CMW Geosciences
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19 September 2024

RESIDENTIAL SUBDIVISION

47 URUMARAKI AVENUE

GEOTECHNICAL COMPLETION REPORT

Cabra Developments Limited

AKL2022-0088AF Rev 0

AKL2022-0088AF		
Date	**Revision**	**Comments**
9 September 2024	A	Initial draft for internal review
19 September 2024	0	Final issue to client

	Name	Signature	Position
Prepared by	Matt Illingworth		Project Engineering Geologist
Reviewed by	Richard Knowles		Principal Geotechnical Engineer CMEngNZ, CPEng
Authorised by	Sam Gibb		Principal Geotechnical Engineer CMEngNZ, CPEng

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1 INTRODUCTION

In accordance with our instructions, this Geotechnical Completion Report has been prepared for Cabra Developments Limited as part of the documentation to be submitted to Auckland Council following earthworks to form a residential subdivision.

This report covers the construction period 11 October 2024 to September 2024 and is intended to be used for certification purposes for new lots (listed below) created from existing Lot 3 DP 523000 as follows:

- 28 new residential lots numbered 1 to 28
- 1 new road referenced as Lot 200
- 1 local purpose utility (stormwater) lot referenced as Lot 300
- 2 COALs referenced as lots 201 and 202
- Riparian Margins subject to planting covenants (covenants D, E, F and G)

This development is located at 47 Urumaraki Avenue in Helensville. As can be seen from the as-built plans, 24 of the lots have been affected by filling as part of the earthworks operations to a maximum depth of approximately 4 metres.

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

- Auckland Council's Resource Consent numbers LUC60409222 and SUB 60409223.
- Auckland Council's Building Consent BCO10372370 for cantilever pole retaining walls numbered 1 to 18
- NZS4431:2022
- Auckland Council's Code of Practice for Land Development and Subdivision, Chapter 2 - Earthworks and Geotechnical, Version 2.0, July 2022
- Aspire Consulting Engineers approved Resource Consent drawing set referenced 1725-RC.
- Capture Land Development Engineers' EPA Plan Set referenced 1081.
- CMW Geosciences' Geotechnical Investigation Report referenced AKL2022-0088AB, Rev 2, dated 16 November 2022, incorporating the CMW Geotechnical Works Specification.
- CMW Geosciences' Cantilever Timber Pole Retaining Wall Design Report referenced AKL2022-0088AD Rev 3, dated 6 October 2023

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

- Geotechnical Designer: CMW Geotechnical NZ Limited
- Certifier: CMW Geotechnical NZ Limited
- Recognised Laboratory: CMW Geotechnical NZ Limited
- Contractor: Hibiscus Contractors
- Sub-contractor (earthworks): Radich Contractors

As CMW has fulfilled the roles of both earth fills Certifier and Geotechnical Designer, this report has been prepared as a combined report covering both of these aspects of the project work.

2 DESCRIPTION OF WORKS

Hibiscus Contractors and their earthmoving subcontractor, Radich Contractors, mobilised to site in early October 2023.

Topsoil stripping began on Lot 1 in mid-October to facilitate cut and fill works to establish a new sediment retention pond. Topsoil stripping across the northern portion of site occurred during late October to mid November. Filling operations began on the northern portion of site in November with material sourced from the elevated central site areas.

Earthworks progressed essentially from north to south to allow for retaining wall construction and civil works to follow immediately behind. Muck-out operations for the road culvert across the main gully were undertaken in early December 2023. The culvert was installed prior to the Christmas 2023 shutdown.

In January 2024 earthworks were able to extend to the south of the gully to facilitate filling and subsequent retaining wall construction here in late January and February 2024. Softer than desirable soils were encountered in some deeper portions of the main cut area, and further investigations were completed to confirm that these would not impact on building platforms. The final retaining walls in the main cut area of lots 19 to 22 were completed in March, with the civil works largely completed by mid-July 2024.

The main items of plant used by the contractors included:

- 3 x Excavators
- 1 x Padfoot Single Drum Compactor
- 1 x 4WD Compactor
- 2 x Moxy Dump Trucks
- 2 x Terex Motorscrapers
- 1 x Lime Hopper and Lime Hoe

3 GEOTECHNICAL QUALITY CONTROL

3.1 Site Observations

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

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

- Adequate topsoil stripping;
- Fill areas prior to the placement of fill materials to ascertain that all mullock, and soft inorganic subsoils had been removed;
- Installation of subsoil drains (excluding road under-channel drains);
- Backfilling of subsoil drains;
- Construction of cantilever pole retaining walls including ground conditions, pile size, spacing and depth; and
- Placement and compaction of engineered fills.

3.2 Compaction Control

Compaction of engineered earth fills was controlled by undrained shear strength measured by handheld shear vane calibrated using the NZGS 2001 method and by air voids as defined by NZS4402.

The criteria for undrained shear strength were a minimum single value of 110 kPa and minimum average of any 10 consecutive tests of 140 kPa.

The criteria for air voids were a maximum single value of 12% and maximum average of any 10 consecutive tests of 10%.

Vane shear strength, water content and in situ density tests were carried out on all areas of the engineered filling to at least the frequency required by the project specification.

These tests showed on occasions that the contractor was struggling to achieve the required compaction standards with the prevailing site and soil conditions. Typically soils were wet of optimum and required lime / cement and air drying to condition them to appropriate moisture content prior to compaction. To the best of our knowledge, all areas of fill were re-worked as necessary. Subsequent testing confirmed compliance with the specification.

4 EVALUATION OF COMPLETED EARTHWORKS

4.1 Natural Hazards

The appended as-built drawings depict the extents of a series of zones that contain limitations intended to ensure that future building and/ or earthworks on the lots is undertaken in a manner that does not lead to buildings being subject to any of the natural hazards described in Section 71(3) of the Building Act, i.e. erosion, falling debris, subsidence, slippage, and inundation. Consideration of the inundation hazard was outside the scope of CMW's brief and has been assessed by others. The applied zones include:

- **Specific Design Zones (slope)** – intended to protect building development from long term creep effects on or adjacent to steep slopes and to protect the slopes from inappropriate loading or undermining.
- **Specific Design Zones (retaining)** - intended to protect the retaining walls from overloading at the crest that could lead to instability;
- **Specific Design Zones (no cut)** - intended to protect the retaining walls from undermining at the toe that could lead to instability;
- **Specific Design Zone (future works)** – intended to ensure that future works do not compromise global stability conditions where significant cuts and/ or fills are expected to be undertaken for building development.

Full descriptions of the restrictions associated with all natural hazards are presented in our Opinion on Suitability in ***Appendix A***. Additional information is also provided in some of the following sections.

4.2 Liquefaction

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

- Review of Auckland Council GIS maps confirms the damage category to be: Very Low Vulnerability
- In accordance with MBIE/NZGS guidance[1] the liquefaction susceptibility of the soils at this site was assessed with respect to geological age and compositional (soil fabric and density) criteria during initial

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

investigations. Our assessment was described in our Geotechnical Investigation Report referenced in Section 1 above and found a very low risk.

4.3 Land Stability and Erosion

The subdivision scheme layout includes near-level platforms with low intervening batter slopes and retaining walls. The batters include portions of the residential lots with maximum gradients of 1(v) in 2.5(h) as depicted on the as-built drawings to provide appropriate stability conditions that meet regulatory requirements for the land.

Stability conditions for finished ground profiles have been assessed under a range of groundwater conditions which satisfy ultimate limit state design criteria. The soil parameters for the analyses were selected from extensive investigation undertaken at the site and from experience in this terrain. We consider that the stability results are satisfactory for all building platform areas, and we are therefore satisfied that these areas are not subject to the natural stability hazards described in the Building Act.

On all steep land, including on engineered batter slopes, surface stability can be compromised by indiscriminate disposal of stormwater onto the ground surface and/ or by removal of vegetation.

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

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

4.4 Retaining Walls

Cantilever pole retaining walls have been constructed in the locations shown on the appended Capture As-built Plan. These walls reach a maximum height of approximately 2.55 metres. They were designed and the construction was observed by this consultancy. A copy of the Producer Statements - Construction Review is provided in ***Appendix F***.

Descriptions of the building and earthworks restrictions within the vicinity of these walls (Specific Design Zones – retaining) are contained in our Opinion on Suitability in ***Appendix A.***

4.5 Fill Induced Settlement

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

4.6 Service Line Trenches

As part of the civil works, sanitary sewer and stormwater services were trenched throughout the development as shown on the appended Stormwater and Sanitary Sewer As-built Plans.

Key service trenches that are either deep or are located on or adjacent to steep ground / batters on lots 1 to 7, 21, 22, 25 and 28 and have been backfilled to the same specification as general fills. Service trench backfills in all other locations have not been specifically tested.

It is normal for building developments involving foundations within a 45-degree zone of influence from pipe inverts to require engineering input. The Auckland Council drawing referenced SW22 provided in ***Appendix C*** extracted from Chapter 4 of the Auckland Council Code of Practice for Land development and Subdivision

depicts their normal requirements for stormwater pipes. Details for water and wastewater pipes are available in the Watercare COP1 - General Requirements and Procedures. Some of the lots are known to have service trenches within the lots as shown on the appended stormwater and wastewater as-built plans.

We note that on this development, deep service lines were installed within lots 1 to 7, 25 and 28 with trench backfills having been compacted. In this situation, risks of foundation settlement and pipe overloading are both considered low in most of the normal 45-degree restriction zone. Additional comments are provided in the Opinion on Suitability in ***Appendix A.***

4.7 Subsoil Drains and Groundwater

The appended Cut to Fill as-built plan shows the position of a subsoil drain and it's outlet that was installed within Lot 3 during the earthworks as described in the following sub-sections.

Descriptions of restrictions associated with this drain and outlet are contained in our appended Opinion on Suitability in ***Appendix A***.

4.7.1 Underfill Drains

These drains were installed at the bases of fills to assist with the earthworks operations by capturing seepages at the cleared ground level. They require no specific maintenance and while their ongoing function is not critical to stability conditions, but they provide ongoing control of groundwater levels and pore water pressure relief so their ongoing function should not be compromised by future works.

Typically these drains comprise punched draincoils surrounded by drainage gravel. Specific design details are provided in the project reports and specifications. If drain depths are unclear at specific locations, they can be estimated from the depths of fills depicted on the as-built plans.

4.7.2 Groundwater

Groundwater levels beneath the engineered fills can be expected to be controlled by the underfill drains and retaining wall drainage and should therefore typically be deeper than 2m, subject to seasonal variations.

In areas of natural ground, based on our work to date we anticipate groundwater levels remaining well below the depth of influence of anticipated earthworks and foundation works for NZS 3604 type dwellings.

4.8 Road Subgrades

Penetration resistance testing was carried out on the road subgrades during construction and the results of this testing were forwarded to Capture Land Development Consultants for pavement remedial design, where needed. Where soft ground with low equivalent CBR values was identified it was generally undercut. All road subgrade areas were subsequently lime/ cement stabilised to achieve appropriate CBR values.

Benkelman Beam testing of the base course was carried out by Road Test Limited on each road and those results were also forwarded to Capture.

4.9 Design of Shallow Foundations

4.9.1 Bearing Capacity

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

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

4.9.2 Foundation Settlements

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

4.9.3 Soil Expansiveness Classification

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

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

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

Testing on 7 samples was completed in accordance with the requirements of NZS 3604 and ACCoPs. All testing was completed by RoadTest Limited, a testing laboratory accredited by IANZ for the tests undertaken. Results are provided in ***Appendix E***.

The testing confirms that:

- Most of the soils tested were expansive in terms of the NZS 3604 definition and were therefore outside the definition of "good ground".
- All of the samples demonstrated high to extreme plasticity characteristics.

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

4.9.4 Site (Seismic) Class

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

4.10 Topsoil Depths

Topsoil depths have been checked by the drilling of a borehole in the approximate centre of the building platform on each lot. The results are considered indicative for each lot, but may be subject to variations. Topsoil depths are between 50 and 300mm on the development lots.

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

4.11 Site Preparation During Construction

Foundation contractors need to be aware of the extreme damage potentially caused by expansive soils and the imperativeness of maintaining optimum moisture contents in all footing excavations and across building platform subgrades between the time of excavation and the pouring of concrete. Pouring foundations on dry, desiccated ground in summer months can lead to heaving and cracking, requiring extensive repairs or even complete house re-builds. Similarly, where perimeter foundations have been treated but floor slabs have

been poured on dry ground, infiltration of moisture via pipe bedding can lead to localised heave, uplift and significant slab damage.

Remedial actions that may be appropriate include combinations of platform protection with a hard fill layer, pouring of a blinding layer of concrete in footing bases and soaking of the building platform with sprinklers for an extended period. However, over-use of sprinklers, ponding of excessive surface water and/ or trafficking of wet soils could also lead to dramatic strength loss and subgrade degradation, so careful management of site surface conditions is always required.

4.12 Site Maintenance and Landscaping

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

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

5 CLOSURE

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

This report has been prepared for use by Cabra Developments Limited in relation to the Residential Subdivision 47 Urumaraki Avenue project in accordance with the scope, proposed uses and limitations described in the report. Should you have further questions relating to the use of your report please do not hesitate to contact us.

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

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

Where a party other than Cabra Developments Limited seeks to rely upon or otherwise use this report, the consent of CMW should be sought prior to any such use. CMW can then advise whether the report and its contents are suitable for the intended use by the other party.

USING YOUR CMW GEOTECHNICAL REPORT

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

Preparation of your report

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

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

Your geotechnical report is based on your project's requirements

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

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

Interpretation of geotechnical data

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

Subsurface conditions can change

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

Interpretation and use by other design professionals

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

Your report's recommendations require confirmation during construction

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

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

Environmental Matters Are Not Covered

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

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

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

STATEMENT OF PROFESSIONAL OPINION ON SUITABILITY OF LAND FOR BUILDING CONSTRUCTION

Development: Residential Subdivision
Developer: Cabra Developments Limited
Location: 47 Urumaraki Avenue, Helensville

I, Richard Knowles, of CMW Geotechnical NZ Limited, Auckland, hereby confirm that:

1. As a Chartered Professional Engineer experienced in the field of geotechnical engineering, I am a Geo-professional as defined in clause 1.2.2 of NZS 4404:2010 and was retained by the Developer as the geo-professional on the above development.
2. The extent of preliminary investigations carried out to date are described in the CMW Geosciences Geotechnical Investigation Report referenced AKL2022-0088AB Rev 2 dated 16 November 2022. The conclusions and recommendations of that document have been re-evaluated in the preparation of this report. The results of all tests and/ or evaluations carried out are as described in my Geotechnical Completion Report dated 19 September 2024.
3. My certification of the earth fills placed on this site is contained in ***Appendix B***.
4. In my professional opinion, not to be construed as a guarantee, I consider that:
    a. The completed earthworks take into account land slope and foundation stability considerations on the building platform areas, but as shown on the appended building restriction zones plans, areas on lots 1 to 3, 5 to 11, 19, 20, 22, 23 and 26 to 28 inclusive have batters comprising gradients steeper than 1(v) in 4 (h). Accordingly, restrictions incorporating **Specific Design Zones (soil creep)** have been applied as depicted on the as-built plans.

        No building construction and no earthworks (i.e. cut or fills of any depth) should take place within the designated **Specific Design Zone (soil creep) areas** unless endorsed by a Chartered Professional Engineer experienced in geomechanics and familiar with the contents of this report. The endorsement will need to consider the implications of the proposals on global stability conditions and soil creep, the interaction with any service pipes and associated trench backfills, control of surface water, construction sequencing, timing and temporary support requirements for the construction of all earthworks, foundations and retaining walls and if necessary, comment on what aspects require engineering inspections and certification. This limitation also applies to long term landscaping works.

    b. **Specific Design Zone (retaining) areas** have been applied on Lots 1, 3, 4, 8 to 14, 16, 17, 20, 21, 23, and 25 to 28 inclusive for the protection of the function of the retaining walls as depicted on the as-built plans. The retaining walls on this stage of the development were typically designed for a maximum of a short 27-degree batter and 12 kPa surcharge load and 0 ° toe slope. The exception are portions of the walls supporting the lower boundaries of lots 9 and 10 where toe slopes of up to 20 degrees have also been incorporated.

        No building construction and no earthworks (i.e. no fills) should take place within these Specific Design Zones that exceed these design limits on the walls unless endorsed by a Chartered Professional Engineer experienced in geomechanics and familiar with the contents of this report who consider the stability implications of the earthworks and/ or building proposals on the retaining walls

    c. **Specific Design Zone (no cut) areas** have been applied on Lots 2, 3, 11 to 13, 15, 17 and 19 to 28 inclusive for the protection of the function of the retaining walls as depicted on the as-built plans. The retaining walls on this stage of the development were typically designed for a 0 ° toe slope.

No earthworks cuts should take place within these Specific Design Zones that exceed these design limits on the walls unless endorsed by a Chartered Professional Engineer experienced in geomechanics and familiar with the contents of this report who consider the stability implications of the earthworks and/ or building proposals on the retaining walls.

d. Lot 14 has not been significantly earthworked but has a moderate gradient that is anticipated to be subject to significant earthworks to facilitate future building. The entire extent of this lot is subject to a **Specific Design Zone (future works)**.

   No building construction and no earthworks (i.e. cut or fills of any depth) should take place on this lot unless endorsed by a Chartered Professional Engineer experienced in geomechanics and familiar with the contents of this report. The endorsement will need to consider the implications of the proposals on global stability conditions and soil creep, construction sequencing, timing and temporary support requirements for the construction of all earthworks, foundations and retaining walls and if necessary, comment on what aspects require engineering inspections and certification. This limitation also applies to long term landscaping works.

e. The function of the subsoil drain installed beneath Lot 3 inclusive as shown on the as-built plans must not be impaired by any building development or landscaping works. Any bored or driven piles must be positioned to avoid damaging the draincoil. Where any subsoil drain is intercepted by building works, it must be reinstated under the direction of a Chartered Professional Engineer to ensure the integrity of the subsoil drainage system.

f. A geotechnical ultimate bearing capacity of 300 kPa may be assumed for shallow foundation design on the building platforms of all the residential lots.

g. The site (seismic) subsoil class for each lot has been assessed in accordance with NZS1170.5:2004 Clause 3.1.3 from borelogs that included measurements of geotechnical properties. Our assessment is that all lots are Class C- shallow soil.

h.

Assessment of Characteristic Surface Movements and Design Classes for NZS 3604 Compliant Buildings		
Lots	**Assessed AS2870 Site Class / 300 Year Design Characteristic Surface Movement (Ys)**	**Anticipated Equivalent NZBC B1/AS1 Expansivity Class for Design / 500 Year Design Characteristic Surface Movement(Ys)**
1 to 12, 17 to 20, 22, 24 to 28	M (moderately reactive) / 40mm	M / 44mm
13, 16, 21, 23	H1 (highly reactive) / 60mm	H / 78mm
14, 15	H2 (highly reactive) / 75mm	H / 78mm

B1/AS1 provides an Acceptable Solution through NZS 3604 for foundation design applying to a limited range of compliant building sizes, shapes and materials and only for concrete floor design with strip footings. In all other cases, NZS 3604 directs the use of AS2870 or a specific design.

If AS2870 is used for the design solution, it must be noted that the characteristic surface movements in that code apply to a (less conservative) 300-year return period drought while B1/AS1 provides for a 500 year return period drought.

Prior to the introduction of the B1/AS1 design information in November 2019, minimum foundation depths recommended as appropriate by geotechnical consultants in Auckland for

shallow footing design underAS2870 were typically of the order of 600mm for Class M, 750mm for Class H1 and 900mm for Class H2.

For building types where neither B1/AS1 nor AS2870 design solutions are required to be applied, such as for IL1 buildings or commercial / industrial buildings, the structural designer should still consider the implications of the potential characteristic surface movement.

i. No building development should take place within the 45-degree zone of influence of stormwater or sewer line or manhole inverts unless endorsed by specific design and by construction inspections undertaken by a Chartered Professional Engineer experienced in geomechanics to ensure that lateral stability and differential settlement issues are addressed and that building loads are transferred beyond the influence of pipes and trench backfills.

   Typically this leads to piling works in this zone as depicted on drawing SW22 extracted from Chapter 4 of the Auckland Council Code of Practice for Land development and Subdivision. A copy is provided in ***Appendix B*** for clarification. However, in some areas where pipes are deeply buried and trench backfills have been compacted, such as inside the front boundaries of lots 1 to 7, 25 and 28, risks of trench settlement and pipe overloading are considered to be low within much of the zone of influence and typical shallow foundations may be appropriate subject to engineering endorsement.

j. On the basis of the earth fill certification and subject to the geotechnical limitations, restrictions and recommendations contained in clauses 4(a), 4(b), 4(c), 4(d), 4(e), 4(f), 4(g), 4(h) and 4(i) above, the filled and natural ground is generally suitable for buildings constructed in accordance with NZS 3604 and the requirements of either NZBC Clause B1/AS1 where appropriate, or AS2870 for the expansive soil class associated with the characteristic surface movement. Alternatively, a specific foundation and structural design may be undertaken by a Chartered Professional Engineer.

