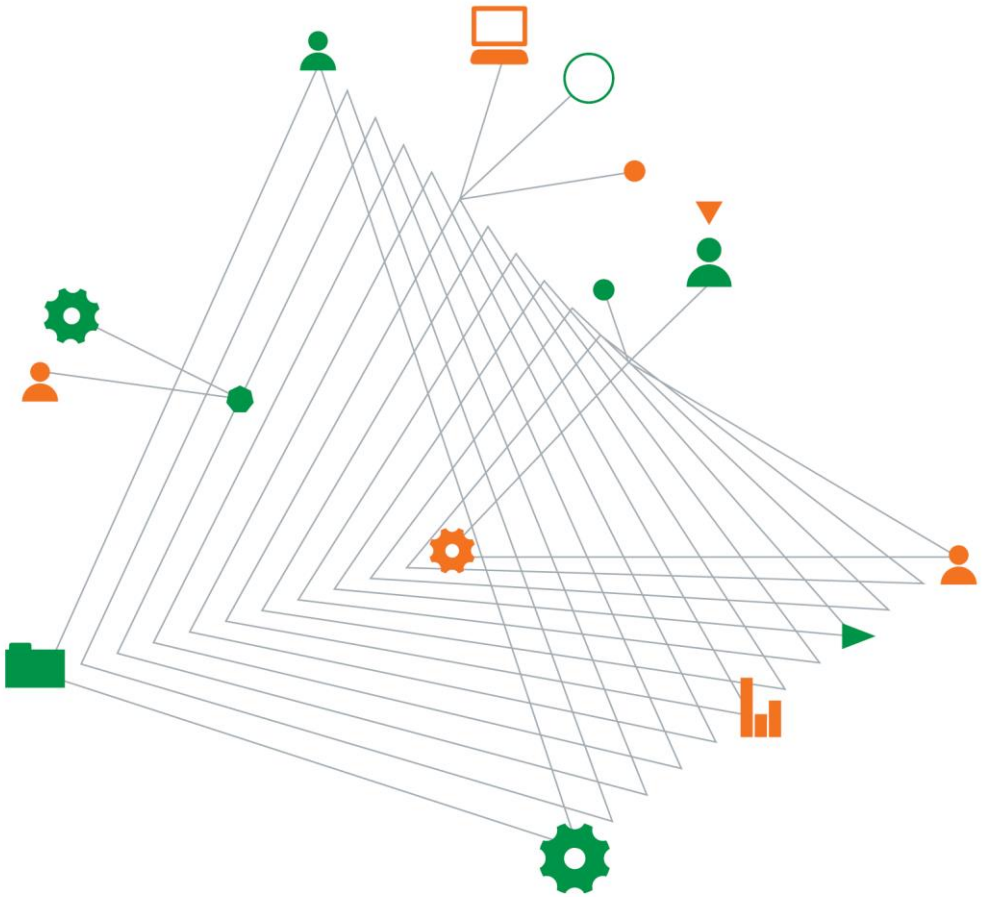
Hugh Green Limited

Geotechnical Completion Report on Donegal Stud Stage 8 at 64 Thomas Road, Flat Bush, Auckland

Project No GENZAUCK16403AC

6 December 2016



Experience comes to life when it is powered by expertise

Donegal Stud Stage 8 at 64 Thomas Road, Flat Bush, Auckland

Hugh Green Limited
Donegal Stud
C/- Harrison Grierson Consultants Limited
PO Box 5760
Wellesley Street
Auckland 1051

Prepared by
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Our Reference: GENZAUCK16403AC

6 December 2016

Dear Will

RE: Geotechnical Completion Report for Residential Subdivision at Donegal Stud Stage 8, 64 Thomas Road, Flat Bush, Auckland

This report presents all supporting geotechnical data and our Suitability Statement in relation to land development works undertaken at the above location.

It has been prepared in accordance with instructions received from Harrison Grierson Consultants Limited and forms part of the documentation required by Auckland Council to achieve certification under Section 224(c) of the Resource Management Act.

If you have any queries or you require any further clarification on any aspects of this report, please do not hesitate to contact the undersigned.

For and on behalf of Coffey

Kah-Weng Ho
Senior Principal

Quality information

Revision history

Revision	Description	Date	Author	Reviewer	Signatory
0	Final	06/12/2016	RB	PM	RB

Distribution

Report Status	No. of copies	Format	Distributed to	Date
Final	1	PDF	Hugh Green Limited	06/12/2016
Final	1	PDF	Auckland Council	06/12/2016
Final	1	Original	Coffey Geotechnics (NZ) Limited	06/12/2016

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Appendices

1. Introduction and Description of Subdivision

This Geotechnical Completion Report (GCR) has been prepared for Hugh Green Limited as part of the documentation required to be submitted to the Auckland Council following residential subdivisional development.

It contains our Suitability Statement, relevant test data and the Harrison Grierson Consultants Limited as-built plan set relating to Stage 8 of the Donegal Stud Residential Subdivision as follows:

Table 1: Harrison Grierson Consultants Limited As-Built Plans

Title	Reference No.	Date
Stage 8 Finished Contours As-Built	136822-AB200	28 November 2016
Stage 8 Cut Fill As-Built	136822-AB220	28 November 2016
Stage 8 Pavement As-Built	136822-AB301	30 November 2016
Stage 8 Pavement As-Built Sections Sheet 1 of 4	136822-AB330	30 November 2016
Stage 8 Pavement As-Built Sections Sheet 2 of 4	136822-AB331	30 November 2016
Stage 8 Pavement As-Built Sections Sheet 3 of 4	136822-AB332	30 November 2016
Stage 8 Pavement As-Built Sections Sheet 4 of 4	136822-AB333	30 November 2016

This report covers the construction period early-August 2016 to mid-November 2016. It is intended to be used for certification purposes for:

- 73 residential lots numbered 1 to 73; and
- 8 new roads named Road 1 to Road 8.

Stage 8 of the subdivision is located at 64 Thomas Road and as can be seen on the cut fill as-built plan, most of the lots have been partly or totally affected by filling, to a maximum depth of up to approximately 1.5 metres.

Pre-existing underfill drains and filling are located within the north western portion of the site, refer Harrison Grierson Consultants limited Finished Contours As-Built Plan presented in Appendix 1. The underfill drains and associated filling are expressly excluded from this certification.

2. Related Reports

Geotechnical Reports prepared on the subject land by this consultancy are as a follows:

- Geotechnical Investigation Report on Donegal Stud subdivision, reference GENZNEWP15126; dated 26 May 2011;
- Earthworks Plan Review on Donegal stud Stage 2 to 4, reference GENZAUCK15126AC, dated 22 August 2012;
- Earthworks Plan Review on Donegal stud Stage 6, reference GENZAUCK15126AF, dated 21 August 2013;
- Geotechnical Completion Report on Donegal Stud Stage 4, reference GENZAUCK15126AC, dated 11 November 2013;

- Geotechnical Completion Report on Donegal Stud Stage 6, reference GENZAUCK15126AF, dated 16 June 2014;
- Geotechnical Investigation Report on 62 Thomas Road, Flat Bush, reference GENZNEWP16403, dated 18 December 2014; and
- Plan Review for Proposed Earthworks (our reference GENZAUCK16403AC dated 22 July 2015 supporting the subdivisional development of Donegal Stud, Stage 8.

The conclusions and recommendations of those documents (where relevant) have been reviewed during the preparation of this report.

3. Earthworks Operations

3.1. Plant

The main items of plant used by the Contractor, Ross Reid Contractors Limited were:

- 2 x Motor scrapers;
- 1 x Bulldozer;
- 2x Moxy Dump Truck;
- 4 x Excavators;
- 1 x Tractor;
- 1 x Water Cart;
- 2 x 825 Caterpillar Sheep Foot compactors;
- 1 x Grader; and
- 2 x Vibrating Drum Roller.

3.2. Construction Programme

Earthworks were conducted within the area defined as Donegal Stud Stage 8 during the previous development of Donegal Park Stages 1A to 1C in the construction season of 1997 to 1998. During this time a series of underfill drains were placed within a gully network prior to engineered fill being placed. The extent and location of the underfill drains is shown on the Harrison Grierson, Stage 8 Finished Contours As-Built Plan, refer Appendix 1. Further, the original Harrison Grierson Depth of Fill Plan, fill compaction test records and Statement of Professional Opinion as to Suitability of Land for Residential Development are contained in Appendix D. These works do not form part of this certification.

Earthworks operations for Stage 8 commenced in mid-December 2015 with the construction of a temporary silt pond in the north western corner of the development area. Prior to the commencement of the enabling works a horse stable was demolished and removed from site and during this process, uncertified filling was uncovered beneath the stables. At this time a trial pit investigation was conducted to ascertain the extent and quality of the uncertified fill materials. Due to the high content of debris contained within the uncertified fill material, it was decided that the material was to be uplifted and stockpiled beyond the northern boundary of the Stage 8 development area.

The formation of the temporary silt pond was completed by mid-January 2016 and at this time topsoil stripping commenced. By late February 2016 the bulk of the uncertified filling and topsoil had been

removed from site. Prior to the commencement of bulk filling an area of soft ground noted during the process of topsoil stripping was undercut by 500mm. The undercut materials were then mixed and conditioned then placed back into the undercut as engineer certified filling.

Bulk earthworks continued steadily with the majority of the cut / fill being completed by April 2016. Prior to the completion of the bulk earthworks (late March2016) a small fill area located on the north eastern boundary (adjacent to a gully system) was prepared to receive fill. Fill was placed at this location to form a batter / abutment for a road culvert crossing that is to be formed at a later date (during the development the greater 64 Thomas Road development area). Due to the toe of the batter being located within the gully and on soft alluvial sediments, it was decided that a 0.5m undercut should be performed to remove the unsuitable alluvial deposits. The unsuitable deposits were then replaced by compacted Soft Pit Run (SPR) hardfill prior to the batter being formed with cohesive fill.

By mid-May earthworks primarily focussed on the respreading of topsoil, the installation of site services and the construction of the internal roads. Due to the prevailing inclement weather conditions it was decided to stabilise the road subgrades with a mixture of lime and cement so that earthworks, including road construction could continue over the winter period. However, due to elevated soil moisture contents and low atmospheric temperatures, subgrade stabilisation was ineffective, particularly in the northern portion of the site.

To enable construction to continue, the roads in the northern portion of the site (Roads 1, 2, 3 and 7) were undercut by up to 600mm with the low strength subgrade materials being replaced with either black sand or compacted GAP65. By September 2016 the undercutting and replacement of the road subgrade materials in the northern portion of the site was mostly complete.

After the completion of the undercutting of the roads described above, sub-basecourse hardfill was then placed and compacted prior to kerb and channels being formed. During this period heaving of the subgrade was observed over sections of Road 4 and Road 5. The extent of the low strength subgrade was delineated and the materials were then undercut by typically 400mm with the unsuitable material being replaced by compacted GAP65.

Road subgrade preparation was completed by mid-October 2016 and at this stage the installation of the road under channel drains and formation of the road pavement commenced. During the bulk earthworks (cut) phase in this area and during the installation of the under channel drains (for Road 2 and Road 5) the pre-existing underfill drain located in and beyond Lot 36 was intercepted or exposed at the surface of the subgrade. As a result, this drain coil was removed in its entirety.

Construction of the road basecourse and installation of site services continues steadily until their completion in late November 2016.

4. Quality Assurance and Controls

4.1. Inspections

During the earthworks engineering inspections were undertaken on a regular basis to assess compliance with NZS 4431 and our project specific recommendations and specifications. Project specific inspections were required on this stage of the development for:

- Topsoil stripping;
- Observed bulk cut to fill operations; and
- Observe the removal of unsuitable fill.

4.2. Quality Control Criteria

4.2.1. Compaction

Due to the varying soil types being used as filling, the compaction control criteria of minimum allowable shear strength and maximum allowable air voids were mainly used for quality assurance purposes.

Specification details were as follows:

Minimum Shear Strength and Maximum Air Voids Method

Table 2: Minimum Shear Strength and Maximum Air Voids Method

(a)	Air Voids Percentage	
	(As defined in NZS 4402)	
	General Fill	
	Average value less than	10%
	Maximum single value	12%
	Maximum value	
(b)	Undrained Shear Strength	
	(Measured by Pilcon shear vane - calibrated using NZGS 2001 method)	
	General fill	
	Average value not less than	140 kPa
	Minimum single value	120 kPa

4.3. Quality Assurance Testing

4.3.1. Compaction

Regular insitu density, strength and water content tests were carried out on all areas of the filling at or in excess of the frequency recommended by NZS 4431. Within Stage 8 there was one occasion where the filling failed to meet the aforementioned criteria. The test failure was relayed to the site foreman and/or his staff, and to the best of our knowledge the affected area of fill was re-worked as necessary. Further testing was carried out until compliance with the standards was achieved.

5. Project Evaluation

5.1. Bearing Capacity and Settlement of Building Foundations

Following the completion of earthworks operations, we returned to the site on 11 August 2016 and 17 November 2016 and drilled a series of hand auger boreholes at appropriate natural ground locations in order to evaluate likely foundation options for future building development. Topsoil depths on each lot were also assessed at this time.

At current subgrade levels all filled and undisturbed natural ground has a geotechnical ultimate bearing capacity of 300 kPa within the influence of conventional shallow residential building foundation loads.

It should be noted that NZS 3604 only allows a maximum backfill depth of 600mm over the building platform of a dwelling unless an Engineering design solution is proposed, on account of the risk of induced consolidation of the subsoils caused by the weight of the backfill.

5.2. Expansive Soils

Two sets of Expansive soil tests were carried out on samples selected from within the zone of likely influence of shallow building foundations in Stage 8 development area.

These tests were carried out in accordance with NZS 4402, "Methods of Testing Soils for Civil Engineering Purposes" test section 2 and were primarily intended to assess the Expansive Classes of the site materials as defined in AS 2870, "Residential Slabs and Footings – Construction".

All test results are IANZ (International Accreditation New Zealand) endorsed and full details are appended.

The AS 2870 Site Class for this subdivision is M (moderate), and is based on the laboratory results together with our visual-tactile assessment and local knowledge. Specific design alternatives for this Site Class are presented in the Suitability Statement.

5.3. Fill Induced Settlement

As a result of our pre-fill inspections and quality control testing, we are of the opinion that induced differential settlements beneath or within the certified filling due to its imposed weight should be insignificant with respect to conventional NZS 3604 residential building developments.

5.4. Vegetation Cover

Wherever practical on sloping land beyond building platform areas all existing grass cover should be maintained and even supplemented with new plantings. Any vegetation cleared beyond the immediate area of building platforms for temporary construction purposes should be replanted replaced as soon as possible.

The contribution of appropriate vegetation cover to overall sediment and erosion control should not be underestimated.

5.5. Stormwater Controls

It is important on all sloping lots that due care is paid to the design and construction of appropriate stormwater disposal systems. These systems should serve to collect all runoff from roofs, decks and paved areas, together with discharges from retaining wall drains and other subsoil drains and should connect directly into the public stormwater drainage network.

5.6. Service Trenches

As is normal on all subdivisions, building developments involving foundations within a 45 degree zone of influence from pipe inverts will require engineering input. However, it is unlikely to be an issue for Stage 8 based on the as-built plans.

5.7. Road Subgrades

Dynamic Cone Penetrometer (DCP) testing was undertaken at regular intervals on the road subgrades and the results were subsequently forwarded to Harrison Grierson Consultants Limited for pavement design purposes. We understand that all roads within Stage 8 were either stabilised with lime and cement or undercut and replaced with black sand and /or GAP65 hardfill, as depicted on Harrison Grierson Consultants limited Stage 8 Pavement As-Built plan, reference136822-AB301, dated 30 November 2016, refer Appendix 1.

5.8. Underfill Drains

During the development of Donegal Park Stages 1A to 1C a series of perforated underfill drains were placed in the mucked out gully inverts to tap groundwater seepages prior to filling, as required by NZS 4431.

These drains were intended to intercept localised groundwater seepages and springs during earthworks and to help provide general control over groundwater levels. They are buried beneath 0.5 to 1.5m depth of engineered filling placed during the construction season of 1997 to 1998. In the event of any foundation solutions being constructed in the 45 degree zone of influence of these drains, they must be endorsed by an Engineer to ensure they do not compromise the function of the drains.

These drains are not covered under this certification.

5.9. Topsoil

Topsoil depths in likely building platform areas were checked by the drilling of a borehole in the approximate centre of each of the lots. Our findings, which are indicative only and subject to variation at other locations, show that likely topsoil depths are between 50 mm and 300 mm.

5.10. Contractor's Work

We have relied on the Contractor's work practices and assume that the works have been carried out in accordance with:

(i) The approved Contract drawings and design details,

(ii) The approved Contract specifications,

(iii) Authorised Variations to (i) and (ii) during the execution of the works,

(iv) The conditions of Resource, Earthworks and Building Consents where applicable,

(v) The relevant Coffey Geotechnics reports, recommendations and site instructions,

and that all as-built information and other details provided to the Client and/or Coffey Geotechnics are accurate and correct in all respects.

