROPERTIES

ARRAN HILL PRECINCT 5 STAGE 2

ROADING AS-BUILT
SHEET 6 OF 7

STATUS	AS-BUILT	REV
SCALE	1:500 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-205-AB	

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2_326\DRAWINGS\SURVASBUILTS\37502-02-200-ROADING PLANS.DWG



LEGEND

- STREET LIGHT
- STREET LIGHT - POSITIONS TBC
- ROAD NAME SIGN
- CATCH PIT/BERM SUMP
- STORMWATER MANHOLE
- GIVE WAY SIGN
- STREET TREE
- SS MANHOLE
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Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates

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REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	KR	23/07/20
2	ISSUED FOR 224c	KR	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	SK	
CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

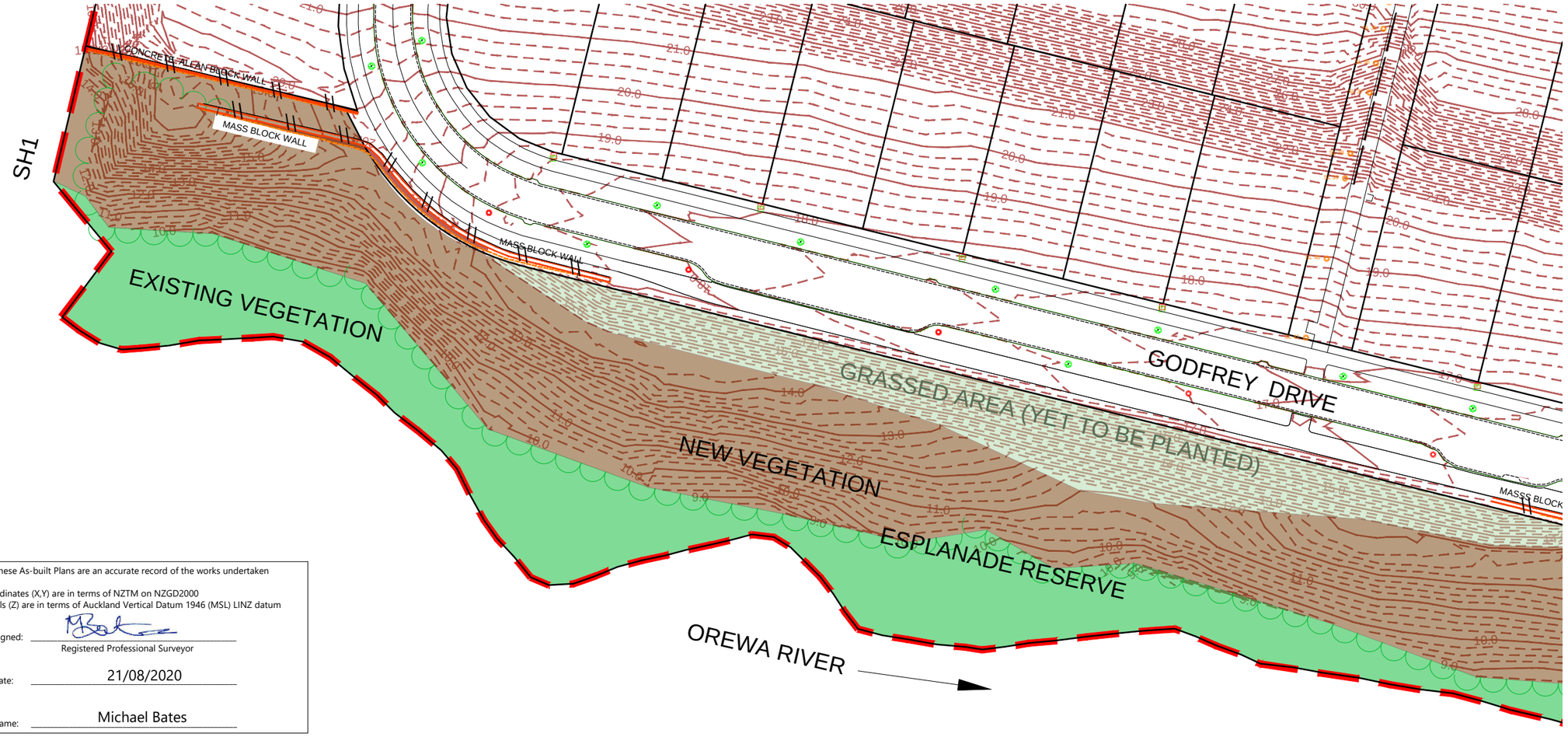
N

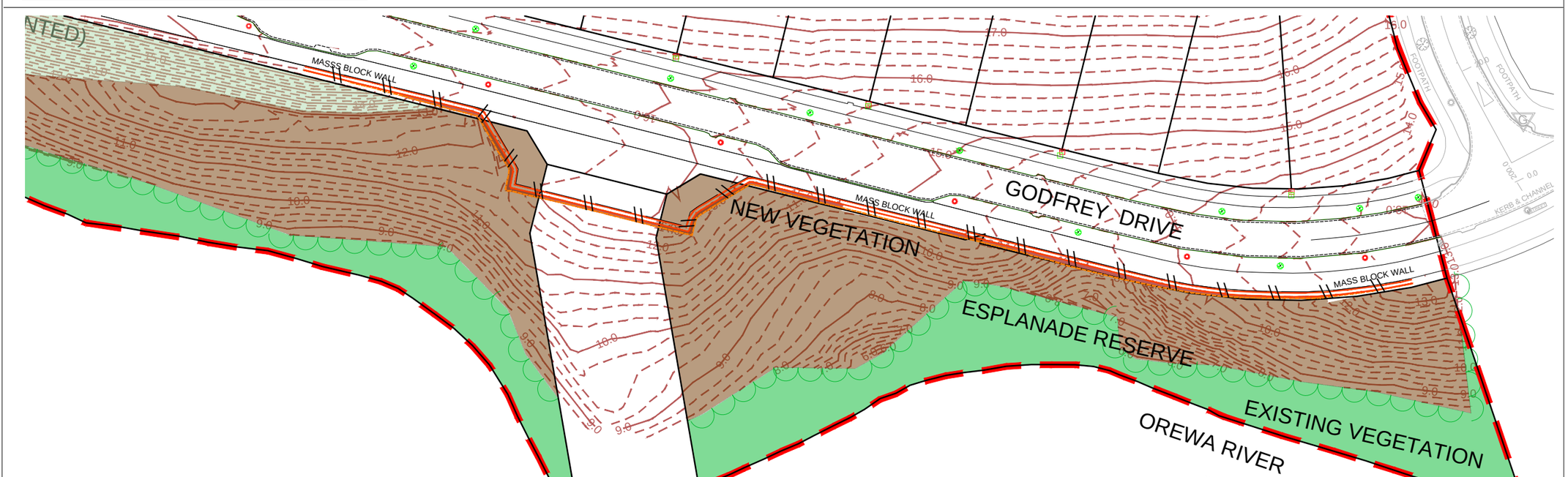
ARRAN HILL PRECINCT 5 STAGE 2

ROADING AS-BUILT
SHEET 7 OF 7

STATUS	AS-BUILT	REV
SCALE	1:500 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-206-AB	

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2.326\DRAWINGS\SURVASBUILTS\37502-02-200-ROADING PLANS.DWG





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- The Levels (Z) are in terms of Auckland Vertical Datum 1946 (MSL) LINZ datum

Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates

WOODS
Est.1970

NOTES

1. NEW CONTOURS ARE AT 0.25m INTERVALS

LEGEND

- CONTOURS MAJOR
- CONTOURS MINOR
- STAGE BOUNDARIES
- LOT BOUNDARIES
- BOTTOM FACE OF WALL
- TOP FACE OF WALL
- FENCE
- DRIPLINE
- GRASSED AREA
- NEWLY VEGETATED AREA
- EXISTING VEGETATION

DISCLAIMER:
THE INFORMATION PORTRAYED ON THIS PLAN IS INTENDED TO BE SOLELY USED AS THE BASE DATA FOR THE PURPOSES OF 224C APPLICATION TO COUNCIL. WFH AND WOOD AND PARTNERS CONSULTANTS ACCEPT NO RESPONSIBILITY FOR ANY BUILDING DESIGN OR CONSTRUCTION WORK BASED ON THIS DRAWING FILE.

REVISION DETAILS		BY	DATE
1	ISSUED FOR 224c	KR	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	SK	
CHECKED	KR	
APPROVED	MB	WOODS.CO.NZ

N

WFH PROPERTIES

ARRAN HILL PRECINCT 5 STAGE 2

RESERVE AS-BUILT
SHEET 1 OF 1

STATUS	AS-BUILT	REV
SCALE	1:750 @ A3	1
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-250-AB	

C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2_326\DRAWINGS\SURVASBUILTS\37502-02-250-RESERVE.DWG, 2020-Aug-24 16:13, NONE, Kendall Reid

SCHEDULE OF COORDINATES		
STORMWATER LOT CONNECTIONS		
NAME	EASTING	NORTHING
Lot 105	1748930.05	5949229.06
Lot 106	1748950.91	5949229.27
Lot 107	1748966.04	5949225.51
Lot 108	1748983.09	5949221.31
Lot 109	1748997.68	5949218.30
Lot 110	1749014.68	5949213.74
Lot 111	1749029.13	5949209.81
Lot 112	1749045.74	5949206.61
Lot 113	1749087.55	5949195.19
Lot 114	1749104.49	5949191.21
Lot 115	1749119.42	5949187.34
Lot 116	1749134.87	5949183.28
Lot 117	1749152.94	5949180.01
Lot 118	1749165.80	5949175.42
Lot 119	1749181.23	5949171.80
Lot 120	1749198.74	5949167.42
Lot 121	1749214.21	5949163.16
Lot 122	1749228.15	5949160.70
Lot 123	1749255.56	5949152.15
Lot 124	1748941.87	5949272.70
Lot 125	1748959.43	5949268.54
Lot 126	1748976.50	5949264.06
Lot 127	1748991.00	5949259.75
Lot 128	1749006.21	5949256.56
Lot 129	1749034.28	5949249.80
Lot 130	1749039.56	5949248.10
Lot 131	1749053.74	5949244.46
Lot 132	1749095.32	5949234.35
Lot 133	1749108.22	5949230.73
Lot 134	1749123.22	5949226.94
Lot 135	1749139.88	5949223.05
Lot 136	1749152.38	5949219.29
Lot 137	1749167.59	5949215.69
Lot 138	1749182.56	5949211.95
Lot 139	1749196.23	5949208.50
Lot 140	1749212.88	5949205.51
Lot 141	1749231.05	5949201.51
THE FOLLOWING CONNECTIONS WERE INSTALLED DURING THE PREVIOUS STAGES CONSTRUCTION		
Lot 79	1748923.01	5949286.89
Lot 80	1748917.76	5949268.57
Lot 81	1748912.80	5949250.09
Lot 82	1748910.37	5949235.17
Lot 83	1748904.76	5949217.02
Lot 84	1748907.07	5949198.64
Lot 85	1749262.45	5949122.27
Lot 87	1749220.16	5949119.48
Lot 88	1749203.88	5949122.97
Lot 89	1749188.72	5949126.52
Lot 90	1749172.85	5949129.96
Lot 91	1749155.35	5949134.48
Lot 92	1749140.30	5949138.15
Lot 93	1749124.25	5949142.09
Lot 94	1749108.92	5949145.75
Lot 95	1749092.56	5949149.74
Lot 96	1749077.20	5949153.75
Lot 97	1749050.55	5949160.60
Lot 98	1749030.60	5949165.38
Lot 99	1749015.21	5949169.19
Lot 100	1749000.18	5949173.09
Lot 101	1748984.72	5949177.27
Lot 102	1748969.19	5949180.75
Lot 103	1748954.24	5949184.22
Lot 104	1748937.25	5949188.69
Lot 142	1749250.23	5949200.28

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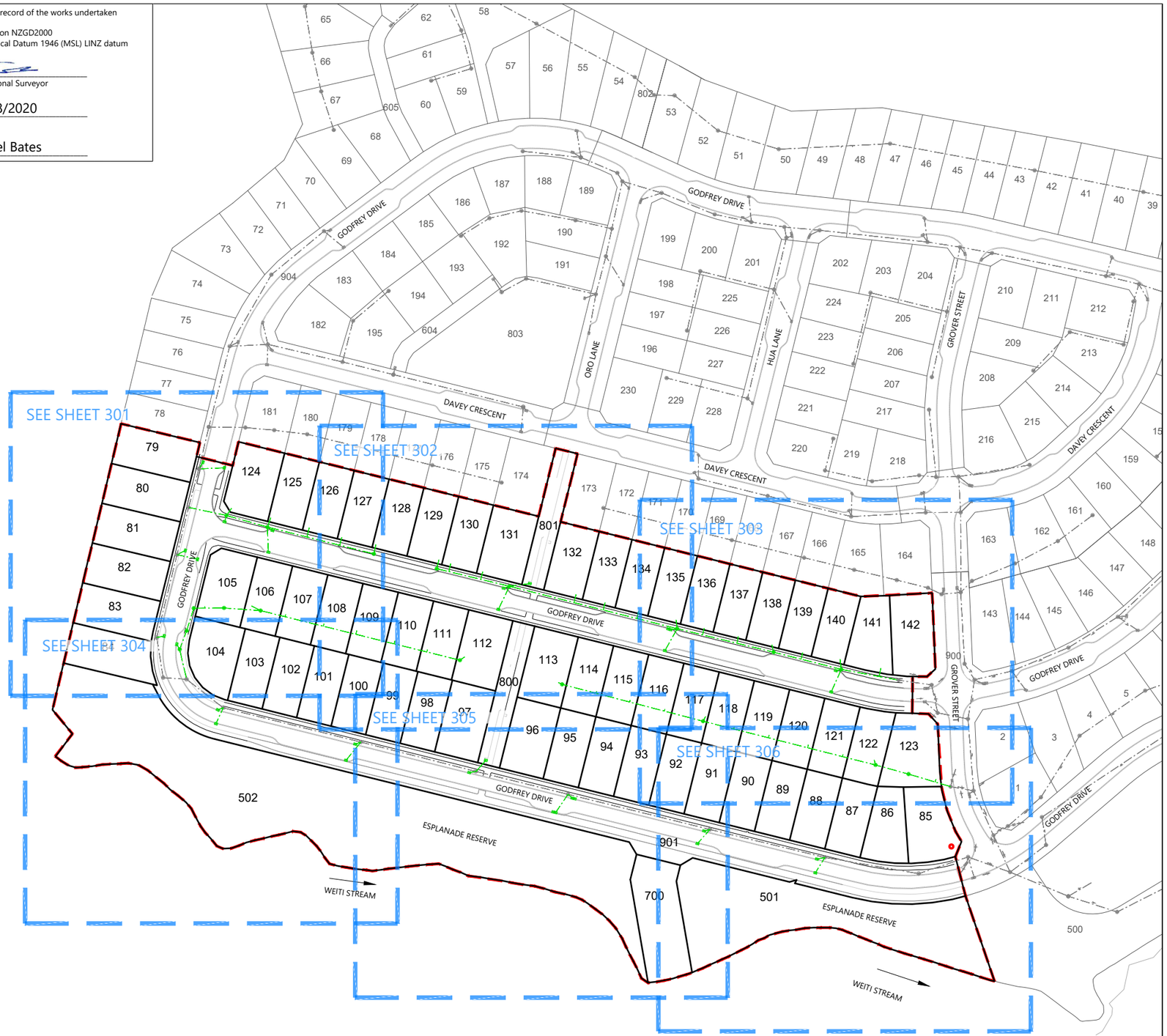
- The Levels (Z) are in terms of Auckland Vertical Datum 1946 (MSL) LINZ datum

Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates



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WOODS EST.1970

LEGEND

- STORMWATER MANHOLE
- STORMWATER CESSPIT
- STORMWATER DOUBLE CESSPIT
- NEW STORMWATER
- EXISTING STORMWATER
- STAGE BOUNDARY

NOTES

1. ALL WORKS AND MATERIALS COMPLY WITH AC STANDARDS FOR ENGINEERING DESIGN AND CONSTRUCTION.
2. ALL PIPE BEDDING COMPLIES WITH AC STANDARDS
3. ALL CESSPIT LEADS AND PIPES UNDER THE ROAD AND CARRIDGEWAYS ARE REINFORCED COACRETE PIPES CLASS 4 (Z) RRJ. ALL OTHER PIPELINES ARE REINFORCED COACRETE CLASS 2 (X) RRJ UNLESS OTHERWISE NOTED.
4. ALL PIPE CROSSINGS UNDER ROADS AND ACCESSWAYS HAVE BEEN HARDFILL BACKFILLED.
5. ALL SW 100mm DIA. RAMPED RISERS HAVE BEEN EXTENDED AND CAPPED OFF 1.0m BELOW THE FINISHED GROUND SURFACE.
6. ALL PRIVATE DRAINAGE CONNECTIONS ARE 100mmϕ.
7. LOT BOUNDARIES ARE SUBJECT TO FINAL SURVEY.
8. ASBUILT DATA HAS BEEN SOURCED FROM A COMBINATION OF WOODS SURVEY MEASURED DATA AND CONTRACTOR RECEIVED DATA.
9. SOME INVERT LEVELS ARE MARK THE LEVELS AT THE ENTRY POINT OF DROP-PIPES INTO THE MH CHAMBER. THESE LEVELS HAVE BEEN CALCULATED FROM OBSERVATIONS TO THE TOP OF THE PIPE.

REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	KR	17/08/20
2	ISSUED FOR 224c	KR	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	SK	
CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

N

WFH PROPERTIES

ARRAN HILL PRECINCT 5 STAGE 2

STORMWATER AS-BUILT
OVERALL LAYOUT
SHEET 1 OF 7

STATUS	AS-BUILT	REV
SCALE	1:2000 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-300-AB	

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2.326\DRAWINGS\SURVASBUILTS\37502-02-300-STORMWATER.DWG

SCHEDULE OF COORDINATES		
STORMWATER LOT CONNECTIONS		
NAME	EASTING	NORTHING
Lot 105	1748930.05	5949229.06
Lot 106	1748950.91	5949229.27
Lot 107	1748966.04	5949225.51
Lot 108	1748983.09	5949221.31
Lot 109	1748997.68	5949218.30
Lot 110	1749014.68	5949213.74
Lot 111	1749029.13	5949209.81
Lot 112	1749045.74	5949206.61
Lot 113	1749087.55	5949195.19
Lot 114	1749104.49	5949191.21
Lot 115	1749119.42	5949187.34
Lot 116	1749134.87	5949183.28
Lot 117	1749152.94	5949180.01
Lot 118	1749165.80	5949175.42
Lot 119	1749181.23	5949171.80
Lot 120	1749198.74	5949167.42
Lot 121	1749214.21	5949163.16
Lot 122	1749228.15	5949160.70
Lot 123	1749255.56	5949152.15
Lot 124	1748941.87	5949272.70
Lot 125	1748959.43	5949268.54
Lot 126	1748976.50	5949264.06
Lot 127	1748991.00	5949259.75
Lot 128	1749006.21	5949256.56
Lot 129	1749034.28	5949249.80
Lot 130	1749039.56	5949248.10
Lot 131	1749053.74	5949244.46
Lot 132	1749095.32	5949234.35
Lot 133	1749108.22	5949230.73
Lot 134	1749123.22	5949226.94
Lot 135	1749139.88	5949223.05
Lot 136	1749152.38	5949219.29
Lot 137	1749167.59	5949215.69
Lot 138	1749182.56	5949211.95
Lot 139	1749196.23	5949208.50
Lot 140	1749212.88	5949205.51
Lot 141	1749231.05	5949201.51
THE FOLLOWING CONNECTIONS WERE INSTALLED DURING THE PREVIOUS STAGES CONSTRUCTION		
Lot 79	1748923.01	5949286.89
Lot 80	1748917.76	5949268.57
Lot 81	1748912.80	5949250.09
Lot 82	1748910.37	5949235.17
Lot 83	1748904.76	5949217.02
Lot 84	1748907.07	5949198.64
Lot 85	1749262.45	5949122.27
Lot 87	1749220.16	5949119.48
Lot 88	1749203.88	5949122.97
Lot 89	1749188.72	5949126.52
Lot 90	1749172.85	5949129.96
Lot 91	1749155.35	5949134.48
Lot 92	1749140.30	5949138.15
Lot 93	1749124.25	5949142.09
Lot 94	1749108.92	5949145.75
Lot 95	1749092.56	5949149.74
Lot 96	1749077.20	5949153.75
Lot 97	1749050.55	5949160.60
Lot 98	1749030.60	5949165.38
Lot 99	1749015.21	5949169.19
Lot 100	1749000.18	5949173.09
Lot 101	1748984.72	5949177.27
Lot 102	1748969.19	5949180.75
Lot 103	1748954.24	5949184.22
Lot 104	1748937.25	5949188.69
Lot 142	1749250.23	5949200.28

I certify that these As-built Plans are an accurate record of the works undertaken and that:

- The coordinates (X,Y) are in terms of NZTM on NZGD2000
- The Levels (Z) are in terms of Auckland Vertical Datum 1946 (MSL) LINZ datum

Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates

DISCLAIMER:
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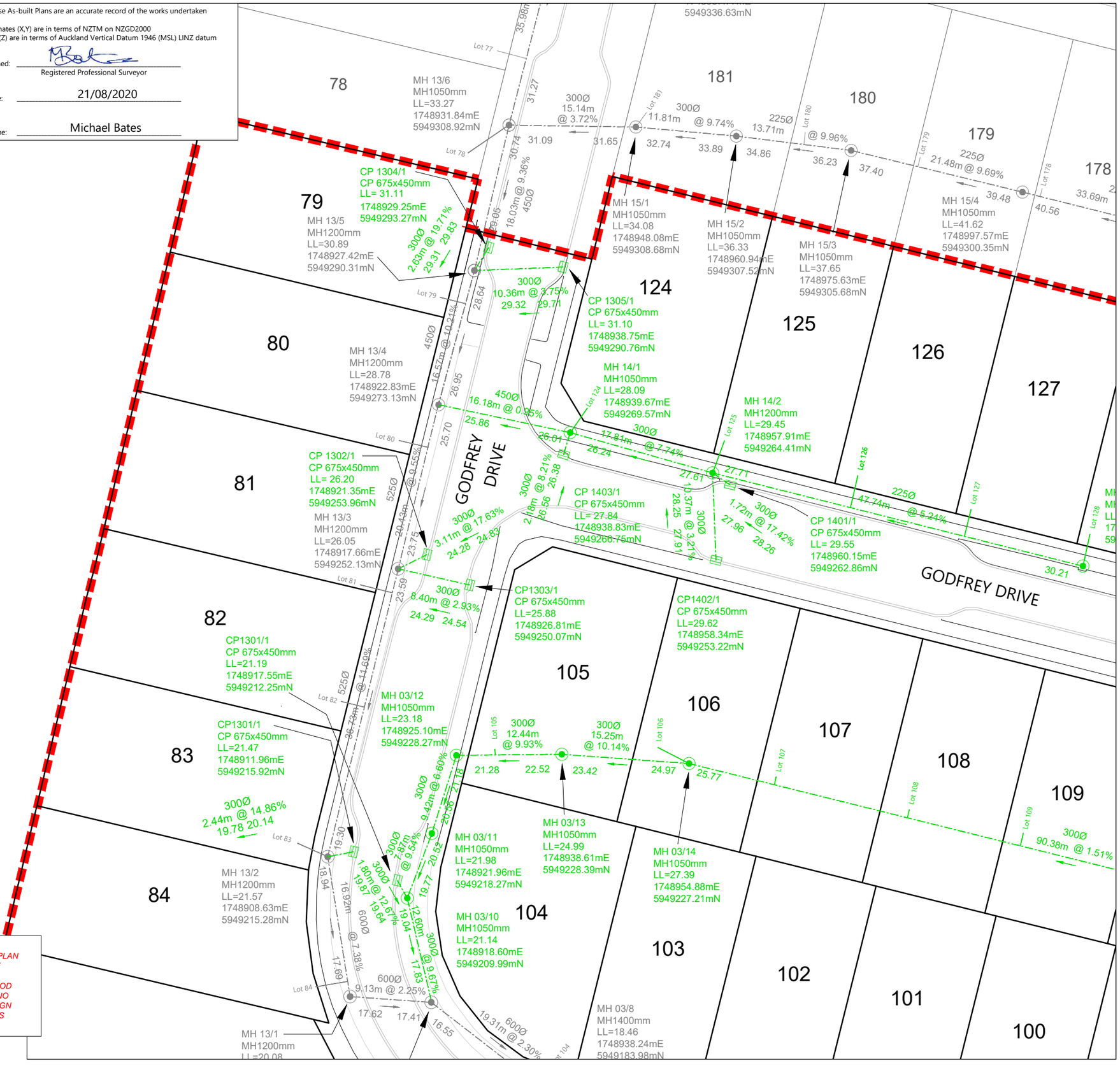

LEGEND

- STORMWATER MANHOLE
- STORMWATER CESSPIT
- STORMWATER DOUBLE CESSPIT
- NEW STORMWATER
- EXISTING STORMWATER
- STAGE BOUNDARY

NOTES

1. ALL WORKS AND MATERIALS COMPLY WITH AC STANDARDS FOR ENGINEERING DESIGN AND CONSTRUCTION.
2. ALL PIPE BEDDING COMPLIES WITH AC STANDARDS
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REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	KR	17/08/20
2	ISSUED FOR 224c	KR	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	SK	
CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

ARRAN HILL PRECINCT 5 STAGE 2

STORMWATER AS-BUILT
SHEET 2 OF 7

STATUS	AS-BUILT	REV
SCALE	1:500 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-301-AB	

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2_326\DRAWINGS\SURVASBUILTS\37502-02-300-STORMWATER.DWG

SCHEDULE OF COORDINATES		
STORMWATER LOT CONNECTIONS		
NAME	EASTING	NORTHING
Lot 105	1748930.05	5949229.06
Lot 106	1748950.91	5949229.27
Lot 107	1748966.04	5949225.51
Lot 108	1748983.09	5949221.31
Lot 109	1748997.68	5949218.30
Lot 110	1749014.68	5949213.74
Lot 111	1749029.13	5949209.81
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Lot 119	1749181.23	5949171.80
Lot 120	1749198.74	5949167.42
Lot 121	1749214.21	5949163.16
Lot 122	1749228.15	5949160.70
Lot 123	1749255.56	5949152.15
Lot 124	1748941.87	5949272.70
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Lot 130	1749039.56	5949248.10
Lot 131	1749053.74	5949244.46
Lot 132	1749095.32	5949234.35
Lot 133	1749108.22	5949230.73
Lot 134	1749123.22	5949226.94
Lot 135	1749139.88	5949223.05
Lot 136	1749152.38	5949219.29
Lot 137	1749167.59	5949215.69
Lot 138	1749182.56	5949211.95
Lot 139	1749196.23	5949208.50
Lot 140	1749212.88	5949205.51
Lot 141	1749231.05	5949201.51
THE FOLLOWING CONNECTIONS WERE INSTALLED DURING THE PREVIOUS STAGES CONSTRUCTION		
Lot 79	1748923.01	5949286.89
Lot 80	1748917.76	5949268.57
Lot 81	1748912.80	5949250.09
Lot 82	1748910.37	5949235.17
Lot 83	1748904.76	5949217.02
Lot 84	1748907.07	5949198.64
Lot 85	1749262.45	5949122.27
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Lot 88	1749203.88	5949122.97
Lot 89	1749188.72	5949126.52
Lot 90	1749172.85	5949129.96
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Lot 93	1749124.25	5949142.09
Lot 94	1749108.92	5949145.75
Lot 95	1749092.56	5949149.74
Lot 96	1749077.20	5949153.75
Lot 97	1749050.55	5949160.60
Lot 98	1749030.60	5949165.38
Lot 99	1749015.21	5949169.19
Lot 100	1749000.18	5949173.09
Lot 101	1748984.72	5949177.27
Lot 102	1748969.19	5949180.75
Lot 103	1748954.24	5949184.22
Lot 104	1748937.25	5949188.69
Lot 142	1749250.23	5949200.28

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- The Levels (Z) are in terms of Auckland Vertical Datum 1946 (MSL) LINZ datum

Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates

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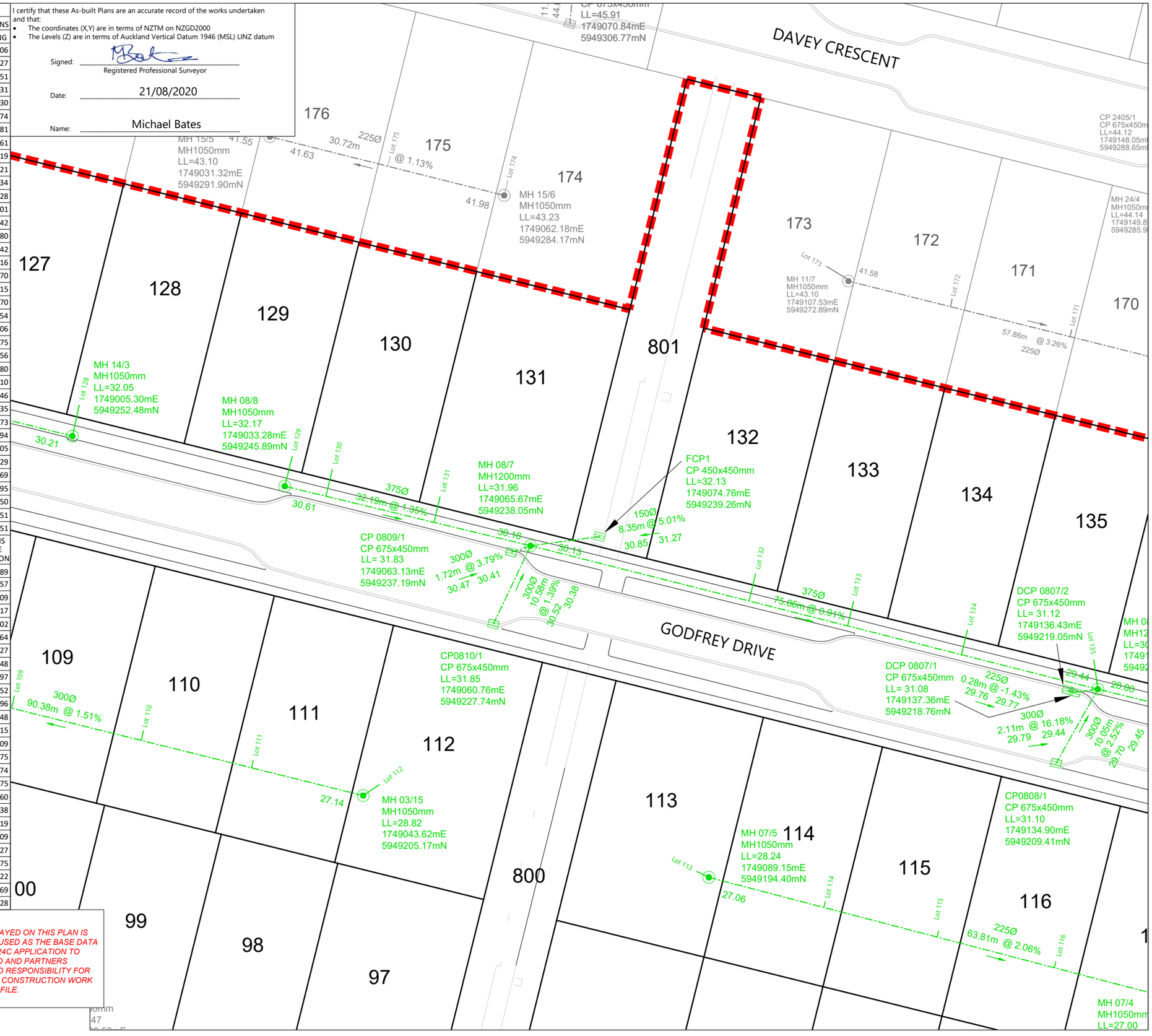

LEGEND

- STORMWATER MANHOLE
- STORMWATER CESSPIT
- STORMWATER DOUBLE CESSPIT
- NEW STORMWATER
- EXISTING STORMWATER
- STAGE BOUNDARY

NOTES

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REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	KR	17/08/20
2	ISSUED FOR 224c	KR	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	SK	
CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

ARRAN HILL PRECINCT 5 STAGE 2

STORMWATER AS-BUILT
SHEET 3 OF 7

STATUS	AS-BUILT	REV
SCALE	1:500 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-302-AB	

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2.326\DRAWINGS\SURVASBUILTS\37502-02-300-STORMWATER.DWG

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Signed: _____
Registered Professional Surveyor

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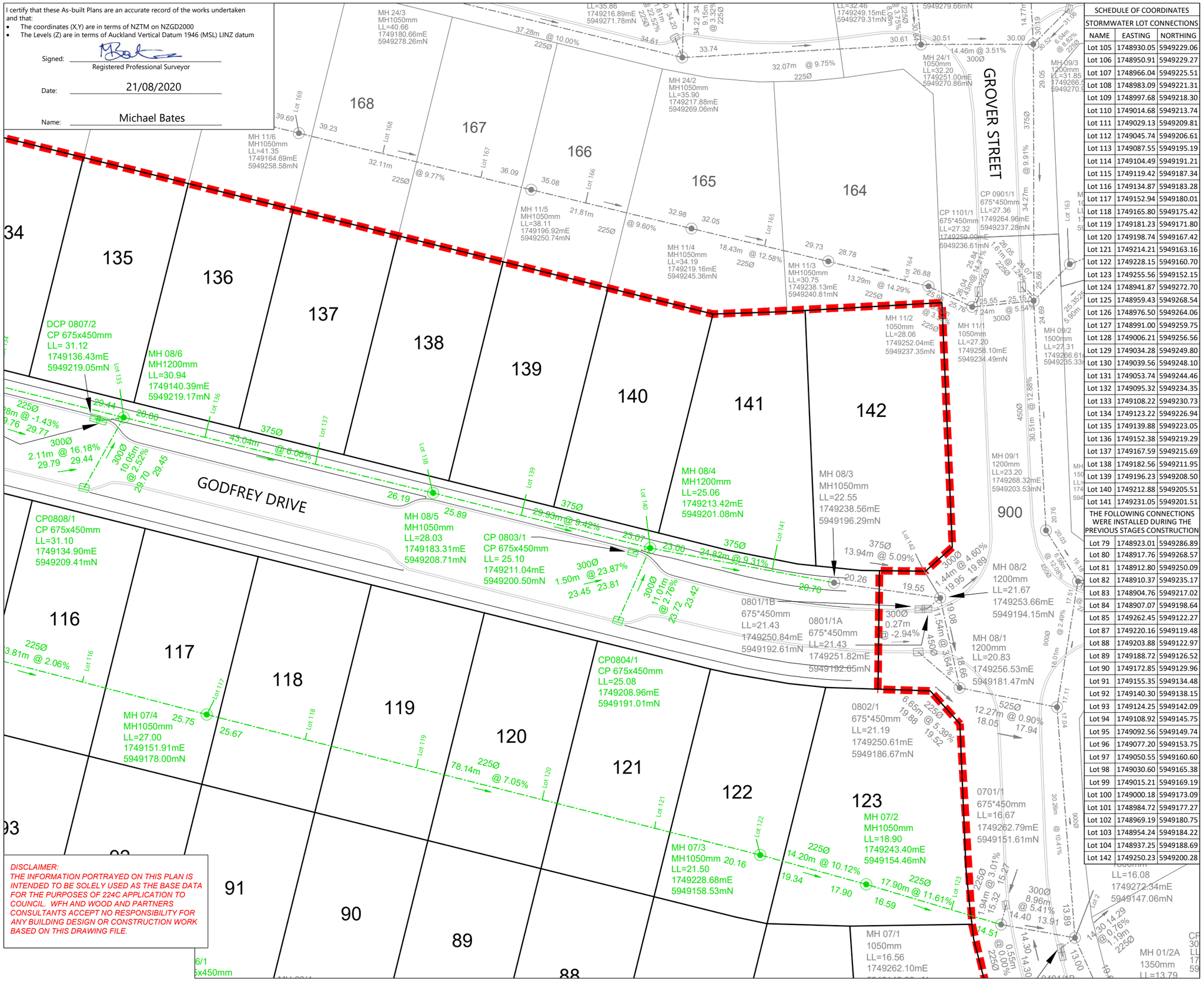
Name: Michael Bates



SCHEDULE OF COORDINATES

STORMWATER LOT CONNECTIONS

NAME	EASTING	NORTHING
Lot 105	1748930.05	5949229.06
Lot 106	1748950.91	5949229.27
Lot 107	1748966.04	5949225.51
Lot 108	1748983.09	5949221.31
Lot 109	1748997.68	5949218.30
Lot 110	1749014.68	5949213.74
Lot 111	1749029.13	5949209.81
Lot 112	1749045.74	5949206.61
Lot 113	1749087.55	5949195.19
Lot 114	1749104.49	5949191.21
Lot 115	1749119.42	5949187.34
Lot 116	1749134.87	5949183.28
Lot 117	1749152.94	5949180.01
Lot 118	1749165.80	5949175.42
Lot 119	1749181.23	5949171.80
Lot 120	1749198.74	5949167.42
Lot 121	1749214.21	5949163.16
Lot 122	1749228.15	5949160.70
Lot 123	1749255.56	5949152.15
Lot 124	1748941.87	5949272.70
Lot 125	1748959.43	5949268.54
Lot 126	1748976.50	5949264.06
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Lot 129	1749034.28	5949249.80
Lot 130	1749039.56	5949248.10
Lot 131	1749053.74	5949244.46
Lot 132	1749095.32	5949234.35
Lot 133	1749108.22	5949230.73
Lot 134	1749123.22	5949226.94
Lot 135	1749139.88	5949223.05
Lot 136	1749152.38	5949219.29
Lot 137	1749167.59	5949215.69
Lot 138	1749182.56	5949211.95
Lot 139	1749196.23	5949208.50
Lot 140	1749212.88	5949205.51
Lot 141	1749231.05	5949201.51

THE FOLLOWING CONNECTIONS WERE INSTALLED DURING THE PREVIOUS STAGES CONSTRUCTION

Lot 79	1748923.01	5949286.89
Lot 80	1748917.76	5949268.57
Lot 81	1748912.80	5949250.09
Lot 82	1748910.37	5949235.17
Lot 83	1748904.76	5949217.02
Lot 84	1748907.07	5949198.64
Lot 85	1749262.45	5949122.27
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Lot 94	1749108.92	5949145.75
Lot 95	1749092.56	5949149.74
Lot 96	1749077.20	5949153.75
Lot 97	1749050.55	5949160.60
Lot 98	1749030.60	5949165.38
Lot 99	1749015.21	5949169.19
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Lot 101	1748984.72	5949177.27
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Lot 104	1748937.25	5949188.69
Lot 142	1749250.23	5949200.28

LEGEND

- STORMWATER MANHOLE
- STORMWATER CESSPIT
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SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	SK	
CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

ARRAN HILL PRECINCT 5 STAGE 2

STORMWATER AS-BUILT
SHEET 4 OF 7

STATUS	AS-BUILT	REV
SCALE	1:500 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-303-AB	

Document No. C:\T2DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2.326\DRAWINGS\SURVASBUILTS\37502-02-300-STORMWATER.DWG

SCHEDULE OF COORDINATES		
STORMWATER LOT CONNECTIONS		
NAME	EASTING	NORTHING
Lot 105	1748930.05	5949229.06
Lot 106	1748950.91	5949229.27
Lot 107	1748966.04	5949225.51
Lot 108	1748983.09	5949221.31
Lot 109	1748997.68	5949218.30
Lot 110	1749014.68	5949213.74
Lot 111	1749029.13	5949209.81
Lot 112	1749045.74	5949206.61
Lot 113	1749087.55	5949195.19
Lot 114	1749104.49	5949191.21
Lot 115	1749119.42	5949187.34
Lot 116	1749134.87	5949183.28
Lot 117	1749152.94	5949180.01
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Lot 119	1749181.23	5949171.80
Lot 120	1749198.74	5949167.42
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Signed: _____
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Date: 21/08/2020

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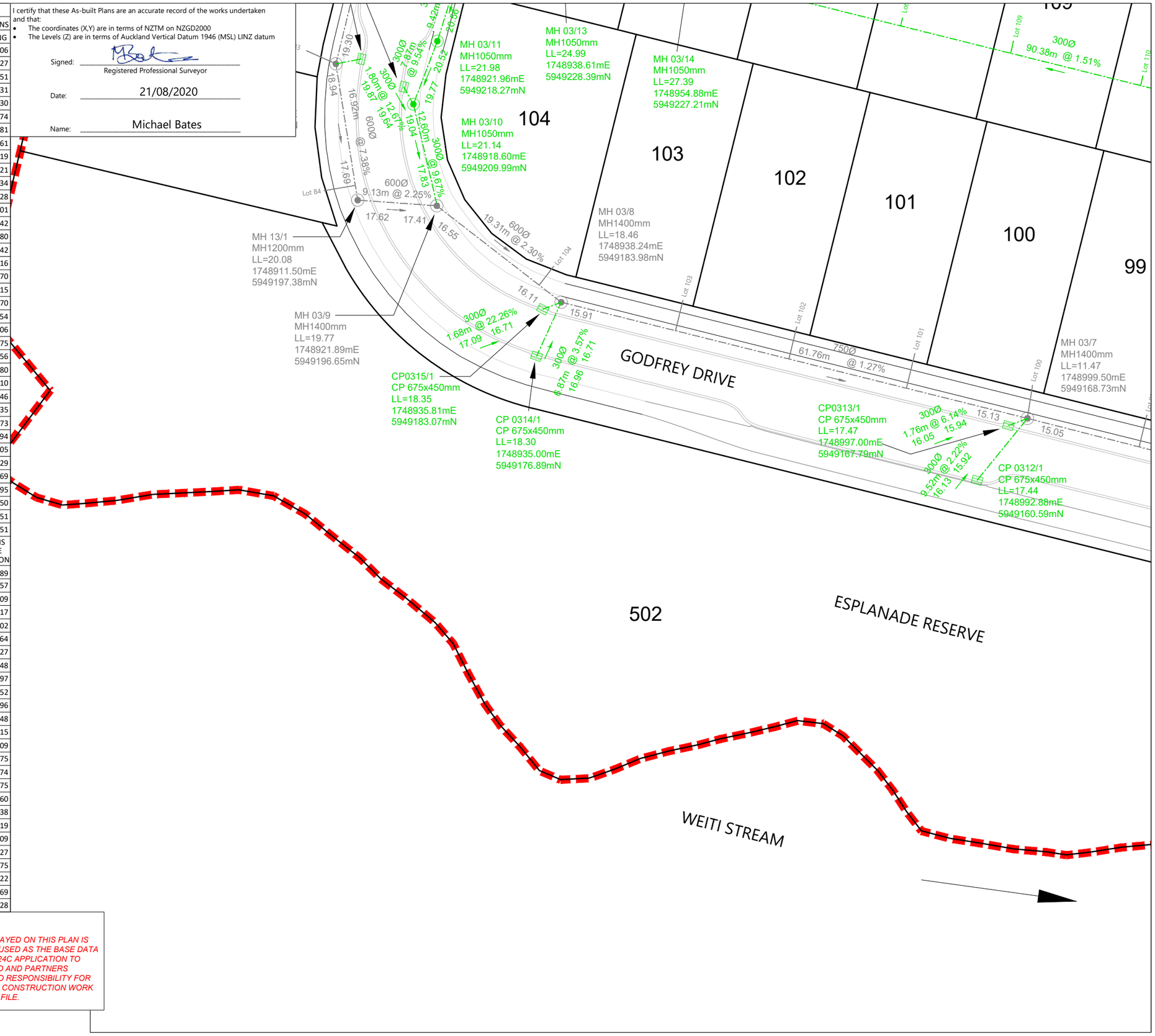

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WOODS
EST.1970

LEGEND

- STORMWATER MANHOLE
- STORMWATER CESSPIT
- STORMWATER DOUBLE CESSPIT
- NEW STORMWATER
- EXISTING STORMWATER
- STAGE BOUNDARY

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SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	SK	
CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

N

WFH PROPERTIES

ARRAN HILL PRECINCT 5 STAGE 2

STORMWATER AS-BUILT
SHEET 5 OF 7

STATUS	AS-BUILT	REV
SCALE	1:500 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-304-AB	

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2_326\DRAWINGS\SURVASBUILTS\37502-02-300-STORMWATER.DWG

SCHEDULE OF COORDINATES		
STORMWATER LOT CONNECTIONS		
NAME	EASTING	NORTHING
Lot 105	1748930.05	5949229.06
Lot 106	1748950.91	5949229.27
Lot 107	1748966.04	5949225.51
Lot 108	1748983.09	5949221.31
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Lot 124	1748941.87	5949272.70
Lot 125	1748959.43	5949268.54
Lot 126	1748976.50	5949264.06
Lot 127	1748991.00	5949259.75
Lot 128	1749006.21	5949256.56
Lot 129	1749034.28	5949249.80
Lot 130	1749039.56	5949248.10
Lot 131	1749053.74	5949244.46
Lot 132	1749095.32	5949234.35
Lot 133	1749108.22	5949230.73
Lot 134	1749123.22	5949226.94
Lot 135	1749139.88	5949223.05
Lot 136	1749152.38	5949219.29
Lot 137	1749167.59	5949215.69
Lot 138	1749182.56	5949211.95
Lot 139	1749196.23	5949208.50
Lot 140	1749212.88	5949205.51
Lot 141	1749231.05	5949201.51
THE FOLLOWING CONNECTIONS WERE INSTALLED DURING THE PREVIOUS STAGES CONSTRUCTION		
Lot 79	1748923.01	5949286.89
Lot 80	1748917.76	5949268.57
Lot 81	1748912.80	5949250.09
Lot 82	1748910.37	5949235.17
Lot 83	1748904.76	5949217.02
Lot 84	1748907.07	5949198.64
Lot 85	1749262.45	5949122.27
Lot 87	1749220.16	5949119.48
Lot 88	1749203.88	5949122.97
Lot 89	1749188.72	5949126.52
Lot 90	1749172.85	5949129.96
Lot 91	1749155.35	5949134.48
Lot 92	1749140.30	5949138.15
Lot 93	1749124.25	5949142.09
Lot 94	1749108.92	5949145.75
Lot 95	1749092.56	5949149.74
Lot 96	1749077.20	5949153.75
Lot 97	1749050.55	5949160.60
Lot 98	1749030.60	5949165.38
Lot 99	1749015.21	5949169.19
Lot 100	1749000.18	5949173.09
Lot 101	1748984.72	5949177.27
Lot 102	1748969.19	5949180.75
Lot 103	1748954.24	5949184.22
Lot 104	1748937.25	5949188.69
Lot 142	1749250.23	5949200.28

I certify that these As-built Plans are an accurate record of the works undertaken and that:

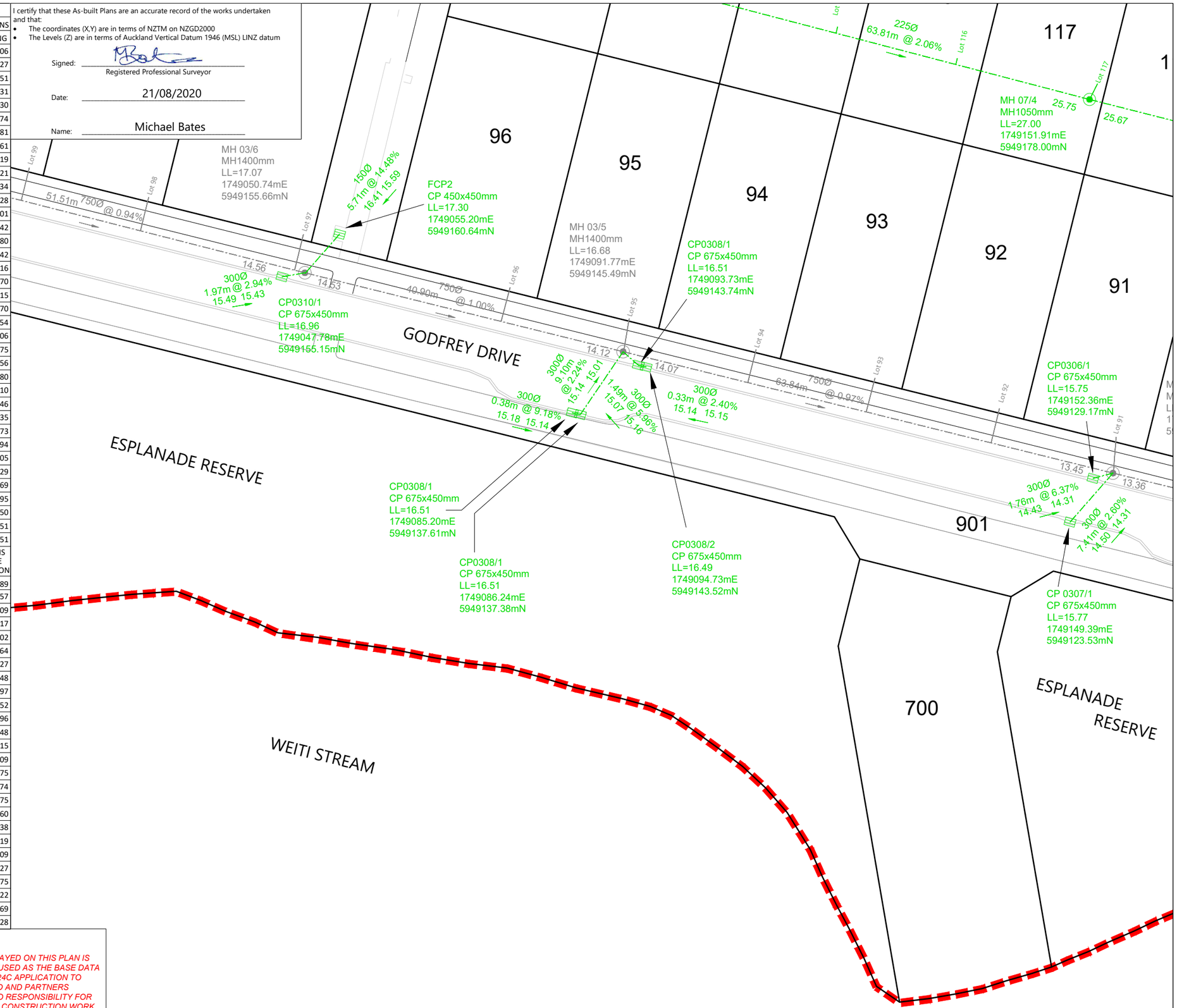
- The coordinates (X,Y) are in terms of NZTM on NZGD2000
- The Levels (Z) are in terms of Auckland Vertical Datum 1946 (MSL) LINZ datum

Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates

DISCLAIMER:
THE INFORMATION PORTRAYED ON THIS PLAN IS INTENDED TO BE SOLELY USED AS THE BASE DATA FOR THE PURPOSES OF 224C APPLICATION TO COUNCIL. WFH AND WOOD AND PARTNERS CONSULTANTS ACCEPT NO RESPONSIBILITY FOR ANY BUILDING DESIGN OR CONSTRUCTION WORK BASED ON THIS DRAWING FILE.



LEGEND

- STORMWATER MANHOLE
- STORMWATER CESSPIT
- STORMWATER DOUBLE CESSPIT
- NEW STORMWATER
- EXISTING STORMWATER
- STAGE BOUNDARY

NOTES

1. ALL WORKS AND MATERIALS COMPLY WITH AC STANDARDS FOR ENGINEERING DESIGN AND CONSTRUCTION.
2. ALL PIPE BEDDING COMPLIES WITH AC STANDARDS
3. ALL CESSPIT LEADS AND PIPES UNDER THE ROAD AND CARRIDGEWAYS ARE REINFORCED COACRETE PIPES CLASS 4 (Z) RRJ. ALL OTHER PIPELINES ARE REINFORCED COACRETE CLASS 2 (X) RRJ UNLESS OTHERWISE NOTED.
4. ALL PIPE CROSSINGS UNDER ROADS AND ACCESSWAYS HAVE BEEN HARDFILL BACKFILLED.
5. ALL SW 100mm DIA. RAMPED RISERS HAVE BEEN EXTENDED AND CAPPED OFF 1.0m BELOW THE FINISHED GROUND SURFACE.
6. ALL PRIVATE DRAINAGE CONNECTIONS ARE 100mmø.
7. LOT BOUNDARIES ARE SUBJECT TO FINAL SURVEY.
8. ASBUILT DATA HAS BEEN SOURCED FROM A COMBINATION OF WOODS SURVEY MEASURED DATA AND CONTRACTOR RECEIVED DATA.
9. SOME INVERT LEVELS ARE MARK THE LEVELS AT THE ENTRY POINT OF DROP-PIPES INTO THE MH CHAMBER. THESE LEVELS HAVE BEEN CALCULATED FROM OBSERVATIONS TO THE TOP OF THE PIPE.

REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	KR	17/08/20
2	ISSUED FOR 224c	KR	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	SK	
CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

ARRAN HILL PRECINCT 5 STAGE 2

STORMWATER AS-BUILT
SHEET 6 OF 7

STATUS	AS-BUILT	REV
SCALE	1:500 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-305-AB	

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2_326\DRAWINGS\SURVASBUILTS\37502-02-300-STORMWATER.DWG

SCHEDULE OF COORDINATES		
STORMWATER LOT CONNECTIONS		
NAME	EASTING	NORTHING
Lot 105	1748930.05	5949229.06
Lot 106	1748950.91	5949229.27
Lot 107	1748966.04	5949225.51
Lot 108	1748983.09	5949221.31
Lot 109	1748997.68	5949218.30
Lot 110	1749014.68	5949213.74
Lot 111	1749029.13	5949209.81
Lot 112	1749045.74	5949206.61
Lot 113	1749087.55	5949195.19
Lot 114	1749104.49	5949191.21
Lot 115	1749119.42	5949187.34
Lot 116	1749134.87	5949183.28
Lot 117	1749152.94	5949180.01
Lot 118	1749165.80	5949175.42
Lot 119	1749181.23	5949171.80
Lot 120	1749198.74	5949167.42
Lot 121	1749214.21	5949163.16
Lot 122	1749228.15	5949160.70
Lot 123	1749255.56	5949152.15
Lot 124	1748941.87	5949272.70
Lot 125	1748959.43	5949268.54
Lot 126	1748976.50	5949264.06
Lot 127	1748991.00	5949259.75
Lot 128	1749006.21	5949256.56
Lot 129	1749034.28	5949249.80
Lot 130	1749039.56	5949248.10
Lot 131	1749053.74	5949244.46
Lot 132	1749095.32	5949234.35
Lot 133	1749108.22	5949230.73
Lot 134	1749123.22	5949226.94
Lot 135	1749139.88	5949223.05
Lot 136	1749152.38	5949219.29
Lot 137	1749167.59	5949215.69
Lot 138	1749182.56	5949211.95
Lot 139	1749196.23	5949208.50
Lot 140	1749212.88	5949205.51
Lot 141	1749231.05	5949201.51
THE FOLLOWING CONNECTIONS WERE INSTALLED DURING THE PREVIOUS STAGES CONSTRUCTION		
Lot 79	1748923.01	5949286.89
Lot 80	1748917.76	5949268.57
Lot 81	1748912.80	5949250.09
Lot 82	1748910.37	5949235.17
Lot 83	1748904.76	5949217.02
Lot 84	1748907.07	5949198.64
Lot 85	1749262.45	5949122.27
Lot 87	1749220.16	5949119.48
Lot 88	1749203.88	5949122.97
Lot 89	1749188.72	5949126.52
Lot 90	1749172.85	5949129.96
Lot 91	1749155.35	5949134.48
Lot 92	1749140.30	5949138.15
Lot 93	1749124.25	5949142.09
Lot 94	1749108.92	5949145.75
Lot 95	1749092.56	5949149.74
Lot 96	1749077.20	5949153.75
Lot 97	1749050.55	5949160.60
Lot 98	1749030.60	5949165.38
Lot 99	1749015.21	5949169.19
Lot 100	1749000.18	5949173.09
Lot 101	1748984.72	5949177.27
Lot 102	1748969.19	5949180.75
Lot 103	1748954.24	5949184.22
Lot 104	1748937.25	5949188.69
Lot 142	1749250.23	5949200.28

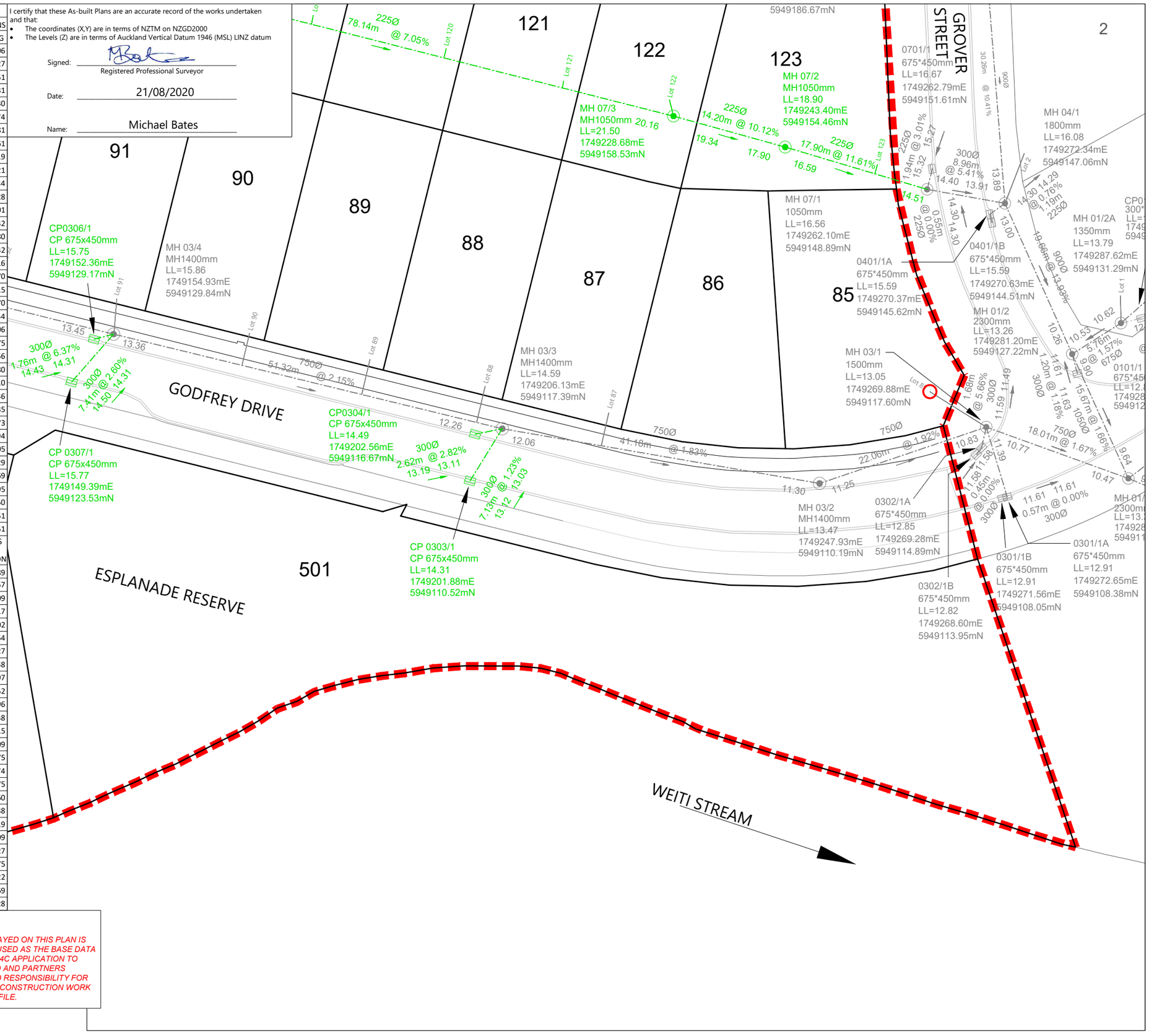
I certify that these As-built Plans are an accurate record of the works undertaken and that:

- The coordinates (X,Y) are in terms of NZTM on NZGD2000
- The Levels (Z) are in terms of Auckland Vertical Datum 1946 (MSL) LINZ datum

Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates



DISCLAIMER:
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WOODS EST.1970

LEGEND

- STORMWATER MANHOLE
- STORMWATER CESSPIT
- STORMWATER DOUBLE CESSPIT
- NEW STORMWATER
- EXISTING STORMWATER
- STAGE BOUNDARY

NOTES

1. ALL WORKS AND MATERIALS COMPLY WITH AC STANDARDS FOR ENGINEERING DESIGN AND CONSTRUCTION.
2. ALL PIPE BEDDING COMPLIES WITH AC STANDARDS
3. ALL CESSPIT LEADS AND PIPES UNDER THE ROAD AND CARRIDGEWAYS ARE REINFORCED COACRETE PIPES CLASS 4 (Z) RRJ. ALL OTHER PIPELINES ARE REINFORCED COACRETE CLASS 2 (X) RRJ UNLESS OTHERWISE NOTED.
4. ALL PIPE CROSSINGS UNDER ROADS AND ACCESSWAYS HAVE BEEN HARDFILL BACKFILLED.
5. ALL SW 100mm DIA. RAMPED RISERS HAVE BEEN EXTENDED AND CAPPED OFF 1.0m BELOW THE FINISHED GROUND SURFACE.
6. ALL PRIVATE DRAINAGE CONNECTIONS ARE 100mmØ.
7. LOT BOUNDARIES ARE SUBJECT TO FINAL SURVEY.
8. ASBUILT DATA HAS BEEN SOURCED FROM A COMBINATION OF WOODS SURVEY MEASURED DATA AND CONTRACTOR RECEIVED DATA.
9. SOME INVERT LEVELS ARE MARK THE LEVELS AT THE ENTRY POINT OF DROP-PIPES INTO THE MH CHAMBER. THESE LEVELS HAVE BEEN CALCULATED FROM OBSERVATIONS TO THE TOP OF THE PIPE.

REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	KR	17/08/20
2	ISSUED FOR 224c	BP	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	SK	
CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

N

WFH PROPERTIES

ARRAN HILL PRECINCT 5 STAGE 2

STORMWATER AS-BUILT
SHEET 7 OF 7

STATUS	AS-BUILT	REV
SCALE	1:500 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-306-AB	

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2_326\DRAWINGS\SURV\ASBUILTS\37502-02-300-STORMWATER.DWG

SCHEDULE OF COORDINATES		
NAME	EASTING	NORTHING
WASTEWATER LOT CONNECTIONS		
Lot 105	1748929.59	5949230.31
Lot 106	1748955.62	5949229.77
Lot 107	1748967.34	5949226.51
Lot 108	1748983.12	5949223.10
Lot 109	1748999.71	5949219.40
Lot 110	1749014.08	5949215.75
Lot 111	1749029.71	5949211.83
Lot 112	1749046.02	5949207.24
Lot 113	1749087.95	5949196.47
Lot 114	1749104.27	5949193.03
Lot 115	1749120.15	5949188.92
Lot 116	1749136.20	5949184.66
Lot 117	1749149.83	5949181.62
Lot 118	1749166.59	5949177.64
Lot 119	1749183.91	5949173.17
Lot 120	1749199.22	5949169.04
Lot 121	1749214.86	5949165.02
Lot 122	1749228.61	5949160.95
Lot 123	1749253.18	5949154.60
Lot 124	1748944.92	5949272.25
Lot 125	1748960.64	5949268.52
Lot 126	1748975.21	5949264.72
Lot 127	1748992.71	5949260.63
Lot 128	1749008.42	5949256.55
Lot 129	1749025.13	5949252.60
Lot 130	1749040.86	5949248.61
Lot 131	1749054.38	5949245.64
Lot 132	1749097.23	5949235.75
Lot 133	1749109.38	5949231.78
Lot 134	1749124.29	5949228.10
Lot 135	1749139.08	5949224.49
Lot 136	1749153.55	5949220.45
Lot 137	1749168.79	5949216.52
Lot 138	1749183.45	5949212.91
Lot 139	1749197.17	5949209.54
Lot 140	1749213.62	5949206.24
Lot 141	1749232.19	5949202.38
THE FOLLOWING CONNECTIONS WERE INSTALLED DURING THE PREVIOUS STAGE'S CONSTRUCTION		
Lot 79	1748922.38	5949287.02
Lot 80	1748917.30	5949269.85
Lot 81	1748913.67	5949253.06
Lot 82	1748909.57	5949234.85
Lot 83	1748904.92	5949217.16
Lot 84	1748905.91	5949197.32
Lot 85	1749262.03	5949121.84
Lot 86	1749228.93	5949119.11
Lot 87	1749220.08	5949120.47
Lot 88	1749204.51	5949124.18
Lot 89	1749187.90	5949128.16
Lot 90	1749172.51	5949131.76
Lot 91	1749159.17	5949135.02
Lot 92	1749140.97	5949139.00
Lot 93	1749125.41	5949143.02
Lot 94	1749109.75	5949146.66
Lot 95	1749094.10	5949150.42
Lot 96	1749078.10	5949154.38
Lot 97	1749049.90	5949161.61
Lot 98	1749030.36	5949166.48
Lot 99	1749016.64	5949169.98
Lot 100	1748999.73	5949174.25
Lot 101	1748985.90	5949177.57
Lot 102	1748968.32	5949182.00
Lot 103	1748953.57	5949185.72
Lot 104	1748938.12	5949189.95
Lot 142	1749251.52	5949200.47

I certify that these As-built Plans are an accurate record of the works undertaken and that:

- The coordinates (X,Y) are in terms of NZTM on NZGD2000
- The Levels (Z) are in terms of Auckland Vertical Datum 1946 (MSL) LINZ datum

Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates

LEGEND

- NEW SANITARY SEWER MANHOLE
- NEW SANITARY SEWER
- EXISTING SANITARY SEWER
- STAGE BOUNDARY

NOTES

1. ALL WORKS AND MATERIALS COMPLY WITH AUCKLAND COUNCIL & WATERCARE SERVICES LTD STANDARDS FOR ENGINEERING DESIGN AND CONSTRUCTION.
2. ALL SANITARY SEWER LINES ARE 150mmØ uPVC CLASS SN16 UNLESS STATED OTHERWISE.
3. ALL PIPE BEDDING COMPLIES WITH WATERCARE STANDARDS.
4. ALL PIPE CROSSINGS UNDER ROADS AND ACCESSWAYS HAVE BEEN HARDFILL BACKFILLED.
5. ALL PRIVATE LOT CONNECTIONS ARE 100mmØ
6. LOT BOUNDARIES ARE SUBJECT TO FINAL SURVEY.
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REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	KR	17/08/20
2	ISSUED FOR 224c	KR	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	SK	
CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

ARRAN HILL PRECINCT 5 STAGE 2

WASTEWATER AS-BUILT OVERALL LAYOUT SHEET 1 OF 7

STATUS	AS BUILT	REV
SCALE	1:2000 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-400-AB	

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Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2.326\DRAWINGS\SURV\ASBUILTS\37502-02-400-SEWER.DWG

SCHEDULE OF COORDINATES		
NAME	EASTING	NORTHING
WASTEWATER LOT CONNECTIONS		
Lot 105	1748929.59	5949230.31
Lot 106	1748955.62	5949229.77
Lot 107	1748967.34	5949226.51
Lot 108	1748983.12	5949223.10
Lot 109	1748999.71	5949219.40
Lot 110	1749014.08	5949215.75
Lot 111	1749029.71	5949211.83
Lot 112	1749046.02	5949207.24
Lot 113	1749087.95	5949196.47
Lot 114	1749104.27	5949193.03
Lot 115	1749120.15	5949188.92
Lot 116	1749136.20	5949184.66
Lot 117	1749149.83	5949181.62
Lot 118	1749166.59	5949177.64
Lot 119	1749183.91	5949173.17
Lot 120	1749199.22	5949169.04
Lot 121	1749214.86	5949165.02
Lot 122	1749228.61	5949160.95
Lot 123	1749253.18	5949154.60
Lot 124	1748944.92	5949272.25
Lot 125	1748960.64	5949268.52
Lot 126	1748975.21	5949264.72
Lot 127	1748992.71	5949260.63
Lot 128	1749008.42	5949256.55
Lot 129	1749025.13	5949252.60
Lot 130	1749040.86	5949248.61
Lot 131	1749054.38	5949245.64
Lot 132	1749097.23	5949235.75
Lot 133	1749109.38	5949231.78
Lot 134	1749124.29	5949228.10
Lot 135	1749139.08	5949224.49
Lot 136	1749153.55	5949220.45
Lot 137	1749168.79	5949216.52
Lot 138	1749183.45	5949212.91
Lot 139	1749197.17	5949209.54
Lot 140	1749213.62	5949206.24
Lot 141	1749232.19	5949202.38
THE FOLLOWING CONNECTIONS WERE INSTALLED DURING THE PREVIOUS STAGE'S CONSTRUCTION		
Lot 79	1748922.38	5949287.02
Lot 80	1748917.30	5949269.85
Lot 81	1748913.67	5949253.06
Lot 82	1748909.57	5949234.85
Lot 83	1748904.92	5949217.16
Lot 84	1748905.91	5949197.32
Lot 85	1749262.03	5949121.84
Lot 86	1749228.93	5949119.11
Lot 87	1749220.08	5949120.47
Lot 88	1749204.51	5949124.18
Lot 89	1749187.90	5949128.16
Lot 90	1749172.51	5949131.76
Lot 91	1749159.17	5949135.02
Lot 92	1749140.97	5949139.00
Lot 93	1749125.41	5949143.02
Lot 94	1749109.75	5949146.66
Lot 95	1749094.10	5949150.42
Lot 96	1749078.10	5949154.38
Lot 97	1749049.90	5949161.61
Lot 98	1749030.36	5949166.48
Lot 99	1749016.64	5949169.98
Lot 100	1748999.73	5949174.25
Lot 101	1748985.90	5949177.57
Lot 102	1748968.32	5949182.00
Lot 103	1748953.57	5949185.72
Lot 104	1748938.12	5949189.95
Lot 142	1749251.52	5949200.47

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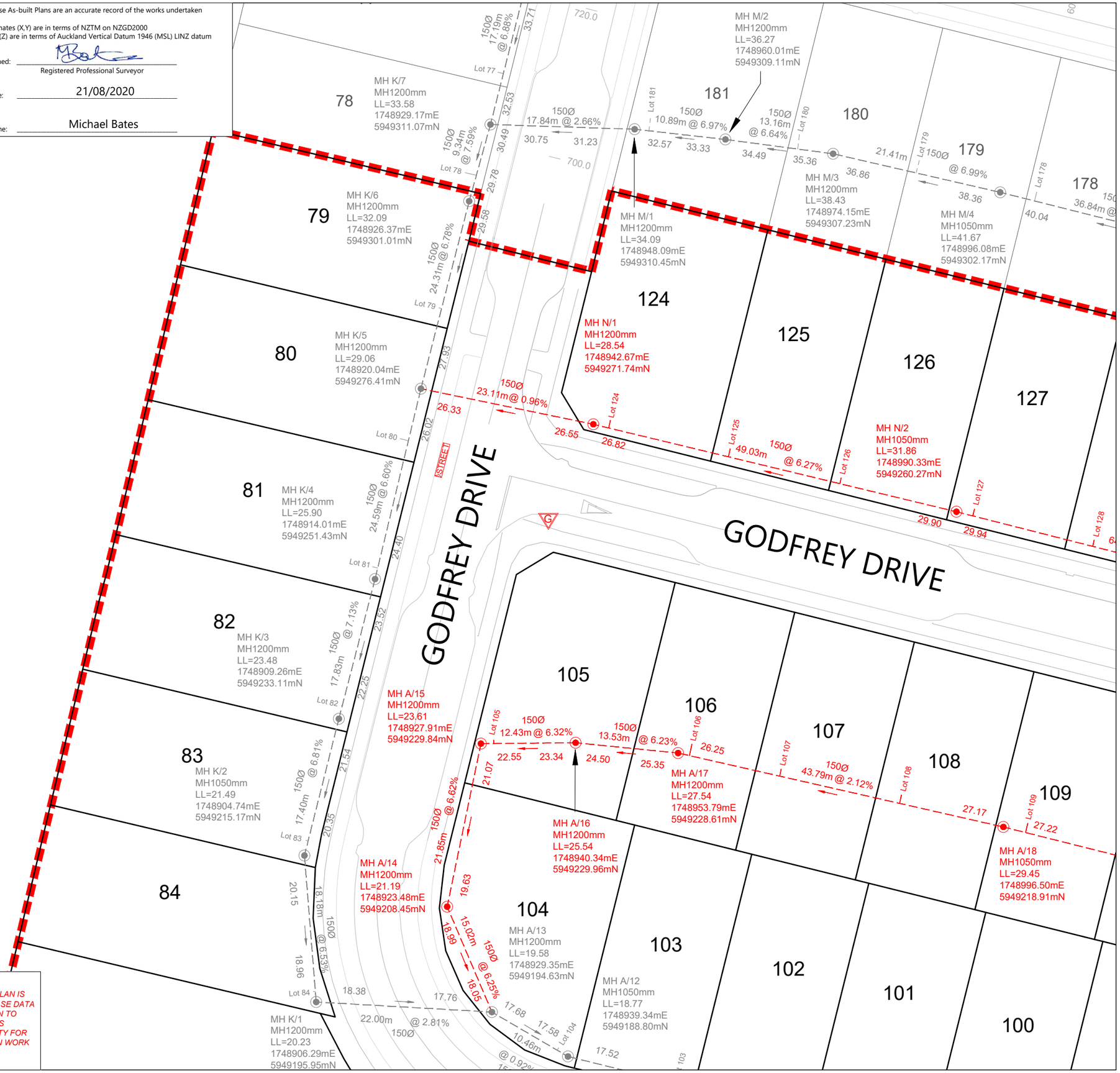
Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates



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WOODS
EST.1970

LEGEND

- NEW SANITARY SEWER MANHOLE
- NEW SANITARY SEWER
- EXISTING SANITARY SEWER
- STAGE BOUNDARY

NOTES

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REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	KR	17/08/20
2	ISSUED FOR 224c	KR	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	SK	
CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

N

WFH PROPERTIES

ARRAN HILL PRECINCT 5 STAGE 2

WASTEWATER AS-BUILT SHEET 2 OF 7

STATUS	AS BUILT	REV
SCALE	1:500 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-401-AB	

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2_326\DRAWINGS\SURV\ASBUILTS\37502-02-400-SEWER.DWG

SCHEDULE OF COORDINATES		
NAME	EASTING	NORTHING
WASTEWATER LOT CONNECTIONS		
Lot 105	1748929.59	5949230.31
Lot 106	1748955.62	5949229.77
Lot 107	1748967.34	5949226.51
Lot 108	1748983.12	5949223.10
Lot 109	1748999.71	5949219.40
Lot 110	1749014.08	5949215.75
Lot 111	1749029.71	5949211.83
Lot 112	1749046.02	5949207.24
Lot 113	1749087.95	5949196.47
Lot 114	1749104.27	5949193.03
Lot 115	1749120.15	5949188.92
Lot 116	1749136.20	5949184.66
Lot 117	1749149.83	5949181.62
Lot 118	1749166.59	5949177.64
Lot 119	1749183.91	5949173.17
Lot 120	1749199.22	5949169.04
Lot 121	1749214.86	5949165.02
Lot 122	1749228.61	5949160.95
Lot 123	1749253.18	5949154.60
Lot 124	1748944.92	5949272.25
Lot 125	1748960.64	5949268.52
Lot 126	1748975.21	5949264.72
Lot 127	1748992.71	5949260.63
Lot 128	1749008.42	5949256.55
Lot 129	1749025.13	5949252.60
Lot 130	1749040.86	5949248.61
Lot 131	1749054.38	5949245.64
Lot 132	1749097.23	5949235.75
Lot 133	1749109.38	5949231.78
Lot 134	1749124.29	5949228.10
Lot 135	1749139.08	5949224.49
Lot 136	1749153.55	5949220.45
Lot 137	1749168.79	5949216.52
Lot 138	1749183.45	5949212.91
Lot 139	1749197.17	5949209.54
Lot 140	1749213.62	5949206.24
Lot 141	1749232.19	5949202.38
THE FOLLOWING CONNECTIONS WERE INSTALLED DURING THE PREVIOUS STAGE'S CONSTRUCTION		
Lot 79	1748922.38	5949287.02
Lot 80	1748917.30	5949269.85
Lot 81	1748913.67	5949253.06
Lot 82	1748909.57	5949234.85
Lot 83	1748904.92	5949217.16
Lot 84	1748905.91	5949197.32
Lot 85	1749262.03	5949121.84
Lot 86	1749228.93	5949119.11
Lot 87	1749220.08	5949120.47
Lot 88	1749204.51	5949124.18
Lot 89	1749187.90	5949128.16
Lot 90	1749172.51	5949131.76
Lot 91	1749159.17	5949135.02
Lot 92	1749140.97	5949139.00
Lot 93	1749125.41	5949143.02
Lot 94	1749109.75	5949146.66
Lot 95	1749094.10	5949150.42
Lot 96	1749078.10	5949154.38
Lot 97	1749049.90	5949161.61
Lot 98	1749030.36	5949166.48
Lot 99	1749016.64	5949169.98
Lot 100	1748999.73	5949174.25
Lot 101	1748985.90	5949177.57
Lot 102	1748968.32	5949182.00
Lot 103	1748953.57	5949185.72
Lot 104	1748938.12	5949189.95
Lot 142	1749251.52	5949200.47