5. Road subgrades have been formed with appropriate regard for slope stability and settlement risks.
6. Reserve areas have been formed with appropriate regard for slope stability risks.

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

For and on behalf of CMW Geosciences

Richard Knowles

Principal Geotechnical Engineer CMEngNZ, CPEng

GCR Summary Table										
Condition	Specific Design Zone (soil creep)	Specific Design Zone (retaining)	Specific Design Zone (no cut)	Specific Design Zone (future works)	Subsoil Drains Present	Geotechnical Ultimate Bearing Capacity (kPa)	NZS1170.5 Site (seismic) Class	AS2870 Expansive Class	Service Lines Present	Indicative Topsoil Depth (mm)
Lot Number	GCR SOPO Clause									
	4(a)	4(b)	4(c)	4(d)	4(e)	4(f)	4(g)	4(h)	4(I)	
1	✓	✓				300	C	M	✓	100
2	✓		✓			300	C	M	✓	200
3	✓	✓	✓		✓	300	C	M	✓	200
4		✓				300	C	M	✓	200
5	✓					300	C	M	✓	100
6	✓					300	C	M	✓	100
7	✓					300	C	M	✓	200
8	✓	✓				300	C	M		200
9	✓	✓				300	C	M		200
10	✓	✓				300	C	M		200
11	✓	✓	✓			300	C	M		200
12		✓	✓			300	C	M		200
13		✓	✓			300	C	H1		200
14		✓		✓		300	C	H2		100
15			✓			300	C	H2		100
16		✓				300	C	H1		200
17		✓	✓			300	C	M		300
18						300	C	M		200
19	✓		✓			300	C	M		200
20	✓	✓	✓			300	C	M		300

GCR Summary Table										
Condition	Specific Design Zone (soil creep)	Specific Design Zone (retaining)	Specific Design Zone (no cut)	Specific Design Zone (future works)	Subsoil Drains Present	Geotechnical Ultimate Bearing Capacity (kPa)	NZS1170.5 Site (seismic) Class	AS2870 Expansive Class	Service Lines Present	Indicative Topsoil Depth (mm)
Lot Number	GCR SOPO Clause									
	4(a)	4(b)	4(c)	4(d)	4(e)	4(f)	4(g)	4(h)	4(I)	
21		✓	✓			300	C	H1	✓	200
22	✓		✓			300	C	M	✓	300
23	✓		✓			300	C	H1		200
24			✓			300	C	M		200
25		✓	✓			300	C	M	✓	200
26	✓	✓	✓			300	C	M		200
27	✓	✓	✓			300	C	M		200
28	✓	✓	✓			300	C	M	✓	Hardfill

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

STATEMENT OF SUITABILITY OF ENGINEERED FILLS FOR LIGHTWEIGHT STRUCTURES

To:	Auckland Council
Development:	Residential Subdivision
Land Title(s):	Lot 3 DP 523000
Location:	47 Urumaraki Avenue, Helensville
Resource Consent Nos:	LUC60409222
Developer:	Cabra Developments Limited
Geotechnical Designer:	Richard Knowles of CMW Geotechnical NZ Limited
Certifier:	Richard Knowles of CMW Geotechnical NZ Limited

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

1. I, Richard Knowles, confirm that I am qualified as a certifier as defined in NZS4431:2022.
2. During this work, I was retained as certifier and I or my certifier's representative undertook inspections and testing as documented in the Geotechnical Completion Report.
3. I am satisfied that the engineered fill shown in the attached as-built survey was placed, compacted and tested in accordance with the attached specification and that all variations and non-compliances have been documented in the Geotechnical Completion report.
4. Based on the information available, I certify that, to the best of my knowledge, the intent of the geotechnical designer (as presented in the design, drawings and Geotechnical Works Specification) has been achieved.
5. The fill areas shown on the Capture as-built cut and fill plan(s) attached are considered suitable for development as per NZS 3604 subject to any other restrictions described in the Geotechnical Completion Report by the Geotechnical Designer.
6. This certification does not remove the necessity for normal inspection and design of foundations as would be made in natural ground.

For and on behalf of CMW Geosciences

Richard Knowles

Principal Geotechnical Engineer CMEngNZ, CPEng

APPENDIX C: AS-BUILT DRAWINGS

Title	Reference No.	Date	Revision
As-Built Final Contours Sheet 1	AB-200	17/09/2024	2
As-Built Final Contours Sheet 2	AB-201	17/09/2024	2
As-Built Final Contours Sheet 3	AB-202	17/09/2024	2
As-Built Cut to Fill Sheet 1	AB-210	17/09/2024	2
As-Built Cut to Fill Sheet 2	AB-211	17/09/2024	2
As-Built Cut to Fill Sheet 3	AB-212	17/09/2024	2
As-Built Roading Plan Sheet 1	AB-300	13/09/2024	0
As-Built Roading Plan Sheet 2	AB-301	13/09/2024	0
As-Built Roading Plan Sheet 3	AB-302	13/09/2024	0
As-Built Stormwater Sheet 1	AB-400	13/09/2024	0
As-Built Stormwater Sheet 2	AB-401	13/09/2024	0
As-Built Stormwater Sheet 3	AB-402	13/09/2024	0
As-Built Stormwater Details	AB-403	13/09/2024	0
As-Built Stormwater Lot Connection Plan Sheet 1	AB-411	13/09/2024	0
As-Built Stormwater Lot Connection Plan Sheet 2	AB-412	13/09/2024	0
As-Built Stormwater Lot Connection Plan Sheet 3	AB-413	13/09/2024	0
As-Built Wastewater Sheet 1	AB-500	13/09/2024	0
As-Built Wastewater Sheet 2	AB-501	13/09/2024	0
As-Built Wastewater Sheet 3	AB-502	13/09/2024	0
As-Built Fire Fighter Water Plan Sheet 1	AB-600	13/09/2024	0
As-Built Fire Fighter Water Plan Sheet 2	AB-601	13/09/2024	0
As-Built Fire Fighter Water Plan Sheet 3	AB-602	13/09/2024	0
As-Built Riparian Yard Plan	AB-900	13/09/2024	0
Stormwater Pipe and Manhole Construction Clearance Requirements	SWCoP - SW22	17/01/2022	3

CABRA GROUP JOINT VENTURE
47 URUMARAK AVENUE
HELENSVILLE

CAPTURE
Land Development Consultants

DATE 13/09/24
CIVIL FOR COMPLETION
JOB No : 1081

Drawing Number	Drawing Title	Scale (A3)	Amendments
200	As-Built Final Contours Sheet 1	1:1000	2
201	As-Built Final Contours Sheet 2	1:500	2
202	As-Built Final Contours Sheet 3	1:500	2
210	As-Built Cut to Fill Sheet 1	1:1000	2
211	As-Built Cut to Fill Sheet 2	1:500	2
212	As-Built Cut to Fill Sheet 3	1:500	2
300	As-Built Roading Plan Sheet 1	1:1000	0
301	As-Built Roading Plan Sheet 2	1:500	0
302	As-Built Roading Plan Sheet 3	1:500	0
400	As-Built Stormwater Sheet 1	1:1000	0
401	As-Built Stormwater Sheet 2	1:500	0
402	As-Built Stormwater Sheet 3	1:500	0
403	As-Built Stormwater Details	As-Drawn	0
411	As-Built Stormwater Lot Connection Plan Sheet 1	1:1000	0
412	As-Built Stormwater Lot Connection Plan Sheet 2	1:500	0
413	As-Built Stormwater Lot Connection Plan Sheet 3	1:500	0
500	As-Built Wastewater Sheet 1	1:1000	0
501	As-Built Wastewater Sheet 2	1:500	0
502	As-Built Wastewater Sheet 3	1:500	0
600	As-Built Fire Fighter Water Plan Sheet 1	1:1000	0
601	As-Built Fire Fighter Water Plan Sheet 2	1:500	0
602	As-Built Fire Fighter Water Plan Sheet 3	1:500	0

CABRA
LAND & PROPERTY DEVELOPMENT

REV	DATE	REVISION DETAILS	ISSUED
0	13/09/24	FOR COMPLETION	DL
1	17/09/24	FOR COMPLETION	DL

CAPTURE
Land Development Consultants

CLIENT
CABRA GROUP JOINT VENTURE

PROJECT
47 URUMARAKI AVENUE
HELENSVILLLE

DRAWING TITLE
DRAWING SCHEDULE

STATUS	SCALE	SIZE
As-Built		A3

PROJECT	DRAWING NO	REVISION
1081	002	1

1081-AB-001-002 Coversheet & Drawing Register.dwg

Final Contours As-Built Legend

- 38.0 — As built Contour (1m interval)
- As built Contour (0.5m interval)
- Extent of Works
- Top of Bank
- 1.45 — Retaining Wall (height label on low side of wall)
- Retaining Wall Fence
- Specific Design Zone (Slope) (Refer to CMW GCR For Details)
- Specific Design Zone (Retaining) (Refer to CMW GCR For Details)
- Specific Design Zone (No cut) (Refer to CMW GCR For Details)

6 DP 357658

5 DP 357658

4 DP 357658

3 DP 357658

2 DP 357658

804 DP 498189

803 DP 498189

3 DP 523000

231 DP 523000

1 DP 510148

Part Rakauwhatiia Block

Lot 1, Lot 2, Lot 3, Lot 4, Lot 5, Lot 6, Lot 7, Lot 8, Lot 9, Lot 10, Lot 11, Lot 12, Lot 13, Lot 14, Lot 15, Lot 16, Lot 17, Lot 18, Lot 19, Lot 20, Lot 21, Lot 22, Lot 23, Lot 24, Lot 25, Lot 26, Lot 27, Lot 28, Lot 200, Lot 201, Lot 202, Lot 203, Lot 204, Lot 300

URUMARAKI AVENUE

Lot 200 URUMARAKI AVENUE

Refer Drawing AB-201

Refer Drawing AB-202

I certify that these as-built plans are an accurate record of 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 the following tolerances:

- For all pipe inverts & roadside channels to be within +/- 10mm (local circuit i.e internal/relative consistency required only)
- For all other assets +/-20mm (e.g Manhole covers, Earthworks)

Name : Tom Lemon

Signed : _____

Registered Professional Surveyor

Registration Number : 1500

Date: 17/09/2024

Contact Number: 09 906 3856

Email: Tom@captureland.nz

ENG60420271 / LUC60409222 / SUB60409223

CLIENT: CABRA LAND & PROPERTY DEVELOPMENT

CABRA GROUP JOINT VENTURE

PROJECT: 47 URUMARAKI AVENUE HELENSVILLE

CAPTURE Land Development Consultants

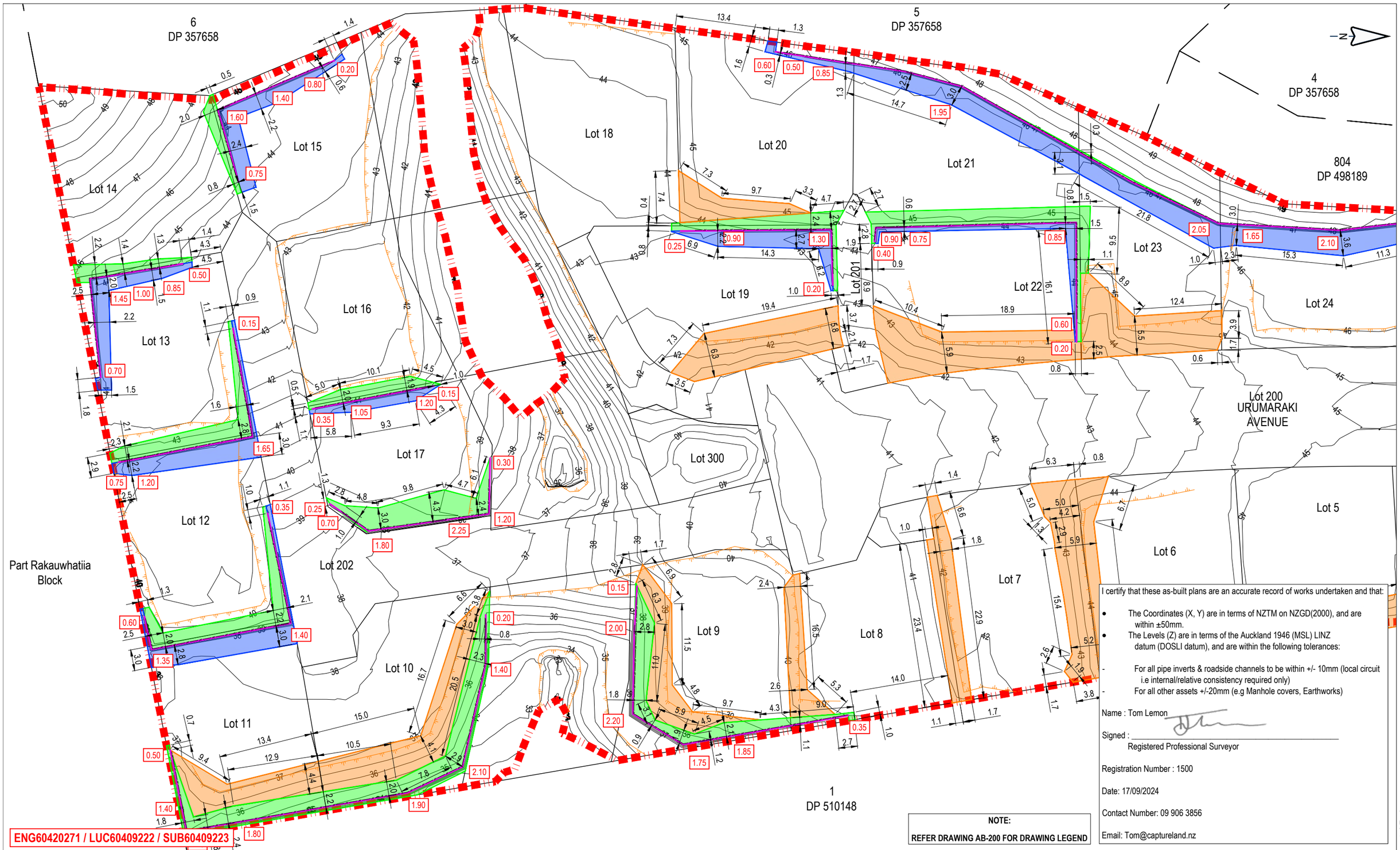
REV	DATE	REVISION DETAILS	ISSUED
2	17/09/24	FOR COMPLETION	DL
1	13/09/24	FOR COMPLETION	DL
0	20/08/24	FOR COMPLETION	DL

DRAWING TITLE: AS-BUILT FINAL CONTOURS SHEET 1

STATUS	SCALE	SIZE
AS-BUILT	1:1000	A3

PROJECT NO	DRAWING NO	REVISION
1081	AB-200	2

1081-AB-200-202 Final Cont AB.dwg



ENG60420271 / LUC60409222 / SUB60409223

NOTE:
REFER DRAWING AB-200 FOR DRAWING LEGEND

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CABRA
LAND & PROPERTY DEVELOPMENT

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JOINT VENTURE

PROJECT
47 URUMARAKI AVENUE
HELENSVILLE

CAPTURE
Land Development Consultants

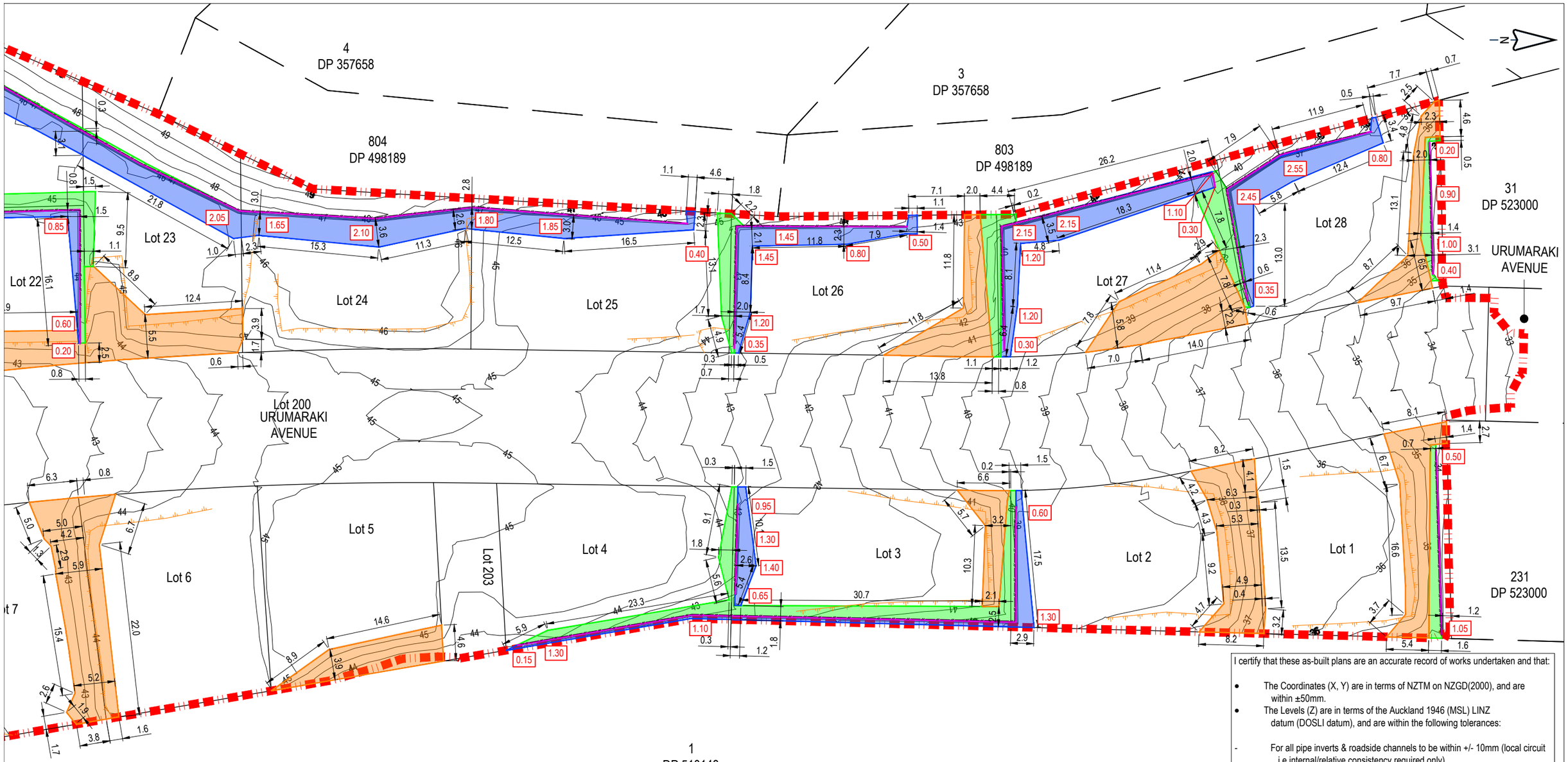
REV	DATE	REVISION DETAILS	ISSUED
2	17/09/24	FOR COMPLETION	DL
1	13/09/24	FOR COMPLETION	DL
0	20/08/24	FOR COMPLETION	DL

DRAWING TITLE
AS-BUILT
FINAL CONTOURS
SHEET 2

STATUS	*SCALE*	*SIZE*
AS-BUILT	1:500	A3

PROJECT NO	*DRAWING NO*	*REVISION*
1081	AB-201	2

1081-AB-200-202 Final Cont AB.dwg



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ENG60420271 / LUC60409222 / SUB60409223