6. Statement of Professional Opinion as to the Suitability of Land for Building Development

I, Kah-Weng Ho, of Coffey Geotechnics (NZ) Limited, Auckland, hereby confirm that:

1. I am a Chartered Professional Engineer experienced in the field of geotechnical engineering as defined in section 1.2.3 of NZS 4404 and was retained by the Developer as the Geotechnical Engineer on Stage 8 of the Donegal Stud residential subdivision, Flat Bush.
2. The extent of preliminary investigations carried out to date are described in Geotechnical Investigation Report, reference GENZAUCK16403AC, dated 18 December 2014. The conclusions and recommendations of that document have been re-evaluated in the preparation of this report. Details of the results of all tests carried out are appended.
3. In my professional opinion, not to be construed as a guarantee, I consider that:
   a. The earth fills shown on the appended Harrison Grierson Consultants Limited Cut-Fill As-Built Plan have been placed in compliance with NZS 4431 and related documents.
   b. The function of all underfill drains on Lots 36, 72 and 73 must not be impaired by any building development or landscaping works. In particular, any bored or driven piles must be positioned to avoid damaging these drains. The presence of all such drains should be recorded on Council's hazard register.
   c. A geotechnical ultimate bearing capacity of 300 kPa may be assumed for shallow foundation design on all lots.

      Where a geotechnical bearing capacity greater than 300 kPa is required, (i.e. outside the limits of NZS 3604, such as when piling is undertaken), further specific site investigation and design of foundations should be carried out prior to building consent application.

   d. The backfilling and compaction of the stormwater and sanitary sewer trenches on this subdivision has where possible been carried out to appropriate standards having regard for the prevailing ground conditions and associated compaction induced pipe loadings.

      Nevertheless, no building development should take place within the 45 degree zone of influence of drain inverts unless endorsed by specific site investigations, foundation designs 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 the pipe and the trench backfill.

   e. The assessed AS 2870:2011 expansive site Class for all lots is M (moderate).
   f. Subject to the geotechnical recommendations and expansive soil assessment associated with 3(b), 3(c) 3(d) and 3(e) above:
      (i) The cut, filled and original ground within residential lot boundaries is generally suitable for residential buildings constructed in accordance with NZS 3604 (that incorporates specific foundation and associated structural design on account of the expansive soils site class) and related documents.
      (ii) On all lots foundation design may be carried out in accordance with AS 2870:2011 (Class M) or alternatively, a specific foundation and structural design may be undertaken by a Chartered Professional Engineer who should allow for expansive soil effects in the design. The minimum recommended foundation depth below cleared ground level following topsoil removal and benching of building platform areas is 600mm for NZS3604 type strip and pad foundations.
4. Road subgrades have been formed having due regard for slope stability and settlement, although CBR values will likely vary between natural and filled ground as is to be expected.

7. Limitations

The as-built plans and the professional opinion contained within this report are furnished to the Auckland Council and Hugh Green Limited for their purposes alone on the express condition that they will not be relied upon by any other person. Prospective purchasers should still satisfy themselves as to any specific conditions pertaining to their particular land interest.

The appended table summarises the status of each residential lot covered by this Suitability Statement.

For and on behalf of Coffey

Prepared By:

Ray Berry
Senior Engineering Geologist

Authorised By:

Kah-Weng Ho
Senior Principal

Table 6: Suitability Statement Summary

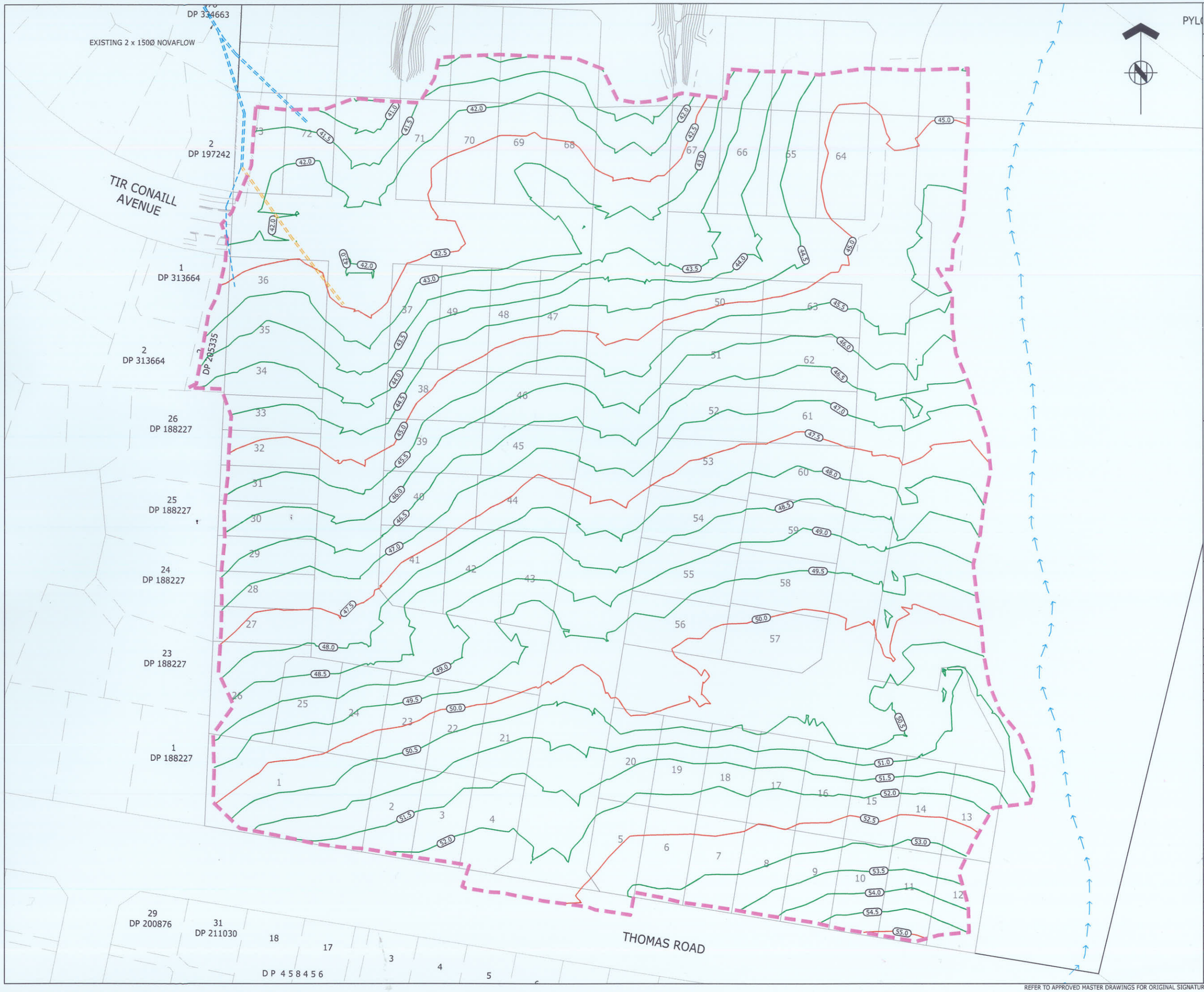
Lot No.	Comments	Topsoil Depth (mm)	Ultimate Bearing (kPa)	AS2870:2011 Class
1	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	300	300	M
2	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	200	300	M
3	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	100	300	M
4	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	200	300	M
5	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	150	300	M
6	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	200	300	M
7	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	75	300	M
8	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	250	300	M
9	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	150	300	M
10	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	250	300	M
11	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	100	300	M
12	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	150	300	M
13	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	100	300	M
14	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	100	300	M
15	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	150	300	M
16	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	200	300	M
17	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	250	300	M
18	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	250	300	M
19	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	200	300	M
20	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	175	300	M
21	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	50	300	M
22	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	100	300	M
23	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	200	300	M

Lot No.	Comments	Topsoil Depth (mm)	Ultimate Bearing (kPa)	AS2870:2011 Class
24	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	175	300	M
25	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	100	300	M
26	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	150	300	M
27	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	200	300	M
28	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	250	300	M
29	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	200	300	M
30	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	200	300	M
31	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	250	300	M
32	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	200	300	M
33	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	225	300	M
34	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	75	300	M
35	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	200	300	M
36	Buried underfill drain to be preserved (refer section 6.3(b)). AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	175	300	M
37	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	50	300	M
38	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	75	300	M
39	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	200	300	M
40	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	175	300	M
41	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	200	300	M
42	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	250	300	M
43	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	300	300	M
44	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	300	300	M
45	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	250	300	M
46	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	300	300	M

Lot No.	Comments	Topsoil Depth (mm)	Ultimate Bearing (kPa)	AS2870:2011 Class
47	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	125	300	M
48	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	175	300	M
49	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	150	300	M
50	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	75	300	M
51	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	200	300	M
52	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	200	300	M
53	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	225	300	M
54	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	225	300	M
55	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	175	300	M
56	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	200	300	M
57	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	200	300	M
58	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	100	300	M
59	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	200	300	M
60	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	150	300	M
61	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	250	300	M
62	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	200	300	M
63	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	200	300	M
64	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	300	300	M
65	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	300	300	M
66	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	250	300	M
67	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	200	300	M
68	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	150	300	M
69	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	150	300	M
70	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	75	300	M

Lot No.	Comments	Topsoil Depth (mm)	Ultimate Bearing (kPa)	AS2870:2011 Class
71	AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	50	300	M
72	Buried underfill drain to be preserved (refer section 6.3(b)). AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	200	300	M
73	Buried underfill drain to be preserved (refer section 6.3(b)). AS 2870 foundation design or NZS 3604 with minimum footing depth 600mm.	200	300	M

Appendix A – Harrison Grierson Consultants Limited As-Built Plans



NOTES:

1. ORIGIN OF LEVELS
   S 66 SO 48643
   RL 54.50m
2. ORIGIN OF COORDINATES
   S 66 SO 48643
   5905356.71mN
   1770941.22mE

LEGEND:

- EXTENT OF EARTHWORKS
- 45.0 CONTOUR MAJOR
- 44.5 CONTOUR MINOR
- EXISTING 150Ø NOVAFLOW
- ABANDONED 150Ø NOVAFLOW

ENGINEERING APPROVAL
ENG-48683

I CERTIFY THAT THESE ASBUILT PLANS ARE AN ACCURATE RECORD OF THE WORKS UNDERTAKEN AND THAT:

- THE COORDINATES (X,Y) ARE IN TERMS OF NZTM ON NZGD (2000), AND ARE WITHIN ±50mm.
- THE LEVELS (Z) ARE IN TERMS OF THE AUCKLAND 1946 (MSL) LINZ DATUM (DOSLI DATUM), AND ARE WITHIN ±25mm.

Signed: ..... CHARTERED PROFESSIONAL ENGINEER
Date: 28.11.16

Name: WILLIAM JOHN FREDERICK PLATTS
Phone: 09-917-5000
Email: w.platts@harrisongrierson.com

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REF	REVISIONS	BY	DATE
A	AS-BUILT	WJP	28.11.16

PROJECT:

DONEGAL STUD
THOMAS ROAD
FLAT BUSH

TITLE:

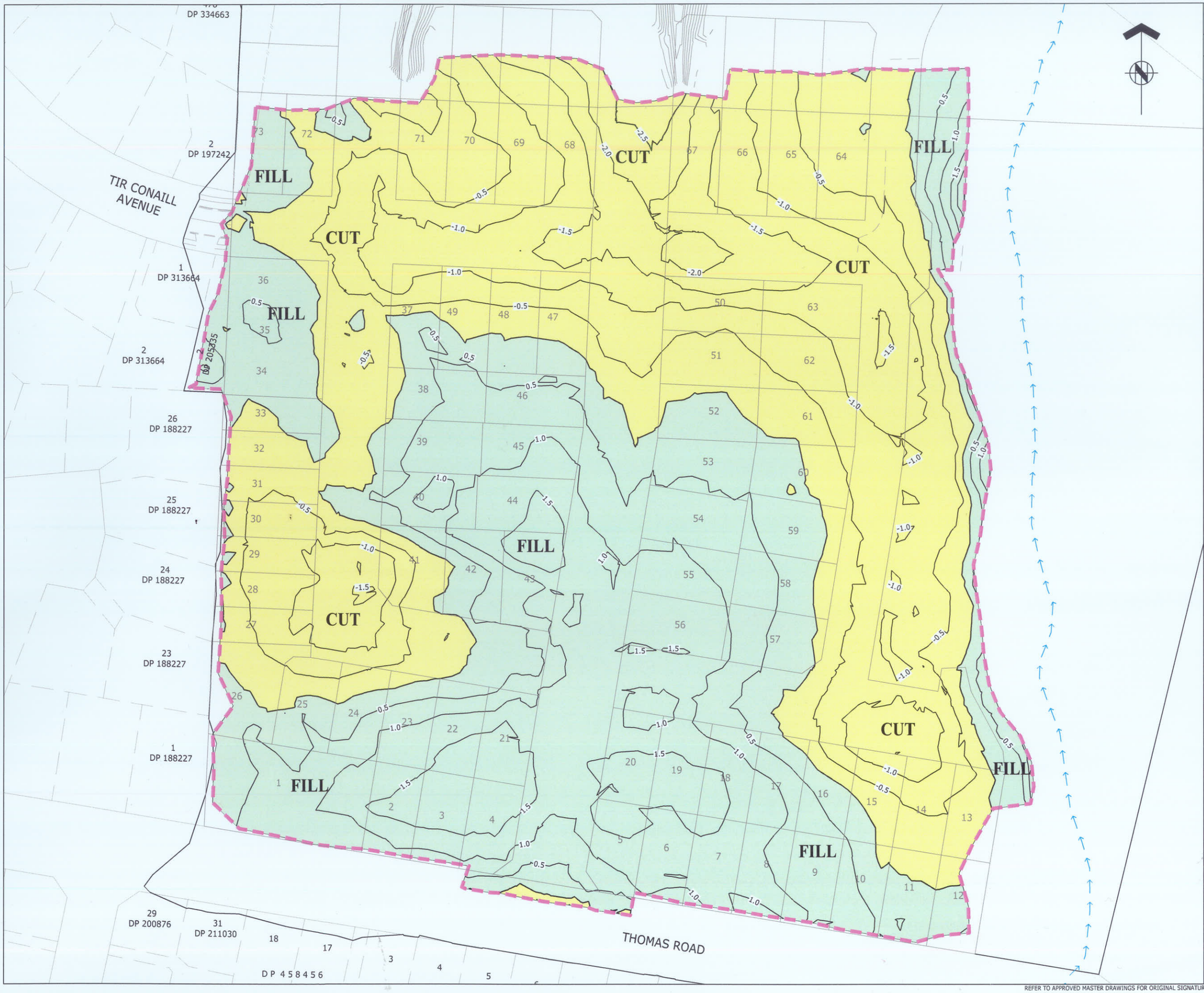
STAGE 8
FINISHED CONTOURS AS-BUILT

ORIGINATOR: SXK	DATE: 10.2016	SIGNED:	PLOT BY: BKB
DRAWN: BB	DATE: 10.2016	SIGNED:	PLOT DATE: 28.11.16
CHECKED: SXK	DATE: 28.11.16	SIGNED:	SURVEY BY: MJS
APPROVED: WJP	DATE: 28.11.16	SIGNED:	SURVEY DATE: 10.2016

ISSUE STATUS: AS-BUILT

PROJECT No: 1050-132822-01	SCALES: 1:500-A1 1:1000-A3	A1
DRAWING No: 136822-AB200		REV A

REFER TO APPROVED MASTER DRAWINGS FOR ORIGINAL SIGNATURES File: NEWMARKET N:\1050\136822_A\CAD\AS-BUILTS\136822-AB200.DWG



ASSOCIATION OF CONSULTING ENGINEERS NEW ZEALAND
ACENZ

ISO 9001 QUALITY ASSURED

NOTES:

1. ORIGIN OF LEVELS
   S 66 SO 48643
   RL 54.50m
2. ORIGIN OF COORDINATES
   S 66 SO 48643
   5905356.71mN
   1770941.22mE

LEGEND

- 1.0 — FILL CONTOUR
- -1.0 — CUT CONTOUR
- EXTENT OF EARTHWORKS
- CUT
- FILL

ENGINEERING APPROVAL
ENG-48683

I CERTIFY THAT THESE ASBUILT PLANS ARE AN ACCURATE RECORD OF THE WORKS UNDERTAKEN AND THAT:

- THE COORDINATES (X,Y) ARE IN TERMS OF NZTM ON NZGD (2000), AND ARE WITHIN ±50mm.
- THE LEVELS (Z) ARE IN TERMS OF THE AUCKLAND 1946 (MSL) LINZ DATUM (DOSLI DATUM), AND ARE WITHIN ±25mm.