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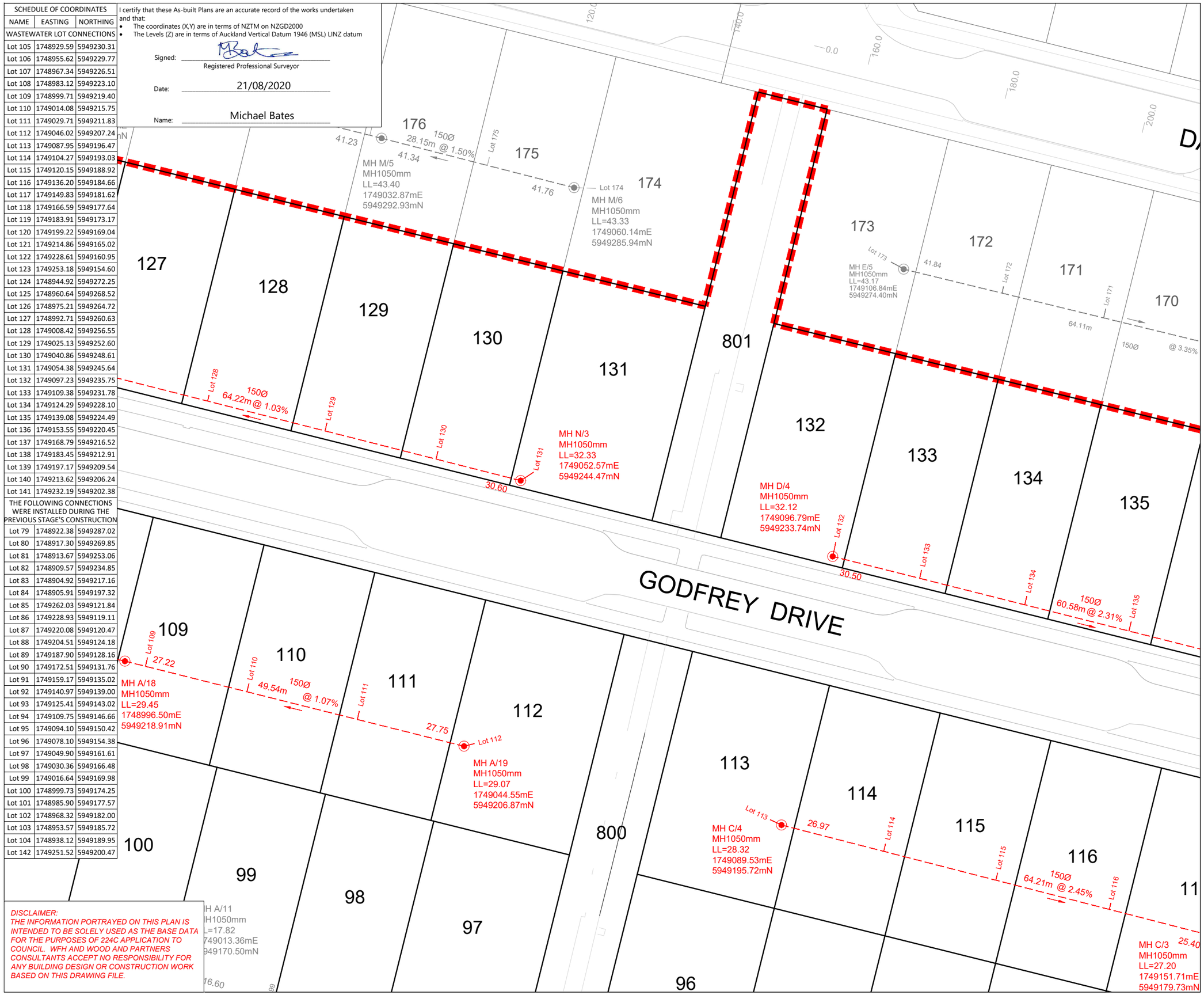
- The Levels (Z) are in terms of Auckland Vertical Datum 1946 (MSL) LINZ datum

Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates



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WOODS
EST.1970

LEGEND

- NEW SANITARY SEWER MANHOLE
- NEW SANITARY SEWER
- EXISTING SANITARY SEWER
- STAGE BOUNDARY

NOTES

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4. ALL PIPE CROSSINGS UNDER ROADS AND ACCESSWAYS HAVE BEEN HARDFILL BACKFILLED.
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REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	KR	17/08/20
2	ISSUED FOR 224c	KR	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	SK	
CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

N

WFH PROPERTIES

ARRAN HILL PRECINCT 5 STAGE 2

WASTEWATER AS-BUILT
SHEET 3 OF 7

STATUS	AS BUILT	REV
SCALE	1:500 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-402-AB	

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2.326\DRAWINGS\SURV\ASBUILTS\37502-02-400-SEWER.DWG

SCHEDULE OF COORDINATES		
NAME	EASTING	NORTHING
WASTEWATER LOT CONNECTIONS		
Lot 105	1748929.59	5949230.31
Lot 106	1748955.62	5949229.77
Lot 107	1748967.34	5949226.51
Lot 108	1748983.12	5949223.10
Lot 109	1748999.71	5949219.40
Lot 110	1749014.08	5949215.75
Lot 111	1749029.71	5949211.83
Lot 112	1749046.02	5949207.24
Lot 113	1749087.95	5949196.47
Lot 114	1749104.27	5949193.03
Lot 115	1749120.15	5949188.92
Lot 116	1749136.20	5949184.66
Lot 117	1749149.83	5949181.62
Lot 118	1749166.59	5949177.64
Lot 119	1749183.91	5949173.17
Lot 120	1749199.22	5949169.04
Lot 121	1749214.86	5949165.02
Lot 122	1749228.61	5949160.95
Lot 123	1749253.18	5949154.60
Lot 124	1748944.92	5949272.25
Lot 125	1748960.64	5949268.52
Lot 126	1748975.21	5949264.72
Lot 127	1748992.71	5949260.63
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Lot 130	1749040.86	5949248.61
Lot 131	1749054.38	5949245.64
Lot 132	1749097.23	5949235.75
Lot 133	1749109.38	5949231.78
Lot 134	1749124.29	5949228.10
Lot 135	1749139.08	5949224.49
Lot 136	1749153.55	5949220.45
Lot 137	1749168.79	5949216.52
Lot 138	1749183.45	5949212.91
Lot 139	1749197.17	5949209.54
Lot 140	1749213.62	5949206.24
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Lot 82	1748909.57	5949234.85
Lot 83	1748904.92	5949217.16
Lot 84	1748905.91	5949197.32
Lot 85	1749262.03	5949121.84
Lot 86	1749228.93	5949119.11
Lot 87	1749220.08	5949120.47
Lot 88	1749204.51	5949124.18
Lot 89	1749187.90	5949128.16
Lot 90	1749172.51	5949131.76
Lot 91	1749159.17	5949135.02
Lot 92	1749140.97	5949139.00
Lot 93	1749125.41	5949143.02
Lot 94	1749109.75	5949146.66
Lot 95	1749094.10	5949150.42
Lot 96	1749078.10	5949154.38
Lot 97	1749049.90	5949161.61
Lot 98	1749030.36	5949166.48
Lot 99	1749016.64	5949169.98
Lot 100	1748999.73	5949174.25
Lot 101	1748985.90	5949177.57
Lot 102	1748968.32	5949182.00
Lot 103	1748953.57	5949185.72
Lot 104	1748938.12	5949189.95
Lot 142	1749251.52	5949200.47

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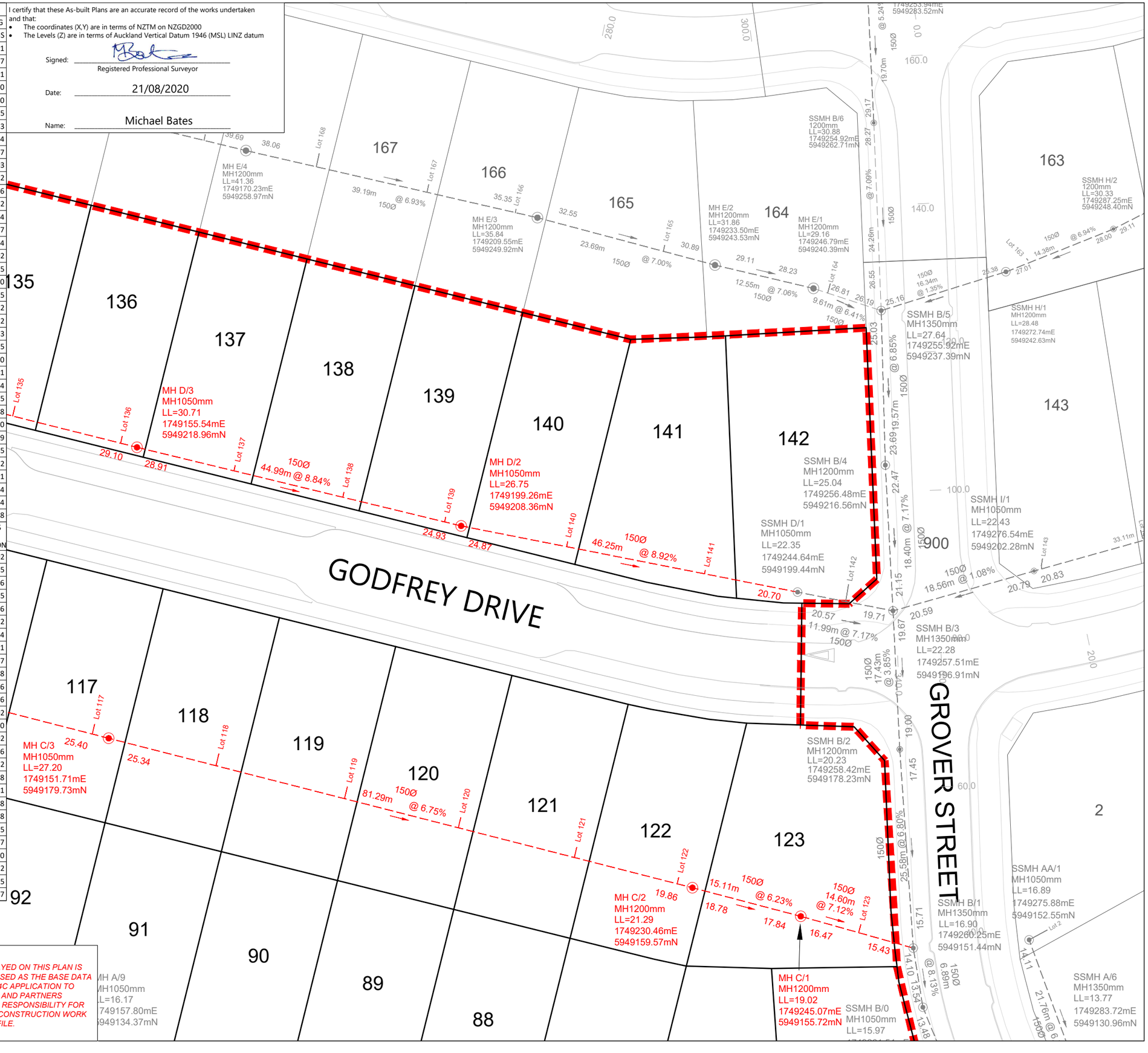
Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates



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WOODS
EST.1970

LEGEND

- NEW SANITARY SEWER MANHOLE
- NEW SANITARY SEWER
- EXISTING SANITARY SEWER
- STAGE BOUNDARY

NOTES

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REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	KR	17/08/20
2	ISSUED FOR 224c	KR	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	SK	
CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

N

WFH PROPERTIES

ARRAN HILL PRECINCT 5 STAGE 2

WASTEWATER AS-BUILT SHEET 4 OF 7

STATUS	AS BUILT	REV
SCALE	1:500 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-403-AB	

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2_326\DRAWINGS\SURV\ASBUILTS\37502-02-400-SEWER.DWG

SCHEDULE OF COORDINATES		
NAME	EASTING	NORTHING
WASTEWATER LOT CONNECTIONS		
Lot 105	1748929.59	5949230.31
Lot 106	1748955.62	5949229.77
Lot 107	1748967.34	5949226.51
Lot 108	1748983.12	5949223.10
Lot 109	1748999.71	5949219.40
Lot 110	1749014.08	5949215.75
Lot 111	1749029.71	5949211.83
Lot 112	1749046.02	5949207.24
Lot 113	1749087.95	5949196.47
Lot 114	1749104.27	5949193.03
Lot 115	1749120.15	5949188.92
Lot 116	1749136.20	5949184.66
Lot 117	1749149.83	5949181.62
Lot 118	1749166.59	5949177.64
Lot 119	1749183.91	5949173.17
Lot 120	1749199.22	5949169.04
Lot 121	1749214.86	5949165.02
Lot 122	1749228.61	5949160.95
Lot 123	1749253.18	5949154.60
Lot 124	1748944.92	5949272.25
Lot 125	1748960.64	5949268.52
Lot 126	1748975.21	5949264.72
Lot 127	1748992.71	5949260.63
Lot 128	1749008.42	5949256.55
Lot 129	1749025.13	5949252.60
Lot 130	1749040.86	5949248.61
Lot 131	1749054.38	5949245.64
Lot 132	1749097.23	5949235.75
Lot 133	1749109.38	5949231.78
Lot 134	1749124.29	5949228.10
Lot 135	1749139.08	5949224.49
Lot 136	1749153.55	5949220.45
Lot 137	1749168.79	5949216.52
Lot 138	1749183.45	5949212.91
Lot 139	1749197.17	5949209.54
Lot 140	1749213.62	5949206.24
Lot 141	1749232.19	5949202.38
THE FOLLOWING CONNECTIONS WERE INSTALLED DURING THE PREVIOUS STAGE'S CONSTRUCTION		
Lot 79	1748922.38	5949287.02
Lot 80	1748917.30	5949269.85
Lot 81	1748913.67	5949253.06
Lot 82	1748909.57	5949234.85
Lot 83	1748904.92	5949217.16
Lot 84	1748905.91	5949197.32
Lot 85	1749262.03	5949121.84
Lot 86	1749228.93	5949119.11
Lot 87	1749220.08	5949120.47
Lot 88	1749204.51	5949124.18
Lot 89	1749187.90	5949128.16
Lot 90	1749172.51	5949131.76
Lot 91	1749159.17	5949135.02
Lot 92	1749140.97	5949139.00
Lot 93	1749125.41	5949143.02
Lot 94	1749109.75	5949146.66
Lot 95	1749094.10	5949150.42
Lot 96	1749078.10	5949154.38
Lot 97	1749049.90	5949161.61
Lot 98	1749030.36	5949166.48
Lot 99	1749016.64	5949169.98
Lot 100	1748999.73	5949174.25
Lot 101	1748985.90	5949177.57
Lot 102	1748968.32	5949182.00
Lot 103	1748953.57	5949185.72
Lot 104	1748938.12	5949189.95
Lot 142	1749251.52	5949200.47

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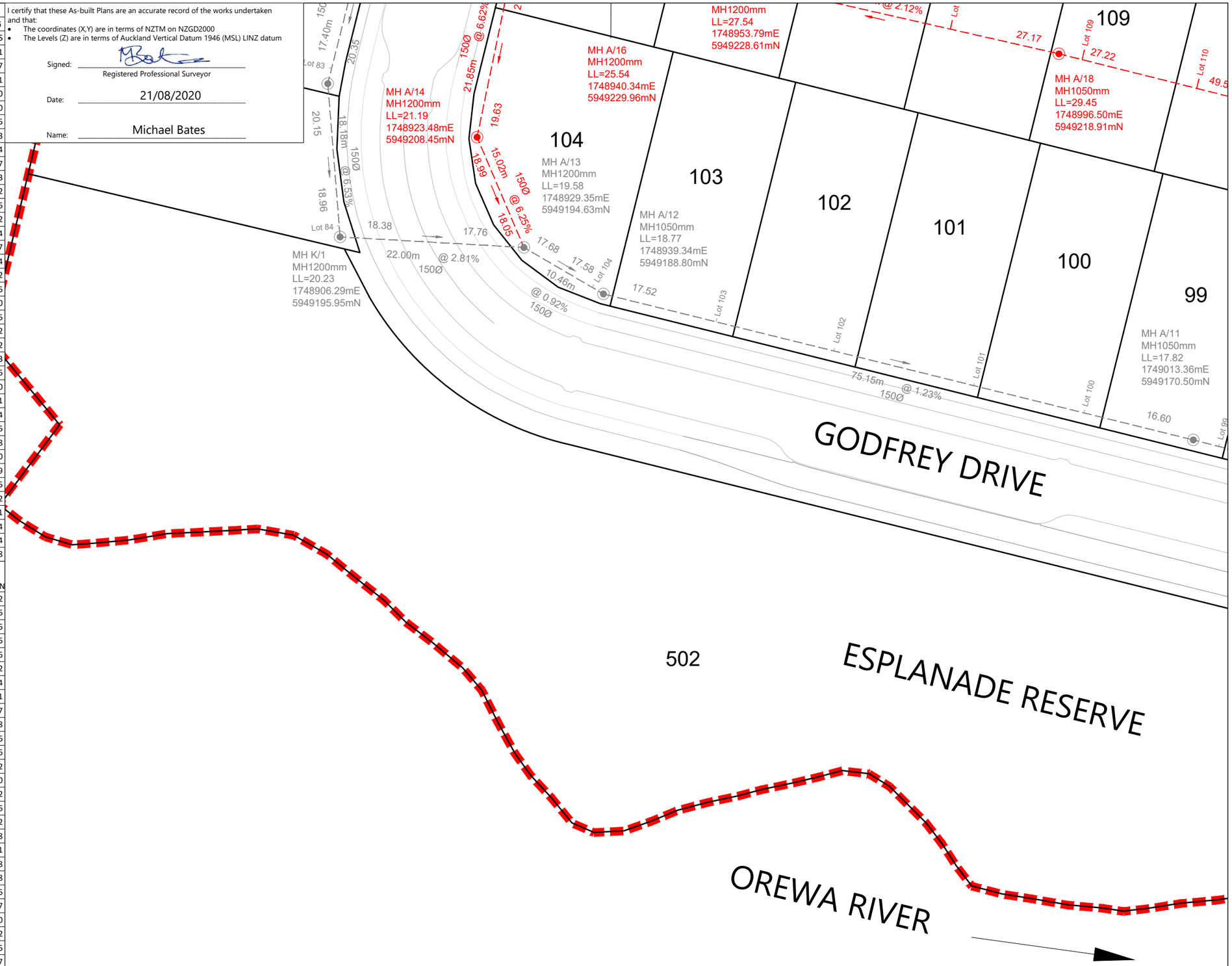
Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates



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WOODS EST.1970

LEGEND

- NEW SANITARY SEWER MANHOLE
- NEW SANITARY SEWER
- EXISTING SANITARY SEWER
- STAGE BOUNDARY

NOTES

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1	ISSUED FOR INFORMATION	KR	17/08/20
2	ISSUED FOR 224c	KR	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	SK	
CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

N

WFH PROPERTIES

ARRAN HILL PRECINCT 5 STAGE 2

WASTEWATER AS-BUILT
SHEET 5 OF 7

STATUS	AS BUILT	REV
SCALE	1:500 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-404-AB	

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2_326\DRAWINGS\SURVY\ASBUILTS\37502-02-400-SEWER.DWG

SCHEDULE OF COORDINATES		
NAME	EASTING	NORTHING
WASTEWATER LOT CONNECTIONS		
Lot 105	1748929.59	5949230.31
Lot 106	1748955.62	5949229.77
Lot 107	1748967.34	5949226.51
Lot 108	1748983.12	5949223.10
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Lot 113	1749087.95	5949196.47
Lot 114	1749104.27	5949193.03
Lot 115	1749120.15	5949188.92
Lot 116	1749136.20	5949184.66
Lot 117	1749149.83	5949181.62
Lot 118	1749166.59	5949177.64
Lot 119	1749183.91	5949173.17
Lot 120	1749199.22	5949169.04
Lot 121	1749214.86	5949165.02
Lot 122	1749228.61	5949160.95
Lot 123	1749253.18	5949154.60
Lot 124	1748944.92	5949272.25
Lot 125	1748960.64	5949268.52
Lot 126	1748975.21	5949264.72
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Lot 128	1749008.42	5949256.55
Lot 129	1749025.13	5949252.60
Lot 130	1749040.86	5949248.61
Lot 131	1749054.38	5949245.64
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Lot 84	1748905.91	5949197.32
Lot 85	1749262.03	5949121.84
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Lot 100	1748999.73	5949174.25
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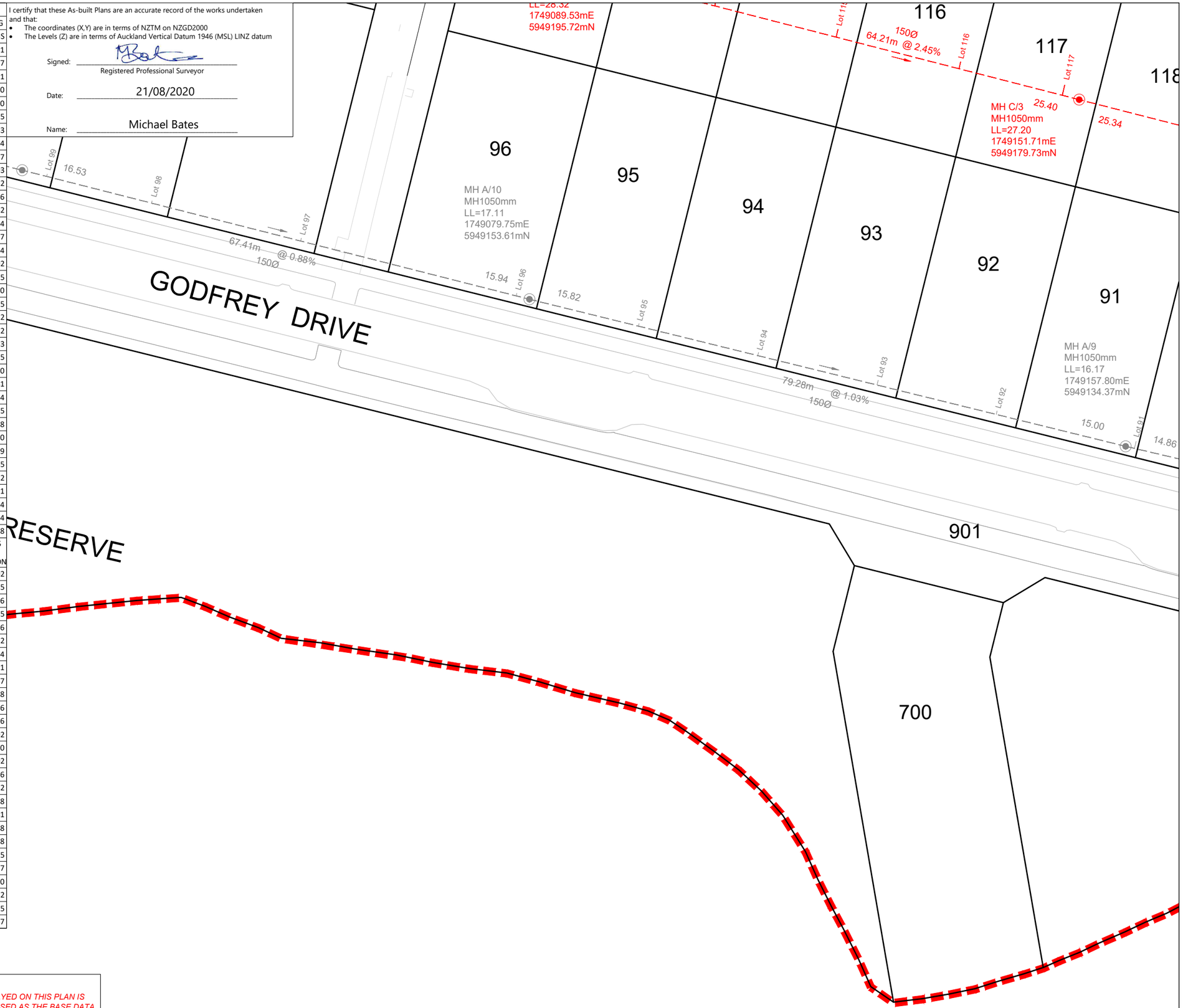

LEGEND

- NEW SANITARY SEWER MANHOLE
- NEW SANITARY SEWER
- EXISTING SANITARY SEWER
- STAGE BOUNDARY

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1	ISSUED FOR INFORMATION	KR	17/08/20
2	ISSUED FOR 224c	KR	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	SK	
CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

N

ARRAN HILL PRECINCT 5 STAGE 2

WASTEWATER AS-BUILT
SHEET 6 OF 7

STATUS	AS BUILT	REV
SCALE	1:500 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-405-AB	

DISCLAIMER:
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Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2_326\DRAWINGS\SURVASBUILTS\37502-02-400-SEWER.DWG

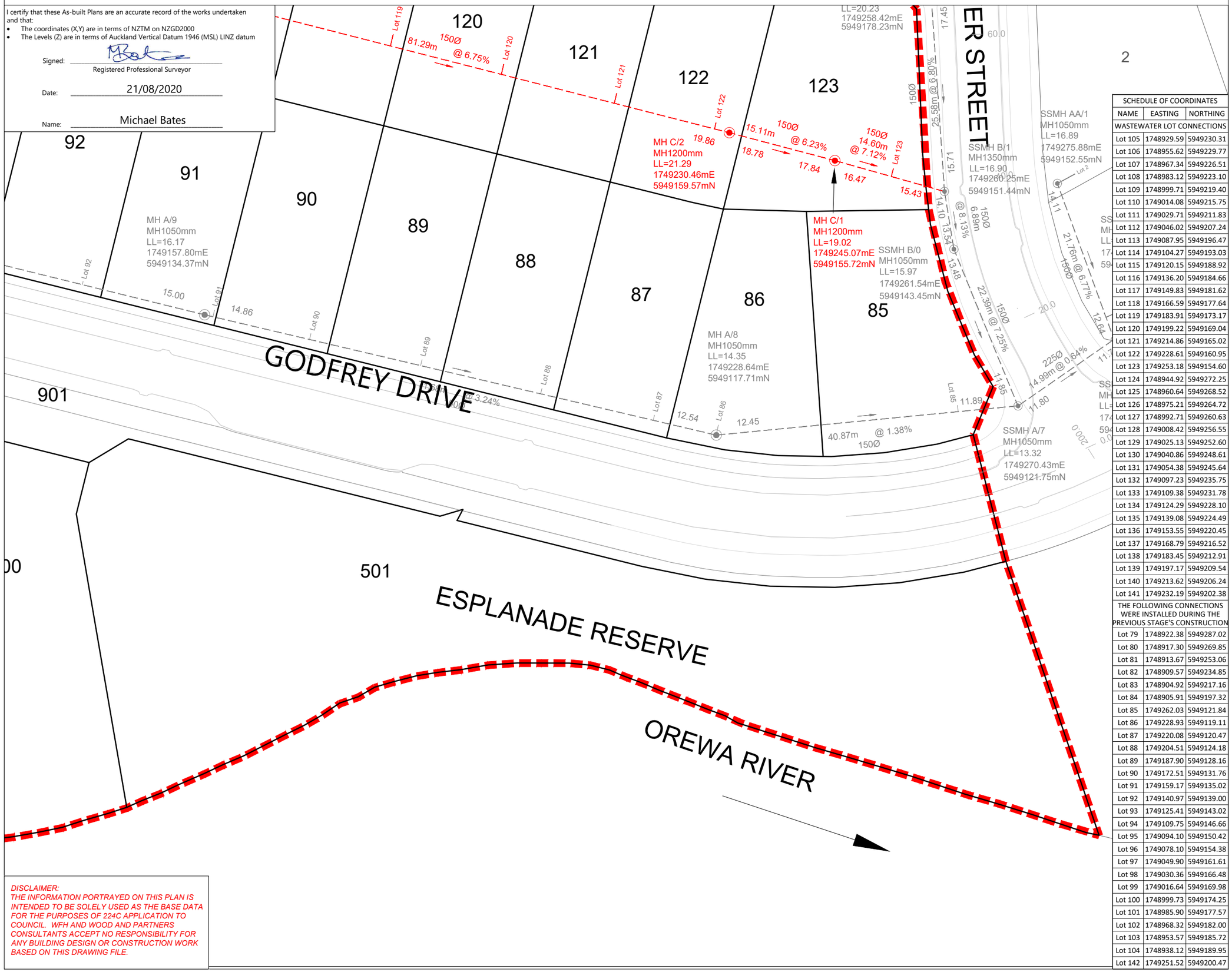
I certify that these As-built Plans are an accurate record of the works undertaken and that:

- The coordinates (X,Y) are in terms of NZTM on NZGD2000
- The Levels (Z) are in terms of Auckland Vertical Datum 1946 (MSL) LINZ datum

Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates



SCHEDULE OF COORDINATES		
NAME	EASTING	NORTHING
WASTEWATER LOT CONNECTIONS		
Lot 105	1748929.59	5949230.31
Lot 106	1748955.62	5949229.77
Lot 107	1748967.34	5949226.51
Lot 108	1748983.12	5949223.10
Lot 109	1748999.71	5949219.40
Lot 110	1749014.08	5949215.75
Lot 111	1749029.71	5949211.83
Lot 112	1749046.02	5949207.24
Lot 113	1749087.95	5949196.47
Lot 114	1749104.27	5949193.03
Lot 115	1749120.15	5949188.92
Lot 116	1749136.20	5949184.66
Lot 117	1749149.83	5949181.62
Lot 118	1749166.59	5949177.64
Lot 119	1749183.91	5949173.17
Lot 120	1749199.22	5949169.04
Lot 121	1749214.86	5949165.02
Lot 122	1749228.61	5949160.95
Lot 123	1749253.18	5949154.60
Lot 124	1748944.92	5949272.25
Lot 125	1748960.64	5949268.52
Lot 126	1748975.21	5949264.72
Lot 127	1748992.71	5949260.63
Lot 128	1749008.42	5949256.55
Lot 129	1749025.13	5949252.60
Lot 130	1749040.86	5949248.61
Lot 131	1749054.38	5949245.64
Lot 132	1749097.23	5949235.75
Lot 133	1749109.38	5949231.78
Lot 134	1749124.29	5949228.10
Lot 135	1749139.08	5949224.49
Lot 136	1749153.55	5949220.45
Lot 137	1749168.79	5949216.52
Lot 138	1749183.45	5949212.91
Lot 139	1749197.17	5949209.54
Lot 140	1749213.62	5949206.24
Lot 141	1749232.19	5949202.38
THE FOLLOWING CONNECTIONS WERE INSTALLED DURING THE PREVIOUS STAGE'S CONSTRUCTION		
Lot 79	1748922.38	5949287.02
Lot 80	1748917.30	5949269.85
Lot 81	1748913.67	5949253.06
Lot 82	1748909.57	5949234.85
Lot 83	1748904.92	5949217.16
Lot 84	1748905.91	5949197.32
Lot 85	1749262.03	5949121.84
Lot 86	1749228.93	5949119.11
Lot 87	1749220.08	5949120.47
Lot 88	1749204.51	5949124.18
Lot 89	1749187.90	5949128.16
Lot 90	1749172.51	5949131.76
Lot 91	1749159.17	5949135.02
Lot 92	1749140.97	5949139.00
Lot 93	1749125.41	5949143.02
Lot 94	1749109.75	5949146.66
Lot 95	1749094.10	5949150.42
Lot 96	1749078.10	5949154.38
Lot 97	1749049.90	5949161.61
Lot 98	1749030.36	5949166.48
Lot 99	1749016.64	5949169.98
Lot 100	1748999.73	5949174.25
Lot 101	1748985.90	5949177.57
Lot 102	1748968.32	5949182.00
Lot 103	1748953.57	5949185.72
Lot 104	1748938.12	5949189.95
Lot 142	1749251.52	5949200.47

LEGEND

- NEW SANITARY SEWER MANHOLE
- NEW SANITARY SEWER
- EXISTING SANITARY SEWER
- STAGE BOUNDARY

NOTES

1. ALL WORKS AND MATERIALS COMPLY WITH AUCKLAND COUNCIL & WATERCARE SERVICES LTD STANDARDS FOR ENGINEERING DESIGN AND CONSTRUCTION.
2. ALL SANITARY SEWER LINES ARE 150mmØ uPVC CLASS SN16 UNLESS STATED OTHERWISE.
3. ALL PIPE BEDDING COMPLIES WITH WATERCARE STANDARDS.
4. ALL PIPE CROSSINGS UNDER ROADS AND ACCESSWAYS HAVE BEEN HARDFILL BACKFILLED.
5. ALL PRIVATE LOT CONNECTIONS ARE 100mmØ
6. LOT BOUNDARIES ARE SUBJECT TO FINAL SURVEY.
7. ALL PIPE AND MH DIAMETERS ARE INTERNAL, AND SHOWN IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.
8. ASBUILT DATA HAS BEEN SOURCED FROM A COMBINATION OF WOODS SURVEY MEASURED DATA AND CONTRACTOR RECEIVED DATA.
9. SOME INVERT LEVELS ARE MARK THE LEVELS AT THE ENTRY POINT OF DROP-PIPES INTO THE MH CHAMBER. THESE LEVELS HAVE BEEN CALCULATED FROM OBSERVATIONS TO THE TOP OF THE PIPE.

REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	KR	17/08/20
2	ISSUED FOR 224c	KR	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	SK	
CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

N

ARRAN HILL PRECINCT 5 STAGE 2

WASTEWATER AS-BUILT
SHEET 7 OF 7

STATUS	AS BUILT	REV
SCALE	1:500 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-406-AB	

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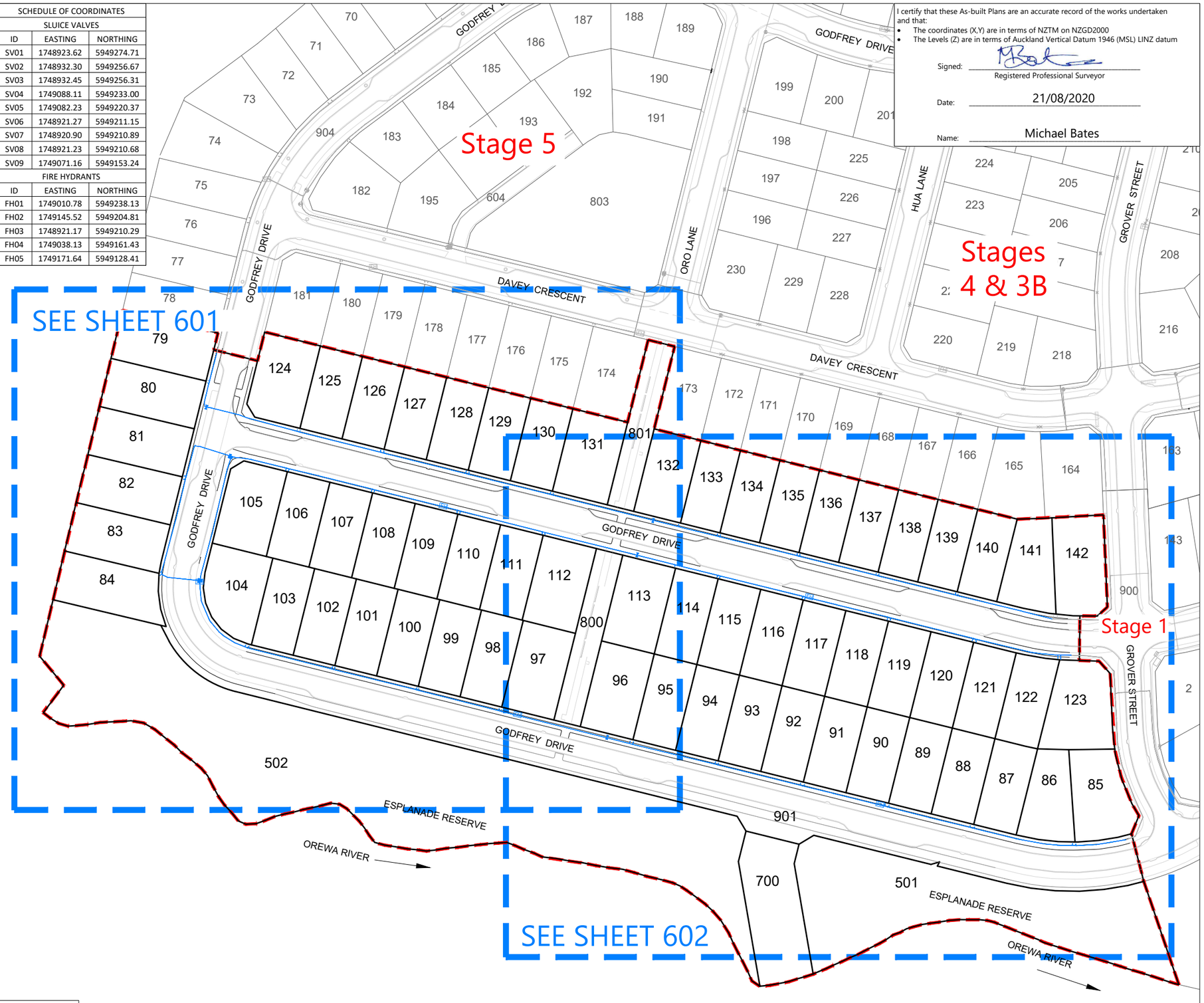
SCHEDULE OF COORDINATES		
LOT CONNECTIONS		
ID	EASTING	NORTHING
WM79	1748924.14	5949284.67
WM80	1748923.92	5949283.80
WM81	1748915.37	5949249.37
WM82	1748915.14	5949248.23
WM83	1748906.63	5949213.92
WM84	1748906.52	5949212.77
WM85	1749243.74	5949114.05
WM86	1749242.58	5949114.19
WM87	1749206.52	5949120.20
WM88	1749204.89	5949120.77
WM89	1749175.00	5949128.31
WM90	1749173.58	5949128.77
WM91	1749143.86	5949135.92
WM92	1749142.42	5949136.39
WM93	1749112.23	5949143.80
WM94	1749111.10	5949144.26
WM95	1749080.93	5949151.61
WM96	1749079.62	5949151.87
WM97	1749032.35	5949163.49
WM98	1749031.47	5949163.82
WM99	1749001.81	5949171.23
WM100	1749001.19	5949171.53
WM101	1748970.98	5949179.08
WM102	1748970.20	5949179.33
WM103	1748939.34	5949186.83
WM104	1748938.18	5949187.24
WM105	1748952.81	5949251.42
WM106	1748953.81	5949251.24
WM107	1748984.38	5949243.65
WM108	1748985.35	5949243.54
WM109	1749015.87	5949235.83
WM110	1749016.85	5949235.61
WM111	1749047.22	5949228.09
WM112	1749048.23	5949227.84
WM113	1749095.97	5949216.07
WM114	1749111.54	5949212.14
WM115	1749112.50	5949211.71
WM116	1749142.88	5949204.26
WM117	1749143.82	5949204.08
WM118	1749174.29	5949196.49
WM119	1749175.40	5949196.34
WM120	1749205.48	5949188.70
WM121	1749207.06	5949188.31
WM122	1749237.08	5949182.25
WM123	1749238.22	5949181.90
WM124	1748957.09	5949266.60
WM125	1748958.14	5949266.38
WM126	1748987.80	5949258.96
WM127	1748988.89	5949258.69
WM128	1749019.31	5949251.29
WM129	1749020.38	5949250.87
WM130	1749050.44	5949243.45
WM131	1749051.40	5949243.12
WM132	1749097.51	5949231.63
WM133	1749111.75	5949228.10
WM134	1749112.91	5949227.85
WM135	1749141.12	5949220.93
WM136	1749142.16	5949220.63
WM137	1749170.25	5949213.61
WM138	1749171.27	5949213.33
WM139	1749199.48	5949206.39
WM140	1749200.37	5949206.01
CONNECTIONS INSTALLED DURING PREVIOUS STAGES		
WM 141	1749235.57	5949198.15
WM 142	1749236.94	5949198.27

SCHEDULE OF COORDINATES		
SLUICE VALVES		
ID	EASTING	NORTHING
SV01	1748923.62	5949274.71
SV02	1748932.30	5949256.67
SV03	1748932.45	5949256.31
SV04	1749088.11	5949233.00
SV05	1749082.23	5949220.37
SV06	1748921.27	5949211.15
SV07	1748920.90	5949210.89
SV08	1748921.23	5949210.68
SV09	1749071.16	5949153.24
FIRE HYDRANTS		
ID	EASTING	NORTHING
FH01	1749010.78	5949238.13
FH02	1749145.52	5949204.81
FH03	1748921.17	5949210.29
FH04	1749038.13	5949161.43
FH05	1749171.64	5949128.41



I certify that these As-built Plans are an accurate record of the works undertaken and that:

- The coordinates (X,Y) are in terms of NZTM on NZGD2000
- The Levels (Z) are in terms of Auckland Vertical Datum 1946 (MSL) LINZ datum

Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates

WOODS
EST.1970

NOTES

1. ALL WORK AND MATERIALS COMPLIES WITH AC STANDARD FOR ENGINEERING DESIGN AND CONSTRUCTION.
2. PIPE BEDDING COMPLIES WITH AC STD DETAIL DRAWING 18000 SHEET 4.4 UNLESS OTHERWISE NOTED.
3. WATERMAINS ARE AN AVERAGE 0.6m BELOW GROUND IN BERMS AND 0.9m BELOW GROUND UNDER ROADS. HARDFILL BACKFILLED BENEATH ROAD CROSSINGS.
4. ALL PIPES ARE LAID APPROXIMATELY 1.4m OFF THE ROAD RESERVE BOUNDARY IN THE COMMON SERVICE TRENCH.
5. PIPE SIZES SHOWN ARE EXTERNAL DIAMETER.
6. LOT BOUNDARIES ARE SUBJECT TO FINAL SURVEY.
7. ASBUILT DATA HAS BEEN SOURCED FROM A COMBINATION OF WOODS SURVEY MEASURED DATA AND CONTRACTOR RECEIVED DATA.

LEGEND

- EXISTING WATERMAIN
- WATERMAIN
- SLUICE VALVE
- FIRE HYDRANT (FH)
- LOT CONNECTION (WM#)
- STAGE BOUNDARY

REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	KR	17/08/20
2	ISSUED FOR 224c	KR	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	SK	
CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

N

WFH PROPERTIES

MILLWATER PRECINCT 5 OREWA WEST STAGE 2

WATERMAIN AS-BUILT
SHEET 1 OF 3

STATUS	AS-BUILT	REV
SCALE	1:1500 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-05-600-AB	

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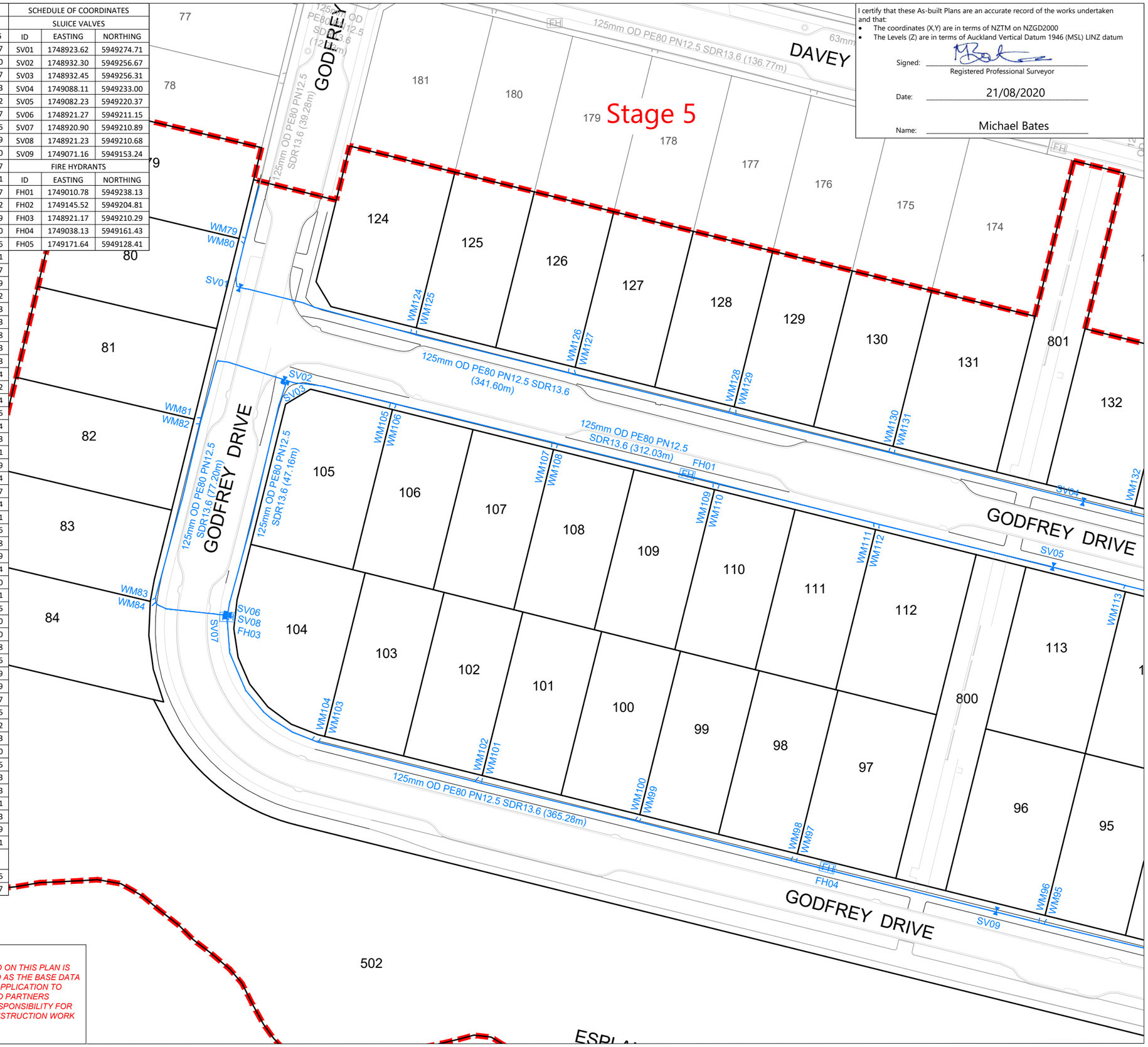
SCHEDULE OF COORDINATES		
LOT CONNECTIONS		
ID	EASTING	NORTHING
WM79	1748924.14	5949284.67
WM80	1748923.92	5949283.80
WM81	1748915.37	5949249.37
WM82	1748915.14	5949248.23
WM83	1748906.63	5949213.92
WM84	1748906.52	5949212.77
WM85	1749243.74	5949114.05
WM86	1749242.58	5949114.19
WM87	1749206.52	5949120.20
WM88	1749204.89	5949120.77
WM89	1749175.00	5949128.31
WM90	1749173.58	5949128.77
WM91	1749143.86	5949135.92
WM92	1749142.42	5949136.39
WM93	1749112.23	5949143.80
WM94	1749111.10	5949144.26
WM95	1749080.93	5949151.61
WM96	1749079.62	5949151.87
WM97	1749032.35	5949163.49
WM98	1749031.47	5949163.82
WM99	1749001.81	5949171.23
WM100	1749001.19	5949171.53
WM101	1748970.98	5949179.08
WM102	1748970.20	5949179.33
WM103	1748939.34	5949186.83
WM104	1748938.18	5949187.24
WM105	1748952.81	5949251.42
WM106	1748953.81	5949251.24
WM107	1748984.38	5949243.65
WM108	1748985.35	5949243.54
WM109	1749015.87	5949235.83
WM110	1749016.85	5949235.61
WM111	1749047.22	5949228.09
WM112	1749048.23	5949227.84
WM113	1749095.97	5949216.07
WM114	1749111.54	5949212.14
WM115	1749112.50	5949211.71
WM116	1749142.88	5949204.26
WM117	1749143.82	5949204.08
WM118	1749174.29	5949196.49
WM119	1749175.40	5949196.34
WM120	1749205.48	5949188.70
WM121	1749207.06	5949188.31
WM122	1749237.08	5949182.25
WM123	1749238.22	5949181.90
WM124	1748957.09	5949266.60
WM125	1748958.14	5949266.38
WM126	1748987.80	5949258.96
WM127	1748988.89	5949258.69
WM128	1749019.31	5949251.29
WM129	1749020.38	5949250.87
WM130	1749050.44	5949243.45
WM131	1749051.40	5949243.12
WM132	1749097.51	5949231.63
WM133	1749111.75	5949228.10
WM134	1749112.91	5949227.85
WM135	1749141.12	5949220.93
WM136	1749142.16	5949220.63
WM137	1749170.25	5949213.61
WM138	1749171.27	5949213.33
WM139	1749199.48	5949206.39
WM140	1749200.37	5949206.01
CONNECTIONS INSTALLED DURING PREVIOUS STAGES		
WM 141	1749235.57	5949198.15
WM 142	1749236.94	5949198.27

SCHEDULE OF COORDINATES		
SLUICE VALVES		
ID	EASTING	NORTHING
SV01	1748923.62	5949274.71
SV02	1748932.30	5949256.67
SV03	1748932.45	5949256.31
SV04	1749088.11	5949233.00
SV05	1749082.23	5949220.37
SV06	1748921.27	5949211.15
SV07	1748920.90	5949210.89
SV08	1748921.23	5949210.68
SV09	1749071.16	5949153.24
FIRE HYDRANTS		
ID	EASTING	NORTHING
FH01	1749010.78	5949238.13
FH02	1749145.52	5949204.81
FH03	1748921.17	5949210.29
FH04	1749038.13	5949161.43
FH05	1749171.64	5949128.41



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Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates

NOTES

1. ALL WORK AND MATERIALS COMPLIES WITH AC STANDARD FOR ENGINEERING DESIGN AND CONSTRUCTION.
2. PIPE BEDDING COMPLIES WITH AC STD DETAIL DRAWING 18000 SHEET 4.4 UNLESS OTHERWISE NOTED.
3. WATERMAINS ARE AN AVERAGE 0.6m BELOW GROUND IN BERMS AND 0.9m BELOW GROUND UNDER ROADS. HARDFILL BACKFILLED BENEATH ROAD CROSSINGS.
4. ALL PIPES ARE LAID APPROXIMATELY 1.4m OFF THE ROAD RESERVE BOUNDARY IN THE COMMON SERVICE TRENCH.
5. PIPE SIZES SHOWN ARE EXTERNAL DIAMETER.
6. LOT BOUNDARIES ARE SUBJECT TO FINAL SURVEY.
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LEGEND

- EXISTING WATERMAIN
- WATERMAIN
- SLUICE VALVE
- FIRE HYDRANT (FH)
- LOT CONNECTION (WM#)
- STAGE BOUNDARY

REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	KR	17/08/20
2	ISSUED FOR 224c	KR	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	SK	
CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

N

WFH PROPERTIES

MILLWATER PRECINCT 5
OREWA WEST
STAGE 2

WATERMAIN AS-BUILT
SHEET 2 OF 3

STATUS	AS-BUILT	REV
SCALE	1:750 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-05-601-AB	

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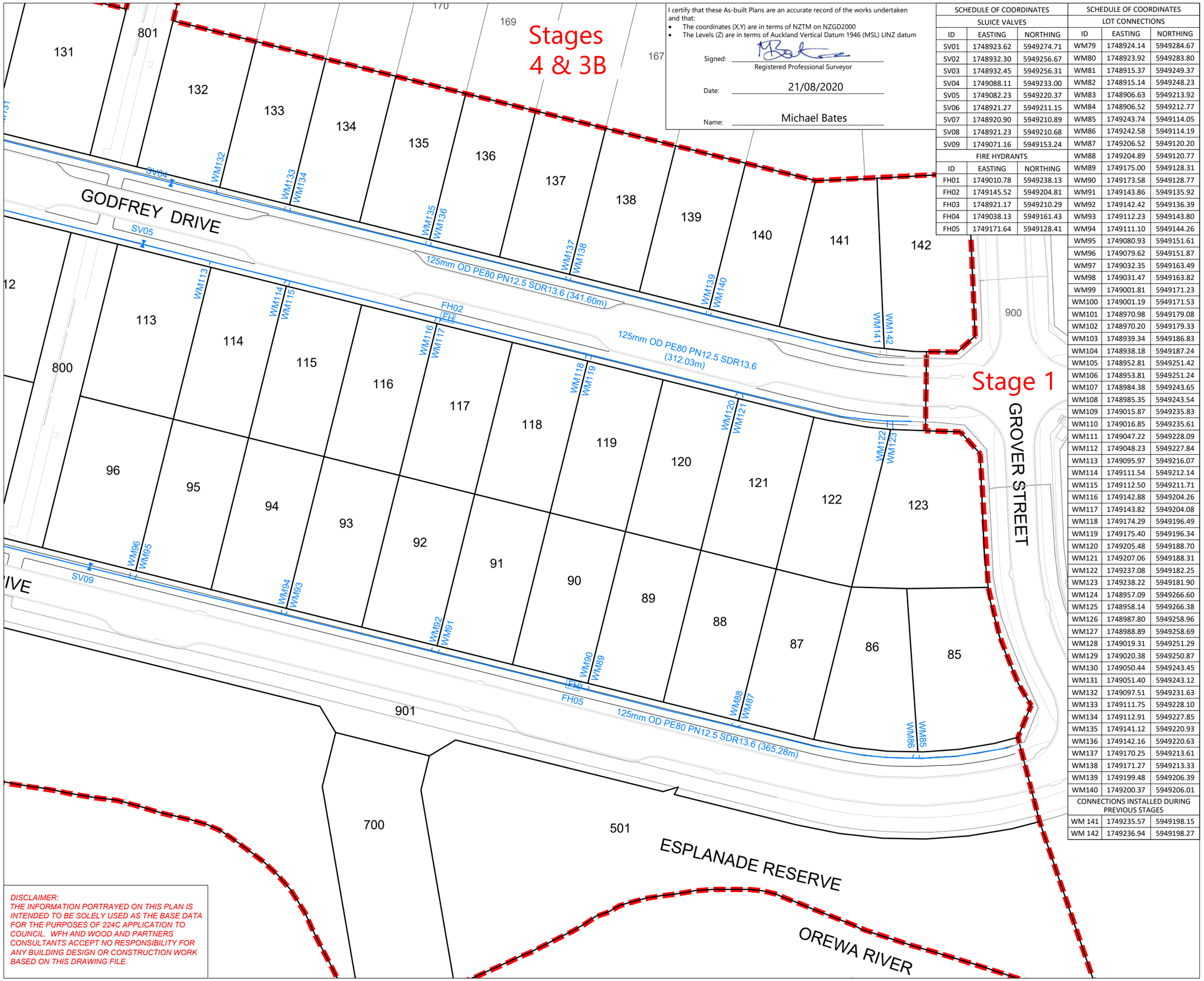

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- The Levels (Z) are in terms of Auckland Vertical Datum 1946 (MSL) LINZ datum

Signed: _____
Registered Professional Surveyor

Date: 21/08/2020

Name: Michael Bates

SCHEDULE OF COORDINATES		
SLUICE VALVES		
ID	EASTING	NORTHING
SV01	1748923.62	5949274.71
SV02	1748932.30	5949256.67
SV03	1748932.45	5949256.31
SV04	1749088.11	5949233.00
SV05	1749082.23	5949220.37
SV06	1748921.27	5949211.15
SV07	1748920.90	5949210.89
SV08	1748921.23	5949210.68
SV09	1749071.16	5949153.24
FIRE HYDRANTS		
ID	EASTING	NORTHING
FH01	1749010.78	5949238.13
FH02	1749145.52	5949204.81
FH03	1748921.17	5949210.29
FH04	1749038.13	5949161.43
FH05	1749171.64	5949128.41

SCHEDULE OF COORDINATES		
LOT CONNECTIONS		
ID	EASTING	NORTHING
WM79	1748924.14	5949284.67
WM80	1748923.92	5949283.80
WM81	1748915.37	5949249.37
WM82	1748915.14	5949248.23
WM83	1748906.63	5949213.92
WM84	1748906.52	5949212.77
WM85	1749243.74	5949114.05
WM86	1749242.58	5949114.19
WM87	1749206.52	5949120.20
WM88	1749204.89	5949120.77
WM89	1749175.00	5949128.31
WM90	1749173.58	5949128.77
WM91	1749143.86	5949135.92
WM92	1749142.42	5949136.39
WM93	1749112.23	5949143.80
WM94	1749111.10	5949144.26
WM95	1749080.93	5949151.61
WM96	1749079.62	5949151.87
WM97	1749032.35	5949163.49
WM98	1749031.47	5949163.82
WM99	1749001.81	5949171.23
WM100	1749001.19	5949171.53
WM101	1748970.98	5949179.08
WM102	1748970.20	5949179.33
WM103	1748939.34	5949186.83
WM104	1748938.18	5949187.24
WM105	1748952.81	5949251.42
WM106	1748953.81	5949251.24
WM107	1748984.38	5949243.65
WM108	1748985.35	5949243.54
WM109	1749015.87	5949235.83
WM110	1749016.85	5949235.61
WM111	1749047.22	5949228.09
WM112	1749048.23	5949227.84
WM113	1749095.97	5949216.07
WM114	1749111.54	5949212.14
WM115	1749112.50	5949211.71
WM116	1749142.88	5949204.26
WM117	1749143.82	5949204.08
WM118	1749174.29	5949196.49
WM119	1749175.40	5949196.34
WM120	1749205.48	5949188.70
WM121	1749207.06	5949188.31
WM122	1749237.08	5949182.25
WM123	1749238.22	5949181.90
WM124	1748957.09	5949266.60
WM125	1748958.14	5949266.38
WM126	1748987.80	5949258.96
WM127	1748988.89	5949258.69
WM128	1749019.31	5949251.29
WM129	1749020.38	5949250.87
WM130	1749050.44	5949243.45
WM131	1749051.40	5949243.12
WM132	1749097.51	5949231.63
WM133	1749111.75	5949228.10
WM134	1749112.91	5949227.85
WM135	1749141.12	5949220.93
WM136	1749142.16	5949220.63
WM137	1749170.25	5949213.61
WM138	1749171.27	5949213.33
WM139	1749199.48	5949206.39
WM140	1749200.37	5949206.01
CONNECTIONS INSTALLED DURING PREVIOUS STAGES		
WM 141	1749235.57	5949198.15
WM 142	1749236.94	5949198.27

DISCLAIMER:
THE INFORMATION PORTRAYED ON THIS PLAN IS INTENDED TO BE SOLELY USED AS THE BASE DATA FOR THE PURPOSES OF 224C APPLICATION TO COUNCIL. WFH AND WOOD AND PARTNERS CONSULTANTS ACCEPT NO RESPONSIBILITY FOR ANY BUILDING DESIGN OR CONSTRUCTION WORK BASED ON THIS DRAWING FILE.

WOODS
EST.1970

NOTES

1. ALL WORK AND MATERIALS COMPLIES WITH AC STANDARD FOR ENGINEERING DESIGN AND CONSTRUCTION.
2. PIPE BEDDING COMPLIES WITH AC STD DETAIL DRAWING 18000 SHEET 4.4 UNLESS OTHERWISE NOTED.
3. WATERMAINS ARE AN AVERAGE 0.6m BELOW GROUND IN BERMS AND 0.9m BELOW GROUND UNDER ROADS. HARDFILL BACKFILLED BENEATH ROAD CROSSINGS.
4. ALL PIPES ARE LAID APPROXIMATELY 1.4m OFF THE ROAD RESERVE BOUNDARY IN THE COMMON SERVICE TRENCH.
5. PIPE SIZES SHOWN ARE EXTERNAL DIAMETER.
6. LOT BOUNDARIES ARE SUBJECT TO FINAL SURVEY.
7. ASBUILT DATA HAS BEEN SOURCED FROM A COMBINATION OF WOODS SURVEY MEASURED DATA AND CONTRACTOR RECEIVED DATA.

LEGEND

- EXISTING WATERMAIN
- WATERMAIN
- SLUICE VALVE
- FIRE HYDRANT (FH)
- LOT CONNECTION (WM#)
- STAGE BOUNDARY

REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	KR	17/08/20
2	ISSUED FOR 224c	KR	21/08/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	SK	
CHECKED	AC	
APPROVED	MB	WOODS.CO.NZ

N

WFH PROPERTIES

MILLWATER PRECINCT 5
OREWA WEST
STAGE 2

WATERMAIN AS-BUILT
SHEET 3 OF 3

STATUS	AS-BUILT	REV
SCALE	1:750 @ A3	2
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-05-602-AB	

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2.326\DRAWINGS\SURVASBUILTS\37502-02-600-WATERMAIN.DWG

I certify that these As-built Plans are an accurate record of the works undertaken and that:

- The coordinates (X,Y) are in terms of NZTM on NZGD2000
- The Levels (Z) are in terms of Auckland Vertical Datum 1946 (MSL) LINZ datum

Signed: _____
Registered Professional Surveyor

Date: 21/07/20

Name: Michael Bates

WOODS
EST.1970

STATE HIGHWAY 1
GODFREY DRIVE
DAVEY CRESCENT
ORO LANE
HUA LANE
GROVER STREET
ESPLANADE RESERVE
OREWA RIVER

SEE SHEET 1301
SEE SHEET 1302
SEE SHEET 1303

LEGEND:

- BOTTOM FACE OF WALL
- TOP FACE OF WALL
- PVC 150ø SUBSOIL DRAINS
- NOVACOIL 150ø SUBSOIL DRAINS
- FENCE
- TOP OF BANK
- BOTTOM OF BANK
- BOUNDARY
- 19.05m BW — OFFSET TO BOUNDARY
- 17.05m F — OFFSET TO FENCE
- STORMWATER LINE & MANHOLE
- STORMWATER LINE & CESSPIT
- DEADMAN
- SLOPE STABILISATION DEVICE
- SUBSOIL BUBBLE-UP CHAMBER

REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	KR	21/07/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	CJ	
CHECKED	MB	
APPROVED	MB	WOODS.CO.NZ

N

WFH PROPERTIES

ARRAN HILL PRECINCT 5 STAGE 2

RETAINING WALL AS-BUILT
OVERALL LAYOUT
SHEET 1 OF 4

STATUS	AS-BUILT	REV
SCALE	1:1500 @ A3	1
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-1300-AB	

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2_326\DRAWINGS\SURV\ASBUILTS\37502-02-130-WALLS.DWG

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- The Levels (Z) are in terms of Auckland Vertical Datum 1946 (MSL) LINZ datum

Signed: _____
Registered Professional Surveyor

Date: 21/07/20

Name: Michael Bates

GODFRE

Lot 105

SL12

SL13

SL14

0.58m BW

0.55m BW

0.56m BW

0.29m BW

0.35m BW

0.50m BW

0.79m BW

BOTTOM OF ALLAN BLOCK RETAINING WALL SOUTH OF BOUNDARY

POOL STYLE FENCE ON TOP OF WALL

POOL STYLE FENCE ON TOP OF WALL

BOTTOM OF MASS BLOCK RETAINING WALL NORTH OF BOUNDARY

LEGEND:

- BOTTOM FACE OF WALL
- TOP FACE OF WALL
- PVC 150ø SUBSOIL DRAINS
- NOVACOIL 150ø SUBSOIL DRAINS
- FENCE
- TOP OF BANK
- BOTTOM OF BANK
- BOUNDARY
- 19.05m BW — OFFSET TO BOUNDARY
- 17.05m F — OFFSET TO FENCE
- STORMWATER LINE & MANHOLE
- STORMWATER LINE & CESSPIT
- DEADMAN
- SLOPE STABILISATION DEVICE
- SUBSOIL BUBBLE-UP CHAMBER

REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	KR	21/07/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	CJ	
CHECKED	MB	
APPROVED	MB	WOODS.CO.NZ

N

WFH PROPERTIES

ARRAN HILL PRECINCT 5 STAGE 2

RETAINING WALL AS-BUILT
SHEET 2 OF 4

STATUS	AS-BUILT	REV
SCALE	1:400 @ A3	1
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-1301-AB	

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2_326\DRAWINGS\SURV\ASBUILTS\37502-02-130-WALLS.DWG

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- The Levels (Z) are in terms of Auckland Vertical Datum 1946 (MSL) LINZ datum

Signed: _____
Registered Professional Surveyor

Date: 21/07/20

Name: Michael Bates

DFREY DRIVE

SL17

SL18

SL19

POOL STYLE FENCE ON TOP OF WALL

BOTTOM OF MASS BLOCK RETAINING WALL NORTH OF BOUNDARY

0.85m BW

0.41m BW

5.50m BW

0.37m BW

LEGEND:

- BOTTOM FACE OF WALL
- TOP FACE OF WALL
- PVC 150ø SUBSOIL DRAINS
- NOVACOIL 150ø SUBSOIL DRAINS
- FENCE
- TOP OF BANK
- BOTTOM OF BANK
- BOUNDARY
- 19.05m BW — OFFSET TO BOUNDARY
- 17.05m F — OFFSET TO FENCE
- STORMWATER LINE & MANHOLE
- STORMWATER LINE & CESSPIT
- DEADMAN
- SLOPE STABILISATION DEVICE
- SUBSOIL BUBBLE-UP CHAMBER

REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	KR	21/07/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	CJ	
CHECKED	MB	
APPROVED	MB	WOODS.CO.NZ

N

ARRAN HILL PRECINCT 5 STAGE 2

RETAINING WALL AS-BUILT
SHEET 3 OF 4

STATUS	AS-BUILT	REV
SCALE	1:400 @ A3	1
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-1302-AB	

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2_326\DRAWINGS\SURV\ASBUILTS\37502-02-130-WALLS.DWG

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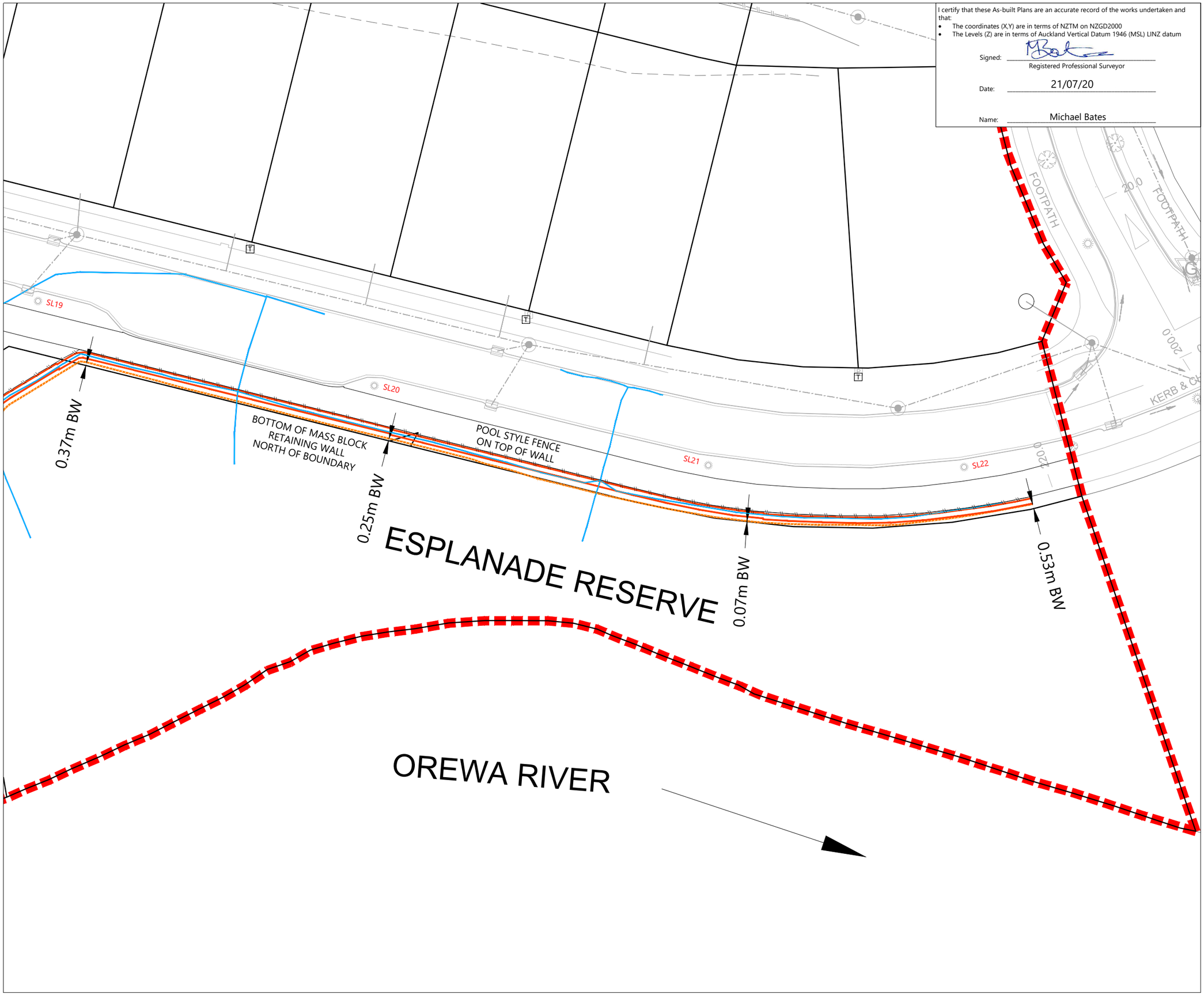
- The coordinates (X,Y) are in terms of NZTM on NZGD2000
- The Levels (Z) are in terms of Auckland Vertical Datum 1946 (MSL) LINZ datum

Signed: _____
Registered Professional Surveyor

Date: 21/07/20

Name: Michael Bates



LEGEND:

- BOTTOM FACE OF WALL
- TOP FACE OF WALL
- PVC 150ø SUBSOIL DRAINS
- NOVACOIL 150ø SUBSOIL DRAINS
- FENCE
- TOP OF BANK
- BOTTOM OF BANK
- BOUNDARY
- 19.05m BW — OFFSET TO BOUNDARY
- 17.05m F — OFFSET TO FENCE
- STORMWATER LINE & MANHOLE
- STORMWATER LINE & CESSPIT
- DEADMAN
- SLOPE STABILISATION DEVICE
- SUBSOIL BUBBLE-UP CHAMBER

REVISION DETAILS		BY	DATE
1	ISSUED FOR INFORMATION	KR	21/07/20

SURVEYED	WOODS	WOODS Ltd LEVEL 1 BUILDING B, 8 NUGENT STREET, GRAFTON AUCKLAND 1023 09 308 9229
DESIGNED	MB	
DRAWN	CJ	
CHECKED	MB	
APPROVED	MB	WOODS.CO.NZ

N

ARRAN HILL PRECINCT 5 STAGE 2

RETAINING WALL AS-BUILT
SHEET 4 OF 4

STATUS	AS-BUILT	REV
SCALE	1:400 @ A3	1
COUNCIL	AUCKLAND COUNCIL	
DWG NO	37502-02-1303-AB	

Document No. C:\12DSYNERGY\DATA\WP-PEN-APP-01\37502 - PRECINCT 5 STAGE 2_326\DRAWINGS\SURV\ASBUILTS\37502-02-130-WALLS.DWG

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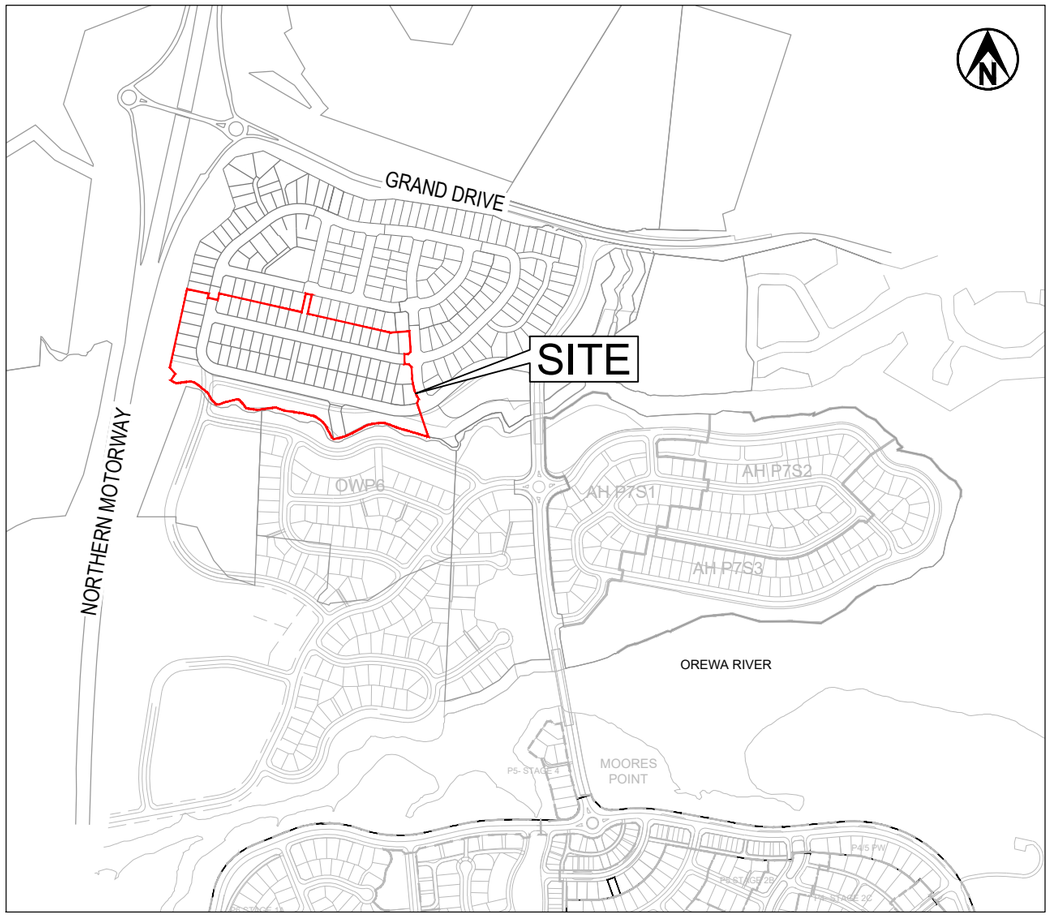
Appendix B: T+T drawings

L:\21854\21854.0031 - Orewa West Precinct 5\WorkingMaterial\CAD\DWG\GCR\STAGE 2\21854.0031-AHP5S2-100.dwg 2020-Sep-10 10:43:00 PM Plotted By: JONALD CASTRO

WFH PROPERTIES LTD
MILLWATER - ARRANS HILL
PRECINCT 5 STAGE 2
COMPLETION REPORT ISSUE

DRAWING	Rev	Title
GENERAL		
● 21854.0031-AHP5S2-100	1	DRAWING LIST AND LOCATION PLAN
● 21854.0031-AHP5S2-101	1	GEOTECHNICAL WORKS PLAN
● 21854.0031-AHP5S2-102	1	GEOTECHNICAL WORKS SUBSOIL DRAIN PLAN
● 21854.0031-AHP5S2-103	1	GEOLOGICAL CROSS SECTION 1
● 21854.0031-AHP5S2-104	1	GEOLOGICAL CROSS SECTIONS 2 & 3
● 21854.0031-AHP5S2-105	1	GEOLOGICAL CROSS SECTION 4
● 21854.0031-AHP5S2-110	1	RETAINING WALL 10 - PLAN AND ELEVATION
● 21854.0031-AHP5S2-111	1	RETAINING WALL - TYPICAL SECTION
● 21854.0031-AHP5S2-112	1	RETAINING WALL 04A & 04B - PLAN
● 21854.0031-AHP5S2-113	1	RETAINING WALL 04A - ELEVATION (SHEET 1 OF 2)
● 21854.0031-AHP5S2-114	1	RETAINING WALL 04A - ELEVATION (SHEET 2 OF 2)
● 21854.0031-AHP5S2-115	1	RETAINING WALL 04B - ELEVATION
● 21854.0031-AHP5S2-116	1	RETAINING WALLS 04A AND 04B - TYPICAL SECTION (H<3m)
● 21854.0031-AHP5S2-117	1	RETAINING WALLS 04A AND 04B - TYPICAL SECTION (3m<H≤5m)
● 21854.0031-AHP5S2-118	1	RETAINING WALLS 04A - TYPICAL SECTION WITH PALISADE WALL 1 (3m<H≤5m)
● 21854.0031-AHP5S2-119	1	RETAINING WALLS 04B - TYPICAL SECTION WITH PALISADE WALL 3 (3m<H≤5m)
● 21854.0031-AHP5S2-120	1	RETAINING WALLS 04B - TYPICAL SECTION (5m<H≤7m)
● 21854.0031-AHP5S2-121	1	RETAINING WALLS 04A - TYPICAL SECTION WITH PALISADE WALL 1 (5m<H≤7m)
● 21854.0031-AHP5S2-122	1	RETAINING WALLS 04B - TYPICAL SECTION WITH PALISADE WALL 3 (5m<H≤7m)
● 21854.0031-AHP5S2-123	1	RE SLOPE 4 & 6 - TYPICAL SECTION
● 21854.0031-AHP5S2-124	1	RE SLOPE 2 & 3 - TYPICAL SECTION
● 21854.0031-AHP5S2-125	1	RE SLOPE 9 - TYPICAL SECTION
● 21854.0031-AHP5S2-126	1	RETAINING WALLS 04A - TYPICAL SECTION WITH PALISADE WALL 2 (3m<H≤5m)
● 21854.0031-AHP5S2-130	1	SHEAR KEY 01 AND 02 PLAN
● 21854.0031-AHP5S2-131	1	SHEAR KEY 01 LONGSECTION (SHEET 1 OF 2)
● 21854.0031-AHP5S2-132	1	SHEAR KEY 01 LONGSECTION (SHEET 2 OF 2)
● 21854.0031-AHP5S2-133	1	SHEAR KEY 02 LONGSECTION (SHEET 1 OF 2)
● 21854.0031-AHP5S2-134	1	SHEAR KEY 02 LONGSECTION (SHEET 2 OF 2)
● 21854.0031-AHP5S2-135	1	GEOLOGY LEGEND AND DEFINITION OF TERMS
● 21854.0031-AHP5S2-140	1	BUILDING LIMITATION PLAN

DRAWING	Rev	Title
● 21854.0031-AHP5S2-141	1	POST EARTHWORKS INVESTIGATION PLAN
● 21854.0031-AHP5S2-142	1	TOPSOIL DEPTHS PLAN
● 21854.0031-AHP5S2-143	1	EARTHWORKS TESTING LOCATION PLAN



LOCATION PLAN
SCALE 1:10,000

● Denotes drawing this issue: 11/09/2020

Tonkin+Taylor
Exceptional thinking together www.tonkintaylor.co.nz

REV	DESCRIPTION	CAD	CHK	DATE
1	COMPLETION REPORT ISSUE	JC	JKK	Sep.20

DESIGNED	JASM	Aug.20	DRAWING STATUS: COMPLETION REPORT
DRAWN	JC	Aug.20	
DESIGN CHECKED	JKK	Sep.20	
DRAWING CHECKED	RBS	Sep.20	

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APPROVED DATE

CLIENT **WFH PROPERTIES LTD**
PROJECT **MILLWATER - ARRANS HILL**
TITLE PRECINCT 5 STAGE 2
DRAWING LIST AND LOCATION PLAN
SCALE (A3) 1:10,000 DWG No. 21854.0031-AHP5S2-100 REV 1

L:\21854\21854.0031 - Orewa West Precinct 5\WorkingMaterial\CAD\DWG\GCR\STAGE 2\21854.0031-AHP5S2-101.dwg 2020-Sep-10 10:47:48 PM Plotted By: JONALD CASTRO

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. COORDINATE DATUM: NZGD2000, MT EDEN CIRCUIT COORDINATES. ORIGIN: LAT 36 52 47S 174 45 51E 800,000MN 400,000ME
   LEVEL DATUM: LINZ (MSL) AUCKLAND VERTICAL DATUM 1946
3. LOT BOUNDARY SUPPLIED BY WOODS, REFERENCE "X_37502_P5_02_BOUNDARY.dwg", DATED 28 AUG 2020.
4. ASBUILT CONTOUR SUPPLIED BY WOODS, REFERENCE "X_37502_P5_02_FINALSURFACE.dwg", DATED DATED 28 AUG 2020.
5. UNDERCUT SUPPLIED BY WOODS, REFERENCE "X_37502_P5_02_LOWEST SURFACE.dwg", DATED 28 AUG 2020.

