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 W aurecongroup.com



Site Inspection Record

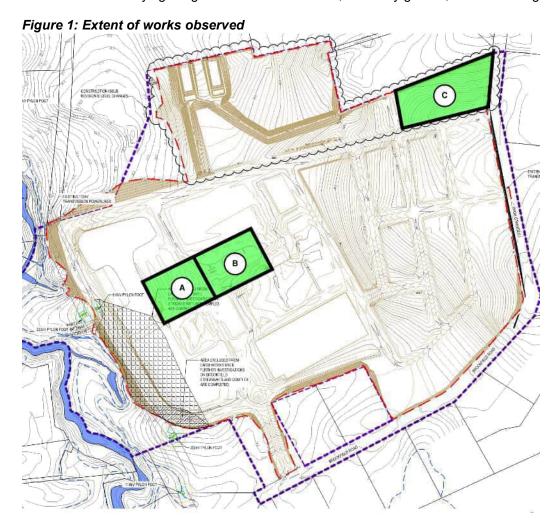
Project Number	510611	Date	15 March 2023
Project Name	Drury Precinct	From	Bryn Pattison
Contractor	Ross Reid Contractors Limited	Total Pages	3
Weather	Sunny with light wind	Conditions	Dry

SUBJECT Bulk Earth Works Topsoil Strip Inspection

Representatives from Aurecon attended site to inspect areas of finished subgrade. Representatives from Ross Reid Contractors were present during the inspection.

Site Observations

- Area A Underlying subgrade was firm underfoot, uniformly graded, and free of organics. This area is to be filled.
- Area B A thin layer of fill had already been placed over the subgrade where topsoil had been trimmed, however from visual inspection it appeared to be homogenous with Area A. This area is to be filled.
- Area C Underlying subgrade was firm underfoot, uniformly graded, and free of organics. This area is to be cut.



PHOTOGRAPHS

Client Name: Site Location: Project No.

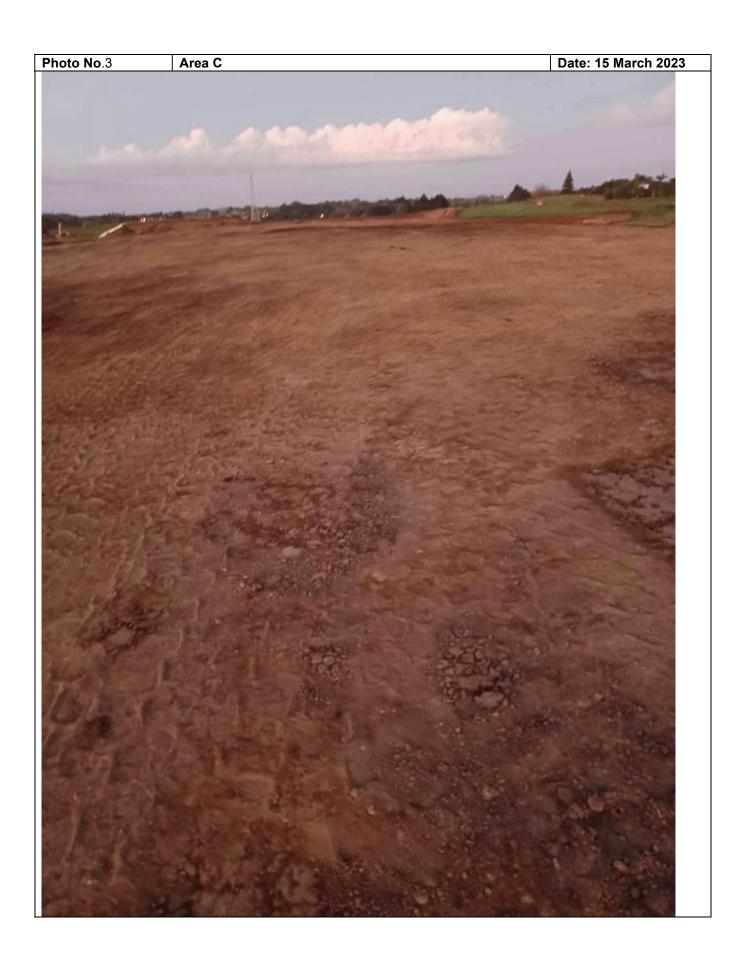
Kiwi Property Group | 133 Fitzgerald Road, Drury | 510611

Photo No.1 Area A Date: 15 March 2023



Photo No.2 Area B Date: 15 March 2023





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Site Inspection Record

Project Number	510611	Date	18 April 2023
Project Name	Drury Precinct	From	Shona du Preez
Contractor	Ross Reid Contractors Limited	Total Pages	3
Weather	Sunny with light wind	Conditions	Fine

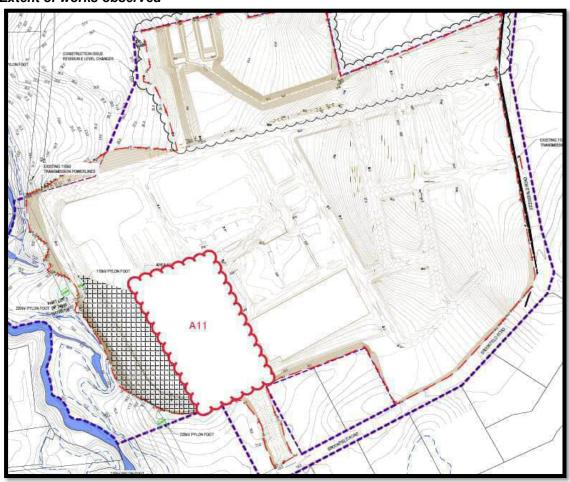
SUBJECT Bulk Earth Works Topsoil Strip Inspection

Representatives from Aurecon attended site to inspect areas of finished topsoil stripping. Representatives from Ross Reid Contractors were present during the inspection.

Site Observations

 Area A11 – Underlying subgrade was firm underfoot, uniformly graded, and free of organics. This area is to be filled

Figure 1: Extent of works observed





PHOTOGRAPHS			
Client Name: Site Location: Project No.			
Kiwi Property Group 133 Fitzgerald Road, Drury 510611			
Photo No.1	Area A11	Date: 18 April 2023	





PHOTOGRAPHS			
Client Name: Site Location: Project No.			
Kiwi Property Group 133 Fitzgerald Road, Drury 510611			
Photo No.2	Area A11	Date: 18 April 2023	





APPENDIX G: LABORATORY TEST DATA



ABN:

93 485 645

Address:

Unit 3, 9 Mohuia Crescent Elsdon Porirua NZ 5022

Laboratory: Wellington Laboratory Phone: 64 27 364 3488

Fax: Email:

wellington@constructionsciences.net

Report Number:

Project Number:

Internal Test Request:

Lot Number:

ERBERG LIMITS REPORT

Client: CMW Geotechnical NZ Ltd

Client Address: 116 Cameron Road, Tauranga

Location: Upper North Island

Supplied To: CMW Geotechnical NZ Limited

Client Reference/s:

Report Date / Page: 10/05/2024 Page 1 of 1

1232/R/28590-1

1232/P/118

1232/T/18108

LOT10

Test Procedures: NZS4402.2.2, NZS4402.2.4, NZS4402.2.3, NZS4402.2.6, NZS4402.2.1

Materials Testing - Hamilton

Sample Number 1232/S/114781 Sample Location

Sampling Method Tested As Received **Drury Centre** Location

Date Sampled 6/05/2024 Sampled By Karl Rutherford **Date Tested** 10/05/2024

Drying / Prep Method Air Dried / Wet Sieved (whole sample) **Material Source**

LL Water Type

Area Description:

Project:

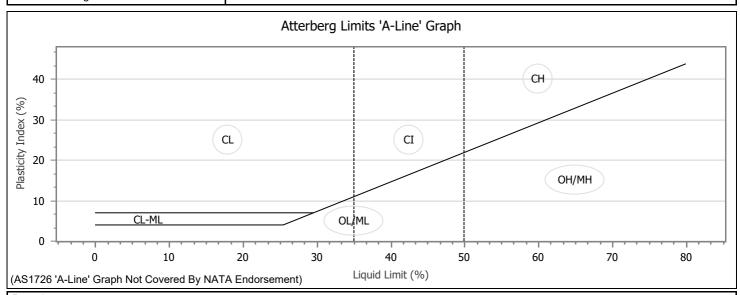
Material Type Insitu

Specification LL Device Type No Specification Cassagrande

Client Reference Prep Mat > 53mm (%) -

Material Description

Atterberg Limit	Specification Minimum	Test Result	Specification Maximum
Liquid Limit		97	
Plastic Limit		41	
Plasticity Index		56	
Linear Shrinkage		21	
Linear Shrinkage Observations:	-		



Remarks

CCREDITED

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation



Accreditation Number:

1232

Approved Signatory: Karl Rutherford



ABN:

93 485 645

Address:

Unit 3, 9 Mohuia Crescent Elsdon Porirua NZ 5022

Laboratory: Wellington Laboratory Phone: 64 27 364 3488

Fax: Email:

wellington@constructionsciences.net

ERBERG LIMITS REPORT

Client: CMW Geotechnical NZ Ltd

Client Address: 116 Cameron Road, Tauranga

Project: Materials Testing - Hamilton

Supplied To: CMW Geotechnical NZ Limited

Upper North Island

Report Number: 1232/R/28591-1

Project Number: 1232/P/118

Lot Number: LOT11

Internal Test Request: 1232/T/18108

Client Reference/s:

Report Date / Page: 13/05/2024 Page 1 of 2

Test Procedures: NZS4402.2.2, NZS4402.2.4, NZS4402.2.3, NZS4402.2.6, NZS4402.2.1

Sample Number 1232/S/114782 Sample Location

Sampling Method Tested As Received **Drury Centre** Location

Date Sampled 6/05/2024 Sampled By Karl Rutherford **Date Tested** 13/05/2024

Drying / Prep Method Oven Dried / Wet Sieved (whole sample) **Material Source**

LL Water Type

Location:

Area Description:

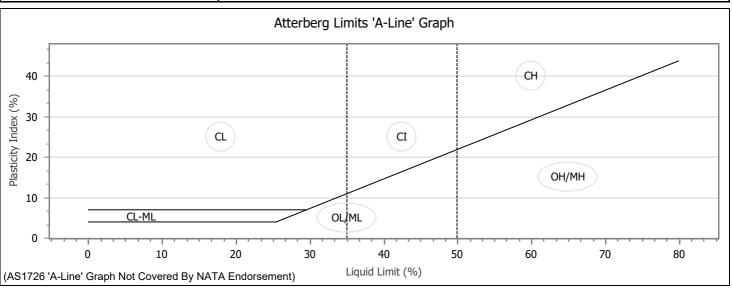
Material Type Insitu

Specification LL Device Type Cassagrande No Specification

Client Reference Prep Mat > 53mm (%) -

Material Description

Atterberg Limit	Specification Minimum	Test Result	Specification Maximum
Liquid Limit		89	
Plastic Limit		41	
Plasticity Index		48	
Linear Shrinkage		17	
Linear Shrinkage Observations:	-	-	



Remarks

CCREDITED

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation



Accreditation Number:

1232

Approved Signatory: Karl Rutherford



ABN:

93 485 645

Address: Unit 3, 9 Mohuia Crescent Elsdon

Porirua NZ 5022

Laboratory: Wellington Laboratory Phone: 64 27 364 3488

Fax: Email:

wellington@constructionsciences.net

ERBERG LIMITS REPORT

Client: CMW Geotechnical NZ Ltd

Client Address: 116 Cameron Road, Tauranga Project: Materials Testing - Hamilton

Location: Upper North Island

Supplied To: CMW Geotechnical NZ Limited

Area Description:

Report Number: 1232/R/28591-1

Project Number: 1232/P/118

Lot Number: LOT20

1232/T/18108 Internal Test Request:

Client Reference/s:

Report Date / Page: 13/05/2024 Page 2 of 2

Test Procedures: NZS4402.2.2, NZS4402.2.4, NZS4402.2.3, NZS4402.2.6, NZS4402.2.1

Sample Number 1232/S/114783 Sample Location

Sampling Method Tested As Received **Drury Centre** Location

Date Sampled 6/05/2024 Sampled By Karl Rutherford **Date Tested** 13/05/2024

Drying / Prep Method Oven Dried / Wet Sieved (whole sample)

LL Water Type

LL Device Type Cassagrande

Client Reference

Material Source

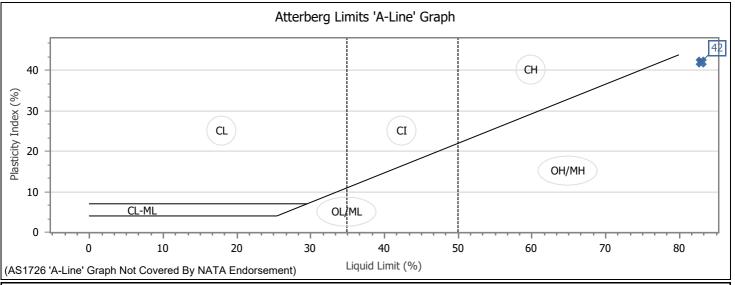
Material Type Insitu

Specification No Specification

Prep Mat > 53mm (%) -

Material Description

Atterberg Limit	Specification Minimum	Test Result	Specification Maximum
Liquid Limit		83	
Plastic Limit		41	
Plasticity Index		42	
Linear Shrinkage		22	
Linear Shrinkage Observations:	-		-



Remarks

CCREDITED

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation



Accreditation Number:

1232

Approved Signatory: Karl Rutherford



93 485 645

ABN:

Address:

Unit 3, 9 Mohuia Crescent Elsdon Porirua NZ 5022

Laboratory: Wellington Laboratory Phone: 64 27 364 3488

Fax: Email:

wellington@constructionsciences.net

Report Number:

Project Number:

ERBERG LIMITS REPORT

Client: CMW Geotechnical NZ Ltd

Client Address: 116 Cameron Road, Tauranga Project: Materials Testing - Hamilton

Location: Upper North Island

Supplied To: CMW Geotechnical NZ Limited

Area Description:

Lot Number: LOT13

Client Reference/s:

Internal Test Request:

Insitu

Report Date / Page: 13/05/2024 Page 1 of 1

1232/R/28598-1

1232/P/118

1232/T/18108

Test Procedures: NZS4402.2.2, NZS4402.2.4, NZS4402.2.3, NZS4402.2.6, NZS4402.2.1

Sample Number 1232/S/114784 Sample Location

Sampling Method Tested As Received **Drury Centre** Location

Date Sampled 6/05/2024 Sampled By Karl Rutherford **Date Tested** 13/05/2024

Drying / Prep Method Oven Dried / Wet Sieved (whole sample)

LL Water Type

Material Type

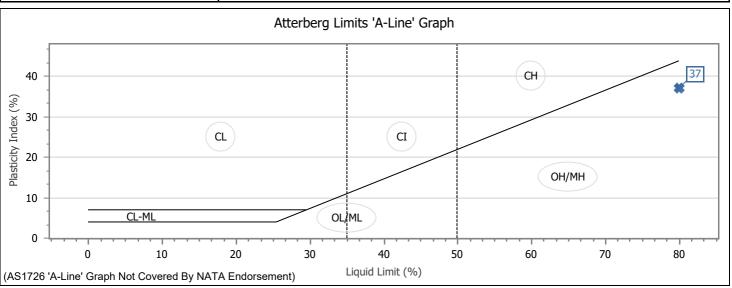
Specification LL Device Type Cassagrande No Specification

Client Reference Prep Mat > 53mm (%) -

Material Description

Atterberg Limit	Specification Minimum	Test Result	Specification Maximum
Liquid Limit		80	
Plastic Limit		43	
Plasticity Index		37	
Linear Shrinkage		22	
Linear Shrinkage Observations:	-		-

Material Source



Remarks

CCREDITED

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation



Accreditation Number:

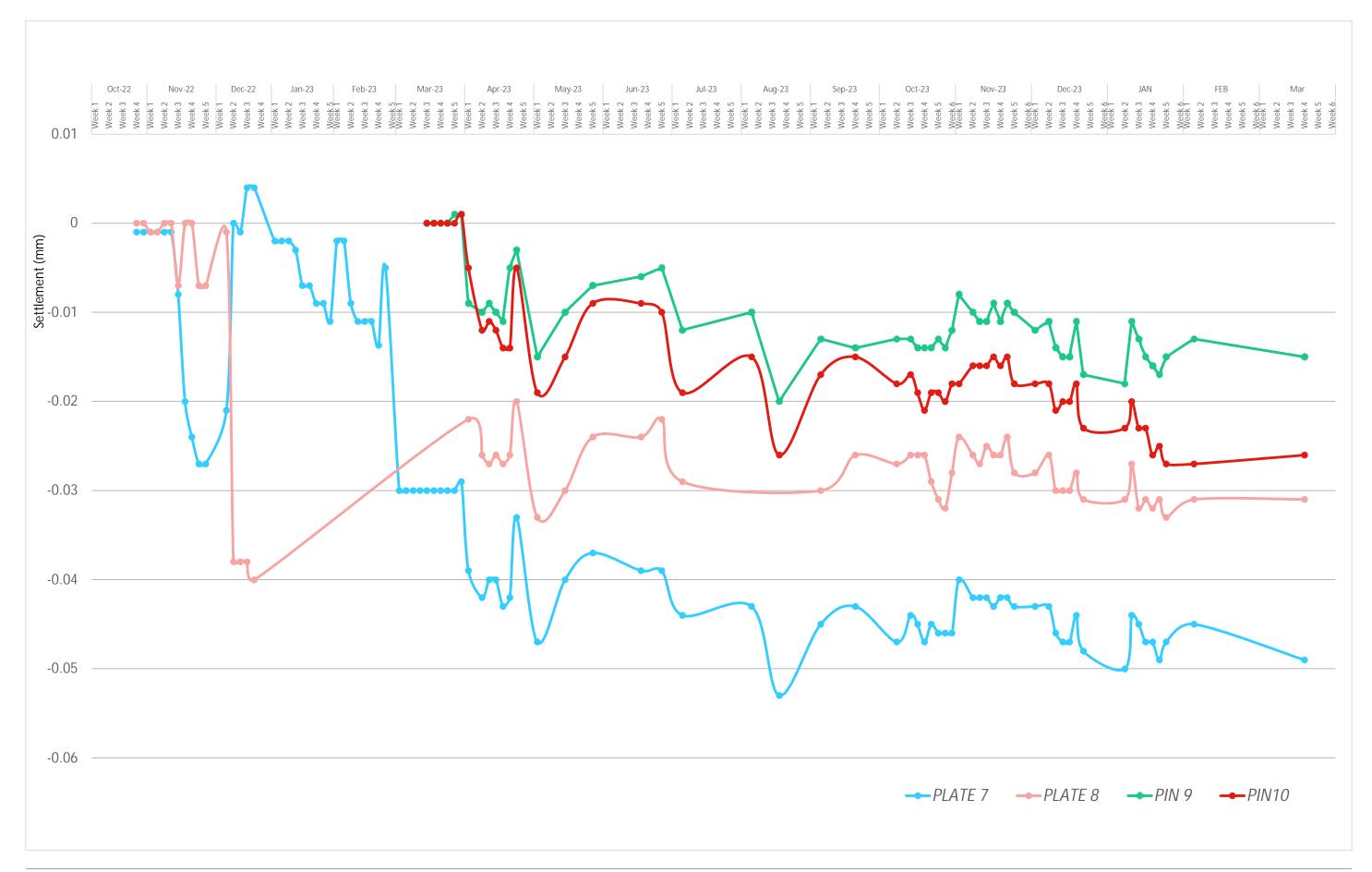
1232

Approved Signatory: Karl Rutherford



APPENDIX H: GEOTECHNICAL MONITORING REPORT







APPENDIX I: EARTHWORKS PRACTICAL COMPLETION AND CERTIFICATION LOT 1



3 July 2024

DRURY CENTRE – STAGE 1 EARTHWORKS 133 FITZGERALD ROAD, DRURY

EARTHWORKS PRACTICAL COMPLETION AND CERTIFICATION LOT 1

Woods Partners (on behalf of Kiwi Property Ltd)

AKS2023-0072 AG Rev 2



AKS2023-0072 AG		
Date	Revision	Comments
4 March 2024	А	Initial draft for internal review
6 March 2024	В	Final draft for client review
6 March 2024	0	Final issue to client
3 May 2024	1	Amendment to Final Issue to include investigation.
26 June 2024	2	Amendment to Final Issue to include bearing capacity & foundation type

	Name	Signature	Position
Prepared by	Shirantha Amarasekera	E Rock	Associate Engineering Geologist
Reviewed & Authorised by	Larry Goldfarb	Kary Goldfarl	Principal Geotechnical Engineer CMEngNZ, CPEng







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	Fill Induced Settlement	
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APPENDICES

Appendix A: Drawings

Appendix B: Earthworks Specification

Appendix C: Field Test Data

Appendix D: Inspection Records

Appendix E: Geotechnical Monitoring Report



1 INTRODUCTION

In accordance with our instructions, this Earthworks Completion and Certification Report has been prepared for Woods Partners (on behalf of Kiwi Property Ltd) following earthworks to form stage 1 of the Drury Centre development.

This report's intended use is to demonstrate practical completion for earthworks carried out as part of the stage 1 earthworks undertaken at the site. It is not intended to be used as a Geotechnical Completion Report (GCR) that is prepared upon completion of earthworks to meet the requirements of the Auckland Council Code of Practice for Land Development and Subdivision, NZS4431:2023, as there is still additional earthworks to be carried out as part of this development, including retaining walls across the south-western boundary. This report covers the earthwork certification of the filling works over the construction period of October 2023 to February 2024.

The practical completion for which this report covers is identified as the blue outlined Lot in the attached drawing CMW-SP-01 (Appendix A) and will be solely used for the purpose of certifying the earthworks for Lot 1 of the development to aid Kiwi Property Ltd in preparing this Lot for commercial use. A GCR will be provided when the stage 1 earthworks is complete.

Stage 1 of the Drury Centre Development is located at 133 Fitzgerald Road, Drury. As can be seen from the plans provided, 5 of the 16 lots have been affected by filling of 2 to 3metres maximum as part of the earthworks operations.

Construction of this subdivision has been undertaken in general accordance with;

- Auckland Council's Resource Consent number BUN60390224
- Auckland Council's Code of Practice for Land Development and Subdivision, Chapter 2 Earthworks and Geotechnical, Version 2.0, May 2023
- The following project related reports:

Project Documentation - ACCoP		
Report Type	Reference and/or Comments	
510611-002-REP-GG-002 Supplementary Geotechnical Report	Aurecon Report, Rev 1, Apr 2023	
510611 Drury Centre Geotechnical Investigation Report	Aurecon Report, Rev 5, Oct 2022	
510611-0100-REP-KF-0003 Detailed Site Investigation	Aurecon Report, Rev 2, May 2021	
Drury Bulk Earthworks Stage 1 Separable Portion 1: Completion Certification 2023 – Geotechnical Review	Aurecon Letter, May 2023 for Lots 001, 012, 013, 016, 017, 018, 019, 020, 021, 022, 101, 110, 111, 112, 301, 302, 304 & 305.	

For the construction of these stages of the development, the following roles were fulfilled as defined in NZS 4431:2022 and the Ministry for the Environment Contaminated Land Management Guidelines:

Geotechnical Fill Certifier: CMW Geotechnical NZ Limited

Sub-contractor (field test): RoadTest
 Recognised Laboratory: RoadTest
 Contractor: Ross Reid



As CMW has the role of earth fill Certifier this report has been prepared to cover that aspect of the project work.

2 DESCRIPTION OF WORKS

The bulk earthworks carried out for the period has mostly been cutting material from the elevated ground (greater than mRL 21) along the western and southwestern boundary and filling to the east of these areas.

Erosion and sediment control works and maintenance of such were carried out over the period, including the construction of Pond 2 & Pond 3.

The cut and fill Layout Plan in *Appendix* A shows that cuts of up to 9m and fills of up to 3m were required to achieve the necessary design levels for the proposed lots. For Lot 1 the southeast quarter is primarily in cut. The filling has only been achieved in part at the time of writing this letter and will soon be completed.

The extent of Earthworks undertaken to date, and that covered by this letter are shown on the Cut Fill Surface, located in Appendix A.

During the course of the site works the Contractor has submitted all QA testing conducted by RoadTest of the engineered fill (NDM and shear vane testing), which were reviewed by CMW.

3 GEOTECHNICAL QUALITY CONTROL

3.1 Site Observations

During the works, site visits were typically undertaken several times each week to assess compliance with NZS 4431 and project specific design recommendations and specifications.

Site visits were carried out to observe and confirm compliance relating to:

- Adequate topsoil stripping;
- Fill areas prior to the placement of fill materials to ascertain that all mullock, and soft inorganic subsoils had been removed:
- Placement and compaction of engineered fills.

4 QUALITY ASSURANCE TESTING

Quality assurance testing of materials was conducted by a sub-contractor (RoadTest) and was completed as required by the Geotechnical Works Specification presented in Aurecon's Report, Drury Centre Bulk Earthworks: Earthworks Specifications, Ref: 510611, Revision 1, Dated 3 December 2021 (Appendix B). Test results are presented in *Appendix C* along with our site observations, *Appendix D*.

Cohesive Materials (Soil Fill and Soil/ Rock Blended Fill) Compaction Test Criteria for Engineered Filling							
Fill Type	Air Voids ⁽¹⁾		Vane Shear Strength ⁽²⁾		Moisture Content ⁽³⁾	Dry Density ⁽³⁾	
	Average	Maximum Single Value	Average	Minimum Single Value	Maximum	Minimum	
Earth Fill	10%	12%	150 kPa	110 kPa	40%	1.3 t/m ³	
Landscape Fill	TBC by Geotechnical Engineer of case-by-case basis						



Cohesive Materials (Soil Fill and Soil/ Rock Blended Fill) Compaction Test Criteria for Engineered Filling							
Fill Type	Air Vo	oids ⁽¹⁾	Vane Shear Strength ⁽²⁾		Moisture Content ⁽³⁾	Dry Density ⁽³⁾	
	Average	Maximum Single Value	Average	Minimum Single Value	Maximum	Minimum	

⁽¹⁾ Air Voids Percentage (as defined in NZS 4402:1986)

All fill testing carried out over this period have compiled with onsite testing requirements. Subsequent testing confirmed compliance with the specification.

A series of top-down testing was conducted on the Lot. The testing comprised the drilling of a series of hand augers at discrete locations across the Lot to evaluate the bearing capacity. The hand augers are presented in *Appendix F*.

5 FVALUATION OF COMPLETED FARTHWORKS

5.1 Fill Induced Settlement

The majority of the filling on this stage of the development was placed between December 2023 and February 2024. A series of settlement markers was installed in areas of deeper fill at its completion and have been periodically monitored for both horizontal and vertical movements. Horizontal changes have been noted to be within the survey accuracy limits, while vertical movements are depicting seasonal shrink/ swell variations as anticipated. Results of the monitoring are provided in the Geotechnical Monitoring Report in *Appendix E* and generally show a plateauing of results.

On the basis of the results, we are satisfied that the compacted engineered fill has settled under the overburden weight. The anticipated settlement magnitude is consistent with the settlement monitoring readings and nearly all of the settlement of the fill has been achieved.

At the time of writing, monthly settlement monitoring is continuing for the purpose of issuing a GCR upon completion of all stage 1 earthworks.

5.2 Preliminary Foundation Design Parameters

Based on the results of the investigations to-date, we consider any future development can be founded on continuous strip footings and interior isolated spread footings with an interior reinforced slab on grade.

General foundation conditions have been included in the below table.

Preliminary Foundation Details						
Item	Methodology	Value	Comment			
Geotechnical Ultimate Bearing Capacity (GUBC) for shallow foundations		300 kPa to 400 kPa	Available within both natural volcanic soils and engineered fill area.			
Expansive Soil Site Class	AS2870	H1 (high)	Anticipated characteristic surface movement of up to 60mm (H1)			

⁽²⁾ Undrained Shear Strength (Measured by hand shear vane – calibrated using NZGS 2001 method)

⁽³⁾ Moisture content and minimum dry density non-compliance may be accepted on site by the Geotechnical Engineer on a case-by-case basis depending on the nature of the material and the other criteria results.



Preliminary Foundation Details					
Item Methodology Value Comment					
Strength reduction factors	B1/VM4 ¹	0.8	Load combinations involving earthquake overstrength		
		0.5	All other load combinations		
Seismic Site Class(es)	NZS1170	С	Alternative Site Class III.		

Based on ground conditions observed in our observations and earth fills placed under engineering control during development construction, total building loads (combination of dead and live loads) should be limited to 10kPa.

If higher geotechnical ultimate bearing capacities are required, further specific site investigation and design of foundations should be carried out prior to Building Consent application.

5.3 Further Work

Further work is recommended following purchase and development of the Lot. This entails the below recommendations for a Geotechnical Design Report to be prepared by a suitably qualified Geotechnical Engineering Consultancy.

The report should contain:

- The results of the additional investigations;
- Results of additional laboratory testing and field test data;
- confirm foundation design parameters;
- Provide design foundation retaining wall, and earthworks recommendations, including design bearing capacities and anticipated total and differential settlements;
- describe future building and/ or earthworks limitations;

apply any restrictions that require further engineering investigation and/ or design on individual lots to avoid future building works exacerbating a natural hazard.

5.4 Summary

Based on the information provided by the Contractor, our site observations and testing we consider that the engineered fill placed across the site over 2023/2024 Earthworks is in general accordance with the requirements for Engineered fill as outlined in NZS4431:1989 and in general accordance with the Aurecon specifications.

6 CLOSURE

Additional important information regarding the use of this CMW practical completion report is provided in the 'Using your CMW Report' document attached to this report.

This report has been prepared for use by Woods Partners (on behalf of Kiwi Property Ltd) in relation to the Drury Centre – Stage 1 Earthworks133 Fitzgerald Road, Drury project in accordance with the scope, proposed uses and limitations described in the report. Should you have further questions relating to the use of your report please do not hesitate to contact us.

¹ Ministry of Business, Innovation and Employment (2019) *Acceptable Solutions and Verification Methods for NZ Building Code Clause B1 Structure*, B1/VM4, Amendment 19



Although regular site visits have been undertaken for observation, for providing guidance and instruction and for testing purposes, the geotechnical services scope did not include full time site presence. To this end, we also rely on the Contractors' work practices and assume that when we have not been present to observe the work, it has been completed to standards and in accordance with the drawings, instructions and consent conditions provided to them.

Similarly, they assume that all as-built information and other details provided to the Client and/ or CMW by other members of the project team are accurate and correct in all respects.

Where a party other than Woods Partners (on behalf of Kiwi Property Ltd) seeks to rely upon or otherwise use this report, the consent of CMW should be sought prior to any such use. CMW can then advise whether the report and its contents are suitable for the intended use by the other party.



USING YOUR CMW GEOTECHNICAL REPORT

Geotechnical reporting relies on interpretation of facts and collected information using experience, professional judgement, and opinion. As such it generally has a level of uncertainty attached to it, which is often far less exact than other engineering design disciplines. The notes below provide general advice on what can be reasonably expected from your report and the inherent limitations of a geotechnical report.

Preparation of your report

Your geotechnical report has been written for your use on your project. The contents of your report may not meet the needs of others who may have different objectives or requirements. The report has been prepared using generally accepted Geotechnical Engineering and Engineering Geology practices and procedures. The opinions and conclusions reached in your report are made in accordance with these accepted principles. Specific items of geotechnical or geological importance are highlighted in the report.

In producing your report, we have relied on the information which is referenced or summarised in the report. If further information becomes available or the nature of your project changes, then the findings in this report may no longer be appropriate. In such cases the report must be reviewed, and any necessary changes must be made by us.

Your geotechnical report is based on your project's requirements

Your geotechnical report has been developed based on your specific project requirements and only applies to the site in this report. Project requirements could include the type of works being undertaken; project locality, size and configuration; the location of any structures on or around the site; the presence of underground utilities; proposed design methodology; the duration or design life of the works; and construction method and/or sequencing.

The information or advice in your geotechnical report should not be applied to any other project given the intrinsic differences between different projects and site locations. Similarly geotechnical information, data and conclusions from other sites and projects may not be relevant or appropriate for your project.

Interpretation of geotechnical data

Site investigations identify subsurface conditions at discrete locations. Additional geotechnical information (e.g. literature and external data source review, laboratory testing etc) are interpreted by Geologists or Engineers to provide an opinion about a site-specific ground model, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist due to the variability of geological environments. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. Interpretation of factual data can be influenced by design and/or construction methods. Where these methods change review of the interpretation in the report may be required.

Subsurface conditions can change

Subsurface conditions are created by natural processes and then can be altered anthropically or over time. For example, groundwater levels can vary with time or activities adjacent to your site, fill may be placed on a site, or the consistency of near surface conditions might be susceptible to seasonal changes. The report is based on conditions which existed at the time of investigation. It is important to confirm whether conditions may have changed, particularly when large periods of time have elapsed since the investigations were performed.

Interpretation and use by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a geotechnical report. To help avoid misinterpretations, it is important to retain the assistance of CMW to work with other project design professionals who are affected by the contents of your report. CMW staff can explain the report implications to design professionals and then review design plans and specifications to see that they have correctly incorporated the findings of this report.

Your report's recommendations require confirmation during construction

Your report is based on site conditions as revealed through selective point sampling. Engineering judgement is then applied to assess how indicative of actual conditions throughout an area the point sampling might be. Any assumptions made cannot be substantiated until construction is complete. For this reason, you should retain geotechnical services throughout the construction stage, to identify variances from previous assumption, conduct additional tests if required and recommend solutions to problems encountered on site.

A Geotechnical Engineer, who is fully familiar with the site and the background information, can assess whether the report's recommendations remain valid and whether changes should be considered as the project develops. An unfamiliar party using this report increases the risk that the report will be misinterpreted.

Environmental Matters Are Not Covered

Unless specifically discussed in your report environmental matters are not covered by a CMW Geotechnical Report. Environmental matters might include the level of contaminants present of the site covered by this report, potential uses or treatment of contaminated materials or the disposal of contaminated materials. These matters can be complex and are often governed by specific legislation.

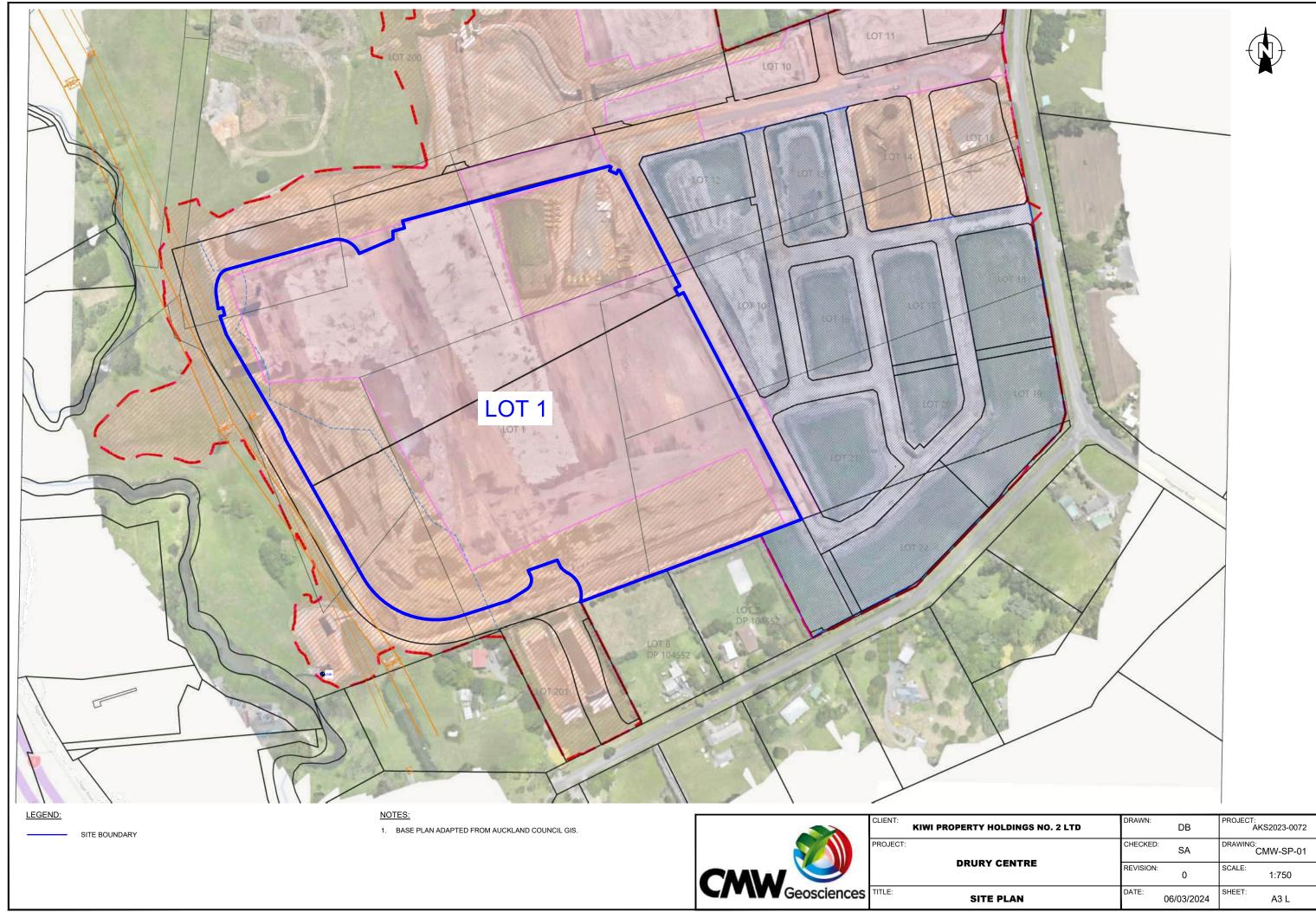
The personnel, equipment, and techniques used to perform an environmental study can differ significantly from those used in this report. For that reason, our report does not provide environmental recommendations. Unanticipated subsurface environmental problems can have large consequences for your site. If you have not obtained your own environmental information about the project site, ask your CMW contact about how to find environmental risk-management guidance.

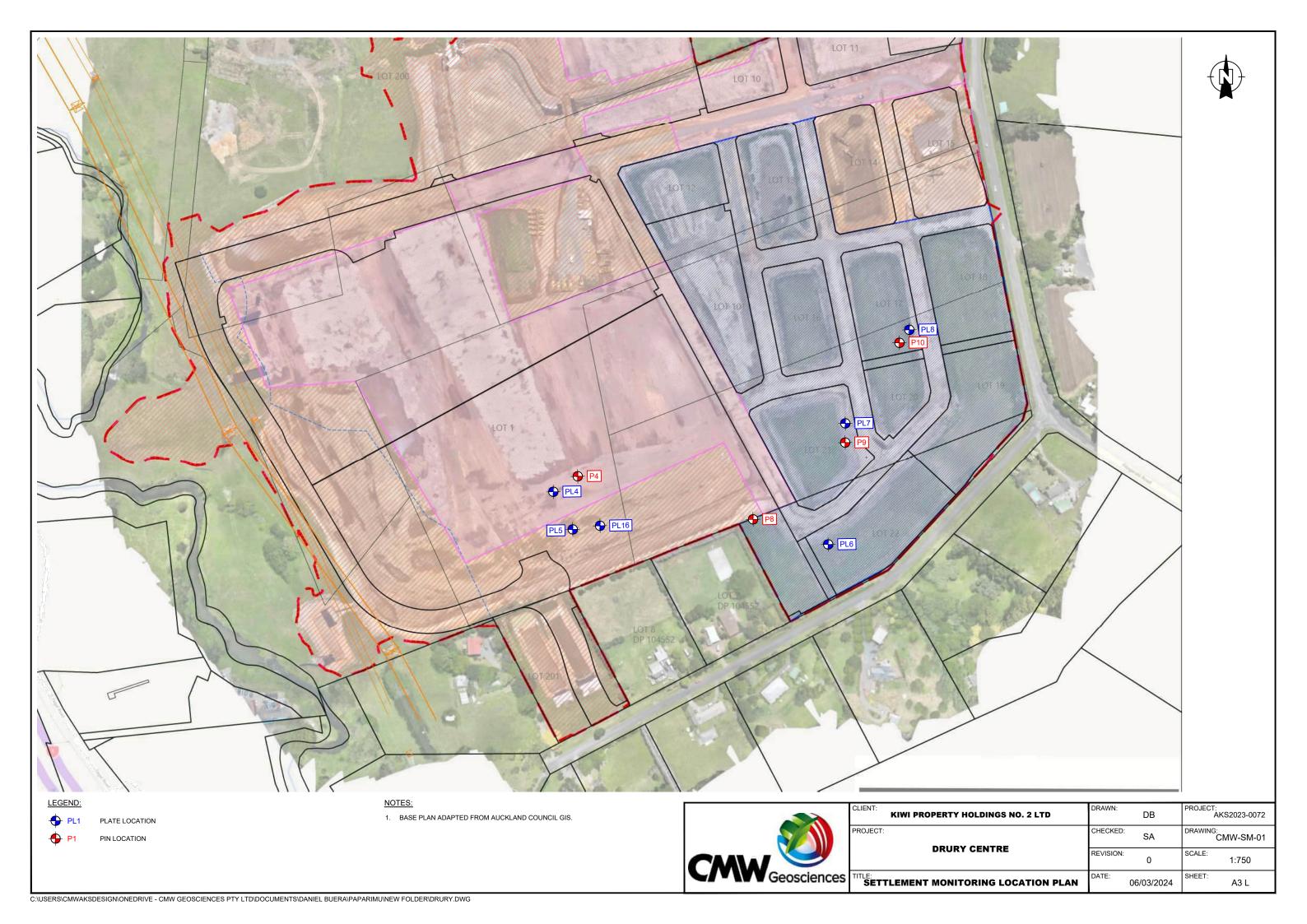


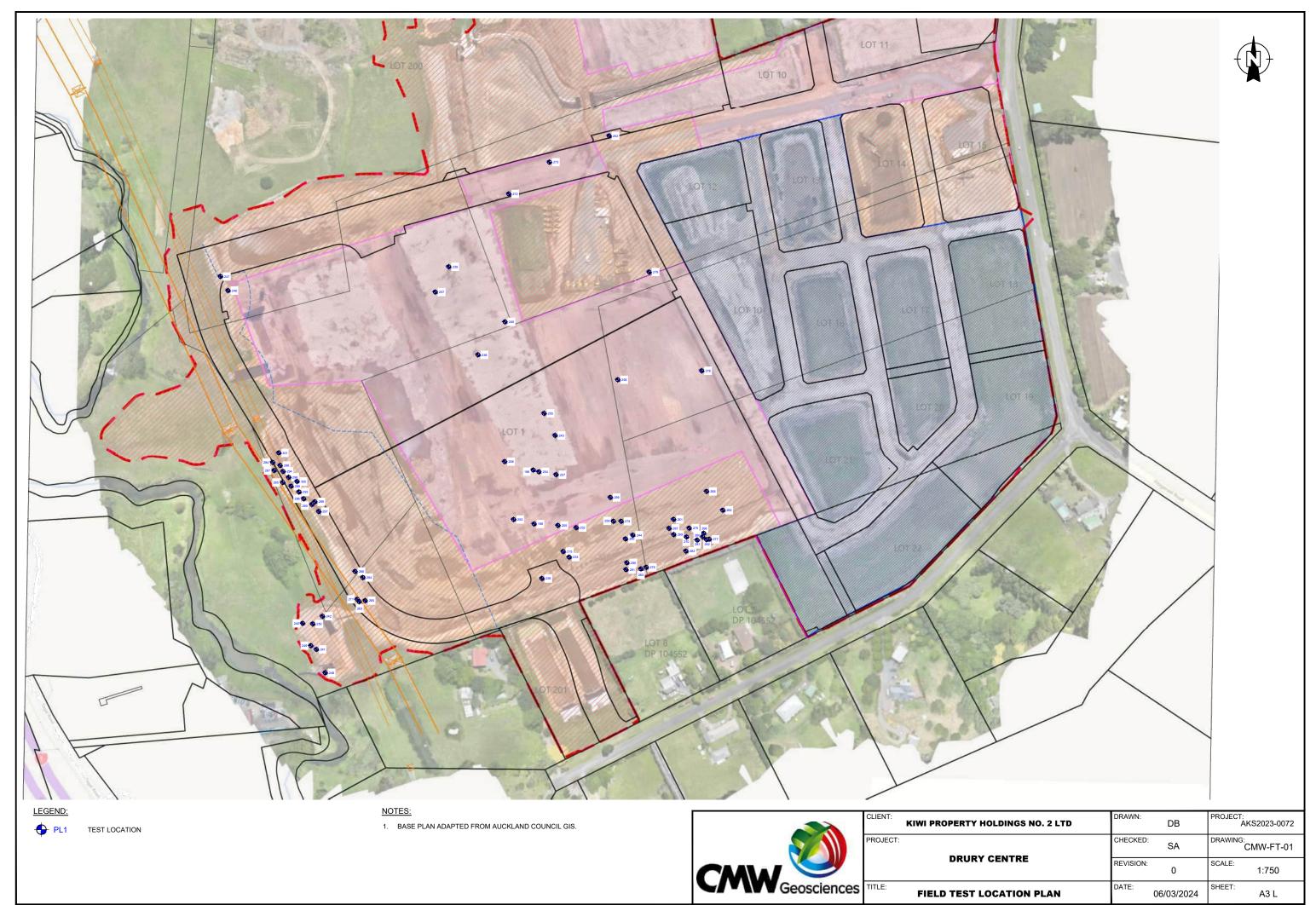


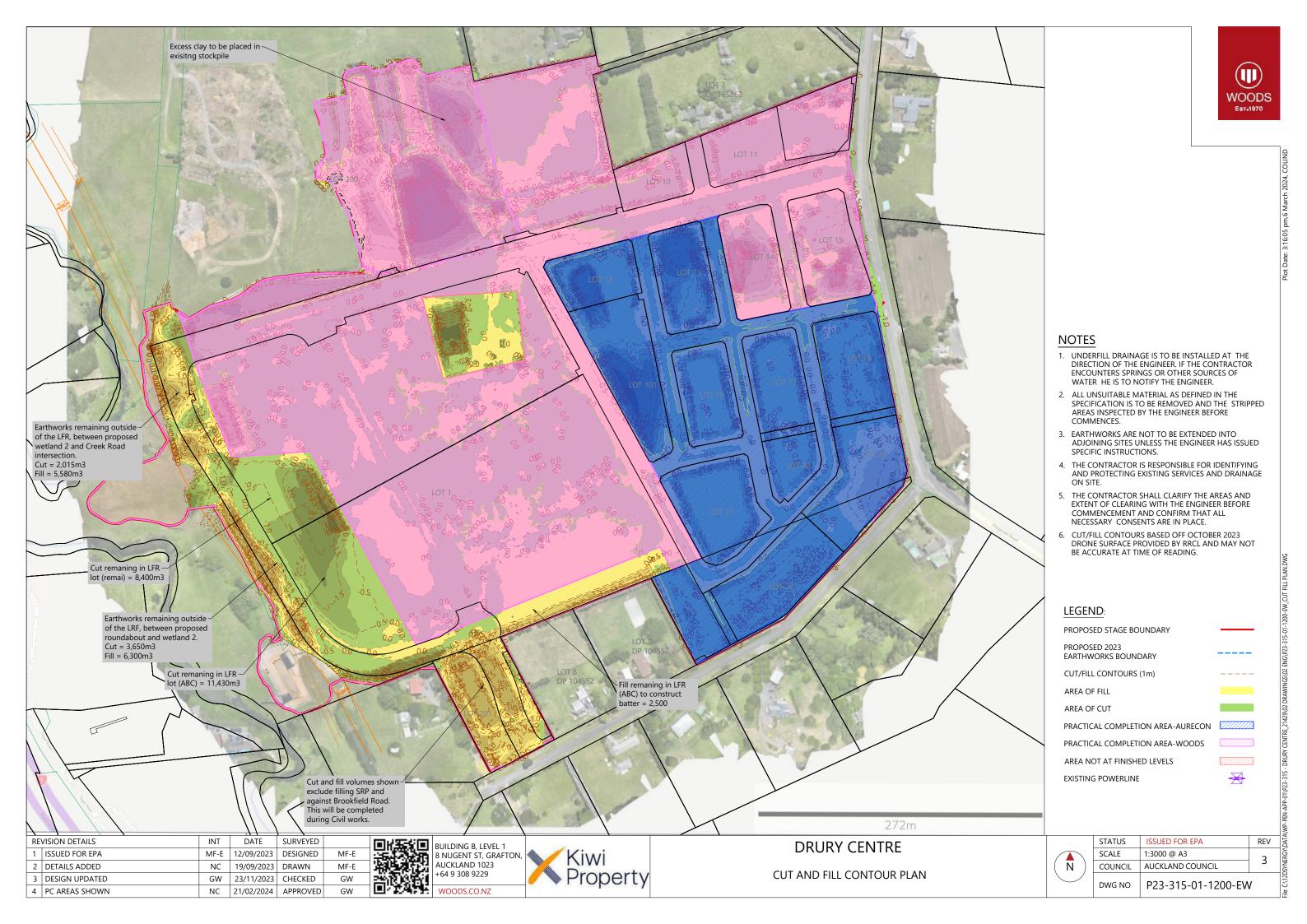
APPENDIX A: DRAWINGS

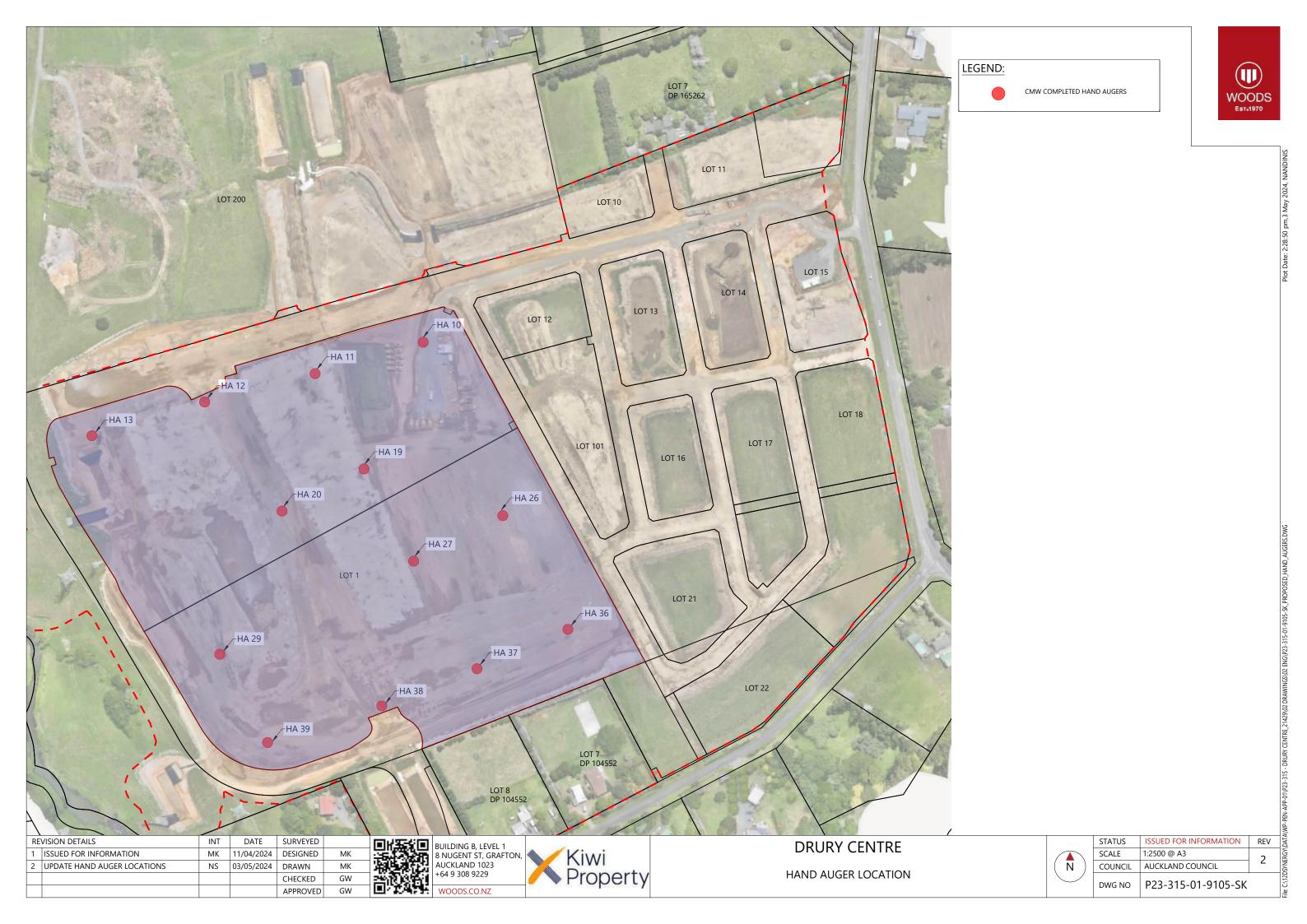
Title	Reference No.	Date	Revision
Lot 1 Site Plan	CMW-SP-01	06/03/2024	0
Settlement Monitoring Location Plan	CMW-SM-01	06/03/2024	0
Field Testing Location Plan	CMW-FT-01	06/03/2024	0
Cut Fill Contour Plan	P23-315-01-1200-EW	21/02/2024	4
Hand Auger Location Plan	P23-315-01-9105-SK	03/05/24	1













APPENDIX B: EARTHWORKS SPECIFICATION

Section 7 Drury Centre Bulk Earthworks: Earthworks **Specifications** Leading. Vibrant. Global.

Document control record

Document prepared by:

Aurecon New Zealand Limited

Level 4, 139 Carlton Gore Road Newmarket Auckland 1023

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1 Extent of Contract

The following provides a general description of the work required which is more specifically defined elsewhere in the Contract Documents.

The Contract includes the following work associated with the construction of earthworks for the Drury Centre Precinct development:

- **a)** Clearing and removal of growth, debris etc from all areas to be earthworks and its removal from site.
- **b)** Stripping of topsoil and unsuitable near surface soils over all areas to be earthworks, stockpiling and later respreading on fill batters or areas requiring landscaping.
- c) Excavation and placement of parts of the excavated material as compacted fill. Disposal of surplus excavation material and excavated contaminated material to an appropriate site licensed to receive the material.
- d) Importation, placement and compaction of bulk fill.
- e) Installation and monitoring of settlement plates and pins.
- f) Mulching and/or grass seeding earthworked areas not stabilised by other means
- **g)** Tidying of all areas disturbed by the works so the site is left in a tidy condition compatible with the surrounding natural environment.
- h) All compliance testing and inspection as required in the specification

The Contractor shall supply all labour, materials, plant and supervision necessary to complete the work in accordance with the Contract Documents.

2 Particular requirements

2.1 Resource Consent

The Resource Consents shall be obtained by the Engineer and shall form part of the Contract Documents. The Contractor shall familiarise itself with the Consents and meet all conditions set down for the works.

2.2 Construction Consents

The Contractor shall uplift all construction consents required from Auckland Council, Auckland Transport and Watercare

Confirmation that all construction consents are in hand shall be provided to the Engineer on request but in no case later than 20 days after acceptance of tender.

2.3 Utility Service Operators

Underground and overhead cables exist around the site. The Principle will arrange for the power and telecommunication disconnections from the public network. On-site water, sewer and stormwater are not connected to any public network and the removal of this needs to be allowed for in the tender schedule.

2.4 Summary of Testing Requirements

The testing requirements of this Specification in relation to earthworks and pavements are summarised below for convenience. Preferred testing methods are suggested, however all test methods meeting the requirements of NZS 4402 will be accepted.

Table 1: Summary of testing requirements

Material	Criteria	Method
Earth fill	Top 1m	Preferred
	98% of Maximum Dry Density (MDD)	Beneath Roads
	Greater than 1m Depth	Nuclear Density Meter (NDM) test at a rate of 1 test per 20m in each traffic lane
	95% of Maximum Dry Density (MDD) All	All other earthworks areas
	Moisture content +/- 2% of Optimum Moisture Content (OMC).	Nuclear Density Meter (NDM) test at a rate of 1 test per 500m ³ , or, a minimum of 1 test per 0.5m thickness of fill is being placed. Whichever is greater.
	<or=10% 10="" 12%="" a="" air="" any="" average="" based="" be="" calculated="" density="" for="" individual="" laboratory="" maximum="" of="" on="" over="" p="" solid="" test.="" test.<="" tests="" to="" voids="" with=""></or=10%>	Each NDM test shall comprise 2 measurements using the same probe hole but orientated at 90 degrees to each other.
	Vane shear strength. Minimum average of 150kPa for 10 tests. Minimum of 110kPa for any one test.	Shear vane test at a rate of 2 tests per 500m³, or, a minimum of 1 test per 0.5m thickness of fill is being placed. Whichever is greater.

		Undrained shear strength of the compacted soil at any			
		test location shall be taken as the mean of a set of tests, comprising 3 tests undertaken within an area of 0.5m ² of each other.			
		Alternative			
		New Zealand standard compaction test (NZS4402, Test 4.1.1).			
Subgrade	CBR	Dynamic Cone Penetrometer test (NZS 4402, Test 6.5.2			
Subgrade	On-site inspection with Engineer	Proof roll on site - Two axle truck with twin tyres on rear axle, loaded to eight tonnes on the rear axle			
Sub-base	Mean > 98% of Max. Dry Density (MDD) Min > 95% of MDD	Preferred			
		Roads			
		Nuclear Density Meter test at a rate of 1 test per 20m in each traffic lane			
		Building platforms or other hardstand areas			
		Nuclear Density Meter test at a rate of 1 test per 10m ²			
		Alternative			
		MDD to be the greater of:			
		New Zealand vibrating hammer compaction test (NZS4402, Test 4.1.3).			
		Plateau Density Test on a test strip of approx. 50m and at an appropriate water content			
Sub-base	CBR > 40%	Dynamic Cone Penetrometer test (NZS 4402, Test 6.5.2)			
Base course	Mean > 98% of MDD	Preferred			
	Min > 95% of MDD	Roads			
		Nuclear Density Meter test at a rate of 1 test per 20m in each traffic lane			
		Building platforms or other hardstand areas			
		Nuclear Density Meter test at a rate of 1 test per 100m ²			
		Alternative			
		MDD to be the greater of:			
		New Zealand vibrating hammer compaction test (NZS4402, Test 4.1.3).			
		Plateau Density Test on a test strip of approx. 50m and at an appropriate water content			
Base course	95% of the deflections measured shall not exceed:	Benkelman Beam test			
	0.8mm for Principal and Collector Streets				

- 1.0mm local streets
- 1.3mm for short local streets and cul-de-sacs

With no measurement exceeding 25% of the above for the particular category.

3 Preliminary and General

3.1 Site Location

The location of the Site and means of access are described on the Drawings. Tenderers shall, before submitting tenders, inspect the site and shall satisfy themselves as to the nature and extent of the work and its feasibility.

The Contractor shall be responsible for the provision of suitable access to and through the Site, and shall make all arrangements necessary with adjacent property owners and with Local and Statutory Authorities.

The Contractor shall limit the areas occupied whether with huts, plant, storage, earthworks or by entering upon land with staff to the areas defined by the Drawings as areas upon which work is to be carried out.

3.2 Site Office, Power, Water and Conveniences

The Contractor shall erect, maintain and, at the completion of the works remove any necessary site offices and other accommodation for Contractor's staff and workmen, and shall make these facilities available for use by the Engineer's Representative during site meetings and inspections.

The Contractor shall make his own arrangements for the supply of power and water for construction purposes. Conveniences for work people shall be provided by the Contractor in accordance with any appropriate by-laws and awards.

3.3 Health and Safety (H & S)

For the duration of the contract, the Contractor shall fulfil its obligations under the Health & Safety at Work Act 2015 and associated Regulations.

3.3.1 Health and Safety Plan

Prior to commencement of work the Contractor shall supplement the H & S information provided in the tender with the provision of a full Site-specific H & S Plan. The plan shall cover the safety of both Contractor's staff and any other people or vehicles that may be on the site or pass through or adjacent to the site during the period of the Contract works. The Contractor shall implement, actively manage and adhere to the plan at all times.

Without limiting the Contractor's obligation to identify and manage all safety issues the Safety Plan should cover as a minimum, the following:

- · Specific hazards and methods of dealing with them
- A process of identification and management of new and existing hazards

- Safety equipment that will be provided and used
- A copy of the accident reporting process
- Arrangements for consideration of issues arising between Contractors and Subcontractors on site
- A schedule of health and safety meetings
- Nominated site staff who will be responsible for managing site health and safety and their relevant training.
- Management staff with overall responsibility for health and safety
- · Procedures for dealing with visitors to the place of work
- Procedures for employee participation in health and safety on site
- Audit procedures
- Procedures for dealing with public movements on or around the project site.
- Procedures for managing emergencies including site evacuation procedures and telephone numbers of relevant company officers and emergency services.

The Contractor shall update and/or modify the H & S plan and its management on an on-going basis as project experience, project staging, or requirements of the Engineer or regulatory bodies may necessitate. Any such changes shall be reported directly to both the Principal and Engineer with reasons.

3.3.2 Site Hazards

The following hazards are identified but the list is not exhaustive and the Contractor shall satisfy itself of all hazards on the site and include these within its Health and Safety Plan.

Site hazards include:

- Contaminated soil
- Trench excavations
- Construction plant
- Fences
- Motor vehicles on adjacent public road
- Public moving adjacent to or through the site
- Above ground cables
- Below ground services
- Open storm drains or streams
- Open silt ponds
- Movement of plant and equipment on site

3.3.3 Suitability of H and S plan

The Engineer reserves the right to withhold approval to commence work if in his/her opinion the H & S plan is not provided or not appropriate to the specific site works. Any approval to commence work given or implied by the Engineer shall not be taken as an approval of the contents of the H & S plan, the preparation and management of which shall be the responsibility of the Contractor.

3.3.4 Health and Safety Compliance

The Contractor shall take all practicable steps to ensure the safety of its employees while at work, and to ensure that no action or inaction of its employees while at work harms any other person.

In particular, the Contractor shall take all practicable steps to:

- Identify hazards.
- Provide and maintain a safe working environment at all times
- Provide and maintain facilities and protective equipment for the safety and health of its employees while they are at work
- Ensure that plant used by an employee at work is designed, made and maintained so that it is safe for use and stored in an appropriate secure environment when not in use
- Ensure that all work carried out for or by the Contractor and all practises and procedures comply
 with all applicable Acts of Parliament, Regulations, Codes of Practice and industry good practice
 and guidelines.
- Ensure that while at work its employees are not exposed to hazards arising out of the arrangement, disposal, manipulation, organisation, processing, storage, transport, working or use of things in their workplace or under the Contractor's control
- Ensure that all employees are adequately trained and supervised in safety procedure relevant to the work being undertaken
- Ensure that emergency response procedures are in place at all times and there is suitable first aid equipment and suitably trained first aid personnel on site at all times.

The Contractor's Health and Safety systems shall also ensure that all practicable steps are taken to ensure the safety of others including:

- Its Subcontractors and the Subcontractor's employees
- Other Contractors working at the place of work
- Members of the public or any other persons or vehicles who may be within or in the vicinity of the site.

3.3.5 Multi Contractor sites

Where there are multiple Contractors who have no sub contractual relationship to the Contractor, on a working site then the Contractor shall work with the Principal and other contractors to agree on overriding health and safety procedures for the site to ensure consistent site wide health and safety systems. Implementation of such site wide systems shall not in any way limit the Contractors health and safety obligations under the Health & Safety at Work Act 2015 and as set out in the Contract documents.

3.3.6 H & S Reporting

The Contractor shall provide regular reports to both the Principal and Engineer as follows:

- i. Immediate reporting (telephone and email with time record) of:
 - Any fatalities and lost time injuries to staff or others working on the site.
 - · Any public accidents or injuries.
 - Any serious harm.

 Any plant breakdowns or accidents, or any spills that create a potential health, safety or environmental risk.

The above matters shall also be reported to OSH, Police, Council, NUO, etc as applicable.

- ii. Written reporting within 24 hours (including follow up reporting in the above cases) of the occurrence of any accident, incident or event, with information on the outcomes and consequential Contractor actions, including the desirability of modifications to H & S systems
- iii. Fortnightly (unless otherwise approved by the Engineer) written reporting of issues during the previous period and expectations for the next period. The report contents shall be agreed between the Engineer and Contractor, but as a minimum shall cover:
 - Confirmation that all H & S systems are in place and being actively managed.
 - H & S accidents /incidents during the period and outcomes.
 - Notifiable works being undertaken and confirmation that notifications have been given to the appropriate regulatory bodies.
 - Subcontractors or "other" contractors on site and any associated H & S issues.
 - Confirmation that all equipment on site meets H & S requirements and is currently certified where applicable.
 - Tool box or other safety meetings or courses provided to the site team or individuals.
 - Any other relevant H & S issues and any needs to modify the safety plan or systems with reasons.

The report shall include H & S expectations for the next period based on the expected work programme and the above contents as applicable.

3.3.7 Notifiable Works

The Contractor shall notify the appropriate Worksafe office of work that is notifiable under the relevant regulations 24 hours prior to starting the work. The Contractor shall maintain notification records and make them available upon request.

3.4 Public Safety

Without limiting the Contractors Health & Safety obligations the Contractor shall take all practicable measures to ensure the safety of the public, vehicles, and livestock in and around any work site, including as a minimum the following:

- provide fences, barriers, signs, lights and other devices as necessary to manage the safe movement of traffic, persons and livestock
- fill, cover, enclose and light all holes, ponds or excavations that could cause a safety risk
- · enclose the contract works by suitably secure fencing whenever necessary to ensure public safety
- if agreed with the Engineer as being necessary for public safety, close off the site and/or adjacent areas to the public. Where any closure requires public notification, work with the Engineer to arrange such notification and meet any legal timing requirements.

