



Geotechnical Completion Report

HITCHEN BLOCK STAGE 12D

For

DFH JOINT VENTURE LIMITED

20 April 2021

Ref No: J00113

DFH Joint Venture Limited
PO Box 302 877
North Harbour 1330

Attention: Mr R Parkinson

Dear Russell

RE: Geotechnical Completion Report for Hitchen Block Stage 12D, Pokeno

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 DFH Joint Venture Limited and forms part of the documentation required by Waikato District 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 Lander Geotechnical Consultants Limited



S.G. Lander
Principal Geotechnical Engineer
CMEngNZ, CPeng, IntPE(NZ)

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1 INTRODUCTION AND DESCRIPTION OF SUBDIVISION

This Geotechnical Completion Report has been prepared for DFH Joint Venture Limited as part of the documentation required to be submitted to the Waikato District Council following residential subdivisional development.

It contains our Suitability Statement, relevant test data and the CivilPlan Consultants Limited as-built plan set relating to Stage 12D of the Hitchen Block Residential Subdivision as follows:

Table 1: CivilPlan Consultants Limited As-Built Plans

Title	Reference No.	Date
As Built Contours	136701-10-AB200	February 2021
As Built Cut-Fill Contours	136701-10-AB201	February 2021
Stormwater As Built	136701-10-AB400	March 2021
Wastewater As Built	136701-10-AB401	March 2021

This report covers the construction period July 2020 to April 2021. It is intended to be used for certification purposes as follows:

- 13 residential lots numbered 1 to 13.
- 1 jointly owned access lots numbered JOAL 1.

This stage of the subdivision is located as shown on the attached CivilPlan Consultants Limited as-built plan. As can be seen on the Cut Fill Contours As-Built plan, all of the lots have been partly or totally affected by filling, to a maximum depth of approximately 8m.

2 RELATED REPORTS

A Geotechnical Investigation Report on the subject land was prepared by this Consultancy, reference J00113, dated 14 May 2020. The conclusions and recommendations of that report have been reviewed during the preparation of this document, along with the following Geotechnical Completion Reports (prepared by Lander Geotechnical Consultants Limited) on adjacent recently completed stages of the subdivision which are tabulated below.

Of importance to this subdivision is the requirement for a Building Line Restriction (BLR) approximately 1m upslope of the steep gully flanks within Lots 11 and 12 (i.e. land steeper than 1(v) in 4(h)). This was determined by site-specific slope stability assessment during the Geotechnical Investigation Report and the final position of the BLR is shown on the As-Built Contours plan. Specific details are presented in Section 5.1.1 of this report and in the Suitability Summary Statement.

Table 2: Lander Geotechnical Consultants Geotechnical Completion Reports

Subdivision Title	Reference No.	Issue Date
Hitchen Block Stage 1 (Residential)	J00113	23 December 2016
Gateway Industrial Part Stage 5 (Lots 28 and 29)	J00022	27 February 2017
Hitchen Block Stage 2A and 2B (Residential)	J00113	14 July 2017
Hitchen Block Stage 2C and 3A (Residential)	J00113	27 October 2017

Subdivision Title	Reference No.	Issue Date
Hitchen Block Stage 3A2, 3B and 3C (Residential)	J00113	20 December 2017
Hitchen Block Stage 5A (Residential)	J00113	26 January 2018
Hitchen Block Stage 4A (Residential)	J00113	23 March 2018
Hitchen Block Stage 6A and 6B (Residential)	J00113	23 May 2018
Hitchen Block Stage 4B (Residential)	J00113	28 August 2018
Hitchen Block Stage 7A & 7B (Residential)	J00113	2 November 2018
Hitchen Block Stage 8A & 8B (Residential)	J00113	9 May 2019
Hitchen Block Stage 6D (Residential)	J00113	4 November 2019
Hitchen Block Stages 11, 12 and 14 (Residential)	J00113	13 March 2020
Hitchen Block Stage 9 (Residential)	J00113	24 June 2020
Hitchen Block Stages 6E & 10A to 10D (Residential)	J00113	16 December 2020
Hitchen Block Stages 10E & 10F (Residential)	J00113	11 March 2021

3 EARTHWORKS OPERATIONS

3.1 Plant

The main items of plant used by the Contractor, Kerry Dines Limited were:

- 7 x bulldozers with scoops,
- 1 x elevating motorscraper,
- 3 x articulated dump trucks,
- 2 x 4WD sheepsfoot compactors,
- 4 x 20T hydraulic excavators,
- 1 x Tractor with disc ploughs.

3.2 Construction Programme

Earthworks operations for this stage commenced in late July 2020 with topsoil stripping and the muckout of the gully which runs beneath lots 2 to 5. Following this, underfill drainage (comprising of 160mm perforated drain coils, covered with drainage aggregate and fully wrapped with geotextile cloth) was installed along the gully invert. These works progressed until late April due to the earthworks season ending.

In mid-November 2020, the muckout of the gully recommenced, extending beneath lots 3, 11 and 12. Following gully stripping operations, a toe key was formed at the base of the gully within lots 11 and 12, which comprised of compacted SPR (soft pit run) materials. Upon completion of the toe key, the underfill drainage was extended over the toe key and fill placement commenced to form a 1(v) in 3(h) batter within the southern portions of lots 3, 11 and 12. These operations were generally complete by late January 2021.

Topsoil stripping operations were also carried out from mid-November 2020 in the northern portions of the site, beneath lots 1 and 6 to 13. Bulk filling operations over these lots were completed alongside the fills within the 1(v) in 3(h) batter. This was followed by infrastructure construction and topsoiling of the lots through until early April 2021.

4 QUALITY ASSURANCE AND CONTROLS

4.1 Inspections

During earthworks construction, engineering observations were undertaken on a near 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 of earthworks areas;
- Removal of soft sediments in the gully inverts;
- Placement of the underfill drains;
- Fill placement and plant performance upon the subgrade periodically throughout the bulk filling works.

4.2 Quality Control

4.2.1 Compaction Criteria

Due to the varying SPR hardfill materials being used as filling, the compaction control criteria was determined by plateau testing and a maximum dry density of 2.09 t/m³ was determined. A minimum density of 95% of the dry density was specified for the hardfill compaction within the toe key. In addition, a minimum Clegg Impact Value (CIV) of 20 was specified for all compacted hardfills.

Where clay fill was used for the bulk site fills the following compaction control criteria was used (as has been used on other stages of the overall subdivision to date):

Minimum Shear Strength and Maximum Air Voids Method

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

Note: The average value shall be determined over any ten consecutive tests

4.2.2 Compaction Assurance Testing

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, and a series of hand auger boreholes were also drilled at selected locations as an added check on quality control. The results of this testing (including testing some testing undertaken on adjacent stages of the subdivision) are appended in Appendix 2.

Control tests carried out on the filling showed that on two occasion the required compaction standards were not being achieved. Results of the test failures were relayed to the site foreman and/or his staff, and the affected areas of fill were re-worked as necessary. In each case, further testing was carried out until compliance with the standards was achieved.

5 PROJECT EVALUATION

5.1 Lot Gradients

5.1.1 Building Line Restriction – Lots 11 and 12

As discussed in Section 2 above, a BLR has been set approximately 1m from the slope crest (i.e. where the slope increases to steeper than 1(v) in 4(h) in lots 11 and 12) based on the slope stability analyses completed as part of the Geotechnical Investigation Report. The location of the BLR is shown on the As-Built Contours plan.

Any building development or earthworks proposed by future land owners within Lots 11 and 12 downslope of the BLR will be subject to further geotechnical investigations and slope stability analyses.

5.1.2 Slopes Steeper than 1(v) in 4(h)

The appended as built contours plan shows areas having gradients steeper than 1(v) in 4(h) or being immediately adjacent to land having such gradients. The extent of these areas has been determined by the surveyed site gradients and our final walkover inspection, but there may be localised areas having such gradients that have not been shown on the plans.

We are satisfied that these lots are not subject to the hazards described in section 71(3) of the Building Act.

Details of resulting building and earthworks restrictions within the vicinity of these lots are presented in the Suitability Statement.

5.2 Bearing Capacity and Settlement of Building Foundations

Following the completion of earthworks operations, we returned to the site in February 2021 and drilled a series of hand auger boreholes in order to determine representative finished ground conditions and hence evaluate likely foundation options for future building development.

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.

Where any building platforms have been rutted by heavy machinery subsequent to this report, or softened due to ponded rainwater, engineering advice should be sought with a view affected areas be

trimmed back to competent ground and reinstated with compacted hardfill to design subgrade level prior to the commencement of building construction.

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 or endorsement is proposed, on account of the risk of induced consolidation of the subsoils caused by the weight of the backfill.

5.3 Expansive Soils

Two sets of Shrink-Swell Index tests were carried out on samples selected from around the site and within the zone of likely influence of shallow building foundations to inform the expansive Site Class for this stage of the subdivision. The Shrink-Swell Index tests were carried out in accordance with AS 1289, "Methods of Testing Soils for Engineering Purposes" test method 7.1.1 and were primarily intended to assess the Expansive Classes of the site materials.

The Expansive Site Class for this subdivision is M (moderate) for all residential lots, as defined in MBIE Acceptable Solutions and Verification Methods amendment 19¹.

Based on the laboratory testing and visual tactile assessments of the soils observed in our post-construction boreholes, the Expansive Site Class for this stage of the subdivision is M (moderate) for all residential lots.

The characteristic surface ground movement (y_s) for Expansive Site Class M is up to 44mm. Details relating to this Expansive Site Classes are provided in Appendix 3, and specific design alternatives for these Site Classes are presented in the Suitability Statement. These classifications may be re-addressed by end users during building consent if site specific laboratory shrink-swell testing is undertaken, as recommended in the MBIE document attached.

5.4 Fill Induced Settlement

As a result of our pre-fill inspections, the installation of subsoil drainage, quality control testing and the elapsed time since the placement of the majority of the filling, 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 development.

5.5 Vegetation Cover

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

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

¹ Ministry of Business, Innovation and Employment. Verification Methods and Acceptable Solutions Amendment 19 for NZ Building Code B1/AS1, Section 3 (as relevant to expansive soils and good ground). Effective 28 November 2019.

5.6 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.

Uncontrolled stormwater discharges onto the ground surface can cause erosion, scour and/or instability on sloping land and should not be permitted under any circumstances where stability could be compromised.

5.7 Service Trenches

As is normal on all subdivisions, building developments involving foundations within a 45° zone of influence from pipe inverts will require Engineering input.

5.8 Underfill Drains

The appended fill as-built cut-fill contour plans show the alignments of perforated underfill drains that were placed in mucked out gully inverts prior to filling to tap groundwater seepages. These drains run beneath portions of residential Lots 2 to 5, 11 and 12.

These drains were intended to intercept localised groundwater seepages during earthworks and/or allow engineered fill placement as required by the project specifications. The drains were installed as a precautionary measure, not as remedial works for any existing instability, and they need no specific maintenance.

Notwithstanding, it is recommended that future foundations or site development works preserve these drains. In the event that they are compromised by any future development in any of the lots they should be reinstated under geotechnical engineering observational guidance.

5.9 Topsoil

Topsoil depths in likely building platform areas were checked by the drilling of a borehole in the approximate centre of lot. Our findings, which are indicative only and subject to variation at other locations, show that likely topsoil depths are between 50 mm and 250 mm. Site specific findings are presented in the Suitability Statement Summary.

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 Lander Geotechnical Consultants Limited reports, recommendations and site instructions,

and that all as-built information and other details provided to the Client and/or Lander Geotechnical Consultants Limited are accurate and correct in all respects.

6 STATEMENT OF PROFESSIONAL OPINION AS TO THE SUITABILITY OF LAND FOR BUILDING DEVELOPMENT

I, S.G. Lander, of Lander Geotechnical Consultants 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 Owner/Developer as the Geotechnical Engineer on Stages 12D of the Hitchen Block residential subdivision.
2. The extent of preliminary investigations carried out to date are described in Geotechnical Investigation Report reference J00113, dated 14 May 2020, and the conclusions and recommendations of that document have been re-evaluated in the preparation of this report (especially with regards to the Building Line Restriction). The results of all tests carried out under Lander Geotechnical Consultants Limited direction 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 fill as-built plan have been placed in compliance with NZS 4431 and related documents.
 - (b) The completed earthworks give due regard to land slope and foundation stability considerations within the residential lots, however, as shown on the appended contour as-built plan, lots 3, 4 and 8 to 13 have gradients steeper than 1(v) in 4(h).

Any building development and/or earthworks proposals downslope of the Building Line Restriction within Lots 11 and 12, or within the areas shown to be steeper than 1(v) in 4(h) on the as-built contours plan are subject to specific geotechnical investigations and/or foundation design, with a view to further site-specific slope stability assessments being required.

- (c) The function of the underfill drains should not be impaired by any building development or landscaping works. In particular, any bored or driven piles must be positioned to avoid damaging the underfill drains. The drains are shown pass under portions of residential Lots 2 to 5, 11 and 12 at depths typically greater than 2m below existing ground level and therefore should not adversely affect shallow foundation systems (dependant on final earthworks proposals). Further comments relating to these drains is provided in the suitability statement summary.
- (d) A geotechnical ultimate bearing capacity of 300 kPa may be assumed for foundation design on all lots (except where specific geotechnical endorsement is required on account of sloping land greater than 1(v) in 4(h)).

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.

- (e) 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.

- (f) The assessed Expansive Site Class in terms of MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure, effective 28 November 2019, is M for all residential lots. The characteristic surface ground movement for this Site Class is up to 44mm in regard to the above standard. Site specific laboratory testing may be undertaken by end-users to re-assess the expansive site class during building consent stage.
- (g) Subject to the geotechnical limitations, restrictions, recommendations and expansive soil assessments associated with 3(b) to 3(f) above:
 - (i) The filled and undisturbed original ground within residential lot boundaries is generally suitable for residential buildings constructed in accordance with NZS 3604 and related documents.
 - (ii) On all residential lots foundation design may be carried out in accordance with Class M (in terms of MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure, effective 28 November 2019) or alternatively, a specific foundation and structural design may be undertaken by a Chartered Professional Engineer who should allow for expansive soil effects referenced above in the design.

For buildings having brittle exterior cladding appropriate control joints should also be specifically designed depending on architectural specifications and structural form.

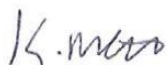
- 4. Road subgrades and lot accessway subgrades have been formed having due regard for slope stability and settlement, available subgrade strengths are dependent on-site conditions and on construction trafficking and variable results should be expected.

The professional opinion contained within this report is furnished to the Waikato District Council and DFH Joint Venture Limited for their purposes alone, with respect to the particular brief given to us. It may not be relied upon in any other context or for any other purpose without our prior review and agreement. It does not remove the necessity for the normal inspection of site conditions at the time of erection of any dwelling.

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

For and on behalf of Lander Geotechnical Consultants Limited

Prepared by:



K. Meffan
Engineering Geologist
MEngNZ

Reviewed By:



C.J. Edwards
Senior Engineering Geologist
CMEngNZ (PEngGeol)

Authorised by:



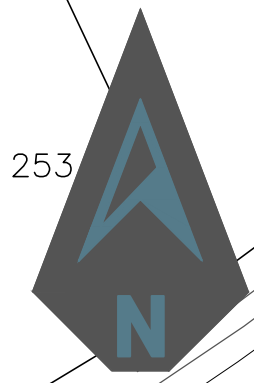
S.G. Lander
Principal Geotechnical Engineer
CMEngNZ, CPeng, IntPE(NZ)

Table 3: Suitability Statement Summary

Lot No.	Comments	Topsoil Depth (mm)	Ultimate Bearing (kPa)	Expansive Site Class (B1/AS1)
1	Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design.	250	300	M
2	Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. Function of underfill drains to be preserved (refer Section 5.8 and 6(3c) for further details).	200	300	M
3	Specific site investigation, foundation design and construction inspections required in areas shown hatched on gradient as-built plan due to 1(v) in 4(h) gradient restrictions. Elsewhere, Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. Function of underfill drains to be preserved (refer Section 5.8 and 6(3c) for further details).	200	300	M
4	Specific site investigation, foundation design and construction inspections required in areas shown hatched on gradient as-built plan due to 1(v) in 4(h) gradient restrictions. Elsewhere, Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. Function of underfill drains to be preserved (refer Section 5.8 and 6(3c) for further details).	250	300	M
5	Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. Function of underfill drains to be preserved (refer Section 5.8 and 6(3c) for further details).	150	300	M
6	Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design.	50	300	M

Lot No.	Comments	Topsoil Depth (mm)	Ultimate Bearing (kPa)	Expansive Site Class (B1/AS1)
7	Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design.	200	300	M
8	Specific site investigation, foundation design and construction inspections required in areas shown hatched on gradient as-built plan due to 1(v) in 4(h) gradient restrictions. Elsewhere, Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design.	200	300	M
9	Specific site investigation, foundation design and construction inspections required in areas shown hatched on gradient as-built plan due to 1(v) in 4(h) gradient restrictions. Elsewhere, Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design.	200	300	M
10	Specific site investigation, foundation design and construction inspections required in areas shown hatched on gradient as-built plan due to 1(v) in 4(h) gradient restrictions. Elsewhere, Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design.	200	300	M
11	Specific site investigation, foundation design and construction inspections required in areas downslope of the Building Line Restriction (refer As-Built Contours plan). Elsewhere, Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design. Function of underfill drains to be preserved (refer Section 5.8 and 6(3c) for further details).	150	300	M

Lot No.	Comments	Topsoil Depth (mm)	Ultimate Bearing (kPa)	Expansive Site Class (B1/AS1)
12	<p>Specific site investigation, foundation design and construction inspections required in areas downslope of the Building Line Restriction (refer As-Built Contours plan).</p> <p>Elsewhere, Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design.</p> <p>Function of underfill drains to be preserved (refer Section 5.8 and 6(3c) for further details).</p>	100	300	M
13	<p>Specific site investigation, foundation design and construction inspections required in areas shown hatched on gradient as-built plan due to 1(v) in 4(h) gradient restrictions.</p> <p>Elsewhere, Foundation design in accordance with MBIE Acceptable Solutions and Verifications Methods for NZ Building Code Clause B1 Structure or engineer approved alternative foundation design.</p>	200	300	M