LEGEND

- STAGE 2 BOUNDARY
- 94 LOT BOUNDARIES
- 35.0 FINISHED GROUND PROFILE (1m INTERVAL)
- RETAINING WALL
- RE SLOPE EXTENT
- VEGETATED REINFORCED EARTH BATTER
- UNDERCUT EXTENT
- SHEAR KEY EXTENT

HISTORICAL INVESTIGATION BY TONKIN & TAYLOR

- BH12 BOREHOLES LOCATIONS (APR.07)
- TP255 TESTPIT LOCATIONS (JUN.-AUG.07)
- TP504 TESTPIT LOCATIONS (2015)
- CPT104 CONE PENETROMETER TEST LOCATIONS (2015)
- MBH2-S BOREHOLES LOCATION (2015)

A3 SCALE 1:1250

0 25 50 75 (m)

ORIGINAL IN COLOUR

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REV	DESCRIPTION	CAD	CHK	DATE
1	COMPLETION REPORT ISSUE	JC	JKK	Sep.20

DESIGNED	JASM	Aug.20	DRAWING STATUS: COMPLETION REPORT
DRAWN	JC	Aug.20	
DESIGN CHECKED	JKK	Sep.20	
DRAWING CHECKED	RBS	Sep.20	

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APPROVED DATE

CLIENT **WFH PROPERTIES LTD**

PROJECT **MILLWATER - ARRANS HILL**

TITLE PRECINCT 5 STAGE 2 GEOTECHNICAL WORKS PLAN

SCALE (A3) 1:1250 DWG No. 21854.0031-AHP5S2-101 REV 1

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NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. COORDINATE DATUM: NZGD2000, MT EDEN CIRCUIT COORDINATES. ORIGIN: LAT 36 52 47S 174 45 51E 800,000MN 400,000ME
   LEVEL DATUM: LINZ (MSL) AUCKLAND VERTICAL DATUM 1946
3. LOT BOUNDARY SUPPLIED BY WOODS, REFERENCE "X_37502_P5_02_BOUNDARY.dwg", DATED 28 AUG 2020.
4. ASBUILT CONTOUR SUPPLIED BY WOODS, REFERENCE "X_37502_P5_02_FINALSURFACE.dwg", DATED DATED 28 AUG 2020.
5. UNDERCUT SUPPLIED BY WOODS, REFERENCE "X_37502_P5_02_LOWEST SURFACE.dwg", DATED 28 AUG 2020.

UNDERCUT 1
UNDERCUT 3
RE SLOPE 4
RE SLOPE 5
SHEARKEY 2
RE SLOPE 3
RE SLOPE 2
RE SLOPE 9
SHEARKEY 1
WALL 10
WALL 04B
WALL 04A
GODFREY DRIVE
ESPLANADE RESERVE
OREWA RIVER

LEGEND

- STAGE 2 BOUNDARY
- 94 LOT BOUNDARIES
- 35.0 FINISHED GROUND PROFILE (1m INTERVAL)
- RETAINING WALL
- RE SLOPE EXTENT
- VEGETATED REINFORCED EARTH BATTER
- UNDERCUT EXTENT
- SHEAR KEY EXTENT
- SUBSOIL DRAIN
- REINFORCED EARTH SLOPE SUBSOIL DRAIN
- GULLY SUBSOIL DRAIN

A3 SCALE 1:1250
0 25 50 75 (m)
ORIGINAL IN COLOUR

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REV	DESCRIPTION	CAD	CHK	DATE
1	COMPLETION REPORT ISSUE	JC	JKK	Sep.20

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DRAWN	JC	Aug.20	
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DRAWING CHECKED	RBS	Sep.20	

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APPROVED DATE

CLIENT **WFH PROPERTIES LTD**
PROJECT **MILLWATER - ARRANS HILL**
TITLE PRECINCT 5 STAGE 2
GEOTECHNICAL WORKS SUBSOIL DRAIN PLAN
SCALE (A3) 1:1250 DWG No. 21854.0031-AHP5S2-102 REV 1

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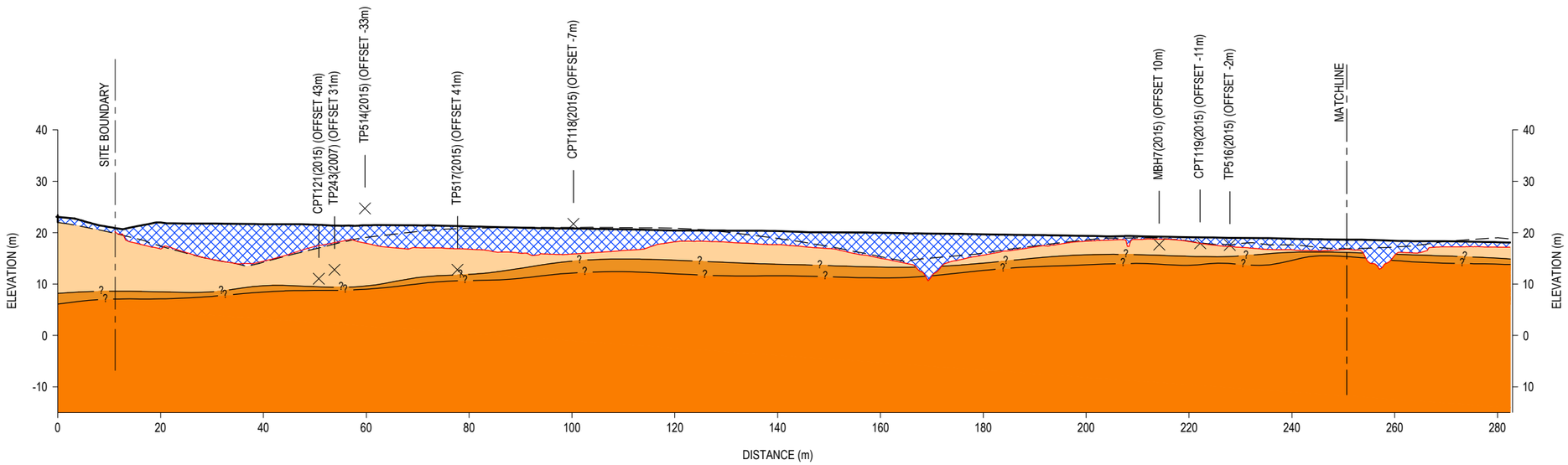
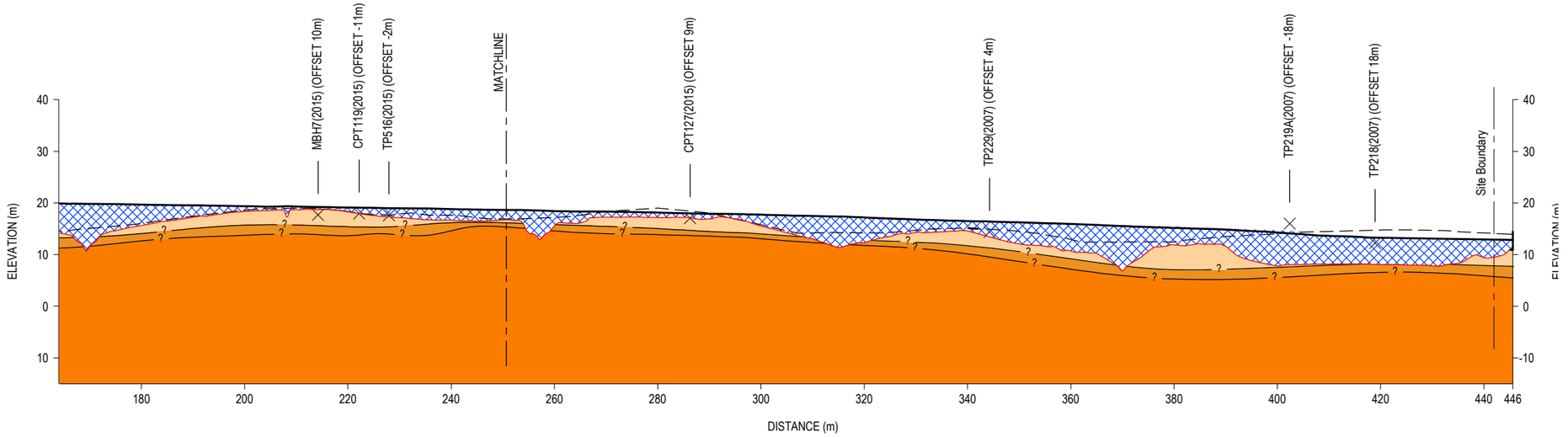
LEGEND

- GROUND PROFILE PRIOR TO PRECINCT 5 COMMENCEMENT
- FINAL GROUND PROFILE
- UNDERCUT/LOWEST SURFACE
- ? GEOLOGICAL CONTACT
- ENGINEERED FILL
- RESIDUAL-WEATHERED ECBF
- HIGHLY WEATHERED ECBF
- SLIGHTLY WEATHERED ECBF



SECTION 1/101
SCALE 1: 1000



SECTION 1/101 CONTINUED
SCALE 1: 1000

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
   LEVEL DATUM: LINZ (MSL) AUCKLAND VERTICAL DATUM 1946
2. ASBUILT CONTOUR SUPPLIED BY WOODS, REFERENCE "X_37502_P5_02_FINALSURFACE.dwg", DATED DATED 28 AUG 2020.
3. UNDERCUT SUPPLIED BY WOODS, REFERENCE "X_37502_P5_02_LOWEST SURFACE.dwg", DATED 28 AUG 2020.

A3 SCALE 1:1000
0 5 10 15 20 30 40 50 (m)

ORIGINAL IN COLOUR

Tonkin+Taylor
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REV	DESCRIPTION	CAD	CHK	DATE	APPROVED	DATE
1	COMPLETION REPORT ISSUE	JC	JKK	Sep.20	NOT FOR CONSTRUCTION	

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION PURPOSES UNLESS SIGNED AS APPROVED

DESIGNED	JASM	Aug.20
DRAWN	JC	Aug.20
DESIGN CHECKED	JKK	Sep.20
DRAWING CHECKED	RBS	Sep.20

DRAWING STATUS: COMPLETION REPORT

CLIENT: WFH PROPERTIES LTD
PROJECT: MILLWATER - ARRANS HILL
TITLE: PRECINCT 5 STAGE 2
GEOLOGICAL CROSS SECTION 1
SCALE (A3): 1:1000 DWG No. 21854.0031-AHP5S2-103 REV 1

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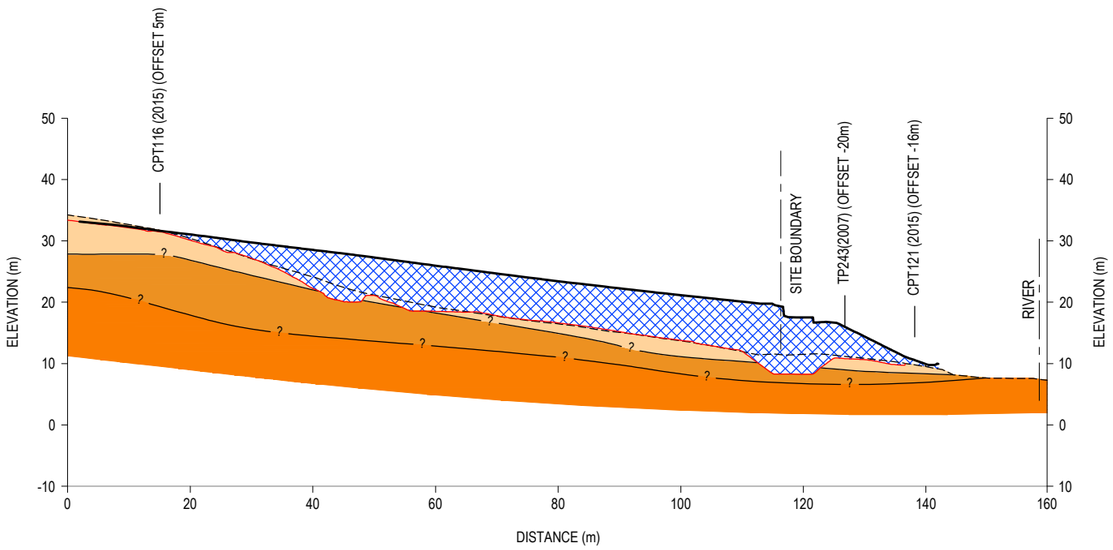
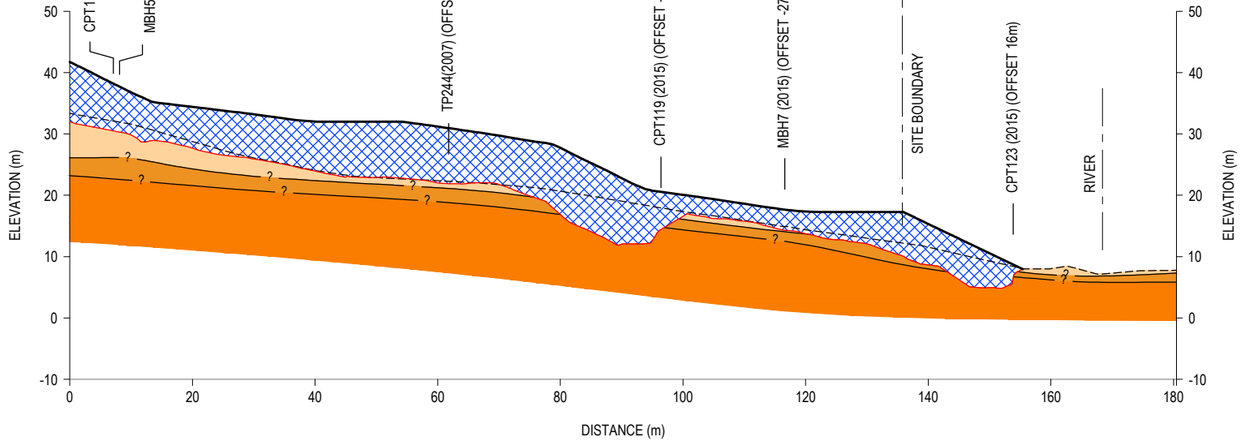
LEGEND

- GROUND PROFILE PRIOR TO PRECINCT 5 COMMENCEMENT
- FINAL GROUND PROFILE
- UNDERCUT/LOWEST SURFACE
- GEOLOGICAL CONTACT
- ENGINEERED FILL
- RESIDUAL-WEATHERED ECBF
- HIGHLY WEATHERED ECBF
- SLIGHTLY WEATHERED ECBF



SECTION 2 / 101
SCALE 1: 1000



SECTION 3 / 101
SCALE 1: 1000

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
   LEVEL DATUM: LINZ (MSL) AUCKLAND VERTICAL DATUM 1946
2. ASBUILT CONTOUR SUPPLIED BY WOODS, REFERENCE "X_37502_P5_02_FINALSURFACE.dwg", DATED DATED 28 AUG 2020.
3. UNDERCUT SUPPLIED BY WOODS, REFERENCE "X_37502_P5_02_LOWEST SURFACE.dwg", DATED 28 AUG 2020.

A3 SCALE 1:1000
0 5 10 15 20 30 40 50 (m)

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REV	DESCRIPTION	CAD	CHK	DATE
1	COMPLETION REPORT ISSUE	JC	JKK	Sep.20

DESIGNED	JASM	Aug.20
DRAWN	JC	Aug.20
DESIGN CHECKED	JKK	Sep.20
DRAWING CHECKED	RBS	Sep.20

DRAWING STATUS: COMPLETION REPORT

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APPROVED DATE

CLIENT **WFH PROPERTIES LTD**
PROJECT **MILLWATER - ARRANS HILL**
TITLE PRECINCT 5 STAGE 2
GEOLOGICAL CROSS SECTIONS 2 & 3
SCALE (A3) 1:1000 DWG No. 21854.0031-AHP5S2-104 REV 1

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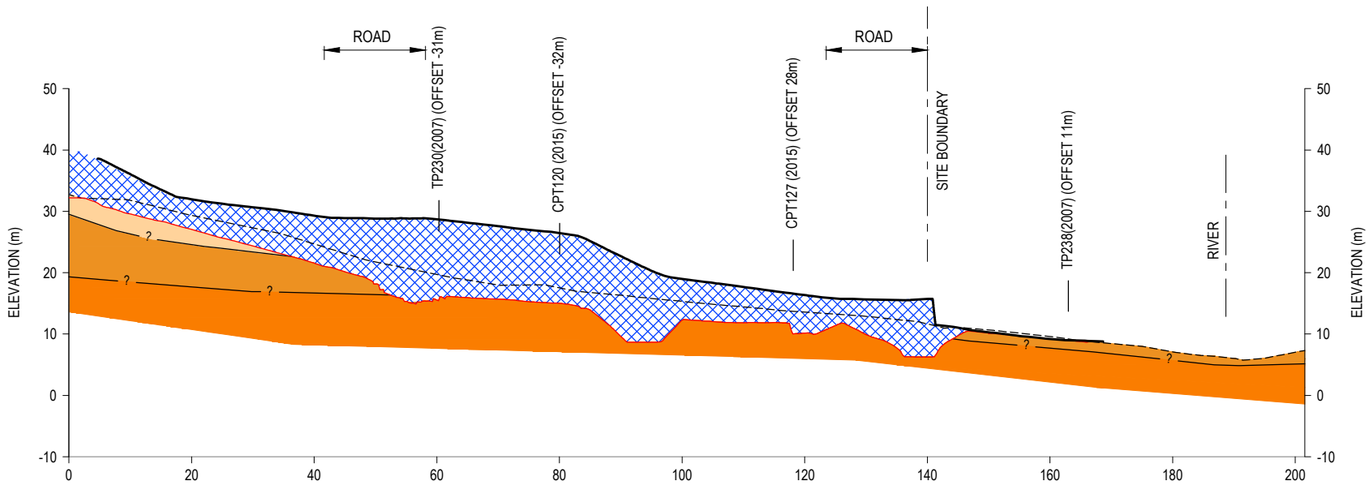
LEGEND

- GROUND PROFILE PRIOR TO PRECINCT 5 COMMENCEMENT
- FINAL GROUND PROFILE
- UNDERCUT/LOWEST SURFACE
- GEOLOGICAL CONTACT
- ENGINEERED FILL
- RESIDUAL-WEATHERED ECBF
- HIGHLY WEATHERED ECBF
- SLIGHTLY WEATHERED ECBF



SECTION 4
SCALE 1:1000 101

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
   LEVEL DATUM: LINZ (MSL) AUCKLAND VERTICAL DATUM 1946
2. ASBUILT CONTOUR SUPPLIED BY WOODS, REFERENCE "X_37502_P5_02_FINALSURFACE.dwg", DATED DATED 28 AUG 2020.
3. UNDERCUT SUPPLIED BY WOODS, REFERENCE "X_37502_P5_02_LOWEST SURFACE.dwg", DATED 28 AUG 2020.

A3 SCALE 1:1000
0 5 10 15 20 30 40 50 (m)

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1	COMPLETION REPORT ISSUE	JC	JKK	Sep.20

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DRAWING STATUS: COMPLETION REPORT

CLIENT: WFH PROPERTIES LTD
PROJECT: MILLWATER - ARRANS HILL
TITLE: PRECINCT 5 STAGE 2
GEOLOGICAL CROSS SECTION 4

SCALE (A3): 1:1000 DWG No.: 21854.0031-AHP5S2-105 REV: 1

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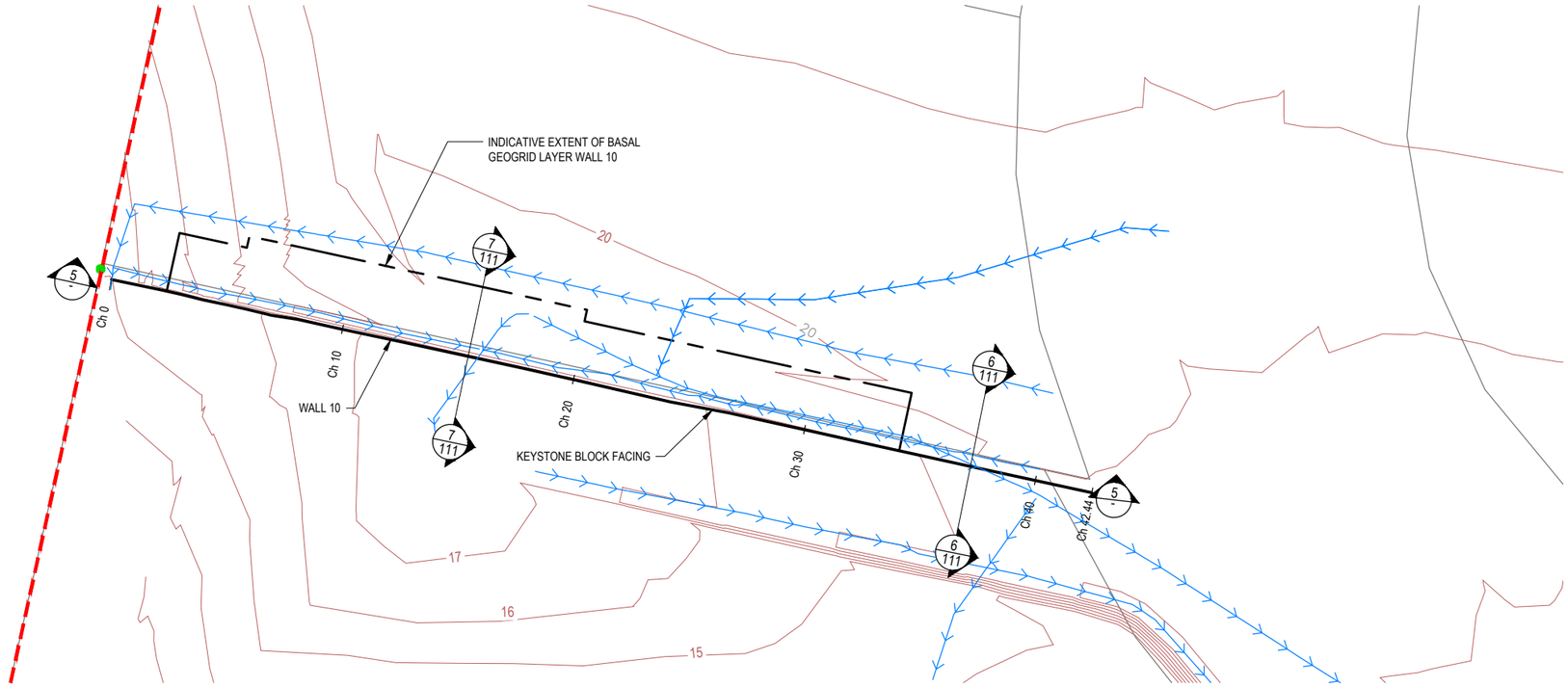
LEGEND

- LOT BOUNDARIES
- STAGE 2 BOUNDARY
- 15 — FINISHED GROUND PROFILE (1m INTERVAL)
- 40 20 — RETAINING WALL CHAINAGE (m)
- RETAINING WALL ALIGNMENT
- GEOGRID STRATAGRID SG550 AT THE BACK OF KEYSTONE BLOCK WALL
- SUBSOIL DRAIN

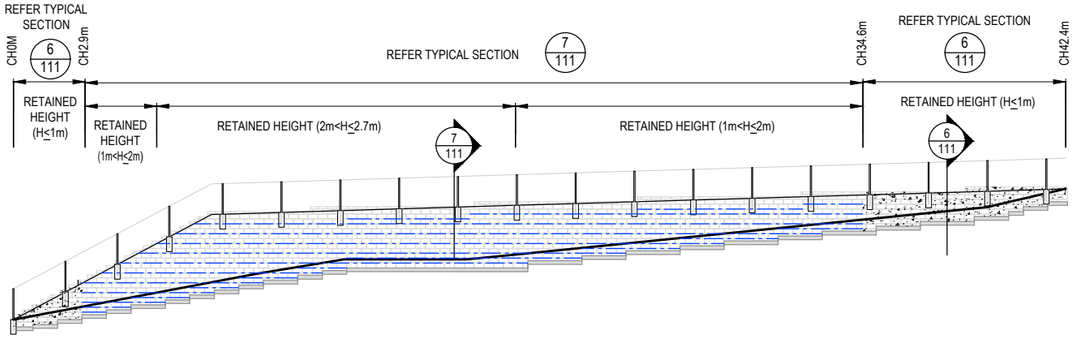
NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. COORDINATE DATUM: NZGD2000, MT EDEN CIRCUIT COORDINATES.
   LEVEL DATUM: LINZ (MSL) AUCKLAND VERTICAL DATUM 1946.
3. WALL SETOUT AS PROVIDED BY WOODS AND CONFIRMED ON SITE BY THE ENGINEER.



RETAINING WALL 10 - PLAN

SCALE 1:250



DATUM RL 13.00

TOP OF WALL (m)	14.93	16.24	17.79	19.03	19.13	19.32	19.36	19.63	19.76	19.92	20.01
TOE OF WALL (m)	14.93	15.24	15.79	16.57	17.14	17.29	17.39	18.30	18.76	19.34	20.10
HEIGHT OF WALL (m)	0.00	1.00	2.00	2.49	1.99	2.03	1.97	1.33	1.00	0.59	0.90
CHAINAGE (m)	0.00	2.93	5.85	10.00	13.60	20.00	20.99	30.00	34.64	40.00	44.44

SECTION 5/- RETAINING WALL 10 - ELEVATION

SCALE 1:250

A3 SCALE 1:250

0 5 10 15 (m)

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REV	DESCRIPTION	CAD	CHK	DATE
1	COMPLETION REPORT ISSUE	JC	JKK	Sep.20

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DRAWING CHECKED	RBS	Sep.20

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CLIENT **WFH PROPERTIES LTD**

PROJECT **MILLWATER - ARRANS HILL**

TITLE PRECINCT 5 STAGE 2
RETAINING WALL 10 - PLAN AND ELEVATION

SCALE (A3) 1:250 DWG No. 21854.0031-AHP5S2-110 REV 1

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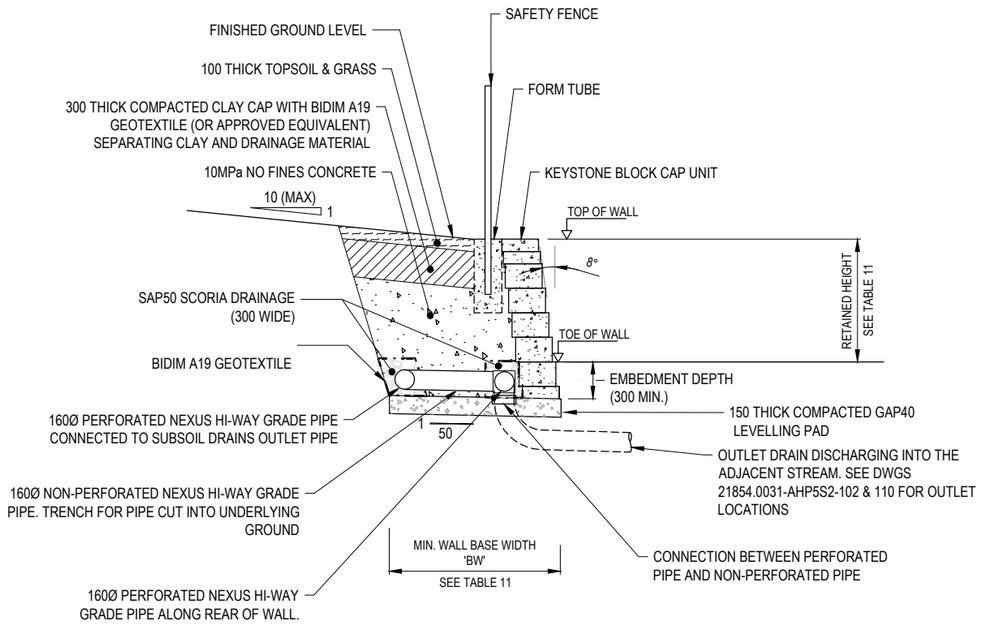
TABLE 11: RETAINING WALL 10 DETAIL TABLE

WALL TYPE	RETAINED HEIGHT (M)	MAX BACK SLOPE	MAX FORWARD SLOPE	MIN. WALL BASE WIDTH (BW) (M)	GEOGRID REQUIREMENTS		
					GEOGRID TYPE	MIN. LENGTH OF GEOGRID (M)	VERTICAL HEIGHT ABOVE TOE OF WALL (M)
KEYSTONE BLOCK	H ≤ 1	1V:10H	0°	1.4	-	-	-
KEYSTONE BLOCK	1 < H ≤ 2	1V:10H	0°	-	STRATAGRID SG550	2.5	-0.2, 0.0, 0.4
						1.5	0.8, 1.2, 1.6
KEYSTONE BLOCK	2 < H ≤ 2.7	1V:10H	0°	-	STRATAGRID SG550	3.0	-0.2, 0.0, 0.4
						2.0	0.8, 1.2, 1.6, 2.0, 2.4

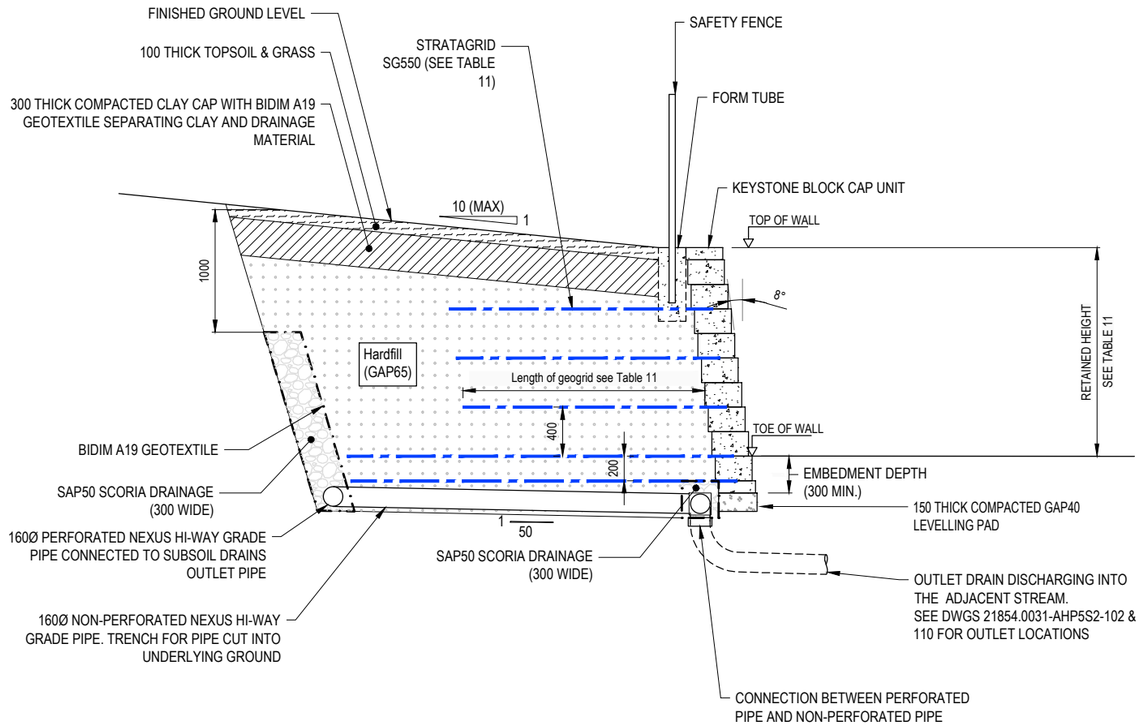
LEGEND

- BIDIM A19 GEOTEXTILE
- STRATAGRID SG550
- HARDFILL (GAP40)
- 10MPa NO FINES CONCRETE
- SAP50 SCORIA
- HARDFILL (GAP65)
- TOPSOIL & GRASS
- COMPACTED CLAY CAP

NOTES
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. WALL SETOUT AS PROVIDED BY WOODS AND CONFIRMED ON SITE BY THE ENGINEER.
3. SEE DWG.21854.0031-AHP5S5-101 FOR RETAINING WALL 10 PLAN AND LONG SECTION.



SECTION 6 KEYSTONE BLOCK WALL TYPICAL SECTION (H<1m)
SCALE 1:50 110 CHAINAGE 0 to 2.9m & CHAINAGE 34.6 to 42.9m



SECTION 7 KEYSTONE BLOCK WALL TYPICAL SECTION (1m<H<2.7m)
SCALE 1:50 110 CHAINAGE 2.9 to 34.6m

A3 SCALE 1:50
0 0.5 1.0 1.5 2.0 2.5 (m)

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CLIENT **WFH PROPERTIES LTD**
PROJECT **MILLWATER - ARRANS HILL**
TITLE PRECINCT 5 STAGE 2
RETAINING WALL 10 - TYPICAL SECTION
SCALE (A3) 1:50 DWG No. 21854.0031-AHP5S2-111 REV 1

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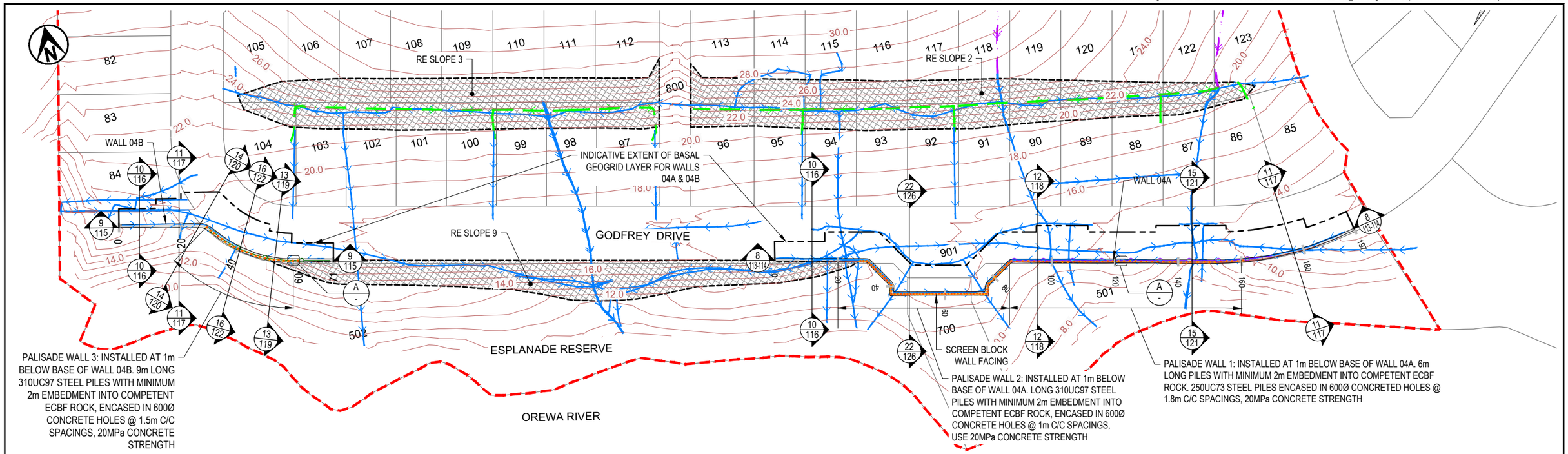
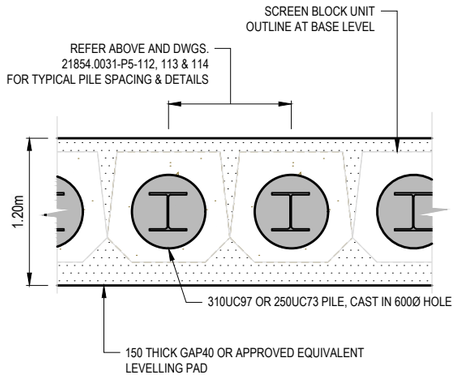


RETAINING WALL 04A & 04B - PLAN

SCALE 1:1250

LEGEND

- LOT BOUNDARIES
- STAGE 2 BOUNDARY
- 15 — FINISHED GROUND PROFILE (1m INTERVAL)
- 40 20 — RETAINING WALL CHAINAGE (m)
- RETAINING WALL ALIGNMENT
- GEOGRID STRATAGRID SG550 AT THE BACK OF KEYSTONE BLOCK WALL
- SUBSOIL DRAIN
- REINFORCED EARTH SLOPE SUBSOIL DRAIN
- GULLY SUBSOIL DRAIN
- RE SLOPE EXTENT



SECTION A - TYPICAL STEEL PILE CONFIGURATION

SCALE 1:50

NOTE: SUBSOIL DRAIN AND TENSAR RE580 GEOGRID NOT SHOWN FOR CLARITY

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. COORDINATE DATUM: NZGD2000, MT EDEN CIRCUIT COORDINATES. LEVEL DATUM: LINZ (MSL) AUCKLAND VERTICAL DATUM 1946.
3. WALL SETOUT AS PROVIDED BY WOODS AND CONFIRMED ON SITE BY THE ENGINEER.

A3 SCALE 1:1250

0 25 50 75 (m)

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CLIENT **WFH PROPERTIES LTD**

PROJECT **MILLWATER - ARRANS HILL**

TITLE PRECINCT 5 STAGE 2
RETAINING WALL 04A & 04B - PLAN

SCALE (A3) AS SHOWN DWG No. 21854.0031-AHP5S2-112 REV 1

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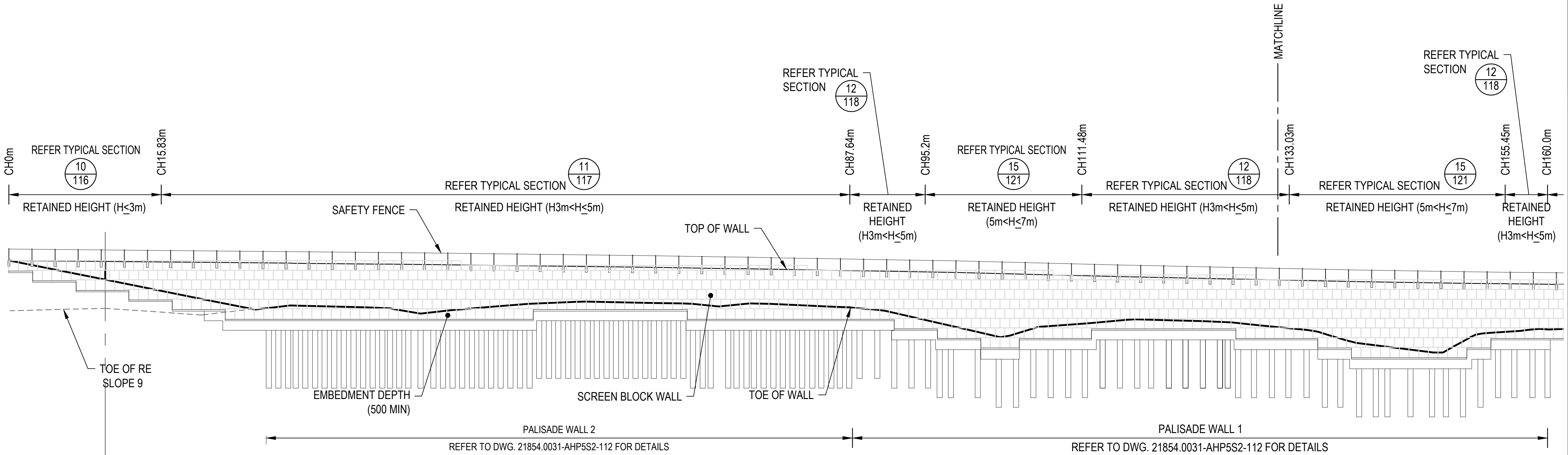

DATUM RL -5.00

HEIGHT OF WALL (m)	0.00	1.89	3.00	3.79	4.40	4.66	4.33	3.65	3.70	3.63	4.00	5.00	6.00	5.15	5.00	4.43	4.76	5.00	6.37	6.65	5.00	4.71
TOP OF WALL (m)	16.90	16.80	16.75	16.71	16.61	16.51	16.40	16.28	16.14	15.98	15.81	15.72	15.62	15.37	15.33	15.14	14.93	14.86	14.71	14.56	14.49	14.44
BOTTOM OF WALL (m)	16.90	14.91	13.75	12.91	12.22	11.86	12.07	12.63	12.44	12.35	11.80	10.72	9.62	10.22	10.33	10.71	10.16	9.86	8.34	7.90	9.49	9.73
CHAINAGE (m)	0.00	10.00	15.83	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	95.20	100.00	110.00	111.48	120.00	130.00	133.03	140.00	150.00	155.45	160.00

SECTION 8/112 RETAINING WALL 04A
SCALE 1: 500

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. LEVEL DATUM: LINZ (MSL) AUCKLAND VERTICAL DATUM 1946.
3. WALL SETOUT AS PROVIDED BY WOODS AND CONFIRMED ON SITE BY THE ENGINEER.

A3 SCALE 1:500
0 5 10 15 20 25 (m)

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1	COMPLETION REPORT ISSUE	JC	JKK	Sep.20

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DRAWING STATUS
COMPLETION REPORT

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CLIENT **WFH PROPERTIES LTD**
PROJECT **MILLWATER - ARRANS HILL**
TITLE PRECINCT 5 STAGE 2
RETAINING WALL 04A - ELEVATION (SHEET 1 OF 2)
SCALE (A3) 1:500 DWG No. 21854.0031-AHP5S2-113 REV 1

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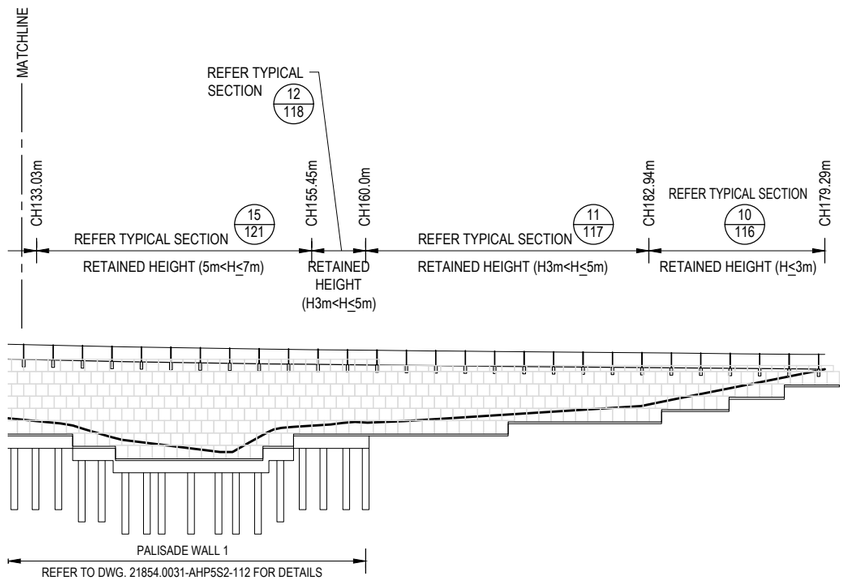

DATUM RL -5.00

HEIGHT OF WALL (m)	5.00	6.37	6.65	5.00	4.71	4.04	3.30	3.00	1.52	0.00
TOP OF WALL (m)	14.86	14.71	14.56	14.49	14.44	14.34	14.25	14.22	14.16	14.09
BOTTOM OF WALL (m)	9.86	8.34	7.90	9.49	9.73	10.30	10.94	11.22	12.63	14.09
CHAINAGE (m)	133.03	140.00	150.00	155.45	160.00	170.00	180.00	182.94	190.00	197.29

SECTION 8/112 RETAINING WALL 04A
SCALE 1: 500

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. LEVEL DATUM: LINZ (MSL) AUCKLAND VERTICAL DATUM 1946.
3. WALL SETOUT AS PROVIDED BY WOODS AND CONFIRMED ON SITE BY THE ENGINEER.

A3 SCALE 1:500
0 5 10 15 20 25 (m)

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CLIENT WFH PROPERTIES LTD
PROJECT MILLWATER - ARRANS HILL
TITLE PRECINCT 5 STAGE 2
RETAINING WALL 04A - ELEVATION (SHEET 2 OF 2)
SCALE (A3) 1:500 DWG No. 21854.0031-AHP5S2-114 REV 1

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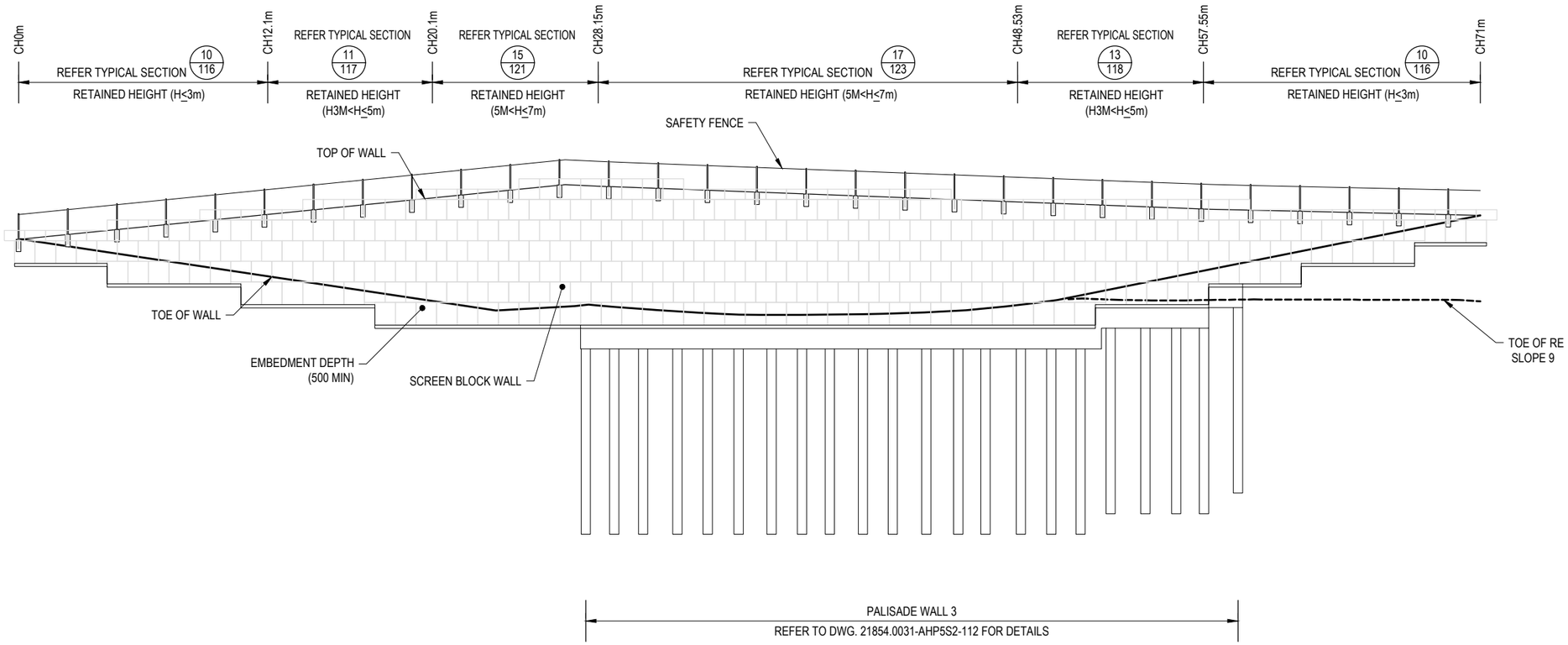

DATUM RL -5.00

TOP OF WALL (M)	17.13		18.13		18.34		19.13		19.71	19.64		19.26		18.94	18.89		18.60	18.54		18.32	18.29
TOE OF WALL (M)	17.13		15.65		15.34		14.15		14.71	13.77		13.48		13.94	14.12		15.60	16.09		18.09	18.29
HEIGHT OF WALL (M)	0.00		2.47		3.00		4.97		5.00	5.87		5.78		5.00	4.76		3.00	2.45		0.22	0.00
CHAINAGE (M)	0.00		10.00		12.10		20.00		28.15	30.00		40.00		48.53	50.00		57.55	60.00		70.00	71.00

SECTION 9/112 RETAINING WALL 04B
SCALE 1:250

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. LEVEL DATUM: LINZ (MSL) AUCKLAND VERTICAL DATUM 1946.
3. WALL SETOUT AS PROVIDED BY WOODS AND CONFIRMED ON SITE BY THE ENGINEER.

A3 SCALE 1:250

0 5 10 15 (m)

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DRAWING CHECKED	RBS	Sep.20

DRAWING STATUS: COMPLETION REPORT

CLIENT **WFH PROPERTIES LTD**

PROJECT **MILLWATER - ARRANS HILL**

TITLE PRECINCT 5 STAGE 2
RETAINING WALL 04B - ELEVATION

SCALE (A3) 1:250 DWG No. 21854.0031-AHP5S2-115 REV 1

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TABLE 1: RETAINING WALL 04A AND 04B (H≤3M) DETAIL TABLE

MAX. RETAINED HEIGHT (m)	MAX. BACK SLOPE	MAX. FORWARD SLOPE	GEOGRID TYPE	MIN. LENGTH OF GEOGRID (m)	VERTICAL LOCATION ABOVE TOE OF WALL (m)
H ≤ 3	0°	1V:3H	TENSAR RE580	6.0	0.0
				3.5	1.0, 2.0

LEGEND

- BIDIM A19 GEOTEXTILE
- TENSAR RE580
- COMPACTED CLAY CAP
- HARDFILL (GAP40)
- HIGH STRENGTH STRUCTURAL FILL
- SAP50 SCORIA
- HARDFILL (GAP65)

NOTES

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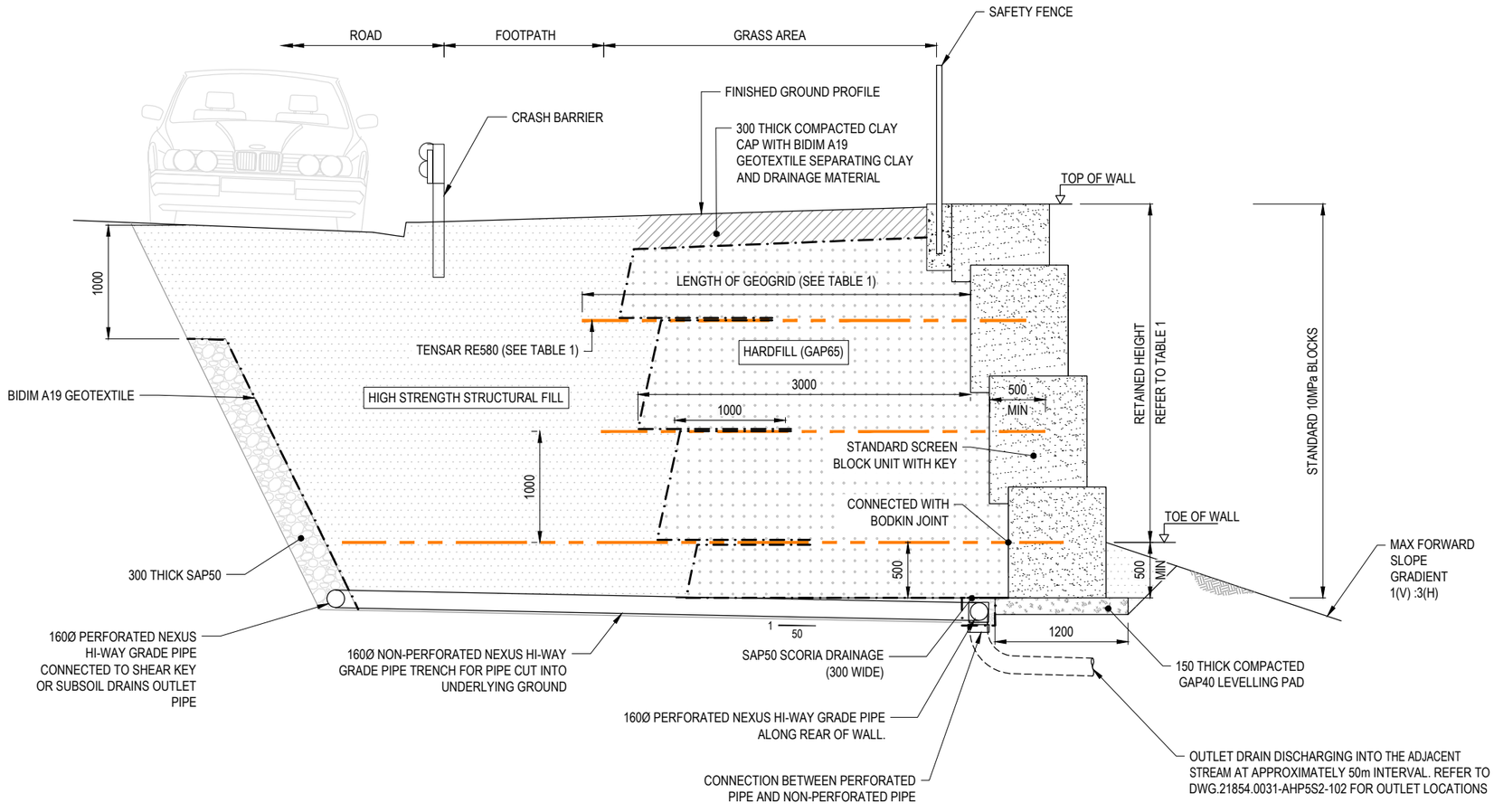
2. WALL SETOUT AS PROVIDED BY WOODS AND CONFIRMED ON SITE BY THE ENGINEER.



SECTION 10 112 / 10 113 / 10 114 / 10 115 SCREEN BLOCK WALL TYPICAL SECTION (H≤3m)
SCALE 1:50 RETAINING WALLS 04A AND 04B

A3 SCALE 1:50
0 0.5 1.0 1.5 2.0 2.5 (m)

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PROJECT MILLWATER - ARRANS HILL
TITLE PRECINCT 5 STAGE 2
RETAINING WALLS 04A AND 04B - TYPICAL SECTION (H≤3m)
SCALE (A3) 1:50 DWG No. 21854.0031-AHP5S2-116 REV 1

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TABLE 2: RETAINING WALL 04A AND 04B (3m<H≤5m) DETAIL TABLE

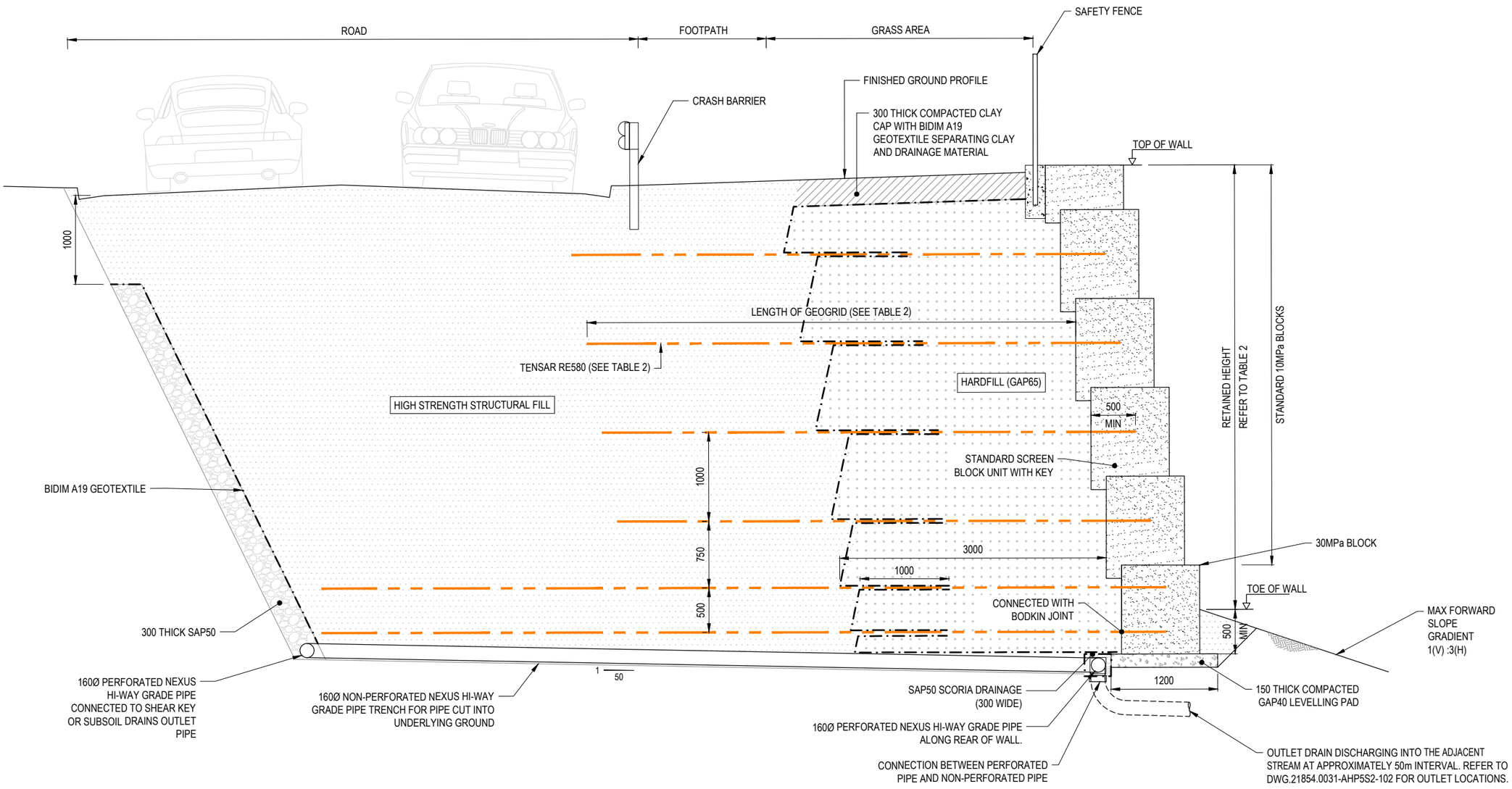
MAX. RETAINED HEIGHT (m)	MAX. BACK SLOPE	MAX. FORWARD SLOPE	GEOGRID TYPE	MIN. LENGTH OF GEOGRID (m)	VERTICAL LOCATION ABOVE TOE OF WALL (m)
3 ≤ H ≤ 5	0°	1V:3H	TENSAR RE580	9.0	-0.25, 0.25
				5.5	1.0, 2.0, 3.0, 4.0

LEGEND

- BIDIM A19 GEOTEXTILE
- TENSAR RE580
- COMPACTED CLAY CAP
- HARDFILL (GAP40)
- HIGH STRENGTH STRUCTURAL FILL
- SAP50 SCORIA
- HARDFILL (GAP65)

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. WALL SETOUT AS PROVIDED BY WOODS AND CONFIRMED ON SITE BY THE ENGINEER.



A3 SCALE 1:50

0 0.5 1.0 1.5 2.0 2.5 (m)

SECTION 11 112 11 113 11 114 11 115 SCREEN BLOCK WALL TYPICAL SECTION (3m≤H≤5m)
SCALE 1:50 RETAINING WALLS 04A AND 04B

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REV	DESCRIPTION	CAD	CHK	DATE	APPROVED	DATE
1	COMPLETION REPORT ISSUE	JC	JKK	Sep.20		

DESIGNED	JASM	Aug.20	DRAWING STATUS	COMPLETION REPORT
DRAWN	JC	Aug.20		
DESIGN CHECKED	JKK	Sep.20		
DRAWING CHECKED	RBS	Sep.20		

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CLIENT **WFH PROPERTIES LTD**

PROJECT **MILLWATER - ARRANS HILL**

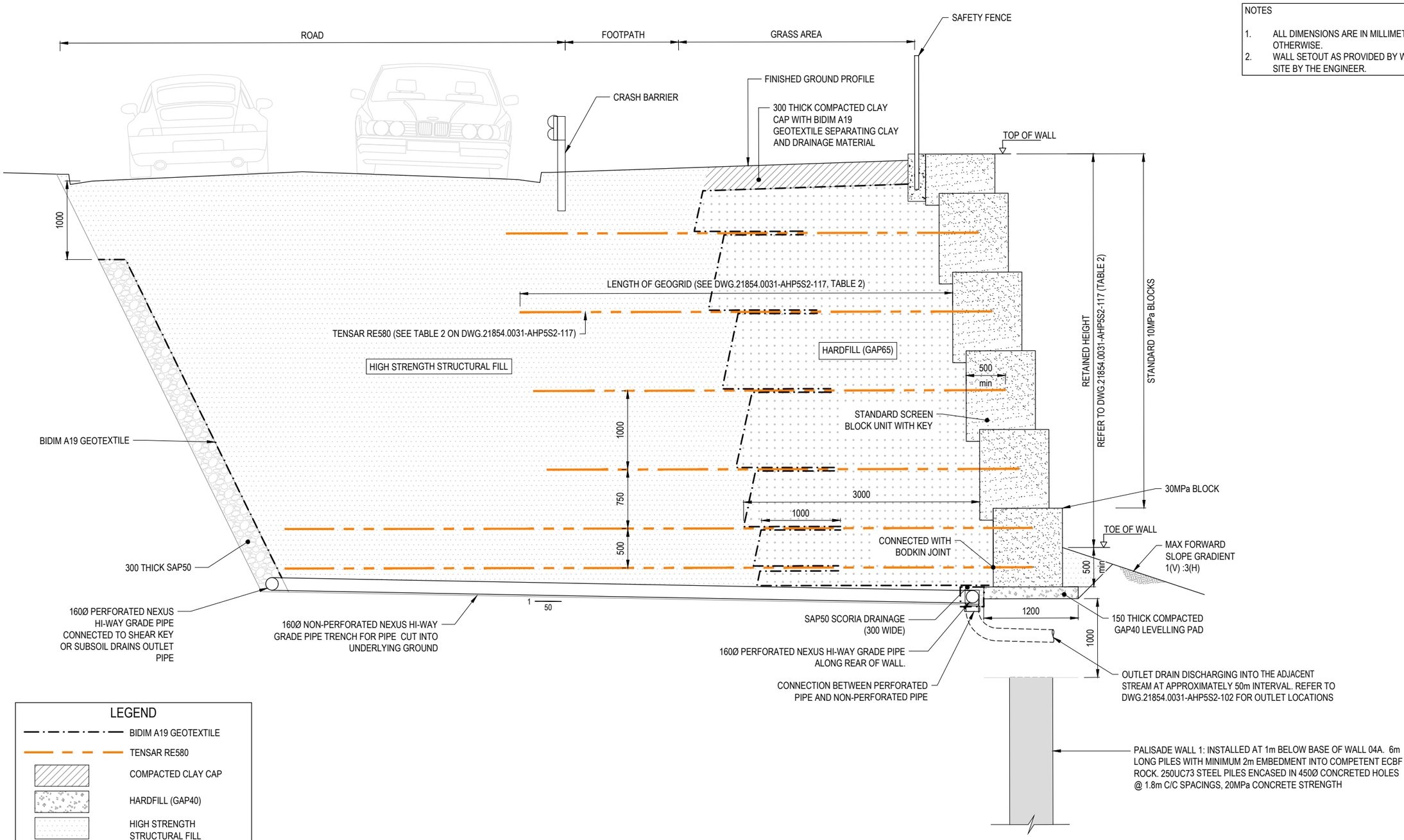
TITLE PRECINCT 5 STAGE 2
RETAINING WALLS 04A AND 04B - TYPICAL SECTION (3m<H<5m)

SCALE (A3) 1:50 DWG No. 21854.0031-AHP5S2-117 REV 1

L:\21854\21854.0031 - Orewa West Precinct 5\WorkingMaterial\CAD\DWG\GCR\STAGE 2\21854.0031-AHP5S2-116_122.dwg 2020-Sep-10 10:49:13 PM Plotted By: JONALD CASTRO

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. WALL SETOUT AS PROVIDED BY WOODS AND CONFIRMED ON SITE BY THE ENGINEER.



LEGEND

- BIDIM A19 GEOTEXTILE
- TENSAR RE580
- COMPACTED CLAY CAP
- HARDFILL (GAP40)
- HIGH STRENGTH STRUCTURAL FILL
- SAP50 SCORIA
- HARDFILL (GAP65)

A3 SCALE 1:50

0 0.5 1.0 1.5 2.0 2.5 (m)

SECTION 12 112 / 12 113 / 12 114 SCREEN BLOCK WALL TYPICAL SECTION (3m≤H≤5m)
SCALE 1: 50 RETAINING WALL 04A WITH PALISADE WALL 1

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REV	DESCRIPTION	CAD	CHK	DATE	APPROVED	DATE
1	COMPLETION REPORT ISSUE	JC	JKK	Sep.20		

DESIGNED	JASM	Aug.20	DRAWING STATUS
DRAWN	JC	Aug.20	COMPLETION REPORT
DESIGN CHECKED	JKK	Sep.20	
DRAWING CHECKED	RBS	Sep.20	

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CLIENT **WFH PROPERTIES LTD**

PROJECT **MILLWATER - ARRANS HILL**

TITLE PRECINCT 5 STAGE 2
RETAINING WALLS 04A - TYPICAL SECTION WITH PALISADE WALL 1 (3m≤H≤5m)

SCALE (A3) 1:50 DWG No. 21854.0031-AHP5S2-118 REV 1

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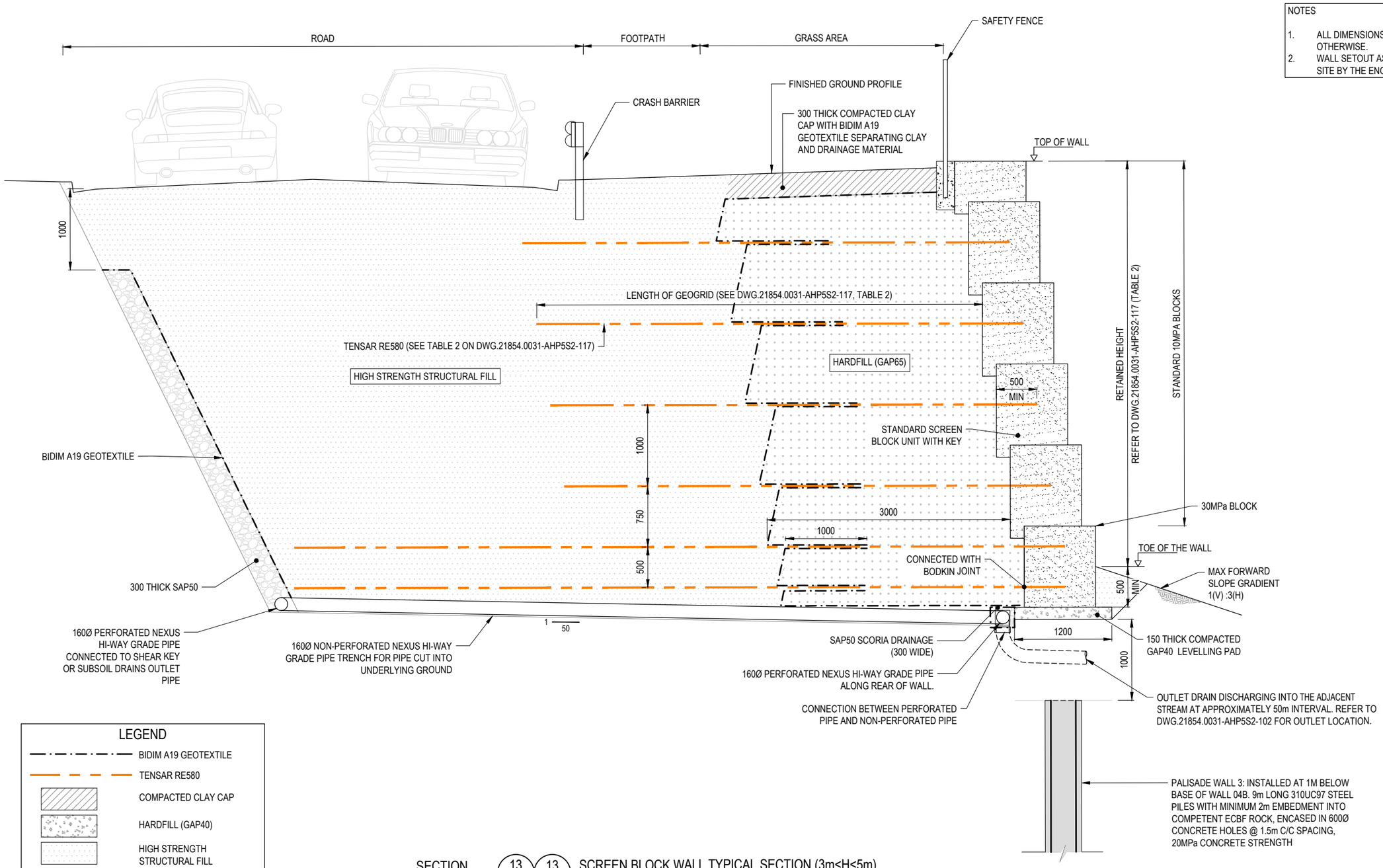
NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. WALL SETOUT AS PROVIDED BY WOODS AND CONFIRMED ON SITE BY THE ENGINEER.



LEGEND

- BIDIM A19 GEOTEXTILE
- TENSAR RE580
- COMPACTED CLAY CAP
- HARDFILL (GAP40)
- HIGH STRENGTH STRUCTURAL FILL
- SAP50 SCORIA
- HARDFILL (GAP65)

A3 SCALE 1:50

0 0.5 1.0 1.5 2.0 2.5 (m)

SECTION 13/112 13/115 SCREEN BLOCK WALL TYPICAL SECTION (3m≤H≤5m)
SCALE 1:50 RETAINING WALL 04B WITH PALISADE WALL 3

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REV	DESCRIPTION	CAD	CHK	DATE
1	COMPLETION REPORT ISSUE	JC	JKK	Sep.20

DESIGNED	JASM	Aug.20	DRAWING STATUS: COMPLETION REPORT
DRAWN	JC	Aug.20	
DESIGN CHECKED	JKK	Sep.20	
DRAWING CHECKED	RBS	Sep.20	

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PROJECT **MILLWATER - ARRANS HILL**

TITLE PRECINCT 5 STAGE 2
RETAINING WALLS 04B - TYPICAL SECTION WITH PALISADE WALL 3 (3m<H<5m)

SCALE (A3) 1:50 DWG No. 21854.0031-AHP5S2-119 REV 1

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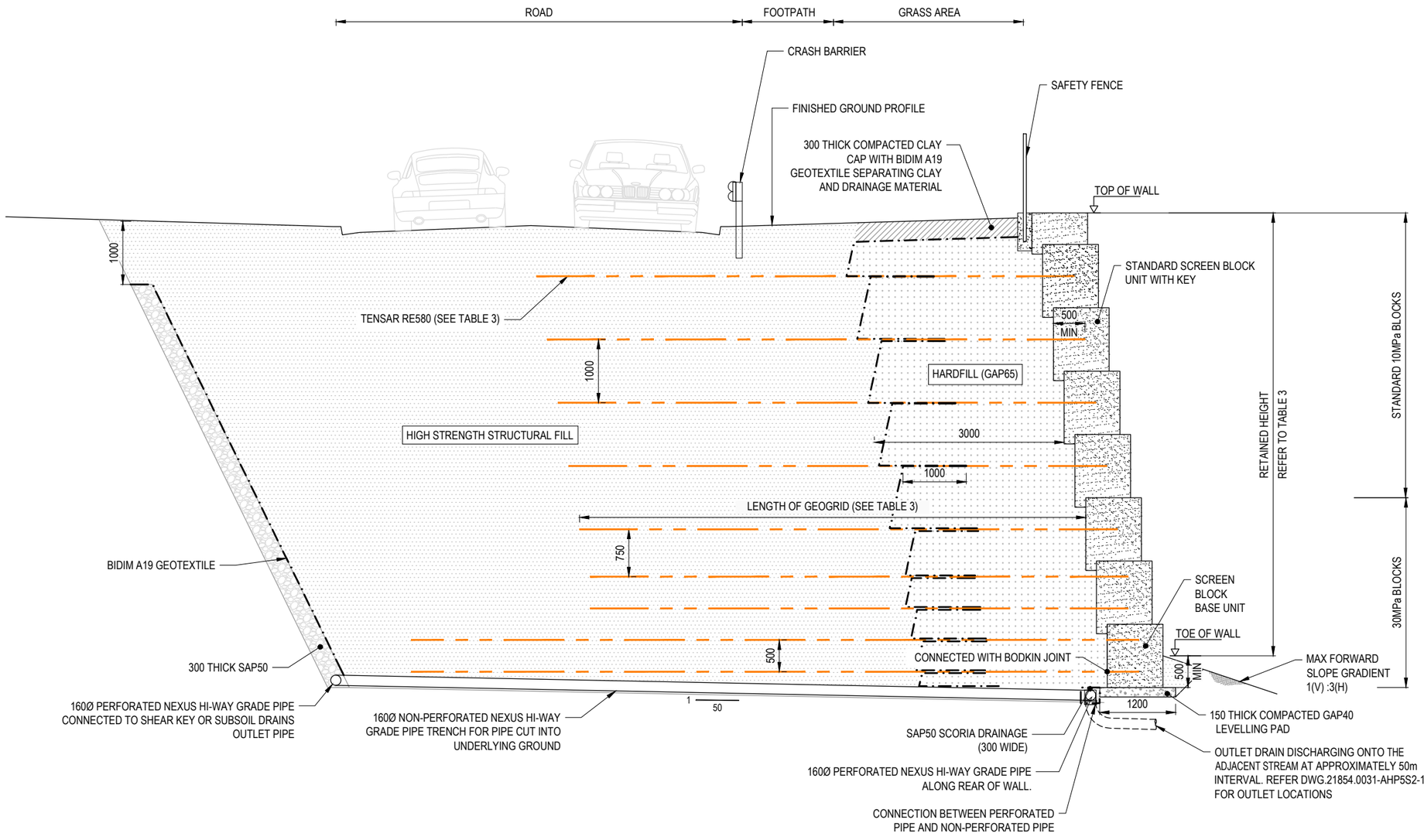
TABLE 3: RETAINING WALLS 04A AND 04B (5m<H≤7m) DETAIL TABLE

MAX. RETAINED HEIGHT (m)	MAX. BACK SLOPE	MAX. FORWARD SLOPE	GEOGRID TYPE	MIN. LENGTH OF GEOGRID (m)	VERTICAL LOCATION ABOVE TOE OF WALL (m)
5 ≤ H ≤ 7	0°	1V:3H	Tensar RE580	11	-0.25, 0.25
				8.0	0.75, 1.25, 2.0, 3.0 4.0, 5.0, 6.0

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. WALL SETOUT AS PROVIDED BY WOODS AND CONFIRMED ON SITE BY THE ENGINEER.