NOTE:
REFER DRAWING AB-200 FOR DRAWING LEGEND

CLIENT
CABRA
LAND & PROPERTY DEVELOPMENT

CABRA GROUP
JOINT VENTURE

PROJECT
47 URUMARAKI AVENUE
HELENSVILLE

CAPTURE
Land Development Consultants

REV	DATE	REVISION DETAILS	ISSUED
2	17/09/24	FOR COMPLETION	DL
1	13/09/24	FOR COMPLETION	DL
0	20/08/24	FOR COMPLETION	DL

DRAWING TITLE
AS-BUILT
FINAL CONTOURS
SHEET 3

STATUS	SCALE	SIZE
AS-BUILT	1:500	A3

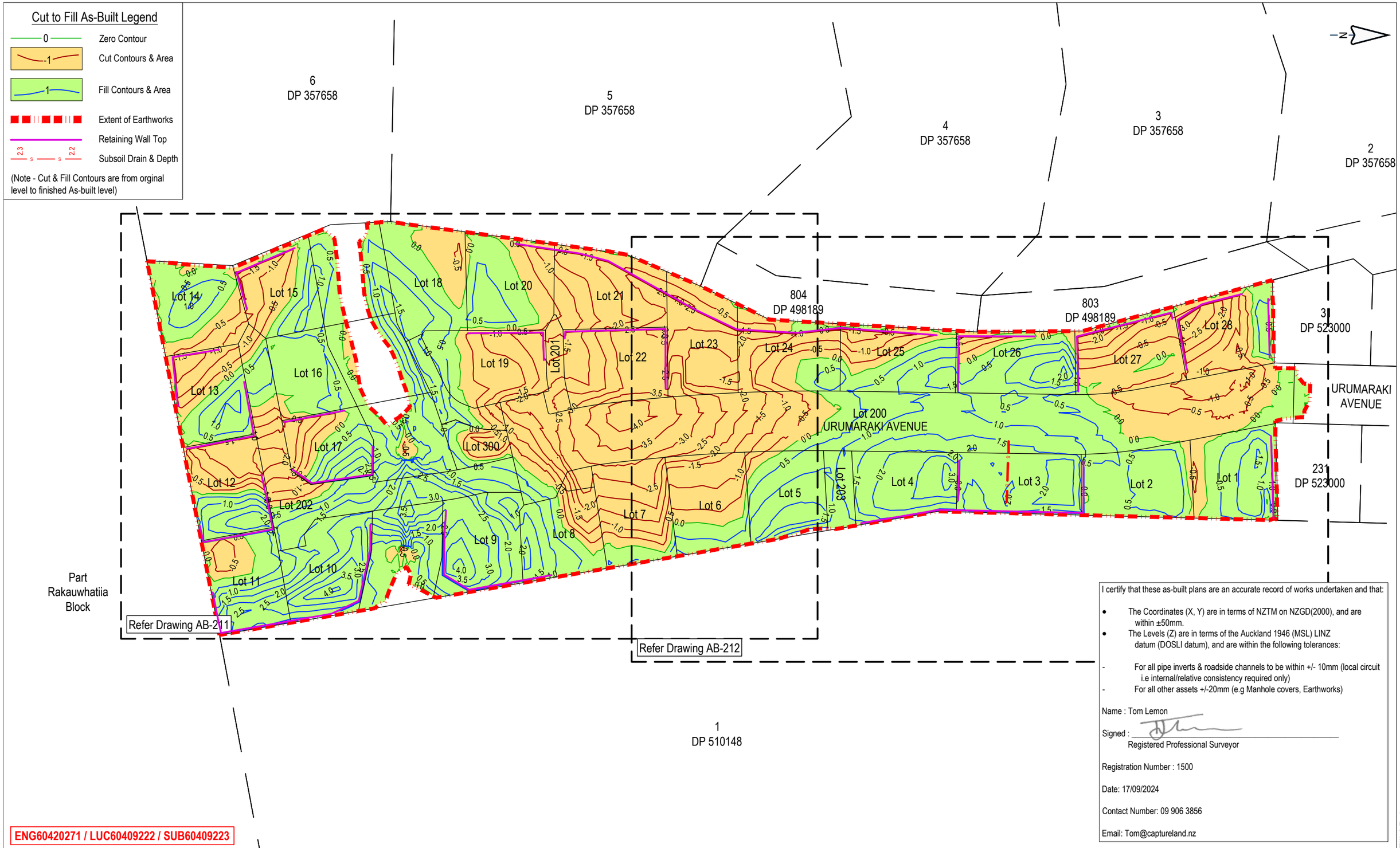
PROJECT NO	DRAWING NO	REVISION
1081	AB-202	2

1081-AB-200-202 Final Cont AB.dwg

Cut to Fill As-Built Legend

- 0 — Zero Contour
- -1 — Cut Contours & Area
- 1 — Fill Contours & Area
- Extent of Earthworks
- Retaining Wall Top
- 2.3 S S 2.2 — Subsoil Drain & Depth

(Note - Cut & Fill Contours are from orginal level to finished As-built level)



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CLIENT: CABRA LAND & PROPERTY DEVELOPMENT

CABRA GROUP JOINT VENTURE

PROJECT: 47 URUMARAKI AVENUE HELENSVILLE

CAPTURE Land Development Consultants

REV	DATE	REVISION DETAILS	ISSUED
2	17/09/24	FOR COMPLETION	DL
1	13/09/24	FOR COMPLETION	DL
0	20/08/24	FOR COMPLETION	DL

DRAWING TITLE: AS-BUILT CUT TO FILL SHEET 1

STATUS	SCALE	SIZE
AS-BUILT	1:1000	A3

PROJECT NO	DRAWING NO	REVISION
1081	AB-210	2

1081-AB-210-212 Cut to Fill AB.dwg

6
DP 357658

5
DP 357658

4
DP 357658

804
DP 498189

Lot 14

Lot 15

Lot 16

Lot 13

Lot 17

Lot 18

Lot 20

Lot 21

Lot 19

Lot 201

Lot 22

Lot 23

Lot 24

Lot 200
URUMARAKI
AVENUE

Lot 300

Lot 12

Lot 202

Lot 10

Lot 11

Lot 9

Lot 8

Lot 7

Lot 6

Lot 5

Part Rakauwhatiia
Block

1
DP 510148

ENG60420271 / LUC60409222 / SUB60409223

Cut to Fill As-Built Legend

- 0 — Zero Contour
- -1 — Cut Contours & Area
- 1 — Fill Contours & Area
- Extent of Earthworks
- Retaining Wall Top
- 23 s s 22 — Subsoil Drain & Depth

(Note - Cut & Fill Contours are from orginal level to finished As-built level)

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LAND & PROPERTY DEVELOPMENT

CABRA GROUP
JOINT VENTURE

PROJECT
47 URUMARAKI AVENUE
HELENSVILLE

CAPTURE
Land Development Consultants

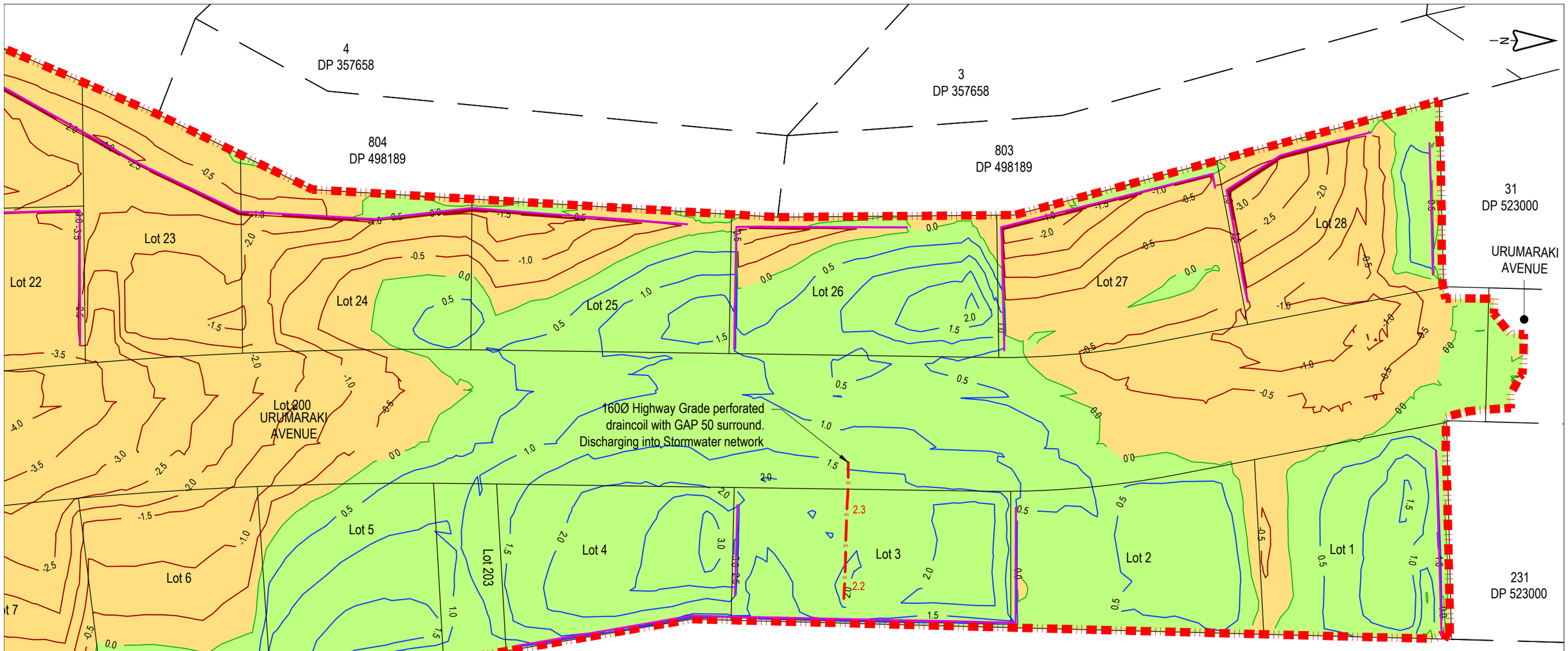
REV	DATE	REVISION DETAILS	ISSUED
2	17/09/24	FOR COMPLETION	DL
1	13/09/24	FOR COMPLETION	DL
0	20/08/24	FOR COMPLETION	DL

DRAWING TITLE
AS-BUILT
CUT TO FILL
SHEET 2

STATUS	SCALE	SIZE
AS-BUILT	1:500	A3

PROJECT NO	DRAWING NO	REVISION
1081	AB-211	2

1081-AB-210-212 Cut to Fill AB.dwg



Cut to Fill As-Built Legend

- 0 — Zero Contour
- -1 — Cut Contours & Area
- 1 — Fill Contours & Area
- Extent of Earthworks
- Retaining Wall Top
- 2.3 S S 2.2 — Subsoil Drain & Depth

(Note - Cut & Fill Contours are from orginal level to finished As-built level)

I certify that these as-built plans are an accurate record of works undertaken and that:

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Name : Tom Lemon

Signed : _____

Registered Professional Surveyor

Registration Number : 1500

Date: 17/09/2024

Contact Number: 09 906 3856

Email: Tom@captureland.nz

ENG60420271 / LUC60409222 / SUB60409223

CLIENT: CABRA LAND & PROPERTY DEVELOPMENT

CABRA GROUP JOINT VENTURE

PROJECT: 47 URUMARAKI AVENUE HELENSVILLE

CAPTURE Land Development Consultants

REV	DATE	REVISION DETAILS	ISSUED
2	17/09/24	FOR COMPLETION	DL
1	13/09/24	FOR COMPLETION	DL
0	20/08/24	FOR COMPLETION	DL

DRAWING TITLE: AS-BUILT CUT TO FILL SHEET 3

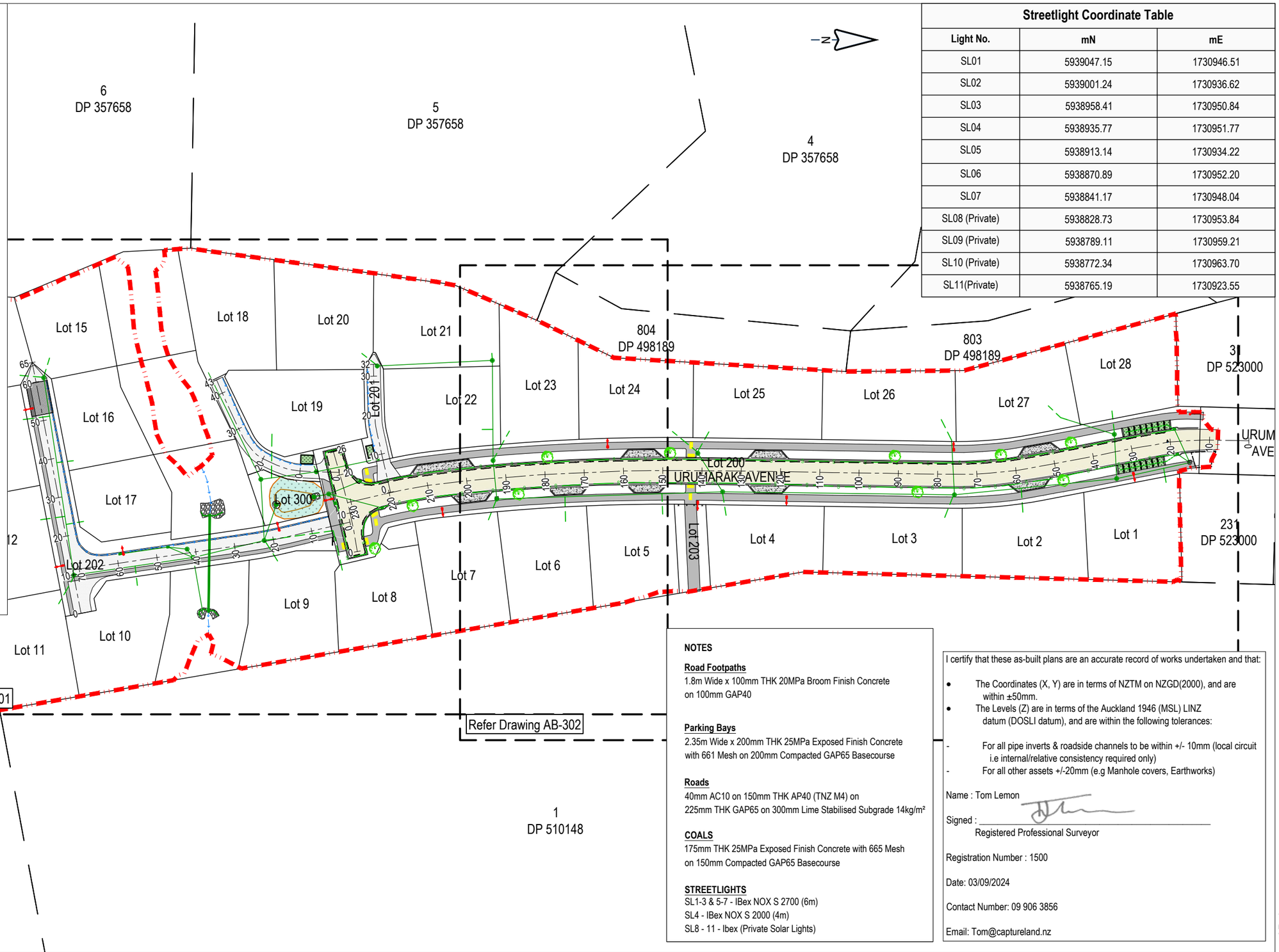
STATUS	SCALE	SIZE
AS-BUILT	1:500	A3

PROJECT NO	DRAWING NO	REVISION
1081	AB-212	2

1081-AB-210-212 Cut to Fill AB.dwg

Road As-Built Legend

- Concrete Footpath
- Concrete Driveways
- Channel Drain
- Parking Bays
- Battered Raingardens
- Hynds Precast Box Raingarden
- Stormwater Catchpit
- New Stormwater manhole & Pipeline
- SW — Existing Stormwater Manhole & Pipeline
- Tactile Ground Surface Indicators
- Street Light
  SL01-SL03 & SL06-SL07 NOX S2700
  SL04 & SL05 NOX S2000
  SL08-SL11 ASY10-900
- Street Tree
- Extent of Works
- S — Underchannel Drain
- Lime Stabilised Subgrade with 14kg/m²
- NSAAT Road Marking



Streetlight Coordinate Table		
Light No.	mN	mE
SL01	5939047.15	1730946.51
SL02	5939001.24	1730936.62
SL03	5938958.41	1730950.84
SL04	5938935.77	1730951.77
SL05	5938913.14	1730934.22
SL06	5938870.89	1730952.20
SL07	5938841.17	1730948.04
SL08 (Private)	5938828.73	1730953.84
SL09 (Private)	5938789.11	1730959.21
SL10 (Private)	5938772.34	1730963.70
SL11(Private)	5938765.19	1730923.55

NOTES

Road Footpaths
1.8m Wide x 100mm THK 20MPa Broom Finish Concrete on 100mm GAP40

Parking Bays
2.35m Wide x 200mm THK 25MPa Exposed Finish Concrete with 661 Mesh on 200mm Compacted GAP65 Basecourse

Roads
40mm AC10 on 150mm THK AP40 (TNZ M4) on 225mm THK GAP65 on 300mm Lime Stabilised Subgrade 14kg/m²

COALS
175mm THK 25MPa Exposed Finish Concrete with 665 Mesh on 150mm Compacted GAP65 Basecourse

STREETLIGHTS
SL1-3 & 5-7 - IBex NOX S 2700 (6m)
SL4 - IBex NOX S 2000 (4m)
SL8 - 11 - Ibex (Private Solar Lights)

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  - For all pipe inverts & roadside channels to be within +/- 10mm (local circuit i.e internal/relative consistency required only)
  - For all other assets +/-20mm (e.g Manhole covers, Earthworks)

Name : Tom Lemon
Signed : _____
Registered Professional Surveyor

Registration Number : 1500

Date: 03/09/2024

Contact Number: 09 906 3856

Email: Tom@captureland.nz

ENG60420271 / LUC60409222 / SUB60409223

CLIENT
CABRA
LAND & PROPERTY DEVELOPMENT

CABRA GROUP JOINT VENTURE

PROJECT
47 URUMARAKI AVENUE
HELENSVILLE

CAPTURE
Land Development Consultants

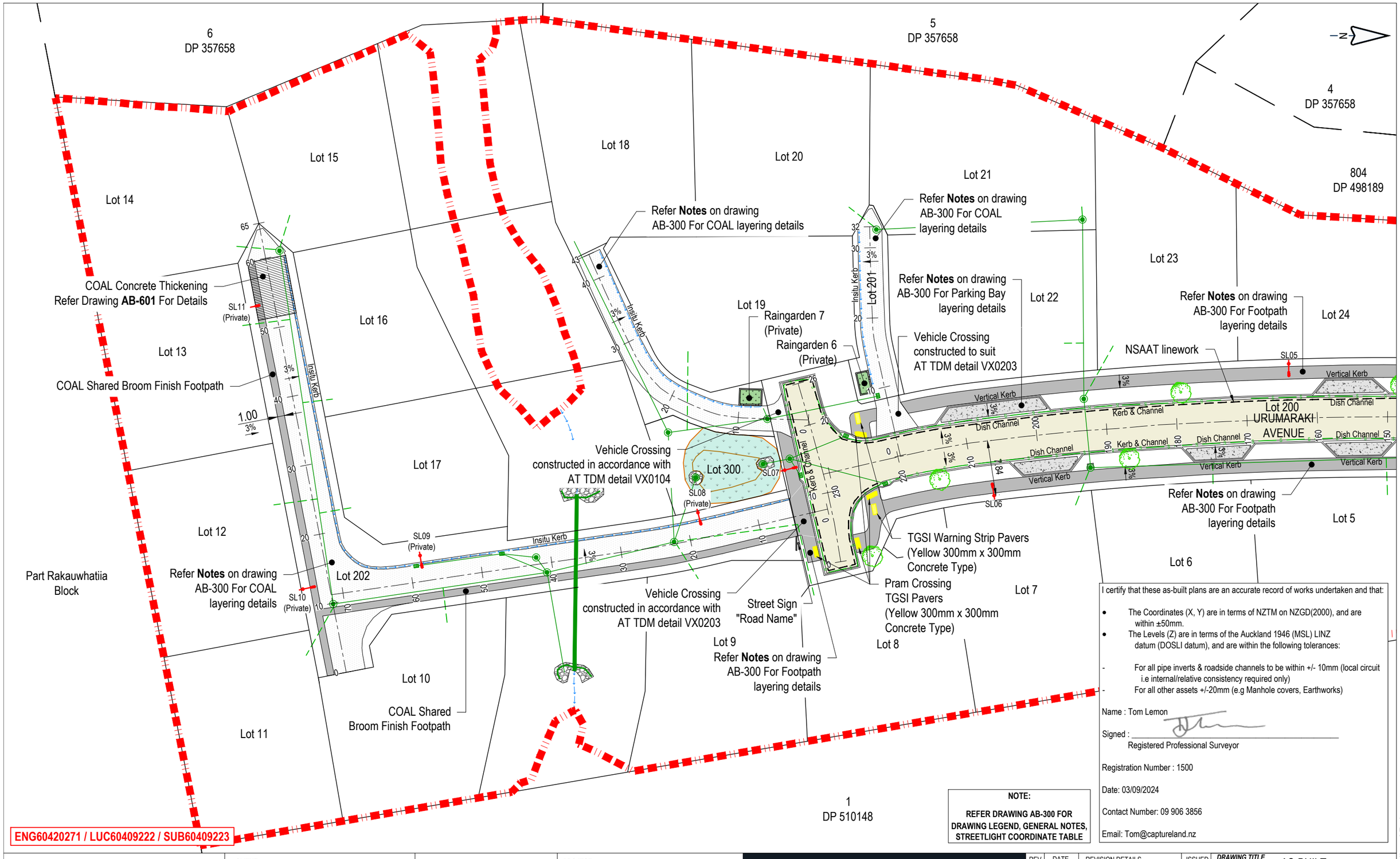
REV	DATE	REVISION DETAILS	ISSUED
0	13/09/24	FOR COMPLETION	DL