Signed: .....
CHARTERED PROFESSIONAL ENGINEER

Date: 28.11.16

Name: WILLIAM PLATTS

Phone: 09-917-5000

Email: w.platts@harrisongrierson.com

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DILWORTH HOUSE 71 GREAT SOUTH ROAD
NEWMARKET AUCKLAND 1051
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W www.harrisongrierson.com

REF	REVISIONS	BY	DATE
A	AS-BUILT	WJP	28.11.16

PROJECT:

DONEGAL STUD
THOMAS ROAD
FLAT BUSH

TITLE:

STAGE 8
CUT FILL AS-BUILT

ORIGINATOR: SXK	DATE: 10.2016	SIGNED:	PLOT BY: BKB
DRAWN: BB	DATE: 10.2016	SIGNED:	PLOT DATE: 28.11.16
CHECKED: SXK	DATE: 28.11.16	SIGNED:	SURVEY BY: MJS
APPROVED: WJP	DATE: 28.11.16	SIGNED:	SURVEY DATE: 10.2016

ISSUE STATUS: AS-BUILT

PROJECT No: 1050-132822-01	SCALES: 1:500-A1 1:1000-A3	A1
DRAWING No: 136822-AB220		REV A

REFER TO APPROVED MASTER DRAWINGS FOR ORIGINAL SIGNATURES File: NEWMARKET N:\1050\136822_A\CAD\AS-BUILTS\136822-AB220.DWG

ROAD 2
ROAD 7
ROAD 2
ROAD 1
ROAD 3
ROAD 8
TIR CONAILL AVENUE
ROAD 5
ROAD 4
ROAD 1
ROAD 6
ROAD 5
THOMAS ROAD

ASSOCIATION OF CONSULTING ENGINEERS NEW ZEALAND
ACENZ
ISO 9001 QUALITY ASSURED

NOTES:

1. ORIGIN OF LEVELS
   S 66 SO 48643
   RL 54.50m
2. ORIGIN OF COORDINATES
   S 66 SO 48643
   5905356.71mN
   1770941.22mE
3. ALL PAVEMENT COVERED IN 30mm HOTMIX (MIX 10)

LEGEND:

- 400mm GAP 65 (UNDERCUT)
  200 AP 65 (SUBBASE)
  150mm AP 40 (BASE)
- 300mm GAP 65 (UNDERCUT)
  200 AP 65 (SUBBASE)
  150mm AP 40 (BASE)
- 600mm BLACK SAND (UNDERCUT)
  250 AP 65 (SUBBASE)
  150mm AP 40 (BASE)
- 600mm BLACK SAND (UNDERCUT)
  200 AP 65 (SUBBASE)
  150mm AP 40 (BASE)
- 3% LIME/1.5% CEMENT (STABILISATION)
  200 AP 65 (SUBBASE)
  150mm AP 40 (BASE)
- 3% LIME/1.5% CEMENT (STABILISATION)
  250 AP 65 (SUBBASE)
  150mm AP 40 (BASE)

ENGINEERING APPROVAL
ENG-48683

I CERTIFY THAT THESE ASBUILT PLANS ARE AN ACCURATE RECORD OF THE WORKS UNDERTAKEN AND THAT:

- THE COORDINATES (X,Y) ARE IN TERMS OF NZTM ON NZGD (2000), AND ARE WITHIN ±50mm.
- THE LEVELS (Z) ARE IN TERMS OF THE AUCKLAND 1946 (MSL) LINZ DATUM (DOSLI DATUM), AND ARE WITHIN ±25mm.

Signed: .....
CHARTERED PROFESSIONAL ENGINEER
Date: 30.11.16

Name: WILLIAM JOHN FREDERICK PLATTS
Phone: 09-917-5000
Email: w.platts@harrisongrierson.com

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REF	REVISIONS	BY	DATE
A	AS-BUILT	WJP	30.11.16

PROJECT:
DONEGAL STUD
THOMAS ROAD
FLAT BUSH

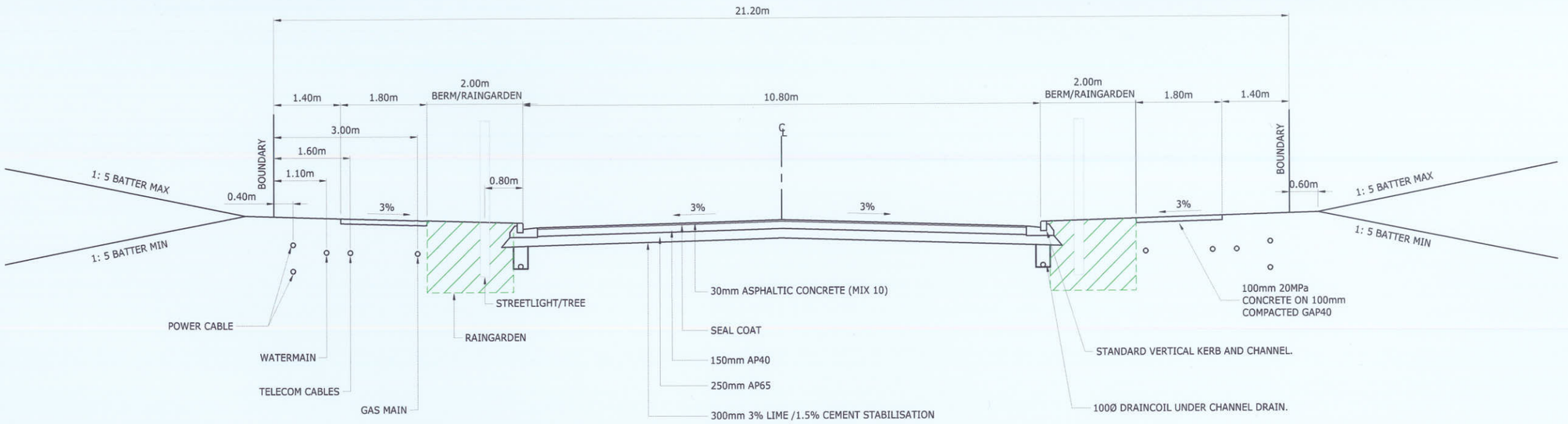
TITLE:
STAGE 8
PAVEMENT AS-BUILT

ORIGINATOR: SXK	DATE: 10.2016	SIGNED:	PLOT BY: BKB
DRAWN: BB	DATE: 10.2016	SIGNED:	PLOT DATE: 30.11.16
CHECKED: SXK	DATE: 30.11.16	SIGNED:	SURVEY BY: MJS
APPROVED: WJP	DATE: 30.11.16	SIGNED:	SURVEY DATE: 10.2016

ISSUE STATUS: AS-BUILT

PROJECT No: 1050-132822-01
SCALES: 1:500-A1 1:1000-A3
A1

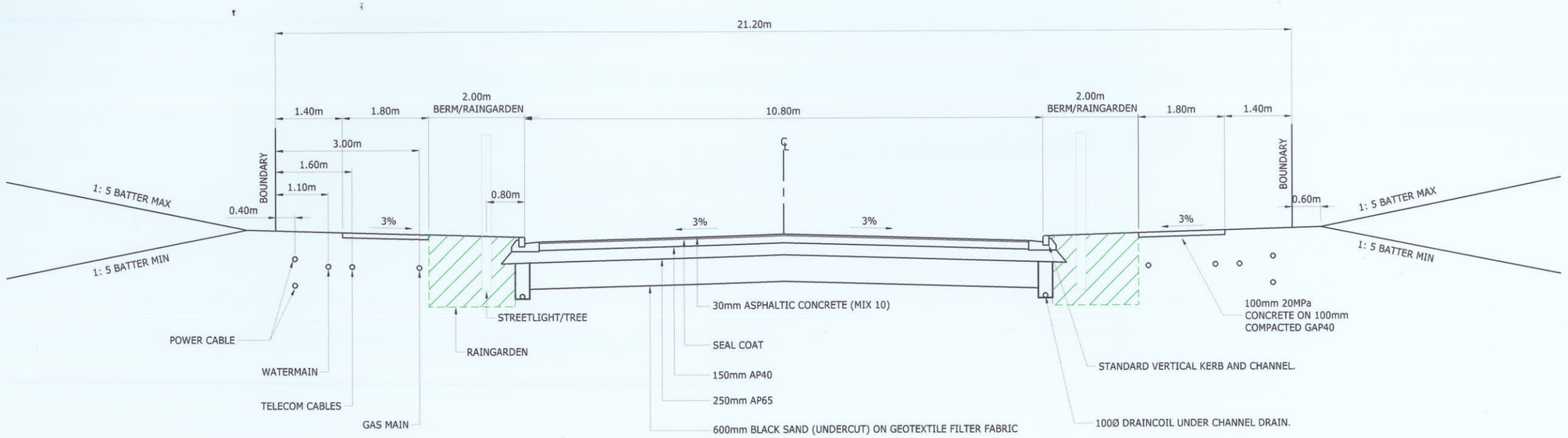
DRAWING No: 136822-AB301
REV A



1 AB301 TYPICAL CROSS SECTION (COLLECTOR ROAD)

SCALE 1:50 -A1
1:100 -A3

ROAD 1 (CH 5.5 - CH 189.5)



2 AB301 TYPICAL CROSS SECTION (COLLECTOR ROAD)

SCALE 1:50 -A1
1:100 -A3

ROAD 1 (CH 189.5 - CH 231.9)

ENGINEERING APPROVAL
ENG-48683

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- THE LEVELS (Z) ARE IN TERMS OF THE AUCKLAND 1946 (MSL) LINZ DATUM (DOSLI DATUM), AND ARE WITHIN ±25mm.

Signed: WJPlatts
CHARTERED PROFESSIONAL ENGINEER
Date: 30.11.16

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Email: w.platts@harrisongrierson.com

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REF	REVISIONS	BY	DATE
A	AS-BUILT	WJP	30.11.16

PROJECT:

DONEGAL STUD
THOMAS ROAD
FLAT BUSH

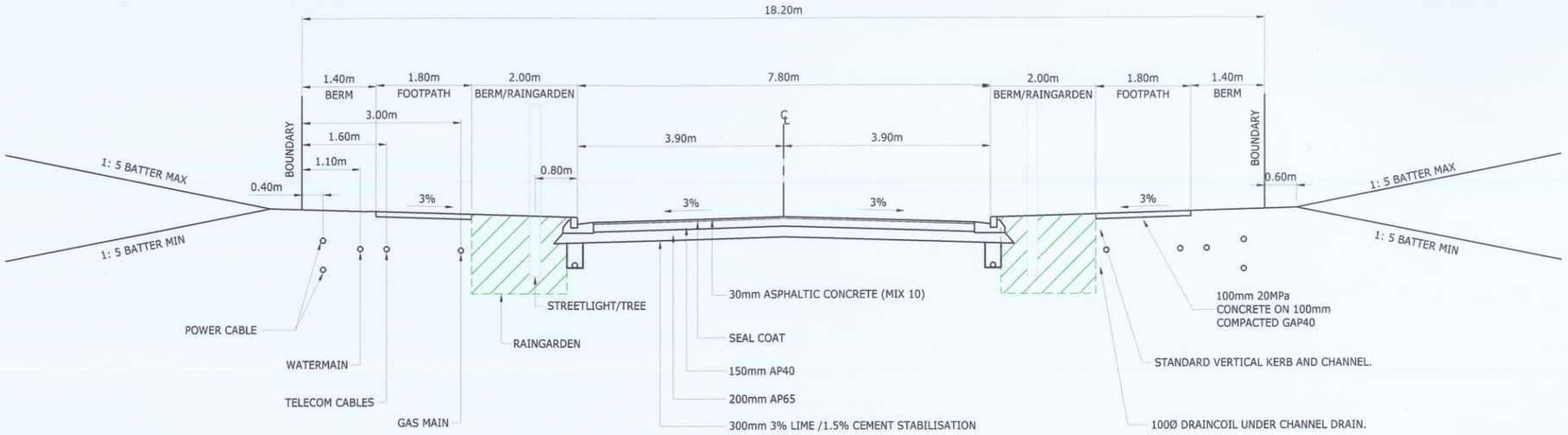
TITLE:

STAGE 8
PAVEMENT AS-BUILT SECTIONS
SHEET 1 0F 4

ORIGINATOR: SXK	DATE: 11.2016	SIGNED:	PLOT BY: BKB
DRAWN: BB	DATE: 11.2016	SIGNED:	PLOT DATE: 30.11.16
CHECKED: SXK	DATE: 30.11.16	SIGNED:	SURVEY BY:
APPROVED: WJP	DATE: 30.11.16	SIGNED:	SURVEY DATE:

ISSUE STATUS: AS-BUILT

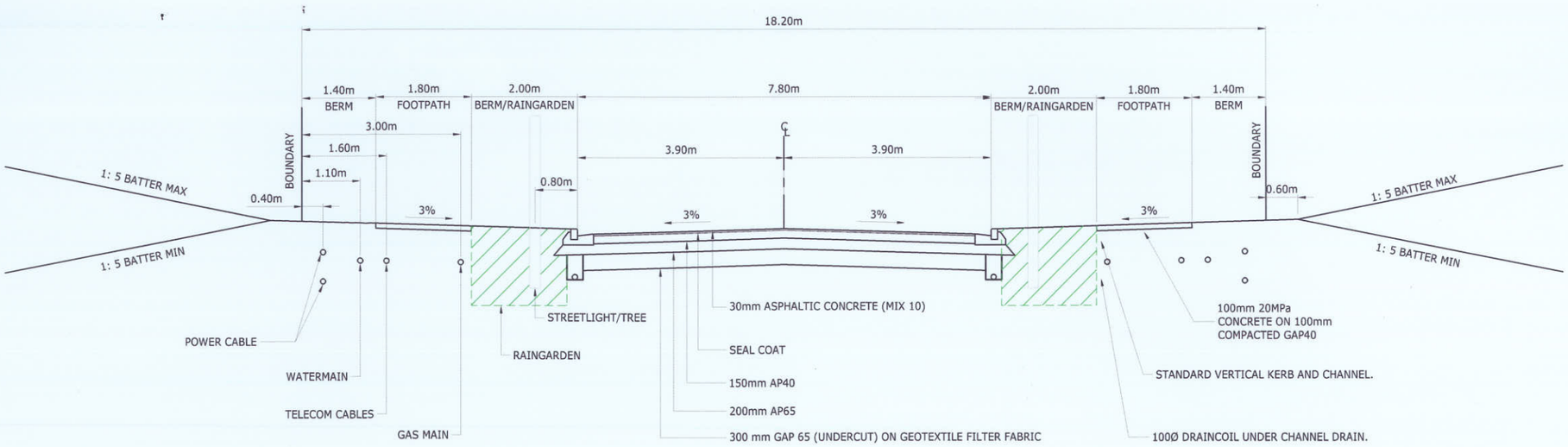
PROJECT No: 1050-132822-01	SCALES: AS SHOWN	A1
DRAWING No: 136822-AB330		REV A



3 AB301 TYPICAL CROSS SECTION (LOCAL ROAD)

SCALE 1:50 -A1
1:100 -A3

ROAD 4 (CH 10 - CH 65)
ROAD 5 (CH 10 - CH 55)
ROAD 8 (CH 0 - CH 29.2)



4 AB301 TYPICAL CROSS SECTION (LOCAL ROAD)

SCALE 1:50 -A1
1:100 -A3

ROAD 5 (CH 55 - CH 170)

ENGINEERING APPROVAL
ENG-48683

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Signed: .....
CHARTERED PROFESSIONAL ENGINEER
Date: 30.11.16

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REF	REVISIONS	BY	DATE
A	AS-BUILT	WJP	30.11.16

PROJECT:

DONEGAL STUD
THOMAS ROAD
FLAT BUSH

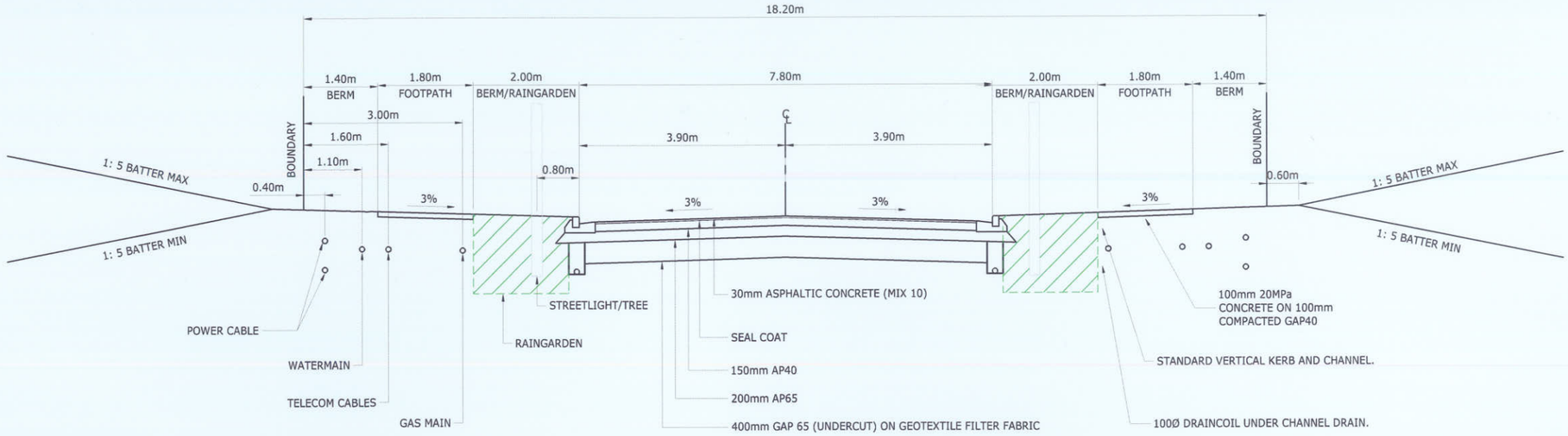
TITLE:

STAGE 8
PAVEMENT AS-BUILT SECTIONS
SHEET 2 0F 4

ORIGINATOR: SXK	DATE: 11.2016	SIGNED:	PLOT BY: BKB
DRAWN: BB	DATE: 11.2016	SIGNED:	PLOT DATE: 30.11.16
CHECKED: SXK	DATE: 30.11.16	SIGNED:	SURVEY BY:
APPROVED: WJP	DATE: 30.11.16	SIGNED:	SURVEY DATE:

ISSUE STATUS: AS-BUILT

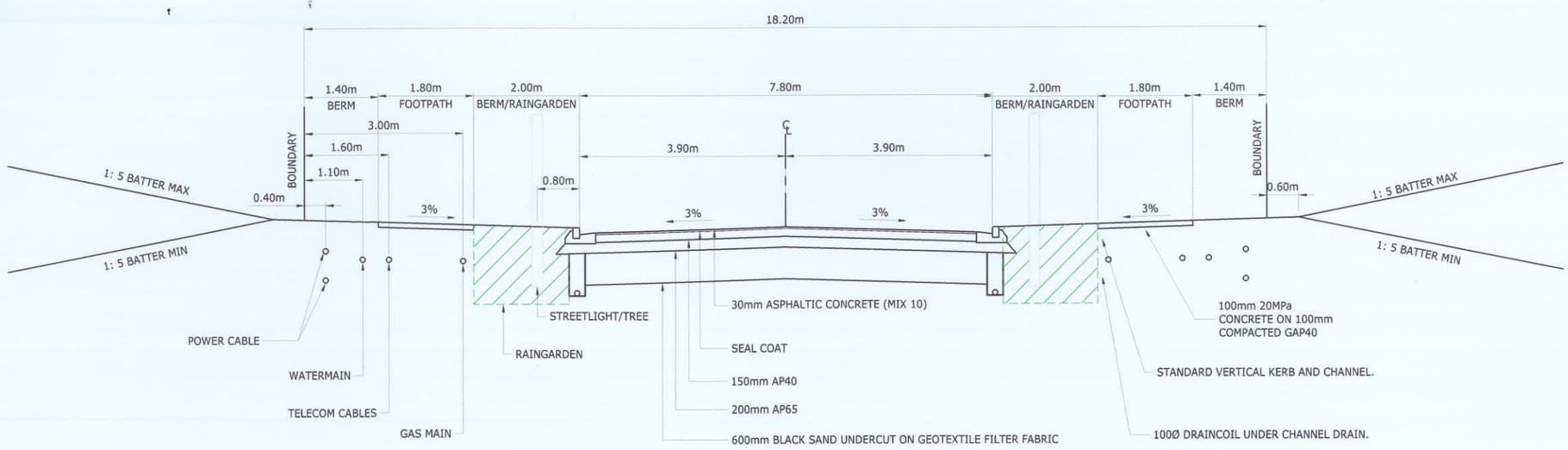
PROJECT No: 1050-132822-01	SCALES: AS SHOWN	A1
DRAWING No: 136822-AB331		REV A



5 AB301 TYPICAL CROSS SECTION (LOCAL ROAD)

SCALE 1:50 -A1
1:100 -A3

ROAD 7 (CH 10 - CH 37.8)



6 AB301 TYPICAL CROSS SECTION (LOCAL ROAD)

SCALE 1:50 -A1
1:100 -A3

ROAD 2 (CH 10 - CH 112.8)

ENGINEERING APPROVAL
ENG-48683

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Signed: .....
CHARTERED PROFESSIONAL ENGINEER
Date: 30.11.16

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REF	REVISIONS	BY	DATE
A	AS-BUILT	WJP	30.11.16

PROJECT:

DONEGAL STUD
THOMAS ROAD
FLAT BUSH

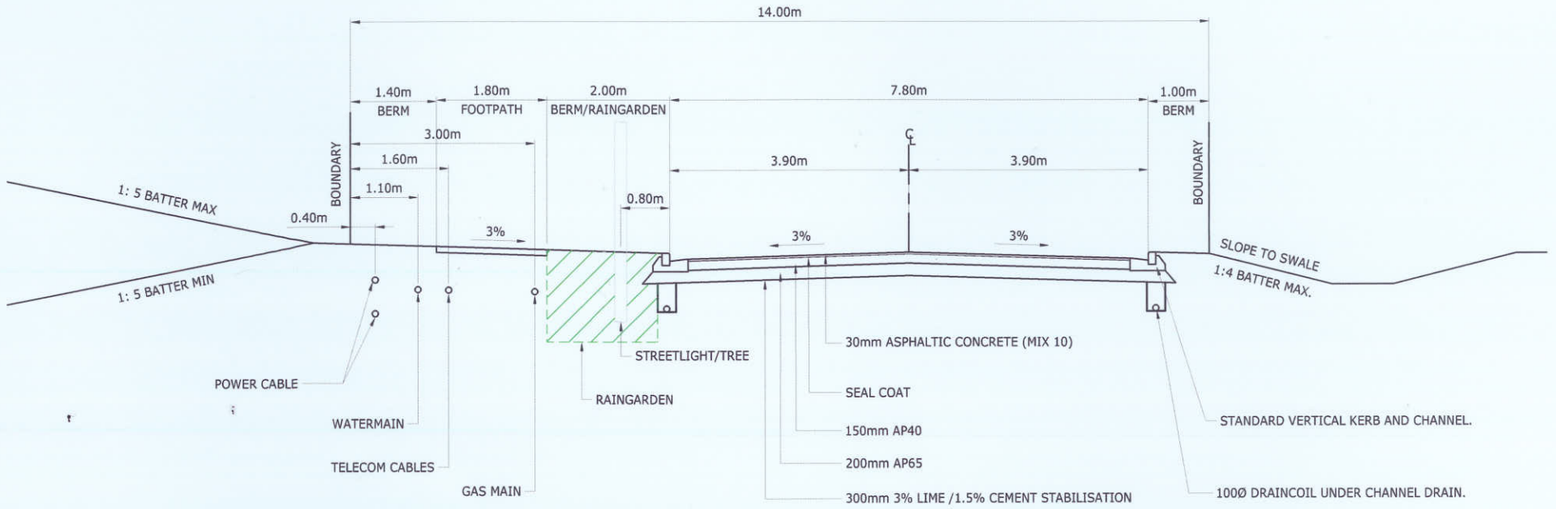
TITLE:

STAGE 8
PAVEMENT AS-BUILT SECTIONS
SHEET 3 0F 4

ORIGINATOR: SXK	DATE: 11.2016	SIGNED:	PLOT BY: BKB
DRAWN: BB	DATE: 11.2016	SIGNED:	PLOT DATE: 30.11.16
CHECKED: SXK	DATE: 30.11.16	SIGNED:	SURVEY BY:
APPROVED: WJP	DATE: 30.11.16	SIGNED:	SURVEY DATE:

ISSUE STATUS: AS-BUILT

PROJECT No: 1050-132822-01	SCALES: AS SHOWN	A1
DRAWING No: 136822-AB332		REV A



7 / AB301 TYPICAL CROSS SECTION (PARK EDGE ROAD)

SCALE 1:50 -A1, 1:100 -A3

ROAD 4 (CH 85 - CH 200.6)

ENGINEERING APPROVAL
ENG-48683

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Signed: WJF Platts
CHARTERED PROFESSIONAL ENGINEER
Date: 30.11.16

Name: WILLIAM JOHN FREDERICK PLATTS
Phone: 09-917-5000
Email: w.platts@harrisongrierson.com

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REF	REVISIONS	BY	DATE
A	AS-BUILT	WJP	30.11.16

PROJECT:

DONEGAL STUD
THOMAS ROAD
FLAT BUSH

TITLE:

STAGE 8
PAVEMENT AS-BUILT SECTIONS
SHEET 4 0F 4

ORIGINATOR: SXK	DATE: 11.2016	SIGNED:	PLOT BY: BKB
DRAWN: BB	DATE: 11.2016	SIGNED:	PLOT DATE: 30.11.16
CHECKED: SXK	DATE: 30.11.16	SIGNED:	SURVEY BY:
APPROVED: WJP	DATE: 30.11.16	SIGNED:	SURVEY DATE:

ISSUE STATUS: AS-BUILT

PROJECT No: 1050-132822-01	SCALES: AS SHOWN	A1
DRAWING No: 136822-AB333		REV A

Appendix B – Classification Test Data

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

coffey
A TETRA TECH COMPANY

Material Test Report

Report No: ETAM16S-07279-1
Issue No: 1

Client:	Coffey Services (NZ) Limited (Auckland) PO Box 8261, Symonds Street Auckland 1150
Principal:	Hugh Green Group Limited
Project No.:	GENZETAM01654AC
Project Name:	GENZAUCK16403AC - DONEGAL STUD STAGE 8
Lot No.:	N/A
TRN:	N/A

IANZ ACCREDITED LABORATORY

Tests indicated as not accredited are outside the scope of the laboratory's accreditation.

Approved Signatory: Cesar Pura
(Senior Technician)
IANZ Accredited Laboratory Number:105
Date of Issue: 24/08/2016

Sample Details

Sample ID:	ETAM16S-07279
Client Sample:	
Date Sampled:	11/08/2016
Source:	Unknown (Sampled by Client)
Material:	Disturbed Soil
Specification:	No Specification
Sampling Method:	Unknown (Not IANZ Endorsed)
Project Location:	Donegal Stud Stage 8
Sample Location:	HA 08, 0.4 - 0.7 m Silty CLAY, highly plastic, pale yellowish gray, moist

Test Results

Description	Method	Result	Limits
Liquid Limit	NZS 4402:1986 Test 2.2	111	
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	23	
Curling		No	
Cracking		Yes	
Sample History		Natural state	
Fraction Tested		Passing 425µm sieve	
Date Tested		22/08/2016	
Moisture Content (%)	NZS 4402:1986 Test 2.1	43.3	
Date Tested		19/08/2016	

Comments

Sampling Method and Material Description are not IANZ Endorsed as part of this Report.
Work Order: ETAM16W02676
Tested By: CP

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

coffey
A TETRA TECH COMPANY

Material Test Report

Report No: ETAM16S-12661-1
Issue No: 1

Client:	Coffey Services (NZ) Limited (Auckland) PO Box 8261, Symonds Street Auckland 1150
Principal:	Ray Berry
Project No.:	773-ETAM00010AC
Project Name:	773-GENZAUCK16403AC - DONEGAL STUD STAGE 8
Lot No.:	N/A
TRN:	N/A

IANZ ACCREDITED LABORATORY

Approved Signatory: James McKelvey
(Senior Technician)
IANZ Accredited Laboratory Number:105
Date of Issue: 23/11/2016

Sample Details

Sample ID:	ETAM16S-12661
Client Sample:	-
Date Sampled:	17/11/2016
Source:	Unknown (Sampled by Client)
Material:	Disturbed Soil
Specification:	No Specification
Sampling Method:	Unknown (Not IANZ Endorsed)
Project Location:	Donegal Stud Stage 8, Flat Bush
Sample Location:	HA12 0.40 - 0.70 m

Test Results

Description	Method	Result	Limits
Liquid Limit	NZS 4402:1986 Test 2.2	82	
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	17	
Curling		No	
Cracking		No	
Sample History		Natural state	
Fraction Tested		Passing 425µm sieve	
Date Tested		21/11/2016	
Moisture Content (%)	NZS 4402:1986 Test 2.1	39.3	
Date Tested		17/11/2016	

Comments

Work Order: ETAM16W03780
Tested By: CP

Appendix C - Field Density Test Summary Sheets

Coffey Services NZ Ltd
144A Cryers Road, East Tamaki, Auckland 2103
PO Box 58877, Botany, Manukau, Auckland 2163
t +64 92723375 f +92723378
www.coffey.com

Client: Coffey Geotechnics NZ Ltd
Address PO Box 8261, Symonds Street, Auckland 1150
Attention: Ray Berry
c.c: -
Project: GENZAUCK16403AC - DONEGAL STUD STAGE 8
Location: Flat Bush

PROJECT CODE: GENZETAM00881AC - 00 Revision No. 1

IANZ ACCREDITED LABORATORY
Tests indicated as not accredited are outside the scope of the laboratory's accreditation

Approved Signatory: Eric Paton
Issue date: 26/09/16

Test method: Test Methods in accordance with: Shear Strength (using field Shear vane in accordance with NZGS 2001):Nuclear Densometer Testing (in accordance with NZS 4407:2015 Test 4.2): Water Content Testing (in accordance with NZS 4402:1986 Test 2.1): Density Calculations (in accordance with NZS 4402:1986 Tests 4.1.1.5(b)). Please note that Air Void calculations are not IANZ endorsed as part of this report.

Date	Work Order No:	Tested by	Test No.	Layer	Material tested	Location	Easting	Northing	RL	Test Depth (mm) FL = Finished level	Comments	Field Shear Strength in kPa UTP = Unable to penetrate				Wet Density (t/m^3)	Oven Water Content (%)	Dry Density (tm^3)	Solid Density	Air Voids (%)
25/02/16	ETAM16W00599	AB	**1**	Fill	Clay	Road Fill	1769947	5905444	46.50			UTP	UTP	UTP	UTP	1.91	21.7	1.57	2.70	7.8
25/02/16	ETAM16W00599	AB	**2**	Fill	Clay	Road Fill	1769938	5905367	-			UTP	UTP	UTP	UTP	1.97	20.8	1.63	2.70	5.6
26/02/16	ETAM16W00600	OT	**3**	Fill	Silty CLAY	See plan	1769990	5905347	-			198	216+	187	216+	1.92	21.8	1.58	2.70	7.0
26/02/16	ETAM16W00600	OT	**4**	Fill	Silty CLAY	See plan	1769984	5905367	-			133	133	187	163	1.99	24.7	1.60	2.70	1.3
26/02/16	ETAM16W00600	OT	**5**	Fill	Silty CLAY	See plan	1769937	5905337	-			216+	216+	216+	216+	2.01	24.2	1.62	2.70	0.8
07/03/16	ETAM16W00676	DL	**6**	Fill	Clay	General fill	1769990	5905358	-			239+	239+	239+	239+	1.97	24.5	1.58	2.70	2.6
07/03/16	ETAM16W00676	DL	**7**	Fill	Clay	General fill	1769989	5905323	-		*Field nuc water content applied	239+	239+	239+	239+	2.03	*22.3	1.66	2.70	1.5
08/03/16	ETAM16W00696	DL	**8**	Fill	Clay	General fill	1769905	5905349	-			239+	239+	239+	239+	1.88	30.3	1.44	2.70	3.0
08/03/16	ETAM16W00696	DL	**9**	Fill	Clay	General fill	1769895	5905366	-			239+	239+	239+	239+	1.93	27.9	1.51	2.70	2.1
10/03/16	ETAM16W00782	DL	**10**	Fill	Clay	General fill	1769890	5905345	-			239+	239+	239+	239+	1.88	24.3	1.51	2.70	7.2
10/03/16	ETAM16W00782	DL	**11**	Fill	Clay	General fill	1769871	5905365	-			239+	239+	239+	239+	2.00	27.3	1.57	2.70	0.0
10/03/16	ETAM16W00782	DL	**12**	Fill	Clay	General fill	1769912	5905346	-			239+	239+	239+	239+	2.04	30.6	1.57	2.70	0.0
14/03/16	ETAM16W00886	DL	**13**	Fill	Clay	General fill	1769928	5905395	-			208	182	156	145	2.09	27.1	1.64	2.70	0.0
14/03/16	ETAM16W00886	DL	**14**	Fill	Clay	General fill	1769907	5905371	-			228	212	187	152	2.01	34.0	1.50	2.7	0.0
14/03/16	ETAM16W00886	DL	**15**	Fill	Clay	General fill	1769889	5905378	-			152	228	182	182	2.00	26.5	1.58	2.7	0.0
15/03/16	ETAM16W00889	DL	**16**	Fill	Clay	General fill	1769932	5905333	-			239+	239+	239+	239+	1.99	22.7	1.62	2.7	3.1
15/03/16	ETAM16W00889	DL	**17**	Fill	Clay	General fill	1769943	5905393	-			239+	239+	239+	239+	1.96	21.8	1.61	2.7	5.3
15/03/16	ETAM16W00889	DL	**18**	Fill	Clay	General fill	1769957	5905412	-			239+	239+	239+	239+	1.94	27.0	1.52	2.7	2.4
17/03/16	ETAM16W00891	DL	**19**	Fill	Clay	General fill	1770044	5905517	-	300mm to subgrade		239+	239+	239+	239+	1.99	22.2	1.63	2.7	3.8
17/03/16	ETAM16W00891	DL	**20**	Fill	Clay	General fill	1770036	5905507	-	FL		239+	239+	239+	239+	2.04	18.2	1.72	2.7	4.8
30/03/16	ETAM16W01000	DL	**21**	Fill	Clay	Refer to plan	1770039	5905304	-			124	148	184	111	1.74	24.9	1.39	2.7	13.8
30/03/16	ETAM16W01000	DL	**22**	Fill	Clay	Refer to plan	1770028	5905315	-			196+	196+	196+	196+	1.99	24.9	1.60	2.7	1.2
30/03/16	ETAM16W01000	DL	**23**	Fill	Clay	Refer to plan	1769995	5905314	-			196+	196+	196+	196+	1.96	24.5	1.57	2.7	3.2

Coffey Services NZ Ltd
144A Cryers Road, East Tamaki, Auckland 2103, New Zealand
PO Box 58 877, Botany, Manukau 2163, New Zealand
t+64 9 272 3375 f+64 9 272 3378 www.coffey.com