SECTION 14 112 14 115 SCREEN BLOCK WALL TYPICAL SECTION (5m≤H≤7m)
SCALE 1:75 RETAINING WALL 04B

A3 SCALE 1:75
0 1 2 3 4 (m)

LEGEND
- BIDIM A19 GEOTEXTILE
- TENSAR RE580
- COMPACTED CLAY CAP
- HARDFILL (GAP40)
- HIGH STRENGTH STRUCTURAL FILL
- SAP50 SCORIA
- HARDFILL (GAP65)

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REV	DESCRIPTION	CAD	CHK	DATE	APPROVED	DATE
1	COMPLETION REPORT ISSUE	JC	JKK	Sep.20	NOT FOR CONSTRUCTION	THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION PURPOSES UNLESS SIGNED AS APPROVED

DESIGNED	JASM	Aug.20	DRAWING STATUS: COMPLETION REPORT
DRAWN	JC	Aug.20	
DESIGN CHECKED	JKK	Sep.20	
DRAWING CHECKED	RBS	Sep.20	

CLIENT WFH PROPERTIES LTD
PROJECT MILLWATER - ARRANS HILL
TITLE PRECINCT 5 STAGE 2
RETAINING WALLS 04B - TYPICAL SECTION (5m≤H≤7m)
SCALE (A3) 1:75 DWG No. 21854.0031-AHP5S2-120 REV 1

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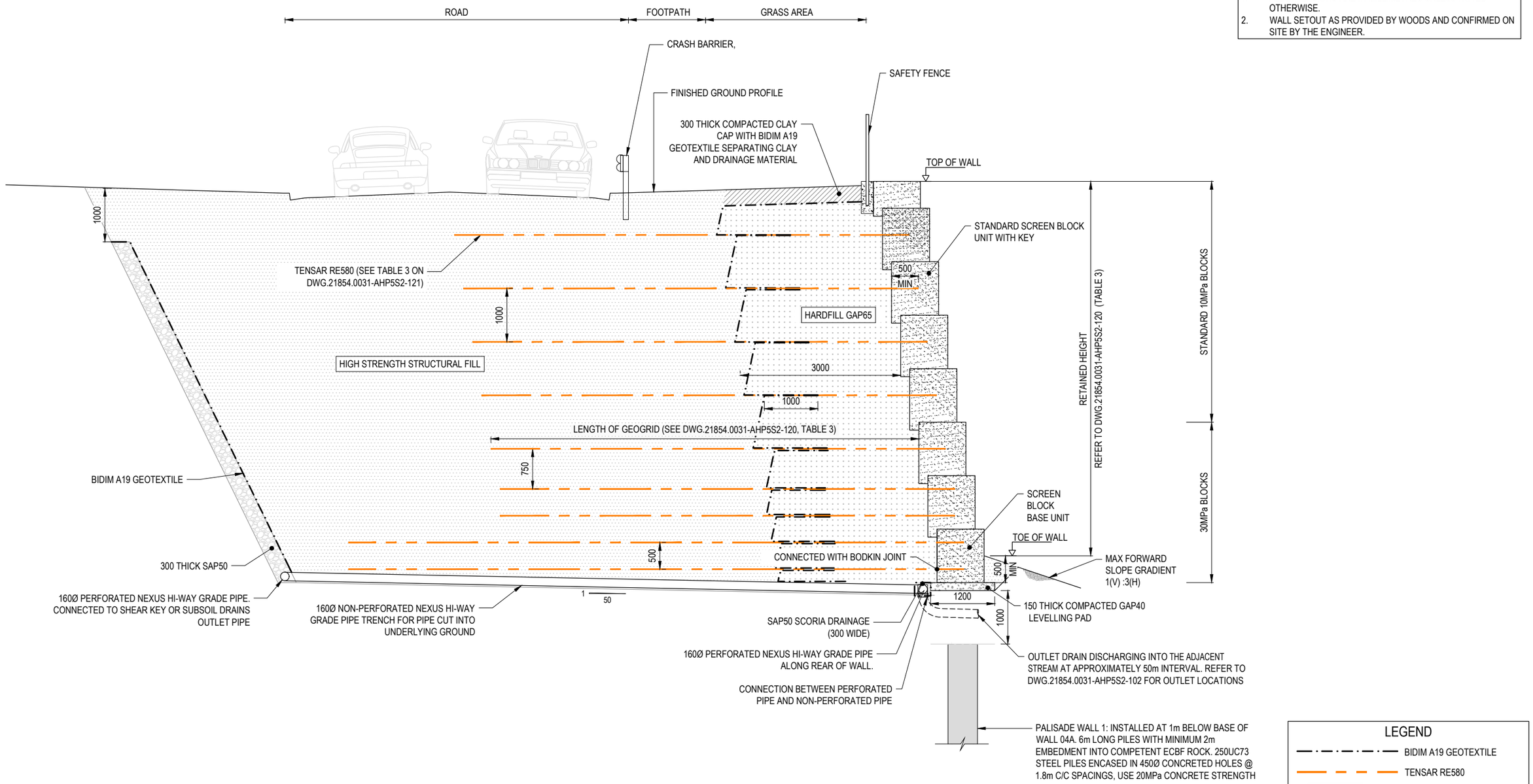
NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. WALL SETOUT AS PROVIDED BY WOODS AND CONFIRMED ON SITE BY THE ENGINEER.



SECTION 15 112 15 113 15 114 SCREEN BLOCK WALL TYPICAL SECTION (5m≤H≤7m)
SCALE 1:75 RETAINING WALL 04A WITH PALISADE WALL 1

LEGEND

- BIDIM A19 GEOTEXTILE
- TENSAR RE580
- COMPACTED CLAY CAP
- HARDFILL (GAP40)
- HIGH STRENGTH STRUCTURAL FILL
- SAP50 SCORIA
- HARDFILL (GAP65)

A3 SCALE 1:75

0 1 2 3 4 (m)

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REV	DESCRIPTION	CAD	CHK	DATE	APPROVED	DATE
1	COMPLETION REPORT ISSUE	JC	JKK	Sep.20		

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DRAWN	JC	Aug.20	COMPLETION REPORT
DESIGN CHECKED	JKK	Sep.20	
DRAWING CHECKED	RBS	Sep.20	

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CLIENT **WFH PROPERTIES LTD**

PROJECT **MILLWATER - ARRANS HILL**

TITLE PRECINCT 5 STAGE 2
RETAINING WALLS 04A - TYPICAL SECTION WITH PALISADE WALL 1 (5m≤H≤7m)

SCALE (A3) 1:75 DWG No. 21854.0031-AHP5S2-121 REV 1

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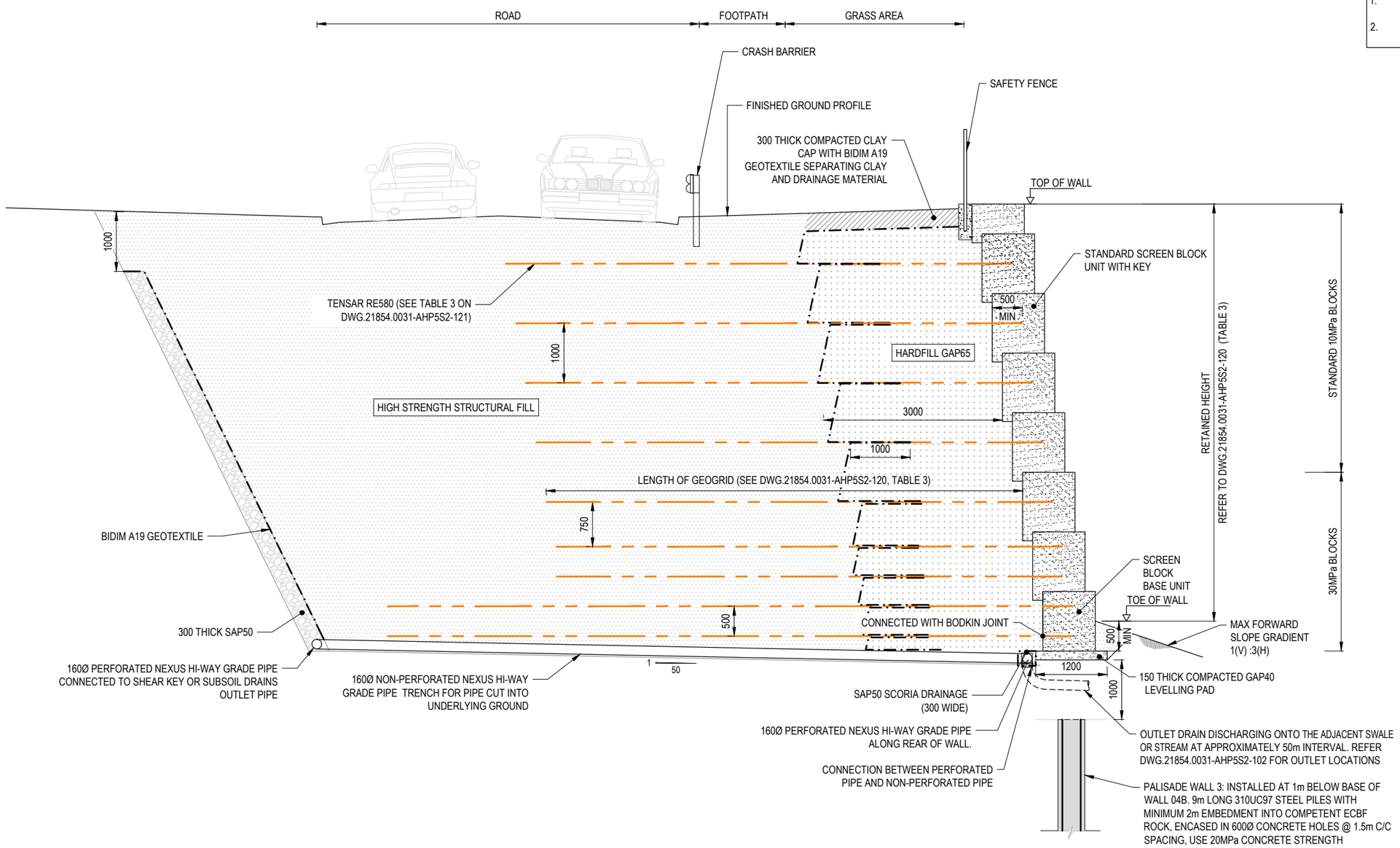
NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. WALL SETOUT AS PROVIDED BY WOODS AND CONFIRMED ON SITE BY THE ENGINEER.



SECTION 16/112 16/115 SCREEN BLOCK WALL TYPICAL SECTION (5m≤H≤7m)
SCALE 1:75 RETAINING WALL 04B WITH PALISADE WALL 3

LEGEND

- BIDIM A19 GEOTEXTILE
- TENSAR RE580
- COMPACTED CLAY CAP
- HARDFILL (GAP40)
- HIGH STRENGTH STRUCTURAL FILL
- SAP50 SCORIA
- HARDFILL (GAP65)

A3 SCALE 1:75

0 1 2 3 4 (m)

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REV	DESCRIPTION	CAD	CHK	DATE	APPROVED	DATE
1	COMPLETION REPORT ISSUE	JC	JKK	Sep.20	NOT FOR CONSTRUCTION	

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION PURPOSES UNLESS SIGNED AS APPROVED

DESIGNED	JASM	Aug.20
DRAWN	JC	Aug.20
DESIGN CHECKED	JKK	Sep.20
DRAWING CHECKED	RBS	Sep.20

DRAWING STATUS: COMPLETION REPORT

CLIENT: WFH PROPERTIES LTD
PROJECT: MILLWATER - ARRANS HILL
TITLE: PRECINCT 5 STAGE 2
RETAINING WALLS 04B - TYPICAL SECTION WITH PALISADE WALL 3 (5m≤H≤7m)
SCALE (A3): 1:75 DWG No. 21854.0031-AHP5S2-122 REV 1

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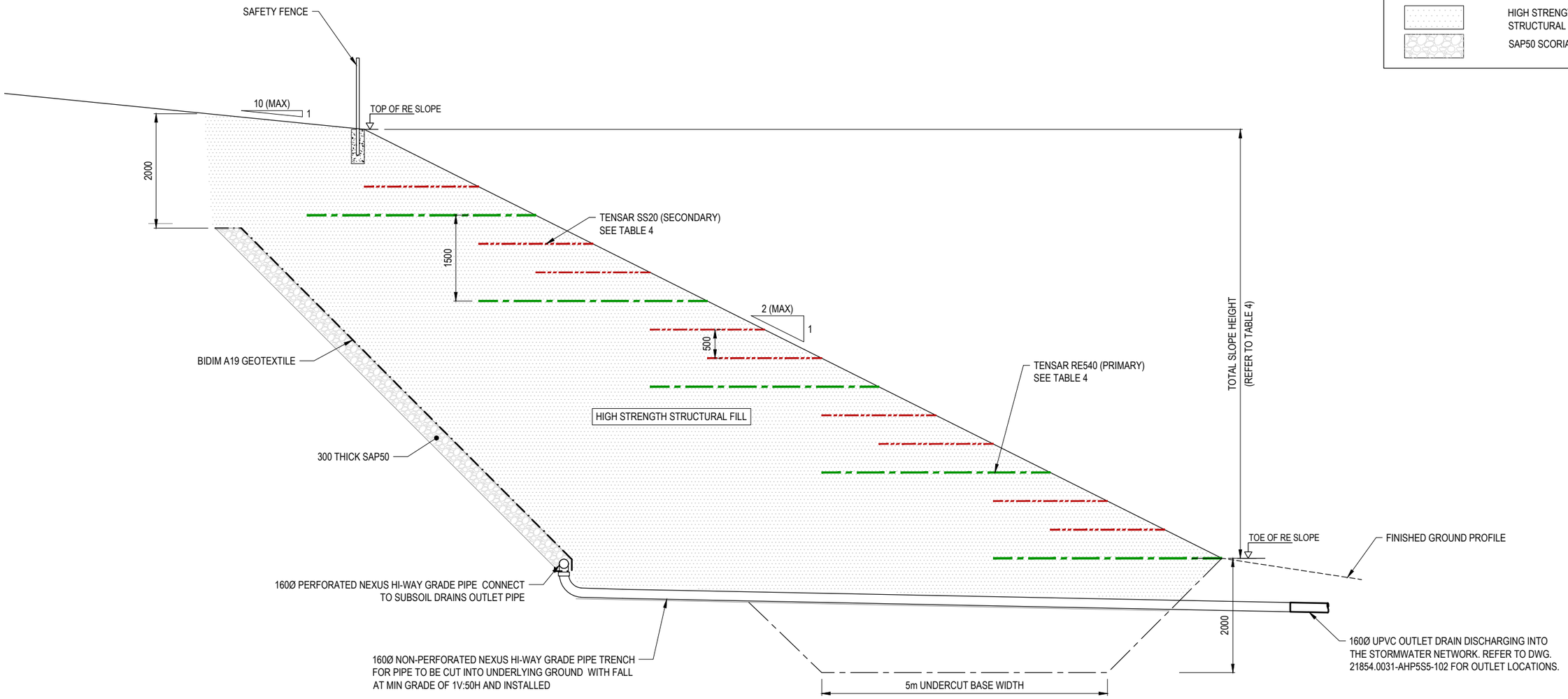
NOTES
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. WALL SETOUT AS PROVIDED BY WOODS AND CONFIRMED ON SITE BY THE ENGINEER.

TABLE 4: REINFORCEMENT DETAIL FOR RE SLOPE 4 AND 6

WALL TYPE	MAXIMUM TOTAL SLOPE HEIGHT (m)	MAX SLOPE	MAX FORWARD SLOPE	MAX BACK SLOPE	GEOGRID REQUIREMENTS		
					GEOGRID TYPE	GEOGRID LENGTH (m)	MAX VERTICAL SPACING (m)
RE SLOPE 4 & 6	H ≤ 8	1V:2H	1V:10H	1V:10H	TENSAR RE540	4.0	1.5
					TENSAR SS20	2.0	0.5

LEGEND
- BIDIM A19 GEOTEXTILE
- TENSAR SS20 (SECONDARY)
- TENSAR RE540 (PRIMARY)
- HIGH STRENGTH STRUCTURAL FILL
- SAP50 SCORIA



SECTION 17/101 RE SLOPE 4 AND 5
SCALE 1: 75

A3 SCALE 1:75
0 1 2 3 4 (m)

ORIGINAL IN COLOUR

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REV	DESCRIPTION	CAD	CHK	DATE
1	COMPLETION REPORT ISSUE	JC	JKK	Sep.20

DESIGNED	JASM	Aug.20	DRAWING STATUS: COMPLETION REPORT
DRAWN	JC	Aug.20	
DESIGN CHECKED	JKK	Sep.20	
DRAWING CHECKED	RBS	Sep.20	

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APPROVED DATE

CLIENT **WFH PROPERTIES LTD**
PROJECT **MILLWATER - ARRANS HILL**
TITLE PRECINCT 5 STAGE 2
RE SLOPE 4 & 6 - TYPICAL SECTION
SCALE (A3) 1:75 DWG No. 21854.0031-AHP5S2-123 REV 1

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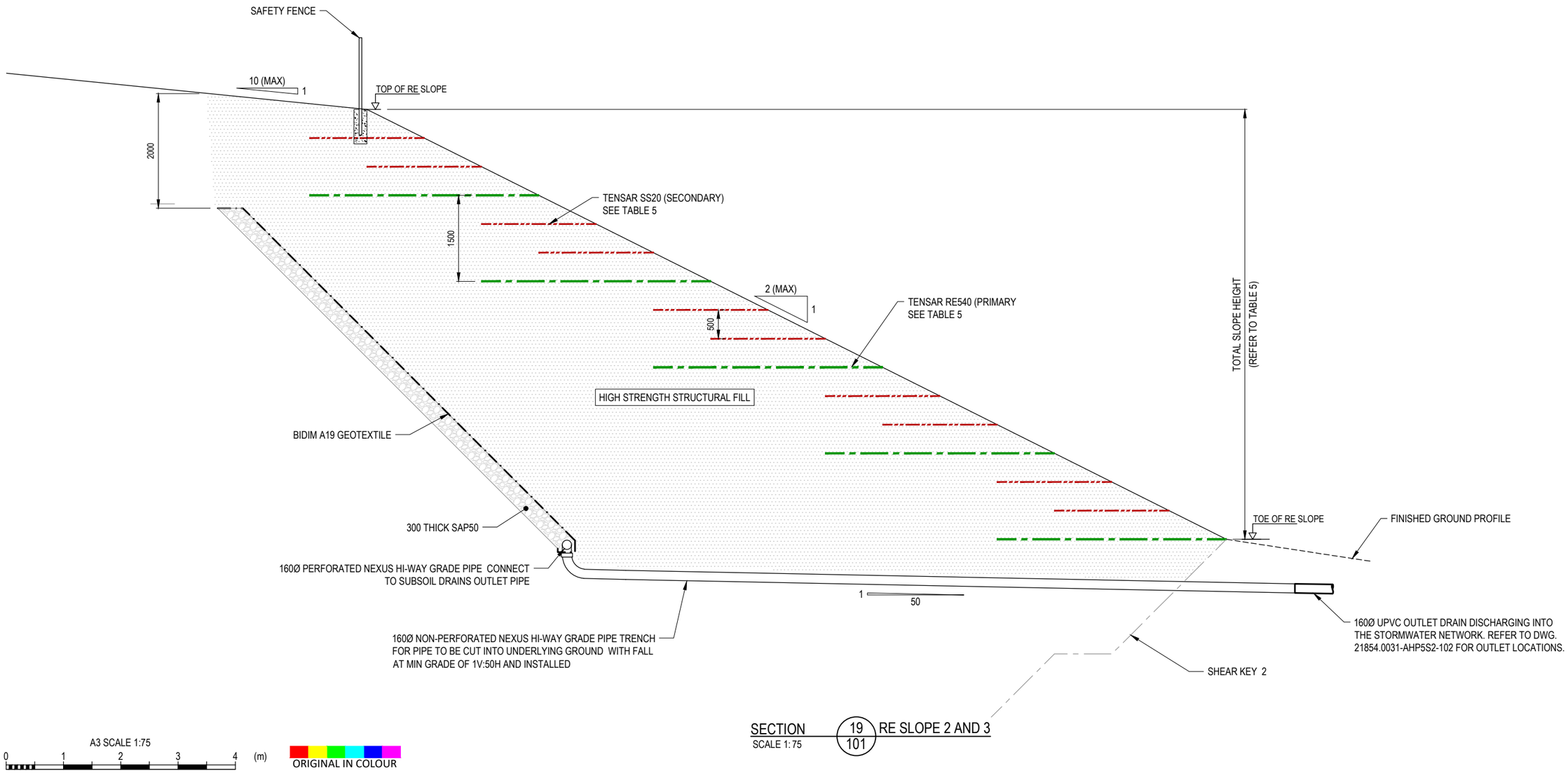
NOTES
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. WALL SETOUT AS PROVIDED BY WOODS AND CONFIRMED ON SITE BY THE ENGINEER.

TABLE 5: REINFORCEMENT DETAIL FOR RE SLOPE 2 AND 3

WALL TYPE	MAXIMUM TOTAL SLOPE HEIGHT (m)	MAX SLOPE	MAX FORWARD SLOPE	MAX BACK SLOPE	GEOGRID REQUIREMENTS		
					GEOGRID TYPE	GEOGRID LENGTH (m)	MAX VERTICAL SPACING (m)
RE SLOPE 2 & 3	H ≤ 8	1V:2H	1V:10H	1V:10H	TENSAR RE540	4.0	1.5
					TENSAR SS20	2.0	0.5

LEGEND
- BIDIM A19 GEOTEXTILE
- TENSAR SS20 (SECONDARY)
- TENSAR RE540 (PRIMARY)
- HIGH STRENGTH STRUCTURAL FILL
- SAP50 SCORIA



SECTION 19/101 RE SLOPE 2 AND 3
SCALE 1:75

A3 SCALE 1:75
0 1 2 3 4 (m)

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REV	DESCRIPTION	CAD	CHK	DATE
1	COMPLETION REPORT ISSUE	JC	JKK	Sep.20

DESIGNED	JASM	Aug.20
DRAWN	JC	Aug.20
DESIGN CHECKED	JKK	Sep.20
DRAWING CHECKED	RBS	Sep.20

DRAWING STATUS: COMPLETION REPORT

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CLIENT **WFH PROPERTIES LTD**
PROJECT **MILLWATER - ARRANS HILL**
TITLE PRECINCT 5 STAGE 2
RE SLOPE 2 & 3 - TYPICAL SECTION
SCALE (A3) 1:75 DWG No. 21854.0031-AHP5S2-124 REV 1

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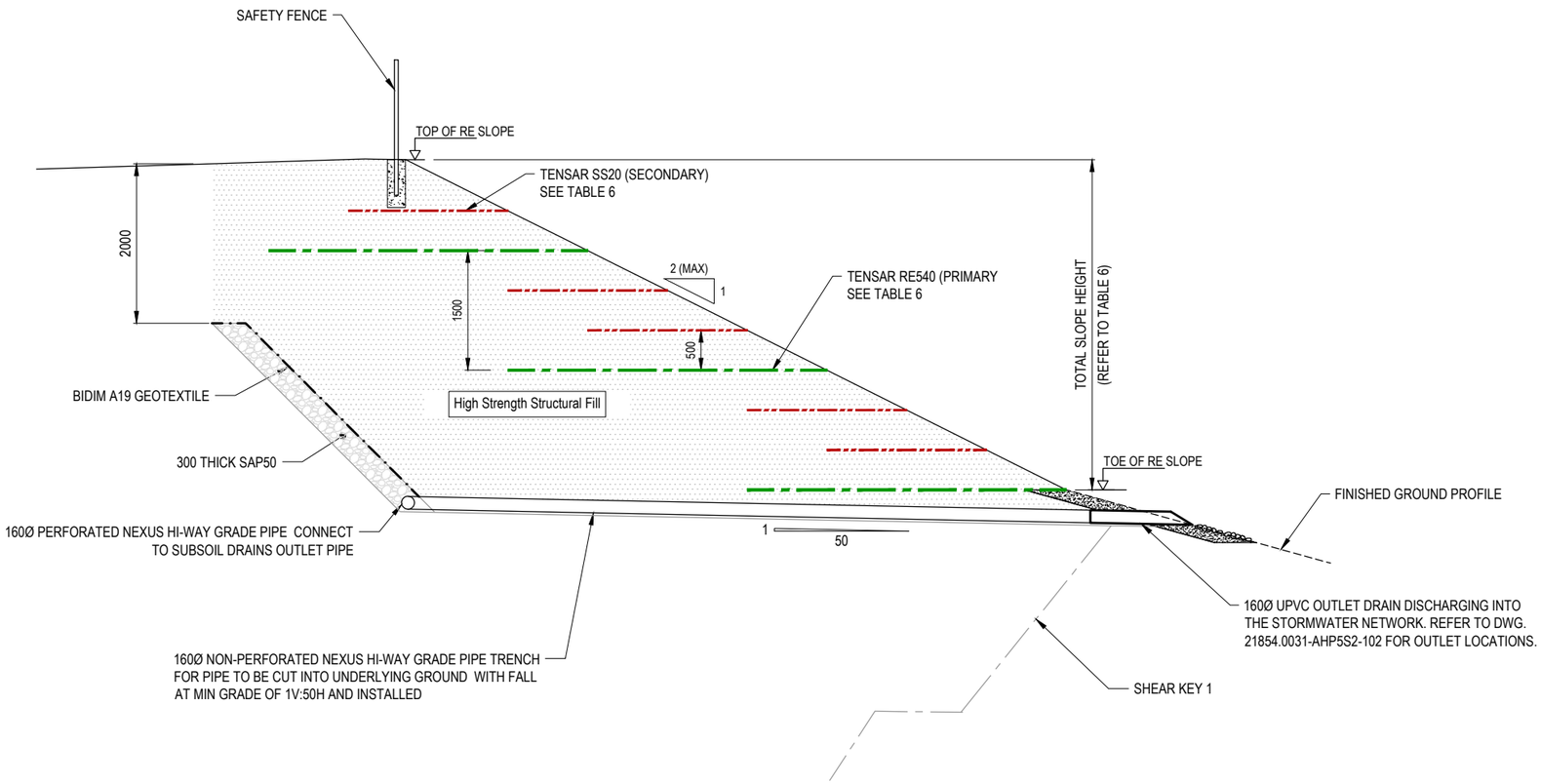
NOTES
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. WALL SETOUT AS PROVIDED BY WOODS AND CONFIRMED ON SITE BY THE ENGINEER.

TABLE 6: REINFORCEMENT DETAIL FOR RE SLOPE 9

WALL TYPE	MAXIMUM TOTAL SLOPE HEIGHT (m)	MAX SLOPE	MAX BACK SLOPE	GEOGRID REQUIREMENTS		
				GEOGRID TYPE	GEOGRID LENGTH (m)	MAX VERTICAL SPACING (m)
RE SLOPE 9	H ≤ 8	1V:2H	1V:10H	TENSAR RE540	4.0	1.5
				TENSAR SS20	2.0	0.5

LEGEND
- BIDIM A19 GEOTEXTILE
- TENSAR SS20 (SECONDARY)
- TENSAR RE540 (PRIMARY)
- HIGH STRENGTH STRUCTURAL FILL
- SAP50 SCORIA



SECTION 18/101 RE SLOPE 9
SCALE 1:75

A3 SCALE 1:75
0 1 2 3 4 (m)
ORIGINAL IN COLOUR

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REV	DESCRIPTION	CAD	CHK	DATE
1	COMPLETION REPORT ISSUE	JC	JKK	Sep.20

DESIGNED	JASM	Aug.20	DRAWING STATUS: COMPLETION REPORT
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DESIGN CHECKED	JKK	Sep.20	
DRAWING CHECKED	RBS	Sep.20	

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CLIENT **WFH PROPERTIES LTD**
PROJECT **MILLWATER - ARRANS HILL**
TITLE PRECINCT 5 STAGE 2
RE SLOPE 9 - TYPICAL SECTION
SCALE (A3) 1:75 DWG No. 21854.0031-AHP5S2-125 REV 1

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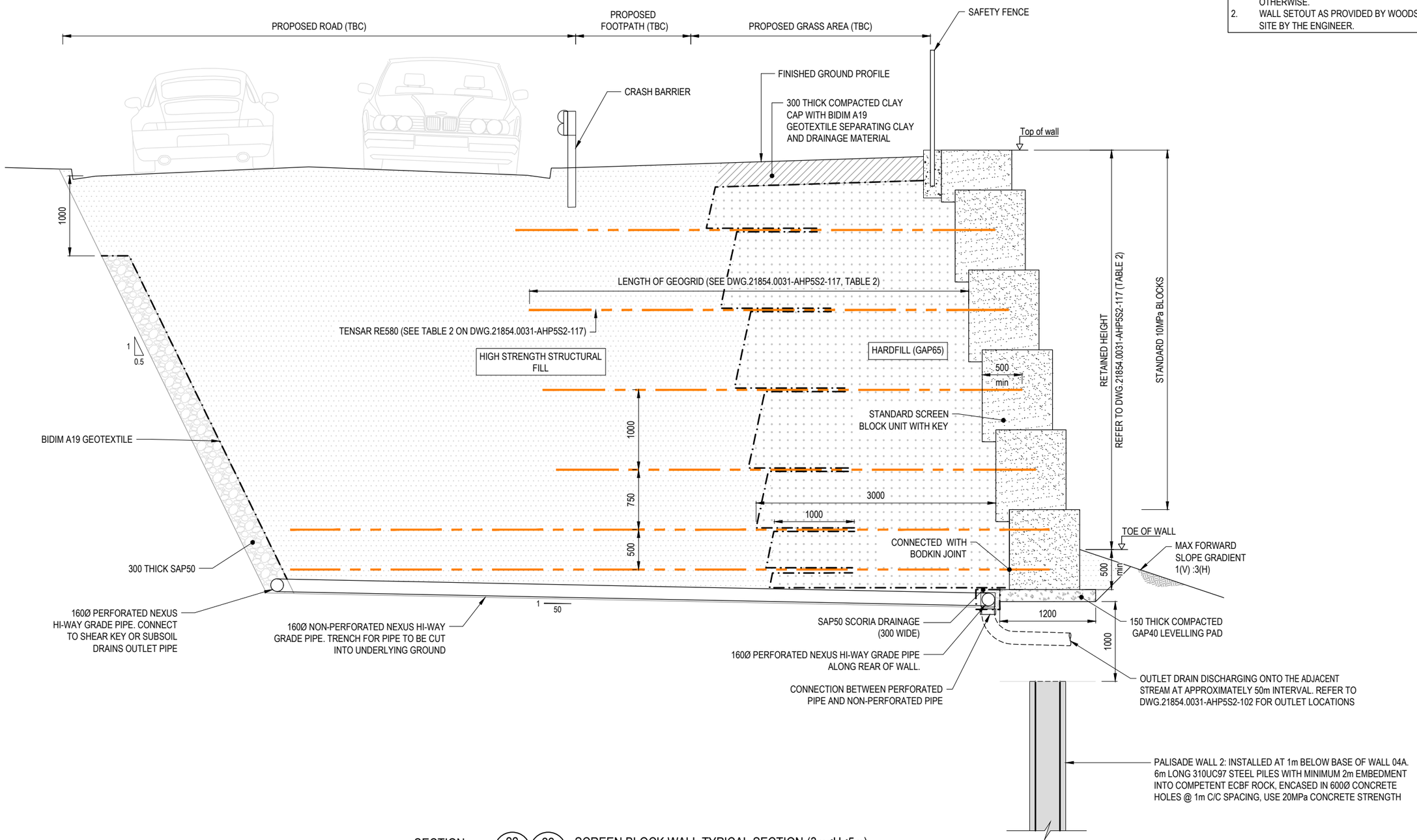
NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. WALL SETOUT AS PROVIDED BY WOODS AND CONFIRMED ON SITE BY THE ENGINEER.



SECTION 22 112 22 115 SCREEN BLOCK WALL TYPICAL SECTION (3m<H≤5m)
SCALE 1:50 RETAINING WALL 04B WITH PALISADE WALL 2

A3 SCALE 1:50
0 0.5 1.0 1.5 2.0 2.5 (m)

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REV	DESCRIPTION	CAD	CHK	DATE
1	COMPLETION REPORT ISSUE	JC	JKK	Sep.20

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CLIENT **WFH PROPERTIES LTD**
PROJECT **MILLWATER - ARRANS HILL**
TITLE PRECINCT 5 STAGE 2
RETAINING WALLS 04A - TYPICAL SECTION WITH PALISADE WALL 2 (3m<H≤5m)
SCALE (A3) 1:50 DWG No. 21854.0031-AHP5S2-126 REV 1

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NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. COORDINATE DATUM: NZGD2000, MT EDEN CIRCUIT COORDINATES. ORIGIN: LAT 36 52 47S 174 45 51E 800,000MN 400,000ME
   LEVEL DATUM: LINZ (MSL) AUCKLAND VERTICAL DATUM 1946
3. LOT BOUNDARY SUPPLIED BY WOODS, REFERENCE "X_37502_P5_02_BOUNDARY.dwg", DATED 21 AUG 2020.
4. ASBUILT CONTOUR SUPPLIED BY WOODS, REFERENCE "X_37502_P5_02_FINALSURFACE.dwg", DATED DATED 21 AUG 2020.
5. UNDERCUT SUPPLIED BY WOODS, REFERENCE "X_37502_P5_02_LOWEST SURFACE.dwg", DATED 21 AUG 2020.

LEGEND

- STAGE 2 BOUNDARY
- 23 — LOT BOUNDARIES
- SHEAR KEY EXTENT
- SHEAR KEY UNDERCUT CONTOURS (5m INTERVAL)
- SHEAR KEY UNDERCUT CONTOURS (1m INTERVAL)
- BASE OF SHEAR KEY AND CHAINAGE — CH 180

A3 SCALE 1:1250

0 25 50 75 (m)

ORIGINAL IN COLOUR

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REV	DESCRIPTION	CAD	CHK	DATE
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DESIGNED	JASM	Aug.20	DRAWING STATUS: COMPLETION REPORT
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PROJECT **MILLWATER - ARRANS HILL**

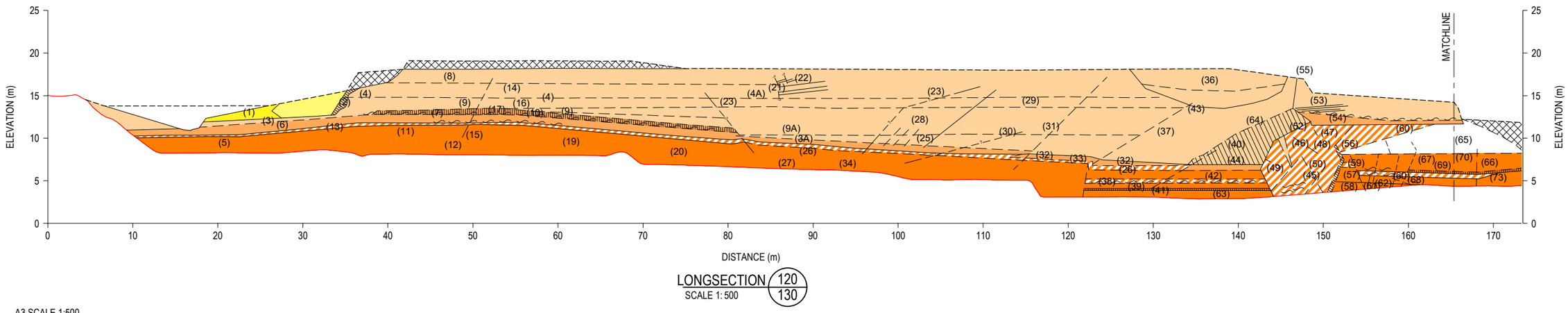
TITLE PRECINCT 5 STAGE 2
SHEAR KEY 01 AND 02 PLAN

SCALE (A3) 1:1250 DWG No. 21854.0031-AHP5S2-130 REV 1

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. LEVEL DATUM: LINZ (MSL) AUCKLAND VERTICAL DATUM 1946
3. FOR LEGEND , REFER TO 21854.0031-AHP5S2-135.

(1) SUSPECTED COLLUVIUM. POSSIBLY ALLUVIUM
(2) ALTERATION OF THE RESIDUAL ECBF AROUND THE OUTER EDGE OF THE ALLUVIUM.
(3) SHEAR PLANE; 4-5° @ 194-229° / PL / SM / N / CG (CLAY, UP TO 4mm THICK). SEEPAGE BEGINS ALONG THIS FEATURE FROM 22.0m. IS COMPOSED OF THREE SHEAR PLANES WITHIN A 30mm ZONE.
(4) SHEAR PLANE; 8° @ 229° / UN / SL / T-MW / CG (WHITISH GREY, SILTY CLAY, UP TO 40mm THICK) FROM 35.5m TO 61.5m / FEST. HAVE MINOR MOVEMENT (<5mm) ALONG THIS PLANE FROM 31.5m TO 61.5m. IS COMPOSED OF MULTIPLE FEST SHEAR PLANES WITHIN A 100mm ZONE.
(5) B; 5° @ 190° / PL / R / T / CN.
(6) B; 7° @ 215° / PL / R / T-VN / CV (CLAY) / FeSt.
(7) MODERATE SEEPAGE ZONE.
(8) SUSPECTED SHEAR PLANE; 2-6° @ 181-207° / UN / SM / T-VN / CV (SANDY CLAY).
(9) SHEAR PLANE; 2-11° @ 152-213° / UN / SM / POLISHING EVIDENT / T-VN / CV (CLAY) / FeSt.
(10) LIMONITE ZONE, COMPOSED OF LIMONITE BANDS AND STAINING. SEEPAGE ALONG THE ENTIRE BASE OF THIS FEATURE. BOUNDED BY TWO SHEAR PLANES.
(11) B; 6° @ 240° / PL / R / T / CN.
(12) B; 5° @ 237° / PL / R / T-VN / CV (sand).
(13) SHEARED N>50 ECBF ZONE. UP TO 250mm THICK, TYPICALLY 100mm THICK. VERY SLOW SEEPAGE OBSERVED AT THE BASE OF THIS UNIT FROM 27.5m TO 50.0m.
(14) SILTY CLAY GOUGE, UP TO 40mm THICK. UNIT IS DECRIBED IN FEATURE (4).
(15) SUSPECTED FAULT. UNABLE TO IDENTIFY ANY FEATURE, HOWEVER EVIDENT THAT FROM THIS POINT THE ROCK LEVEL BEGINS TO REDUCE TO THE EAST AND FEATURE (14) AND (16) BECOME PRESENT.
(16) SHEAR PLANE; 4-13° @ 176-191° / UN / SM / TYPICALLY POLISHED / VN-MW / CG (CLAYEY SAND, UP TO 30mm THICK) / FEST. IS COMPOSED OF THREE SHEAR PLANES WITHIN A 90mm ZONE. UNABLE TO LOCATE THE SHEAR PLANE AFTER INTERACTION WITH FEATURE (37). SOME LINEAR FEATURES VISIBLE, BUT DID NOT APPEAR TO BE A SHEAR PLANE.
(17) B; 6° @ 226° / PL / SM / T-VN / CV (CLAY).
(18) B; 4° @ 230° / PL / R / T-VN / CV (SAND).
(19) B; 2° @ 225° / PL / R / T-VN / CV (SAND).
(20) B; 3° @ 173° / PL / R / T-VN / CV (SAND).
(21) SUSUPECTED FAULT. FEATURE (8) STOPS AT THE FAULT AND BEDDING ANGLES CAN BE OBSERVED CHANGING LOCALLY AROUND THE FEATURE. INDETERMINATE OFFSET, HOWEVER BEDS DO NOT LINE UP WITH ANY WITHIN CLOSE PROXIMITY.B; 3° @ 173° / PL / R / T-VN / CV (SAND).
(22) SUSPECTED FAULT. OBSERVED OFFSET UP TO 200mm.
(23) F; 62° @ 174° / UN / SM / T / CN. ROCK LEVEL INCREASES, LIMONITE ZONE CEASES, OFFSET OF THE WEATHERED ECBF AND FEATURES (3) & (9), CLAY GOUGE ALONG FEATURE (4) CEASES, RESIDUAL ECBF UNITS UP TO 1.00m ABOVE THE WEATHERED ECBF TO THE EAST BECOME CLAYEY AND SILT DOMINATED.
(24) F; 72-86° @ 247-264° / PL / R / T / CV (SANDY SILT) / INDETERMINATE OFFSET.
(25) UNDULATING COMPLETELY WEATHERED ECBF UPPER SURFACE, HAS BEEN CAUSED DUE TO MULTIPLE SMALL FAULTS OFFSETTING THE UNIT.
(26) SHEAR PLANE; 1-7° @ 196-205° / UN / R / VN / CV (CLAYEY SILT).
(27) B; 5° @ 175° / PL / R / T-VN / CV (sand).
(3A) SHEAR PLANE; 4° @ 194° / PL / SM / VN-MN / CV (SILTY CLAY) / CZ (UP TO 30mm THICK).
(4A) SHEAR PLANE; 1-3° @ 200° / PL / SL / T-VN / TYPICALLY CV (SILTY CLAY) BUT CG (PINK, SILTY CLAY, UP TO 70mm THICK) FROM 91.5m TO 102.5m. MINOR MOVEMENT (UP TO 20mm) IS VISIBLE ALONG THIS PLANE FROM 97.0m TO 116.5m. ONCE THE SHEAR PLANE INTERACTS WITH FEATURE (37) AT 116.5m, IT MERGES AND HAS CREATED A LOCALISED LANDSLIDE WHERE THE FACE HAS RELAXED.
(9A) SHEAR PLANE; 2-6° @ 201° / UN / R / VN-N / CV (CLAY) / FEST. UNABLE TO LOCATE THE SHEAR PLANE AFTER INTERACTION WITH FEATURE (37). SOME LINEAR FEATURES VISIBLE, BUT DID NOT APPEAR TO BE A SHEAR PLANE.
(28) THREE SMALL FAULTS. TYPICALLY F; 55-82° @ 243-284° / UN / SM / T / CN / UP TO 300mm OFFSET.
(29) SILTY CLAY GOUGE, UP TO 70mm THICK. UNIT IS DECRIBED IN FEATURE (4A).
(30) SUSPECTED FAULT. SEEN AS A LINEATION WITHIN THE CUT FACE. BEDDING ANGLES ALTER AT THE INTERSECTION BUT WAS UNABLE TO IDENTIFY FURTHER.
(30) F; 66-81° @ 256° / UN / R / T-VN / CV (SANDY CLAY) / FEST / 400MM OFFSET OF THE SHEARED N>50 ECBF UNIT, NO OTHER FEATURES DISPLAY EFFECTS.
(32) LIMONITE SHEAR ZONE, COMPOSED OF MULTIPLE SHEAR PLANES, OBSERVED AS LIMONITE BANDS. SEEPAGE ALONG THE ENTIRE BASE OF THIS FEATURE.
(33) SHEAR PLANE; 6° @ 148° / PL / SM / T-VN / CV (CLAY) / FeSt.
(34) B; 5° @ 193° / PL / R / T / CV (SAND).
(35) F; 85° @ 261° / PL / SM / T / CN / INDETERMINATE OFFSET.
(36) LOCALISED LANDSLIDE DUE TO THE RELAXATION OF THE FACE. MOVEMENT HAS OCCURRED ALONG THE FAULT OF FEATURE (37), WHICH HAS MERGED WITH THE SHEAR PLANE OF FEATURE (4A). BOTH OF THESE FEATURES SHOW SIGN OF MINOR SLIPPING, UP TO 20mm, BEFORE THE LANDSLIDE.
(37) F; 78-82° @ 264° / PL / SM / VN - MW / CG (CLAY AND BROKEN N>50 ECBF FRAGMENTS, UP TO 60MM THICK). VISIBLE VERTICAL OFFSET OF 500-1100mm, SUSPECT THERE HAS BEEN SOME LATERAL MOVEMENT ALONG THE FAULT ALSO.
(38) SZ; 3° @ 144° / UN / R / T-MN / CG (CLAY, UP TO 15mm THICK). ASSOCIATED WITH BLACK CARBONACEOUS MATERIAL BANDS (ABOVE AND BELOW). THE MAIN SHEAR PLANE IS LOCATED BELOW 0.50m OF SHEARED SILSTONE.
(39) SILTSONE BED, UP TO 90mm THICK: B; 4° @ 151° / PL / SM / T / CN.
(40) LIMONITE ZONE, COMPOSED OF LIMONITE BANDS AND STAINING.
(41) F?; 59-62° @ 255-271° / UN / R / T / FeSt / INDETERMINATE OFFSET.
(42) B; 3° @ 140° / PL / R / T-VN / CV (silty sand).
(43) FEATURES (4A) AND (37) MERGE AT THIS LOCATION AND CANNOT BE ACCURATELY LOCATED WITHIN THE LANDSLIDE SCARP DUE TO ACCESS ISSUES.
(44) SHEAR PLANE; 4-18° @ 158° / UN / SM / MINOR POLISHING EVIDENT / T-VN / CV (CLAY).
(45) B; 29° @ 100° / PL / R / T-VN / CV (SAND).
(46) F; 42-70° @ 248-257° / UN / R / T-VN / CV (SILTY SAND) / CZ (UP TO 60mm) / FeSt.
(47) J; 56-67° @ 255° / UN / R / T-VN / FeSt.
(48) J; 40° @ 255° / PL / SM / Minor Polishing / T-VN / CV (CLAY).
(49) J; 48° @ 252° / PL / SM / MINOR POLISHING / T-VN / CV (CLAY).
(50) B; 3° @ 140° / PL / R / T-VN / CV (silty sand).
(51) J; 81° @ 049° / PL / SM / T / CN.
(52) F; 48-78° @ 081-321° / UN / R / T-MW / CN / CZ (5-50mm THICK) / FeSt / INDETERMINATE OFFSET.
(52A) F; 82° @ 067-081° / PL / R / T-MW / CN / CZ (5-50mm THICK) / INDETERMINATE OFFSET.
(53) B; 1° @ 125° / PL / R / T-VN / CV (SILTY SAND).
(54) SHEAR PLANE; 6° @ 153° / PL / SM / VN / CV (SILT) / FeSt (5-140MM THICK).
(55) ORGANIC SILT UNIT (TOPSOIL). POSSIBLY FILL?
(56) F; 73-80° @ 234-273° / UN / R / N-MW / CN / CZ (UP TO 110mm THICK, GRAVELLY SILTY CLAY).
(57) SZ; 13° @ 119° / UN / R / T-VN / CV (SANDY SILT). SHEARED SILTSTONE UNIT, UP TO 450mm THICK).
(57A) SZ; 8° @ 130° / UN / R / T-VN / CV (SANDY SILT). SHEARED SILTSTONE UNIT, UP TO 450mm THICK).
(58) FINE TO COARSE SANDSTONE UNIT WITH MINOR LITHICS. LITHICS ARE FINE TO MEDIUM.
(59) F; 86-89° @ 074-259° / UN / SM / POLISHED / T / CN.
(60) F; 59-81° @ 256-311° / UN / R / VN-N / CV (SILTY SAND) / FeSt.
(61) TWO PARALLEL JOINTS. J; 52° @ 247° / PL / SL / T-VN / CV (SAND).
(62) FOUR JOINTS. TYPICALLY J; 82-89° @ 056-069° / PL / R / T-VN / CN.
(63) B; 2° @ 152° / PL / R / T / CN.
(64) B; 1° @ 122° / PL / SM / VN / CV (clay).
(65) AREA OF THE SHEAR KEY IS DIFFICULT TO MAP DUE TO THE AMOUNT OF RUBBLE ON THE SURFACE OF THE SLOPE. INSPECTED AREA BUT COULD NOT IDENTIFY ANY FEATURES.
(66) FAULT OBSERVED BEDDING ANGLE CHANGE AND FEATURE (57 / 57A) PICHINING OUT IN THIS LOCATION. HOWEVER, NO FEATURE WAS ABLE TO BE LOCATED TO BE MEASURED.
(67) J; 71° @ 067° / UN / R / T-VN / CV (SAND).
(68) TWO PARALLEL JOINTS. J; 47-58° @ 247° / PL / SM / T / CN.
(69) FINE TO COARSE SANDSTONE UNIT WITH MINOR LITHICS. LITHICS ARE FINE TO COARSE.
(70) B; 17° @ 250° / UN / SM / T / CN.
(71) AREA OF FILL PLACED OVER THE SHEAR KEY AS THE OLD ACCESS RAMP FOR EXCAVATION.
(72) B; 30° @ 220° / UN / SM / T / CN.
(73) SHEARED N>50 ECBF UNIT PINCHES OUT AT THIS LOCATION, MEANING THE ROCK LEVEL INCREASES BY 1.25m.



LONGSECTION 120 / 130
SCALE 1: 500

A3 SCALE 1:500
0 5 10 15 20 25 (m)

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REV	DESCRIPTION	CAD	CHK	DATE
1	COMPLETION REPORT ISSUE	JC	JKK	Sep.20

DESIGNED	JASM	Aug.20	DRAWING STATUS: COMPLETION REPORT
DRAWN	JC	Aug.20	
DESIGN CHECKED	JKK	Sep.20	
DRAWING CHECKED	RBS	Sep.20	

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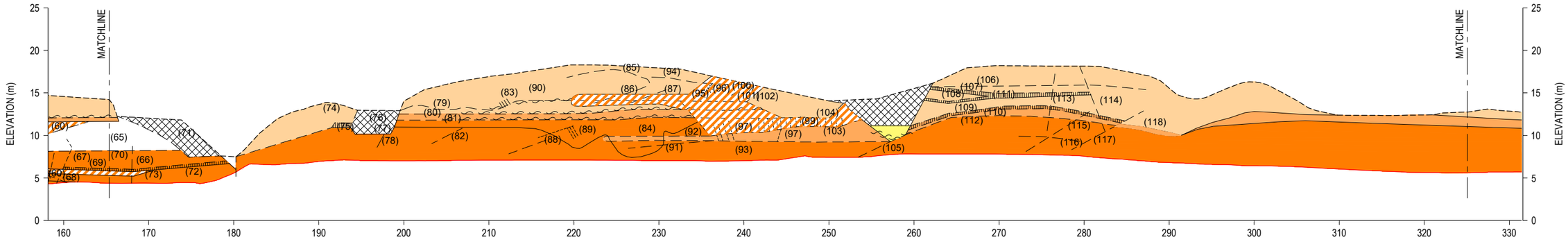
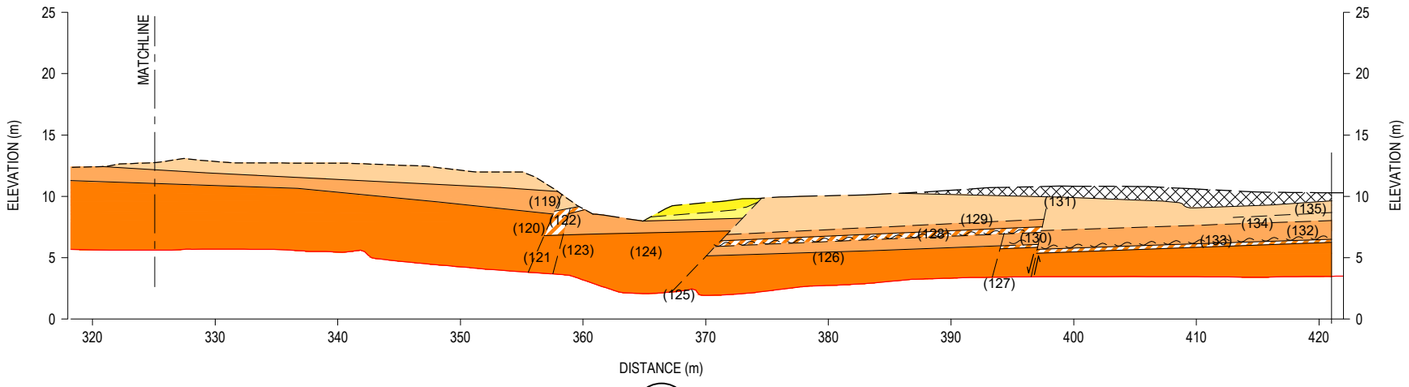
CLIENT: WFH PROPERTIES LTD
PROJECT: MILLWATER - ARRANS HILL
TITLE: PRECINCT 5 STAGE 2
SHEAR KEY 01 LONGSECTION (SHEET 1 OF 2)
SCALE (A3): 1:500 DWG No. 21854.0031-AHP5S2-131 REV 1

(74) LIMONITE ZONE, UP TO 500MM THICK.
(75) SHEAR PLANE; 11° @ 221° / PL / R / T-VN / FeSt.
(76) FILL ZONE. FILL HAS BEEN PLACED HERE FOR AN ACCESS RAMP TO THE SHEAR KEY DURING EXCAVATION.
(77) DRAIN COIL.
(78) F; 84° @ 331° / UN / R / T-VN / FeSt.
(79) SHEAR PLANE; 3-6° @ 220-234° / UN / R / VN / CV (SILTY CLAY).
(80) SHEAR PLANE; 6° @ 224° / PL / SL / POLISHED / VN / CV (CLAY).
(81) SHEAR PLANE; 5° @ 228° / PL / SL / POLISHED / T-VN / CV (CLAY).
(82) F; 52-85° @ 356° / UN / R / VN / STAINED GREENISH GREY. APPEARS TO LINK INTO THE 1.20m INCREASE IN FEATURE (6) AT 18.50m INTO SECTION 1.
(83) SHEAR PLANE; 6° @ 224° / PL / SL / POLISHED / VN / CV (CLAY).
(84) J; 83° @ 001° / UN / R / T-VN / FeSt.
(85) SHEAR PLANE; 6-38° @ 281° / UN / SM / PARTIALLY POLISHED / VN-N / CV (SILTY SAND).
(86) F; 32-87° @ 359° / UN / SM / T-MW / CZ (UP TO 25mm THICK) / STAINED DARK BROWNISH GREY.
(87) F; 36-81° @ 355° / UM / SM / POLISHED / CZ (UP TO 10MM THICK) / FEST (UP TO 35mm THICK) / STAINED DARK BROWNISH GREY.
(88) J; 83° @ 001° / UN / R / T-VN / FeSt.
(89) THREE PARALLEL JOINTS. J; 84° @ 253° / UN / R / T-VN / FeSt.
(90) B; 5° @ 220° / PL / R / T / CN.
(91) SHEAR PLANE; 6-10° @ 243° / UN / R / T-N / CC (UP TO 5mm) / STAINED GREENISH GREY.
(92) WEDGE OF WEATHERED ECBF.
(93) SHEAR PLANE; 3-24° @ 289° / UN / R / T-VN / CV (SANDY SILT).
(94) B; 5° @ 231° / PL / R / T / CN.
(95) F; 86° @ 357° / PL / R / T-VN / FeSt (UP TO 40mm THICK).
(96) SIX PARALLEL FAULTS. F; 82° @ 293° / PL / R / T-VN / FeSt.
(97) F; 63-84° @ 266-327° / PL / R / T-VN / CV (SANDY SILT) / FeSt.
(98) FOUR JOINTS. J; 70-81° @ 239° / PL / R / T-VN / CN.
(99) MULTIPLE SMALL FAULTS. TYPICALLY: F; 83° @ 269° / PL / R / T-MN / CV (SILTY SAND) / FeSt.
(100) J; 52° @ 355° / PL / R / T-VN / FeSt.
(101) J; 39-42° @ 349° / PL / R / T / FeSt.
(102) J; 40° @ 344° / PL / R / T-VN / FeSt.
(103) SHEAR PLANE; 3-64° @ 219-271° / UN / R / VN-N / CZ (UP TO 80MM THICK) / FeSt.
(104) SHEAR PLANE; 7-21° @ 243° / UN / R / T-N / CZ (UP TO 150mm THICK) / FeSt.
(105) F?; 48° @ 297° / PL / SM / T / CN.
(106) SHEAR PLANE; 2-14° @ 142-198° / UN / R / T-VN / FeSt.
(107) SHEAR PLANE; 20° @ 157° / PL / R / T / FeSt (UP TO 150mm THICK).
(108) SHEAR PLANE; 13-22° @ 184° / UN / R / T / FeSt (UP TO 200mm THICK).
(109) LIMONITE ZONE, UP TO 250mm THICK.
(110) SHEAR PLANE; 2-38° @ 141° / UN / R / T-VN / CV (CLAYEY SILT) / FeSt (UP TO 250MM THICK).
(111) SHEAR PLANE; 1-4° @ 136° / UN / R / VN / CV (SAND) / FEST (UP TO 450mm THICK). THIS FEATURE HAS BEEN CREATED AFTER THE MERGING OF FEATURES (36 & 37).
(112) SHEAR PLANE; 2° @ 132° / PL / R / T-VN / CV (SAND) / FEST / STAINED BROWNISH GREY.
(113) F; 74° @ 349° / PL / SM / T / CV (SILTY SAND) / FeSt.
(114) F; 66° @ 301° / PL / R / T-VN / FeSt.
(115) F; 42-47° @ 182° / PL / R / T / CV (SAND).
(116) B; 3° @ 145° / PL / R / VN / CV (SILTY SAND). POSSIBLY A SHEAR PLANE?
(117) F; 85° @ 162° / PL / R / VN-N / CV (SANDY SILT) / STAINED DARK BROWNISH GREY.
(118) SHEAR PLANE; 3-8° @ 152° / PL / R / N / FeSt (UP TO 450MM THICK).



LONGSECTION 120/130 CONTINUED
SCALE 1: 500

(119) B; 4-13° @ 209° / UN / SM / T-VN / FeSt (UP TP 30mm THICK) / CV (SILT)
(120) B; 4° @ 198° / UN / R / T-VN / CV (SILT)
(121) F; 73-82° @ 144° / UN / R / VN-V / FeSt (25mm THICK) / CV (SILTY SAND) / 1.6m OFFSET
(122) B; 13° @ 202° / UN / R / VN / CV (SAND)
(123) J; 71° @ 117° / PL / SM / VN-N / FeSt / CV (SANDY SILT).
(124) B; 8° @ 218° / PL / SM / T-VN / CV (SILTY SAND).
(125) F; 74° @ 140° / PL / R / VN-N / Cz (UP TO 70mm THICK) / CV (SAND)
(126) B; 4-12° @ 179-187° / UN / R / T / CV (SAND).
(127) J; 79-88° @ 121° / UN / R / T / FeST.
(128) SHEAR PLANE; 8° @ 200° / UN / R / VN-N / Cz (40mm THICK) / CV (SILTY SAND)
(129) SHEAR PLANE; 5° @ 160° / UN / R / T-VN / CV (SAND)
(131) F; 78-90° @ 124-291° / UN / R / T / CN
(132) B; 5-10° @ 182° / PL / R / T-VN / CN
(133) SHEAR PLANE; 6-8° @ 204° / SM / UN / T-VN / Cz (30-140mm THICK) / CC (UP TO 12mm THICK, CLAYEY SILT, GREY)
(134) SHEAR PLANE; 8-11° @ 202° / UN / SM / T-VN / CC (3mm THICK, CLAYEY SILT, GREY)
(135) [AS #57 IN STAGE 1 LONGSECTION]; SHEAR PLANE 8-13° @ 198-211° / UN / R / T-VN / FeST (UP TO 250mm THICK)



LONGSECTION 120/130 CONTINUED
SCALE 1: 500

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. LEVEL DATUM: LINZ (MSL) AUCKLAND VERTICAL DATUM 1946
3. FOR LEGEND , REFER TO 21854.0031-AHP5S2-135.

A3 SCALE 1:500
0 5 10 15 20 25 (m)
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REV	DESCRIPTION	CAD	CHK	DATE
1	COMPLETION REPORT ISSUE	JC	JKK	Sep.20

DESIGNED	JASM	Aug.20
DRAWN	JC	Aug.20
DESIGN CHECKED	JKK	Sep.20
DRAWING CHECKED	RBS	Sep.20

DRAWING STATUS: COMPLETION REPORT

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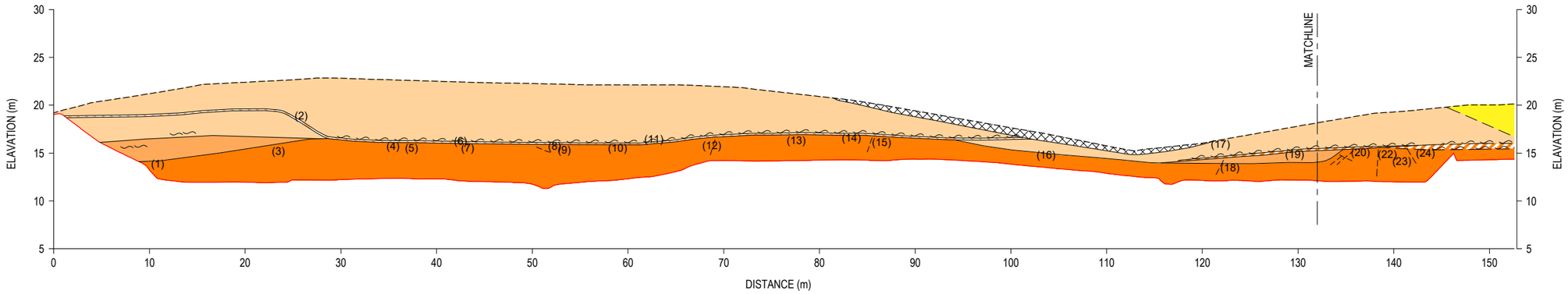
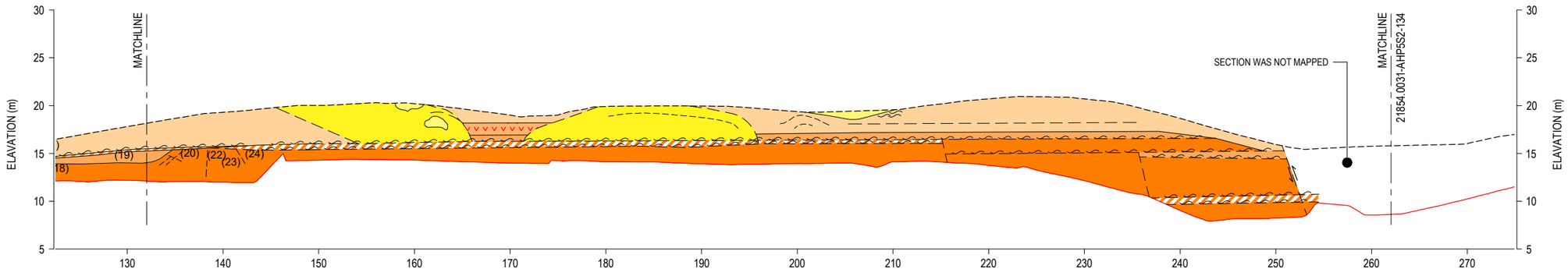
CLIENT WFH PROPERTIES LTD
PROJECT MILLWATER - ARRANS HILL
TITLE PRECINCT 5 STAGE 2
SHEAR KEY 01 LONGSECTION (SHEET 2 OF 2)
SCALE (A3) 1:500 DWG No. 21854.0031-AHP5S2-132 REV 1

L:\21854\21854.0031 - Orewa West Precinct 5\WorkingMaterial\CAD\DWG\GCR\STAGE 2\21854.0031-AHP5S2-131_34.dwg 2020-Sep-10 10:50:15 PM Plotted By: JONALD CASTRO

(1) B 04° / 208°
(2) SIDE OF REACTIVATED LANDSLIDE -TENSION CRACKS TERMINATE ALONG THIS BOUNDARY
(3) B 02° / 192°
(4) B 04° / 187°
(56) J 78° / 61°
(6) SHEAR PLANE 07° / 207°
(7) B 08° / 212°
(8) J 86° / 188°
(9) B 08° / 206°
(10) B 06° / 152°
(11) SHEAR PLANE 08° / 208°
(12) J 88° / 120°
(13) B 04° / 184°
(14) B 04° / 179°
(15) J 84° / 126°
(16) B 08° / 185°
(17) B 10° / 199°
(18) J 90° / 150°
(19) B 12° / 179°
(20) J 37° / 263°
(21) J 50° / 269°
(22) J 58° / 099°
(23) B 45° / 211°
(24) J 80° / 101°



LONGSECTION 121/130
SCALE 1: 500



LONGSECTION 121/130 CONTINUED
SCALE 1: 500

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. LEVEL DATUM: LINZ (MSL) AUCKLAND VERTICAL DATUM 1946
3. FOR LEGEND , REFER TO 21854.0031-AHP5S2-135.

A3 SCALE 1:500
0 5 10 15 20 25 (m)

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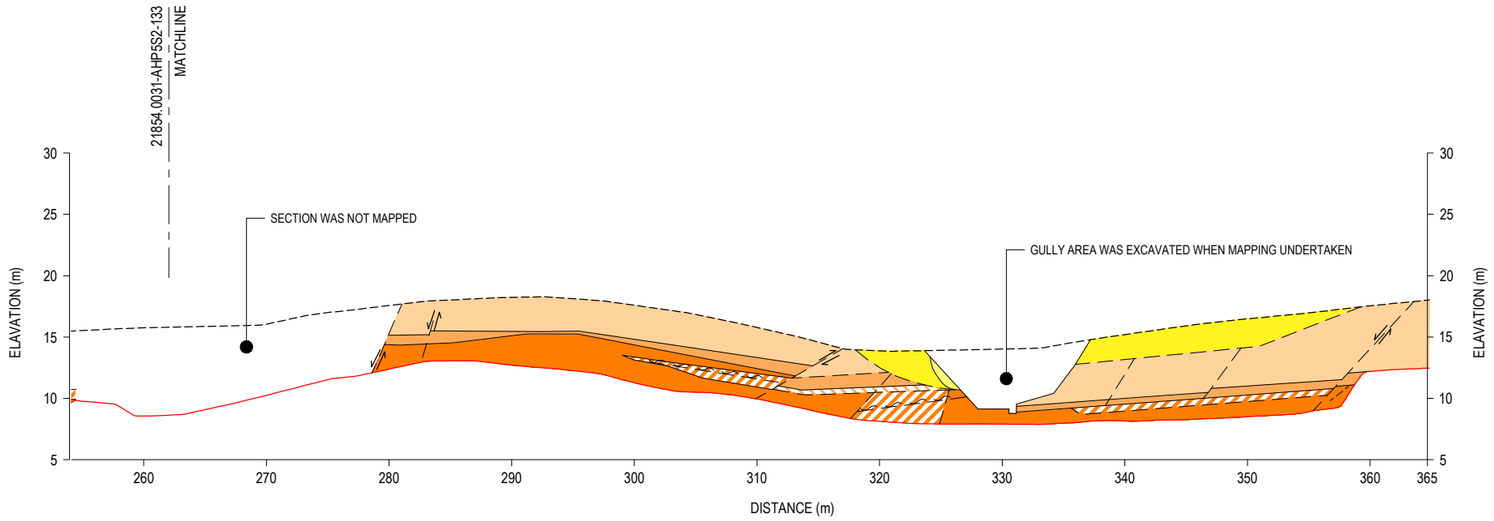
CLIENT **WFH PROPERTIES LTD**
PROJECT **MILLWATER - ARRANS HILL**
TITLE PRECINCT 5 STAGE 2
SHEAR KEY 02 LONGSECTION (SHEET 1 OF 2)
SCALE (A3) 1:500 DWG No. 21854.0031-AHP5S2-133 REV 1



LONGSECTION 121/130 CONTINUED
SCALE 1: 500

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TITLE PRECINCT 5 STAGE 2
SHEAR KEY 02 LONGSECTION (SHEET 2 OF 2)
SCALE (A3) 1:500 DWG No. 21854.0031-AHP5S2-134 REV 1

LONGSECTION MATERIAL LEGEND

- ALLUVIUM
  SILTY CLAY AND CLAYEY SILT, FIRM TO STIFF, MOIST TO WET, LIGHT GREY TO WHITE, ORGANIC LAYERS, GENERALLY THINLY BEDDED (SUBHORIZONTAL)
- COLLUVIUM
- RESIDUAL EAST COAST BAYS FORMATION SOILS
- HW-MW EAST COAST BAYS FORMATION SOILS
- HW-MW EAST COAST BAYS FORMATION (SHEARED)
- SW-UW EAST COAST BAYS FORMATION (SHEARED)
  INTERBEDDED SANDSTONE, SILTSTONE AND MUDSTONE.
  SANDSTONE, SILTY, VERY WEAK, DARK GREY.
  SILTSTONE AND MUDSTONE, EXTREMELY WEAK TO VERY WEAK, DARK GREY
- SW-UW EAST COAST BAYS FORMATION
  INTERBEDDED SANDSTONE, SILTSTONE AND MUDSTONE.
  SANDSTONE, SILTY, VERY WEAK, DARK GREY.
  SILTSTONE AND MUDSTONE, EXTREMELY WEAK TO VERY WEAK, DARK GREY
- ENGINEERED FILL
- SHEAR SURFACE
- EXISTING GROUND LEVEL
- UNDERCUT LEVEL
- SEEPAGE

DEFECT CODE LEGEND

SHAPE		ROUGHNESS		APERTURE		
TERM	CODE	DESCRIPTION OF JOINT SURFACE	CODE	TERM	SYMBOL	DESCRIPTION (SEPERATION)
STEPPED	ST	SLICKENSIDED	SL	TIGHT	T	NIL
UNDULATING	UN	SMOOTH	SM	VERY NARROW	VN	0 TO 2mm
PLANAR	PL	ROUGH	R	NARROW	N	2 TO 6mm
				MODERATELY NARROW	MN	6 TO 20mm
				MODERATELY WIDE	MW	20 TO 60mm
				WIDE	W	60 TO 200mm
				VERY WIDE	VW	>200mm

INFILLINGS AND COATINGS

CLAY GOUGE	CG	JOINTS HAVE OPENINGS BETWEEN OPPOSING FACES OF INTACT ROCK SUBSTANCE IN EXCESS OF 1mm FILLED WITH CLAY GOUGE. CLAY IS GENERALLY DESCRIBED IN TERMS OF SOIL PROPERTIES.
CLAY VENEERS	CV	JOINTS CONTAIN CLAY COATING WHOSE MAXIMUM THICKNESS DOES NOT EXCEED 1MM. NOTE: DESCRIBE CLAY IN TERMS OF SOIL PROPERTIES.
PENETRATIVE LIMONITE	PL	JOINT TRACES ARE MARKED IN TERMS OF WELL DEFINED ZONES OF SLIGHTLY TO MODERATELY WEATHERED FERRUGINISED ROCK-SUBSTANCE WITHIN THE ADJACENT ROCK.
LIMONITE STAINED	FeSt	JOINT SURFACES ARE STAINED OR COATED WITH LIMONITE, ALTHOUGH THE ROCK SUBSTANCE IMMEDIATELY ADJACENT TO THE JOINTS IS FRESH.
COATED	CT SC	JOINTS EXHIBIT COATINGS OTHER THAN CLAY OR LIMONITE, EG. CARBONATE (CT) OR SILICA (SC)
CEMENTED	CL CS CC	JOINTS ARE CEMENTED WITH LIMONITE (CL), SILICA (CS), OR CARBONATES (CC)
CLEAN	CN	JOINT SURFACES SHOW NO TRACE OF CLAY, LIMONITE, OR OTHER COATINGS

TYPE		
TERM	CODE	SYMBOL
BEDDING	B	15° DIP ANGLE / STRIKE
JOINT	J	55° DIP ANGLE / STRIKE
SHEAR ZONE	SZ	20° DIP ANGLE / STRIKE
FAULT TRACE	F	40° DIP ANGLE / STRIKE

TYPICAL EXAMPLE:

(5) F 51° @ 230° / PL / SM / T-VN / CV (SILTY CLAY)

- (5) NO. IN DEFECT SET
- F TYPE
- 51° DIP ANGLE
- 230° DIP DIRECTION
- PL SHAPE
- SM ROUGHNESS
- T-VN APERTURE
- CV INFILLING/COATING TYPE
- (SILTY CLAY) INFILLING DESCRIPTION (AS PER SOIL DESCRIPTION)

ORIGINAL IN COLOUR

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REV	DESCRIPTION	CAD	CHK	DATE	APPROVED	DATE
1	COMPLETION REPORT ISSUE	JC	JKK	Sep.20		

DESIGNED	JASM	Aug.20
DRAWN	JC	Aug.20
DESIGN CHECKED	JKK	Sep.20
DRAWING CHECKED	RBS	Sep.20

DRAWING STATUS: COMPLETION REPORT

NOT FOR CONSTRUCTION

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION PURPOSES UNLESS SIGNED AS APPROVED

CLIENT **WFH PROPERTIES LTD**

PROJECT **MILLWATER - ARRANS HILL**

TITLE PRECINCT 5 STAGE 2
GEOLOGY LEGEND AND DEFINITION OF TERMS

SCALE (A3) NTS DWG No. 21854.0031-AHP5S2-135 REV 1

L:\21854\21854.0031 - Orewa West Precinct 5\WorkingMaterial\CAD\DWG\GCR\STAGE 2\21854.0031-AHP5S2-140.dwg 2020-Sep-10 10:50:36 PM Plotted By: JONALD CASTRO

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. COORDINATE DATUM: NZGD2000, MT EDEN CIRCUIT COORDINATES. ORIGIN: LAT 36 52 47S 174 45 51E 800,000MN 400,000ME
   LEVEL DATUM: LINZ (MSL) AUCKLAND VERTICAL DATUM 1946
3. LOT BOUNDARY SUPPLIED BY WOODS, REFERENCE "X_37502_P5_02_BOUNDARY.dwg", DATED 28 AUG 2020.
4. ASBUILT CONTOUR SUPPLIED BY WOODS, REFERENCE "X_37502_P5_02_FINALSURFACE.dwg", DATED DATED 28 AUG 2020.

LEGEND

- STAGE 2 BOUNDARY
- 94 LOT BOUNDARIES
- 35.0 FINISHED GROUND PROFILE (1m INTERVAL)
- RETAINING WALL
- BUILDING LIMITATION ZONE

A3 SCALE 1:1250

0 25 50 75 (m)

ORIGINAL IN COLOUR

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REV	DESCRIPTION	CAD	CHK	DATE
1	COMPLETION REPORT ISSUE	JC	JKK	Sep.20

DESIGNED	JASM	Aug.20	DRAWING STATUS: COMPLETION REPORT
DRAWN	JC	Aug.20	
DESIGN CHECKED	JKK	Sep.20	
DRAWING CHECKED	RBS	Sep.20	

NOT FOR CONSTRUCTION

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APPROVED DATE

CLIENT **WFH PROPERTIES LTD**

PROJECT **MILLWATER - ARRANS HILL**

TITLE PRECINCT 5 STAGE 2
BUILDING LIMITATION PLAN

SCALE (A3) 1:1250 DWG No. 21854.0031-AHP5S2-140 REV 1

L:\21854\21854.0031 - Orewa West Precinct 5\WorkingMaterial\CAD\DWG\GCR\STAGE 2\21854.0031-AHP5S2-141.dwg 2020-Sep-10 10:50:46 PM Plotted By: JONALD CASTRO

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. COORDINATE DATUM: NZGD2000, MT EDEN CIRCUIT COORDINATES. ORIGIN: LAT 36 52 47S 174 45 51E 800,000MN 400,000ME
   LEVEL DATUM: LINZ (MSL) AUCKLAND VERTICAL DATUM 1946
3. LOT BOUNDARY SUPPLIED BY WOODS, REFERENCE "X_37502_P5_02_BOUNDARY.dwg", DATED 28 AUG 2020.
4. ASBUILT CONTOUR SUPPLIED BY WOODS, REFERENCE "X_37502_P5_02_FINALSURFACE.dwg", DATED DATED 28 AUG 2020.
5. CUT FILL CONTOURS SUPPLIED BY WOODS, REFERENCE "X_37502_P5_02_ORIGINAL FINAL.dwg", DATED 28 AUG 2020.

LEGEND

- STAGE 2 BOUNDARY
- 94 — LOT BOUNDARIES
- 35.0 — FINISHED GROUND PROFILE (1m INTERVAL)
- RETAINING WALL
- RE SLOPE EXTENT
- VEGETATED REINFORCED EARTH BATTER
- 2.0 — FILL CONTOURS
- 0.0 — ZERO CONTOURS
- -2.0 — CUT CONTOURS
- HA — HAND AUGER TO 3m DEPTH (FULLY LOGGED)

A3 SCALE 1:1250

0 25 50 75 (m)

ORIGINAL IN COLOUR

REV	DESCRIPTION	CAD	CHK	DATE
1	COMPLETION REPORT ISSUE	JC	JKK	Sep.20

DESIGNED	JASM	Aug.20	DRAWING STATUS
DRAWN	JC	Aug.20	COMPLETION REPORT
DESIGN CHECKED	JKK	Sep.20	
DRAWING CHECKED	RBS	Sep.20	

NOT FOR CONSTRUCTION

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APPROVED DATE

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CLIENT **WFH PROPERTIES LTD**

PROJECT **MILLWATER - ARRANS HILL**

TITLE PRECINCT 5 STAGE 2
POST EARTHWORKS INVESTIGATION PLAN

SCALE (A3) 1:1250 DWG No. 21854.0031-AHP5S2-141 REV 1

L:\21854\21854.0031 - Orewa West Precinct 5\WorkingMaterial\CAD\DWG\GCR\STAGE 2\21854.0031-AHP5S2-142.dwg 2020-Sep-10 10:50:55 PM Plotted By: JONALD CASTRO

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. COORDINATE DATUM: NZGD2000, MT EDEN CIRCUIT COORDINATES. ORIGIN: LAT 36 52 47S 174 45 51E 800,000MN 400,000ME
   LEVEL DATUM: LINZ (MSL) AUCKLAND VERTICAL DATUM 1946
3. LOT BOUNDARY SUPPLIED BY WOODS, REFERENCE "X_37502_P5_02_BOUNDARY.dwg", DATED 28 AUG 2020.
4. ASBUILT CONTOUR SUPPLIED BY WOODS, REFERENCE "X_37502_P5_02_FINALSURFACE.dwg", DATED DATED 28 AUG 2020.
5. UNDERCUT SUPPLIED BY WOODS, REFERENCE "X_37502_P5_02_LOWEST SURFACE.dwg", DATED 28 AUG 2020.