3.5 Requirements of Authorities

The work is to be carried out in accordance with the Contract Documents and the requirements of Territorial Authorities having jurisdiction over the area in which the work is located and utility operators

having jurisdiction over utilities in or around the site. The Contractor shall ascertain and become familiar with any such requirements prior to commencing work.

The Contractor shall obtain and uplift such permits/consents as may be required by Local or other Authorities and allow for the payment of all such fees or levies in the tender rates.

Authorities or utility operators may require inspections of the work at various stages of construction to ensure their requirements are being satisfied. The Contractor shall establish which inspections are required, and shall arrange for the inspections to take place. Failure to arrange inspections may result in work being rejected.

Should the Authorities or utility operators request modifications to the Work specified in the Contract Documents, the Contractor shall notify the Engineer before proceeding. Where the Contractor considers such modifications may constitute an extra payment under the terms of the Contract, any claim will be considered only when the modifications have been approved by the Engineer, prior to their being undertaken.

The approval of the work by the Authorities and utility operators will be required before the issue of the Certificate of Practical Completion.

3.6 Compliance

The Contractor shall be deemed to have allowed for all work associated with the safe and orderly carrying out of the demolition work, including complying with all Territorial Authority requirements, demolition consent, Building Act, WorkSafe NZ requirements, and all other acts, laws, by-laws and regulations that may affect the execution of the contract. No variations will be allowed on the grounds of ignorance of the site or the buildings on it or adjoining, or the conditions under which the work will be executed.

3.7 Discrepancies

The Contractor is deemed to be competent and experienced enough to interpret the Contract Documentation to ensure successful system completion and operation.

Any ambiguities in the Design Drawings and Specifications and the balance of the Contract Documents should be noted. The Contractor shall provide the details of its initial review to the Engineer within one month from the Date of Acceptance of the Tender or issue of the Design Drawing set (whichever is the later). The Contractor shall not be entitled to Claim for additional Costs and/or time for ambiguities in the Design Drawings and Specification and the balance of the Contract Documents discovered after submission of the initial review.

After this initial review period has taken place any discrepancies, ambiguities or conflict noted will be the responsibility of the Contractor and no variation and or extension of time will be claimable.

3.8 Noticeboard

The Contractor shall erect and maintain in a prominent position at the entrance to the site a signboard displaying the name of the project, the name of the Principal, Engineer and Contractor, and telephone numbers indicating where the Contractor's Representative may be contacted after working hours.

3.9 Publicity and Signs

The Contractor shall not make statements to the media regarding policy, road conditions or contractual matters. All enquiries are to be directed to the Engineer or Principal.

3.10 NZTA Specifications

The following NZTA Specifications, including all current amendments shall be read with and form part of the Contract Documents. Whilst the listed NZTA Specifications are not provided within the Contract Documents they are available on line from the NZTA web site. Copies of these NZTA Specifications are available for inspection at the office of the Engineer during business hours.

NZTA B/2	Construction of Unbound Granular Pavement Layers
NZTA E/2	Performance of Bitumen Distributors
NZTA E/3	Performance of Road Marking Paint Applicators
NZTA F/1	Earthworks Construction
NZTA F/5	Corrugated Plastic Pipe Subsoil Drain Construction
NZTA F/6	Fabric Wrapped Aggregate Subsoil Drain Construction
NZTA M/1	Asphaltic Bitumens
NZTA M/4	Basecourse Aggregate
NZTA M/6	Sealing Chips
NZTA M/7	Roadmarking Paints
NZTA M/10	Dense graded, stone mastic and fine graded asphalt paving materials.
NZTA M/12	Raised Pavement Markers
NZTA M/13	Adhesion Agents
NZTA M/14	Edge Marker Posts
NZTA P/3	First Coat Sealing
NZTA P/4	Resealing
NZTA P/9	Construction of Asphaltic Concrete Paving
NZTA P/12	Pavement Marking
NZTA P/14	Installation of Raised Pavement Markers
NZTA Q/1	Quality Assurance for Chip Sealing
NZTA Q/3	Normal Quality Assurance Level Contracts

3.11 Underground Services

The locations and extent of underground and above ground services where shown on the Drawings are provided for the information of Tenderers, but no guarantee is given as to the correctness or completeness of this information. The Contractor shall notify all applicable Network Utility Operators (NUO's), search all records and have field markouts of all services undertaken by the relevant NUO, to best available accuracy standards, at least one week in advance of the work, and shall be responsible for their protection, and for the cost of repair or replacement of any services damaged by neglect of this requirement.

Any work required on an existing live utility service shall be undertaken by the relevant Network Utility Operator (NUO) or its approved contractors. The Contractor shall be responsible for coordinating and attending upon any such NUO works.

The Contractor shall ensure that any existing utility surface openings are kept clean and undamaged for the project duration.

Should interruptions to services be required, or if there is a possibility that they may be interrupted as a result of work, a thorough investigation must be made to ensure no other areas/users will be affected.

3.12 Protection of Property

The Contractor shall minimise any inconvenience to any persons affected by the work and shall prevent nuisance by dust, mud, stockpiled materials or noise. Unless otherwise specified the Contractor shall not unduly delay the legal passage of persons or vehicles through or within the site of the works. Where it is necessary to restrict access to public or private property prior notice shall be given to persons affected. Access shall not be completely restricted for longer than 24 hours without prior approval of the Engineer.

The Contractor shall protect all Contract Works from damage on the site and adjoining areas. This requirement includes supporting of structures, walls, fences and protecting all services and property which may, unless so protected, be damaged as a result of the execution of the Contract Works.

Whereby reason of activities of the Contractor damage results to any public or private property including roads, footpaths, structures, trees or gardens, such damage shall be made good by the Contractor without extra payment to the satisfaction of the property owner.

If, at any stage during the work, the Engineer determines by inspection that further work in accordance with the Contract is likely to damage any work or adjoining public or private property, the Engineer may require the Contractor to carry out adequate measures to prevent such damage occurring. Where such measures are, in the opinion of the Engineer, beyond the requirements of the original Contract, additional payment will be made for such work.

3.13 Road, Pavement and Kerb Protection

The Contractor shall provide and maintain all temporary roads, temporary pavement crossovers, hard standings washing down facilities and associated drainage, etc. as necessary to ensure that mud is not carried on to adjacent roads or paved areas by vehicles leaving the site. Vehicles removing spoil, rubbish, etc., from the site shall not be loaded beyond their normal capacity and shall be fitted with proper tail-boards and side - boards to eliminate the dropping of spoil or rubbish. Roads and paths, if fouled by spoil, concrete or other material, shall be cleaned immediately to the extent of washing if necessary or as directed by the Engineer.

The Contractor shall protect permanent roads, pavements, footpaths, kerbs and crossovers as required for access and carrying out of the Contract Works. Any rectification or upgrade costs of damage by vehicles and / or weather to bring the road to a design level as specified in this Contract shall be the responsibility of the Contractor.

The Contractor shall remove temporary roads, paths and crossovers prior to Practical Completion, or when no longer required, and make good and / or reinstate all permanent roads, pavements, footpaths, kerbs, crossovers, street channels, street and other surfaces to the satisfaction of the Engineer and the relevant Authorities, at the Contractor's cost.

3.14 Site Maintenance, Clean Up and Restoration

The Contractor shall keep the site clean and tidy at all times. Contractor to pay continuous attention to the removal of litter, waste materials, garbage and refuse including food scraps, vermin control and the like.

The Contractor is responsible for the supply and removal of skips and bins. Skips and bins shall not restrict traffic in carriageways and must be illuminated at night. The location of Contractor's skips and bins shall be accepted by the Engineer as part of the EMP, and shown on their site Control Plan.

Debris must not be stored within stairways, passages or exits. All debris, including food scraps, shall be removed from site and placed in bins. The Contractor is required to ensure that the work area is kept clean and tidy and that bins are emptied on a regular basis. Bins and debris shall be removed before holiday periods at Easter, Christmas and prior to public holidays.

For dropping refuse, the Contractor must use hoppers and shutters, chutes or refuse buckets which are covered or of such a design as to confine the material completely and prevent dust emission.

All spoil from earthworks shall be removed by the Contractor from the site.

Prior to the issue of the Practical Completion Certificate, the Contractor shall remove from the site and all areas used by it for the purpose of the Contract, all temporary Works, plant, buildings, rubbish, unused Materials, construction facilities and other Material and equipment belonging to it and its Subcontractors or used under its direction, and leave the Site and such other areas clean and tidy to the satisfaction of the Engineer.

The Contractor must properly dispose of all solid, liquid and gaseous contaminants in accordance with all statutory requirements and remove from site.

3.15 Work Standards in Private Property

The process through which the Contractor is to undertake work in private properties is outlines below:

- The Contractor shall notify private property owners at least one week prior to starting construction on their property
- No trench shall be open for longer than 2 weeks on an individual property
- The Contractor is to inform all residents in the event of a variation to the original programme of works, in writing within 24 hours of the variation
- All requests for information by the Resident shall be attended to by the Contractor within 24 hours
- The Contractor is to complete all works in private property by the deadlines supplied on the submitted programme of works
- There shall be no instances where unreasonable actions on the part of the Contractor may prejudicially affect the goodwill and reputation of the Council
- Reinstatement's shall be completed in accordance with the agreements included in the tender documents
- All reinstatement's shall be completed within 1 week of the trench being backfilled

3.16 Quality Management

3.16.1 Introduction

This Contract shall be completed in accordance with the requirements of NZTA Specification Q/3 for Normal Quality Assurance Level Contracts - TQS2.

The Contractor is responsible for quality control measures which incorporate all techniques including checking and testing required to ensure construction meets all the requirements of the Drawings and Specifications.

If the Engineer tests any part of the works and finds that it is not in compliance with the specified requirements, the Contractor shall be liable for the cost of testing, including any costs incurred by the Engineer or Principal.

All necessary producer statements and Contract Quality documentation including Inspection Checklists shall be provided by the Contractor before the Certificate of Practical Completion is issued.

3.16.2 Recommended Check/Inspection/Tests, etc

Check/inspection/tests and their regularity shall be identified by the Contractor in the Quality Plan but as a minimum the following shall be included:

- Programming and performance against programmes
- · Health and Safety status and issues
- Traffic and pedestrian control
- Survey and set out
- Landowner liaison
- · Daily site weather and activity summary
- Procedures for field checking of utility service location
- Recording of pipe sizes, strengths testing regimes as applicable
- Compaction testing regimes for bulk earthworks and pavements and name of independent testing organisation.
- Material specifications, sources and how ongoing quality is to be controlled, including type and regularity of field laboratory testing and recording – Refer also the section on "Compliance Testing by Contractor" within this Specification
- Construction tolerances, check levels for pavement layers, drains, etc.
- Seal materials and binder application rates, including design basis and weather conditions during sealing

Sampling and testing materials and measurements checks on completed layers shall be carried out by a registered laboratory engaged by the Contractor at its cost.

Where NZS test or other recognised test method is not applicable the Contractor shall detail the equipment to be employed and prescribe the method to be used to show compliance with the contract documents.

The Engineer shall not be bound to accept any work where QA results indicate non-conforming materials, work outside of tolerance or unacceptable work methods. The Engineer shall also not be bound to accept any QA results if independent verification checks, tests or measurements show a variation those submitted by the Contractor.

No payment will be certified for scheduled items claimed by the Contractor until the Contractor has submitted completed compliance documentation to the Engineer for such completed work.

3.17 Compliance Testing by Contractor

The Contractor shall be responsible for compliance testing on materials and work standards used in the Contract.

a) Bulk fill

The Contractor shall engage a suitably qualified independent testing laboratory or Consulting Engineer to test and monitor the fill preparation and placement and provide a certificate confirming that the compaction works have met the Specification standards at the end of the project. The certificate shall include suitable drawings to show the position (location and level) and results of all testing undertaken.

3.18 Engineer's Verification and Inspections

From time to time the Engineer may without advance notification, arrange for his/her own testing or inspection of any part of the works or plant or materials being used in the works. When requested, the Contractor shall facilitate access for the Engineer or the Engineer's advisers and attend on them as required, all at no extra cost to the Contract.

Should the Engineer find evidence of non-conforming materials or workmanship or results at variance with any certified Quality Control Checklist, the Quality Representative/Manager, on request from the Engineer, shall supply within one working day a Non-Conformance Report (NCR) including a written explanation for the variance detailing what remedial action has been taken.

Where the Contract Documents provide for inspections by the Engineer, or the Engineer has given notice of a wish to inspect items of work, the Contractor shall give the Engineer at least 24 hours' notice of the need for the inspection.

The Engineer accepts no responsibility for being unable to attend the site if inadequate notice is given. In such cases no work on the particular aspect of the project will be allowed until the inspection has been made and no time extensions will be allowed for the delay.

Where the Engineer carries out inspections or testing and finds the work inspected or tested has not been completed in accordance with the Specification, thereby requiring further involvement of the Engineer or specialist testers or advisers then the Engineer reserves the right to charge all such extra work to the cost of the Contractor.

Where the Engineer identifies non-compliance even where the contractors Quality Assurance shows complying work, the Engineer may stop the work until it is confirmed that work standards or materials comply. In such cases all costs associated with the stop work and all remedial measures required to achieve compliance shall be borne by the Contractor.

3.19 Engineer's charges

Where the Engineer incurs costs associated with addressing issues relating to non-conforming work or additional inspections as provided for within this Specification and Contract Conditions, costs will be deducted from money due or becoming due to the Contractor.

Costs will be based on time and expense based on the following rates:

Engineer to the Contract \$270/hour

Engineer's Representative \$150/hour

Other Professional Personnel \$130/hour
 Vehicle \$1.00/km
 Expenses \$ as incurred

(All costs exclusive of GST). Expenses will include costs such as specialist laboratory or field testing services and use of specialist advisers where deemed necessary by the Engineer.

3.20 Setting out

The Contractor shall locate and verify survey marks and datum points required to set out the works. The Contractor shall record and maintain their position.

The Contractor shall set out all the work in accordance with the pegs and levels shown on the Drawings or Instructions supplied by the Engineer, and to do so shall employ suitable qualified personnel equipped with all necessary instruments.

If any survey marks or pegs are in the way of the Contractor's operations, the Engineer shall be informed who will advise on action to be taken.

The Contractor is to take all practical steps to protect survey pegs, survey marks and datum points during construction. Should the reinstatement of any pegs be required as a result of poor construction practice, the reinstatement will be at the Contractors cost.

3.21 Noise

The Contractor shall minimise noise generated during this project and arrange the works so as to minimise the effects of any noise on the public. Construction noise shall comply with noise limits as stated in any Resource Consent conditions, the requirements of NZS 6803, the requirements of the Resource Management Act sections 326, 327 and 328 and the Health and Safety in Employment Regulations Clause 11.

The Contractor shall minimise the effects of noise generation by including in the planning of the work such factors as placing of plant, programming the sequence of operations and other management functions.

The Contractor shall comply with the requirements set out below including the requirement that noise should not exceed the workplace exposure limited set by WorkSafe NZ.

The Contractor shall comply with:

- All regulations under health and safety legislation with regard to acceptable noise exposure for employees. Noise assessment and management shall be in accordance with the guidelines in NZS 1269:2014 Occupational Noise Management Parts 0-4 in particular hearing protector selection as outlined in Part 3.
- NZS 6803:1999. This standard covers noise emitted by construction and maintenance works and outlines acceptable upper noise limits at neighbouring areas. Table 2 shall apply to the Contract Works, that is the site shall be treated as a residential area. The limits apply outside neighbouring buildings; one metre from the façades and 1.2 to 1.5 metres above the relevant floor level.
- Conditions of the relevant Consents.

The method of measurement and assessment of noise form construction, maintenance and demolition work shall be accordance with NZS 6801:2008 Acoustics - Measurement of Sound, except for as expressly provided in NZS6803:1999. The various sound measurement and assessment terms and

parameters discussed above are described fully in NZS 6801:2008 Acoustics - Measurement of Sound.

The Contractor is to notify the neighbours and parties affected of the proposed programme of works via a letter drop.

The Contractors shall ensure that all items of noise producing plant on site are equipped with silencers and noise insulation to reduce noise at source to the lowest levels achievable in terms of the best of current low noise equipment design. The Engineer has the right to order the removal and replacement of plant at no cost to the Principal, if the Contractor has not complied with this clause and better low-noise plant is available.

3.22 Vibration

Vibration is always to be minimized on the site and within the vicinity of the site.

Construction vibration monitoring shall be undertaken to demonstrate that all vibrations to third party buildings or structures generated from construction activities are less than the maximum limits recommended in the German Standard DIN 4150-3:1999 "Structural Vibration – Effects of Vibration on Structures". In the first instance the Contractor shall undertake vibration monitoring at the property boundary. Additional monitoring inside the neighbouring property shall be undertaken where the vibration limits at the boundary exceed the above standard, or where complaints are received. Where access is granted such additional monitoring shall be undertaken either outside the building but connected to the building foundation, or inside the building. The peak particle velocity (ppv) limits which are to be applied are summarised in Table 1 and Figure 1 or as otherwise required by the Resource Consent.

The Contractor shall undertake vibration monitoring at the beginning of each phase of the Works, or when construction plant or methodology changes that is likely to result in an increase in the vibrations emitted, to demonstrate compliance with the above vibration limits. All vibration monitoring shall be undertaken by appropriately qualified and experienced personnel approved by the Engineer.

All vibration monitoring shall be undertaken at a time approved by the Engineer, when construction operations are most likely to result in maximum vibrations at the site boundaries. Vibration measurement instruments shall be placed by the Contractor at varying distances from the site to ensure that vibration is within the limits set out in the DIN standard 4150-3:1999, and to ensure that effects from vibration on occupants of adjacent structures are no more than minor.

The Contractor shall note that building occupants may notice or be disturbed by vibrations at levels lower than those cited in DIN 4150-3:1999 (i.e. vibration is perceptible at levels above 0.3 mm/s), which might give rise to complaints. This vibration is often due to occupants concern over building damage, and can generally be mitigated through effective consultation regarding the project objectives and timeframes, vibration monitoring and demonstration to the occupant that vibration levels are within acceptable levels. The Contractor shall take responsibility for liaison and discussions with neighbouring occupants to relay this information to them, and to keep them informed of construction activities and programme. On request of the Engineer, the Contractor shall provide vibration records to the occupants. The Contractor shall also take all practicable steps to minimise disruption to the occupants as much as possible.

Where required by the Resource Consent, the Contractor shall prepare a Construction Vibration Plan in accordance with this section. This is to form part of the Construction Management Plan.

Table 2: Summary of Vibration Velocity Limits During Construction

	Maximum Permitted Vibration Velocity (mm/s)			
Type of Structure	Foundation Frequency (Intermittent)			Foundation
	Less than 10 Hz	10 to 50 Hz	50 to 100 Hz ^(a)	Frequency (Continuous)
Residential Structures Residential dwellings and buildings of similar design and/or use	5	5 to 15	15 to 5	5
Sensitive Structures Structures that, because of their sensitivity to vibration, do not correspond to those listed above and of great intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	3

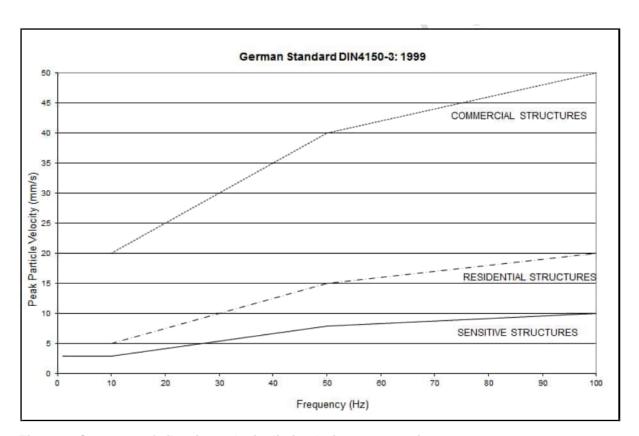


Figure 1: Summary of vibration velocity limits during construction

3.23 Dust and Sediment

The Contractor shall be responsible to ensure that adjacent residents, business proprietors or other members of the public suffer no inconvenience or hardship from dust or sediment arising by any means whatsoever from the works during the course of the Contract. The Contractor shall allow for the prevention of such a dust nuisance or sediment runoff in its scheduled rates.

Remove dirt and droppings deposited on public or private thoroughfares from vehicles servicing the site to the satisfaction of the appropriate authorities and the Engineer.

3.24 Construction Programmes

The Contractor shall, at the time of preparing their tenders, prepare an outline construction programme and satisfy themselves of the feasibility of constructing the Work with the plant, labour and materials available within the specified time.

Unless otherwise described in the Conditions of Contract, within fourteen days following the date of the Letter of Acceptance of Tender the Contractor shall submit for the Engineer's review a detailed Construction Programme showing the proposed sequence for carrying out the work and the construction methods, plant and labour to be employed, all in accordance with the Contract Documents and with the critical path indicated. The Engineer will have the right to reject or modify any such programme which is not in the interests of the Principal, and the first progress payment will not become due until a satisfactory modified programme has been received.

3.25 Hours of Work

No construction work under the Contract, other than emergency or maintenance work, shall be undertaken between the hours of 9:00 p.m. and 7:00 a.m., nor at any time on a Sunday or Easter Friday, Easter Sunday, Anzac Day and Christmas Day without the prior permission of the Engineer and of any Public Authority whose consent may be required.

3.26 Site Reports and Meetings

Unless otherwise directed, at all times when no work is being undertaken at the site, the Contractor shall arrange for the telephoning or emailing of a message to this effect to the Engineer. These reports shall be made before 9:00 a.m., in order to assist the Engineer in avoiding wasted site visits. Where the Contractor fails to provide these reports resulting in the Engineer undertaking unnecessary site visits such costs will be deducted from Contract sums owing.

The Contractor shall arrange for the attendance of its Representative and key Sub-contractors at regular site meetings with the Engineer for the purpose of reviewing the progress and quality of the work. Unless otherwise directed, site meetings shall be held each week at a venue and time approved by the Engineer.

3.27 Traffic Control

3.27.1 **General**

To ensure the safety of Contractors staff and road users, a high standard of traffic control complying as a minimum with the NZTA "Code of Practice for Temporary Traffic Management" (COPTTM: Fourth Edition, August 2015) will be required. In areas where work is likely to have the potential to disrupt traffic the Contractor shall submit in writing a Traffic Management Plan (TMP) detailing the methodology for traffic control including a plan of the proposed sign placements and the name of the Traffic Control Supervisor who will be responsible for Traffic Control on a day to day basis.

No work shall commence on the site prior to the Engineer's written agreement that the Contractor's Traffic Management Plan has been accepted. The Contractor is to advise all staff and subcontractors working on the site of their responsibilities to the Traffic Control Supervisor.

The TMP shall be considered a living document through the project. Where problems on the site, or ongoing experience with a TMP indicates changes or improvements should be made the TMP shall be modified and resubmitted to the Engineer with reasons for the proposed changes. Costs associated with any changes shall be borne by the Contractor.

3.27.2 Traffic Control Inspections

Traffic control inspections shall be undertaken at least once daily by the Contractor seven days per week and more frequently should faults occur. Any identified non-compliance to the Traffic Management Plan shall be rectified immediately. The Contractor is to pay particular attention to the condition of all temporary and permanent traffic signs, edge marker posts and raised pavement markers within the Site. These should be checked as part of the daily traffic control inspection and any identified as missing or damaged shall be replaced within two hours (applies 24 hours a day, 7 days per week). All signs and delineation devices shall be regularly cleaned to be free of grime and dust.

3.27.3 Edge Delineation

Edge delineation shall be maintained by the use of either temporary or permanent reflectorised marker posts. Where the use of marker posts is not practicable, other means of delineation in accordance with COPTTM shall be provided. Permanent marker posts shall be reinstated before the removal of the temporary guidance. Edge marker posts shall comply with NZTA M/14 Specification.

3.27.4 Non-Conforming Traffic Control

If during the course of the Contract the Engineer is required to investigate complaints of inadequate traffic control by the Contractor, then, if it is found to be non-conforming, the Engineer shall be reimbursed by the Contractor for the costs and disbursements for such investigation. Reimbursements shall be set out in the section of this Specification entitled "Engineers' Charges".

3.28 Permanent Signs and Marker Posts

The Contractor shall locate accurately and record on a plan the positions and number of existing traffic facilities, road edge marker posts, route position markers, etc.

The Contractor shall be responsible for the maintenance of all existing marker posts, route position pegs, advisory, warning and information signs and shall replace to the Engineer's satisfaction any that are lost, stolen or damaged.

3.29 Notification of Works

At least 1 week prior to commencement of work the Contractor shall notify land owners affected by the works of the likely start of the physical works.

The Contractor shall either send a copy of letters sent out to the Engineer, or shall write to the Engineer certifying that such notification has been made.

3.30 Land entry

Right of entry onto private property will be obtained by the Principal.

3.31 Facilities to be Provided and Maintained by the Contractor

3.31.1 Site Accommodation and Facilities ('Site Sheds')

The Contractor shall provide and erect a neat group of site sheds constructed from uniform materials in an area indicated on the Site Plan.

The site accommodation and facilities provided by the Contractor shall include a secure site office and an area that could function as a first aid / sick-bay. The Contractor must provide, in addition to the site office and other amenities, the following facilities for use by the Engineer, Consultants and Principal when visiting site:

- Access to Contractor's drawings;
- Safety hats, vests and boots for up to six (6) people; and
- Meeting space of sufficient size to accommodate the typical attendee numbers for a regular Site Meeting.

No temporary or permanent desk space for the Engineer, Consultants or Principal is required. All temporary buildings and structures should be maintained in good order during currency of the Contract and shall be removed at Practical Completion of the Contract Works, unless otherwise agreed by the Engineer.

3.31.2 Site Office

The Contractor shall establish an office on the site to deal with the matters relating to this Contract. The offices shall be under the personal control of the Contractor's Representative who shall have full authority to deal with and carry out the following:

- a) All communications with the Engineer;
- b) Ordering of material and goods; and
- c) Financial matters except those of a major nature as may be agreed by the Engineer.

3.31.3 Site Hoarding

The Contractor shall install and maintain all necessary hoardings and fences, screens, gates, footways, gangways, gantries, platforms, temporary walls and enclosures, etc., to protect the Contract Works, persons and property.

The location of the hoarding shall be agreed with the Engineer and Principal.

Gates shall be provided as required for construction access, egress and emergency use from the site. A key to the lockable gate(s) shall be provided to the Principal via the Engineer at the commencement of the Contract Works to enable emergency access.

3.31.4 Project and Temporary Signage

The Principal will supply and install project and general promotional information signage to the 'public' side of the site hoarding.

The Contractor is responsible for the cost and provision (including production, erection, maintenance and removal) of all necessary temporary construction signage including all required statutory and information signage to identify the site, advise safety control measures, hazardous materials and dangerous goods stored within the site, and re-direct non-construction vehicular and pedestrian traffic around the perimeter of the site in accordance with the TMP.

Any proposed signage, excluding directional and safety compliance / statutory signage, must be approved by the Principal prior to installation via the Engineer to Contract. This approval includes any signage to cranes and the like.

3.31.5 Water and Sewer

The Contractor shall connect to water and sewer points nominated by the Principal. The Contractor shall meet all costs for connection and disconnection. The Principal will pay for reasonable consumption costs.

3.31.6 Sanitary Provisions

The Contractor shall provide toilet facilities for its own and its Subcontractors use. The Contractor shall provide water tight refuse bins for use by its workforce. The Contractor is responsible for connection

and disconnection to the Principal's sewer. The Contractor is to have satisfied themselves that the available sewer system is sufficient for the site needs. Any additional permanent or temporary facilities are fully at the Contractors cost.

3.31.7 **Security**

The Contractor shall be wholly responsible for the proper and adequate safeguards for the Contract Works and for all fixed and unfixed Materials on the site during both working and non -working hours, throughout the Contract.

The Contractor shall receive, check, record and secure all equipment, Materials and supplies being delivered to the site and stored within the boundaries of the site.

The Contractor shall ensure all tools, equipment, Materials and supplies are stored and used in accordance with the manufacturer's directions and any statutory requirements governing their storage or use.

When the site is left unattended, the Contractor must ensure that all points of entry to the site are locked and any other means or points of access are prevented.

3.31.8 First Aid and Medical Facilities

The Contractor shall in all respects be fully responsible for the provision of first aid services to its employees and employees of its Subcontractors and suppliers, including coordinating the transport of injured personnel to hospital or other appropriate facilities as and when required.

3.32 Cleanliness of Site

The Contractor shall take precautions to keep the site and adjacent public areas, roads etc free of debris and mud. Adequate vehicle washing facilities shall be provided at all times on the construction site and all vehicles shall be cleaned free of mud and debris prior to passage on to public streets.

The Contractor shall programme such work accordingly and allow in the Contract rates for all such costs which may be necessary to meet these requirements. If the measures taken by the Contractor are not adequate the associated work shall cease and remedial measures may be taken by the Engineer at the Contractor's expense.

3.33 Removal of Materials

Unless approved otherwise by the Engineer all surplus material shall be moved from the site immediately as it becomes surplus.

On completion of the Contract the Contractor shall remove any surplus material used in connection with the works, leaving the area of his operations tidy and free from debris.

3.34 Clean Up and Maintenance

On completion of the work, the Contractor shall remove all construction plant, buildings, surplus materials and garbage, and leave the site clean and tidy to the satisfaction of the Engineer.

The work shall be maintained for the length of the Defects Liability period and this shall include the repair of damaged road surfacing whether the result of faulty material, workmanship, vandalism or wear and tear.

3.35 Statements to the Media

The Contractor shall not make statements to the media regarding policy, road conditions or contractual matters. All inquiries are to be directed to the Engineer or the Principal.

3.36 Cultural Monitoring

There is a requirement for the contractor to engage with local iwi organizations throughout the lifecycle of the project. In more detail, participate in consultation with representatives of Ngai Tai ki Tamaki, Ngati Tamaoho, Ngaati Whanaunga, Te Akitai Waiohua, Ngati Paoa and Ngati Te Ata in respect of their request to undertake cultural monitoring, Karakia and other such religious or cultural ceremonies where appropriate, associated with the following milestones:

- a) Pre-start meeting
- b) Following the completion of pre-commencement works
- c) Implementation of sediment control measures
- d) Prior to completion of bulk earthworks across the site

3.37 Payment

The costs associated with complying with these Preliminary and General requirements of the Specification shall be included in the rates and amounts tendered in the Schedule in accordance with this Specification.

4 Clearing and Stripping

4.1 Scope

The work specified in this section covers the clearing and disposal of vegetation and other unwanted material and the stripping and stockpiling of topsoil from within the area of the work as defined in the Drawings.

The Contractor shall supply all plant, materials, labour and supervision for the clearing and stripping of all such materials as is required for the proper execution of the work.

4.2 Clearing

The area of the work shall be cleared of all obstructions except those specifically required to remain. Clearing shall include complete removal from the site of buildings, foundations, trees, logs, scrub, grass, roots and other vegetation, paving materials, fences and garbage.

All trees within the limits of the earthworks shall be felled unless otherwise specified. Trees and other vegetation beyond the limits of the earthworks shall be disturbed only when directed or approved by the Engineer. Any trees specifically designated by the Engineer shall be protected from damage by the Contractor's operations.

4.3 Disposal

Unless otherwise specified, all material cleared shall become the property of the Contractor, and shall be removed from the Site and disposed of in a safe and legal manner and so as not to inconvenience the owners of adjoining property. The Contractors shall pay any tip fees required.

Burning of material will not be permissible.

4.4 Stripping

All topsoil, turfs, humus and organic material remaining after the clearing of vegetation shall be stripped from the surface of the ground within the limits of the earthworks, to such depth as is directed by the Engineer.

Topsoil is defined as the top layer of soil characterised by the presence of organic matter. The more suitable topsoil shall be stockpiled separately and neatly for later respreading. The location and size of stockpiles shall be subject to the approval of the Engineer. Surfaces of topsoil stockpiles shall be rolled smooth to minimise erosion and unless otherwise specified shall be sown with clover seed at a coverage of 10 grams per square metre.

4.5 Measurement and Payment

Where provided for in the Schedule, measurement for payment of clearing shall be by plan area of ground surface cleared in accordance with the Contract. Additional payment will be made for individual trees felled or structures demolished and disposed of if such items are shown in the Schedule. Measurement for payment of stripping of topsoil will be by volume measured in stockpiles.

Payment at the scheduled rates or amounts for clearing and stripping shall include for all costs associated with this work. Where separate items for clearing and stripping are not shown in the Schedule, payment shall be included in the rates or amounts scheduled for earthworks.

5 Sediment Control and Environmental Management During Construction

5.1 Scope

This Specification covers the precautions to be taken by the Contractor to control erosion and sediment effects and minimise related damage or environmental deterioration to the Works, surrounding property, or receiving environment during the period of the Contract including the Defects Liability period and any longer period when required by the Contract Documents.

The Contractor shall supply all system design, plant, labour, materials and supervision necessary to ensure the satisfactory construction, operation and maintenance of the environmental protection systems throughout the contract period and beyond as necessary until the construction works and any drainage changes are stabilised to a standard where risk of adverse effects from the works are minimal.

5.2 Design Methodology

An Environmental and Earthworks Management Plan (EMP) supported by associated design calculations and drawings as necessary shall be prepared by the Contractor and provided to the Engineer before commencement of any earthworks or construction having potential to have adverse effects on the works, the neighbourhood or the broader receiving environment.

The EMP shall be a comprehensive plan incorporating earthworks methodology, sediment and dust control, treatment of dewatering flows, and any other environmental measures necessary to manage potential adverse effects from the works and meet Resource Consent conditions.

Design and construction management techniques for avoiding adverse effects from the works shall be in accordance with the design codes adopted by the controlling environmental authority and current good practice. Detailed design of mitigation measures such as isolating features, fences, cut off ditches, detention ponds etc shall be undertaken by a suitably qualified person employed by the Contractor.

5.3 Techniques for Managing Adverse Effects

Although the Contractor shall retain responsibility for the design and implementation of environmental protection during the works a number of basic management principles shall be followed. In particular:

- a) Areas being earthworked or otherwise disturbed at any one time shall be kept to a minimum.
- b) As soon as any reasonable sized earthworked area has been completed to final grade or a stage where it will be left for two months or more it shall be surface stabilised by topsoiling and grassing or similar approved method to minimise runoff, erosion, dust nuisance and improve appearance.
- c) Light soil or sand areas may require coating with mulch or similar to avoid wind-blown nuisance.
- d) Surfaces of fills in progress shall be shaped to prevent materials yet to be compacted from becoming saturated, to prevent erosion and to prevent ponding on the fills (except where the areas are designed as ponding or settlement areas).
- e) Diversion ditches and catch drains shall be used to divert upslope catchments around areas of earthworks.

- f) Catch drains or similar interception methods shall be used where feasible to intercept stormwater from disturbed areas and divert it to designed settlement areas and ponds before providing for managed discharge to natural gullies, waterways or other receiving area.
- g) Where works are immediately adjacent to live waterways measures shall be taken to separate the live waterway from the works if at all possible and to cut off any silt or debris from being suspended into the waterway.
- h) Temporary riprap or other anti-erosion methods shall be used where discharges could erode natural slopes.
- i) Brush or filter mesh fences, hay bales, detention ponds and other techniques shall be used as necessary to limit erosion and collect water borne soil in a way that manages adverse downstream effects on streams and natural water bodies.
- j) Topsoil, excavated soil or other material shall be located in positions where the risk of erosion into the receiving environment is minimised and shall be encircled with cut off drains and filter fences as appropriate to ensure such risk is further avoided.
- k) Washing and cleaning facilities shall be provided to ensure trucks and other plant does not carry silt or dust onto public roads or private roads owned or partially owned by other parties.

In all cases the requirements of any applicable Resource Consents shall be met.

5.4 Management of Protection Systems

Prior to, during, and following rain the Contractor shall arrange for attendance by plant, labour and supervision to ensure safe operation of protection systems, including isolation bunds, settlement ponds, catch drains, detritus fences and outlets and the like.

Detention and interception facilities shall be cleared and maintained regularly to insure they perform in accordance with their design throughout the contract period and beyond as necessary. Silt, debris, etc, removed from interception and settlement works shall be spread to dry in areas approved by the Engineer and disposed of as directed, either as material for use in the construction of earth fill or by removal to dumps away from the site.

5.5 Modification to Protection Systems

If at any time during the contract the performance of the environmental protection systems, or ongoing review of them, indicates that they need to be extended or modified the design modification and construction shall be undertaken by the Contractor at no extra cost to the Principal.

5.6 Environmental or Property Damaged

Where environmental or property damage occurs to any party as a result of works being undertaken or not undertaken by the Contractor such damage shall be repaired by the Contractor to the satisfaction of the property owner or authority involved, without additional payment.

5.7 Measurement and Payment

The cost of complying with these requirements of the Specification shall be included in the amounts tendered for this item in the Schedule of Prices or, if no separate item is shown, in the rates and amounts for the various items of earthworks construction.

Where the Engineer directs that material won from settlement ponds be removed from the site, such cartage and disposal will be measured and paid for as an additional item.

6 Excavation

6.1 Scope

The work specified in this section covers the excavation of earth and rock to form the land as detailed on the Drawings. The Contractor shall excavate out all material above the finished levels or contours of the site or above road formation levels where applicable, making due allowance for restoration of topsoil and the construction of pavements, foundations and underground utilities.

The Contractor shall supply all plant, materials, labour and supervision necessary to carry out the work in accordance with this Specification.

6.2 Preliminary

The Contractor shall satisfy itself as to the nature of the ground to be excavated prior to submitting a tender. Where subsurface information obtained by the Engineer is made available, it is done so without guarantee as to its accuracy or completeness. Tenderers shall make their own deductions as to the nature and conditions of the materials to be excavated and to the accuracy or completeness of the information provided.

6.3 Environmental Management

During construction, the Contractor shall take all necessary measures to manage the earthworks methodology and the minimisation of adverse environmental effects on the site and receiving environment by compliance with the requirements of the Specification entitled "Sediment Control and Environmental Management during Construction", and environmental good practice.

Unless otherwise provided in the Schedule, no separate payment will be made for this work. Its costs will be considered to be included in the various rates or amounts scheduled for earthworks items.

6.4 Operation of Plant

The Contractor shall be responsible for the determination of suitable types of plant to carry out the excavation operations in accordance with the Contract.

6.5 Mixing of Materials

Where materials being excavated include mixtures of topsoil, unsuitable material and material suitable for use as earth fill, the excavation shall be carried out as far as is practicable so as to avoid mixing the materials.

6.6 Disposal

All material removed from the excavation, and which is approved as suitable by the Engineer, shall be used as far as practicable in the construction of fills or for backfilling within the Work.

Excavated material shall not be removed from the Site without the consent of the Engineer. Surplus or unsuitable material which is approved for removal shall become the property of the Contractor and shall be disposed of away from the site in a safe and legal manner.

6.7 Undercutting

Any excavation taken to greater depths than shown on the Drawings, without authority of the Engineer and any unauthorised excavations shall be backfilled with suitable material compacted in layers in accordance with the requirements of the Specification for "Earth Fill", without further payment.

6.8 Slips

Slips of material from cut batters or natural ground shall be removed and disposed of as specified. Slips with an in-place volume exceeding 10 cubic metres will be paid for at the appropriate scheduled rate or amount for excavation, provided such slips did not result from any foreseeable action or inaction by the Contractor.

6.9 Maintain Excavation

Secure and maintain excavations free from slips, erosion, water and other fluids or fallen materials. Provide and maintain all pile liners, shoring, strutting, sheet piling, planking, pumps and other materials or plan necessary for carrying out and maintaining excavations and remove them where no longer necessary.

The cut face of any slopes created during excavation shall be monitored daily by the Contractor before any work is undertaken under the excavated slope. Should the condition of the slope the be deemed unsafe in the opinion of the Contractor, the Engineer shall be notified immediately, and allowance shall be made to inspect the slope.

6.10 Inspection

No backfilling shall be placed until the relevant area has been inspected by the Engineer.

6.11 Finished Surfaces

The finished surfaces of excavation shall conform to the levels, lines, grades and contours shown on the Drawings, within the tolerances specified. Where not otherwise specified any point on the finished surfaces shall conform to the following tolerances in respect of the levels shown or inferred on the Drawings: -

Subgrade Surfaces - +10mm/-50mm

Slopes flatter than 1 on 6 - +/-50mm

Slopes of between 1 on 6 and 1 on 2 - +/-100mm

Slopes steeper than 1 on 2 - +/-200mm

Vertical or near vertical excavations shall be of adequate dimension to enable safe access and placing of formwork etc.

Finished surfaces may vary from the designated slope or level by the tolerances shown above measured at right angles to the slopes, but any variations shall be gradual so as not to impair the appearance of the surface or hold ponded water. Finished surfaces excavated for the construction of structures, concrete work, etc., shall be completed to a level such that the detailed dimension of such structures, etc., is achieved.

Where excavations abut against undisturbed ground they shall be trimmed to conform with the shape of the adjacent ground so that the profile is continuous and compatible.

6.12 Classification of Material

Unless otherwise stated in the Schedule of Prices, materials excavated will not be classified for payment and no additional payment will be made for the excavation of any material, which is hard, cemented, wet, dry or otherwise.

6.13 Stockpiling

Any material intended for reuse shall be stockpiled in locations that have been pre-approved in advance by the Engineer. Stockpiles where practical shall be located neatly outside the excavated areas but not so as to jeopardise the ground stability or affect access ways of the wider site.

6.14 Dewatering

The Contractor shall keep excavations free from water, and shall provide all pumps, drainage pipes and other equipment required for this purpose. Where prior approval is obtained from the Local Authority, discharge into existing stormwater drains will be permitted but adequate settling chambers shall be constructed to trap silt. Should deposition occur in existing drains as a result of the operations of the Contractor such deposits shall be cleared immediately by the Contractor at its own expense.

6.15 Safety and Ground Support

Safety procedures in excavation shall comply with the requirements of the WorkSafe NZ for notifiable work and the published Code of Practice for Excavations.

6.16 Measurement and Payment

Where provided for in the Schedule of Prices, materials excavated will be measured for payment by volume *in situ* after clearing and prior to excavation, to the levels, lines, grades and contours shown on the Drawings.

Materials excavated will be paid for at the appropriate scheduled rate or amount tendered for earthworks. Where classification of excavated material is provided for in the Schedule of prices, payment will be at the appropriate rate or amount for the type of material excavated, as classified by the Engineer.

Except where otherwise provided, the scheduled rates or amounts for excavation or earthworks shall include all work associated with excavation in accordance with this Specification, together with all work associated with the transport and disposal or with the spreading and compaction as fill of the excavated material as specified here and elsewhere.

7 Excavation and Filling for Building Platform and Site Works

7.1 Scope

The work specified in this section covers the excavation of existing surfaces including earth and rock to provide for building floors and foundations or non-trafficked slab areas. The Contractor shall excavate out all materials above the finished levels or contours of the site where applicable, making due allowance for restoration of topsoil and the construction of pavements, foundations and underground utilities.

The Contractor shall provide all plant, materials, labour and supervision necessary to carry out the work in accordance with the Specification.

7.2 Preliminary

The Contractor shall satisfy himself as to the nature of the ground to be excavated prior to submitting a tender. Where subsurface information obtained by the Engineer is made available, it is done so without guarantee as to its accuracy or completeness. Tenderers shall make their own deductions as to the nature and conditions of the materials to be excavated and to the accuracy or completeness of the information provided.

7.3 Extent of Work

The Contractor is to provide a finished platform level to the earthworks level shown on the Drawings. A protective layer of metal is to be placed and compacted on the building platform as shown or topsoil placed and respread.

7.4 Operation of Plant

The Contractor shall be responsible for the determination of suitable types of plant to carry out the excavation operations in accordance with the Contract.

7.5 Mixing of Materials

Where materials being excavated includes mixture of topsoil, unsuitable material and material suitable for use as earth fill, the excavation shall be carried out as far as is practical so as to avoid mixing the materials.

7.6 Disposal

All material removed from the excavation, and which is approved as suitable by the engineer, shall be used as far as practicable in the construction of fills or for backfilling within the Work. Excavated spoil required for backfilling of trenches and around foundations and pits, where practical shall be deposited neatly alongside the excavation, but not so as to jeopardise the stability of the excavation.

Excavated material shall not be removed from the Site without the consent of the Engineer. Surplus or unsuitable material which is approved for removal shall become the property of the Contractor and shall be disposed of away from the site in a safe and legal manner.

7.7 Undercutting

Any excavation taken to greater depths than shown on the Drawings or the Engineer's written instructions, shall be backfilled with engineered fill to the proper level in accordance with the Engineer's instructions.

7.8 Maintain Excavation

Secure and maintain excavations free from slips, erosion, water and other fluids or fallen materials. Provide and maintain all pile liners, shoring, strutting, sheet piling, planking, pumps and other materials or plan necessary for carrying out and maintaining excavations and remove them where no longer necessary.

The cut face of any slopes created during excavation shall be monitored daily by the Contractor before any work is undertaken under the excavated slope. Should the condition of the slope the be deemed unsafe in the opinion of the Contractor, the Engineer shall be notified immediately, and allowance shall be made to inspect the slope.

7.9 Inspection

No backfilling shall be placed until the relevant area has been inspected by the Engineer.

7.10 Hardfilling

Hardfill material shall be good quality metal of approved origin, well graded and able to be compacted to a dense layer, maximum size 80mm. It shall be free from silts or clays which will cause it to weave when wet. The filling shall be spread in layers of loose thickness not greater than 200mm and compacted to achieve not less than 95% of the maximum dry density obtained for the hardfill material in accordance with NZS 4402: 1986: Test 4.1.1. The Contractor shall ensure suitable weather, metal type and moisture content to enable proper compaction without developing soft spots or weaving. Any areas where excessive deflections occur shall be removed and replaced at the Contractor's expense.

7.11 Basecourse Material

Aggregate for construction of basecourse layers immediately below slabs, foundations etc, shall be crushed rock, free from silt or clay lumps, weathered or disintegrated rock, organic and other non-mineral matter.

Basecourse material shall comply with the NZTA Specification M/4:2006 "Specification for Basecourse aggregate", Grading AP40. In regions where NZTA provides for a Regional basecourse, this material may be approved for use subject to the Contractor notifying this intent in the tender and gaining approval for its use prior to entering into a contract. In all cases the percentage of broken faces shall be at least 70%.

Tests to check compliance with NZTA Specifications shall be carried out on representative samples of the aggregate selected from bin, stockpile or truck.

7.12 Placing and Compaction of Basecourse

Basecourse material shall be placed and compacted in layers with an uncompacted thickness not exceeding 150mm and not less than 50mm. Each layer shall be compacted by multiple passes of a smooth steel wheeled roller or other plant approved by the Engineer, to not less than 98% of the maximum dry density obtained for the basecourse material by the New Zealand Standard Compaction

Test (NZS 4402, Test 4.1.1), and so as to satisfy deflection requirements as specified by the Local Authority.

Compaction of basecourse shall take place at a water content appropriate to the plant being used. If water is required to be added, a fine mist spray shall be used and excess water shall be prevented from damaging the subgrade or sub-base. The uppermost layer shall be compacted and the finished surface proof rolled using a smooth steel wheeled roller, with rear rolls at least 500 mm wide and loaded to not less than six tonnes per metre width.

7.13 Backfilling Against Foundations

Backfill around foundations shall be thoroughly consolidated in layers using suitable mechanical equipment. All timber, rubbish and other loose material shall be removed before backfilling.

Backfilling material and compaction of the backfill shall be as for hardfill.

7.14 Finished Surfaces

The finished surfaces of excavation for building site works shall conform to the levels, lines, grades and contours shown on the Drawings, within the tolerances specified. Where not otherwise specified any point on the finished surfaces shall conform to the following tolerances in respect of the levels shown or inferred on the Drawings: -

Slab and foundation subgrades - +10mm/-50mm

Slopes flatter than 1 on 6 - +/-50mm

Slopes of between 1 on 6 and 1 on 2 - +/-100mm

Slopes steeper than 1 on 2 - +/-200mm

Vertical or near vertical excavations shall be of adequate dimension to enable safe access and placing of formwork etc.

Finished surfaces may vary from the designated slope or level by the tolerances shown above measured at right angles to the slopes, but any variations shall be gradual so as not to impair the appearance of the surface or hold ponded water. Finished surfaces excavated for the construction of structures, concrete work, etc., shall be completed to a level such that the detailed dimension of such structures, etc., is achieved.

Where excavations abut against undisturbed ground they shall be trimmed to conform with the shape of the adjacent ground so that the profile is continuous and compatible.

7.15 Stockpiling

Any material intended for reuse shall be stockpiled in locations that have been pre-approved in advance by the Engineer. If suitable locations are not available on site, the Contractor shall arrange an alternate storage site at his own expense. Stockpiles where practical shall be located neatly outside the excavated areas but not so as to jeopardise the ground stability, or affect access ways of the wider site.

7.16 Dewatering

The Contractor shall keep excavations free from water, and shall provide all pumps, drainage pipes and other equipment required for this purpose. Where prior approval is obtained from the Local Authority, discharge into existing stormwater drains will be permitted but adequate settling chambers shall be

constructed to trap silt. Should deposition occur in existing drains as a result of the operations of the Contractor such deposits shall be cleared immediately by the Contractor at its own expense.

7.17 Safety and Ground Support

Safety procedures in excavation shall comply with the requirements of the WorkSafe NZ for notifiable work and the published Code of Practice for Excavations.

The Contractor shall form his own estimate of the amount of any temporary ground support which may be required, and shall allow for all such costs in his tender. Timbering placed below top of pipe level shall be withdrawn as bedding and backfilling material is placed, unless the Engineer requires otherwise.

Any slips or subsidence which occur during the course of the work shall be cleared away and made good by the Contractor without extra payment.

7.18 Obstructions

Prior to excavation, the Contractor shall prove the location of all existing underground utilities crossing the site by hand excavation, taking care to avoid damage. Any sewers, stormwater or subsoil drains, underground cables, gas or water mains, other services or structural foundations encountered must be left intact. Should any underground utility be disturbed during excavation, the responsible authority shall be notified immediately.

7.19 Measurement and Payment

Where provided for in the Schedule of Prices, materials excavated will be measured for payment by volume in-situ or square measure after clearing and prior to excavation, to the levels, lines and grades shown on the Drawings.

Materials excavated will be paid for at the appropriate scheduled rate or amount tendered for earthworks.

Except where otherwise provided, the scheduled rates or amounts for excavation or earthworks shall include all work associated with excavation in accordance with this Specification, together with all work associated with the transport and disposal or with the spreading and compaction as fill, of the excavated material, all as specified here and elsewhere.

8 Earth fill

8.1 Scope

The work specified in this section covers the construction of earth fill and all other subsidiary work necessary so that the areas of fill are brought to conform with the lines, grades, elevations and slopes shown or inferred on the Drawings or as directed by the Engineer.

The Contractor shall prepare the areas on which fill is to be placed and shall transport, spread, stockpile, condition, compact and grade the fill material and finish the areas making due allowance for the restoration of topsoil and the construction of pavements and underground utilities.

8.2 Operation of Plant

The Contractor shall be responsible for the determination of suitable types of plant to carry out the sheet piling and filling operations in accordance with the Contract.

8.3 Surface Preparation

The Contractor shall clear and strip the areas on which fill material is to be placed and along haul roads in accordance with the part of the Specification entitled "Clearing and Stripping". Low density, saturated, weak or organic soils exposed by clearing and stripping shall be excavated as directed by the Engineer. If considered by the Engineer to be unsuitable for use as filling, some or all of these soils shall be disposed of beyond the site, neatly stockpiled or wasted in approved areas as directed. If considered suitable by the Engineer, some or all of these soils shall be reused as fillings in layers as directed.

The exposed surfaces of natural ground upon which fill is to be placed shall be compacted so as to achieve relative compaction at least equal to that specified for the fill to a depth of 150mm. If necessary to meet this requirement, the ground shall be bladed until it is uniform, free of large clods and brought to suitable water content prior to compaction.

Before filling commences in any area of the Site, the cleared and stripped surface shall be inspected and approved by the Engineer's Representative and if required shall be subjected to proof rolling using a fully laden rubber tyred motor scraper or similar approved plant. Where directed by the Engineer, any soft or compressible areas shall be excavated and refilled with suitable compacted material.

Where fill material is to be placed against a hillside or previous fill where the slope is steeper than 1 vertical on 4 horizontal, the slope shall be prepared by benching. Near horizontal benches, suitably graded for drainage, shall be cut at vertical intervals of not less than 1 metre up the slope as the fill surface is raised, so that no less than 75% of the plan area on which fill is to be placed shall consist of such benches. Apart from the rates or amounts shown the Schedule for earthworks, no additional payment will be made for such benching.

Where shown on the Drawings or where seepage is encountered, the ground shall be trenched, graded or benched and subsoil drains installed to collect the seepage and discharge it to an approved point clear of the fill in accordance with details shown on the Drawings or as directed by the Engineer. Where shown on the Drawings, culverts shall be constructed as detailed.

8.4 Fill Material

Except for materials removed during clearing and stripping of topsoil or material designated as unsuitable by the Engineer, the on-site soils obtained from excavation may be used for general filling.

Wherever possible, the Contractor shall use suitable material won from cut areas or approved borrow areas within the site. When material imported from off the site is used, the Contractor shall obtain the required permissions and permits, and pay all royalties and charges required in connection with its use.

Imported material shall be of consistent well graded type and be subject to the approval of the Engineer prior to use. Material which is organic or highly plastic for example will not be considered as being suitable. A representative 10kg sample of proposed imported material shall be delivered to the Engineer at least three days before approval is required. Laboratory testing of imported fill material shall be provided with the representative sample. The laboratory testing provided shall be the same as per the site won material, with the test type and frequency provided in the "Testing" section below.

Prior to placing imported fill, the Contractor shall deliver to the site (and later dispose of) a 4m³ control sample of fill material for site comparisons and checking. The control sample must meet the requirements of this Specification, and be confirmed by the Engineer as being representative and approved before any material is used in the work.

8.5 Testing

The Contractor shall be responsible for testing and determination of the acceptability of earth fill materials. Prior to commencement of bulk fill construction, representative samples of the proposed fill material shall be sent to an approved laboratory to be tested for compliance, with the results provided to the Engineer. The Contractor shall seek acceptance from the Engineer for the testing laboratory that is proposed to be use, which shall hold appropriate accreditation for the tests to be performed. The Engineer may request an alternative testing laboratory is used.

The requirements for testing and minimum testing frequencies are stated below. The amount of testing is based on the fill material encountered onsite and number of source locations. Fill material types are likely to comprise residual clays/silts soils, weathered basalt and alluvial clays/silts.

Table	3:	Source	Suitability	Testing
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Test Type/Requirement	Test Method	Test Frequency
Standard Compaction with Air Voids	NZS 4402:1986, Test 4.1.1	3 tests per site-won fill material for each source location.
Water Content (In-situ)	NZS 4402:1986, Test 2.1	3 tests per site-won fill material for each source location.
Shear Strength	NZGS Guideline for Hand Held Shear Vane Test 2001	3 tests per site-won fill material for each source location, undertaken on a compacted mould sample, which shall be measured and reported for every point on each compaction curve.
Particle Size Distribution	NZS 4402:1986, Test 2.8.1	3 tests per site-won fill material for each source location.
Plasticity Index	NZS 4402:1986, Test 2.2, 2.3 & 2.4	3 tests per site-won fill material for each source location.

These results will be used to determine OMC range, and MDD for NDM testing.

In addition, the Contractor shall obtain representative samples of each fill material type and arrange laboratory testing in accordance with the Solid Density Test (NZS 4402:1986, Test 2.7.2) prior to placement of engineered fill. Laboratory determined solid density is required on cohesive soils to enable accurate calculation of % air voids.

No fill layers shall be placed prior to such laboratory testing being forwarded to the Engineer.

At the discretion of the Engineer, an alternative approach to the laboratory testing may be taken to assess the fill.

8.6 Placing, Spreading and Water Conditioning

No fill material shall be placed until the Engineer has inspected and approved the surface preparation of that part of the Site.

Fill material shall be placed and spread in a systematic manner and in uniform near horizontal layers which, prior to compaction, do not exceed 200mm in thickness.

Any lumps or rocks exceeding 100mm in greatest dimension shall be either broken down to less than 100mm or removed or used as may be directed by the Engineer.

When the water content of the fill material is below that which is necessary to achieve the specified degree of compaction, water shall be added and thoroughly mixed into the fill material until it is uniformly dispersed throughout the soil. Similarly, when the water content of the fill material is too high, the soil shall be air dried by scarifying, harrowing, discing or other aeration processes. The water content shall also be kept low enough to provide a stable working surface for the hauling and compacting plant, free from heaving, weaving and excessive rutting.

No fill material shall be placed, spread or compacted during or immediately following wet weather or when ground is frozen. Except for essential work to maintain safety, drainage or prevent damage to work, no equipment shall be moved on or over the site except along access roads during or immediately following wet weather.

Where any compacted subgrade or fill has deteriorated due to wet weather or an interruption in the work, the material affected shall be scarified and recompacted to the required standard before any further fill material is placed or spread over it.

8.7 Compaction

After each layer of fill has been placed, spread evenly and brought to a suitable water content (+/- 2% of Optimum Moisture Content, OMC). It shall be compacted to at least the compaction standard specified herein.

- a) The compaction shall be taken as 98% Maximum Dry Density (MDD) in terms of the New Zealand Standard Compaction Test (NZS 4402, Test 4.1.1) for the top 1m of filled areas and 95% Maximum Dry Density for those parts of fills at greater than 1m depth of the finished surface. Compaction shall be at +/- 2% of OMC for all earth fill.
- b) All material shall be compacted so as to achieve an average air void ratio of no more than 10% over 10 tests and a maximum of 12% on any one test, and an average undrained shear strength (Su) of no less than 150kPa, and minimum of 110kPa for any one test. Note: air voids/penetration criteria have no validity if not taken on the same day as fill placement and no rain or other wetting occurs between the time of compaction and the time of testing. Otherwise percentage of NZ Standard Compaction must then be applied.

Each NDM test shall comprise shall comprise 2 measurements using the same probe hole but orientated at 90 degrees to each other.

Undrained shear strength of the compacted soil at any test location shall be taken as the mean of a set of tests, comprising 3 tests undertaken within an area of 0.5m² of each other.

Compaction and testing shall be in general accordance with NZS 4431:1989.

Compaction shall be accomplished with approved, special-purpose compaction equipment. The equipment shall make sufficient passes to ensure that the required compaction has been uniformly obtained everywhere.

Fill batter faces shall be compacted as a separate operation, either by overfilling and cutting back, or by rolling with compacting plant working up and down the slope.

8.8 Finished Surfaces

The finished surfaces of earth fill shall conform to the levels, lines, grades and contours shown on the Drawings or directed by the Engineer, within the tolerances specified.

Where not otherwise specified any point on the finished fill surfaces shall conform to the following tolerances in respect of the levels shown or inferred on the Drawings: -

Subgrade subgrades - +10mm/-50mm

Slopes flatter than 1 on 6 - +/-50mm

Slopes of between 1 on 6 and 1 on 2 - +/-100mm

Slopes steeper than 1 on 2 - +/-200mm

Floor level on permanent storage ponds - +20mm/-50mm

Batter slopes on permanent ponds - +50 mm/-100mm

Finished surfaces may vary from the designated slope or level by the tolerances shown above measured at right angles to the slopes, but any variations shall be gradual so as not to impair the appearance of the surface or hold ponded water. Finished surfaces for the construction of structures, concrete work, etc., shall be completed to a level such that the detailed dimension of such structures, etc., is achieved.

Where fillings abut against undisturbed ground they shall be trimmed to conform with the shape of the adjacent ground so that the profile is continuous and compatible.

In any area so specified on the Drawings, the Contractor shall adjust the quantities of cut and fill as directed by the Engineer, varying finished levels as necessary to achieve a balance of earthworks quantities.

8.9 Backfilling

Backfilling around structures and as required to bring undercut areas to formation or finished levels shall, unless otherwise specified, consist of selected fill material, spread and compacted in layers using suitable plant such that the relative compaction requirements of the Specification are satisfied.

8.10 Environmental Management

During construction, the Contractor shall take all necessary measures to manage the earthworks methodology and the minimisation of adverse environmental effects on the site and receiving environment by compliance with the requirements of the Specification entitled "Sediment Control and Environmental Management during Construction" and environmental good practice.

Unless otherwise provided in the Schedule, no separate payment will be made for this work. Its costs will be considered to be included in the various rates or amounts scheduled for earthworks items.

8.11 Compliance Testing

The Contractor shall be responsible for engaging a suitably qualified soil testing organisation independent of the Contractor to undertake inspection and testing of the earth fill works. The inspection shall include viewing of the cleared and benched natural ground prior to filling and ongoing inspections and compaction testing of fill throughout the project.

The testing shall be done at vertical and horizontal intervals selected to give a representative and reliable spread of tests through the fill works. The testing regime proposed by the Contractor's nominated testing organisation shall be described in the QA information provided by the Contractor before commencement of the contract works. The Engineer reserves the right to require reasonable changes to the testing regime and such changes shall be implemented at no extra cost to the contract.

Compaction non-compliances shall be immediately brought to the notice of the Contractor and Engineer, faulty areas shall be removed, treated as appropriate (drying, moisturising etc), re-compacted and retested until complying fill standards are met.

All testing reports must be emailed in both pdf and excel formats to the Engineer, within one week following the date of testing.

Each test locations and elevations shall be recorded on a cut/fill plan and labelled appropriately and clearly. All tests locations shall have a plan accuracy of 1m of their location, and the co-ordinates and elevations of each test reported on the test sheets. Elevation accuracy is to be within 100 mm.

There is to be no duplication of test numbering at any site, regardless of the material being tested or the stage of development.

The independent inspections shall also be responsible for identifying any areas where batters are not being laid at appropriate slopes.

On completion of the earthworks, the Contractor and testing organisation shall prepare accurate and tidy as-built plans of the earthworks showing all test locations (position and reduced level) along with a testing report including records of the tests and explanations of actions taken on non-compliances. The report shall be signed by the testing organisation confirming that the specified compaction standards have been met. The report and attachments shall be provided in electronic format and triplicate hard copy, to the Engineer for distribution as follows.

- One copy held by the Engineer.
- One copy to be passed to the controlling local authority.
- One copy to be passed to the Principal.

8.12 Engineer's Verification

The Contractor shall facilitate inspection by the Engineer at all times during construction. The Engineer may from time to time carry out check tests of the soil properties, water content and the compaction standards being achieved in the fill, but the Contractor will remain responsible for achieving the required standard of work.

The Engineer shall have the right, at any stage of the work and until the end of the Defects Liability period, to have material which has not been compacted to the specified standard or which contains organic material, tree roots or the like, wherever it may be, excavated and recompacted to the specified standard without additional payment to the Contractor.

The Engineer may deduct from the Contract amounts payable to the Contractor the cost of check tests on fill material which show the specified compaction has not been achieved.

Fill construction shall be arranged to permit testing to be carried out as the work proceeds. The Contractor shall, on request and without further payment, provide excavating equipment and remove material from above the test level, and subsequently backfill to Specification requirements. Whenever earthmoving, compaction or like work is in progress at the same time as compaction testing, the Contractor shall at any time required by the Engineer, without extra payment, provide safety protection for personnel carrying out testing to the satisfaction of the Engineer.

On request by the Engineer, the Contractor shall provide a suitably loaded truck with driver, or other equipment, for proof rolling which shall be paid for at the appropriate plant hire rate.

8.13 Measurement and Payment

Where provided for in the Schedule of Prices, earth fill excavated from cut areas or approved borrow areas within the Site will be measured by volume in situ prior to excavation. Fill material imported from outside the Site will be measured by volume in situ in the completed fills.

Earth fills will be paid for at the appropriate scheduled rate or amount for earthworks. Except where otherwise provided, the scheduled rates or amounts shall include all costs associated with the excavation, transport, spreading compaction of fill material, compliance testing, as-built recording and associated work as specified.

9 Settlement Monitoring

9.1 General

Instrumentation is required to monitor ground displacement of placed fills. Displacement will be monitored by survey of settlement plates and pins, as shown on the Drawings. Additional instrumentation may be required during construction should adverse ground displacements be observed on site, this will be at the Engineer's discretion during or following construction.

The purpose of instrumentation and monitoring is to:

- Observe the rate and magnitude of settlement;
- Verify the parameters and assumptions made in the settlement analysis;
- Determine the timing of subsequent construction stages;
- Allow contingency measures to be implemented in a timely fashion, if required.
- Instrumentation details and locations shall be as per the Drawing.

Drawings referenced in this Specification shall be updated by the Engineer as required to include actual instrument locations and any additional instrumentation that may be required during construction.

Further to this, other components of this Specification may be changed during the works to reflect changes in materials utilised, alterations to the works plan, etc.

9.2 Instrumentation Installation

All installations shall be in accordance with the manufacturer's recommendations and instructions (where applicable) and in accordance with this Specification.

Settlement plates and settlement pins installation and monitoring shall be carried out under the supervision of a registered surveyor.

Instrumentation shall be installed as early as practical (e.g. following site earthworks activities). When deciding on program for instrumentation installation, consideration shall be given to construction activities likely to damage instrumentation as well as safety of plant and personnel during the installation process.

The Contractor shall obtain the Engineer's approval of the proposed instrumentation (e.g. make and model) prior to installation.

The Contractor shall ensure all instrumentation, are located in plan and elevation by engineering survey immediately upon installation.

Once the Contractor finalises the construction programme it shall be discussed with the Engineer and the stages at which each instrument will be installed, and the order of priority shall be discussed and jointly decided upon.

As-built plans shall be provided to the Engineer within two days of installation, which include the instrumentation X, Y and Z coordinates.

9.3 Protection

Instrumentation forms an integral part of the construction monitoring and must be protected at all times against any damage. Construction activities adjacent to instruments must be carried out with care. In

particular, fill placement around the instruments shall be undertaken by manual methods within a distance of 1m.