SITE PLAN

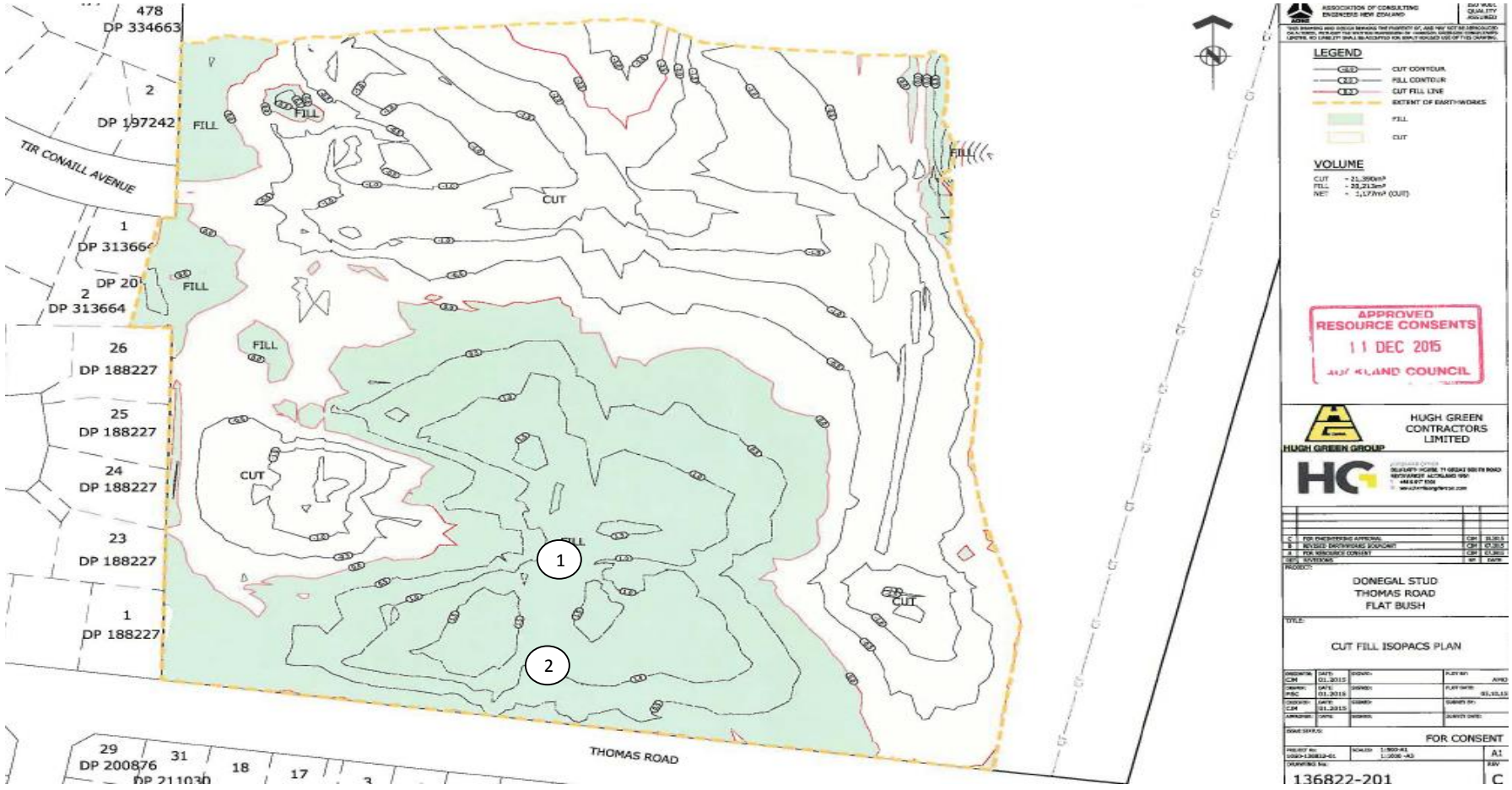
NOT TO SCALE

Project No: GENZETAM00881AC - 00
Work Order No: ETAM16W00599
Page: 2 of 10

Project: GENZAUCK16403AC - DONEGAL STUD STAGE 8

Location: Road fill

Tested by: AB
Date tested: 25/02/16



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SITE PLAN

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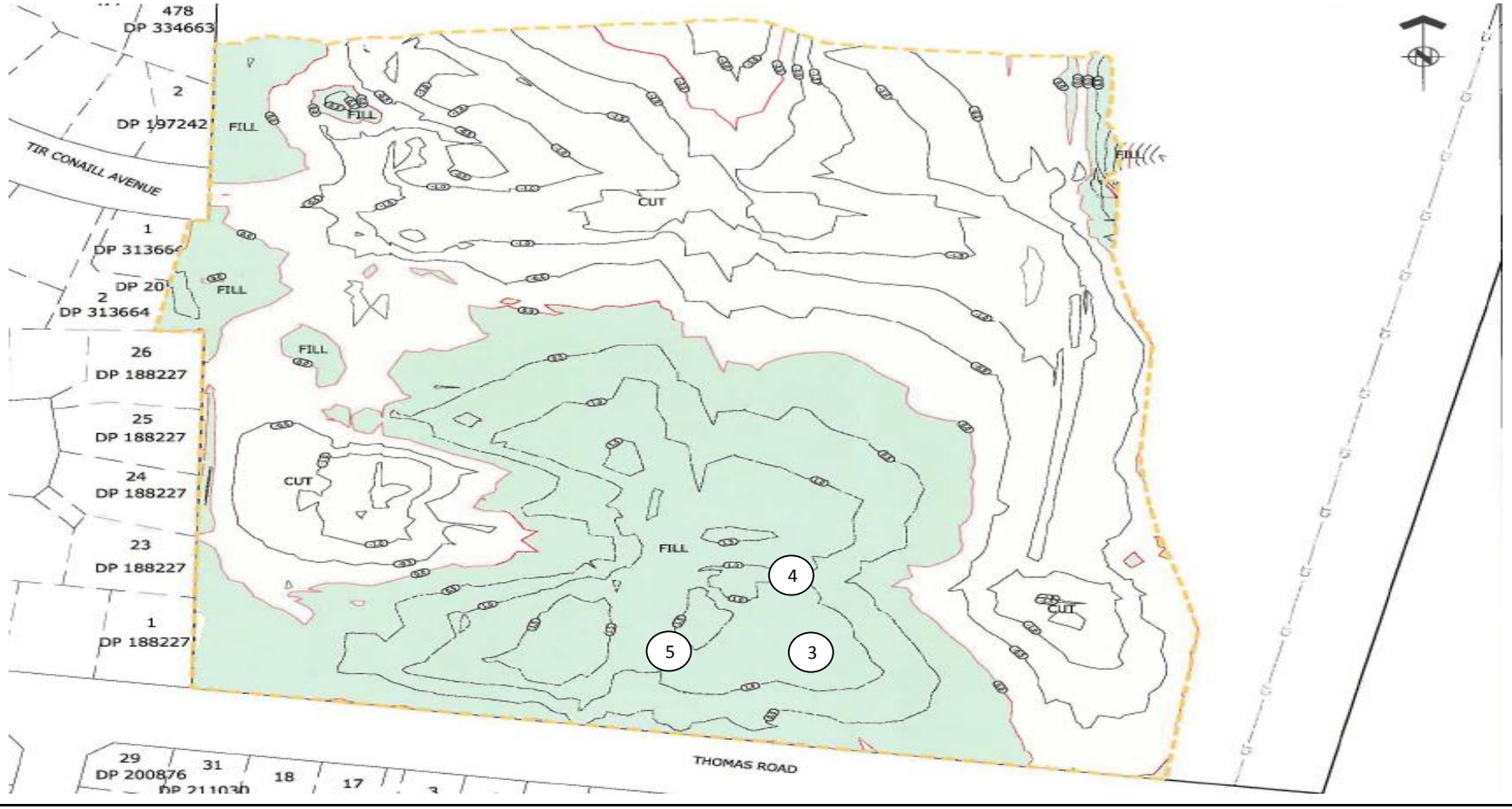
Project No: GENZETAM00881AC - 00
Work Order No: ETAM16W00600
Page: 3 of 10