DRAWING TITLE
AS-BUILT
ROADING PLAN
SHEET 1

STATUS	SCALE	SIZE
AS-BUILT	1:1000	A3

PROJECT NO	DRAWING NO	REVISION
1081	AB-300	0

1081-AB-300-302 Roading AB.dwg



ENG60420271 / LUC60409222 / SUB60409223

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Registered Professional Surveyor

Registration Number : 1500

Date: 03/09/2024

Contact Number: 09 906 3856

Email: Tom@captureland.nz

NOTE:

REFER DRAWING AB-300 FOR DRAWING LEGEND, GENERAL NOTES, STREETLIGHT COORDINATE TABLE

CLIENT

CABRA
LAND & PROPERTY DEVELOPMENT

CABRA GROUP JOINT VENTURE

PROJECT

47 URUMARAKI AVENUE
HELENSVILLE

CAPTURE
Land Development Consultants

REV	DATE	REVISION DETAILS	ISSUED
0	13/09/24	FOR COMPLETION	DL

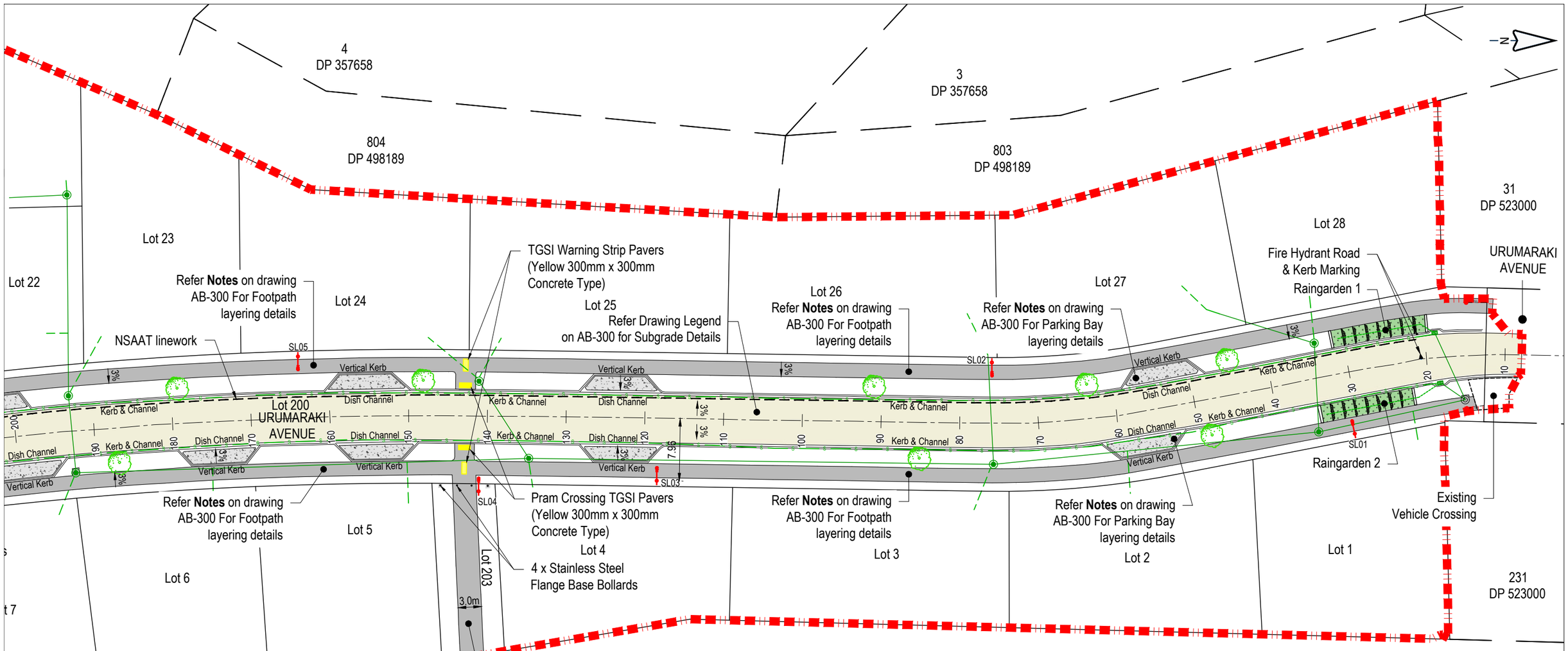
DRAWING TITLE

AS-BUILT
ROADING PLAN
SHEET 2

STATUS	*SCALE*	*SIZE*
AS-BUILT	1:500	A3

PROJECT NO	*DRAWING NO*	*REVISION*
1081	AB-301	0

1081-AB-300-302 Roading AB.dwg



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- For all other assets +/-20mm (e.g Manhole covers, Earthworks)

Name : Tom Lemon

Signed : _____
Registered Professional Surveyor

Registration Number : 1500

Date: 03/09/2024

Contact Number: 09 906 3856

Email: Tom@captureland.nz

ENG60420271 / LUC60409222 / SUB60409223

CLIENT
CABRA
LAND & PROPERTY DEVELOPMENT

CABRA GROUP
JOINT VENTURE

PROJECT
47 URUMARAKI AVENUE
HELENSVILLE

CAPTURE
Land Development Consultants

REV	DATE	REVISION DETAILS	ISSUED
0	13/09/24	FOR COMPLETION	DL

DRAWING TITLE
AS-BUILT
ROADING PLAN
SHEET 3

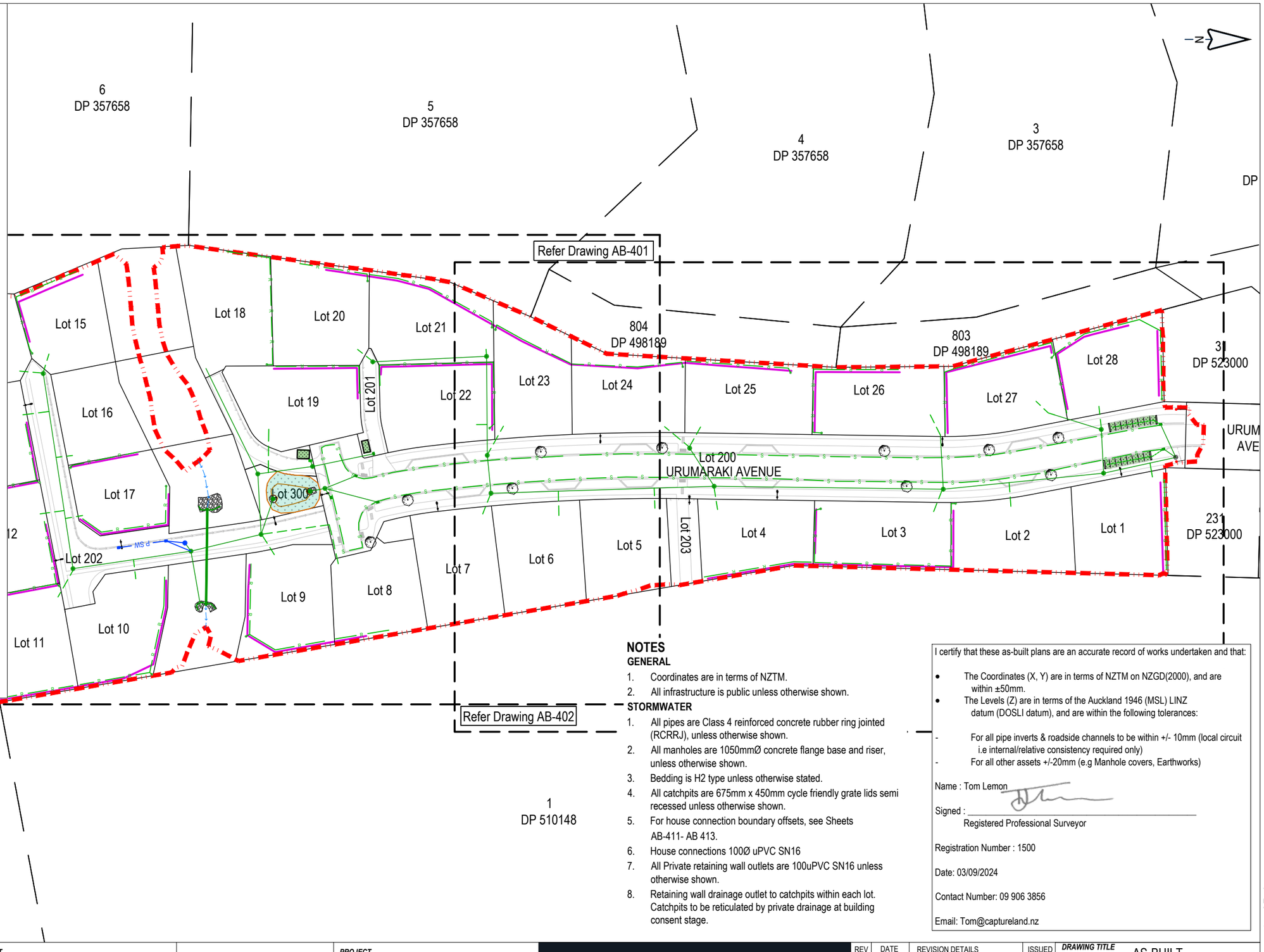
STATUS	*SCALE*	*SIZE*
AS-BUILT	1:500	A3

PROJECT NO	*DRAWING NO*	*REVISION*
1081	AB-302	0

1081-AB-300-302 Roading AB.dwg

Stormwater As-Built Legend

- Battered Raingardens (Public)
- Hynds Precast Box Raingarden (Private)
- Stormwater Catchpit
- New Stormwater Manhole & Pipeline (Public)
- P SW — New Stormwater Manhole & Pipeline (Private)
- SW — Existing Stormwater Manhole & Pipeline
- Stormwater Scruffy Dome Manhole
- Street Tree
- Extent of Works
- S — Underchannel Drain
- R — Retaining Wall Drainage (Private)
- Retaining Wall Ø300 Catchpit (Private)
- Retaining Wall
- Rock Rip Rap
- Stormwater Raingarden
- Watercourse
- Lot Connection



NOTES

GENERAL

1. Coordinates are in terms of NZTM.
2. All infrastructure is public unless otherwise shown.

STORMWATER

1. All pipes are Class 4 reinforced concrete rubber ring jointed (RCRRJ), unless otherwise shown.
2. All manholes are 1050mmØ concrete flange base and riser, unless otherwise shown.
3. Bedding is H2 type unless otherwise stated.
4. All catchpits are 675mm x 450mm cycle friendly grate lids semi recessed unless otherwise shown.
5. For house connection boundary offsets, see Sheets AB-411- AB 413.
6. House connections 100Ø uPVC SN16
7. All Private retaining wall outlets are 100uPVC SN16 unless otherwise shown.
8. Retaining wall drainage outlet to catchpits within each lot. Catchpits to be reticulated by private drainage at building consent stage.

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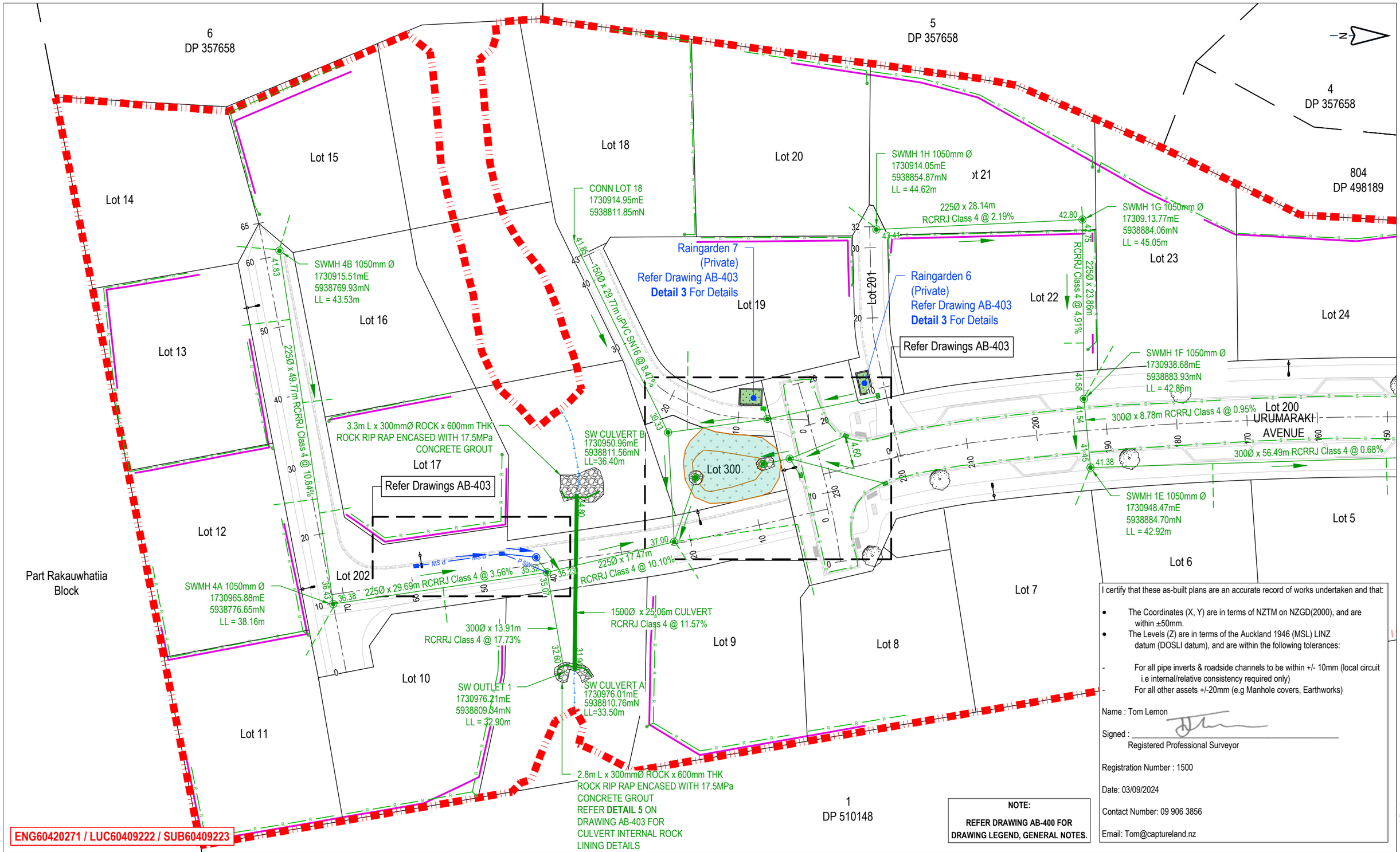
DRAWING TITLE: AS-BUILT STORMWATER PLAN SHEET 1

STATUS	SCALE	SIZE
AS-BUILT	1:1000	A3

PROJECT NO	DRAWING NO	REVISION
1081	AB-400	0

1081-AB-400-403 Stormwater AB.dwg



NOTE:
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REV	DATE	REVISION DETAILS	ISSUED
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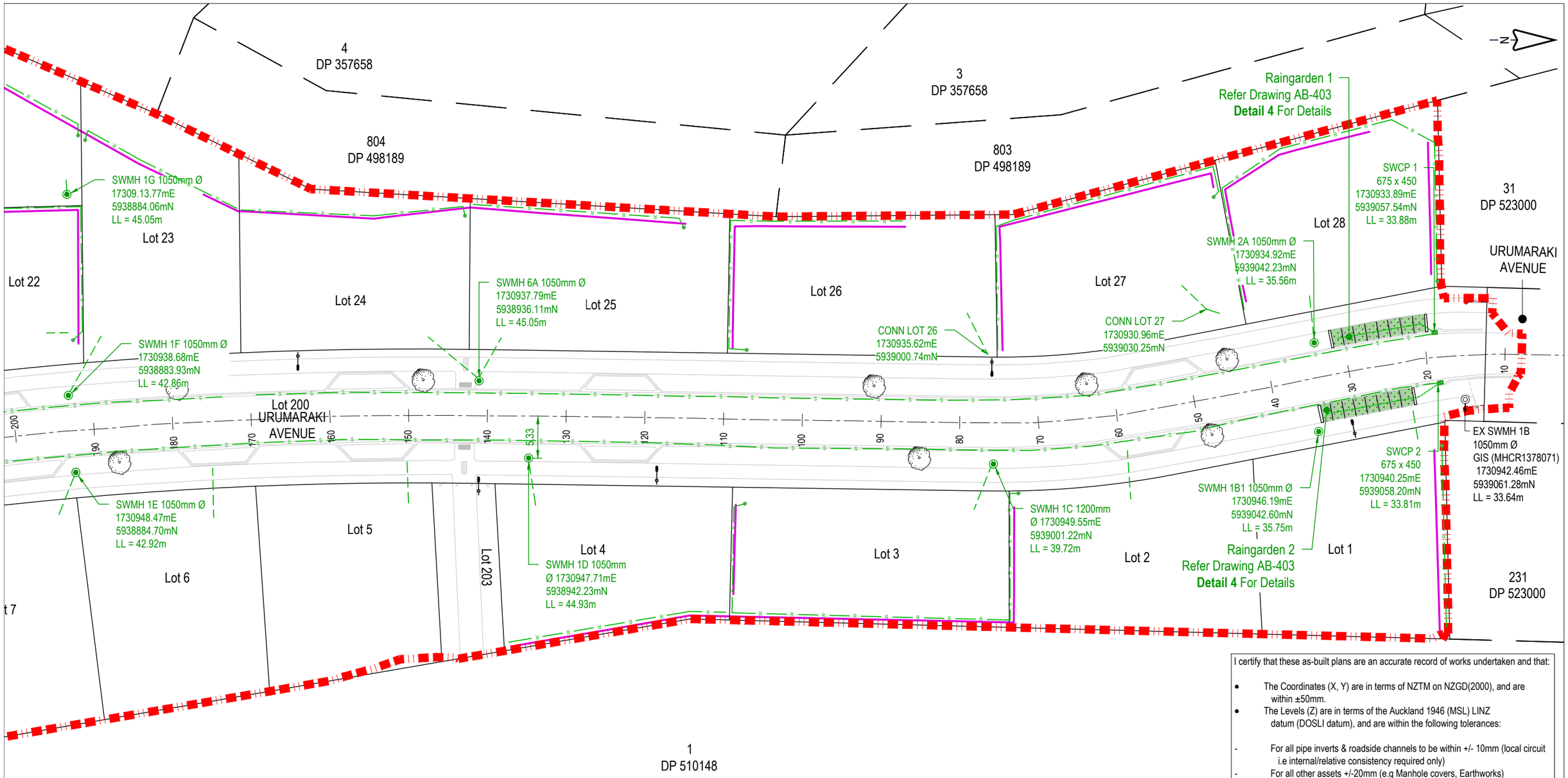
DRAWING TITLE: AS-BUILT STORMWATER PLAN SHEET 2

STATUS	SCALE	SIZE
AS-BUILT	1:500	A3

PROJECT NO	DRAWING NO	REVISION
1081	AB-401	0

1081-AB-400-403 Stormwater AB.dwg



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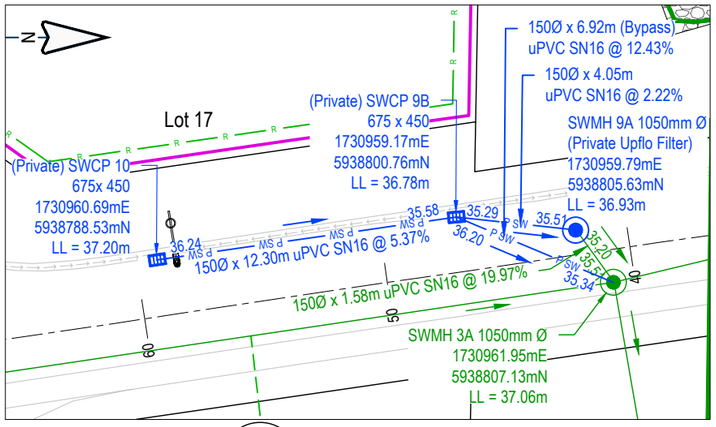
DRAWING TITLE
AS-BUILT
STORMWATER PLAN
SHEET 3