Instrumentation and monitoring equipment locations shall be clearly identified on site by means of fencing with pegs and glow mesh fencing as detailed on the Drawings or as otherwise proposed by the Contractor and approved by the Engineer.

If an instrument is damaged, the Contractor shall repair or replace the damaged instrument as soon as is practically possible to the satisfaction of the Engineer, who may impose stop-work orders in the vicinity of the instrument if it is critical. Baseline Readings should be taken within 24 hours after the repair once the instrument is stabilised.

Settlement points on structures shall be appropriately positioned and protected in order to allow monitoring at all stages throughout the adjacent construction activities, without risk of damage or displacement as a result of the activities.

9.4 Baseline Reading Requirements

Baseline readings of all monitoring equipment shall be taken to demonstrate that the instruments are working correctly, and to establish baseline behaviour of the ground or structures. The number of base readings and duration between successive base readings are to be undertaken as per this Specification and the Drawings, and as a minimum will not be less than two separate readings 3 days apart.

Baseline readings shall be carried out immediately after installation and before adjacent construction commences. The Contractor shall allow sufficient time between installing instruments and commencing construction activities, which the instruments are intended to monitor the effects of, particularly for instruments requiring several readings to obtain a reliable baseline.

A reference levelling point should also be installed and located in a safe location outside of the filling area, and comprise a pin sleeved to 2.5m to 3m depth so that any seasonal volume changes effecting surface levels are accounted for.

9.5 Monitoring Requirements

Following baseline, monitoring shall be undertaken as shown on the Drawings unless an alternative frequency is specified or agreed to by the Engineer.

Settlement plates and pins must be monitored to±2mm vertical accuracy.

Construction of buildings, utilities, pavements, or other infrastructure are not to commence within 50m of monitoring equipment until the Engineer has confirmed deformations have slowed to acceptable rates.

The following instrumentation and monitoring frequency are required:

Table 4: Instrumentation and monitoring frequency

Instrumentation	Installation	Monitoring Frequency*
Settlement plates	Installed on stripped subgrade prior to placement of engineered fill.	During fill placement – Twice weekly During preloading – Weekly
Settlement pins	Installed in engineered fill surface once at final design level.	<u>During preloading</u> – Weekly

^{*}Baseline reading required in addition to the monitoring frequency provided in the table.

The results shall be reported to the Engineer. The frequency of the survey may be relaxed by the engineer depending on the results.

9.6 Surcharge

Surcharge is defined as the placement of soil or fill in addition to the final earthworks design level to accelerate settlement. If the building platforms are to be surcharged then the contractor is to submit a plan showing the location and height of the surcharge, as well as noting the material type of the surcharge soil and any existing monitoring points that would be affected. The surcharge plan will need to be approved by the Engineer prior to any surcharge being placed.

If monitoring points need to be adjusted to accommodate the surcharge the following applies:

- Settlement plates will need to be extended so these sit above the surcharge fill levels and monitoring continues as per the Drawing and this Specification.
- Settlement pins, if installed, will need to be removed, re-established on the same X Y coordinates and new baseline readings taken. If settlement pins are not installed yet, then pin installation is as per the Drawing and this Specification.

Adjustments or changes to the monitoring points can only be undertaken with the approval from the Engineer.

10 Hold Points and Engineer's Approvals

10.1 Hold points for Contractor's advice to Engineer

As a guide to the contractor, the points at which the works shall be paused, and the engineer's approval to proceed obtained, include but are not necessarily limited to the following:

- Approval of documents to be prepared by Contractor as captured in this document
- Clearance certificate post contaminated soil removal to prove all contamination has been removed.
- Following strip of topsoil prior to cut to fill commencing.
- Installation of settlement monitoring instrumentation.
- During placement of initial fill layers and at half depth of the engineered fill.
- · At finished level of the engineered fill.
- Approval of finished levels prior to respread of topsoil or stabilising of surface.

The Contractor shall also hold any other works for inspection by the Engineer as instructed from time to time.



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APPENDIX C: FIELD TEST DATA



FILL CONTROL SUMMARY SHEET

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

Job Name : Drury Town Centre
Client : Ross Reid Contractors Ltd

Address: PO Box 58545

Attention:

Botany

Deon DeRidder

 Project No. :
 22 0101 68

 Date of Order :
 29.04.23

Applicate
Signatory - Zach Hooton

Test results indicated as not accredited are outside the scope of the laboratory's

TEST	TESTED	DATE	TEST	TEST	WET	OVEN	DRY	SOLID	AIR	AVERAGE	MDD	MDD			ELD		RL	EASTING	NORTHING	NOTES
NUMBER	BY	TESTED	LOCATION	DEPTH (mm)	DENSITY (t/m³)	WATER CONTENT (%)	DENSITY (t/m³)	DENSITY (t/m³) Supplied	VOIDS %	AIR VOIDS %	(t/m ³) Supplied	(%)		STRE	EAR NGTH kPa		(m)			
253	JR	18.12.23	See Plan	150	1.65	35.2	1.22	2.54	9.0	9.5		#DIV/0!	217++	217++	217++	217++	21.30	416840 10	774016.86	
200	U.V.	10.12.20	Coo i iaii	100	1.58	41.1	1.12	2.54	10.0	0.0		<i>"B1170</i> "	2	2	2		21.00	110010110	77 10 10.00	
254	JR	18.12.23	See Plan	150	1.74	53.0	1.14	2.54	0.0	0.0		#DIV/0!	217++	217++	217++	217++	21.84	416859 96	774056.10	
204	OIX	10.12.20	Occ i idii	100	1.75	51.2	1.16	2.54	0.0	0.0		#B1470.	21711	21711	21711	21711	21.04	410000.00	774000.10	
255	JR	18.12.23	See Plan	150	1.78	46.8	1.21	2.54	0.0	0.0		#DIV/0!	217++	217++	217++	217++	22.31	416863 39	774103.94	
200	OIX	10.12.20	Occ i idii	100	1.74	46.6	1.19	2.54	0.0	0.0		#B1470.	21711	21711	21711	21711	22.01	410000.00	774100.04	
256	JR	18.12.23	See Plan	150	1.77	39.4	1.27	2.54	0.2	1.1		#DIV/0!	217++	217++	217++	217++	20.70	416921.52	774016.81	
200	OIX	10.12.20	Occ i idii	100	1.74	39.0	1.25	2.54	2.1			#B1470.	21711	21711	21711	21711	20.70	410021.02	774010.01	
257	JR	18.12.23	See Plan	150	1.70	53.3	1.11	2.54	0.0	0.0		#DIV/0!	21744	21744	217	217	21.88	<i>1</i> 16772.86	774201.28	
257	UI.	10.12.20	Occ i laii	130	1.71	56.5	1.10	2.54	0.0	0.0		#B14/0:	21777	21777	21777	21777	21.00	410772.00	77-201.20	
258	JR	18.12.23	See Plan	150	1.74	42.9	1.22	2.54	0.0	0.0		#DIV/0!	21744	21744	217	217	22.62	416023.07	774132.31	
250	JIK	10.12.25	Oce i laii	130	1.71	46.5	1.17	2.54	0.0	0.0		#DIV/0:	217++	217++	21777	217++	22.02	410323.07	774132.31	

Checked By: MQ
Date: 21.12.23
Page: 1 of 1

RS009





152C Foundry Road, Silverdale 0932

FILL CONTROL SUMMARY SHEET

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

22 0101 48

29.04.22

Project No. :

Date of Order:

Job Name : Drury Town Centre

Client: Ross Reid Contractors Ltd Address: PO Box 58545

Botany

Attention : Deon DeRidder

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

Signatory - Zach Hooton

-																		
TEST	TESTED	DATE	TEST	TEST	WET	OVEN	DRY	SOLID	AIR	AVERAGE	MDD	MDD		FIE	LD	·	RL	NOTES
NUMBER	BY	TESTED	LOCATION	DEPTH	DENSITY	WATER	DENSITY	DENSITY	VOIDS	AIR				SHI	EAR			
				(mm)	(t/m ³)	CONTENT	(t/m ³)	(t/m ³)		VOIDS	(t/m ³)	(%)		STRE	NGTH		(m)	
						(%)		Supplied	%	%	Supplied			in l	кРа			
	i i				1.76	51.0	1.17	2.54	0.0									Easting - 416860.613
198	l ZH l	05.10.23	See Plan	150	1.70	31.0	1.17	2.54	0.0	0.0	1.08	108	177	213	217+	156	20.90	
					1.75	51.1	1.16	2.54	0.0									Northing - 774061.387
					1.78	50.5	1.18	2.54	0.0									Easting - 416862.089
199	ZH	05.10.23	See Plan	150						0.0	1.08	109	156	185	160	177	20.24	
					1.73	46.1	1.18	2.54	0.0									Northing - 774017.434

Checked By: ZH
Date: 09.10.23
Page: 1 of 1

RS009





152C Foundry Road, Silverdale 0932

FILL CONTROL SUMMARY SHEET

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

22 0101 49

29.04.22

Project No. :

Date of Order:

Job Name : Drury Town Centre

Client: Ross Reid Contractors Ltd
Address: PO Box 58545

Botany

Attention : Deon DeRidder

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

Signatory - Zach Hooton

																		-6
TEST	TESTED	DATE	TEST	TEST	WET	OVEN	DRY	SOLID	AIR	AVERAGE	MDD	MDD		FIE	LD		RL	NOTES
NUMBER	BY	TESTED	LOCATION	DEPTH	DENSITY	WATER	DENSITY	DENSITY	VOIDS	AIR				SHI	EAR			
				(mm)	(t/m ³)	CONTENT	(t/m ³)	(t/m ³)		VOIDS	(t/m ³)	(%)		STRE	NGTH		(m)	
						(%)		Supplied	%	%	Supplied			in l	кРа			
200	KC	06.10.23	See Plan	150	1.68	45.2	1.16	2.54	2.2	2.9	1.08	108	155	179+	179+	159	17.86	Easting - 416842.997
200	, KC	00.10.23	See Plain	130	1.68	43.0	1.17	2.54	3.5	2.9	1.00	100	155	179+	179+	159	17.00	Northing - 774432.240
201	KC	06.10.23	See Plan	150	1.75	46.0	1.20	2.54	0.0	0.0	1.08	110	153	153	179+	155	16.92	Easting - 416831.861
201	I IC	00.10.23	Jee Flatt	130	1.72	45.7	1.18	2.54	0.0	0.0	1.00	110	133	133	1797	133	10.92	Northing - 774424.641

Checked By: ZH
Date: 10.10.23
Page: 1 of 1





FILL CONTROL SUMMARY SHEET

Project No.:

Date of Order:

22 0101 50

29.04.23

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

Drury Town Centre Job Name : Client : Ross Reid Contractors Ltd

Address: PO Box 58545

Botany

Attention: Deon DeRidder



Signatory - Zach Hooton

TEST NUMBER	TESTED BY	DATE TESTED	TEST LOCATION	TEST DEPTH	WET DENSITY	OVEN WATER	DRY DENSITY	SOLID DENSITY	AIR VOIDS	AVERAGE AIR	MDD	MDD			ELD EAR		RL	EASTING	NORTHING	NOTES
				(mm)	(t/m ³)	CONTENT (%)	(t/m ³)	(t/m ³) Supplied	%	VOIDS %	(t/m³) Supplied	(%)			NGTH <pa< td=""><td></td><td>(m)</td><td></td><td></td><td></td></pa<>		(m)			
202	KC	12.10.23	See Plan	150	1.79	37.1	1.30	2.54	0.3	2.8	1.08	120	178++	159	141	140	20.16	A16875 11	774391.02	
202	RO	12.10.23	Oce i lan	130	1.72	34.6	1.28	2.54	5.3	2.0	1.00	120	170++	100	141	140	20.10	410073.11	774091.02	
203	KC	12.10.23	See Plan	150	1.64	50.7	1.09	2.54	2.0	1.8	1.08	101	178++	178++	178++	178++	19.61	416854 18	774432.69	
200	I.O	12.10.20	Occ i iaii	100	1.64	51.4	1.08	2.54	1.7	1.0	1.00	101	17011	17011	17011	17011	13.01	410004.10	774402.00	
204	KC	12.10.23	See Plan	150	1.74	43.1	1.22	2.54	0.0	0.0	1.08	113	155	152	178++	170	20.88	/16032 7 2	774406.64	
204	NO	12.10.23	See Flair	130	1.74	42.8	1.22	2.54	0.0	0.0	1.00	113	133	132	17077	170++	20.00	410932.72	774400.04	
205	KC	12.10.23	See Plan	150	1.74	39.8	1.24	2.54	1.7	0.8	1.08	116	154	178	178++	172	21.26	/16086 56	774415.80	
200	NO	12.10.23	JEE FIAIT	150	1.76	40.1	1.26	2.54	0.0	0.0	1.00	110	154	170++	170++	112	21.20	410300.30	114415.60	

Checked By:

NT = Not Tested Page: 1 of



FILL CONTROL SUMMARY SHEET

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

Project No.:

Date of Order:

22 0101 51

29.04.23

Job Name : Drury Town Centre
Client : Ross Reid Contractors Ltd

Address: PO Box 58545

Botany

Attention : Deon DeRidder



TEST NUMBER	TESTED BY	DATE TESTED	TEST LOCATION	TEST DEPTH (mm)	WET DENSITY (t/m³)	OVEN WATER CONTENT (%)	DRY DENSITY (t/m³)	SOLID DENSITY (t/m³) Supplied	AIR VOIDS %	AVERAGE AIR VOIDS %	MDD (t/m³) Supplied	MDD (%)	SHI STRE	ELD EAR :NGTH kPa		RL (m)	EASTING	NORTHING	NOTES
206	JR	16.10.23	See Plan	150	1.70 1.70	45.5 46.5	1.17 1.16	2.54 2.54	0.7 0.5	0.6	1.08	108	167 193	118	128	21.38	416836.80	774067.78	Fill A11
207	JR	16.10.23	See Plan	150	1.74 1.74	40.4 45.8	1.24 1.19	2.54 2.54	1.4 0.0	0.7	1.08	112	228++ 228++	228++	228++	21.16	416879.66	774057.94	Fill A11
208	JR	16.10.23	See Plan	150	1.66 1.66	57.5 57.3	1.06 1.06	2.54 2.54	0.0	0.0	1.08	98	154 171	167	143	20.67	416915.69	774394.33	Fill A7
209	JR	16.10.23	See Plan	150	1.73 1.73	48.0 43.3	1.17 1.21	2.54 2.54	0.0	0.1	1.08	110	167 167	150	193	22.62	416960.59	774434.68	Fill A7

Checked By: ZH
Date: 19.10.23
Page: 1 of 1



ROADTEST...

152C Foundry Road, Silverdale 0932

FILL CONTROL SUMMARY SHEET

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

Job Name: Drury Town Centre
Client: Ross Reid Contractors Ltd

Address: PO Box 58545

Botany

Attention : Deon DeRidder

Project No.: 22 0101 52

Date of Order: 29.04.23

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

Signatory - Ed Cull

TEST	TESTED	DATE	TEST	TEST	WET	OVEN	DRY	SOLID	AIR	AVERAGE	MDD	MDD		FIE	LD		RL	EASTING	NORTHING	NOTES
NUMBER	BY	TESTED	LOCATION	DEPTH (mm)	DENSITY (t/m³)	WATER CONTENT (%)	DENSITY (t/m³)	DENSITY (t/m³) Supplied	VOIDS %	AIR VOIDS %	(t/m³) Supplied	(%)		SHE STREI in k	NGTH		(m)			
210	ID	17.10.23	See Plan	150	1.68	50.4	1.11	2.54	0.0	0.0	1.08	102	212	162	171	150	22.15	416000 15	774412.66	Eill A.Z
210	JK	17.10.23	See Flair	150	1.67	53.2	1.09	2.54	0.0	0.0	1.00	102	212	102	171	130	22.10	410909.13	774412.00	FIII A7
211	JR	17.10.23	See Plan	150	1.70	53.0	1.11	2.54	0.0	0.0	1.08	103	171	143	95	189	23.17	416943 17	774441.37	Fill A7
2.11	5/1	17.10.20	OCC I Idii	130	1.70	53.4	1.11	2.54	0.0	0.0	1.00	100	.,,	1-30	55	.55	20.17	410040.17	774441.07	1 111 / 3.1

Checked By: DT
Date: 25.10.23
Page: 1 of 1



FILL CONTROL SUMMARY SHEET

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

Job Name : Drury Town Centre
Client : Ross Reid Contractors Ltd

Address: PO Box 58545

Botany

Attention : Deon DeRidder

		100
Project No. :	22 0101 54	Test results indicated as not occredited are outside the scope of the laboratory's occreditation
Date of Order:	29.04.23	TAG LABORAT
		postate
		Signatory - Zach Hooton

TEST	TESTED	DATE	TEST	TEST	WET	OVEN	DRY	SOLID	AIR	AVERAGE	MDD	MDD	FIELD	RL	EASTING	NORTHING	NOTES
NUMBER	BY	TESTED	LOCATION	DEPTH (mm)	DENSITY (t/m³)	WATER CONTENT (%)	DENSITY (t/m³)	DENSITY (t/m³) Supplied	VOIDS %	AIR VOIDS %	(t/m³) Supplied	(%)	SHEAR STRENGTH in kPa	(m)			
215	DT & MQ	06.11.23	See Plan	150	1.75 1.73	45.3 44.6	1.21 1.20	2.54 2.54	0.0	0.0	1.08	111	217++ 217++ 217++ 217++	20.31	416880.77	773991.42	Test1 - A11

 Checked By:
 ZH

 Date:
 11.11.23

 Page:
 1 of 1





FILL CONTROL SUMMARY SHEET

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

Job Name : Drury Town Centre
Client : Ross Reid Contractors Ltd

Address: PO Box 58545

Botany

Attention : Deon DeRidder

Project No.: 22 0101 55

Date of Order: 29.04.23

Text results indicated as not accredited are usualise the scope of the laboratory's accreditation

Signatory - Zach Hooton

TEST	TESTED	DATE	TEST	TEST	WET	OVEN	DRY	SOLID	AIR	AVERAGE	MDD	MDD		FIE	LD		RL	EASTING	NORTHING	NOTES
NUMBER	BY	TESTED	LOCATION	DEPTH	DENSITY	WATER	DENSITY	DENSITY	VOIDS	AIR				SHE	EAR					
				(mm)	(t/m ³)	CONTENT	(t/m ³)	(t/m ³)		VOIDS	(t/m ³)	(%)		STRE	NGTH		(m)			
						(%)		Supplied	%	%	Supplied			in l	kPa					
																			•	
			i i		1.79	47.3	1.21	2.54	0.0											
216	KC	07.11.23	See Plan	150	1.75	77.5	1.21	2.04	0.0	0.0	1.08	112	155	155	145	178++	22.17	416907.08	774402.15	
					1.75	45.3	1.20	2.54	0.0											
217	KC	07.11.23	See Plan	150	1.76	50.2	1.17	2.54	0.0	0.0	1.08	108	177	170 .	170	178++	23.16	446044.42	774427.92	
217	, KC	07.11.23	See Plan	150	1.75	50.2	1.16	2.54	0.0	0.0	1.06	106	177	1/0+	1/0++	1/0++	23.10	410941.13	114421.92	
218	кс	07.11.23	See Plan	150	1.71	48.3	1.15	2.54	0.0	0.0	1.08	107	178+	165	151	178++	23.63	446070.00	774422.94	
210	KC .	07.11.23	See Plan	150	1.74	49.3	1.17	2.54	0.0	0.0	1.06	107	1/0+	100	151	1/0++	23.03	410979.23	774422.94	

Checked By: ZH
Date: 11.11.23
Page: 1 of 1





FILL CONTROL SUMMARY SHEET

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

Project No. :

Date of Order :

22 0101 56

29.04.23

Job Name : Drury Town Centre
Client : Ross Reid Contractors Ltd

Address: PO Box 58545

Botany

Attention : Deon DeRidder

Test results indicated as not accredited are outside the accredited are outside the accredited to accreditation

Signatory - Zach Hooton

																			l .	
TEST	TESTED	DATE	TEST	TEST	WET	OVEN	DRY	SOLID	AIR	AVERAGE	MDD	MDD		FIE	LD		RL	EASTING	NORTHING	NOTES
NUMBER	BY	TESTED	LOCATION	DEPTH	DENSITY	WATER	DENSITY	DENSITY	VOIDS	AIR				SHE	EAR					
				(mm)	(t/m ³)	CONTENT	(t/m ³)	(t/m ³)		VOIDS	(t/m ³)	(%)		STRE	NGTH		(m)			
						(%)		Supplied	%	%	Supplied			in k	кРа					
																		•'	•	
219	1/0	00.44.00	Con Diese	150	1.81	39.9	1.29	2.54	0.0	0.0	1.08	440	470	470	470	470	20.54	440004 40	774400 00	
219	KC	08.11.23	See Plan	150	1.80	42.3	1.27	2.54	0.0	0.0	1.08	118	178++	1/8++	1/8++	1/8++	20.54	416864.48	774423.92	
					1.00	42.3	1.21	2.34	0.0											
220	КC	08.11.23	See Plan	150	1.79	47.6	1.21	2.54	0.0	0.0	1.08	110	172	157	147	178++	19.04	416841.80	774450.39	
220	110	00.11.20	Occ i idii	100	1.75	48.8	1.18	2.54	0.0	0.0	1.00	110	172	101	1-17	17011	10.04	410041.00	77-100.00	
221	KC	08.11.23	See Plan	150	1.74	43.9	1.21	2.54	0.0	0.5	1.08	112	178++	172	154	160	21.09	416877.89	774459.78	
221	NC	00.11.23	Jee Flaii	130	1.72	42.6	1.21	2.54	1.1	0.5	1.06	112	170++	112	134	100	21.09	410077.09	114439.10	

 Checked By:
 ZH

 Date:
 11.11.23

 Page:
 1 of 1



FILL CONTROL SUMMARY SHEET

Project No.:

Date of Order:

22 0101 57

29.04.23

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

Job Name : Drury Town Centre
Client : Ross Reid Contractors Ltd

Address: PO Box 58545

Botany

Attention : Deon DeRidder



TEST NUMBER	TESTED BY	DATE TESTED	TEST LOCATION	TEST DEPTH (mm)	WET DENSITY (t/m³)	OVEN WATER CONTENT (%)	DRY DENSITY (t/m³)	SOLID DENSITY (t/m³) Supplied	AIR VOIDS %	AVERAGE AIR VOIDS %	MDD (t/m³) Supplied	MDD (%)		SH STRE	ELD EAR ENGTH kPa		RL (m)	EASTING	NORTHING	NOTES
222	KC	09.11.23	See Plan	150	1.72	51.5	1.14	2.54	0.0	0.0	1.08	106	178++	178++	162	154	22.54	416911 33	774401.37	
	1.0	00111120	000 1 1011	100	1.73	48.8	1.16	2.54	0.0	0.0	1.00				.02	.0.	22.0	110011100	77 1101101	
223	KC	09.11.23	See Plan	150	1.67	54.4	1.08	2.54	0.0	0.0	1.08	102	178++	177	178++	178++	23.38	416944 23	774412.02	
223	I TO	03.11.23	Occ i iaii	100	1.69	51.8	1.11	2.54	0.0	0.0	1.00	102	17011	'''	1,011	17011	20.00	710544.25	774412.02	
224	KC	09.11.23	See Plan	150	1.66	53.5	1.08	2.54	0.0	0.1	1.08	96	170	170	170	178++	23.83	416972.79	774418.28	
224	NC	03.11.23	OCC FIAIT	130	1.60	60.4	1.00	2.54	0.3	0.1	1.00	30	170++	170++	170++	170++	23.03	410312.13	774410.20	

Checked By: ZH
Date: 14.11.23
Page: 1 of 1



FILL CONTROL SUMMARY SHEET

Project No.:

Date of Order:

22 0101 58

29.04.23

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

Job Name : Drury Town Centre
Client : Ross Reid Contractors Ltd

Address: PO Box 58545

Botany

Attention : Deon DeRidder



TEST	TESTED	DATE	TEST	TEST	WET	OVEN	DRY	SOLID	AIR	AVERAGE	MDD	MDD		FIE	ELD		RL	EASTING	NORTHING NOTES
NUMBER	BY	TESTED	LOCATION	DEPTH (mm)	DENSITY (t/m³)	WATER CONTENT (%)	DENSITY (t/m³)	DENSITY (t/m³) Supplied	VOIDS %	AIR VOIDS %	(t/m³) Supplied	(%)		STRE	EAR :NGTH kPa		(m)		
225	KC	10.11.23	See Plan	150	1.76	44.0	1.22	2.54	0.0	0.2	1.08	114	178++	178++	178++	178++	20.83	416876 07	774012.70
220	110	10.11.20	Occ i idii	100	1.74	41.4	1.23	2.54	0.5	0.2	1.00	117	17011	17011	17011	17011	20.00	410070.07	774012.70
226	KC	10.11.23	See Plan	150	1.71	54.1	1.11	2.54	0.0	0.0	1.08	105	170	170	170	178++	19.95	446962 67	773969.03
220	NC	10.11.23	See Plan	150	1.70	47.9	1.15	2.54	0.0	0.0	1.00	105	170++	170++	170++	170++	19.95	410003.07	113909.03

Checked By: ZH
Date: 14.11.23
Page: 1 of 1



ROADTEST...

152C Foundry Road, Silverdale 0932

FILL CONTROL SUMMARY SHEET

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

Job Name : Drury Town Centre

 Client:
 Ross Reid Contractors Ltd
 Project No.:
 22 0101 59

 Address:
 PO Box 58545
 Date of Order:
 29.04.23

Botany

Attention : Deon DeRidder



TEST	TESTED	DATE	TEST	TEST	WET	OVEN	DRY	SOLID	AIR	AVERAGE	MDD	MDD		FIE			RL	EASTING	NORTHING	NOTES
NUMBER	BY	TESTED	LOCATION	DEPTH (mm)	DENSITY (t/m³)	WATER CONTENT (%)	DENSITY (t/m³)	DENSITY (t/m³) Supplied	VOIDS %	AIR VOIDS %	(t/m³) Supplied	(%)			EAR NGTH <pa< td=""><td></td><td>(m)</td><td></td><td></td><td></td></pa<>		(m)			
227	КC	11.11.23	See Plan	150	1.75	53.0	1.14	2.54	0.0	0.0	1.08	106	178++	178++	178++	178++	24.07	416987 68	774411.89	
221	NO	11.11.20	Occ i iaii	130	1.72	51.0	1.14	2.54	0.0	0.0	1.00	100	17011	17011	17011	17011	24.07	410307.00	774411.03	
228	кc	11.11.23	See Plan	150	1.71	58.0	1.08	2.54	0.0	0.0	1.08	99	178++	178++	178++	178++	23.00	416940.32	774398.04	
220		20	ooo i iaii	.00	1.69	58.8	1.06	2.54	0.0	0.0	1.00	00					20.00	110010.02	77 1000101	
229	кс	11.11.23	See Plan	150	1.73	48.0	1.17	2.54	0.0	0.0	1.08	109	17844	17844	17844	178++	21.70	A16807 20	774384.42	
223	10	11.11.20	Occ i iaii	130	1.75	48.3	1.18	2.54	0.0	0.0	1.00	103	17011	17011	170	17011	21.70	410037.23	774304.42	
230	кс	11.11.23	See Plan	150	1.76	50.8	1.17	2.54	0.0	0.0	1.08	106	178+	1/11	145	157	19.16	416840 14	774628.41	
230	NO	11.11.23	See Flair	130	1.72	52.2	1.13	2.54	0.0	0.0	1.00	100	170+	141	1	137	19.10	410040.14	774020.41	
231	КC	11.11.23	See Plan	150	1.76	45.8	1.20	2.54	0.0	0.0	1.08	110	178++	178++	17844	17844	20.24	416867.22	774389.28	
231	NO	11.11.23	See Flair	130	1.71	46.9	1.16	2.54	0.0	0.0	1.00	110	170++	170++	170++	17077	20.24	410007.22	774309.20	

Checked By: ZH
Date: 16.11.23
Page: 1 of 1



FILL CONTROL SUMMARY SHEET

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

Project No.:

Date of Order:

22 0101 60

29.04.23

Job Name: Drury Town Centre
Client: Ross Reid Contractors Ltd

Address: PO Box 58545

Botany

Attention : Deon DeRidder



Signatory - Zach Hooton

TEST NUMBER	TESTED	DATE	TEST	TEST	WET	OVEN	DRY	SOLID	AIR	AVERAGE	MDD	MDD	FIELD	RL	EASTING	NORTHING	NOTES
NUMBER	BY	TESTED	LOCATION	DEPTH (mm)	DENSITY (t/m³)	WATER CONTENT (%)	DENSITY (t/m³)	DENSITY (t/m³) Supplied	VOIDS %	AIR VOIDS %	(t/m³) Supplied	(%)	SHEAR STRENGTH in kPa	(m)			
232	JR	13.11.23	See Plan	150	1.78 1.78	43.4 46.1	1.24 1.22	2.54 2.54	0.0	0.0	1.08	114	228++ 228++ 228++ 228++	20.99	416891.05	774011.15	Fill A11
233	JR	13.11.23	See Plan	150	1.66 1.67	40.8 39.9	1.18 1.19	2.54 2.54	5.3 5.6	5.5	1.08	110	228++ 228++ 228++ 228++	- 50.75	416885.69	773986.89	Fill A11

Checked By: ZH
Date: 15.11.23
Page: 1 of 1



FILL CONTROL SUMMARY SHEET

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

Project No. :

Date of Order :

22 0101 61

29.04.23

Job Name : **Drury Town Centre** Client : Ross Reid Contractors Ltd

Address: PO Box 58545

Botany

Attention: Deon DeRidder Test results indicated as not accredited are outside the scope of the laboratory's accreditation

																	-6
TEST	TESTED	DATE	TEST	TEST	WET	OVEN	DRY	SOLID	AIR	AVERAGE	MDD	MDD	FIELD	RL	EASTING	NORTHING	NOTES
NUMBER	BY	TESTED	LOCATION	DEPTH (mm)	DENSITY (t/m³)	WATER CONTENT (%)	DENSITY (t/m³)	DENSITY (t/m³) Supplied	VOIDS %	AIR VOIDS %	(t/m³) Supplied	(%)	SHEAR STRENGTH in kPa	(m)			
234	JR	16.11.23	See Plan	150	1.72	42.8	1.20	2.54	1.1	0.5	1.08	110	228++ 228++ 228++ 228++	21.07	416863.69	774431.53	Fill A11 - Test 1
					1.72	46.9	1.17	2.54	0.0								
235	JR	16.11.23	See Plan	150	1.69	45.4	1.16	2.54	1.6	2.3	1.08	108	228++ 228++ 228++ 228++	21.63	416891 18	774478 81	Fill A11 - Test 2
233	OIX.	10.11.20	OCC I IAII	130	1.68	43.2	1.17	2.54	3.1	2.0	1.00	100	22011 22011 22011	21.03	410031.10	774470.01	1 11 10002

Checked By: MQ 21.11.23 Date: Page: 1 of 1

RS009



152C Foundry Road, Silverdale 0932

FILL CONTROL SUMMARY SHEET

Project No.:

Date of Order:

22 0101 63

29.04.23

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

Job Name : Drury Town Centre
Client : Ross Reid Contractors Ltd

Address: PO Box 58545

Botany

Attention : Deon DeRidder



TEST NUMBER	TESTED BY	DATE TESTED	TEST LOCATION	TEST DEPTH (mm)	WET DENSITY (t/m³)	OVEN WATER CONTENT (%)	DRY DENSITY (t/m³)	SOLID DENSITY (t/m³) Supplied	AIR VOIDS %	AVERAGE AIR VOIDS %	MDD (t/m³) Supplied	MDD (%)		SH STRE	ELD EAR :NGTH kPa		RL (m)	EASTING	NORTHING	NOTES
236	DT	28.11.23	See Plan	150	1.77	44.6	1.22	2.54	0.0	1.9	1.08	109	217++	217++	217++	217++	21.50	416875.48	774392.45	
					1.64	46.3	1.12	2.54	3.8											
237	DT	28.11.23	See Plan	150	1.75	52.7	1.15	2.54	0.0	0.0	1.08	106	217++	217++	217++	217++	21.03	416856.23	774427.78	
251		20.11.20	OCC I IAII	150	1.73	49.7	1.15	2.54	0.0	0.0	1.00	100	21777	Z1/TT		21777	21.00	+10000.20	114421.10	

Checked By: ZH
Date: 05.12.23
Page: 1 of 1



FILL CONTROL SUMMARY SHEET

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

Project No.:

Date of Order:

22 0101 64

29.04.23

Job Name: Drury Town Centre
Client: Ross Reid Contractors Ltd

Address: PO Box 58545

Botany

Attention : Deon DeRidder



TEST	TESTED	DATE	TEST	TEST	WET	OVEN	DRY	SOLID	AIR	AVERAGE	MDD	MDD		FIELD		RL	EASTING	NORTHING	NOTES
NUMBER	BY	TESTED	LOCATION	DEPTH (mm)	DENSITY (t/m³)	WATER CONTENT (%)	DENSITY (t/m³)	DENSITY (t/m³) Supplied	VOIDS %	AIR VOIDS %	(t/m³) Supplied	(%)	ST	SHEAR RENGTH in kPa		(m)			
238	JR	29.11.23	See Plan	150	1.73 1.72	48.9 45.2	1.16 1.18	2.54 2.54	0.0	0.0	1.08	108	228++ 228	++ 228++	228++	22.32	416808.28	774150.76	Fill A4
239	JR	29.11.23	See Plan	150	1.71	45.0 47.2	1.18 1.16	2.54	0.7	0.4	1.08	108	228+ 228	3+ 228++	228++	22.17	416783.20	774222.27	Fill A4

Checked By: ZH
Date: 05.12.23
Page: 1 of 1



FILL CONTROL SUMMARY SHEET

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

Project No. :

Date of Order:

22 0101 65

29.04.23

Job Name : Drury Town Centre
Client : Ross Reid Contractors Ltd

Address: PO Box 58545

Botany

Attention : Deon DeRidder



TEST NUMBER	TESTED BY	DATE TESTED	TEST LOCATION	TEST DEPTH (mm)	WET DENSITY (t/m³)	OVEN WATER CONTENT (%)	DRY DENSITY (t/m³)	SOLID DENSITY (t/m³) Supplied	AIR VOIDS %	AVERAGE AIR VOIDS %	MDD (t/m³) Supplied	MDD (%)		SH STRE	ELD EAR ENGTH kPa		RL (m)	EASTING	NORTHING NOTES
240	JR	30.11.23	See Plan	150	1.77	44.4	1.22	2.54	0.0	0.0	1.08	114	193	198	171	228+	14.12	416668.96	773929.03 Pond 2
					1.79	44.9	1.23	2.54	0.0										
241	JR	30.11.23	See Plan	150	1.78	43.2	1.24	2.54	0.0	0.0	1.08	116	189	214	198	228+	15.19	416680.57	773907.93 Pond 2
241	JIX	30.11.23	See I lali	130	1.77	39.7	1.27	2.54	0.0	0.0	1.00	110	103	214	130	220+	10.19	410000.57	773907.93 1 GHd 2
242	ΙD	20.44.22	Con Dian	450	1.77	43.6	1.23	2.54	0.0	0.0	1.00	445	220.	047	220.	220.	45.00	440005.04	772025 47 Daniel 2
242	JR	30.11.23	See Plan	150	1.77	40.1	1.26	2.54	0.0	0.0	1.08	115	228+	217	228+	220+	15.23	416685.01	773935.17 Pond 2
243	JR	30.11.23	See Plan	150	1.74	44.5	1.20	2.54	0.0	1.9	1.08	114	228++	22811	228++	228++	22.16	416872.40	774086.02 Fill A11
240	OI (30.11.23	OCC I Idii	100	1.73	36.8	1.26	2.54	3.7	1.5	1.00	117	22011	22011	22011	22011	22.10	410072.40	774000.02 1 1 1 1
244	JR	30.11.23	See Plan	150	1.65	43.6	1.15	2.54	4.5	3.2	1.08	106	202	22011	228++	22011	19.84	416937.39	774005.75 A11 Pre Fill
244	JK	30.11.23	See Flair	130	1.67	46.5	1.14	2.54	1.9	3.2	1.00	100	202	220++	220++	220++	19.04	410937.39	774005.75 ATT FIE FIII
245	JR	30.11.23	See Plan	150	1.79	37.1	1.30	2.54	0.3	0.2	1.08	120	22011	22011	22011	228++	22.43	416920 OF	774178.15 Fill A4
240	JK	30.11.23	See Fiall	100	1.78	39.2	1.28	2.54	0.0] 0.∠	1.00	120	220++	220++	220++	220++	ZZ.43	410029.90	774176.15 Fill A4
246	ID	20 11 22	Coo Dior	150	1.74	47.1	1.18	2.54	0.0	0.0	1.08	110	220 :	220.1	220	220	20.06	446602.47	774400 66 Fill A2
∠46	JR	30.11.23	See Plan	150	1.74	44.6	1.20	2.54	0.0	0.0	1.08	110	228+	228++	228++		20.86	410003.17	774199.66 Fill A3
0.47	ID	00.44.00	Can Dia:	450	1.72	43.1	1.20	2.54	1.0	0.0	4.00	444	400	047	407	04.4	40.70	44.05.00.00	774044 40 F:11 40
247	JR	30.11.23	See Plan	150	1.73	43.7	1.20	2.54	0.3	0.6	1.08	111	193	217	167	214	19.78	416596.88	774211.12 Fill A3

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Date: 06.12.23
Page: 1 of 1



FILL CONTROL SUMMARY SHEET

Project No.:

Date of Order:

22 0101 66

29.04.23

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

Job Name : Drury Town Centre

Client: Ross Reid Contractors Ltd
Address: PO Box 58545

Botany

Attention : Deon DeRidder



TEST	TESTED	DATE	TEST	TEST	WET	OVEN	DRY	SOLID	AIR	AVERAGE	MDD	MDD		FIE	ELD		RL	EASTING	NORTHING	NOTES
NUMBER	BY	TESTED	LOCATION	DEPTH	DENSITY	WATER	DENSITY	DENSITY	VOIDS	AIR				SH	EAR					
				(mm)	(t/m ³)	CONTENT	(t/m ³)	(t/m ³)		VOIDS	(t/m ³)	(%)		STRE	NGTH		(m)			
						(%)		Supplied	%	%	Supplied			in	kPa					
																		•	-	
248	ID	01.12.23	See Plan	150	1.75	41.9	1.23	2.54	0.0	0.0	1.08	112	206	214	193	171	16.83	446600 40	773889.12 Pc	and 2
240	JR	01.12.23	See Plan	150	1.75	47.4	1.19	2.54	0.0	0.0	1.06	112	206	214	193	171	10.03	410000.42	773009.12	ona z
249	JR	01.12.23	See Plan	150	1.73	36.6	1.27	2.54	3.8	3.9	1.08	117	193	2201	228+	214	16.04	416676.47	773911.04 P	and 2
249	JK	01.12.23	See Flair	150	1.73	36.6	1.26	2.54	4.0	3.9	1.00	117	193	220+	220+	214	10.04	410070.47	773911.04	ona z
250	JR	01.12.23	See Plan	150	1.75	35.8	1.29	2.54	3.3	3.4	1.08	119	228+	2201	228+	228+	15.47	416677.60	773928.82 P	and 2
250	JK	01.12.23	See Flair	130	1.75	35.7	1.29	2.54	3.5	3.4	1.00	119	220+	220+	220+	220+	15.47	410077.00	113920.02	onu z

Checked By: ZH
Date: 06.12.23
Page: 1 of 1

RS009



152C Foundry Road, Silverdale 0932

FILL CONTROL SUMMARY SHEET

Project No.:

Date of Order:

22 0101 69

29.04.23

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

Job Name : Drury Town Centre
Client : Ross Reid Contractors Ltd

Address: PO Box 58545

Botany

Attention : Deon DeRidder



																			Signatory - Zach Hooton
TEST NUMBER	TESTED BY	DATE TESTED	TEST LOCATION	TEST DEPTH (mm)	WET DENSITY (t/m³)	OVEN WATER CONTENT (%)	DRY DENSITY (t/m³)	SOLID DENSITY (t/m³) Supplied	AIR VOIDS %	AVERAGE AIR VOIDS %	MDD (t/m³) Supplied	MDD (%)	FIE SHE STREN in k	AR NGTH		RL (m)	EASTING	NORTHING	NOTES
259	DT	19.12.23	See Plan	150	1.73 1.74	31.2 32.0	1.32 1.32	2.54 2.54	6.8 6.0	6.4	1.08	122	217++ 217++	217++	217++	21.49	416918.58	774036.23	
260	DT	19.12.23	See Plan	150	1.76 1.77	40.0 40.3	1.25 1.26	2.54 2.54	0.5	0.2	1.08	116	186 191	210	213	20.25	416931.58	774002.62	

Checked By: ZH
Date: 09.01.24
Page: 1 of 1



FILL CONTROL SUMMARY SHEET

Project No.:

Date of Order:

22 0101 70

29.04.23

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

Job Name : Drury Town Centre
Client : Ross Reid Contractors Ltd

Address: PO Box 58545

Botany

Attention : Deon DeRidder



TEST NUMBER	TESTED BY	DATE TESTED	TEST LOCATION	TEST DEPTH	WET DENSITY	OVEN WATER	DRY DENSITY	SOLID DENSITY	AIR VOIDS	AVERAGE AIR	MDD	MDD	FIELD SHEAR		RL	EASTING	NORTHING	NOTES
				(mm)	(t/m ³)	CONTENT (%)	(t/m ³)	(t/m³) Supplied	%	VOIDS %	(t/m³) Supplied	(%)	STRENGTH in kPa		(m)			
261	DT	10.01.24	See Plan	150	1.79	38.0	1.29	2.54	0.0	0.0	1.08	121	217++ 217++ 217++ 21	17++	20.23	416970 41	774019.41	A11 Pre Fill
20.	٥.	10101121	OGO I IGII	100	1.83	38.9	1.31	2.54	0.0	0.0	1.00				20.20		77 1010111	, , , , , , , , , , , , , , , , , , ,
262	DT	10.01.24	See Plan	150	1.77	59.8	1.11	2.54	0.0	0.0	1.08	105	217++ 217++ 217++ 21	17++	19.69	417010 47	774027.47	A11 Pre Fill
202	Di	10.01.24	Occ i idii	100	1.77	51.0	1.17	2.54	0.0	0.0	1.00	100	21711 21711 21711 21	.,	10.00	417010.47	774027.41	7(111101 III
263	DT	10.01.24	See Plan	150	1.81	32.0	1.37	2.54	2.4	3.5	1.08	123	217++ 217++ 217++ 21	17	17.13	/1671/ QQ	773947.77	A11 Pro Fill
203	Di	10.01.24	Oce i laii	130	1.74	34.1	1.30	2.54	4.5	5.5	1.00	125	217++ 217++ 217++ 21	17 ++	17.13	410714.33	113341.11	ATTTIETIII
264	DT	10.01.24	See Plan	150	1.72	38.7	1.24	2.54	3.4	4.6	1.08	113	217++ 217++ 217++ 21	17	18.00	116717 17	773967.43	A11 Pro Fill
204	וט	10.01.24	OCC FIAIT	130	1.68	38.5	1.21	2.54	5.8	4.0	1.00	113	21177 21177 21177	1777	10.00	410717.47	113901.43	ATTELIII

Checked By: ZH
Date: 12.01.24
Page: 1 of 1



FILL CONTROL SUMMARY SHEET

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001 (Please note Air Void calculations are not IANZ endorsed as part of this report)

Project No. :

Date of Order :

22 0101 71

29.04.23

Job Name : Client : Drury Town Centre Ross Reid Contractors Ltd

Address: PO Box 58545 Botany

Attention : Deon DeRidder

TEST NUMBER	TESTED BY	DATE TESTED	TEST LOCATION	TEST DEPTH (mm)	WET DENSITY (t/m³)	OVEN WATER CONTENT (%)	DRY DENSITY (t/m³)	SOLID DENSITY (t/m³) Supplied	AIR VOIDS %	AVERAGE AIR VOIDS %	MDD (t/m³) Supplied	MDD (%)		SH STRE	ELD EAR NGTH kPa		RL (m)	EASTING	NORTHING	NOTES
265	DT	11.01.24	See Plan	150	1.78 1.74	44.8 46.5	1.23 1.19	2.54 2.54	0.0	0.0	1.08	112	171	182	185	210	18.33	416719.80	773948.70	
266	DT	11.01.24	See Plan	150	1.71	39.4	1.22	2.54	3.6	1.8	1.08	116	217++	217++	217++	217++	18.65	416711.11	773972.28	
					1.78	38.4	1.28	2.54	0.0											
267	DT	11.01.24	See Plan	150	1.76	38.9	1.27	2.54	0.6	0.3	1.08	118	198	198	201	204	20.49	416966 87	774011.90	
20.	٥.		000 1 10.11	.00	1.82	42.3	1.28	2.54	0.0	0.0	1.00					20.	200	110000.01		
268	268 DT	11.01.24	See Plan	150	1.77	38.3	1.28	2.54	0.5	0.5	1.08	119	217++	217++	217	+ 217++	21.05	416006.02	774042.65	
200	D1	11.01.24	OCC I Idii	100	1.78	37.3	1.30	2.54	0.4	0.0	1.00	113	21777	21777	21777	21777	21.00	410030.32	77-10-12.00	

Checked By: 17.01.24 Date: Page: 1 of 1



FILL CONTROL SUMMARY SHEET

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001 (Please note Air Void calculations are not IANZ endorsed as part of this report)

Project No.:

Date of Order :

22 0101 72

29.04.23

Job Name : Client : Drury Town Centre Ross Reid Contractors Ltd

Address: PO Box 58545 Botany

Attention : Deon DeRidder

TEST NUMBER	TESTED BY	DATE TESTED	TEST LOCATION	TEST DEPTH (mm)	WET DENSITY (t/m³)	OVEN WATER CONTENT (%)	DRY DENSITY (t/m³)	SOLID DENSITY (t/m³) Supplied	AIR VOIDS %	AVERAGE AIR VOIDS %	MDD (t/m³) Supplied	MDD (%)		FIELD SHEAR STRENGTH in kPa		SHEAR STRENGTH		RL (m)	EASTING	NORTHING	NOTES
269	269 DT	12.01.24	See Plan	150	1.77	40.2	1.26	2.54	0.0	0.0	1.08	118	217++	217++	217++	217++	+ 20.79	416970.69	774006.99		
					1.78	38.6	1.29	2.54	0.0	1											
270	DT	12.01.24	See Plan	150	1.71	40.7	1.21	2.54	2.9	2.3	1.08	114	217++	217++	+ 217++	217++	19.64	416981.27	774005.13		
270		12.01.24	occ i idii		1.75	38.7	1.26	2.54	1.6		1.00	114									
271	271 DT	12.01.24	See Plan	an 150	1.78	39.6	1.28	2.54	0.0	4.6	1.08	114	217	+ 217++	++ 217++ 2	217++	17.32	416713.29	773949.64		
2/1	D1	12.01.24	Oce i lan		1.63	37.4	1.18	2.54	9.2	4.0		114	217								

Checked By: 17.01.24 Date: Page: 1 of 1



FILL CONTROL SUMMARY SHEET

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

Project No. :

Date of Order:

22 0101 73

29.04.23

Job Name : Drury Town Centre
Client : Ross Reid Contractors Ltd

Address: PO Box 58545

Botany

Attention : Deon DeRidder



TEST NUMBER	TESTED BY	DATE TESTED	TEST LOCATION	TEST DEPTH (mm)	WET DENSITY (t/m³)	OVEN WATER CONTENT (%)	DRY DENSITY (t/m³)	SOLID DENSITY (t/m³) Supplied	AIR VOIDS %	AVERAGE AIR VOIDS %	MDD (t/m³) Supplied	MDD (%)	FIELD SHEAR STRENGTH in kPa		RL (m)	EASTING	NORTHING	NOTES	
272	JR	15.01.24	See Plan	150	1.77 1.74	47.2 46.6	1.20 1.19	2.54 2.54	0.0	0.0	1.08	110	228++ 228++	228++	228++	21.98	416831.24	774282.61	Fill A5
273	JR	15.01.24	See Plan	150	1.62 1.64	47.0 42.2	1.10 1.15	2.54 2.54	4.6 5.9	5.2	1.08	105	228++ 228++	228++	228++	22.32	416863.94	774309.07	Fill A5
274	JR	15.01.24	See Plan	150	1.74 1.73	47.4 46.5	1.18 1.18	2.54 2.54	0.0	0.0	1.08	109	146 136	150	128	21.26	416927.66	774017.05	Fill A11
275	JR	15.01.24	See Plan	150	1.73 1.74	43.9 45.6	1.21 1.20	2.54 2.54	0.0	0.0	1.08	111	158 193	189	171	20.84	416983.20	774012.45	Fill A11

Checked By: ZH
Date: 17.01.24
Page: 1 of 1



FILL CONTROL SUMMARY SHEET

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

Project No.:

Date of Order:

22 0101 74

29.04.23

Job Name : Drury Town Centre
Client : Ross Reid Contractors Ltd

Address: PO Box 58545

Botany

Attention : Deon DeRidder

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

Signatory - Zach Hooton

TEST	TESTED	DATE	TEST	TEST	WET	OVEN	DRY	SOLID	AIR	AVERAGE	MDD	MDD		FIELD		RL	EASTING	NORTHING	NOTES
NUMBER	BY	TESTED	LOCATION	DEPTH	DENSITY	WATER	DENSITY	DENSITY	VOIDS	AIR			SHE	EAR					
				(mm)	(t/m ³)	CONTENT	(t/m ³)	(t/m ³)		VOIDS	(t/m ³)	(%)	STRE	NGTH		(m)			
						(%)		Supplied	%	%	Supplied		in k	(Pa					
						(**)								iii ki d					
																	1		
276	ID	ID 40.04.04 Coo Bloom	See Plan	150	1.72	38.2	1.24	1.24 2.54 3.7	3.3	1.00	1.08 118	228+ 228+	220	220	18.74	446049.69	772070 02	EII A44	
2/6	JR 19.01.24 See Plar	See Plan	150	1.77	34.6	1.31	2.54	2.8		1.08		228+ 228+	228++	1220++	10.74	410940.00	773979.83	FIII ATT	
					1.77	34.6	1.31	2.54	2.0										
277	ID	10.01.04	See Plan	lan 150	1.78	36.8	1.30	2.54	0.7	0.4	1.08	120	184 175	171	198	18.90	416999.77	774002 64	Fill A11
2//	JR	19.01.24	See Plan		1.81	39.4	1.29	2.54	0.0			120	184 175	171				774003.61	
					1.01	39.4	1.29	2.54	0.0										
278	JR	19.01.24	See Plan	150	1.82	43.0	1.27	2.54	0.0	0.3	1.08	114	22011 22011	000	000	23.29	44,0004,00	774141.06	F:II A44
210	2/8 JR 1	19.01.24	See Flair	150	1.72	44.1	1.19	2.54	0.6	0.3	1.06	114	228++ 228++ 228++		220++	23.29	410991.23	774141.00	TIII ATT
-			+		1.72	77.1	1.10	2.07	0.0				 						
279	279 JR 19.01.	19.01.24	See Plan	lan 150	1.72	39.4	1.23	2.54	3.1	1.5	1.08	118	228++ 228++],,,,,,	220	23.43	416046 06	774220.91	
219	JK	19.01.24	See Fiall	130	1.84	39.7	1.32	2.54	0.0	1.0	1.00	110	220++ 220++	ZZO++	220++	23.43	410940.90	114220.91	

Checked By: ZH
Date: 24.01.24
Page: 1 of 1



152C Foundry Road, Silverdale 0932

FILL CONTROL SUMMARY SHEET

Project No. :

Date of Order:

22 0101 75

29.04.23

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

Job Name : Drury Town Centre
Client : Ross Reid Contractors Ltd

Address: PO Box 58545

Botany

Attention : Deon DeRidder



TEST	TESTED	DATE	TEST	TEST	WET	OVEN	DRY	SOLID	AIR	AVERAGE	MDD	MDD		FII	ELD		RL	EASTING	NORTHING	NOTES
NUMBER	BY	TESTED	LOCATION	DEPTH	DENSITY	WATER	DENSITY	DENSITY	VOIDS	AIR	•			SH	EAR					
				(mm)	(t/m ³)	CONTENT	(t/m ³)	(t/m ³)		VOIDS	(t/m ³)	(%)		STRE	ENGTH		(m)			
						(%)		Supplied	%	%	Supplied			in	kPa					
280	JR	23.01.24	See Plan	150	1.74	45.3	1.20	2.54	0.0	0.0	1.08	110	228+	228++	228++	228++	20.00	416994 36	774005.50	Fill A11
200	OIX	20.01.24	Occ i lan	100	1.73	46.3	1.18	2.54	0.0	0.0	1.00	110	2201	22011	22011	22011	20.00	410004.00	774000.00	7 111 / (1 1
281	JR	23.01.24	See Plan	150	1.70	48.8	1.14	2.54	0.0	0.6	1.08	107	228++	228++	228++	228++	19.31	416990.06	774002.82	Fill Δ11
201	OIX.	20.01.24	OCC I Idii	130	1.70	44.5	1.18	2.54	1.2	0.0	1.00	107	22011	22011	22011	22011	10.01	410330.00	774002.02	1 111 73.1 1
282	JR	23.01.24	See Plan	150	1.74	40.7	1.24	2.54	0.8	0.4	1.08	113	2281	228++	228++	228++	18.69	416980.90	773993.67	Fill A11
202	JIX	23.01.24	See Flair	130	1.75	45.9	1.20	2.54	0.0	0.4	1.00	113	220+	220++	22077	22077	10.09	410900.90	113993.01	A
283	JR	23.01.24	See Plan	150	1.62	41.1	1.15	2.54	7.6	6.8	1.08	107	228++	228++	228++	228++	19.21	416944.51	773978.44	Fill A11
203	υIX	20.01.24	OGG FIAIT	130	1.64	42.2	1.15	2.54	6.0	0.0	1.00	107	ZZ0TT	22077	22077	22077	13.21	710344.31	113310.44	A



152C Foundry Road, Silverdale 0932

FILL CONTROL SUMMARY SHEET

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

Project No.:

Date of Order:

22 0101 76

29.04.23

Job Name : Drury Town Centre
Client : Ross Reid Contractors Ltd

Address: PO Box 58545

Botany

Attention : Deon DeRidder



TEST	TESTED	DATE	TEST	TEST	WET	OVEN	DRY	SOLID	AIR	AVERAGE	MDD	MDD			ELD		RL	EASTING	NORTHING	NOTES
NUMBER	BY	TESTED	LOCATION	DEPTH	DENSITY	WATER	DENSITY	DENSITY	VOIDS	AIR	3.				IEAR					
				(mm)	(t/m ³)	CONTENT	(t/m ³)	(t/m ³)	<u>.</u> .	VOIDS	(t/m ³)	(%)			ENGTH		(m)			
						(%)		Supplied	%	%	Supplied			ın	kPa			l	l	
														1	_			,	•	
284	JR	24.01.24	See Plan	150	1.68	41.5	1.18	2.54	4.2	4.6	1.08	109	193	228+	228++	228++	15.09	416642 35	774060 11	Prefill area A2 / A3
204	OI V	24.01.24	occ i iaii	100	1.66	42.0	1.17	2.54	5.0	4.0	1.00	100	100	2201	22011	22011	10.00	410042.00	774000.11	Tronii area 7/2 / 7/6
285	JR	24.01.24	See Plan	150	1.80	35.6	1.33	2.54	0.7	0.6	1.08	123	22011	22011	22011	228++	15.42	416650.85	774042.04	Prefill area A2 / A3
200	JK	24.01.24	See Flair	130	1.80	36.0	1.32	2.54	0.5	0.6	1.00	123	220++	220++	220++	220++	13.42	410000.00	774043.94	Freilli area AZ / AS
206	ID	24.01.24	See Plan	150	1.71	36.2	1.25	2.54	5.3	5.3	1.08	116	22011	22011	22011	228++	16.74	416668.18	774024 04	Prefill area A2 / A3
286	JR	24.01.24	See Plan	130	1.71	35.9	1.26	2.54	5.4	ე.ა	1.06	116	220++	220++	220++	220++	10.74	410000.10	774031.01	Fiteliii alea AZ / A3





152C Foundry Road, Silverdale 0932

FILL CONTROL SUMMARY SHEET

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

Project No.:

Date of Order:

22 0101 77

29.04.23

Job Name : Drury Town Centre
Client : Ross Reid Contractors Ltd

Address: PO Box 58545 Botany

Attention : Deon DeRidder

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

Signatory - Zach Hooton

TEST	TESTED	DATE	TEST	TEST	WET	OVEN	DRY	SOLID	AIR	AVERAGE	MDD	MDD		FIE			RL	EASTING	NORTHING	NOTES
NUMBER	BY	TESTED	LOCATION	DEPTH (mm)	DENSITY (t/m³)	WATER CONTENT	DENSITY (t/m³)	DENSITY (t/m³)	VOIDS	AIR VOIDS	(t/m ³)	(%)			EAR NGTH		(m)			
				()	(4)	(%)	(4)	Supplied	%	%	Supplied	(70)		in k			(111)			
287	JR	25.01.24	See Plan	150	1.68	34.5	1.25	2.54	7.6	7.4	1.08	115	228++	228++	228++	22811	16.38	416643.72	774053.62	Fill A2 / A3
201	ΟIX	20.01.24	OCC I Idii	100	1.68	35.4	1.24	2.54	7.2	7.4	1.00	110	22011	22011	22011	22011	10.50	410043.72	774000.02	1 111 / 12 / 7 / 10
288	JR	25.01.24	See Plan	150	1.77	45.2	1.22	2.54	0.0	0.0	1.08	114	228++	228++	228++	228++	16.19	416648.50	774057.75	Fill A2 / A3
	J. C	20.01.21	00011011		1.78	43.2	1.24	2.54	0.0	0.0								110010.00		,
289	JR	25.01.24	See Plan	150	1.85	38.1	1.34	2.54	0.0	0.0	1.08	125	228++	228++	228++	228++	16.30	416657.64	774040.96	Fill A2 / A3
200	OT C	20.01.21	00011011	100	1.87	36.4	1.37	2.54	0.0	0.0	1.00	120	22011	22011		22011	10.00	110007.01	77 10 10.00	1 111 / 12 / / 10
290	JR	25.01.24	See Plan	150	1.72	41.9	1.21	2.54	1.4	0.9	1.08	111	228++	228++	228++	228++	17.18	416674.88	774026.35	 Fill A2 / A3
	J. C	20.01.21	00011011		1.71	44.5	1.19	2.54	0.5	0.0								11007 1100	11 1020.00	, 27,7.6
291	JR	25.01.24	See Plan	150	1.73	48.8	1.16	2.54	0.0	0.0	1.08	106	167	214	198	171	19.58	416932.21	773977.66	Fill All
	U				1.73	53.1	1.13	2.54	0.0	0.0										
292	JR	25.01.24	See Plan	150	1.75	45.5	1.20	2.54	0.0	0.0	1.08	111	146	171	167	193	20.34	416997.61	774003.29	 Fill All
	.				1.75	46.1	1.20	2.54	0.0											
293	JR	25.01.24	See Plan	150	1.65	44.3	1.14	2.54	4.2	4.3	1.08	107	228	198	214	228+	17.61	416664.24	774036.43	 Fill A2 / A3
	.				1.66	42.9	1.16	2.54	4.4											
294	JR	25.01.24	See Plan	150	1.79	43.6	1.25	2.54	0.0	0.0	1.08	115	228++	228++	228++	228++	16.96	416650.97	774052.92	Fill A2 / A3
	51 \		00011011		1.79	45.1	1.24	2.54	0.0	0.0								110000.01		, 277.0
295	JR	25.01.24	See Plan	150	1.74	43.6	1.21	2.54	0.0	0.0	1.08	111	228++	228++	228++	228+	20.03	416932.92	773983.21	 Fill All
	.		300		1.73	45.0	1.19	2.54	0.0	0.0										
296	JR	25.01.24	See Plan	150	1.73	47.9	1.17	2.54	0.0	0.0	1.08	109	193	184	167	171	20.73	416995.21	774008.46	Fill All
200	011	20.01.27	300 1 1011	.00	1.73	45.1	1.19	2.54	0.0	0.0	1.00	100				''	20.70	. 10000.21	. , 1000.40	

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152C Foundry Road, Silverdale 0932

FILL CONTROL SUMMARY SHEET

TEST STANDARD - NUCLEAR DENSOMETER, NZS 4407:2015 TEST 4.2; WATER CONTENT, NZS 4402 TEST 2.1; SHEAR VANE, NZ GEOTECHNICAL SOCIETY GUIDELINES INC. 2001

(Please note Air Void calculations are not IANZ endorsed as part of this report)

Project No.:

Date of Order:

22 0101 78

29.04.23

Job Name : Drury Town Centre
Client : Ross Reid Contractors Ltd

Address: PO Box 58545

Botany

Attention : Deon DeRidder



TEST NUMBER	TESTED BY	DATE TESTED	TEST LOCATION	TEST DEPTH (mm)	WET DENSITY (t/m³)	OVEN WATER CONTENT (%)	DRY DENSITY (t/m³)	SOLID DENSITY (t/m³) Supplied	AIR VOIDS %	AVERAGE AIR VOIDS %	MDD (t/m³) Supplied	MDD (%)		SH STRE	ELD EAR ENGTH kPa		RL (m)	EASTING	NORTHING	NOTES
297	JR	26.01.24	See Plan	150	1.76	38.0	1.27	2.54	1.4	0.7	1.08	115	228++	228++	228++	228++	18.44	416680.65	774020.75 Fill A2/A	.3
					1.75	44.4	1.21	2.54	0.0											
298	JR	26.01.24	See Plan	150	1.73	48.6	1.17	2.54	0.0	0.0	1.08	108	167	171	150	167	17.86	416655.61	774048.25 Fill A2/A	.3
200	J. C	20.01.21	00011011	100	1.73	47.4	1.17	2.54	0.0	0.0	1.00		101		.00	107	17.00	110000.01	77 10 10.20	.0
299	JR	26.01.24	See Plan	150	1.75	39.7	1.25	2.54	0.8	0.4	1.08	115	167	154	150	189	18.64	416677.35	774028.62 Fill A2/A	.3
299	JIX	20.01.24	See I lan	100	1.75	43.6	1.22	2.54	0.0	0.4	1.00	113	107	154	130	103	10.04	410077.55	774020.02 11 111 / 12//	
300	JR	26.01.24	See Plan	150	1.69	46.7	1.15	2.54	0.9	0.8	1.08	106	171	193	217	214	18.96	416662.42	774044.98 Fill A2/A	.2
300	JK	20.01.24	See Flair	130	1.69	47.7	1.14	2.54	0.7	0.6	1.00	100	171	193	217	214	10.90	410002.42	774044.96 FIII AZ/A	
301	JR	26.01.24	See Plan	150	1.74	38.6	1.26	2.54	1.9	1.3	1.08	115	2281	22811	228++	22871	18.85	416647.19	774067.96 Fill A2/A	.3
301	JIX	20.01.24	See Fiall	100	1.74	41.3	1.23	2.54	0.8	1.3	1.00	110	220+	220++	220++	22077	10.00	410047.19	774007.90 Fill A2/A	



APPENDIX D: INSPECTION RECORDS



Project Name	Drury Centre - Kiwi Property Group
Location	Drury, Auckland
Project Number	AKS2023-0072
Date	05/10/2023
Time	12:50 pm
Author	SA
Attendance	CMW: SA Contractors: Deon (Ross Reid)
Weather / Site conditions	Sunny/Dry
Details of plant onsite	1 x Motor Scraper
What is being inspected?	Trimming material to commence filling as identified in red circle below.
What is your location? Attach plan.	28 ha
Inspection notes	

Attended site to observe site stripping material at A11, exposing AVF cohesive soils comprising very stiff south Auckland volcanic clay and silt, orange in colour. Testing to be carried out by road test which Contractor will provide results. Unsuitable material trimmed from location and site okay to commence filling provided that results of testing is meets specification

Instructions/ recommendations given to contractors

No instructions given.

Further Inspections

No further inspections planned. Will visit whilst filling is being carried out.

Attachments

None

Photos and videos



Looking north - Trimming of topsoil material to exposed volcanic soils.



Exposed subgrade comprising, AVF clay & silt. Some topsoil stuck in wheels have been left behind by motor scraper.



Project Name	Drury Centre - Kiwi Property Group
Location	Drury, Auckland
Project Number	AKS2023-0072
Date	05/10/2023
Time	12:55 pm
Author	SA
Attendance	CMW: SA Contractors: Deon (Ross Reid)
Weather / Site conditions	Sunny/Dry
Details of plant onsite	1 x sheep foot bulldozer
What is being inspected?	Disking material previously placed in earthworks season 1.
What is your location? Attach plan.	Date of the state
Inspection notes	Attended site to observe disking of material placed previously in earthworks season 1 (red circle above) within A11. Due to winter wet period, material has been disked to allow for drying before recompacting. Material to be retest and meet earthworks specification

recommendations given to contractors
Further Inspections

No further inspections planned. Will visit whilst filling is being carried out.