Project: GENZAUCK16403AC - DONEGAL STUD STAGE 8

Location: As below

Tested by: OT
Date tested: 26/02/16



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SITE PLAN

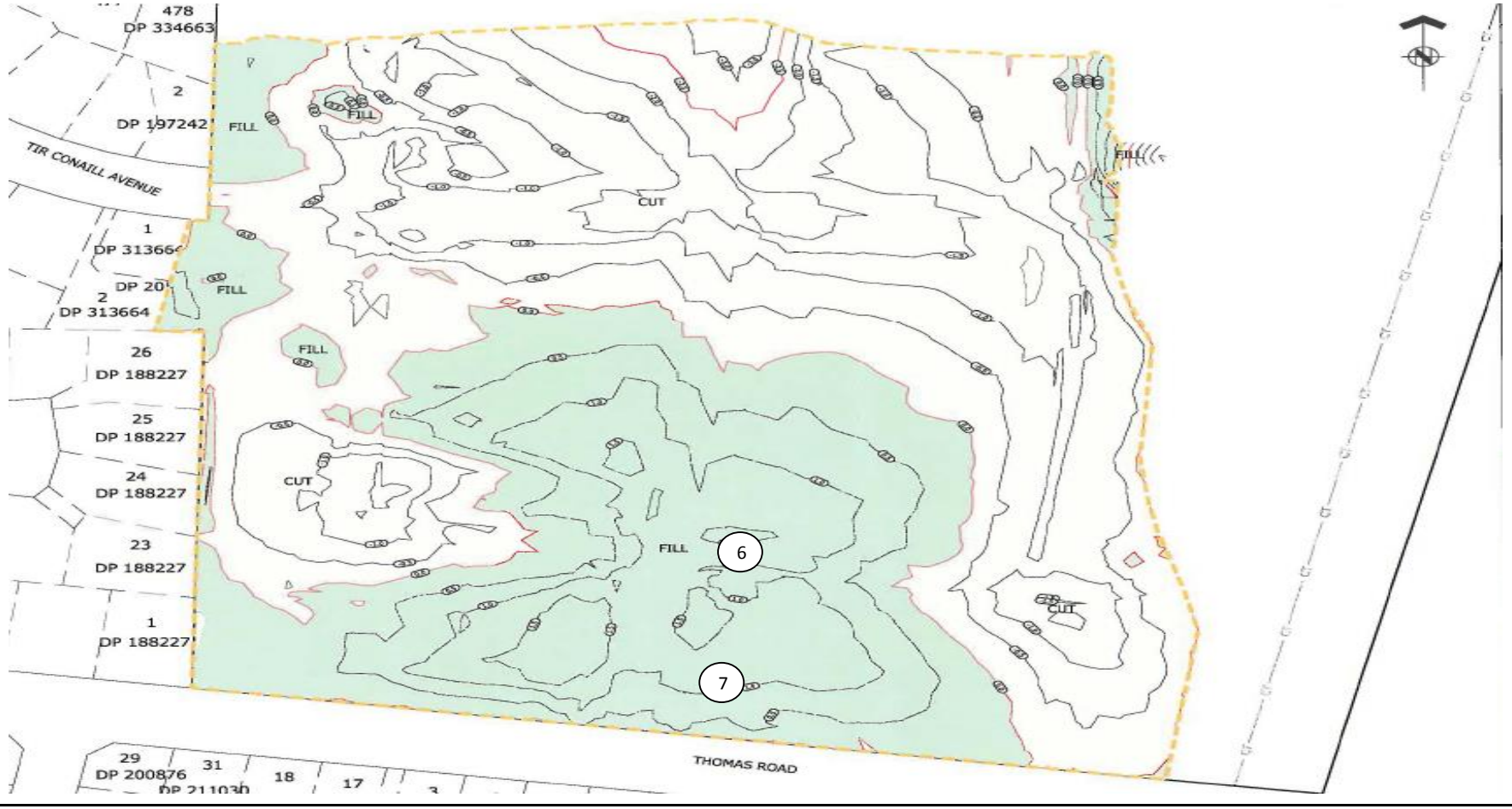
NOT TO SCALE

Project No: GENZETAM00881AC - 00
Work Order No: ETAM16W00676
Page: 4 of 10

Project: GENZAUCK16403AC - DONEGAL STUD STAGE 8

Location: General fill

Tested by: DL
Date tested: 07/03/16



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SITE PLAN

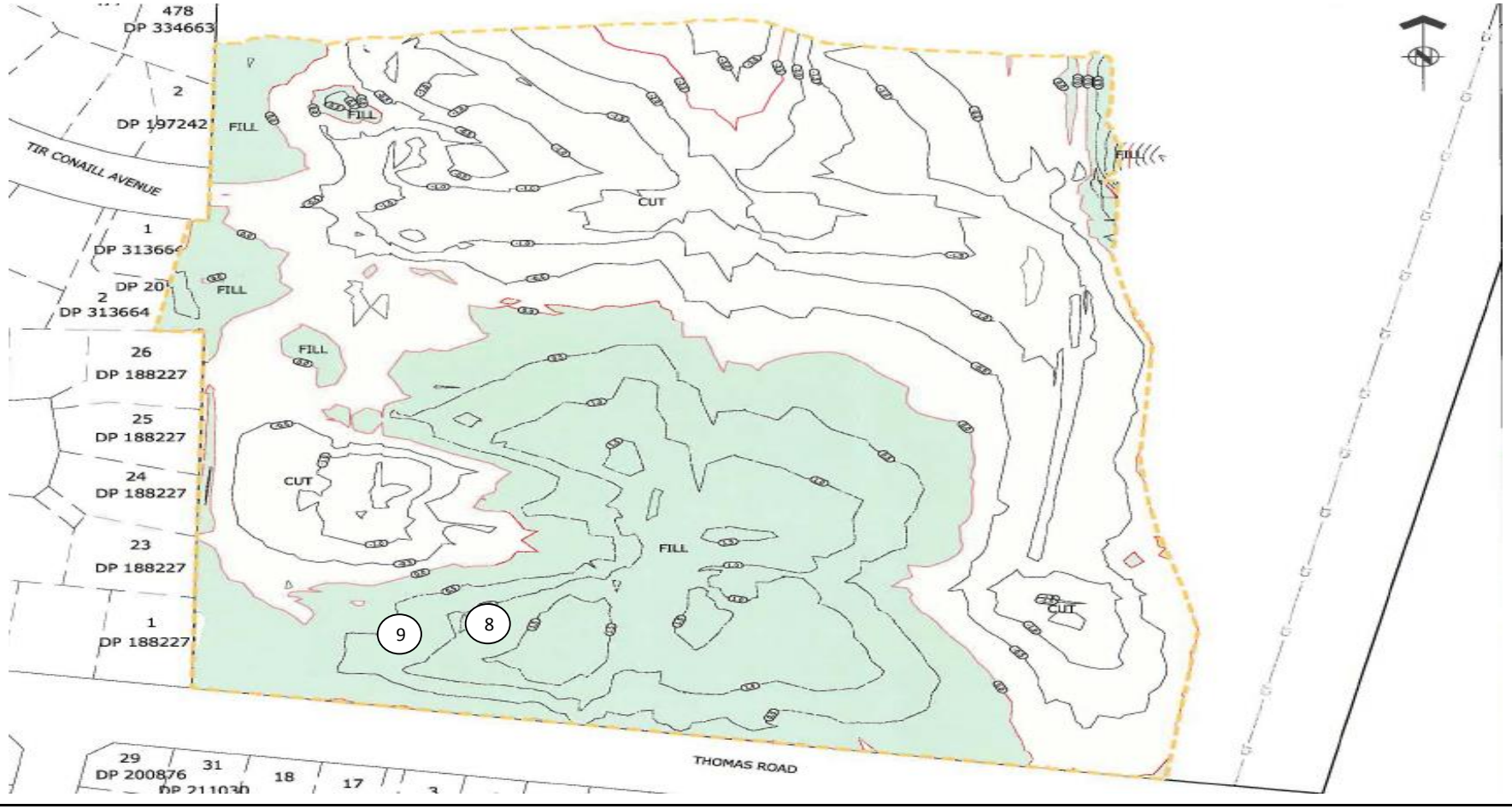
NOT TO SCALE

Project No: GENZETAM00881AC - 00
Work Order No: ETAM16W00696
Page: 5 of 10

Project: GENZAUCK16403AC - DONEGAL STUD STAGE 8

Location: General fill

Tested by: DL
Date tested: 08/03/16



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SITE PLAN

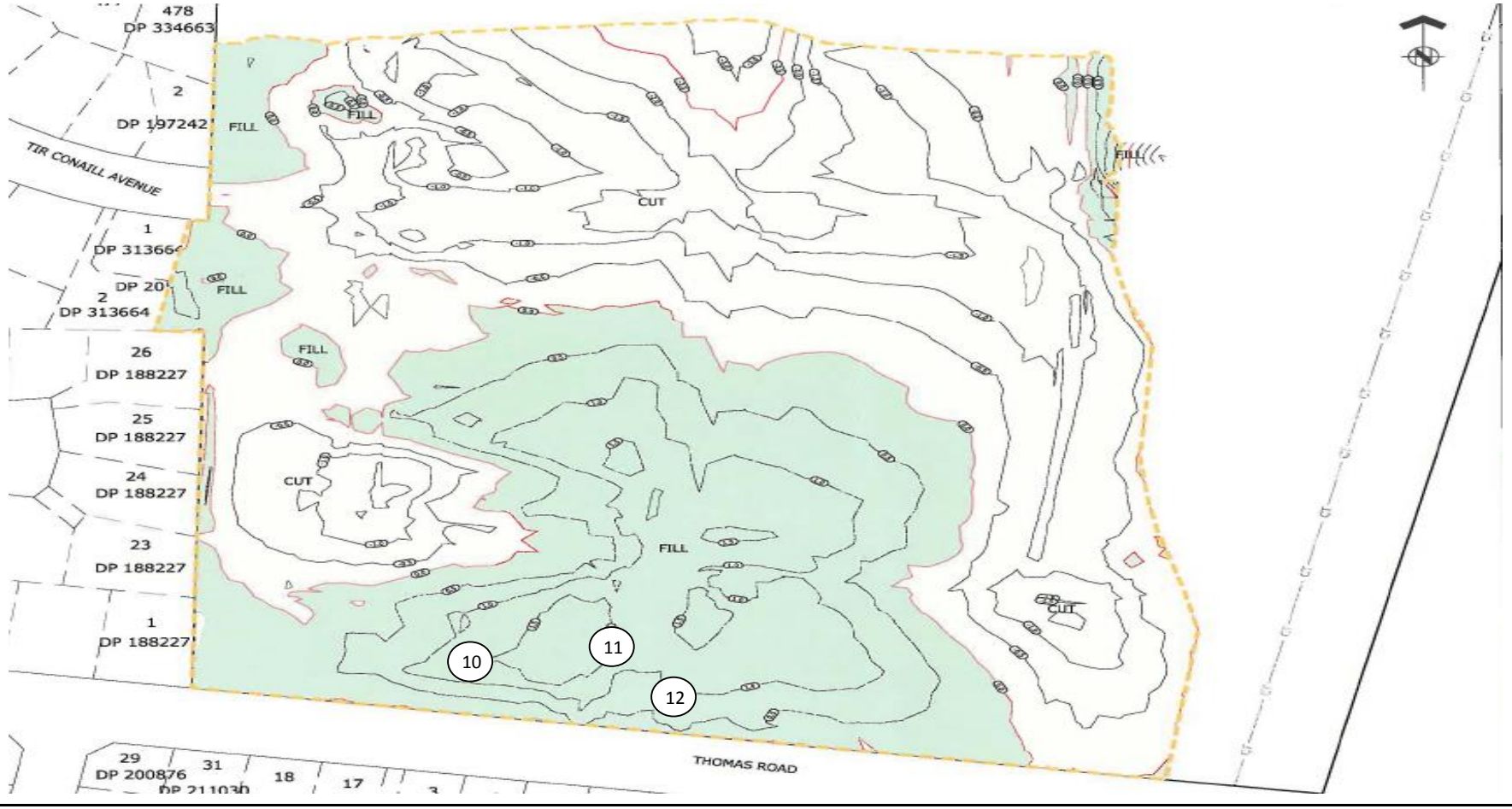
NOT TO SCALE

Project No: GENZETAM00881AC - 00
Work Order No: ETAM16W00782
Page: 6 of 10

Project: GENZAUCK16403AC - DONEGAL STUD STAGE 8

Location: General fill

Tested by: DL
Date tested: 10/03/16



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SITE PLAN

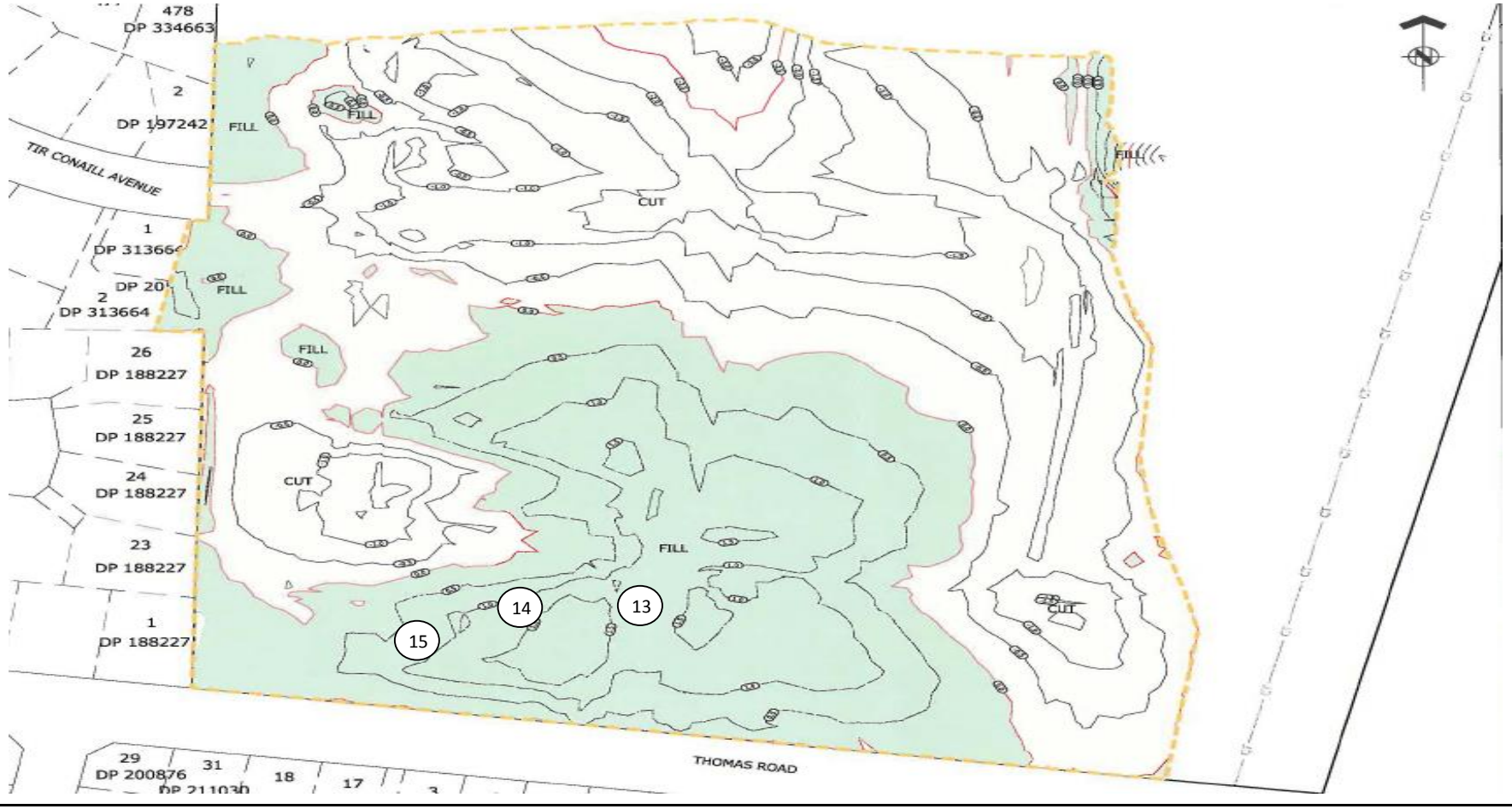
NOT TO SCALE

Project No: GENZETAM00881AC - 00
Work Order No: ETAM16W00886
Page: 7 of 10

Project: GENZAUCK16403AC - DONEGAL STUD STAGE 8

Location: General fill

Tested by: DL
Date tested: 14/03/16



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SITE PLAN

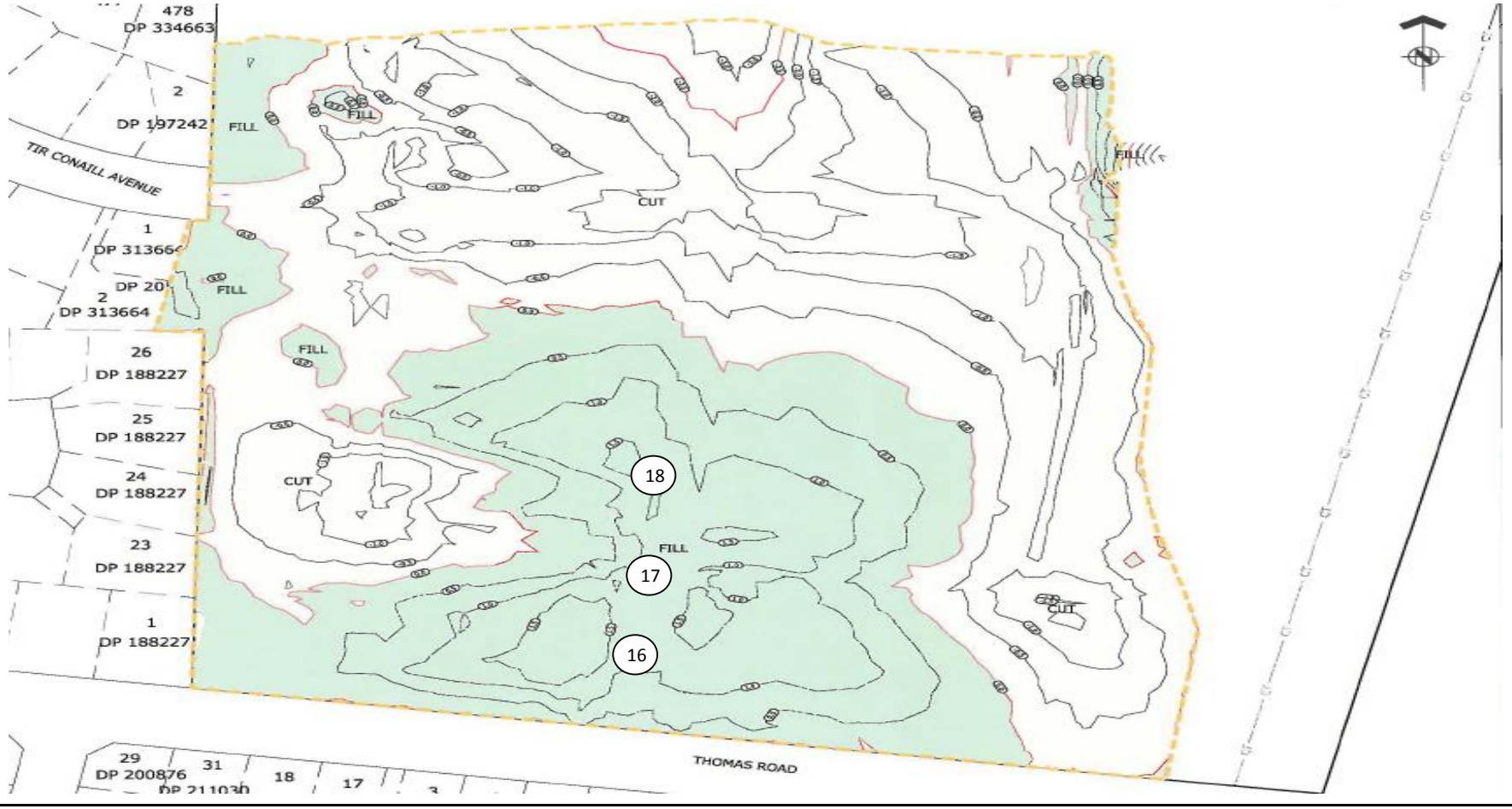
NOT TO SCALE

Project No: GENZETAM00881AC - 00
Work Order No: ETAM16W00889
Page: 8 of 10

Project: GENZAUCK16403AC - DONEGAL STUD STAGE 8

Location: General fill

Tested by: DL
Date tested: 15/03/16



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SITE PLAN

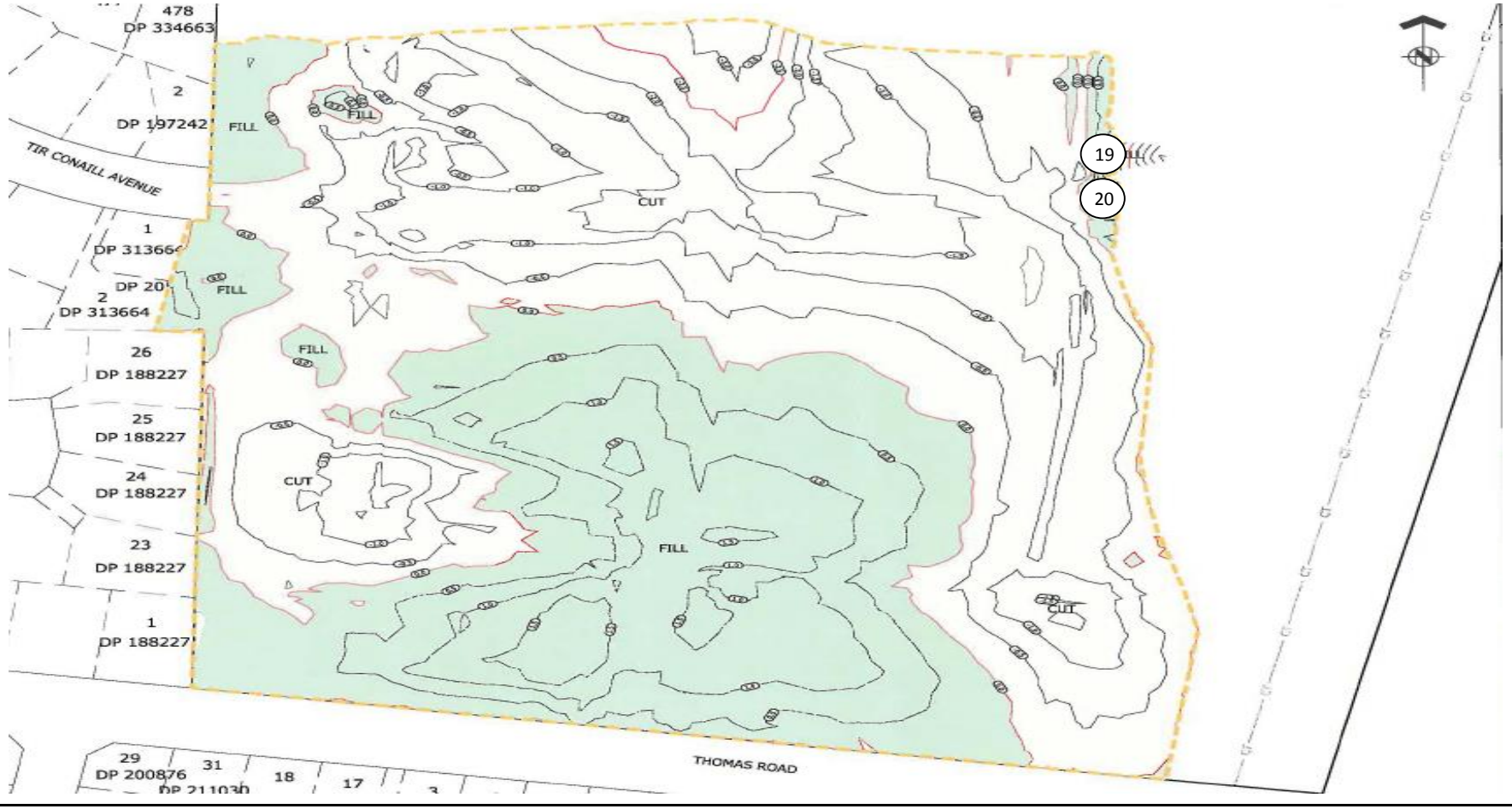
NOT TO SCALE

Project No: GENZETAM00881AC - 00
Work Order No: ETAM16W00891
Page: 9 of 10

Project: GENZAUCK16403AC - DONEGAL STUD STAGE 8

Location: General fill

Tested by: DL
Date tested: 17/03/16



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SITE PLAN

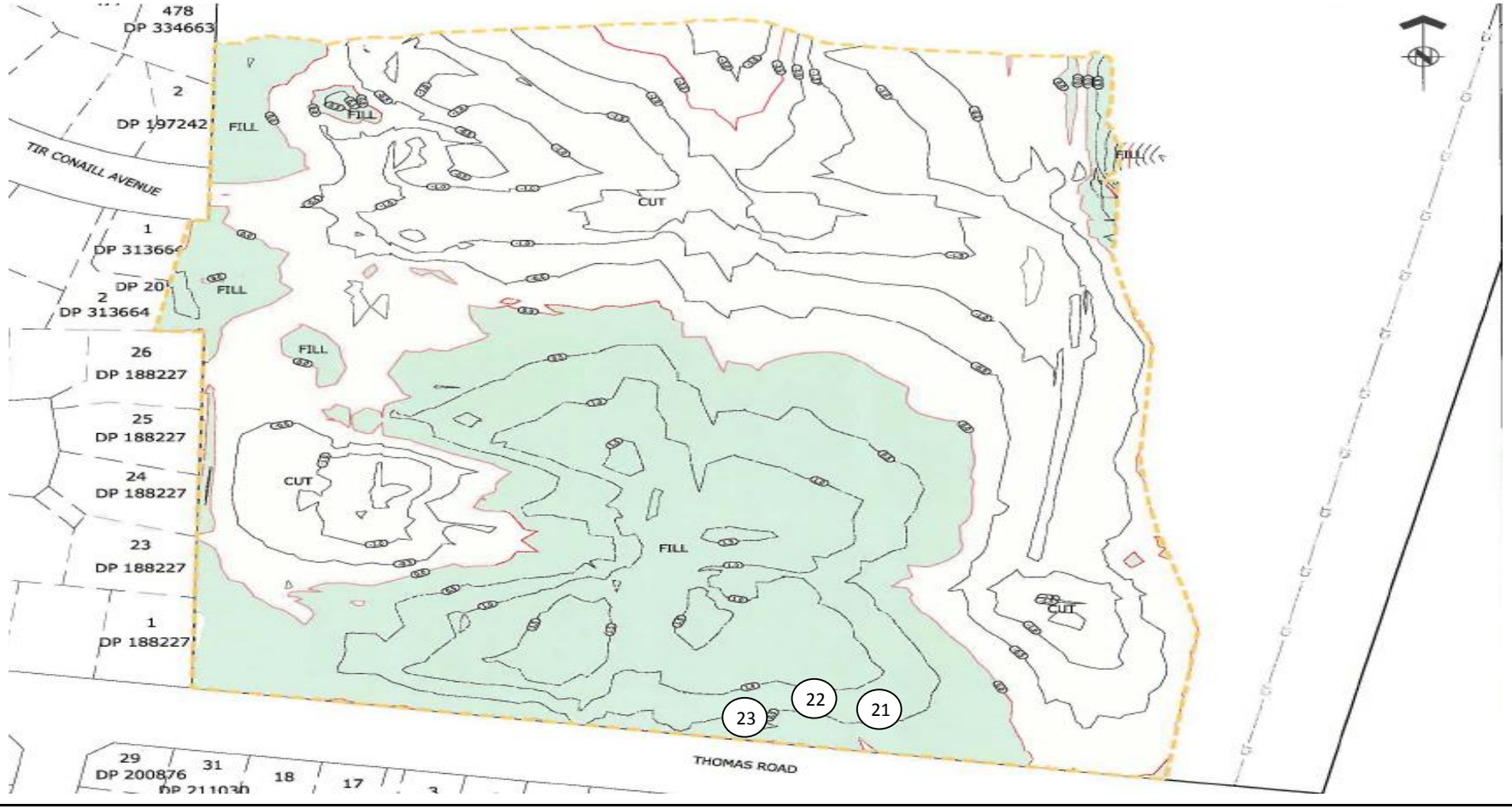
NOT TO SCALE

Project No: GENZETAM00881AC - 00
Work Order No: ETAM16W01000
Page: 10 of 10

Project: GENZAUCK16403AC - DONEGAL STUD STAGE 8

Location: As below

Tested by: DL
Date tested: 30/03/16



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t +64 92723375 f +92723378
www.coffey.com

Client:	Coffey Services NZ Ltd (Auckland)	**PROJECT CODE:**	773-ETAM00010AC
Address	PO Box 8261, Symonds Street, Auckland 1150	Page:	1 of 2
Attention:	Ray Berry		
c.c:	-		
Project:	773-GENZAUCK16403AC - DONEGAL STUD STAGE 8		
Location:	Previous Project No. = GENZETAM00818AC		

IANZ ACCREDITED LABORATORY

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

Approved Signatory: James McKelvey

Issue date: 2/12/2016

Test method: Test Methods in accordance with: Shear Strength (using field Shear vane in accordance with NZGS 2001):Nuclear Densometer Testing (in accordance with NZS 4407:2015 Test 4.2): Water Content Testing (in accordance with NZS 4402:1986 Test 2.1): Density Calculations (in accordance with NZS 4402:1986 Tests 4.1.1.5(b)). Please note that Air Void calculations are not IANZ endorsed as part of this report.