STATUS	*SCALE*	*SIZE*
AS-BUILT	1:500	A3

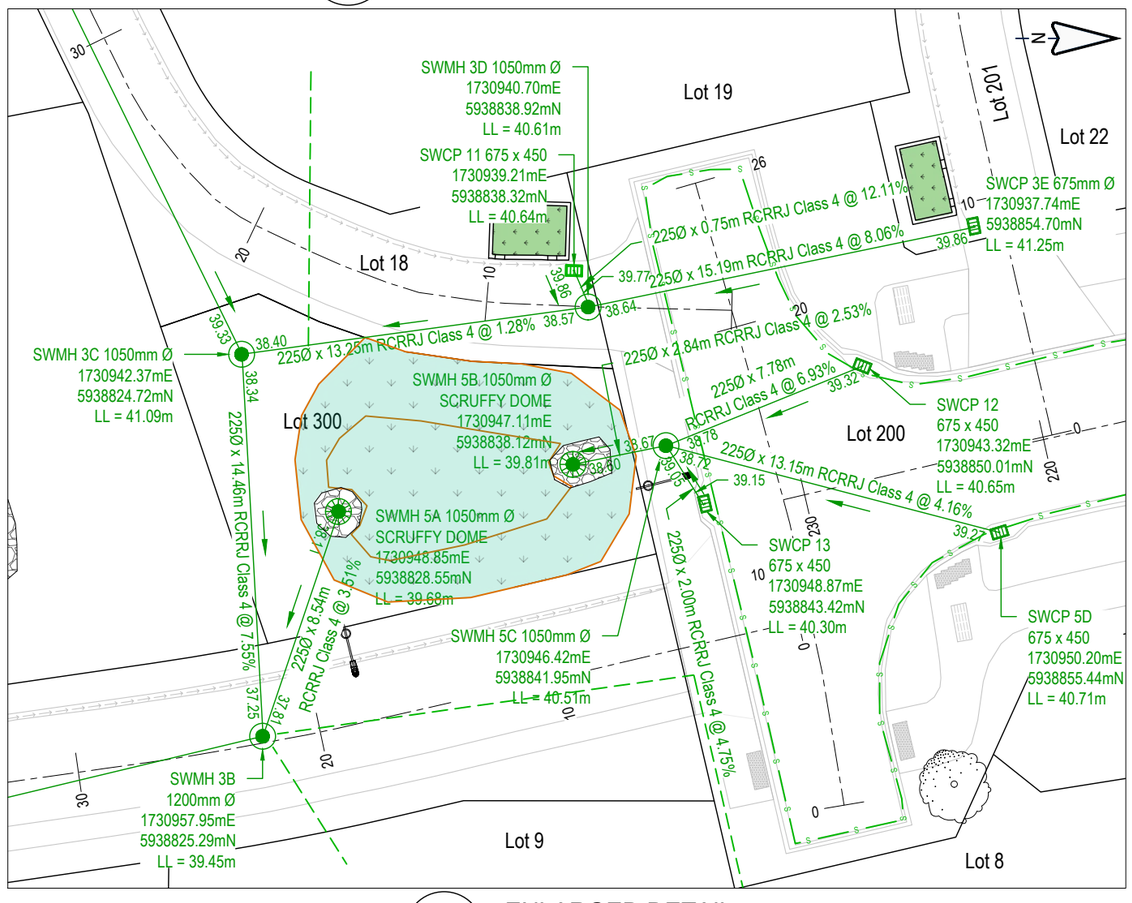
PROJECT NO	*DRAWING NO*	*REVISION*
1081	AB-402	0

1081-AB-400-403 Stormwater AB.dwg



1 / 402 ENLARGED DETAIL

Scale: 1:250



2 / 402 ENLARGED DETAIL

Scale: 1:250

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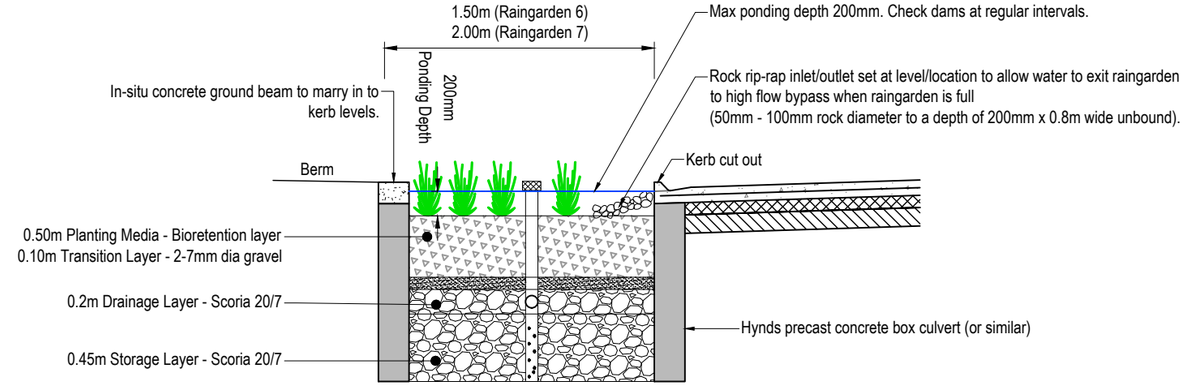
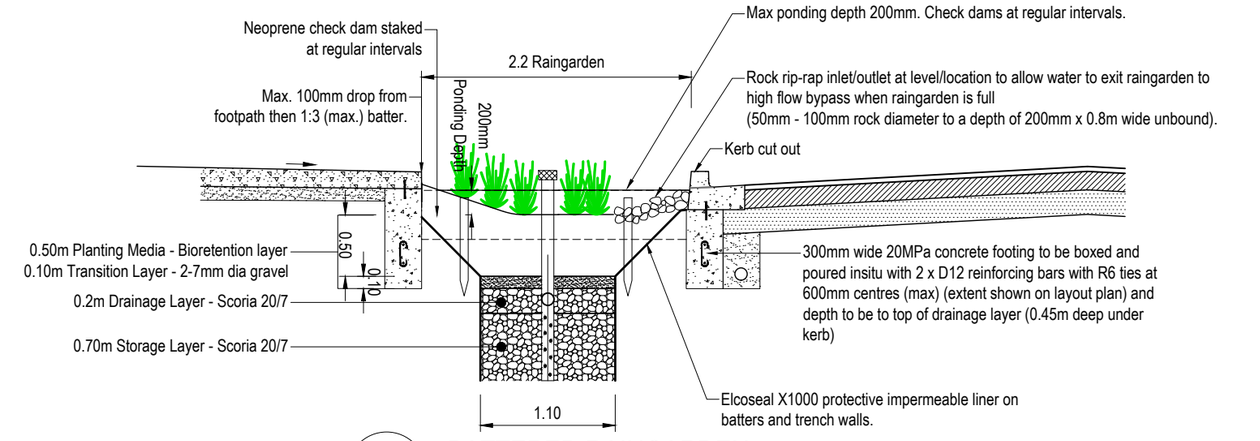


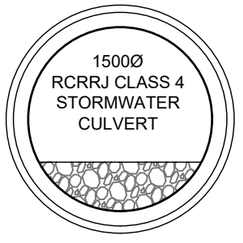
3 / 302 HYNDS PRECAST RAINGARDEN (PRIVATE)

Scale: 1:50



4 / 303 BATTERED RAINGARDEN

Scale: 1:50



5 / - CULVERT ROCK LINING

Scale: 1:50

IL(in)=34.80m

IL(out)=31.90m

NOTE:

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PROJECT: 47 URUMARAKI AVENUE HELENSVILLE

CAPTURE Land Development Consultants

REV	DATE	REVISION DETAILS	ISSUED
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DRAWING TITLE: AS-BUILT STORMWATER DETAILS

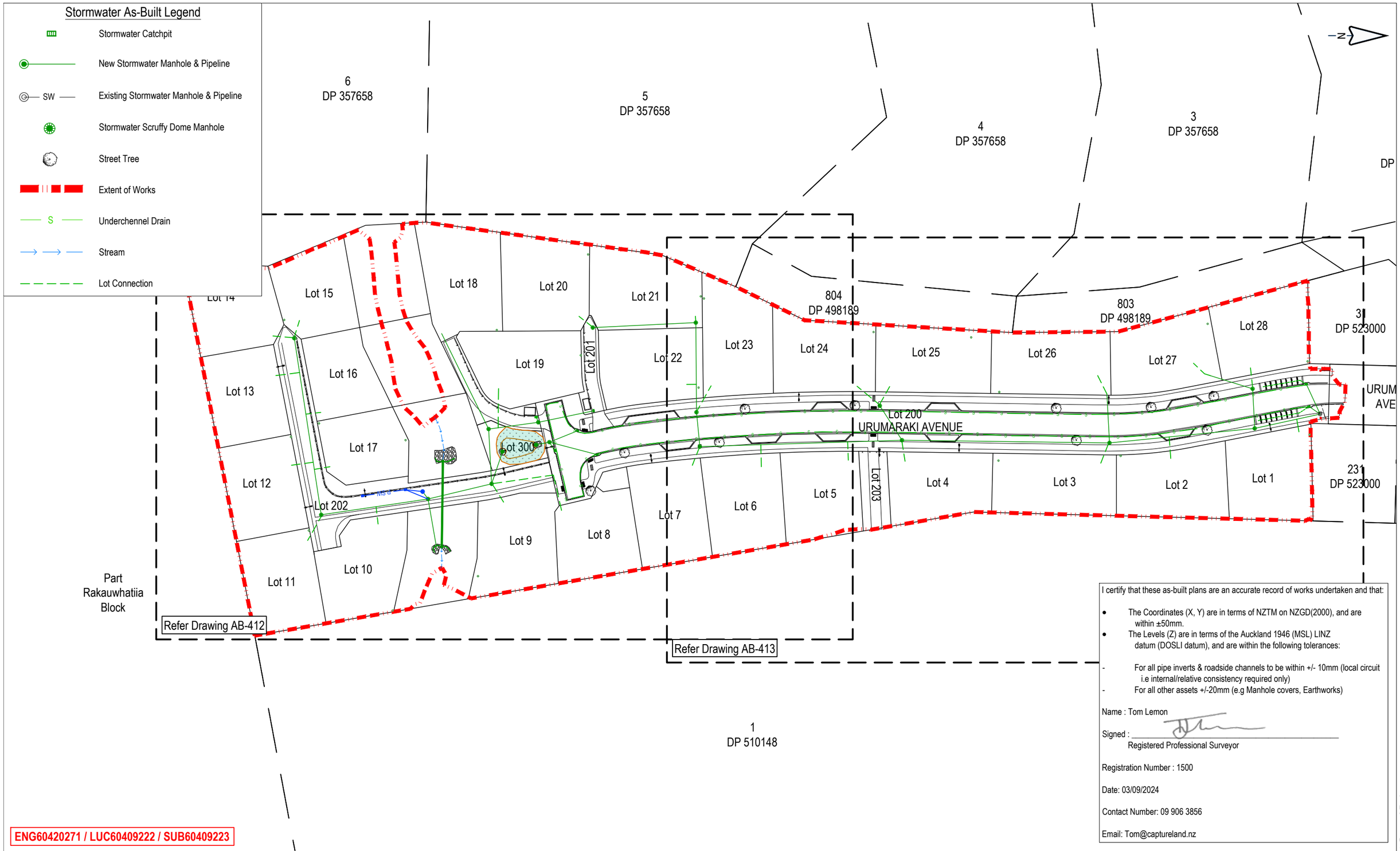
STATUS	SCALE	SIZE
AS-BUILT	AS-DRAWN	A3

PROJECT NO	DRAWING NO	REVISION
1081	AB-403	0

1081-AB-400-403 Stormwater AB.dwg

Stormwater As-Built Legend

- Stormwater Catchpit
- New Stormwater Manhole & Pipeline
- SW — Existing Stormwater Manhole & Pipeline
- Stormwater Scruffy Dome Manhole
- Street Tree
- Extent of Works
- S — Underchennel Drain
- Stream
- Lot Connection



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Land Development Consultants

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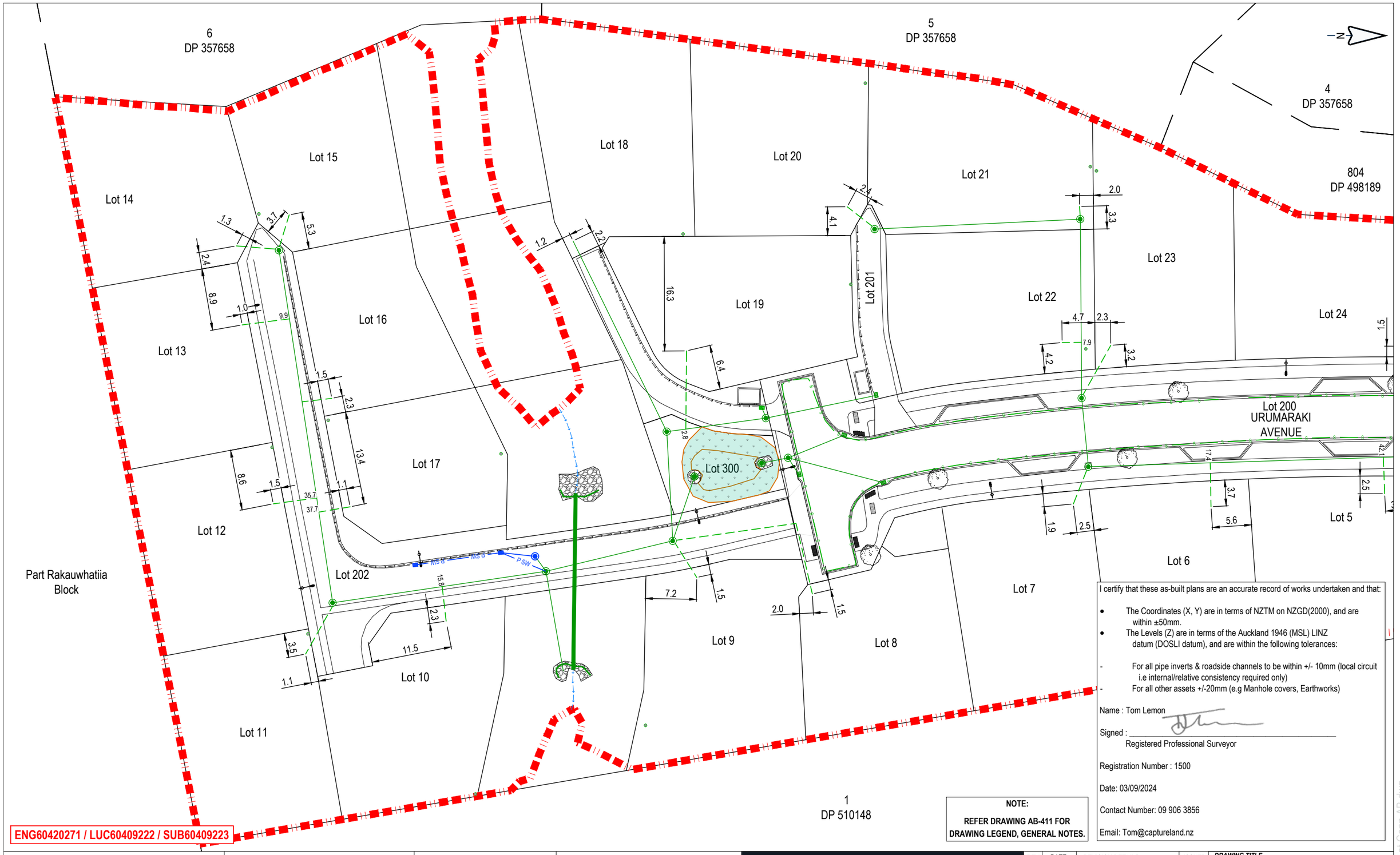
DRAWING TITLE
AS-BUILT
STORMWATER LOT CONNECTION
PLAN SHEET 1

STATUS	*SCALE*	*SIZE*
AS-BUILT	1:1000	A3

PROJECT NO	*DRAWING NO*	*REVISION*
1081	AB-411	0

1081-AB-411-413 SW Lot Conn AB.dwg



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NOTE:
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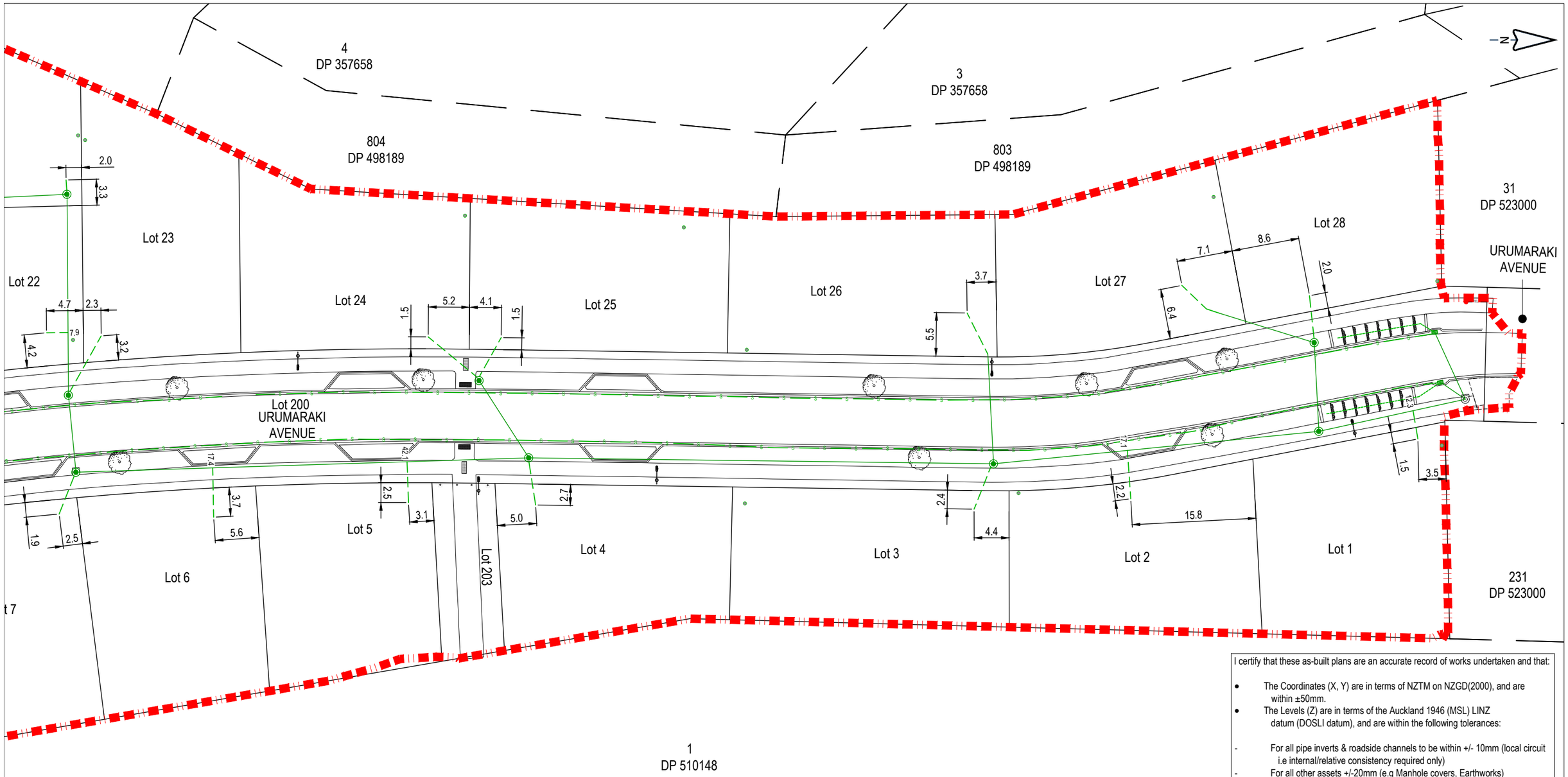
DRAWING TITLE
AS-BUILT
STORMWATER LOT CONNECTION
PLAN SHEET 2