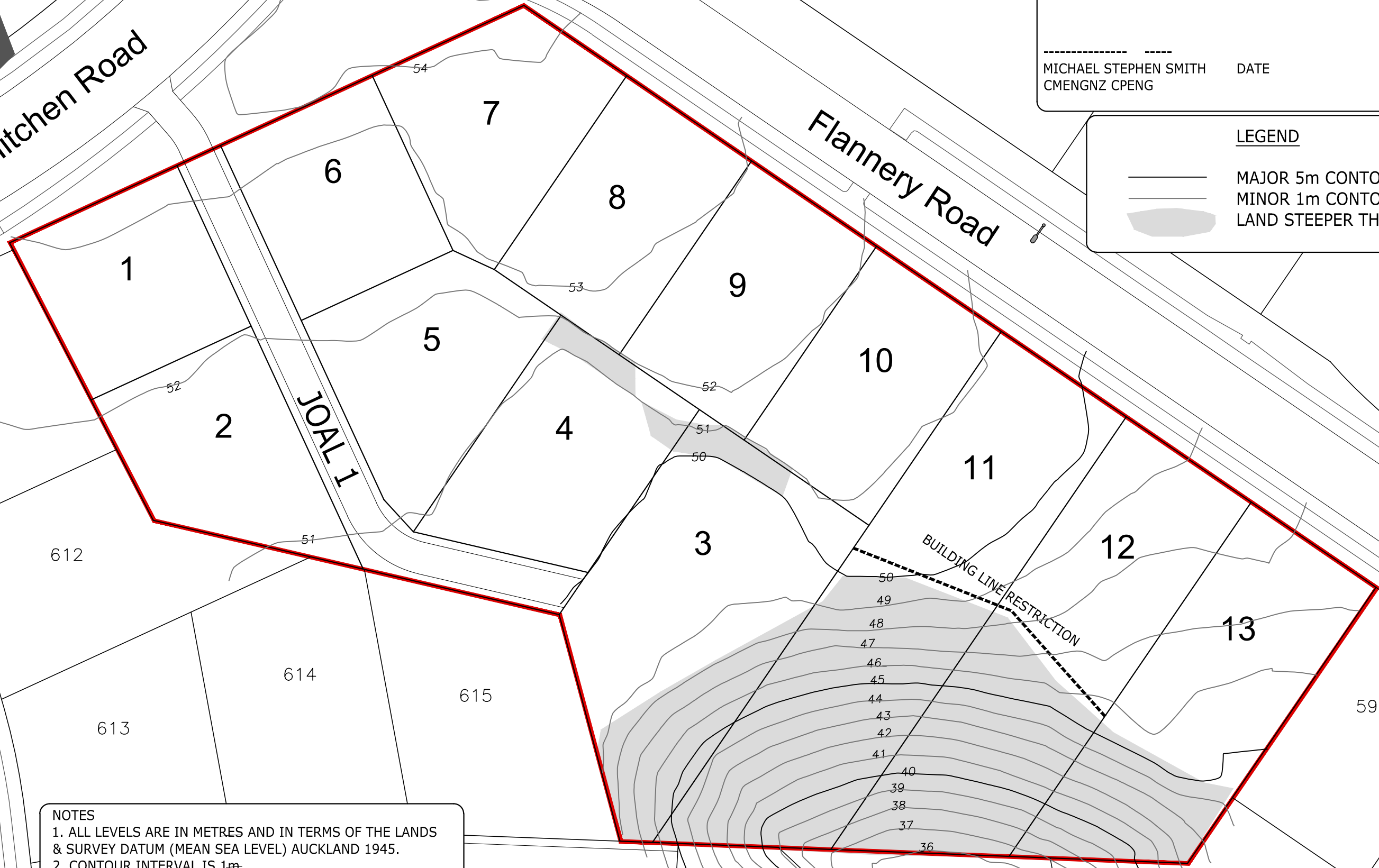
253

Hitchen Road

Flannery Road

JOAL 1




Peacock Place



I, MICHAEL STEPHEN SMITH, CMENGNZ CPENG HEREBY BELIEVE ON ALL REASONABLE GROUNDS THAT THE CONTOURS SHOWN ARE ACCURATELY PLOTTED IN RELATION TO BOUNDARIES AS THIS INFORMATION HAS BEEN PROVIDED BY THE CONTRACTOR OF THE WORKS - KERRY DINES LTD.

MICHAEL STEPHEN SMITH DATE
CMENGNZ CPENG

LEGEND

-  MAJOR 5m CONTOUR
-  MINOR 1m CONTOUR
-  LAND STEEPER THAN 1:4

NOTES

1. ALL LEVELS ARE IN METRES AND IN TERMS OF THE LANDS & SURVEY DATUM (MEAN SEA LEVEL) AUCKLAND 1945.
2. CONTOUR INTERVAL IS 1m
3. CONTOURS ACCURACY IS + OR - 0.5m

A	ISSUED FOR 224c	RJP	02-21
REV	REVISION DETAILS	BY	DATE

PLOTTED:	DATE:	02-21
RJP	DATE:	02-21
APPROVED:	DATE:	02-21
MSS	DATE:	02-21

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CIVILPLAN
CONSULTANTS

Level 9, Laidlaw House, 20 Amersham Way, Manukau, Auckland. Phone: 09 222 2445

PROJECT TITLE:
DFH JOINT VENTURE
HITCHEN STAGE 12D SUBDIVISION
POKENO

SHEET TITLE:
AS BUILT CONTOURS

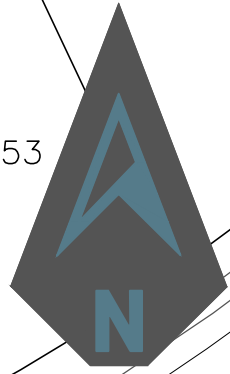
ISSUE STATUS: **AS BUILT**

SCALE: (A1/A3) 1:250 / 1:500

SCALE BAR 0 5 10 15 20 25m

DRAWING NUMBER: **136701-12D-AB200** REV: **A**

253



Hitchen Road

Flannery Road





Peacock Place

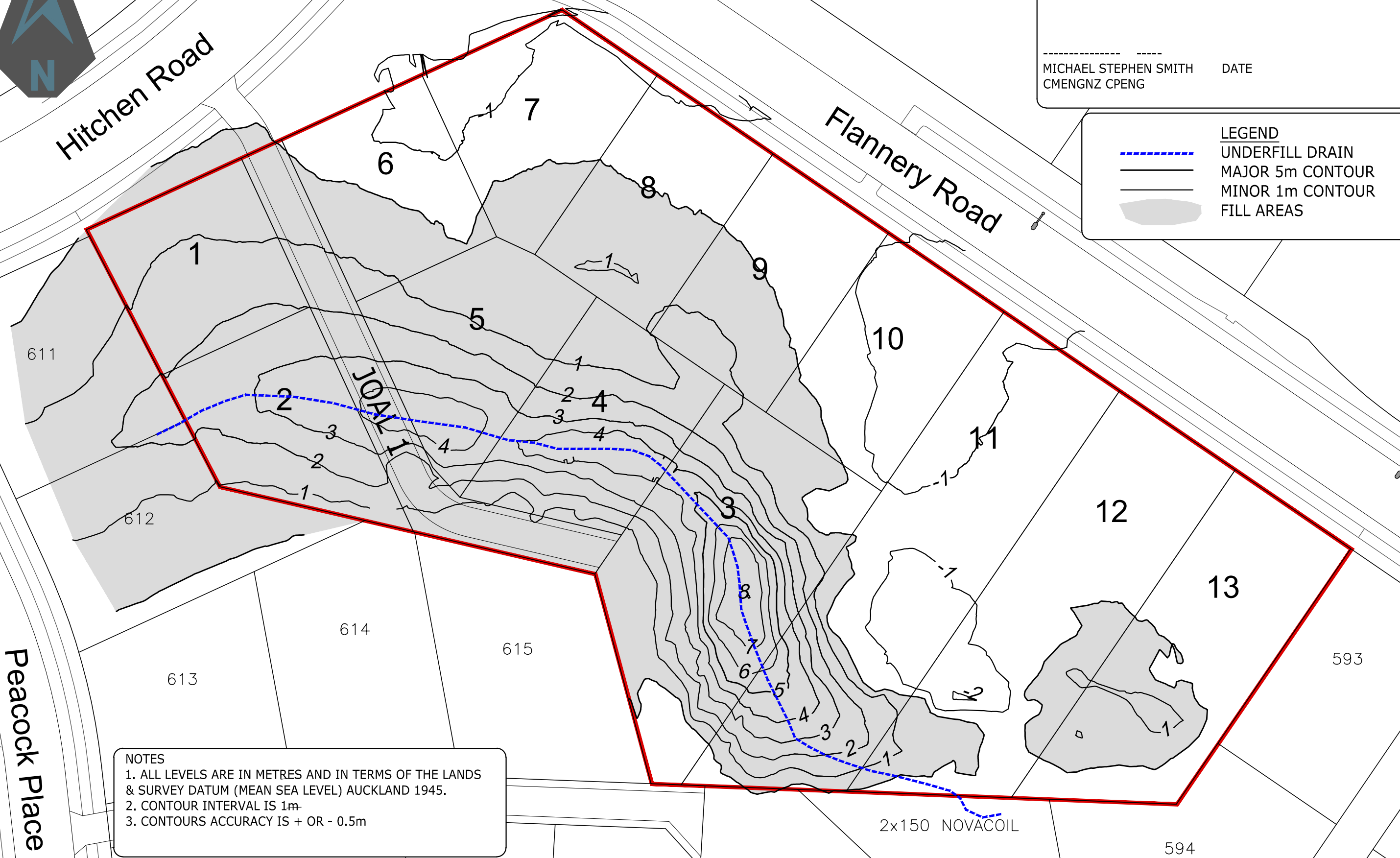
I, MICHAEL STEPHEN SMITH, CMENGNZ CPENG HEREBY BELIEVE ON ALL REASONABLE GROUNDS THAT THE CONTOURS SHOWN ARE ACCURATELY PLOTTED IN RELATION TO BOUNDARIES AS THIS INFORMATION HAS BEEN PROVIDED BY THE CONTRACTOR OF THE WORKS - KERRY DINES LTD.

MICHAEL STEPHEN SMITH
CMENGNZ CPENG

DATE

LEGEND

-  UNDERFILL DRAIN
-  MAJOR 5m CONTOUR
-  MINOR 1m CONTOUR
-  FILL AREAS



NOTES

1. ALL LEVELS ARE IN METRES AND IN TERMS OF THE LANDS & SURVEY DATUM (MEAN SEA LEVEL) AUCKLAND 1945.
2. CONTOUR INTERVAL IS 1m
3. CONTOURS ACCURACY IS + OR - 0.5m

REV	ISSUED FOR	BY	DATE
A	ISSUED FOR 224c	RJP	02-21
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CIVILPLAN CONSULTANTS

Level 9, Laidlaw House, 20 Amersham Way, Manukau, Auckland. Phone: 09 222 2445

PROJECT TITLE:
DFH JOINT VENTURE
HITCHEN STAGE 12D SUBDIVISION
POKENO

SHEET TITLE:
AS BUILT CUT-FILL CONTOURS

ISSUE STATUS: **AS BUILT**

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DRAWING NUMBER: **136701-12D-AB201** REV: **A**

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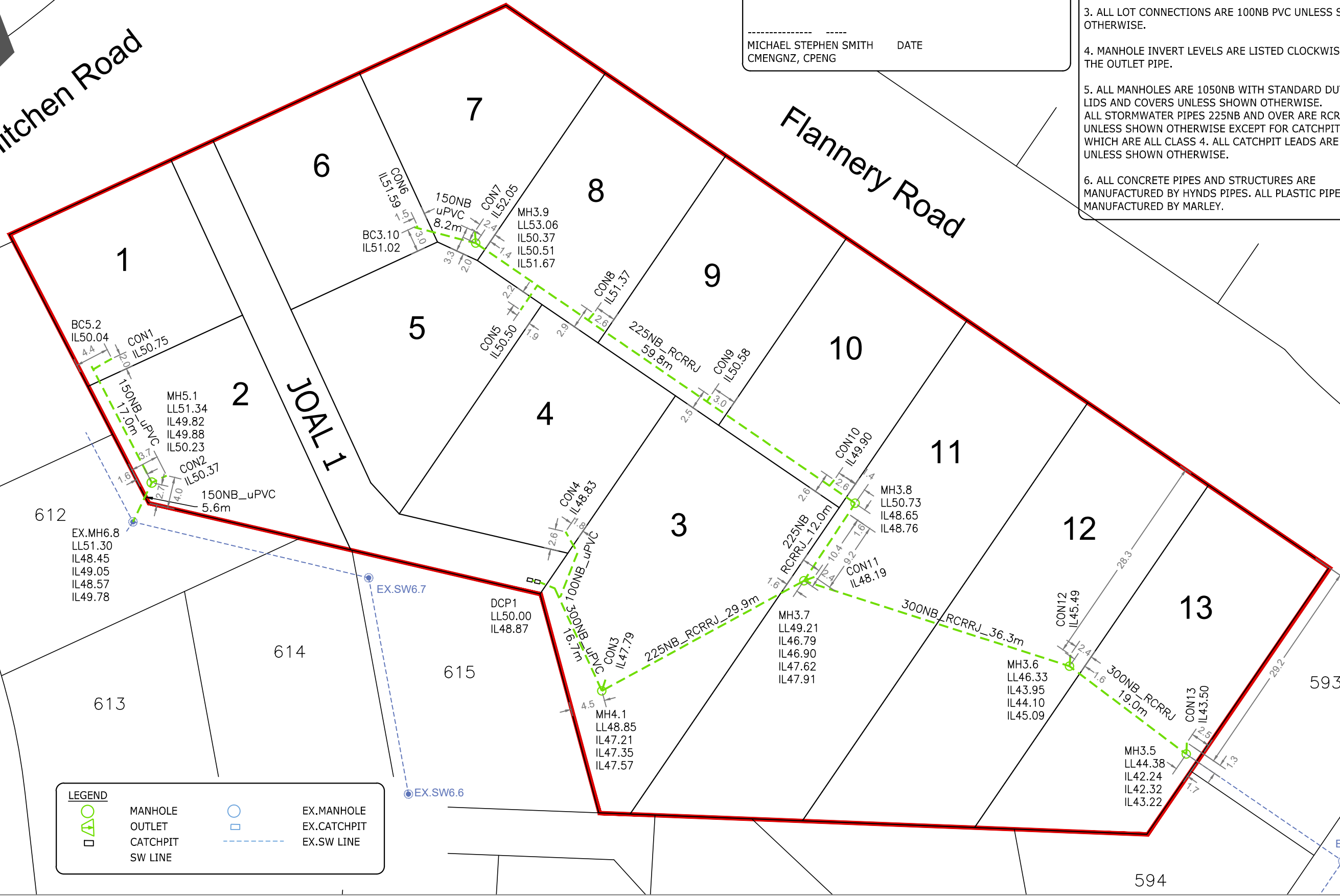
253



Hitchen Road

Flannery Road

Peacock Place



I, MICHAEL STEPHEN SMITH, CMENGNZ CPENG HEREBY BELIEVE ON ALL REASONABLE GROUNDS THAT THE PIPE SIZES, FITTINGS, POSITIONS, COORDINATES AND LEVELS SHOWN ARE ACCURATELY PLOTTED IN RELATION TO BOUNDARIES AND IS CORRECT AS THIS INFORMATION HAS BEEN PROVIDED BY THE CONTRACTOR OF THE WORKS - KERRY DINES LTD.

 MICHAEL STEPHEN SMITH DATE
 CMENGNZ, CPENG

- NOTES**
1. ALL COORDINATES ARE IN METRES AND IN TERMS OF GEODETIC 2000 MT. EDEN
 2. ALL LEVELS ARE IN METRES AND IN TERMS OF THE LANDS AND SURVEY DATUM (MEAN SEA LEVEL) AUCKLAND 1946
 3. ALL LOT CONNECTIONS ARE 100NB PVC UNLESS SHOWN OTHERWISE.
 4. MANHOLE INVERT LEVELS ARE LISTED CLOCKWISE FROM THE OUTLET PIPE.
 5. ALL MANHOLES ARE 1050NB WITH STANDARD DUTY LIDS AND COVERS UNLESS SHOWN OTHERWISE. ALL STORMWATER PIPES 225NB AND OVER ARE RCRRJ CLASS 2 UNLESS SHOWN OTHERWISE EXCEPT FOR CATCHPIT LEADS WHICH ARE ALL CLASS 4. ALL CATCHPIT LEADS ARE 225NB UNLESS SHOWN OTHERWISE.
 6. ALL CONCRETE PIPES AND STRUCTURES ARE MANUFACTURED BY HYNDS PIPES. ALL PLASTIC PIPES ARE MANUFACTURED BY MARLEY.

LEGEND

	MANHOLE		EX.MANHOLE
	OUTLET		EX.CATCHPIT
	CATCHPIT		EX.SW LINE
	SW LINE		

ISSUED FOR 224c	RJP	04-21
REVISION DETAILS	BY	DATE

PLOTTED:	DATE:	03-21
RJP	DATE:	03-21
APPROVED:	DATE:	03-21
MSS		

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CIVILPLAN
CONSULTANTS

Level 9, Laidlaw House, 20 Amersham Way, Manukau, Auckland. Phone: 09 222 2445

PROJECT TITLE:
 DFH JOINT VENTURE
 HITCHEN STAGE 12D SUBDIVISION
 POKENO

SHEET TITLE:
 AS BUILT STORMWATER

ISSUE STATUS: **AS BUILT**

SCALE: (A1/A3) 1:250 / 1:500

SCALE BAR 0 5 10 15 20 25m

DRAWING NUMBER: **136701-12D-AB400** REV: **A**

Filepath: P:\APPPDATA\LOCAL\AUTODESK\C3D 2020\ENU\TEMPLATE C:\DATA\POKENO\HITCHEN\STAGE 12D\AS BUILT\136701-12-AB400.DWG

253



Hitchen Road

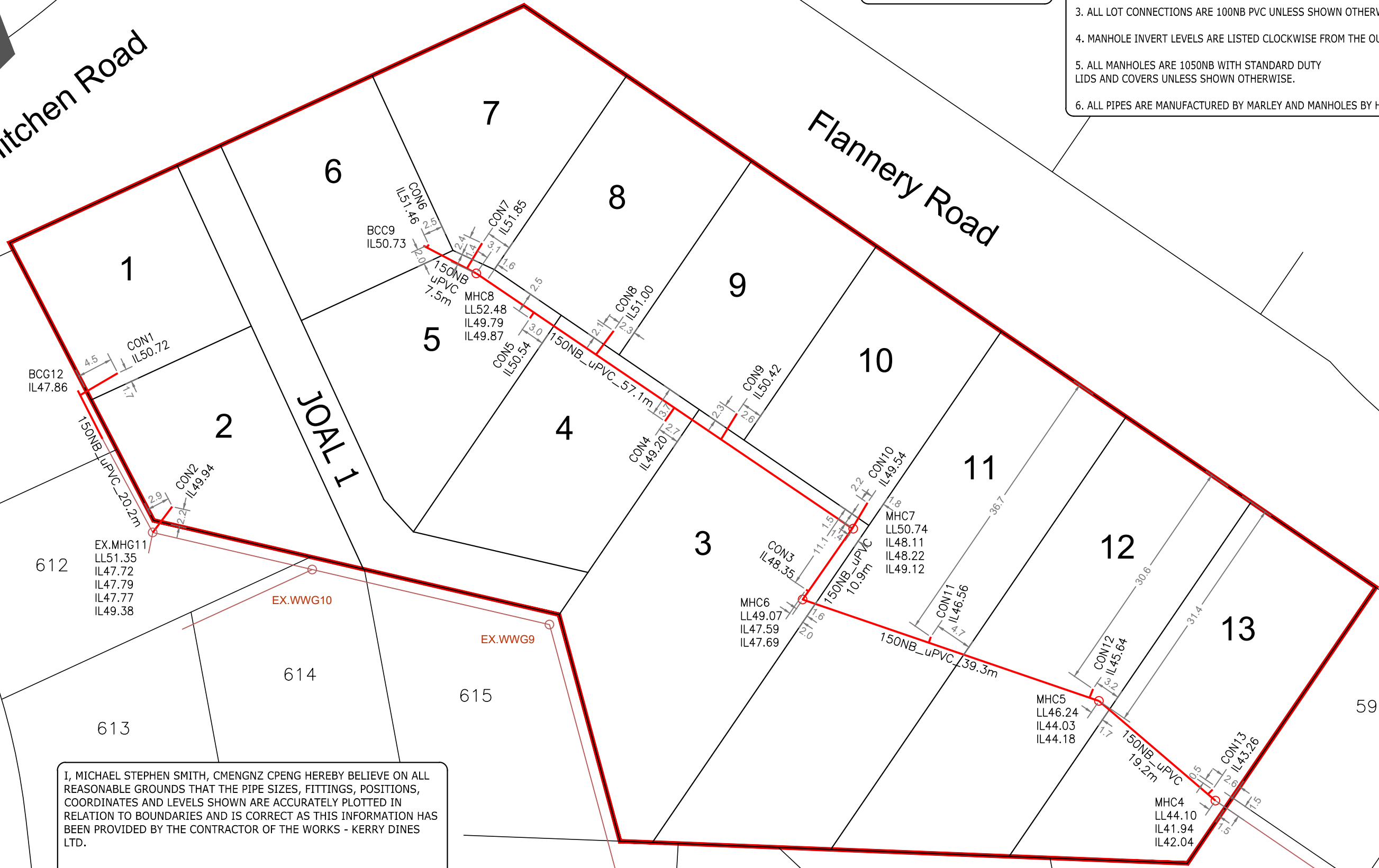
Flannery Road

Peacock Place

LEGEND

- MANHOLE
- WW LINE
- EX.MANHOLE
- EX.WW LINE

- NOTES**
1. ALL COORDINATES ARE IN METRES AND IN TERMS OF GEODETIC 2000 MT. EDEN
 2. ALL LEVELS ARE IN METRES AND IN TERMS OF THE LANDS AND SURVEY DATUM (MEAN SEA LEVEL) AUCKLAND 1946
 3. ALL LOT CONNECTIONS ARE 100NB PVC UNLESS SHOWN OTHERWISE.
 4. MANHOLE INVERT LEVELS ARE LISTED CLOCKWISE FROM THE OUTLET PIPE.
 5. ALL MANHOLES ARE 1050NB WITH STANDARD DUTY LIDS AND COVERS UNLESS SHOWN OTHERWISE.
 6. ALL PIPES ARE MANUFACTURED BY MARLEY AND MANHOLES BY HYNDS PIPES.