Date	Work Order No:	Tested by	Test No.	Layer	Material tested	Location	Chainage (m)	Offset (m)	Offset from	Easting	Northing	Lane	RL	Test Depth (mm) FL = Finished level	Comments	Field Shear Strength in kPa UTP = Unable to penetrate				Wet Density (t/m^3)	Oven Water Content (%)	Dry Density (t/m^3)	Solid Density (t/m^3)	Air Voids (%)
30/11/2016	ETAM16W04109	FP + JBG	**24**	FL	Silty CLAY	General Fill	-	-	-	1770036	5905315	-	-	150	Retest of #21	UTP	UTP	UTP	UTP	1.89	24.4	1.52	2.70	6.8

Coffey Services NZ Ltd
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SITE PLAN

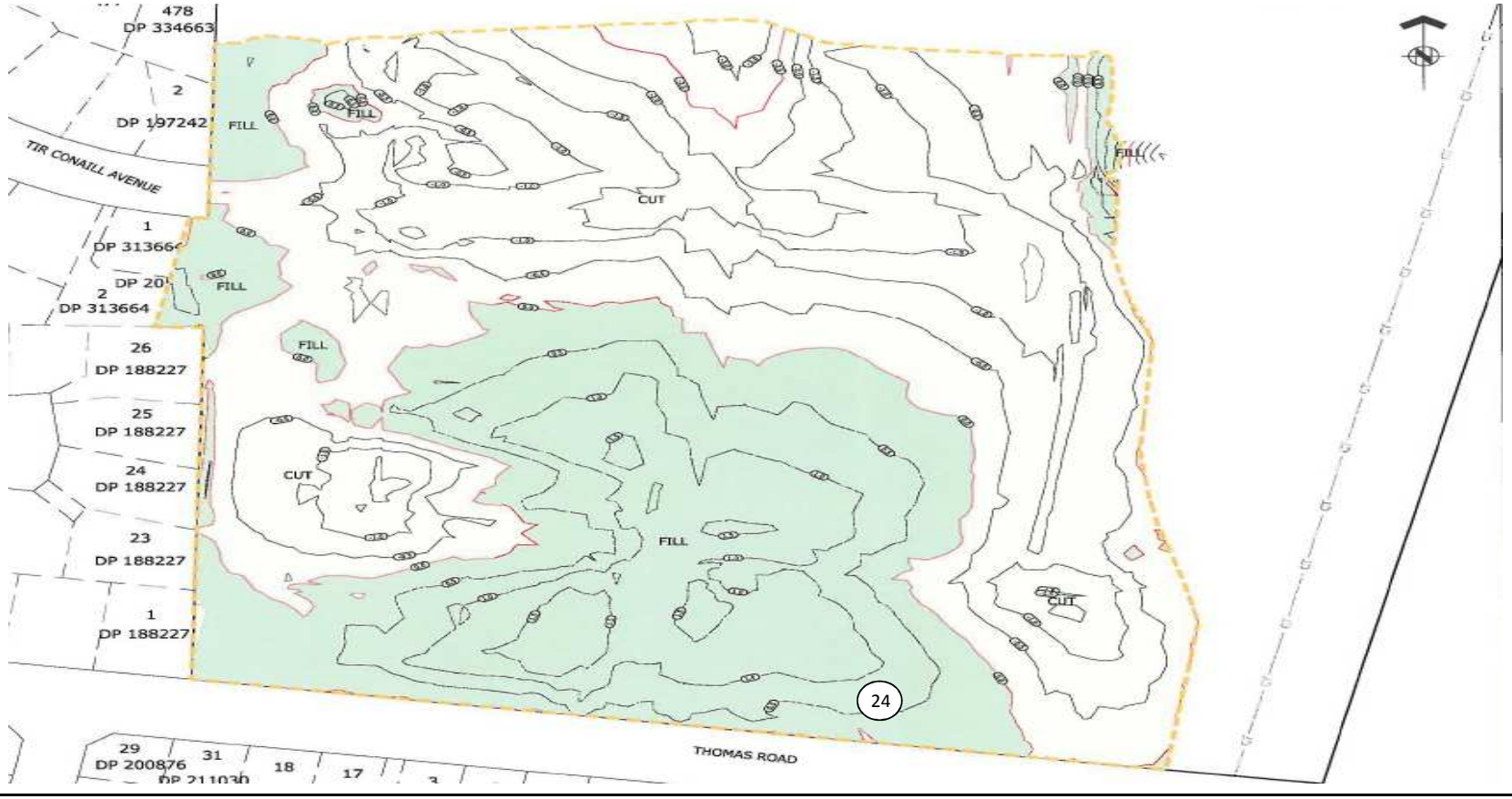
NOT TO SCALE

Project No: 773-ETAM00010AC
Work Order No: ETAM16W04109
Page: 2 of 2

Project: 773-GENZAUCK16403AC - DONEGAL STUD STAGE 8

Location: As below

Tested by: FP and JBG
Date tested: 30/11/2016



Appendix D – Previous Earthworks Certification Documentation

APPENDIX 1

SCALA PENETROMETER TEST RESULTS

geolab
air, soil & water
laboratory services
P.O.Box 5760, WELLESLEY STREET.
PHONE: (09) 3090346

SCALA PENETROMETER TEST

SITE: DONAGAL STUD FARM, EAST TAMAKI

JOB No: 147515.1 | CLIENT: GREEN AND McCAHILL

DATE TESTED: 22/1/98

DRAWING No: 7515.SC9.DWG

TABLE OF BLOWS PER 50mm INCREMENT

DEPTH OF PENETRATION	SC 1	SC 2	SC 3	SC 4	SC 5	SC 6	SC 7	SC 8	SC 9	SC 10
DEPTH START (M)	0.00m	0.00m	0.00m	0.00m	0.00m	0.00m	0.00m	0.00m	0.00m	0.00m
50mm	1	1	1	1	1	1	1	1	1	1
100mm	2	1	1	1	1	1	1	2	1	1
150mm	2	1	3	1	1	2	3	3	2	3
200mm	3	2	2	1	2	5	2	3	4	2
250mm	4	1	1	1	1	4	2	2	5	2
300mm	5	2	1	2	2	4	3	1	4	3
350mm	5	2	1	1	1	4	3	1	7	1
400mm	4	1	2	1	2	3	3	1	3	2
450mm	4	1	2	1	1	3	3	1	4	2
500mm	4	1	1	1	2	4	4	4	4	1
550mm	3	1	1	2	1	3	3	3	3	2
600mm	4	1	1	4	2	2	3	3	2	2
650mm	4	1	1	4	2	2	4	1	2	4
700mm	4	1	1	4	2	1	2	1	2	3
750mm	7	1	1	2	2	2	2	1	2	4
800mm	20+	1	2	3	2	2	2	1	2	3
850mm		1	2	2	4	2	2	2	3	4
900mm		1	2	1	7	2	2	1	2	3
950mm		1	1	1	2	2	2	1	2	4
1000mm		1	1	1	2	2	2	3	3	2
1050mm		1	1	1	2	1	1	2	4	2
1100mm		2	1	1	2	3	2	2	4	2
1150mm		2	2	2	2	3	3	3	4	3
1200mm		2	2	2	2	2	3	3	5	4
1250mm		4	3	2	3	6	3	5	3	2
1300mm		5	2	2	4	6	3	3	5	3
1350mm		9	4	3	4	4	3	5	5	4
1400mm		11	4	2	5	4	3	4	5	3
1450mm		12	3	5	5	3	5	4	8	4
1500mm		12	4	4	4	3	5	4	3	4
1550mm										
1600mm										
1650mm										
1700mm										
1750mm										
1800mm										
1850mm										
1900mm										
1950mm										
2000mm										
DEPTH END (M)	0.80m	1.50m	1.50m	1.50m	1.50m	1.50m	1.50m	1.50m	1.50m	1.50m

COMMENTS:

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air, soil & water
laboratory services
P.O.Box 5760, WELLESLEY STREET.
PHONE: (09) 3090346

SCALA PENETROMETER TEST

SITE: DONAGAL STUD FARM, EAST TAMAKI

JOB No: 147515.1 | CLIENT: GREEN AND McCAHILL

DATE TESTED: 22/1/98

DRAWING No: 7515-SC10.DWG

TABLE OF BLOWS PER 50mm INCREMENT

DEPTH OF PENETRATION	SC 11	SC 12	SC 13	SC 14	SC 15	SC 16	SC 17	SC 18	SC 19	SC 20
DEPTH START (M)	0.00m	0.00m	1.00m	0.00m	0.00m	0.00m	0.00m	0.00m	0.00m	0.00m
50mm	1	1	1	1	1	1	1	1	1	1
100mm	1	1	1	1	1	2	3	1	1	1
150mm	1	1	1	1	2	4	4	3	5	1
200mm	1	1	2	1	1	4	4	3	4	1
250mm	1	1	2	1	2	4	4	3	3	1
300mm	1	1	3	1	2	4	4	3	2	1
350mm	2	1	5	1	5	9	7	4	1	1
400mm	3	1	7	1	3	5	7	4	2	1
450mm	1	1	5	1	7	2	4	4	2	1
500mm	1	1	6	1	5	2	4	4	2	1
550mm	2	1	7	1	3	2	2	3	2	1
600mm	2	4	6	1	3	2	2	3	2	1
650mm	4	4	5	2	3	2	1	3	2	2
700mm	6	2	5	2	3	2	2	3	1	1
750mm	6	2	5	1	2	1	3	4	2	1
800mm	4	2	6	2	3	2	4	4	1	1
850mm	3	2	5	1	2	2	3	5	2	1
900mm	4	2	3	2	2	2	2	2	1	1
950mm	6	1	1	1	2	1	2	1	2	1
1000mm	3	1	1	1	3	2	2	1	1	1
1050mm	2	1	2	1	4	2	2	4	3	1
1100mm	1	1	2	1	3	3	4	3	3	1
1150mm	2	2	1	1	2	4	6	2	3	1
1200mm	3	2	1	1	3	3	9	2	3	1
1250mm	4	4	3	2	2	3	9	3	2	1
1300mm	2	2	3	1	3	2	9	3	2	1
1350mm	3	2	2	1	4	3	9	3	2	1
1400mm	3	2	2	1	4	3	9	4	2	3
1450mm	3	2	2	2	5	5	9	4	2	4
1500mm	3	2	2	1	5	5	8	4	2	6
1550mm										
1600mm										
1650mm										
1700mm										
1750mm										
1800mm										
1850mm										
1900mm										
1950mm										
2000mm										
DEPTH END (M)	1.50m	1.50m	1.50m	1.50m	1.50m	1.50m	1.50m	1.50m	1.50m	1.50m

COMMENTS:

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air, soil & water
laboratory services
P.O.Box 5760, WELLESLEY STREET.
PHONE: (09) 3090346

SCALA PENETROMETER TEST

SITE: DONAGAL STUD FARM, EAST TAMAKI

JOB No: 147515.1 | CLIENT: GREEN AND McCAHILL

DATE TESTED: 22/1/98

DRAWING No: 7515-SC11.DWG

TABLE OF BLOWS PER 50mm INCREMENT

DEPTH OF PENETRATION	SC 21	SC 22	SC 23							
DEPTH START (M)	0.00m	0.00m	0.00m							
50mm	1	1	1							
100mm	1	2	1							
150mm	2	4	3							
200mm	2	2	2							
250mm	1	2	4							
300mm	1	2	5							
350mm	1	5	6							
400mm	2	3	4							
450mm	3	3	4							
500mm	11	3	2							
550mm	7	4	3							
600mm	4	2	2							
650mm	4	2	4							
700mm	3	2	5							
750mm	2	3	9							
800mm	2	5	6							
850mm	2	10	6							
900mm	1	10	3							
950mm	1	9	3							
1000mm	1	10	3							
1050mm	1	9								
1100mm	2	10								
1150mm	2	10								
1200mm	2	9								
1250mm	2	10								
1300mm	2	20+								
1350mm	3									
1400mm	4									
1450mm	4									
1500mm	3									
1550mm										
1600mm										
1650mm										
1700mm										
1750mm										
1800mm		-								
1850mm										
1900mm										
1950mm										
2000mm										
DEPTH END (M)	1.50m	1.30m	1.00m							

COMMENTS:

APPENDIX 2

COMPACTION CONTROL TEST RESULTS

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INSITU DENSITY TEST RESULTS

SITE: DONAGAL STUD, CHAPPLE ROAD **JOB No: 147515.2**

TEST NO	DATE	R.L.	SOIL DESCRIPTION	Pb	M.C.	Pd	S.G.	A.V.	SHEAR STRENGTH	RETEST No	COMMENTS
T1	12/11/97		Silt, very clayey, grey, some brown	1867 1864	30.6 30.6	1429 1427	2.68 2.68	2.9 3.1	V,191+x2,174 154,143,125		
T2	21/11/97		Silt, clayey, pale grey, light brown pockets	1681 1682	42.6 42.6	1179 1180	2.68 2.68	5.8 5.7	V,192+x3,145 140,134		
T3			Silt, clayey, pale grey, light brown pockets	1724 1725	48.3 48.3	1163 1163	2.68 2.68	0.5 0.4	V,153,134,126 111,95,84	T9	Mixed to blend and dry before recompacting
T4			Silt, clayey, pale grey, light brown pockets	1813 1812	35.9 35.9	1334 1334	2.68 2.68	2.4 2.4	V,192+x5,145		
T5	24/11/97		Silt, slighlty clayey, light brown, occasional light grey	1964 1963	24.2 24.2	1582 1581	2.68 2.68	2.7 2.8	V,174+x4,143,127		
T6			Silt, slighlty clayey, light brown, occasional light grey	1964 1967	29.9 29.9	1511 1514	2.68 2.68	-1.7 -1.8	V,174+x5,130		
T7			Silt, slighlty clayey, light brown, occasional light grey	2000 1998	23.4 23.4	1620 1619	2.68 2.68	1.6 1.7	V,174+x2,166,152 143,136		
T8			Silt, slighlty clayey, light brown, occasional light grey	1944 1940	24.5 24.5	1561 1558	2.68 2.68	3.5 3.7	V,174+x4,140 127		
T9			Silt, clayey, pale grey and light brown	1628 1630	52.9 52.9	1065 1066	2.68 2.68	4.0 3.8	V,174+x6	T3	
T10	26/11/97		Silt, slightly clayey, trace sand (fg) light brown	1920 1923	17.0 17.0	1641 1644	2.68 2.68	10.9 10.7	V,174+x3,143,132 121		
T11			Silt, slightly clayey, trace sand (fg) light brown	1825 1826	34.4 34.4	1358 1359	2.68 2.68	2.7 2.6	V,174+x3,143,121 119		
T12	27/11/97		Silt, trace sand (f-mg), light brown	1705 1706	39.8 39.8	1219 1220	2.68 2.68	5.9 5.9	V,192192+x6		

Pb Bulk Density (kg/m3)
M.C. Moisture Content (%)
Pd Dry Density (kg/m3)
A.V. Air Voids (%)