Attachments

None

Photos and videos

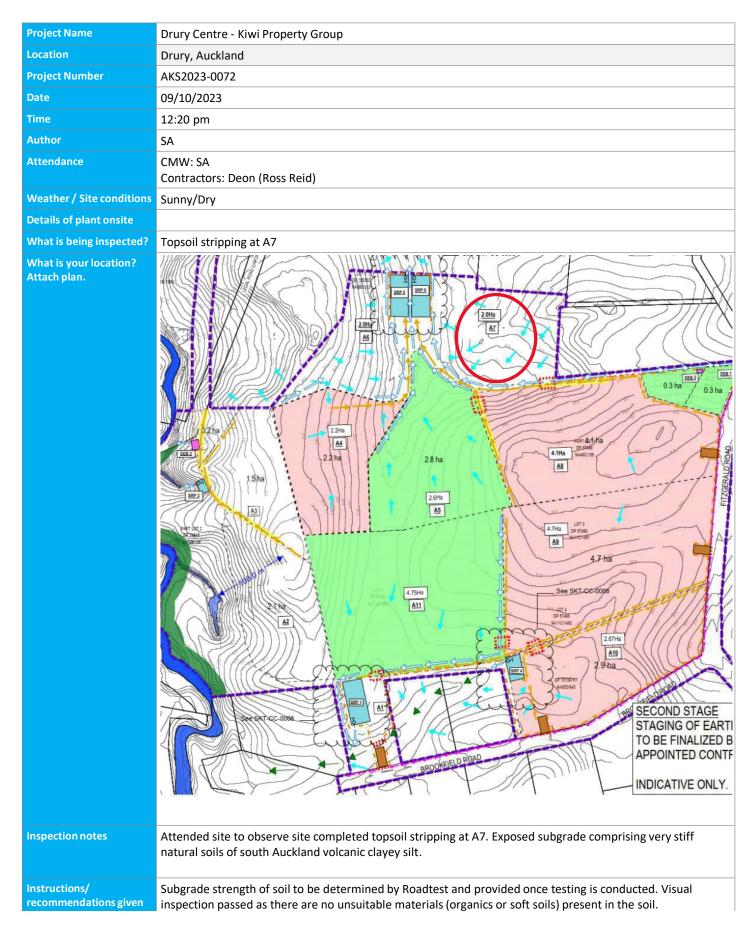


Looking south - Season 1 filling at A11 being disked and allowed to dry prior to recompacting and recommencing filling.



Looking south west - Extent of disking at A11.





to contractors

Further Inspections

None

Attachments

None

Photos and videos



Looking north east - Extent of topsoil stripping exposing subgrade.



Looking east - AVF silt exposed following topsoil stripping works.



Project Name	Drury Centre - Kiwi Property Group
Location	Drury, Auckland
Project Number	AKS2023-0072
Date	26/10/2023
Time	10:10 am
Author	SA
Attendance	CMW: Shirantha (SA) Ross Reid: Deon (DR) Woods: Glenn (GW) Kiwi Property: Elizabeth (ED) Pragmatix: Jayson (JT)
Weather / Site conditions	Partly Cloudy/Dry
Details of plant onsite	
What is being inspected?	Cut material at A4
What is your location? Attach plan.	2 Sha SECOND STAGE STAGING OF EART TO BE FINALIZED APPOINTED CONT.
Inspection notes	Material cut from A4, in the process of it

Instructions/	None
recommendations given to contractors	
Further Inspections	None
Attachments	None

Photos and videos



Looking south – Cutting of A4 comprising clayey silt material with basalt clast inclusions.



Looking east – Cut sequence into ridgeline which forms the edge of A4. It is expected that a further 3 meters of cut required to achieve design levels.



Looking north west – View from ridgeline. Material comprising clayey silt with basalt gravel inclusions. At time of photo taken, ridgeline has been cut down by 1 m.



Track rolled material comprising clayey silt with basalt gravel inclusions.



Project Name	Drury Centre - Kiwi Property Group
Location	Drury, Auckland
Project Number	AKS2023-0072
Date	26/10/2023
Time	10:20 am
Author	SA
Attendance	CMW: Shirantha (SA) Ross Reid: Deon (DR) Woods: Glenn (GW) Kiwi Property: Elizabeth (ED) Pragmatix: Jayson (JT)
Weather / Site conditions	Partly Cloudy/Dry
Details of plant onsite	1 x Excavator
What is being inspected?	Pond 3
What is your location? Attach plan.	28 ha And And And And And And And An
	INDICATIVE ONLY

Construction of pond on sloping ground. Pond is cut and founded on predominantly intermixed clay and silt with basalt gravel inclusions. Slopes of pond does not appear to show instability. Cutting from the pond is taken to the stockpile at A5/A6.

Instructions/ recommendations given to contractors None

Further Inspections

Inspect when pond is complete

Attachments

None

Photos and videos



Looking east – Pond construction



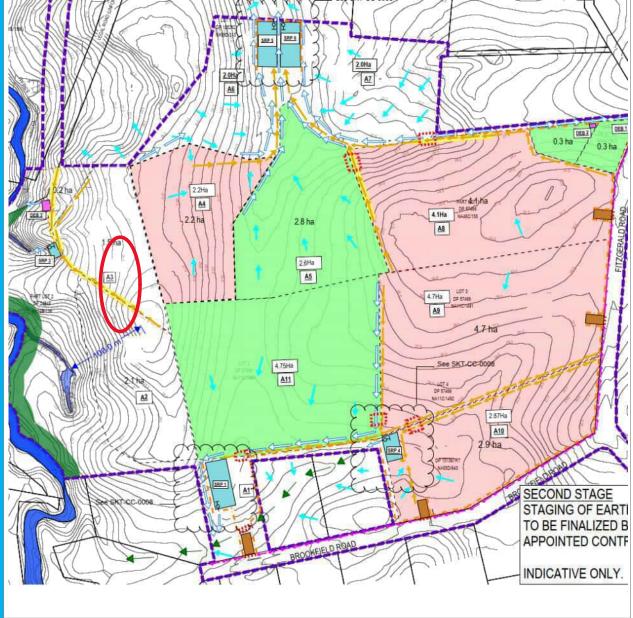
Construction of sediment pond side walls does not appear to show instability at 2v:1h. Material consists of predominantly clay & silt with highly to completely weathered basalt. The variability in soil type apparent in the sediment pond construction is consistent with weathered basalt flow features.



Looking north west – Extent of the northern edge of pond, to be excavated to design.



Project Name	Drury Centre - Kiwi Property Group
Location	Drury, Auckland
Project Number	AKS2023-0072
Date	02/11/2023
Time	11:30 am
Author	SA
Attendance	CMW: Shirantha (SA) Ross Reid: Deon (DR)
Weather / Site conditions	Sunny/Dry
Details of plant onsite	1 x Excavator, 2 x ADT
What is being inspected?	Pond 3
What is your location? Attach plan.	20Ha 20Ha A



Inspection notes

Instructions/ recommendations given to contractors

Further Inspections

Continuation of pond 3 construction.

Basalt boulders present on the side walls of the sediment pond. Questioned Contractor if these will be removed. They won't be as it adds to the stability and the Environmental Manager is happy that they remain insitu.

Inspect when pond is complete.

None

Attachments

Photos and videos





Looking east – Pond construction

No visibility of pond instability of the site walls. The variability in soil type apparent in the sediment pond construction is consistent with weathered basalt flow features.



Looking north east – northern edge of pond being excavated. Cut material taken to stock pile for blending.



Project Name	Drury Centre - Kiwi Property Group
Location	Drury, Auckland
Project Number	AKS2023-0072
Date	02/11/2023
Time	11:35 am
Author	SA
Attendance	CMW: Shirantha (SA) Ross Reid: Deon (DR)
Weather / Site conditions	Sunny/Dry
Details of plant onsite	
What is being inspected?	A4
What is your location? Attach plan.	2295 AA 1.5 ha 2.2 ha 2.2 ha 3.3 ha 3.3 ha 4.7 h

SECOND STAGE STAGING OF EARTI TO BE FINALIZED B APPOINTED CONTF

INDICATIVE ONLY.

Instructions/ recommendations given Weather has affected progress and cutting of material to design level (DL). Contractor letting area dry after disking surface. A further 1.5 m still required to be cut from area to reach DL

to contractors

Basalt boulders present on the side walls of the sediment pond. Questioned Contractor if these will be removed. They won't be as it adds to the stability and the Environmental Manager is happy that they remain insitu.

Further Inspections

Inspection notes

None

Attachments

Photos and videos

None



Looking south east - Haul Road

Contractor haul road constructed for plant to use for accessing Pond 3 for removal of cut material and taken to stockpile at A6/A7.



Looking west – Cut material having been disked and let to dry prior to being removed and placed at stockpile at A6/A7.



Project Name	Drury Centre - Kiwi Property Group
Location	Drury, Auckland
Project Number	AKS2023-0072
Date	08/11/2023
Time	14:15 pm
Author	SA
Attendance	CMW: Shirantha (SA) Ross Reid: Deon (DR)
Weather / Site conditions	Sunny/Dry
Details of plant onsite	None
What is being inspected?	Pond 3
What is your location? Attach plan.	20Ha 20Ha 20Ha 20Ha 20Ha 20Ha 20Ha 20Ha

and the second second
Instructions/
recommendations given

Weather has affected progress and cutting of material to design level (DL). Contractor letting area dry after disking surface. A further 1.5 m still required to be cut from area to reach DL

to contractors

Basalt boulders present on the side walls of the sediment pond. Questioned Contractor if these will be removed. They won't be as it adds to the stability and the Environmental Manager is happy that they remain insitu.

Further Inspections

Inspection notes

When Contractor completes outlet and rip rap structure.

Attachments

None

Photos and videos

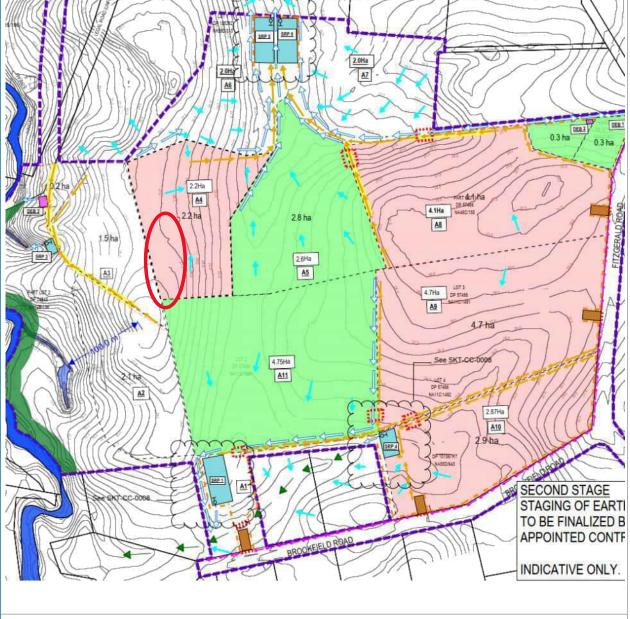


Looking south east - Pond 3

Completion to final design levels. No stability issues identified. Basalt boulders noted on the south east and south western slopes. Contractor to construct outflow on the north eastern corner.



Site Works Inspection Record	
Project Name	Drury Centre - Kiwi Property Group
Location	Drury, Auckland
Project Number	AKS2023-0072
Date	08/11/2023
Time	14:20 pm
Author	SA
Attendance	CMW: Shirantha (SA) Ross Reid: Deon (DR)
Weather / Site conditions	Sunny/Dry
Details of plant onsite	1 x bulldozer
What is being inspected?	A4 trimming and disking
What is your location? Attach plan.	2.0Ha AE 0.3 ha 0.3 ha 0.3 ha



Instructions/
recommendations given

Weather has affected progress and cutting of material to design level (DL). Contractor letting area dry after disking surface. A further 1.5 m still required to be cut from area to reach DL

to contractors

Basalt boulders present on the side walls of the sediment pond. Questioned Contractor if these will be removed. They won't be as it adds to the stability and the Environmental Manager is happy that they remain insitu.

Further Inspections

Inspection notes

When Contractor completes outlet and rip rap structure.

Attachments

None

Photos and videos



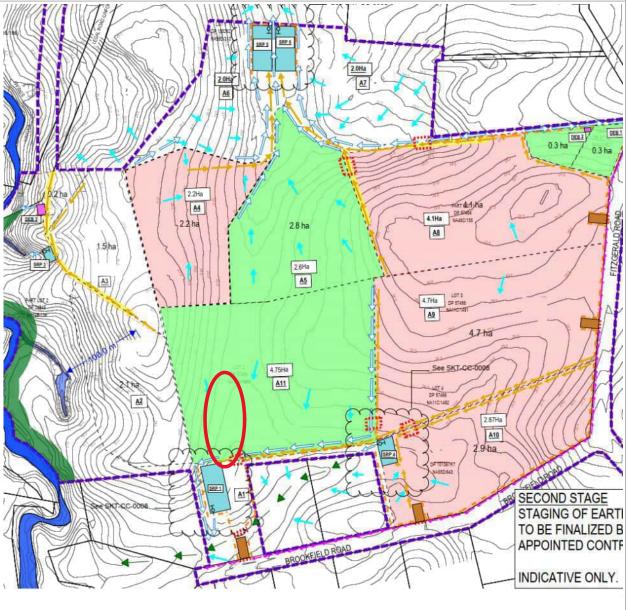
Looking south east - Pond 3

Completion to final design levels. No stability issues identified. Basalt boulders noted on the south east and south western slopes. Contractor to construct outflow on the north eastern corner.



Project Name	Drury Centre - Kiwi Property Group
Location	Drury, Auckland
Project Number	AKS2023-0072
Date	23/11/2023
Time	10:00 am
Author	KN
Attendance	CMW: Karamvir Nahal (KN) Ross Reid: Deon (DR)
Weather / Site conditions	Sunny/Dry
Details of plant onsite	1 x bulldozer 1 x padfoot roller
What is being inspected?	A11 - Trimming

What is your location?
Attach plan.



Unspection notes

Weather has affected progress and cutting of material to design level (DL). Contractor letting area dry after disking surface.

Instructions/

Instructions/ recommendations given to contractors Soil is wet and will be left to dry before recompacting.

Further Inspections

Photos and videos

27/11/2023

Attachments

None



Wet soil being let to dry.

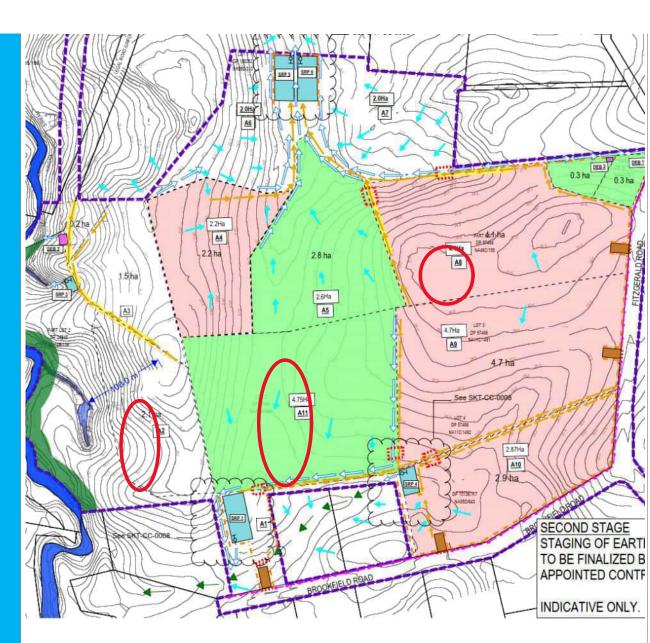


A11 Soil is trimmed and drying before recompacting.



Project Name	Drury Centre - Kiwi Property Group
Location	Drury, Auckland
Project Number	AKS2023-0072
Date	27/11/2023
Time	10:30 am
Author	KN
Attendance	CMW: Karamvir (KN), Shirantha (SA) Ross Reid: Nigel
Weather / Site conditions	Sunny/Dry
Details of plant onsite	1 x Bulldozer 1 x Padfoot roller 1 x Motor scraper 1 x Moxy dump truck
What is being inspected?	 Pond 2: Topsoil strip-off A11: Clay being stripped off after drying A8: Trimming and compacting

What is your location? Attach plan.



Inspection notes

Pond 2:

- The topsoil has been stripped-off.
- There are pegs located on topsoil mediums which are still to be cut. The pegs will first be offset, then the topsoil will be cut, and the pegs will be placed back into the original location.
- The north western side of Pond 2 will be cut.
- The south eastern side of Pond 2 will be filled.

A11:

- The clay in A11 has been dried and is now being trimmed off using a motor-scraper.
- The clay is being transported to the stockpile in A5.

A8:

• The clay in A8 is being trimmed and compacted using a padfoot roller.

Instructions/ recommendations given to contractors

N/A

Further Inspections

28/11/2023

Attachments

None

Photos and videos

Pond 2





A11





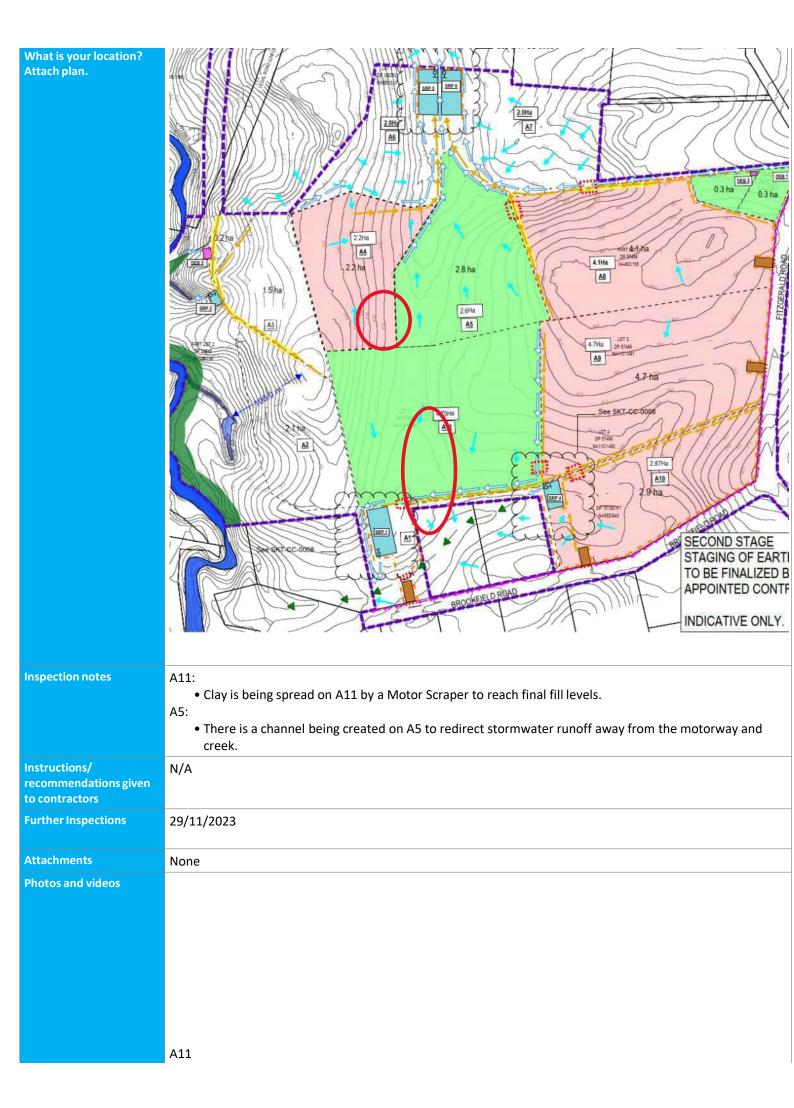
Α8







Project Name	Drury Centre - Kiwi Property Group
Location	Drury, Auckland
Project Number	AKS2023-0072
Date	28/11/2023
Time	2:20 PM
Author	KN
Attendance	CMW: Karamvir (KN) Ross Reid: Nigel
Weather / Site conditions	Sunny/Dry
Details of plant onsite	2 x Bulldozer 2 x Motor Scraper 1 x Excavator
What is being inspected?	Filling on A11Earthworks on A5













Project Name	Drury Centre - Kiwi Property Group
Location	Drury, Auckland
Project Number	AKS2023-0072
Date	29/11/2023
Time	10:30 AM
Author	KN
Attendance	CMW: Karamvir + Heba Ross Reid: Nigel
Weather / Site conditions	Sunny/Dry
Details of plant onsite	A11: 3 x Motor Scraper 1 x Bulldozer Pond 2: 1 x Excavator 1 x Bulldozer 1 x Padfoot Roller
What is being inspected?	A11: Filling and Compacting Pond 2: Cut and Fill







Pond 2





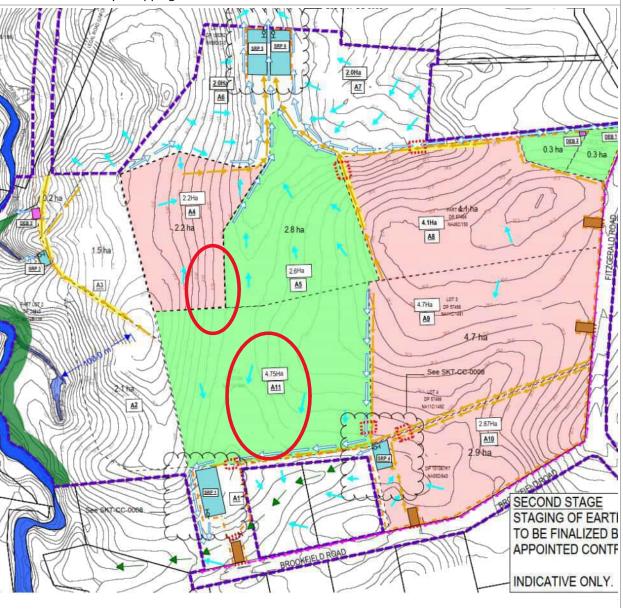






Project Name	Drury Centre - Kiwi Property Group
Location	Drury, Auckland
Project Number	AKS2023-0072
Date	30/11/2023
Time	2:30 PM
Author	KN
Attendance	CMW: Karamvir + Shirantha Ross Reid: Nigel
Weather / Site conditions	Sunny/Dry
Details of plant onsite	3 x Motor Scraper 1 x Bulldozer
What is being inspected?	A11: Clay fill A4 & A11 Boundary: Stripping
What is your location?	

What is your location? Attach plan.



Inspection notes

A11:

- Clay fill has been placed on section A11 by Motor Scraper's.
- The clay is being let to dry, before more clay fill is added and compacted.
- The clay fill will be compacted in a lift of 500mm.

A4 & A11 Boundary:

- The topsoil has been stripped off in the area near the boundary of section A4 and A11.
- Small pockets of weak soils had been encountered by the contractor.
- The weak soil pockets have been excavated and removed.
- Stiff volcanic soils have been encountered in the subgrade.
- Road Test have carried out a Shear Vane Test in the strip-off area and have passed it.

Instructions/
recommendations given
to contractors

N/A

Further Inspections

KN will arrange with Nigel from Ross Reid

Attachments

None

Photos and videos

A11









Pond 2





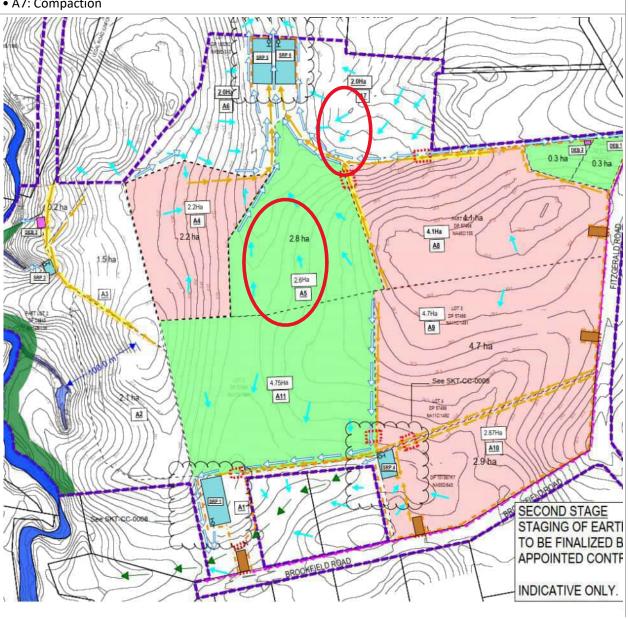






Project Name	Drury Centre - Kiwi Property Group
Location	Drury, Auckland
Project Number	AKS2023-0072
Date	11/12/2023
Time	2:00 PM
Author	KN
Attendance	CMW: Karamvir + Thomas Ross Reid: Nigel
Weather / Site conditions	Sunny/Dry
Details of plant onsite	1 x Bulldozer 1 x Padfoot Roller
What is being inspected?	A5: Stockpile A7: Compaction
What is your location?	

Attach plan.



Inspection notes	A5: • The stockpile on A5 is being shaped by a bulldozer.
	A7: • Clay is being compacted on A7 with a padfoot roller.
	It has been too wet due to high rainfall, and works have not been carried out regularly.
Instructions/ recommendations given to contractors	N/A
Further Inspections	KN will arrange with Nigel from Ross Reid
Attachments	None
Photos and videos	





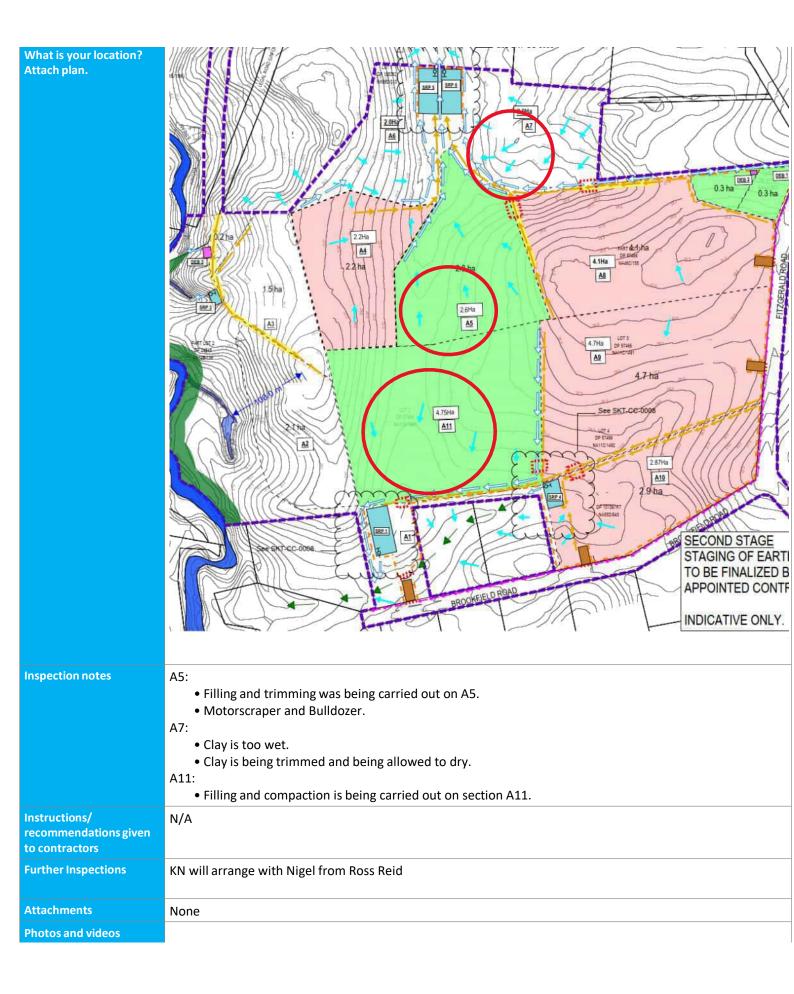




Project Name	Drury Centre - Kiwi Property Group
Location	Drury, Auckland
Project Number	AKS2023-0072
Date	12/12/2023
Time	4:00 PM
Author	KN
Attendance	CMW: Karamvir Ross Reid: Nigel
Weather / Site conditions	Sunny/Dry
Details of plant onsite	3 x Motorscraper 2 x Bulldozer
What is being inspected?	 A7: Filling and Compacting A8: Filling and Cutting A3: Cut A2: Pond



Project Name	Drury Centre - Kiwi Property Group
Location	Drury, Auckland
Project Number	AKS2023-0072
Date	13/12/2023
Time	11:30 AM
Author	KN
Attendance	CMW: Karamvir Ross Reid: Nigel
Weather / Site conditions	Sunny/Wet
Details of plant onsite	3 x Motorscraper 2 x Bulldozer 1 x Excavator
What is being inspected?	A5: • Fill and Trim A7: • Trim A11: • Fill and Compact



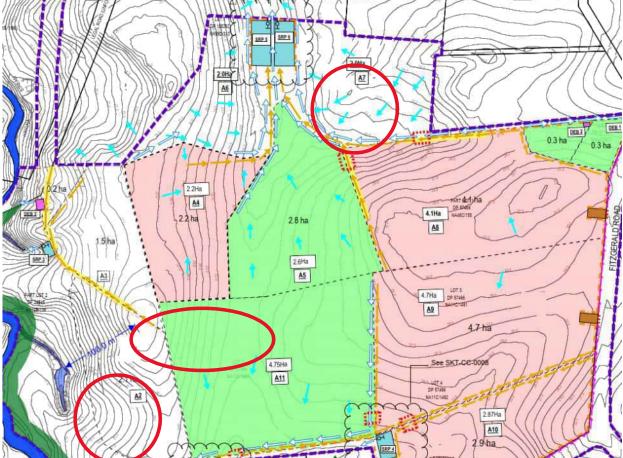








Site Works Inspe	Site Works Inspection Record	
Project Name	Drury Centre - Kiwi Property Group	
Location	Drury, Auckland	
Project Number	AKS2023-0072	
Date	14/12/2023	
Time	10:30 AM	
Author	KN	
Attendance	CMW: Karamvir Ross Reid: Nigel	
Weather / Site conditions	Sunny/Dry	
Details of plant onsite	3 x Excavator 3 x Moxy Truck 2 x Padfoot Roller 1 x Bulldozer 1 x Grader	
What is being inspected?	A2: • Soil strip off A5 & A2: • Fill • Compaction A7: • Grading • Compaction	
What is your location? Attach plan.		





Inspection notes

A2:

- Section A2 is being stripped.
- The topsoil from A2 will be used to create bunds.
- The bunds will be constructed between A2 and the creek which runs along the motorway.
- The clay from A2 will be used for fill on A5 and A7.
- The clay on A2 is Volcanic Silty CLAY.
- The clay is acceptable for fill material.
- The stripping of A2 was observed and inspected. It was noted that there are patches of topsoil which must be removed, before clay can be used for fill.

A2 and A5

• The area between section A2 and A5 is being filled and compacted.

A7:

• Section A7 is being graded and compacted.

Instructions/ recommendations given to contractors

KN has instructed Nigel (Ross Reid) to ensure that all of the topsoil patches encountered in the stripping of

• All topsoil or organics encountered must be removed.

Further Inspections

KN will arrange with Nigel from Ross Reid

A2 must not be used for Fill.

Attachments

None

Photos and videos













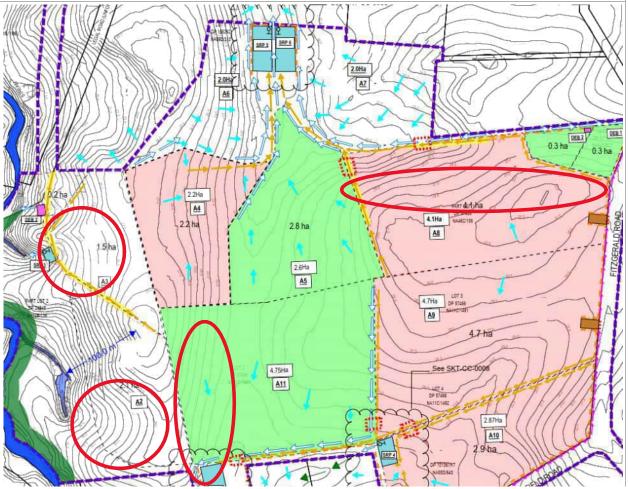






Project Name	Drury Centre - Kiwi Property Group
Location	Drury, Auckland
Project Number	AKS2023-0072
Date	18/12/2023
Time	1:30 PM
Author	KN
Attendance	CMW: Karamvir Ross Reid: Nigel, Bruce
Weather / Site conditions	Sunny/Dry
Details of plant onsite	2 x Excavator 2 x Padfoot Roller 1 x Motor Scraper
What is being inspected?	A2: • Cut A3: • Loading Soil A8: • Bunds A11: • Fill
What is your location?	

What is your location? Attach plan.





Inspection notes

A2:

- Cut on the hill of A2.
- The clay from the cut on A2 will be used for fill on A11.
- The topsoil from the cut on A2 will be transported off site for another Ross Reid job.

A3:

• Clay is being top loaded into a Motor Scraper using an Excavator as it is too wet for the Motor Scraper to load soil.

A8:

• Clay bunds are being constructed along the boundary of A8 for an environmental inspection.

A11:

- A11 is being filled.
- The clay being used to fill has come from the A2 cut and is good material for fill.

Tests:

- Road Test has carried out Fill Tests in A11, A5, and A3.
- All tests have passed.

Instructions/ recommendations given to contractors N/A

Further Inspections

KN will arrange with Nigel from Ross Reid

Attachments

None

Photos and videos

A2







Α8



Α2





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A11





Project Name	Drury Centre - Kiwi Property Group
Location	Drury, Auckland
Project Number	AKS2023-0072
Date	20/12/2023
Time	3:00 PM
Author	KN
Attendance	CMW: Karamvir
Weather / Site conditions	Sunny/Dry
Details of plant onsite	1 x Motor Scraper 1 x Grader 1 x Water Cart 2 x Excavator 2 x Moxy Truck
What is being inspected?	A2: Sealing and topsoil being taken off site A7: Topsoiling A11: Sealing







Α7









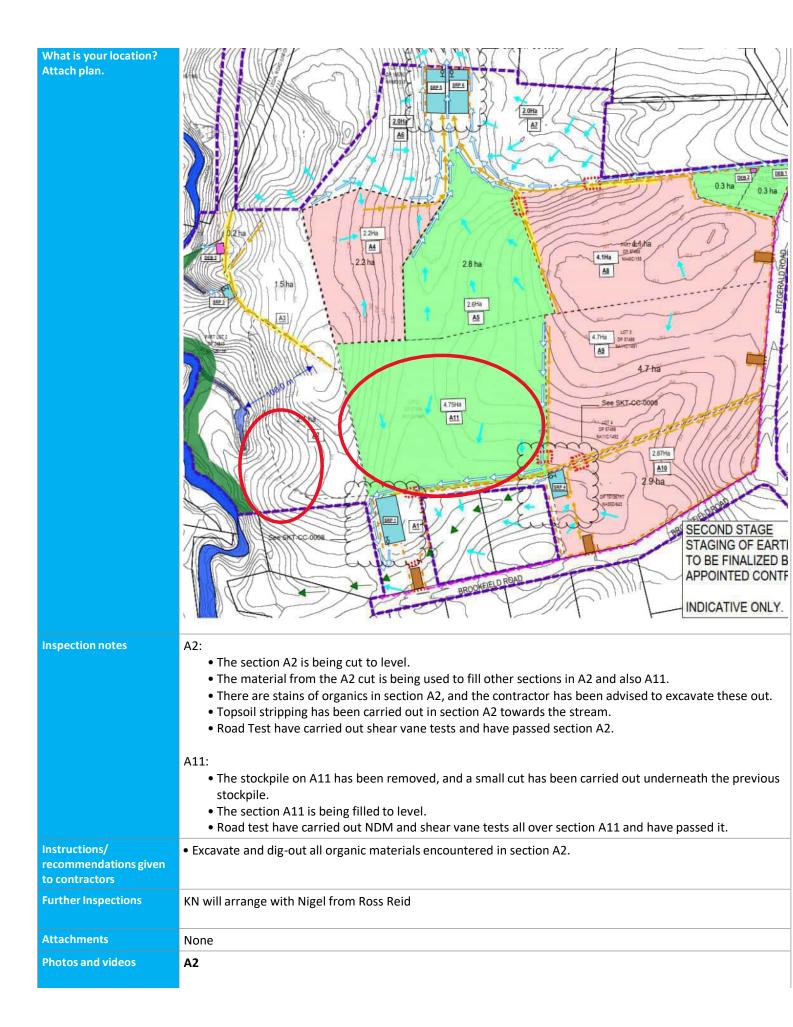






2024.01.10 Site Walkover

Project Name	Drury Centre - Kiwi Property Group
Location	Drury, Auckland
Project Number	AKS2023-0072
Date	10/01/2024
Time	10:00 AM
Author	KN
Attendance	CMW: Karamvir Ross Reid: Nigel
Weather / Site conditions	Sunny/Dry
Details of plant onsite	3 x Motor Scraper 2 x Excavator 2 x Moxy Trucks 1 x Grader 1 x Bulldozer
What is being inspected?	A2: Cut and Fill A11: Fill

















A11





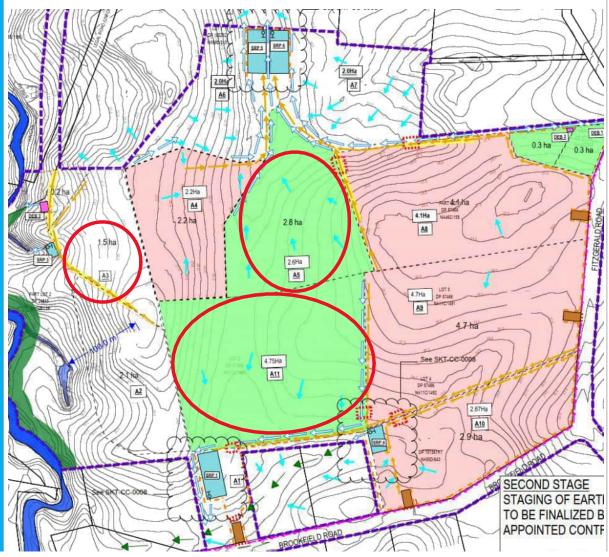




2024.01.11 Site Walkover

Project Name	Drury Centre - Kiwi Property Group
Location	Drury, Auckland
Project Number	AKS2023-0072
Time	3:30 PM
Author	KN
Attendance	CMW: Karamvir Ross Reid: Nigel
Weather / Site conditions	Sunny / Dry
Details of plant onsite	1 x Grader 2 x Motor Scraper 2 x Padfoot Roller 2 x Excavator 2 x Moxy Truck 1 x Water Cart
What is being inspected?	A3: Slope batter A5: Filling and compacting A11: Filling and compacting
What is your location?	







A3:

• Excavator is battering the slope on A3.

A5:

- Section A5 is being filled and compacted.
- The material for the fill is coming from section A3.

A11:

- The section A11 is being filled and compacted to level.
- The material for the fill on section A11 is coming from the stock pile on section A2.

Other:

- Road Test have carried out fill tests on section A2 and have passed it.
- A watercart is being used to control dust on-site.

Instructions/ recommendations given to contractors

N/A

Further Inspections

Ross Reid will contact CMW AKS

Attachments

N/A

Photos and videos

A3:



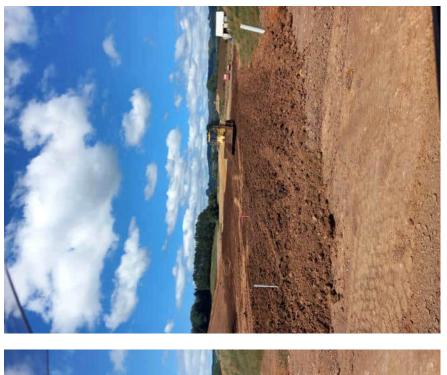






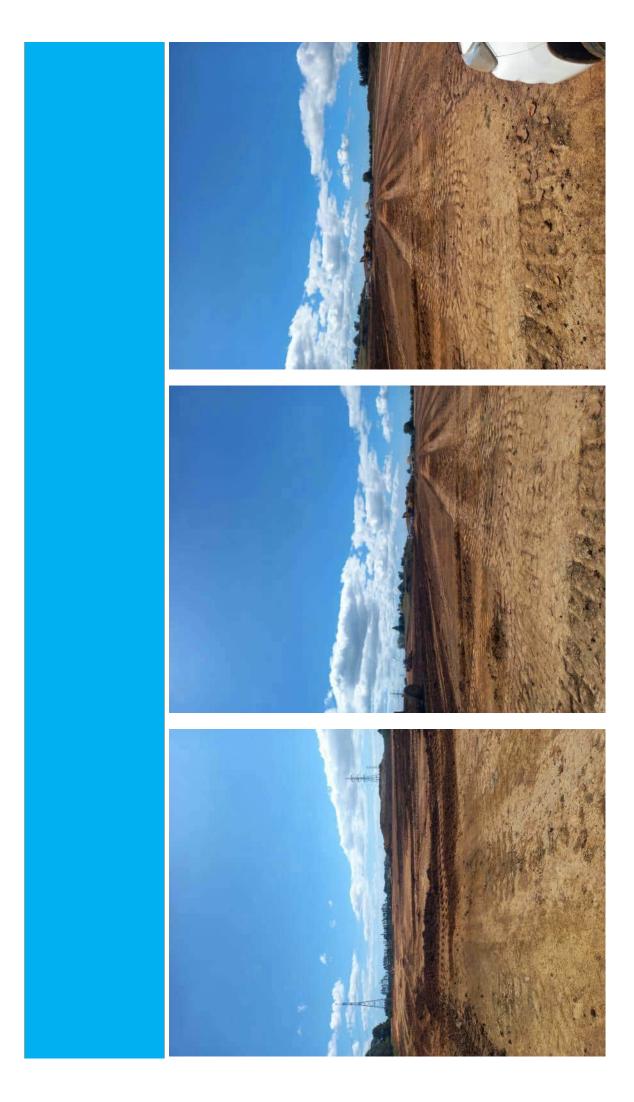


A5:





A11:



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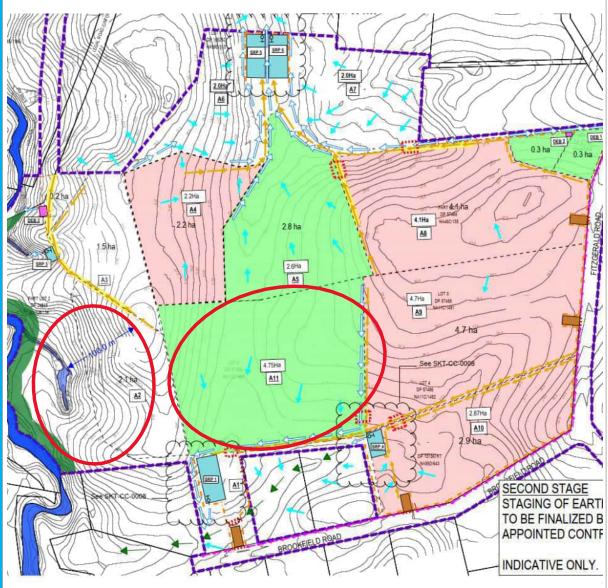




2024.01.18 Site Walkover

Project Name	Drury Centre - Kiwi Property Group
Location	Drury, Auckland
Project Number	AKS2023-0072
Time	3:30 PM
Author	Karamvir Nahal
Attendance	CMW: Karamvir Ross Reid: Nigel
Weather / Site conditions	Sunny / Dry
Details of plant onsite	1 x Excavator 1 x Grader 2 x Moxy Truck 2 x Bulldozer 2 x Motor Scraper
What is being inspected?	A2 A11

What is your location? Attach plan.





A2:

- Topsoil in A2 has been stripped and clay has been exposed.
- Water is sitting in puddles on the exposed clay surface.
- The contractor has mentioned he will cut a channel to remove the water and let it dry out with sunny weather. Once dried he will cut the top 150mm 300mm accordingly.
- Road Test will carry out an inspection in the morning on 19/01/2024.

A11:

• A11 is being brought to the FL.

Instructions/ recommendations given to contractors

to contractors

• Contractor has been advised to remove all water from the A2 cut and then let it to dry. Once it has been dried out, the contractor must cut the top layer of clay before filling with clay can continue.

Further Inspections

19/01/2024 to check A2 cut.

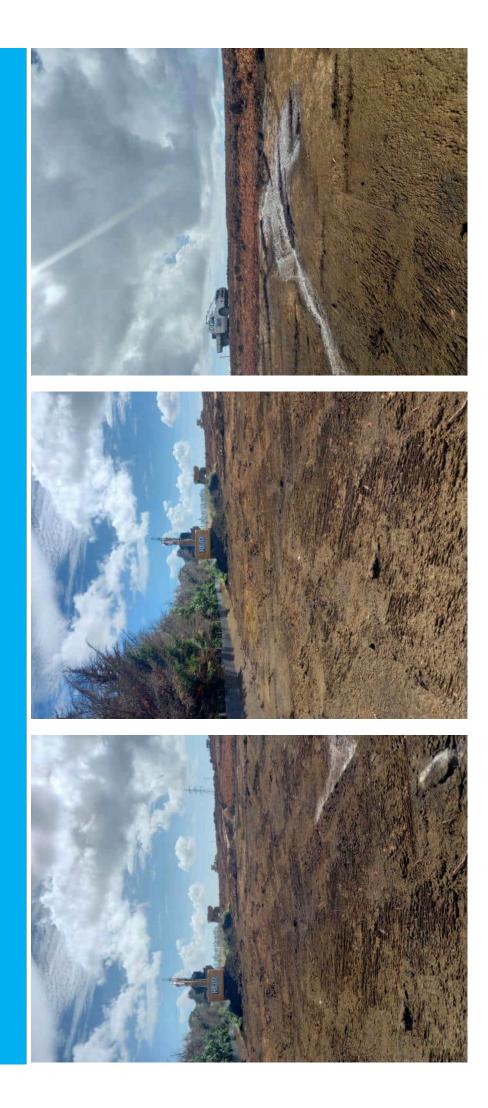
Attachments

Photos and videos

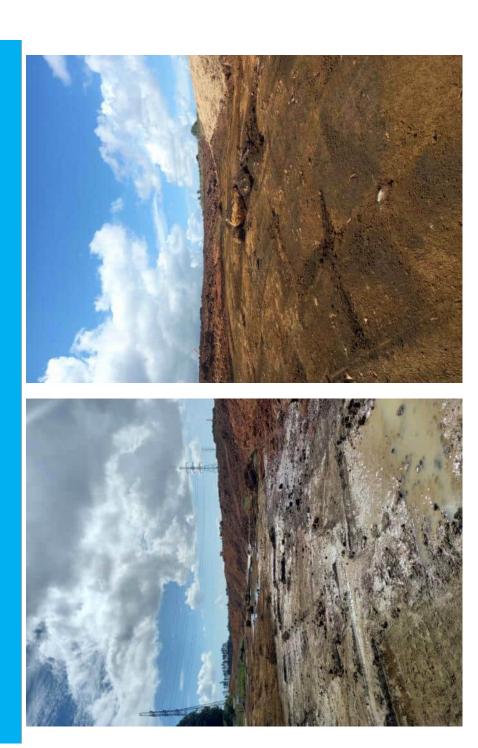
A2:

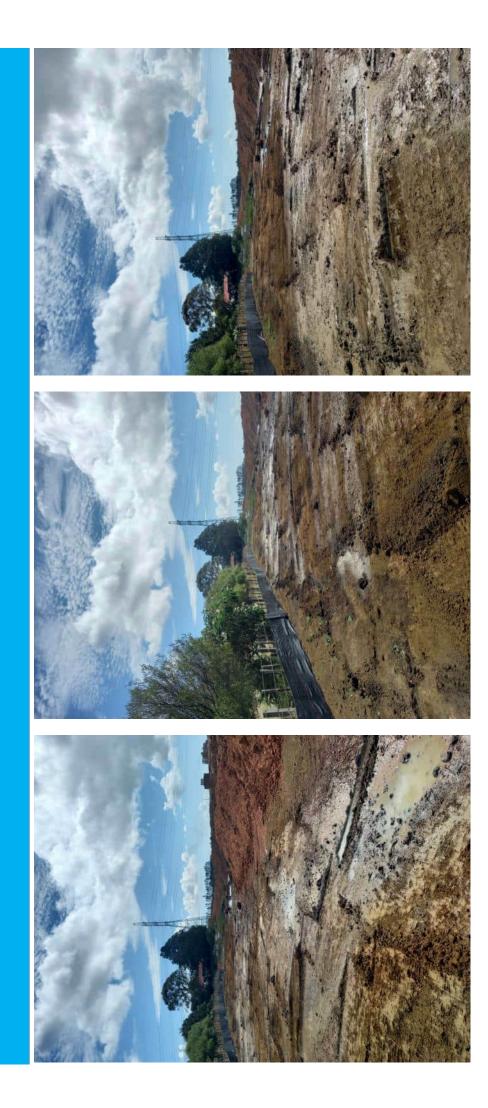




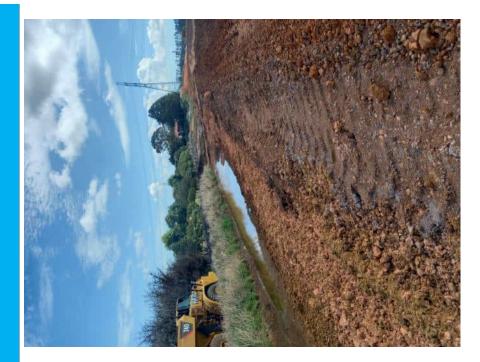


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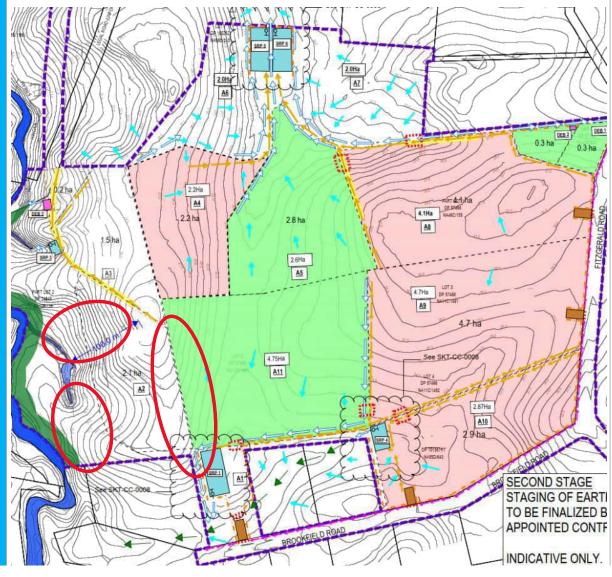




2024.01.19 Site Walkover

Project Name	Drury Centre - Kiwi Property Group
Location	Drury, Auckland
Project Number	AKS2023-0072
Time	10:00 AM
Author	Karamvir Nahal
Attendance	CMW: Karamvir, Jaskaran Ross Reid: Nigel
Weather / Site conditions	Sunny / Dry
Details of plant onsite	1 x Moxy Truck 1 x Padfoot Roller 1 x Grader 1 x Bulldozer 2 x Motor Scraper 2 x Excavator
What is being inspected?	A2 A11
What is your location?	

What is your location? Attach plan.





A2:

- Water is still ponding on the exposed clay in section A2.
- The contractor has mentioned that he will let the water dry out over the sunny period.
- Shear Vanes were carried out in the cut for A2 and the readings ranged between 121kPa and 204+kPa.
- A padfoot roller is being used to compact the area between section A2 and A11.
- Clay from A2 stock pile is being used to fill the area between section A2 and A11.

A11:

• A grader is being used to bring A11 to the correct FL.

Instructions/ recommendations given to contractors • Engineer has advised the contractor that once the water has been removed/dried from the surface. The contractor must trim the surface by about 150mm - 300mm to good ground.

Further Inspections

22/01/2024

Attachments

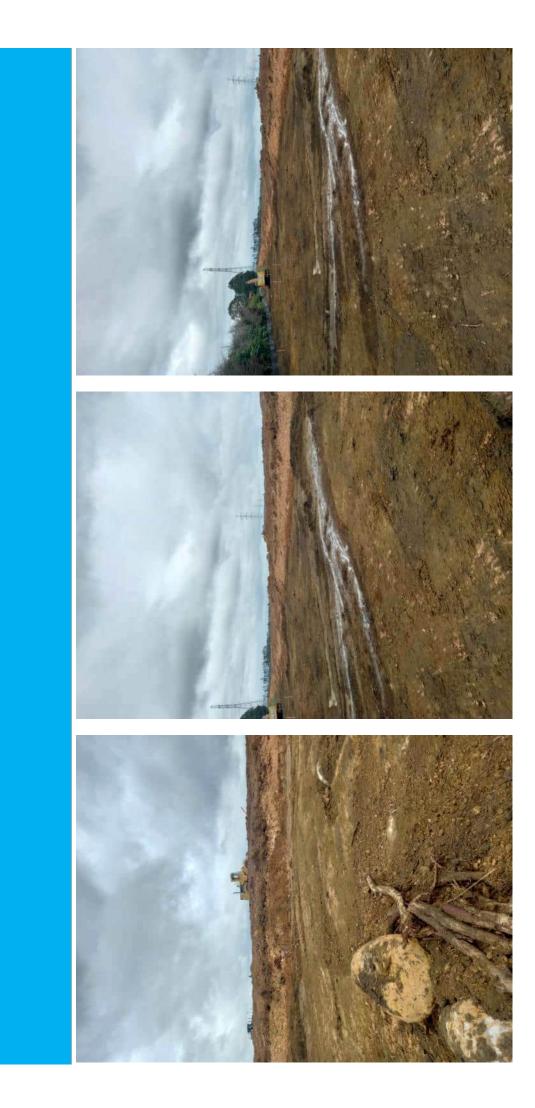
N/A

Photos and videos

A2

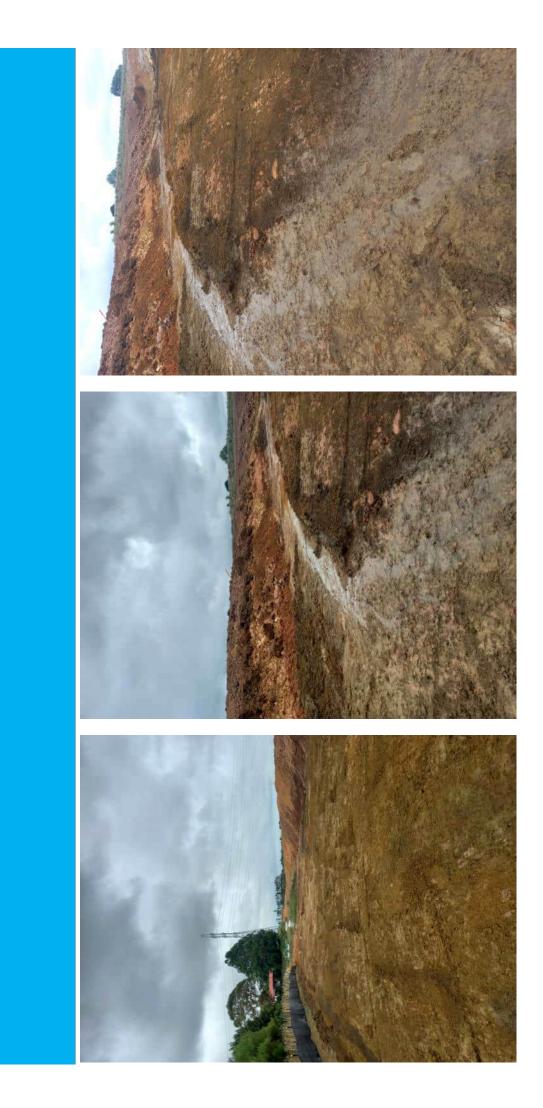






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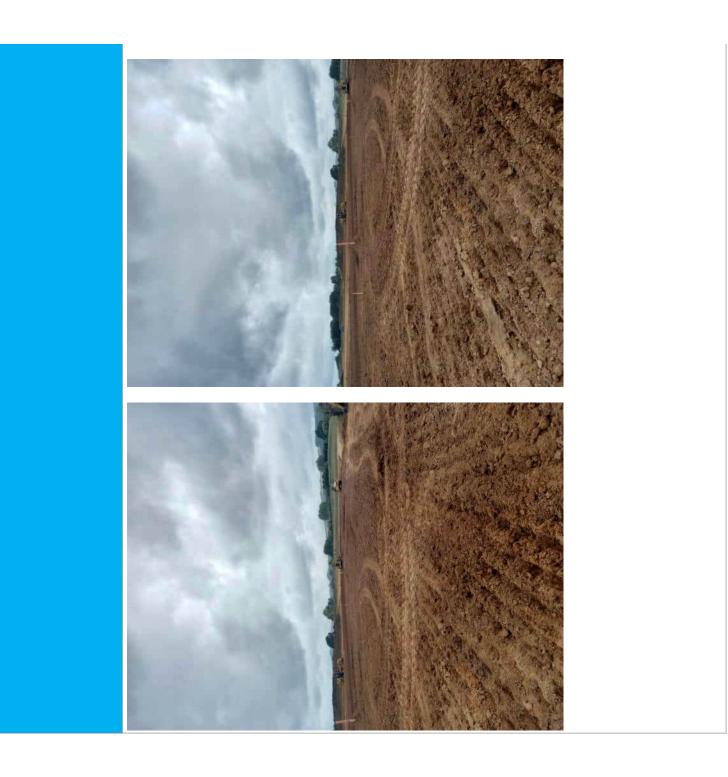
2024 January Page 30







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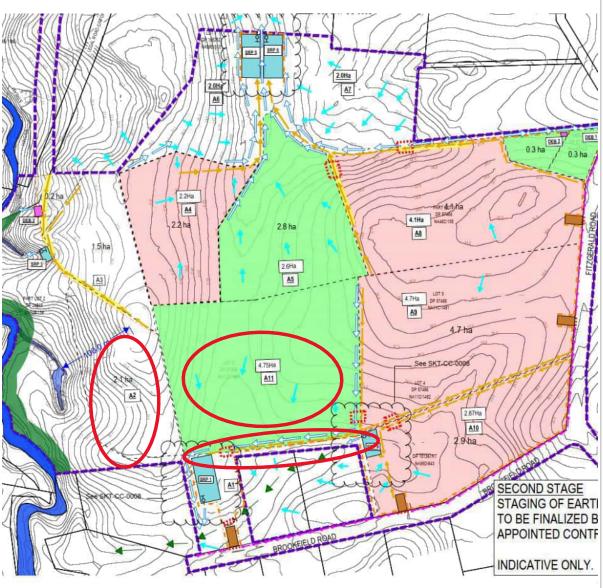


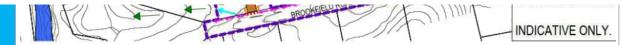


2024.01.22 Site Walkover

Project Name	Drury Centre - Kiwi Property Group
Location	Drury, Auckland
Project Number	AKS2023-0072
Time	11:30 AM
Author	Karamvir
Attendance	CMW: Karamvir Ross Reid: Nigel
Weather / Site conditions	Sunny / Dry
Details of plant onsite	1 x Grader 1 x Padfoot Roller 1 x Bulldozer 1 x Excavator 3 x Motor Scraper
What is being inspected?	A2 A11

What is your location? Attach plan.





A2:

• Section A2 is being cut and the material is being transported to the rear of A11 for fill.

A11:

- The section A11 is being compacted and levelled to FL.
- The cut area at the rear of A11 (A2 and A11 border) has been inspected using a shear vane at multiple locations. The readings from the shear vane range between 168kPa UTP. This area is dry, and is free from any topsoil or organic material and is okay to fill.

Instructions/ recommendations given to contractors

• Okay to fill in section A11 rear (A2 and A11 border).

Further Inspections

Ross Reid will contact CMW

Attachments

N/A

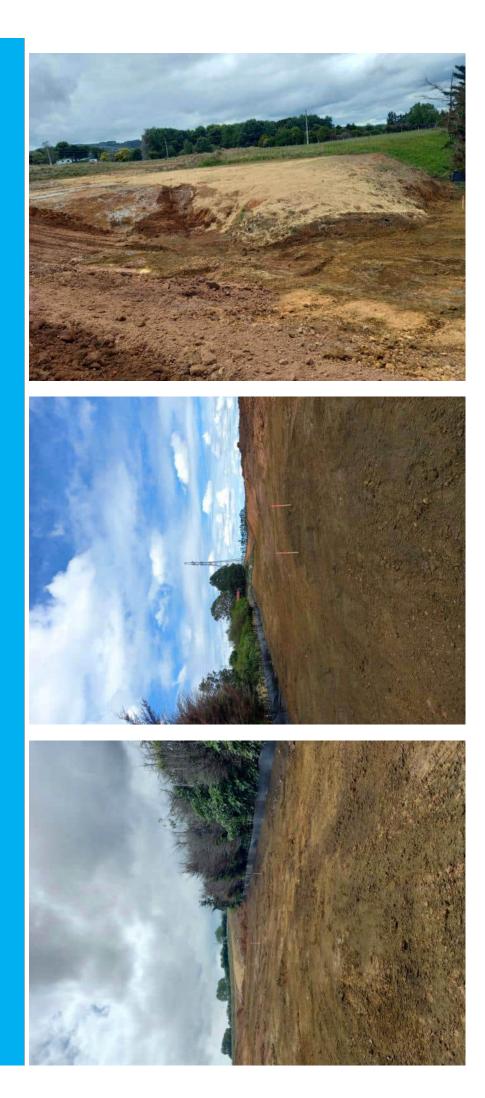
Photos and videos



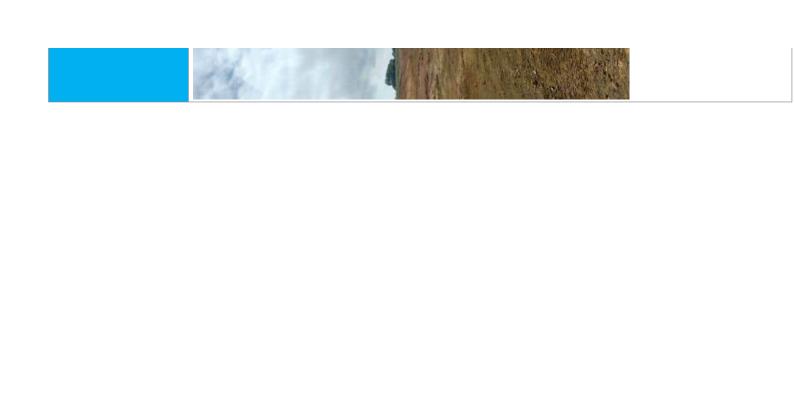




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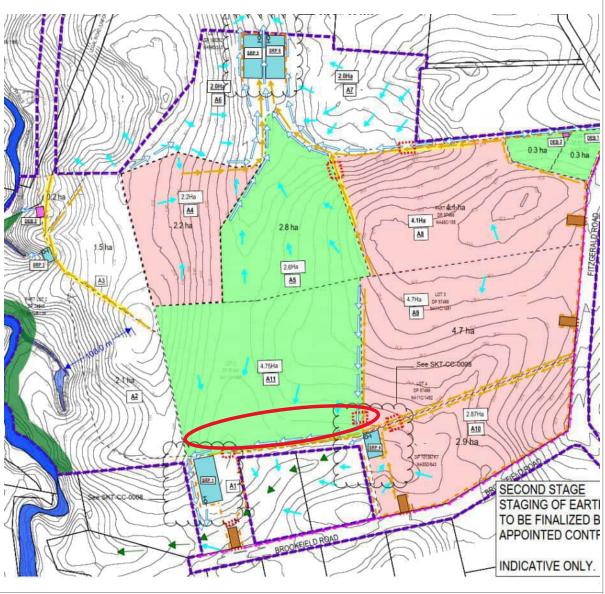




2024.01.23 Site Walkover

Project Name	Drury Centre - Kiwi Property Group
Location	Drury, Auckland
Project Number	AKS2023-0072
Time	12:00 PM
Author	Karamvir Nahal
Attendance	CMW: Karamvir Ross Reid: Nigel
Weather / Site conditions	Rain / Wet
Details of plant onsite	1 x Excavator
What is being inspected?	A11

What is your location? Attach plan.



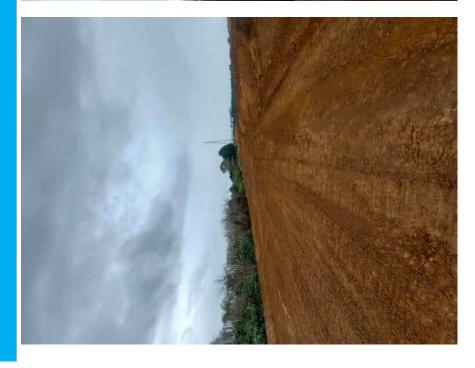
Inspection notes

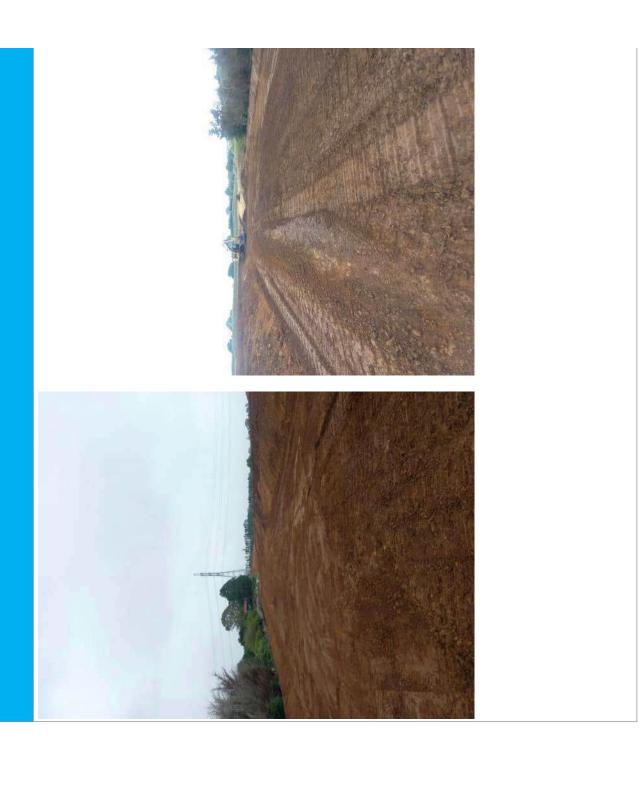
A11:

- The clay filling of the area at the rear of section A11 has begun.
- Road Test have carried out a total of 4 tests in the area for that layer and have passed it.
- Due to the rain, the contractor has stopped filling the area.