I, MICHAEL STEPHEN SMITH, CMENGNZ CPENG HEREBY BELIEVE ON ALL REASONABLE GROUNDS THAT THE PIPE SIZES, FITTINGS, POSITIONS, COORDINATES AND LEVELS SHOWN ARE ACCURATELY PLOTTED IN RELATION TO BOUNDARIES AND IS CORRECT AS THIS INFORMATION HAS BEEN PROVIDED BY THE CONTRACTOR OF THE WORKS - KERRY DINES LTD.

 MICHAEL STEPHEN SMITH DATE
 CMENGNZ CPENG

REV	ISSUED FOR	RJP	DATE
A	ISSUED FOR 224c	RJP	04-21
	REVISION DETAILS	BY	DATE

PLOTTED:	DATE:	THIS DRAWING AND DESIGN REMAINS THE PROPERTY OF, AND MAY NOT BE REPRODUCED OR ALTERED, WITHOUT THE WRITTEN PERMISSION OF CIVILPLAN CONSULTANTS LIMITED. NO LIABILITY SHALL BE ACCEPTED FOR UNAUTHORISED USE OF THIS DRAWING.
RJP	03-21	
DRAWN:	DATE:	
RJP	03-21	
APPROVED:	DATE:	
MSS	03-21	

CIVILPLAN
CONSULTANTS

Level 9, Laidlaw House, 20 Amersham Way, Manukau, Auckland. Phone: 09 222 2445

PROJECT TITLE:
 DFH JOINT VENTURE
 HITCHEN STAGE 12D SUBDIVISION
 POKENO

SHEET TITLE:
 AS BUILT WASTE WATER

ISSUE STATUS: **AS BUILT**

SCALE: (A1/A3) 1:250 / 1:500

SCALE BAR 0 5 10 15 20 25m

DRAWING NUMBER: **136701-12D-AB401** REV: **A**

Filepath: P:\APPPDATA\LOCAL\AUTODESK\C3D 2020\ENU\TEMPLATE C:\DATA\POKENO\HITCHEN\STAGE 12D\AS BUILT\136701-12-AB401.DWG

Lander Geotechnical
 PO Box 97 385
 Manukau
 Auckland 2241

Attention: Shane Lander

Dear Shane

Hitchen Block, Pokeno - Stage 12D Site Report

Customer's Instructions

We were instructed to:

Complete nuclear densometer, shear vane and impact hammer testing at the above-mentioned site when requested and report the results.

Specifications

As per email from Mike (Lander Geotechnical) on the 8/01/2019 the specification for Earthworks Testing was as follows;

- Average air voids <10% with maximum air voids 12%.
- Average shear strength >140 kPa with minimum single value 120 kPa.
- Average value to be determined over 10 consecutive tests.

As requested by Kyle (Lander Geotechnical) the specification for hardfill testing in the Toe Key was a minimum density of 95% of maximum dry density (MDD) and an impact hammer > 20.

As confirmed by Kyle by email on the 9/12/20 the MDD (2.09 t/m³) to be used for the hardfill being tested on site was to be same as used in REB1 at Hitchens Block, Stage 5. MDD determined from Geotechnics plateau density test on 19/2/20.

Laboratory Determined Parameters of Material

Material Type	Maximum Dry Density	Optimum Water Content	Solid Density Assumed	Report Reference Number/Supplier
	t/m ³	%	t/m ³	
SPR	2.09	-	-	Geotechnics Plateau Density Test on 19/2/20

Dates of Procedures

Testing was carried out from the 23/10/20 to the 18/01/21.

Locations

Testing was carried out as instructed by the contractor on site. Individual test locations were selected on site by the Geotechnics technician on behalf of the customer.

The attached plans provide indicative locations only and are not to scale. All other information we provide regarding location should be referenced to the asset owner.

Samples

Samples taken for moisture content verification were disposed of after 24 hours.

Methods

NZGS 8:2001 - Test method for determining the vane shear strength of a cohesive soil using a hand held shear vane.

NZS 4407:2015 Test 4.2 - Method using a nuclear surface moisture-density gauge (Direct Transmission Mode) – NDM

NZS 4407:2015 Test 3.1 - Determination of water content

NZS 4407:2015 Test 4.3 Method using a nuclear surface moisture density-gauge (Backscatter mode) - NDM

ASTM D 5874-16 - Standard test method for determination of the impact value (IV) of a soil – Impact Test

Material Description

Material descriptions are provided in the attached results. All hardfill descriptions were provided by the contractor on site.

Results

The following is attached:

Earthworks results summary, hardfill results summary and testing location plans.

Test Remarks

NDM – Direct Transmission

The test method may not be appropriate for materials containing a nominal maximum particle size of >40 mm.

Nuclear densometers are calibrated for a bulk density range of 1,728 kg/m³ to 2,756 kg/m³. Test results outside of these bulk density limits are not covered under the IANZ endorsement of this report.

An assumed solid density value of 2.70 t/m³ was agreed with the customer. We do not take responsibility for misrepresentation or misinterpretation arising from the use of this assumed value to calculate air voids.

Where oven calculated air voids are negatives, these have been reported as zero.

The calculation of air voids is based on wet density (measured by the nuclear densometer), moisture content (measured by oven drying) and solid density (either assumed or measured by laboratory

testing). Negative air voids may be caused by incorrect assumed solid density or due to the variability of onsite material when compared to that tested in a laboratory.

Determination of Water Content

Samples used for the determination of the water content were sampled in conjunction with nuclear densometer testing and disposed of after 24 hours.

NDM – Backscatter

The test method may not be appropriate for materials containing a nominal maximum particle size of >40 mm.

The wet density and moisture content were measured by the nuclear densometer.

The calculation of percentage compaction is obtained from NDM density values and customer provided maximum dry density (MDD) target.

Impact Value

Field procedure A was used. The test method is appropriate for materials having a maximum particle size of less than 37.5 mm. Results of tests that were performed on materials containing larger particle sizes, are not covered under the IANZ endorsement of this report.

Calculations of equivalent CBR are based on $CBR = IV^2 \times 0.07$. This calculation is not covered under the IANZ endorsement of this report.

Pass/Fail Criteria

We accept no liability for any circumstances that may arise due to the inclusion of the pass/fail criteria or the use of this information by third parties. Pass/fail criteria are based solely on numerical values with no consideration given to uncertainty and are not covered under the IANZ endorsement of these results.

General Remarks

This report has been prepared for the benefit of Lander Geotechnical, with respect to the particular brief given to us and it cannot be relied upon in other contexts or for any other purpose without our prior review and agreement.

The inherent uncertainties of site investigation work, mean the nature and continuity of subsoil away from the test location could vary from the data logged.

Material descriptions are included for information only and are not covered under the IANZ endorsement of this report.

Sample(s) not destroyed during testing will be retained for one month from the date of this report before being discarded.

Please reproduce this report in full when transmitting to others or including in internal reports.

If we can be of any further assistance, feel free to get in touch. Contact details are provided at the bottom of the letterhead page.

GEOTECHNICS LTD

Report prepared by:



.....
Josh Allan
Projects Manager
Approved Signatory

Authorised for Geotechnics by:

.....
Steven Anderson
Project Director

Report checked by:



.....
Seven Baker
CMT Field Technician



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

5-Mar-21

t:\geotechnicsgroup\projects\1009213\1009213.0657 - hitchen block, pokeno\workingmaterial\stage 12d\20210305 jra rpt2.docx



1 Hill Street
 Onehunga
 Auckland 1061
 New Zealand
 p. +64 9 356 3510

Project Name : Hitchens Block, Pokeno - Stage 12D
 Customer : Lander Geotechnical Ltd.

Project Number	1009213.0657.0/2
Entered By	JRA
Checked By	DASA / SEBA
Approved By	SJA

URN.	Tech.	Date	Location	Layer	Material Type	Test Type	NDM 0°			NDM 90°			AVERAGE NDM			Solid Density (t/m³) Assumed	Oven Moisture content (%)	Final Corrected		Average Air Voids (10 X Tests)	Shear Vane Reading (kPa)				Retest URN	PASS / FAIL	Comments				
							Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)	Wet Density (t/m³)	Moisture Content (%)	Air Voids (%)			Oven Dry Density (t/m³)	Average Air Voids (%)		Reading 1	Reading 2	Reading 3	Reading 4				Average SV (4 x Tests)	Average SV (10 X Sets)	(P) Pass	(F) Fail
1.1	JRA	23/10/2020	Fill Area - See Site Plan	~1m Below FL	Clay SILT	NDM / SV	1.87	31.7	2.3	1.87	32.5	1.8	1.87	32.1	2.0	2.70	33.1	1.41	1.4	-	163	171	171	174	170	-	-	P			
1.2	JRA	23/10/2020	Fill Area - See Site Plan	~1m Below FL	Clay SILT	NDM / SV	1.86	30.5	3.7	1.87	29.4	3.8	1.87	30.0	3.7	2.70	33.7	1.40	1.2	-	150	171	144	147	153	-	-	P			
2.1	JRA	28/10/2020	Fill Area - See Site Plan	~0.5m Below FL	Clay SILT	NDM / SV	1.88	32.0	1.5	1.88	31.3	2.2	1.88	31.7	1.8	2.70	38.1	1.36	0.0	-	187	136	171	160	164	-	-	P			
2.2	JRA	28/10/2020	Fill Area - See Site Plan	~0.5m Below FL	Clay SILT	NDM / SV	1.88	35.0	-0.4	1.91	34.8	0.0	1.89	34.9	0.0	2.70	36.6	1.39	0.0	-	187	182	187	187	186	-	-	P			
3.1	JRA	4/11/2020	Fill Area - See Site Plan	~FL	Clay SILT	NDM / SV	1.88	34.4	0.1	1.90	33.2	0.0	1.89	33.8	0.0	2.70	31.1	1.44	1.9	-	187	187	187	187	187	-	-	P			
3.2	JRA	4/11/2020	Fill Area - See Site Plan	~FL	Clay SILT	NDM / SV	1.78	34.6	5.2	1.78	35.9	4.4	1.78	35.3	4.8	2.70	34.5	1.32	5.3	-	131	131	171	187	155	-	-	P			
10.1	DASA	21/12/2020	Fill Area - See Site Plan	~0.6m below Toe Fill Line	Clay SILT	NDM / SV	1.72	41.5	4.8	1.71	40.9	5.5	1.71	41.2	5.1	2.70	32.0	1.30	10.4	-	170	154	185	170	170	-	-	P			
10.2				~0.3m below Toe Fill Line		NDM / SV	1.70	39.0	7.0	1.70	37.3	8.1	1.70	38.2	7.6	2.70	31.6	1.29	11.4	-	216	200	UTP	200	205	-	-	P			
10.3				~0.6m below Toe Fill Line		NDM / SV	1.72	39.4	5.6	1.72	38.3	6.5	1.72	38.9	6.1	2.70	33.5	1.29	9.2	-	UTP	216	216	UTP	216	-	-	P			
10.4				~0.3m below Toe Fill Line		NDM / SV	1.70	38.4	7.5	1.69	39.0	7.3	1.70	38.7	7.4	2.70	31.4	1.29	11.7	5.3	216	200	UTP	UTP	208	181	-	-	P		
11.1	DASA	6/01/2021	Fill Area - See Site Plan	~FL	Clay SILT	NDM / SV	1.82	38.1	1.1	1.83	37.9	0.7	1.82	38.0	0.9	2.70	36.2	1.34	2.0	5.3	216	216	216	216	216	186	-	P			
11.2				~FL		NDM / SV	1.88	30.9	2.6	1.88	31.8	2.0	1.88	31.4	2.3	2.70	32.8	1.41	1.3	5.3	170	216	216	216	205	191	-	P			
11.3				~5 - 6m below FL		NDM / SV	1.75	40.0	3.9	1.75	42.8	2.0	1.75	41.4	2.9	2.70	36.4	1.28	5.8	5.9	154	170	216	185	181	193	-	P			
11.4				~5 - 6m below FL		NDM / SV	1.78	38.2	3.0	1.77	40.2	2.5	1.78	39.2	2.8	2.70	37.3	1.29	3.9	6.3	216	216	191	200	206	195	-	P			
12.1	DASA	11/01/2021	Fill Area - See Site Plan	~4m below FL	Clay SILT	NDM / SV	1.55	45.6	12.3	1.55	47.3	11.1	1.55	46.5	11.7	2.70	40.1	1.11	14.7	-	185	154	170	173	171	193	13.3	F	Air Voids > 12%		
12.2				~5m below FL		NDM / SV	1.68	41.8	6.4	1.68	40.9	6.9	1.68	41.4	6.7	2.70	41.6	1.19	6.5	7.7	185	173	176	170	176	195	-	P			
13.1	JRA	13/01/2021	Fill Area - See Site Plan	~FL (Batter)	Clay SILT	NDM / SV	1.73	43.3	3.1	1.73	41.5	3.8	1.73	42.4	3.5	2.70	43.2	1.21	3.0	7.0	199	199	187	199	196	198	-	P			
13.2				~3m below FL		NDM / SV	1.84	39.1	0.0	1.84	38.8	0.0	1.84	39.0	0.0	2.70	32.4	1.39	3.7	6.2	199	199	199	199	199	197	-	P			
13.3				~4m Below FL		NDM / SV	1.84	36.8	0.6	1.85	37.9	0.0	1.84	37.4	0.1	2.70	36.6	1.35	0.6	5.3	199	199	199	199	199	196	-	P	Retest of URN 12.1		
14.1	JRA	18/01/2021	Fill Area - See Site Plan	~1m below FL	Clay SILT	NDM / SV	1.86	35.3	0.7	1.85	37.2	0.0	1.85	36.3	0.3	2.70	36.0	1.36	0.5	4.2	199	UTP	199	199	199	195	-	P			
14.2				~2.5m below FL		NDM / SV	1.75	42.2	2.7	1.75	43.8	1.5	1.75	43.0	2.1	2.70	38.0	1.27	4.8	4.5	125	145	187	170	157	189	-	P			

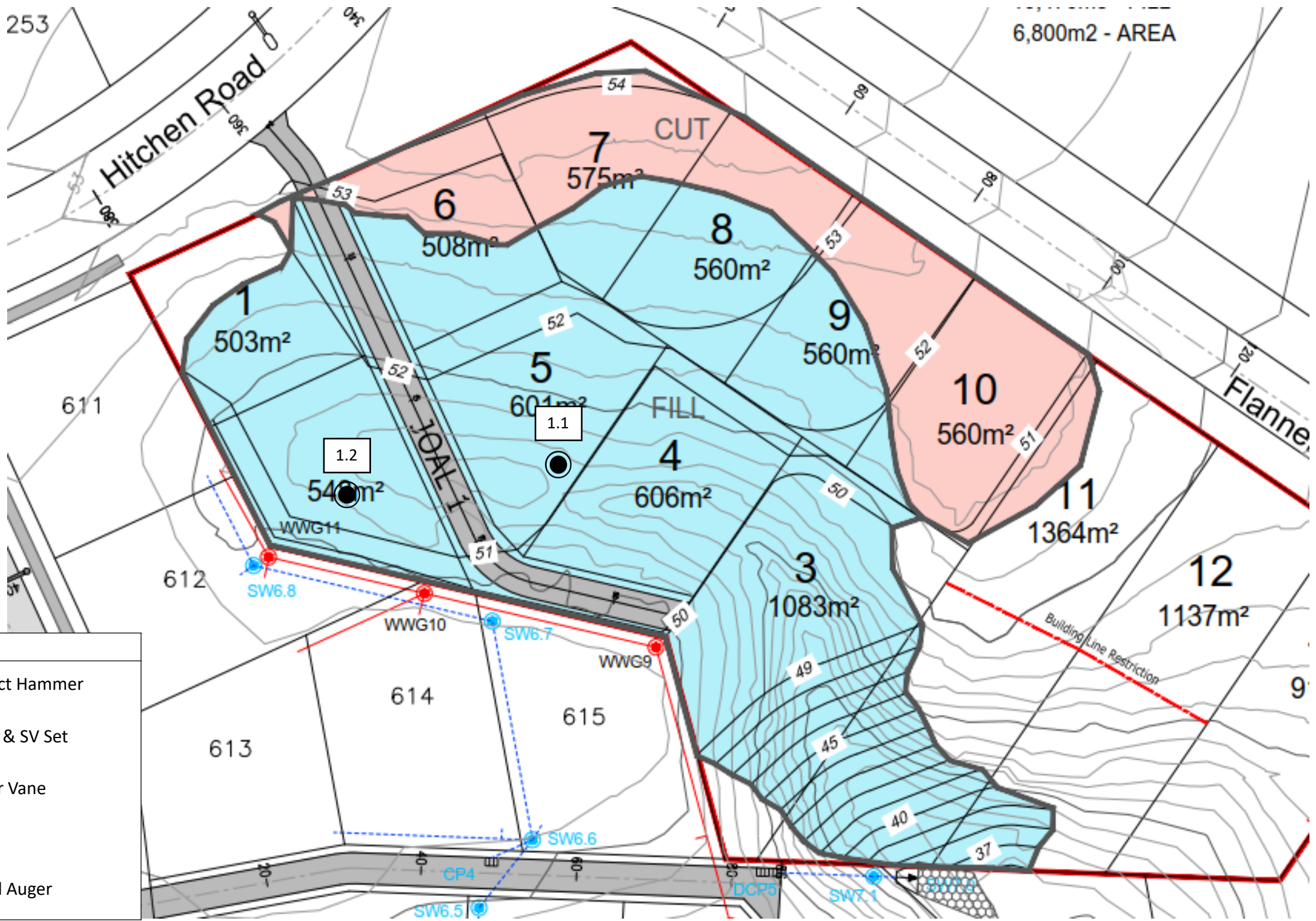


Job : Hitchen Block, Pokeno - Stage 12D






Customer: Lander Geotechnical

Job #	1009213.0560.0.0/2
Entered By	DASA / JRA
Checked By	JRA / DASA
Approved By	SJA