LEGEND

- STAGE 2 BOUNDARY
- 94 — LOT BOUNDARIES
- 35.0 — FINISHED GROUND PROFILE (1m INTERVAL)
- RETAINING WALL
- RE SLOPE EXTENT
- VEGETATED REINFORCED EARTH BATTER
- UNDERCUT EXTENT
- SHEAR KEY EXTENT
- 200 — TOPSOIL DEPTH (mm) TAKEN AT CENTRE OF EACH LOT

A3 SCALE 1:1250

0 25 50 75 (m)

ORIGINAL IN COLOUR

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REV	DESCRIPTION	CAD	CHK	DATE
1	COMPLETION REPORT ISSUE	JC	JKK	Sep.20

DESIGNED	JASM	Aug.20	DRAWING STATUS: COMPLETION REPORT
DRAWN	JC	Aug.20	
DESIGN CHECKED	JKK	Sep.20	
DRAWING CHECKED	RBS	Sep.20	

NOT FOR CONSTRUCTION

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION PURPOSES UNLESS SIGNED AS APPROVED

APPROVED DATE

CLIENT **WFH PROPERTIES LTD**

PROJECT **MILLWATER - ARRANS HILL**

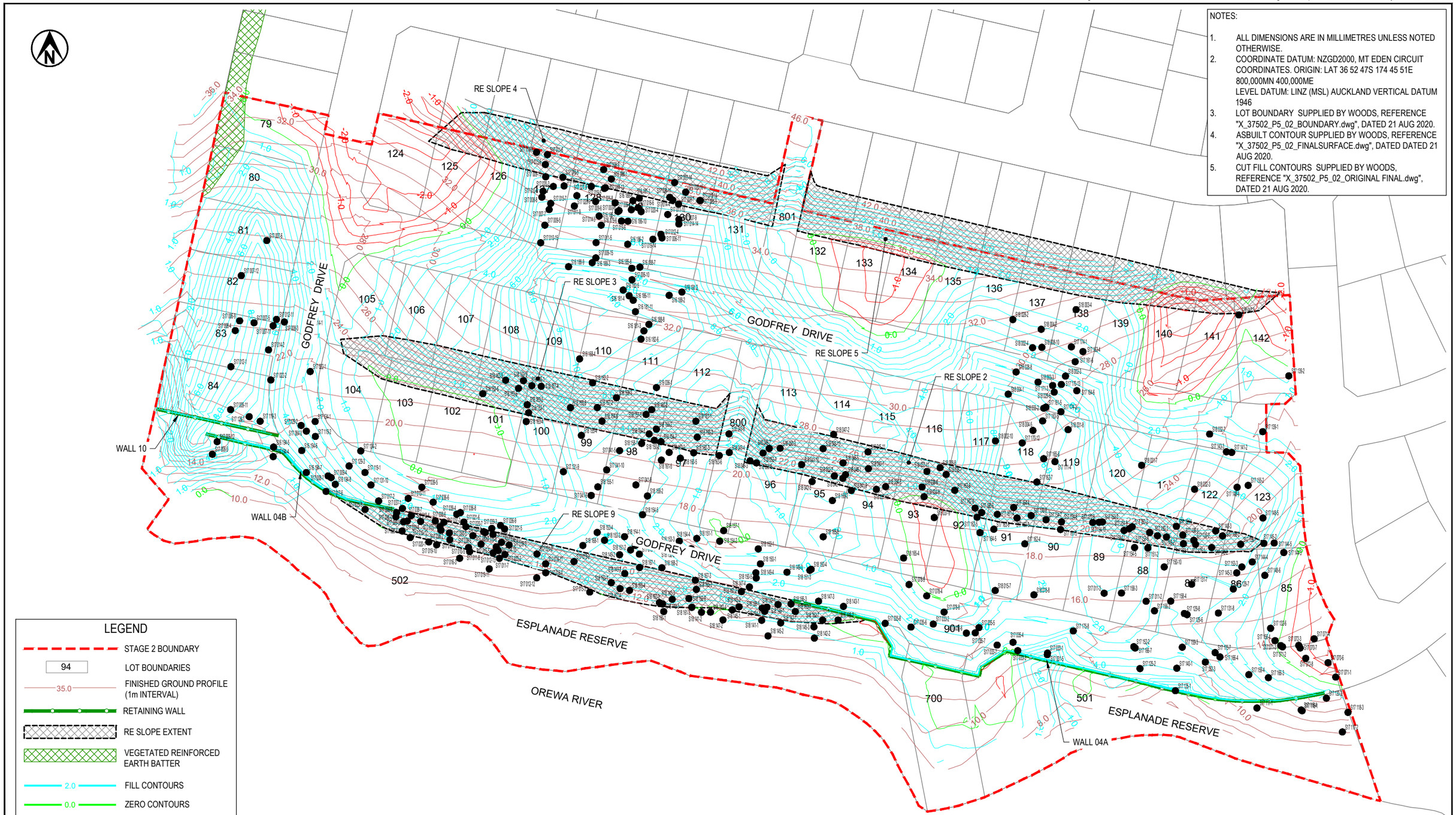
TITLE PRECINCT 5 STAGE 2
TOPSOIL DEPTHS PLAN

SCALE (A3) 1:1250 DWG No. 21854.0031-AHP5S5-142 REV 1

L:\21854\21854.0031 - Orewa West Precinct 5\WorkingMaterial\CAD\DWG\GCR\STAGE 2\21854.0031-AHP5S2-143.dwg 2020-Sep-10 10:51:08 PM Plotted By: JONALD CASTRO

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. COORDINATE DATUM: NZGD2000, MT EDEN CIRCUIT COORDINATES. ORIGIN: LAT 36 52 47S 174 45 51E 800,000MN 400,000ME
   LEVEL DATUM: LINZ (MSL) AUCKLAND VERTICAL DATUM 1946
3. LOT BOUNDARY SUPPLIED BY WOODS, REFERENCE "X_37502_P5_02_BOUNDARY.dwg", DATED 21 AUG 2020.
4. ASBUILT CONTOUR SUPPLIED BY WOODS, REFERENCE "X_37502_P5_02_FINALSURFACE.dwg", DATED DATED 21 AUG 2020.
5. CUT FILL CONTOURS SUPPLIED BY WOODS, REFERENCE "X_37502_P5_02_ORIGINAL FINAL.dwg", DATED 21 AUG 2020.



LEGEND

- STAGE 2 BOUNDARY
- 94 — LOT BOUNDARIES
- 35.0 — FINISHED GROUND PROFILE (1m INTERVAL)
- RETAINING WALL
- RE SLOPE EXTENT
- VEGETATED REINFORCED EARTH BATTER
- 2.0 — FILL CONTOURS
- 0.0 — ZERO CONTOURS
- -2.0 — CUT CONTOURS
- S16 08116 — EARTHWORKS TESTING LOCATION (URN NUMBER)

A3 SCALE 1:1250

0 25 50 75 (m)

ORIGINAL IN COLOUR

Tonkin+Taylor

Exceptional thinking together www.tonkintaylor.co.nz

REV	DESCRIPTION	CAD	CHK	DATE
1	COMPLETION REPORT ISSUE	JC	JKK	Sep.20

DESIGNED	JASM	Aug.20	DRAWING STATUS: COMPLETION REPORT
DRAWN	JC	Aug.20	
DESIGN CHECKED	JKK	Sep.20	
DRAWING CHECKED	RBS	Sep.20	

NOT FOR CONSTRUCTION

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION PURPOSES UNLESS SIGNED AS APPROVED

APPROVED DATE

CLIENT **WFH PROPERTIES LTD**

PROJECT **MILLWATER - ARRANS HILL**

TITLE PRECINCT 5 STAGE 2
EARTHWORKS TESTING LOCATION PLAN

SCALE (A3) 1:1250 DWG No. 21854.0031-AHP5S2-143 REV 1

Appendix C: Contractors certificates

- JG Civil PS3 – Millwater Precinct 5 – Stage 2 Civil works
- Hick Bros Civil Construction Limited PS3 - Precinct 5 – Wall 4A Fence
- Wall 4B Fence
- Wall 10 Fence
- ICB Retaining & Construction Limited PS3 – Walls 2, 5 and 4B
- ICB Retaining & Construction Limited PS3 – Wall 4A
- ICB Retaining & Construction Limited PS3 – Wall 10
- Hick Bros Civil Construction Limited PS3 – Precinct 5 – Stage 2 Earthworks

PS3 - FORM OF PRODUCER STATEMENT- CONSTRUCTION

ISSUED BY: HICK BROS CIVIL CONSTRUCTION LIMITED

TO: WFH Development Ltd

IN RESPECT OF: Precinct 5 Stage 2 Earthworks
AT: 157 Grand Drive, Orewa

HICK BROS CIVIL CONSTRUCTION LTD has contracted to WFH Development Ltd to carry out and complete certain building works in accordance with a contract, titled Precinct 5 Stage 2 Earthworks ("the contract")

I MATT THOMAS a duly authorized representative of HICK BROS CIVIL CONSTRUCTION LIMITED believe on reasonable grounds that HICK BROS CIVIL CONSTRUCTION LIMITED has carried out and completed all of the contract works in in accordance with the contract.

Date: 10th December 2019

(Signature of Authorized Agent on behalf of)

HICK BROS CIVIL CONSTRUCTION LIMITED
(Contractor)

42 FORGE ROAD, SILVERDALE
(Address)

SIXTH SCHEDULE

(NZS 3910:2003)

FORM OF PRODUCER STATEMENT CONSTRUCTION

ISSUED BY **ICB Retaining & Construction Limited**
(Contractor)

TO **Hick Bros Civil Contractors Ltd**
(Principal)

IN RESPECT OF **Allan Block Walls RW10**
(Description of Contract Works)

AT **Godfrey Drive, Silverdale, Auckland. Lot 1000 DP 522519**
(Address)

ICB Retaining & Construction Ltd
(Contractor)

has contracted to **Hick Bros Civil Contractors Ltd**
(Principal)

to carry out and complete certain building works in accordance with a contract, titled

Supply and Installation of Allan Block Walls RW10 at Godfrey Drive, Silverdale, Auckland *(The Contract)*
(The Project)

I, ***Chris Burke*** a duly authorised
(Duly Authorised Agent)

representative of **ICB Retaining & Construction Limited**
(Contractor)

Believe on reasonable grounds that **ICB Retaining & Construction Limited**
(Contractor)

has carried out and completed:
☑ All ☐ Part only as specified in the attached particulars of the building works in accordance with the Building Consent# BCO10270476-A and any Authorised Instruction / Variations that have been issued during the course of the work.

(Signature of Authorised Agent on Behalf of)

2 July 2020
(Date)

ICB Retaining & Construction Limited
(Contractor)

PO Box 303 340, North Harbour, Auckland
(Address)

FORM OF PRODUCER STATEMENT PS3 – CONSTRUCTION

At project completion, this form shall be completed by the building contractor and supplied to the Engineer.

ISSUED BY: North Harbour Fencing
(Building Contractor)

TO: Hick Bro's Civil
(Owner/Principal)

IN RESPECT OF: Fencing on wall 10 (Folded panels)
(Description of Contract Works)

AT: Millwater
(Address)

T/A: Auckland Council **BUILDING CONSENT No:**
(Territorial Authority / Building Consent Authority)

The above Building Contractor has contracted to the above Owner/Principal to carry out and complete certain building works in accordance with the contract, titled

..... ("the contract")
(Title of building contract)

I Ken Wells a duly authorised representative of the
(Builder's Authorised Agent)

above building contractor, believe on reasonable grounds that the above building contractor has carried out and completed

☑ All ☐ Part only as specified in the attached particulars

of the building works in accordance with the contract.

K Wells
(Signature of Authorised Agent on behalf of the Building Contractor)

20A Manga Rd
(Date)

Silverdale
Auckland
(Address)

This producer statement is confirmation by the builder(s) that they have carried out the building work in accordance with the drawings, specifications (and site amendments) that are part of the contract / building consent documents.

Work covered by this statement should have been supervised and checked by suitably qualified trades-persons.

The Engineer requires this producer statement and a copy of the T/A's building consent conditions, to confirm that items of the contract that he has not personally examined, have in fact been built according to the documents, so that the Engineer may issue appropriate documents to the T/A for it to release the Code Compliance Certificate.

SIXTH SCHEDULE

(NZS 3910:2003)

FORM OF PRODUCER STATEMENT CONSTRUCTION

ISSUED BY **ICB Retaining & Construction Limited**
(Contractor)

TO **Hick Bros Civil Construction Ltd**
(Principal)

IN RESPECT OF **ICB Screen Block Retaining Wall RW4A. Lot 805 DP463561**
(Description of Contract Works)

AT **157 Grand Drive, Orewa, Auckland**
(Address)

ICB Retaining & Construction Ltd
(Contractor)

has contracted to **Hick Bros Civil Construction Ltd**
(Principal)

to carry out and complete certain building works in accordance with a contract, titled

Supply and Installation of ICB Screen Block Retaining Wall RW4A at 157 Grand Drive, Orewa, Auckland
(The Project) *(The Contract)*

I, ***Chris Burke*** a duly authorised
(Duly Authorised Agent)

representative of **ICB Retaining & Construction Limited**
(Contractor)

Believe on reasonable grounds that **ICB Retaining & Construction Limited**
(Contractor)

has carried out and completed:
☑ All ☐ Part only as specified in the attached particulars of the building works in accordance with the Building Consent# REG66652, REG66703 and any Authorised Instruction / Variations that have been issued during the course of the work.

(Signature of Authorised Agent on Behalf of)

2 July 2020
(Date)

ICB Retaining & Construction Limited
(Contractor)

PO Box 303 340, North Harbour, Auckland
(Address)

PS3 - FORM OF PRODUCER STATEMENT- CONSTRUCTION

ISSUED BY: HICK BROS CIVIL CONSTRUCTION LIMITED

TO: WFH Development Ltd

IN RESPECT OF: Precinct 5 Retaining Wall 4A Fence
AT: 157 Grand Drive, Orewa

HICK BROS CIVIL CONSTRUCTION LTD has contracted to WFH Development Ltd to carry out and complete certain building works in accordance with a contract, titled Precinct 5 Retaining Wall 4A Fence ("the contract")

I MATT THOMAS a duly authorized representative of HICK BROS CIVIL CONSTRUCTION LIMITED believe on reasonable grounds that HICK BROS CIVIL CONSTRUCTION LIMITED has carried out and completed all of the contract works in in accordance with the contract.

Date: 3rd July 2020

(Signature of Authorized Agent on behalf of)

HICK BROS CIVIL CONSTRUCTION LIMITED
(Contractor)

42 FORGE ROAD, SILVERDALE
(Address)

FORM OF PRODUCER STATEMENT PS3 – CONSTRUCTION
At project completion, this form shall be completed by the building contractor and supplied to the Engineer.

ISSUED BY: NORTH HARBOUR FENCING LTD
(Building Contractor)

TO: JG CIVIL
(Owner/Principal)

IN RESPECT OF: FOLDED POOL FENCING INSTALLED AT WALL 4A
(Description of Contract Works)

AT: MILLWATER PRECINCT 5, STAGE 2
(Address)

T/A: AUCKLAND **BUILDING CONSENT No:**.....
(Territorial Authority / Building Consent Authority)

The above Building Contractor has contracted to the above Owner/Principal to carry out and complete certain building works in accordance with the contract, titled

MILLWATER PRECINCT 5, STAGE 2 FENCING ("the contract")
(Title of building contract)

I SIMON NICHOLSON a duly authorised representative of the
(Builder's Authorised Agent)

above building contractor, believe on reasonable grounds that the above building contractor has carried out and completed

☑ All ☐ Part only as specified in the attached particulars

of the building works in accordance with the contract.

.....
(Signature of Authorised Agent on behalf of the Building Contractor)

31 AUGUST 2020
(Date)

20A MANGA RD
SILVERDALE
(Address)

This producer statement is confirmation by the builder(s) that they have carried out the building work in accordance with the drawings, specifications (and site amendments) that are part of the contract / building consent documents.

Work covered by this statement should have been supervised and checked by suitably qualified trades-persons.

The Engineer requires this producer statement and a copy of the T/A's building consent conditions, to confirm that items of the contract that he has not personally examined, have in fact been built according to the documents, so that the Engineer may issue appropriate documents to the T/A for it to release the Code Compliance Certificate.

Schedule 6 – Form of Producer Statement – Construction

ISSUED BY JG Civil Ltd *(Contractor)*

TO WFH Properties Ltd *(Principal)*

IN RESPECT OF Precinct 5 – Stage 2 *(Description of Contract Works)*

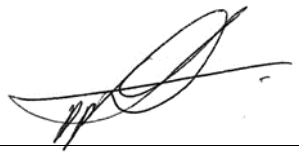
AT Millwater, Godfrey drive *(Address)*

JG Civil Ltd (Contractor) has contracted to *WFH Properties Ltd (Principal)* to carry out and complete certain building works in accordance with a Contract titled *Precinct 5 – Stage 2* ('the Contract')

I *Joel Giddy (Duly Authorised Agent)* a duly authorised representative of *JG Civil Ltd (Contractor)* believe on reasonable grounds that *JG Civil Ltd (Contractor)* has carried out and completed:

☑ All

☐ Part only as specified in the attached particulars of the contract works in accordance with the Contract



Date 27/08/2020

(Signature of Authorised Agent on behalf of)

JG Civil Ltd

(Contractor)

180 Foundry Road, Silverdale

(Address)

SIXTH SCHEDULE

(NZS 3910:2003)

FORM OF PRODUCER STATEMENT CONSTRUCTION

ISSUED BY **ICB Retaining & Construction Limited**
(Contractor)

TO **Hick Brothers Construction.**
(Principal)

IN RESPECT OF **Mass Block Walls 02, 5 and 4B, Precent 5, Orewa West, Auckland, Lot 805 DP463561**
(Description of Contract Works)

AT **157 Grand Drive, Orewa, Auckland**
(Address)

ICB Retaining & Construction Ltd
(Contractor)

has contracted to **Hick Brothers Construction**
(Principal)

to carry out and complete certain building works in accordance with a contract, titled

Supply and Installation of Mass Block Walls 2, 4A, 4B, 5 and 6 to Precent 5, Orewa West (Arran Hill) – for WFH Properties Ltd
(The Contract)

(The Project)

I, ***Chris Burke*** a duly authorised
(Duly Authorised Agent)

representative of **ICB Retaining & Construction Limited**
(Contractor)

Believe on reasonable grounds that **ICB Retaining & Construction Limited**
(Contractor)

has carried out and completed:
☑ All ☐ Part only as specified in the attached particulars of the building works in accordance with the Building Consent No. REG66652, REG66703 and any Authorised Instruction / Variations that have been issued during the course of the work.

(Signature of Authorised Agent on Behalf of)

23 November 2017
(Date)

ICB Construction Limited
(Contractor)

PO Box 303 340, North Harbour, Auckland
(Address)

Appendix D: NZS 3604.2011 Expansive soils (extract)

NZS 3604:2011 Expansive Soils (Extract)

Expansive soils tend to be moderately to highly plastic clays that undergo appreciable volume change upon changes in moisture content. Technically, they are defined in NZS 3604:2011 as those soils having a liquid limit of more than 50% and a linear shrinkage of more than 15%. Where soils are quite silty or sandy, shrink and swell is less of a problem, due to the lower clay contents.

Building damage resulting from expansive soil movement can range from relatively minor brick veneer cracking and internal cracking on wall corners and wall ceiling corners with attendant door and windows jamming, through to extensive cracking of foundation block framework, extensive internal visual cracking and significant warping of building frames. Damage is dependent on building construction and materials and is rarely of structural concern.

NZS 3604:2011 "Timber Framed Buildings" defines good ground as follows:

"Any soil or rock capable of permanently withstanding an ultimate bearing capacity of 300kPa (i.e. an allowable bearing pressure of 100kPa using a factor of safety of 3.0), but excludes:

a) *Potentially compressible ground such as topsoil, soft soils such as clay which can be moulded easily in the fingers, and uncompacted loose gravel which contains obvious voids;*

b) *Expansive soils being those that have a liquid limit of more than 50% when tested in accordance with NZS 4402 Test 2.2, and a linear shrinkage of more than 15% when tested in accordance with NZS 4402 Test 2.6, and*

c) *Any ground which could foreseeably experience movement of 25mm or greater for any reason including one or a combination of: land instability, ground creep, subsidence, seasonal swelling and shrinking, frost heave, changing ground water level, erosion, dissolution of soil in water, and effects of tree roots."*

Foundations on expansive soils are outside the scope of NZS 3604:2011 as an acceptable solution to the New Zealand Building Code (NZBC). Specific engineering design of foundation elements is involved where expansive soils are present with a recommendation that AS 2870:2011 is used for building design. While not mandatory, AS 2870 designs will allow for a non-specific design foundation to be used without resorting to further ongoing investigation or design.

AS 2870 uses a range of factors to assess characteristic soil movement including:

i. Building distress due to ground movement visible on adjacent structures,

ii. Known soil properties and site specific testing to determine the shrink / swell index of a soil (Test 7.1.1 in AS 1289 – Methods of Testing Soils for Engineering Purposes).

AS 2870 is based on defining soil types into various hazard classes based on expected surface movement and depth of desiccation that could occur. It then applies various foundation designs and embedment depths based on the form of building construction (slab on ground, strip footing, stiffened raft, stiffened slab with deep edge beams, etc). AS2870 uses more reinforcing steel than NZ designs generally would to create stiffer foundations that are better able to tolerate ground movement.

The Australian approach also regards expansive soil to a considerable extent being a home owner maintenance issue and significant emphasis is put into ensuring that people understand the influence that trees and dry summers etc may have on foundation performance. See Appendix E.

Appendix E: CSIRO – BTF18 – Foundation Maintenance and Footing Performance: A Homeowners Guide

Foundation Maintenance and Footing Performance: A Homeowner's Guide

CSIRO

BTF 18
replaces
Information
Sheet 10/91

Buildings can and often do move. This movement can be up, down, lateral or rotational. The fundamental cause of movement in buildings can usually be related to one or more problems in the foundation soil. It is important for the homeowner to identify the soil type in order to ascertain the measures that should be put in place in order to ensure that problems in the foundation soil can be prevented, thus protecting against building movement.

This Building Technology File is designed to identify causes of soil-related building movement, and to suggest methods of prevention of resultant cracking in buildings.

Soil Types

The types of soils usually present under the topsoil in land zoned for residential buildings can be split into two approximate groups – granular and clay. Quite often, foundation soil is a mixture of both types. The general problems associated with soils having granular content are usually caused by erosion. Clay soils are subject to saturation and swell/shrink problems.

Classifications for a given area can generally be obtained by application to the local authority, but these are sometimes unreliable and if there is doubt, a geotechnical report should be commissioned. As most buildings suffering movement problems are founded on clay soils, there is an emphasis on classification of soils according to the amount of swell and shrinkage they experience with variations of water content. The table below is Table 2.1 from AS 2870, the Residential Slab and Footing Code.

Causes of Movement

Settlement due to construction

There are two types of settlement that occur as a result of construction:

- Immediate settlement occurs when a building is first placed on its foundation soil, as a result of compaction of the soil under the weight of the structure. The cohesive quality of clay soil mitigates against this, but granular (particularly sandy) soil is susceptible.
- Consolidation settlement is a feature of clay soil and may take place because of the expulsion of moisture from the soil or because of the soil's lack of resistance to local compressive or shear stresses. This will usually take place during the first few months after construction, but has been known to take many years in exceptional cases.

These problems are the province of the builder and should be taken into consideration as part of the preparation of the site for construction. Building Technology File 19 (BTF 19) deals with these problems.

Erosion

All soils are prone to erosion, but sandy soil is particularly susceptible to being washed away. Even clay with a sand component of say 10% or more can suffer from erosion.

Saturation

This is particularly a problem in clay soils. Saturation creates a bog-like suspension of the soil that causes it to lose virtually all of its bearing capacity. To a lesser degree, sand is affected by saturation because saturated sand may undergo a reduction in volume – particularly imported sand fill for bedding and blinding layers. However, this usually occurs as immediate settlement and should normally be the province of the builder.

Seasonal swelling and shrinkage of soil

All clays react to the presence of water by slowly absorbing it, making the soil increase in volume (see table below). The degree of increase varies considerably between different clays, as does the degree of decrease during the subsequent drying out caused by fair weather periods. Because of the low absorption and expulsion rate, this phenomenon will not usually be noticeable unless there are prolonged rainy or dry periods, usually of weeks or months, depending on the land and soil characteristics.

The swelling of soil creates an upward force on the footings of the building, and shrinkage creates subsidence that takes away the support needed by the footing to retain equilibrium.

Shear failure

This phenomenon occurs when the foundation soil does not have sufficient strength to support the weight of the footing. There are two major post-construction causes:

- Significant load increase.
- Reduction of lateral support of the soil under the footing due to erosion or excavation.
- In clay soil, shear failure can be caused by saturation of the soil adjacent to or under the footing.

GENERAL DEFINITIONS OF SITE CLASSES

Class	Foundation
A	Most sand and rock sites with little or no ground movement from moisture changes
S	Slightly reactive clay sites with only slight ground movement from moisture changes
M	Moderately reactive clay or silt sites, which can experience moderate ground movement from moisture changes
H	Highly reactive clay sites, which can experience high ground movement from moisture changes
E	Extremely reactive sites, which can experience extreme ground movement from moisture changes
A to P	Filled sites
P	Sites which include soft soils, such as soft clay or silt or loose sands; landslip; mine subsidence; collapsing soils; soils subject to erosion; reactive sites subject to abnormal moisture conditions or sites which cannot be classified otherwise

Tree root growth
Trees and shrubs that are allowed to grow in the vicinity of footings can cause foundation soil movement in two ways:

- Roots that grow under footings may increase in cross-sectional size, exerting upward pressure on footings.
- Roots in the vicinity of footings will absorb much of the moisture in the foundation soil, causing shrinkage or subsidence.

Unevenness of Movement

The types of ground movement described above usually occur unevenly throughout the building's foundation soil. Settlement due to construction tends to be uneven because of:

- Differing compaction of foundation soil prior to construction.
- Differing moisture content of foundation soil prior to construction.

Movement due to non-construction causes is usually more uneven still. Erosion can undermine a footing that traverses the flow or can create the conditions for shear failure by eroding soil adjacent to a footing that runs in the same direction as the flow.

Saturation of clay foundation soil may occur where subfloor walls create a dam that makes water pond. It can also occur wherever there is a source of water near footings in clay soil. This leads to a severe reduction in the strength of the soil which may create local shear failure.

Seasonal swelling and shrinkage of clay soil affects the perimeter of the building first, then gradually spreads to the interior. The swelling process will usually begin at the uphill extreme of the building, or on the weather side where the land is flat. Swelling gradually reaches the interior soil as absorption continues. Shrinkage usually begins where the sun's heat is greatest.

Effects of Uneven Soil Movement on Structures

Erosion and saturation
Erosion removes the support from under footings, tending to create subsidence of the part of the structure under which it occurs. Brickwork walls will resist the stress created by this removal of support by bridging the gap or cantilevering until the bricks or the mortar bedding fail. Older masonry has little resistance. Evidence of failure varies according to circumstances and symptoms may include:

- Step cracking in the mortar beds in the body of the wall or above/below openings such as doors or windows.
- Vertical cracking in the bricks (usually but not necessarily in line with the vertical beds or perpends).

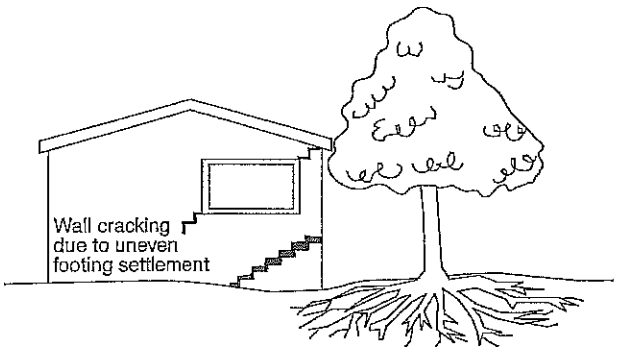
Isolated piers affected by erosion or saturation of foundations will eventually lose contact with the bearers they support and may tilt or fall over. The floors that have lost this support will become bouncy, sometimes rattling ornaments etc.

Seasonal swelling/shrinkage in clay
Swelling foundation soil due to rainy periods first lifts the most exposed extremities of the footing system, then the remainder of the perimeter footings while gradually permeating inside the building footprint to lift internal footings. This swelling first tends to create a dish effect, because the external footings are pushed higher than the internal ones.

The first noticeable symptom may be that the floor appears slightly dished. This is often accompanied by some doors binding on the floor or the door head, together with some cracking of cornice mitres. In buildings with timber flooring supported by bearers and joists, the floor can be bouncy. Externally there may be visible dishing of the hip or ridge lines.

As the moisture absorption process completes its journey to the innermost areas of the building, the internal footings will rise. If the spread of moisture is roughly even, it may be that the symptoms will temporarily disappear, but it is more likely that swelling will be uneven, creating a difference rather than a disappearance in symptoms. In buildings with timber flooring supported by bearers and joists, the isolated piers will rise more easily than the strip footings or piers under walls, creating noticeable doming of flooring.

Trees can cause shrinkage and damage



As the weather pattern changes and the soil begins to dry out, the external footings will be first affected, beginning with the locations where the sun's effect is strongest. This has the effect of lowering the external footings. The doming is accentuated and cracking reduces or disappears where it occurred because of dishing, but other cracks open up. The roof lines may become convex.

Doming and dishing are also affected by weather in other ways. In areas where warm, wet summers and cooler dry winters prevail, water migration tends to be toward the interior and doming will be accentuated, whereas where summers are dry and winters are cold and wet, migration tends to be toward the exterior and the underlying propensity is toward dishing.

Movement caused by tree roots
In general, growing roots will exert an upward pressure on footings, whereas soil subject to drying because of tree or shrub roots will tend to remove support from under footings by inducing shrinkage.

Complications caused by the structure itself
Most forces that the soil causes to be exerted on structures are vertical – i.e. either up or down. However, because these forces are seldom spread evenly around the footings, and because the building resists uneven movement because of its rigidity, forces are exerted from one part of the building to another. The net result of all these forces is usually rotational. This resultant force often complicates the diagnosis because the visible symptoms do not simply reflect the original cause. A common symptom is binding of doors on the vertical member of the frame.

Effects on full masonry structures
Brickwork will resist cracking where it can. It will attempt to span areas that lose support because of subsided foundations or raised points. It is therefore usual to see cracking at weak points, such as openings for windows or doors.

In the event of construction settlement, cracking will usually remain unchanged after the process of settlement has ceased.

With local shear or erosion, cracking will usually continue to develop until the original cause has been remedied, or until the subsidence has completely neutralised the affected portion of footing and the structure has stabilised on other footings that remain effective.

In the case of swell/shrink effects, the brickwork will in some cases return to its original position after completion of a cycle, however it is more likely that the rotational effect will not be exactly reversed, and it is also usual that brickwork will settle in its new position and will resist the forces trying to return it to its original position. This means that in a case where swelling takes place after construction and cracking occurs, the cracking is likely to at least partly remain after the shrink segment of the cycle is complete. Thus, each time the cycle is repeated, the likelihood is that the cracking will become wider until the sections of brickwork become virtually independent.

With repeated cycles, once the cracking is established, if there is no other complication, it is normal for the incidence of cracking to stabilise, as the building has the articulation it needs to cope with the problem. This is by no means always the case, however, and monitoring of cracks in walls and floors should always be treated seriously.

Upheaval caused by growth of tree roots under footings is not a simple vertical shear stress. There is a tendency for the root to also exert lateral forces that attempt to separate sections of brickwork after initial cracking has occurred.

The normal structural arrangement is that the inner leaf of brickwork in the external walls and at least some of the internal walls (depending on the roof type) comprise the load-bearing structure on which any upper floors, ceilings and the roof are supported. In these cases, it is internally visible cracking that should be the main focus of attention, however there are a few examples of dwellings whose external leaf of masonry plays some supporting role, so this should be checked if there is any doubt. In any case, externally visible cracking is important as a guide to stresses on the structure generally, and it should also be remembered that the external walls must be capable of supporting themselves.

Effects on framed structures
Timber or steel framed buildings are less likely to exhibit cracking due to swell/shrink than masonry buildings because of their flexibility. Also, the doming/dishing effects tend to be lower because of the lighter weight of walls. The main risks to framed buildings are encountered because of the isolated pier footings used under walls. Where erosion or saturation cause a footing to fall away, this can double the span which a wall must bridge. This additional stress can create cracking in wall linings, particularly where there is a weak point in the structure caused by a door or window opening. It is, however, unlikely that framed structures will be so stressed as to suffer serious damage without first exhibiting some or all of the above symptoms for a considerable period. The same warning period should apply in the case of upheaval. It should be noted, however, that where framed buildings are supported by strip footings there is only one leaf of brickwork and therefore the externally visible walls are the supporting structure for the building. In this case, the subfloor masonry walls can be expected to behave as full brickwork walls.

Effects on brick veneer structures
Because the load-bearing structure of a brick veneer building is the frame that makes up the interior leaf of the external walls plus perhaps the internal walls, depending on the type of roof, the building can be expected to behave as a framed structure, except that the external masonry will behave in a similar way to the external leaf of a full masonry structure.

Water Service and Drainage

Where a water service pipe, a sewer or stormwater drainage pipe is in the vicinity of a building, a water leak can cause erosion, swelling or saturation of susceptible soil. Even a minuscule leak can be enough to saturate a clay foundation. A leaking tap near a building can have the same effect. In addition, trenches containing pipes can become watercourses even though backfilled, particularly where broken rubble is used as fill. Water that runs along these trenches can be responsible for serious erosion, interstrata seepage into subfloor areas and saturation.

Pipe leakage and trench water flows also encourage tree and shrub roots to the source of water, complicating and exacerbating the problem.
Poor roof plumbing can result in large volumes of rainwater being concentrated in a small area of soil:

- Incorrect falls in roof guttering may result in overflows, as may gutters blocked with leaves etc.
- Corroded guttering or downpipes can spill water to ground.
- Downpipes not positively connected to a proper stormwater collection system will direct a concentration of water to soil that is directly adjacent to footings, sometimes causing large-scale problems such as erosion, saturation and migration of water under the building.

Seriousness of Cracking

In general, most cracking found in masonry walls is a cosmetic nuisance only and can be kept in repair or even ignored. The table below is a reproduction of Table C1 of AS 2870.

AS 2870 also publishes figures relating to cracking in concrete floors, however because wall cracking will usually reach the critical point significantly earlier than cracking in slabs, this table is not reproduced here.

Prevention/Cure

Plumbing
Where building movement is caused by water service, roof plumbing, sewer or stormwater failure, the remedy is to repair the problem. It is prudent, however, to consider also rerouting pipes away from the building where possible, and relocating taps to positions where any leakage will not direct water to the building vicinity. Even where gully traps are present, there is sometimes sufficient spill to create erosion or saturation, particularly in modern installations using smaller diameter PVC fixtures. Indeed, some gully traps are not situated directly under the taps that are installed to charge them, with the result that water from the tap may enter the backfilled trench that houses the sewer piping. If the trench has been poorly backfilled, the water will either pond or flow along the bottom of the trench. As these trenches usually run alongside the footings and can be at a similar depth, it is not hard to see how any water that is thus directed into a trench can easily affect the foundation's ability to support footings or even gain entry to the subfloor area.

Ground drainage
In all soils there is the capacity for water to travel on the surface and below it. Surface water flows can be established by inspection during and after heavy or prolonged rain. If necessary, a grated drain system connected to the stormwater collection system is usually an easy solution.

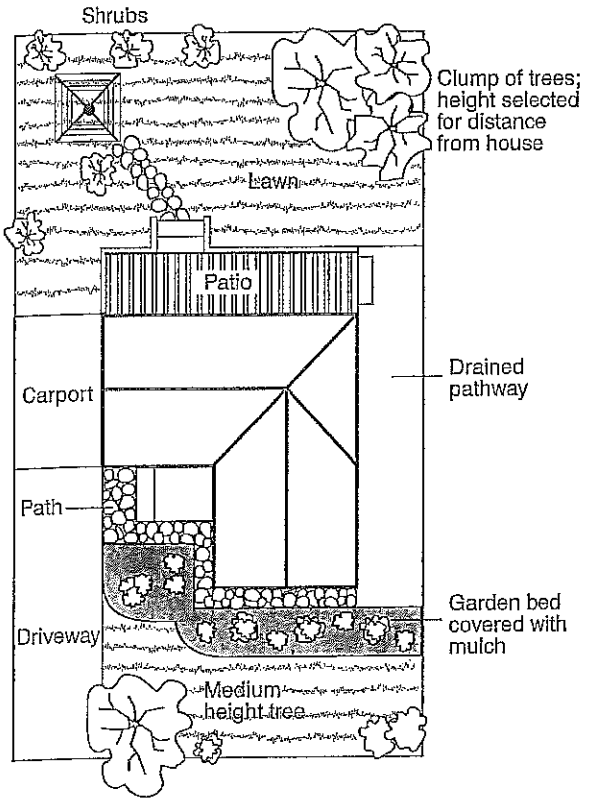
It is, however, sometimes necessary when attempting to prevent water migration that testing be carried out to establish watertable height and subsoil water flows. This subject is referred to in BTF 19 and may properly be regarded as an area for an expert consultant.

Protection of the building perimeter
It is essential to remember that the soil that affects footings extends well beyond the actual building line. Watering of garden plants, shrubs and trees causes some of the most serious water problems.

For this reason, particularly where problems exist or are likely to occur, it is recommended that an apron of paving be installed around as much of the building perimeter as necessary. This paving

CLASSIFICATION OF DAMAGE WITH REFERENCE TO WALLS

Description of typical damage and required repair	Approximate crack width limit (see Note 3)	Damage category
Hairline cracks	<0.1 mm	0
Fine cracks which do not need repair	<1 mm	1
Cracks noticeable but easily filled. Doors and windows stick slightly	<5 mm	2
Cracks can be repaired and possibly a small amount of wall will need to be replaced. Doors and windows stick. Service pipes can fracture. Weathertightness often impaired	5–15 mm (or a number of cracks 3 mm or more in one group)	3
Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Window and door frames distort. Walls lean or bulge noticeably, some loss of bearing in beams. Service pipes disrupted	15–25 mm but also depend on number of cracks	4



should extend outwards a minimum of 900 mm (more in highly reactive soil) and should have a minimum fall away from the building of 1:60. The finished paving should be no less than 100 mm below brick vent bases.

It is prudent to relocate drainage pipes away from this paving, if possible, to avoid complications from future leakage. If this is not practical, earthenware pipes should be replaced by PVC and backfilling should be of the same soil type as the surrounding soil and compacted to the same density.

Except in areas where freezing of water is an issue, it is wise to remove taps in the building area and relocate them well away from the building – preferably not uphill from it (see BTF 19).

It may be desirable to install a grated drain at the outside edge of the paving on the uphill side of the building. If subsoil drainage is needed this can be installed under the surface drain.

Condensation

In buildings with a subfloor void such as where bearers and joists support flooring, insufficient ventilation creates ideal conditions for condensation, particularly where there is little clearance between the floor and the ground. Condensation adds to the moisture already present in the subfloor and significantly slows the process of drying out. Installation of an adequate subfloor ventilation system, either natural or mechanical, is desirable.

Warning: Although this Building Technology File deals with cracking in buildings, it should be said that subfloor moisture can result in the development of other problems, notably:

- Water that is transmitted into masonry, metal or timber building elements causes damage and/or decay to those elements.
- High subfloor humidity and moisture content create an ideal environment for various pests, including termites and spiders.
- Where high moisture levels are transmitted to the flooring and walls, an increase in the dust mite count can ensue within the living areas. Dust mites, as well as dampness in general, can be a health hazard to inhabitants, particularly those who are abnormally susceptible to respiratory ailments.

The garden

The ideal vegetation layout is to have lawn or plants that require only light watering immediately adjacent to the drainage or paving edge, then more demanding plants, shrubs and trees spread out in that order.

Overwatering due to misuse of automatic watering systems is a common cause of saturation and water migration under footings. If it is necessary to use these systems, it is important to remove garden beds to a completely safe distance from buildings.

Existing trees

Where a tree is causing a problem of soil drying or there is the existence or threat of upheaval of footings, if the offending roots are subsidiary and their removal will not significantly damage the tree, they should be severed and a concrete or metal barrier placed vertically in the soil to prevent future root growth in the direction of the building. If it is not possible to remove the relevant roots without damage to the tree, an application to remove the tree should be made to the local authority. A prudent plan is to transplant likely offenders before they become a problem.

Information on trees, plants and shrubs

State departments overseeing agriculture can give information regarding root patterns, volume of water needed and safe distance from buildings of most species. Botanic gardens are also sources of information. For information on plant roots and drains, see Building Technology File 17.

Excavation

Excavation around footings must be properly engineered. Soil supporting footings can only be safely excavated at an angle that allows the soil under the footing to remain stable. This angle is called the angle of repose (or friction) and varies significantly between soil types and conditions. Removal of soil within the angle of repose will cause subsidence.

Remediation

Where erosion has occurred that has washed away soil adjacent to footings, soil of the same classification should be introduced and compacted to the same density. Where footings have been undermined, augmentation or other specialist work may be required. Remediation of footings and foundations is generally the realm of a specialist consultant.

Where isolated footings rise and fall because of swell/shrink effect, the homeowner may be tempted to alleviate floor bounce by filling the gap that has appeared between the bearer and the pier with blocking. The danger here is that when the next swell segment of the cycle occurs, the extra blocking will push the floor up into an accentuated dome and may also cause local shear failure in the soil. If it is necessary to use blocking, it should be by a pair of fine wedges and monitoring should be carried out fortnightly.

This BTF was prepared by John Lewer FAIB, MIAMA, Partner, Construction Diagnosis.

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Appendix F: Test results

- Post earthworks geotechnical investigation logs
- Laboratory test results – liquid limit, linear shrinkage and shrink-swell testing
- Bulk earthworks test results
- Civil earthworks test results

GEOTECHNICS

Job: Arrans Hill P5 - Stage 2

Client: T+T

Job #	21854.0031
Entered By	ALTA
Checked By	PEFE
Approved By	-

URN	Tech.	Date	Location	Layer	Material	Test Type	NDM 0°			NDM 90°			AVERAGE NDM			Solid Density (t/m³) Assumed	Oven Moisture content (%)	Final Corrected		Shear Vane Reading (kPa)					Retest URN	PASS / FAIL	Comments
						NDM / SV	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)			Oven Dry Density (t/m³)	Average Air Voids (%)	Reading 1	Reading 2	Reading 3	Reading 4	Average SV (4 x Tests)		(P) Pass / (F) Fail	
S20-006.1	ALTA	5/03/2020	EX K/5-K/4	Surface	claySILT	SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	Specifcation for trench backfill provided by Jason Kelly (T+T) requires a shear strength ≥ 120KPa.
S20-006.2			K/5-K/4	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	156	171	202	171	175	-	P	
S20-006.3			K/4-K/3	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	202	>218	>218	>218	>214	-	P	
S20-006.4			K/3-K/2	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-006.5			K/2-K/1	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	211	UTP	UTP	UTP	211	-	P	
S20-007.1	ALTA	10/03/2020	A/17-A/16	Surface	claySILT	SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-007.2			A/16-A/15	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-007.3			A/15-A/14	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-007.4			A/14-EXA/13	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
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S20-007.6			A/12-A/11	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-007.7			A/12-A/11	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	211	205	>218	>218	>213	-	P	
S20-007.8			A/12-A/11	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	211	>218	>218	>216	-	P	
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S20-007.18			A/9-A/8	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	218	UTP	UTP	UTP	218	-	P	
S20-007.19			A/8-A/7	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	

GEOTECHNICS

Job: Arrans Hill P5 - Stage 2

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Job #	21854.0031
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S20-008.1	ALTA	11/03/2020	N/1-N/2	Surface	claySILT	SV	-	-	-	-	-	-	-	-	-	-	-	-	-	199	>218	>218	>218	>213	-	P	
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S20-008.4			N/2-N/3	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
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S20-008.7			N/2-N/3	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	187	202	>218	>218	>206	-	P	
S20-008.8			D/4-D/3	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-008.9			D/4-D/3	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	202	>218	>218	>214	-	P	
S20-008.10			D/4-D/3	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	205	174	>218	>204	-	P	
S20-008.11			D/3-D/2	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-008.12			D/3-D/2	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	215	>217	-	P	
S20-008.13			D/3-D/2	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	205	>218	>218	>215	-	P	
S20-008.14			D/2-D/1	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-008.15			D/2-D/1	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	193	>218	196	202	>202	-	P	
S20-008.16			D/2-D/1	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	

GEOTECHNICS

Job: Arrans Hill P5 - Stage 2

Client: T+T

Job #	21854.0031
Entered By	ALTA
Checked By	PEFE
Approved By	-

URN	Tech.	Date	Location	Layer	Material	Test Type	NDM 0°			NDM 90°			AVERAGE NDM			Solid Density (t/m³) Assumed	Oven Moisture content (%)	Final Corrected		Shear Vane Reading (kPa)					Retest URN	PASS / FAIL	Comments
						NDM / SV	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)			Oven Dry Density (t/m³)	Average Air Voids (%)	Reading 1	Reading 2	Reading 3	Reading 4	Average SV (4 x Tests)		(P) Pass / (F) Fail	
S20-010.1	ALTA	11/05/2020	C/1-C/2	Surface	claySILT	SV	-	-	-	-	-	-	-	-	-	-	-	-	-	140	171	140	134	146	-	P	Specifcation for trench backfill provided by Jason Kelly (T+T) requires a shear strength ≥ 120KPa.
S20-010.2			C/2-C/3	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	211	>218	199	202	>208	-	P	
S20-010.3			C/2-C/3	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	156	>218	202	>218	>198	-	P	
S20-010.4			C/2-C/3	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	174	>218	>218	>207	-	P	
S20-010.5			C/2-C/3	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	208	159	183	193	186	-	P	
S20-010.6			C/2-C/3	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	208	>218	>218	>218	>215	-	P	
S20-010.7			C/3-C/4	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	171	199	218	171	190	-	P	
S20-010.8			C/3-C/4	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-010.9			C/3-C/4	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	180	202	180	187	187	-	P	
S20-010.10			C/3-C/4	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	171	140	171	162	161	-	P	
S20-010.11			A/19-A/18	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	199	>218	>218	>218	>213	-	P	
S20-010.12			A/19-A/18	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	215	>218	>218	>218	>217	-	P	
S20-010.13			A/19-A/18	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	215	187	140	152	173	-	P	
S20-010.14			A/18-A/17	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	140	146	140	168	149	-	P	
S20-010.15			A/18-A/17	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	218	162	171	187	184	-	P	
S20-010.16			A/18-A/17	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	180	196	156	152	171	-	P	
S20-011.1	ALTA	15/05/2020	A/14-EXA/12	Surface	claySILT	SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-011.2			A/14-EXA/12	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	202	140	211	215	192	-	P	
S20-011.3			A/14-EXA/12	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	156	199	146	162	166	-	P	
S20-011.4			A/14-EXA/12	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	137	124	162	149	143	-	P	
S20-011.5			A/14-EXA/12	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	146	162	137	140	146	-	P	
S20-011.6			A/14-EXA/12	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	137	140	174	190	160	-	P	

GEOTECHNICS

Job: Arrans Hill P5 - Stage 2

Client: T+T

Job #	21854.0031
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URN	Tech.	Date	Location	Layer	Material	Test Type	NDM 0°			NDM 90°			AVERAGE NDM			Solid Density (t/m³) Assumed	Oven Moisture content (%)	Final Corrected		Shear Vane Reading (kPa)					Retest URN	PASS / FAIL	Comments
						NDM / SV	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)			Oven Dry Density (t/m³)	Average Air Voids (%)	Reading 1	Reading 2	Reading 3	Reading 4	Average SV (4 x Tests)		(P) Pass / (F) Fail	
S20-012.1				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	Specifcation for trench backfill provided by Jason Kelly (T+T) requires a shear strength > 120KPa.
S20-012.2				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	162	>215	218	187	>195	-	P	
S20-012.3				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.4				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	202	>218	208	>218	>211	-	P	
S20-012.5				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	199	215	>218	>218	>212	-	P	
S20-012.6				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.7				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.8				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.9				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.10				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.11				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.12				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.13				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	177	174	168	171	173	-	P	
S20-012.14				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	202	>218	>218	>218	>214	-	P	
S20-012.15				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	171	171	174	187	176	-	P	
S20-012.16				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	202	152	171	177	176	-	P	
S20-012.17				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.18				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.19	ALTA	20/05/2020	Road 3 Footpath	Surface	claySILT	SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.20				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.21				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.22				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.23				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.24				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.25				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.26				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.27				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.28				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.29				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	171	156	162	187	169	-	P	
S20-012.30				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	208	>218	>218	>218	>215	-	P	
S20-012.31				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.32				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.33				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	202	>218	>218	>218	>214	-	P	
S20-012.34				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	187	152	171	162	168	-	P	
S20-012.35				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	171	>218	>218	>206	-	P	
S20-012.36				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.37				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	

GEOTECHNICS

Job: Arrans Hill P5 - Stage 2

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Job #	21854.0031
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URN	Tech.	Date	Location	Layer	Material	Test Type	NDM 0°			NDM 90°			AVERAGE NDM			Solid Density (t/m³) Assumed	Oven Moisture content (%)	Final Corrected		Shear Vane Reading (kPa)					Retest URN	PASS / FAIL	Comments
						NDM / SV	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)			Oven Dry Density (t/m³)	Average Air Voids (%)	Reading 1	Reading 2	Reading 3	Reading 4	Average SV (4 x Tests)		(P) Pass / (F) Fail	
S20-012.38	ALTA	20/05/2020	Road 1 Footpath	Surface	claySILT	SV	-	-	-	-	-	-	-	-	-	-	-	-	-	171	>218	>218	>218	>206	-	P	Specifcation for trench backfill provided by Jason Kelly (T+T) requires a shear strength > 120KPa.
S20-012.39				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	156	171	171	171	167	-	P	
S20-012.40				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.41				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.42				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	156	171	202	171	175	-	P	
S20-012.43				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.44				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	174	171	187	>218	>187	-	P	
S20-012.45				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	187	>218	>218	>218	>210	-	P	
S20-012.46				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	187	187	187	>194	-	P	
S20-012.47				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.48				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.49				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	156	199	146	162	166	-	P	
S20-012.50				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	171	168	159	156	163	-	P	
S20-012.51				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	146	162	137	140	146	-	P	
S20-012.52				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	215	>218	202	>213	-	P	
S20-012.53				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	137	152	174	190	163	-	P	
S20-012.54				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.55				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	211	205	>218	>218	>213	-	P	
S20-012.56				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	187	171	171	124	163	-	P	
S20-012.57				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	171	>218	>218	187	>198	-	P	
S20-012.58				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	121	137	140	>154	-	P	
S20-012.59				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	218	218	218	218	218	-	P	
S20-012.60				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.61				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.62				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	124	140	171	137	143	-	P	
S20-012.63				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	187	171	>218	>198	-	P	
S20-012.64				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	168	137	215	140	165	-	P	
S20-012.65				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.66				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	202	168	171	168	177	-	P	
S20-012.67				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.68				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	156	152	140	159	152	-	P	
S20-012.69				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.70				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	202	>218	>218	>218	>214	-	P	
S20-012.71				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.72				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	174	>218	>218	>207	-	P	
S20-012.73				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.74				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.75				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	156	171	187	168	170	-	P	
S20-012.76				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-012.77				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	

GEOTECHNICS

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URN	Tech.	Date	Location	Layer	Material	Test Type	NDM 0°			NDM 90°			AVERAGE NDM			Solid Density (t/m³) Assumed	Oven Moisture content (%)	Final Corrected		Shear Vane Reading (kPa)					Retest URN	PASS / FAIL	Comments
						NDM / SV	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)			Oven Dry Density (t/m³)	Average Air Voids (%)	Reading 1	Reading 2	Reading 3	Reading 4	Average SV (4 x Tests)		(P) Pass / (F) Fail	
S20-013.1	ALTA	28/05/2020	Road 3 Service Trench	Surface	claySILT	SV	-	-	-	-	-	-	-	-	-	-	-	-	-	202	171	140	>218	>183	-	P	Specifcation for trench backfill provided by Jason Kelly (T+T) requires a shear strength > 120KPa.
S20-013.2				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	124	156	168	149	149	-	P	
S20-013.3				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	180	215	208	202	201	-	P	
S20-013.4				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	193	187	>218	205	>201	-	P	
S20-013.5				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	190	>218	>218	>211	-	P	
S20-013.6				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	168	199	202	190	190	-	P	
S20-013.7				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.8				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.9				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	143	187	202	208	185	-	P	
S20-013.10				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.11				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	218	137	187	162	176	-	P	
S20-013.12				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.13				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.14				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.15				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	183	>218	>218	>218	>209	-	P	
S20-013.16				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.17				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.18				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	177	152	162	187	169	-	P	
S20-013.19				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.20				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.21				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	171	202	187	190	187	-	P	
S20-013.22				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	162	187	>218	199	>191	-	P	
S20-013.23				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	177	>218	>218	>218	>208	-	P	
S20-013.24				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	156	152	162	143	153	-	P	
S20-013.25				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	199	>218	>218	>218	>213	-	P	
S20-013.26				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.27				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.28				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	187	>218	>218	>218	>210	-	P	
S20-013.29				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.30				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.31				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.32				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.33				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.34				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	187	171	146	187	173	-	P	
S20-013.35				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.36				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.37				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.38				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	171	>218	>218	>218	>206	-	P	

GEOTECHNICS

Job: Arrans Hill P5 - Stage 2

Client: T+T

Job #	21854.0031
Entered By	ALTA
Checked By	PEFE
Approved By	-

URN	Tech.	Date	Location	Layer	Material	Test Type	NDM 0°			NDM 90°			AVERAGE NDM			Solid Density (t/m³) Assumed	Oven Moisture content (%)	Final Corrected		Shear Vane Reading (kPa)					Retest URN	PASS / FAIL	Comments
						NDM / SV	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)			Oven Dry Density (t/m³)	Average Air Voids (%)	Reading 1	Reading 2	Reading 3	Reading 4	Average SV (4 x Tests)		(P) Pass / (F) Fail	
S20-013.39				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	218	177	177	171	186	-	P	Specifcation for trench backfill provided by Jason Kelly (T+T) requires a shear strength > 120KPa.
S20-013.40				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	124	137	168	171	150	-	P	
S20-013.41				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	177	171	187	156	173	-	P	
S20-013.42				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.43				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.44				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	187	202	174	183	187	-	P	
S20-013.45				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.46				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.47				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.48				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.49				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.50				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.51	ALTA	28/05/2020	Road 1 Service Trench	Surface	claySILT	SV	-	-	-	-	-	-	-	-	-	-	-	-	-	196	187	177	171	183	-	P	
S20-013.52				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	140	171	187	171	167	-	P	
S20-013.53				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	199	174	174	140	172	-	P	
S20-013.54				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.55				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	152	>218	>218	>218	>201	-	P	
S20-013.56				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.57				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.58				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.59				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.60				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	152	171	146	208	169	-	P	
S20-013.61				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.62				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-013.63				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	

GEOTECHNICS

Job: Arrans Hill P5 - Stage 2

Client: T+T

Job #	21854.0031
Entered By	ALTA
Checked By	PEFE
Approved By	-

URN	Tech.	Date	Location	Layer	Material	Test Type	NDM 0°			NDM 90°			AVERAGE NDM			Solid Density (t/m³) Assumed	Oven Moisture content (%)	Final Corrected		Shear Vane Reading (kPa)					Retest URN	PASS / FAIL	Comments
						NDM / SV	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)			Oven Dry Density (t/m³)	Average Air Voids (%)	Reading 1	Reading 2	Reading 3	Reading 4	Average SV (4 x Tests)		(P) Pass / (F) Fail	
S20-014.1			Davey Crescent - Road 3 Staircase	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	183	121	109	>218	>158	-	P	
S20-014.2				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	118	152	>218	140	>157	-	P	
S20-014.3				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	131	202	156	124	153	-	P	Specifcation for Staircase Subgrade provided by Jason Kelly (T+T) requires a bearing capacity ≥ 100KPa.
S20-014.4				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	106	168	137	>157	-	P	
S20-014.5				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	140	152	165	128	146	-	P	
S20-014.6				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	140	177	168	137	156	-	P	
S20-014.7				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	171	109	159	174	153	-	P	
S20-014.8			Road 3 - Road 1 Staircase	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	121	93	183	199	149	-	P	
S20-014.9				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	180	>218	>218	218	>208	-	P	
S20-014.10	ALTA	15/06/2020		Surface	claySILT	SV	-	-	-	-	-	-	-	-	-	-	-	-	-	180	196	202	190	192	-	P	
S20-014.11				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-014.12				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-014.13				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-014.14				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	168	156	177	124	156	-	P	
S20-014.15				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	109	140	137	159	136	-	P	
S20-014.16				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	187	199	171	174	183	-	P	
S20-014.17				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-014.18				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	
S20-014.19				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	>218	>218	>218	>218	>218	-	P	

GEOTECHNICS

Job: Precent 5 Arrans Hill

Client: Tonkin & Taylor

Job #	21854.0031
Entered By	CBEN
Checked By	JLON
Approved By	-

URN	Tech.	Date	Location	GPS Coordination			Material	Test Type	NDM 0°			NDM 90°			AVERAGE NDM			Solid Density (t/m³) Assumed	Oven Moisture content (%)	Final Corrected		Shear Vane Reading (kPa)					Retest URN	PASS / FAIL	Comments
				Easting	Northing	RL		NDM / SV	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)			Oven Dry Density (t/m³)	Average Air Voids (%)	Reading 1	Reading 2	Reading 3	Reading 4	Average SV (4 x Tests)		(P) Pass / (F) Fail	
S18 141-1	CBEN	15/09/2018	Shear Key 1	2659566.465	6510845.61	8.145	clayey SILT	NDM / SV	1.88	25.9	6.2	1.89	26.6	5.0	1.88	26.3	5.6	2.7	27.7	1.47	4.6	148	148	142	133	143		P	
S18 141-2	CBEN	15/09/2018	Shear Key 1	2659546.018	6510848.759	9.312	clayey SILT	NDM / SV	1.93	26.4	2.9	1.93	25.5	3.6	1.93	26.0	3.3	2.7	27.8	1.51	1.9	142	162	148	133	146		P	
S18 142-1	CBEN	17/09/2018	Shear Key 1	2659568.327	6510850.034	8.741	clayey SILT	NDM / SV	1.92	21.0	7.8	1.92	21.3	7.4	1.92	21.2	7.6	2.7	23.9	1.55	5.4	177	148	177	177	170		P	
S18 142-2	CBEN	17/09/2018	Shear Key 1	2659584.267	6510839.18	9.133	clayey SILT	NDM / SV	1.94	20.0	7.8	1.94	20.5	7.4	1.94	20.3	7.6	2.7	22.7	1.58	5.6	142	207	177	148	169		P	
S18 142-3	CBEN	17/09/2018	Shear Key 1	2659532.863	6510851.856	8.365	clayey SILT	NDM / SV	1.84	28.1	6.6	1.84	29.1	5.9	1.84	28.6	6.2	2.7	31.8	1.39	4.1	142	142	148	142	144		P	
S18 142-4	CBEN	17/09/2018	Shear Key 1	2659549.105	6510848.757	8.732	clayey SILT	NDM / SV	1.85	26.4	7.2	1.86	25.0	7.9	1.85	25.7	7.5	2.7	32.6	1.40	2.7	148	148	142	133	143		P	
S18 143-1	CBEN	18/09/2018	Shear Key 1	2659594.387	6510849.761	10.786	clayey SILT	NDM / SV	1.96	21.3	5.8	2.00	20.5	4.3	1.98	20.9	5.0	2.7	22.3	1.62	3.9	177	162	142	162	161		P	
S18 143-2	CBEN	18/09/2018	Shear Key 1	2659558.849	6510850.36	9.458	clayey SILT	NDM / SV	1.91	28.2	3.0	1.91	26.4	4.3	1.91	27.3	3.7	2.7	30.3	1.46	1.5	142	148	148	177	154		P	
S18 143-3	CBEN	18/09/2018	Shear Key 1	2659536.173	6510853.369	9.704	clayey SILT	NDM / SV	1.86	24.8	7.7	1.86	26.9	6.2	1.86	25.9	6.9	2.7	29.1	1.44	4.6	133	142	207	162	161		P	
S18 145-1	CBEN	21/09/2018	Shear Key 1	2659556.535	6510849.36	8.312	clayey SILT	NDM / SV	1.88	25.0	6.9	1.87	26.6	6.1	1.87	25.8	6.5	2.7	26.8	1.48	5.8	148	177	177	148	163		P	
S18 145-2	CBEN	21/09/2018	Shear Key 1	2659568.505	6510840.258	10.55	clayey SILT	NDM / SV	1.84	29.6	5.2	1.86	29.0	4.9	1.85	29.3	5.0	2.7	31.9	1.40	3.3	177	177	148	162	166		P	
S18 145-3	CBEN	21/09/2018	Shear Key 1	2659584.198	6510843.015	10.812	clayey SILT	NDM / SV	1.87	30.3	3.5	1.84	31.5	4.0	1.85	30.9	3.8	2.7	31.8	1.41	3.2	148	148	162	177	159		P	
S18 146-1	CBEN	22/09/2018	Shear Key 1	2659572.135	6510850.86	9.781	clayey SILT	NDM / SV	1.80	32.9	5.3	1.80	32.0	5.7	1.80	32.5	5.5	2.7	34.6	1.34	4.1	207	192	207	148	189		P	
S18 146-2	CBEN	22/09/2018	Shear Key 1	2659592.464	6510845.188	10.862	clayey SILT	NDM / SV	1.81	29.7	6.8	1.81	28.9	7.3	1.81	29.3	7.1	2.7	36.2	1.33	2.6	177	177	207	171	183		P	
S18 147-1	CBEN	24/09/2018	Shear Key 1	2659572.916	6510844.589	12.202	clayey SILT	NDM / SV	1.88	29.8	3.3	1.88	29.7	3.3	1.88	29.8	3.3	2.7	29.7	1.45	3.3	169	169	154	154	162		P	
S18 147-2	CBEN	24/09/2018	Shear Key 1	2659553.291	6510846.015	12.217	clayey SILT	NDM / SV	1.87	31.4	2.6	1.87	32.7	1.6	1.87	32.1	2.1	2.7	30.2	1.44	3.4	154	168	168	196	172		P	
S18 147-3	CBEN	24/09/2018	Shear Key 1	2659585.966	6510851.709	12.354	clayey SILT	NDM / SV	1.86	31.5	3.3	1.86	30.5	3.9	1.86	31.0	3.6	2.7	28.0	1.45	5.7	154	163	154	182	163		P	
S18 147-4	CBEN	24/09/2018	Shear Key 1	2659562.522	6510857.029	12.999	clayey SILT	NDM / SV	1.81	30.9	6.2	1.80	31.2	6.5	1.80	31.1	6.4	2.7	31.2	1.37	6.3	154	140	168	168	158		P	
S18 149-1	CBEN	28/09/2018	Shear Key 1	2659520.184	6510862.463	10.49	clayey SILT	NDM / SV	1.82	33.6	4.0	1.83	31.6	4.4	1.82	32.6	4.2	2.7	37.8	1.32	0.9	140	196	196	140	168		P	
S18 149-2	CBEN	28/09/2018	Shear Key 1	2659518.553	6510868.881	11.478	clayey SILT	NDM / SV	1.81	36.6	2.3	1.81	32.0	5.3	1.81	34.3	3.8	2.7	38.8	1.30	1.1	196	168	168	134	167		P	
S18 149-3	CBEN	28/09/2018	Shear Key 1	2659575.395	6510861.786	14.624	clayey SILT	NDM / SV	1.83	27.4	7.6	1.84	29.8	5.3	1.83	28.6	6.5	2.7	26.9	1.44	7.7	196	168	134	168	167		P	
S18 149-4	CBEN	28/09/2018	Shear Key 1	2659564.811	6510861.806	14.174	clayey SILT	NDM / SV	1.85	25.3	7.9	1.85	26.1	7.2	1.85	25.7	7.6	2.7	27.2	1.46	6.5	196	196	196	196	196		P	
S18 150-1	CBEN	1/10/2018	Behind RE Wall 9	2659566.434	6510864.806	14.623	clayey SILT	NDM / SV	1.82	37.7	1.5	1.81	36.9	2.3	1.81	37.3	1.9	2.7	35.3	1.34	3.1	196	154	156	168	169		P	
S18 150-2	CBEN	1/10/2018	Shear Key 2	2659531.184	6510907.554	13.808	clayey SILT	NDM / SV	1.89	31.6	1.4	1.90	29.5	2.5	1.89	30.6	2.0	2.7	36.8	1.38	0.0	196	196	196	196	196		P	
S18 150-3	CBEN	1/10/2018	Shear Key 2	2659544.485	6510903.035	15.668	clayey SILT	NDM / SV	1.77	38.5	3.5	1.77	35.1	5.7	1.77	36.8	4.6	2.7	34.9	1.31	5.8	196	196	196	196	196		P	
S18 150-4	CBEN	1/10/2018	Behind RE Wall 9	2659583.662	6510862.61	14.67	clayey SILT	NDM / SV	1.94	29.8	0.2	1.93	31.0	0.0	1.94	30.4	0.0	2.7	33.3	1.45	0.0	196	196	196	196	196		P	
S18 150-5	CBEN	1/10/2018	Behind RE Wall 9	2659564.885	6510860.009	14.801	clayey SILT	NDM / SV	1.96	29.5	0.0	1.96	26.1	1.9	1.96	27.8	0.7	2.7	32.8	1.47	0.0	196	196	196	196	196		P	
S18 151-1	CBEN	2/10/2018	Behind RE Wall 9	2659544.94	6510873.887	15.337	clayey SILT	NDM / SV	1.82	30.9	5.7	1.82	32.5	4.6	1.82	31.7	5.1	2.7	30.2	1.40	6.1	134	140	140	168	146		P	
S18 151-2	CBEN	2/10/2018	Behind RE Wall 9	2659522.331	6510870.436	13.845	clayey SILT	NDM / SV	1.88	33.1	0.9	1.88	31.2	2.2	1.88	32.2	1.6	2.7	31.3	1.43	2.1	196	196	196	196	196		P	Tests 1and 4 close to SV minimum spectification, advised site manager to keep an eye on the material as it maybe getting too wet.
S18 151-3	CBEN	2/10/2018	Behind RE Wall 9	2659583.19	6510862.279	21.375	clayey SILT	NDM / SV	1.85	28.4	5.6	1.86	29.4	4.3	1.86	28.9	5.0	2.7	27.7	1.45	5.8	140	140	154	168	151		P	
S18 151-4	CBEN	2/10/2018	Behind RE Wall 9	2659542.979	6510870.436	15.461	clayey SILT	NDM / SV	1.80	37.7	2.3	1.79	35.1	4.4	1.80	36.4	3.4	2.7	35.8	1.32	3.7	126	140	140	154	140		P	
S18 152-1	CBEN	3/10/2018	Behind RE Wall 9	2659565.805	6510869.909	16.414	clayey SILT	NDM / SV	1.85	27.7	6.2	1.85	30.8	4.3	1.85	29.3	5.2	2.7	30.2	1.42	4.6	140	168	168	196	168		P	
S18 152-2	CBEN	3/10/2018	Behind RE Wall 9	2659535.842	6510870.89	15.54	clayey SILT	NDM / SV	1.86	25.3	7.3	1.88	25.7	6.4	1.87	25.5	6.9	2.7	24.9	1.50	7.3	126	140	140	182	147		P	
S18 153-1	CBEN	4/10/2018	Behind RE Wall 9	2659523.978	6510871.945	15.264	clayey SILT	NDM / SV	1.85	26.0	7.3	1.86	27.6	5.9	1.86	26.8	6.6	2.7	28.4	1.44	5.5	196	196	196	196	196		P	
S18 153-2	CBEN	4/10/2018	Behind RE Wall 9	2659513.532	6510873.923	14.686	clayey SILT	NDM / SV	1.85	34.3	1.5	1.84	30.8	4.7	1.85	32.6	3.1	2.7	35.2	1.36	1.4	168	168	182	196	179		P	
S18 153-3	CBEN	4/10/2018	Behind RE Wall 9	2659532.006	6510872.229	16.078	clayey SILT	NDM / SV	1.84	31.1	4.5	1.84	31.9	3.6	1.84	31.5	4.0	2.7	33.7	1.38	2.6	140	140	154	154	147		P	
S18 153-4	CBEN	4/10/2018	Behind RE Wall 9	2659511.1	6510876.625	15.372	clayey SILT	NDM / SV	1.79	33.7	5.2	1.79	36.0	4.1	1.79	34.9	4.6	2.7	37.8	1.30	2.8	168	182	140	140	158		P	
S18 154-1	CBEN	5/10/2018	Behind RE Wall 9	2659520.37	6510874.999	16.753	clayey SILT	NDM / SV	1.86	28.6	5.2	1.85	28.8	5.4	1.85	28.7	5.3	2.7	42.6	1.30	0.0	168	168	140	168	161		P	
S18 154-2	CBEN	5/10/2018	Behind RE Wall 9	2659552.72	6510872.787	16.724	clayey SILT	NDM / SV	1.88	27.9	4.3	1.87	27.0	5.5	1.88	27.5	4.9	2.7	29.6	1.45	3.4	140	140	154	196	158		P	
S18 154-3	CBEN	5/10/2018	Shear Key 2	2659529.441	6510909.753	14.574	clayey SILT	NDM / SV	1.79	31.3	7.0	1.80	29.9	7.5	1.79	30.6	7.2	2.7	39.4	1.29	1.8	140	140	134	196	153		P	
S18 154-4	CBEN	5/10/2018	Behind RE Wall 9	2659538.976	6510873.11	16.853	clayey SILT	NDM / SV	1.82	33.5	3.6	1.83	34.7	2.6	1.83	34.1	3.1	2.7	34.8	1.35	2.7	140	140	123	112	129	S18 155-1	F	Failed minimum shear strength specification. Matarial cut and spread to dry.
S18 154-5	CBEN	5/10/2018	Behind RE Wall 9	2659526.658	6510882.349	16.877	clayey SILT	NDM / SV	1.87	28.5	4.8	1.87	31.0	2.9	1.87	29.8	3.9	2.7	32.5	1.41	2.0	112	134	140	154	135	S18 155-1	F	
S18 154-6	CBEN	5/10/2018	Shear Key 2	2659513.503	6510914.42	14.466	clayey SILT	NDM / SV	1.81	40.7	0.3	1.81	38.2	1.2	1.81	39.5	0.7	2.7	38.8	1.30	1.1	196	196	196	196	196		P	
S18 154-7	CBEN	5/10/2018	Shear Key 2	2659533.448	6510907.051	15.745	clayey SILT	NDM / SV	1.89	26.4	5.2	1.89	26.5	5.0	1.89	26.5	5.1	2.7	30.9	1.44	1.9	140	196	154	196	172		P	
S18 155-1	CBEN	8/10/2018	Behind RE Wall 9	2659511.638	6510892.114	17.222	clayey SILT	NDM / SV	1.87	28.5	4.5	1.88	30.5	2.7	1.88	29.5	3.6	2.7	29.8	1.45	3.4	196	196	196	196	196		P	