		Due to rain and wet clay, there are no earthworks being carried out at the subject site.
	Instructions/ recommendations given to contractors	• Ensure the clay in A11 is let dry before filling can continue to the FL.
	Further Inspections	Ross Reid will contact CMW
	Attachments	N/A
	Photos and videos	A11:





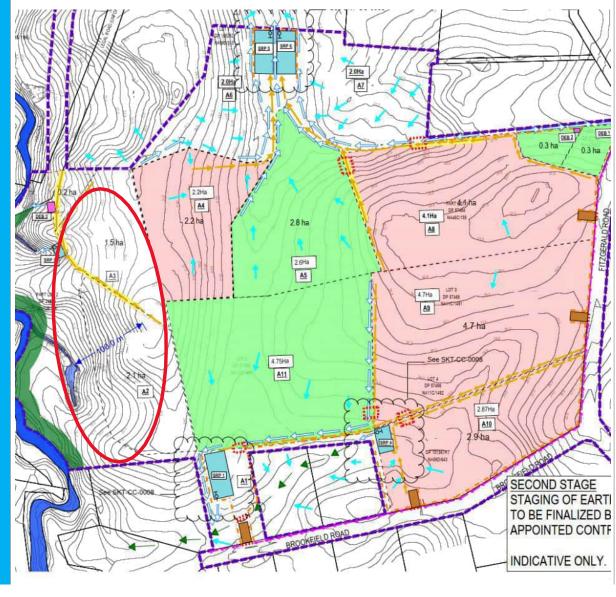




2024.01.24 Site Walkover

Project Name	Drury Centre - Kiwi Property Group
Location	Drury, Auckland
Project Number	AKS2023-0072
Time	12:30 PM
Author	Karamvir
Attendance	CMW: Karamvir Ross Reid: Nigel Road Test: Josh
Weather / Site conditions	Sunny / Dry
Details of plant onsite	1 x Excavator 2 x Moxy Truck 1 x Bulldozer 3 x Motor Scraper
What is being inspected?	A2 A3
What is your location?	

What is your location? Attach plan.



• Fill along the creek in both A2 and A3.

Ross Reid will contact CMW

- Road Test have carried out Pre-Fill Tests in the area and have passed it.
- Cut on top of A2. The cut will be used to fill bottom of A2, and excess cut will be stockpiled.

Instructions/ $recommendations\,given$

• Small patches of topsoil are to be removed from A2 before clay fill.

to contractors

Attachments

N/A

Photos and videos

Further Inspections





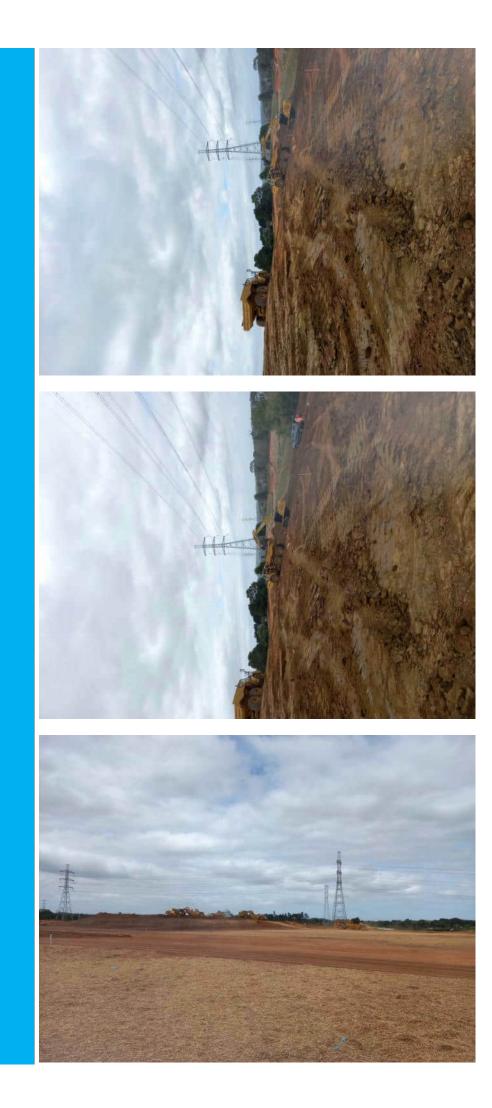












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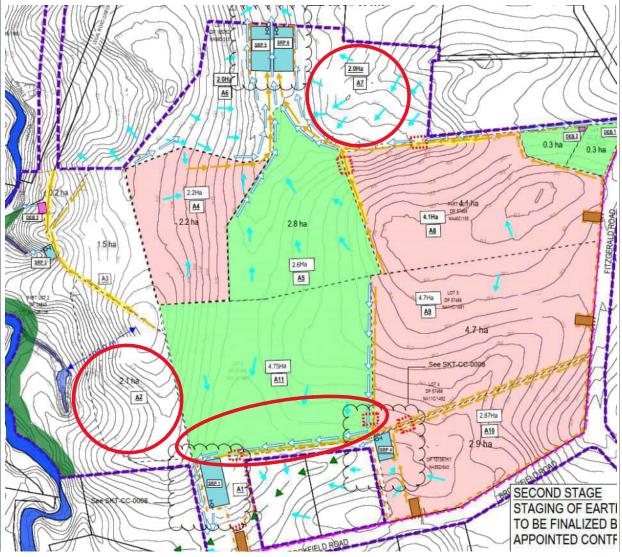




2024.01.25 Site Walkover

Project Name	Drury Centre - Kiwi Property Group
Location	Drury, Auckland
Project Number	AKS2023-0072
Time	1:00 PM
Author	Karamvir
Attendance	CMW: Karamvir Ross Reid: Nigel
Weather / Site conditions	Sunny / Dry
Details of plant onsite	1 x Water Cart 1 x Padfoot Roller 1 x Bulldozer 1 x Excavator 2 x Moxy Truck
What is being inspected?	A2 A7 A11
What is your location?	

What is your location? Attach plan.





Inspection notes

- Water cart is spraying across the site for dust control.
- The surplus cut from A2 is being stockpiled in A7.
- Road Test have done 4 Fill Tests in A2 and have passed.
- A11 fill area has been tested on 24/01/2024 and had passed. Ross Reid will now fill a further 500mm.

Instructions/ recommendations given to contractors N/A

Further Inspections

Ross Reid will contact CMW

Attachments

N/A

Photos and videos















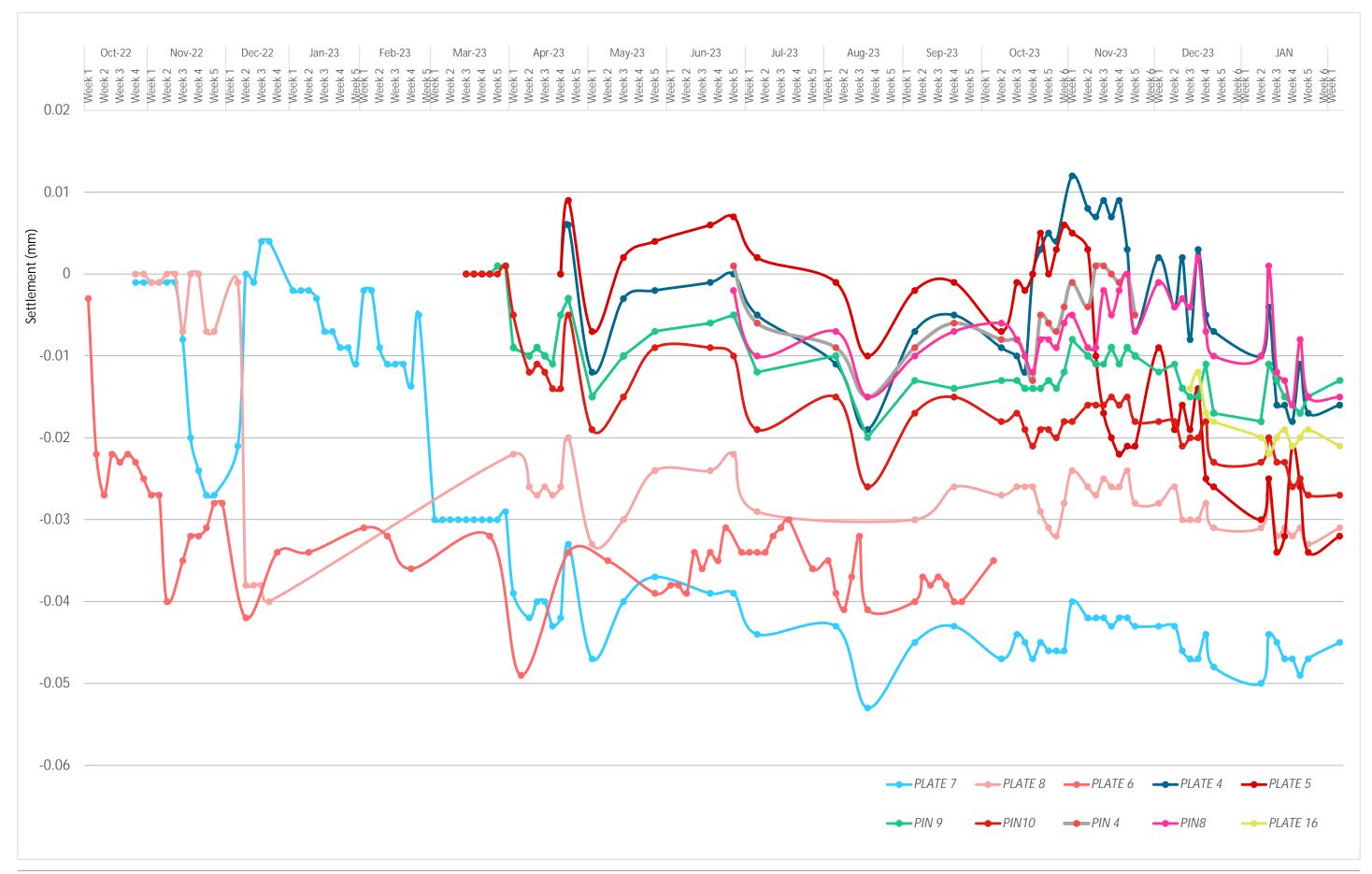






APPENDIX E: GEOTECHNICAL MONITORING REPORT







APPENDIX F: HAND AUGER LOGS

Client: Woods Group Project: 133 Fitzgerald Road

Site Location: Drury

Project No.: AKS2023-0072

Date: 23/04/2024

PRELIMINARY



Borehole Location: Refer to Site Plan Scale: 1:25 Sheet 1 of 1

	ole Location: I							<u>sne</u>	et 1 (<u> 1C</u>
Positio	on: 1//3647.2	2mĿ;	589	9098	6.4mN Projection: NZTM Datum: NZVD2016 Survey Source: Han	d-held	d GE	25		
San	nples & Insitu Tests	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	E (E	ynamic Penetro Blows/10	meter
Depth	Type & Results	교	Dep	Grapl	Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Con	Consi		5 10) 1:
0.3	Peak = 32kPa Residual = 14kPa Peak = 173kPa Residual = 44kPa		-		CL: Silty CLAY with trace gravel : reddish brown. Low plasticity; gravel, fine. (Fill) CL: Silty CLAY: yellowish orange streaked orange. Low plasticity. (Auckland Volcanics)					
0.6	Peak = 179kPa Residual = 63kPa			<u>×</u>						
0.9	Peak = 184kPa Residual = 80kPa		1 -	X	at 0.80m, becoming yellowish brown streaked orange.					
					Borehole terminated at 1.0 m					
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			-							
			4 -							
			-							
		1	5 -						\pm	

Termination Reason: Target depth reached.

Shear Vane No: 2323 DCP No:
Remarks: Groundwater not encountered.

Client: Woods Group Project: 133 Fitzgerald Road

Site Location: Drury

Project No.: AKS2023-0072

Date: 23/04/2024

PRELIMINARY



Borehole Location: Refer to Site Plan Scale: 1:25 Sheet 1 of 1

1					Datum: NZVD2016 Survey Source: Han	a-nei				_
Sam	ples & Insitu Tests	RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/ Relative Density	F (E	ynamic Penetroi Blows/10	mete 00mn
Depth	Type & Results		ă	 	CL: Silty CLAY with trace sand : brownish red mottled grey. Low plasticity; sand, fine to medium.	≥ 0	Cor		5 10) 1
0.3-1.0 0.3	Expansive - D Peak = 179kPa		-		(Fill) at 0.20m, becoming dark brownish red, sand absent.					
	Residual = 63kPa		-		at 0.40m, becoming orange-brown mottled red and orange.					
0.6	Peak = 193kPa Peak = >192kPa		-							
0.9	Peak = 140kPa Residual = 69kPa		1 -	X	CL: Silty CLAY: orange-brown. Low plasticity. (Auckland Volcanics)				\downarrow	
1.2	Peak = UTP		- - - -	×	from 1.10m to 1.20m, contains a lens of dark red sandy silt.					
1.6	Peak = 193kPa Peak = >192kPa		-	X X X X X X X X X X						
2.0	Peak = UTP		2 —	×_×	Borehole terminated at 2.0 m				<u> </u>	
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			-							

Termination Reason: Target depth reached.

Shear Vane No: 2323 DCP No:
Remarks: Groundwater not encountered.

Client: Woods Group Project: 133 Fitzgerald Road

Site Location: Drury

Project No.: AKS2023-0072

Date: 23/04/2024

PRELIMINARY



Borehole Location: Refer to Site Plan Scale: 1:25 Sheet 1 of 2

Р	osition	n:				Projection: NZTM						
2	Samp	oles & Insitu Tests		Ê	Log	Datum: NZVD2016 Survey Source: Hand			D F	Oynami Penetro Blows/1	omete	er
Codiameter	Depth	Type & Results	RL (m)	Depth (m)	Graphic Log	Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/ Relative Density			0 1	
	0.3	Peak = 193kPa Peak = >192kPa			- ×	CL: Silty CLAY: orange-brown mottled red and grey. Low plasticity. (Topsoil) CL: Silty CLAY: orange-brown mottled dark red. Low plasticity.						
	0.6	Peak = UTP		-	X	(Auckland Volcanics) at 0.40m, becoming yellowish brown mottled bluish grey.						
	0.0	, can			X_ X_ X_ X_	at 0.60m, becoming light yellowish brown streaked red.						
				1 -	- ×	Borehole terminated at 1.0 m						H
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				5 -]							1

Termination Reason: Target depth reached.

Shear Vane No: 2323 DCP No:

Remarks: Groundwater notencountered.

Client: Woods Group Project: 133 Fitzgerald Road

Site Location: Drury Project No.: AKS2023-0072

Date: 18/04/2024



Position: 416780.3mE; 774141.2mN Projection: NZTM
Datum: NZVD2016 Survey Source: Hand Held GPS

					Datum: NZVD2016 Survey Source: Han	<u>d He</u> l	<u>d G</u> F	S			
Sar	mples & Insitu Tests	RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour, fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/ Relative Density	E (E	ynamio Penetro Blows/1	omete 100mn	er m)
Depth	Type & Results	"	۵	Gra	rook. Colour, rabito, rock frame, additional comments. (Ofigin/geological unit)	≥ŏ	Cor	-	5 10 	0 1	5
0.3	Peak = UTP				CL: Silty CLAY: reddish brown. Low plasticity. (Fill)						
0.6	Peak = 151kPa Residual = 66kPa		_		at 0.50m, becoming orange-brown		VSt to H				
0.9	Peak = >193kPa		1 -		at 0.80m, becoming mottled dark brown.						
1.2	Peak = UTP		1 -	× × × × × × × × × × × × × × × × × × ×	CL: Silty CLAY: orange-brown mottled red. Low plasticity. (Auckland Volcanics)						
1.6	Peak = UTP		-	×_ ×_ ×_ ×_ ×_ ×_ ×_ ×_ ×_ ×_ ×_ ×_ ×_ ×							
2.0	Peak = UTP		2 -	× × × × ×							
2.4	Peak = UTP		- - - -	× × × × × × × × × × × × × × × × × × ×		М	Н				
2.8	Peak = UTP		3 -	XXXXXXXXX							
3.2	Peak = UTP			× × × × × × × × × × × × × × × × × × ×	at 3.30m, becoming dark brown, contains minor sand						
3.6	Peak = 154kPa Residual = 58kPa		-	× × × × × × × × × × × × × × × × × × ×	CL: Silty CLAY: light yellowish brown streaked black and red. Low plasticity. (Auckland Volcanics)						
4.0	Peak = UTP		4 -	× × × × × × × × × × × × × × × × × × ×	at 4.20m, becoming yellowish brown streaked red.						
4.4	Peak = UTP		-	× × × × × × × × × × × × × × × × × × ×			VSt to H				
4.8	Peak = UTP			X	at 4.60m, becoming yellowish brown speckled black.						
1			5 -		Borehole terminated at 5.0 m	1					+

Termination Reason: Target Depth Reached
Shear Vane No: 2323 DCP No:
Remarks: Groundwater not encountered.

Client: Woods Group Project: 133 Fitzgerald Road

Site Location: Drury

Project No.: AKS2023-0072

Date: 23/04/2024

PRELIMINARY



Borehole Location: Refer to Site Plan

Position: Projection: NZTM

Scale: 1:25 Sheet 1 of 1

Р	osition	n:				Projection: NZTM					
				1		Datum: NZVD2016 Survey Source: Hand	d-hel	d GF	PS		
Groundwater	Samp	oles & Insitu Tests	RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/ Relative Density	()	Oynamic Penetror Blows/10	neter I0mm)
Grou	Depth	Type & Results	L	De	Gra	Rock: Colour; rabric; rock name; additional comments. (ongin/geological unit)	žδ	Con		5 10	15
				-		CL: Silty CLAY with trace gravel: dark reddish brown mottled orange. Low plasticity; gravel, fine, subangular. (Topsoil)					
	0.3	Peak = UTP		-	× ×	CL: Silty CLAY: dark reddish brown speckled orange. Low plasticity. (Auckland Volcanics)					
	0.6	Peak = 193kPa		-	X_ X						
		Peak = >192kPa		-	XX	at 0.80m, becoming light orange-brown brown streaked orange.					
	0.9	Peak = 183kPa Residual = 32kPa		1 -	×						
				'	-	Borehole terminated at 1.0 m					
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Termination Reason: Target depth reached.

Shear Vane No: 2323 DCP No:
Remarks: Groundwater not encountered.

Client: Woods Group Project: 133 Fitzgerald Road

Site Location: Drury

Date: 23/04/2024

Project No.: AKS2023-0072

PRELIMINARY



Borehole Location: Refer to Site Plan Scale: 1:25 Sheet 1 of 2

						Datum: NZVD2016 Survey Source: Han	d-hel	d GF	2S			
Groundwater	Samp	les & Insitu Tests	RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/ Relative Density	(1	Oynami Penetro Blows/1	ometer	r
5	Depth	Type & Results		De	Gra		≥ŏ	Con		5 1	0 15	5
	0.3	Peak = UTP				CL: Silty CLAY with minor gravel: dark reddish brown mottled grey and red. Low plasticity; gravel, fine to coarse, subangular. (Fill) CL: Silty CLAY: orange streaked red. Low plasticity. (Auckland Volcanics)						
	0.6	Peak = UTP		-	× × × × × × × × × × × × × × × × × × ×							
	0.9	Peak = UTP			×	at 0.80m, becoming orange.						
				2 -		Borehole terminated at 1.0 m						
				5 -	× × × × × × × × × × × × × × × × × × ×							

Termination Reason: Target depth reached.

Shear Vane No: 2323 DCP No:
Remarks: Groundwater not encountered.

Client: Woods Group Project: 133 Fitzgerald Road

Site Location: Drury Project No.: AKS2023-0072

Date: 23/04/2024

PRELIMINARY



Borehole Location: Refer to Site Plan Scale: 1:25 Sheet 1 of 2

 sitior	1.				Projection: NZTM Datum: NZVD2016 Survey Source: Hand	d-hele	d GF	'S			
Samp	les & Insitu Tests	RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/ Relative Density	E (E	ynami Penetro Blows/1	omete 00m	er nm)
Depth	Type & Results		٥	ğ		20	Relat	Ĺ	5 1) <i>·</i>	15
					CL: Silty CLAY: dark reddish brown mottled red. Low plasticity. (Fill)						
0.3	Peak = 193kPa Peak = >192kPa										
			-	^X	CL: Silty CLAY: brown. Low plasticity. (Auckland Volcanics)						
0.6	Peak = UTP										
				<u> </u>	from 0.70m to 8.00m, becoming mottled light pink.						
0.9	Peak = UTP			<u>×</u> _×							
			1 -		Borehole terminated at 1.0 m	-					
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			5 -								+

Termination Reason: Target depth reached.

Shear Vane No: 2323 DCP No:
Remarks: Groundwater not encountered.

Client: Woods Group Project: 133 Fitzgerald Road

Site Location: Drury

Project No.: AKS2023-0072

Date: 23/04/2024

PRELIMINARY



Borehole Location: Refer to Site Plan Scale: 1:25 Sheet 1 of 1

	Positio	n·	10101		5110 1				5110	eli	01 1	
-	บอเแบ	11.		ı		Projection: NZTM Datum: NZVD2016 Survey Source: Han	d-hel	d GF	'S_			
Groundwater	Samp	ples & Insitu Tests	RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding, plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/ Relative Density	F (E	Oynamio Penetro Blows/1	ometer 00mm	r n)
Groi	Depth	Type & Results		De	L.,		≥გ	Con Relati		5 10	0 1	5
	0.3	Peak = 193kPa Peak = >192kPa		-	× × × × × × × × × × × × × × × × × × ×	CL: Silty CLAY with minor sand and trace gravel: dark greyish brown. speckled red ad white. Low plasticity; sand, fine to medium; gravel, fine. (Auckland Volcanics)						
	0.6	Peak = UTP			×— ×— ×— ×— ×—							
	0.9	Peak = UTP		1 -	×							
						Borehole terminated at 1.0 m						
				2 -								
				3 -								
				-								
				5 -						\equiv	\equiv	

Termination Reason: Target depth reached.

Shear Vane No: 2323 DCP No:
Remarks: Groundwater not encountered.

Client: Woods Group Project: 133 Fitzgerald Road

Site Location: Drury Project No.: AKS2023-0072

Date: 18/04/2024



Position: 417010.1mE; 774046.1mN Projection: NZTM

Datum: NZVD2016 Survey Source: Hand Held GPS

					Datum: NZVD2016 Survey Source: Hand	т нег		<u> </u>		
Samp	oles & Insitu Tests	RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	Consistency/ Relative Density	[ynamic Penetroi Blows/10	meter
Depth	Type & Results	귐	Dept	Graph	Rock: Colour, fabric; rock name; additional comments. (origin/geological unit)	Mois	Consis Relative		5 10) 15
0.3	Peak = >140kPa		-		CL: Silty CLAY with trace sand: reddish brown mottled red. Low plasticity; sand, fine to medium. (Fill) at 0.40m, becoming dark reddish brown, gravel absent.	М	н			
0.6	Peak = UTP				at 0.60m, becoming brown mottled dark brown					
0.9 1.0	Peak = 121kPa Residual = 47kPa Peak = 166kPa Residual = 50kPa		1 -	× × × × × × × × × × × × × × × × × × ×	CH: Silty CLAY: yellowish brown streaked red and light grey. Highly plastic. (Auckland Volcanics)	M to W	VSt			
1.2	Peak = UTP			X_X_X_X_X_X_X_X_X_X_X_X_X_X_X_X_X_X_X_	at 1.20m, becoming greenish brown streaked orange.					
1.6	Peak = UTP		-	X X		М	Н			
2.0	Peak = UTP		2 -	× ×	at 1.80m, becoming orange-brown streaked red.					
			3 —							
			-							
			4 -							
1			-	1					.	

Termination Reason: Target Depth Reached
Shear Vane No: 2323 DCP No:
Remarks: Groundwater not encountered.

Client: Woods Group Project: 133 Fitzgerald Road

Site Location: Drury Project No.: AKS2023-0072

Date: 19/04/2024



Position: 416937.0mE; 774014.5mN Projection: NZTM
Datum: NZVD2016 Survey Source: Hand Held GPS

						Datum: NZVD2016 Survey Source: Hand	leH t	d GF	2S			
Sa	amples & Insitu Te	ests	RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)	Moisture Condition	. ≥	E (E	Oynamio Penetro Blows/1	omete 00mr	er m)
Dept	h Type & Re	sults		ď	Gra		≥ŏ	Cor		5 10	0 1	5
0.3	Peak = >14	l0kPa				CL: Silty CLAY with trace sand: dark reddish brown mottled orange. Low plasticity; sand, fine to coarse. (Fill)						
0.6	Residual = 4	47kPa 1kPa				at 0.70m, becoming orange. CH: Silty CLAY: orange streaked red. Highly plastic.	М	VSt to H				
0.9	Peak = U	ITP		1 -	X X X X	(Auckland Volcanics)						
1.2	Peak = 124 Residual = 3	4kPa 30kPa			X X X X X X X X X X	CH: Silty CLAY: orange. Highly plastic. (Auckland Volcanics)						
1.6	Peak = U	ITP		-	X	CL: Silty CLAY: brownish green. Low plasticity. (Auckland Volcanics)						
2.0	Peak = U	ITP		2 -		CL: Silty CLAY: brown streaked bluish grey. Low plasticity	M to W					
2.4	Peak = >14	l0kPa		-		(Auckland Volcanics)		н				
2.8	Peak = >14	l0kPa			-X- -X- -X- -X- -X- -X- -X- -X- -X- -X-	CL: Silty CLAY with trace sand: orange-brown mottled reddish brown. Low plasticity; sand, fine to coarse. (Auckland Volcanics) ML: Sandy SILT with minor gravel: reddish brown. Non-plastic; sand, fine to coarse; gravel, fine.	M					
				3 -		(Auckland Volcanics) Borehole terminated at 3.0 m						
				-								
				4 -	- - - - - - -							
					- - - - -							
				-	- - - - -							
				5 -	-							

Termination Reason: Target Depth Reached
Shear Vane No: 2323 DCP No:
Remarks: Groundwater not encountered.

Client: Woods Group Project: 133 Fitzgerald Road

Site Location: Drury Project No.: AKS2023-0072

Date: 18/04/2024



Position: 416860.4mE; 773984.6mN Projection: NZTM
Datum: NZVD2016 Survey Source: Hand Held GPS

					Datum: NZVD2016 Survey Source: Han	uile	u Gi	-3			_
Samp	ples & Insitu Tests	RL (m)	Depth (m)	Graphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit)	Moisture Condition	Consistency/ Relative Density	[Dynami Penetro Blows/1	ometer	er
Depth	Type & Results	R	Dept	Graph	Rock: Colour, fabric; rock name; additional comments. (origin/geological unit)	Mois	Consis Relative		5 1	 0 1: 	5
0.3	Peak = UTP				CL: Silty CLAY: orange streaked red. Low plasticity. (Fill) at 0.40m, becoming mottled dark brown						
0.6	Peak = UTP		-		at 0.50m, becoming mottled light yellow at 0.70m, becoming dark brown.	М	н				
0.9	Peak = UTP		1 -		at 1.00m, becoming brown mottled dark brown.						
1.2	Peak = UTP				at 1.20m, becoming orange-brown streaked red						
1.6	Peak = >193kPa		-		CH: Silty CLAY: brown. Highly plastic. (Fill) at 1.50m, becoming streaked red.						
2.0	Peak = 110kPa Residual = 41kPa		2 -	×	CH: Silty CLAY: dark reddish brown. Highly plastic. (Auckland Volcanics)	M to	VSt to				
2.4	Peak = 151kPa Residual = 83kPa		-	× × × × × × × × × × × × × × × × × × ×	CH: Silty CLAY: yellowish brown. Highly plastic. (Auckland Volcanics)						
2.8	Peak = 153kPa Residual = 69kPa			X X X X X X X X X X	at 2.80m, becoming mottled orange.						
			3 -		Borehole terminated at 3.0 m						
			-								
			4 -								
			-								

Termination Reason: Target Depth Reached
Shear Vane No: 2323 DCP No:
Remarks: Groundwater not encountered.

Client: Woods Group Project: 133 Fitzgerald Road

Site Location: Drury

Project No.: AKS2023-0072

Date: 23/04/2024

PRELIMINARY



Borehole Location: Refer to Site Plan Scale: 1:25 Sheet 1 of 1

	sition	1:				Projection: NZTM				<u> </u>	<u> </u>	•
Datum: NZVD2016 Survey Source: Hand							d-held	d GF), on a mai		
Samples & Insitu Test			RL (m)		raphic Log	Material Description Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit)		Consistency/ Relative Density	(E	Oynamio Penetro Blows/1	omete 100mr	m)
o L	Jepin	Type & Results			<u> </u>		Moisture Condition	Re o	ڵ؎			Ľ
					-X	CL: Silty CLAY: orange-brown streaked red. Low plasticity. (Auckland Volcanics)						
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	0.3	Peak = UTP			- <u>×</u>	at 0.30m, becoming dark reddish brown mottled orange.						
					1×— ×							
	0.6	Peak = UTP			<u> </u>							
	0.9	Peak = UTP		1 -	×		_					
					-	Borehole terminated at 1.0 m						
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Termination Reason: Target depth reached.

Shear Vane No: 2323 DCP No:
Remarks: Groundwater not encountered.



2 July 2024

DRURY CENTRE – STAGE 1 EARTHWORKS 133 FITZGERALD ROAD, DRURY

GEOTECHNICAL COMPLETION REPORT

Kiwi Property Holdings No. 2 Limited

AKS2023-0072AJ Rev 1



AKS2023-0072AJ						
Date	Revision	Comments				
01 May 2024	А	Initial draft for internal review				
03 May 2024	В	Final draft for client review				
13 May 2024	0	Issued to Client				
2 July 2024	1	Issued to Client				

	Name	Signature	Position
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1 INTRODUCTION

In accordance with our instructions, this Geotechnical Completion Report (GCR) has been prepared for Kiwi Property Holdings No. 2 Limited as part of the documentation to be submitted to Auckland Council following earthworks to form the residential lots for Stage 1 of the Drury Centre development.

This report covers the construction period from earthworks season 2021 and 2022 through to practical completion of the lots to March 2024. This report is intended to be used for certification purposes for the new lots (listed below):

- 13 new residential lots numbered Lot 10 to Lot 22;
- 6 new roads numbered Road 9, 10, 21 to 23 and 25;
- 1 reserve numbered Lot 101

Stage 1 of the Drury Centre Development is located off 133 Fitzgerald Road, Drury. As can be seen from the asbuilt plans Appendix C, 13 of the lots have been affected by filling as part of the earthworks operations to a maximum depth of approximately 8 metres.

Construction of this subdivision has been undertaken in general accordance with;

- Auckland Council's Resource Consent number BUN60390224 and Engineering Approval letter dated 13 April 2022
- NZS4431:1986 (consent predates 2022 update)
- Auckland Council's Code of Practice for Land Development and Subdivision, Chapter 2 Earthworks and Geotechnical, Version 2.0, May 2023
- Aurecon consented drawing set referenced 510611-0100-DRG-CC-0000, dated 21 May 2021



The following project related reports:

Project Documentation - ACCoP					
Report Type	Reference and/or Comments				
Geotechnical Interpretative Report	Aurecon Geotechnical Interpretative Report – 510611- 002-REP-GG-001.Rev5				
Geotechnical Works Specification (earthworks)	Aurecon Standard Earthworks Specification – 510611 Drury Centre Earthworks Specification.Rev1				
Geotechnical Supplementary Report	AKS2023-0071 AG Earthworks Practical Completion and Certification Lot 1 Rev 0				

For the construction of these stages of the development, the following roles were fulfilled as defined in NZS 4431:1986 and the Ministry for the Environment Contaminated Land Management Guidelines:

• Earthworks Designer: Aurecon Ltd (2021 to 2023) & Woods Partners Ltd (2023 to 2024)

Geotechnical Designer & Certifier: Aurecon Ltd (2021 to 2023) & CMW Geotechnical NZ Limited (2023 to

2024)

Recognised Laboratory: Road TestContractor: Ross Reid

As CMW has the role of earthfill Certifier this report has been prepared to cover that aspect of the project work.

1.1 Commercial Lot

At the time of writing this GCR, commercial lot (1) was still currently being finalised with the construction of reinforced earth retaining walls along the eastern property boundary and a segmental retaining wall on the property boundary with 105 Brookfield Road still to be completed. This area of the project and commercial lot will be addressed in a separate GCR upon completion of all retaining structure earthworks associated with commercial lot 1. CMW has completed an Earthworks Practical Completion and Certification for Lot 1, AKS2023-0072AJ, dated 2 July 2024 in which it confirms that all cut to fill earthworks associated to Lot 1 has been completed in accordance with the Earthworks Specification and has provided preliminary foundation design parameters for any future developments for the lot. Practical completion and certification for Lot 1 and the Earthworks Specification has been appended to this GCR for reference.

2 DESCRIPTION OF WORKS

The main bulk earthworks operations commenced between May 2022 and December 2023 by Ross Reid Contractors Ltd. This generally consisted of cutting into the existing land within Lots 10 to 19 and filling in within Lots 20 to 22.

The cut and fill Layout Plan in *Appendix* A shows that cuts of up to 5.5m and fills of up to 3.0m were required to achieve the necessary design levels for the proposed lots. All residential lots have been topsoiled and grassed.

The extent of Earthworks undertaken to date, and that covered by this GCR are shown on the Cut-Fill Surface, located in Appendix A.

Majority of the site works for the residential lots were carried out before CMW were engaged with only minor works carried out around Lot 19. The previous consultant, Aurecon who oversaw the earthworks certification



onsite till May 2023 have provided a Geotechnical Review Report of these works of which CMW have reviewed as part of this GCR.

During the course of the site works the Contractor has submitted all QA testing conducted by RoadTest of the engineered fill (NDM and shear vane testing), which were reviewed and certified by Aurecon and CMW have accepted. Further intrusive investigations comprising top-down hand auger testing were conducted on each residential lot to evaluate the bearing capacity of each lot. The hand augers are presented in *Appendix E* and *Appendix G* as part of the QA testing for the GCR.

3 GEOTECHNICAL QUALITY CONTROL

3.1 Site Observations

During the works, site visits were typically undertaken several times each week to assess compliance with NZS 4431 and project specific design recommendations and specifications.

Site visits were carried out to observe and confirm compliance relating to:

- Adequate topsoil stripping;
- Fill areas prior to the placement of fill materials to ascertain that all mullock, and soft inorganic subsoils had been removed:
- Placement and compaction of engineered fills.

4 QUALITY ASSURANCE TESTING

Quality assurance testing of materials was completed as required by the Geotechnical Works Specification presented in Aurecon's Earthworks Specification, 510611 Drury Centre Earthworks Spec Rev 1, 3 December 2021, presented in *Appendix D*. Test results are presented in Appendix E and Appendix G.

Cohesive Materials (Soil Fill and Soil/ Rock Blended Fill) Compaction Test Criteria for Engineered Filling									
Fill Type	Air Vo	oids ⁽¹⁾	Vane Shear Strength ⁽²⁾		Moisture Content ⁽³⁾	Dry Density ⁽³⁾			
тш туре	Average	Maximum Single Value	Average	Minimum Single Value	Maximum	Minimum			
Earth Fill	10%	12%	150 kPa	110 kPa	40%	1.3 t/m ³			
Landscape Fill TBC by Geotechnical Engineer of case-by-case basis									

⁽¹⁾ Air Voids Percentage (as defined in NZS 4402:1986)

While these tests showed on occasions that the contractor was struggling to achieve the required compaction standards with the prevailing site and soil conditions, to the best of our knowledge, all areas of fill were reworked as necessary. Subsequent testing confirmed compliance with the specification.

⁽²⁾ Undrained Shear Strength (Measured by hand shear vane – calibrated using NZGS 2001 method)

⁽³⁾ Moisture content and minimum dry density non-compliance may be accepted on site by the Geotechnical Engineer on a case-by-case basis depending on the nature of the material and the other criteria results.



5 EVALUATION OF COMPLETED EARTHWORKS

5.1 Liquefaction

The liquefaction risk for the lots on this development has been assessed as follows:

- Review of Aurecon's Geotechnical Interpretive Report and Auckland Council GIS maps confirms the damage category to be: Very Low Vulnerability
- In accordance with MBIE/NZGS guidance¹ the liquefaction susceptibility of the soils at this site was assessed with respect to geological age and compositional (soil fabric and density) criteria during initial investigations by Aurecon. Liquefaction assessment was described in the Geotechnical Interpretative Report referenced in Section 5.4 and found a very low risk.

Investigations and analysis by Aurecon were completed in accordance with the Guidance. As a result of that work, the earthworks carried out to date, particularly areas where there has been cut, the earthworks surface has remained within the South Auckland Volcanic Formation (SAVF) and therefore liquefaction is unlikely.

5.2 Land Stability and Erosion

The residential lots have been developed from cutting away a hill on an existing plateau landform to form an earthwork surface that is relatively flat to gently sloping to Fitzgerald Road, the western boundary. As such, the potential for unstable conditions for finished ground profile is negligeable and satisfy ultimate limit state design criteria. The soil parameters for stability analysis were selected from extensive investigation undertaken at the site and from experience in this terrain.

The subdivision scheme layout includes a series of batter slopes to form level terraces for building platforms. The batters include portions of the residential lots with maximum gradients of 1(v) in 3(h. We consider the conditions to be satisfactory for all building platform areas, and we are therefore satisfied that these areas are not subject to the natural stability hazards described in the Building Act.

Along Lot 19, the northwestern boundary (corner of Fitzgerald and Brookfield Road), the finished surface beneath the two roads has resulted in a cut slope varying in height from 1.0m to 2.0m. We consider this stability of the cut to be negligeable based on the soil conditions seen and experience with stability in this terrain. On all steep land, including on engineered batter slopes, surface stability can be compromised by indiscriminate disposal of stormwater onto the ground surface and/ or by removal of vegetation.

Building and landscape designers must ensure that all runoff from solid surfaces is directed into the stormwater system. It is also important that care is paid to the disposal of stormwater during construction so that concentrated discharges (e.g. from unconnected spouting) are not directed towards steep ground.

Depths of mulch and topsoil applied to sloping areas should be limited to less than 150mm to minimise the risks of saturation leading to localised slumping on batter face. Wherever practical on such land, and particularly on steep batters, existing vegetation and grass cover should be well maintained. Any vegetation cleared beyond the immediate area of building platforms for temporary construction purposes should be replanted or replaced as soon as possible. The roots of an established vegetation cover can serve to bind the surface soils while the foliage can reduce rain infiltration and soil saturation, resulting in better resistance to erosion and shallow slumping.

5.3 Uncertified Temporary Filling

At the time of completing this GCR all Residential Lots have environmental clean water diversion control bunds constructed on the perimeter of the Lots. For Lots 12 to 14, temporary staging for topsoil screening had been

¹ Earthquake Geotechnical Engineering Practice, Module 3: Identification, assessment and mitigation of liquefaction hazards", (November 2021)



taking place with a number of topsoil stockpiles present on the Lots. It is anticipated that all uncertified filling will be removed from the Lots prior to hand over to the residential builder and in such a case a certified Geotechnical Engineer will need to confirm Lots are cleared in accordance with the requirements of NZS 3604 and ACCoPs, and the anticipated final levels are met as shown in drawing P23-315-01-1100-EW, *Appendix C*.

The areas containing these deposits are covered by the Specific Design Zone (uncertified fill) check this is listed in SOPO and descriptions of the restrictions are contained in our Opinion on Suitability in *Appendix A*.

5.4 Fill Induced Settlement

The majority of the filling on this stage of the development was placed between December 2023 and February 2024. A series of settlement markers was installed in areas of deeper fill at its completion and have been periodically monitored for both horizontal and vertical movements. Horizontal changes have been noted to be within the survey accuracy limits, while vertical movements are depicting seasonal shrink/ swell variations as anticipated. Results of the monitoring are provided in *Appendix E* and generally show a plateauing of results.

On the basis of the relatively minor magnitude of fill depths on this site, together with the elapsed time since it was placed, we consider that remaining post-construction settlements will be within code limits.

5.5 Service Line Trenches

At the time of writing this GCR civil works, sanitary sewer and stormwater services have not been constructed including the service trenching required for installation of these services.

As is normal on all subdivisions, building developments involving foundations within a 45-degree zone of influence from pipe inverts will require engineering input. The Auckland Council drawing referenced SW22 provided in *Appendix B* extracted from Chapter 4 of the Auckland Council Code of Practice for Land development and Subdivision depicts their requirements for stormwater pipes. Details for water and wastewater pipes are available in the Watercare COP1 - General Requirements and Procedures. It is anticipated that the majority of lots will have service trenches within the lots. The resulting restrictions are presented in our Opinion on Suitability in *Appendix A*.

5.6 Groundwater

The extensive investigation carried out prior to any earthworks encountered groundwater within the basalt layer, at depths that would unlikely affect the bulk earthworks. This was confirmed in our observation records along with Aurecon's as groundwater was not encountered during the bulk earthworks.

Based on our work to date we anticipate groundwater levels remaining well below the depth of influence of anticipated earthworks and foundation works for NZS 3604 type dwellings.

5.7 Design of Shallow Foundations

5.7.1 Bearing Capacity

Once bulk earthworks and top-soiling of the building platforms had been completed, our staff drilled hand auger boreholes on platforms in natural ground to determine representative finished ground conditions and hence evaluate likely foundation options for future building development. Our assessments of bearing capacity for the design of shallow foundations on each building platform are contained in our Opinion on Suitability in *Appendix A*.

As detailed in our Opinion on Suitability, in general the residential lots have a bearing capacity of 300kPa. Under AS2870, the material is considered H1 due to shrinkage limit.

If higher geotechnical ultimate bearing capacities are required than have been specified, further specific site investigation and design of foundations should be carried out prior to Building Consent application.



5.7.2 Foundation Settlements

At the bearing pressures specified in *Appendix A* and subject to the design requirements for soil expansiveness provided below, differential settlement of shallow foundations for buildings designed in accordance with NZS 3604 (including the 600mm subfloor fill depth limit) should be within code limits.

5.7.3 Soil Expansiveness Classification

Seasonal soil moisture variations within most clay-rich soils typically result in the soil swelling during winter months and then shrinking during summer months. These seasonal movements can cause issues such as cracking of concrete floors, brittle cladding and masonry walls or distortion of building frames causing doors and windows to jam from differential settlement. The effects are further compounded by local influences that worsen differential movements. These may include growth of high demand trees and shrubs that cause localised soil drying or either leaking pipes or tree root removal, leading to localised wetting.

The potential effects need to be managed in a combination of appropriate:

- classification of the level of risk
- design of foundations
- management of soil moisture conditions by contractors during construction
- management of landscaping and plantings by homeowners throughout a building's lifetime

Testing on 4 samples was completed in accordance with the requirements of NZS 3604 and ACCoPs. All testing is currently being performed by Construction Science, a testing laboratory accredited by IANZ for the tests undertaken.

The purpose for the testing will confirm:

- The extent of the soils tested are expansive in terms of the NZS 3604 definition and whether therefore outside the definition of "good ground".
- The samples tested demonstrated a range of expansivity characteristics.

Results of our assessment of the maximum characteristic surface movement (ys) for each lot are contained in our Statement of Opinion on Suitability of Land in *Appendix A*.

5.7.4 Site (Seismic) Class

Our assessments of NZS 1170.5 site Class(es) is provided in our Opinion of Suitability and the Summary Table, both in *Appendix A*.

5.8 Topsoil Depths

Topsoil depths have been checked by the drilling of a borehole in the approximate centre of the building platform on each lot. The results are considered indicative for each lot, but may be subject to variations. Topsoil depths are between 100 and 400mm on these stages of the development.

Site specific findings are contained in our Opinion on Suitability Summary in *Appendix A*. It is possible that further levelling works have been undertaken since the investigations and accordingly, we strongly recommend that lot purchasers complete their own checks of topsoil depths.

5.9 Site Preparation During Construction

Foundation contractors need to be aware of the extreme damage potentially caused by expansive soils and the imperativeness of maintaining optimum moisture contents in all footing excavations and across building platform subgrades between the time of excavation and the pouring of concrete. Pouring foundations on dry, desiccated ground in summer months can lead to heaving and cracking, requiring extensive repairs or even



complete house re-builds. Similarly, where perimeter foundations have been treated but floor slabs have been poured on dry ground, infiltration of moisture via pipe bedding can lead to localised heave, uplift and significant slab damage.

Remedial actions that may be appropriate include combinations of platform protection with a hard fill layer, pouring of a blinding layer of concrete in footing bases and soaking of the building platform with sprinklers for an extended period.

5.10 Site Maintenance and Landscaping

Due to potential soil expansivity, landowners must be mindful of the potential impacts of planting or removal of high water demand plants. Where their roots may extend close to footings (i.e. within a lateral distance of 1.5 times the mature tree height), these actions can lead to significant settlement or heave damage.

For a comprehensive understanding of the potential effects of expansive soils, maintenance recommendations and vegetation management information, we strongly recommend that land owners obtain a copy of CSIRO publication BTF 18 (Foundation Maintenance and Footing Performance – A Homeowners Guide) that is available online.

6 CLOSURE

Additional important information regarding the use of your CMW report is provided in the 'Using your CMW Report' document attached to this report.

This report has been prepared for use by Kiwi Property Holdings No. 2 Limited in relation to the Drury Centre – Stage 1 Earthworks 133 Fitzgerald Road, Drury project in accordance with the scope, proposed uses and limitations described in the report. Should you have further questions relating to the use of your report please do not hesitate to contact us.

Although regular site visits have been undertaken for observation, for providing guidance and instruction and for testing purposes, the geotechnical services scope did not include full time site presence. To this end, our Opinion on Suitability in *Appendix A* and our Suitability Statement in *Appendix B* also rely on the Contractors' work practices and assumes that when we have not been present to observe the work, it has been completed to high standards and in accordance with the drawings, instructions and consent conditions provided to them.

Similarly, we assume that all as-built information and other details provided to the Client and/ or CMW by other members of the project team are accurate and correct in all respects.

Where a party other than Kiwi Property Holdings No. 2 Limited seeks to rely upon or otherwise use this report, the consent of CMW should be sought prior to any such use. CMW can then advise whether the report and its contents are suitable for the intended use by the other party.



USING YOUR CMW GEOTECHNICAL REPORT

Geotechnical reporting relies on interpretation of facts and collected information using experience, professional judgement, and opinion. As such it generally has a level of uncertainty attached to it, which is often far less exact than other engineering design disciplines. The notes below provide general advice on what can be reasonably expected from your report and the inherent limitations of a geotechnical report.

Preparation of your report

Your geotechnical report has been written for your use on your project. The contents of your report may not meet the needs of others who may have different objectives or requirements. The report has been prepared using generally accepted Geotechnical Engineering and Engineering Geology practices and procedures. The opinions and conclusions reached in your report are made in accordance with these accepted principles. Specific items of geotechnical or geological importance are highlighted in the report.

In producing your report, we have relied on the information which is referenced or summarised in the report. If further information becomes available or the nature of your project changes, then the findings in this report may no longer be appropriate. In such cases the report must be reviewed, and any necessary changes must be made by us.

Your geotechnical report is based on your project's requirements

Your geotechnical report has been developed based on your specific project requirements and only applies to the site in this report. Project requirements could include the type of works being undertaken; project locality, size and configuration; the location of any structures on or around the site; the presence of underground utilities; proposed design methodology; the duration or design life of the works; and construction method and/or sequencing.

The information or advice in your geotechnical report should not be applied to any other project given the intrinsic differences between different projects and site locations. Similarly geotechnical information, data and conclusions from other sites and projects may not be relevant or appropriate for your project.

Interpretation of geotechnical data

Site investigations identify subsurface conditions at discrete locations. Additional geotechnical information (e.g. literature and external data source review, laboratory testing etc) are interpreted by Geologists or Engineers to provide an opinion about a site specific ground models, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist due to the variability of geological environments. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. Interpretation of factual data can be influenced by design and/or construction methods. Where these methods change review of the interpretation in the report may be required.

Subsurface conditions can change

Subsurface conditions are created by natural processes and then can be altered anthropically or over time. For example, groundwater levels can vary with time or activities adjacent to your site, fill may be placed on a site, or the consistency of near surface conditions might be susceptible to seasonal changes. The report is based on conditions which existed at the time of investigation. It is important to confirm whether conditions may have changed, particularly when large periods of time have elapsed since the investigations were performed.

Interpretation and use by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a geotechnical report. To help avoid misinterpretations, it is important to retain the assistance of CMW to work with other project design professionals who are affected by the contents of your report. CMW staff can explain the report implications to design professionals and then review design plans and specifications to see that they have correctly incorporated the findings of this report.

Your report's recommendations require confirmation during construction

Your report is based on site conditions as revealed through selective point sampling. Engineering judgement is then applied to assess how indicative of actual conditions throughout an area the point sampling might be. Any assumptions made cannot be substantiated until construction is complete. For this reason, you should retain geotechnical services throughout the construction stage, to identify variances from previous assumption, conduct additional tests if required and recommend solutions to problems encountered on site.

A Geotechnical Engineer, who is fully familiar with the site and the background information, can assess whether the report's recommendations remain valid and whether changes should be considered as the project develops. An unfamiliar party using this report increases the risk that the report will be misinterpreted.

Environmental Matters Are Not Covered

Unless specifically discussed in your report environmental matters are not covered by a CMW Geotechnical Report. Environmental matters might include the level of contaminants present of the site covered by this report, potential uses or treatment of contaminated materials or the disposal of contaminated materials. These matters can be complex and are often governed by specific legislation.

The personnel, equipment, and techniques used to perform an environmental study can differ significantly from those used in this report. For that reason, our report does not provide environmental recommendations. Unanticipated subsurface environmental problems can have large consequences for your site. If you have not obtained your own environmental information about the project site, ask your CMW contact about how to find environmental risk-management guidance.



APPENDIX A: STATEMENT OF PROFESSIONAL OPINION ON SUITABILITY OF LAND FOR BUILDING CONSTRUCTION



STATEMENT OF PROFESSIONAL OPINION ON SUITABILITY OF LAND FOR BUILDING CONSTRUCTION

Development: Stage 1 of the Drury Centre Development Developer: Kiwi Property Holdings No. 2 Limited

Location: Drury

I, Larry Goldfarb, of CMW Geotechnical NZ Limited, Auckland, hereby confirm that:

- 1. As a Chartered Professional Engineer experienced in the field of geotechnical engineering, I am a Geoprofessional as defined in clause 1.2.2 of NZS 4404:2010 and was retained by the Developer as the geoprofessional on the above development.
- 2. The extent of preliminary investigations carried out to date are described in the Aurecon Geotechnical Interpretative Report referenced 510611-002-REP-GG-001.Rev5, dated 4 October 2022. The conclusions and recommendations of those documents have been re-evaluated in the preparation of this report. The extent of my inspections and those under my auspices during construction, and the results of all tests and/ or evaluations carried out are as described in my Geotechnical Completion Report dated 1 May 2024.
- 3. I have relied on the Earthworks QA and Certification by Aurecon provided in *Appendix B* that confirms that the earth fills shown in *Appendix C*, drawing number P23-315-01-1270-AB for Lots 12, 13 and 16 to 22 have been placed in compliance with the requirements of Auckland Council and my specification.
 - Further to the above by Aurecon, my certification of the earth fills placed on this site for Lot 10, 11, 14 and 15 is contained in *Appendix B* and have been placed in general compliance with the requirements of Auckland Council and my specification.
- 4. In my professional opinion, not to be construed as a guarantee, I consider that:
 - a. The completed earthworks take into account land slope and foundation stability considerations on the building platform areas.
 - b. A geotechnical ultimate bearing capacity of 300 kPa may be assumed for shallow foundation design on the building platforms of Lots 10 to 22 inclusive.
 - c. The site (seismic) subsoil class for each lot has been assessed in accordance with NZS1170.5:2004 Clause 3.1.3 from borelogs that included measurements of geotechnical properties. Our assessment is that lots 10 to 22 are Class C- shallow soil.

d.

Assessment of Characteristic Surface Movements and Design Classes for NZS 3604 Compliant Buildings									
Lots	Assessed Maximum Characteristic Surface Movement (Ys) for 500 Year Design (mm)	Suitable NZBC B1/AS1 Expansivity Class for Design	Suitable AS2870-2015 Class for Design						
10 to 22	67	H (highly)	H1						

Notes:

B1/AS1 design applies to a limited range of building sizes, shapes and materials within the scope of NZS3604 and applies only to floor design with strip footings. In all other cases, AS2870 design or specific design should be adopted.



Prior to the introduction of the B1/AS1 design information in November 2019, minimum foundation depths recommended as appropriate by geotechnical consultants in Auckland for shallow footing design under AS2870 were typically of the order of 750mm for Class H1.

- e. No building development should take place within the 45-degree zone of influence of stormwater or sewer line or manhole inverts unless endorsed by specific design and by construction inspections undertaken by a Chartered Professional Engineer experienced in geomechanics to ensure that lateral stability and differential settlement issues are addressed and that building loads are transferred beyond the influence of pipes and trench backfills. A copy of drawing SW22 extracted from Chapter 4 of the Auckland Council Code of Practice for Land development and Subdivision this document is provided in *Appendix B* for clarification. Details for water and wastewater pipes are available in the Watercare COP1 General Requirements and Procedures.
- f. On the basis of the earth fill certification and subject to the geotechnical limitations, restrictions and recommendations contained in clauses 4(a), 4(b), 4(c), 4(d) and 4(e) above:
 - The filled and natural ground is generally suitable for buildings constructed in accordance with NZS 3604 and the requirements of either NZBC Clause B1/AS1 where appropriate, or AS2870 for the expansive soil class associated with the characteristic surface movement. Alternatively, a specific foundation and structural design may be undertaken by a Chartered Professional Engineer.
 - Specific site investigations, design modifications and construction inspections should be carried out as necessary by a Chartered Professional Engineer, experienced in geomechanics, for all buildings exceeding these limitations, but in any event, we consider it prudent for all land owners to engage a Chartered Professional Engineer to undertake site specific investigation and foundation design with a view to optimising bearing capacities, design loads, earthworks and retaining walls.
- 5. Road subgrades have been formed with appropriate regard for slope stability and settlement risks.
- 6. Reserve areas have been formed with appropriate regard for slope stability and seepage risks.

The following table summarises the conditions on each of the residential lots.

For and on behalf of CMW Geosciences

Lary Goldfarl

Larry Goldfarb

Principal Geotechnical Engineer CMEngNZ, CPEng



Condition	Geotechnical Ultimate Bearing Capacity (kPa) NZS 1170.5 Site (seismic) Class AS2870 Expansive Class		Service Lines Restrictions	Indicative Topsoil Depth (mm)	Specific Design Zone (uncertified fill)	
GCR SOPO Clause	4(b)	4(c)	4(d)	4(e)		
Lot number						
10	300	С	H1	~	400	~
11	300	С	H1	✓	300	✓
12	300	С	H1	~	-	✓
13	300	С	H1	~	100	~
14	300	С	H1	~	- 0	✓
15	300	С	H1	~		✓
16	300	С	H1	~	150	~
17	300	С	H1	~	150	✓
18	300	С	H1	~	150	✓
19	300	С	H1	~	200	✓
20	300	С	H1	~	150	✓
21	300	С	H1	~	250	~
22	300	С	H1	~	300	✓



APPENDIX B: STATEMENT OF SUITABILITY OF ENGINEERED FILL FOR LIGHTWEIGHT STRUCTURES



STATEMENT OF SUITABILITY OF ENGINEERED FILLS FOR LIGHTWEIGHT STRUCTURES

To: Auckland Council

Development: Stages 1 of the Drury East Development

Land Title(s): Lot 1, Lot 3, Lot 4 DP 57466, Lot 1 DP 101367 & Lot 1 DP 87159

Location: 133 Fitzgerald Road, Drury

Resource Consent Nos: BUN60390224

Developer: Kiwi Property Holdings No. 2 Limited

Geotechnical Designer: Dr Jan Kupec of Aurecon

Certifier: Larry Goldfarb of CMW Geotechnical NZ Limited

This Statement of Suitability is provided as an appendix to the CMW Geosciences Geotechnical Completion Report referenced in the page footer below, that also contains all as-built plans, inspection and test plan, geotechnical works specification, test results and test inspection records relevant to the work completed.

- 1. I, Larry Goldfarb, confirm that I am qualified as a certifier as defined in NZS4431:1986.
- 2. During this work, I was retained as certifier and I or my certifier's representative undertook inspections and testing as documented in the Geotechnical Completion Report.
- 3. I am satisfied that the engineered fill shown in the attached as-built survey was placed, compacted and tested in accordance with the attached specification and that all variations and non-compliances have been documented in the Geotechnical Completion report.
- 4. Based on the information available, I certify that, to the best of my knowledge, the intent of the geotechnical designer (as presented in the design, drawings and Geotechnical Works Specification) has been achieved.
- 5. The fill areas shown on the Wood Partners Ltd as-built cut and fill plan(s) attached are considered suitable for development as per NZS 3604 subject to any other restrictions described in the Geotechnical Completion Report by the Geotechnical Designer.
- 6. This certification does not remove the necessity for normal inspection and design of foundations as would be made in natural ground.

For and on behalf of CMW Geosciences

Lary Goldfarl

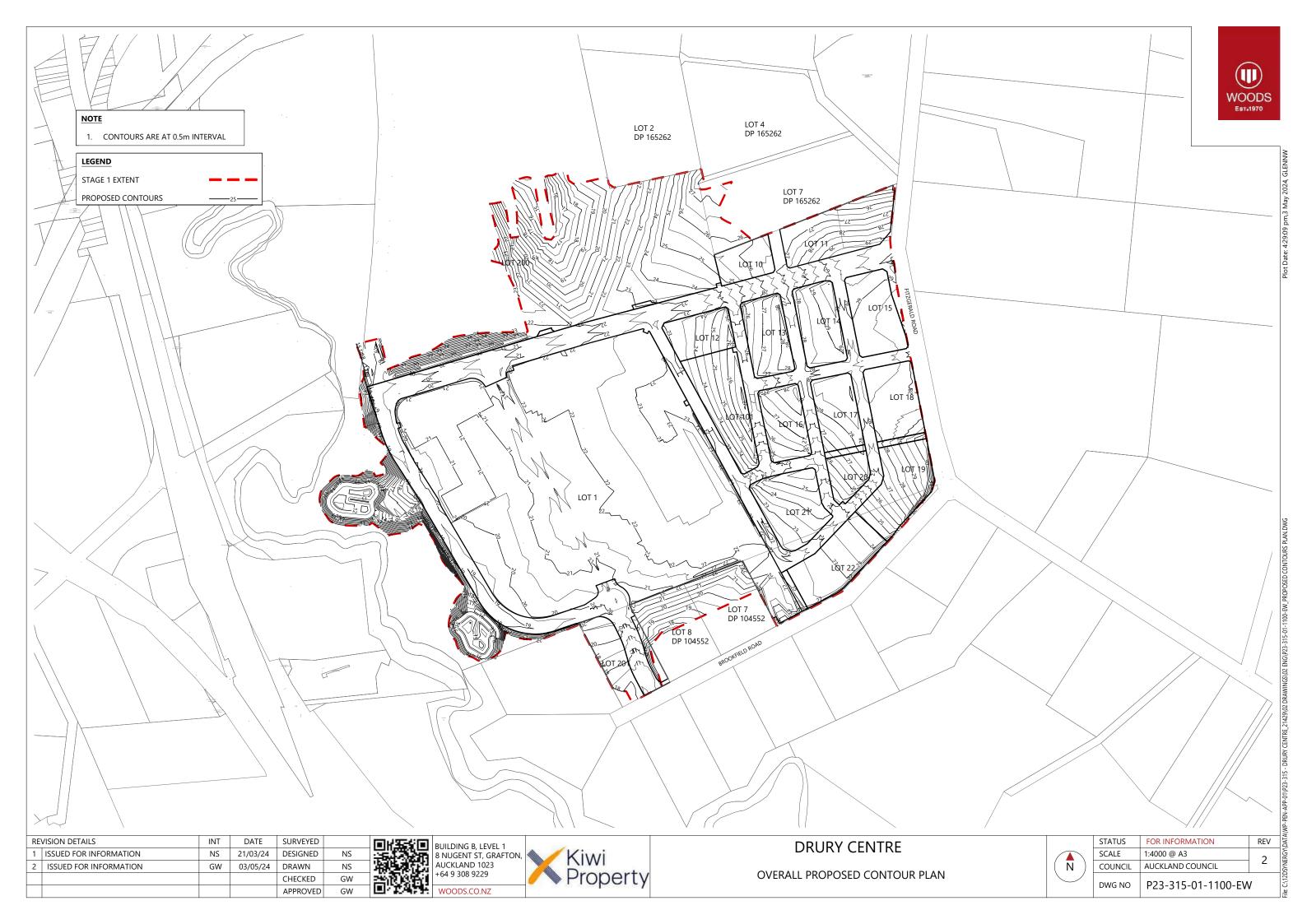
Larry Goldfarb

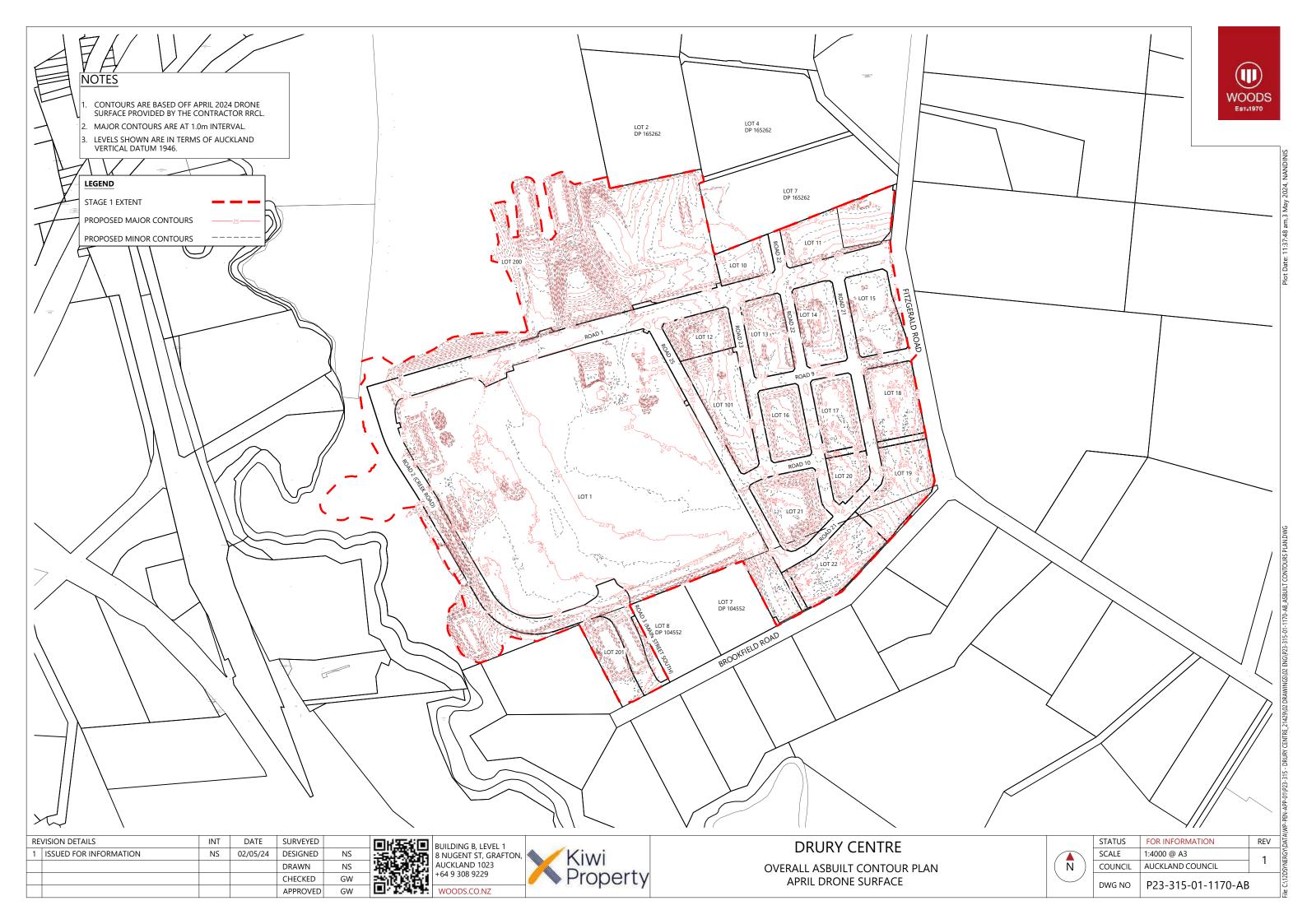
Principal Geotechnical Engineer CMEngNZ, CPEng

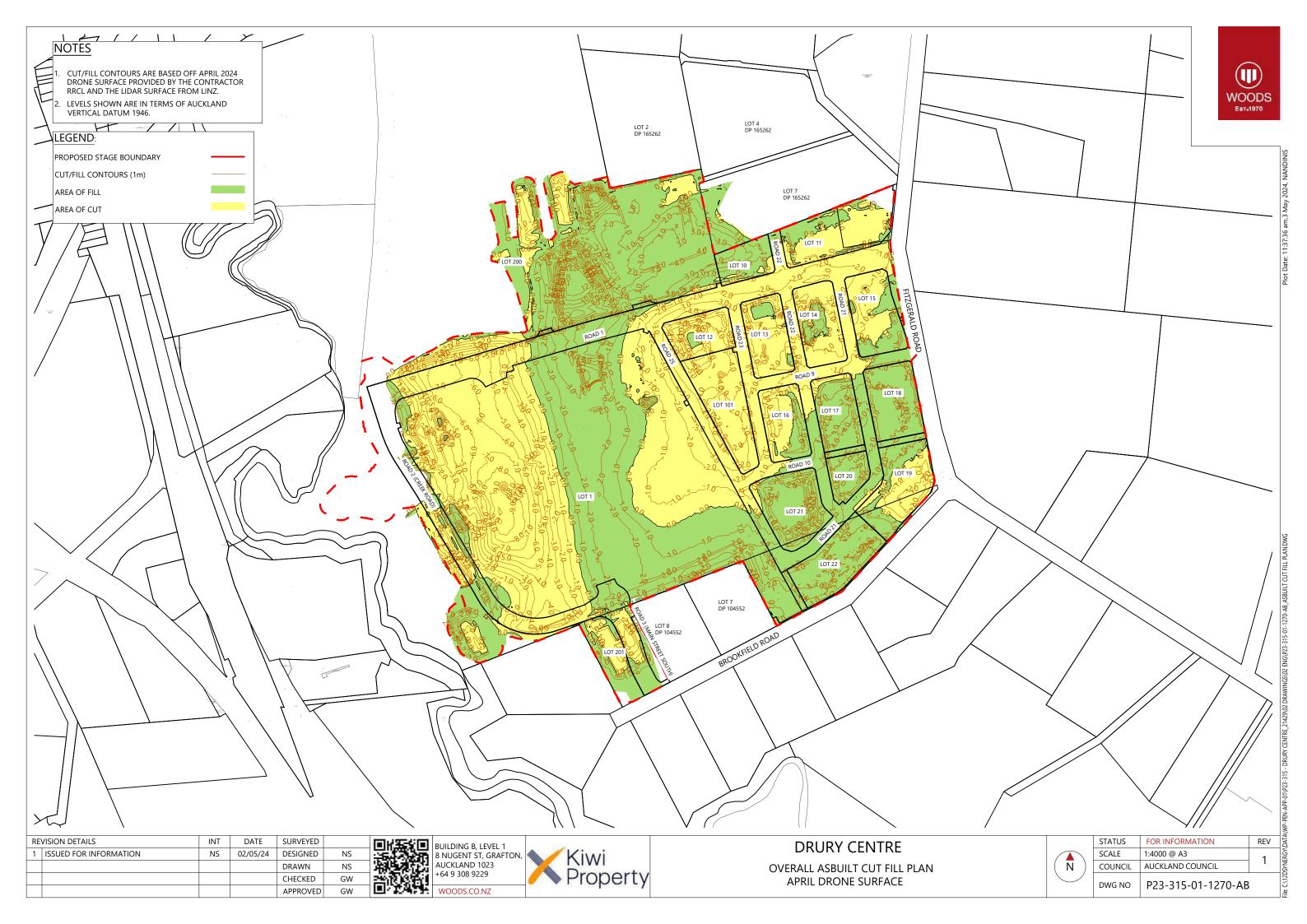


APPENDIX C: DRAWINGS

Title	Reference No.	Date	Revision
Overall AsBuilt Contour Plan – April Drone Surface	P23-315-01-1170-AB	02/05/24	1
Overall AsBuilt Cut Fill Plan – April Drone Surface	P23-315-01-1270-AB	02/05/24	1
Overral Proposed Contour Plan	P23-315-01-1100-EW	03/05/24	2
Hand Auger Locations	P23-315-01-9105-SK	03/04/24	1











APPENDIX D: AURECON EARTHWORKS QA AND CERTIFICATION

Aurecon New Zealand Limited Level 3, Te Tihi 110 Carlton Gore Road, Newmarket, Auckland 1023 PO Box 9762, Newmarket, Auckland 1149, New Zealand New Zealand T +64 9 520 6019E auckland@aurecongroup.comW aurecongroup.com



2023-09-22

David Schwartfeger Project Manager Kiwi Property Group PO Box 2071 Auckland 1140

Dear David

Re: Drury Centre Project – Earthworks QA and Certification up to May 2023 – Geotechnical Review, Our Ref 501611

1 Introduction

Aurecon New Zealand Ltd (Aurecon) was engaged by Kiwi Property Holdings No.2 Limited to provide earthworks compaction control and geotechnical earthworks certification for a residential and commercial development located at 133 Fitzgerald Road, Drury (herein referred to as the 'Project').