URN	Tech.	Date	Material Type	Location	Layer	Chainage	Offset	Nuclear Density (Backscatter)								Impact Value 1	Impact Value 2	Retest URN	PASS / FAIL		Comments	
								Wet Density	Dry Density (t/m ³)	Moisture Content (%)	Maximum Dry Density (t/m ³)	% Maximum Dry Density	Solid Density (t/m ³)	% Solid Density	% Total Voids				Degree of Saturation	(P) Pass		(F) Fail
4.1	DASA / JRA	15/12/2020	SPR	Stage 12D - Toe Key	~1m Placed	-	-	1.92	1.78	7.5	2.09	85.4%	-	-	-	-	16	-	5	F	< 95 % MDD & Impact Value < 20	
4.2						-	-	-	-	-	-	-	-	-	-	-	10	-		F		
4.3						-	-	-	-	-	-	-	-	-	-	-	-	9		-		F
5.1	JRA	16/12/2020	SPR	Stage 12D - Toe Key	~1m Placed	-	-	2.22	2.09	6.4	2.09	100.0%	-	-	-	-	28	-	-	P	Retest of URN 4 hardfill after material removed and replaced.	
5.2						-	-	2.29	2.15	6.2	2.09	103.0%	-	-	-	-	32	-	-	P		
6.1	JRA	17/12/2020	SPR	Stage 12D - Toe Key	~1.5m Placed	-	-	2.13	1.99	7.1	2.09	95.0%	-	-	-	-	27	-	-	P		
6.2						-	-	2.25	2.15	5.1	2.09	102.6%	-	-	-	-	30	-	-	P		
7.1	JRA	17/12/2020	SPR	Stage 12D - Toe Key	~0.5m Placed	-	-	2.22	2.05	8.0	2.09	98.2%	-	-	-	-	27	-	-	P	Toe Key extended to the West - Hardfill had been dug out and replaced with new hardfill.	
7.2					~1m Placed	-	-	2.23	2.10	6.2	2.09	100.5%	-	-	-	-	36	-	-	P		
7.3					~2m Placed (~FL)	-	-	2.25	2.12	6.0	2.09	101.7%	-	-	-	-	37	-	-	P		
7.4					-	-	2.22	2.06	8.0	2.09	98.3%	-	-	-	-	26	-	-	P			
8.1	DASA	18/12/2020	SPR	Stage 12D - Toe Key	~1.5m Placed	-	-	2.24	2.08	7.7	2.09	99.4%	-	-	-	-	41	-	-	P	Toe Key extended to the West - Hardfill had been dug out and replaced with new hardfill.	
8.2						-	-	2.21	2.07	6.9	2.09	98.8%	-	-	-	-	40	-	-	P		
8.3						-	-	-	-	-	-	-	-	-	-	-	-	36	-	-		P
8.4						-	-	-	-	-	-	-	-	-	-	-	-	40	-	-		P
8.5						-	-	-	-	-	-	-	-	-	-	-	-	28	-	-		P
8.6						-	-	-	-	-	-	-	-	-	-	-	-	32	-	-		P
9.1	DASA	18/12/2020	SPR	Stage 12D - Toe Key	2m Placed (~FL)	-	-	2.19	2.06	6.3	2.09	98.6%	-	-	-	-	32	-	-	P		
9.2						-	-	-	-	-	-	-	-	-	-	-	-	30	-	-	P	
9.3						-	-	-	-	-	-	-	-	-	-	-	-	28	-	-	P	
9.4						-	-	-	-	-	-	-	-	-	-	-	-	34	-	-	P	
9.5						-	-	-	-	-	-	-	-	-	-	-	-	40	-	-	P	
9.6						-	-	-	-	-	-	-	-	-	-	-	-	28	-	-	P	



Legend:

-  Impact Hammer
-  NDM & SV Set
-  Shear Vane
-  Scala
-  Hand Auger

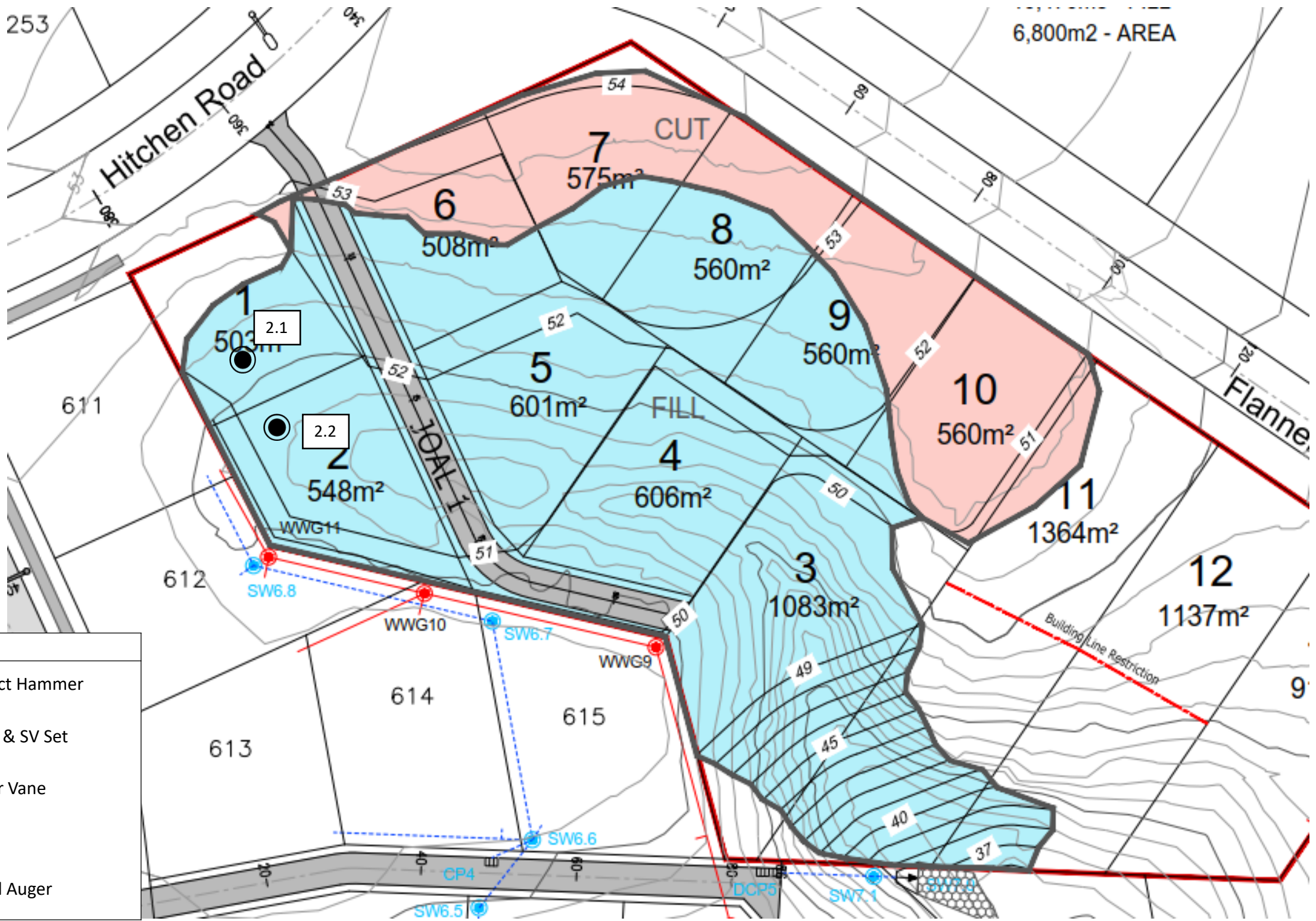
Test Location Plan

Site:	Hitchen Block Stage 12D	Job Name:	Hitchen Block Stage 12D	Drawn:	JRA	Date:	23/10/2020
Location:	Fill Area	Job No.:	1009213.0657.0.0/2	URN:	1	Date:	23/10/2020
		Lab Ref:	- N/A	Scale:	Not to Scale	Rev.:	1



GEOTECHNICS LTD.
 233 Manukau Road, Pukekohe
 Auckland, New Zealand
 ph. +64 (0)9 356 3510
 e. enquiry@geotechnics.co.nz
 w. www.geotechnics.co.nz





Legend:

- Impact Hammer
- NDM & SV Set
- Shear Vane
- Scala
- Hand Auger

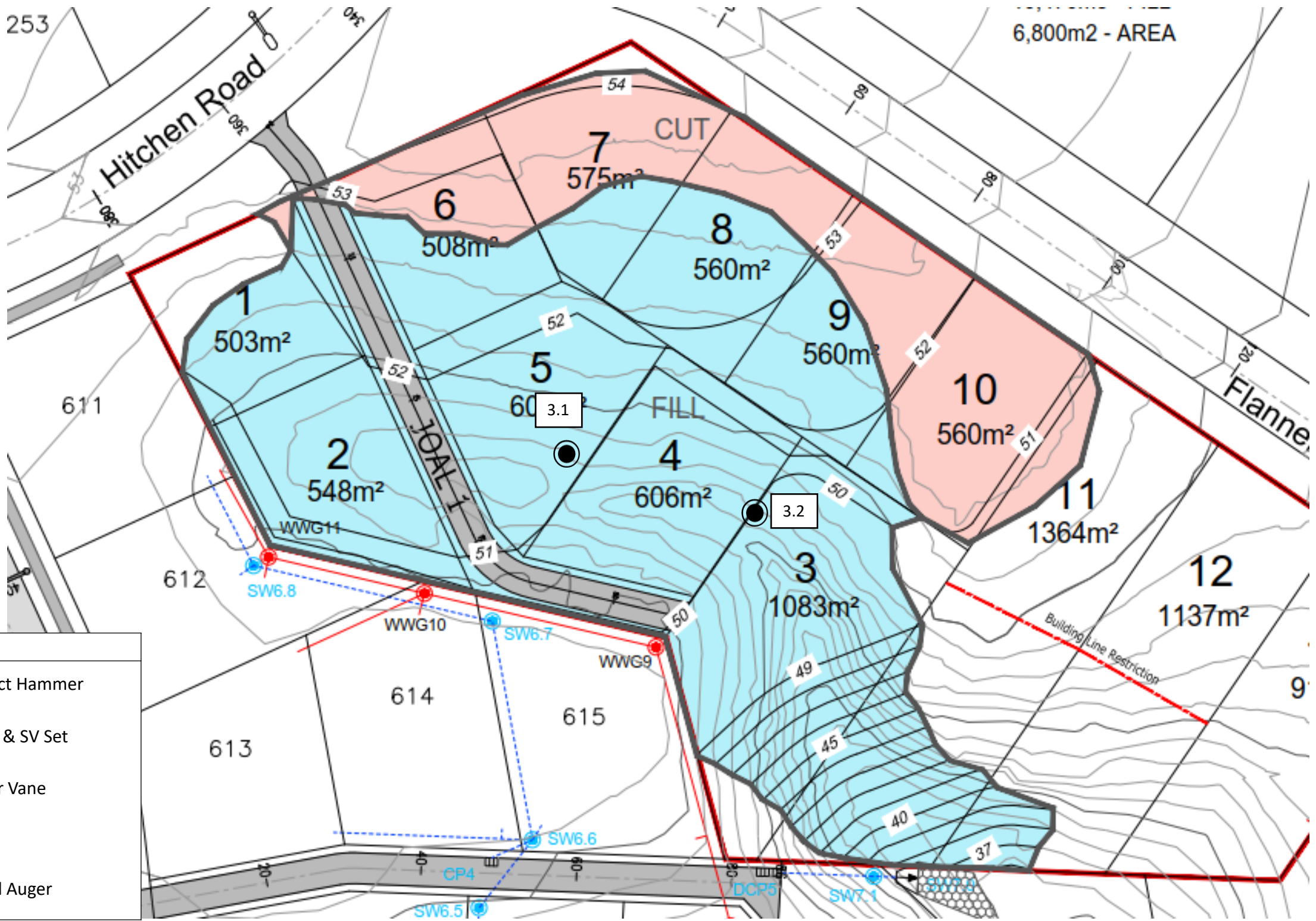
Test Location Plan

Site:	Hitchen Block Stage 12D	Job Name:	Hitchen Block Stage 12D	Drawn:	JRA	Date:	28/10/2020
Location:	Fill Area	Job No.:	1009213.0657.0.0/2	URN:	2	Date:	28/10/2020
		Lab Ref:	- N/A	Scale:	Not to Scale	Rev.:	1








GEOTECHNICS LTD.
 233 Manukau Road, Pukekohe
 Auckland, New Zealand
 ph. +64 (0)9 356 3510
 e. enquiry@geotechnics.co.nz
 w. www.geotechnics.co.nz





Legend:

-  Impact Hammer
-  NDM & SV Set
-  Shear Vane
-  Scala
-  Hand Auger

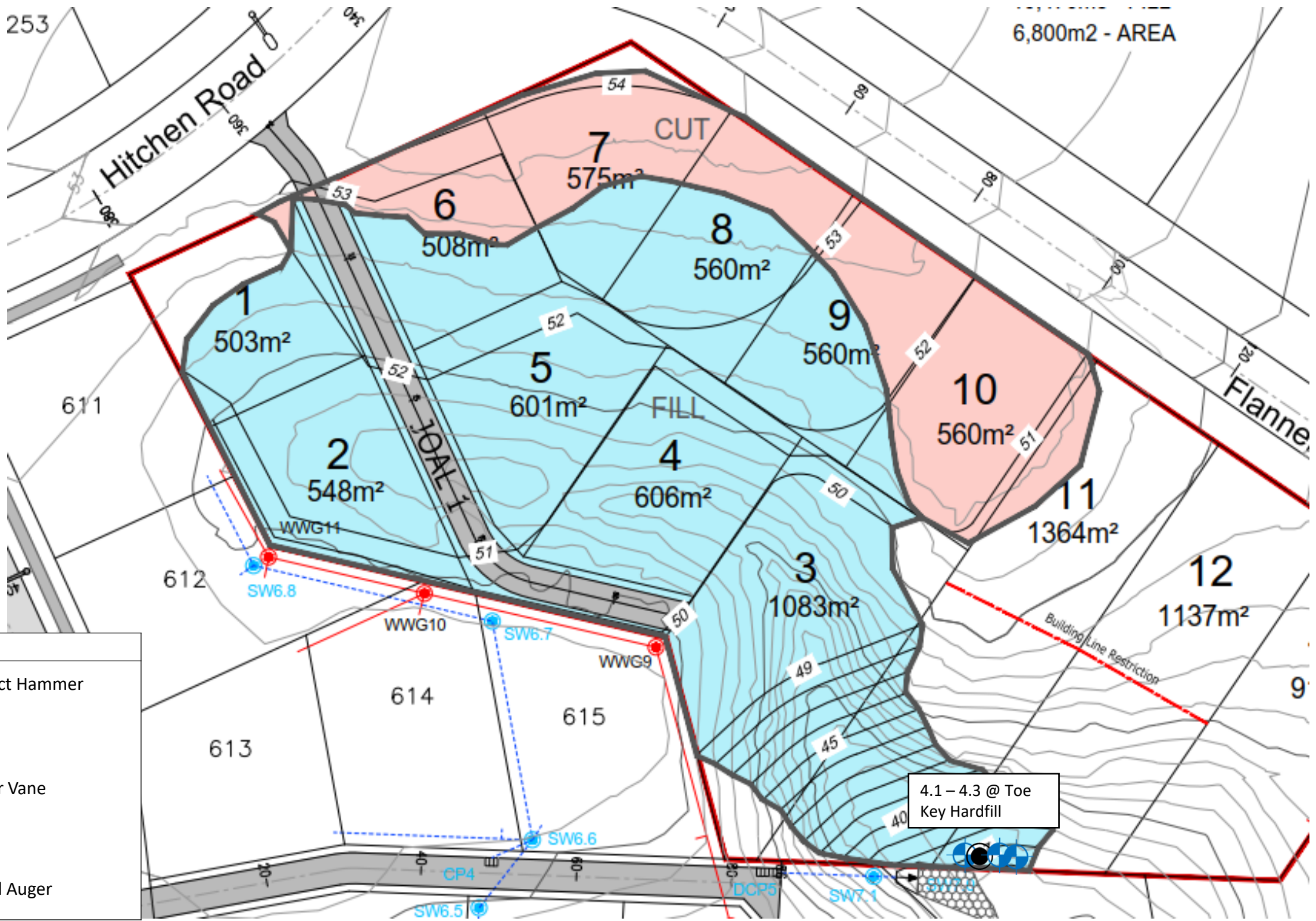
Test Location Plan

Site:	Hitchen Block Stage 12D	Job Name:	Hitchen Block Stage 12D	Drawn:	JRA	Date:	4/11/2020
Location:	Fill Area	Job No.:	1009213.0657.0.0/2	URN:	3	Date:	4/11/2020
		Lab Ref:	- N/A	Scale:	Not to Scale	Rev.:	1








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Legend:

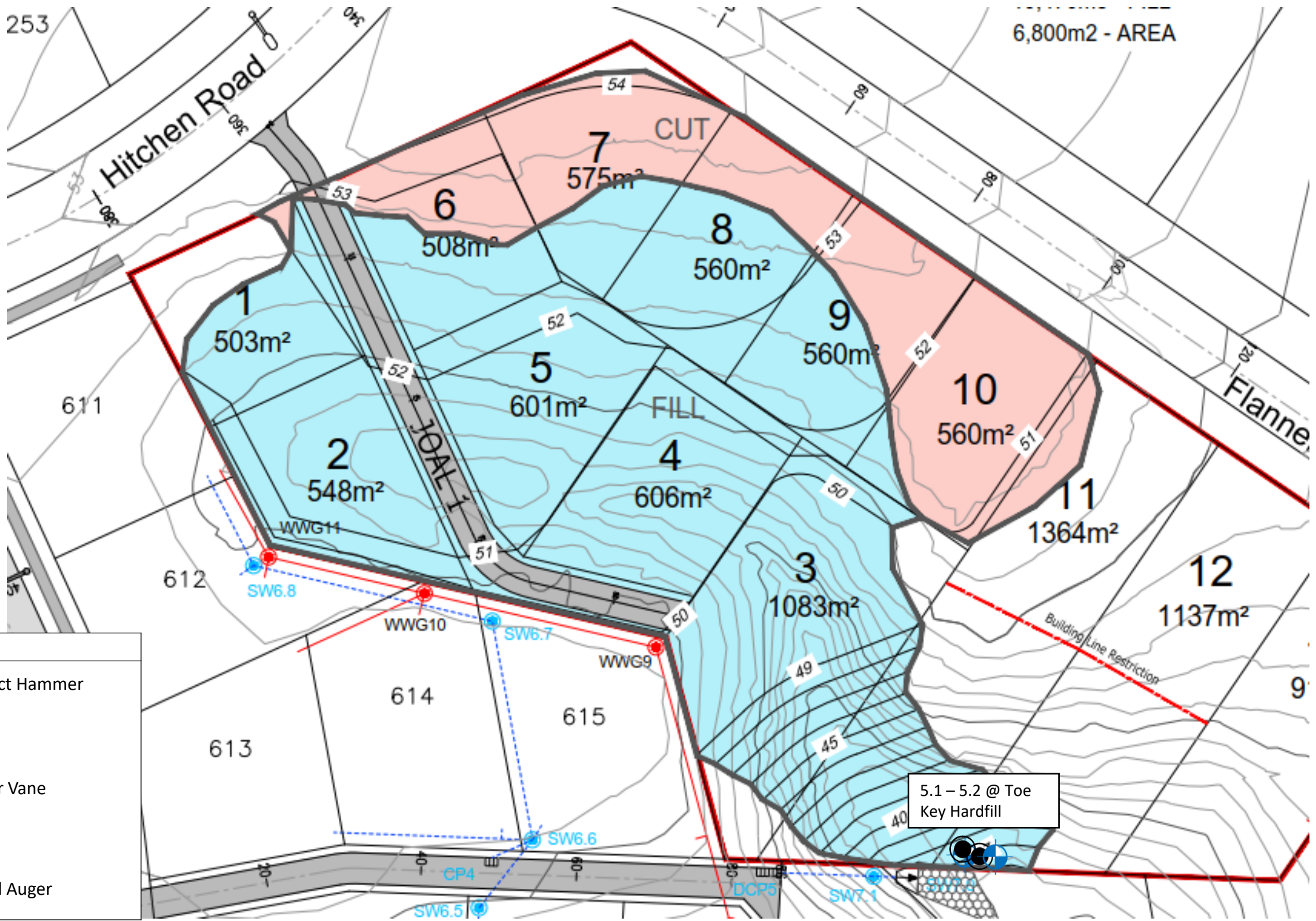
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-  NDM
-  Shear Vane
-  Scala
-  Hand Auger

Test Location Plan






Site:	Hitchen Block Stage 12D	Job Name:	Hitchen Block Stage 12D	Drawn:	JRA / DASA	Date:	15/12/2020
Location:	Toe Key	Job No.:	1009213.0657.0.0/2	URN:	4	Date:	15/12/2020
		Lab Ref:	- N/A	Scale:	Not to Scale	Rev.:	1



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Legend:

-  Impact Hammer
-  NDM
-  Shear Vane
-  Scala
-  Hand Auger

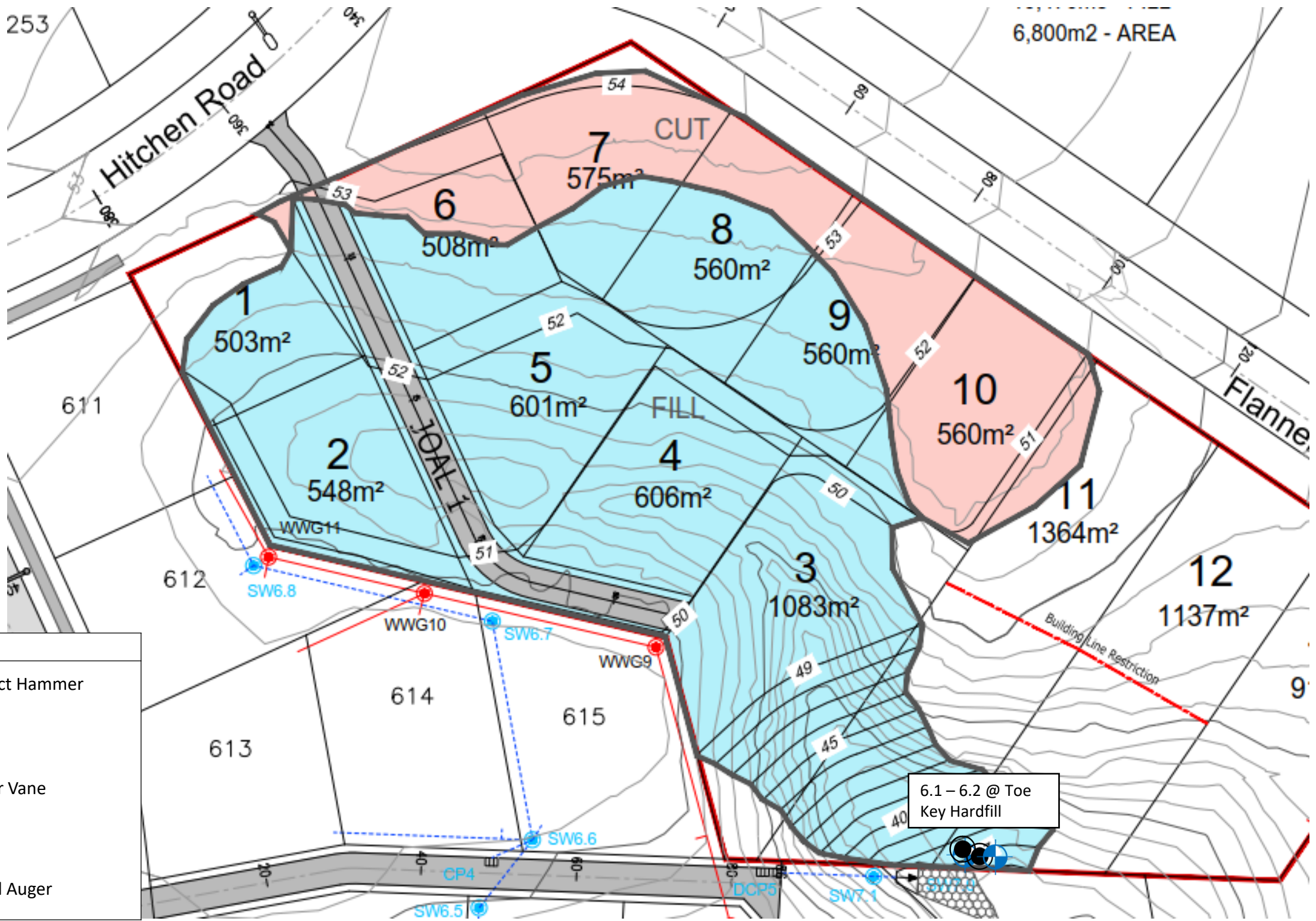
Test Location Plan

Site:	Hitchen Block Stage 12D	Job Name:	Hitchen Block Stage 12D	Drawn:	JRA	Date:	16/12/2020
Location:	Toe Key	Job No.:	1009213.0657.0.0/2	URN:	5	Date:	16/12/2020
		Lab Ref:	- N/A	Scale:	Not to Scale	Rev.:	1








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Legend:

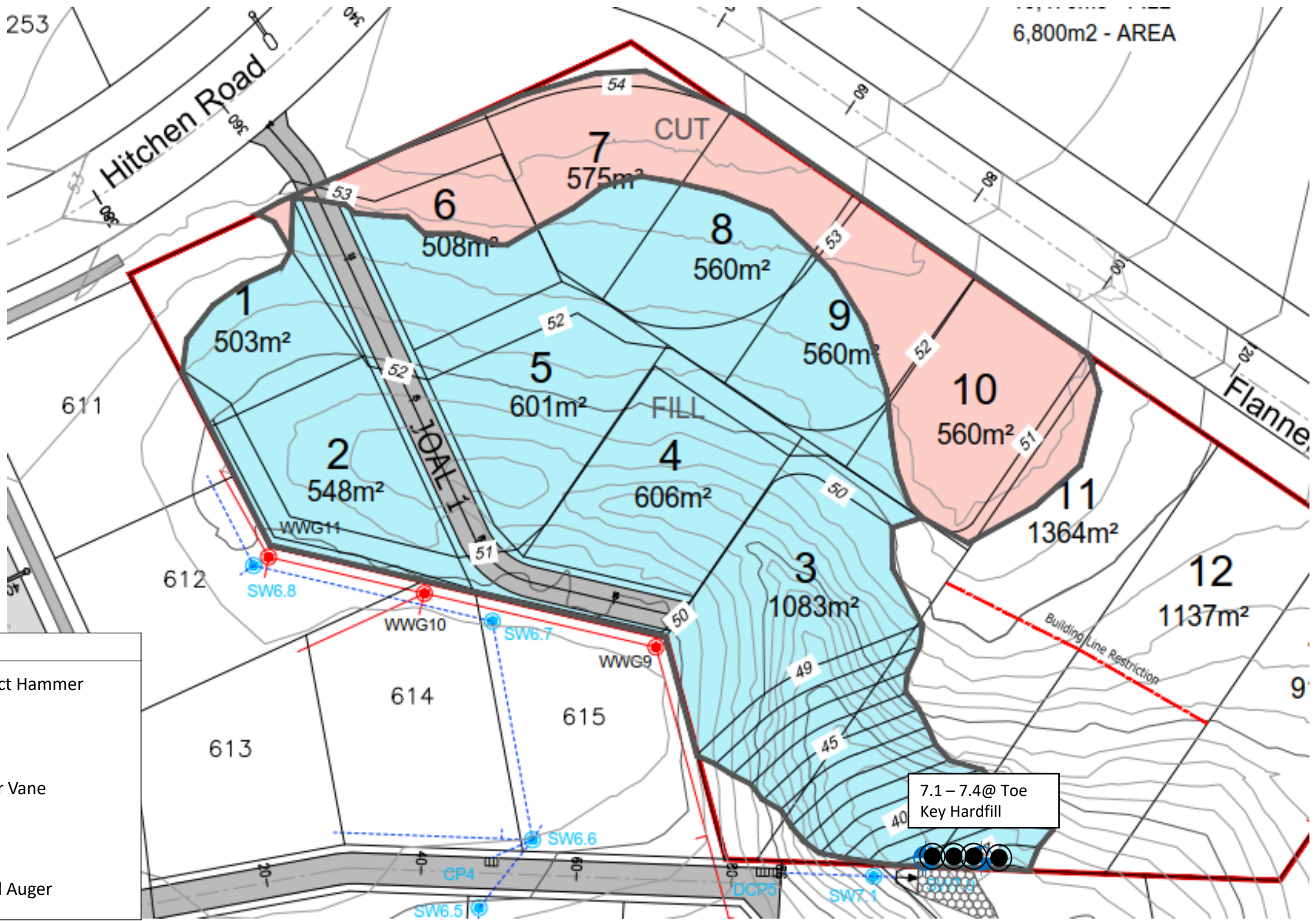
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-  NDM
-  Shear Vane
-  Scala
-  Hand Auger

Test Location Plan






Site:	Hitchen Block Stage 12D	Job Name:	Hitchen Block Stage 12D	Drawn:	JRA	Date:	17/12/2020
Location:	Toe Key	Job No.:	1009213.0657.0.0/2	URN:	6	Date:	17/12/2020
		Lab Ref:	- N/A	Scale:	Not to Scale	Rev.:	1

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Legend:

-  Impact Hammer
-  NDM
-  Shear Vane
-  Scala
-  Hand Auger

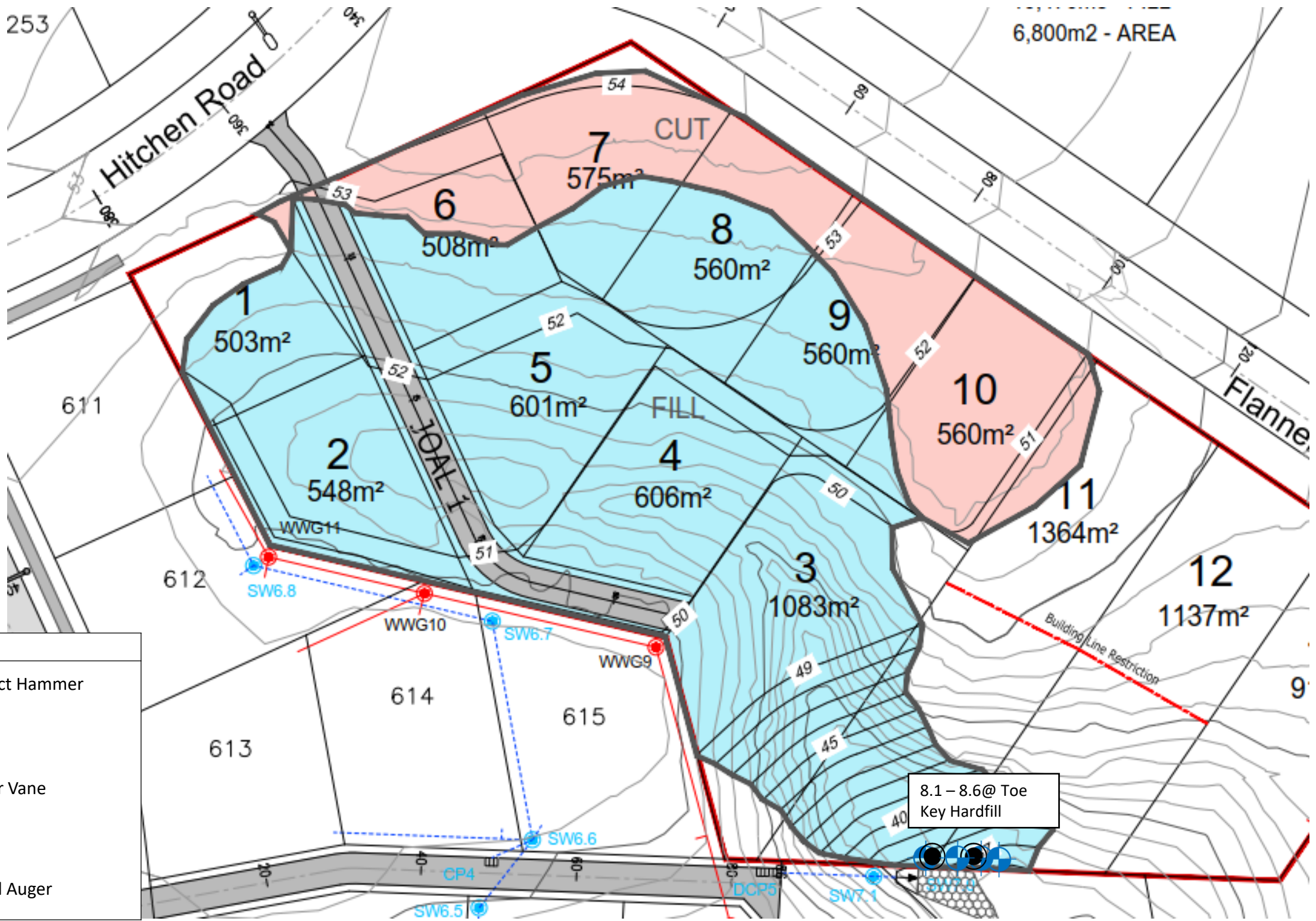
Test Location Plan

Site:	Hitchen Block Stage 12D	Job Name:	Hitchen Block Stage 12D	Drawn:	JRA	Date:	17/12/2020
Location:	Toe Key	Job No.:	1009213.0657.0.0/2	URN:	7	Date:	17/12/2020
		Lab Ref:	- N/A	Scale:	Not to Scale	Rev.:	1








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Legend:

-  Impact Hammer
-  NDM
-  Shear Vane
-  Scala
-  Hand Auger

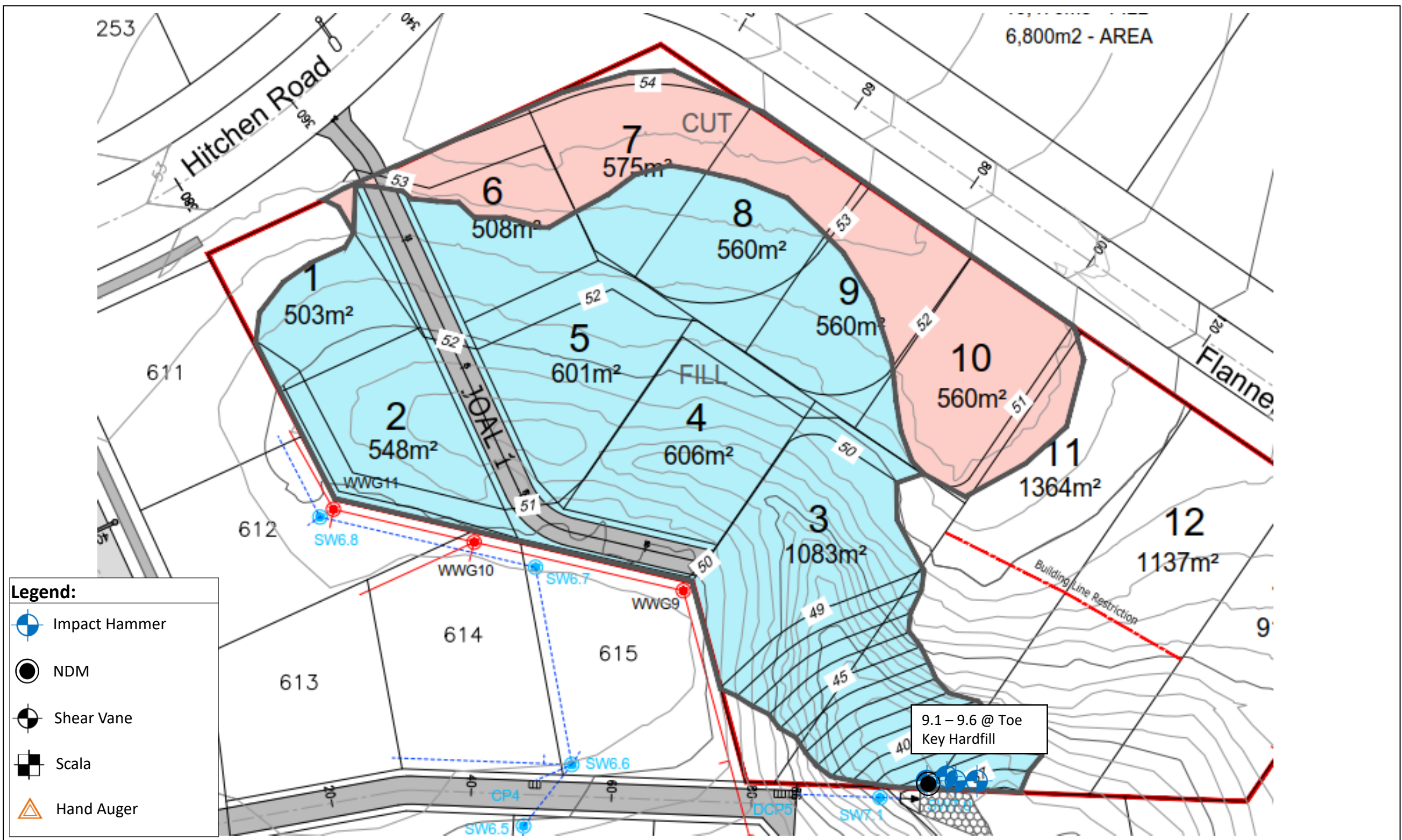
Test Location Plan

Site:	Hitchen Block Stage 12D	Job Name:	Hitchen Block Stage 12D	Drawn:	JRA	Date:	18/12/2020
Location:	Toe Key	Job No.:	1009213.0657.0.0/2	URN:	8	Date:	18/12/2020
		Lab Ref:	- N/A	Scale:	Not to Scale	Rev.:	1








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Legend:

-  Impact Hammer
-  NDM
-  Shear Vane
-  Scala
-  Hand Auger

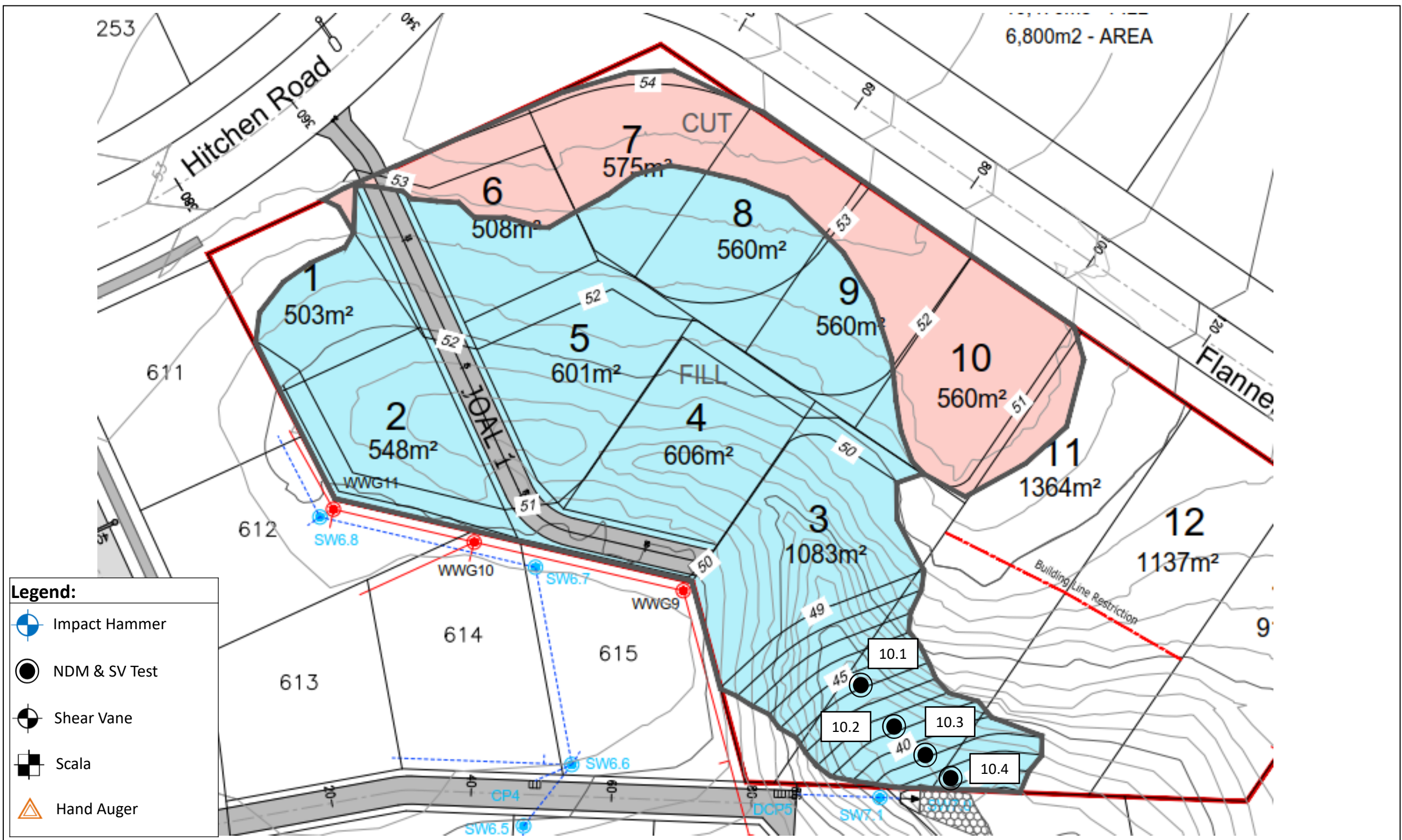
Test Location Plan

Site:	Hitchen Block Stage 12D	Job Name:	Hitchen Block Stage 12D	Drawn:	DASA	Date:	18/12/2020
Location:	Toe Key	Job No.:	1009213.0657.0.0/2	URN:	9	Date:	18/12/2020
		Lab Ref:	- N/A	Scale:	Not to Scale	Rev.:	1








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 e. enquiry@geotechnics.co.nz
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Legend:

-  Impact Hammer
-  NDM & SV Test
-  Shear Vane
-  Scala
-  Hand Auger

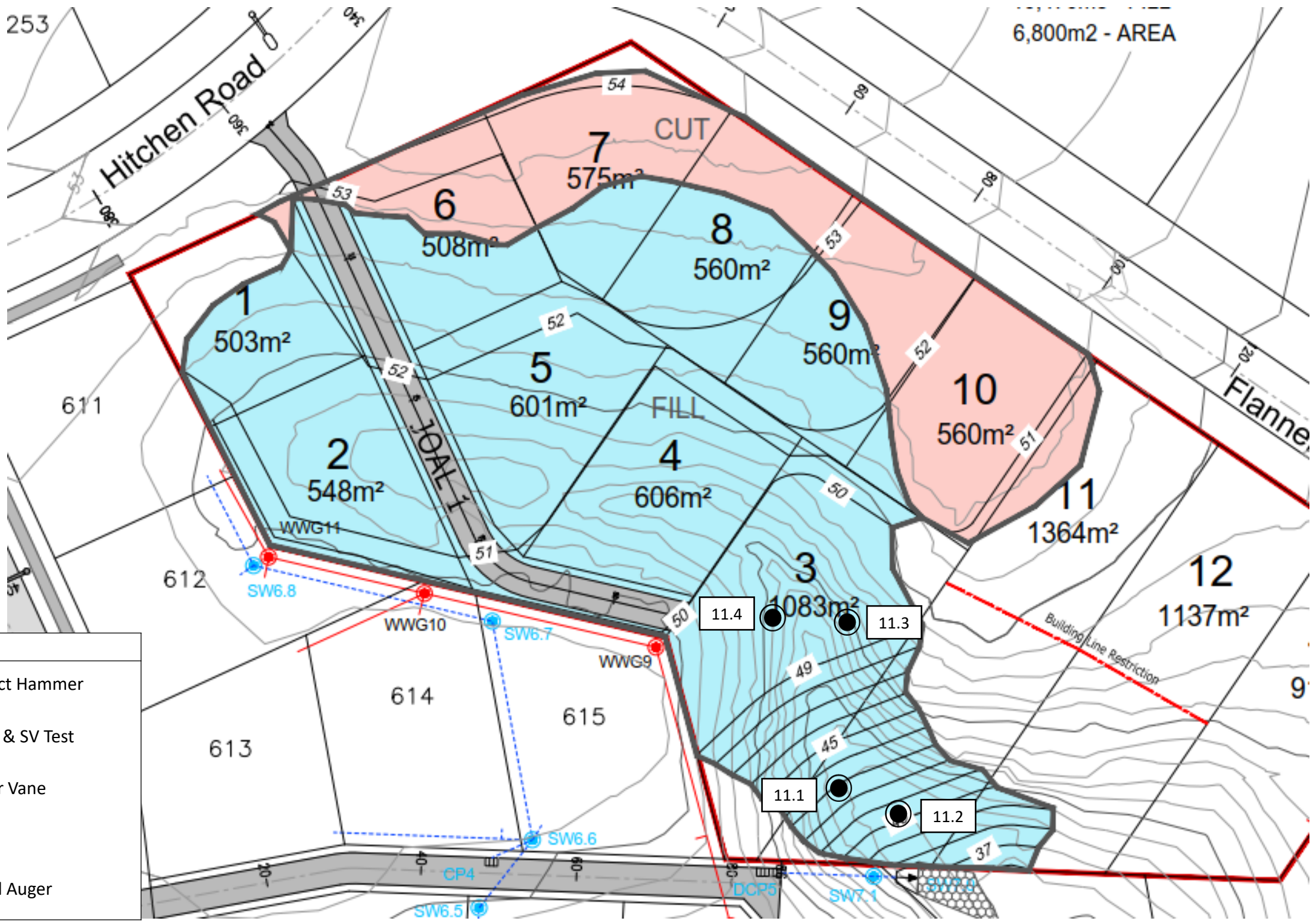
Test Location Plan

Site:	Hitchen Block Stage 12D	Job Name:	Hitchen Block Stage 12D	Drawn:	DASA	Date:	21/12/2020
Location:	Gully Fill	Job No.:	1009213.0657.0.0/2	URN:	10	Date:	21/12/2020
		Lab Ref:	- N/A	Scale:	Not to Scale	Rev.:	1








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Legend:

-  Impact Hammer
-  NDM & SV Test
-  Shear Vane
-  Scala
-  Hand Auger

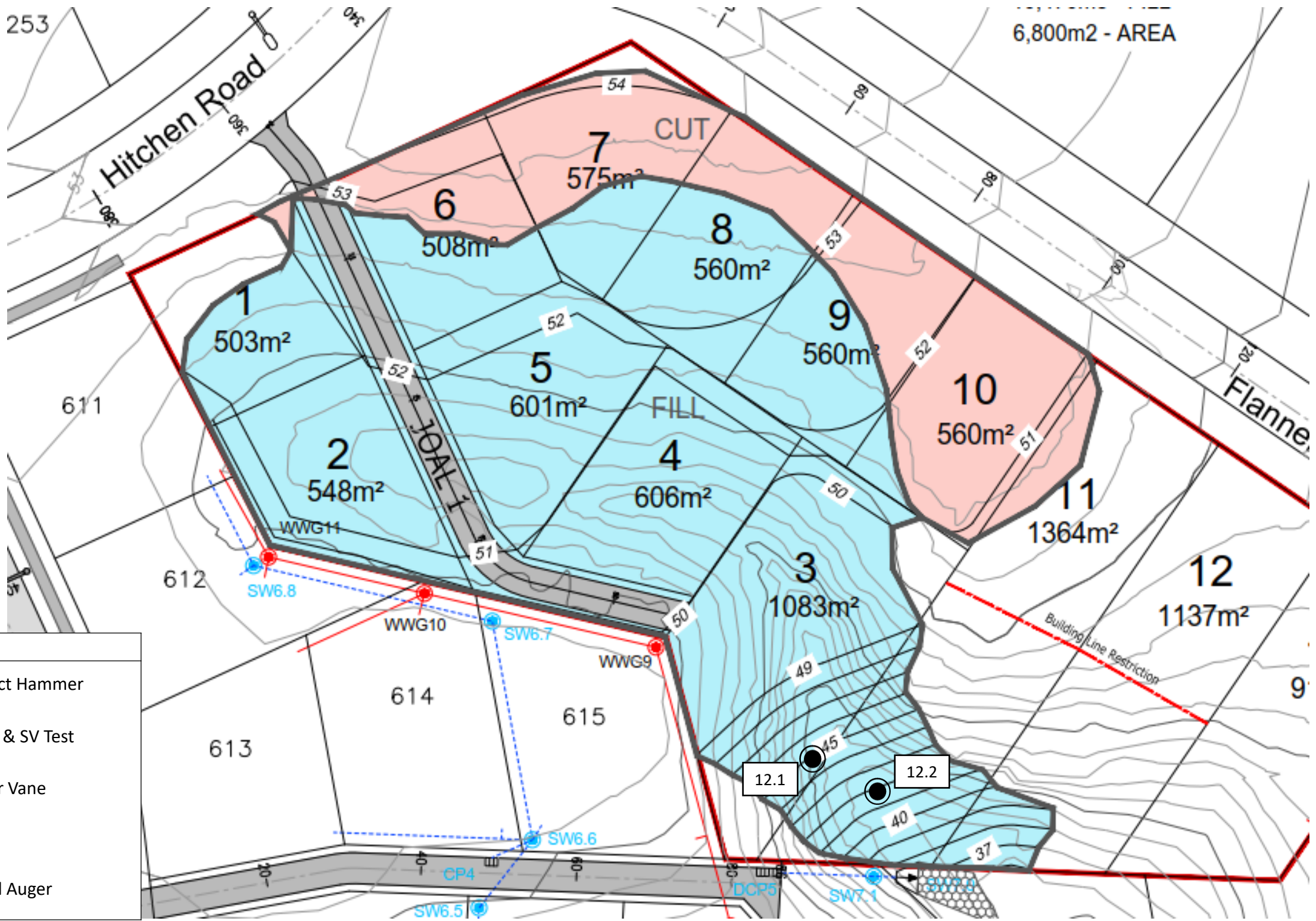
Test Location Plan

Site:	Hitchen Block Stage 12D	Job Name:	Hitchen Block Stage 12D	Drawn:	DASA	Date:	6/1/2021
Location:	Gully Fill	Job No.:	1009213.0657.0.0/2	URN:	11	Date:	6/1/2021
		Lab Ref:	- N/A	Scale:	Not to Scale	Rev.:	1








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 Auckland, New Zealand
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 e. enquiry@geotechnics.co.nz
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Legend:

-  Impact Hammer
-  NDM & SV Test
-  Shear Vane
-  Scala
-  Hand Auger

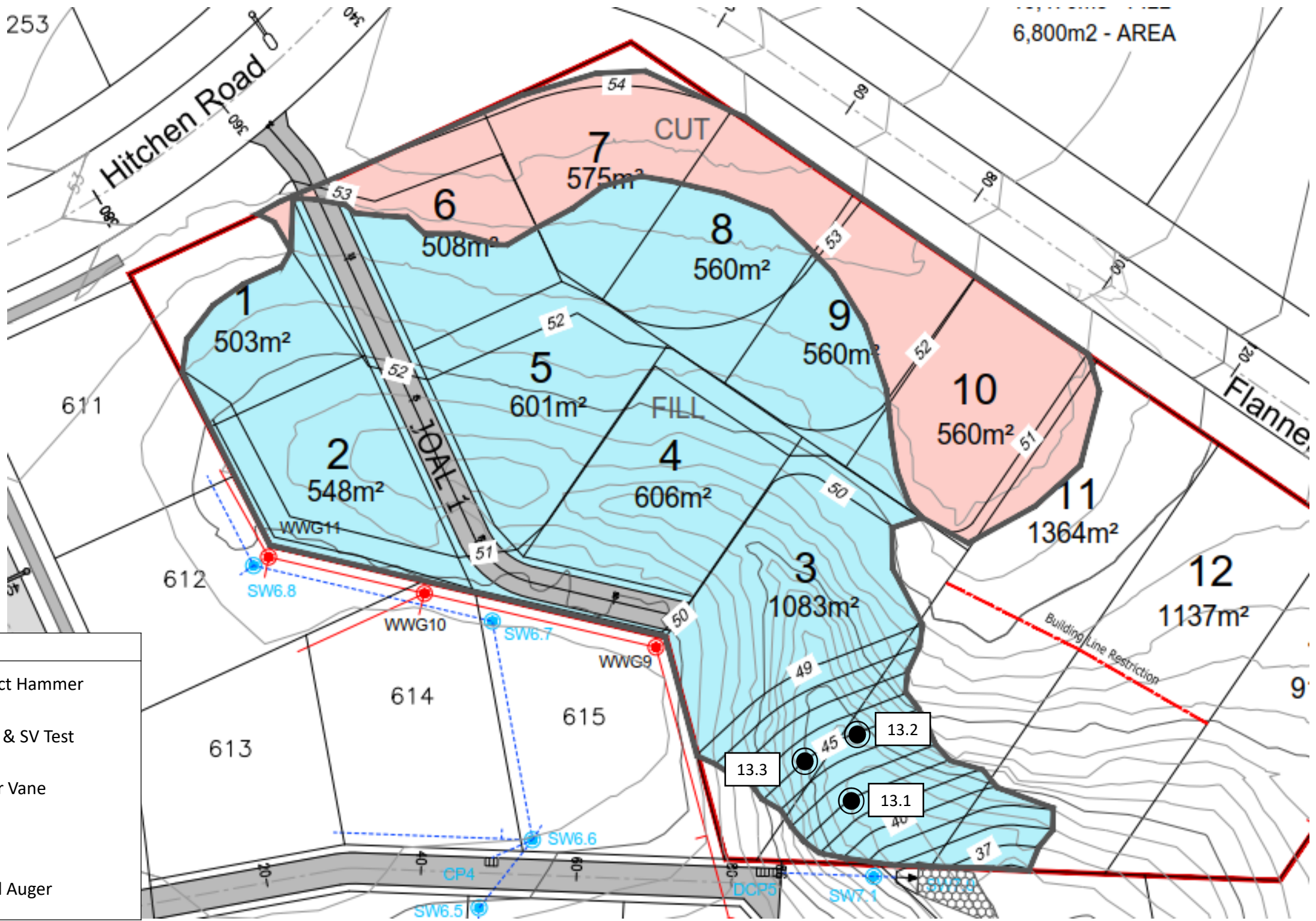
Test Location Plan

Site:	Hitchen Block Stage 12D	Job Name:	Hitchen Block Stage 12D	Drawn:	DASA	Date:	11/1/2021
Location:	Gully Fill	Job No.:	1009213.0657.0.0/2	URN:	12	Date:	11/1/2021
		Lab Ref:	- N/A	Scale:	Not to Scale	Rev.:	1








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Legend:

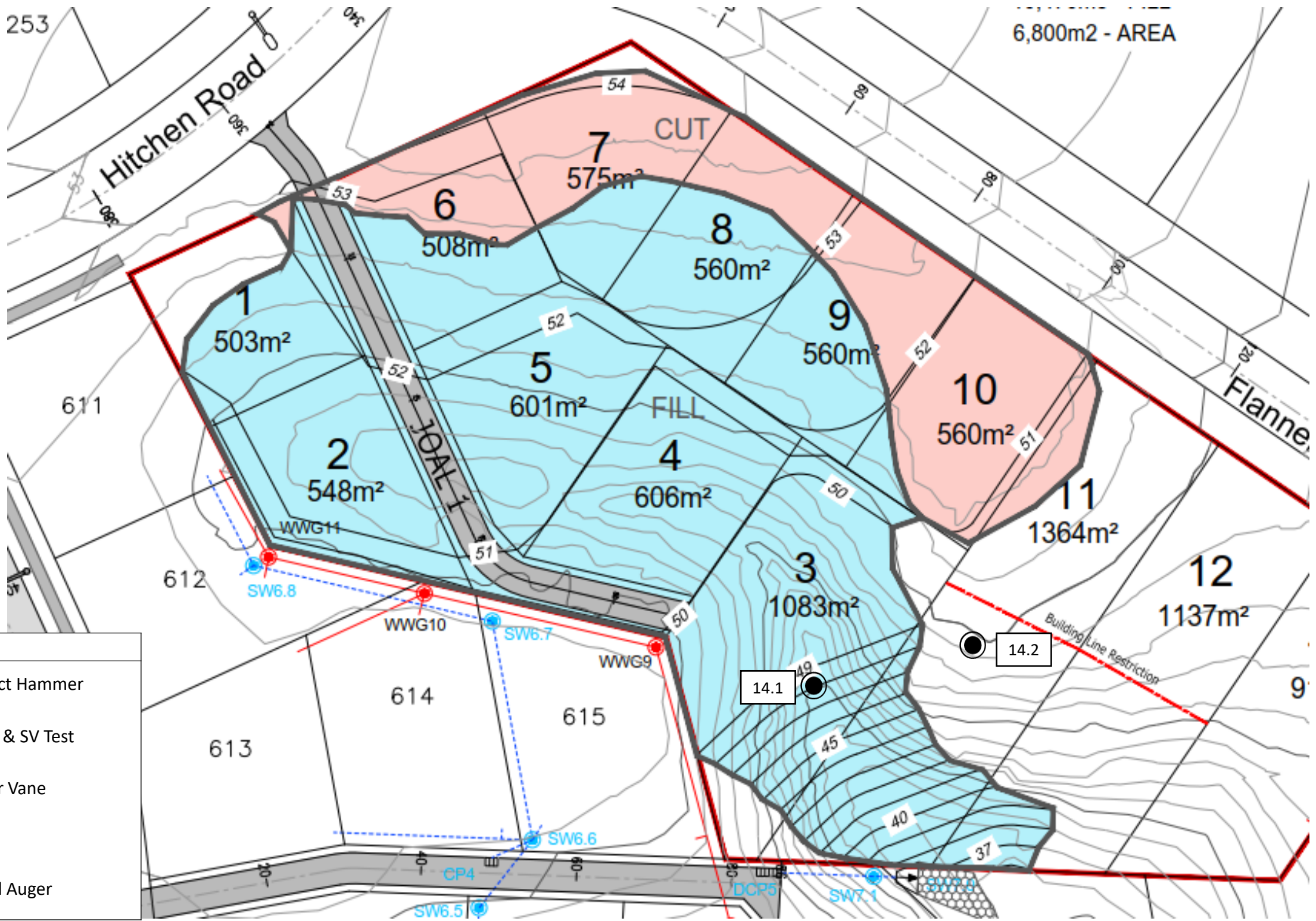
-  Impact Hammer
-  NDM & SV Test
-  Shear Vane
-  Scala
-  Hand Auger

Test Location Plan






Site:	Hitchen Block Stage 12D	Job Name:	Hitchen Block Stage 12D	Drawn:	JRA	Date:	13/1/2021
Location:	Gully Fill	Job No.:	1009213.0657.0.0/2	URN:	13	Date:	13/1/2021
		Lab Ref:	- N/A	Scale:	Not to Scale	Rev.:	1



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 e. enquiry@geotechnics.co.nz
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Legend:

-  Impact Hammer
-  NDM & SV Test
-  Shear Vane
-  Scala
-  Hand Auger

Test Location Plan

Site:	Hitchen Block Stage 12D	Job Name:	Hitchen Block Stage 12D	Drawn:	JRA	Date:	18/1/2021
Location:	Gully Fill	Job No.:	1009213.0657.0.0/2	URN:	14	Date:	18/1/2021
		Lab Ref:	- N/A	Scale:	Not to Scale	Rev.:	1



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 e. enquiry@geotechnics.co.nz
 w. www.geotechnics.co.nz





Our Ref: 1100674.0004.0.0/Rep1
Customer Ref: J00113
24 February 2021

Lander Geotechnical Limited
PO Box 97 385,
Manukau, Auckland

Attention: Kyle Meffan

Dear Kyle

Hitchen Block, Pokeno
Laboratory Test Report

The samples we collected from the above mentioned site have been tested according to your instructions and the results are included in this report. Results apply only to the sample(s) tested.