GEOTECHNICS

Job: Precent 5 Arrans Hill

Client: Tonkin & Taylor

Job #	21854.0031
Entered By	CBEN
Checked By	JLON
Approved By	-

URN	Tech.	Date	Location	GPS Coordination			Material	Test Type	NDM 0°			NDM 90°			AVERAGE NDM			Solid Density (t/m³) Assumed	Oven Moisture content (%)	Final Corrected		Shear Vane Reading (kPa)					Retest URN	PASS / FAIL	Comments
				Easting	Northing	RL		NDM / SV	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)			Oven Dry Density (t/m³)	Average Air Voids (%)	Reading 1	Reading 2	Reading 3	Reading 4	Average SV (4 x Tests)		(P) Pass / (F) Fail	
S18 155-2	CBEN	8/10/2018	Shear Key 2	2659531.959	6510911.333	16.536	clayey SILT	NDM / SV	1.81	36.5	2.4	1.81	37.4	2.1	1.81	37.0	2.2	2.7	36.4	1.33	2.6	168	168	182	154	168		P	
S18 155-3	CBEN	8/10/2018	Shear Key 2	2659545.813	6510908.313	17.674	clayey SILT	NDM / SV	1.85	26.5	7.1	1.85	28.0	6.0	1.85	27.3	6.5	2.7	28.9	1.44	5.3	196	196	140	154	172		P	
S18 155-4	CBEN	8/10/2018	Shear Key 2	2659506.382	6510909.738	15.902	clayey SILT	NDM / SV	1.78	34.6	5.3	1.78	34.9	5.1	1.78	34.8	5.2	2.7	36.4	1.31	4.2	182	191	168	154	174		P	
S18 155-5	CBEN	8/10/2018	Shear Key 2	2659502.873	6510919.243	16.094	clayey SILT	NDM / SV	1.80	34.4	4.4	1.80	36.4	3.3	1.80	35.4	3.8	2.7	34.0	1.34	4.7	154	140	196	182	168		P	
S18 156-1	CBEN	9/10/2018	Behind RE Wall 9	GPS Error			clayey SILT	NDM / SV	1.86	33.7	1.5	1.88	31.8	1.9	1.87	32.8	1.7	2.7	33.9	1.40	0.9	196	196	168	154	179		P	
S18 157-1	CBEN	10/10/2018	Behind RE Wall 9	2659554.147	6510876.355	17.481	clayey SILT	NDM / SV	1.79	33.7	5.6	1.79	37.6	3.2	1.79	35.7	4.3	2.7	43.5	1.24	0.0	154	196	196	168	179		P	
S18 157-2	CBEN	10/10/2018	Behind RE Wall 9	2659511.995	6510919.097	18.043	clayey SILT	NDM / SV	1.74	34.7	7.2	1.73	35.3	7.4	1.74	35.0	7.3	2.7	34.8	1.29	7.4	140	149	154	168	153		P	
S18 157-3	CBEN	10/10/2018	Behind RE Wall 9	2659528.547	6510916.402	17.923	clayey SILT	NDM / SV	1.83	34.8	2.6	1.83	33.5	3.5	1.83	34.2	3.0	2.7	33.9	1.37	3.2	168	163	182	196	177		P	
S18 158-1	CBEN	11/10/2018	Behind RE Wall 9	2659526.829	6510906.575	18.091	clayey SILT	NDM / SV	1.85	35.7	0.7	1.84	35.9	1.2	1.85	35.8	1.0	2.7	36.8	1.35	0.3	154	154	168	196	168		P	
S18 158-2	CBEN	11/10/2018	Behind RE Wall 9	2659528.456	6510888.668	18.19	clayey SILT	NDM / SV	1.84	30.3	5.1	1.84	29.5	5.7	1.84	29.9	5.4	2.7	29.7	1.42	5.5	196	168	140	140	161		P	
S18 160-1	CBEN	16/10/2018	RE Wall 9	2659533.18	6510849.27	10.143	clayey SILT	NDM / SV	1.75	32.9		1.77	32.4	7.0	1.76	32.7	7.4	2.7	35.1	1.31	5.8	140	154	154	154	151		P	
S18 160-2	CBEN	16/10/2018	Behind RE Wall 9	2659530.515	6510917.983	18.509	clayey SILT	NDM / SV	1.80	33.2	5.1	1.79	32.6	6.2	1.79	32.9	5.6	2.7	34.6	1.33	4.6	196	196	196	196	196		P	
S18 160-3	CBEN	16/10/2018	RE Wall 9	2659531.757	6510852.332	13.635	clayey SILT	NDM / SV	1.80	31.9	6.1	1.79	30.4	7.5	1.79	31.2	6.8	2.7	36.3	1.32	3.6	196	196	196	196	196		P	
S18 160-4	CBEN	16/10/2018	RE Wall 9	2659521.685	6510856.688	10.799	clayey SILT	NDM / SV	1.78	30.4	8.0	1.77	32.4	7.2	1.77	31.4	7.6	2.7	34.2	1.32	5.8	196	196	196	196	196		P	
S18 160-5	CBEN	16/10/2018	RE Wall 9	2659539.911	6510901.265	17.667	clayey SILT	NDM / SV	1.73	34.2	8.0	1.73	34.4	7.8	1.73	34.3	7.9	2.7	34.5	1.29	7.8	196	196	196	196	196		P	
S18 161-1	CBEN	17/10/2018	Behind RE Wall 9	2659545.452	6510913.761	19.325	clayey SILT	NDM / SV	1.80	33.2	5.3	1.79	33.2	5.4	1.80	33.2	5.3	2.7	38.7	1.29	2.0	196	196	196	196	196		P	
S18 161-2	CBEN	17/10/2018	Behind RE Wall 9	2659536.148	6510903.343	19.123	clayey SILT	NDM / SV	1.75	34.6	7.1	1.75	35.3	6.5	1.75	35.0	6.8	2.7	41.0	1.24	3.3	196	196	196	196	196		P	
S18 161-3	CBEN	17/10/2018	RE Wall 9	2659542.783	6510850.514	11.862	clayey SILT	NDM / SV	1.76	39.4	3.5	1.77	34.3	6.1	1.76	36.9	4.8	2.7	39.9	1.26	3.0	196	196	196	196	196		P	
S18 161-4	CBEN	17/10/2018	RE Wall 9	2659518.493	6510857.38	11.776	clayey SILT	NDM / SV	1.74	35.6	6.8	1.73	35.7	7.1	1.74	35.7	6.9	2.7	40.9	1.23	3.9	140	140	154	196	158		P	
S18 161-5	CBEN	17/10/2018	RE Wall 9	2659533.43	6510900.779	19.376	clayey SILT	NDM / SV	1.79	33.5	5.2	1.81	33.1	4.6	1.80	33.3	4.9	2.7	42.8	1.26	0.0	196	196	196	196	196		P	
S18 162-1	CBEN	18/10/2018	Shear Key 2	2659488.591	6510917.808	15.674	clayey SILT	NDM / SV	1.89	31.0	1.8	1.90	31.5	1.0	1.89	31.3	1.4	2.7	41.0	1.34	0.0	154	196	196	140	172		P	
S18 162-2	CBEN	18/10/2018	Behind RE Wall 9	2659510.573	6510927.561	19.869	clayey SILT	NDM / SV	1.80	32.2	5.7	1.79	37.4	3.3	1.79	34.8	4.4	2.7	40.5	1.28	1.0	196	154	168	196	179		P	
S18 162-5	CBEN	18/10/2018	Shear Key 2	2659473.14	6510924.593	15.483	clayey SILT	NDM / SV	1.82	32.8	4.2	1.81	34.1	4.2	1.81	33.5	4.2	2.7	32.4	1.37	4.8	154	196	182	182	179		P	
S18 162-6	CBEN	18/10/2018	Shear Key 2	2659485.306	6510926.192	16.321	clayey SILT	NDM / SV	1.79	33.5	5.7	1.79	35.3	4.2	1.79	34.4	4.9	2.7	30.1	1.37	7.7	182	168	168	140	165		P	
S18 162-7	CBEN	18/10/2018	RE Wall 9	2659587.21	6510845.256	12.43	clayey SILT	NDM / SV	1.82	32.5	4.4	1.81	35.6	2.8	1.82	34.1	3.6	2.7	32.2	1.38	4.8	140	140	154	182	154		P	
S18 162-8	CBEN	18/10/2018	RE Wall 9	2659541.831	6510853.531	12.691	clayey SILT	NDM / SV	1.79	30.4	7.3	1.81	30.0	6.7	1.80	30.2	7.0	2.7	32.2	1.36	5.7	168	168	140	154	158		P	
S18 163-1	CBEN	19/10/2018	RE Wall 9	2659515.525	6510859.432	12.76	clayey SILT	NDM / SV	1.76	32.9	7.6	1.75	33.4	7.7	1.75	33.2	7.7	2.7	34.9	1.30	6.6	196	196	196	196	196		P	
S18 163-2	CBEN	19/10/2018	Shear Key 2	2659488.183	6510920.548	17.243	clayey SILT	NDM / SV	1.81	33.4	4.6	1.81	30.9	6.0	1.81	32.2	5.3	2.7	36.0	1.33	2.8	196	196	196	196	196		P	
S18 163-3	CBEN	19/10/2018	Shear Key 2	2659480.993	6510929.026	17.252	clayey SILT	NDM / SV	1.82	30.4	6.1	1.81	32.5	5.0	1.81	31.5	5.6	2.7	36.7	1.33	2.2	196	196	196	196	196		P	
S18 163-4	CBEN	19/10/2018	Shear Key 2	2659487.707	6510914.825	17.61	clayey SILT	NDM / SV	1.81	35.0	3.5	1.81	33.0	4.5	1.81	34.0	4.0	2.7	36.0	1.33	2.7	196	196	196	196	196		P	
S18 163-5	CBEN	19/10/2018	Shear Key 2	2659487.045	6510928.739	17.77	clayey SILT	NDM / SV	1.82	30.0	6.3	1.84	31.0	4.6	1.83	30.5	5.5	2.7	34.3	1.36	3.0	196	196	196	196	196		P	
S18 163-6	CBEN	19/10/2018	RE Wall 9	2659553.173	6510901.913	20.844	clayey SILT	NDM / SV	1.82	33.9	3.8	1.81	33.2	4.8	1.81	33.6	4.3	2.7	35.8	1.33	2.8	140	154	140	168	151		P	
S18 163-7	CBEN	19/10/2018	Behind RE Wall 9	2659577.962	6510848.372	12.842	clayey SILT	NDM / SV	1.75	36.7	5.5	1.77	34.2	6.1	1.76	35.5	5.8	2.7	41.0	1.25	2.6	168	168	196	154	172		P	
S18 164-1	CBEN	20/10/2018	RE Wall 9	2659567.551	6510848.643	13.676	clayey SILT	NDM / SV	1.81	30.0	6.5	1.82	27.8	7.6	1.82	28.9	7.0	2.7	33.3	1.36	4.1	196	196	196	196	196		P	
S18 165-1	CBEN	23/10/2018	RE Wall 9	2659566.71	6510849.732	15.182	clayey SILT	NDM / SV	1.75	35.8	6.1	1.74	37.5	5.6	1.75	36.7	5.8	2.7	40.0	1.25	3.9	196	196	196	196	196		P	
S18 165-2	CBEN	23/10/2018	RE Wall 9	2659544.444	6510856.565	13.771	clayey SILT	NDM / SV	1.77	30.9	8.0	1.79	29.8	8.0	1.78	30.4	8.0	2.7	33.2	1.34	6.2	196	196	196	196	196		P	
S18 165-3	CBEN	23/10/2018	Behind RE Wall 9	2659587.98	6510873.592	17.532	clayey SILT	NDM / SV	1.88	29.0	3.6	1.79	33.6	5.3	1.84	31.3	4.4	2.7	37.0	1.34	0.8	154	154	140	196	161		P	
S18 165-4	CBEN	23/10/2018	Behind RE Wall 9	2659615.186	6510865.789	16.976	clayey SILT	NDM / SV	1.79	35.4	4.1	1.78	38.7	3.0	1.78	37.1	3.6	2.7	30.3	1.37	7.8	196	154	168	168	172		P	
S18 166-1	CBEN	24/10/2018	Behind RE Wall 9	2659489.867	6510926.985	19.585	clayey SILT	NDM / SV	1.85	26.8	6.9	1.84	27.6	6.6	1.85	27.2	6.8	2.7	28.3	1.44	6.0	168	168	196	182	179		P	
S18 166-2	CBEN	24/10/2018	Behind RE Wall 9	2659591.353	6510885.827	14.575	clayey SILT	NDM / SV	1.83	28.0	6.9	1.83	27.3	7.5	1.83	27.7	7.2	2.7	27.7	1.43	7.2	154	196	196	196	186		P	
S18 166-3	CBEN	24/10/2018	RE Wall 9	2659576.555	6510850.976	14.813	clayey SILT	NDM / SV	1.83	29.7	5.6	1.83	31.6	4.6	1.83	30.7	5.1	2.7	32.5	1.38	3.8	196	196	196	196	196		P	
S18 167-1	CBEN	25/10/2018	RE Wall 9	2659525.269	6510864.423	15.166	clayey SILT	NDM / SV	1.84	27.9	6.5	1.84	30.2	4.9	1.84	29.1	5.7	2.7	26.1	1.46	7.8	196	196	196	196	196		P	
S18 167-2	CBEN	25/10/2018	RE Wall 9	2659559.761	6510855.5	15.192	clayey SILT	NDM / SV	1.74	37.0	6.0	1.75	37.9	5.0	1.74	37.5	5.5	2.7	41.1	1.24	3.5	154	154	196	196	175		P	
S18 167-3	CBEN	25/10/2018	RE Wall 9	2659544.167	6510859.665	15.287	clayey SILT	NDM / SV	1.80	31.6	6.3	1.79	30.3	7.5	1.79	31.0	6.9	2.7	33.0	1.35	5.6	196	196	196	196	196		P	
S18 167-4	CBEN	25/10/2018	RE Wall 9	2659493.051	6510926.688	19.268	clayey SILT	NDM / SV	1.86	25.0	7.7	1.84	27.4	6.7	1.85	26.2	7.2	2.7	27.5	1.45	6.3	140	154	196	196	172		P	

GEOTECHNICS

Job: Precent 5 Arrans Hill

Client: Tonkin & Taylor

Job #	21854.0031
Entered By	CBEN
Checked By	JLON
Approved By	-

URN	Tech.	Date	Location	GPS Coordination			Material	Test Type	NDM 0°			NDM 90°			AVERAGE NDM			Solid Density (t/m³) Assumed	Oven Moisture content (%)	Final Corrected		Shear Vane Reading (kPa)					Retest URN	PASS / FAIL	Comments
				Easting	Northing	RL		NDM / SV	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)			Oven Dry Density (t/m³)	Average Air Voids (%)	Reading 1	Reading 2	Reading 3	Reading 4	Average SV (4 x Tests)		(P) Pass / (F) Fail	
S18 168-1	CBEN	26/10/2018	RE Wall 9	2659506.123	6510872.3	16.6	clayey SILT	NDM / SV	1.72	38.7	5.9	1.73	35.4	7.3	1.73	37.1	6.6	2.7	42.1	1.22	3.8	196	196	196	196	196		P	
S18 168-2	CBEN	26/10/2018	RE Wall 9	2659532.873	6510864.193	16.147	clayey SILT	NDM / SV	1.73	35.3	7.6	1.73	36.6	6.6	1.73	36.0	7.1	2.7	42.8	1.21	3.2	154	154	196	168	168		P	
S18 168-3	CBEN	26/10/2018	Behind RE Wall 2-3	2659518.572	6510922.292	20.821	clayey SILT	NDM / SV	1.80	33.0	5.2	1.80	33.6	4.8	1.80	33.3	5.0	2.7	39.4	1.29	1.3	154	154	168	168	161		P	
S18 168-4	CBEN	26/10/2018	Behind RE Wall 2-3	2659506.32	6510935.752	21.551	clayey SILT	NDM / SV	1.82	30.1	5.9	1.83	29.8	5.9	1.83	30.0	5.9	2.7	39.4	1.31	0.0	196	196	140	154	172		P	
S18 170-1	CBEN	2/11/2018	Behind RE Wall 2-3	2659549.986	6510938.178	23.523	clayey SILT	NDM / SV	1.97	28.2	0.0	1.97	29.3	0.0	1.97	28.8	0.0	2.7	34.4	1.47	0.0	196	196	182	126	175		P	
S18 171-1	CBEN	5/11/2018	Behind RE Wall 2-3	2659511.777	6510935.745	21.396	clayey SILT	NDM / SV	1.83	33.8	3.3	1.84	33.6	2.7	1.83	33.7	3.0	2.7	28.6	1.43	6.4	196	196	196	196	196		P	
S18 171-2	CBEN	5/11/2018	Behind RE Wall 2-3	2659530.861	6510920.124	21.999	clayey SILT	NDM / SV	1.81	31.4	5.9	1.82	32.0	4.6	1.82	31.7	5.3	2.7	35.2	1.34	3.0	196	196	196	196	196		P	
S18 171-3	CBEN	5/11/2018	Behind RE Wall 2-3	2659601.177	6510899.751	21.381	clayey SILT	NDM / SV	1.83	29.3	6.0	1.83	29.3	6.2	1.83	29.3	6.1	2.7	44.6	1.27	0.0	196	196	196	196	196		P	
S18 171-4	CBEN	5/11/2018	Behind RE Wall 2-3	2659556.676	6510933.445	23.226	clayey SILT	NDM / SV	1.90	29.5	2.2	1.88	30.8	2.4	1.89	30.2	2.3	2.7	27.0	1.49	4.6	196	196	196	196	196		P	
S18 171-5	CBEN	5/11/2018	Behind RE Wall 2-3	2659534.017	6510921.813	22.436	clayey SILT	NDM / SV	1.89	27.2	4.4	1.89	28.1	3.7	1.89	27.7	4.1	2.7	27.6	1.48	4.1	196	196	196	196	196		P	
S18 171-6	CBEN	5/11/2018	Behind RE Wall 2-3	2659604.364	6510897.145	22.55	clayey SILT	NDM / SV	1.89	27.7	4.0	1.91	25.5	5.0	1.90	26.6	4.5	2.7	30.5	1.46	1.6	196	196	196	196	196		P	
S18 172-1	CBEN	6/11/2018	Behind RE Wall 2-3	2659605.602	6510899.143	23.478	clayey SILT	NDM / SV	1.82	35.9	2.4	1.84	34.3	2.3	1.83	35.1	2.3	2.7	37.2	1.33	1.0	140	196	196	164	174		P	
S18 172-2	CBEN	6/11/2018	Behind RE Wall 2-3	2659568.034	6510910.264	23.39	clayey SILT	NDM / SV	1.78	35.1	5.0	1.79	34.6	4.9	1.78	34.9	5.0	2.7	37.6	1.30	3.3	158	196	196	164	179		P	
S18 172-3	CBEN	6/11/2018	Behind RE Wall 2-3	2659524.757	6510921.862	22.514	clayey SILT	NDM / SV	1.84	30.1	5.2	1.84	29.8	5.1	1.84	30.0	5.1	2.7	35.0	1.36	1.8	196	196	196	196	196		P	
S18 172-4	CBEN	6/11/2018	Behind RE Wall 2-3	2659635.059	6510898.356	23.623	clayey SILT	NDM / SV	1.81	31.6	5.5	1.81	33.1	4.5	1.81	32.4	5.0	2.7	34.4	1.35	3.7	158	158	164	196	169		P	
S18 172-5	CBEN	6/11/2018	Behind RE Wall 2-3	2659613.325	6510903.666	23.926	clayey SILT	NDM / SV	1.78	35.8	4.3	1.79	34.7	4.9	1.78	35.3	4.6	2.7	42.5	1.25	0.4	158	196	164	126	161		P	
S18 172-6	CBEN	6/11/2018	Behind RE Wall 2-3	2659522.141	6510921.66	22.884	clayey SILT	NDM / SV	1.83	31.4	4.8	1.83	32.6	4.0	1.83	32.0	4.4	2.7	31.0	1.40	5.0	158	196	164	126	161		P	
S18 173-1	CBEN	7/11/2018	Behind RE Wall 2-3	2659633.46	6510899.626	25.127	clayey SILT	NDM / SV	1.78	35.5	4.8	1.78	34.4	5.6	1.78	35.0	5.2	2.7	37.1	1.30	3.9	196	196	196	196	196		P	
S18 173-2	CBEN	7/11/2018	Behind RE Wall 2-3	2659602.104	6510908.126	24.866	clayey SILT	NDM / SV	1.80	30.1	7.3	1.80	33.0	5.4	1.80	31.6	6.3	2.7	32.8	1.35	5.5	164	196	140	196	174		P	
S18 173-3	CBEN	7/11/2018	Behind RE Wall 2-3	2659567.821	6510914.889	24.43	clayey SILT	NDM / SV	1.81	32.2	5.5	1.80	33.3	4.8	1.80	32.8	5.2	2.7	35.3	1.33	3.5	140	140	196	164	160		P	
S18 173-4	CBEN	7/11/2018	Behind RE Wall 2-3	2659563.6	6510929.294	24.1	clayey SILT	NDM / SV	1.90	27.8	3.5	1.89	28.8	3.4	1.90	28.3	3.5	2.7	30.4	1.45	2.0	164	164	196	196	180		P	
S18 173-5	CBEN	7/11/2018	Behind RE Wall 2-3	2659517.343	6510943.83	23.219	clayey SILT	NDM / SV	1.78	33.7	6.0	1.79	31.6	6.8	1.78	32.7	6.4	2.7	35.4	1.32	4.7	140	196	196	182	179		P	
S18 174-1	CBEN	8/11/2018	Behind RE Wall 2-3	2659516.219	6510943.869	23.1	clayey SILT	NDM / SV	1.87	25.6	6.9	1.88	25.5	6.3	1.87	25.6	6.6	2.7	30.3	1.44	3.2	196	196	196	196	196		P	
S18 174-2	CBEN	8/11/2018	Behind RE Wall 2-3	2659541.401	6510927.119	24.401	clayey SILT	NDM / SV	1.77	34.2	5.9	1.77	32.1	7.3	1.77	33.2	6.6	2.7	32.8	1.33	6.8	140	164	196	196	174		P	
S18 174-3	CBEN	8/11/2018	Behind RE Wall 2-3	2659562.508	6510934.259	24.958	clayey SILT	NDM / SV	1.82	33.6	3.8	1.82	33.9	3.8	1.82	33.8	3.8	2.7	34.1	1.36	3.6	126	140	182	140	147		P	Material close to Minimum Shear Strength, advised site manager.
S18 175-1	CBEN	9/11/2018	Shear Key 2	2659468.235	6510927.823	16.326	clayey SILT	NDM / SV	1.76	34.1	6.4	1.77	34.4	6.1	1.77	34.3	6.3	2.7	38.6	1.27	3.7	196	196	196	196	196		P	
S18 175-2	CBEN	9/11/2018	Behind RE Wall 2-3	2659616.989	6510903.838	25.919	clayey SILT	NDM / SV	1.71	40.4	5.8	1.70	39.3	6.6	1.71	39.9	6.2	2.7	36.8	1.25	7.9	158	158	196	164	169		P	
S18 175-3	CBEN	9/11/2018	Behind RE Wall 2-3	GPS Error			clayey SILT	NDM / SV	1.84	35.9	1.2	1.83	32.9	3.7	1.83	34.4	2.5	2.7	42.7	1.29	0.0	158	196	164	164	171		P	
S18 175-4	CBEN	9/11/2018	Behind RE Wall 2-3	2659573.63	6510922.272	25.019	clayey SILT	NDM / SV	1.77	40.7	2.4	1.77	39.3	2.8	1.77	40.0	2.6	2.7	34.9	1.31	5.6	196	196	196	196	196		P	
S18 175-5	CBEN	9/11/2018	Behind RE Wall 2-3	2659540.062	6510926.144	24.271	clayey SILT	NDM / SV	1.77	34.6	5.9	1.78	32.8	6.2	1.78	33.7	6.0	2.7	45.0	1.23	0.0	158	196	196	158	177		P	
S18 176-1	JLON	12/11/2018	Shear Key 2	2659467.028	6510924.83	16.265	clayey SILT	NDM / SV	1.85	30.3	4.5	1.86	32.1	2.4	1.86	31.2	3.5	2.7	35.2	1.37	1.0	196	196	196	196	196		P	
S18 176-2	JLON	12/11/2018	Shear Key 2	2659455.651	6510926.322	14.677	clayey SILT	NDM / SV	1.82	32.3	4.7	1.81	33.2	4.7	1.81	32.8	4.7	2.7	36.6	1.34	3.1	196	168	190	196	188		P	
S18 176-3	JLON	12/11/2018	Shear Key 2	2659450.664	6510925.935	14.835	clayey SILT	NDM / SV	1.80	31.8	5.9	1.79	30.3	7.3	1.80	31.1	6.6	2.7	37.4	1.32	3.1	196	165	196	182	185		P	
S18 176-4	JLON	12/11/2018	Behind RE Wall 2-3	2659552.207	6510940.503	25.064	clayey SILT	NDM / SV	1.83	30.2	5.6	1.83	31.1	4.8	1.83	30.7	5.2	2.7	31.2	1.33	0.9	154	196	140	154	161		P	
S18 176-5	JLON	12/11/2018	Behind RE Wall 2-3	2659565.937	6510915.049	25.142	clayey SILT	NDM / SV	1.80	32.8	5.4	1.80	35.9	3.3	1.80	34.4	4.3	2.7	32.0	1.37	6.4	154	168	196	140	165		P	
S18 176-6	JLON	12/11/2018	Shear Key 2	2659458.969	6510939.429	17.771	clayey SILT	NDM / SV	1.79	30.6	7.5	1.77	33.4	6.3	1.78	32.0	6.9	2.7	34.9	1.35	6.9	196	196	196	196	196		P	
S18 176-7	JLON	12/11/2018	Shear Key 2	2659465.299	6510933.532	17.588	clayey SILT	NDM / SV	1.81	33.2	4.6	1.81	32.7	5.0	1.81	33.0	4.8	2.7	39.8	1.34	3.6	196	196	196	196	196		P	
S18 176-8	JLON	12/11/2018	Behind RE Wall 2-3	2659534.765	6510923.956	24.892	clayey SILT	NDM / SV	1.85	33.1	2.5	1.84	32.2	3.5	1.85	32.7	3.0	2.7	34.6	1.32	0.0	196	168	196	154	179		P	
S18 177-1	JLON	13/11/2018	Shear Key 2	2659464.667	6510941.917	19.283	clayey SILT	NDM / SV	1.77	35.8	5.1	1.76	32.7	7.3	1.77	34.3	6.2	2.7	37.7	1.31	6.0	196	196	196	196	196		P	
S18 177-2	JLON	13/11/2018	Shear Key 2	2659474.109	6510929.618	19.137	clayey SILT	NDM / SV	1.82	36.9	1.8	1.81	34.4	3.8	1.81	35.7	2.8	2.7	39.4	1.30	0.5	196	196	196	196	196		P	
S18 177-3	JLON	13/11/2018	Behind RE Wall 2-3	2659551.263	6510938.831	25.587	clayey SILT	NDM / SV	1.90	28.6	3.0	1.88	26.5	5.6	1.89	27.6	4.3	2.7	28.6	1.47	3.5	196	196	196	196	196		P	
S18 177-4	JLON	13/11/2018	Behind RE Wall 2-3	2659581.902	6510915.336	26.022	clayey SILT	NDM / SV	1.90	26.6	4.5	1.80	26.0	9.9	1.85	26.3	7.2	2.7	27.8	1.45	6.1	196	196	196	196	196		P	
S18 177-5	JLON	13/11/2018	Shear Key 2	2659472.387	6510932.782	19.427	clayey SILT	NDM / SV	1.82	35.0	2.8	1.80	38.3	1.8	1.81	36.7	2.3	2.7	33.5	1.36	4.2	138	152	152	165	152		P	
S18 178-1	JLON	14/11/2018	Shear Key 2	2659469.751	6510939.113	20.699	clayey SILT	NDM / SV	1.91	28.3	2.5	1.95	27.2	1.7	1.93	27.8	2.1	2.7	27.8	1.51	2.1	193	152	152	152	162		P	
S18 178-2	JLON	14/11/2018	Shear Key 2	2659481.078	6510927.38	20.182	clayey SILT	NDM / SV	1.79	35.4	4.2	1.80	34.3	4.5	1.79	34.9	4.3	2.7	37.8	1.30	2.5	165	165	193	193	179		P	

GEOTECHNICS

Job: Precent 5 Arrans Hill

Client: Tonkin & Taylor

Job #	21854.0031
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Checked By	JLON
Approved By	-

URN	Tech.	Date	Location	GPS Coordination			Material	Test Type	NDM 0°			NDM 90°			AVERAGE NDM			Solid Density (t/m³) Assumed	Oven Moisture content (%)	Final Corrected		Shear Vane Reading (kPa)					Retest URN	PASS / FAIL	Comments
				Easting	Northing	RL		NDM / SV	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)			Oven Dry Density (t/m³)	Average Air Voids (%)	Reading 1	Reading 2	Reading 3	Reading 4	Average SV (4 x Tests)		(P) Pass / (F) Fail	
S18 178-3	JLON	14/11/2018	Shear Key 2	2659471.566	6510941.718	20.934	clayey SILT	NDM / SV	1.91	30.3	1.1	1.92	29.5	1.6	1.91	29.9	1.3	2.7	35.0	1.42	0.0	165	165	193	193	179		P	
S18 179-1	JLON	15/11/2018	Behind RE Wall 2-3	2659613.525	6510912.51	26.913	clayey SILT	NDM / SV	1.85	31.9	3.1	1.84	32.7	3.5	1.85	32.3	3.3	2.7	25.4	1.47	8.1	191	191	191	191	191		P	
S18 179-2	JLON	15/11/2018	Behind RE Wall 2-3	2659639.893	6510903.923	21.995	clayey SILT	NDM / SV	1.83	28.0	7.0	1.83	28.7	6.3	1.83	28.4	6.7	2.7	26.1	1.45	8.3	150	191	191	164	174		P	
S18 179-3	JLON	15/11/2018	Behind RE Wall 2-3	2659598.448	6510924.741	26.715	clayey SILT	NDM / SV	1.78	40.7	1.9	1.77	39.4	3.1	1.77	40.1	2.5	2.7	44.2	1.23	0.2	136	136	150	110	133		P	
S18 180-1	JLON	16/11/2018	Behind RE Wall 2-3	2659582.679	6510930.551	26.622	clayey SILT	NDM / SV	1.79	33.3	5.6	1.80	34.4	4.5	1.79	33.9	5.1	2.7	37.0	1.31	3.1	191	191	191	191	191		P	
S18 180-2	JLON	16/11/2018	Behind RE Wall 2-3	2659607.826	6510909.046	27.107	clayey SILT	NDM / SV	1.80	34.4	4.5	1.81	35.9	2.6	1.81	35.2	3.5	2.7	35.8	1.33	3.1	191	191	191	191	191		P	
S18 180-3	JLON	16/11/2018	Behind RE Wall 2-3	2659555.036	6510933.577	26.472	clayey SILT	NDM / SV	1.80	31.4	6.4	1.80	29.5	7.5	1.80	30.5	6.9	2.7	30.9	1.37	6.6	191	191	191	191	191		P	
S18 180-4	JLON	16/11/2018	Behind RE Wall 2-3	2659587.388	6510916.223	27.557	clayey SILT	NDM / SV	1.82	32.1	4.7	1.79	36.4	3.4	1.81	34.3	4.0	2.7	34.1	1.35	4.1	191	191	191	191	191		P	
S18 181-1	JLON	19/11/2018	Shear Key 2	2659442.26	6510929.152	13.092	clayey SILT	NDM / SV	1.81	28.5	7.6	1.82	29.1	6.9	1.81	28.8	7.3	2.7	31.5	1.38	5.4	164	164	191	136	164		P	
S18 181-2	JLON	19/11/2018	Shear Key 2	2659442.36	6510940.033	14.235	clayey SILT	NDM / SV	1.82	29.4	6.5	1.83	31.5	4.5	1.83	30.5	5.5	2.7	34.3	1.36	3.0	191	191	164	164	178		P	
S18 181-3	JLON	19/11/2018	Behind RE Wall 2-3	2659562.069	6510944.753	26.778	clayey SILT	NDM / SV	1.83	28.7	6.6	1.82	30.3	6.0	1.82	29.5	6.3	2.7	34.5	1.36	3.0	177	191	177	164	177		P	
S18 181-4	JLON	19/11/2018	Behind RE Wall 2-3	2659547.302	6510927.85	26.977	clayey SILT	NDM / SV	1.84	29.1	5.6	1.85	28.1	6.1	1.84	28.6	5.9	2.7	32.0	1.40	3.6	191	191	191	191	191		P	
S18 181-6	JLON	19/11/2018	Shear Key 2	2659441.418	6510940.982	15.385	clayey SILT	NDM / SV	1.78	31.6	7.1	1.79	32.1	6.3	1.79	31.9	6.7	2.7	33.4	1.34	5.7	191	191	191	191	191		P	
S18 181-7	JLON	19/11/2018	Shear Key 2	2659444.161	6510933.946	15.878	clayey SILT	NDM / SV	1.81	29.9	6.6	1.82	29.0	6.8	1.82	29.5	6.7	2.7	30.7	1.39	5.9	191	150	191	191	181		P	
S18 181-8	JLON	19/11/2018	Shear Key 2	2659432.251	6510934.626	12.571	clayey SILT	NDM / SV	1.89	27.9	4.1	1.88	29.6	3.4	1.88	28.8	3.7	2.7	31.3	1.44	1.9	150	164	191	164	167		P	
S18 181-9	JLON	19/11/2018	Shear Key 2	2659440.132	6510929.549	14.44	clayey SILT	NDM / SV	1.80	28.8	7.9	1.79	30.1	7.7	1.80	29.5	7.8	2.7	33.1	1.35	5.4	191	150	164	164	167		P	
S18 182-1	JLON	20/11/2018	Behind RE Wall 2-3	2659523.449	6510934.17	26.701	clayey SILT	NDM / SV	1.82	33.9	3.7	1.82	32.0	4.8	1.82	33.0	4.3	2.7	33.3	1.36	4.1	164	150	191	191	174		P	
S18 182-2	JLON	20/11/2018	Behind RE Wall 2-3	2659523.206	6510936.598	26.7	clayey SILT	NDM / SV	1.83	26.1	8.3	1.82	27.1	7.9	1.83	26.6	8.1	2.7	26.2	1.45	8.4	191	191	191	191	191		P	
S18 182-3	JLON	20/11/2018	Behind RE Wall 2-3	2659502.074	6510942.727	24.961	clayey SILT	NDM / SV	1.86	28.3	5.1	1.86	28.5	5.0	1.86	28.4	5.0	2.7	36.3	1.37	0.0	191	191	191	191	191		P	
S18 183-1	JLON	21/11/2018	Shear Key 2	2659450.007	6510941.947	18.128	clayey SILT	NDM / SV	1.75	34.2	7.1	1.75	32.5	8.1	1.75	33.4	7.6	2.7	32.9	1.32	7.9	193	193	193	193	193		P	
S18 183-2	JLON	21/11/2018	Behind RE Wall 3	2659481.964	6510936.45	21.831	clayey SILT	NDM / SV	1.82	27.9	7.4	1.83	29.9	5.6	1.83	28.9	6.5	2.7	30.6	1.40	5.3	193	193	193	193	193		P	
S18 183-3	JLON	21/11/2018	Shear Key 2	2659459.709	6510927.954	17.345	clayey SILT	NDM / SV	1.82	32.9	4.1	1.82	30.5	5.9	1.82	31.7	5.0	2.7	36.4	1.33	2.0	193	165	193	193	186		P	
S18 183-4	JLON	21/11/2018	Shear Key 2	2659451.007	6510944.143	18.076	clayey SILT	NDM / SV	1.83	32.5	4.2	1.82	32.5	4.5	1.82	32.5	4.3	2.7	34.5	1.36	3.0	165	193	152	193	176		P	
S18 183-5	JLON	21/11/2018	Behind RE Wall 3	2659479.846	6510945.696	23.92	clayey SILT	NDM / SV	1.86	30.9	3.5	1.84	28.1	6.2	1.85	29.5	4.8	2.7	31.3	1.41	3.6	193	193	193	193	193		P	
S18 183-6	JLON	21/11/2018	Behind RE Wall 3	2659485.164	6510930.789	22.728	clayey SILT	NDM / SV	1.82	30.7	5.4	1.83	30.2	5.5	1.83	30.5	5.5	2.7	34.0	1.36	3.1	193	193	193	193	193		P	
S18 185-1	JLON	23/11/2018	Behind RE Wall 2-3	GPS Error			clayey SILT	NDM / SV	1.80	32.2	5.8	1.80	32.4	5.5	1.80	32.3	5.6	2.7	28.3	1.40	8.3	165	138	193	193	172		P	
S18 185-2	JLON	23/11/2018	Behind RE Wall 2-3	2659531.604	6510928.669	21.738	clayey SILT	NDM / SV	1.82	34.6	3.3	1.83	32.6	3.8	1.82	33.6	3.5	2.7	34.1	1.36	3.2	165	193	193	138	172		P	
S18 185-3	JLON	23/11/2018	Shear Key 2	2659422.6	6510942.627	14.559	clayey SILT	NDM / SV	1.80	34.9	3.9	1.81	31.1	5.9	1.81	33.0	4.9	2.7	32.6	1.36	5.2	138	165	165	152	155		P	
S18 185-4	JLON	23/11/2018	Shear Key 2	2659433.931	6510933.02	14.265	clayey SILT	NDM / SV	1.78	34.0	5.7	1.77	33.3	6.5	1.78	33.7	6.1	2.7	33.4	1.33	6.3	152	165	165	138	155		P	
S18 185-5	JLON	23/11/2018	Behind RE Wall 2-3	2659582.952	6510919.498	29.154	clayey SILT	NDM / SV	1.83	30.5	5.3	1.83	32.4	4.2	1.83	31.5	4.7	2.7	29.9	1.41	5.8	193	193	193	193	193		P	
S18 185-6	JLON	23/11/2018	Behind RE Wall 2-3	2659607.708	6510911.947	28.907	clayey SILT	NDM / SV	1.80	36.1	3.2	1.80	31.6	6.2	1.80	33.9	4.7	2.7	31.6	1.37	6.1	193	193	193	193	193		P	
S18 185-7	JLON	23/11/2018	Shear Key 2	2659428.912	6510937.172	14.572	clayey SILT	NDM / SV	1.80	31.2	6.4	1.80	31.5	6.0	1.80	31.4	6.2	2.7	33.2	1.35	5.0	165	193	165	193	179		P	
S18 187-1	JLON	27/11/2018	Shear Key 2	2659424.68	6510943.545	15.307	clayey SILT	NDM / SV	1.71	37.2	7.6	1.79	31.9	6.2	1.75	34.6	6.8	2.7	37.0	1.28	5.4	138	152	193	193	169		P	
S18 187-2	JLON	27/11/2018	Shear Key 2	2659440.747	6510929.536	15.876	clayey SILT	NDM / SV	1.78	36.3	4.2	1.78	34.0	5.7	1.78	35.2	4.9	2.7	38.5	1.29	2.9	138	138	165	152	148		P	
S18 188-1	JLON	28/11/2018	Behind RE Wall 2-3	2659529.913	6510944.809	27.151	clayey SILT	NDM / SV	1.88	30.0	3.3	1.88	29.7	3.1	1.88	29.9	3.2	2.7	31.7	1.43	1.9	138	193	193	165	172		P	
S18 188-2	JLON	28/11/2018	Behind RE Wall 2-3	2659550.06	6510951.617	27.21	clayey SILT	NDM / SV	1.83	31.9	4.6	1.81	31.5	5.6	1.82	31.7	5.1	2.7	32.3	1.37	4.7	193	165	165	152	169		P	
S18 188-3	JLON	28/11/2018	Shear Key 2	2659434.799	6510929.215	16.342	clayey SILT	NDM / SV	1.81	33.5	4.6	1.80	34.2	4.4	1.80	33.9	4.5	2.7	34.8	1.34	3.9	193	193	193	193	193		P	
S18 188-4	JLON	28/11/2018	Shear Key 2	2659452.499	6510930.555	17.541	clayey SILT	NDM / SV	1.80	36.5	3.2	1.79	34.0	4.9	1.80	35.3	4.0	2.7	36.3	1.32	3.4	165	193	152	193	176		P	
S18 188-5	JLON	28/11/2018	Shear Key 2	2659427.105	6510950	17.887	clayey SILT	NDM / SV	1.74	34.2	7.5	1.75	34.8	6.7	1.75	34.5	7.1	2.7	35.6	1.29	6.4	138	193	165	152	162		P	
S18 188-6	JLON	28/11/2018	Shear Key 2	2659428.728	6510943.865	17.766	clayey SILT	NDM / SV	1.89	29.3	2.9	1.88	26.9	5.1	1.89	28.1	4.0	2.7	34.0	1.41	0.0	165	152	193	165	169		P	
S18 188-7	JLON	28/11/2018	Shear Key 2	2659449.553	6510945.454	19.281	clayey SILT	NDM / SV	1.83	34.0	3.0	1.82	31.1	5.5	1.82	32.6	4.2	2.7	36.5	1.34	1.7	138	138	124	165	141		P	
S18 188-8	JLON	28/11/2018	Shear Key 2	2659443.365	6510924.163	17.251	clayey SILT	NDM / SV	1.81	31.8	5.5	1.82	30.4	5.8	1.82	31.1	5.7	2.7	37.2	1.32	1.8	138	152	138	152	145		P	
S18 189-1	JLON	29/11/2018	Behind RE Wall 3	2659415.72	6510944.484	18.303	clayey SILT	NDM / SV	1.75	33.8	7.5	1.75	38.3	4.7	1.75	36.1	6.1	2.7	37.7	1.27	5.1	138	138	152	165	148		P	
S18 189-2	JLON	29/11/2018	Behind RE Wall 3	2659441.293	6510924.241	18.192	clayey SILT	NDM / SV	1.74	41.7	3.4	1.74	37.8	5.5	1.74	39.8	4.4	2.7	36.4	1.27	6.4	193	152	138	138	155		P	
S18 189-3	JLON	29/11/2018	Behind RE Wall 3	2659438.853	6510945.426	18.968	clayey SILT	NDM / SV	1.76	34.6	6.1	1.75	36.1	6.1	1.76	35.4	6.1	2.7	38.0	1.27	4.5	132	138	152	152	144		P	

GEOTECHNICS

Job: Precent 5 Arrans Hill

Client: Tonkin & Taylor

Job #	21854.0031
Entered By	CBEN
Checked By	JLON
Approved By	-

URN	Tech.	Date	Location	GPS Coordination			Material	Test Type	NDM 0°			NDM 90°			AVERAGE NDM			Solid Density (t/m³) Assumed	Oven Moisture content (%)	Final Corrected		Shear Vane Reading (kPa)					Retest URN	PASS / FAIL	Comments
				Easting	Northing	RL		NDM / SV	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)			Oven Dry Density (t/m³)	Average Air Voids (%)	Reading 1	Reading 2	Reading 3	Reading 4	Average SV (4 x Tests)		(P) Pass / (F) Fail	
S18 189-4	JLON	29/11/2018	Behind RE Wall 2-3	2659501.079	6510948.229	26.08	clayey SILT	NDM / SV	1.83	31.0	4.9	1.84	35.0	1.9	1.84	33.0	3.4	2.7	34.7	1.36	2.3	165	138	193	193	172		P	
S18 189-5	JLON	29/11/2018	Behind RE Wall 2-3	2659534.999	6510943.417	28.092	clayey SILT	NDM / SV	1.85	33.3	2.5	1.83	34.1	2.8	1.84	33.7	2.6	2.7	35.9	1.35	1.2	152	152	193	138	159		P	
S18 189-6	JLON	29/11/2018	Behind RE Wall 3	2659435.027	6510934.157	18.897	clayey SILT	NDM / SV	1.82	27.7	7.7	1.80	30.4	6.9	1.81	29.1	7.3	2.7	32.1	1.37	5.2	152	152	193	165	166		P	
S18 189-7	JLON	29/11/2018	Behind RE Wall 3	2659427.39	6510949.144	19.448	clayey SILT	NDM / SV	1.85	27.6	6.1	1.84	27.6	6.7	1.85	27.6	6.4	2.7	33.1	1.39	2.6	193	193	193	193	193		P	
S18 189-8	JLON	29/11/2018	Behind RE Wall 3	2659440.861	6510947.415	19.835	clayey SILT	NDM / SV	1.87	32.2	2.0	1.87	30.1	3.6	1.87	31.2	2.8	2.7	32.1	1.42	2.2	193	193	138	152	169		P	
S18 190-1	JLON	30/11/2018	Behind RE Wall 3	2659425.752	6510946.694	19.362	clayey SILT	NDM / SV	1.78	35.7	4.7	1.78	33.3	6.1	1.78	34.5	5.4	2.7	36.2	1.31	4.3	152	165	193	152	166		P	
S18 190-2	JLON	30/11/2018	Behind RE Wall 3	2659446.605	6510933.064	19.126	clayey SILT	NDM / SV	1.85	32.9	2.7	1.84	34.2	2.4	1.84	33.6	2.6	2.7	32.7	1.39	3.1	138	124	193	193	162		P	
S18 190-3	JLON	30/11/2018	Behind RE Wall 3	2659429.668	6510921.591	19.367	clayey SILT	NDM / SV	1.81	35.1	3.5	1.81	31.9	5.4	1.81	33.5	4.4	2.7	37.6	1.31	1.9	165	165	165	193	172		P	
S18 190-4	JLON	30/11/2018	Behind RE Wall 3	2659427.155	6510923.085	20.028	clayey SILT	NDM / SV	1.77	35.5	5.5	1.75	34.7	6.6	1.76	35.1	6.0	2.7	33.0	1.32	7.3	110	124	138	124	124	S18 196-1	F	Failed minimum shear strength specification. Matarial recently stabilised and to be re-tested next site visit.
S18 190-5	JLON	30/11/2018	Behind RE Wall 3	2659428.099	6510956.976	20.802	clayey SILT	NDM / SV	1.76	34.0	6.9	1.74	34.7	7.1	1.75	34.4	7.0	2.7	33.6	1.31	7.5	193	152	152	165	166		P	
S18 196-1	JLON	8/12/2018	Behind RE Wall 3	2659440.729	6510940.381	20.565	clayey SILT	NDM / SV	1.80	36.3	3.0	1.80	31.5	6.2	1.80	33.9	4.6	2.7	33.4	1.35	4.9	193	179	165	193	183		P	
S18 196-2	JLON	8/12/2018	Behind RE Wall 3	2659468.189	6510916.353	20.809	clayey SILT	NDM / SV	1.78	32.0	6.9	1.79	31.9	6.5	1.78	32.0	6.7	2.7	39.2	1.28	2.3	193	165	193	193	186		P	
S18 196-3	JLON	8/12/2018	Behind RE Wall 3	2659413.843	6510945.534	14.512	clayey SILT	NDM / SV	1.83	36.3	1.7	1.83	34.6	2.8	1.83	35.5	2.2	2.7	35.9	1.34	2.0	152	193	165	193	176		P	
S18 197-1	JLON	10/12/2018	Behind RE Wall 3	2659445.946	6510954.341	51.425	clayey SILT	NDM / SV	1.88	27.1	5.2	1.87	28.6	4.8	1.87	27.9	5.0	2.7	28.8	1.45	4.3	193	193	193	193	193		P	
S18 197-2	JLON	10/12/2018	Behind RE Wall 3	2659427.437	6510943.334	20.585	clayey SILT	NDM / SV	1.86	29.5	4.7	1.87	33.2	1.7	1.86	31.4	3.1	2.7	33.1	1.40	2.0	165	165	193	138	165		P	
S18 197-3	JLON	10/12/2018	Behind RE Wall 3	2659446.877	6510956.738	23.021	clayey SILT	NDM / SV	1.84	29.2	5.5	1.83	30.7	4.9	1.84	30.0	5.2	2.7	31.5	1.40	4.1	193	193	193	193	193		P	
S18 197-4	JLON	10/12/2018	Behind RE Wall 3	2659423.756	6510953.249	21.666	clayey SILT	NDM / SV	1.84	32.3	3.3	1.85	30.4	4.5	1.85	31.4	3.9	2.7	33.3	1.38	2.6	138	193	165	165	165		P	
S18 198-1	JLON	11/12/2018	Behind RE Wall 3	2659442.637	6510941.766	22.453	clayey SILT	NDM / SV	1.79	36.4	3.8	1.80	35.5	3.5	1.79	36.0	3.7	2.7	37.7	1.30	2.6	165	138	138	165	152		P	
S18 198-2	JLON	11/12/2018	Behind RE Wall 3	2659469.814	6510936.493	23.78	clayey SILT	NDM / SV	1.83	31.1	4.7	1.84	31.5	4.2	1.84	31.3	4.4	2.7	30.9	1.40	4.7	193	193	193	193	193		P	
S18 198-3	JLON	11/12/2018	Behind RE Wall 3	2659475.49	6510950.626	25.577	clayey SILT	NDM / SV	1.86	30.0	4.0	1.86	31.1	3.2	1.86	30.6	3.6	2.7	32.4	1.41	2.4	165	179	193	193	183		P	
S18 198-4	JLON	11/12/2018	Behind RE Wall 3	2659604.319	6511026.733	44.534	clayey SILT	NDM / SV	1.91	26.9	3.7	1.91	26.9	3.6	1.91	26.9	3.7	2.7	28.6	1.49	2.4	193	193	193	165	186		P	
S18 198-5	JLON	11/12/2018	Behind RE Wall 3	2659569.613	6511041.031	39.026	clayey SILT	NDM / SV	1.93	25.5	4.1	1.93	25.5	4.1	1.93	25.5	4.1	2.7	28.0	1.50	2.2	193	193	193	193	193		P	
S18 198-6	JLON	11/12/2018	Subgrade Below Stockpile	2659555.28	6511050.726	42.577	clayey SILT	NDM / SV	1.93	28.9	1.3	1.91	33.3	-0.7	1.92	31.1	0.3	2.7	32.4	1.45	0.0	193	193	193	193	193		P	
S18 198-7	JLON	11/12/2018	Subgrade Below Stockpile	2659530.305	6511055.383	42.395	clayey SILT	NDM / SV	1.82	29.9	6.0	1.83	28.4	6.6	1.83	29.2	6.3	2.7	30.2	1.40	5.6	193	193	193	193	193		P	
S18 198-8	JLON	11/12/2018	Behind RE Wall 3	2659439.075	6510948.403	24.523	clayey SILT	NDM / SV	1.76	31.9	8.0	1.75	34.1	7.0	1.76	33.0	7.5	2.7	30.9	1.34	8.8	193	193	193	193	193		P	
S18 198-9	JLON	11/12/2018	Behind RE Wall 3	2659465.074	6510938.542	24.453	clayey SILT	NDM / SV	1.82	32.5	4.5	1.83	28.0	6.9	1.83	30.3	5.7	2.7	29.7	1.41	6.1	165	165	193	193	179		P	
S18 198-10	JLON	11/12/2018	Behind RE Wall 3	2659480.627	6510937.121	25.173	clayey SILT	NDM / SV	1.89	30.3	2.4	1.89	28.6	3.5	1.89	29.5	3.0	2.7	32.9	1.42	0.6	193	193	193	193	193		P	
S18 198-11	JLON	11/12/2018	Behind RE Wall 3	2659567.073	6511059.047	44.627	clayey SILT	NDM / SV	1.74	36.2	6.7	1.74	34.1	7.8	1.74	35.2	7.2	2.7	31.7	1.32	9.4	193	193	193	193	193		P	Material close to Minimum Air Voids, advised site manager.
S18 199-1	JLON	12/12/2018	Behind RE Wall 3	2659462.541	6510941.854	24.096	clayey SILT	NDM / SV	1.85	26.2	7.4	1.84	25.8	7.9	1.85	26.0	7.6	2.7	25.8	1.47	7.7	165	193	193	193	186		P	
S18 199-2	JLON	12/12/2018	Behind RE Wall 3	2659467.135	6510957.088	25.443	clayey SILT	NDM / SV	1.89	24.7	6.5	1.90	26.3	4.7	1.89	25.5	5.6	2.7	27.2	1.49	4.3	152	193	165	193	176		P	
S18 199-3	JLON	12/12/2018	Behind RE Wall 3	2659439.286	6510944.9	23.526	clayey SILT	NDM / SV	1.82	28.2	7.4	1.81	31.0	6.1	1.81	29.6	6.7	2.7	29.5	1.40	6.8	193	193	193	193	193		P	
S18 199-4	JLON	12/12/2018	Behind RE Wall 3	2659599.773	6511020.173	44.629	clayey SILT	NDM / SV	1.85	33.6	2.4	1.87	32.7	1.6	1.86	33.2	2.0	2.7	36.3	1.36	0.0	152	138	165	165	155		P	
S18 199-5	JLON	12/12/2018	Behind RE Wall 3	2659551.129	6511055.784	42.678	clayey SILT	NDM / SV	1.83	30.6	5.4	1.85	31.5	3.8	1.84	31.1	4.6	2.7	32.2	1.39	3.8	193	193	165	165	179		P	
S18 199-6	JLON	12/12/2018	Behind RE Wall 3	2659557.728	6511037.002	42.225	clayey SILT	NDM / SV	1.83	32.6	3.7	1.82	33.8	3.4	1.83	33.2	3.5	2.7	31.4	1.39	4.7	193	193	165	193	186		P	
S18 200-1	JLON	13/12/2018	Behind RE Wall 3	2659463.497	6510969.884	28.668	clayey SILT	NDM / SV	1.78	35.2	4.6	1.78	36.4	4.4	1.78	35.8	4.5	2.7	37.6	1.29	3.4	179	179	165	165	172		P	
S18 200-2	JLON	13/12/2018	Behind RE Wall 3	2659582.422	6510938.42	28.625	clayey SILT	NDM / SV	1.82	31.7	5.0	1.82	34.7	3.1	1.82	33.2	4.1	2.7	32.8	1.37	4.3	165	165	193	179	176		P	
S18 200-3	JLON	13/12/2018	Behind RE Wall 3	2659521.535	6510944.494	27.391	clayey SILT	NDM / SV	1.80	32.6	5.5	1.81	35.9	2.9	1.80	34.3	4.2	2.7	33.7	1.35	4.6	165	193	193	179	183		P	
S18 200-4	JLON	13/12/2018	Behind RE Wall 3	2659477.992	6510967.099	28.017	clayey SILT	NDM / SV	1.86	32.0	2.9	1.87	32.2	1.9	1.86	32.1	2.4	2.7	34.3	1.39	1.0	138	138	124	165	141		P	Material close to Minimum Shear Strength, advised site manager.
S18 200-5	JLON	13/12/2018	Behind RE Wall 3	2659458.369	6510977.766	31.132	clayey SILT	NDM / SV	1.81	35.4	3.2	1.81	33.8	4.1	1.81	34.6	3.6	2.7	36.6	1.33	2.4	152	152	152	138	149		P	
S18 201-1	JLON	14/12/2018	Behind RE Wall 3	2659493.305	6510938.098	26.445	clayey SILT	NDM / SV	1.84	31.1	4.5	1.83	32.7	3.7	1.84	31.9	4.1	2.7	34.4	1.37	2.5	152	152	165	193	166		P	
S18 201-2	JLON	14/12/2018	Behind RE Wall 3	2659465.867	6510946.645	25.202	clayey SILT	NDM / SV	1.85	31.1	4.0	1.85	30.6	4.2	1.85	30.9	4.1	2.7	32.8	1.39	2.8	193	193	193	193	193		P	
S18 201-3	JLON	14/12/2018	Behind RE Wall 3	2659542.075	6510939.058	28.498	clayey SILT	NDM / SV	1.86	33.7	1.7	1.86	30.4	3.9	1.86	32.1	2.8	2.7	32.7	1.40	2.3	165	138	165	165	158		P	
S18 201-4	JLON	14/12/2018	Behind RE Wall 3	2659504.347	6510935.98	27.61	clayey SILT	NDM / SV	1.86	33.7	1.7	1.84	30.4	4.9	1.85	32.1	3.3	2.7	31.5	1.41	3.7	193	138	193	152	169		P	
S18 201-5	JLON	14/12/2018	Behind RE Wall 3	2659471.97	6510888.553	17.115	clayey SILT	NDM / SV	1.90	25.5	5.4	1.97	26.0	1.6	1.93	25.8	3.5	2.7	24.0	1.56	4.8	193	193	193	193	193		P	
S18 201-6	JLON	14/12/2018	Behind RE Wall 3	2659533.622	6510873.296	17.527	clayey SILT	NDM / SV	1.90	29.2	2.8	1.89	28.2	3.9	1.89	28.7	3.4	2.7	25.5	1.51	5.7	193	193	193	193	193		P	

GEOTECHNICS

Job: Precent 5 Arrans Hill

Client: Tonkin & Taylor

Job #	21854.0031
Entered By	CBEN
Checked By	JLON
Approved By	-

URN	Tech.	Date	Location	GPS Coordination			Material	Test Type	NDM 0°			NDM 90°			AVERAGE NDM			Solid Density (t/m³) Assumed	Oven Moisture content (%)	Final Corrected		Shear Vane Reading (kPa)					Retest URN	PASS / FAIL	Comments
				Easting	Northing	RL		NDM / SV	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)			Oven Dry Density (t/m³)	Average Air Voids (%)	Reading 1	Reading 2	Reading 3	Reading 4	Average SV (4 x Tests)		(P) Pass / (F) Fail	
S18 202-1	JLON	17/12/2018	Behind RE Wall 2-3	GPS Error			clayey SILT	NDM / SV	1.81	35.9	3.1	1.81	30.0	6.8	1.81	33.0	4.9	2.7	34.2	1.35	4.1	193	193	193	193	193		P	
S18 202-2	JLON	17/12/2018	Behind RE Wall 2-3	2659574.384	6510950.86	29.464	clayey SILT	NDM / SV	1.84	29.9	5.2	1.84	30.7	4.7	1.84	30.3	5.0	2.7	32.7	1.39	3.3	193	193	193	193	193		P	
S18 202-3	JLON	17/12/2018	Behind RE Wall 2-3	2659473.152	6510937.841	26.381	clayey SILT	NDM / SV	1.81	26.9	9.0	1.80	29.7	7.5	1.80	28.3	8.2	2.7	28.1	1.41	8.4	193	193	193	193	193		P	
S18 202-4	JLON	17/12/2018	Top Of Hill	2659594.455	6511022.466	44.862	clayey SILT	NDM / SV	1.80	29.3	7.5	1.80	31.1	6.6	1.80	30.2	7.1	2.7	32.5	1.36	5.5	193	193	193	193	193		P	
S18 202-5	JLON	17/12/2018	Top Of Hill	2659568.799	6511041.538	43.266	clayey SILT	NDM / SV	1.78	39.7	2.4	1.76	40.8	2.4	1.77	40.3	2.4	2.7	41.6	1.25	1.7	193	193	193	193	193		P	
S18 202-6	JLON	17/12/2018	Behind Re Wall 3	2659468.452	6510938.406	25.171	clayey SILT	NDM / SV	1.83	27.4	7.7	1.83	28.7	6.6	1.83	28.1	7.1	2.7	28.5	1.42	6.8	193	193	193	193	193		P	
S18 202-7	JLON	17/12/2018	Behind Re Wall 3	2659505.187	6510934.512	26.516	clayey SILT	NDM / SV	1.84	30.9	4.4	1.83	29.6	6.0	1.83	30.3	5.2	2.7	27.9	1.43	6.9	193	193	193	193	193		P	
S18 203-1	JLON	18/12/2018	Behind Re Wall 3	2659518.486	6510935.881	28.275	clayey SILT	NDM / SV	1.90	28.5	3.3	1.90	30.5	1.5	1.90	29.5	2.4	2.7	25.4	1.51	5.4	193	193	193	193	193		P	
S18 203-2	JLON	18/12/2018	Behind Re Wall 3	2659556.643	6510933.849	29.394	clayey SILT	NDM / SV	1.92	23.6	5.7	1.94	22.3	6.1	1.93	23.0	5.9	2.7	20.4	1.60	8.0	193	193	193	193	193		P	
S18 203-3	JLON	18/12/2018	Top Of Hill	2659578.835	6511040.415	44.294	clayey SILT	NDM / SV	1.89	31.2	1.7	1.86	30.2	3.9	1.87	30.7	2.8	2.7	28.4	1.46	4.5	193	193	193	193	193		P	
S18 203-4	JLON	18/12/2018	Top Of Hill	2659539.47	6511051.664	43.079	clayey SILT	NDM / SV	1.82	35.8	2.5	1.82	36.6	2.1	1.82	36.2	2.3	2.7	34.0	1.36	3.7	193	193	193	193	193		P	
S18 203-5	JLON	18/12/2018	Behind RE Wall 2	2659553.682	6510955.687	29.37	clayey SILT	NDM / SV	1.94	25.0	3.8	1.93	23.1	5.5	1.94	24.1	4.7	2.7	27.2	1.52	2.2	193	193	193	193	193		P	
S18 204-1	JLON	19/12/2018	Behind RE Wall 2-3	2659505.433	6510943.429	27.905	clayey SILT	NDM / SV	1.74	39.5	4.8	1.74	38.9	4.7	1.74	39.2	4.7	2.7	36.8	1.27	6.1	193	193	193	193	193		P	
S18 204-2	JLON	19/12/2018	Top Of Hill	2659580.93	6511027.616	44.486	clayey SILT	NDM / SV	2.00	27.8	0.0	2.00	30.6	0.0	2.00	29.2	0.0	2.7	28.8	1.55	0.0	193	193	193	193	193		P	
S18 204-3	JLON	19/12/2018	Top Of Hill	2659584.699	6511037.72	44.938	clayey SILT	NDM / SV	1.97	27.7	0.2	1.97	29.8	0.0	1.97	28.8	0.0	2.7	27.3	1.55	0.6	193	193	193	193	193		P	
S18 204-4	JLON	19/12/2018	Behind Wall 4A	2659602.874	6510851.389	11.877	clayey SILT	NDM / SV	1.90	28.8	2.7	1.90	29.7	2.0	1.90	29.3	2.4	2.7	24.1	1.53	6.2	193	193	193	193	193		P	
S19 003-1	CBEN	7/01/2019	Top Of Hill	2659531.157	6511030.103	41.778	clayey SILT	NDM / SV	1.87	30.3	3.3	1.86	28.4	5.1	1.87	29.4	4.2	2.7	31.5	1.42	2.7	193	193	193	193	193		P	
S19 003-2	CBEN	7/01/2019	Top Of Hill	2659564.207	6511020.731	42.107	clayey SILT	NDM / SV	1.87	28.0	4.8	1.87	28.1	4.9	1.87	28.1	4.9	2.7	30.6	1.43	3.1	152	138	165	165	155		P	
S19 004-1	CBEN	8/01/2019	Top Of Hill	2659544.825	6511028.864	42.851	clayey SILT	NDM / SV	1.86	30.2	4.1	1.85	29.8	4.7	1.85	30.0	4.4	2.7	29.2	1.44	4.9	193	193	193	193	193		P	
S19 004-2	CBEN	8/01/2019	Top Of Hill	2659524.599	6511037.648	42.343	clayey SILT	NDM / SV	1.83	29.6	5.7	1.84	26.5	7.4	1.84	28.1	6.5	2.7	28.4	1.43	6.3	193	193	193	193	193		P	
S19 004-3	CBEN	8/01/2019	Behind RE Wall 2	2659661.798	6510906.861	26.363	clayey SILT	NDM / SV	1.94	22.0	6.2	1.93	21.9	6.9	1.93	22.0	6.6	2.7	22.0	1.58	6.5	193	193	193	193	193		P	
S19 004-4	CBEN	8/01/2019	Behind RE Wall 2	2659651.985	6510898.522	25.288	clayey SILT	NDM / SV	1.78	32.7	6.4	1.78	33.9	5.8	1.78	33.3	6.1	2.7	35.7	1.31	4.6	193	193	193	193	193		P	
S19 004-5	CBEN	8/01/2019	Behind RE Wall 2	2659586.137	6511029.098	45.003	clayey SILT	NDM / SV	1.89	28.0	3.8	1.89	27.8	4.2	1.89	27.9	4.0	2.7	25.9	1.50	5.5	193	193	193	193	193		P	
S19 005-1	CBEN	9/01/2019	Behind RE Wall 2	2659650.158	6510902.355	27.636	clayey SILT	NDM / SV	1.78	33.2	5.9	1.77	38.9	3.0	1.78	36.1	4.4	2.7	38.1	1.29	3.2	193	193	193	193	193		P	
S19 005-2	CBEN	9/01/2019	Behind RE Wall 2	2659671.887	6510894.567	26.442	clayey SILT	NDM / SV	1.75	36.8	5.4	1.76	34.8	6.4	1.75	35.8	5.9	2.7	35.9	1.29	5.9	193	193	193	193	193		P	
S19 005-3	CBEN	9/01/2019	Top Of Hill	2659546.446	6511040.68	43.921	clayey SILT	NDM / SV	1.87	29.1	4.3	1.87	38.1	0.0	1.87	33.6	1.2	2.7	28.9	1.45	4.4	193	193	193	193	193		P	
S19 005-4	CBEN	9/01/2019	Top Of Hill	2659571.39	6511024.097	45.21	clayey SILT	NDM / SV	1.91	27.9	2.9	1.92	24.6	5.2	1.91	26.3	4.0	2.7	30.1	1.47	1.2	193	193	193	193	193		P	
S19 005-5	CBEN	9/01/2019	Behind RE Wall 2	2659671.334	6510896.341	24.556	clayey SILT	NDM / SV	1.77	33.6	6.4	1.78	32.1	7.1	1.77	32.9	6.8	2.7	31.4	1.35	7.7	193	193	193	193	193		P	
S19 005-6	CBEN	9/01/2019	Behind RE Wall 2	2659659.05	6510898.495	27.719	clayey SILT	NDM / SV	1.81	33.4	4.4	1.82	33.2	4.0	1.82	33.3	4.2	2.7	29.8	1.40	6.5	193	193	193	193	193		P	
S19 005-7	CBEN	9/01/2019	Top Of Hill	2659520.997	6511036.156	43.683	clayey SILT	NDM / SV	1.84	30.2	4.9	1.84	29.4	5.4	1.84	29.8	5.1	2.7	31.4	1.40	4.1	193	193	193	193	193		P	
S19 006-1	CBEN	10/01/2019	Behind RE Wall 2	2659674.138	6510900.373	26.903	clayey SILT	NDM / SV	1.80	30.7	6.8	1.79	33.4	5.4	1.80	32.1	6.0	2.7	34.9	1.33	4.2	193	193	193	193	193		P	
S19 006-2	CBEN	10/01/2019	Behind RE Wall 2	2659662.16	6510906.163	27.522	clayey SILT	NDM / SV	1.81	30.9	6.3	1.81	33.0	4.8	1.81	32.0	5.5	2.7	32.7	1.36	5.1	193	193	193	193	193		P	
S19 006-3	CBEN	10/01/2019	Top Of Hill	2659573.355	6511033.109	45.193	clayey SILT	NDM / SV	1.83	35.1	2.4	1.83	31.5	4.6	1.83	33.3	3.5	2.7	34.5	1.36	2.8	165	165	193	193	179		P	
S19 006-4	CBEN	10/01/2019	Top Of Hill	2659563.15	6511038.999	45.056	clayey SILT	NDM / SV	1.84	28.1	6.5	1.83	30.2	5.5	1.83	29.2	6.0	2.7	34.5	1.36	2.5	152	165	193	163	168		P	
S19 006-5	CBEN	10/01/2019	Top Of Hill	2659543.162	6511052.779	44.372	clayey SILT	NDM / SV	1.83	30.8	5.3	1.83	29.4	6.0	1.83	30.1	5.6	2.7	35.6	1.35	2.0	152	193	163	163	168		P	
S19 007-1	CBEN	11/01/2019	Behind Wall 4A	2659594.119	6510853.343	13.289	clayey SILT	NDM / SV	1.81	33.3	4.5	1.81	33.8	4.2	1.81	33.6	4.4	2.7	37.2	1.32	2.1	193	193	193	193	193		P	
S19 007-2	CBEN	11/01/2019	Behind RE Wall 2	2659669.815	6510925.32	28.916	clayey SILT	NDM / SV	1.77	32.8	7.0	1.76	36.5	5.1	1.77	34.7	6.0	2.7	32.9	1.33	7.1	152	165	193	193	176		P	
S19 007-3	CBEN	11/01/2019	Road 2 Undercut	2659759.066	6511065.197	36.541	clayey SILT	NDM / SV	1.78	31.8	6.9	1.76	32.0	7.8	1.77	31.9	7.4	2.7	32.9	1.33	6.7	193	193	193	193	193		P	
S19 007-4	CBEN	11/01/2019	Top Of Hill	2659539.221	6511042.706	44.945	clayey SILT	NDM / SV	1.83	33.2	3.3	1.84	32.5	3.3	1.84	32.9	3.3	2.7	33.1	1.38	3.1	152	152	165	193	166		P	
S19 007-5	CBEN	11/01/2019	Top Of Hill	2659556.685	6511037.524	45.745	clayey SILT	NDM / SV	1.79	31.7	6.4	1.80	33.0	5.3	1.80	32.4	5.9	2.7	34.1	1.34	4.7	165	165	193	152	169		P	
S19 008-1	CBEN	12/01/2019	Top Of Hill	2659572.255	6511035.75	45.819	clayey SILT	NDM / SV	1.89	28.2	3.8	1.89	33.0	0.3	1.89	30.6	2.0	2.7	30.1	1.45	2.4	193	193	193	193	193		P	
S19 009-1	JLON	15/01/2018	Re Wall 2 (old fill)	2659717.731	6510866.886	18.1	clayey SILT	NDM / SV	1.78	32.4	6.5	1.80	29.5	7.7	1.79	31.0	7.1	2.7	30.0	1.38	7.7	193	193	193	193	193		P	
S19 009-2	JLON	15/01/2018	Re Wall 2 (new fill)	2659728.253	6510867.176	17.898	clayey SILT	NDM / SV	1.72	32.6	9.5	1.73	35.2	7.7	1.73	33.9	8.6	2.7	35.5	1.27	7.7	193	193	193	193	193		P	
S19 009-3	JLON	15/01/2018	W Grover St Undercut	2659747.028	6511085.955	36.155	clayey SILT	NDM / SV	1.89	32.6	1.0	1.87	34.0	1.0	1.88	33.3	1.0	2.7	36.7	1.37	0.0	165	193	193	138	172		P	
S19 009-4	JLON	15/01/2018	W Grover St Undercut	2659724	6510867.096	17.306	clayey SILT	NDM / SV	1.78	31.5	7.4	1.77	34.2	6.0	1.77	32.9	6.7	2.7	35.4	1.31	5.1	193	193	193	193	193		P	

GEOTECHNICS

Job: Precent 5 Arrans Hill

Client: Tonkin & Taylor

Job #	21854.0031
Entered By	CBEN
Checked By	JLON
Approved By	-

URN	Tech.	Date	Location	GPS Coordination			Material	Test Type	NDM 0°			NDM 90°			AVERAGE NDM			Solid Density (t/m³) Assumed	Oven Moisture content (%)	Final Corrected		Shear Vane Reading (kPa)					Retest URN	PASS / FAIL	Comments
				Easting	Northing	RL		NDM / SV	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)			Oven Dry Density (t/m³)	Average Air Voids (%)	Reading 1	Reading 2	Reading 3	Reading 4	Average SV (4 x Tests)		(P) Pass / (F) Fail	
S19 010-1	JLON	16/01/2019	Re Wall 2	2659706.489	6510870.061	19.065	clayey SILT	NDM / SV	1.79	30.3	7.3	1.80	30.9	6.5	1.80	30.6	6.9	2.7	33.1	1.35	5.2	193	193	193	193	193		P	
S19 010-2	JLON	16/01/2019	Behind Retaining wall 4A	2659598.793	6510854.145	14.821	clayey SILT	NDM / SV	1.81	32.5	5.1	1.82	30.9	5.4	1.82	31.7	5.2	2.7	34.4	1.35	3.5	193	193	193	193	193		P	
S19 010-3	JLON	16/01/2019	Behind Retaining wall 4A	2659593.681	6510853.363	14.171	clayey SILT	NDM / SV	1.87	32.3	2.1	1.82	30.5	6.1	1.84	31.4	4.1	2.7	34.2	1.37	2.2	193	193	193	193	193		P	
S19 010-4	JLON	16/01/2019	Top Of Hill	2659532.649	6511017.656	39.874	clayey SILT	NDM / SV	1.99	26.4	0.3	2.00	26.4	-0.4	1.99	26.4	0.0	2.7	24.9	1.60	1.1	193	193	193	193	193		P	
S19 011-1	JLON	18/01/2019	Top Of Hill	2659716.98	6511077.92	36.897	clayey SILT	NDM / SV	1.87	28.4	4.5	1.85	30.3	4.3	1.86	29.4	4.4	2.7	29.2	1.44	4.5	193	193	193	193	193		P	
S19 011-2	JLON	18/01/2019	Behind RE wall 2	2659527.362	6510964.571	30.792	clayey SILT	NDM / SV	1.87	27.5	5.1	1.88	29.7	3.5	1.88	28.6	4.3	2.7	30.7	1.43	2.8	193	193	165	152	176		P	
S19 013-1	JLON	19/01/2019	Behind Retaining wall 4A	2659594.512	6510854.566	14.659	clayey SILT	NDM / SV	1.81	33.5	4.3	1.82	34.9	2.9	1.82	34.2	3.6	2.7	36.6	1.33	2.1	193	193	193	193	193		P	
S19 013-2	JLON	19/01/2019	Behind RE Wall 4	2659540.684	6511010.74	40.361	clayey SILT	NDM / SV	1.97	25.6	1.8	1.96	24.7	2.8	1.97	25.2	2.3	2.7	26.3	1.56	1.4	193	193	193	193	193		P	
S19 014-1	JLON	21/01/2019	Behind Retaining wall 4A	2659592.099	6510853.266	15.079	clayey SILT	NDM / SV	1.96	24.9	2.7	1.96	27.7	0.4	1.96	26.3	1.5	2.7	24.6	1.58	2.9	193	193	193	193	193		P	
S19 014-2	JLON	21/01/2019	Behind RE Wall 4	2659576.131	6510944.498	21.19	clayey SILT	NDM / SV	2.06	28.6	0.0	2.04	26.6	0.0	2.05	27.6	0.0	2.7	29.0	1.59	0.0	193	193	193	193	193		P	
S19 014-3	JLON	21/01/2019	Behind RE Wall 4	2659517.324	6510949.717	28.901	clayey SILT	NDM / SV	1.91	28.4	2.8	1.88	30.6	2.6	1.89	29.5	2.7	2.7	35.1	1.40	0.0	193	165	165	193	179		P	
S19 015-1	JLON	22/01/2019	Behind Retaining wall 4A	2659590.635	6510854.826	15.732	clayey SILT	NDM / SV	1.75	35.9	6.0	1.76	35.4	5.8	1.76	35.7	5.9	2.7	35.6	1.29	5.9	193	193	193	193	193		P	
S19 016-1	JLON	23/01/2019	Behind RE Wass 2-3	2659588.393	6510938.244	31.181	clayey SILT	NDM / SV	1.88	32.1	1.4	1.88	30.7	2.3	1.88	31.4	1.8	2.7	32.8	1.42	0.9	179	188	193	179	185		P	
S19 016-2	JLON	23/01/2019	Behind RE Wass 2-3	2659546.519	6510953.398	30.481	clayey SILT	NDM / SV	1.92	28.9	1.6	1.92	29.2	1.7	1.92	29.1	1.6	2.7	33.9	1.43	0.0	193	193	193	193	193		P	
S19 016-3	JLON	23/01/2019	Behind RE Wass 2-3	2659588.952	6510934.724	21.041	clayey SILT	NDM / SV	1.88	30.5	2.5	1.89	29.2	2.9	1.89	29.9	2.7	2.7	33.5	1.42	0.2	193	193	193	193	193		P	
S19 016-4	JLON	23/01/2019	RE Slope 2	2659690.884	6510873.258	19.49	clayey SILT	NDM / SV	1.86	27.1	6.1	1.86	25.1	7.8	1.86	26.1	7.0	2.7	24.9	1.49	7.9	193	193	193	193	193		P	
S19 017-1	JLON	24/01/2019	RE Slope 2	2659657.644	6510877.643	19.698	clayey SILT	NDM / SV	1.95	26.6	1.8	1.96	25.6	2.2	1.96	26.1	2.0	2.7	29.5	1.51	0.0	193	193	193	193	193		P	
S19 017-2	JLON	24/01/2019	RE Slope 2	2659713.316	6511071.282	39.128	clayey SILT	NDM / SV	1.92	28.5	2.2	1.92	27.9	2.3	1.92	28.2	2.3	2.7	33.4	1.44	0.0	193	193	193	193	193		P	
S19 017-3	JLON	24/01/2019	RE Slope 2	2659694.392	6510875.107	20.376	clayey SILT	NDM / SV	1.75	36.0	6.1	1.75	37.3	5.1	1.75	36.7	5.6	2.7	33.3	1.31	7.7	165	193	179	174	178		P	
S19 018-1	JLON	25/01/2019	Small Undercut top of hill	2659732.94	6511011.441	35.629	clayey SILT	NDM / SV	1.70	50.7	1.2	1.80	33.8	4.7	1.75	42.3	2.5	2.7	55.2	1.13	0.0	193	124	165	152	159		P	
S19 018-2	JLON	25/01/2019	RE Slope 2	2659676.141	6510879.677	20.953	clayey SILT	NDM / SV	1.72	35.1	8.0	1.80	35.1	4.0	1.76	35.1	6.0	2.7	40.8	1.25	2.7	193	193	193	193	193		P	
S19 018-3	JLON	25/01/2019	RE Slope 2	2659577.17	6510899.591	23.104	clayey SILT	NDM / SV	1.72	35.1	8.0	1.71	39.8	6.0	1.72	37.5	6.9	2.7	37.5	1.25	6.9	193	193	193	193	193		P	
S19 019-1	JLON	29/01/2019	Behind RE Wall 3	2659566.577	6510952.879	31.7	clayey SILT	NDM / SV	1.81	35.6	3.1	1.82	32.8	4.2	1.82	34.2	3.6	2.7	41.7	1.28	0.0	154	215	169	125	166		P	
S19 019-2	JLON	29/01/2019	Top Of Hill	2659528.26	6511072.42	45.248	clayey SILT	NDM / SV	1.86	30.3	4.0	1.86	28.4	5.0	1.86	29.4	4.5	2.7	38.2	1.35	0.0	169	169	184	154	169		P	
S19 019-3	JLON	29/01/2019	Top Of Hill	2659555.881	6511070.24	45.435	clayey SILT	NDM / SV	1.81	37.5	2.1	1.81	33.9	3.9	1.81	35.7	3.0	2.7	39.0	1.30	1.0	154	169	215	215	188		P	
S19 019-4	JLON	29/01/2019	Behind RE Wall 4	2659544.202	6511015.62	40.536	clayey SILT	NDM / SV	1.89	28.6	3.6	1.89	29.6	2.9	1.89	29.1	3.3	2.7	30.2	1.45	2.5	215	215	215	215	215		P	
S19 019-5	JLON	29/01/2019	Top Of Hill	2659569.559	6511005.928	41.194	clayey SILT	NDM / SV	1.85	34.8	1.6	1.85	33.1	2.7	1.85	34.0	2.2	2.7	37.1	1.35	0.2	184	184	215	215	200		P	
S19 019-5	JLON	29/01/2019	Top Of Hill	2659547.19	6511062.725	46.052	clayey SILT	NDM / SV	1.88	29.0	3.7	1.90	25.8	5.3	1.89	27.4	4.5	2.7	27.6	1.48	4.4	215	215	215	215	215		P	
S19 020-1	JLON	30/01/2019	Small Undercut top of hill	2659633.471	6511061.323	42.221	clayey SILT	NDM / SV	1.80	34.6	4.3	1.79	35.1	4.4	1.79	34.9	4.3	2.7	39.0	1.29	1.8	184	215	215	215	207		P	
S19 020-2	JLON	30/01/2019	Small Undercut top of hill	2659662.016	6511087.103	38.158	clayey SILT	NDM / SV	1.79	31.3	6.7	1.82	30.8	5.7	1.81	31.1	6.2	2.7	40.3	1.29	0.5	154	138	184	184	165		P	
S19 020-3	JLON	30/01/2019	RE Wall 2	2659642.906	6510887.312	21.244	clayey SILT	NDM / SV	1.85	27.2	6.6	1.84	26.9	7.2	1.85	27.1	6.9	2.7	26.9	1.45	7.0	215	215	215	215	215		P	
S19 021-1	JLON	31/01/2019	RE Wall 2	2659696.162	6510879.295	21.985	clayey SILT	NDM / SV	1.72	36.3	7.4	1.73	35.2	7.7	1.72	35.8	7.6	2.7	35.6	1.27	7.6	184	169	169	184	177		P	
S19 021-2	JLON	31/01/2019	Behind RE Wall 4	2659566.274	6511009.954	42.111	clayey SILT	NDM / SV	1.95	30.9	1.4	1.97	29.5	-1.2	1.96	30.2	0.0	2.7	36.2	1.44	0.0	194	154	1564	138	513		P	
S19 021-3	JLON	31/01/2019	Behind RE Wall 4	2659561.969	6511008.287	41.233	clayey SILT	NDM / SV	1.95	26.4	2.3	1.94	26.6	2.7	1.94	26.5	2.5	2.7	37.0	1.42	0.0	154	154	215	184	177		P	
S19 021-4	JLON	31/01/2019	RE Wall 3	2659509.906	6510916.207	21.955	clayey SILT	NDM / SV	1.81	32.4	5.3	1.81	31.5	5.6	1.81	32.0	5.5	2.7	33.3	1.36	4.6	215	215	215	215	215		P	
S19 021-5	JLON	31/01/2019	Behind RE Wall 4	2659516.059	6511011.375	40.177	clayey SILT	NDM / SV	1.83	30.0	5.6	1.85	28.4	6.0	1.84	29.2	5.8	2.7	34.2	1.37	2.4	215	215	215	215	215		P	
S19 022-1	JLON	1/02/2019	RE Wall 3	2659475.78	6510924.453	22.247	clayey SILT	NDM / SV	1.83	32.3	4.2	1.83	31.6	4.4	1.83	32.0	4.3	2.7	33.4	1.37	3.3	215	215	215	215	215		P	
S19 022-2	JLON	1/02/2019	Behind RE Wall 4	2659537.044	6511020.472	41.175	clayey SILT	NDM / SV	1.87	31.5	2.4	1.87	30.3	3.3	1.87	30.9	2.9	2.7	32.6	1.41	1.7	154	154	169	138	154		P	
S19 022-3	JLON	1/02/2019	Behind RE Wall 4	2659584.131	6511009.668	46.555	clayey SILT	NDM / SV	1.88	28.7	4.2	1.88	29.6	3.5	1.88	29.2	3.9	2.7	28.1	1.46	4.6	215	154	154	169	173		P	
S19 022-4	JLON	1/02/2019	Small Undercut top of hill	2659626.011	6511122.23	36.392	clayey SILT	NDM / SV	1.84	31.9	3.7	1.83	33.0	3.8	1.84	32.5	3.7	2.7	30.6	1.41	4.9	154	215	184	154	177		P	
S19 022-5	JLON	1/02/2019	Behind RE Wall 4	2659590.587	6510896.363	22.548	clayey SILT	NDM / SV	1.72	35.6	7.9	1.74	34.0	8.0	1.73	34.8	7.9	2.7	38.5	1.25	5.8	215	215	215	215	215		P	
S19 024-1	JLON	2/02/2019	RE Wall 2	2659693.64	6510880.439	22.693	clayey SILT	NDM / SV	1.81	34.4	4.0	1.82	32.1	4.9	1.81	33.3	4.4	2.7	36.4	1.33	2.5	215	215	215	215	215		P	
S19 024-2	JLON	2/02/2019	Behind RE Wall 5	2659543.057	6511015.094	35.09	clayey SILT	NDM / SV	1.96	20.9	6.0	1.96	21.7	5.5	1.96	21.3	5.8	2.7	24.1	1.58	3.5	215	215	215	215	215		P	
S19 024-3	JLON	2/02/2019	Top Of Hill	2659523.486	6511092.893	46.518	clayey SILT	NDM / SV	1.90	28.1	3.3	1.91	27.1	3.8	1.90	27.6	3.5	2.7	25.4	1.52	5.2	215	215	215	215	215		P	
S19 024-4	JLON	2/02/2019	RE Wall 3	2659450.934	6510932.578	22.784	clayey SILT	NDM / SV	1.91	29.7	1.8	1.91	31.7	0.1	1.91	30.7	0.9	2.7	38.5	1.38	4.2	215	215	215	215	215		P	