The works done at the Project through to May 2023 has included large scale earthworks over the southern part of the site, which have been undertaken during the later part of the 2021 to 2022 earthworks season and the 2022 to 2023 earthworks season. Earthworks are still ongoing; however, the Client has engaged other consultants and Aurecon will not be involved in the project going forward. Therefore, this letter has been prepared to provide an overview of the earthworks undertaken up to May 2023.

The earthworks design undertaken by Aurecon is presented in the approved resource consent drawings (Resource Consent BUN60390224) in Appendix A. The extent of earthworks covered by this letter, up to May 2023, is shown on the Ross Reid Contractors Ltd Cut Fill As-Built Surface Drawing in Appendix B.

The purpose of this letter is to detail the earthworks undertaken at the site and present the earth fill compaction results and confirm the suitability of the engineered fill including certification of the filling works conducted in the 2021/2022 and 2022/2023 earthworks seasons.

It is understood that this document will be superseded by a Geotechnical Completion Report (GCR) that will be prepared by others that meets the requirements of the Auckland Council Code of Practice for Land Development and Subdivision, NZS4431:1989¹, the consent conditions outlined in consent BUN60390224 and the stamped consented drawings, upon completion of the project.

2 Geotechnical Reports

In preparation of this letter, we have reviewed the following, previously issued documents, pertaining to the Earthworks aspects of the project:

 Aurecon Geotechnical Investigation Report (GIR) Drury Centre Geotechnical Investigation Report, Ref: 510611, Rev 5. Dated, 4 October 2022.

¹ At the time of resource consenting the earthworks were designed in accordance with NZS4431:1989, which has since been superseded by NZS4431:2022.



- Aurecon Report, Section 7: Drury Centre Bulk Earthworks: Earthworks Specifications, Ref. 510611, Revision 1, Dated 3 December 2021.
- Aurecon Letter Drury Bulk Earthworks Stage 1 Separable Portion 1: Completion Certificate 2023

 Geotechnical Review, dated 15 May 2023.

A copy of the Practical completion letter and Earthworks Specifications are presented in Appendix C, for ease of reference.

3 Earthworks Operations

Erosion and sediment control works, and some minor filling commenced on the 11 April 2022 with the main bulk earthworks operations undertaken between May 2022 and 15 May 2023, by Ross Reid Contractors Ltd.

The proposed earthworks are presented on the approved set of resource consent Earthworks Drawings in Appendix A. The cut and fill Layout Plan shows that cuts of up to 9m and fills of up to 8m are required to achieve the necessary design levels of the proposed future lots. This has only been achieved in part at the time of writing this letter.

The extent of Earthworks undertaken to date, and that covered by this letter are shown on the Ross Reid Contractors Ltd, Cut Fill As-Built Surface, located in Appendix B.

3.1 Quantities

The quantities of cuts and fill placed during the 2022/2023 earthworks period, as part of the Stage 1 Earthworks, covered in this letter are presented in Table 1.

Table 1: Summary of the Stage 1 cut to fill quantities.

Item*	Quantity (m ³)**
Imported Fill (Certifiable)	165.2
Cut to Certified Fill (Excluding Top Loading)	243,573.36
Cut to certified Fill (Top Loading)	20,570.51
Stockpiled Organic Material for respreading or removal.	8,887.54
Unsuitable Material Removed from Site	6,425.76

^{*}Excluding topsoil volumes

The surface level achieved by the filling works outlined above is presented on the Ross Reid Contractors Ltd Cut Fill Surface Drawing Located in Appendix B.

4 Quality Assurance and Controls

4.1 Laboratory Testing

Laboratory testing was conducted on the site won and imported fill materials prior to their use. Testing was conducted by IANZ accredited facilities, and the results evaluated by an Aurecon Engineering Geologist, who provided confirmation of their suitability for use as bulk fill.

The requirements for laboratory testing and minimum testing frequencies, as defined in the Earthworks Specification, and are presented in Table 2.

^{**}Quantities as per Ross Reid Progress Payment Schedule #12 - May 2023.



Table 2: Source suitability testing

Test Type/Requirement	Test Method	Test Frequency
Standard Compaction with Air Voids	NZS 4402:1986, Test 4.1.1	3 tests per site-won fill material for each source location.
Water Content (In-situ)	NZS 4402:1986, Test 2.1	3 tests per site-won fill material for each source location.
Shear Strength	NZGS Guideline for Hand Held Shear Vane Test 2001	3 tests per site-won fill material for each source location, undertaken on a compacted mould sample, which shall be measured and reported for every point on each compaction curve.
Particle Size Distribution	NZS 4402:1986, Test 2.8.1	3 tests per site-won fill material for each source location.
Plasticity Index	NZS 4402:1986, Test 2.2, 2.3 & 2.4	3 tests per site-won fill material for each source location.

The results of the Laboratory testing received from the Contractor is presented in Appendix D.

4.2 Site Monitoring Inspections

During the earthworks season site monitoring inspections were undertaken on a regular basis by an Aurecon Engineer, to assess general compliance with NZS4431:1989 and the Earthworks Specification and monitoring schedule. The inspections included stripping of topsoil, removal of noncertified fill and the benching of the ground prior to the placement of fill.

During earthworks we observed the cut to fill material being placed and assessed its suitability for use as engineered fill prior, including proof rolling of subgrade for soft spots prior to fill placement, observing the fill being compacted and insitu testing of the fill.

Site Inspection Reports (SIR) are presented in Appendix E.

4.3 Quality Control Criteria

The quality control criteria were set out in Earthworks Specification, a summary of which is presented in Table 3. A copy of the full Earthworks Specification is included in Appendix C.

Table 3: Summary of testing requirements

Material	Criteria	Method
Earth fill	Top 1m	Preferred
	98% of Maximum Dry Density (MDD)	Beneath Roads
	Greater than 1m Depth	Nuclear Density Meter (NDM) test at a rate of 1 test per
	95% of Maximum Dry Density (MDD)	20m in each traffic lane
	All	All other earthworks areas
	Moisture content +/- 2% of Optimum Moisture Content (OMC).	Nuclear Density Meter (NDM) test at a rate of 1 test per 500m ³ , or, a minimum of 1 test per 0.5m thickness of fill is being placed. Whichever is greater.
	<pre><or=10% 10<="" air="" average="" over="" pre="" voids=""></or=10%></pre>	3,
	tests with a maximum of 12% for any	
	individual test. Air voids to be	



Material	Criteria	Method
	calculated based on laboratory solid density test. Vane shear strength. Minimum average of 150kPa for 10 tests. Minimum of 110kPa for any one test.	Each NDM test shall comprise 2 measurements using the same probe hole but orientated at 90 degrees to each other. Shear vane test at a rate of 2 tests per 500m³, or, a minimum of 1 test per 0.5m thickness of fill is being placed. Whichever is greater. Undrained shear strength of the compacted soil at any test location shall be taken as the mean of a set of tests, comprising 3 tests undertaken within an area of 0.5m² of each other. Alternative New Zealand standard compaction test (NZS4402, Test 4.1.1).
Subgrade	CBR	Dynamic Cone Penetrometer test (NZS 4402, Test 6.5.2)
Subgrade	On-site inspection with Engineer	Proof roll on site - Two axle truck with twin tyres on rear axle, loaded to eight tonnes on the rear axle
Sub-base	Mean > 98% of Max. Dry Density (MDD) Min > 95% of MDD	Preferred Roads Nuclear Density Meter test at a rate of 1 test per 20m in each traffic lane Building platforms or other hardstand areas Nuclear Density Meter test at a rate of 1 test per 10m² Alternative MDD to be the greater of: New Zealand vibrating hammer compaction test (NZS4402, Test 4.1.3). Plateau Density Test on a test strip of approx. 50m and at an appropriate water content
Sub-base	CBR > 40%	Dynamic Cone Penetrometer test (NZS 4402, Test 6.5.2)
Base course	Mean > 98% of MDD Min > 95% of MDD	Preferred Roads Nuclear Density Meter test at a rate of 1 test per 20m in each traffic lane Building platforms or other hardstand areas Nuclear Density Meter test at a rate of 1 test per 100m² Alternative MDD to be the greater of: New Zealand vibrating hammer compaction test (NZS4402, Test 4.1.3). Plateau Density Test on a test strip of approx. 50m and at an appropriate water content



Material	Criteria	Method
Base course	95% of the deflections measured shall not exceed: • 0.8mm for Principal and Collector Streets • 1.0mm local streets • 1.3mm for short local streets and cul-de-sacs With no measurement exceeding 25% of the above for the particular category.	Benkelman Beam test

It is noted that as only bulk earthworks have been undertaken to date and the testing requirements which are relevant from the table are the first row – Earth Fill.

4.4 Quality Assurance Testing

In-situ density monitoring was carried out on the general fill areas, to check air voids, water content and undrained shear strengths (Su). Testing was conducted by an independent IANZ endorsed laboratory, engaged by the Contractor. Results of the Nuclear Densometer (NDM) and shear vane testing were submitted to Aurecon for review. Areas that did not meet the standard for engineered fill, set out in Table 2, were reworked and retested until they met the requirements.

The testing was evaluated holistically, with more importance that air voids, shear vane and NDM results pass, noting that moisture content is used by the Contractor to evaluate and optimise to reach the compaction requirements (moisture content provided as guideline).

Testing was conducted at or greater frequency than that recommended by NZS4431:1989, and the Earthworks Specification. The testing results are presented in Appendix E. It is understood that final as-builts will be provided at the completion of the earthworks in accordance with the Earthworks Specification.

4.4.1 Hand Augers

A series of top-down testing was conducted on the lots that had received Practical Completion as Drury Bulk Earthworks Stage 1 Separable Portion 1: Completion Certificate 2023— Geotechnical Review to evaluate the bearing capacity of each lot. The testing comprised the drilling of a series of hand augers at discrete locations across the lots. Due to works ceasing on the project the bearing capacity was not evaluated as part of this letter, it is understood that lot specific testing and evaluation will be conducted as part of the Geotechnical Completion Report, upon completion of the project.

The hand augers are presented as part of the QA Testing in Appendix E.

4.5 Settlement Monitoring Summary

As part of the site work, the Contractor installed and monitored settlement plates and pins. The locations of these are shown in Appendix F. Aurecon supervised and reviewed the settlement monitoring data received from the Contractor for the period covering 26 October 2022 to 28 June 2023. The processed data has been presented in Appendix F. We note the following about the settlement data to date.

- Observed settlement is generally similar to the calculated settlements.
- The settlement data over the past three months indicates a general plateauing of results.



- There is some variability in the readings due to the following reasons:
 - Survey accuracy.
 - Nature of the plastic soils (shrinkage and swelling depending on moisture levels)
 - Heaving of the material due to machinery working close by the pins and plates to achieve compaction.
 - Damage to the monitoring pins, for example the sudden drop in the reading for Plate 3 was due
 to the plate being bumped by a machine so the readings were reset following the incident.

At the time of writing, it is understood that settlement monitoring is ongoing and will be managed by a newly appointed Geotechnical Engineer to the project.

5 Summary

Based on the information provided by the Contractor, our site observations and testing we consider that the engineered fill placed across the site over the 2022/2023 Earthworks seasons meets the requirements for Engineered fill in accordance with NZS4431:1989.

6 Limitations

This Letter has been prepared in accordance with the brief provided to us, the contents of the letter are understood to be used as part of a Geotechnical Completion Report that will be prepared by a Client appointed third-party Geotechnical Engineer in the future, when the works are complete. The Certifying Engineer will still need to satisfy themselves as to the quality of the earthworks for land development and subdivision, Aurecon New Zealand Ltd accepts no liability for the use of the data, opinions and recommendations given in this letter by a third-party.

Subsurface conditions, such as groundwater levels, can change over time, as earthworks stabilise, and static groundwater conditions equilibrate. This should be borne in mind, particularly if this letter is referred to after a protracted delay. Additionally, as earthworks are still on-going, ground conditions are likely to change from the time of preparation of this letter, therefore it is recommended that the recommendations provided in the original geotechnical reports are revised in a Geotechnical Completion Report upon completion of the project.



Yours sincerely

Letter prepared by

Reviewed by:

David Bosse

Senior Engineering Geologist

James Muirson

Lead Engineering Geologist

Verified by:

Wilhelm Nel

Land Infrastructure Practise Lead.



Appendix A
Consented Drawings

BUN60390224

KIWI PROPERTY - DRURY

COVER SHEET

NG No. 510611 - 0100 - DRG - CC - 0000 - C

Approved Resource Consent Plan

13/04/2022

DRAWING LIST

EARHTWORKS		
510611-0100-DRG-CC-0000	COVER SHEET	С
510611-0100-DRG-CC-0001	EXISTING SITE LAYOUT PLAN	В
510611-0100-DRG-CC-0002	CUT AND FILL LAYOUT PLAN	С
510611-0100-DRG-CC-0003	DESIGN CONTOUR LAYOUT PLAN	С
510611-0100-DRG-CC-0011	EROSION AND SEDIMENT CONTROL DETAIL - SHEET 1	В
510611-0100-DRG-CC-0012	EROSION AND SEDIMENT CONTROL DETAIL - SHEET 2	В
510611-0100-SKT-CC-0005	EROSION AND SEDIMENT CONTROL PLAN STARTING SEQUENCE - SHEET 1	В
510611-0100-SKT-CC-0006	EROSION AND SEDIMENT CONTROL PLAN SEQUENCING SECOND PHASE - SHEET 2	В
510611-0100-SKT-CC-0007	EROSION AND SEDIMENT CONTROL PLAN SEQUENCING FINAL PHASE - SHEET 3	В
510611-0100-SKT-CC-0008	EROSION AND SEDIMENT CONTROL PLAN CLOSE-UP AREAS	Α
UTILITIES		
510611-0100-DRG-CC-0021	TRANSMISSION POWERLINE PLAN AND SECTIONS	С
510611-0100-DRG-UT-0030	EXISTING UTILITIES LAYOUT PLAN - SHEET 1	В





LOCALITY PLAN

ABN: 54 005 139 873

A person using the Aurecon drawings and other data accepts the risk of using the drawings and other data:

1. In electronic form without requesting and checking them for accuracy against the original hard copy versions;

2. For any purposes not agreed to in writing by Aurecon.

Wherever a discrepancy in the contract documents is found and unless directed otherwise by the Principal/Engineer, the contractor shall adopt, at their own cost the greater quantum, class of finish, grade, or specification where applicable.

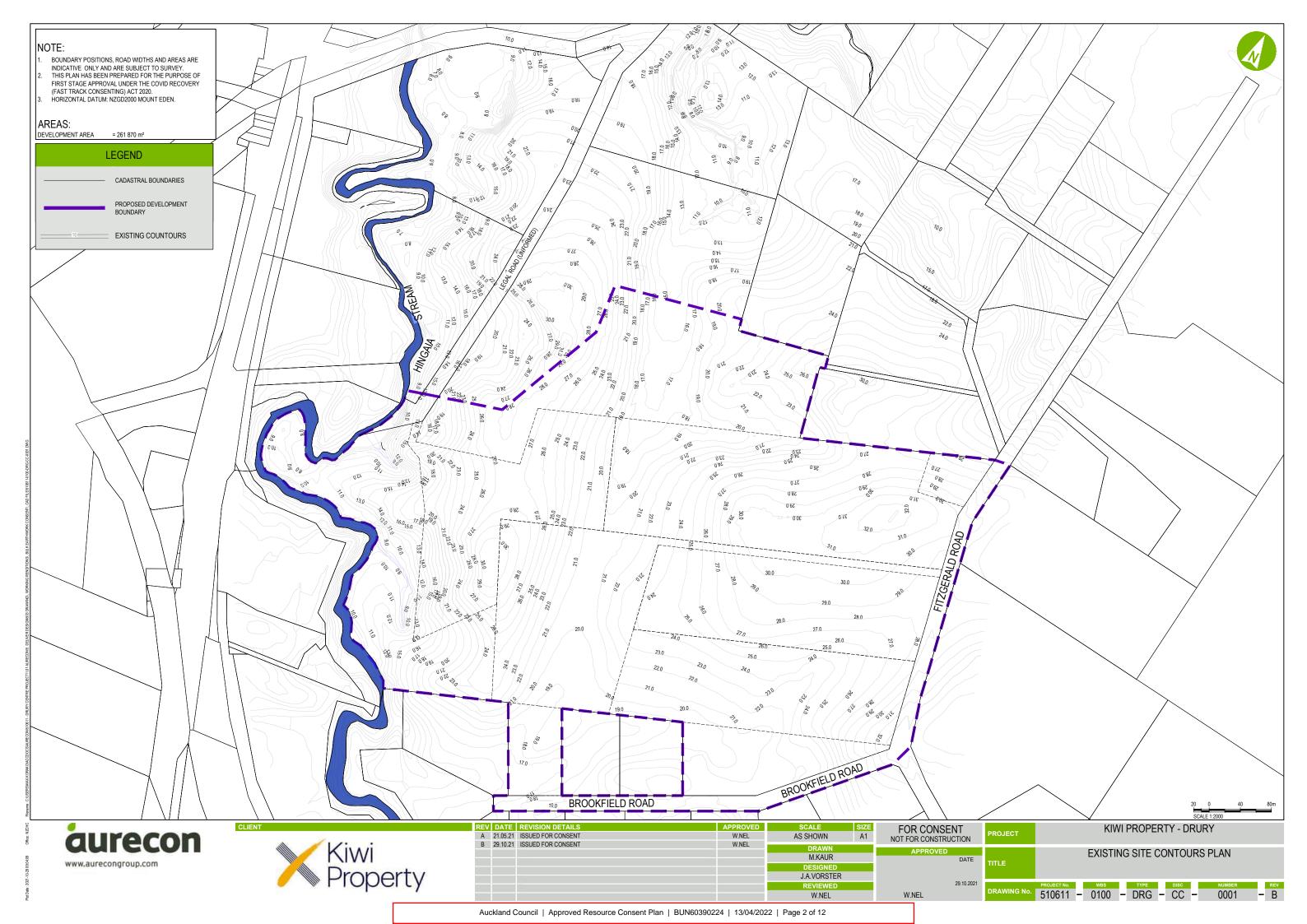
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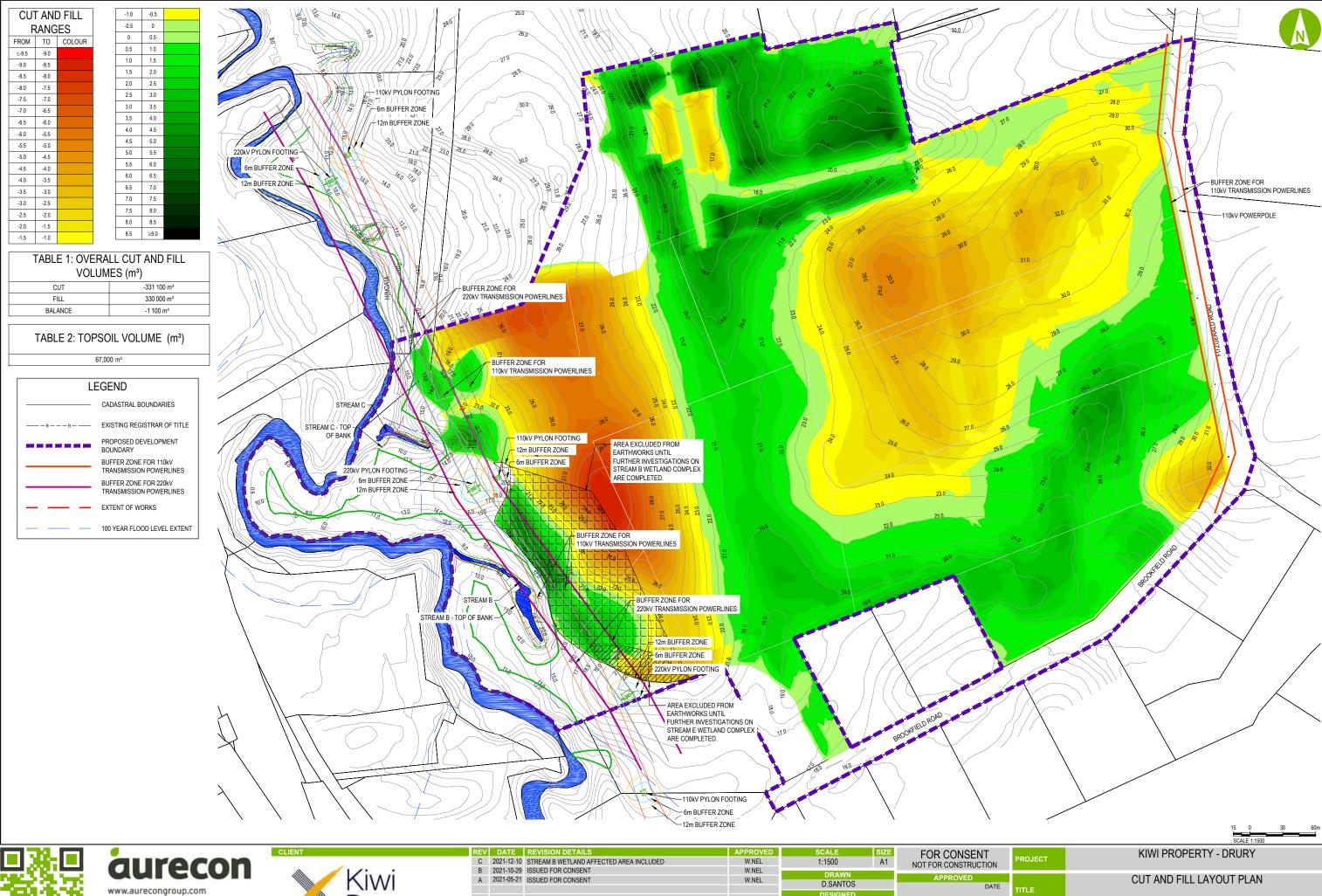






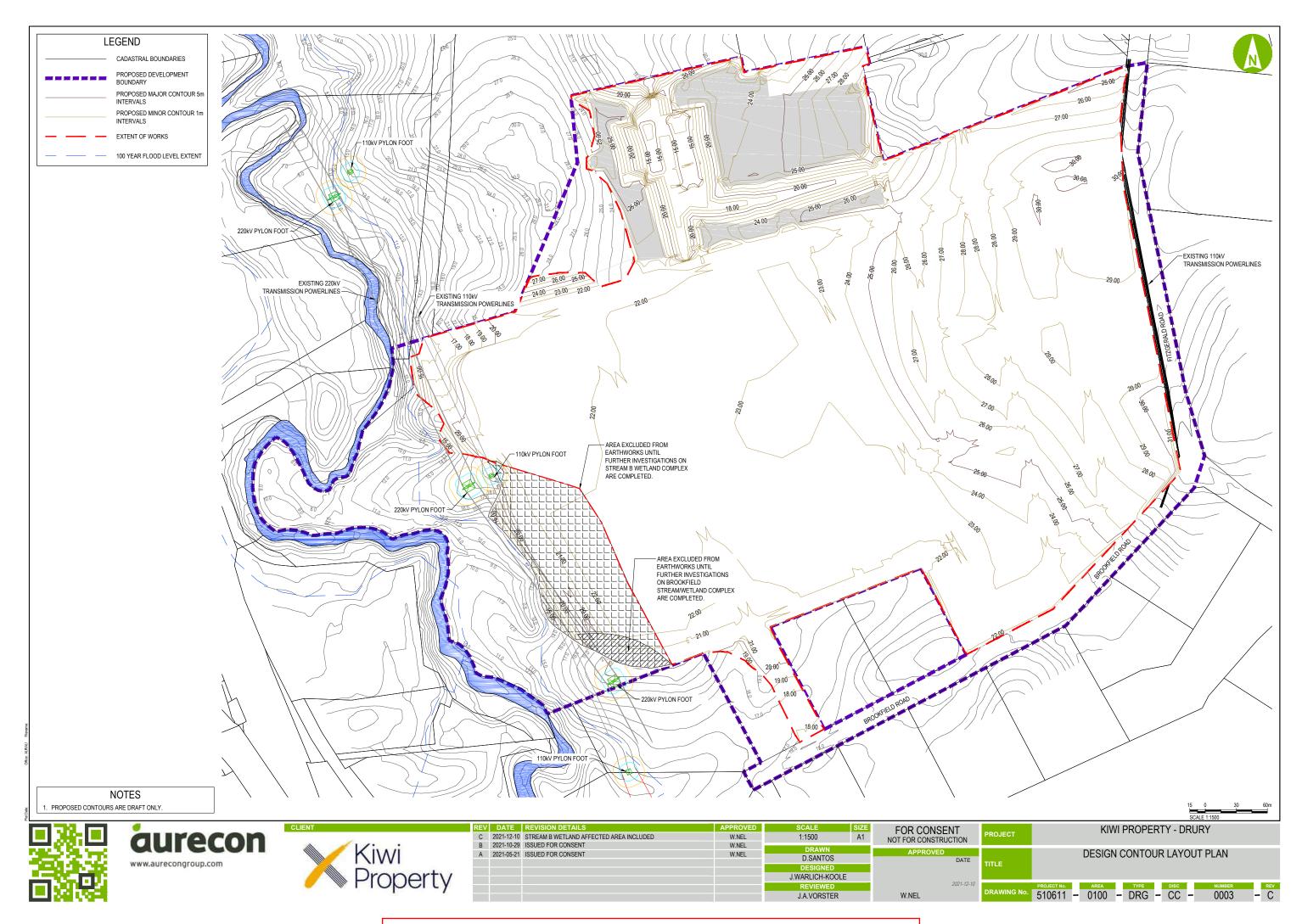
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2	2021-10-29	ISSUED FOR CONSENT	W.NEL	DDAWN			
2	2021-05-21	ISSUED FOR CONSENT	W.NEL	DRAWN		APPROVED	
				D.SANTOS		DATE	TITLE
				DESIGNED			
				J.A.VORSTER			
				REVIEWED		2021-12-10	DRAWIN
				J.A.VORSTER		W.NEL	DRAWIN

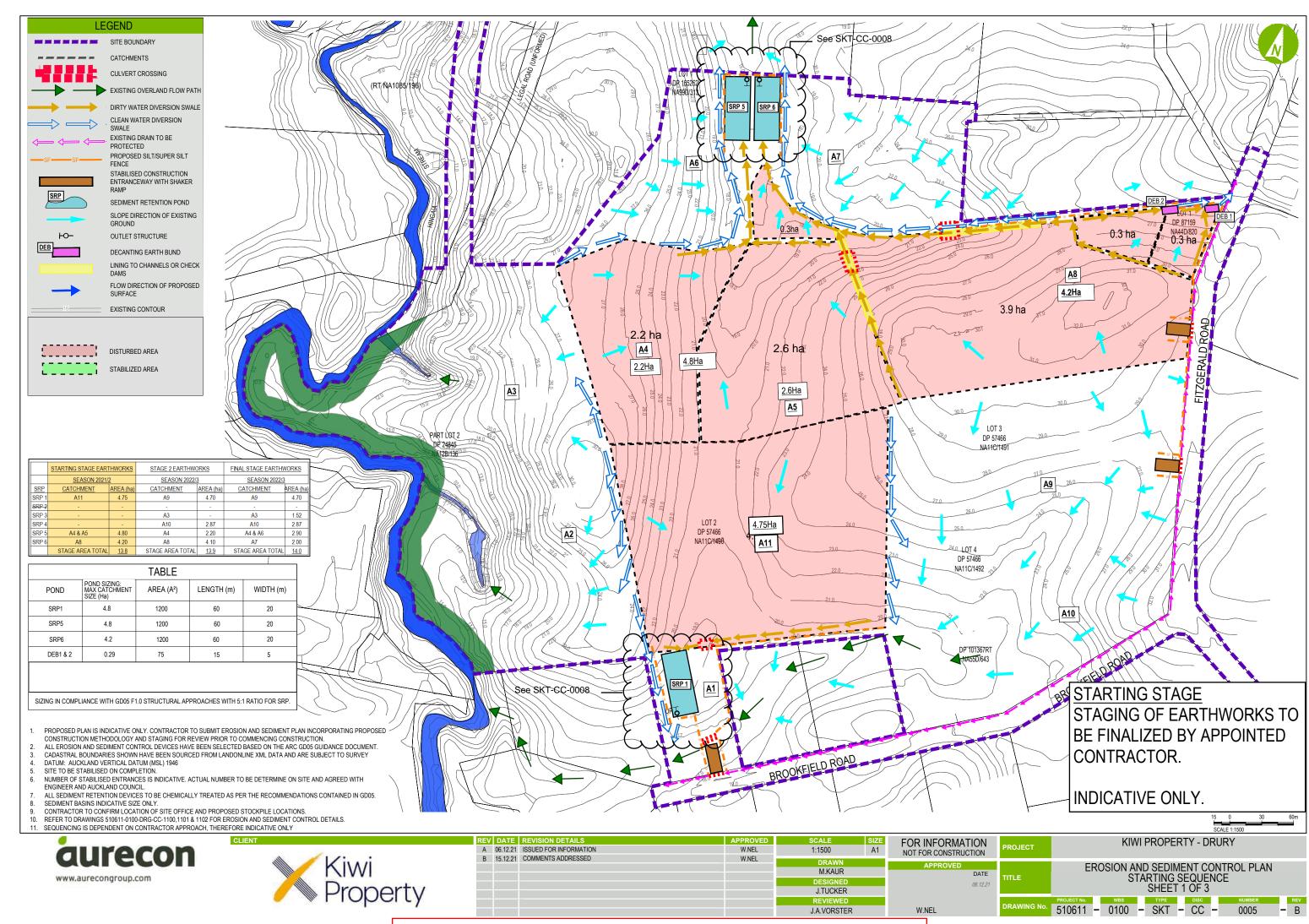




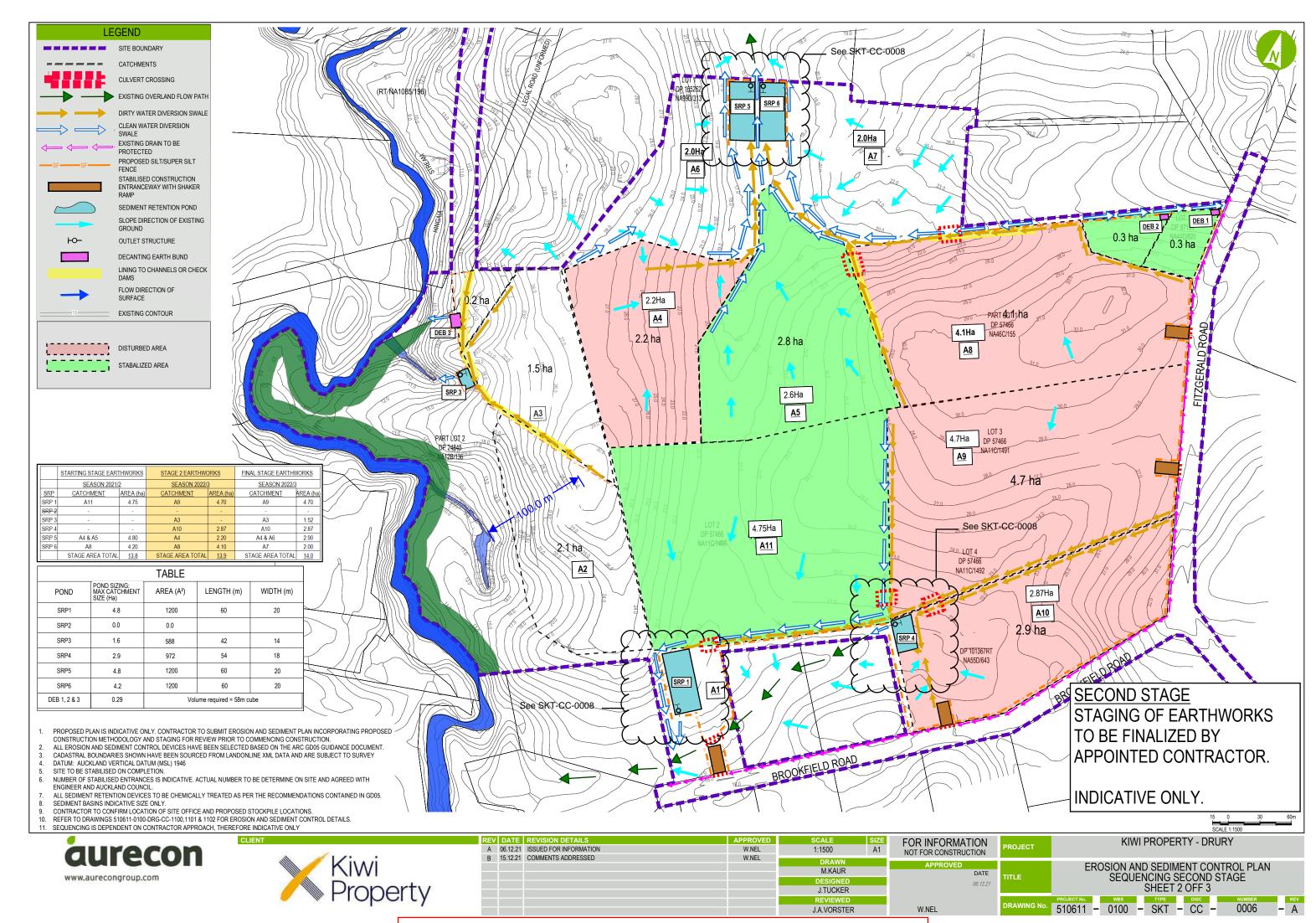


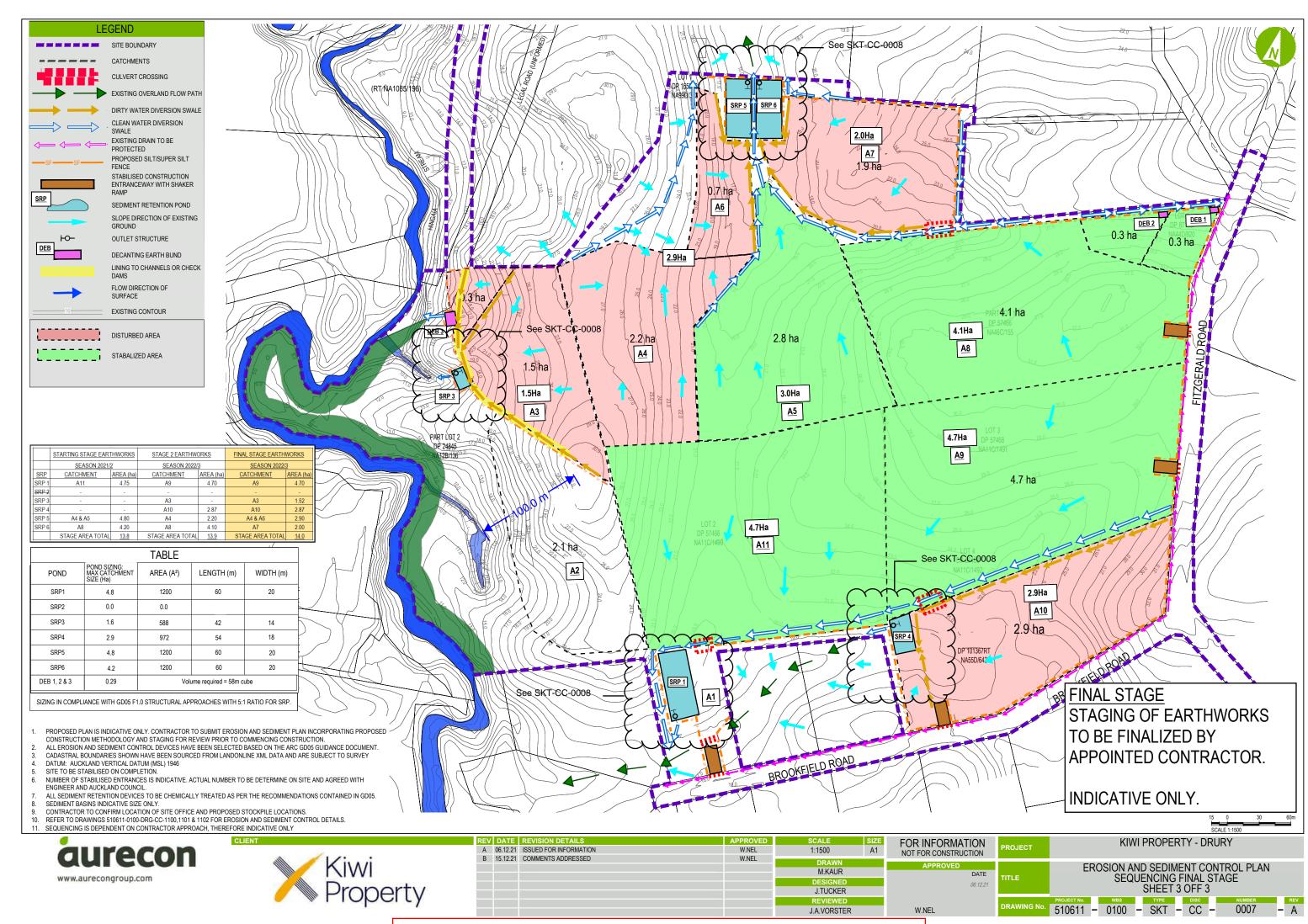




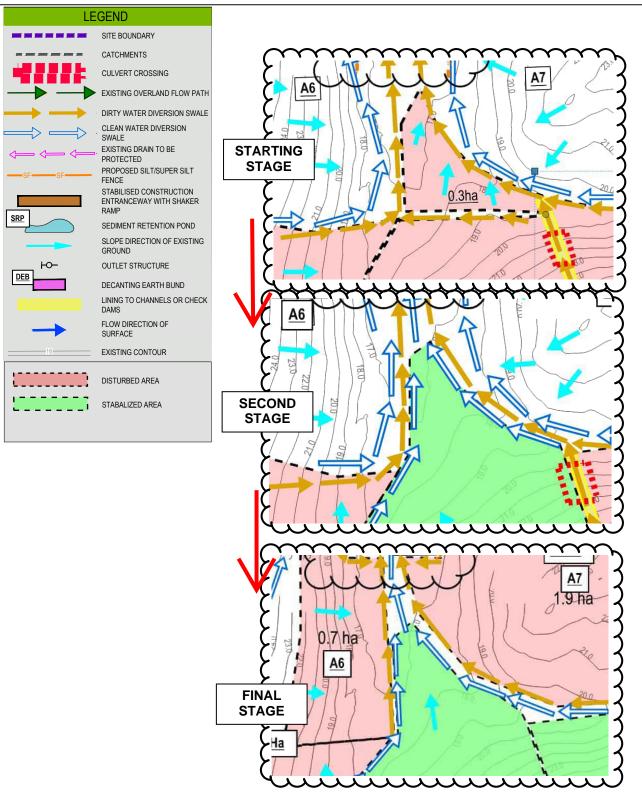


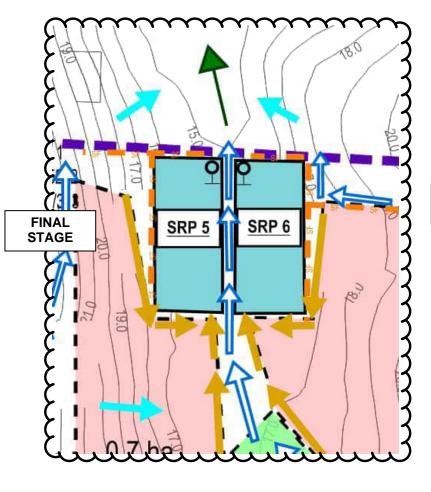
Auckland Council | Approved Resource Consent Plan | BUN60390224 | 13/04/2022 | Page 5 of 12

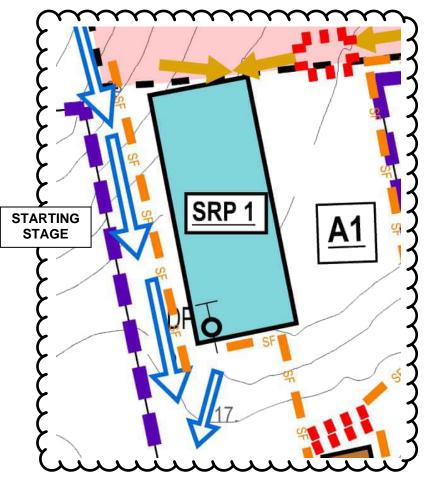


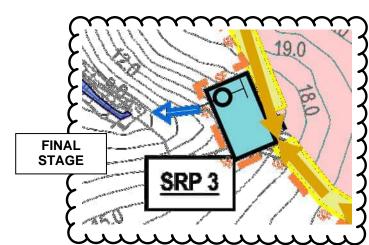


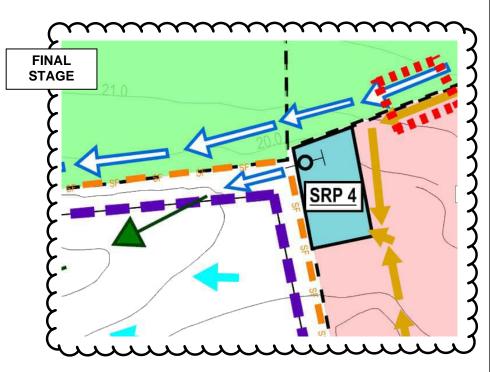
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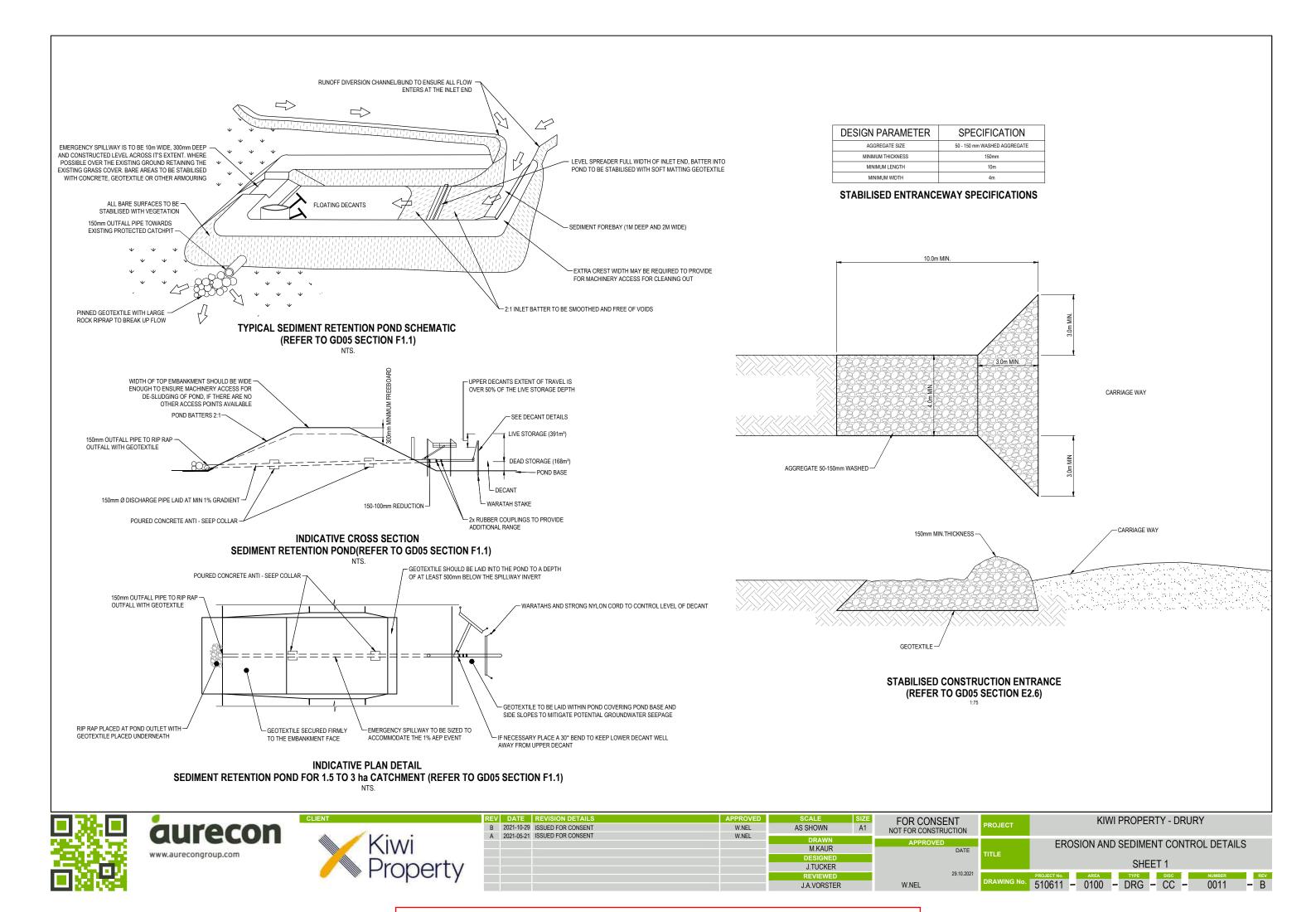


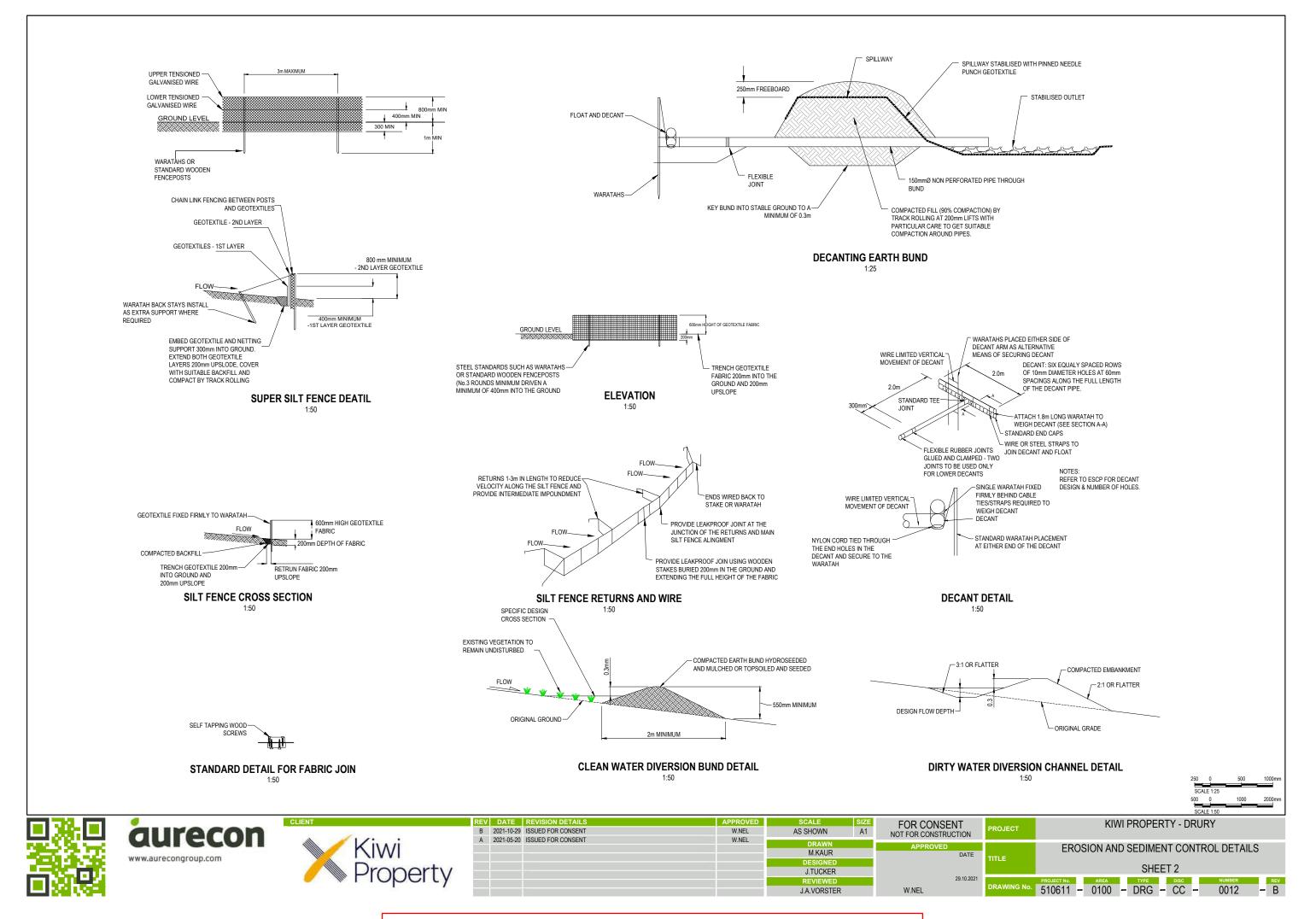
- PROPOSED PLAN IS INDICATIVE ONLY. CONTRACTOR TO SUBMIT EROSION AND SEDIMENT PLAN INCORPORATING PROPOSED CONSTRUCTION METHODOLOGY AND STAGING FOR REVIEW PRIOR TO COMMENCING CONSTRUCTION.
- ALL EROSION AND SEDIMENT CONTROL DEVICES HAVE BEEN SELECTED BASED ON THE ARC GDD5 GUIDANCE DOCUMENT. CADASTRAL BOUNDARIES SHOWN HAVE BEEN SOURCED FROM LANDONLINE XML DATA AND ARE SUBJECT TO SURVEY
- DATUM: AUCKLAND VERTICAL DATUM (MSL) 1946
- SITE TO BE STABILISED ON COMPLETION.
- NUMBER OF STABILISED ENTRANCES IS INDICATIVE. ACTUAL NUMBER TO BE DETERMINE ON SITE AND AGREED WITH ENGINEER AND AUCKLAND COUNCIL.
- ALL SEDIMENT RETENTION DEVICES TO BE CHEMICALLY TREATED AS PER THE RECOMMENDATIONS CONTAINED IN GD05.
- SEDIMENT BASINS INDICATIVE SIZE ONLY.
 CONTRACTOR TO CONFIRM LOCATION OF SITE OFFICE AND PROPOSED STOCKPILE LOCATIONS.
- REFER TO DRAWINGS 510611-0100-DRG-CC-1100,1101 & 1102 FOR EROSION AND SEDIMENT CONTROL DETAILS.
 SEQUENCING IS DEPENDENT ON CONTRACTOR APPROACH, THEREFORE INDICATIVE ONLY

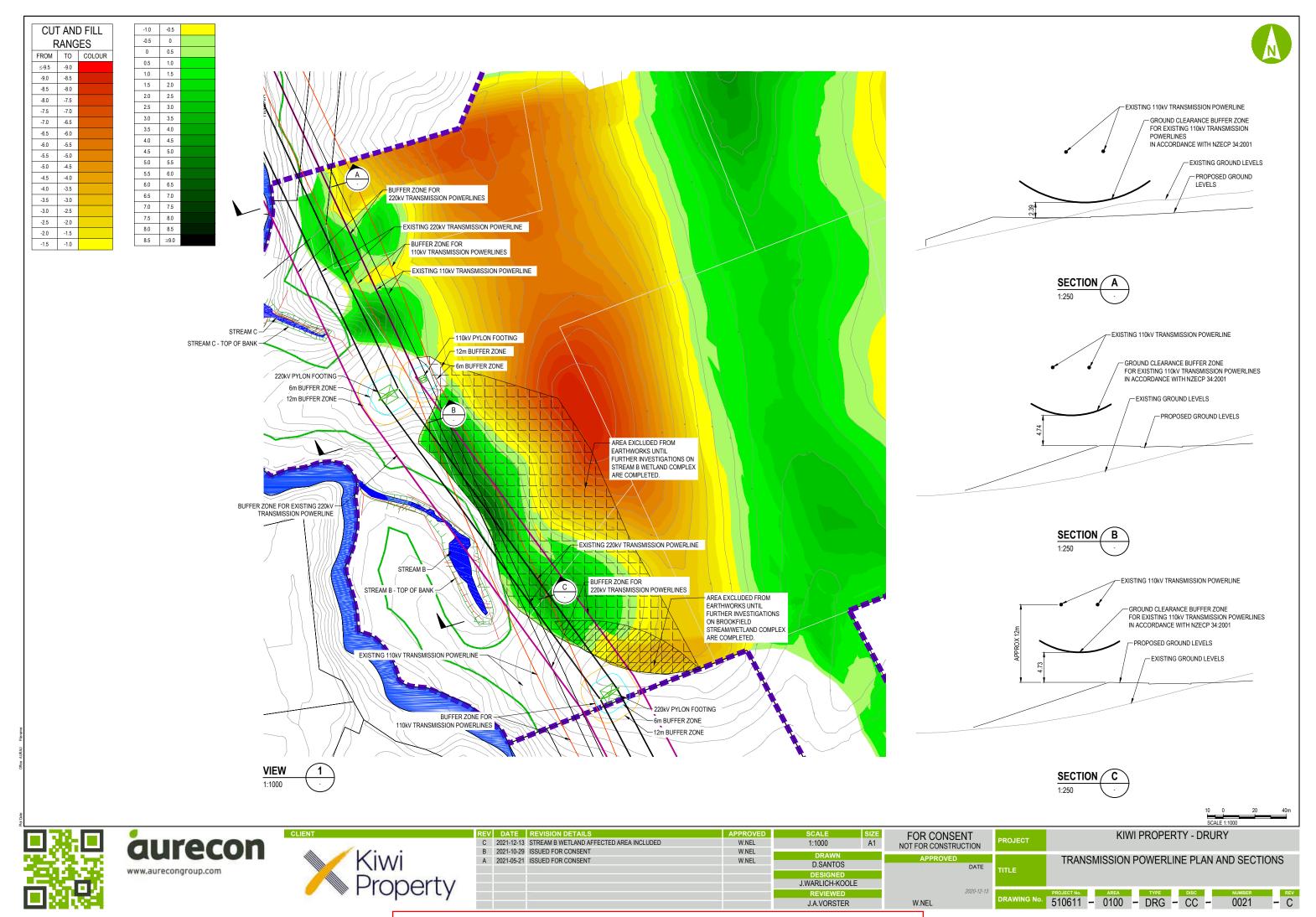


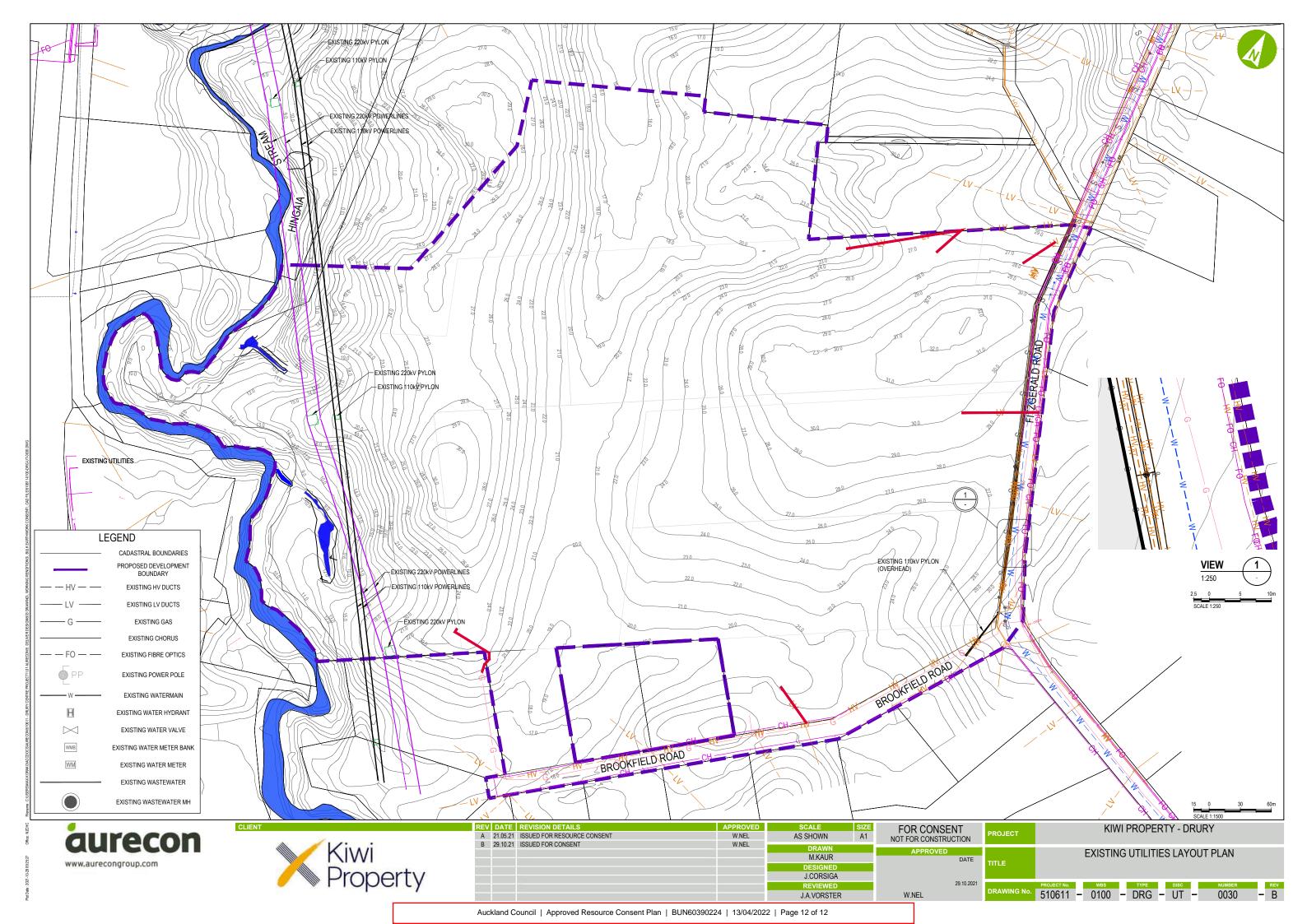


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				M.KAUR				EROSION AND SEDIMENT CONTI "CLOSE-UP" OF AREAS		MENT CO	CONTROL PLAN		
						DATE	TITLE			EΔC			
				DESIGNED		15.12.21				_/\0	10		
				J.TUCKER									
				REVIEWED				PROJECT No.	WBS	TYPE	DISC	NUMBER	REV
				J.A.VORSTER		W.NEL	DRAWING No.	510611 -	0100	- SKT	- CC -	- 0008	- A



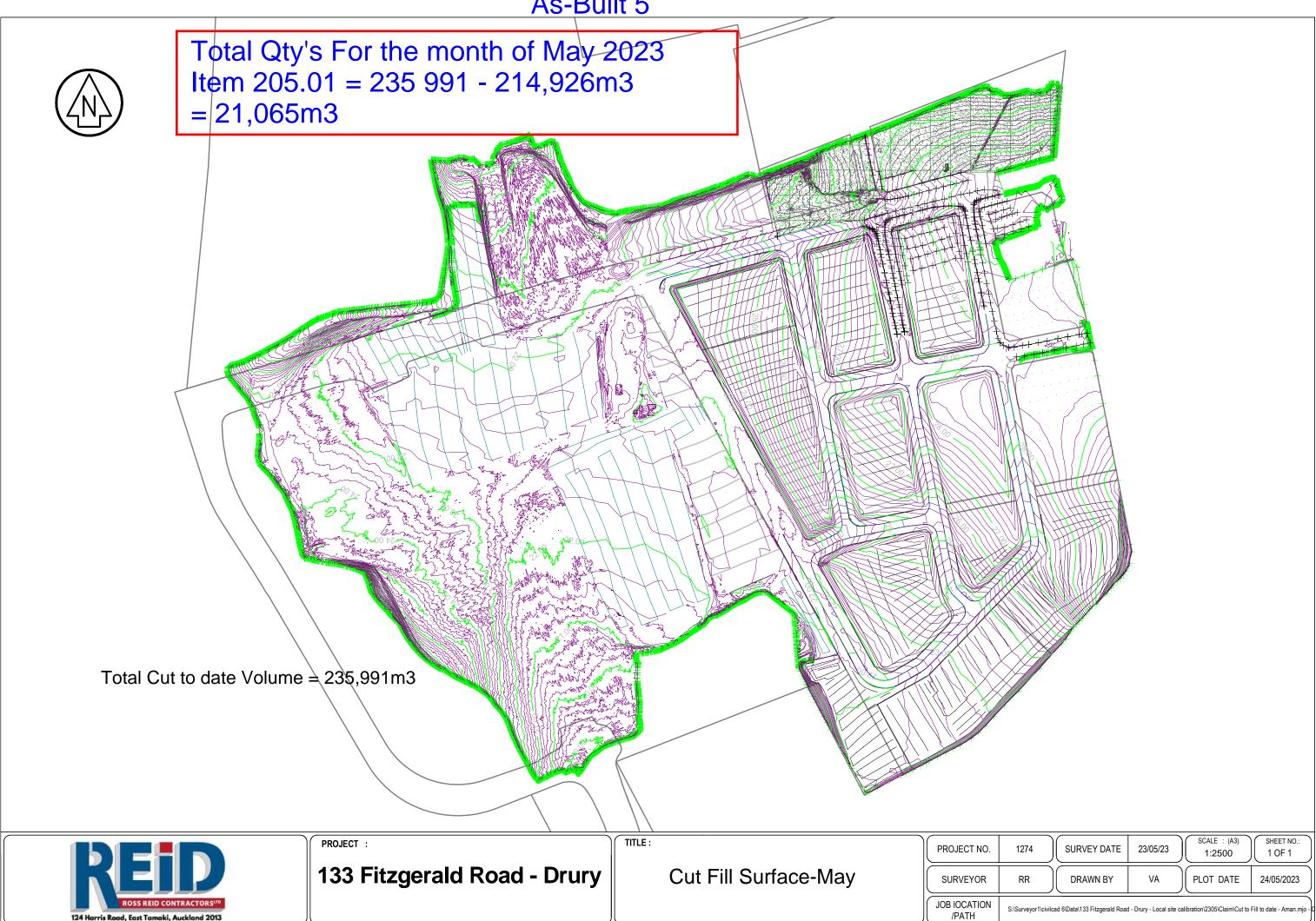








Appendix B Ross Reid Survey - May 2023





Appendix C

Earthworks Specification and Practical Completion
Certificate

Section 7 Drury Centre Bulk Earthworks: Earthworks **Specifications** Leading. Vibrant. Global.