Descriptions are enclosed for your information, but are not covered under the IANZ endorsement of this report.

This report has been prepared for the benefit of Lander Geotechnical Limited, with respect to the particular brief given to us and it cannot be relied upon in other contexts or for any other purpose without our prior review and agreement.

This report may be reproduced only in full.

Samples not destroyed during testing will be retained for one month from the date of this report before being discarded. If we can be of any further assistance, feel free to get in touch. Contact details are provided at the bottom of this page.

GEOTECHNICS LTD

Report prepared by:

.....
Jack Singh
Laboratory Technician
Approved Signatory

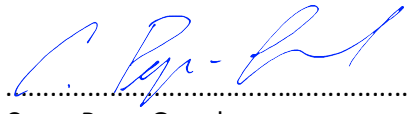
Authorised for Geotechnics by:

.....
Paul Burton
Project Director



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

Report checked by:



Corey Papu-Gread
Christchurch Manager

24-Feb-21

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45A Parkhouse Road
Wigram
Christchurch 8042
New Zealand
p +64 3 361 0300

Geotechnics Project Number 1100674.0004.0.0
QESTLab Work Order ID W21CH-0019
Customer Project ID J00113

Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003

TEST DETAILS

LOCATION	Description	Hitchen Block, Pokeno-Stage 12 D		
	Data	N/A		
SAMPLE	Geotechnics ID	S21CH000076	BH No	Lot 3
	Reference	Lot 3	Top Depth	0.6m
	Sampled By	Geotechnics	Bottom Depth	
	Description	SILT with trace clay, minor to some sand and minor gravel. Orange brown mottled red. Moist.		
SPECIMEN	Reference	Depth		
	Description			


TEST RESULTS

	Applied Pressure	(kPa)	25
SWELL TEST	Initial Water Content	(%)	31.0
	Bulk Density	(t/m ³)	1.89
	Dry Density	(t/m ³)	1.44
	Final Water Content	(%)	32.7
	Swelling Strain	(%)	0.08
SHRINKAGE TEST	Initial Water Content	(%)	31.2
	Shrinkage Strain	(%)	6.1
	Inert Material Estimate in the Soil Specimen	(%)	10
	Soil Crumbling During Shrinkage		Minor
	Cracking of the Shrinkage Specimen		Moderate
	SHRINK - SWELL INDEX	(%)	3.4

TEST REMARKS

• Estimates of inert material, soil cracking and soil crumbling are enclosed for your information, but are not covered under the IANZ endorsement of this report. • This test result is IANZ accredited. • Date tested 17/02/2021

Approved Signatory Jack Singh
Date 24/02/2021

 GEOTECHNICS	45A Parkhouse Road		
	Wigram	Geotechnics Project Number 1100674.0004.0.0	
	Christchurch 8042	QESTLab Work Order ID W21CH-0019	
	New Zealand	Customer Project ID J00113	
p +64 3 361 0300			
Determination of the Shrink - Swell Index - AS 1289 Test 7.1.1 - 2003			
TEST DETAILS			
LOCATION	Description	Hitchen Block, Pokeno-Stage 12 D	
	Data	N/A	
SAMPLE	Geotechnics ID	S21CH000077	BH No Lot 12
	Reference	Lot 12	Top Depth 0.6m
	Sampled By	Geotechnics	Bottom Depth
	Description	SILT with some clay and trace sand, yellowish brown. Moist.	
SPECIMEN	Reference	Depth	
	Description		
TEST RESULTS			
	Applied Pressure	(kPa)	25
SWELL TEST	Initial Water Content	(%)	23.5
	Bulk Density	(t/m ³)	1.96
	Dry Density	(t/m ³)	1.59
	Final Water Content	(%)	24.5
	Swelling Strain	(%)	-0.08
SHRINKAGE TEST	Initial Water Content	(%)	23.8
	Shrinkage Strain	(%)	5.5
	Inert Material Estimate in the Soil Specimen	(%)	None
	Soil Crumbling During Shrinkage		None
	Cracking of the Shrinkage Specimen		Minor
	SHRINK - SWELL INDEX	(%)	3.1
TEST REMARKS			
<ul style="list-style-type: none"> • Estimates of inert material, soil cracking and soil crumbling are enclosed for your information, but are not covered under the IANZ endorsement of this report. • This test result is IANZ accredited. • Date tested 16/02/2021 			
Approved Signatory	Jack Singh		
Date	24/02/2021		

3.2 Slab-on-ground in expansive soils

3.2.1 NZS 3604 Clause 1.1.2 Buildings covered by this Standard

Amend 1.1.2(a) to read:

“Buildings founded on good ground or on expansive soils where the requirements of 1.1.5 are met”

3.2.2 NZS 3604 New Clause

Add new: **“Clause 1.1.5 Buildings on expansive soils**

Buildings on expansive soils shall be supported on slab-on-ground foundations complying with 7.5.13 and in addition to 1.1.2 shall be limited as follows:

- (a) single storey, stand-alone household unit, and
- (b) maximum length or width of floor of 24.0 m including any attached garage, and
- (c) simple plan shapes such as rectangular, L, T or boomerang, and
- (d) concrete slab-on-ground with a minimum thickness of 100 mm and a minimum concrete compressive strength of 20 MPa, and
- (e) simple roof forms, incorporating hips, valleys, gables or mono pitches, and
- (f) maximum overall height of 7.0 m to roof apex from lowest cleared ground level, and
- (g) maximum roof height of 3.0 m, and
- (h) roof slope between 10° and 35° from the horizontal, and
- (i) maximum span of roof truss 12.0 m, and
- (j) external walls maximum of 2.4 m height studs, other than gable end walls and walls to mono-pitched roofs, which shall not exceed 4.0 m.

COMMENT:

Floor plans

Where floor plans incorporate re-entrant corners then continuity of the exterior ground beam shall be maintained by continuing it as an internal beam, with the exterior beam details continued for a length of at least 1.0 m into the internal beam. This is only applicable where internal beams are specified in Tables 7.4A and 7.4B. This is aimed to bring the solution in NZS 3604 in line with Clause 5.3.8 of AS 2870:2011.

Ground movement

Provision for the additional ground movement effects from trees near to foundations in expansive soils should be considered. Trees remove moisture from the soil for a radius equal to the height of the tree. This causes expansive soils to shrink to varying degrees, and when near houses leads to differential settlement occurring under foundations. Movement of the foundations may lead to cracks in the building and door jamming.

Where existing trees (including trees that have been recently removed) are located closer to the foundations than 1.5 times the mature height of a tree, then additional geotechnical advice should be obtained. Planting of new trees should be avoided near foundations of new buildings or neighbouring buildings on sites with expansive soils.

3.2.3 NZS 3604 Clause 7.5.1

Add the following paragraph at the end of Clause 7.5.1:

“Slabs on expansive soils for buildings meeting the requirements of 1.1.5 shall, in addition to meeting the requirements of 7.5.1 to 7.5.12, meet the requirements of 7.5.13. Where there is conflict the requirements of 7.5.13 shall apply.”

3.2.4 NZS 3604 New clause, tables and figures

Add new: **Clause 7.5.13 Slab-on-ground in expansive soils**

7.5.13.1 Identification of expansive soils

7.5.13.1.1 Should reasonable enquiry as outlined in 3.1.3 show any signs of expansive soils, the expansive soil class, as defined in AS 2870, shall be established by one or all of:

- (a) enquiry to the local territorial authority, and/or
- (b) reference to the certificate of suitability issued in terms of NZS 4431, and/or
- (c) a soil test undertaken by a suitably qualified soils engineer.

7.5.13.1.2 Expansive soil class shall be defined as:

- (a) Slightly ‘S’, having an I_{SS} range of 0–1.9%, and a 500 year design characteristic surface movement return (y_S) of 22 mm, or
- (b) Moderately ‘M’, having an I_{SS} range of 2.0–3.7% and a 500 year design characteristic surface movement return (y_S) of 44 mm, or

(c) Highly 'H', having an I_{SS} range of 3.8–6.5% and a 500 year design characteristic surface movement return (y_S) of 78 mm, or

(d) Extremely 'E', having an I_{SS} range of 6.6–7.5% and a 500 year design characteristic surface movement return (y_S) of 90 mm.

7.5.13.2 Maximum aspect ratio of concrete slabs

The aspect ratio of the concrete slabs or bays of concrete slabs, such as in the case of L, T or boomerang concrete slab shapes, shall not exceed 5 to 1 (length to width).

7.5.13.3 Foundation details

7.5.13.3.1 For the identified expansive soil class the foundation details, external and internal thickenings shall be as follows.

(a) For light wall claddings refer to Table 7.4A and Figure 7.22.

(b) For medium wall or heavy wall claddings refer to Table 7.4B and Figure 7.23.

7.5.13.3.2 Situations where no internal thickenings shall be required are limited to a rectangular slab with long side not exceeding 17.0 m. Where this limit is exceeded, add additional internal thickenings across the slab with the same cross section dimensions and reinforcing as the external footing, so that the centre to centre spacing of thickenings is always less than 17.0 m.

COMMENT:

Design constraints:

a) The characteristic surface movements and the corresponding expansivity classifications have been calculated based on design for ultimate limit state (ULS) conditions for a 1 in 1000 year "extreme" drought event, and the serviceability limit state (SLS) conditions for a 1 in 500 year drought event.

b) Maximum soil movements are calculated to be based on a 500 year return period for SLS, and a 1000 year return period for ULS*;

(*NB: This differed from the recommendations contained within BRANZ Study Report 120A (BSR120A) which used a 300 year return period for the design level drought conditions)

c) Climate parameters adopted from BSR120A of $\Delta u = 1.2$ pF, $H_s = 1.5$ m, and a crack depth of 0.5 H_s

d) The I_{SS} (soil stability index) ranges attributed to the expansivity classifications as defined in 3.2.4 above have been calculated using the parameters presented in BSR120A and Equation 2.3.1 of AS 2870:2011.

e) Sites subject to parameters that differ from those mentioned above, in particular sites where the crack depth is less than 0.75 m, such as cut natural ground or clay backfill, require specific engineering assessment to confirm their appropriate site classification.

f) The effects of nearby trees (whether existing, recently removed, or future planting) are not considered in these solutions. It is recommended that specific geotechnical engineering advice is obtained where a tree is within a lateral distance of 1.5 times its mature height of the foundations.

Maintenance of foundations in expansive soils

Normal maintenance is that work generally recognised as necessary to achieve the expected performance over time of the foundation located on expansive soils. Unless otherwise specified by the designer and noted on the drawings, basic normal maintenance tasks should ensure that:

a) the drainage and wetting of the site is controlled so that extremes of wetting and drying of the soils are prevented, and

b) the position and operation of gardens adjacent to the dwelling are controlled, and the planting of trees near to foundations is suitably restricted, and

c) any leaks which develop in plumbing, storm water or sanitary sewage systems are repaired promptly.

Table 7.4A Reinforced concrete foundations in expansive soils for light wall claddings Clause 7.5.13 and Figure 7.22				
Expansive soil class	Slightly 'S'	Moderately 'M'	Highly 'H'	Extremely 'E'
Soil embedment (De)	375 mm	525 mm	575 mm	625 mm
Top steel (A _s top)	2/D 16	2/D16	2/D16	2/D16
Bottom steel (A _s bottom)	1/D16	1/D25	1/D20	1/D25
Stirrups	R6/ 125 crs.	R6/ 125 crs.	R6/ 300 crs.	R6/ 300 crs.
Maximum spacing of internal thickenings	no internal thickening	no internal thickening	2.5 m crs.	2.5 m crs.
Depth of thickening (D1)	–	–	400 mm	450 mm
Base width (B1)	–	–	300 mm	350 mm
Top steel (A _s top)	–	–	2/D20	2/D20
Bottom steel (A _s bottom)	–	–	2/D16	2/D20
Stirrups	–	–	R6/ 150 crs.	R6/ 150 crs.

Table 7.4B Reinforced concrete foundations in expansive soils for medium wall and heavy wall claddings Clause 7.5.13 and Figure 7.23				
Expansive soil class	Slightly 'S'	Moderately 'M'	Highly 'H'	Extremely 'E'
Soil embedment (De)	500 mm	550 mm	775 mm	800 mm
Top steel (A _s top)	2/D16	2/D20	2/D20	3/D20
Bottom steel (A _s bottom)	2/D16	2/D16	2/D20	2/D20
Stirrups	R6/ 125 crs.	R6/ 250 crs.	R6/ 300 crs.	R6/ 300 crs.
Maximum spacing of internal thickenings	–	2.5 m crs.	2.5 m crs.	2.5 m crs.
Depth of thickening (D1)	–	350 mm	450 mm	500 mm
Base width (B1)	–	300 mm	300 mm	350 mm
Top steel (A _s top)	–	2/D16	3/D20	3/D20
Bottom steel (A _s bottom)	–	2/D16	2/D16	2/D20
Stirrups	–	R6/ 125 crs.	R6/ 150 crs.	R6/ 150 crs.

Amend 19
Nov 2019

Client : DFH JOINT VENTURE LIMITED
Project Location : HITCHEN BLOCK STAGE 12D
 POKENO
Job Number: J00113

Auger Borehole Nos. Lots 1 & 3


Sheet 1 of 3

Vane Head: 1750
 Logged By: NM
 Processor: JM
 Date: 10.02.21

Borehole Location:	mN	mE	Ground R.L.
	Description: Refer to site plan		

SOIL DESCRIPTION

Legend	Depth (m)	Standing Water Level	Vane Shear (kPa) peak/ residual	Soil Sensitivity	Sample and Laboratory / Other Test Details
Borehole Lot 1					
	0.0				
	0.5		270+		
	1.0		270+		
	1.5		193/135	1.4	
	2.0		270+		
Borehole Lot 3					
	0.0				
	0.5		270+		
	1.0		270+		
	1.5		270+		
	2.0		270+		

	Comments: Groundwater not encountered. UTP = unable to penetrate. EOB = end of borehole.	Borehole Diameter:	Topsoil	Sand	Sandstone	Plutonic	+++++
		50mm	Fill	Gravel	Siltstone	No Core	+++++
		Checked:	Clay	Organic	Limestone		
			Silt	Pumice	Volcanic		

Client : DFH JOINT VENTURE LIMITED
Project Location : HITCHEN BLOCK STAGE 12D
 POKENO
Job Number: J00113

Auger Borehole Nos. Lots 8 & 11

Sheet 2 of 3

Vane Head: 1750
 Logged By: NM
 Processor : JM
 Date: 10.02.21

Borehole Location:	mN	mE	Ground R.L.
	Description: Refer to site plan		

SOIL DESCRIPTION

Legend	Depth (m)	Standing Water Level	Vane Shear (kPa) peak/ residual	Soil Sensitivity	Sample and Laboratory / Other Test Details
Borehole Lot 8					
TOPSOIL	0.0				
clayey SILT, orange and grey mottled red. Hard, moist, low plasticity, with trace fine gravel [FILL] becoming orange with trace fine sand with trace limonite	0.5		270+		
silty CLAY with trace fine sand, orange. Hard, moist, high plasticity, with trace limonite [NATURAL] becoming insensitve	1.0		270+		
	1.5		231/162	1.4	
	2.0		250/154	1.6	
EOB at 2.0m. Target Depth.					
Borehole Lot 11					
clayey SILT with trace fine sand, grey streaked orange. Very stiff, moist, low plasticity [NATURAL]	0.0				
silty CLAY with trace fine sand, grey streaked orange. Very stiff, moist, medium plasticity, insensitve becoming grey and red streaked orange becoming hard	0.5		196/119	1.6	
	1.0		212/108	1.9	
	1.5		231/154	1.5	
	2.0		270+		
EOB at 2.0m. Target Depth.					



Comments:
 Groundwater not encountered.
 UTP = unable to penetrate.
 EOB = end of borehole.

Borehole Diameter: 50mm	Topsoil	Sand	Sandstone	Plutonic
	Fill	Gravel	Siltstone	No Core
Checked: KM	Clay	Organic	Limestone	
	Silt	Pumice	Volcanic	

Client : DFH JOINT VENTURE LIMITED
Project Location : HITCHEN BLOCK STAGE 12D
 POKENO
Job Number: J00113

Auger Borehole Nos. Lot 13

Sheet 3 of 3

Vane Head: 1750
 Logged By: NM
 Processor : JM
 Date: 10.02.21

Borehole Location:	mN	mE	Ground R.L.	Legend	Depth (m)	Standing Water Level	Vane Shear (kPa) peak/ residual	Soil Sensitivity	Sample and Laboratory / Other Test Details
Description: Refer to site plan				SOIL DESCRIPTION					
Borehole Lot 13									
silty CLAY, orange/brown. Very stiff, moist, medium plasticity, insensitive, with some medium gravel [FILL] becoming red streaked orange									
becoming grey mottled orange/brown									
with trace fine sand									
becoming hard									
silty CLAY, grey mottled orange brown. Hard, moist, high plasticity [NATURAL]									
at 2.0m, becoming very stiff, insensitive									
EOB at 2.0m. Target Depth.									