STATUS	*SCALE*	*SIZE*
AS-BUILT	1:500	A3

PROJECT NO	*DRAWING NO*	*REVISION*
1081	AB-412	0

1081-AB-411-413 SW Lot Conn AB.dwg



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DRAWING TITLE
AS-BUILT
STORMWATER LOT CONNECTION
PLAN SHEET 3

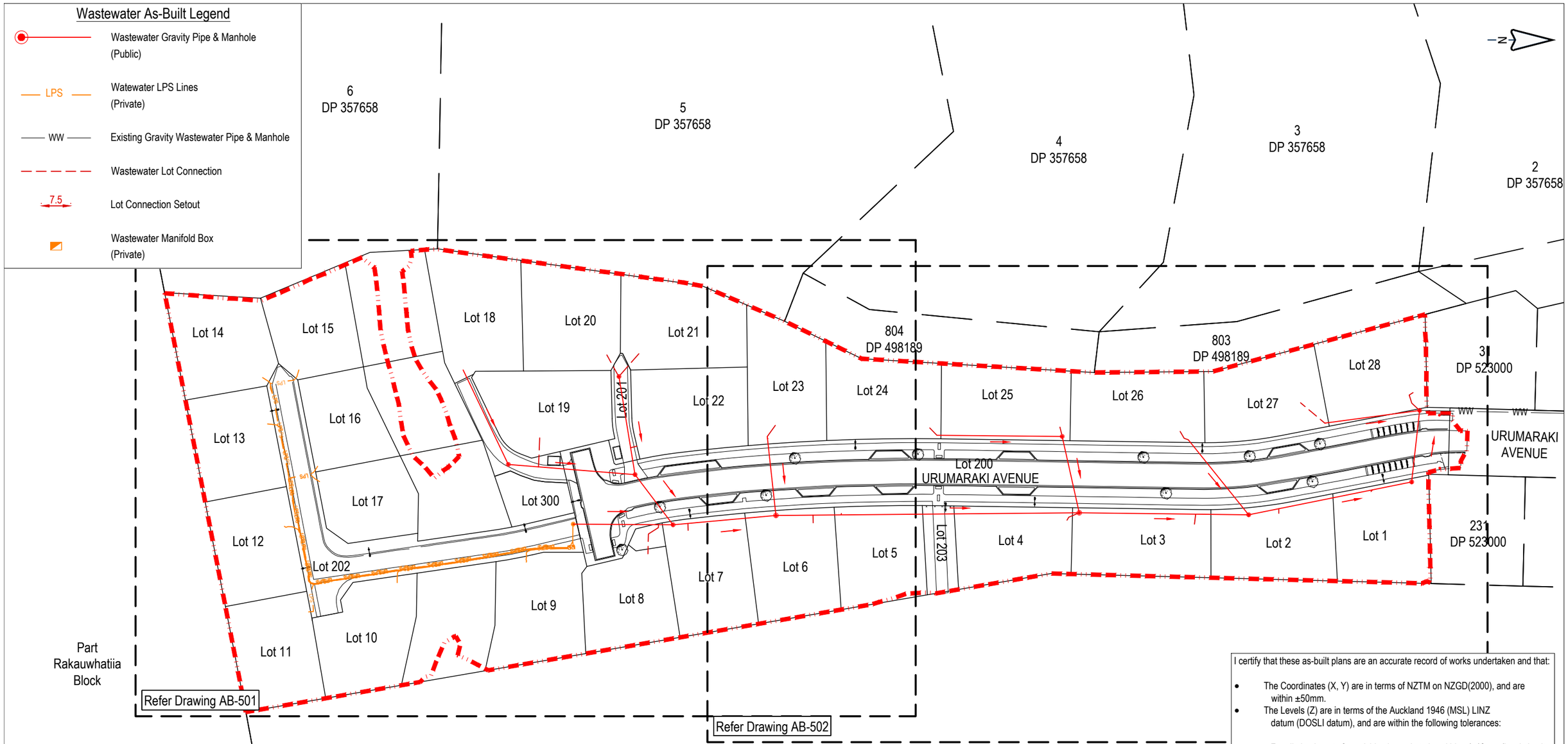
STATUS	*SCALE*	*SIZE*
AS-BUILT	1:500	A3

PROJECT NO	*DRAWING NO*	*REVISION*
1081	AB-413	0

1081-AB-411-413 SW Lot Conn AB.dwg

Wastewater As-Built Legend

- Wastewater Gravity Pipe & Manhole (Public)
- LPS — Watewater LPS Lines (Private)
- WW — Existing Gravity Wastewater Pipe & Manhole
- Wastewater Lot Connection
- 7.5 — Lot Connection Setout
- Wastewater Manifold Box (Private)



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NOTES

GENERAL

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2. All infrastructure is public unless otherwise shown.

WASTEWATER RETICULATION

1. Cover for wastewater reticulation.
a. Mains under grass berms and footpaths 600mm
b. Mains under road carriageway 900mm
2. Wastewater main 75, 63, 50 & 40OD - PE100 PN16
3. Stainless Steel bolts and nuts used for flanged connections.
4. Metallic Detector Tape provided above all Wastewater mains and riser mains

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CLIENT

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DRAWING TITLE
AS-BUILT
WASTEWATER PLAN
SHEET 1

STATUS	*SCALE*	*SIZE*
AS-BUILT	1:1000	A3

PROJECT NO	*DRAWING NO*	*REVISION*
1081	AB-500	0

1081-AB-500-502 Wastewater AB.dwg

Wastewater As-Built Legend

- Wastewater Gravity Pipe & Manhole (Public)
- LPS — Watewater LPS Lines (Private)
- WW — Existing Gravity Wastewater Pipe & Manhole
- Wastewater Lot Connection
- 7.5 — Lot Connection Setout
- Wastewater Manifold Box (Private)

Lot 15
Lot 18
Lot 20
Lot 21
5 DP 357658
4 DP 357658
804 DP 498189
Lot 23
Lot 22
Lot 24
Lot 19
Lot 16
Lot 13
Lot 17
Lot 300
Lot 12
Lot 202
Part Rakauwhatiia Block
Lot 10
Lot 11
Lot 9
Lot 8
Lot 7
Lot 6
Lot 5
Lot 200 URUMARAKI AVENUE
1 DP 510148

A-10 Line End
1730914.06mE
5938813.89mN
LL = 43.20m

E-1 1050mm Ø
1730916.46mE
5938853.43mN
LL = 44.29m

150Ø x 26.08m uPVC SN16 @ 9.96%

150Ø x 24.21m uPVC SN16 @ 11.28%

A-8 1050mm Ø
1730941.45mE
5938857.06mN
LL = 41.09m

C-1 Line End
1730932.40mE
5938890.81mN
IL = 44.11m

150Ø x 19.57m uPVC SN16 @ 1.11%

150Ø x 31.26m uPVC SN16 @ 0.84%

A-9 1050mm Ø
1730938.27mE
5938824.91mN
LL = 41.82m

150Ø x 14.92m uPVC SN16 @ 1.12%

150Ø x 24.31m uPVC SN16 @ 0.74%

150Ø x 25.13m uPVC SN16 @ 1.07%

17 x 40mmOD PE100 PN16 Pressure Rising Mains for each lot (Private)

50mmOD PE100 PN16 Rising Main (Private)

D-1 1050mm Ø
(Private Satelite Manhole)
1730953.73mE
5938841.11mN
LL = 40.54m

1 x 3 Lot & 1x 6 Lot Manifold Boxes (Private) For Lots 9-17

A-7 1050mm Ø
1730954.35mE
5938866.46mN
LL = 41.83m

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WASTEWATER RETICULATION

1. Cover for wastewater reticulation.
   a. Mains under grass berms and footpaths 600mm
   b. Mains under road carriageway 900mm
2. Wastewater main 75, 63, 50 & 40OD - PE100 PN16
3. Stainless Steel bolts and nuts used for flanged connections.
4. Metallic Detector Tape provided above all Wastewater mains and riser mains

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PROJECT: 47 URUMARAKI AVENUE HELENSVILLE

CAPTURE Land Development Consultants

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DRAWING TITLE: AS-BUILT WASTEWATER PLAN SHEET 2

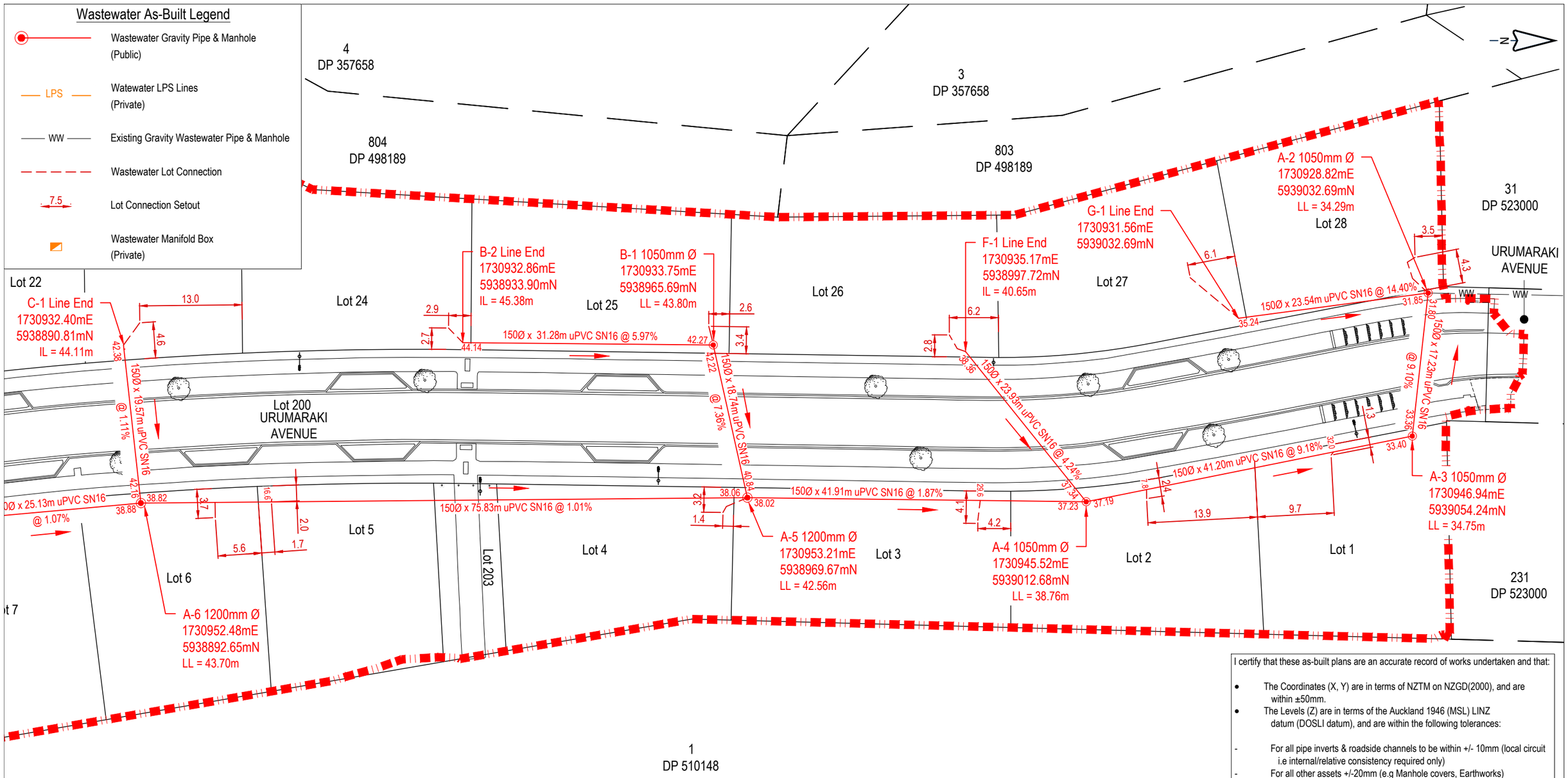
STATUS	SCALE	SIZE
AS-BUILT	1:500	A3

PROJECT NO	DRAWING NO	REVISION
1081	AB-501	0

1081-AB-500-502 Wastewater AB.dwg

Wastewater As-Built Legend

- Wastewater Gravity Pipe & Manhole (Public)
- LPS — Watewater LPS Lines (Private)
- WW — Existing Gravity Wastewater Pipe & Manhole
- Wastewater Lot Connection
- 7.5 — Lot Connection Setout
- Wastewater Manifold Box (Private)



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b. Mains under road carriageway 900mm
2. Wastewater main 75, 63, 50 & 40OD - PE100 PN16
3. Stainless Steel bolts and nuts used for flanged connections.
4. Metallic Detector Tape provided above all Wastewater mains and riser mains

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DRAWING TITLE: AS-BUILT WASTEWATER PLAN SHEET 3

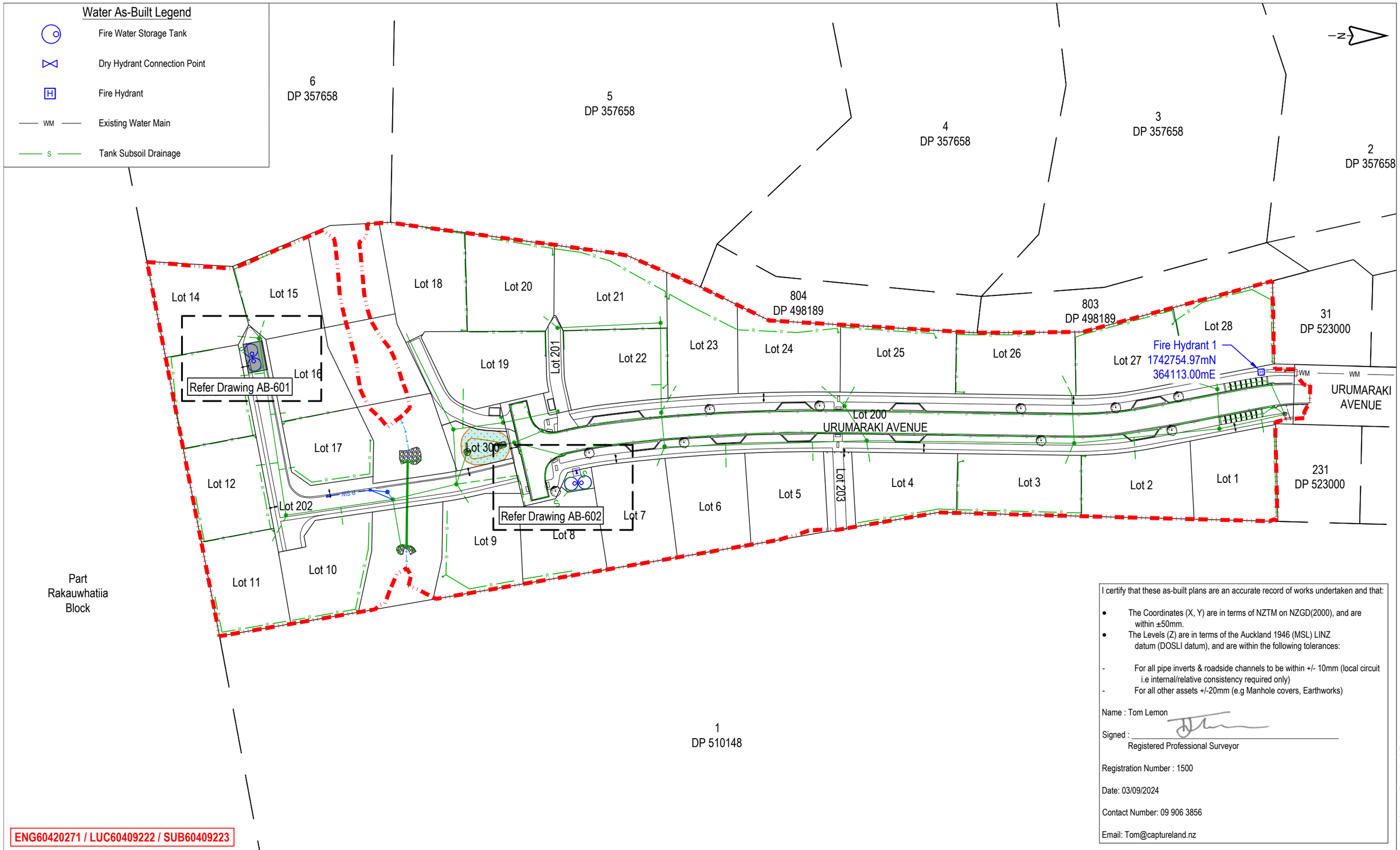
STATUS	SCALE	SIZE
AS-BUILT	1:500	A3

PROJECT NO	DRAWING NO	REVISION
1081	AB-502	0

1081-AB-500-502 Wastewater AB.dwg

Water As-Built Legend

- Fire Water Storage Tank
- Dry Hydrant Connection Point
- Fire Hydrant
- WM — Existing Water Main
- S — Tank Subsoil Drainage



I certify that these as-built plans are an accurate record of 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 the following tolerances:

- For all pipe inverts & roadside channels to be within +/- 10mm (local circuit i.e internal/relative consistency required only)
- For all other assets +/-20mm (e.g Manhole covers, Earthworks)

Name : Tom Lemon

Signed : _____

Registered Professional Surveyor

Registration Number : 1500

Date: 03/09/2024

Contact Number: 09 906 3856

Email: Tom@captureland.nz

ENG60420271 / LUC60409222 / SUB60409223

CLIENT

CABRA
LAND & PROPERTY DEVELOPMENT

CABRA GROUP
JOINT VENTURE

PROJECT

47 URUMARAKI AVENUE
HELENSVILLE

CAPTURE
Land Development Consultants

REV	DATE	REVISION DETAILS	ISSUED
0	13/09/24	FOR COMPLETION	DL

DRAWING TITLE
AS-BUILT
FIRE FIGHTING WATER PLAN
SHEET 1

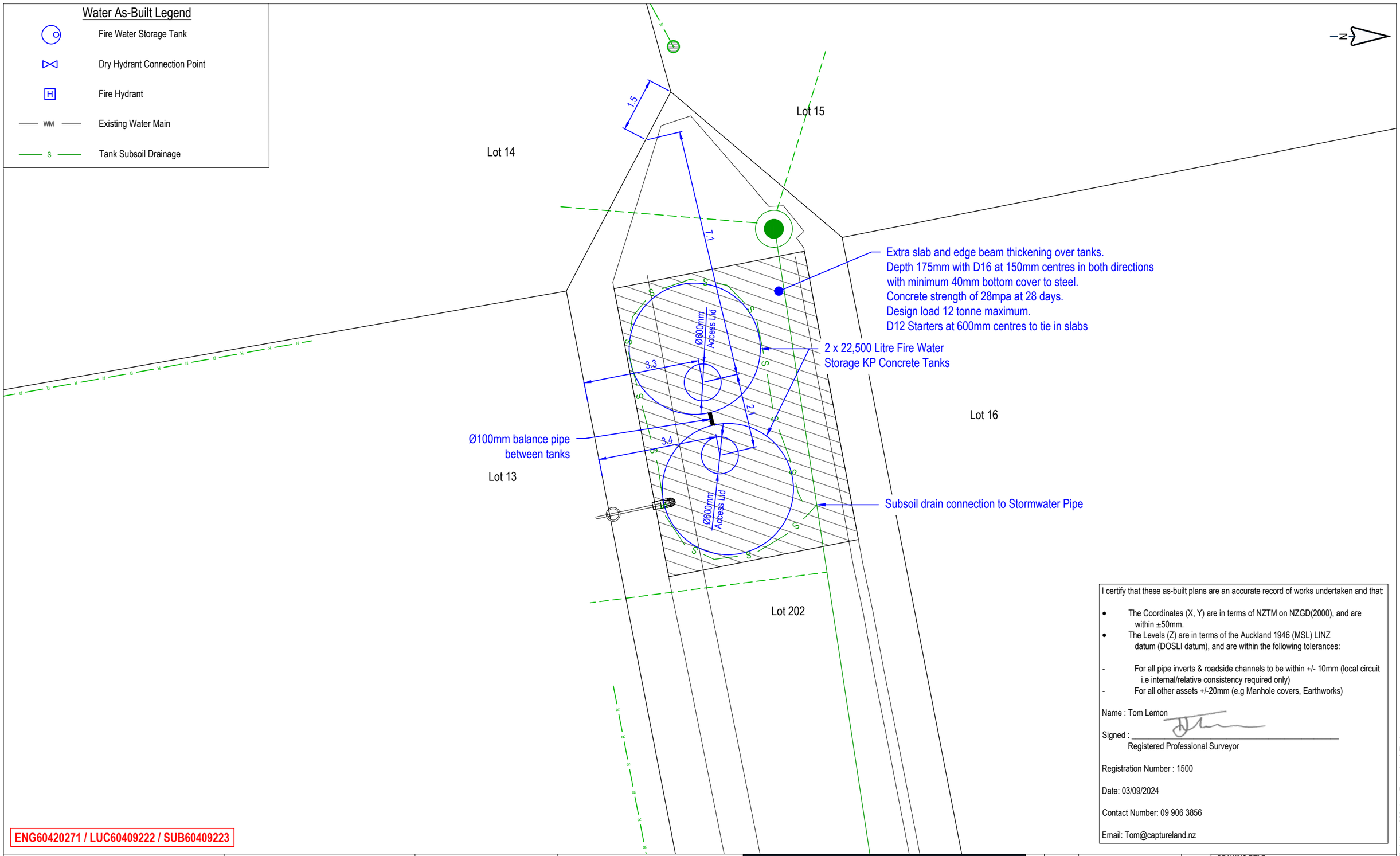
STATUS	*SCALE*	*SIZE*
AS-BUILT	1:1000	A3