Document control record

Document prepared by:

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- b) Using the documents or data for any purpose not agreed to in writing by Aurecon.

Document control aurecon					aurecon		
Report title		Standard Earthworks Specifications					
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1 Extent of Contract

The following provides a general description of the work required which is more specifically defined elsewhere in the Contract Documents.

The Contract includes the following work associated with the construction of earthworks for the Drury Centre Precinct development:

- **a)** Clearing and removal of growth, debris etc from all areas to be earthworks and its removal from site.
- **b)** Stripping of topsoil and unsuitable near surface soils over all areas to be earthworks, stockpiling and later respreading on fill batters or areas requiring landscaping.
- c) Excavation and placement of parts of the excavated material as compacted fill. Disposal of surplus excavation material and excavated contaminated material to an appropriate site licensed to receive the material.
- d) Importation, placement and compaction of bulk fill.
- e) Installation and monitoring of settlement plates and pins.
- f) Mulching and/or grass seeding earthworked areas not stabilised by other means
- **g)** Tidying of all areas disturbed by the works so the site is left in a tidy condition compatible with the surrounding natural environment.
- h) All compliance testing and inspection as required in the specification

The Contractor shall supply all labour, materials, plant and supervision necessary to complete the work in accordance with the Contract Documents.

2 Particular requirements

2.1 Resource Consent

The Resource Consents shall be obtained by the Engineer and shall form part of the Contract Documents. The Contractor shall familiarise itself with the Consents and meet all conditions set down for the works.

2.2 Construction Consents

The Contractor shall uplift all construction consents required from Auckland Council, Auckland Transport and Watercare

Confirmation that all construction consents are in hand shall be provided to the Engineer on request but in no case later than 20 days after acceptance of tender.

2.3 Utility Service Operators

Underground and overhead cables exist around the site. The Principle will arrange for the power and telecommunication disconnections from the public network. On-site water, sewer and stormwater are not connected to any public network and the removal of this needs to be allowed for in the tender schedule.

2.4 Summary of Testing Requirements

The testing requirements of this Specification in relation to earthworks and pavements are summarised below for convenience. Preferred testing methods are suggested, however all test methods meeting the requirements of NZS 4402 will be accepted.

Table 1: Summary of testing requirements

Material	Criteria	Method
Earth fill	Top 1m	Preferred
	98% of Maximum Dry Density (MDD)	Beneath Roads
	Greater than 1m Depth	Nuclear Density Meter (NDM) test at a rate of 1 test per 20m in each traffic lane
	95% of Maximum Dry Density (MDD) All	All other earthworks areas
	Moisture content +/- 2% of Optimum Moisture Content (OMC).	Nuclear Density Meter (NDM) test at a rate of 1 test per 500m ³ , or, a minimum of 1 test per 0.5m thickness of fill is being placed. Whichever is greater.
	<or=10% 10="" 12%="" a="" air="" any="" average="" based="" be="" calculated="" density="" for="" individual="" laboratory="" maximum="" of="" on="" over="" p="" solid="" test.="" test.<="" tests="" to="" voids="" with=""></or=10%>	Each NDM test shall comprise 2 measurements using the same probe hole but orientated at 90 degrees to each other.
	Vane shear strength. Minimum average of 150kPa for 10 tests. Minimum of 110kPa for any one test.	Shear vane test at a rate of 2 tests per 500m³, or, a minimum of 1 test per 0.5m thickness of fill is being placed. Whichever is greater.

		Undrained shear strength of the compacted soil at any		
		test location shall be taken as the mean of a set of tests, comprising 3 tests undertaken within an area of 0.5m ² of each other.		
		Alternative		
		New Zealand standard compaction test (NZS4402, Test 4.1.1).		
Subgrade	CBR	Dynamic Cone Penetrometer test (NZS 4402, Test 6.5.2)		
Subgrade	On-site inspection with Engineer	Proof roll on site - Two axle truck with twin tyres on rear axle, loaded to eight tonnes on the rear axle		
Sub-base	Mean > 98% of Max. Dry Density	Preferred		
	(MDD)	Roads		
	Min > 95% of MDD	Nuclear Density Meter test at a rate of 1 test per 20m in each traffic lane		
		Building platforms or other hardstand areas		
		Nuclear Density Meter test at a rate of 1 test per 10m ²		
		Alternative		
		MDD to be the greater of:		
		New Zealand vibrating hammer compaction test (NZS4402, Test 4.1.3).		
		Plateau Density Test on a test strip of approx. 50m and at an appropriate water content		
Sub-base	CBR > 40%	Dynamic Cone Penetrometer test (NZS 4402, Test 6.5.2)		
Base course	Mean > 98% of MDD	Preferred		
	Min > 95% of MDD	Roads		
		Nuclear Density Meter test at a rate of 1 test per 20m in each traffic lane		
		Building platforms or other hardstand areas		
		Nuclear Density Meter test at a rate of 1 test per 100m ²		
		Alternative		
		MDD to be the greater of:		
		New Zealand vibrating hammer compaction test (NZS4402, Test 4.1.3).		
		Plateau Density Test on a test strip of approx. 50m and at an appropriate water content		
Base course	95% of the deflections measured shall not exceed:	Benkelman Beam test		
	0.8mm for Principal and Collector Streets			

- 1.0mm local streets
- 1.3mm for short local streets and cul-de-sacs

With no measurement exceeding 25% of the above for the particular category.

3 Preliminary and General

3.1 Site Location

The location of the Site and means of access are described on the Drawings. Tenderers shall, before submitting tenders, inspect the site and shall satisfy themselves as to the nature and extent of the work and its feasibility.

The Contractor shall be responsible for the provision of suitable access to and through the Site, and shall make all arrangements necessary with adjacent property owners and with Local and Statutory Authorities.

The Contractor shall limit the areas occupied whether with huts, plant, storage, earthworks or by entering upon land with staff to the areas defined by the Drawings as areas upon which work is to be carried out.

3.2 Site Office, Power, Water and Conveniences

The Contractor shall erect, maintain and, at the completion of the works remove any necessary site offices and other accommodation for Contractor's staff and workmen, and shall make these facilities available for use by the Engineer's Representative during site meetings and inspections.

The Contractor shall make his own arrangements for the supply of power and water for construction purposes. Conveniences for work people shall be provided by the Contractor in accordance with any appropriate by-laws and awards.

3.3 Health and Safety (H & S)

For the duration of the contract, the Contractor shall fulfil its obligations under the Health & Safety at Work Act 2015 and associated Regulations.

3.3.1 Health and Safety Plan

Prior to commencement of work the Contractor shall supplement the H & S information provided in the tender with the provision of a full Site-specific H & S Plan. The plan shall cover the safety of both Contractor's staff and any other people or vehicles that may be on the site or pass through or adjacent to the site during the period of the Contract works. The Contractor shall implement, actively manage and adhere to the plan at all times.

Without limiting the Contractor's obligation to identify and manage all safety issues the Safety Plan should cover as a minimum, the following:

- · Specific hazards and methods of dealing with them
- A process of identification and management of new and existing hazards

- Safety equipment that will be provided and used
- A copy of the accident reporting process
- Arrangements for consideration of issues arising between Contractors and Subcontractors on site
- A schedule of health and safety meetings
- Nominated site staff who will be responsible for managing site health and safety and their relevant training.
- Management staff with overall responsibility for health and safety
- · Procedures for dealing with visitors to the place of work
- Procedures for employee participation in health and safety on site
- Audit procedures
- Procedures for dealing with public movements on or around the project site.
- Procedures for managing emergencies including site evacuation procedures and telephone numbers of relevant company officers and emergency services.

The Contractor shall update and/or modify the H & S plan and its management on an on-going basis as project experience, project staging, or requirements of the Engineer or regulatory bodies may necessitate. Any such changes shall be reported directly to both the Principal and Engineer with reasons.

3.3.2 Site Hazards

The following hazards are identified but the list is not exhaustive and the Contractor shall satisfy itself of all hazards on the site and include these within its Health and Safety Plan.

Site hazards include:

- Contaminated soil
- Trench excavations
- Construction plant
- Fences
- Motor vehicles on adjacent public road
- Public moving adjacent to or through the site
- Above ground cables
- Below ground services
- Open storm drains or streams
- Open silt ponds
- Movement of plant and equipment on site

3.3.3 Suitability of H and S plan

The Engineer reserves the right to withhold approval to commence work if in his/her opinion the H & S plan is not provided or not appropriate to the specific site works. Any approval to commence work given or implied by the Engineer shall not be taken as an approval of the contents of the H & S plan, the preparation and management of which shall be the responsibility of the Contractor.

3.3.4 Health and Safety Compliance

The Contractor shall take all practicable steps to ensure the safety of its employees while at work, and to ensure that no action or inaction of its employees while at work harms any other person.

In particular, the Contractor shall take all practicable steps to:

- Identify hazards.
- Provide and maintain a safe working environment at all times
- Provide and maintain facilities and protective equipment for the safety and health of its employees while they are at work
- Ensure that plant used by an employee at work is designed, made and maintained so that it is safe for use and stored in an appropriate secure environment when not in use
- Ensure that all work carried out for or by the Contractor and all practises and procedures comply
 with all applicable Acts of Parliament, Regulations, Codes of Practice and industry good practice
 and guidelines.
- Ensure that while at work its employees are not exposed to hazards arising out of the arrangement, disposal, manipulation, organisation, processing, storage, transport, working or use of things in their workplace or under the Contractor's control
- Ensure that all employees are adequately trained and supervised in safety procedure relevant to the work being undertaken
- Ensure that emergency response procedures are in place at all times and there is suitable first aid equipment and suitably trained first aid personnel on site at all times.

The Contractor's Health and Safety systems shall also ensure that all practicable steps are taken to ensure the safety of others including:

- Its Subcontractors and the Subcontractor's employees
- Other Contractors working at the place of work
- Members of the public or any other persons or vehicles who may be within or in the vicinity of the site.

3.3.5 Multi Contractor sites

Where there are multiple Contractors who have no sub contractual relationship to the Contractor, on a working site then the Contractor shall work with the Principal and other contractors to agree on overriding health and safety procedures for the site to ensure consistent site wide health and safety systems. Implementation of such site wide systems shall not in any way limit the Contractors health and safety obligations under the Health & Safety at Work Act 2015 and as set out in the Contract documents.

3.3.6 H & S Reporting

The Contractor shall provide regular reports to both the Principal and Engineer as follows:

- i. Immediate reporting (telephone and email with time record) of:
 - Any fatalities and lost time injuries to staff or others working on the site.
 - Any public accidents or injuries.
 - Any serious harm.

 Any plant breakdowns or accidents, or any spills that create a potential health, safety or environmental risk.

The above matters shall also be reported to OSH, Police, Council, NUO, etc as applicable.

- ii. Written reporting within 24 hours (including follow up reporting in the above cases) of the occurrence of any accident, incident or event, with information on the outcomes and consequential Contractor actions, including the desirability of modifications to H & S systems
- iii. Fortnightly (unless otherwise approved by the Engineer) written reporting of issues during the previous period and expectations for the next period. The report contents shall be agreed between the Engineer and Contractor, but as a minimum shall cover:
 - Confirmation that all H & S systems are in place and being actively managed.
 - H & S accidents /incidents during the period and outcomes.
 - Notifiable works being undertaken and confirmation that notifications have been given to the appropriate regulatory bodies.
 - Subcontractors or "other" contractors on site and any associated H & S issues.
 - Confirmation that all equipment on site meets H & S requirements and is currently certified where applicable.
 - Tool box or other safety meetings or courses provided to the site team or individuals.
 - Any other relevant H & S issues and any needs to modify the safety plan or systems with reasons.

The report shall include H & S expectations for the next period based on the expected work programme and the above contents as applicable.

3.3.7 Notifiable Works

The Contractor shall notify the appropriate Worksafe office of work that is notifiable under the relevant regulations 24 hours prior to starting the work. The Contractor shall maintain notification records and make them available upon request.

3.4 Public Safety

Without limiting the Contractors Health & Safety obligations the Contractor shall take all practicable measures to ensure the safety of the public, vehicles, and livestock in and around any work site, including as a minimum the following:

- provide fences, barriers, signs, lights and other devices as necessary to manage the safe movement of traffic, persons and livestock
- fill, cover, enclose and light all holes, ponds or excavations that could cause a safety risk
- enclose the contract works by suitably secure fencing whenever necessary to ensure public safety
- if agreed with the Engineer as being necessary for public safety, close off the site and/or adjacent areas to the public. Where any closure requires public notification, work with the Engineer to arrange such notification and meet any legal timing requirements.

3.5 Requirements of Authorities

The work is to be carried out in accordance with the Contract Documents and the requirements of Territorial Authorities having jurisdiction over the area in which the work is located and utility operators

having jurisdiction over utilities in or around the site. The Contractor shall ascertain and become familiar with any such requirements prior to commencing work.

The Contractor shall obtain and uplift such permits/consents as may be required by Local or other Authorities and allow for the payment of all such fees or levies in the tender rates.

Authorities or utility operators may require inspections of the work at various stages of construction to ensure their requirements are being satisfied. The Contractor shall establish which inspections are required, and shall arrange for the inspections to take place. Failure to arrange inspections may result in work being rejected.

Should the Authorities or utility operators request modifications to the Work specified in the Contract Documents, the Contractor shall notify the Engineer before proceeding. Where the Contractor considers such modifications may constitute an extra payment under the terms of the Contract, any claim will be considered only when the modifications have been approved by the Engineer, prior to their being undertaken.

The approval of the work by the Authorities and utility operators will be required before the issue of the Certificate of Practical Completion.

3.6 Compliance

The Contractor shall be deemed to have allowed for all work associated with the safe and orderly carrying out of the demolition work, including complying with all Territorial Authority requirements, demolition consent, Building Act, WorkSafe NZ requirements, and all other acts, laws, by-laws and regulations that may affect the execution of the contract. No variations will be allowed on the grounds of ignorance of the site or the buildings on it or adjoining, or the conditions under which the work will be executed.

3.7 Discrepancies

The Contractor is deemed to be competent and experienced enough to interpret the Contract Documentation to ensure successful system completion and operation.

Any ambiguities in the Design Drawings and Specifications and the balance of the Contract Documents should be noted. The Contractor shall provide the details of its initial review to the Engineer within one month from the Date of Acceptance of the Tender or issue of the Design Drawing set (whichever is the later). The Contractor shall not be entitled to Claim for additional Costs and/or time for ambiguities in the Design Drawings and Specification and the balance of the Contract Documents discovered after submission of the initial review.

After this initial review period has taken place any discrepancies, ambiguities or conflict noted will be the responsibility of the Contractor and no variation and or extension of time will be claimable.

3.8 Noticeboard

The Contractor shall erect and maintain in a prominent position at the entrance to the site a signboard displaying the name of the project, the name of the Principal, Engineer and Contractor, and telephone numbers indicating where the Contractor's Representative may be contacted after working hours.

3.9 Publicity and Signs

The Contractor shall not make statements to the media regarding policy, road conditions or contractual matters. All enquiries are to be directed to the Engineer or Principal.

3.10 NZTA Specifications

The following NZTA Specifications, including all current amendments shall be read with and form part of the Contract Documents. Whilst the listed NZTA Specifications are not provided within the Contract Documents they are available on line from the NZTA web site. Copies of these NZTA Specifications are available for inspection at the office of the Engineer during business hours.

NZTA B/2	Construction of Unbound Granular Pavement Layers
NZTA E/2	Performance of Bitumen Distributors
NZTA E/3	Performance of Road Marking Paint Applicators
NZTA F/1	Earthworks Construction
NZTA F/5	Corrugated Plastic Pipe Subsoil Drain Construction
NZTA F/6	Fabric Wrapped Aggregate Subsoil Drain Construction
NZTA M/1	Asphaltic Bitumens
NZTA M/4	Basecourse Aggregate
NZTA M/6	Sealing Chips
NZTA M/7	Roadmarking Paints
NZTA M/10	Dense graded, stone mastic and fine graded asphalt paving materials.
NZTA M/12	Raised Pavement Markers
NZTA M/13	Adhesion Agents
NZTA M/14	Edge Marker Posts
NZTA P/3	First Coat Sealing
NZTA P/4	Resealing
NZTA P/9	Construction of Asphaltic Concrete Paving
NZTA P/12	Pavement Marking
NZTA P/14	Installation of Raised Pavement Markers
NZTA Q/1	Quality Assurance for Chip Sealing
NZTA Q/3	Normal Quality Assurance Level Contracts

3.11 Underground Services

The locations and extent of underground and above ground services where shown on the Drawings are provided for the information of Tenderers, but no guarantee is given as to the correctness or completeness of this information. The Contractor shall notify all applicable Network Utility Operators (NUO's), search all records and have field markouts of all services undertaken by the relevant NUO, to best available accuracy standards, at least one week in advance of the work, and shall be responsible for their protection, and for the cost of repair or replacement of any services damaged by neglect of this requirement.

Any work required on an existing live utility service shall be undertaken by the relevant Network Utility Operator (NUO) or its approved contractors. The Contractor shall be responsible for coordinating and attending upon any such NUO works.

The Contractor shall ensure that any existing utility surface openings are kept clean and undamaged for the project duration.

Should interruptions to services be required, or if there is a possibility that they may be interrupted as a result of work, a thorough investigation must be made to ensure no other areas/users will be affected.

3.12 Protection of Property

The Contractor shall minimise any inconvenience to any persons affected by the work and shall prevent nuisance by dust, mud, stockpiled materials or noise. Unless otherwise specified the Contractor shall not unduly delay the legal passage of persons or vehicles through or within the site of the works. Where it is necessary to restrict access to public or private property prior notice shall be given to persons affected. Access shall not be completely restricted for longer than 24 hours without prior approval of the Engineer.

The Contractor shall protect all Contract Works from damage on the site and adjoining areas. This requirement includes supporting of structures, walls, fences and protecting all services and property which may, unless so protected, be damaged as a result of the execution of the Contract Works.

Whereby reason of activities of the Contractor damage results to any public or private property including roads, footpaths, structures, trees or gardens, such damage shall be made good by the Contractor without extra payment to the satisfaction of the property owner.

If, at any stage during the work, the Engineer determines by inspection that further work in accordance with the Contract is likely to damage any work or adjoining public or private property, the Engineer may require the Contractor to carry out adequate measures to prevent such damage occurring. Where such measures are, in the opinion of the Engineer, beyond the requirements of the original Contract, additional payment will be made for such work.

3.13 Road, Pavement and Kerb Protection

The Contractor shall provide and maintain all temporary roads, temporary pavement crossovers, hard standings washing down facilities and associated drainage, etc. as necessary to ensure that mud is not carried on to adjacent roads or paved areas by vehicles leaving the site. Vehicles removing spoil, rubbish, etc., from the site shall not be loaded beyond their normal capacity and shall be fitted with proper tail-boards and side - boards to eliminate the dropping of spoil or rubbish. Roads and paths, if fouled by spoil, concrete or other material, shall be cleaned immediately to the extent of washing if necessary or as directed by the Engineer.

The Contractor shall protect permanent roads, pavements, footpaths, kerbs and crossovers as required for access and carrying out of the Contract Works. Any rectification or upgrade costs of damage by vehicles and / or weather to bring the road to a design level as specified in this Contract shall be the responsibility of the Contractor.

The Contractor shall remove temporary roads, paths and crossovers prior to Practical Completion, or when no longer required, and make good and / or reinstate all permanent roads, pavements, footpaths, kerbs, crossovers, street channels, street and other surfaces to the satisfaction of the Engineer and the relevant Authorities, at the Contractor's cost.

3.14 Site Maintenance, Clean Up and Restoration

The Contractor shall keep the site clean and tidy at all times. Contractor to pay continuous attention to the removal of litter, waste materials, garbage and refuse including food scraps, vermin control and the like.

The Contractor is responsible for the supply and removal of skips and bins. Skips and bins shall not restrict traffic in carriageways and must be illuminated at night. The location of Contractor's skips and bins shall be accepted by the Engineer as part of the EMP, and shown on their site Control Plan.

Debris must not be stored within stairways, passages or exits. All debris, including food scraps, shall be removed from site and placed in bins. The Contractor is required to ensure that the work area is kept clean and tidy and that bins are emptied on a regular basis. Bins and debris shall be removed before holiday periods at Easter, Christmas and prior to public holidays.

For dropping refuse, the Contractor must use hoppers and shutters, chutes or refuse buckets which are covered or of such a design as to confine the material completely and prevent dust emission.

All spoil from earthworks shall be removed by the Contractor from the site.

Prior to the issue of the Practical Completion Certificate, the Contractor shall remove from the site and all areas used by it for the purpose of the Contract, all temporary Works, plant, buildings, rubbish, unused Materials, construction facilities and other Material and equipment belonging to it and its Subcontractors or used under its direction, and leave the Site and such other areas clean and tidy to the satisfaction of the Engineer.

The Contractor must properly dispose of all solid, liquid and gaseous contaminants in accordance with all statutory requirements and remove from site.

3.15 Work Standards in Private Property

The process through which the Contractor is to undertake work in private properties is outlines below:

- The Contractor shall notify private property owners at least one week prior to starting construction on their property
- No trench shall be open for longer than 2 weeks on an individual property
- The Contractor is to inform all residents in the event of a variation to the original programme of works, in writing within 24 hours of the variation
- All requests for information by the Resident shall be attended to by the Contractor within 24 hours
- The Contractor is to complete all works in private property by the deadlines supplied on the submitted programme of works
- There shall be no instances where unreasonable actions on the part of the Contractor may prejudicially affect the goodwill and reputation of the Council
- Reinstatement's shall be completed in accordance with the agreements included in the tender documents
- All reinstatement's shall be completed within 1 week of the trench being backfilled

3.16 Quality Management

3.16.1 Introduction

This Contract shall be completed in accordance with the requirements of NZTA Specification Q/3 for Normal Quality Assurance Level Contracts - TQS2.

The Contractor is responsible for quality control measures which incorporate all techniques including checking and testing required to ensure construction meets all the requirements of the Drawings and Specifications.

If the Engineer tests any part of the works and finds that it is not in compliance with the specified requirements, the Contractor shall be liable for the cost of testing, including any costs incurred by the Engineer or Principal.

All necessary producer statements and Contract Quality documentation including Inspection Checklists shall be provided by the Contractor before the Certificate of Practical Completion is issued.

3.16.2 Recommended Check/Inspection/Tests, etc

Check/inspection/tests and their regularity shall be identified by the Contractor in the Quality Plan but as a minimum the following shall be included:

- Programming and performance against programmes
- · Health and Safety status and issues
- Traffic and pedestrian control
- Survey and set out
- Landowner liaison
- · Daily site weather and activity summary
- Procedures for field checking of utility service location
- Recording of pipe sizes, strengths testing regimes as applicable
- Compaction testing regimes for bulk earthworks and pavements and name of independent testing organisation.
- Material specifications, sources and how ongoing quality is to be controlled, including type and regularity of field laboratory testing and recording – Refer also the section on "Compliance Testing by Contractor" within this Specification
- Construction tolerances, check levels for pavement layers, drains, etc.
- Seal materials and binder application rates, including design basis and weather conditions during sealing

Sampling and testing materials and measurements checks on completed layers shall be carried out by a registered laboratory engaged by the Contractor at its cost.

Where NZS test or other recognised test method is not applicable the Contractor shall detail the equipment to be employed and prescribe the method to be used to show compliance with the contract documents.

The Engineer shall not be bound to accept any work where QA results indicate non-conforming materials, work outside of tolerance or unacceptable work methods. The Engineer shall also not be bound to accept any QA results if independent verification checks, tests or measurements show a variation those submitted by the Contractor.

No payment will be certified for scheduled items claimed by the Contractor until the Contractor has submitted completed compliance documentation to the Engineer for such completed work.

3.17 Compliance Testing by Contractor

The Contractor shall be responsible for compliance testing on materials and work standards used in the Contract.

a) Bulk fill

The Contractor shall engage a suitably qualified independent testing laboratory or Consulting Engineer to test and monitor the fill preparation and placement and provide a certificate confirming that the compaction works have met the Specification standards at the end of the project. The certificate shall include suitable drawings to show the position (location and level) and results of all testing undertaken.

3.18 Engineer's Verification and Inspections

From time to time the Engineer may without advance notification, arrange for his/her own testing or inspection of any part of the works or plant or materials being used in the works. When requested, the Contractor shall facilitate access for the Engineer or the Engineer's advisers and attend on them as required, all at no extra cost to the Contract.

Should the Engineer find evidence of non-conforming materials or workmanship or results at variance with any certified Quality Control Checklist, the Quality Representative/Manager, on request from the Engineer, shall supply within one working day a Non-Conformance Report (NCR) including a written explanation for the variance detailing what remedial action has been taken.

Where the Contract Documents provide for inspections by the Engineer, or the Engineer has given notice of a wish to inspect items of work, the Contractor shall give the Engineer at least 24 hours' notice of the need for the inspection.

The Engineer accepts no responsibility for being unable to attend the site if inadequate notice is given. In such cases no work on the particular aspect of the project will be allowed until the inspection has been made and no time extensions will be allowed for the delay.

Where the Engineer carries out inspections or testing and finds the work inspected or tested has not been completed in accordance with the Specification, thereby requiring further involvement of the Engineer or specialist testers or advisers then the Engineer reserves the right to charge all such extra work to the cost of the Contractor.

Where the Engineer identifies non-compliance even where the contractors Quality Assurance shows complying work, the Engineer may stop the work until it is confirmed that work standards or materials comply. In such cases all costs associated with the stop work and all remedial measures required to achieve compliance shall be borne by the Contractor.

3.19 Engineer's charges

Where the Engineer incurs costs associated with addressing issues relating to non-conforming work or additional inspections as provided for within this Specification and Contract Conditions, costs will be deducted from money due or becoming due to the Contractor.

Costs will be based on time and expense based on the following rates:

Engineer to the Contract \$270/hour

Engineer's Representative \$150/hour

Other Professional Personnel \$130/hour
 Vehicle \$1.00/km
 Expenses \$ as incurred

(All costs exclusive of GST). Expenses will include costs such as specialist laboratory or field testing services and use of specialist advisers where deemed necessary by the Engineer.

3.20 Setting out

The Contractor shall locate and verify survey marks and datum points required to set out the works. The Contractor shall record and maintain their position.

The Contractor shall set out all the work in accordance with the pegs and levels shown on the Drawings or Instructions supplied by the Engineer, and to do so shall employ suitable qualified personnel equipped with all necessary instruments.

If any survey marks or pegs are in the way of the Contractor's operations, the Engineer shall be informed who will advise on action to be taken.

The Contractor is to take all practical steps to protect survey pegs, survey marks and datum points during construction. Should the reinstatement of any pegs be required as a result of poor construction practice, the reinstatement will be at the Contractors cost.

3.21 Noise

The Contractor shall minimise noise generated during this project and arrange the works so as to minimise the effects of any noise on the public. Construction noise shall comply with noise limits as stated in any Resource Consent conditions, the requirements of NZS 6803, the requirements of the Resource Management Act sections 326, 327 and 328 and the Health and Safety in Employment Regulations Clause 11.

The Contractor shall minimise the effects of noise generation by including in the planning of the work such factors as placing of plant, programming the sequence of operations and other management functions.

The Contractor shall comply with the requirements set out below including the requirement that noise should not exceed the workplace exposure limited set by WorkSafe NZ.

The Contractor shall comply with:

- All regulations under health and safety legislation with regard to acceptable noise exposure for employees. Noise assessment and management shall be in accordance with the guidelines in NZS 1269:2014 Occupational Noise Management Parts 0-4 in particular hearing protector selection as outlined in Part 3.
- NZS 6803:1999. This standard covers noise emitted by construction and maintenance works and outlines acceptable upper noise limits at neighbouring areas. Table 2 shall apply to the Contract Works, that is the site shall be treated as a residential area. The limits apply outside neighbouring buildings; one metre from the façades and 1.2 to 1.5 metres above the relevant floor level.
- Conditions of the relevant Consents.

The method of measurement and assessment of noise form construction, maintenance and demolition work shall be accordance with NZS 6801:2008 Acoustics - Measurement of Sound, except for as expressly provided in NZS6803:1999. The various sound measurement and assessment terms and

parameters discussed above are described fully in NZS 6801:2008 Acoustics - Measurement of Sound.

The Contractor is to notify the neighbours and parties affected of the proposed programme of works via a letter drop.

The Contractors shall ensure that all items of noise producing plant on site are equipped with silencers and noise insulation to reduce noise at source to the lowest levels achievable in terms of the best of current low noise equipment design. The Engineer has the right to order the removal and replacement of plant at no cost to the Principal, if the Contractor has not complied with this clause and better low-noise plant is available.

3.22 Vibration

Vibration is always to be minimized on the site and within the vicinity of the site.

Construction vibration monitoring shall be undertaken to demonstrate that all vibrations to third party buildings or structures generated from construction activities are less than the maximum limits recommended in the German Standard DIN 4150-3:1999 "Structural Vibration – Effects of Vibration on Structures". In the first instance the Contractor shall undertake vibration monitoring at the property boundary. Additional monitoring inside the neighbouring property shall be undertaken where the vibration limits at the boundary exceed the above standard, or where complaints are received. Where access is granted such additional monitoring shall be undertaken either outside the building but connected to the building foundation, or inside the building. The peak particle velocity (ppv) limits which are to be applied are summarised in Table 1 and Figure 1 or as otherwise required by the Resource Consent.

The Contractor shall undertake vibration monitoring at the beginning of each phase of the Works, or when construction plant or methodology changes that is likely to result in an increase in the vibrations emitted, to demonstrate compliance with the above vibration limits. All vibration monitoring shall be undertaken by appropriately qualified and experienced personnel approved by the Engineer.

All vibration monitoring shall be undertaken at a time approved by the Engineer, when construction operations are most likely to result in maximum vibrations at the site boundaries. Vibration measurement instruments shall be placed by the Contractor at varying distances from the site to ensure that vibration is within the limits set out in the DIN standard 4150-3:1999, and to ensure that effects from vibration on occupants of adjacent structures are no more than minor.

The Contractor shall note that building occupants may notice or be disturbed by vibrations at levels lower than those cited in DIN 4150-3:1999 (i.e. vibration is perceptible at levels above 0.3 mm/s), which might give rise to complaints. This vibration is often due to occupants concern over building damage, and can generally be mitigated through effective consultation regarding the project objectives and timeframes, vibration monitoring and demonstration to the occupant that vibration levels are within acceptable levels. The Contractor shall take responsibility for liaison and discussions with neighbouring occupants to relay this information to them, and to keep them informed of construction activities and programme. On request of the Engineer, the Contractor shall provide vibration records to the occupants. The Contractor shall also take all practicable steps to minimise disruption to the occupants as much as possible.

Where required by the Resource Consent, the Contractor shall prepare a Construction Vibration Plan in accordance with this section. This is to form part of the Construction Management Plan.

Table 2: Summary of Vibration Velocity Limits During Construction

	Maximum Permitted Vibration Velocity (mm/s)				
Type of Structure	Foundation Frequency (Intermittent)			Foundation	
	Less than 10 Hz	10 to 50 Hz	50 to 100 Hz ^(a)	Frequency (Continuous)	
Residential Structures Residential dwellings and buildings of similar design and/or use	5	5 to 15	15 to 5	5	
Sensitive Structures Structures that, because of their sensitivity to vibration, do not correspond to those listed above and of great intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	3	

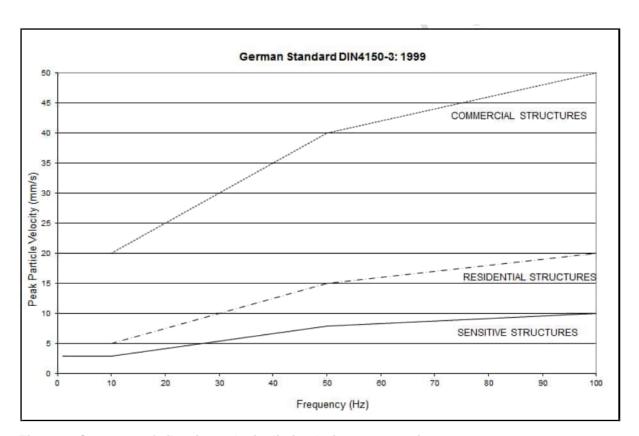


Figure 1: Summary of vibration velocity limits during construction

3.23 Dust and Sediment

The Contractor shall be responsible to ensure that adjacent residents, business proprietors or other members of the public suffer no inconvenience or hardship from dust or sediment arising by any means whatsoever from the works during the course of the Contract. The Contractor shall allow for the prevention of such a dust nuisance or sediment runoff in its scheduled rates.

Remove dirt and droppings deposited on public or private thoroughfares from vehicles servicing the site to the satisfaction of the appropriate authorities and the Engineer.

3.24 Construction Programmes

The Contractor shall, at the time of preparing their tenders, prepare an outline construction programme and satisfy themselves of the feasibility of constructing the Work with the plant, labour and materials available within the specified time.

Unless otherwise described in the Conditions of Contract, within fourteen days following the date of the Letter of Acceptance of Tender the Contractor shall submit for the Engineer's review a detailed Construction Programme showing the proposed sequence for carrying out the work and the construction methods, plant and labour to be employed, all in accordance with the Contract Documents and with the critical path indicated. The Engineer will have the right to reject or modify any such programme which is not in the interests of the Principal, and the first progress payment will not become due until a satisfactory modified programme has been received.

3.25 Hours of Work

No construction work under the Contract, other than emergency or maintenance work, shall be undertaken between the hours of 9:00 p.m. and 7:00 a.m., nor at any time on a Sunday or Easter Friday, Easter Sunday, Anzac Day and Christmas Day without the prior permission of the Engineer and of any Public Authority whose consent may be required.

3.26 Site Reports and Meetings

Unless otherwise directed, at all times when no work is being undertaken at the site, the Contractor shall arrange for the telephoning or emailing of a message to this effect to the Engineer. These reports shall be made before 9:00 a.m., in order to assist the Engineer in avoiding wasted site visits. Where the Contractor fails to provide these reports resulting in the Engineer undertaking unnecessary site visits such costs will be deducted from Contract sums owing.

The Contractor shall arrange for the attendance of its Representative and key Sub-contractors at regular site meetings with the Engineer for the purpose of reviewing the progress and quality of the work. Unless otherwise directed, site meetings shall be held each week at a venue and time approved by the Engineer.

3.27 Traffic Control

3.27.1 **General**

To ensure the safety of Contractors staff and road users, a high standard of traffic control complying as a minimum with the NZTA "Code of Practice for Temporary Traffic Management" (COPTTM: Fourth Edition, August 2015) will be required. In areas where work is likely to have the potential to disrupt traffic the Contractor shall submit in writing a Traffic Management Plan (TMP) detailing the methodology for traffic control including a plan of the proposed sign placements and the name of the Traffic Control Supervisor who will be responsible for Traffic Control on a day to day basis.

No work shall commence on the site prior to the Engineer's written agreement that the Contractor's Traffic Management Plan has been accepted. The Contractor is to advise all staff and subcontractors working on the site of their responsibilities to the Traffic Control Supervisor.

The TMP shall be considered a living document through the project. Where problems on the site, or ongoing experience with a TMP indicates changes or improvements should be made the TMP shall be modified and resubmitted to the Engineer with reasons for the proposed changes. Costs associated with any changes shall be borne by the Contractor.

3.27.2 Traffic Control Inspections

Traffic control inspections shall be undertaken at least once daily by the Contractor seven days per week and more frequently should faults occur. Any identified non-compliance to the Traffic Management Plan shall be rectified immediately. The Contractor is to pay particular attention to the condition of all temporary and permanent traffic signs, edge marker posts and raised pavement markers within the Site. These should be checked as part of the daily traffic control inspection and any identified as missing or damaged shall be replaced within two hours (applies 24 hours a day, 7 days per week). All signs and delineation devices shall be regularly cleaned to be free of grime and dust.

3.27.3 Edge Delineation

Edge delineation shall be maintained by the use of either temporary or permanent reflectorised marker posts. Where the use of marker posts is not practicable, other means of delineation in accordance with COPTTM shall be provided. Permanent marker posts shall be reinstated before the removal of the temporary guidance. Edge marker posts shall comply with NZTA M/14 Specification.

3.27.4 Non-Conforming Traffic Control

If during the course of the Contract the Engineer is required to investigate complaints of inadequate traffic control by the Contractor, then, if it is found to be non-conforming, the Engineer shall be reimbursed by the Contractor for the costs and disbursements for such investigation. Reimbursements shall be set out in the section of this Specification entitled "Engineers' Charges".

3.28 Permanent Signs and Marker Posts

The Contractor shall locate accurately and record on a plan the positions and number of existing traffic facilities, road edge marker posts, route position markers, etc.

The Contractor shall be responsible for the maintenance of all existing marker posts, route position pegs, advisory, warning and information signs and shall replace to the Engineer's satisfaction any that are lost, stolen or damaged.

3.29 Notification of Works

At least 1 week prior to commencement of work the Contractor shall notify land owners affected by the works of the likely start of the physical works.

The Contractor shall either send a copy of letters sent out to the Engineer, or shall write to the Engineer certifying that such notification has been made.

3.30 Land entry

Right of entry onto private property will be obtained by the Principal.

3.31 Facilities to be Provided and Maintained by the Contractor

3.31.1 Site Accommodation and Facilities ('Site Sheds')

The Contractor shall provide and erect a neat group of site sheds constructed from uniform materials in an area indicated on the Site Plan.

The site accommodation and facilities provided by the Contractor shall include a secure site office and an area that could function as a first aid / sick-bay. The Contractor must provide, in addition to the site office and other amenities, the following facilities for use by the Engineer, Consultants and Principal when visiting site:

- Access to Contractor's drawings;
- Safety hats, vests and boots for up to six (6) people; and
- Meeting space of sufficient size to accommodate the typical attendee numbers for a regular Site Meeting.

No temporary or permanent desk space for the Engineer, Consultants or Principal is required. All temporary buildings and structures should be maintained in good order during currency of the Contract and shall be removed at Practical Completion of the Contract Works, unless otherwise agreed by the Engineer.

3.31.2 Site Office

The Contractor shall establish an office on the site to deal with the matters relating to this Contract. The offices shall be under the personal control of the Contractor's Representative who shall have full authority to deal with and carry out the following:

- a) All communications with the Engineer;
- b) Ordering of material and goods; and
- c) Financial matters except those of a major nature as may be agreed by the Engineer.

3.31.3 Site Hoarding

The Contractor shall install and maintain all necessary hoardings and fences, screens, gates, footways, gangways, gantries, platforms, temporary walls and enclosures, etc., to protect the Contract Works, persons and property.

The location of the hoarding shall be agreed with the Engineer and Principal.

Gates shall be provided as required for construction access, egress and emergency use from the site. A key to the lockable gate(s) shall be provided to the Principal via the Engineer at the commencement of the Contract Works to enable emergency access.

3.31.4 Project and Temporary Signage

The Principal will supply and install project and general promotional information signage to the 'public' side of the site hoarding.

The Contractor is responsible for the cost and provision (including production, erection, maintenance and removal) of all necessary temporary construction signage including all required statutory and information signage to identify the site, advise safety control measures, hazardous materials and dangerous goods stored within the site, and re-direct non-construction vehicular and pedestrian traffic around the perimeter of the site in accordance with the TMP.

Any proposed signage, excluding directional and safety compliance / statutory signage, must be approved by the Principal prior to installation via the Engineer to Contract. This approval includes any signage to cranes and the like.

3.31.5 Water and Sewer

The Contractor shall connect to water and sewer points nominated by the Principal. The Contractor shall meet all costs for connection and disconnection. The Principal will pay for reasonable consumption costs.

3.31.6 Sanitary Provisions

The Contractor shall provide toilet facilities for its own and its Subcontractors use. The Contractor shall provide water tight refuse bins for use by its workforce. The Contractor is responsible for connection

and disconnection to the Principal's sewer. The Contractor is to have satisfied themselves that the available sewer system is sufficient for the site needs. Any additional permanent or temporary facilities are fully at the Contractors cost.

3.31.7 **Security**

The Contractor shall be wholly responsible for the proper and adequate safeguards for the Contract Works and for all fixed and unfixed Materials on the site during both working and non -working hours, throughout the Contract.

The Contractor shall receive, check, record and secure all equipment, Materials and supplies being delivered to the site and stored within the boundaries of the site.

The Contractor shall ensure all tools, equipment, Materials and supplies are stored and used in accordance with the manufacturer's directions and any statutory requirements governing their storage or use.

When the site is left unattended, the Contractor must ensure that all points of entry to the site are locked and any other means or points of access are prevented.

3.31.8 First Aid and Medical Facilities

The Contractor shall in all respects be fully responsible for the provision of first aid services to its employees and employees of its Subcontractors and suppliers, including coordinating the transport of injured personnel to hospital or other appropriate facilities as and when required.

3.32 Cleanliness of Site

The Contractor shall take precautions to keep the site and adjacent public areas, roads etc free of debris and mud. Adequate vehicle washing facilities shall be provided at all times on the construction site and all vehicles shall be cleaned free of mud and debris prior to passage on to public streets.

The Contractor shall programme such work accordingly and allow in the Contract rates for all such costs which may be necessary to meet these requirements. If the measures taken by the Contractor are not adequate the associated work shall cease and remedial measures may be taken by the Engineer at the Contractor's expense.

3.33 Removal of Materials

Unless approved otherwise by the Engineer all surplus material shall be moved from the site immediately as it becomes surplus.

On completion of the Contract the Contractor shall remove any surplus material used in connection with the works, leaving the area of his operations tidy and free from debris.

3.34 Clean Up and Maintenance

On completion of the work, the Contractor shall remove all construction plant, buildings, surplus materials and garbage, and leave the site clean and tidy to the satisfaction of the Engineer.

The work shall be maintained for the length of the Defects Liability period and this shall include the repair of damaged road surfacing whether the result of faulty material, workmanship, vandalism or wear and tear.

3.35 Statements to the Media

The Contractor shall not make statements to the media regarding policy, road conditions or contractual matters. All inquiries are to be directed to the Engineer or the Principal.

3.36 Cultural Monitoring

There is a requirement for the contractor to engage with local iwi organizations throughout the lifecycle of the project. In more detail, participate in consultation with representatives of Ngai Tai ki Tamaki, Ngati Tamaoho, Ngaati Whanaunga, Te Akitai Waiohua, Ngati Paoa and Ngati Te Ata in respect of their request to undertake cultural monitoring, Karakia and other such religious or cultural ceremonies where appropriate, associated with the following milestones:

- a) Pre-start meeting
- b) Following the completion of pre-commencement works
- c) Implementation of sediment control measures
- d) Prior to completion of bulk earthworks across the site

3.37 Payment

The costs associated with complying with these Preliminary and General requirements of the Specification shall be included in the rates and amounts tendered in the Schedule in accordance with this Specification.

4 Clearing and Stripping

4.1 Scope

The work specified in this section covers the clearing and disposal of vegetation and other unwanted material and the stripping and stockpiling of topsoil from within the area of the work as defined in the Drawings.

The Contractor shall supply all plant, materials, labour and supervision for the clearing and stripping of all such materials as is required for the proper execution of the work.

4.2 Clearing

The area of the work shall be cleared of all obstructions except those specifically required to remain. Clearing shall include complete removal from the site of buildings, foundations, trees, logs, scrub, grass, roots and other vegetation, paving materials, fences and garbage.

All trees within the limits of the earthworks shall be felled unless otherwise specified. Trees and other vegetation beyond the limits of the earthworks shall be disturbed only when directed or approved by the Engineer. Any trees specifically designated by the Engineer shall be protected from damage by the Contractor's operations.

4.3 Disposal

Unless otherwise specified, all material cleared shall become the property of the Contractor, and shall be removed from the Site and disposed of in a safe and legal manner and so as not to inconvenience the owners of adjoining property. The Contractors shall pay any tip fees required.

Burning of material will not be permissible.

4.4 Stripping

All topsoil, turfs, humus and organic material remaining after the clearing of vegetation shall be stripped from the surface of the ground within the limits of the earthworks, to such depth as is directed by the Engineer.

Topsoil is defined as the top layer of soil characterised by the presence of organic matter. The more suitable topsoil shall be stockpiled separately and neatly for later respreading. The location and size of stockpiles shall be subject to the approval of the Engineer. Surfaces of topsoil stockpiles shall be rolled smooth to minimise erosion and unless otherwise specified shall be sown with clover seed at a coverage of 10 grams per square metre.

4.5 Measurement and Payment

Where provided for in the Schedule, measurement for payment of clearing shall be by plan area of ground surface cleared in accordance with the Contract. Additional payment will be made for individual trees felled or structures demolished and disposed of if such items are shown in the Schedule. Measurement for payment of stripping of topsoil will be by volume measured in stockpiles.

Payment at the scheduled rates or amounts for clearing and stripping shall include for all costs associated with this work. Where separate items for clearing and stripping are not shown in the Schedule, payment shall be included in the rates or amounts scheduled for earthworks.

5 Sediment Control and Environmental Management During Construction

5.1 Scope

This Specification covers the precautions to be taken by the Contractor to control erosion and sediment effects and minimise related damage or environmental deterioration to the Works, surrounding property, or receiving environment during the period of the Contract including the Defects Liability period and any longer period when required by the Contract Documents.

The Contractor shall supply all system design, plant, labour, materials and supervision necessary to ensure the satisfactory construction, operation and maintenance of the environmental protection systems throughout the contract period and beyond as necessary until the construction works and any drainage changes are stabilised to a standard where risk of adverse effects from the works are minimal.

5.2 Design Methodology

An Environmental and Earthworks Management Plan (EMP) supported by associated design calculations and drawings as necessary shall be prepared by the Contractor and provided to the Engineer before commencement of any earthworks or construction having potential to have adverse effects on the works, the neighbourhood or the broader receiving environment.

The EMP shall be a comprehensive plan incorporating earthworks methodology, sediment and dust control, treatment of dewatering flows, and any other environmental measures necessary to manage potential adverse effects from the works and meet Resource Consent conditions.

Design and construction management techniques for avoiding adverse effects from the works shall be in accordance with the design codes adopted by the controlling environmental authority and current good practice. Detailed design of mitigation measures such as isolating features, fences, cut off ditches, detention ponds etc shall be undertaken by a suitably qualified person employed by the Contractor.

5.3 Techniques for Managing Adverse Effects

Although the Contractor shall retain responsibility for the design and implementation of environmental protection during the works a number of basic management principles shall be followed. In particular:

- a) Areas being earthworked or otherwise disturbed at any one time shall be kept to a minimum.
- b) As soon as any reasonable sized earthworked area has been completed to final grade or a stage where it will be left for two months or more it shall be surface stabilised by topsoiling and grassing or similar approved method to minimise runoff, erosion, dust nuisance and improve appearance.
- c) Light soil or sand areas may require coating with mulch or similar to avoid wind-blown nuisance.
- d) Surfaces of fills in progress shall be shaped to prevent materials yet to be compacted from becoming saturated, to prevent erosion and to prevent ponding on the fills (except where the areas are designed as ponding or settlement areas).
- e) Diversion ditches and catch drains shall be used to divert upslope catchments around areas of earthworks.

- f) Catch drains or similar interception methods shall be used where feasible to intercept stormwater from disturbed areas and divert it to designed settlement areas and ponds before providing for managed discharge to natural gullies, waterways or other receiving area.
- g) Where works are immediately adjacent to live waterways measures shall be taken to separate the live waterway from the works if at all possible and to cut off any silt or debris from being suspended into the waterway.
- h) Temporary riprap or other anti-erosion methods shall be used where discharges could erode natural slopes.
- i) Brush or filter mesh fences, hay bales, detention ponds and other techniques shall be used as necessary to limit erosion and collect water borne soil in a way that manages adverse downstream effects on streams and natural water bodies.
- j) Topsoil, excavated soil or other material shall be located in positions where the risk of erosion into the receiving environment is minimised and shall be encircled with cut off drains and filter fences as appropriate to ensure such risk is further avoided.
- k) Washing and cleaning facilities shall be provided to ensure trucks and other plant does not carry silt or dust onto public roads or private roads owned or partially owned by other parties.

In all cases the requirements of any applicable Resource Consents shall be met.

5.4 Management of Protection Systems

Prior to, during, and following rain the Contractor shall arrange for attendance by plant, labour and supervision to ensure safe operation of protection systems, including isolation bunds, settlement ponds, catch drains, detritus fences and outlets and the like.

Detention and interception facilities shall be cleared and maintained regularly to insure they perform in accordance with their design throughout the contract period and beyond as necessary. Silt, debris, etc, removed from interception and settlement works shall be spread to dry in areas approved by the Engineer and disposed of as directed, either as material for use in the construction of earth fill or by removal to dumps away from the site.

5.5 Modification to Protection Systems

If at any time during the contract the performance of the environmental protection systems, or ongoing review of them, indicates that they need to be extended or modified the design modification and construction shall be undertaken by the Contractor at no extra cost to the Principal.

5.6 Environmental or Property Damaged

Where environmental or property damage occurs to any party as a result of works being undertaken or not undertaken by the Contractor such damage shall be repaired by the Contractor to the satisfaction of the property owner or authority involved, without additional payment.

5.7 Measurement and Payment

The cost of complying with these requirements of the Specification shall be included in the amounts tendered for this item in the Schedule of Prices or, if no separate item is shown, in the rates and amounts for the various items of earthworks construction.

Where the Engineer directs that material won from settlement ponds be removed from the site, such cartage and disposal will be measured and paid for as an additional item.

6 Excavation

6.1 Scope

The work specified in this section covers the excavation of earth and rock to form the land as detailed on the Drawings. The Contractor shall excavate out all material above the finished levels or contours of the site or above road formation levels where applicable, making due allowance for restoration of topsoil and the construction of pavements, foundations and underground utilities.

The Contractor shall supply all plant, materials, labour and supervision necessary to carry out the work in accordance with this Specification.

6.2 Preliminary

The Contractor shall satisfy itself as to the nature of the ground to be excavated prior to submitting a tender. Where subsurface information obtained by the Engineer is made available, it is done so without guarantee as to its accuracy or completeness. Tenderers shall make their own deductions as to the nature and conditions of the materials to be excavated and to the accuracy or completeness of the information provided.

6.3 Environmental Management

During construction, the Contractor shall take all necessary measures to manage the earthworks methodology and the minimisation of adverse environmental effects on the site and receiving environment by compliance with the requirements of the Specification entitled "Sediment Control and Environmental Management during Construction", and environmental good practice.

Unless otherwise provided in the Schedule, no separate payment will be made for this work. Its costs will be considered to be included in the various rates or amounts scheduled for earthworks items.

6.4 Operation of Plant

The Contractor shall be responsible for the determination of suitable types of plant to carry out the excavation operations in accordance with the Contract.

6.5 Mixing of Materials

Where materials being excavated include mixtures of topsoil, unsuitable material and material suitable for use as earth fill, the excavation shall be carried out as far as is practicable so as to avoid mixing the materials.

6.6 Disposal

All material removed from the excavation, and which is approved as suitable by the Engineer, shall be used as far as practicable in the construction of fills or for backfilling within the Work.

Excavated material shall not be removed from the Site without the consent of the Engineer. Surplus or unsuitable material which is approved for removal shall become the property of the Contractor and shall be disposed of away from the site in a safe and legal manner.

6.7 Undercutting

Any excavation taken to greater depths than shown on the Drawings, without authority of the Engineer and any unauthorised excavations shall be backfilled with suitable material compacted in layers in accordance with the requirements of the Specification for "Earth Fill", without further payment.

6.8 Slips

Slips of material from cut batters or natural ground shall be removed and disposed of as specified. Slips with an in-place volume exceeding 10 cubic metres will be paid for at the appropriate scheduled rate or amount for excavation, provided such slips did not result from any foreseeable action or inaction by the Contractor.

6.9 Maintain Excavation

Secure and maintain excavations free from slips, erosion, water and other fluids or fallen materials. Provide and maintain all pile liners, shoring, strutting, sheet piling, planking, pumps and other materials or plan necessary for carrying out and maintaining excavations and remove them where no longer necessary.

The cut face of any slopes created during excavation shall be monitored daily by the Contractor before any work is undertaken under the excavated slope. Should the condition of the slope the be deemed unsafe in the opinion of the Contractor, the Engineer shall be notified immediately, and allowance shall be made to inspect the slope.

6.10 Inspection

No backfilling shall be placed until the relevant area has been inspected by the Engineer.

6.11 Finished Surfaces

The finished surfaces of excavation shall conform to the levels, lines, grades and contours shown on the Drawings, within the tolerances specified. Where not otherwise specified any point on the finished surfaces shall conform to the following tolerances in respect of the levels shown or inferred on the Drawings: -

Subgrade Surfaces - +10mm/-50mm

Slopes flatter than 1 on 6 - +/-50mm

Slopes of between 1 on 6 and 1 on 2 - +/-100mm

Slopes steeper than 1 on 2 - +/-200mm

Vertical or near vertical excavations shall be of adequate dimension to enable safe access and placing of formwork etc.

Finished surfaces may vary from the designated slope or level by the tolerances shown above measured at right angles to the slopes, but any variations shall be gradual so as not to impair the appearance of the surface or hold ponded water. Finished surfaces excavated for the construction of structures, concrete work, etc., shall be completed to a level such that the detailed dimension of such structures, etc., is achieved.

Where excavations abut against undisturbed ground they shall be trimmed to conform with the shape of the adjacent ground so that the profile is continuous and compatible.

6.12 Classification of Material

Unless otherwise stated in the Schedule of Prices, materials excavated will not be classified for payment and no additional payment will be made for the excavation of any material, which is hard, cemented, wet, dry or otherwise.

6.13 Stockpiling

Any material intended for reuse shall be stockpiled in locations that have been pre-approved in advance by the Engineer. Stockpiles where practical shall be located neatly outside the excavated areas but not so as to jeopardise the ground stability or affect access ways of the wider site.

6.14 Dewatering

The Contractor shall keep excavations free from water, and shall provide all pumps, drainage pipes and other equipment required for this purpose. Where prior approval is obtained from the Local Authority, discharge into existing stormwater drains will be permitted but adequate settling chambers shall be constructed to trap silt. Should deposition occur in existing drains as a result of the operations of the Contractor such deposits shall be cleared immediately by the Contractor at its own expense.

6.15 Safety and Ground Support

Safety procedures in excavation shall comply with the requirements of the WorkSafe NZ for notifiable work and the published Code of Practice for Excavations.

6.16 Measurement and Payment

Where provided for in the Schedule of Prices, materials excavated will be measured for payment by volume *in situ* after clearing and prior to excavation, to the levels, lines, grades and contours shown on the Drawings.

Materials excavated will be paid for at the appropriate scheduled rate or amount tendered for earthworks. Where classification of excavated material is provided for in the Schedule of prices, payment will be at the appropriate rate or amount for the type of material excavated, as classified by the Engineer.

Except where otherwise provided, the scheduled rates or amounts for excavation or earthworks shall include all work associated with excavation in accordance with this Specification, together with all work associated with the transport and disposal or with the spreading and compaction as fill of the excavated material as specified here and elsewhere.

7 Excavation and Filling for Building Platform and Site Works

7.1 Scope

The work specified in this section covers the excavation of existing surfaces including earth and rock to provide for building floors and foundations or non-trafficked slab areas. The Contractor shall excavate out all materials above the finished levels or contours of the site where applicable, making due allowance for restoration of topsoil and the construction of pavements, foundations and underground utilities.

The Contractor shall provide all plant, materials, labour and supervision necessary to carry out the work in accordance with the Specification.

7.2 Preliminary

The Contractor shall satisfy himself as to the nature of the ground to be excavated prior to submitting a tender. Where subsurface information obtained by the Engineer is made available, it is done so without guarantee as to its accuracy or completeness. Tenderers shall make their own deductions as to the nature and conditions of the materials to be excavated and to the accuracy or completeness of the information provided.

7.3 Extent of Work

The Contractor is to provide a finished platform level to the earthworks level shown on the Drawings. A protective layer of metal is to be placed and compacted on the building platform as shown or topsoil placed and respread.

7.4 Operation of Plant

The Contractor shall be responsible for the determination of suitable types of plant to carry out the excavation operations in accordance with the Contract.

7.5 Mixing of Materials

Where materials being excavated includes mixture of topsoil, unsuitable material and material suitable for use as earth fill, the excavation shall be carried out as far as is practical so as to avoid mixing the materials.

7.6 Disposal

All material removed from the excavation, and which is approved as suitable by the engineer, shall be used as far as practicable in the construction of fills or for backfilling within the Work. Excavated spoil required for backfilling of trenches and around foundations and pits, where practical shall be deposited neatly alongside the excavation, but not so as to jeopardise the stability of the excavation.

Excavated material shall not be removed from the Site without the consent of the Engineer. Surplus or unsuitable material which is approved for removal shall become the property of the Contractor and shall be disposed of away from the site in a safe and legal manner.

7.7 Undercutting

Any excavation taken to greater depths than shown on the Drawings or the Engineer's written instructions, shall be backfilled with engineered fill to the proper level in accordance with the Engineer's instructions.

7.8 Maintain Excavation

Secure and maintain excavations free from slips, erosion, water and other fluids or fallen materials. Provide and maintain all pile liners, shoring, strutting, sheet piling, planking, pumps and other materials or plan necessary for carrying out and maintaining excavations and remove them where no longer necessary.

The cut face of any slopes created during excavation shall be monitored daily by the Contractor before any work is undertaken under the excavated slope. Should the condition of the slope the be deemed unsafe in the opinion of the Contractor, the Engineer shall be notified immediately, and allowance shall be made to inspect the slope.

7.9 Inspection

No backfilling shall be placed until the relevant area has been inspected by the Engineer.

7.10 Hardfilling

Hardfill material shall be good quality metal of approved origin, well graded and able to be compacted to a dense layer, maximum size 80mm. It shall be free from silts or clays which will cause it to weave when wet. The filling shall be spread in layers of loose thickness not greater than 200mm and compacted to achieve not less than 95% of the maximum dry density obtained for the hardfill material in accordance with NZS 4402: 1986: Test 4.1.1. The Contractor shall ensure suitable weather, metal type and moisture content to enable proper compaction without developing soft spots or weaving. Any areas where excessive deflections occur shall be removed and replaced at the Contractor's expense.

7.11 Basecourse Material

Aggregate for construction of basecourse layers immediately below slabs, foundations etc, shall be crushed rock, free from silt or clay lumps, weathered or disintegrated rock, organic and other non-mineral matter.

Basecourse material shall comply with the NZTA Specification M/4:2006 "Specification for Basecourse aggregate", Grading AP40. In regions where NZTA provides for a Regional basecourse, this material may be approved for use subject to the Contractor notifying this intent in the tender and gaining approval for its use prior to entering into a contract. In all cases the percentage of broken faces shall be at least 70%.

Tests to check compliance with NZTA Specifications shall be carried out on representative samples of the aggregate selected from bin, stockpile or truck.

7.12 Placing and Compaction of Basecourse

Basecourse material shall be placed and compacted in layers with an uncompacted thickness not exceeding 150mm and not less than 50mm. Each layer shall be compacted by multiple passes of a smooth steel wheeled roller or other plant approved by the Engineer, to not less than 98% of the maximum dry density obtained for the basecourse material by the New Zealand Standard Compaction

Test (NZS 4402, Test 4.1.1), and so as to satisfy deflection requirements as specified by the Local Authority.

Compaction of basecourse shall take place at a water content appropriate to the plant being used. If water is required to be added, a fine mist spray shall be used and excess water shall be prevented from damaging the subgrade or sub-base. The uppermost layer shall be compacted and the finished surface proof rolled using a smooth steel wheeled roller, with rear rolls at least 500 mm wide and loaded to not less than six tonnes per metre width.

7.13 Backfilling Against Foundations

Backfill around foundations shall be thoroughly consolidated in layers using suitable mechanical equipment. All timber, rubbish and other loose material shall be removed before backfilling.

Backfilling material and compaction of the backfill shall be as for hardfill.

7.14 Finished Surfaces

The finished surfaces of excavation for building site works shall conform to the levels, lines, grades and contours shown on the Drawings, within the tolerances specified. Where not otherwise specified any point on the finished surfaces shall conform to the following tolerances in respect of the levels shown or inferred on the Drawings: -

Slab and foundation subgrades - +10mm/-50mm

Slopes flatter than 1 on 6 - +/-50mm

Slopes of between 1 on 6 and 1 on 2 - +/-100mm

Slopes steeper than 1 on 2 - +/-200mm

Vertical or near vertical excavations shall be of adequate dimension to enable safe access and placing of formwork etc.

Finished surfaces may vary from the designated slope or level by the tolerances shown above measured at right angles to the slopes, but any variations shall be gradual so as not to impair the appearance of the surface or hold ponded water. Finished surfaces excavated for the construction of structures, concrete work, etc., shall be completed to a level such that the detailed dimension of such structures, etc., is achieved.

Where excavations abut against undisturbed ground they shall be trimmed to conform with the shape of the adjacent ground so that the profile is continuous and compatible.

7.15 Stockpiling

Any material intended for reuse shall be stockpiled in locations that have been pre-approved in advance by the Engineer. If suitable locations are not available on site, the Contractor shall arrange an alternate storage site at his own expense. Stockpiles where practical shall be located neatly outside the excavated areas but not so as to jeopardise the ground stability, or affect access ways of the wider site.

7.16 Dewatering

The Contractor shall keep excavations free from water, and shall provide all pumps, drainage pipes and other equipment required for this purpose. Where prior approval is obtained from the Local Authority, discharge into existing stormwater drains will be permitted but adequate settling chambers shall be

constructed to trap silt. Should deposition occur in existing drains as a result of the operations of the Contractor such deposits shall be cleared immediately by the Contractor at its own expense.

7.17 Safety and Ground Support

Safety procedures in excavation shall comply with the requirements of the WorkSafe NZ for notifiable work and the published Code of Practice for Excavations.

The Contractor shall form his own estimate of the amount of any temporary ground support which may be required, and shall allow for all such costs in his tender. Timbering placed below top of pipe level shall be withdrawn as bedding and backfilling material is placed, unless the Engineer requires otherwise.

Any slips or subsidence which occur during the course of the work shall be cleared away and made good by the Contractor without extra payment.

7.18 Obstructions

Prior to excavation, the Contractor shall prove the location of all existing underground utilities crossing the site by hand excavation, taking care to avoid damage. Any sewers, stormwater or subsoil drains, underground cables, gas or water mains, other services or structural foundations encountered must be left intact. Should any underground utility be disturbed during excavation, the responsible authority shall be notified immediately.

7.19 Measurement and Payment

Where provided for in the Schedule of Prices, materials excavated will be measured for payment by volume in-situ or square measure after clearing and prior to excavation, to the levels, lines and grades shown on the Drawings.

Materials excavated will be paid for at the appropriate scheduled rate or amount tendered for earthworks.

Except where otherwise provided, the scheduled rates or amounts for excavation or earthworks shall include all work associated with excavation in accordance with this Specification, together with all work associated with the transport and disposal or with the spreading and compaction as fill, of the excavated material, all as specified here and elsewhere.

8 Earth fill

8.1 Scope

The work specified in this section covers the construction of earth fill and all other subsidiary work necessary so that the areas of fill are brought to conform with the lines, grades, elevations and slopes shown or inferred on the Drawings or as directed by the Engineer.

The Contractor shall prepare the areas on which fill is to be placed and shall transport, spread, stockpile, condition, compact and grade the fill material and finish the areas making due allowance for the restoration of topsoil and the construction of pavements and underground utilities.

8.2 Operation of Plant

The Contractor shall be responsible for the determination of suitable types of plant to carry out the sheet piling and filling operations in accordance with the Contract.

8.3 Surface Preparation

The Contractor shall clear and strip the areas on which fill material is to be placed and along haul roads in accordance with the part of the Specification entitled "Clearing and Stripping". Low density, saturated, weak or organic soils exposed by clearing and stripping shall be excavated as directed by the Engineer. If considered by the Engineer to be unsuitable for use as filling, some or all of these soils shall be disposed of beyond the site, neatly stockpiled or wasted in approved areas as directed. If considered suitable by the Engineer, some or all of these soils shall be reused as fillings in layers as directed.

The exposed surfaces of natural ground upon which fill is to be placed shall be compacted so as to achieve relative compaction at least equal to that specified for the fill to a depth of 150mm. If necessary to meet this requirement, the ground shall be bladed until it is uniform, free of large clods and brought to suitable water content prior to compaction.

Before filling commences in any area of the Site, the cleared and stripped surface shall be inspected and approved by the Engineer's Representative and if required shall be subjected to proof rolling using a fully laden rubber tyred motor scraper or similar approved plant. Where directed by the Engineer, any soft or compressible areas shall be excavated and refilled with suitable compacted material.

Where fill material is to be placed against a hillside or previous fill where the slope is steeper than 1 vertical on 4 horizontal, the slope shall be prepared by benching. Near horizontal benches, suitably graded for drainage, shall be cut at vertical intervals of not less than 1 metre up the slope as the fill surface is raised, so that no less than 75% of the plan area on which fill is to be placed shall consist of such benches. Apart from the rates or amounts shown the Schedule for earthworks, no additional payment will be made for such benching.

Where shown on the Drawings or where seepage is encountered, the ground shall be trenched, graded or benched and subsoil drains installed to collect the seepage and discharge it to an approved point clear of the fill in accordance with details shown on the Drawings or as directed by the Engineer. Where shown on the Drawings, culverts shall be constructed as detailed.

8.4 Fill Material

Except for materials removed during clearing and stripping of topsoil or material designated as unsuitable by the Engineer, the on-site soils obtained from excavation may be used for general filling.

Wherever possible, the Contractor shall use suitable material won from cut areas or approved borrow areas within the site. When material imported from off the site is used, the Contractor shall obtain the required permissions and permits, and pay all royalties and charges required in connection with its use.

Imported material shall be of consistent well graded type and be subject to the approval of the Engineer prior to use. Material which is organic or highly plastic for example will not be considered as being suitable. A representative 10kg sample of proposed imported material shall be delivered to the Engineer at least three days before approval is required. Laboratory testing of imported fill material shall be provided with the representative sample. The laboratory testing provided shall be the same as per the site won material, with the test type and frequency provided in the "Testing" section below.