GEOTECHNICS

Job: Precent 5 Arrans Hill

Client: Tonkin & Taylor

Job #	21854.0031
Entered By	CBEN
Checked By	JLON
Approved By	-

URN	Tech.	Date	Location	GPS Coordination			Material	Test Type	NDM 0°			NDM 90°			AVERAGE NDM			Solid Density (t/m³) Assumed	Oven Moisture content (%)	Final Corrected		Shear Vane Reading (kPa)					Retest URN	PASS / FAIL	Comments
				Easting	Northing	RL		NDM / SV	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)			Oven Dry Density (t/m³)	Average Air Voids (%)	Reading 1	Reading 2	Reading 3	Reading 4	Average SV (4 x Tests)		(P) Pass / (F) Fail	
S19 024-5	JLON	2/02/2019	Behind RE Wall 5	2659560.000	6511008.447	41.983	clayey SILT	NDM / SV	1.90	31.0	1.2	1.92	33.3	0.0	1.91	32.2	0.0	2.7	40.0	1.36	5.1	215	215	215	215	215		P	
S19 025-1	JLON	5/02/2019	RE Wall 2	2659674.696	6510881.983	23.511	clayey SILT	NDM / SV	1.72	38.9	6.0	1.73	36.3	7.1	1.72	37.6	6.6	2.7	39.9	1.23	5.3	169	215	215	215	204		P	
S19 025-2	JLON	5/02/2019	Behind RE Wall 5	2659548.102	6511020.471	41.884	clayey SILT	NDM / SV	1.93	29.4	0.9	1.93	31.9	-0.8	1.93	30.7	0.0	2.7	31.9	1.46	0.9	154	169	215	215	188		P	
S19 025-3	JLON	5/02/2019	RE Wall 3	2659509.619	6510918.162	23.467	clayey SILT	NDM / SV	1.79	36.6	3.8	1.76	37.0	4.9	1.77	36.8	4.3	2.7	39.2	1.27	2.9	215	215	215	215	215		P	
S19 026-1	JLON	7/02/2019	Behind RE Wall 5	2659600.541	6510982.108	35.493	clayey SILT	NDM / SV	1.78	27.3	9.8	1.88	28.3	4.2	1.83	27.8	7.0	2.7	29.7	1.41	5.7	154	169	169	184	169		P	
S19 026-2	JLON	7/02/2019	Behind RE Wall 5	2659615.627	6510975.947	35.962	clayey SILT	NDM / SV	1.88	26.9	5.3	1.88	29.6	3.2	1.88	28.3	4.2	2.7	29.3	1.45	3.5	184	184	154	154	169		P	
S19 026-3	JLON	7/02/2019	RE Wall 3	2659674.548	6510887.415	23.75	clayey SILT	NDM / SV	1.78	31.1	7.3	1.79	30.5	7.6	1.78	30.8	7.4	2.7	32.0	1.35	6.7	215	215	215	215	215		P	
S19 026-4	JLON	7/02/2019	RE Wall 3	2659516.783	6510917.521	24.76	clayey SILT	NDM / SV	1.75	37.3	5.1	1.76	37.6	4.8	1.75	37.5	4.9	2.7	39.0	1.26	4.0	154	200	184	154	173		P	
S19 026-5	JLON	7/02/2019	Behind RE Wall 5	2659613.396	6510978.309	36.605	clayey SILT	NDM / SV	1.80	34.8	3.9	1.79	35.9	3.7	1.80	35.4	3.8	2.7	38.1	1.30	2.1	154	169	215	154	173		P	
S19 027-1	JLON	8/02/2019	Undercut Road 7	2659609.734	6511091.075	42.541	clayey SILT	NDM / SV	1.80	35.7	3.6	1.79	40.0	1.6	1.79	37.9	2.6	2.7	39.2	1.29	1.8	169	215	215	215	204		P	
S19 027-2	JLON	8/02/2019	RE Wall 2	2659678.348	6510885.741	24.512	clayey SILT	NDM / SV	1.75	38.5	4.4	1.76	37.0	4.9	1.76	37.8	4.6	2.7	43.0	1.23	1.7	184	215	215	194	202		P	
S19 027-3	JLON	8/02/2019	RE Wall 3	2659614.813	6510896.468	24.978	clayey SILT	NDM / SV	1.76	35.5	5.8	1.74	37.7	5.3	1.75	36.6	5.6	2.7	40.1	1.25	3.5	215	215	215	215	215		P	
S19 029-1	JLON	11/02/2019	RE Wall 2	2659683.456	6511086.884	37.146	clayey SILT	NDM / SV	1.75	38.8	4.6	1.75	41.8	2.5	1.75	40.3	3.5	2.7	41.3	1.24	3.0	154	169	184	184	173		P	
S19 029-2	JLON	11/02/2019	Undercut Road 8	2659683.456	6511086.884	37.146	clayey SILT	NDM / SV	1.87	28.8	4.6	1.84	27.5	6.9	1.85	28.2	5.8	2.7	26.4	1.47	7.1	215	215	215	215	215		P	
S19 029-3	JLON	11/02/2019	Re Wall 3	2659447.027	6510936.767	24.84	clayey SILT	NDM / SV	1.76	36.5	5.3	1.77	36.3	4.9	1.76	36.4	5.1	2.7	38.1	1.28	4.1	184	184	215	215	200		P	
S19 029-4	JLON	11/02/2019	Behind RE Wall 5	2659596.828	6510989.86	40.56	clayey SILT	NDM / SV	1.84	30.5	4.5	1.85	30.6	4.1	1.85	30.6	4.3	2.7	30.9	1.41	4.1	215	215	215	215	215		P	
S19 030-1	JLON	12/02/2019	RE Wall 2	2659589.223	6510904.528	25.383	clayey SILT	NDM / SV	1.73	37.6	5.9	1.74	36.8	6.2	1.74	37.2	6.1	2.7	38.5	1.25	5.3	200	184	200	200	196		P	
S19 030-2	JLON	12/02/2019	Behind RE Wall 4	2659529.268	6511010.876	41.435	clayey SILT	NDM / SV	1.90	32.5	0.5	1.90	33.4	0.6	1.90	33.0	0.0	2.7	42.7	1.33	6.2	154	184	215	215	192		P	
S19 030-3	JLON	12/02/2019	Behind RE Wall 5	2659587.366	6510997.217	41.694	clayey SILT	NDM / SV	1.80	32.0	5.9	1.81	29.9	6.5	1.81	31.0	6.2	2.7	28.3	1.41	8.0	154	215	215	138	181		P	
S19 030-4	JLON	12/02/2019	Behind RE Wall 5	2659636.228	6510983.315	35.913	clayey SILT	NDM / SV	1.80	30.7	6.9	1.81	28.6	7.8	1.80	29.7	7.3	2.7	28.8	1.40	7.9	169	169	200	215	188		P	
S19 030-5	JLON	12/02/2019	Undercut W of Road 7	2659573.617	6511094.97	43.704	clayey SILT	NDM / SV	1.94	28.0	1.4	1.94	27.3	2.1	1.94	27.7	1.7	2.7	24.7	1.56	4.0	154	169	215	215	188		P	
S19 030-6	JLON	12/02/2019	Undercut W of Road 7	2659547.898	6511111.081	45.71	clayey SILT	NDM / SV	1.80	39.4	1.2	1.79	39.4	2.0	1.79	39.4	1.6	2.7	44.3	1.24	1.1	129	215	169	169	171		P	
S19 030-7	JLON	12/02/2019	Undercut W of Road 7	2659679.524	6510961.44	31.899	clayey SILT	NDM / SV	1.78	32.6	6.8	1.77	36.6	4.4	1.77	34.6	5.6	2.7	34.6	1.32	5.6	138	169	184	138	157		P	
S19 030-8	JLON	12/02/2019	Undercut W of Road 7	2659494.754	6510925.947	25.404	clayey SILT	NDM / SV	1.76	34.9	6.1	1.77	33.6	6.7	1.76	34.3	6.4	2.7	35.4	1.30	5.7	200	184	184	154	181		P	
S19 031-1	JLON	13/02/2019	Behind RE Wall 5	2659661.897	6510973.136	36.935	clayey SILT	NDM / SV	1.89	25.9	5.4	1.90	25.4	5.6	1.89	25.7	5.5	2.7	27.5	1.49	4.1	215	215	215	215	215		P	
S19 031-2	JLON	13/02/2019	Behind RE Wall 5	2659676.393	6510977.704	34.477	clayey SILT	NDM / SV	1.89	26.2	5.4	1.90	24.5	6.3	1.89	25.4	5.8	2.7	28.3	1.47	3.7	215	215	215	215	215		P	
S19 031-3	JLON	13/02/2019	Behind RE Wall 5	2659599.135	6510995.181	42.713	clayey SILT	NDM / SV	1.93	23.6	5.2	1.93	24.7	4.5	1.93	24.2	4.9	2.7	25.6	1.54	3.7	215	215	215	215	215		P	
S19 031-4	JLON	13/02/2019	Behind RE Wall 4	2659540.969	6511016.89	41.913	clayey SILT	NDM / SV	1.93	24.8	4.2	1.91	27.7	3.0	1.92	26.3	3.6	2.7	26.1	1.53	3.7	184	215	215	184	200		P	
S19 031-5	JLON	13/02/2019	RE Wall 2	2659627.297	6510895.066	23.438	clayey SILT	NDM / SV	1.73	37.5	6.0	1.72	39.4	5.6	1.73	38.5	5.8	2.7	35.2	1.28	7.7	215	215	215	215	215		P	
S19 031-6	JLON	13/02/2019	RE Wall 3	2659536.857	6510917.619	27.19	clayey SILT	NDM / SV	1.83	29.9	5.8	1.83	33.2	3.5	1.83	31.6	4.7	2.7	34.1	1.36	3.0	215	215	215	215	215		P	
S19 032-1	JLON	14/02/2019	Behind RE Wall 5	2659691.305	6510963.691	34.487	clayey SILT	NDM / SV	1.78	36.4	4.0	1.78	37.3	3.8	1.78	36.9	3.9	2.7	32.1	1.35	6.9	129	138	169	154	148		P	
S19 032-2	JLON	14/02/2019	Behind RE Wall 5	2659709.613	6510963.489	33.353	clayey SILT	NDM / SV	1.79	33.0	5.8	1.78	32.7	6.6	1.78	32.9	6.2	2.7	32.8	1.34	6.2	184	184	154	154	169		P	
S19 032-3	JLON	14/02/2019	Behind RE Wall 4	2659566.696	6511007.115	43.46	clayey SILT	NDM / SV	1.90	27.3	3.8	1.91	28.1	2.9	1.91	27.7	3.3	2.7	30.3	1.46	1.4	184	184	138	154	165		P	
S19 032-4	JLON	14/02/2019	Behind RE Wall 4	2659513.851	6511015.853	41.639	clayey SILT	NDM / SV	1.85	33.8	2.1	1.85	32.5	3.2	1.85	33.2	2.7	2.7	30.7	1.41	4.3	154	169	184	184	173		P	
S19 032-5	JLON	14/02/2019	Behind RE Wall 5	2659655.875	6510981.227	38.809	clayey SILT	NDM / SV	1.91	24.5	5.7	1.91	25.6	4.7	1.91	25.1	5.2	2.7	26.0	1.52	4.5	215	215	215	215	215		P	
S19 032-6	JLON	14/02/2019	Behind RE Wall 5	2659677.141	6510972.073	35.482	clayey SILT	NDM / SV	1.92	25.1	4.8	1.91	23.7	6.3	1.91	24.4	5.5	2.7	25.9	1.52	4.4	184	200	184	184	188		P	
S19 033-1	JLON	15/12/2019	RE Wall 3	2659509.807	6510922.637	26.436	clayey SILT	NDM / SV	1.73	37.2	6.2	1.74	34.8	7.5	1.73	36.0	6.9	2.7	36.1	1.27	6.8	215	215	215	215	215		P	
S19 033-2	JLON	15/12/2019	RE Wall 2	2659580.016	6510910.21	26.344	clayey SILT	NDM / SV	1.77	33.5	6.7	1.77	33.0	6.8	1.77	33.3	6.8	2.7	37.1	1.29	4.4	215	215	215	215	215		P	
S19 033-3	JLON	15/12/2019	Behind RE Wall 4	2659547.252	6511019.106	43.606	clayey SILT	NDM / SV	1.79	33.2	5.7	1.79	33.7	5.1	1.79	33.5	5.4	2.7	38.9	1.29	2.1	215	138	154	215	181		P	
S19 033-4	JLON	15/12/2019	Behind RE Wall 5	2659668.829	6510981.409	37.502	clayey SILT	NDM / SV	1.89	24.4	6.7	1.89	22.4	8.0	1.89	23.4	7.4	2.7	23.4	1.53	7.4	138	169	215	215	184		P	
S19 033-5	JLON	15/12/2019	Behind RE Wall 5	2659695.876	6510976.743	35.698	clayey SILT	NDM / SV	1.88	24.1	7.3	1.91	23.0	6.9	1.89	23.6	7.1	2.7	24.6	1.52	6.3	169	215	215	138	184		P	
S19 033-6	JLON	15/12/2019	RE Wall 3	2659520.999	6510922.393	27.122	clayey SILT	NDM / SV	1.73	35.9	7.4	1.72	36.6	7.3	1.72	36.3	7.4	2.7	36.7	1.26	7.1	215	215	215	215	215		P	
S19 033-7	JLON	15/12/2019	RE Wall 3	2659696.9	6510977.528	36.279	clayey SILT	NDM / SV	1.84	30.0	4.9	1.84	31.6	3.9	1.84	30.8	4.4	2.7	34.1	1.37	2.2	138	184	184	215	180		P	
S 19 034-1	JLON	18/02/2019	RE Wall 3	2659526.514	6510925.389	28.735	clayey SILT	NDM / SV	1.73	36.2	6.8	1.74	33.7	7.8	1.74	35.0	7.3	2.7	34.9	1.29	7.3	169	215	215	184	196		P	
S 19 034-2	JLON	18/02/2019	RE Wall 2	2659600.477	6510907.752	26.933	clayey SILT	NDM / SV	1.75	33.8	7.5	1.74	33.9	8.0	1.74	33.9	7.8	2.7	35.1	1.29	7.0	215	215	215	215	215		P	

GEOTECHNICS

Job: Precent 5 Arrans Hill

Client: Tonkin & Taylor

Job #	21854.0031
Entered By	CBEN
Checked By	JLON
Approved By	-

URN	Tech.	Date	Location	GPS Coordination			Material	Test Type	NDM 0°			NDM 90°			AVERAGE NDM			Solid Density (t/m³) Assumed	Oven Moisture content (%)	Final Corrected		Shear Vane Reading (kPa)					Retest URN	PASS / FAIL	Comments
				Easting	Northing	RL		NDM / SV	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)			Oven Dry Density (t/m³)	Average Air Voids (%)	Reading 1	Reading 2	Reading 3	Reading 4	Average SV (4 x Tests)		(P) Pass / (F) Fail	
S 19 034-3	JLON	18/02/2019	Behind RE Wall 5	2659652.517	6510979.357	39.087	clayey SILT	NDM / SV	1.93	26.4	3.1	1.95	25.5	2.9	1.94	26.0	3.0	2.7	31.2	1.48	0.0	138	154	184	169	161		P	
S 19 034-4	JLON	18/02/2019	Behind RE Wall 4	2659515.051	6511028.513	42.998	clayey SILT	NDM / SV	1.81	31.7	5.4	1.81	33.2	4.7	1.81	32.5	5.1	2.7	38.7	1.30	1.2	77	215	184	111	147	S 19 034-5	F	Failed due to Shear Vanes, Site manager advised.
S 19 034-5	JLON	18/02/2019	Behind RE Wall 4	2659526.655	6511026.419	43.425	clayey SILT	NDM / SV	1.75	34.1	7.4	1.73	35.8	7.0	1.74	35.0	7.2	2.7	35.4	1.29	6.9	154	200	200	154	177		P	
S 19 034-6	JLON	18/02/2019	Behind RE Wall 5	2659685.249	6510975.496	35.455	clayey SILT	NDM / SV	1.76	35.4	6.0	1.75	35.8	6.2	1.75	35.6	6.1	2.7	35.5	1.29	6.2	200	154	154	200	177		P	
S19 035-1	JLON	19/02/2019	Behind Re Wall 3	2659493.783	6510931.366	28.338	clayey SILT	NDM / SV	1.83	34.6	2.8	1.83	31.5	4.5	1.83	33.1	3.7	2.7	34.0	1.36	3.0	215	215	215	215	215		P	
S19 035-2	JLON	19/02/2019	Behind Re Wall 3	2659539.465	6510920.956	27.943	clayey SILT	NDM / SV	1.79	32.2	6.5	1.78	30.7	7.6	1.78	31.5	7.0	2.7	33.9	1.33	5.5	215	215	215	215	215		P	

GEOTECHNICS

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URN	Tech.	Date	Location	GPS Coordination			Material	Test Type	NDM 0°			NDM 90°			AVERAGE NDM			Solid Density (t/m³) Assumed	Oven Moisture content (%)	Final Corrected		Shear Vane Reading (kPa)					Retest URN	PASS / FAIL	Comments
				Easting	Northing	RL		NDM / SV	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)			Oven Dry Density (t/m³)	Average Air Voids (%)	Reading 1	Reading 2	Reading 3	Reading 4	Average SV (4 x Tests)		(P) Pass / (F) Fail	
S19 035-3	JLON	19/02/2019	RE Wall 2-3	2659564.668	6510914.096	27.496	clayey SILT	NDM / SV	1.78	33.2	6.1	1.78	32.6	6.5	1.78	32.9	6.3	2.7	35.0	1.32	5.0	215	215	215	215	215		P	
S19 035-4	JLON	19/02/2019	Behind RE Wall 5	2659666.188	6510975.915	38.428	clayey SILT	NDM / SV	1.99	23.6	2.3	1.99	22.5	3.5	1.99	23.1	2.9	2.7	23.8	1.61	2.3	184	184	215	215	200		P	
S19 035-5	JLON	19/02/2019	Behind RE Wall 5	2659682.205	6510982.43	37.872	clayey SILT	NDM / SV	1.86	29.1	4.9	1.87	31.7	2.6	1.86	30.4	3.7	2.7	31.8	1.41	2.8	215	184	184	215	200		P	
S19 035-6	JLON	19/02/2019	Behind RE Wall 4	2659549.34	6511022.735	44.91	clayey SILT	NDM / SV	1.76	32.6	7.5	1.77	30.8	8.4	1.76	31.7	8.0	2.7	36.2	1.29	5.2	147	169	200	184	175		P	
S19 035-7	JLON	19/02/2019	Behind RE Wall 4	2659670.002	6510976.476	38.281	clayey SILT	NDM / SV	1.96	25.2	2.8	1.95	24.7	3.6	1.95	25.0	3.2	2.7	24.2	1.57	3.8	215	215	215	215	215		P	
S19 036-1	JLON	20/02/2019	RE Wall 4	2659532.272	6510925.491	28.783	clayey SILT	NDM / SV	1.76	33.9	7.0	1.75	33.5	7.3	1.75	33.7	7.2	2.7	34.5	1.30	6.7	154	184	184	215	184		P	
S19 036-2	JLON	20/02/2019	Behind RE Wall 4	2659523.253	6511022.979	44.156	clayey SILT	NDM / SV	1.93	23.2	5.6	1.93	22.7	5.9	1.93	23.0	5.7	2.7	26.6	1.53	2.9	154	184	184	512	259		P	
S19 036-3	JLON	20/02/2019	Behind RE Wall 5	2659642.008	6510982.787	40.861	clayey SILT	NDM / SV	1.97	25.3	2.1	1.95	25.0	3.4	1.96	25.2	2.8	2.7	25.6	1.56	2.4	215	215	215	215	215		P	
S19 036-4	JLON	20/02/2019	Behind RE Wall 5	2659681.685	6510973.55	38.552	clayey SILT	NDM / SV	1.95	24.8	3.3	1.96	23.3	4.2	1.95	24.1	3.8	2.7	26.2	1.55	2.1	215	215	215	215	215		P	
S19 037-1	JLON	21/02/2019	Behind RE Wall 3	2659477.45	6510945.283	29.379	clayey SILT	NDM / SV	1.78	32.9	6.5	1.77	31.8	7.6	1.77	32.4	7.1	2.7	31.1	1.35	7.9	215	215	215	215	215		P	
S19 037-2	JLON	21/02/2019	Behind RE Wall 3	2659454.079	6510951.25	28.036	clayey SILT	NDM / SV	1.78	31.2	7.6	1.79	30.0	7.8	1.78	30.6	7.7	2.7	30.6	1.36	7.7	215	215	215	215	215		P	
S19 037-3	JLON	21/02/2019	Behind RE Wall 5	2659672.742	6510985.705	39.226	clayey SILT	NDM / SV	1.82	31.6	4.8	1.81	32.6	4.8	1.82	32.1	4.8	2.7	31.7	1.38	5.1	215	215	215	215	215		P	
S19 038-1	JLON	22/02/2019	Behind RE Wall 3	2659556.481	6510971.449	33.618	clayey SILT	NDM / SV	1.86	30.4	4.1	1.86	29.6	4.4	1.86	30.0	4.2	2.7	31.1	1.42	3.5	154	184	215	184	184		P	
S19 038-2	JLON	22/02/2019	Behind RE Wall 5	2659651.247	6510980.299	40.958	clayey SILT	NDM / SV	1.74	34.5	7.3	1.75	34.0	7.0	1.75	34.3	7.1	2.7	36.5	1.28	5.8	184	184	200	215	196		P	
S19 039-1	JLON	25/02/2019	Behind RE Wall 5	2659665.126	6510988.815	41.3	clayey SILT	NDM / SV	1.80	34.5	4.2	1.80	34.3	4.4	1.80	34.4	4.3	2.7	30.1	1.38	7.1	169	184	200	169	181		P	
S19 039-2	JLON	25/02/2019	Behind RE Wall 5	GPS Error			clayey SILT	NDM / SV	1.85	28.3	5.6	1.85	28.7	5.3	1.85	28.5	5.4	2.7	32.6	1.40	2.6	215	215	215	215	215		P	
S19 040-1	JLON	26/02/2019	RE Wall 5	2659680.827	6510947.147	30.529	clayey SILT	NDM / SV	1.90	26.2	4.8	1.91	28.0	2.9	1.91	27.1	3.9	2.7	29.6	1.47	2.0	154	169	169	215	177		P	
S19 040-2	JLON	26/02/2019	RE Wall 5	2659649.068	6510959.878	33.637	clayey SILT	NDM / SV	1.86	29.1	4.6	1.87	31.1	3.0	1.86	30.1	3.8	2.7	29.5	1.44	4.2	215	215	215	215	215		P	
S19 040-3	JLON	26/02/2019	Behind RE Wall 3	2659451.557	6510964.618	28.033	clayey SILT	NDM / SV	1.87	28.9	4.4	1.85	30.5	4.0	1.86	29.7	4.2	2.7	28.6	1.45	5.0	215	215	215	215	215		P	
S19 041-1	JLON	27/02/2019	Behind RE Wall 3	2659478.212	6510974.592	31.336	clayey SILT	NDM / SV	1.84	30.2	5.1	1.84	30.3	4.7	1.84	30.3	4.9	2.7	34.1	1.37	2.3	169	1874	215	215	618		P	
S19 041-2	JLON	27/02/2019	Behind RE Wall 3	2659453.308	6510969.184	29.374	clayey SILT	NDM / SV	1.82	28.3	7.2	1.83	31.7	4.6	1.82	30.0	5.9	2.7	34.0	1.36	3.3	215	215	215	215	215		P	
S19 042-1	JLON	28/02/2019	Behind RE Wall 3	2659477.532	6510957.325	29.807	clayey SILT	NDM / SV	1.91	30.2	1.3	1.92	27.4	3.0	1.91	28.8	2.1	2.7	35.4	1.41	0.0	169	184	215	215	196		P	
S19 042-2	JLON	28/02/2019	Behind RE Wall 5	2659736.835	6510951.216	27.993	clayey SILT	NDM / SV	1.81	31.2	6.0	1.81	31.0	6.1	1.81	31.1	6.0	2.7	27.5	1.42	8.5	215	215	215	215	215		P	
S19 042-3	JLON	28/02/2019	Service Trench Behind RE Wall 2-3	2659569.302	6510938.832	31.392	clayey SILT	NDM / SV	1.77	28.5	9.5	1.78	27.3	9.9	1.78	27.9	9.7	2.7	27.8	1.39	9.8	215	215	215	215	215		P	
S19 042-4	JLON	28/02/2019	Service Trench Behind RE Wall 2-3	2659572.515	6510955.07	31.414	clayey SILT	NDM / SV	1.81	31.9	5.6	1.79	35.3	4.2	1.80	33.6	4.9	2.7	30.4	1.38	7.0	215	215	215	215	215		P	
S19 042-5	JLON	28/02/2019	Behind RE Wall 3	2659512.105	6510957.23	31.895	clayey SILT	NDM / SV	1.81	32.3	5.1	1.79	35.5	4.2	1.80	33.9	4.6	2.7	36.6	1.32	3.0	215	215	215	215	215		P	
S19 042-6	JLON	28/02/2019	Behind RE Wall 5	2659723.145	6510951.645	28.89	clayey SILT	NDM / SV	1.81	32.3	5.1	1.79	35.5	4.2	1.80	33.9	4.6	2.7	33.7	1.35	4.8	215	215	215	215	215		P	
S19 043-1	JLON	1/03/2019	RE Wall 5				clayey SILT	NDM / SV	1.78	32.6	6.6	1.78	33.2	6.4	1.78	32.9	6.5	2.7	45.0	1.23	0.0	215	215	215	215	215		P	
S19 043-2	JLON	1/03/2019	Pond 5/6	2659448.848	6510995.73	30.07	clayey SILT	NDM / SV	1.76	36.7	5.2	1.76	36.0	5.6	1.76	36.4	5.4	2.7	46.2	1.20	0.0	184	154	169	215	181		P	
S19 043-3	JLON	1/03/2019	RE Wall 5	2659710.466	6510954.879	31.89	clayey SILT	NDM / SV	1.83	30.7	5.3	1.84	29.6	5.3	1.83	30.2	5.3	2.7	33.9	1.37	2.8	184	169	215	184	188		P	
S19 043-4	JLON	1/03/2019	Pond 5/6	2659442.622	6510997.001	30.255	clayey SILT	NDM / SV	1.79	27.3	9.3	1.79	26.9	9.6	1.79	27.1	9.5	2.7	29.4	1.39	7.9	UTP	UTP	UTP	UTP	UTP		P	
S19 043-5	JLON	1/03/2019	RE Wall 5	2659723.564	6510957.794	30.861	clayey SILT	NDM / SV	1.80	30.8	6.5	1.80	30.5	6.6	1.80	30.7	6.6	2.7	35.4	1.33	3.5	215	216	217	218	217		P	
S19 044-1	JLON	2/03/2019	RE Wall 5	2659685.885	6510955.228	32.211	clayey SILT	NDM / SV	1.87	26.4	6.1	1.86	28.5	5.4	1.86	27.5	5.7	2.7	25.4	1.49	7.2	215	215	215	215	215		P	
S19 044-2	JLON	2/03/2019	RE Wall 5	2659720.398	6510957.762	32.298	clayey SILT	NDM / SV	1.87	24.4	7.8	1.84	26.9	7.2	1.85	25.7	7.5	2.7	27.2	1.46	6.4	194	215	184	169	191		P	
S19 045-1	JLON	4/03/2019	RE Wall 5	2659693.376	6510956.379	31.974	clayey SILT	NDM / SV	1.75	34.8	6.5	1.74	34.0	7.7	1.75	34.4	7.1	2.7	33.2	1.31	7.8	215	215	215	215	215		P	
S19 045-2	JLON	4/03/2019	RE wall 5	2659679.727	6510957.086	33.107	clayey SILT	NDM / SV	1.78	33.4	5.9	1.77	34.9	5.5	1.78	34.2	5.7	2.7	36.5	1.30	4.3	215	215	215	215	215		P	
S19 045-3	JLON	4/03/2019	Behind RE Wall 4	2659467.986	6511033.509	39.837	clayey SILT	NDM / SV	1.76	34.9	6.3	1.76	37.6	4.4	1.76	36.3	5.3	2.7	34.9	1.30	6.1	169	169	184	200	181		P	
S19 045-4	JLON	4/03/2019	Service Trench Behind RE Wall 4-5	2659620.223	6511161.348	36.557	clayey SILT	NDM / SV	1.70	33.7	9.8	1.72	32.8	9.5	1.71	33.3	9.6	2.7	34.1	1.28	9.1	215	215	215	215	215		P	
S19 045-5	JLON	4/03/2019	RE Wall 5	GPS Error			clayey SILT	NDM / SV	1.80	35.1	3.8	1.80	35.0	4.1	1.80	35.1	3.9	2.7	36.2	1.32	3.2	215	215	215	215	215		P	
S19 046-1	JLON	5/03/2019	Behind RE Wall 4	2659488.917	6511034.166	41.653	clayey SILT	NDM / SV	1.75	29.2	10.0	1.76	30.0	9.1	1.76	29.6	9.5	2.7	30.0	1.35	9.3	215	215	215	215	215		P	

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Checked By	JLON
Approved By	-

URN	Tech.	Date	Location	GPS Coordination			Material	Test Type	NDM 0°			NDM 90°			AVERAGE NDM			Solid Density (t/m³) Assumed	Oven Moisture content (%)	Final Corrected		Shear Vane Reading (kPa)					Retest URN	PASS / FAIL	Comments
				Easting	Northing	RL		NDM / SV	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)			Oven Dry Density (t/m³)	Average Air Voids (%)	Reading 1	Reading 2	Reading 3	Reading 4	Average SV (4 x Tests)		(P) Pass / (F) Fail	
S19 046-2	JLON	5/03/2019	RE Wall 5	2659638.06	6510965.53	34.857	clayey SILT	NDM / SV	1.78	32.0	7.1	1.78	30.4	7.8	1.78	31.2	7.4	2.7	30.4	1.37	7.9	215	215	215	215	215		P	
S19 046-3	JLON	5/03/2019	RE Wall 5	2659671.617	6510962.256	34.808	clayey SILT	NDM / SV	1.80	36.7	3.1	1.78	33.6	5.7	1.79	35.2	4.4	2.7	32.8	1.35	5.8	184	184	215	215	200		P	
S19 046-4	JLON	5/03/2019	RE Wall 5	2659693.258	6510960.999	35.438	clayey SILT	NDM / SV	1.84	29.2	5.6	1.85	30.4	4.5	1.84	29.8	5.1	2.7	33.0	1.39	2.9	184	200	215	215	204		P	
S19 046-5	JLON	5/03/2019	RE Wall 5	2659657.525	6510965.145	36.54	clayey SILT	NDM / SV	1.81	35.7	2.9	1.83	34.8	2.7	1.82	35.3	2.8	2.7	32.6	1.37	4.5	215	215	184	184	200		P	
S19 047-1	JLON	6/03/2019	RE Wall 5	2659618.034	6510971.349	35.941	clayey SILT	NDM / SV	1.82	31.3	5.3	1.81	30.7	6.0	1.82	31.0	5.7	2.7	33.2	1.36	4.2	177	200	169	200	187		P	
S19 047-2	JLON	6/03/2019	RE Wall 4	2659441.675	6511022.006	33.119	clayey SILT	NDM / SV	1.82	33.5	3.6	1.82	30.8	5.4	1.82	32.2	4.5	2.7	33.7	1.36	3.5	154	154	144	169	155		P	
S19 047-3	JLON	6/03/2019	RE Wall 4	2659454.149	6511016.943	34.089	clayey SILT	NDM / SV	1.77	37.6	4.0	1.77	41.3	1.8	1.77	39.5	2.9	2.7	40.0	1.26	2.6	169	184	154	154	165		P	
S19 048-1	JLON	7/03/2019	RE Wall 4	2659448.881	6511024.736	34.763	clayey SILT	NDM / SV	1.79	31.7	6.7	1.78	32.0	7.0	1.78	31.9	6.8	2.7	30.5	1.37	7.7	UTP	UTP	UTP	UTP	UTP		P	
S19 048-2	JLON	7/03/2019	RE Wall 5	2659670.433	6510963.801	36.156	clayey SILT	NDM / SV	1.87	30.1	3.6	1.86	30.7	3.5	1.86	30.4	3.6	2.7	31.7	1.42	2.7	215	215	215	215	215		P	
S19 048-3	JLON	7/03/2019	RE Wall 5	2659630.226	6510971.993	35.949	clayey SILT	NDM / SV	1.87	28.0	5.1	1.86	27.8	5.6	1.86	27.9	5.3	2.7	32.3	1.41	2.3	184	215	215	184	200		P	
S19 048-4	JLON	7/03/2019	RE Wall 4	2659478.794	6511008.884	35.52	clayey SILT	NDM / SV	1.80	31.2	6.5	1.80	32.7	5.6	1.80	32.0	6.0	2.7	32.2	1.36	5.9	215	215	215	215	215		P	
S19 049-1	JLON	8/03/2019	RE Wall 4	2659469.176	6511017.908	35.93	clayey SILT	NDM / SV	1.82	38.4	1.0	1.81	38.5	1.1	1.82	38.5	1.0	2.7	31.8	1.38	5.2	193	193	193	193	193		P	
S19 049-2	JLON	8/03/2019	RE Wall 5	2659663.306	6510965.926	36.64	clayey SILT	NDM / SV	1.81	30.8	6.1	1.82	29.9	6.1	1.82	30.4	6.1	2.7	31.1	1.39	5.6	193	193	193	193	193		P	
S19 050-1	JLON	11/03/2019	RE Wall 5	2659619.921	6510974.45	37.244	clayey SILT	NDM / SV	1.86	25.7	7.4	1.86	25.6	7.2	1.86	25.7	7.3	2.7	24.8	1.49	7.9	169	184	169	215	184		P	
S19 050-2	JLON	11/03/2019	RE Wall 4	2659549.738	6510991.009	36.539	clayey SILT	NDM / SV	1.77	31.9	7.4	1.77	30.9	8.0	1.77	31.4	7.7	2.7	33.1	1.33	6.6	215	215	215	215	215		P	
S19 050-3	JLON	11/03/2019	RE Wall 4	2659507.869	6511002.285	36.485	clayey SILT	NDM / SV	1.88	29.1	3.5	1.90	28.5	2.9	1.89	28.8	3.2	2.7	26.7	1.50	4.7	184	184	169	184	180		P	
S19 050-4	JLON	11/03/2019	RE Wall 5	2659616.237	6510975.019	37.209	clayey SILT	NDM / SV	1.87	26.7	5.9	1.87	27.2	5.7	1.87	27.0	5.8	2.7	26.8	1.47	5.9	215	184	184	169	188		P	
S19 051-1	JLON	12/03/2019	RE Wall 4	2659473.435	6511018.081	37.636	clayey SILT	NDM / SV	1.87	31.6	2.6	1.87	31.5	2.4	1.87	31.6	2.5	2.7	32.8	1.41	1.7	UTP	UTP	UTP	UTP	UTP		P	
S19 051-2	JLON	12/03/2019	RE Wall 5	2659661.888	6510968.451	37.72	clayey SILT	NDM / SV	1.87	35.0	0.0	1.87	31.7	2.3	1.87	33.4	1.1	2.7	35.3	1.38	0.0	200	200	169	184	188		P	
S19 051-3	JLON	12/03/2019	Road 7 Service trench cap	2659605.633	6511093.259	40.259	clayey SILT	NDM / SV	1.84	33.6	2.7	1.84	34.0	2.4	1.84	33.8	2.6	2.7	35.5	1.36	1.5	129	138	169	154	148		P	
S19 051-4	JLON	12/03/2019	Road 1 Service trench cap	2659410.853	6510906.47	19.371	clayey SILT	NDM / SV	1.88	31.1	2.2	1.89	27.8	3.9	1.89	29.5	3.0	2.7	30.1	1.45	2.6	215	215	215	215	215		P	
S19 051-5	JLON	12/03/2019	RE Wall 4	2659516.231	6511003.076	37.728	clayey SILT	NDM / SV	1.88	29.6	3.3	1.90	28.8	3.1	1.89	29.2	3.2	2.7	30.6	1.45	2.2	184	184	215	169	188		P	
S19 051-6	JLON	12/03/2019	RE Wall 5	2659600.091	6511019.766	38.098	clayey SILT	NDM / SV	1.84	32.4	3.3	1.84	30.9	4.4	1.84	31.7	3.9	2.7	32.3	1.39	3.4	169	215	184	184	188		P	
S19 052-1	JLON	13/03/2019	RE Wall 4	2659552.946	6510994.149	38.484	clayey SILT	NDM / SV	1.74	33.4	7.9	1.74	34.0	7.7	1.74	33.7	7.8	2.7	35.8	1.28	6.5	169	200	200	184	188		P	
S19 052-2	JLON	13/03/2019	RE Wall 5	2659613.151	6510981.016	38.946	clayey SILT	NDM / SV	1.82	29.8	6.1	1.82	30.7	5.8	1.82	30.3	6.0	2.7	32.9	1.37	4.2	169	215	215	215	204		P	
S19 052-3	JLON	13/03/2019	RE Wall 4	2659493.021	6511009.635	38.791	clayey SILT	NDM / SV	1.87	27.0	5.6	1.88	29.3	3.3	1.88	28.2	4.5	2.7	26.8	1.48	5.4	215	184	215	184	200		P	
S19 052-4	JLON	13/03/2019	RE Wall 5	2659661.764	6510971.677	39.467	clayey SILT	NDM / SV	1.85	29.0	5.2	1.86	30.8	3.5	1.86	29.9	4.3	2.7	29.2	1.44	4.8	215	184	215	184	200		P	
S19 053-1	JLON	14/03/2019	RE Wall 4	2659509.702	6511007.239	39.104	clayey SILT	NDM / SV	1.79	31.5	6.9	1.80	29.5	7.5	1.79	30.5	7.2	2.7	29.3	1.39	8.0	215	215	215	215	215		P	
S19 053-2	JLON	14/03/2019	RE Wall 4	2659560.011	6510994.425	38.216	clayey SILT	NDM / SV	1.84	26.3	8.0	1.85	27.2	6.6	1.84	26.8	7.3	2.7	27.9	1.44	6.5	215	215	215	215	215		P	
S19 053-3	JLON	14/03/2019	RE Wall 5	2659671.583	6510971.962	39.775	clayey SILT	NDM / SV	1.83	29.6	6.2	1.83	28.4	6.7	1.83	29.0	6.4	2.7	28.1	1.43	7.0	215	215	215	215	215		P	
S19 055-1	SAWE	15/03/2019	RE Wall 4	2659521.648	6511006.781	39.499	clayey SILT	NDM / SV	1.81	30.6	6.3	1.80	30.5	6.6	1.81	30.6	6.5	2.7	31.4	1.37	5.9	184	200	184	215	196		P	
S19 055-2	SAWE	15/03/2019	RE Wall 4	2659508.179	6511008.403	40.25	clayey SILT	NDM / SV	1.81	30.4	6.3	1.81	30.2	6.8	1.81	30.3	6.6	2.7	31.2	1.38	6.0	215	215	215	215	215		P	
S19 055-3	SAWE	15/03/2019	RE Wall 5	2659630.705	6510980.397	42.401	clayey SILT	NDM / SV	1.83	29.9	5.8	1.84	28.1	6.2	1.84	29.0	6.0	2.7	30.5	1.41	5.0	144	215	169	169	174		P	
S19 055-4	SAWE	15/03/2019	RE Wall 4	2659566.201	6510995.931	40.677	clayey SILT	NDM / SV	1.76	33.8	7.1	1.76	33.7	6.8	1.76	33.8	6.9	2.7	32.2	1.33	7.9	215	215	215	215	215		P	
S19 055-5	SAWE	15/03/2019	RE Wall 5	2659594.922	6510988.288	41.337	clayey SILT	NDM / SV	1.81	29.3	6.9	1.82	30.7	5.7	1.82	30.0	6.3	2.7	30.8	1.39	5.7	215	215	215	215	215		P	
S19 056-1	SAWE	16/03/2019	RE Wall 4	2659526.565	6511004.254	41.194	clayey SILT	NDM / SV	1.78	31.3	7.4	1.80	31.5	6.0	1.79	31.4	6.7	2.7	36.4	1.31	3.5	215	215	215	215	215		P	
S19 056-2	SAWE	16/03/2019	RE Wall 4	2659565.247	6510997.753	40.067	clayey SILT	NDM / SV	1.80	30.6	7.0	1.81	30.7	6.3	1.80	30.7	6.6	2.7	29.8	1.39	7.2	215	215	215	215	215		P	
S19 056-3	SAWE	16/03/2019	RE Wall 5	2659636.786	6510980.65	41.467	clayey SILT	NDM / SV	1.90	25.9	4.8	1.89	26.2	5.1	1.90	26.1	4.9	2.7	24.6	1.52	6.0	215	215	215	215	215		P	
S19 057-1	SAWE	18/03/2019	REWall 4	2659513.281	6511010.773	42.153	clayey SILT	NDM / SV	1.89	26.8	4.6	1.90	26.5	4.5	1.90	26.7	4.6	2.7	24.8	1.52	6.0	215	215	215	215	215		P	
S19 057-2	SAWE	18/03/2019	REWall 4	2659566.069	6510998.214	42.668	clayey SILT	NDM / SV	1.82	36.9	1.6	1.82	37.6	1.1	1.82	37.3	1.4	2.7	37.2	1.33	1.4	215	215	215	215	215		P	
S19 057-3	SAWE	18/03/2019	RE Wall 5	2659630.78	6510983.457	42.591	clayey SILT	NDM / SV	1.81	26.0	9.2	1.85	27.4	6.5	1.83	26.7	7.9	2.7	29.4	1.42	6.0	215	215	215	215	215		P	
S19 057-4	SAWE	18/03/2019	RE Wall 4	2659550.785	6511002.381	43.076	clayey SILT	NDM / SV	1.82	32.5	4.7	1.82	32.9	4.3	1.82	32.7	4.5	2.7	35.9	1.34	2.4	215	215	215	215	215		P	
S19 058-1	JLON	19/03/2019	RE Wall 4	2659510.44	6511013.514	44.295	clayey SILT	NDM / SV	1.84	29.6	5.2	1.83	28.8	6.3	1.84	29.2	5.8	2.7	28.7	1.43	6.1	215	215	215	215	215		P	
S19 058-2	JLON	19/03/2019	Infront of RE Wall 2	2659648.751	6510867.409	17.639	clayey SILT	NDM / SV	1.84	30.7	4.4	1.86	28.5	5.0	1.85	29.6	4.7	2.7	29.1	1.44	5.0	154	169	169	184	169		P	

GEOTECHNICS

Job: Precent 5 Arrans Hill

Client: Tonkin & Taylor

Job #	21854.0031
Entered By	CBEN
Checked By	JLON
Approved By	-

URN	Tech.	Date	Location	GPS Coordination			Material	Test Type	NDM 0°			NDM 90°			AVERAGE NDM			Solid Density (t/m³) Assumed	Oven Moisture content (%)	Final Corrected		Shear Vane Reading (kPa)					Retest URN	PASS / FAIL	Comments
				Easting	Northing	RL		NDM / SV	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)			Oven Dry Density (t/m³)	Average Air Voids (%)	Reading 1	Reading 2	Reading 3	Reading 4	Average SV (4 x Tests)		(P) Pass / (F) Fail	
S19 059-1	JLON	21/03/2019	Undercut W of Road 7	GPS Error			clayey SILT	NDM / SV	1.85	31.8	3.5	1.87	31.4	2.7	1.86	31.6	3.1	2.7	30.2	1.43	4.1	169	184	184	215	188		P	
S19 059-2	JLON	21/03/2019	Undercut W of Road 7	GPS Error			clayey SILT	NDM / SV	1.81	31.8	5.4	1.83	31.7	4.3	1.82	31.8	4.9	2.7	34.3	1.36	3.2	184	184	169	215	188		P	
S19 060-1	JLON	26/03/2019	Undercut Bellow RE Wall 8	2659515.785	6511237.417	28.348	clayey SILT	NDM / SV	1.87	24.1	7.9	1.88	24.2	7.3	1.88	24.2	7.6	2.7	24.9	1.50	7.0	215	215	215	215	215		P	
S19 060-2	JLON	26/03/2019	Undercut Bellow RE Wall 8	2659522.555	6511231.762	29.179	clayey SILT	NDM / SV	1.87	26.5	5.9	1.90	24.1	6.4	1.89	25.3	6.1	2.7	24.0	1.52	7.1	UTP	UTP	UTP	UTP	UTP		P	
S19 061-1	JLON	27/03/2019	Undercut Bellow RE Wall 8	2659491.296	6511232.81	27.431	clayey SILT	NDM / SV	1.78	32.2	6.6	1.79	31.9	6.4	1.79	32.1	6.5	2.7	29.8	1.38	8.0	215	215	215	215	215		P	
S19 061-2	JLON	27/03/2019	Undercut Bellow RE Wall 8	2659478.524	6511228.342	26.929	clayey SILT	NDM / SV	1.85	26.8	6.6	1.86	27.4	6.0	1.86	27.1	6.3	2.7	26.3	1.47	6.9	UTP	UTP	UTP	UTP	UTP		P	
S19 061-3	JLON	27/03/2019	Undercut Bellow RE Wall 8	2659502.702	6511231.694	27.575	clayey SILT	NDM / SV	1.88	26.5	5.7	1.86	25.9	7.2	1.87	26.2	6.4	2.7	24.3	1.50	7.9	215	215	215	215	215		P	
S19 065-1	JLON	4/04/2019	RE Wall 8	2659501.63	6511243.714	28.379	clayey SILT	NDM / SV	1.89	27.9	3.9	1.89	28.4	3.7	1.89	28.2	3.8	2.7	28.4	1.47	3.6	215	215	215	215	215		P	
S19 066-1	JLON	5/04/2019	RE Wall 8	2659528.16	6511236.344	29.764	clayey SILT	NDM / SV	1.91	28.7	2.6	1.88	28.2	4.4	1.89	28.5	3.5	2.7	27.1	1.49	4.5	215	215	215	215	215		P	
S19 066-2	JLON	5/04/2019	RE Wall 8	2659466.46	6511232.933	30.345	clayey SILT	NDM / SV	1.90	30.7	1.6	1.91	27.3	3.7	1.90	29.0	2.6	2.7	28.7	1.48	2.8	215	215	215	215	215		P	
S19 067-1	JLON	9/04/2019	RE Wall 8	2659496.551	6511241.128	30.715	clayey SILT	NDM / SV	1.80	30.8	6.5	1.82	31.9	4.7	1.81	31.4	5.6	2.7	29.7	1.40	6.7	215	215	215	215	215		P	
S19 068-1	JLON	10/4/119	RE Wall 8	2659518.811	6511235.936	31.237	clayey SILT	NDM / SV	1.85	30.5	4.3	1.83	32.0	4.1	1.84	31.3	4.2	2.7	27.4	1.45	6.9	169	184	215	215	196		P	
S19 068-2	JLON	10/4/119	RE Wall 8	2659474.741	6511233.476	31.601	clayey SILT	NDM / SV	1.85	30.3	4.4	1.85	29.4	5.0	1.85	29.9	4.7	2.7	27.2	1.45	6.6	215	215	215	215	215		P	
S19 069-1	JLON	15/04/2019	RE Wall 8	2659499.649	6511234.403	32.003	clayey SILT	NDM / SV	1.89	30.2	2.4	1.88	27.8	4.6	1.88	29.0	3.5	2.7	30.7	1.44	2.3	215	215	215	215	215		P	
S19 069-2	JLON	15/04/2019	RE Wall 8	2659462.064	6511223.763	32.612	clayey SILT	NDM / SV	1.86	28.7	5.0	1.87	29.0	4.2	1.87	28.9	4.6	2.7	27.7	1.46	5.4	215	215	215	215	215		P	
S19 070-1	CBEN	16/04/2019	RE Wall 8	2659504.552	6511237.811	33.12	clayey SILT	NDM / SV	1.83	29.1	6.3	1.81	29.6	6.7	1.82	29.4	6.5	2.7	32.9	1.37	4.2	154	184	169	154	165		P	
S19 070-2	CBEN	16/04/2019	RE Wall 8	2659495.384	6511222.687	32.853	clayey SILT	NDM / SV	1.89	29.7	2.6	1.89	28.4	3.6	1.89	29.1	3.1	2.7	33.1	1.42	0.3	154	154	169	169	162		P	
S19 071-1	CBEN	17/04/2019	RE Wall 8	2659477.711	6511228.464	35.034	clayey SILT	NDM / SV	1.84	27.7	6.7	1.84	27.3	7.2	1.84	27.5	7.0	2.7	28.1	1.43	6.5	138	215	154	169	169		P	
S19 071-2	CBEN	17/04/2019	RE Wall 8	2659526.478	6511231.32	33.552	clayey SILT	NDM / SV	1.88	31.4	1.8	1.89	28.9	3.4	1.89	30.2	2.6	2.7	32.2	1.43	1.2	154	138	184	154	158		P	
S19 072-1	CBEN	18/04/2019	RE Wall 8	2659510.488	6511232.387	34.089	clayey SILT	NDM / SV	1.82	27.9	7.5	1.83	28.5	6.7	1.83	28.2	7.1	2.7	28.6	1.42	6.8	152	138	132	165	147		P	
S19 073-1	CBEN	26/04/2019	RE Wall 8	2659479.69	6511227.444	34.634	clayey SILT	NDM / SV	1.87	33.0	1.6	1.85	35.8	0.7	1.86	34.4	1.1	2.7	34.2	1.39	1.3	184	215	215	215	207		P	
S19 073-2	CBEN	26/04/2019	RE Wall 8	2659509.384	6511234.321	34.659	clayey SILT	NDM / SV	1.76	33.9	6.5	1.76	33.2	7.1	1.76	33.6	6.8	2.7	37.0	1.29	4.8	154	169	184	215	181		P	
S19 073-1	CBEN	29/04/2019	RE Wall 8	2659527.633	6511226.651	35.439	clayey SILT	NDM / SV	1.82	35.7	2.2	1.82	37.9	1.1	1.82	36.8	1.7	2.7	39.4	1.31	0.1	154	169	169	154	162		P	
S19 073-2	CBEN	29/04/2019	RE Wall 8	2659506.649	6511220.941	35.5	clayey SILT	NDM / SV	1.83	35.2	2.0	1.83	36.3	1.8	1.83	35.8	1.9	2.7	34.1	1.36	2.9	169	169	154	169	165		P	
S19 074-1	CBEN	30/04/2019	RE Wall 8	2659481.609	6511228.614	36.111	clayey SILT	NDM / SV	1.76	36.9	5.1	1.75	35.3	6.3	1.76	36.1	5.7	2.7	36.4	1.29	5.5	165	152	138	193	162		P	
S19 075-1	CBEN	1/05/2019	RE Wall 8	2659478.492	6511224.959	36.524	clayey SILT	NDM / SV	1.78	35.4	4.8	1.78	33.2	6.0	1.78	34.3	5.4	2.7	40.0	1.27	2.0	154	169	154	184	165		P	
S19 076-1	CBEN	2/05/2019	RE Wall 8	2659506.728	6511227.273	37.832	clayey SILT	NDM / SV	1.73	38.7	5.4	1.72	37.2	6.7	1.73	38.0	6.1	2.7	38.0	1.25	6.0	193	193	193	193	193		P	
S19 077-1	CBEN	3/05/2019	W Boundary Trench Backfill	2659432.261	6511119.072	45.35	clayey SILT	NDM / SV	1.74	32.1	9.0	1.73	33.9	8.5	1.73	33.0	8.7	2.7	34.3	1.29	8.0	193	193	193	193	193		P	
S19 077-2	CBEN	3/05/2019	W Boundary Trench Backfill	2659449.554	6511129.643	47.91	clayey SILT	NDM / SV	1.74	33.9	7.6	1.74	34.7	7.2	1.74	34.3	7.4	2.7	33.2	1.31	8.0	193	193	193	193	193		P	
S19 077-3	CBEN	3/05/2019	RE Wall 8	2659527.843	6511217.883	36.943	clayey SILT	NDM / SV	1.85	30.7	3.9	1.85	30.6	4.3	1.85	30.7	4.1	2.7	33.3	1.39	2.4	152	165	152	193	166		P	
S19 078-1	CBEN	6/05/2019	RE Wall 8	2659498.821	6511226.385	38.449	clayey SILT	NDM / SV	1.81	31.3	5.8	1.81	33.0	4.9	1.81	32.2	5.3	2.7	33.7	1.35	4.3	138	193	165	193	172		P	
S19 078-2	CBEN	6/05/2019	RE Wall 8	2659504.902	6511212.539	39.321	clayey SILT	NDM / SV	1.81	31.6	5.7	1.81	31.5	5.5	1.81	31.6	5.6	2.7	33.3	1.36	4.5	138	132	152	138	140		P	
S19 079-1	CBEN	7/05/2019	RE Wall 8	2659494.892	6511214.624	38.805	clayey SILT	NDM / SV	1.84	30.3	4.8	1.82	31.4	5.1	1.83	30.9	4.9	2.7	30.5	1.40	5.2	138	138	132	165	143		P	
S19 079-2	CBEN	7/05/2019	RE Wall 8	2659526.37	6511206.581	39.661	clayey SILT	NDM / SV	1.82	28.1	7.3	1.83	30.6	5.3	1.83	29.4	6.2	2.7	30.5	1.40	5.5	193	165	138	138	159		P	
S19 080-1	CBEN	8/05/2019	RE Wall 8	2659519.653	6511203.261	39.847	clayey SILT	NDM / SV	1.80	33.2	5.3	1.79	33.8	5.0	1.80	33.5	5.1	2.7	34.8	1.33	4.3	152	152	138	138	145		P	
S19 080-2	CBEN	8/05/2019	RE Wall 8	2659504.056	6511188.797	38.771	clayey SILT	NDM / SV	1.79	31.8	6.4	1.80	32.6	5.6	1.80	32.2	6.0	2.7	32.7	1.35	5.7	165	152	138	138	148		P	
S19 081-1	CBEN	9/05/2019	RE Wall 8	2659499.664	6511195.577	40.196	clayey SILT	NDM / SV	1.78	37.0	3.9	1.78	37.6	3.4	1.78	37.3	3.6	2.7	38.2	1.29	3.1	179	152	152	165	162		P	
S19 081-2	CBEN	9/05/2019	RE Wall 8	2659527.246	6511194.506	46.465	clayey SILT	NDM / SV	1.77	34.7	5.6	1.77	32.4	7.0	1.77	33.6	6.3	2.7	37.7	1.29	3.8	138	152	165	152	152		P	
S19 082-1	CBEN	10/05/2019	Above RE Wall 8	2659514.589	6511158.645	45.013	clayey SILT	NDM / SV	1.77	34.8	5.6	1.76	32.5	7.6	1.77	33.7	6.6	2.7	32.3	1.33	7.5	152	138	138	193	155		P	
S19 082-2	CBEN	10/05/2019	Above RE Wall 9	2659540.011	6511164.011	43.674	clayey SILT	NDM / SV	1.76	37.6	4.4	1.75	38.0	5.0	1.75	37.8	4.7	2.7	40.8	1.25	3.0	193	165	165	138	165		P	
S19 082-1	CBEN	14/05/2019	Undercut Road 1	2659569.167	6511154.9	40.686	clayey SILT	NDM / SV	1.83	34.9	2.2	1.84	36.0	1.3	1.84	35.5	1.7	2.7	37.0	1.34	0.8	193	193	193	193	193		P	
S19 082-2	CBEN	14/05/2019	Undercut Road 1	2659531.292	6511144.106	45.449	clayey SILT	NDM / SV	1.81	33.6	4.2	1.82	33.4	4.2	1.81	33.5	4.2	2.7	34.5	1.35	3.6	193	193	193	193	193		P	
S19 083-1	CBEN	15/05/2019	Undercut Road 1	2659536.332	6511147.269	45.801	clayey SILT	NDM / SV	1.85	36.1	0.5	1.86	34.6	1.1	1.86	35.4	0.8	2.7	36.7	1.36	0.0	193	193	193	193	193		P	
S19 083-1	CBEN	16/05/2019	Stage 4 Pond Lots 50-52	2659656.976	6511140.185	33.832	clayey SILT	NDM / SV	1.84	32.8	3.0	1.85	35.4	1.2	1.85	34.1	2.1	2.7	30.3	1.42	4.6	138	152	193	193	169		P	
S19 083-2	CBEN	16/05/2019	Stage 4 Pond Lots 50-52	2659657.211	6511143.048	33.768	clayey SILT	NDM / SV	1.85	32.7	2.6	1.87	32.0	2.4	1.86	32.4	2.5	2.7	36.1	1.37	0.1	193	138	138	152	155		P	

GEOTECHNICS

Job: Precent 5 Arrans Hill

Client: Tonkin & Taylor

Job #	21854.0031
Entered By	CBEN
Checked By	JLON
Approved By	-

URN	Tech.	Date	Location	GPS Coordination			Material	Test Type	NDM 0°			NDM 90°			AVERAGE NDM			Solid Density (t/m³) Assumed	Oven Moisture content (%)	Final Corrected		Shear Vane Reading (kPa)					Retest URN	PASS / FAIL	Comments
				Easting	Northing	RL		NDM / SV	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)			Oven Dry Density (t/m³)	Average Air Voids (%)	Reading 1	Reading 2	Reading 3	Reading 4	Average SV (4 x Tests)		(P) Pass / (F) Fail	
S19 085-1	CBEN	17/05/2019	SW Corner Undercut	2659369.914	6510924.651	16.19	clayey SILT	NDM / SV	1.84	30.3	5.1	1.84	30.8	4.8	1.84	30.6	5.0	2.7	33.3	1.38	3.1	152	165	152	152	155		P	
S19 085-2	CBEN	17/05/2019	SW Corner Undercut	2659368.52	6510931.165	17.544	clayey SILT	NDM / SV	1.88	29.6	3.4	1.88	29.0	3.8	1.88	29.3	3.6	2.7	30.5	1.44	2.8	165	165	152	193	169		P	
S19 085-3	CBEN	17/05/2019	SW Corner Undercut	2659373.868	6510945.177	19.62	clayey SILT	NDM / SV	1.82	31.4	5.5	1.81	34.6	3.8	1.81	33.0	4.6	2.7	33.1	1.36	4.5	193	138	165	165	165		P	
S19 086-1	CBEN	20/05/2019	SW Corner Undercut	2659372.328	6510926.563	18.347	clayey SILT	NDM / SV	1.81	29.1	7.5	1.79	29.0	8.3	1.80	29.1	7.9	2.7	32.4	1.36	5.7	193	193	193	193	193		P	
S19 086-2	CBEN	20/05/2019	SW Corner Undercut	2659370.87	6510929.236	19.956	clayey SILT	NDM / SV	1.83	28.9	6.1	1.84	29.5	5.7	1.83	29.2	5.9	2.7	29.3	1.42	5.9	193	193	193	193	193		P	
S19 086-3	CBEN	20/05/2019	SW Corner Undercut	2659377.863	6510941.498	20.68	clayey SILT	NDM / SV	1.85	29.4	5.1	1.84	27.7	6.7	1.84	28.6	5.9	2.7	31.2	1.41	4.1	UTP	UTP	UTP	UTP	UTP		P	
S19 086-4	CBEN	20/05/2019	Pond 5/11	2659396.044	6510976.518	19.155	clayey SILT	NDM / SV	1.83	33.2	3.3	1.86	32.5	2.5	1.85	32.9	2.9	2.7	33.9	1.38	2.2	193	193	193	193	193		P	
S19 087-1	CBEN	21/05/2019	Pond 5/11	2659395.244	6510963.093	19.514	clayey SILT	NDM / SV	1.79	37.1	3.4	1.79	34.1	5.0	1.79	35.6	4.2	2.7	35.5	1.32	4.3	193	193	193	193	193		P	
S19 087-2	CBEN	21/05/2019	Pond 5/11	2659398.051	6510980.796	21.072	clayey SILT	NDM / SV	1.76	33.5	7.3	1.77	33.5	6.7	1.76	33.5	7.0	2.7	32.4	1.33	7.7	152	138	165	152	152		P	
S19 087-3	CBEN	21/05/2019	NW Pond	2659430.781	6511061.376	35.844	clayey SILT	NDM / SV	1.78	37.8	3.2	1.79	38.0	2.6	1.79	37.9	2.9	2.7	43.3	1.25	0.0	138	138	165	124	141		P	
S19 087-4	CBEN	21/05/2019	NW Pond	2659439.853	6511056.867	36.77	clayey SILT	NDM / SV	1.80	38.1	2.2	1.77	40.0	2.4	1.79	39.1	2.3	2.7	43.6	1.24	0.0	152	138	138	138	142		P	
S19 088-1	CBEN	22/05/2019	Pond 5/11	2659391.816	6510957.208	20.305	clayey SILT	NDM / SV	1.80	38.7	1.9	1.79	35.9	4.0	1.79	37.3	2.9	2.7	38.9	1.29	2.0	152	152	165	165	159		P	
S19 088-2	CBEN	22/05/2019	Pond 5/11	2659389.372	6510978.855	23.71	clayey SILT	NDM / SV	1.76	33.5	7.2	1.77	32.3	7.4	1.76	32.9	7.3	2.7	35.4	1.30	5.8	138	165	165	152	155		P	
S19 088-3	CBEN	22/05/2019	Pond 5/11	2659391.893	6510958.034	20.509	clayey SILT	NDM / SV	1.82	29.1	6.8	1.83	28.6	6.6	1.83	28.9	6.7	2.7	26.4	1.44	8.4	193	193	193	193	193		P	
S19 089-1	CBEN	23/05/2019	Pond 5/11	2659387.243	6510967.5	21.573	clayey SILT	NDM / SV	1.80	41.7	0.0	1.79	37.5	2.8	1.80	39.6	1.3	2.7	41.0	1.27	0.5	152	138	165	138	148		P	
S19 089-2	CBEN	23/05/2019	Pond 5/11	2659390.564	6510948.342	20.811	clayey SILT	NDM / SV	1.83	26.6	7.9	1.84	28.0	6.6	1.83	27.3	7.3	2.7	27.9	1.43	6.9	193	193	138	138	166		P	
S19 089-3	CBEN	23/05/2019	Pond 5/11	2659408.014	6510973.878	23.779	clayey SILT	NDM / SV	1.78	38.0	3.3	1.80	37.7	2.4	1.79	37.9	2.9	2.7	37.6	1.30	3.0	138	193	193	138	166		P	
S19 089-4	CBEN	23/05/2019	Pond 5/11	2659388.797	6510984.613	24.165	clayey SILT	NDM / SV	1.80	32.0	6.0	1.79	34.6	4.7	1.79	33.3	5.3	2.7	32.9	1.35	5.6	193	193	193	193	193		P	
S19 090-1	CBEN	24/05/2019	Pond 5/11	2659388.678	6510976.096	24.078	clayey SILT	NDM / SV	1.82	36.1	2.4	1.81	32.4	5.1	1.81	34.3	3.7	2.7	37.9	1.31	1.5	152	138	165	152	152		P	
S19 090-2	CBEN	24/05/2019	Pond 5/11	2659388.169	6510989.69	26.254	clayey SILT	NDM / SV	1.80	35.3	3.9	1.81	33.5	4.1	1.81	34.4	4.0	2.7	35.1	1.34	3.6	124	152	165	138	145		P	
S19 091-1	CBEN	27/05/2019	Lot Undercut	2659434.11	6511097.229	40.644	clayey SILT	NDM / SV	1.75	35.3	6.6	1.75	39.1	4.4	1.75	37.2	5.5	2.7	37.6	1.27	5.2	152	138	193	165	162		P	
S19 091-2	CBEN	27/05/2019	Lot Undercut	2659449.787	6511111.83	43.421	clayey SILT	NDM / SV	1.75	32.5	8.0	1.76	34.0	6.8	1.76	33.3	7.4	2.7	37.8	1.27	4.7	165	165	193	135	165		P	
S19 091-3	CBEN	27/05/2019	Pond 5/11	2659391.96	6511009.346	30.324	clayey SILT	NDM / SV	1.78	37.3	3.4	1.79	35.8	4.0	1.79	36.6	3.7	2.7	39.9	1.28	1.7	193	193	193	193	193		P	
S19 091-4	CBEN	27/05/2019	Lot Undercut	2659466.218	6511119.756	45.34	clayey SILT	NDM / SV	1.76	38.5	4.2	1.76	37.8	4.3	1.76	38.2	4.2	2.7	36.8	1.29	5.0	152	165	193	152	166		P	
S19 092-1	JLON	28/05/2019	Road One Undercut	2659483.068	6511109.664	42.574	clayey SILT	NDM / SV	1.80	32.8	5.3	1.80	35.8	3.7	1.80	34.3	4.5	2.7	36.1	1.32	3.4	165	165	193	138	165		P	
S19 093-1	JLON	29/05/2019	Road One Undercut	2659403.644	6510984.083	25.974	clayey SILT	NDM / SV	1.77	36.6	4.8	1.76	37.0	5.1	1.76	36.8	5.0	2.7	38.7	1.27	3.8	138	193	165	152	162		P	
S19 094-1	CBEN	30/05/2019	Pond 5/11	2659406.028	6510983.699	26.16	clayey SILT	NDM / SV	1.77	35.2	5.3	1.79	34.2	5.0	1.78	34.7	5.1	2.7	35.0	1.32	4.9	193	193	193	193	193		P	
S19 094-2	CBEN	30/05/2019	Road One Undercut	2659451.265	6511081.904	43.252	clayey SILT	SV	-	-	-	-	-	-	-	-	-	-	-	-	-	110	110	138	116	119	S19 101-3	F	Failed due to minimum (120kPa) and average (140kPa) Shear Strength value.
S19 094-3	CBEN	30/05/2019	Pond 5/11	2659387.474	6510990.466	26.491	clayey SILT	NDM / SV	1.80	35.6	3.5	1.79	35.8	3.8	1.80	35.7	3.7	2.7	33.3	1.35	5.2	193	193	193	193	193		P	
S19 100-1	CBEN	10/06/2019	Above Pond 5/11	2659399.491	6510976.64	26.364	clayey SILT	NDM / SV	1.78	36.4	4.4	1.77	34.4	5.7	1.78	35.4	5.0	2.7	44.8	1.23	0.0	UTP	UTP	UTP	UTP	-		P	
S19 101-1	CBEN	11/06/2019	W Lots Above Pond	2659393.312	6511005.673	29.842	clayey SILT	NDM / SV	1.82	37.2	1.7	1.82	34.9	3.2	1.82	36.1	2.5	2.7	39.0	1.31	0.7	165	138	193	193	172		P	
S19 101-2	CBEN	11/06/2019	W Lots Above Pond	2659413.522	6510988.605	28.134	clayey SILT	NDM / SV	1.80	37.6	2.1	1.80	34.1	4.4	1.80	35.9	3.3	2.7	38.4	1.30	1.7	138	152	193	193	169		P	
S19 101-3	CBEN	11/06/2019	Road One Undercut	2659424.047	6510988.379	28.292	clayey SILT	NDM / SV	1.77	33.9	6.1	1.77	34.1	5.8	1.77	34.0	6.0	2.7	35.9	1.31	4.8	193	193	193	193	193		P	Re-test for S19 094-2
S19 102-1	CBEN	12/06/2019	Road One Undercut	2659457.046	6511058.402	38.157	clayey SILT	NDM / SV	1.83	31.6	4.4	1.81	33.5	4.1	1.82	32.6	4.3	2.7	33.3	1.37	3.8	193	193	193	193	193		P	
S19 102-2	CBEN	12/06/2019	Road One Undercut	2659433.394	6511019.659	33.114	clayey SILT	NDM / SV	1.81	35.8	2.7	1.82	34.6	3.3	1.82	35.2	3.0	2.7	35.1	1.34	3.1	165	152	193	152	166		P	
S19 103-1	CBEN	13/06/2019	Road One Undercut	2659471.04	6511104.848	45.505	clayey SILT	NDM / SV	1.88	30.4	2.8	1.89	31.1	1.8	1.88	30.8	2.3	2.7	31.9	1.43	1.5	193	193	193	193	193		P	
S19 103-2	CBEN	13/06/2019	Road One Undercut	2659446.932	6511073.006	36.394	clayey SILT	NDM / SV	1.78	38.2	3.3	1.77	36.1	5.0	1.77	37.2	4.1	2.7	33.9	1.32	6.1	193	193	193	193	193		P	
S19 106-1	CBEN	26/06/2019	Behind Wall 4A	2659634.752	6510853.184	15.773	clayey SILT	NDM / SV	1.83	27.5	7.1	1.83	28.9	6.4	1.83	28.2	6.7	2.7	29.4	1.42	5.9	193	193	193	193	193		P	
S19 106-2	CBEN	26/06/2019	Behind Wall 4A	2659629.724	6510846.937	15.676	clayey SILT	NDM / SV	1.84	29.1	5.8	1.83	32.6	3.8	1.83	30.9	4.8	2.7	32.0	1.39	4.0	165	193	193	165	179		P	
S19 110-1	CBEN	1/07/2019	Behind Wall 4A	2659643.482	6510836.848	11.32	clayey SILT	NDM / SV	1.93	22.9	5.9	1.93	24.3	4.7	1.93	23.6	5.3	2.7	26.0	1.53	3.4	193	193	193	193	193		P	
S19 111-1	CBEN	2/07/2019	Behind Wall 4A	2659642.432	6510835.665	12.252	clayey SILT	NDM / SV	1.91	26.1	4.5	1.91	27.8	3.2	1.91	27.0	3.9	2.7	27.9	1.49	3.2	193	193	193	193	193		P	
S19 112-1	CBEN	3/07/2019	Behind Wall 4A	2659613.347	6510843.35	10.255	clayey SILT	NDM / SV	1.87	27.3	5.6	1.89	28.3	3.8	1.88	27.8	4.7	2.7	27.3	1.48	5.1	165	193	193	152	176		P	
S19 115-1	CBEN	11/07/2019	Behind Wall 4A	GPS Error			clayey SILT	NDM / SV	1.77	34.0	6.1	1.78	34.4	5.4	1.78	34.2	5.7	2.7	33.9	1.33	5.9	193	193	193	193	193		P	
S19 116-1	CBEN	15/07/2019	Behind Wall 4A	2659617.825	6510838.786	12.968	clayey SILT	NDM / SV	1.78	32.7	6.3	1.78	36.1	4.4	1.78	34.4	5.3	2.7	37.4	1.30	3.5	193	193	193	193	193		P	
S19 120-1	CBEN	25/07/2019	Behind Wall 4A	2659630.332	6510834.88	13.538	clayey SILT	NDM / SV	1.77	33.6	6.2	1.77	35.6	5.0	1.77	34.6	5.6	2.7	32.8	1.34	6.8	193	193	193	193	193		P	

GEOTECHNICS

Job: Precent 5 Arrans Hill

Client: Tonkin & Taylor

Job #	21854.0031
Entered By	CBEN
Checked By	JLON
Approved By	-

URN	Tech.	Date	Location	GPS Coordination			Material	Test Type	NDM 0°			NDM 90°			AVERAGE NDM			Solid Density (t/m³) Assumed	Oven Moisture content (%)	Final Corrected		Shear Vane Reading (kPa)					Retest URN	PASS / FAIL	Comments
				Easting	Northing	RL		NDM / SV	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)			Oven Dry Density (t/m³)	Average Air Voids (%)	Reading 1	Reading 2	Reading 3	Reading 4	Average SV (4 x Tests)		(P) Pass / (F) Fail	
S19 121-1	CBEN	26/07/2019	Behind Wall 4A	2659644.073	6510836.01	14.093	clayey SILT	NDM / SV	1.81	32.3	5.0	1.80	32.3	5.9	1.80	32.3	5.5	2.7	33.5	1.35	4.7	193	193	193	193	193		P	
S19 125-1	CBEN	14/08/2019	Behind Wall 4A	2659632.473	6510837.678	15.368	clayey SILT	NDM / SV	1.73	36.5	6.6	1.75	36.3	5.7	1.74	36.4	6.2	2.7	38.4	1.26	5.0	138	130	152	152	143		P	
S19 125-2	CBEN	14/08/2019	Behind Wall 4A	2659622.414	6510836.998	14.98	clayey SILT	NDM / SV	1.74	36.2	6.2	1.74	34.9	7.1	1.74	35.6	6.6	2.7	36.6	1.28	6.0	193	165	152	152	166		P	
S19 126-1	CBEN	16/08/2019	Behind Wall 4A	2659604.059	6510859.469	16.413	clayey SILT	NDM / SV	1.79	35.9	3.9	1.79	35.7	4.0	1.79	35.8	3.9	2.7	36.9	1.31	3.3	152	152	193	193	173		P	
S19 130-1	CBEN	28/08/2019	Behind Wall 4A	2659624.276	6510837.015	16.133	clayey SILT	NDM / SV	1.88	31.4	2.2	1.87	30.6	3.1	1.87	31.0	2.6	2.7	30.8	1.43	2.8	193	193	193	193	193		P	
S19 130-2	CBEN	28/08/2019	Behind Wall 4A	2659633.805	6510837.912	16.001	clayey SILT	NDM / SV	1.82	32.0	4.8	1.84	29.0	5.6	1.83	30.5	5.2	2.7	31.5	1.39	4.5	193	193	193	193	193		P	
S20 001-1	ALTA	31/01/2020	Sediment Pond	GPS Error - Refer to site plan			clayey SILT	NDM / SV	1.81	30.6	6.5	1.80	28.2	8.6	1.80	29.4	7.5	2.7	29.0	1.40	7.8	218	218	218	218	218		P	
S20 001-2	ALTA	31/01/2020	Sediment Pond	GPS Error - Refer to site plan			clayey SILT	NDM / SV	1.83	29.1	6.2	1.83	29.1	6.4	1.83	29.1	6.3	2.7	29.8	1.41	5.8	218	218	218	218	218		P	
S20 002-1	ALTA	3/02/2020	Sediment Pond	GPS Error - Refer to site plan			clayey SILT	NDM / SV	1.79	35.9	4.1	1.79	37.3	2.9	1.79	36.6	3.5	2.7	34.6	1.33	4.8	202	199	183	187	193		P	
S20 002-2	ALTA	3/02/2020	Sediment Pond	GPS Error - Refer to site plan			clayey SILT	NDM / SV	1.83	33.2	3.7	1.84	31.0	4.5	1.83	32.1	4.1	2.7	28.5	1.43	6.5	140	143	202	218	176		P	
S20 015-1	ALTA	3/08/2020	Sediment Pond	2659674.975	6510855.66	15.806	clayey SILT	NDM / SV	1.83	35.1	2.3	1.84	30.7	4.8	1.83	32.9	3.5	2.7	37.5	1.33	0.6	156	146	171	177	162		P	
S20 015-2	ALTA	3/08/2020	Sediment Pond	2659678.938	6510861.869	16.476	clayey SILT	NDM / SV	1.82	31.6	5.2	1.82	33.8	3.8	1.82	32.7	4.5	2.7	36.0	1.34	2.4	171	152	159	183	166		P	
S20 016-1	ALTA	4/08/2020	Sediment Pond	265677.584	6510857.25	16.536	clayey SILT	NDM / SV	1.82	31.3	5.5	1.82	37.5	1.6	1.82	34.4	3.5	2.7	34.0	1.35	3.8	193	149	156	196	173		P	
S20 16-2	ALTA	4/08/2020	Sediment Pond	2659679.012	6510863.57	17.49	clayey SILT	NDM / SV	1.87	32.6	1.9	1.87	31.8	2.5	1.87	32.2	2.2	2.7	29.8	1.44	3.8	>218	193	196	205	>203		P	