Comments:
 Groundwater not encountered.
 UTP = unable to penetrate.
 EOB = end of borehole.

Borehole Diameter:	Topsoil	Sand	Sandstone	Plutonic
50mm	Fill	Gravel	Siltstone	No Core
Checked:	Clay	Organic	Limestone	
KM	Silt	Pumice	Volcanic	

30/07/20 - Stage 12D

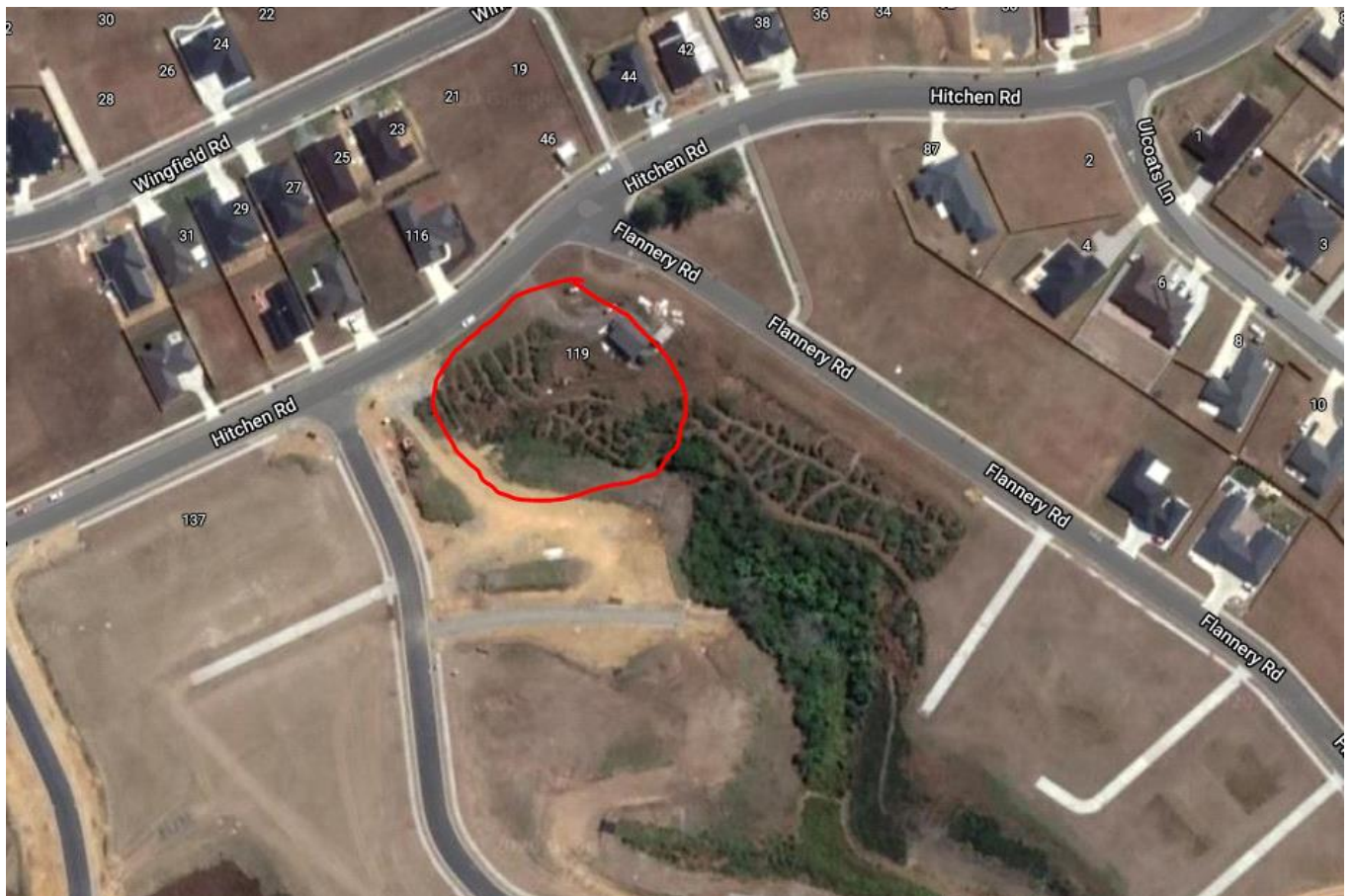
Thursday, 30 July 2020 3:07 p.m.

Site Inspection Record

Project # & Name:	J00113 - Hitchen Block
Date & Time:	30/07/20
Author:	TT
Plant Operating:	
Weather:	Fine

Site Observations and Instructions:

Observed muck out of portion of gully circled below. Decant to be formed here to allow further earthworks up slope within gully. Muck out looked suitable with benches to be formed 2 compactors width in flanks to lock this fill batter in. Batter only temporary until next season when earthworks occur downslope. Underfill drain to be placed through this area (discussed specs which are consistent with other drains across site) that will lead into the earthworks upslope and eventually downslope as well. Fill materials to cut from cut area above which looked fine to use. Testing to take place every 1m lift. Contractor to get in touch when gully upslope is being stripped.











Site Inspection Record

Project # & Name: J00113 - Hitchen Block

Site Observations and Instructions:

Project no. and name: J00113 - Hitchen Block	Date & Time: 4.08.20
Client/contractors present:	Lander staff: KM SV no:
Plant operating: 1 excavator, 1 mixer	
Inspection for (tick all that apply): Shallow Foundations <input type="checkbox"/> Pile Foundations <input type="checkbox"/> Site Meeting <input type="checkbox"/> Subgrade <input checked="" type="checkbox"/> Retaining Wall <input type="checkbox"/> Other <input type="checkbox"/>	
Observations/Discussions: <p>Fenner's Rd</p> <p>Hitchen Rd</p> <p>x = stripped to natural, inorganic very ripe ash soils</p> <p>area of sully skip exposed very ripe ash soils</p> <p>/// = sully chipping still in progress</p>	
Inspection Result:	Pass <input checked="" type="checkbox"/> Fail <input type="checkbox"/>



Site Inspection Record

Project # & Name:	J00113 - Hitchen Block
Date & Time:	28/10/20 - 10am
Author:	KM
Plant Operating:	
Weather:	

Site Observations and Instructions:

Visited site to observe earthworks in REB1. Contractors had finished fill placement ready for the next layer of primary geogrid placement. The fill batter is now entering zone 2 and SG500 grid is being used for these portions of the batter as per our design.

Rear drain blanket trench was open and the top of the blanket and metal backfill was present, as well as the rear of the grid in approx. 0.4m layers.

Earthworks are also commencing in the large slip area at the far end of the site. Silt controls are currently being formed for these works prior to stripping operations commencing.

In Stage 12D, earthworks filling operations are progressing, and the underfill drain is likely to be extended in the next week or two.

















16/11/20 - PM - Stage 12D

Monday, 16 November 2020 3:19 PM

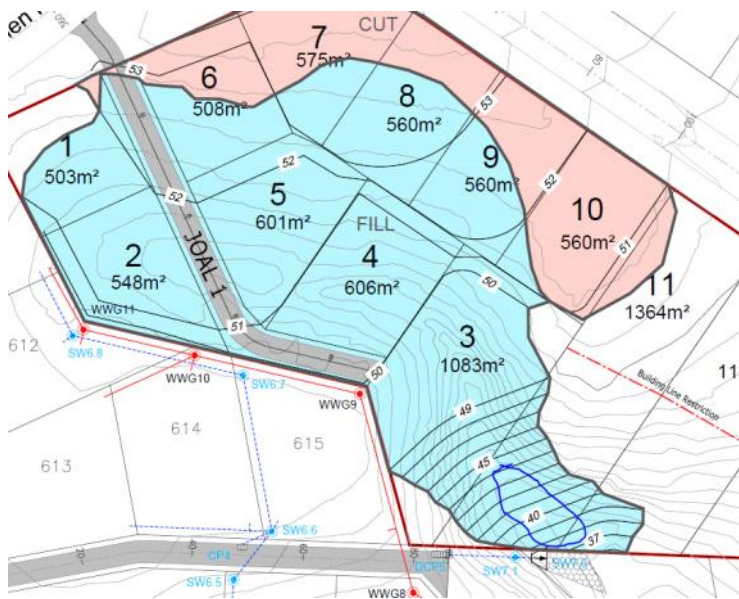
Site Inspection Record

Project # & Name:	J00113 - Hitchen Block
Date & Time:	16/11/20 - 1:30pm
Author:	KM
Plant Operating:	
Weather:	

Site Observations and Instructions:

Visited site to observe the gully muckout within Stage 12D. The muckout is commencing from the lower portion of the gully and will tie in with the existing underfill drain once some engineered fill has been placed in the area to allow digger access. Approx. area sighted shown in blue annotation below. Will return to site tomorrow to observe progress here.

Also inspected the removal the stockpile materials within Fill D. Very stiff, orange/brown ash soils were exposed consistent with the stripped soils previously sighted within the adjacent cut areas.











20/11/20 - REB1&2, Stage 12D

Friday, 20 November 2020 12:41 PM

Site Inspection Record

Project # & Name:	J00113 - Hitchen Block
Date & Time:	20/11/20 - 11am
Author:	KM
Plant Operating:	
Weather:	

Site Observations and Instructions:

Stage 10:

Visited site to inspect that underfill drain outlets have been installed. Both drains were sighted and have been formed as scruffy dome or rip-rap channel outlets.

REB2:

Observed shear key operations in this gully. The shear key looked that same as our previous inspection, and the gully is still being mucked out for the shear key. From what we can see the base appears hard, however, we haven't been able to test the base of the shear key yet due to the muckout still needing to progress.

Informed the contractors that we will inspect once a larger section of the shear key has been opened up, and that they will need to create a level surface for the shear key and then bench up the sides of the gully when backfilling with hardfill.

REB1:

Primary geogrid has been laid out to 13m length. Grid layout and overlap is sufficient. The rear fill drain was also being connected and has been sufficiently linked up.

Stage 12D:

Not much progress has been made since our last inspection in this area. The SPR in the base of the gully is still loose and requires compaction. The contractor is planning to bring a pad-foot roller down to this area to start backfilling the gully.













30/11/20 - Stage 12D

Monday, 30 November 2020 12:58 PM

Site Inspection Record

Project # & Name:	J00113 - Hitchen Block
Date & Time:	30/11/20 - 9:45am
Author:	KM
Plant Operating:	
Weather:	

Site Observations and Instructions:

Visited site to inspect earthworks operations in Stage 12D area.

Not much progress has been made since our previous inspection and there is spoil along the gully which is still to be cleared. Also discussed that a toe key is required at the base of the proposed fill batter, which the contractors are proposing to install prior to building the fill batter.

Also discussed the stripping in Lots 611 and 612 which Russell emailed about last week. This area is still covered by a topsoil stockpile. Advised the operator to get Dylan to get us in for an inspection prior to placing fill in this area.





08/12/20 - REB2, Stage 12D

Tuesday, 8 December 2020 2:05 PM

Site Inspection Record

Project # & Name:	J00113 - Hitchen Block
Date & Time:	08/12/20 - 8:45am
Author:	KM
Plant Operating:	
Weather:	

Site Observations and Instructions:

Visited site at the request of Dylan to inspect the following:

REB2:

The front/downslope part of the shear key has been excavated to depth, with hard, orange/brown silty soils exposed at the base. A trial pit was excavated with the rock bucket and went to a depth of approximately 2m before it became too hard to excavate further.

A small section of softened soils remains to be removed in part of the base.

A section of the existing underfill drain behind the shear key has been flattened due to plant tracking over this area. Advised that this section of the underfill drain would need to be chased out and a new drain relayed here. The contractor also had concerns about the soils under the drain being soft, so we will look at this when the gully has been opened up.

12D:

Toe key construction is still in progress. The contractors have excavated down approximately 3m and have encountered slop. Advised them to clean this out and continue to muck out the area to very stiff soils as per our detail.

REB2:







REB1 progress:





12D toe key:





Damaged underfill drain in REB2:





09/12/20 - REB1&2, Stage 12D

Wednesday, 9 December 2020 3:08 PM

Site Inspection Record

Project # & Name:	J00113 - Hitchen Block
Date & Time:	09/12/20 - 11am
Author:	KM
Plant Operating:	
Weather:	

Site Observations and Instructions:

Visited site at the request of Dylan to inspect the following:

- Inspected toe key in Stage 12D. Contractors have excavated to approx. 4m with no improvement in ground conditions. Advised that they could place a 500mm raft of compacted SPR to allow them to start backfilling.
- Inspected shear key excavations in REB2. Hard ground exposed throughout along the base of the key which had been further excavated since yesterday. Advised that backfilling can commence with SPR100 once they have pumped the water out of the excavation. Plateau test from REB1 will still remain relevant.

REB 2 shear key:





REB 1 area:



Stage 12D:



10/12/20 - Stage 12D

Thursday, 10 December 2020 12:45 PM

Site Inspection Record

Project # & Name:	J00113 - Hitchen Block
Date & Time:	10/12/20 - 10:30am
Author:	KM
Plant Operating:	
Weather:	

Site Observations and Instructions:

Visited site to check on toe key works in Stage 12D. The first section of the toe key has been backfilled with hardfill.

Also, drilled at hand auger in Lot 612. Encountered approx. 0.6m of fill overlying very stiff, natural ash soils.





15/12/20 - Stage 12D

Tuesday, 15 December 2020 2:24 PM

Site Inspection Record

Project # & Name:	J00113 - Hitchen Block
Date & Time:	15/12/20 - 12pm
Author:	KM
Plant Operating:	
Weather:	

Site Observations and Instructions:

Visited site to inspect 12D toe key. Contractor had already filled with SPR to 1.5m without getting us to inspect or getting fill testing so asked them to dig back to subgrade in the centre. Firm soils exposed at the base, however, the toe key will be about 2-3m thick so no undercut was recommended. Contractors said they needed to backfill the area immediately. We advised that they need to give adequate notice for geotech and fill test inspection in this case.

Also, inspected stripping over Lots 612 & 612. Generally very stiff natural ash soils were exposed, however, some topsoil/rubbish was observed which we recommended be undercut to natural ground. Will look at this again tomorrow afternoon with Chris.

12D topsoil stripping:





12D fill/toe key area:







16/12/20 - REB1&2, welded tuff area, Stage 12D

Wednesday, 16 December 2020 5:56 PM

Site Inspection Record

Project # & Name:	J00113 - Hitchen Block
Date & Time:	16/12/20 - 1pm
Author:	KM
Plant Operating:	
Weather:	

Site Observations and Instructions:

Visited site with Chris and Shane for a senior/principals site visit. Observed the following:

- Welded tuff materials are still being cut behind the site office. We need to discuss with Russell options here. Either the materials can be left in place and the end users will need undercut the materials with bigger diggers etc when doing footings and drainage lines, or the material can be undercut by approx. 0.6-1m and backfilled with certified clay, however, this will raise the expansive class in these lots (which would currently be good ground).
- REB2 shear key excavations. They have filled about 2m and have missed testing again. Advised Dylan to excavate some areas down to 1m for a test prior to placing further fills. Will inform Josh.
- REB1 is near level and is set to be completed in the new year. Will catch up with Trevor on the first week back to organise inspections for the final geogrid layers here to ensure they are placed properly around drainage lines.
- Stage 12D toe key. The contractors failed their previous test here, achieved CIV readings of around 10. They removed the material, discarded the wetter SPR and refilled with a heavier roller. Josh to retest. The model also needs to be rechecked to confirm minimum toe key requirements are adequate.
- Also observed the stripping area in lots 611 and 612. Rubbish/pre-existing fills are still present. Reiterated that these materials be fully undercut. Will return to site tomorrow to observe general earthworks operations.





17/12/20 - Stage 12D

Thursday, 17 December 2020 1:23 PM

Site Inspection Record

Project # & Name:	J00113 - Hitchen Block
Date & Time:	17/12/20 - 10am
Author:	KM
Plant Operating:	
Weather:	

Site Observations and Instructions:

Inspected backfill in 12D toe key. Compaction appears to be going well with no obvious deflections noted under a 12T smooth drum roller. The latest fill test passed on both clegg hammer and backscatter testing.

Also observed undercutting of topsoil/pre-existing fill in the top section of Stage 12D. The base of the undercut is generally down to natural ground, although there is some minor topsoil mottling to chase out. The existing fill cut shows a layer of topsoil within the fill placed by Dines which is within 2m of surface level. Advised that this should be undercut and removed from the fill. Will return to site again tomorrow morning to inspect.







18/12/20 - REB1&2, Stage 12D

Friday, 18 December 2020 12:21 PM

Site Inspection Record

Project # & Name:	J00113 - Hitchen Block
Date & Time:	18/12/20 - 10:45am
Author:	KM
Plant Operating:	
Weather:	

Site Observations and Instructions:

Inspected the following at the request of Dylan:

- At top of Stage 12D, topsoil horizon has been chased out and is ready to be filled again.
- At Stage 12D toe key, they have filled up another metre and are waiting for the next test. Hardfill surface appears well compacted visually. Asked Dylan to get the extent of the key surveyed to ensure that the key matches the full extent of the fill batter.
- At REB1, geogrid is being laid out, with grid lengths of around 5m and 14m being recorded as per our design for the top layers.
- At REB2 shear key, contractor has informed that additional testing was undertaken at 1m and 2m fill heights. Also observed stripping to the base of the key in the rear portions. Hard surface encountered here. A trial pit at the base was only able to be excavated approximately 1m with a rock bucket, consistent with the previous test.

REB1:



Stage 12D toe key:



REB 2 shear key:









12D topsoil horizon stripping:





21/12/20 - Stage 12D

Monday, 21 December 2020 2:09 PM

Site Inspection Record

Project # & Name:	J00113 - Hitchen Block
Date & Time:	21/12/20 - 12:15pm
Author:	
Plant Operating:	
Weather:	

Site Observations and Instructions:

Visited site at request of Dylan to observe site works prior to the Christmas break. Not much has progressed since our previous visit. Toe key has been completed and clay fill for the 1(v) in 3(h) batter is now commencing.

Also requested that some more fill be placed to buttress the site cut at the top of the gully flank to ensure stability is maintained to the house.



Site Inspection Record

Project # & Name:	J00113 - Hitchen Block
Date & Time:	27/01/21 - 10:15am
Author:	KM
Plant Operating:	
Weather:	

Site Observations and Instructions:

Visited site to inspect general earthworks operations. Observations and recommendations as follows:

- Within Stage 12D the 1(v) in 3(h) batter has been formed to final height and has been trimmed and topsoiled.
- Stripping has commenced up the flanks of the gully in REB2 for preparation of the fill batter placement. Recommended the installation of 3 additional underfill drains in areas of seepage, two up the eastern flank and one up the southern (rear) which will connect into the existing underfill drain.
- Discussed that benching into the flanks will require an average bench depth of 2m which Dines have already programmed up.
- Will meet on Friday with Cirtex and Chris to discuss topsoiling the face of REB1 as the contractors are having difficulty getting the topsoil to stay in place.