Prior to placing imported fill, the Contractor shall deliver to the site (and later dispose of) a 4m³ control sample of fill material for site comparisons and checking. The control sample must meet the requirements of this Specification, and be confirmed by the Engineer as being representative and approved before any material is used in the work.

8.5 Testing

The Contractor shall be responsible for testing and determination of the acceptability of earth fill materials. Prior to commencement of bulk fill construction, representative samples of the proposed fill material shall be sent to an approved laboratory to be tested for compliance, with the results provided to the Engineer. The Contractor shall seek acceptance from the Engineer for the testing laboratory that is proposed to be use, which shall hold appropriate accreditation for the tests to be performed. The Engineer may request an alternative testing laboratory is used.

The requirements for testing and minimum testing frequencies are stated below. The amount of testing is based on the fill material encountered onsite and number of source locations. Fill material types are likely to comprise residual clays/silts soils, weathered basalt and alluvial clays/silts.

Table	3:	Source	Suitability	Testing
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Test Type/Requirement	Test Method	Test Frequency
Standard Compaction with Air Voids	NZS 4402:1986, Test 4.1.1	3 tests per site-won fill material for each source location.
Water Content (In-situ)	NZS 4402:1986, Test 2.1	3 tests per site-won fill material for each source location.
Shear Strength	NZGS Guideline for Hand Held Shear Vane Test 2001	3 tests per site-won fill material for each source location, undertaken on a compacted mould sample, which shall be measured and reported for every point on each compaction curve.
Particle Size Distribution	NZS 4402:1986, Test 2.8.1	3 tests per site-won fill material for each source location.
Plasticity Index	NZS 4402:1986, Test 2.2, 2.3 & 2.4	3 tests per site-won fill material for each source location.

These results will be used to determine OMC range, and MDD for NDM testing.

In addition, the Contractor shall obtain representative samples of each fill material type and arrange laboratory testing in accordance with the Solid Density Test (NZS 4402:1986, Test 2.7.2) prior to placement of engineered fill. Laboratory determined solid density is required on cohesive soils to enable accurate calculation of % air voids.

No fill layers shall be placed prior to such laboratory testing being forwarded to the Engineer.

At the discretion of the Engineer, an alternative approach to the laboratory testing may be taken to assess the fill.

8.6 Placing, Spreading and Water Conditioning

No fill material shall be placed until the Engineer has inspected and approved the surface preparation of that part of the Site.

Fill material shall be placed and spread in a systematic manner and in uniform near horizontal layers which, prior to compaction, do not exceed 200mm in thickness.

Any lumps or rocks exceeding 100mm in greatest dimension shall be either broken down to less than 100mm or removed or used as may be directed by the Engineer.

When the water content of the fill material is below that which is necessary to achieve the specified degree of compaction, water shall be added and thoroughly mixed into the fill material until it is uniformly dispersed throughout the soil. Similarly, when the water content of the fill material is too high, the soil shall be air dried by scarifying, harrowing, discing or other aeration processes. The water content shall also be kept low enough to provide a stable working surface for the hauling and compacting plant, free from heaving, weaving and excessive rutting.

No fill material shall be placed, spread or compacted during or immediately following wet weather or when ground is frozen. Except for essential work to maintain safety, drainage or prevent damage to work, no equipment shall be moved on or over the site except along access roads during or immediately following wet weather.

Where any compacted subgrade or fill has deteriorated due to wet weather or an interruption in the work, the material affected shall be scarified and recompacted to the required standard before any further fill material is placed or spread over it.

8.7 Compaction

After each layer of fill has been placed, spread evenly and brought to a suitable water content (+/- 2% of Optimum Moisture Content, OMC). It shall be compacted to at least the compaction standard specified herein.

- a) The compaction shall be taken as 98% Maximum Dry Density (MDD) in terms of the New Zealand Standard Compaction Test (NZS 4402, Test 4.1.1) for the top 1m of filled areas and 95% Maximum Dry Density for those parts of fills at greater than 1m depth of the finished surface. Compaction shall be at +/- 2% of OMC for all earth fill.
- b) All material shall be compacted so as to achieve an average air void ratio of no more than 10% over 10 tests and a maximum of 12% on any one test, and an average undrained shear strength (Su) of no less than 150kPa, and minimum of 110kPa for any one test. Note: air voids/penetration criteria have no validity if not taken on the same day as fill placement and no rain or other wetting occurs between the time of compaction and the time of testing. Otherwise percentage of NZ Standard Compaction must then be applied.

Each NDM test shall comprise shall comprise 2 measurements using the same probe hole but orientated at 90 degrees to each other.

Undrained shear strength of the compacted soil at any test location shall be taken as the mean of a set of tests, comprising 3 tests undertaken within an area of 0.5m² of each other.

Compaction and testing shall be in general accordance with NZS 4431:1989.

Compaction shall be accomplished with approved, special-purpose compaction equipment. The equipment shall make sufficient passes to ensure that the required compaction has been uniformly obtained everywhere.

Fill batter faces shall be compacted as a separate operation, either by overfilling and cutting back, or by rolling with compacting plant working up and down the slope.

8.8 Finished Surfaces

The finished surfaces of earth fill shall conform to the levels, lines, grades and contours shown on the Drawings or directed by the Engineer, within the tolerances specified.

Where not otherwise specified any point on the finished fill surfaces shall conform to the following tolerances in respect of the levels shown or inferred on the Drawings: -

Subgrade subgrades - +10mm/-50mm

Slopes flatter than 1 on 6 - +/-50mm

Slopes of between 1 on 6 and 1 on 2 - +/-100mm

Slopes steeper than 1 on 2 - +/-200mm

Floor level on permanent storage ponds - +20mm/-50mm

Batter slopes on permanent ponds - +50 mm/-100mm

Finished surfaces may vary from the designated slope or level by the tolerances shown above measured at right angles to the slopes, but any variations shall be gradual so as not to impair the appearance of the surface or hold ponded water. Finished surfaces for the construction of structures, concrete work, etc., shall be completed to a level such that the detailed dimension of such structures, etc., is achieved.

Where fillings abut against undisturbed ground they shall be trimmed to conform with the shape of the adjacent ground so that the profile is continuous and compatible.

In any area so specified on the Drawings, the Contractor shall adjust the quantities of cut and fill as directed by the Engineer, varying finished levels as necessary to achieve a balance of earthworks quantities.

8.9 Backfilling

Backfilling around structures and as required to bring undercut areas to formation or finished levels shall, unless otherwise specified, consist of selected fill material, spread and compacted in layers using suitable plant such that the relative compaction requirements of the Specification are satisfied.

8.10 Environmental Management

During construction, the Contractor shall take all necessary measures to manage the earthworks methodology and the minimisation of adverse environmental effects on the site and receiving environment by compliance with the requirements of the Specification entitled "Sediment Control and Environmental Management during Construction" and environmental good practice.

Unless otherwise provided in the Schedule, no separate payment will be made for this work. Its costs will be considered to be included in the various rates or amounts scheduled for earthworks items.

8.11 Compliance Testing

The Contractor shall be responsible for engaging a suitably qualified soil testing organisation independent of the Contractor to undertake inspection and testing of the earth fill works. The inspection shall include viewing of the cleared and benched natural ground prior to filling and ongoing inspections and compaction testing of fill throughout the project.

The testing shall be done at vertical and horizontal intervals selected to give a representative and reliable spread of tests through the fill works. The testing regime proposed by the Contractor's nominated testing organisation shall be described in the QA information provided by the Contractor before commencement of the contract works. The Engineer reserves the right to require reasonable changes to the testing regime and such changes shall be implemented at no extra cost to the contract.

Compaction non-compliances shall be immediately brought to the notice of the Contractor and Engineer, faulty areas shall be removed, treated as appropriate (drying, moisturising etc), re-compacted and retested until complying fill standards are met.

All testing reports must be emailed in both pdf and excel formats to the Engineer, within one week following the date of testing.

Each test locations and elevations shall be recorded on a cut/fill plan and labelled appropriately and clearly. All tests locations shall have a plan accuracy of 1m of their location, and the co-ordinates and elevations of each test reported on the test sheets. Elevation accuracy is to be within 100 mm.

There is to be no duplication of test numbering at any site, regardless of the material being tested or the stage of development.

The independent inspections shall also be responsible for identifying any areas where batters are not being laid at appropriate slopes.

On completion of the earthworks, the Contractor and testing organisation shall prepare accurate and tidy as-built plans of the earthworks showing all test locations (position and reduced level) along with a testing report including records of the tests and explanations of actions taken on non-compliances. The report shall be signed by the testing organisation confirming that the specified compaction standards have been met. The report and attachments shall be provided in electronic format and triplicate hard copy, to the Engineer for distribution as follows.

- One copy held by the Engineer.
- One copy to be passed to the controlling local authority.
- One copy to be passed to the Principal.

8.12 Engineer's Verification

The Contractor shall facilitate inspection by the Engineer at all times during construction. The Engineer may from time to time carry out check tests of the soil properties, water content and the compaction standards being achieved in the fill, but the Contractor will remain responsible for achieving the required standard of work.

The Engineer shall have the right, at any stage of the work and until the end of the Defects Liability period, to have material which has not been compacted to the specified standard or which contains organic material, tree roots or the like, wherever it may be, excavated and recompacted to the specified standard without additional payment to the Contractor.

The Engineer may deduct from the Contract amounts payable to the Contractor the cost of check tests on fill material which show the specified compaction has not been achieved.

Fill construction shall be arranged to permit testing to be carried out as the work proceeds. The Contractor shall, on request and without further payment, provide excavating equipment and remove material from above the test level, and subsequently backfill to Specification requirements. Whenever earthmoving, compaction or like work is in progress at the same time as compaction testing, the Contractor shall at any time required by the Engineer, without extra payment, provide safety protection for personnel carrying out testing to the satisfaction of the Engineer.

On request by the Engineer, the Contractor shall provide a suitably loaded truck with driver, or other equipment, for proof rolling which shall be paid for at the appropriate plant hire rate.

8.13 Measurement and Payment

Where provided for in the Schedule of Prices, earth fill excavated from cut areas or approved borrow areas within the Site will be measured by volume in situ prior to excavation. Fill material imported from outside the Site will be measured by volume in situ in the completed fills.

Earth fills will be paid for at the appropriate scheduled rate or amount for earthworks. Except where otherwise provided, the scheduled rates or amounts shall include all costs associated with the excavation, transport, spreading compaction of fill material, compliance testing, as-built recording and associated work as specified.

9 Settlement Monitoring

9.1 General

Instrumentation is required to monitor ground displacement of placed fills. Displacement will be monitored by survey of settlement plates and pins, as shown on the Drawings. Additional instrumentation may be required during construction should adverse ground displacements be observed on site, this will be at the Engineer's discretion during or following construction.

The purpose of instrumentation and monitoring is to:

- Observe the rate and magnitude of settlement;
- Verify the parameters and assumptions made in the settlement analysis;
- Determine the timing of subsequent construction stages;
- Allow contingency measures to be implemented in a timely fashion, if required.
- Instrumentation details and locations shall be as per the Drawing.

Drawings referenced in this Specification shall be updated by the Engineer as required to include actual instrument locations and any additional instrumentation that may be required during construction.

Further to this, other components of this Specification may be changed during the works to reflect changes in materials utilised, alterations to the works plan, etc.

9.2 Instrumentation Installation

All installations shall be in accordance with the manufacturer's recommendations and instructions (where applicable) and in accordance with this Specification.

Settlement plates and settlement pins installation and monitoring shall be carried out under the supervision of a registered surveyor.

Instrumentation shall be installed as early as practical (e.g. following site earthworks activities). When deciding on program for instrumentation installation, consideration shall be given to construction activities likely to damage instrumentation as well as safety of plant and personnel during the installation process.

The Contractor shall obtain the Engineer's approval of the proposed instrumentation (e.g. make and model) prior to installation.

The Contractor shall ensure all instrumentation, are located in plan and elevation by engineering survey immediately upon installation.

Once the Contractor finalises the construction programme it shall be discussed with the Engineer and the stages at which each instrument will be installed, and the order of priority shall be discussed and jointly decided upon.

As-built plans shall be provided to the Engineer within two days of installation, which include the instrumentation X, Y and Z coordinates.

9.3 Protection

Instrumentation forms an integral part of the construction monitoring and must be protected at all times against any damage. Construction activities adjacent to instruments must be carried out with care. In

particular, fill placement around the instruments shall be undertaken by manual methods within a distance of 1m.

Instrumentation and monitoring equipment locations shall be clearly identified on site by means of fencing with pegs and glow mesh fencing as detailed on the Drawings or as otherwise proposed by the Contractor and approved by the Engineer.

If an instrument is damaged, the Contractor shall repair or replace the damaged instrument as soon as is practically possible to the satisfaction of the Engineer, who may impose stop-work orders in the vicinity of the instrument if it is critical. Baseline Readings should be taken within 24 hours after the repair once the instrument is stabilised.

Settlement points on structures shall be appropriately positioned and protected in order to allow monitoring at all stages throughout the adjacent construction activities, without risk of damage or displacement as a result of the activities.

9.4 Baseline Reading Requirements

Baseline readings of all monitoring equipment shall be taken to demonstrate that the instruments are working correctly, and to establish baseline behaviour of the ground or structures. The number of base readings and duration between successive base readings are to be undertaken as per this Specification and the Drawings, and as a minimum will not be less than two separate readings 3 days apart.

Baseline readings shall be carried out immediately after installation and before adjacent construction commences. The Contractor shall allow sufficient time between installing instruments and commencing construction activities, which the instruments are intended to monitor the effects of, particularly for instruments requiring several readings to obtain a reliable baseline.

A reference levelling point should also be installed and located in a safe location outside of the filling area, and comprise a pin sleeved to 2.5m to 3m depth so that any seasonal volume changes effecting surface levels are accounted for.

9.5 Monitoring Requirements

Following baseline, monitoring shall be undertaken as shown on the Drawings unless an alternative frequency is specified or agreed to by the Engineer.

Settlement plates and pins must be monitored to±2mm vertical accuracy.

Construction of buildings, utilities, pavements, or other infrastructure are not to commence within 50m of monitoring equipment until the Engineer has confirmed deformations have slowed to acceptable rates.

The following instrumentation and monitoring frequency are required:

Table 4: Instrumentation and monitoring frequency

Instrumentation	Installation	Monitoring Frequency*
Settlement plates	Installed on stripped subgrade prior to placement of engineered fill.	During fill placement – Twice weekly During preloading – Weekly
Settlement pins	Installed in engineered fill surface once at final design level.	<u>During preloading</u> – Weekly

^{*}Baseline reading required in addition to the monitoring frequency provided in the table.

The results shall be reported to the Engineer. The frequency of the survey may be relaxed by the engineer depending on the results.

9.6 Surcharge

Surcharge is defined as the placement of soil or fill in addition to the final earthworks design level to accelerate settlement. If the building platforms are to be surcharged then the contractor is to submit a plan showing the location and height of the surcharge, as well as noting the material type of the surcharge soil and any existing monitoring points that would be affected. The surcharge plan will need to be approved by the Engineer prior to any surcharge being placed.

If monitoring points need to be adjusted to accommodate the surcharge the following applies:

- Settlement plates will need to be extended so these sit above the surcharge fill levels and monitoring continues as per the Drawing and this Specification.
- Settlement pins, if installed, will need to be removed, re-established on the same X Y coordinates and new baseline readings taken. If settlement pins are not installed yet, then pin installation is as per the Drawing and this Specification.

Adjustments or changes to the monitoring points can only be undertaken with the approval from the Engineer.

10 Hold Points and Engineer's Approvals

10.1 Hold points for Contractor's advice to Engineer

As a guide to the contractor, the points at which the works shall be paused, and the engineer's approval to proceed obtained, include but are not necessarily limited to the following:

- Approval of documents to be prepared by Contractor as captured in this document
- Clearance certificate post contaminated soil removal to prove all contamination has been removed.
- Following strip of topsoil prior to cut to fill commencing.
- Installation of settlement monitoring instrumentation.
- During placement of initial fill layers and at half depth of the engineered fill.
- At finished level of the engineered fill.
- Approval of finished levels prior to respread of topsoil or stabilising of surface.

The Contractor shall also hold any other works for inspection by the Engineer as instructed from time to time.



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2023-05-15

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Dear David

Drury Bulk Earthworks Stage 1 Separable Portion 1: Completion Certificate 2023– Geotechnical Review

1 Introduction

We understand that as part of the earthworks for the Drury Centre Development, a completion certificate is required for the earthworks undertaken to date. The earthworks have been undertaken by Ross Reid Contractor Ltd, with Aurecon New Zealand Ltd (Aurecon) undertaking inspections and reviews of quality assurance (QA) documentation. At this stage a Geotechnical Completion Report (GCR) is not required but confirmation is required on the suitability of the work undertaken by the Contractor to date.

2 QA Testing Review

The areas of Separable Portion 1 inspected is presented in Appendix A.

The following table provides a summary of the QA checks that Aurecon has undertaken to date for the areas included as Separable Portion 1 in Practical Completion Certificate nr.1:

X Kiwi Property				DRURY BULK EARTHWORKS PROJECT		ORKS	aurecon		
	QA PROGRESS TRACKING SHEET								
	Lot Deta	ils Inspection / Test Completed (Y / N)							
Lot Number	Full / Partial	Description	Topsoil Strip	Subgrade	Subgrade Survey	Fill Compaction	Placing Topsoil	Topsoil Survey	Mulching / Grassing
LOT 001	Partial	LFR	Υ	Υ	Υ	Υ	Υ	Υ	Υ
LOT 012	Full	Residential	Υ	Υ	Υ	Υ	Υ	Υ	Υ
LOT 013	Full	Residential	Υ	Υ	Υ	Υ	Υ	Υ	Υ
LOT 016	Full	Residential	Υ	Υ	Υ	Υ	Υ	Υ	Υ
LOT 017	Full	Residential	Υ	Υ	Υ	Υ	Υ	Υ	Υ
LOT 018	Full	Residential	Υ	Y	Υ	Υ	Υ	Y	Υ
LOT 019	Full	Residential	Υ	Υ	Υ	Υ	Υ	Υ	Υ
LOT 020	Full	Residential	Υ	Υ	Υ	Υ	Υ	Υ	Υ





DRURY BULK EARTHWORKS PROJECT



QA PROGRESS TRACKING SHEET

	Lot Deta	ils			Inspection / Test Completed (Y / N)				
Lot Number	Full / Partial	Description	Topsoil Strip	Subgrade	Subgrade Survey	Fill Compaction	Placing Topsoil	Topsoil Survey	Mulching / Grassing
LOT 021	Full	Residential	Υ	Υ	Υ	Υ	Υ	Υ	Υ
LOT 022	Full	Residential	Υ	Υ	Υ	Υ	Υ	Υ	Υ
LOT 101	Full	Reserve	Υ	Υ	Υ	Υ	Υ	N	Υ
LOT 110	Full	Access Way	Υ	Υ	Υ	Υ	Υ	Υ	Υ
LOT 111	Full	Access Way	Υ	Υ	Υ	Υ	Υ	Υ	Υ
LOT 112	Full	Access Way	Υ	Υ	Υ	Υ	Υ	Υ	Υ
LOT 301	Partial	Road	Υ	Υ	Υ	Υ	N/A	N/A	Υ
LOT 302	Partial	Road	Υ	Υ	Υ	Υ	N/A	N/A	Υ
LOT 304	Partial	Road	Υ	Υ	Υ	Υ	N/A	N/A	Υ
LOT 305	Full	Road	Υ	Υ	Υ	Υ	N/A	N/A	Υ

Note: This checksheet should be read in conjunction with the Defect List for Separable Portion 1 which will cover minor remedial work identified

Table 1: QA progress tracking summary

During the course of the site works the Contractor has also submitted QA testing of the engineered fill (NDM and shear vane testing), which were reviewed by Aurecon.

Based on our inspections and QA testing provided to us by the Contractor the engineered earthfill has achieved the required compaction.

3 Settlement Monitoring

As part of the site work, the Contractor installed and monitored settlement plates and pins. The locations of these are shown in Appendix B.

The settlement data received from the Contractor has been presented in Appendix C.

We note the following about the settlement data.

- Observed settlement match calculated settlements.
- The settlement data over the past three months indicates a general plateauing of results.
- There is some variability in the readings due to the following reasons:
 - Survey accuracy.
 - o Nature of the plastic soils (shrinkage and swelling depending on moisture levels)
 - Heaving of the material due to machinery working close by the pins and plates to achieve compaction
 - Damage to the monitoring pins, for example the sudden drop in the reading for Plate 3
 was due to the plate being bumped by a machine so the readings were reset following
 the incident.

Although works have stopped over the winter season, monitoring will continue every second week, which will provide further information on the settlement trend and confirm the plateauing of results, with the absence of site works affecting results.



4 Conclusion

In summary, based on site inspections by Aurecon and our review of the QA testing provided to us, we can confirm that the earthworks in the area covered by Practical Completion Certificate nr. 1 to date meet the requirements of the specification and the engineered fill placed across the site has achieved the required compaction.

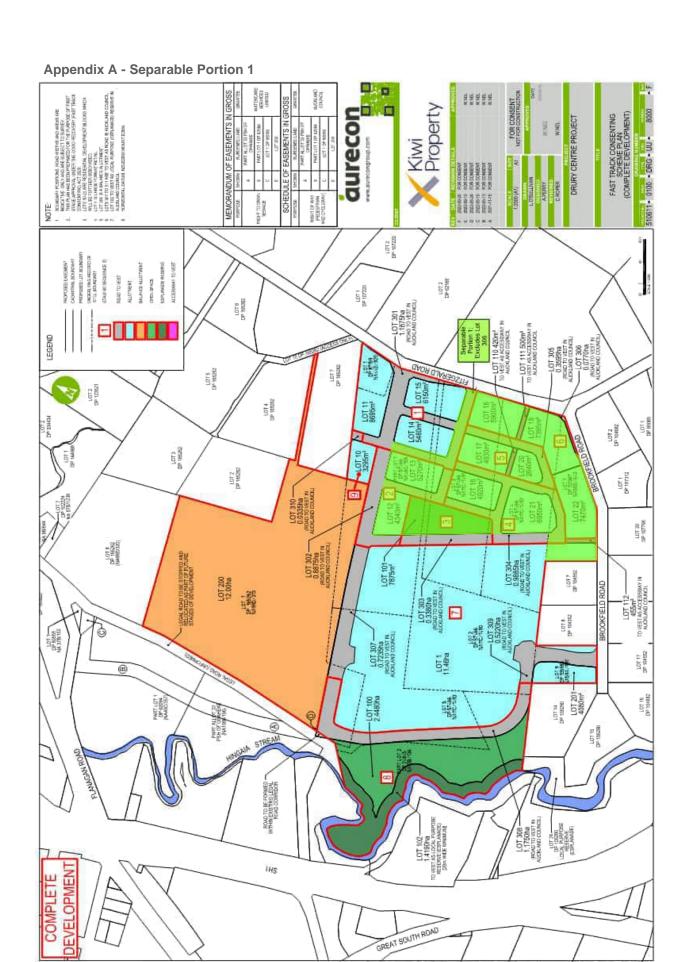
Yours sincerely

Dr Jan Kupec

PhD MSc canding FEngNZ CPEng IntPE APEC Engineer

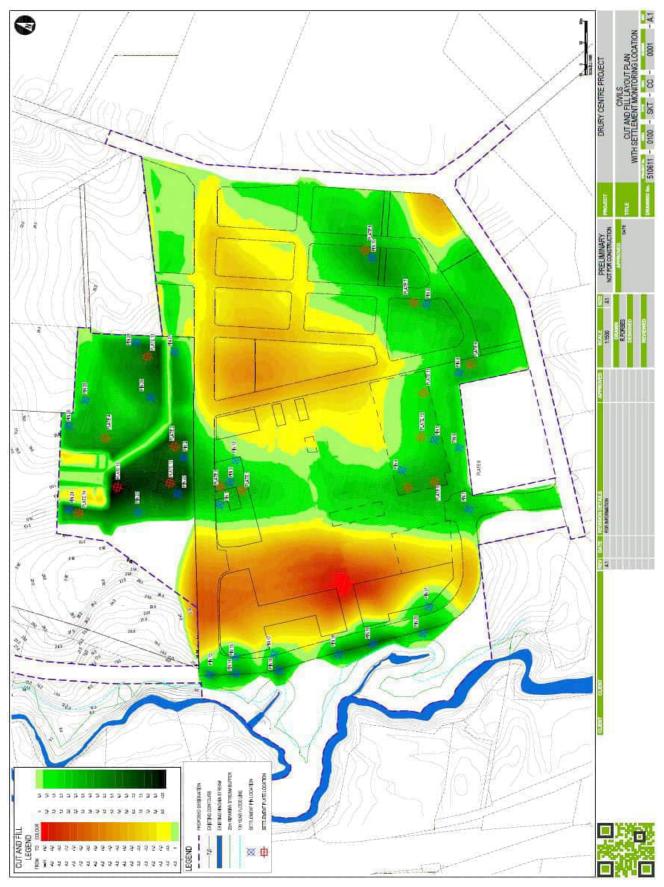
Principal - Ground Engineering







Appendix B – Settlement Plate and Pin Locations





Appendix D
Laboratory Testing



East Tamaki Laboratory

Coffey Services (NZ) Limited

144A Cryers Road, East Tamaki NZ 2013 PO Box 58877, Botany, Manukau NZ 2163

Phone: +64 9 272 3375 Fax: +64 9 272 3378

Report No: ETAM17S-00118-1

Issue No: 1

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

{This document may not be altered or reproduced except in full. This report relates only to the positions

Approved Signatory: James McKelvey (Senior Technician) IANZ Accredited Laboratory Number:105

12/01/2017

Date of Issue: 18/01/2017

Material Test Report

Client:

ENGEO Limited

PO Box 305136, Triton Plaza

Auckland 0757

Principal:

Project No.: Project Name:

773-ETAM00143AA 13451 - ENGEO Testing

Lot No.:

TRN: -

Sample Details

Sample ID:

ETAM17S-00118

Client Sample:

Date Sampled:

21/12/2016

Source:

Unknown (Sampled by Client)

Material:

Disturbed Soil

Specification:

No Specification

Sampling Method: Project Location:

Unknown (Not IANZ Endorsed)

Sample Location:

13451 **BH01**

0.5 - 0.6 m

Test Results Description Method Result Limits Liquid Limit NZS 4402:1986 Test 2.2 118 Plastic Limit NZS 4402:1986 Test 2.3 Not Tested Plasticity Index NZS 4402:1986 Test 2.4 Not Tested Linear Shrinkage NZS 4402:1986 Test 2.6 25 Curling No Cracking Yes Sample History Natural state Fraction Tested Passing 425µm sieve **Date Tested** 16/01/2017 Moisture Content (%) NZS 4402:1986 Test 2.1 63.8

Comments

Date Tested

Work Order: ETAM17W00052



East Tamaki Laboratory

Coffey Services (NZ) Limited

144A Cryers Road, East Tamaki NZ 2013 PO Box 58877, Botany, Manukau NZ 2163

Phone: +64 9 272 3375 Fax: +64 9 272 3378

Report No: ETAM17S-00117-1

Issue No: 1

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

{This document may not be altered or reproduced except in full. This report relates only to the positions

In Ally

Approved Signatory: James McKelvey (Senior Technician) IANZ Accredited Laboratory Number:105 Date of Issue: 18/01/2017

Material Test Report

Client:

ENGEO Limited

PO Box 305136, Triton Plaza

Auckland 0757

Principal:

Project No.:

773-ETAM00143AA

Project Name:

13451 - ENGEO Testing

Lot No.:

TRN: -

Sample Details

Sample ID:

ETAM17S-00117

Client Sample:

21/12/2016

Date Sampled:

Source:

Unknown (Sampled by Client)

Material:

Disturbed Soil

Specification: Sampling Method: No Specification

Project Location:

Unknown (Not IANZ Endorsed)

Sample Location:

13451 **BH01**

0.5 - 0.6 m

Test Results

Description	Method	Result	Limits
Allophane Content	NZS 4402:1986 Test 3.4	>7%	
Date Tested		12/01/2017	

Comments

Work Order: ETAM17W00052



Material Test Report

Client:

ENGEO Limited

PO Box 305136, Triton Plaza

Auckland 0757

Principal:

Project No.:

773-ETAM00143AA

Project Name:

13451 - ENGEO Testing

Lot No.:

TRN: -

East Tamaki Laboratory

Coffey Services (NZ) Limited

144A Cryers Road, East Tamaki NZ 2013 PO Box 58877, Botany, Manukau NZ 2163

Phone: +64 9 272 3375 Fax: +64 9 272 3378

Report No: ETAM17S-00119-1

Issue No: 1

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

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Joseph J.

Approved Signatory: James McKelvey

(Senior Technician)

IANZ Accredited Laboratory Number:105 Date of Issue: 18/01/2017

Sample Details

Sample ID:

ETAM17S-00119

Client Sample:

Date Sampled:

21/12/2016

Source:

Unknown (Sampled by Client)

Material: Specification: Disturbed Soil

Sampling Method:

No Specification

Project Location:

Unknown (Not IANZ Endorsed)

Sample Location:

13451 BH02

0.5 m

Test Results

Description	Method	Result	Limits
Allophane Content	NZS 4402:1986 Test 3.4	5 - 7 %	
Date Tested		12/01/2017	

Comments

Work Order: ETAM17W00052



East Tamaki Laboratory

Coffey Services (NZ) Limited

144A Cryers Road, East Tamaki NZ 2013 PO Box 58877, Botany, Manukau NZ 2163

Phone: +64 9 272 3375 Fax: +64 9 272 3378

Report No: ETAM17S-00121-1

Issue No: 1

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

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July 1

Approved Signatory: James McKelvey (Senior Technician) IANZ Accredited Laboratory Number:105 Date of Issue: 18/01/2017

Material Test Report

Client:

ENGEO Limited

PO Box 305136. Triton Plaza

Auckland 0757

Principal:

Project No.: **Project Name:** 773-ETAM00143AA

13451 - ENGEO Testing

Lot No.:

TRN: -

Sample Details

Sample ID:

ETAM17S-00121

Client Sample:

Date Sampled:

21/12/2016

Source:

Unknown (Sampled by Client)

Material:

Disturbed Soil

Specification:

No Specification

Sampling Method:

Unknown (Not IANZ Endorsed)

Project Location: Sample Location:

13451 **BH03**

Test Results

Description	Method	Result	Limits
Liquid Limit	NZS 4402:1986 Test 2.2	127	
Plastic Limit	NZS 4402:1986 Test 2.3	Not Tested	(9.)
Plasticity Index	NZS 4402:1986 Test 2.4	Not Tested	
Linear Shrinkage	NZS 4402:1986 Test 2.6	24	
Curling		No	
Cracking		Yes	
Sample History		Natural state	
Fraction Tested		Passing 425µm sieve	
Date Tested		16/01/2017	
Moisture Content (%)	NZS 4402:1986 Test 2.1	50,2	
Date Tested		12/01/2017	

Comments

Work Order: ETAM17W00052



Material Test Report

Client:

ENGEO Limited

PO Box 305136, Triton Plaza

Auckland 0757

Principal:

Project No.: Project Name: 773-ETAM00143AA 13451 - ENGEO Testing

Lot No.:

TRN: -

East Tamaki Laboratory

Coffey Services (NZ) Limited

144A Cryers Road, East Tamaki NZ 2013 PO Box 58877, Botany, Manukau NZ 2163

Phone: +64 9 272 3375 Fax: +64 9 272 3378

Report No: ETAM17S-00120-1

Issue No: 1

Tests indicated as not accredited are outside the scope of the laboratory's accreditation.
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Approved Signatory: James McKelvey (Senior Technician)

IANZ Accredited Laboratory Number:105

Date of Issue: 18/01/2017

Sample Details

Sample ID:

ETAM17S-00120

Client Sample:

Date Sampled: Source:

21/12/2016

Material:

Unknown (Sampled by Client)

Specification:

Disturbed Soil No Specification

Sampling Method:

Unknown (Not IANZ Endorsed)

Project Location:

13451

Sample Location:

BH03

Test Results

Description Method Result Limits Allophane Content NZS 4402:1986 Test 3.4 5-7% **Date Tested** 12/01/2017

Comments

Work Order: ETAM17W00052



East Tamaki Laboratory

Coffey Services (NZ) Limited

144A Cryers Road, East Tamaki NZ 2013 PO Box 58877, Botany, Manukau NZ 2163

Phone: +64 9 272 3375 Fax: +64 9 272 3378

Report No: ETAM17S-00122-1

Issue No: 1

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

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Approved Signatory: James McKelvey (Senior Technician) IANZ Accredited Laboratory Number:105 Date of Issue: 18/01/2017

Material Test Report

Client:

ENGEO Limited

PO Box 305136, Triton Plaza

Auckland 0757

Principal:

Project No.:

773-ETAM00143AA

Project Name:

13451 - ENGEO Testing

Lot No.: -

TRN: -

Sample Details

Sample ID:

ETAM17S-00122

Client Sample:

Date Sampled:

21/12/2016

Source:

Unknown (Sampled by Client)

Material:

Disturbed Soil

Specification: Sampling Method:

No Specification

Project Location:

Unknown (Not IANZ Endorsed)

Sample Location:

HA11 0.4 m

Test Results

100t Hoodito			
Description	Method	Result	Limits
Allophane Content	NZS 4402:1986 Test 3.4	5 - 7 %	
Date Tested		12/01/2017	

Comments

Work Order: ETAM17W00052





Project Name: Drury Town Centre

Deon DeRidder

Location: A5 - Cut Area Project No: 22 0101 00

Page: 1 of 4

Client: Ross Reid Contractors Ltd Date of Order: 02.05.22

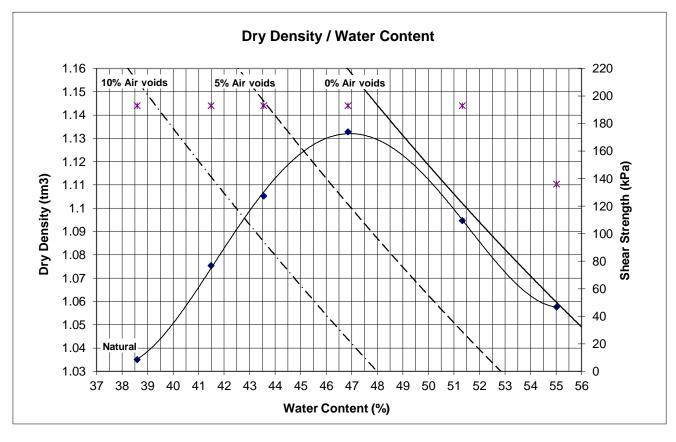
Address: PO Box 58545

Attention:

Botany Sample No.: 070N

Sample Method: Hand Sample Date: 03.05.22

Sampled By: AS



Maximum Dry Density: 1.13 t/m³ Optimum Water Content: 47.0 %

Measured

Natural Water Content: 38.0 % Solid Density of Soil: 2.54 t/m³

Description of Soil : Orange brown SILT

Fraction of soil tested : Passing 19mm History of sample : Natural

Comments:

Tested By:	AS	Date :	03 to 09.05.22
Calculated By :	ZH	Date :	12.05.22
Checked By:	ZH	Date :	13.05.22





Project Name: Drury Town Centre

Deon DeRidder

Location: A8 - Cut Area Project No: 22 0101 00

Page: 2 of 4

Client: Ross Reid Contractors Ltd Date of Order: 02.05.22

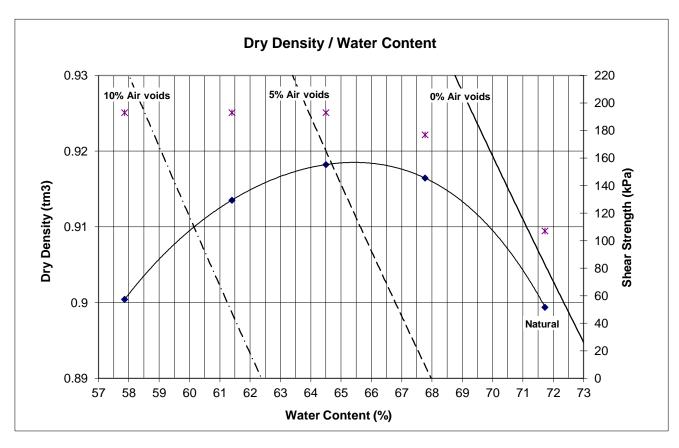
Address: PO Box 58545

Attention:

Botany Sample No.: 071N

Sample Method: Hand Sample Date: 03.05.22

Sampled By: AS



Maximum Dry Density: 0.92 t/m³ Optimum Water Content: 65.0 %

Natural Water Content: 71.7 %
Solid Density of Soil: 2.58 t/m³
Description of Soil: Orange brown SILT

Fraction of soil tested : Passing 19mm sieve History of sample : Natural

Comments:

-

Measured

Tested By:	AS	Date :	03 to 12.05.22
Calculated By :	ZH	Date :	13.05.22
Checked By:	ZH	Date :	16.05.22





Project Name: Drury Town Centre

Location: A11 - Cut area Project No: 22 0101 00

Page: 3 of 4

Client: Ross Reid Contractors Ltd Date of Order: 02.05.22

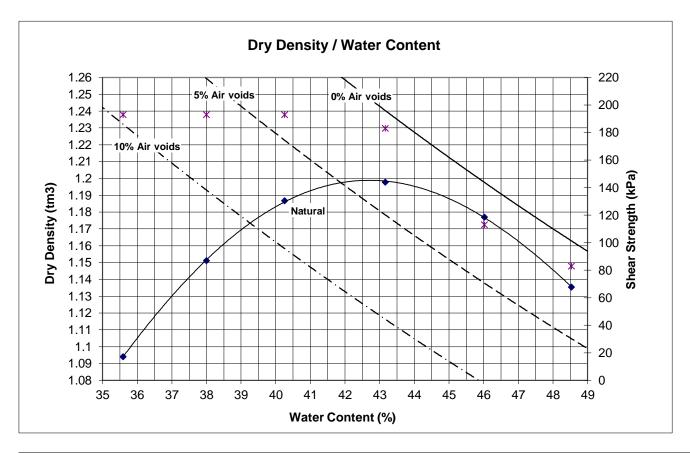
Address: PO Box 58545

Botany Sample No.: 072N

Sample Method: Hand

Attention: Deon DeRidder Sample Date: 03.05.22

Sampled By: AS



Maximum Dry Density: 1.20 t/m³ Optimum Water Content: 43.0 %

Measured

Natural Water Content: 40.3 %
Solid Density of Soil: 2.67 t/m³
Description of Soil: Orange brown SILT

Fraction of soil tested : Passing 19mm sieve History of sample : Natural

Comments:

Tested By:	AS	Date :	03 to 12.05.22
Calculated By:	ZH	Date :	13.05.22
Checked By:	ZH	Date :	16.05.22



DETERMINATION OF THE WATER CONTENT, CONE PENETRATION LIMIT, PLASTIC LIMIT, PLASTICITY INDEX & LINEAR SHRINKAGE

TEST METHOD NZS 4402: 1986 TEST 2.1, 2.3, 2.4, 2.5 & 2.6

Project Name: **Drury Town Centre**

> Project No: 22 0101 00

Client: Ross Reid Contractors Ltd Page: 4 of 4 02.05.22

PO Box 58545 Address:

Date of Order:

Botany

Sample Method: Hand

Deon DeRidder Sample Date: Attention: 03.05.22

> Sampled By: AS

Test Details:

Test performed on: Whole Sample

History: Natural

Sample No.	Location	Depth (m)	Cone Penetration (CPL)	Plastic Limit (PL)	Plasticity Index (PI)	Linear Shrinkage (LS)	Natural Water Content (%)
070N	A5 - Cut area	SGL	97	52	45	23	37.9
071N	A8 - Cut area	2.5m below	124	61	63	24	72.6
072N	A11 - Cut area	1.5m below	106	45	61	25	42.1

Comments:

Tested By:	AS	Date :	03 to 17.05.22
Calculated By :	AS	Date :	19.05.22
Checked By :	ZH	Date :	20.05.22



STEVENSON AGGREGATES LIMITED

Drury Quarry Corner Quarry / Fitzgerald Roads, Drury Auckland www.stevenson.co.nz

Test Number: 211975 Report Number: 39280T

Date of Issue: 9th June 2021 Page 1 of 5 Pages

FINAL REPORT FOR STEVENSON AGGREGATES LTD - CLEVEDON QUARRY

Clients Address: Private Bag 94000

MANUKAU CITY 2241

Attention: Ross Twidle

Reference: Production Quality Control

Subject: AGGREGATE TESTING

Clients Instructions: Conduct the tests as detailed below on the aggregate sample retrieved.

Test Methods: 1. NZS4407: 2015: Tests

3.7.1: Determination of the Solid Density of Aggregate Particles

- Pycnometer Method

3.8.2 Particle Size Distribution – Dry Sieve Method 3.15: Determination of the California Bearing Ratio

2. NZS4402: 1986: Tests

4.1.1: Dry Density/Water Content Relationship

– NZ Standard Compaction

4.1.2: Dry Density/Water Content Relationship

- NZ Heavy Compaction

Date Sampled: 28th May 2021

Date Received: 28th May 2021

Date of Tests: March – April 2021

Description of Sample: Soft Pit Run (SPR)

Source: Clevedon Quarry

Notes: i. Field sample received in its natural state.

ii. Sampling of aggregate is not covered by this report.

for STEVENSON AGGREGATES LTD

B T BUCKLAND

IANZ APPROVED SIGNATORY

Hulund



Material: Soft Pit Run Test No.: 211975

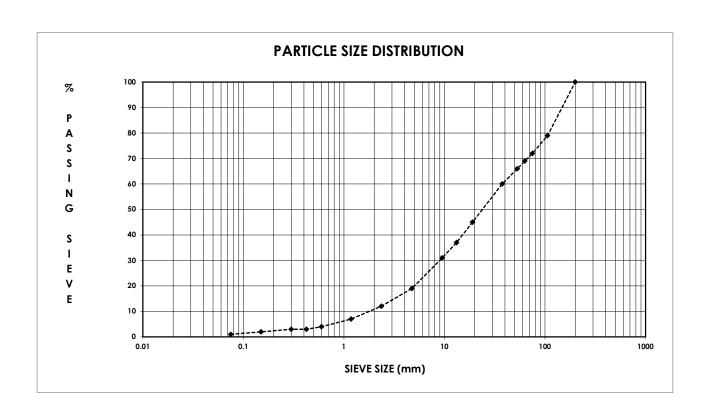
Source: Clevedon Quarry Date Sampled: 28th May 2021

Job: Production Quality Control Reference No.: -

Quantity in Stockpile: Unknown Location: Quarry Stockpile

TEST METHOD	RESULT	SPECIFICATION
Particle Size Distribution (Wet Sieve Method)	See below	-

SIEVE SIZE (mm)	200	106	75	63	37.5	19	13.2	9.5	4.75	2.36	1.18	0.600	0.425	0.300	0.150	0.075
% PASSING SIEVE (Dry)	100	79	72	69	60	45	37	31	19	12	7	4	3	3	2	1
MAXIMUM SPECIFIED LIMIT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MINIMUM SPECIFIED LIMIT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(Dry) = Oven Dried Sample (Wet) = % passing finest sieve obtained by difference								Fii	neness	Modulu	s:	-				



Material: Soft Pit Run Test No.: 211975

Source: Clevedon Quarry Date Sampled: 28th May 2021

Job: Production Quality Control Reference No.: -

Quantity in Stockpile: Unknown Location: Quarry Stockpile

CALIFORNIAN BEARING RATIO

		Result
Compaction effort		NI Heavy Compaction
Sample condition		Soaked
Surcharge mass	(kg)	4.0
Period of Soaking	(Days)	4
Compacted dry density	(t/m³)	2.06
Compacted water content	(%)	11.2
Soaked water content	(%)	11.5
Swell	(%)	-0.4
Rate of penetration	(mm/min)	1
Depth CBR recorded	(mm)	5.0
California Bearing Ratio	CBR	50%

Notes: i. Negative Swell implies shrinkage

ii. Test performed on material passing the 19.0mm test Sieve (45%).

CALIFORNIAN BEARING RATIO

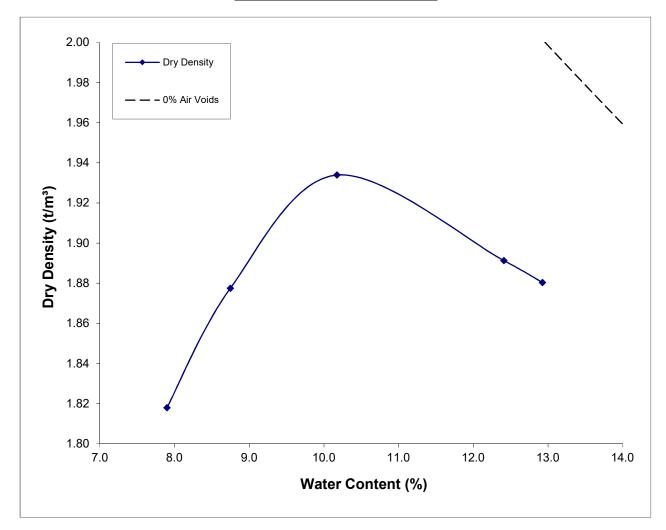
		Result
Compaction effort		NZ Standard Compaction
Sample condition		Soaked
Surcharge mass	(kg)	4.0
Period of Soaking	(Days)	4
Compacted dry density	(t/m³)	1.96
Compacted water content	(%)	13.4
Soaked water content	(%)	12.2
Swell	(%)	0.0
Rate of penetration	(mm/min)	1
Depth CBR recorded	(mm)	5.0
California Bearing Ratio	CBR	35%

Notes: i. Negative Swell implies shrinkage

ii. Test performed on material passing the 19.0mm test Sieve (45%).

Material:Soft Pit RunTest No.:211975Source:Clevedon QuarryDate Sampled:28th May 2021Job:Production Quality ControlReference No.:-Quantity in Stockpile:UnknownLocation:Quarry Stockpile

NZ STANDARD COMPACTION



Maximum Dry	Optimum Water	Solid Density	Natural
Density	Content	Measured	Water Content
(t/m³)	(%)	(t/m³)	<19mm %
1.93	10.0	2.70	

Water Content	(%)	7.9	8.7	10.2	12.4	12.9
Dry Density	(t/m³)	1.82	1.88	1.93	1.89	1.88

Note: i. Test performed on material <19.0mm (45%).

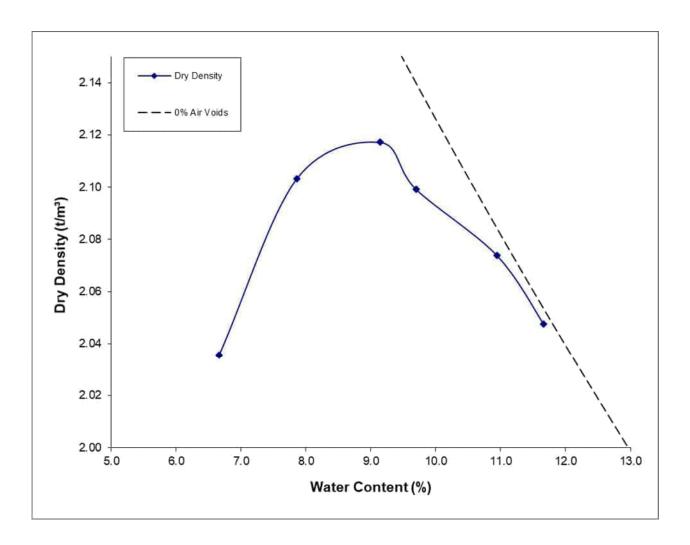
Material: Soft Pit Run Test No.: 211975

Source: Clevedon Quarry Date Sampled: 28th May 2021

Job: Production Quality Control Reference No.: -

Quantity in Stockpile: Unknown Location: Quarry Stockpile

NZ HEAVY COMPACTION



Maximum Dry	Optimum Water	Solid Density	Natural
Density	Content	Measured	Water Content
(t/m³)	(%)	(t/m³)	<19mm %
2.12	9.0	2.70	6.9

Water Content	(%)	6.7	7.9	9.1	9.7	10.9	11.7
Dry Density	(t/m³)	2.04	2.10	2.12	2.10	2.07	2.05

Note: i. Test performed on material <19.0mm (45%).



STEVENSON AGGREGATES LIMITED
Drury Quarry
Corner Quarry / Fitzgerald Roads, Drury
Auckland
www.stevenson.co.nz

Test Number: 221807 Report Number: 42470T

Date of Issue: 9th June 2022 Page 1 of 5 Pages

FINAL REPORT FOR STEVENSON AGGREGATES LTD - CLEVEDON QUARRY

Clients Address: PO Box 94000

MANUKAU CITY 2241

Attention: Mr R. Twidle

Reference: Production Quality Control

Subject: AGGREGATE TESTING

Clients Instructions: Conduct the tests as detailed below on the aggregate sample retrieved.

Test Methods: 1. NZS4407: 2015: Tests

3.6 Determination of the Sand Equivalent

3.7.1: Determination of the Solid Density of Aggregate Particles

- Pycnometer Method

3.8.1: Particle Size Distribution – Wet Sieve Method

3.10 Determination of Crushing Resistance of Coarse Aggregates under

a specified load

3.15: Determination of the California Bearing Ratio (CBR)

2. NZS4402: 1986: Test

4.1.1: Dry Density/Water Content Relationship

- NZ Standard Compaction

4.1.3: Dry Density/Water Content Relationship

- NZ Vibration Hammer Compaction

Date Sampled: 27th April 2022

Date Received: 27th April 2022

Date of Test: April - June 2022

Description of Sample: Soft Pit Run

Source: Clevedon Quarry

Note: i. Field sample received in its natural state.

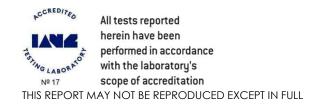
ii. Sampling of aggregate and product information is not covered by this report.

iii. Test results apply to sample received.

for STEVENSON AGGREGATES LTD

T A WHITMORE

IANZ APPROVED SIGNATORY



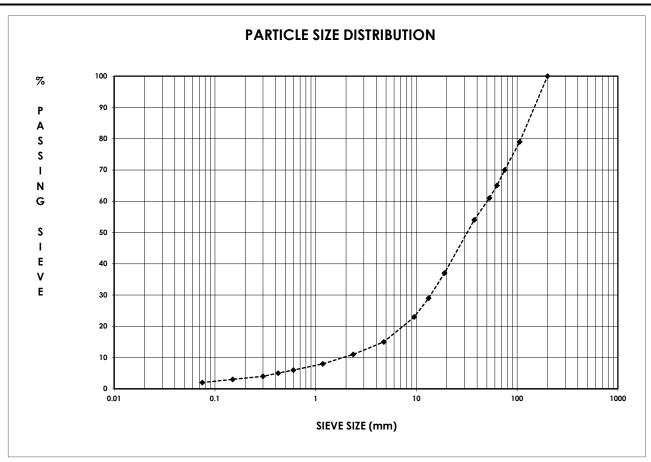
Material:Soft Pit RunTest No.:221807Source:Clevedon QuarryDate Sampled:27th April 2022Job:Production Quality ControlReference No.:-Quantity in Stockpile:UnknownLocation:Quarry Stockpile

TEST METHOD	RESULT	SPECIFICATION
Particle Size Distribution (Wet Sieve method)	See below	-
Crushing Resistance	12% @ 130kN	10% @ 130kN
Sand Equivalent (Air Dried, Washed, Brushed, Mechanical Shaking)	26	-

Notes: i. Crushing Resistance test performed on material passing 13.2mm sieve and retained on 9.5mm sieve.

ii. Crushing resistance needed to produce 10% fines is LESS than specified load

SIEVE SIZE (mm)	200	106	75	63	37.5	19	13.2	9.5	4.75	2.36	1.18	0.600	0.425	0.300	0.150	0.075
% PASSING SIEVE (Wet)	100	79	70	65	54	37	29	23	15	11	8	6	5	4	3	2
MAXIMUM SPECIFIED LIMIT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MINIMUM SPECIFIED LIMIT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(Dry) = Oven Dried Sample (Wet) = % passing finest sieve obtained by difference Fineness Modulus:						s:	-									



Material:	Soft Pit Run	Test No.:	221807
Source:	Clevedon Quarry	Date Sampled:	27 th April 2022
Job:	Production Quality Control	Reference No.:	-
Quantity in Stockpile:	Unknown	Location:	Quarry Stockpile

CALIFORNIAN BEARING RATIO

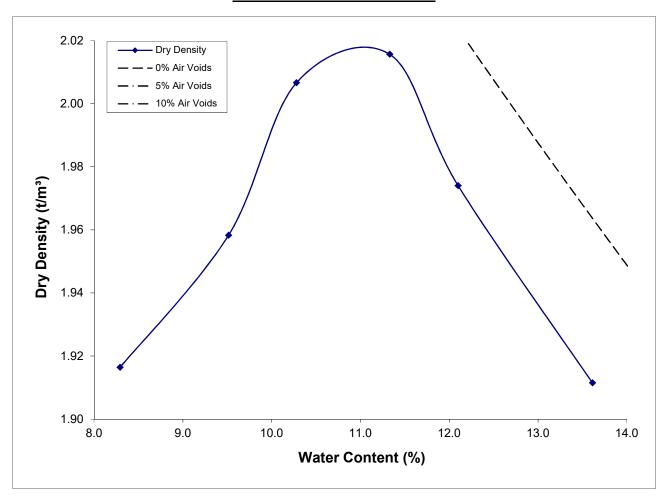
		Results
Compaction Effort		NZ Vibration Hammer
Sample Condition		Soaked
Surcharge Mass	(kg)	4.0
Period of Soaking	(Days)	4
Compacted Dry Density	(t/m³)	2.04
Compacted Water Content	(%)	11.0
Soaked Water Content	(%)	11.4
Swell	(%)	0
Rate of Penetration	(mm/min)	1
Depth CBR Recorded	(mm)	5.0
California Bearing Ratio	CBR	60%

Notes: i. Negative Swell implies shrinkage.

ii. Test performed on material passing the 19.0mm Test Sieve (37%).

Material:	Soft Pit Run	Test No.:	221807
Source:	Clevedon Quarry	Date Sampled:	27 th April 2022
Job:	Production Quality Control	Reference No.:	-
Quantity in Stockpile:	Unknown	Location:	Quarry Stockpile

NZ STANDARD COMPACTION



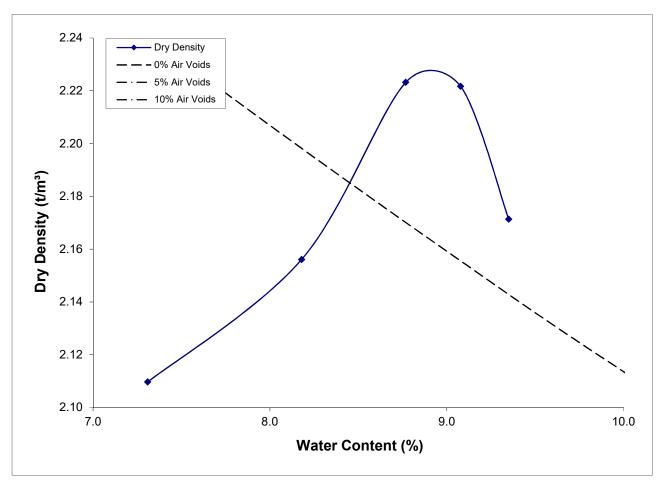
Maximum Dry	Optimum Water	Solid Density	Natural
Density	Content	Measured	Water Content
(t/m³)	(%)	(t/m³)	(%)
2.02	11.0	2.68	6.9

Water Content	(%)	8.3	9.5	10.3	11.3	12.1	13.6
Dry Density	(t/m³)	1.92	1.96	2.01	2.02	1.97	1.91

Note: i. Test performed on material passing the 19.0mm sieve (37%)

Material:	Soft Pit Run	Test No.:	221807
Source:	Clevedon Quarry	Date Sampled:	27 th April 2022
Job:	Production Quality Control	Reference No.:	-
Quantity in Stockpile:	Unknown	Location:	Quarry Stockpile

NZ VIBRATION HAMMER COMPACTION

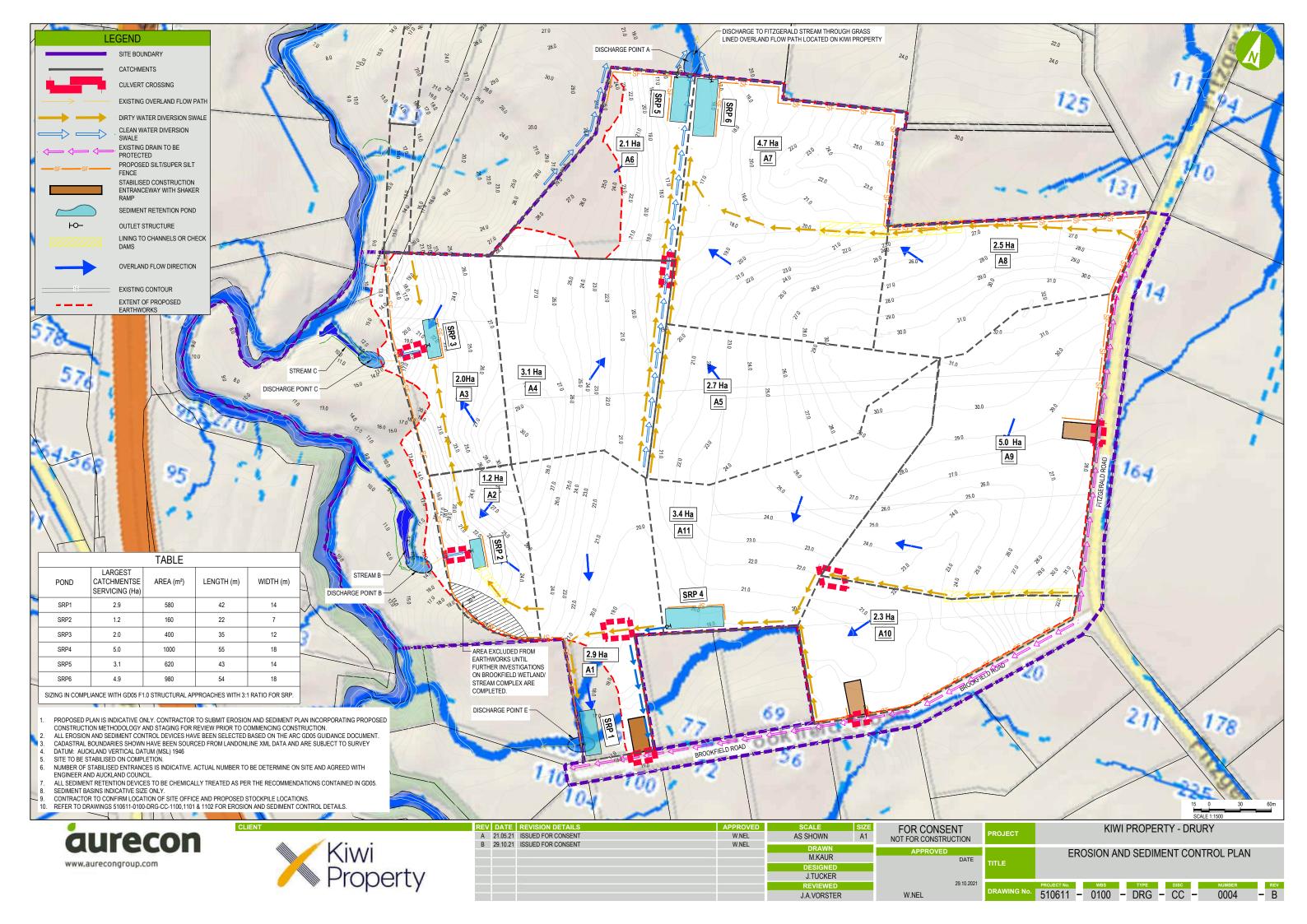


Maximum Dry Density (t/m³)	Optimum Water Content (%)	Solid Density Measured (t/m³)	Natural Water Content (<37.5mm) %
2.22	9.0	2.68	6.7

Water Content	(%)	7.3	8.2	8.8	9.1	9.3
Dry Density	(t/m³)	2.11	2.16	2.22	2.22	2.17

Note: i. Test performed on material passing the 37.5mm sieve (54%)

Allophane Soil Assessment Drury Centre Precinct 510611







Project Name: Drury Town Centre

Deon DeRidder

Location: A5 - Cut Area Project No: 22 0101 00

Page: 1 of 4

Client: Ross Reid Contractors Ltd Date of Order: 02.05.22

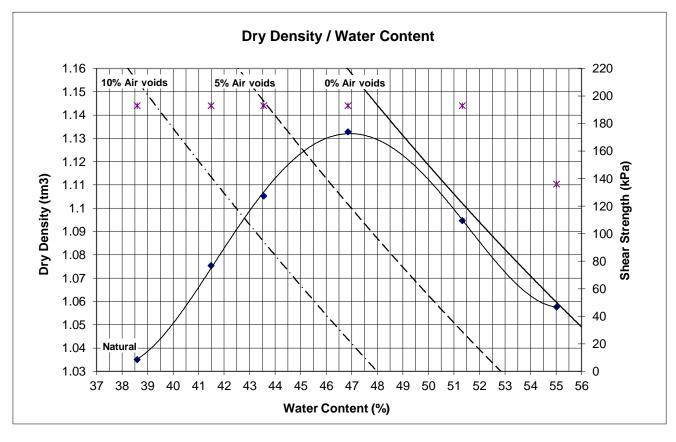
Address: PO Box 58545

Attention:

Botany Sample No.: 070N

Sample Method: Hand Sample Date: 03.05.22

Sampled By: AS



Maximum Dry Density: 1.13 t/m³ Optimum Water Content: 47.0 %

Measured

Natural Water Content: 38.0 % Solid Density of Soil: 2.54 t/m³

Description of Soil : Orange brown SILT

Fraction of soil tested : Passing 19mm History of sample : Natural

Comments:

Tested By:	AS	Date :	03 to 09.05.22
Calculated By :	ZH	Date :	12.05.22
Checked By:	ZH	Date :	13.05.22





Project Name: Drury Town Centre

Deon DeRidder

Location: A8 - Cut Area Project No: 22 0101 00

Page: 2 of 4

Client: Ross Reid Contractors Ltd Date of Order: 02.05.22

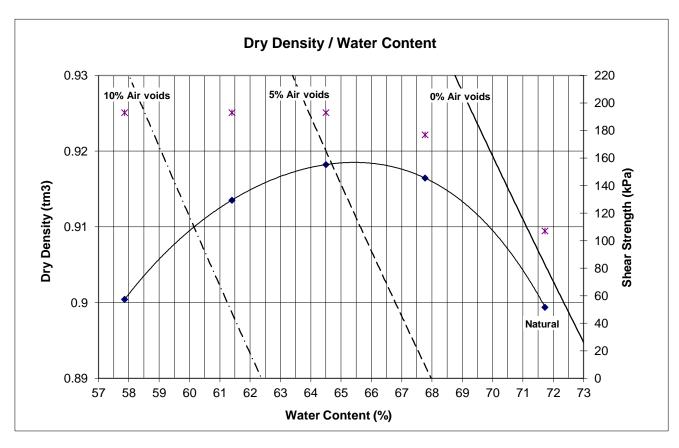
Address: PO Box 58545

Attention:

Botany Sample No.: 071N

Sample Method: Hand Sample Date: 03.05.22

Sampled By: AS



Maximum Dry Density: 0.92 t/m³ Optimum Water Content: 65.0 %

Natural Water Content: 71.7 %
Solid Density of Soil: 2.58 t/m³
Description of Soil: Orange brown SILT

Fraction of soil tested : Passing 19mm sieve History of sample : Natural

Comments:

assing reministere Thistory of sample. Tratal

Measured

Tested By:	AS	Date :	03 to 12.05.22	
Calculated By:	ZH	Date :	13.05.22	
Checked By:	ZH	Date :	16.05.22	





Project Name: Drury Town Centre

Location: A11 - Cut area Project No: 22 0101 00

Page: 3 of 4

Client: Ross Reid Contractors Ltd Date of Order: 02.05.22

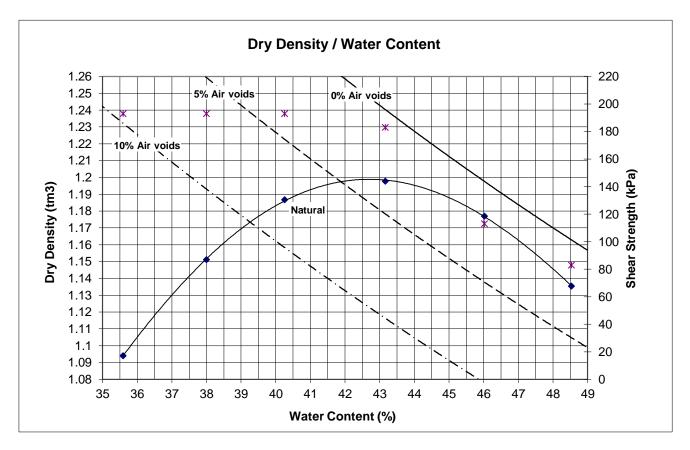
Address: PO Box 58545

Botany Sample No.: 072N

Sample Method : Hand

Attention: Deon DeRidder Sample Date: 03.05.22

Sampled By: AS



Maximum Dry Density: 1.20 t/m³ Optimum Water Content: 43.0 %

Measured

Natural Water Content: 40.3 % Solid Density of Soil: 2.67 t/m³

Description of Soil : Orange brown SILT Fraction of soil tested : Passing 19mm sieve

Fraction of soil tested : Passing 19mm sieve History of sample : Natural Comments :

Tested By: AS Date: 03 to 12.05.22

 Calculated By :
 ZH
 Date :
 13.05.22

 Checked By :
 ZH
 Date :
 16.05.22