PROJECT NO	*DRAWING NO*	*REVISION*
1081	AB-600	0

1081-AB-600-602 Fire Fighting Water Supply AB.dwg

Water As-Built Legend

- Fire Water Storage Tank
- Dry Hydrant Connection Point
- Fire Hydrant
- WM — Existing Water Main
- S — Tank Subsoil Drainage



I certify that these as-built plans are an accurate record of 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 the following tolerances:

- For all pipe inverts & roadside channels to be within +/- 10mm (local circuit i.e internal/relative consistency required only)
- For all other assets +/-20mm (e.g Manhole covers, Earthworks)

Name : Tom Lemon

Signed : _____

Registered Professional Surveyor

Registration Number : 1500

Date: 03/09/2024

Contact Number: 09 906 3856

Email: Tom@captureland.nz

ENG60420271 / LUC60409222 / SUB60409223

CLIENT: CABRA LAND & PROPERTY DEVELOPMENT

CABRA GROUP JOINT VENTURE

PROJECT: 47 URUMARAKI AVENUE HELENSVILLE

CAPTURE Land Development Consultants

REV	DATE	REVISION DETAILS	ISSUED
0	13/09/24	FOR COMPLETION	DL

DRAWING TITLE: AS-BUILT FIRE FIGHTING WATER PLAN SHEET 2

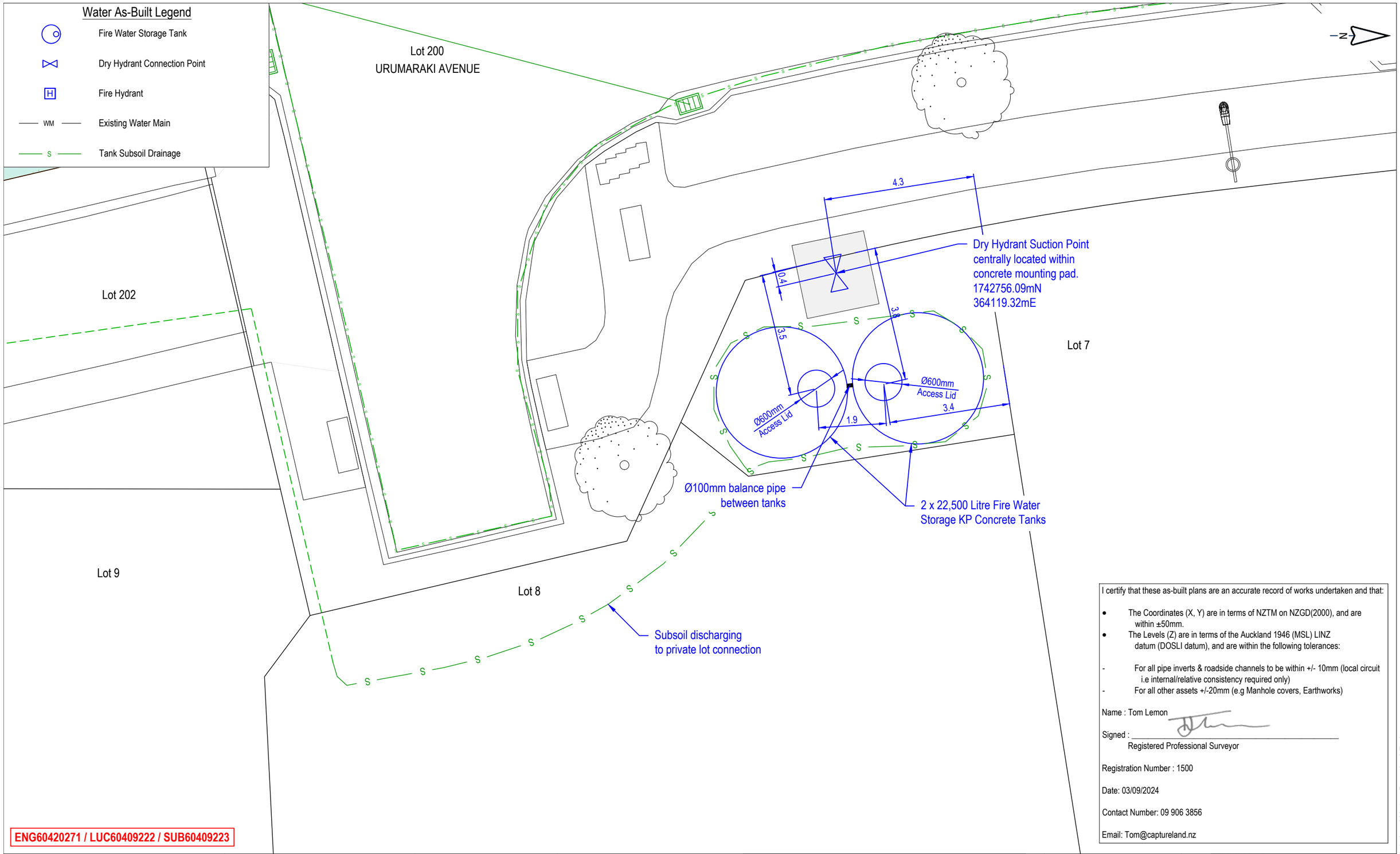
STATUS	SCALE	SIZE
AS-BUILT	1:100	A3

PROJECT NO	DRAWING NO	REVISION
1081	AB-601	0

1081-AB-600-602 Fire Fighting Water Supply AB.dwg

Water As-Built Legend

- Fire Water Storage Tank
- Dry Hydrant Connection Point
- Fire Hydrant
- WM — Existing Water Main
- S — Tank Subsoil Drainage



I certify that these as-built plans are an accurate record of 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 the following tolerances:

- For all pipe inverts & roadside channels to be within +/- 10mm (local circuit i.e internal/relative consistency required only)
- For all other assets +/-20mm (e.g Manhole covers, Earthworks)

Name : Tom Lemon

Signed : _____
Registered Professional Surveyor

Registration Number : 1500

Date: 03/09/2024

Contact Number: 09 906 3856

Email: Tom@captureland.nz

ENG60420271 / LUC60409222 / SUB60409223

CLIENT: CABRA LAND & PROPERTY DEVELOPMENT

CABRA GROUP JOINT VENTURE

PROJECT: 47 URUMARAKI AVENUE HELENSVILLE

CAPTURE Land Development Consultants

REV	DATE	REVISION DETAILS	ISSUED
0	13/09/24	FOR COMPLETION	DL

DRAWING TITLE: AS-BUILT FIRE FIGHTING WATER PLAN SHEET 3

STATUS	SCALE	SIZE
AS-BUILT	1:100	A3

PROJECT NO	DRAWING NO	REVISION
1081	AB-602	0

1081-AB-600-602 Fire Fighting Water Supply AB.dwg

Legend

Covenant areas to be protected

6
DP 357658

5
DP 357658

Lot 14

Lot 15

Lot 18

Lot 20

Lot 21

G

F

E

D

Lot 16

Lot 19

Lot 201

Lot 22

Lot 23

Lot 24

Lot 13

Lot 17

Lot 300

Lot 200
URUMARAKI
AVENUE

Lot 12

Lot 202

Lot 5

Lot 6

Lot 7

Part Rakauwhatiia
Block

Lot 10

Lot 9

Lot 8

Lot 11

1
DP 510148

LOCALITY PLAN

ENG60420271 / LUC60409222 / SUB60409223

CLIENT

CABRA
LAND & PROPERTY DEVELOPMENT

CABRA GROUP
JOINT VENTURE

PROJECT

47 URUMARAKI AVENUE
HELENSVILLE

CAPTURE
Land Development Consultants

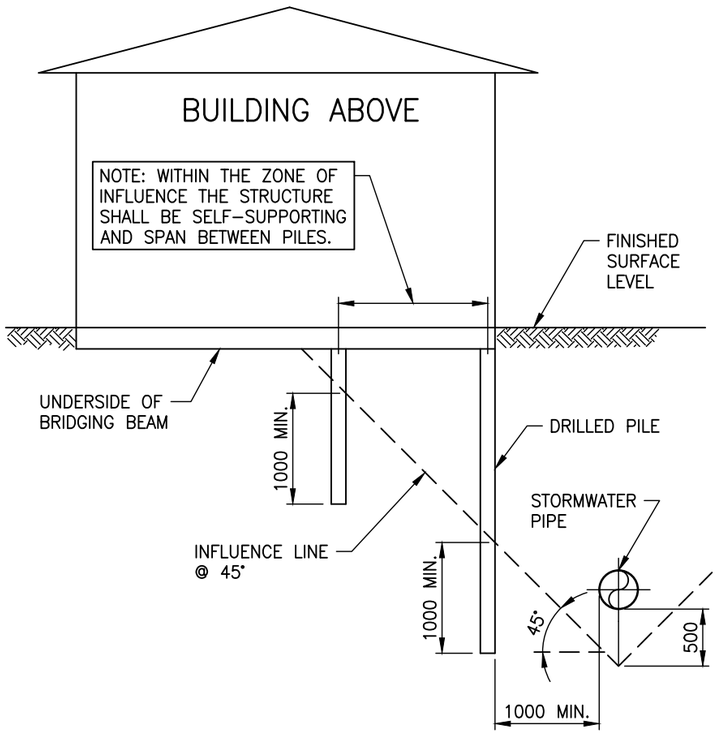
REV	DATE	REVISION DETAILS	ISSUED
0	13/09/24	FOR COMPLETION	DL

DRAWING TITLE: AS-BUILT RIPARIAN YARD PLAN

STATUS	SCALE	SIZE
AS-BUILT	1:500	A3

PROJECT NO	DRAWING NO	REVISION
1081	AB-900	0

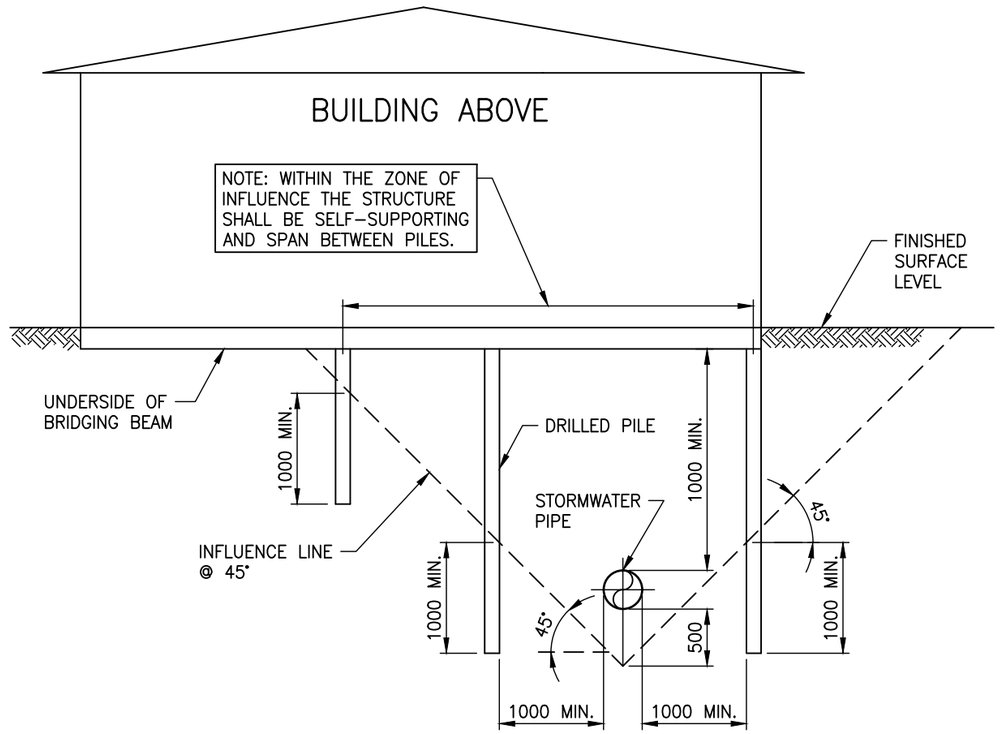
1081-AB-900 Riparian Yard.dwg



BUILD CLOSE

'WORKS CLOSE' NOTES:

1. OUTSIDE ZONE OF INFLUENCE, NORMAL FOUNDATION REQUIREMENTS APPLY.
2. SPECIFIC APPROVAL IS REQUIRED FROM AUCKLAND COUNCIL IF WORKS ARE ADJACENT TO PIPES LARGER THAN 375mm INTERNAL DIAMETER, OR GREATER THAN 2.0m DEEP.
3. BUILDING SHALL BE OUTSIDE ALL OVERLAND FLOW PATHS AND FLOODPLAINS. SEE SECTION 4.3.5.6 AND 4.3.5.7 OF THE SWCoP FOR FURTHER DETAILS.
4. PILES SHALL BE CONSTRUCTED TO A DEPTH OF 1.0m BELOW INFLUENCE LINE.



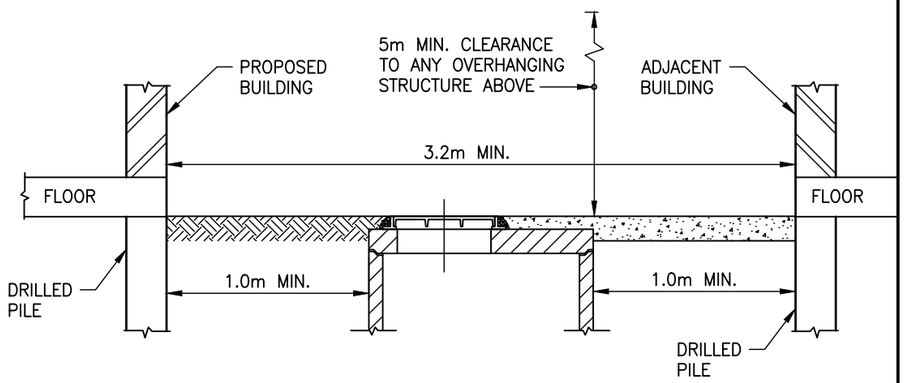
BUILD OVER

'WORKS OVER' NOTES:

1. OUTSIDE ZONE OF INFLUENCE, NORMAL FOUNDATION REQUIREMENTS APPLY.
2. THE DETAIL APPLIES TO STORMWATER PIPES ≤ 375mm NOMINAL DIAMETER AND ≤ 2.0m DEPTH TO INVERT.
3. WORKS OVER PIPES LARGER THAN 375mm NOMINAL DIAMETER IS NOT ALLOWED.
4. PILES SHALL BE CONSTRUCTED TO A DEPTH OF 1.0m BELOW INFLUENCE LINE.
5. BRIDGING IS NOT ALLOWED OVER PIPES WHERE CLEAR VERTICAL SEPARATION DISTANCE FROM TOP OF PIPE TO UNDERSIDE OF BRIDGING BEAM IS LESS THAN 1.0m.

GENERAL NOTES:

1. THE INFORMATION ON THIS PAGE IS INTENDED TO SHOW EXAMPLES OF TYPICAL SCENARIOS AND SHALL BE USED FOR GENERAL GUIDANCE PURPOSES ONLY. SIGNIFICANT VARIATIONS ON A SITE-BY-SITE BASIS ARE TO BE EXPECTED AND IT IS IN NO WAY IMPLIED THAT MEETING ANY OF THESE REQUIREMENTS WILL GUARANTEE APPROVAL.
2. WHERE CONSTRUCTION WORKS ARE PROPOSED IN THE VICINITY OF EXISTING PUBLIC STORMWATER ASSETS, ANY NECESSARY MEASURES TO PROTECT SUCH ASSETS SHALL BE IMPLEMENTED, IN ACCORDANCE WITH SECTION 4.3.23 OF THE SWCoP.
3. REQUIREMENTS FOR FOUNDATION DESIGN, ETC. APPLY TO BOTH SIDES OF THE PIPE.
4. NO DRIVEN PILES ARE PERMITTED WITHIN 10m OF BRICK STORMWATER STRUCTURES, OR WITHIN 5m OF ALL OTHER STORMWATER STRUCTURES.
5. SPECIFIC APPROVAL IS REQUIRED FROM AUCKLAND COUNCIL FOR DRIVEN PILES IN PARTIALLY DRILLED HOLES, WITHIN THE 5m-10m ZONE.
6. PILES THAT MAY BE REQUIRED TO RESIST HORIZONTAL FORCES WILL REQUIRE SPECIFIC DESIGN.
7. PILE/FOOTING LOCATION POINT MUST BE BELOW 45° "ZONE OF INFLUENCE".
8. ALL MANHOLES SHALL HAVE 24 HOURS UNOBSTRUCTED ACCESS.
9. MANHOLES IN BASEMENTS, OR IN LOCATIONS WHERE SUFFICIENT CLEARANCE IS UNAVAILABLE, ARE NOT PERMITTED.
10. ALL PIPE 'WORK OVER' WILL REQUIRE SPECIFIC APPROVAL BY AUCKLAND COUNCIL.
11. REFER TO SECTION 4.3.23 OF THE SWCOP FOR PIPE 'WORK OVER' REQUIREMENTS.
12. FOR MANHOLES GREATER THAN 4m DEEP OR LARGER THAN 1200mm DIA. SPECIFIC DESIGN (INCLUDING CLEARANCE REQUIREMENTS) IS REQUIRED.
13. SPECIFIC APPROVAL FROM COUNCIL IS REQUIRED FOR WORKS WITHIN 10 METERS OF A RISING MAIN.
14. WORKS OVER RISING MAIN IS NOT ALLOWED.



MANHOLE CONSTRUCTION CLEARANCE

STORMWATER CODE OF PRACTICE STANDARD DETAILS REVISION: 3 REV DATE: 17 JANUARY 2022 CAD FILENAME: AC-STD-SW22.DWG	AUCKLAND COUNCIL STORMWATER PIPE AND MANHOLE CONSTRUCTION CLEARANCE REQUIREMENTS MANHOLES NEAR WORKS AND WORKS CLOSE TO, OR OVER, PIPES	ENVIRONMENTAL-SW	ORIGINAL SCALE A3 SCALE: N.T.S. DRAWING SET: SWCoP SHEET: 1 OF 1 DRAWING No.: SW22 REV: 3

APPENDIX D: FIELD TEST DATA

LF11 Soil Field Density NDM Direct Transmission with VSS Report (Cohesive Soils) (Rev 18)

Auckland Laboratory
CMW Geotechnical NZ Limited
11/63, Arrenway Drive, Rosedale, NZ 0632
PO Box 300206, Albany, Auckland, NZ 0752
Phone: +64 (09) 4144 632

Project:	47 Urumaraki Avenue
Project No:	AKL2022-0088
Location:	Helensville
Report No:	AKL2022-0088LAA Rev.0
Report Date:	9/02/2024
Client:	Cabra Developments Ltd
Client Address:	19 Tamariki Ave, Orewa, Auckland 0931

Test Methods:
NZS 4407 2015 Test 3.1 ◊
NZS 4407 2015 Test 4.2
NZGS:August 2001

Notes:
Solid Density: Assumed
Solid Density Data Source: N/A
Testing Locations Selected By: CMW Field Staff
◊ Only samples <2.0mm will be considered for endorsed testing
① Blade size of 19mm used.