GEOTECHNICS

Job: Arrans Hill P5 - Stage 2

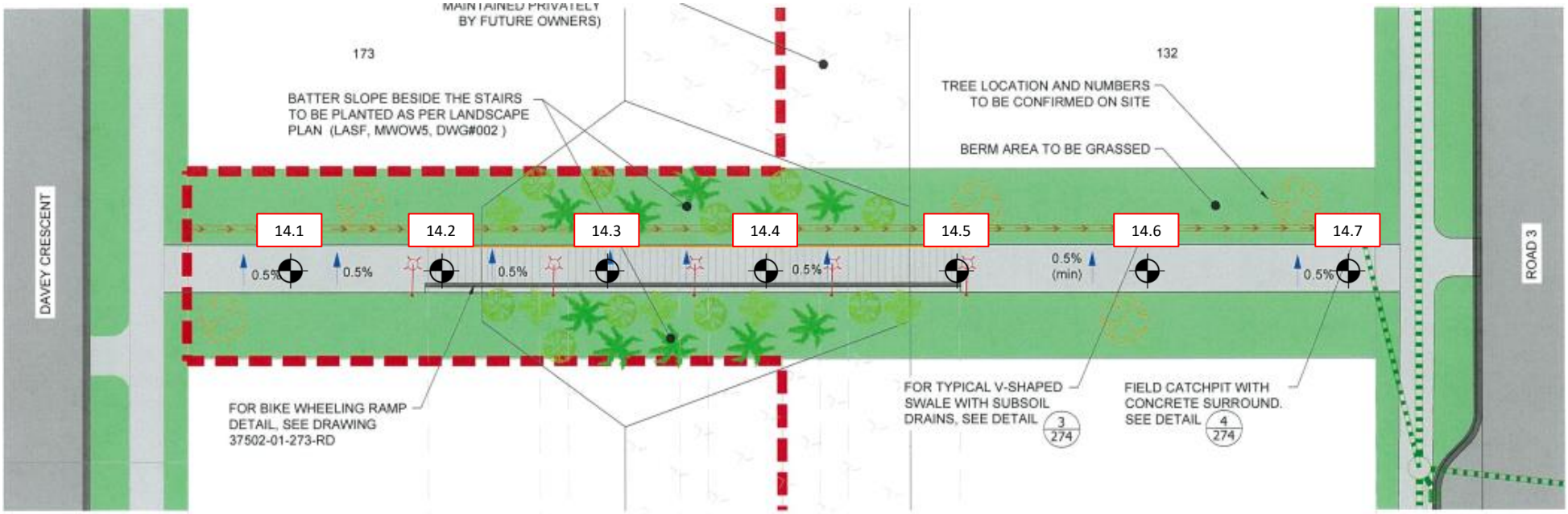
Client: T+T

Job #	21854.0031
Entered By	ALTA
Checked By	PEFE
Approved By	-

URN	Tech.	Date	Location	Layer	Material	Test Type	NDM 0°			NDM 90°			AVERAGE NDM			Solid Density (t/m³) Assumed	Oven Moisture content (%)	Final Corrected		Shear Vane Reading (kPa)					Retest URN	PASS / FAIL	Comments
						NDM / SV	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)			Oven Dry Density (t/m³)	Average Air Voids (%)	Reading 1	Reading 2	Reading 3	Reading 4	Average SV (4 x Tests)		(P) Pass / (F) Fail	
S20-014.1			Davey Crescent - Road 3 Staircase	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	183	121	109	218	158	-	P	
S20-014.2				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	118	152	218	140	157	-	P	
S20-014.3				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	131	202	156	124	153	-	P	
S20-014.4				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	218	106	168	137	157	-	P	
S20-014.5				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	140	152	165	128	146	-	P	
S20-014.6				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	140	177	168	137	156	-	P	
S20-014.7				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	171	109	159	174	153	-	P	
S20-014.8			Road 3 - Road 1 Staircase	Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	121	93	183	199	149	-	P	
S20-014.9				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	180	218	218	218	208	-	P	
S20-014.10	ALTA	15/06/2020		Surface	claySILT	SV	-	-	-	-	-	-	-	-	-	-	-	-	-	180	196	202	190	192	-	P	Staircase Subgrade requires a bearing capacity ≥ 100KPa
S20-014.11				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	218	218	218	218	218	-	P	
S20-014.12				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	218	218	218	218	218	-	P	
S20-014.13				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	218	218	218	218	218	-	P	
S20-014.14				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	168	156	177	124	156	-	P	
S20-014.15				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	109	140	137	159	136	-	P	
S20-014.16				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	187	199	171	174	183	-	P	
S20-014.17				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	218	218	218	218	218	-	P	
S20-014.18				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	218	218	218	218	218	-	P	
S20-014.19				Surface		SV	-	-	-	-	-	-	-	-	-	-	-	-	-	218	218	218	218	218	-	P	

Legend:

- Impact Hammer
- NDM (Backscatter)
- Shear Vane
- Scala
- Test Area



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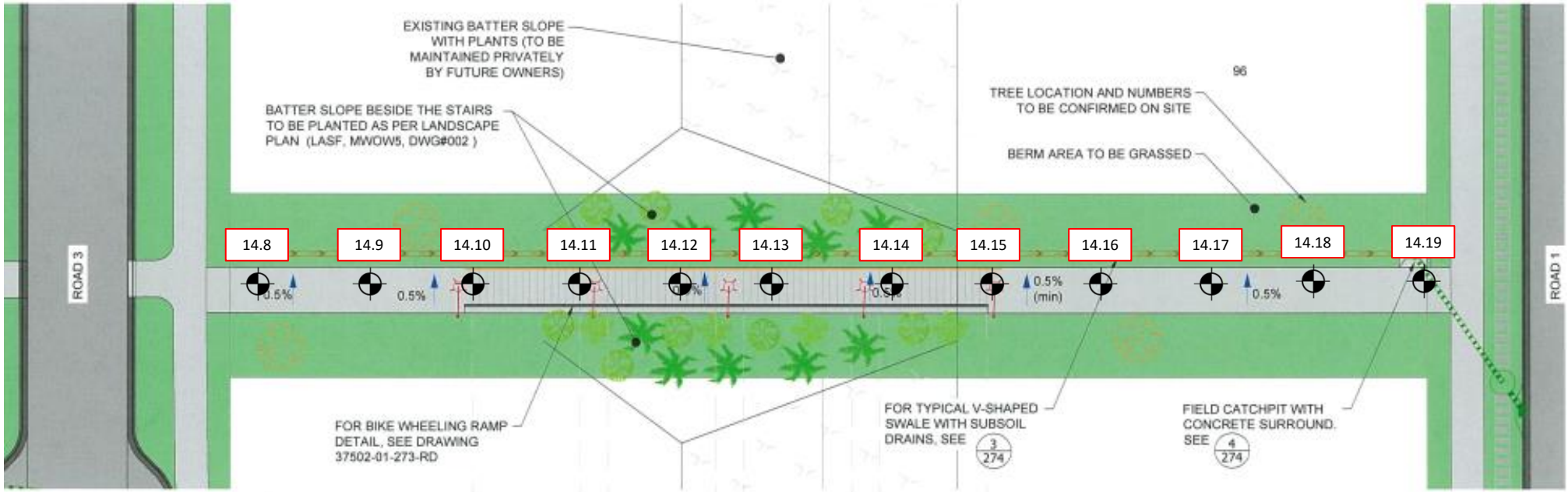
Test Location Plan

N

Site:	Stage 2	Job Name:	Arrans Hill P5	Drawn:	ALTA	Date:	15/06/2020
Location:	Davey Crescent – Road 3 Staircase	Job No.:	21854.0031	URN:	S20-014	Date:	15/06/2020
		Lab Ref:	-	Scale:	Not to Scale	Rev.:	1

Legend:

- Impact Hammer
- NDM (Backscatter)
- Shear Vane
- Scala
- Test Area



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Test Location Plan

Site:	Stage 2	Job Name:	Arrans Hill P5	Drawn:	ALTA	Date:	15/06/2020
Location:	Road 3 – Road 1 Staircase	Job No.:	21854.0031	URN:	S20-014	Date:	15/06/2020
		Lab Ref:	-	Scale:	Not to Scale	Rev.:	1

N

HAND AUGER LOG

HOLE Id: **Lot 081**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2	LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: 5949259.97 mN (NZTM2000) 1748907.69 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 13/05/2020
	DRILL METHOD: HA	HOLE FINISHED: 13/05/2020
R.L.: 26.59m		DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: WIRO

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 1 2 3 4 5 6 7 8 9	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION \ WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Box 1, 0.0-3.1m					>186 kPa		26	0.0	TS	M			SILT, dark brown, moist, non plastic
					>186 kPa			0.5		H	H		SILT,yellowish brown; hard, moist, non plastic 0.6m: light brown mottled red, minor gravel
					>186 kPa			1.0					SILT, yellowish brown mottled light greyish white; hard, moist, non plastic
					UTP					D			SILT, yellowish brown, hard, dry, non plastic
					UTP		25	1.5					
					138/58 kPa					M	VSt		clayey SILT, yellowish brown with brown inclusions; very stiff, moist, low plasticity,
								2.0					SILT, yellowish brown with brown inclusions; very stiff, moist, non plastic
					94/27 kPa						VSt-H		SILT, reddish brown, very stiff to hard, moist, non plastic
					UTP			2.5			VSt		clayey SILT, yellowish brown with brown streaks, very stiff, moist, low plasticity 2.9m: minor topsoil inclusions
					>186 kPa		24						
					141/66 kPa			3.0					
													3.1m: Target depth
							23	3.5					

COMMENTS:

Hole Depth 3.1m

Scale 1:20

Rev.: A

Tonkin+Taylor

CORE PHOTOS

BOREHOLE No.: **Lot 081**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2		LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000)	5949259.97 mN 1748907.69 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 13/05/2020
R.L.:	26.59m	DRILL METHOD: HA	HOLE FINISHED: 13/05/2020
DATUM:	NZVD2016		DRILLED BY: GEOTECHNICS
			LOGGED BY: RBE CHECKED: WIRO

0.00-3.10m

HAND AUGER LOG

HOLE Id: **Lot 084**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2	LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: 5949206.93 mN (NZTM2000) 1748897.21 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 13/05/2020
	DRILL METHOD: HA	HOLE FINISHED: 13/05/2020
R.L.: 20.20m		DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: WIRO

GEOLOGICAL												ENGINEERING DESCRIPTION
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 1 2 3 4 5 6 7 8 9	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
							20	0	TS	M			SILT, dark brown; moist, non plastic
					UTP						H		SILT, light brown, minor gravel; hard, moist, non plastic
					70/25 kPa			0.5			St		0.6 - 0.8m: stiff
					>186 kPa						H		
								1.0			H		SILT, extremely hard, grey; penetrated with difficulty (block of grey siltstone)
					167/80 kPa		19				VSt		SILT, minor clay, yellowish brown and light brown with grey inclusions; very stiff, moist, non plastic
					186/90 kPa			1.5					1.3m: reddish brown, some grey
					186/88 kPa								1.7m: light brown and yellowish brown with grey inclusions
					145/56 kPa			2.0			VSt-H		clayey SILT, yellowish brown and reddish brown; very stiff to hard, moist, low plasticity
					178/85 kPa		18						
					>186 kPa			2.5					
Box 1, 0.0-3.1m	DRY: 13/05/2020 on completion				>186 kPa			3.0					2.9m: yellowish brown and brown with small grey sandstone inclusions
							17						3.1m: Target depth
								3.5					

COMMENTS:

Hole Depth 3.1m

Scale 1:20

Rev.: A

Tonkin+Taylor

CORE PHOTOS

BOREHOLE No.: **Lot 084**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2		LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000)	5949206.93 mN 1748897.21 mE	DRILL TYPE: 50mm hand auger DRILL METHOD: HA	HOLE STARTED: 13/05/2020 HOLE FINISHED: 13/05/2020 DRILLED BY: GEOTECHNICS
R.L.:	20.20m		
DATUM:	NZVD2016		LOGGED BY: RBE CHECKED: WIRO

0.00-3.10m

HAND AUGER LOG

HOLE Id: **Lot 086**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2	LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000) 5949125.60 mN 1749231.14 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 13/05/2020
	DRILL METHOD: HA	HOLE FINISHED: 13/05/2020
R.L.: 15.19m		DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: WIRO

GEOLOGICAL												ENGINEERING DESCRIPTION
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 1 2 3 4 5 6 7 8 9	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION \ WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
							15	0	TS	M			SILT, dark brown, moist, non plastic
					>186 kPa			0.5			VSt-H		SILT, minor clay, light orange brown, very stiff to hard, moist, non plastic 0.5m: minor fine gravel
					>186 kPa								
					>186 kPa			1.0					
					186/64 kPa		14						
					>186 kPa			1.5					1.7m: minor grey sandstone gravel
					>186 kPa								
					>186 kPa			2.0			H		clayey SILT, brown and yellowish brown, hard, moist, low plasticity
					UTP		13						sandy SILT, brown; hard, moist, non plastic, with minor grey incluisions
Box 1, 0.0-3.1m	DRY: 13/05/2020 on completion				UTP			2.5					
					UTP			3.0					
							12						3.1m: Target depth
								3.5					

COMMENTS:

Hole Depth 3.1m

Scale 1:20

Rev.: A

Tonkin+Taylor

CORE PHOTOS

BOREHOLE No.: **Lot 086**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2		LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000)	5949125.60 mN 1749231.14 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 13/05/2020
		DRILL METHOD: HA	HOLE FINISHED: 13/05/2020
R.L.:	15.19m		DRILLED BY: GEOTECHNICS
DATUM:	NZVD2016		LOGGED BY: RBE CHECKED: WIRO

0.00-3.10m

HAND AUGER LOG

HOLE Id: **Lot 089**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2	LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000) 5949132.04 mN 1749189.17 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 13/05/2020
	DRILL METHOD: HA	HOLE FINISHED: 13/05/2020
R.L.: 15.83m		DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: WIRO

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 1 2 3 4 5 6 7 8 9	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION \ WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
					UTP @ 0.4m		15	0.5		M	H		sandy SILT, grey, reddish brown and yellowish brown; hard, moist, non plastic 0.4m: reddish brown
					UTP @ 0.9m								0.9m: yellowish brown with grey inclusions
					UTP @ 1.4m			1.0					1.4m: reddish brown with grey inclusions
					UTP @ 1.5m			1.5		D			SILT, grey and brown; hard, dry, non plastic; difficult to auger 1.6m: reddish brown 1.7m: brown and grey
					UTP @ 2.0m		14	2.0					sandy SILT, yellowish brown with minor grey inclusions, hard, dry, non plastic, difficult to auger
					149/89 kPa @ 2.4m					M	VSt		SILT, some clay, reddish brown and brown with grey inclusions; very stiff, moist, low to no plasticity; minor gravel 2.6m: orange brown
Box 1, 0.0-3.1m	DRY: 13/05/2020 on completion				173/72 kPa @ 2.6m 159/36 kPa @ 3.0m		13	2.5 3.0					SILT, light brown mottled orange brown, very stiff, moist, non plastic
							12	3.5					3.1m: Target depth

COMMENTS:

Hole Depth 3.1m

Scale 1:20

Rev.: A

Tonkin+Taylor

CORE PHOTOS

BOREHOLE No.: **Lot 089**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2		LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000)	5949132.04 mN 1749189.17 mE	DRILL TYPE: 50mm hand auger DRILL METHOD: HA	HOLE STARTED: 13/05/2020 HOLE FINISHED: 13/05/2020 DRILLED BY: GEOTECHNICS
R.L.:	15.83m		
DATUM:	NZVD2016		LOGGED BY: RBE CHECKED: WIRO

0.00-3.10m

HAND AUGER LOG

HOLE Id: **Lot 092**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2	LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: 5949146.91 mN (NZTM2000) 1749137.78 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 13/05/2020
	DRILL METHOD: HA	HOLE FINISHED: 13/05/2020
R.L.: 17.20m		DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: WIRO

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 1 2 3 4 5 6 7 8 9	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
							17	0.0	TS	M			SILT,dark brown, moist, non plastic
					155/46 kPa						VSt-H		SILT, brown with grey inclusions, hard to very stiff, moist, non plastic
					>186 kPa			0.5					
					>186 kPa								0.9m: inclusions of grey sandstone
								1.0			VSt		clayey SILT, yellowish brown and light greyish white; very stiff, moist, low plasticity
					167/45 kPa		16						
					122/32 kPa			1.5			St-VSt		SILT, light whitish grey; stiff to very stiff, moist, non plastic
													1.7m: light brown with orange bands
					114/16 kPa								
					85/19 kPa			2.0					
							15						2.3m: orange brown
					111/36 kPa						VSt		clayey SILT, orange brown and light grey, very stiff, moist, low plasticity
								2.5			St		SILT, orange brown and light grey; stiff, moist, non plastic
					88/21 kPa						St-VSt		SILT, trace clay, grey; stiff to very stiff, moist, non plastic
Box 1, 0.0-3.1m	DRY: 13/05/2020 on completion				141/27 kPa			3.0					
							14						3.1m: Target depth
								3.5					

COMMENTS:

Hole Depth 3.1m

Scale 1:20

Rev.: A

Tonkin+Taylor

CORE PHOTOS

BOREHOLE No.: **Lot 092**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2		LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000)	5949146.91 mN 1749137.78 mE	DRILL TYPE: 50mm hand auger DRILL METHOD: HA	HOLE STARTED: 13/05/2020 HOLE FINISHED: 13/05/2020 DRILLED BY: GEOTECHNICS
R.L.:	17.20m		
DATUM:	NZVD2016		LOGGED BY: RBE CHECKED: WIRO

0.00-3.10m

HAND AUGER LOG

HOLE Id: **Lot 095**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2	LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: 5949158.40 mN (NZTM2000) 1749090.96 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 13/05/2020
		HOLE FINISHED: 13/05/2020
R.L.: 17.73m	DRILL METHOD: HA	DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: WIRO

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 1 2 3 4 5 6 7 8 9	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION \ WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
								0.0	TS	M			SILT, dark brown with yellowish brown inclusions; moist, non plastic
					>186 kPa						VSt		clayey SILT, light greyish white mottled pink; very stiff, moist, low plasticity
					161/66 kPa		17	0.5			VSt-H		SILT, yellowish brown and brown; very stiff to hard, moist, non plastic, some grey sandy inclusions
					>186 kPa			1.0					
					154/50 kPa								
					>186 kPa		16	1.5					
					186/69 kPa								
					>186 kPa			2.0					clayey SILT, pink mottled white; very stiff to hard, moist, low plasticity
					186/65 kPa								2.5m: brown and dark brown
					>186 kPa		15	2.5			VSt		clayey SILT, orange brown to brown with black mottles, very stiff, moist, low plasticity
Box 1, 0.0-3.1m	DRY: 13/05/2020 on completion				145/72 kPa			3.0					
													3.1m: Target depth
							14	3.5					

COMMENTS:

Hole Depth 3.1m

Scale 1:20

Rev.: A

Tonkin+Taylor

CORE PHOTOS

BOREHOLE No.: **Lot 095**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2		LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000)	5949158.40 mN 1749090.96 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 13/05/2020
		DRILL METHOD: HA	HOLE FINISHED: 13/05/2020
R.L.:	17.73m		DRILLED BY: GEOTECHNICS
DATUM:	NZVD2016		LOGGED BY: RBE CHECKED: WIRO

0.00-3.10m

HAND AUGER LOG

HOLE Id: **Lot 097**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2	LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000) 5949170.61 mN 1749042.52 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 13/05/2020
	DRILL METHOD: HA	HOLE FINISHED: 13/05/2020
R.L.: 18.31m		DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: WIRO

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 1 2 3 4 5 6 7 8 9	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
							18	0.0	TS	M			SILT, dark brown with yellowish brown inclusions, moist, low to no plasticity
					183/68 kPa			0.5			VSt-H		clayey SILT, yellowish brown mottled reddish brown, very stiff to hard, moist, low plasticity
					158/48 kPa								0.5m: brown inclusions
					>186 kPa			1.0					0.6m: brown and yellowish brown
					>186 kPa		17						
					>186 kPa			1.5					1.6m: abundant grey sandstone inclusions
					>186 kPa								1.9m: inlcusion of grey siltstone
					129/45 kPa			2.0					2.0m: yellowish brown and brown, medium plasticity
					>186 kPa		16						2.4m: brown and blackish brown, low plasticity
					UTP			2.5			H		SILT, brown and blackish brown, hard, moist, non plastic; minor gravel
Box 1, 0.0-3.1m	DRY; 13/05/2020 on completion				138/53 kPa			3.0			VSt		clayey SILT, yellowish brown and white, very stiff, moist, low plasticity
							15	3.1					3.1m: Target depth
								3.5					

COMMENTS:

Hole Depth 3.1m

Scale 1:20

Rev.: A

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Tonkin+Taylor

CORE PHOTOS

BOREHOLE No.: **Lot 097**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2		LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000)	5949170.61 mN 1749042.52 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 13/05/2020
		DRILL METHOD: HA	HOLE FINISHED: 13/05/2020
R.L.:	18.31m		DRILLED BY: GEOTECHNICS
DATUM:	NZVD2016		LOGGED BY: RBE CHECKED: WIRO

0.00-3.10m

HAND AUGER LOG

HOLE Id: **Lot 100**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2	LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000) 5949182.52 mN 1748997.33 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 13/05/2020
	DRILL METHOD: HA	HOLE FINISHED: 13/05/2020
R.L.: 18.88m		DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: WIRO

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 1 2 3 4 5 6 7 8 9	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
									TS	M			SILT dark brown, moist, non plastic
					● >186 kPa						VSt		SILT, some clay, light brown with brown streaks and grey inclusions, very stiff, moist, low to no plasticity
					● 159/56 kPa			0.5					
					● 146/37 kPa		18				VSt-H		clayey SILT, yellowish brown, very stiff to hard, moist, low plasticity
					● UTP			1.0					1.1m: yellowish brown, minor gravel
					● >186 kPa			1.5			VSt		clayey SILT, brown with yellowish brown streaks, minor black mottles from 1.4m; very stiff, moist, low plasticity
					● 170/89 kPa		17						1.7m: brown and reddish brown
					● 149/68 kPa			2.0			St-VSt		SILT, reddish brown, very stiff to stiff, moist, non plastic
					● 158/48 kPa			2.5					2.3m: orange brown
					● 126/32 kPa								2.6m: reddish brown
Box 1, 0.0-3.1m	DRY: 04/05/2020 on completion				● 84/32 kPa		16	3.0					2.9m: orange brown
													3.1m: Target depth
							15	3.5					

COMMENTS:

Hole Depth 3.1m

Scale 1:20

Rev.: A

Tonkin+Taylor

CORE PHOTOS

BOREHOLE No.: **Lot 100**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2		LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000)	5949182.52 mN 1748997.33 mE	DRILL TYPE: 50mm hand auger DRILL METHOD: HA	HOLE STARTED: 13/05/2020 HOLE FINISHED: 13/05/2020 DRILLED BY: GEOTECHNICS
R.L.:	18.88m		
DATUM:	NZVD2016		LOGGED BY: RBE CHECKED: WIRO

0.00-3.10m

HAND AUGER LOG

HOLE Id: **Lot 103**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2	LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: 5949195.58 mN (NZTM2000) 1748950.02 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 13/05/2020
	DRILL METHOD: HA	HOLE FINISHED: 13/05/2020
R.L.: 19.56m		DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: WIRO

GEOLOGICAL											ENGINEERING DESCRIPTION
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 1 2 3 4 5 6 7 8 9	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION \ WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
									TS	M			SILT, dark brown; moist, non plastic
					>186 kPa						VSt-H		SILT, yellowish brown and reddish brown; very stiff to hard, moist, non plastic
					>186 kPa		19	0.5					0.3m: sandy to 0.6m, with minor grey inclusions
					177/57 kPa			1.0			VSt		SILT, orange brown to reddish brown, very stiff, moist, non plastic
					130/29 kPa								
					89/13 kPa		18	1.5					
					121/31 kPa								
					145/28 kPa			2.0					sandy SILT, orange brown with minor black mottles; very stiff, moist, non plastic
					133/37 kPa								
					145/35 kPa		17	2.5					
Box 1, 0.0-3.1m	DRY: 13/05/2020 on completion				158/35 kPa			3.0					
													3.1m: Target depth
							16	3.5					

COMMENTS:

Hole Depth 3.1m

Scale 1:20

Rev.: A

Tonkin+Taylor

CORE PHOTOS

BOREHOLE No.: **Lot 103**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2		LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000)	5949195.58 mN 1748950.02 mE	DRILL TYPE: 50mm hand auger DRILL METHOD: HA	HOLE STARTED: 13/05/2020 HOLE FINISHED: 13/05/2020 DRILLED BY: GEOTECHNICS
R.L.:	19.56m		
DATUM:	NZVD2016		LOGGED BY: RBE CHECKED: WIRO

0.00-3.10m

HAND AUGER LOG

HOLE Id: **Lot 105**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2	LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: 5949241.90 mN (NZTM2000) 1748947.61 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 13/05/2020
		HOLE FINISHED: 13/05/2020
R.L.: 27.42m	DRILL METHOD: HA	DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: WIRO

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 1 2 3 4 5 6 7 8 9	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION \ WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
									TS				SILT, dark brown, moist, non plastic
					UTP								SILT, light brown, hard, moist, non plastic 0.4m: brown, with gravel
					UTP		27	0.5					sandy gravelly SILT, light brown; hard, dry to moist, non plastic
					UTP								SILT, light brown and greyish brown, minor gravel; hard, dry to moist, non plastic
					UTP			1.0					1.7m: trace clay, light brown mottled yellowish and reddish brown
					>186 kPa		26						
					>186 kPa			1.5					SILT, reddish brown, hard, moist, non plastic 2.2m: minor gravel
					>186 kPa								
					UTP		25	2.0					clayey SILT, yellowish brown with grey inclusions, hard, moist, low plasticity
Box 1, 0.0-3.1m	DRY: 13/05/2020 on completion				>186 kPa			2.5					
					>186 kPa			3.0					3.1m: Target depth
							24	3.5					

COMMENTS:

Hole Depth 3.1m

Scale 1:20

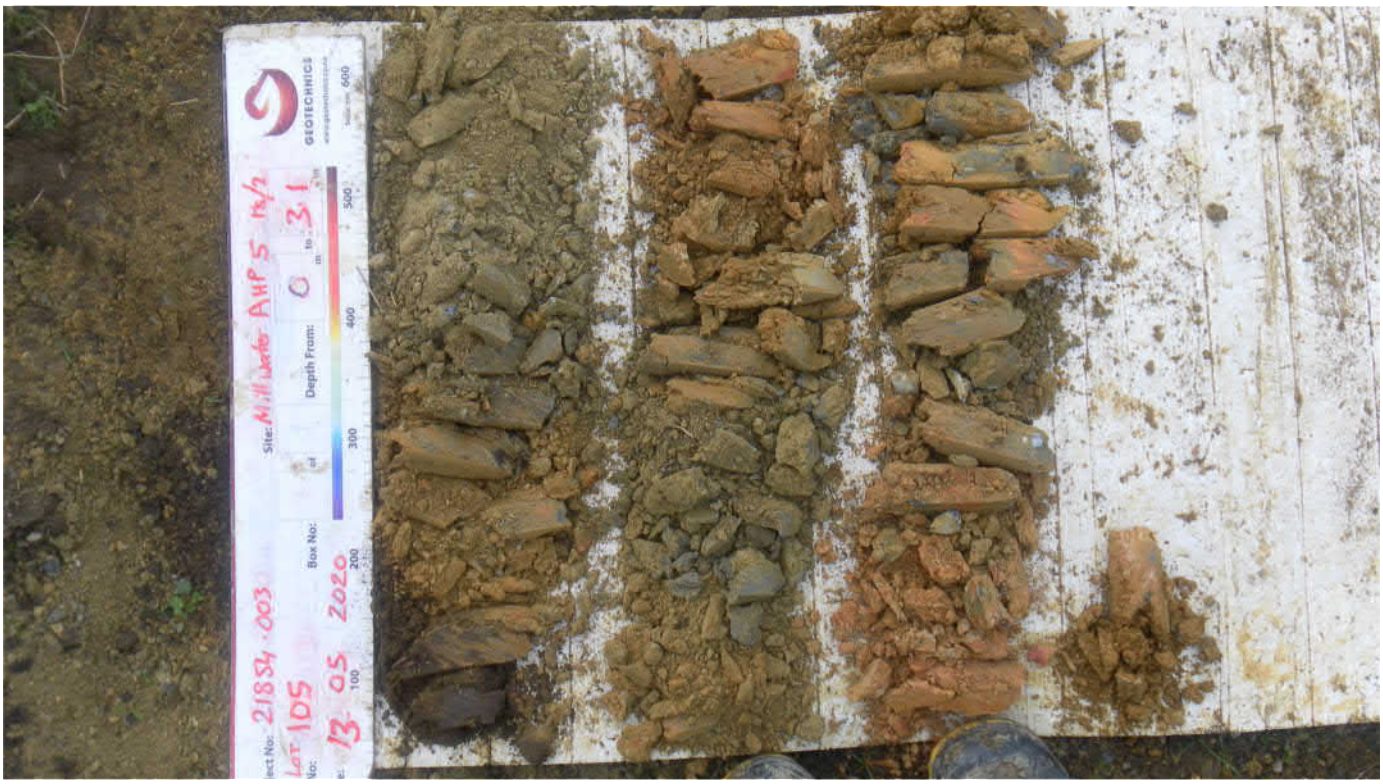
Rev.: A

CORE PHOTOS

BOREHOLE No.: **Lot 105**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2	LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: 5949241.90 mN (NZTM2000) 1748947.61 mE R.L.: 27.42m DATUM: NZVD2016	DRILL TYPE: 50mm hand auger DRILL METHOD: HA	HOLE STARTED: 13/05/2020 HOLE FINISHED: 13/05/2020 DRILLED BY: GEOTECHNICS LOGGED BY: RBE CHECKED: WIRO



0.00-3.10m

HAND AUGER LOG

HOLE Id: **Lot 108**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2	LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: 5949234.82 mN (NZTM2000) 1748991.80 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 13/05/2020
	DRILL METHOD: HA	HOLE FINISHED: 13/05/2020
R.L.: 30.96m		DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: WIRO

GEOLOGICAL											ENGINEERING DESCRIPTION
GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 1 2 3 4 5 6 7 8 9	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION \ WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
Box 1, 0.0-2.5m	DRY; 13/05/2020 on completion				>186 kPa >186 kPa UTP >186 kPa >186 kPa >186 kPa >186 kPa UTP gravel		30 29 28 27	0.5 1.0 1.5 2.0 2.5 3.0 3.5	TS	M H			SILT dark brown; moist, non plastic. SILT, some sand, light brown, hard, moist, non plastic 0.7m: Greyish brown, with abundant angular fine grey gravel SILT, brown, hard, moist, non plastic SILT, light brown, abundant fine gravel, grey. Extremely hard to auger owing to gravel. 2.5m: Refusal

COMMENTS:

Hole Depth 2.5m

Scale 1:20

Rev.: A

Tonkin+Taylor

CORE PHOTOS

BOREHOLE No.: **Lot 108**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2		LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000)	5949234.82 mN 1748991.80 mE	DRILL TYPE: 50mm hand auger DRILL METHOD: HA	HOLE STARTED: 13/05/2020 HOLE FINISHED: 13/05/2020 DRILLED BY: GEOTECHNICS
R.L.:	30.96m		
DATUM:	NZVD2016		LOGGED BY: RBE CHECKED: WIRO

0.00-2.50m

HAND AUGER LOG

HOLE Id: **Lot 111**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2	LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000) 5949223.08 mN 1749036.98 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 12/05/2020
	DRILL METHOD: HA	HOLE FINISHED: 12/05/2020
R.L.: 30.91m		DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: WIRO

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 1 2 3 4 5 6 7 8 9	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION \ WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
									TS	M			SILT, dark brown; moist, non plastic
											VSt		clayey SILT, yellowish brown, very stiff, moist, low plasticity
					● 161/32 kPa					D-M	H		SILT, minor clay, reddish brown, hard, moist, non plastic
					● UTP			0.5					
					● >186 kPa		30						
								1.0					1.0m: grey inclusions
					● >186 kPa								
					● UTP			1.5					1.5m: brown and reddish brown, non plastic
													1.6m: brown, dry to moist, minor fine gravel
					● >186 kPa		29						
					● >186 kPa			2.0					
					● >186 kPa			2.5					2.6m: abundant gravel
					● >186 kPa								
Box 1, 0.0-3.1m	DRY: 12/05/2020 on completion				● UTP		28	3.0					3.0m: grey and reddish brown
													3.1m: Target depth
							27	3.5					

COMMENTS:

Hole Depth 3.1m

Scale 1:20

Rev.: A

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CORE PHOTOS

BOREHOLE No.: **Lot 111**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2		LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000)	5949223.08 mN 1749036.98 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 12/05/2020
		DRILL METHOD: HA	HOLE FINISHED: 12/05/2020
R.L.:	30.91m		DRILLED BY: GEOTECHNICS
DATUM:	NZVD2016		LOGGED BY: RBE CHECKED: WIRO

0.00-3.10m

HAND AUGER LOG

HOLE Id: **Lot 115**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2	LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000) 5949201.91 mN 1749119.48 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 12/05/2020
	DRILL METHOD: HA	HOLE FINISHED: 12/05/2020
R.L.: 30.33m		DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: WIRO

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 1 2 3 4 5 6 7 8 9	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION \ WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
									TS	M			SILT, dark brown, moist, non plastic
					187/- kPa		30	0.5			H		SILT reddish brown and brown, hard, moist, non plastic
					>218 kPa								0.6m: minor brown sandstone inclusions
					>218 kPa			1.0					0.9m: abundant fine gravel
					>218 kPa		29						SILT, brown to orange and reddish brown, with grey inclusions; hard, moist, non plastic,
					>218 kPa			1.5					1.7m: blackish brown inclusions
					>218 kPa								
					>218 kPa		28	2.0					
					>218 kPa								
					>218 kPa			2.5					
Box 1, 0.0-3.1m	DRY: 12/05/2020 on completioni				>218 kPa			3.0					2.9m: minor clay
													3.1m: Target depth
							27	3.5					

COMMENTS:

Hole Depth 3.1m

Scale 1:20

Rev.: A

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CORE PHOTOS

BOREHOLE No.: **Lot 115**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2		LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000)	5949201.91 mN 1749119.48 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 12/05/2020
		DRILL METHOD: HA	HOLE FINISHED: 12/05/2020
R.L.:	30.33m		DRILLED BY: GEOTECHNICS
DATUM:	NZVD2016		LOGGED BY: RBE CHECKED: WIRO

0.00-3.10m

HAND AUGER LOG

HOLE Id: **Lot 118**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2	LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000) 5949190.33 mN 1749165.85 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 12/05/2020
	DRILL METHOD: HA	HOLE FINISHED: 12/05/2020
R.L.: 28.35m		DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: WIRO

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 1 2 3 4 5 6 7 8 9	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION \ WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
							28	0.0	TS	M			SILT, dark brown, moist, non plastic
											H		SILT, minor clay, yellowish brown and reddish brown; hard, moist, non plastic
					UTP								sandy SILT, reddish brown, hard, moist, non plastic; minor gravel
					>186 kPa			0.5					
					UTP								
					>186 kPa			1.0					sandy SILT, minor clay, brown and grey; hard, moist, non plastic
					UTP		27						sandy SILT, brown with grey inclusions, minor gravel; hard, dry to moist, non plastic
					UTP			1.5					
					>186 kPa								2.0m: abundant angular gravel
					>186 kPa			2.0					SILT, minor clay, brown; hard, moist, low plasticity
					UTP		26						2.3m: reddish brown and brown with grey inclusions; low to no plasticity
					>186 kPa			2.5					clayey SILT, brown mottled red and black; hard, moist, low plasticity
Box 1, 0.0-3.1m	DRY: 12/05/2020 on completion							3.0					
							25						3.1m: Target depth
								3.5					

COMMENTS:

Hole Depth 3.1m

Scale 1:20

Rev.: A

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CORE PHOTOS

BOREHOLE No.: **Lot 118**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2		LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000)	5949190.33 mN 1749165.85 mE	DRILL TYPE: 50mm hand auger DRILL METHOD: HA	HOLE STARTED: 12/05/2020 HOLE FINISHED: 12/05/2020 DRILLED BY: GEOTECHNICS
R.L.:	28.35m		
DATUM:	NZVD2016		LOGGED BY: RBE CHECKED: WIRO

0.00-3.10m

HAND AUGER LOG

HOLE Id: **Lot 121**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2	LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000) 5949178.75 mN 1749214.40 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 12/05/2020
	DRILL METHOD: HA	HOLE FINISHED: 12/05/2020
R.L.: 24.10m		DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: WIRO

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	DRY: 12/05/2020 WET: On completion	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 1 2 3 4 5 6 7 8 9	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION \ WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
							24	0.0		M			Gravel hardstanding
					145/61 kPa			0.5			VSt		SILT, some clay, yellowish brown, light greyish white and reddish brown, very stiff, moist, low to no plasticity
					166/68 kPa								
					135/64 kPa								
					159/82 kPa		23	1.0					
					161/82 kPa			1.5					1.8m: brown and grey inclusions; non plastic
					>186 kPa					D-M	H		SILT, brown with red and grey inclusions, hard, dry to moist, non plastic
Box 1, 0.0-3.0m					UTP			2.0					
					UTP		22						
					>186 kPa			2.5					3.0m: dry, very hard to auger
					UTP			3.0					3m: Target depth
							21						
								3.5					

COMMENTS:

Hole Depth 3m

Scale 1:20

Rev.: A

Tonkin+Taylor

CORE PHOTOS

BOREHOLE No.: **Lot 121**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2		LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000)	5949178.75 mN 1749214.40 mE	DRILL TYPE: 50mm hand auger DRILL METHOD: HA	HOLE STARTED: 12/05/2020 HOLE FINISHED: 12/05/2020 DRILLED BY: GEOTECHNICS
R.L.:	24.10m		
DATUM:	NZVD2016		LOGGED BY: RBE CHECKED: WIRO

0.00-3.00m

HAND AUGER LOG

HOLE Id: **Lot 124**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2	LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000) 5949275.36 mN 1748955.00 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 12/05/2020
	DRILL METHOD: HA	HOLE FINISHED: 12/05/2020
R.L.: 30.30m		DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: WIRO

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 1 2 3 4 5 6 7 8 9	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
							30	0.0	TS	M			SILT, dark brown; moist, non plastic
											VSt		SILT, some clay, yellowish brown with grey inciusions; very stiff, moist, low to no plasticity
					● 180/45 kPa						VSt-H		clayey SILT, yellowish brown with brown inclusions; very stiff to hard, moist, low plasticity
					● >186 kPa			0.5					
					● 174/41 kPa								
							29	1.0			VSt		sandy SILT, light brown with orange mottles, very stiff, moist, non plastic
					● >186 kPa								
					● 146/24 kPa			1.5					SILT, light brown with orange brown bands; very stiff, moist, non plastic
					● 153/25 kPa								
					● 162/23 kPa			2.0					2.0m: brown, moist to wet
					● 141/27 kPa		28						2.1m: light brown and orange brown
								2.5		M-W	H		sandy SILT, brown mottled orange brown, hard, moist to wet, non plastic
Box 1, 0.0-3.1m	DRY: 12/05/2020 on completion				● UTP								2.7m: orange, hard
					● UTP			3.0					
							27	3.1					3.1m: Target depth
								3.5					

COMMENTS:

Hole Depth 3.1m

Scale 1:20

Rev.: A

Tonkin+Taylor

CORE PHOTOS

BOREHOLE No.: **Lot 124**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2		LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000)	5949275.36 mN 1748955.00 mE	DRILL TYPE: 50mm hand auger DRILL METHOD: HA	HOLE STARTED: 12/05/2020 HOLE FINISHED: 12/05/2020 DRILLED BY: GEOTECHNICS
R.L.:	30.30m		
DATUM:	NZVD2016		LOGGED BY: RBE CHECKED: WIRO

0.00-3.10m

HAND AUGER LOG

HOLE Id: **Lot 127**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2	LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000) 5949265.08 mN 1748998.64 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 12/05/2020
	DRILL METHOD: HA	HOLE FINISHED: 12/05/2020
R.L.: 32.90m		DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: WIRO

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 1 2 3 4 5 6 7 8 9	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
										M			SILT dark brown; moist, non plastic
											H		SILT, some clay, brown mottled yellowish and reddish brown with grey inclusions; hard, moist, low to no plasticity: minor gravel
					>186 kPa			0.5					0.5m: non plastic
					>186 kPa								
					UTP		32						0.9m: abundant fine gravel, grey
					UTP			1.0					
					154/66 kPa			1.5			VSt-H		clayey SILT, yellowish brown and reddish brown with dark brown inclusions and minor grey inclusions; very stiff, moist, low plasticity
					147/68 kPa		31						
					149/60 kPa			2.0					
					137/66 kPa			2.5					2.7m: abundant grey sandy inclusions
					149/78 kPa								
Box 1, 0.0-3.1m	DRY: 12/05/2020 on completion				UTP		30	3.0					2.9m: hard; abundant grey weak sandstone gravel
													3.1m: Target depth
							29	3.5					

COMMENTS:

Hole Depth 3.1m

Scale 1:20

Rev.: A

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CORE PHOTOS

BOREHOLE No.: **Lot 127**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2		LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000)	5949265.08 mN 1748998.64 mE	DRILL TYPE: 50mm hand auger DRILL METHOD: HA	HOLE STARTED: 12/05/2020 HOLE FINISHED: 12/05/2020 DRILLED BY: GEOTECHNICS
R.L.:	32.90m		
DATUM:	NZVD2016		LOGGED BY: RBE CHECKED: WIRO

0.00-3.10m

HAND AUGER LOG

HOLE Id: **Lot 130**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2	LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000) 5949252.29 mN 1749045.01 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 12/05/2020
	DRILL METHOD: HA	HOLE FINISHED: 12/05/2020
R.L.: 33.00m		DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: WIRO

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 1 2 3 4 5 6 7 8 9	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION \ WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
								0.0	TS	M			SILT, dark brown, moist, non plastic
											VSt		clayey SILT, yellowish brown and light grey, very stiff, moist, low plasticity
					165/45 kPa								sandy SILT, orange brown and reddish brown, very stiff, moist, non plastic
					80/21 kPa			0.5					
					>186 kPa								0.9m: grey inclusions, minor gravel
							32	1.0					clayey SILT, light brown, very stiff, moist, low plasticity
					179/27 kPa								SILT, some clay, yellowish brown and brown, very stiff, moist, low plasticity
					>186 kPa			1.5					
					163/86 kPa								clayey SILT, yellowish brown and reddish brown, very stiff, moist, low plasticity
					174/86 kPa		31	2.0					
					154/72 kPa								2.5m: brown and reddish brown, low to medium plasticity, minor grey inclusions
					130/50 kPa			2.5					
Box 1, 0.0-3.1m	DRY: 12/05/2020 on completion				141/76 kPa		30	3.0					
													3.1m: Target depth
								3.5					

COMMENTS:

Hole Depth 3.1m

Scale 1:20

Rev.: A

CORE PHOTOS

BOREHOLE No.: **Lot 130**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2		LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000)	5949252.29 mN 1749045.01 mE	DRILL TYPE: 50mm hand auger DRILL METHOD: HA	HOLE STARTED: 12/05/2020 HOLE FINISHED: 12/05/2020 DRILLED BY: GEOTECHNICS
R.L.:	33.00m		
DATUM:	NZVD2016		LOGGED BY: RBE CHECKED: WIRO

0.00-3.10m

HAND AUGER LOG

HOLE Id: **Lot 132**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2	LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: 5949241.75 mN (NZTM2000) 1749091.35 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 12/05/2020
		HOLE FINISHED: 12/05/2020
R.L.: 32.98m	DRILL METHOD: HA	DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: WIRO

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 1 2 3 4 5 6 7 8 9	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION \ WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
									TS	M			SILT, dark brown; moist, non plastic
					>186 kPa			0.5			VSt-H		SILT, some clay, yellowish brown, grey and brown; very stiff to hard, low plasticity, moist
					166/28 kPa								
					>186 kPa		32	1.0					SILT, yellowish brown mottled light greyish white; hard to very stiff, moist, non plastic
					186/53 kPa								
					174/40 kPa			1.5					
					157/40 kPa								
					111/42 kPa		31	2.0					2.3m: minor clay
					147/54 kPa								
					100/48 kPa			2.5					
Box 1, 0.0-3.1m	DRY: 12/05/2020 on completion				186/32 kPa		30	3.0					3.0m: reddish mottles and reddish brown bands
													3.1m: Target depth
								3.5					
							29						

COMMENTS:

Hole Depth 3.1m

Scale 1:20

Rev.: A

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CORE PHOTOS

BOREHOLE No.: **Lot 132**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2		LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000)	5949241.75 mN 1749091.35 mE	DRILL TYPE: 50mm hand auger DRILL METHOD: HA	HOLE STARTED: 12/05/2020 HOLE FINISHED: 12/05/2020 DRILLED BY: GEOTECHNICS
R.L.:	32.98m		
DATUM:	NZVD2016		LOGGED BY: RBE CHECKED: WIRO

0.00-3.10m

HAND AUGER LOG

HOLE Id: **Lot 135**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2	LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: 5949229.33 mN (NZTM2000) 1749135.63 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 12/05/2020
	DRILL METHOD: HA	HOLE FINISHED: 12/05/2020
R.L.: 32.21m		DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: WIRO

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 1 2 3 4 5 6 7 8 9	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
									TS	M			SILT, dark brown, moist, non plastic
					>186 kPa		32	0.5			H		SILT, some clay, yellowish brown; hard, moist, non plastic
					>186 kPa								0.6m: inclusions of gravel
					>186 kPa								0.9m: reddish and yellowish brown
					>186 kPa		31	1.0			VSt-H		SILT, some clay, yellowish brown mottled light greyish white, hard to very stiff, moist, low plasticity
					>186 kPa			1.5					1.4m: brown with dark brown inclusions
					162/77 kPa								
					179/62 kPa		30	2.0			St-VSt		SILT, some clay, brown and yellowish brown; moist, stiff to very stiff, medium plasticity
					52/28 kPa			2.5					2.7m: low plasticity
Box 1, 0.0-3.1m	DRY: 12/05/2020 on completion				127/68 kPa								
					108/31 kPa			3.0					
							29	3.5					3.1m: Target depth

COMMENTS:

Hole Depth 3.1m

Scale 1:20

Rev.: A

CORE PHOTOS

BOREHOLE No.: **Lot 135**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2	LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: 5949229.33 mN (NZTM2000) 1749135.63 mE R.L.: 32.21m DATUM: NZVD2016	DRILL TYPE: 50mm hand auger DRILL METHOD: HA	HOLE STARTED: 12/05/2020 HOLE FINISHED: 12/05/2020 DRILLED BY: GEOTECHNICS LOGGED BY: RBE CHECKED: WIRO

0.00-3.10m

HAND AUGER LOG

HOLE Id: **Lot 138**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2	LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000) 5949219.31 mN 1749181.28 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 12/05/2020
	DRILL METHOD: HA	HOLE FINISHED: 12/05/2020
R.L.: 29.59m		DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: WIRO

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 1 2 3 4 5 6 7 8 9	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
									TS	M			SILT dark brown; moist, non plastic
					>186 kPa						H		clayey SILT, yellowish brown; hard, low plasticity, moist
													SILT, brown mottled yellowish brown and reddish brown, hard, moist, non plastic; minor gravel
					UTP		29	0.5					0.6m: abundant gravel
										D-M			sandy SILT, light brown and orange brown, hard, moist, non plastic
					UTP			1.0					1.1m: grey and brown
					>186 kPa								1.3m: dry to moist, light brown
Box 1, 0.0-3.1m	DRY: 12/05/2020 on completion				>186 kPa		28	1.5					
					UTP								
					>186 kPa			2.0					
					>186 kPa								
					UTP		27	2.5					
					UTP			3.0					3.1m: Target depth
							26	3.5					

COMMENTS:

Hole Depth 3.1m

Scale 1:20

Rev.: A

Tonkin+Taylor

CORE PHOTOS

BOREHOLE No.: **Lot 138**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2		LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000)	5949219.31 mN 1749181.28 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 12/05/2020
		DRILL METHOD: HA	HOLE FINISHED: 12/05/2020
R.L.:	29.59m		DRILLED BY: GEOTECHNICS
DATUM:	NZVD2016		LOGGED BY: RBE CHECKED: WIRO

0.00-3.10m

HAND AUGER LOG

HOLE Id: **Lot141**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2	LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000) 5949210.92 mN 1749224.03 mE	DRILL TYPE: 50mm hand auger	HOLE STARTED: 12/05/2020
	DRILL METHOD: HA	HOLE FINISHED: 12/05/2020
R.L.: 25.36m		DRILLED BY: GEOTECHNICS
DATUM: NZVD2016		LOGGED BY: RBE CHECKED: WIRO

GEOLOGICAL | ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MATERIAL COMPOSITION.	WATER	CORE RECOVERY (%)	METHOD	SCALA PENETROMETER (Blows/100mm) 0 1 2 3 4 5 6 7 8 9	TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa) 10 25 50 100 200	Description and Additional Observations
					149/53 kPa		25	0.5		M	VSt		SILT, dark brown; moist, non plastic
					135/42 kPa								SILT, yellowish brown, light brown and orange brown; very stiff, moist, non plastic
					126/32 kPa			1.0					
					101/19 kPa		24						1.4m: trace sand, orange brown
					108/19 kPa			1.5					
					108/21 kPa								
					68/19 kPa			2.0			St-VSt		SILT, light whitish brown with orange bands; stiff to very stiff, non plastic, moist
					141/24 kPa		23	2.5					
					183/27 kPa								
Box 1, 0.0-3.1m	DRY: 12/05/2020 on completion				UTP			3.0			VSt-H		SILT, grey; very stiff to hard, moist, non plastic
							22	3.5					3.1m: Target depth

COMMENTS:

Hole Depth 3.1m

Scale 1:20

Rev.: A

HandAugerLog - 10/07/2020 12:18:35 PM - Produced with Core-GS by GeRoc

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CORE PHOTOS

BOREHOLE No.: **Lot141**

SHEET: 1 OF 1

PROJECT: Millwater P5 stg2		LOCATION: Orewa West	JOB No.: 21854.0031
CO-ORDINATES: (NZTM2000)	5949210.92 mN 1749224.03 mE	DRILL TYPE: 50mm hand auger DRILL METHOD: HA	HOLE STARTED: 12/05/2020 HOLE FINISHED: 12/05/2020 DRILLED BY: GEOTECHNICS
R.L.:	25.36m		
DATUM:	NZVD2016		LOGGED BY: RBE CHECKED: WIRO

0.00-3.10m

GEOTECHNICS

Our Ref: 1100441.0.0.0/Rep 1
Customer Ref: 21854.0031
03 July 2020

Tonkin + Taylor
PO Box 5271
Victoria Street West
Auckland 1142

Attention: Mr Jason Kelly

Dear Jason

Millwater Precinct 5 - Stage 2

Laboratory Test Report

Samples from the above mentioned site have been tested as received according to your instructions and the results are included in this report. Results apply only to the samples tested.

Descriptions are enclosed for your information, but are not covered under the IANZ endorsement of this report.

This report has been prepared for the benefit of Tonkin + Taylor, with respect to the particular brief given to us and it cannot be relied upon in other contexts or for any other purpose without our prior review and agreement.

This report may be reproduced only in full.

Samples not destroyed during testing will be retained for one month from the date of this report before being discarded. If we can be of any further assistance, feel free to get in touch. Contact details are provided at the bottom of this page.

GEOTECHNICS LTD

Report prepared by:

Sim Tirunahari
I am the author of this document
2020.07.03 12:49:37 +12'00'

.....
Sim Tirunahari
Soils Laboratory Manager
Approved Signatory

Authorised for Geotechnics by:

.....
Steven Anderson
Project Director

Report checked by:

.....
James Kimiangatau
Laboratory Technician

IANZ ACCREDITED LABORATORY

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

3-Jul-20
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GEOTECHNICS

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Geotechnics Project Number	1100441.0000
QESTLab Work Order ID	W20AK-0108
Customer Project ID	21854.0031

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000307		
	Reference	LOT 81	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, light yellowish brown mixed with light grey, mottled orange, very high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**81**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.

Approved Signatory	Sim Tirunahari
Date	2/07/2020

GEOTECHNICS

1 Hill Street
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New Zealand
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Geotechnics Project Number	1100441.0000
QESTLab Work Order ID	W20AK-0108
Customer Project ID	21854.0031

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000308		
	Reference	LOT 84	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, medium brown mixed with grey, mottled orange-red, high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**61**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.

Approved Signatory	Sim Tirunahari
Date	2/07/2020

GEOTECHNICS

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Geotechnics Project Number	1100441.0000
QESTLab Work Order ID	W20AK-0108
Customer Project ID	21854.0031

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000309		
	Reference	LOT 86	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with light grey, mottled orange-red, high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**68**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.

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Date	2/07/2020

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Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000310		
	Reference	LOT 92	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with light grey, mottled orange-red, very high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**71**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.

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Date	2/07/2020

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Customer Project ID	21854.0031

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000311		
	Reference	LOT 97	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with light grey, mottled orange-red, very high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**72**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.

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Customer Project ID	21854.0031

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000312		
	Reference	LOT 103	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with light grey, mottled orange-red, high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**66**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.

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QESTLab Work Order ID	W20AK-0108
Customer Project ID	21854.0031

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000313		
	Reference	LOT 105	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, grey, mottled light yelow-orange-red, very high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit **73**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.

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Date 2/07/2020

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Geotechnics Project Number	1100441.0000
QESTLab Work Order ID	W20AK-0108
Customer Project ID	21854.0031

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000314		
	Reference	LOT 111	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, light red mixed with light grey, mottled black, very high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**72**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.

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Date	2/07/2020

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Geotechnics Project Number	1100441.0000
QESTLab Work Order ID	W20AK-0109
Customer Project ID	21854.0031

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000315		
	Reference	LOT 115	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, light red mixed with light grey, mottled black, high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**68**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.

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QESTLab Work Order ID	W20AK-0109
Customer Project ID	21854.0031

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000316		
	Reference	LOT 118	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, light red mixed with light grey, mottled black, high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**67**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.

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Customer Project ID	21854.0031

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000317		
	Reference	LOT 121	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, light yellowish brown mixed with light grey, mottled red, very high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**75**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.

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Customer Project ID	21854.0031

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000318		
	Reference	LOT 127	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with grey, mottled red, high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**70**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.

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Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000319		
	Reference	LOT 132	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with grey, mottled red, high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**69**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.

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Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000320		
	Reference	LOT 138	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with grey, mottled red, very high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**72**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.

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Customer Project ID	21854.0031

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000321		
	Reference	LOT 141	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, light yelowish brown mixed with light grey, mottled orange, high plasticity.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	**56**

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • The sample description follows the "NZGS Guidelines for field description of soil and rock". • This test result is IANZ accredited.

Approved Signatory	Sim Tirunahari
Date	2/07/2020

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Geotechnics Project Number	1100441.0000
QESTLab Work Order ID	W20AK-0110
Customer Project ID	21854.0031

Determination of the Linear Shrinkage - NZS 4402:1986 Test 2.6

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000322		
	Reference	LOT 81	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, light yellowish brown mixed with light grey, mottled orange, very high plasticity.		
SPECIMEN	**Reference**		**Depth**	
	Description			

Linear Shrinkage **17%**

TEST REMARKS

• This test result is IANZ accredited.

Approved Signatory Sim Tirunahari

Date 2/07/2020

Our Ref.No. 1100441.0.0.0/Rep1

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QESTLab Work Order ID	W20AK-0110
Customer Project ID	21854.0031

Determination of the Linear Shrinkage - NZS 4402:1986 Test 2.6

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000323		
	Reference	LOT 84	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, medium brown mixed with grey, mottled orange-red, high plasticity.		
SPECIMEN	**Reference**		**Depth**	
	Description			

Linear Shrinkage **14%**

TEST REMARKS

• This test result is IANZ accredited.

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Date 2/07/2020

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QESTLab Work Order ID	W20AK-0110
Customer Project ID	21854.0031

Determination of the Linear Shrinkage - NZS 4402:1986 Test 2.6

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000324		
	Reference	LOT 86	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with light grey, mottled orange-red, high plasticity.		
SPECIMEN	**Reference**		**Depth**	
	Description			

Linear Shrinkage **15%**

TEST REMARKS

• This test result is IANZ accredited.

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Determination of the Linear Shrinkage - NZS 4402:1986 Test 2.6

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000325		
	Reference	LOT 92	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with light grey, mottled orange-red, very high plasticity.		
SPECIMEN	**Reference**		**Depth**	
	Description			

Linear Shrinkage **15%**

TEST REMARKS

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Determination of the Linear Shrinkage - NZS 4402:1986 Test 2.6

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000326		
	Reference	LOT 97	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with light grey, mottled orange-red, very high plasticity.		
SPECIMEN	**Reference**		**Depth**	
	Description			

Linear Shrinkage **17%**

TEST REMARKS

• This test result is IANZ accredited.

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Determination of the Linear Shrinkage - NZS 4402:1986 Test 2.6

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000327		
	Reference	LOT 103	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with light grey, mottled orange-red, high plasticity.		
SPECIMEN	**Reference**		**Depth**	
	Description			

Linear Shrinkage **15%**

TEST REMARKS

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Determination of the Linear Shrinkage - NZS 4402:1986 Test 2.6

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000328		
	Reference	LOT 105	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, grey, mottled light yelow-orange-red, very high plasticity.		
SPECIMEN	**Reference**		**Depth**	
	Description			

Linear Shrinkage **16%**

TEST REMARKS

• This test result is IANZ accredited.

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Determination of the Linear Shrinkage - NZS 4402:1986 Test 2.6

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000329		
	Reference	LOT 111	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, light red mixed with light grey, mottled black, very high plasticity.		
SPECIMEN	**Reference**		**Depth**	
	Description			

Linear Shrinkage **18%**

TEST REMARKS

• This test result is IANZ accredited.

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Determination of the Linear Shrinkage - NZS 4402:1986 Test 2.6

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000330		
	Reference	LOT 115	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, light red mixed with light grey, mottled black, high plasticity.		
SPECIMEN	**Reference**		**Depth**	
	Description			

Linear Shrinkage **17%**

TEST REMARKS

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TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000331		
	Reference	LOT 118	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, light red mixed with light grey, mottled black, high plasticity.		
SPECIMEN	**Reference**		**Depth**	
	Description			

Linear Shrinkage **14%**

TEST REMARKS

• This test result is IANZ accredited.

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Determination of the Linear Shrinkage - NZS 4402:1986 Test 2.6

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000332		
	Reference	LOT 121	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, light yellowish brown mixed with light grey, mottled red, very high plasticity.		
SPECIMEN	**Reference**		**Depth**	
	Description			

Linear Shrinkage **17%**

TEST REMARKS

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TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000333		
	Reference	LOT 127	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with grey, mottled red, high plasticity.		
SPECIMEN	**Reference**		**Depth**	
	Description			

Linear Shrinkage **17%**

TEST REMARKS

• This test result is IANZ accredited.

Approved Signatory Sim Tirunahari

Date 2/07/2020

Our Ref.No. 1100441.0.0.0/Rep1

GEOTECHNICS

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Geotechnics Project Number	1100441.0000
QESTLab Work Order ID	W20AK-0111
Customer Project ID	21854.0031

Determination of the Linear Shrinkage - NZS 4402:1986 Test 2.6

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000334		
	Reference	LOT 132	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with grey, mottled red, high plasticity.		
SPECIMEN	**Reference**		**Depth**	
	Description			

Linear Shrinkage **17%**

TEST REMARKS

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Date 2/07/2020

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Geotechnics Project Number	1100441.0000
QESTLab Work Order ID	W20AK-0111
Customer Project ID	21854.0031

Determination of the Linear Shrinkage - NZS 4402:1986 Test 2.6

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000335		
	Reference	LOT 138	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with grey, mottled red, very high plasticity.		
SPECIMEN	**Reference**		**Depth**	
	Description			

Linear Shrinkage **18%**

TEST REMARKS

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Geotechnics Project Number	1100441.0000
QESTLab Work Order ID	W20AK-0111
Customer Project ID	21854.0031

Determination of the Linear Shrinkage - NZS 4402:1986 Test 2.6

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000336		
	Reference	LOT 141	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, light yellowish brown mixed with light grey, mottled orange, high plasticity.		
SPECIMEN	**Reference**		**Depth**	
	Description			

Linear Shrinkage **12%**

TEST REMARKS

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Geotechnics Project Number	**1100441.0000**
QESTLab Work Order ID	**W20AK-0112**
Customer Project ID	**21854.0031**

Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000337	**HA No**	
	Reference	LOT 81	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, light yellowish brown mixed with light grey, mottled orange.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	37.6
	Bulk Density	(t/m³)	1.72
	Dry Density	(t/m³)	1.25
	Final Water Content	(%)	39.4
	Swelling Strain	(%)	0.28
SHRINKAGE TEST	Initial Water Content	(%)	36.6
	Shrinkage Strain	(%)	3.1
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Moderate
SHRINK - SWELL INDEX		(%)	1.8

TEST REMARKS

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Customer Project ID	**21854.0031**

Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000338	**HA No**	
	Reference	LOT 81	**Top Depth**	1.0m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, light yellowish brown mixed with light grey, mottled orange.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	36.3
	Bulk Density	(t/m³)	1.77
	Dry Density	(t/m³)	1.30
	Final Water Content	(%)	38.0
	Swelling Strain	(%)	0.16
SHRINKAGE TEST	Initial Water Content	(%)	40.5
	Shrinkage Strain	(%)	2.4
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Major
SHRINK - SWELL INDEX		(%)	1.4

TEST REMARKS

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Customer Project ID	**21854.0031**

Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000339	**HA No**	
	Reference	LOT 84	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, medium brown mixed with grey, mottled orange-red.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	27.9
	Bulk Density	(t/m³)	1.79
	Dry Density	(t/m³)	1.40
	Final Water Content	(%)	30.4
	Swelling Strain	(%)	0.11
SHRINKAGE TEST	Initial Water Content	(%)	29.0
	Shrinkage Strain	(%)	1.7
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Major
SHRINK - SWELL INDEX		(%)	1.0

TEST REMARKS

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Customer Project ID	**21854.0031**

Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000340	**HA No**	
	Reference	LOT 84	**Top Depth**	1.0m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, medium brown mixed with grey, mottled orange-red.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	27.2
	Bulk Density	(t/m³)	1.90
	Dry Density	(t/m³)	1.49
	Final Water Content	(%)	28.8
	Swelling Strain	(%)	0.28
SHRINKAGE TEST	Initial Water Content	(%)	26.7
	Shrinkage Strain	(%)	1.7
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Major
SHRINK - SWELL INDEX		(%)	1.0

TEST REMARKS

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Customer Project ID	**21854.0031**

Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000341	**HA No**	
	Reference	LOT 86	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with light grey, mottled orange-red.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	30.7
	Bulk Density	(t/m³)	1.84
	Dry Density	(t/m³)	1.41
	Final Water Content	(%)	32.7
	Swelling Strain	(%)	0.36
SHRINKAGE TEST	Initial Water Content	(%)	29.1
	Shrinkage Strain	(%)	2
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Moderate
SHRINK - SWELL INDEX		(%)	1.2

TEST REMARKS

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Customer Project ID	**21854.0031**

Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000342	**HA No**	
	Reference	LOT 86	**Top Depth**	1.0m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with light grey, mottled orange-red.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	30.1
	Bulk Density	(t/m³)	1.76
	Dry Density	(t/m³)	1.35
	Final Water Content	(%)	33.4
	Swelling Strain	(%)	0.10
SHRINKAGE TEST	Initial Water Content	(%)	29.5
	Shrinkage Strain	(%)	1.9
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Moderate
SHRINK - SWELL INDEX		(%)	1.1

TEST REMARKS

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Customer Project ID	**21854.0031**

Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000343	**HA No**	
	Reference	LOT 92	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with light grey, mottled orange-red.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	35.9
	Bulk Density	(t/m³)	1.75
	Dry Density	(t/m³)	1.29
	Final Water Content	(%)	36.4
	Swelling Strain	(%)	0.02
SHRINKAGE TEST	Initial Water Content	(%)	35.7
	Shrinkage Strain	(%)	2.4
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Major
SHRINK - SWELL INDEX		(%)	1.3

TEST REMARKS

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Customer Project ID	**21854.0031**

Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000344	**HA No**	
	Reference	LOT 92	**Top Depth**	1.0m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with light grey, mottled orange-red.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	30.8
	Bulk Density	(t/m³)	1.87
	Dry Density	(t/m³)	1.43
	Final Water Content	(%)	31.6
	Swelling Strain	(%)	0.13
SHRINKAGE TEST	Initial Water Content	(%)	27.8
	Shrinkage Strain	(%)	3.9
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Moderate
SHRINK - SWELL INDEX		(%)	2.2

TEST REMARKS

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Customer Project ID	**21854.0031**

Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000345	**HA No**	
	Reference	LOT 97	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with light grey, mottled orange-red.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	29.5
	Bulk Density	(t/m³)	1.85
	Dry Density	(t/m³)	1.43
	Final Water Content	(%)	32.3
	Swelling Strain	(%)	0.48
SHRINKAGE TEST	Initial Water Content	(%)	31.0
	Shrinkage Strain	(%)	2.8
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Major
SHRINK - SWELL INDEX		(%)	1.7

TEST REMARKS

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Customer Project ID	**21854.0031**

Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000346	**HA No**	
	Reference	LOT 97	**Top Depth**	1.0m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with light grey, mottled orange-red.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	48.0
	Bulk Density	(t/m³)	1.71
	Dry Density	(t/m³)	1.16
	Final Water Content	(%)	49.9
	Swelling Strain	(%)	0.39
SHRINKAGE TEST	Initial Water Content	(%)	37.4
	Shrinkage Strain	(%)	6.3
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Major
SHRINK - SWELL INDEX		(%)	3.6

TEST REMARKS

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Customer Project ID	**21854.0031**

Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000347	**HA No**	
	Reference	LOT 103	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with light grey, mottled orange-red.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	33.2
	Bulk Density	(t/m³)	1.77
	Dry Density	(t/m³)	1.33
	Final Water Content	(%)	34.7
	Swelling Strain	(%)	0.09
SHRINKAGE TEST	Initial Water Content	(%)	31.5
	Shrinkage Strain	(%)	1.1
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Moderate
SHRINK - SWELL INDEX		(%)	0.6

TEST REMARKS

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Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000348	**HA No**	
	Reference	LOT 103	**Top Depth**	1.0m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with light grey, mottled orange-red.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	35.1
	Bulk Density	(t/m³)	1.82
	Dry Density	(t/m³)	1.35
	Final Water Content	(%)	36.3
	Swelling Strain	(%)	0.11
SHRINKAGE TEST	Initial Water Content	(%)	39.6
	Shrinkage Strain	(%)	5
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Major
SHRINK - SWELL INDEX		(%)	2.8

TEST REMARKS

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Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000349	**HA No**	
	Reference	LOT 105	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, grey, mottled light yelow-orange-red.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	33.5
	Bulk Density	(t/m³)	1.74
	Dry Density	(t/m³)	1.30
	Final Water Content	(%)	34.8
	Swelling Strain	(%)	0.10
SHRINKAGE TEST	Initial Water Content	(%)	24.8
	Shrinkage Strain	(%)	1.8
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Major
SHRINK - SWELL INDEX		(%)	1.0

TEST REMARKS

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Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000350	**HA No**	
	Reference	LOT 111	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, light red mixed with light grey, mottled black.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	23.8
	Bulk Density	(t/m³)	1.95
	Dry Density	(t/m³)	1.58
	Final Water Content	(%)	25.0
	Swelling Strain	(%)	0.47
SHRINKAGE TEST	Initial Water Content	(%)	26.9
	Shrinkage Strain	(%)	2.5
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Major
SHRINK - SWELL INDEX		(%)	1.5

TEST REMARKS

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Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000351	**HA No**	
	Reference	LOT 111	**Top Depth**	1.0m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, light red mixed with light grey, mottled black.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	30.1
	Bulk Density	(t/m³)	1.87
	Dry Density	(t/m³)	1.44
	Final Water Content	(%)	31.1
	Swelling Strain	(%)	0.36
SHRINKAGE TEST	Initial Water Content	(%)	25.9
	Shrinkage Strain	(%)	2.1
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Major
SHRINK - SWELL INDEX		(%)	1.3

TEST REMARKS

• This test result is IANZ accredited.

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Date 2/07/2020

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Geotechnics Project Number	**1100441.0000**
QESTLab Work Order ID	**W20AK-0113**
Customer Project ID	**21854.0031**

Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000352	**HA No**	
	Reference	LOT 115	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, light red mixed with light grey, mottled black.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	33.9
	Bulk Density	(t/m³)	1.83
	Dry Density	(t/m³)	1.37
	Final Water Content	(%)	35.8
	Swelling Strain	(%)	0.32
SHRINKAGE TEST	Initial Water Content	(%)	23.8
	Shrinkage Strain	(%)	2
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Major
SHRINK - SWELL INDEX		(%)	1.2

TEST REMARKS

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Customer Project ID	**21854.0031**

Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000353	**HA No**	
	Reference	LOT 115	**Top Depth**	1.0m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with light grey, mottled orange-red.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	23.1
	Bulk Density	(t/m³)	1.86
	Dry Density	(t/m³)	1.51
	Final Water Content	(%)	26.6
	Swelling Strain	(%)	0.39
SHRINKAGE TEST	Initial Water Content	(%)	25.2
	Shrinkage Strain	(%)	3.3
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Major
SHRINK - SWELL INDEX		(%)	2.0

TEST REMARKS

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Customer Project ID	**21854.0031**

Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000354	**HA No**	
	Reference	LOT 118	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, light red mixed with light grey, mottled black.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	31.4
	Bulk Density	(t/m³)	1.84
	Dry Density	(t/m³)	1.40
	Final Water Content	(%)	32.3
	Swelling Strain	(%)	0.15
SHRINKAGE TEST	Initial Water Content	(%)	34.1
	Shrinkage Strain	(%)	1.3
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Minor
SHRINK - SWELL INDEX		(%)	0.7

TEST REMARKS

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Customer Project ID	**21854.0031**

Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000355	**HA No**	
	Reference	LOT 118	**Top Depth**	1.0m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with light grey-red.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	36.7
	Bulk Density	(t/m³)	1.59
	Dry Density	(t/m³)	1.16
	Final Water Content	(%)	40.7
	Swelling Strain	(%)	0.03
SHRINKAGE TEST	Initial Water Content	(%)	29.4
	Shrinkage Strain	(%)	1.9
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Moderate
SHRINK - SWELL INDEX		(%)	1.1

TEST REMARKS

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Customer Project ID	**21854.0031**

Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000356	**HA No**	
	Reference	LOT 121	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, light yellowish brown mixed with light grey, mottled red.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	36.3
	Bulk Density	(t/m³)	1.80
	Dry Density	(t/m³)	1.32
	Final Water Content	(%)	38.0
	Swelling Strain	(%)	0.39
SHRINKAGE TEST	Initial Water Content	(%)	35.3
	Shrinkage Strain	(%)	4.5
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Major
SHRINK - SWELL INDEX		(%)	2.6

TEST REMARKS

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Geotechnics Project Number	**1100441.0000**
QESTLab Work Order ID	**W20AK-0114**
Customer Project ID	**21854.0031**

Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000357	**HA No**	
	Reference	LOT 121	**Top Depth**	1.0m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, light yellowish brown mixed with light grey, mottled red.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	37.8
	Bulk Density	(t/m³)	1.80
	Dry Density	(t/m³)	1.31
	Final Water Content	(%)	39.2
	Swelling Strain	(%)	0.68
SHRINKAGE TEST	Initial Water Content	(%)	32.5
	Shrinkage Strain	(%)	5
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Major
SHRINK - SWELL INDEX		(%)	3.0

TEST REMARKS

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Customer Project ID	**21854.0031**

Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000358	**HA No**	
	Reference	LOT 127	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with grey, mottled red.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	24.0
	Bulk Density	(t/m³)	1.90
	Dry Density	(t/m³)	1.53
	Final Water Content	(%)	27.0
	Swelling Strain	(%)	0.80
SHRINKAGE TEST	Initial Water Content	(%)	25.9
	Shrinkage Strain	(%)	2.5
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Major
SHRINK - SWELL INDEX		(%)	1.6

TEST REMARKS

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Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000359	**HA No**	
	Reference	LOT 132	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with light grey, mottled orange-red.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	30.6
	Bulk Density	(t/m³)	1.87
	Dry Density	(t/m³)	1.43
	Final Water Content	(%)	31.6
	Swelling Strain	(%)	0.36
SHRINKAGE TEST	Initial Water Content	(%)	31.6
	Shrinkage Strain	(%)	3.6
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Major
SHRINK - SWELL INDEX		(%)	2.1

TEST REMARKS

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Customer Project ID	**21854.0031**

Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000360	**HA No**	
	Reference	LOT 132	**Top Depth**	1.0m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, light yelowish brown mixed with light grey, mottled orange.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	33.2
	Bulk Density	(t/m³)	1.76
	Dry Density	(t/m³)	1.32
	Final Water Content	(%)	33.4
	Swelling Strain	(%)	1.45
SHRINKAGE TEST	Initial Water Content	(%)	31.9
	Shrinkage Strain	(%)	3.8
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Moderate
SHRINK - SWELL INDEX		(%)	2.5

TEST REMARKS

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Customer Project ID	**21854.0031**

Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000361	**HA No**	
	Reference	LOT 138	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with grey, mottled red.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	22.9
	Bulk Density	(t/m³)	1.95
	Dry Density	(t/m³)	1.59
	Final Water Content	(%)	24.8
	Swelling Strain	(%)	0.44
SHRINKAGE TEST	Initial Water Content	(%)	26.2
	Shrinkage Strain	(%)	3.5
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Moderate
SHRINK - SWELL INDEX		(%)	2.1

TEST REMARKS

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Customer Project ID	**21854.0031**

Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000362	**HA No**	
	Reference	LOT 138	**Top Depth**	1.0m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, brown mixed with grey, mottled red.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	26.3
	Bulk Density	(t/m³)	1.86
	Dry Density	(t/m³)	1.47
	Final Water Content	(%)	29.1
	Swelling Strain	(%)	0.35
SHRINKAGE TEST	Initial Water Content	(%)	31.4
	Shrinkage Strain	(%)	4.3
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Minor
SHRINK - SWELL INDEX		(%)	2.5

TEST REMARKS

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TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000363	**HA No**	
	Reference	LOT 141	**Top Depth**	0.5m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, light yelowish brown mixed with light grey, mottled orange.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	32.0
	Bulk Density	(t/m³)	1.77
	Dry Density	(t/m³)	1.34
	Final Water Content	(%)	34.0
	Swelling Strain	(%)	0.04
SHRINKAGE TEST	Initial Water Content	(%)	31.5
	Shrinkage Strain	(%)	1.7
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Minor
SHRINK - SWELL INDEX		(%)	1.0

TEST REMARKS

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Customer Project ID	**21854.0031**

Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	**Description**	Millwater Precinct 5 - Stage 2		
	Data	N/A		
SAMPLE	**Geotechnics ID**	S20AK000364	**HA No**	
	Reference	LOT 141	**Top Depth**	1.0m
	Sampled By		**Bottom Depth**	
	Description	clayey SILT with trace of sand, firm to stiff, light yelowish brown mixed with light grey-orange, mottled red.		
SPECIMEN	**Reference**	N/A	**Depth**	N/A
	Description	N/A		

TEST RESULTS

APPLIED PRESSURE		(kPa)	25
SWELL TEST	Initial Water Content	(%)	34.1
	Bulk Density	(t/m³)	1.73
	Dry Density	(t/m³)	1.29
	Final Water Content	(%)	36.6
	Swelling Strain	(%)	0.02
SHRINKAGE TEST	Initial Water Content	(%)	45.4
	Shrinkage Strain	(%)	3.8
	Inert Material Estimate in the Soil Specimen	(%)	0
	Soil Crumbling During Shrinkage		NIL
	Cracking of the Shrinkage Specimen		Major
SHRINK - SWELL INDEX		(%)	2.1

TEST REMARKS

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