S Shear Strength (P - blows per 50mm on scala penetrometer, V - shear strength by vane (kPa) in terms of BS: 1377:1975)
S.G. Specific Gravity
R.L. Reduced Level (metres)

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INSITU DENSITY TEST RESULTS

SITE: DONAGAL STUD, CHAPPLE ROAD **JOB No: 147515.2**

TEST NO	DATE	R.L.	SOIL DESCRIPTION	Pb	M.C.	Pd	S.G.	A.V.	SHEAR STRENGTH	RETEST No	COMMENTS
T13			Silt, slightly clayey, light brown and light grey	2015 2014	21.5 21.5	1659 1658	2.68 2.68	2.5 2.5	V,192+x2,163,144 132,100	T14	Excavated to 0.3m and left to dry before recompacting
T14	28/11/97		Silt, slightly clayey, light brown trace topsoil	2009 2008	23.5 23.5	1627 1626	2.68 2.68	1.1 1.2	V,174+x2,158,148 140,122	T13	
T15	01/12/97		Silt, slightly clayey, light brown and light grey	1856 1854	29.2 29.2	1436 1434	2.68 2.68	4.4 4.5	V,192+x2,158 145x2,122		
T16			Silt, slightly clayey, light brown and light grey	1760 1762	25.7 25.7	1400 1402	2.68 2.68	11.8 11.7	V,192+x3,165,158 151		
T17	05/12/97		Silt, slightly clayey and clayey, light grey and grey brown, moist to wet	1695 1697	65.0 65.0	1027 1028	2.68 2.68	-5.1 -5.2	V,120,104,94,75 64,62	T23	
T18	08/12/97		Silt, slightly clayey, brown and light brown	1724 1725	50.7 50.7	1144 1145	2.68 2.68	-0.7 -0.7	V,191+x2,178,168 136,128		
T19			Silt, slightly clayey, brown	1798 1790	32.6 32.6	1356 1350	2.68 2.68	5.2 5.6	V,191+x6		
T20			Silt, slightly clayey, brown	1738 1735	31.2 31.2	1325 1323	2.68 2.68	9.3 9.4	V,191+x6		
T21			Silt, slightly clayey, light grey and orange/red	1718 1716	55.8 55.8	1102 1101	2.68 2.68	-2.7 -2.6	V,191+x2,162,159 155,137		
T22	09/12/97		Silt, slightly clayey, brown and light brown	1742 1745	49.9 49.9	1162 1164	2.68 2.68	-1.4 -1.5	V,191+,178,161 137,128,112		
T23			Silt, slightly clayey, light brown and black-brown	1683 1682	54.4 54.4	1090 1089	2.68 2.68	0.0 0.1	V,191+x2,178 137,125,109	T17	
T24	11/12/97		Silt, slightly clayey, light brown and light grey	1861 1860	30.9 30.9	1422 1421	2.68 2.68	3.0 3.1	V,192+x2,162,145 142,135		

Pb Bulk Density (kg/m3)
M.C. Moisture Content (%)
Pd Dry Density (kg/m3)
A.V. Air Voids (%)

S Shear Strength (P - blows per 50mm on scala penetrometer, V - shear strength by vane (kPa) in terms of BS: 1377:1975)
S.G. Specific Gravity
R.L. Reduced Level (metres)

geolab

INSITU DENSITY TEST RESULTS

SITE: DONAGAL STUD, CHAPPLE ROAD **JOB No: 147515.2**

TEST NO	DATE	R.L.	SOIL DESCRIPTION	Pb	M.C.	Pd	S.G.	A.V.	SHEAR STRENGTH	RETEST No	COMMENTS
T25	12/12/97		Silt, clayey and slightly sandy, light grey and light brown	1807 1805	30.0 30.0	1390 1388	2.68 2.68	6.4 6.5	V,192+x3,163,151 141		
T26	15/12/97		Silt, slightly clayey, grey brown and light grey	1701 1700	41.3 41.3	1204 1203	2.68 2.68	5.4 5.4	V,191+x3,137 128,124		
T27			Silt, slightly clayey, grey brown and light grey	1842 1843	29.4 29.4	1423 1424	2.68 2.68	5.0 5.0	V,191+x6		
T28			Silt, slightly clayey, grey brown and light grey, trace sand	1781 1782	36.5 36.5	1305 1306	2.68 2.68	3.7 3.6	V,191+x2,182 168,148,137		
T29			Silt, slightly clayey, grey brown and light grey, trace sand	1946 1917	24.1 24.1	1568 1544	2.68 2.68	3.7 5.1	V,191+x6		
T30	18/12/97		Silt, slightly clayey/clayey, light grey and light brown	1719 1720	47.4 47.4	1166 1167	2.68 2.68	1.2 1.1	V,192+,178,169 162,151,134		
T31			Silt, slightly clayey/clayey, light grey and light brown	1773 1772	43.4 43.4	1236 1236	2.68 2.68	0.2 0.2	V,192+x2,169,149 145,121		
T32	22/12/97		Silt, slightly clayey, light brown	1922 1923	22.0 22.0	1576 1577	2.68 2.68	6.6 6.5	V, 192+x6		
T33			Silt, slightly clayey, light brown	1639 1642	57.4 57.4	1041 1043	2.68 2.68	1.4 1.2	V,192+x3,178,161 157		
T34	23/12/97		Silt, slightly clayey, brown	1919 1920	20.7 20.7	1590 1591	2.68 2.68	7.8 7.7	V,191+,164,148 111,88,84	T41	Mixed to blend and dry before recompacting
T35			Silt, slightly clayey, light brown and light grey	1965 1964	27.0 27.0	1547 1546	2.68 2.68	0.5 0.5	V,UTPx3,191+x2 148		
T36			Silt, slightly clayey, light brown, light grey, and some grey brown	1617 1620	46.8 46.8	1102 1104	2.68 2.68	7.4 7.2	V,182,164,162 155,144,137		

Pb Bulk Density (kg/m3)
M.C. Moisture Content (%)
Pd Dry Density (kg/m3)
A.V. Air Voids (%)

S Shear Strength (P - blows per 50mm on scala penetrometer, V - shear strength by vane (kPa) in terms of BS: 1377:1975)
S.G. Specific Gravity
R.L. Reduced Level (metres)

geolab

INSITU DENSITY TEST RESULTS

SITE: DONAGAL STUD, CHAPPLE ROAD **JOB No: 147515.2**

TEST NO	DATE	R.L.	SOIL DESCRIPTION	Pb	M.C.	Pd	S.G.	A.V.	SHEAR STRENGTH	RETEST No	COMMENTS
T37	23/12/97		Silt, slightly clayey, light brown, light grey, some grey brown	1769 1770	34.8 34.8	1313 1313	2.68 2.68	5.4 5.3	V,191+x2,164,159, 148		
T38	30/12/97		Silt, clayey, light grey	1720 1721	45.9 45.9	1179 1179	2.68 2.68	1.9 1.8	V,191+x6		
T39			Silt, clayey, light grey	1786 1785	37.8 37.8	1296 1295	2.68 2.68	2.6 2.7	V,191+x6		
T40			Silt, slightly clayey, light grey	1940 1941	19.6 19.6	1622 1623	2.68 2.68	7.7 7.7	V,191+x4,164 148		
T41			Silt, slightly clayey, light grey	1976 1978	20.6 20.6	1639 1640	2.68 2.68	5.1 5.0	V,191+x4,156 146	T34	
T42	31/12/98		Silt, slightly clayey, light grey	1957 1960	19.6 19.6	1637 1639	2.68 2.68	6.9 6.8	V,191+x6		
T43			Silt, clayey, light grey	1762 1760	40.0 40.0	1258 1257	2.68 2.68	2.7 2.8	V,191+x6		
T44	12/01/98		Silt, slightly clayey, light brown and light grey	1952 1951	11.2 11.2	1756 1755	2.68 2.68	14.9 14.9	V,UTPx2,192+x2 171	T45	Mixed with wet soil before recompacting
T45	13/1/98		Silt, slightly clayey, grey and light brown	1796 1797	34.7 34.7	1333 1334	2.68 2.68	4.0 3.9	V,UTPx4, 156,143	T44	
T46			Silt, slightly clayey, grey and light brown	1874 1875	17.9 17.9	1590 1591	2.68 2.68	12.3 12.2	V,UTPx2,174+x2 169,158	T48	Excavated to 0.5m and water added before recompacting
T47	14/1/98		Silt, slightly clayey, light brown, dry	1670 1672	25.5 25.5	1331 1332	2.68 2.68	16.4 16.3	V,UTPx6	T49	Excavated to 0.5m and water added before recompacting
T48				1976 1977	22.1 22.1	1618 1619	2.68 2.68	3.8 3.8	V,UTPx6	T46	

Pb Bulk Density (kg/m3)
M.C. Moisture Content (%)
Pd Dry Density (kg/m3)
A.V. Air Voids (%)

S Shear Strength (P - blows per 50mm on scala penetrometer, V - shear strength by vane (kPa) in terms of BS: 1377:1975)
S.G. Specific Gravity
R.L. Reduced Level (metres)

geolab

INSITU DENSITY TEST RESULTS

SITE: DONAGAL STUD, CHAPPLE ROAD **JOB No: 147515.2**

TEST NO	DATE	R.L.	SOIL DESCRIPTION	Pb	M.C.	Pd	S.G.	A.V.	SHEAR STRENGTH	RETEST No	COMMENTS
T49	+15/1/98		Silt, slightly clayey, light grey and light brown	1740 1742	40.8 40.8	1236 1237	2.68 2.68	3.5 3.4	V,158,155x2,145 134,132	T47	
T50			Silt, slightly clayey, light grey and light brown	1819 1820	40.7 40.7	1293 1293	2.68 2.68	-0.9 -0.9	V,192+x5,125		
T51	+19/1/98		Silt, slightly clayey, light brown	1799 1812	25.8 25.8	1430 1441	2.68 2.68	9.8 9.1	V,174+x2,169,158 156,121		

Pb Bulk Density (kg/m3)
M.C. Moisture Content (%)
Pd Dry Density (kg/m3)
A.V. Air Voids (%)

S Shear Strength (P - blows per 50mm on scala penetrometer, V - shear strength by vane (kPa) in terms of BS: 1377:1975)
S.G. Specific Gravity
R.L. Reduced Level (metres)

APPENDIX 3

FILL SPECIFICATION

9.0 EARTHWORKS AND EARTHWORKS CONTROL CRITERIA

9.1 General

At the time of writing of this report, no earthworks proposals had been provided. Based on the landform, it is assumed that only limited earthworks will take place. These would probably be limited to in-filling of the gullies, with possible some "cut" to provide the materials for the infilling and to equalise the levels across the site. Prior to any placement of engineered fill, any soft, organic or otherwise unsuitable materials should be removed from below the areas to be filled and suitable drainage measures emplaced. These should be sufficient to prevent groundwater from rising through the fill and causing a reduction in the in-situ shear strength of the fill. It may be necessary to culvert the stream, depending on the scheme design. Fill should be placed in layers no more than 0.15m thick when compacted. All fill placed against sloping ground should be properly benched into the natural materials, in benches no greater than 0.5m in height.

If 'cuts' are to be made on the site, it is possible that final ground levels may be close to the level of the organic silts noted in the exploratory holes. If this is the case this could lead to excessive settlement of any buildings constructed in these areas. Consequently it would be necessary to excavate out at least 1m of such voids beneath normal light residential buildings, and fill the void created with an engineered fill. If development other than normal light residential buildings are contemplated, it is recommended, that finalised plans are supplied to Harrison Grierson for further analysis.

9.2 Fill Materials and Compaction Criteria

As the amount of "cut" material produced from earthworks will probably be limited, only one laboratory compaction testing was undertaken. It may be necessary to import suitable material for use as engineering fill.

If the materials arising from the "cut" and any imported materials are cohesive the following criteria are suggested as a guide for earthworks control:

1. **Air Voids Percentage:** (As defined in NZS 4402:1986)

   An average value of not more than 10% and no test result permitted to be greater then 12%, in any concurrent group of three tests;

2. **Undrained Shear Strengths:**

   An average value of not less than 140kPa and no single result less than 110 kPa, in any group of three tests at any one location;

3. **Moisture Content:**

   Not less than 4% of optimum and not less than 2% above optimum.

APPENDIX 4

STATEMENT OF PROFESSIONAL OPINION

To: The City Manager
Manukau City Council
MANUKAU

STATEMENT OF PROFESSIONAL OPINION AS TO SUITABILITY OF LAND FOR RESIDENTIAL DEVELOPMENT

SUBDIVISION: Donegal Park Stages 1A, 1B & 1C

OWNER/DEVELOPER: Green & McCahill Residential Ltd

LOCATION: Thomas Road

I, Philip Walter Matthew WILLIAMS of HARRISON GRIERSON CONSULTANTS LIMITED, 429 Parnell Road, Parnell

hereby confirm that:

1 I am a Registered Engineer experienced in the field of soils engineering and was retained by the owner/developer as the Soils Engineer on the above subdivision.

2 The extent of my inspections during construction and the results of all tests carried out are described in the accompanying report no. 14.7515.1 dated March 1998. The purpose of the report is to provide a record of the earthworks procedures and to describe the technical background upon which this statement of professional opinion has been based. The lots covered by this statement are nos. 1 to 45, 127 to 135,and 193 to 224.

3 One purpose of this statement is to describe the extent to which buildings designed in accordance with NZS 3604:1990 "Code of Practice for Light Timber Framed Buildings Not Requiring Specific Design" (NZS 3604) can rely upon soil conditions for foundation construction in accordance with that Code. In this regard the reference to NZS 3604 is itself specific, and does not include other non-specific design codes such as NZS 4229.

4 In my professional opinion, not to be construed as a guarantee, I consider that the fill shown on the attached Harrison Grierson Consultant's drawing no. 7515-G01 has been placed in accordance with NZS 4431:1989, Code of Practice for Earthfills for Residential Development and NZS 4404:1981, Code of Practice for Urban Land Subdivision.

5 With respect to the safe bearing capacity of soils, in my professional opinion, not to be construed as a guarantee, I consider that:

i) The filled ground is suitable for buildings constructed in accordance with NZS 3604 and for which it is believed that the modified soils thereon will afford a foundation safe bearing capacity of 100kPa for shallow foundations.

ii) The natural ground and excavated ground comprising all lots except for those referred to in item 5 iii) below, is suitable for buildings constructed in accordance with NZS 3604 and for which it is believed that the unmodified soils thereon will afford a foundation safe bearing capacity of 100kPa for shallow foundations.

iii) The suitability of natural and excavated ground comprising all or part of the lots 197,198,199,201,202,203, 213, 214, 215 and 216 (all within stage 1B of the subdivision) will be reported on at a later date. These lots are excluded from this certification.

6 Due to the expansive nature of Auckland soils, and of the soils on this site in particular, the following precautions should be observed on all sites:

i) Conventional shallow pad and strip footings for all buildings be founded at a minimum depth of 450mm below prepared platform levels.

ii) Where buildings straddle both filled ground and natural or excavated ground, and depending on the nature of the building, allowance be made for possible differential seasonal swelling and shrinking of the disparate soil types.

7 This statement does not extend to retaining walls (including basement excavation retaining walls), or site development cuts or fills which fall within the scope of the Building Act or which require Council resource consent.

8 This statement of professional opinion does not remove the necessity for the usual inspection of foundation excavations by Council and any unexpected or unusual site conditions encountered should in the first instance be referred to Harrison Grierson Consultants Ltd for evaluation.

9 This statement of professional opinion is furnished to the Council and the owner/developer for their purpose alone on the express condition that it will not be relied upon by any other person.

Signed ..... Date 08:04:98

DRAWING

7515-G01

I CERTIFY THAT WE HAVE INSPECTED THE FINAL FORMATION OF THIS SUBDIVISION AND, HAVING REVEIWED THIS PLAN IN CONJUCTION WITH THE KNOWLEDGE OF THE EARTHWORKS CARRIED OUT, ARE SATISFIED THAT THIS IS A TRUE AND ACCURATE RECORD OF THE EARTHWORKS

CERTIFIED _____
REGISTERED ENGINEERING ASSOCIATE

I CERTIFY THAT, TO THE BEST OF MY KNOWLEDGE, THE FILL CONTOURS SHOWN ON THIS DRAWING ARE ACCURATELY PLOTTED IN RELATION TO LOT BOUNDARIES , AND THAT FILL DEPTHS SHOWN ARE CORRECT

CERTIFIED _____
REGISTERED ENGINEERING ASSOCIATE
NB - HEIGHT DATUM, MSL DOSLI 1949

LEGEND

T 43 DENSITY TEST LOCATION

S 1 SCALA PENETROMETER TEST LOCATION

REVISIONS:	DATE	NAME
1. TEST LOCATIONS ADDED BY HGCL	25/3/96	J.F.

DATE ISSUED: FEB 1996

DONEGAL PARK STG 1A,1B & 1C

DEPTH OF FILL PLAN

GREEN & MACCAHILL RESIDENTIAL LTD

Harrison Grierson Consultants Ltd
P.O. Box 5760
Wellesley St Auckland

HGCL DRAWING No. 7515-G01 A3:1:1500

WOOD & PARTNERS CONSULTANTS LTD.
REGISTERED SURVEYORS
CONSULTING ENGINEERS.
72 GRAFTON ROADPO BOX 6752. AUCKLAND
PH.379-8255. FAX.379-8256.

SCALE: 1:750
SHEET No 1
OF 1 SHEETS.
CLIENT REF: AC/DANIDOP
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