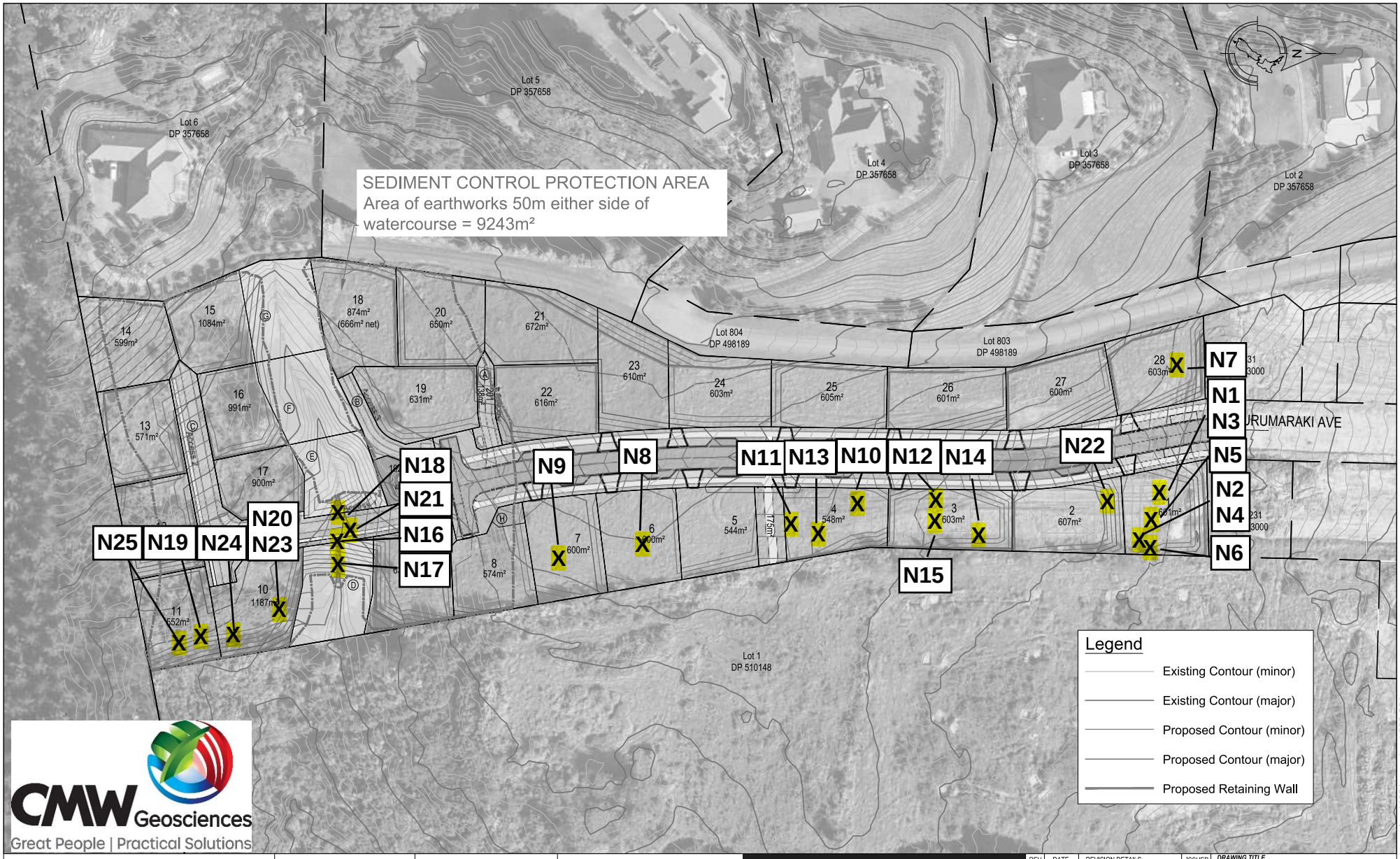
Test results indicated as not accredited are outside the scope of the laboratory's accreditation

Measurements marked * are not accredited and are outside the scope of the laboratories accreditation

Date Sampled	Sample No.	Test Location*		Soil Description*	Solid Density (t/m³) *	Vane ID		In-situ Vane Shear Strengths					Field and Laboratory Testing Data								Comments
		Test Area	RL/Details			Head #	Blade # ①	Test 1 (kPa)	Test 2 (kPa)	Test 3 (kPa)	Test 4 (kPa)	Ave.	Gauge Wet Density (t/m³) **	Gauge Dry Density (t/m³)	Gauge Water Content (%)	Gauge Air Voids (%)	Gauge Probe Depth (mm)	Oven Water Content (%)	Oven Dry Density (t/m³)	Oven Calculated Air Voids (%) *	
18/10/2023	N1	Lot 1	-	LS CLAY	2.60	3661	3661	154	135	135	122	137	1.68	1.13	48.3	2	300	43.9	1.17	4	
	N2	Lot 1	-	LS CLAY	2.60	3661	3661	138	145	148	167	150	1.61	1.09	47.1	6	300	43.4	1.12	8	
19/10/2023	N3	Lot 1	Surface	LS CLAY	2.60	3661	3661	174	199	225+	225+	206+	1.65	1.14	44.7	5	300	35.2	1.22	10	
	N4	Lot 1	300mm Down	LS CLAY	2.60	3661	3661	225+	225+	UTP	UTP	225+	1.71	1.15	48.3	0	300	43.7	1.19	2	
20/10/2023	N5	Lot 1	Final Level	CLAY Fill	2.60	3863	3863	232	215	182	199	207	1.72	1.20	43.3	2	300	43.9	1.20	1	
	N6	Lot 1	Final Level	CLAY Fill	2.60	3863	3863	165	159	212	215	188	1.75	1.22	43.2	0	300	42.6	1.23	0	
9/11/2023	N7	Lot 28	-	CLAY Fill	2.60	2992	2992	160	158	142	144	151	1.79	1.24	44.8	-3	300	42.0	1.26	-1	
	N8	Lot 6	-	CLAY Fill	2.60	2992	2992	152	147	142	142	146	1.76	1.31	34.6	4	300	34.6	1.31	4	
	N9	Lot 7	-	CLAY Fill	2.60	2992	2992	144	155	174	179	163	1.78	1.27	40.1	0	300	43.3	1.24	-2	
13/11/2023	N10	Lot 4	-	CLAY Fill	2.60	2992	2992	187	187	168	174	179	1.85	1.36	36.5	-2	300	37.2	1.35	-2	
27/11/2023	N11	Lot 4	-	CLAY Fill	2.60	3661	3661	203	237+	237+	237+	229+	1.82	1.31	39.1	-1	300	36.1	1.34	0	
7/12/2023	N12	Lot 3	-	LS CLAY Fill	2.60	3661	3661	142	142	122	146	138	1.77	1.16	52.5	-6	300	-	-	-	No Sample Taken
	N13	Lot 3	-	LS CLAY Fill	2.60	3661	3661	159	186	176	186	177	1.71	1.13	50.8	-1	300	47.1	1.16	0	
	N14	Lot 4	-	LS CLAY Fill	2.60	3661	3661	UTP	UTP	UTP	UTP	UTP	1.71	1.15	47.9	0	300	42.6	1.20	3	
12/12/2023	N15	Lot 3	-	CLAY Fill	2.60	3661	3661	237	UTP	UTP	UTP	237+	1.64	1.09	50.4	3	300	45.9	1.12	5	
15/12/2023	N16	Culvert Crossing	-	CLAY Fill	2.60	3661	3661	UTP	UTP	190	UTP	190+	1.70	1.15	47.5	1	300	48.7	1.14	0	
19/12/2023	N17	Culvert Crossing	-	CLAY Fill	2.60	3661	3661	176	163	170	170	170	1.75	1.19	47.1	-2	300	44.4	1.21	0	
	N18	Culvert Crossing	-	CLAY Fill	2.60	3661	3661	159	220	227	210	204	1.65	1.14	44.2	6	300	48.8	1.11	4	
17/12/2024	N19	Lot 11	-	LS CLAY Fill	2.60	3661	3661	203	186	153	139	170	1.76	1.22	44.5	-1	300	41.0	1.25	1	
	N20	Lot 10	-	LS CLAY Fill	2.60	3661	3661	129	190	153	237	177	1.77	1.26	40.7	0	300	38.9	1.28	1	
	N21	Culvert Crossing	-	LS CLAY Fill	2.60	3661	3661	163	183	203	129	170	1.73	1.17	48.2	-1	300	39.1	1.25	3	
	N22	Lot 2	-	LS CLAY Fill	2.60	3661	3661	UTP	UTP	UTP	UTP	UTP	1.73	1.27	36.4	5	300	32.7	1.30	7	
23/01/2024	N23	Lot 10	-	LS CLAY Fill	2.60	3661	3661	183	153	220	132	172	1.79	1.28	40.4	-1	300	44.1	1.24	-3	
	N24	Lot 10	-	LS CLAY Fill	2.60	3661	3661	166	186	159	176	172	1.78	1.26	40.6	0	300	38.1	1.29	2	
	N25	Lot 11	-	LS CLAY Fill	2.60	3661	3661	153	153	193	142	160	1.61	1.08	48.7	6	300	39.9	1.15	10	

** Gauge Wet Densities outside of the calibrated range of 1.754 to 2.611 t/m³ are not accredited and are outside the laboratories scope of accreditation.

Created By: JLM Date: 7/11/2023
Checked By: JP Date: 9/02/2024
Authorised Signatory (KTP): JLM Date: 8/03/2024



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CLIENT: CABRA LAND & PROPERTY DEVELOPMENT — CABRA GROUP JOINT VENTURE

PROJECT: 47 URUMARAKI AVENUE HELENSVILLE

CAPTURE Land Development Consultants

REV	DATE	REVISION DETAILS	ISSUED
A	12/06/23	ISSUE FOR EPA	TL

DRAWING TITLE: PROPOSED CONTOURS OVERALL

STATUS	SCALE	SIZE
FOR APPROVAL	1:1000	A3

PROJECT NO	DRAWING NO	REVISION
1081	EPA-EW200	A

c:_cam jobs\helensville\epa plans\1081 epa sheet 200-201

LF14 Dynamic Cone Penetration (DCP) Test Report (Rev 18)

NZS 4402: 1988 Test 6.5.2

Project:	47 Urumaraki Ave
Project No:	AKL2022-0088
Location:	Helensville
Report No:	AKL2022-0088LAB Rev.0
Test Date:	30/11/2023
Tested By:	ZW
DCP ID#:	DCP31
Client:	Cabra Developments Ltd
Client Address:	19 Tamariki Ave, Orewa, Auckland 0931
CBR Test Calculation:	Austroads (2010) (fine grained cohesive)

Auckland Laboratory
CMW Geotechnical NZ Limited
11/63, Arrenway Drive, Rosedale, NZ 0632
PO Box 300206, Albany, Auckland, NZ 0752
Phone: +64 (09) 4144 632

Testing Locations Selected By: CMW Field Staff

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

*** Equivalent CBR Values are not accredited and are outside the scope of the laboratory's accreditation**

Test No	1		2		3					
Test Location	Culvert Top		Culvert Middle		Culvert Bottom					
Chainage & Offset	-		-		-					
Material & Layer	CLAY		CLAY		CLAY					
Depth (mm)	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100	0	0	0	0	0	0				
100 - 200	1	2	1	2	1	2				
200 - 300	1	2	1	2	1	2				
300 - 400	2	4	2	4	1	2				
400 - 500	1	2	2	4	2	4				
500 - 600	3	6	2	4	3	6				
600 - 700	3	6	3	6	2	4				
700 - 800	3	6	2	4	3	6				
800 - 900	3	6	2	4	4	8				
900 - 1000										

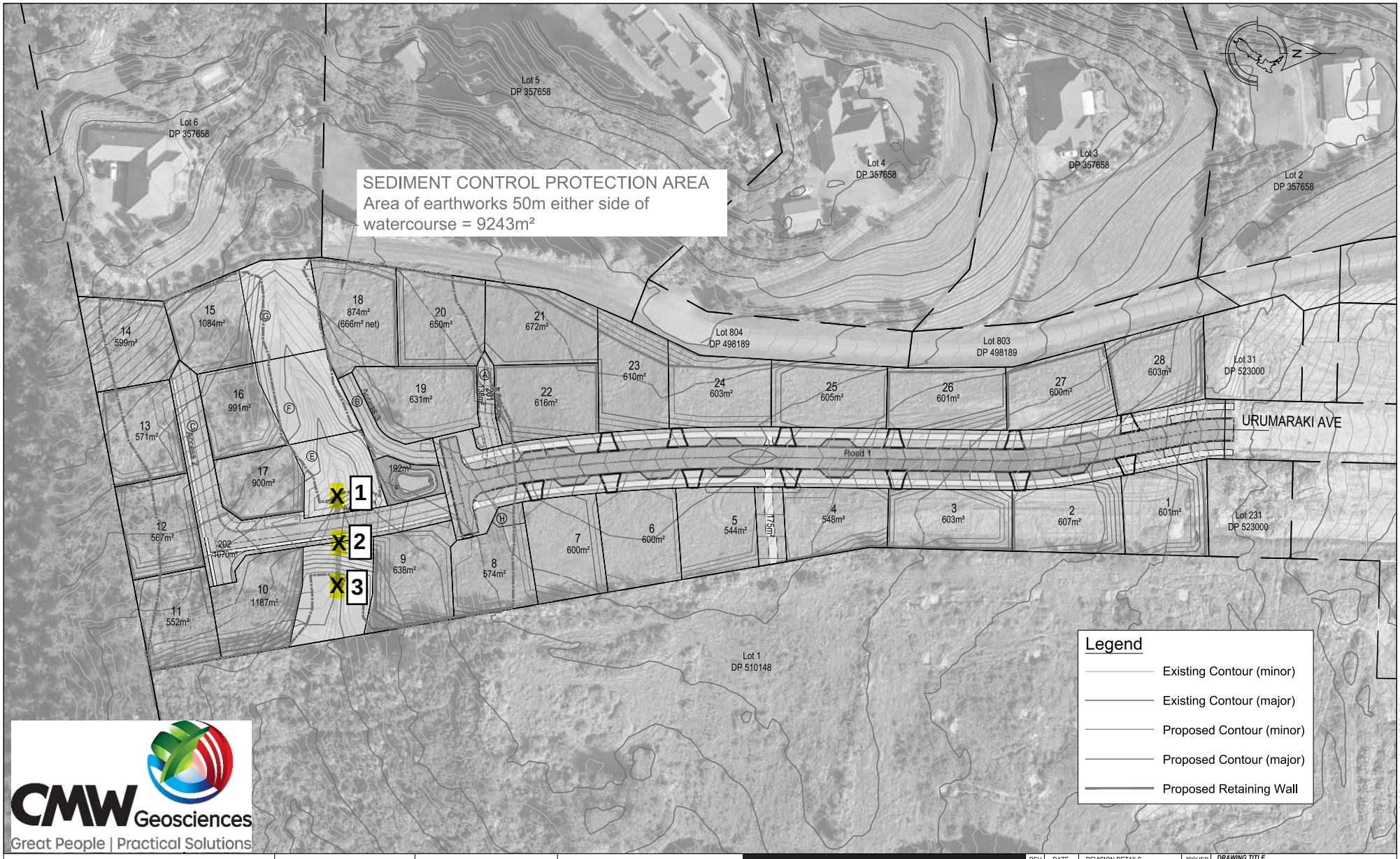
Test No										
Test Location										
Chainage & Offset										
Material & Layer										
Depth	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100										
100 - 200										
200 - 300										
300 - 400										
400 - 500										
500 - 600										
600 - 700										
700 - 800										
800 - 900										
900 - 1000										

Created by: JP Date: 4/12/2023

Checked by: JP Date: 8/02/2024

Authorised Signatory (KTP): JLM Date: 4/03/2024

* Equivalent CBR values are taken from Fig 5.3, Austroads Guide to Pavement Technology, Part 2: Pavement Structural Design, Austroads 2010. Values are relevant to fine grained soils only.



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CLIENT: CABRA LAND & PROPERTY DEVELOPMENT

CABRA GROUP JOINT VENTURE

PROJECT: 47 URUMARAKI AVENUE HELENSVILLE

CAPTURE Land Development Consultants

REV	DATE	REVISION DETAILS	ISSUED
A	12/06/23	ISSUE FOR EPA	TL

DRAWING TITLE: PROPOSED CONTOURS OVERALL

STATUS	SCALE	SIZE
FOR APPROVAL	1:1000	A3

PROJECT NO	DRAWING NO	REVISION
1081	EPA-EW200	A

c:_cam\jobs\helensville\epa plans\1081 epa sheet 200-201

LF11 Soil Field Density NDM Direct Transmission with VSS Report (Cohesive Soils) (Rev 18)

Auckland Laboratory
CMW Geotechnical NZ Limited
11/63, Arrenway Drive, Rosedale, NZ 0632
PO Box 300206, Albany, Auckland, NZ 0752
Phone: +64 (09) 4144 632

Project:	47 Urumarakai Drive
Project No:	AKL2022-0088
Location:	Helensville
Report No:	AKL2022-0088LAC Rev 0
Report Date:	11/09/2024
Client:	Cabra Developments Ltd
Client Address:	19 Tamariki Ave, Orewa, Auckland 0931

Test Methods:
NZS 4407 2015 Test 3.1 ◊
NZS 4407 2015 Test 4.2
NZGS:August 2001

Notes:
Solid Density: Assumed
Solid Density Data Source: N/A
Testing Locations Selected By: CMW Field Staff
◊ Only samples <2.0mm will be considered for endorsed testing
① Blade size of 19mm used.

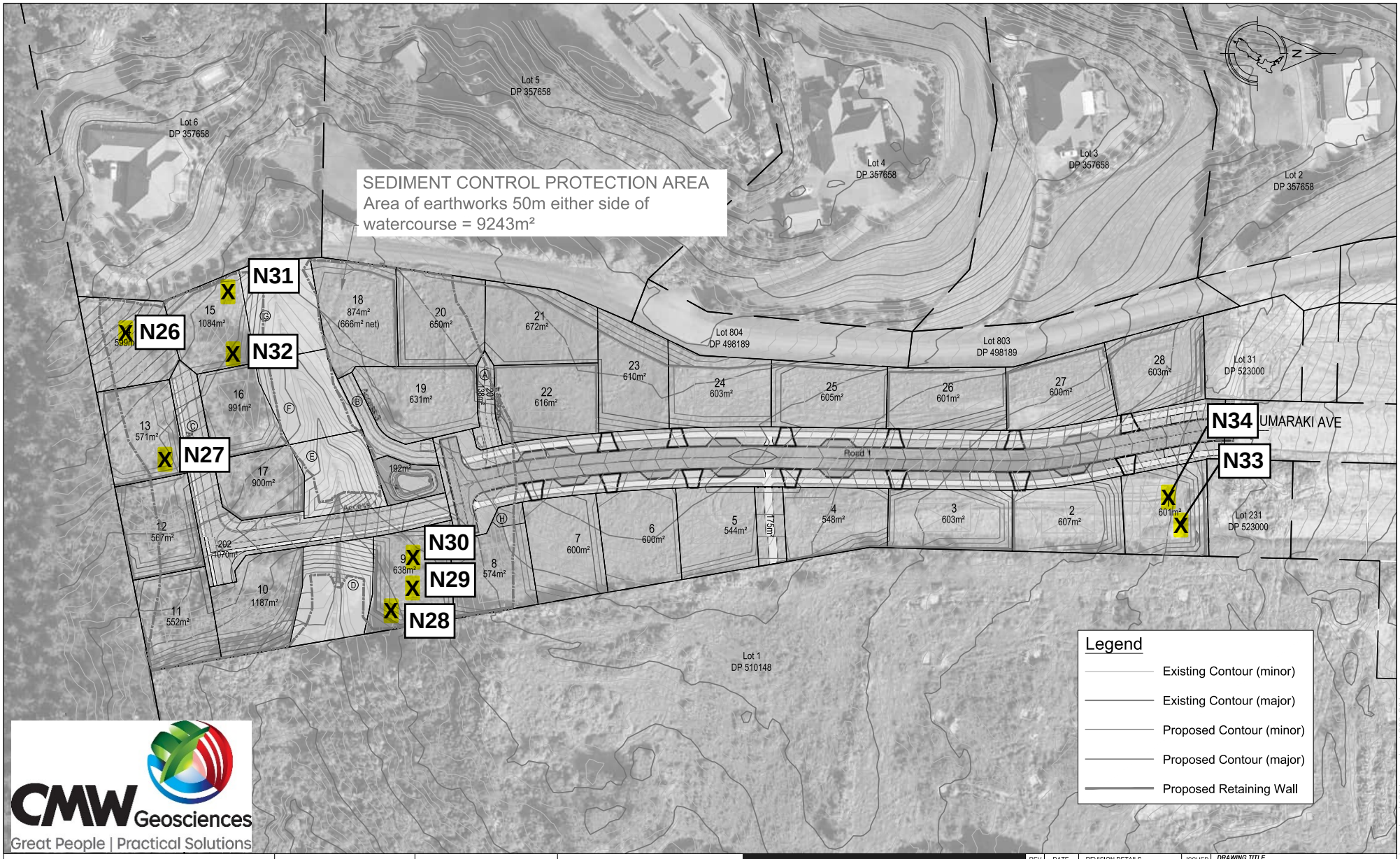
Test results indicated as not accredited are outside the scope of the laboratory's accreditation

Measurements marked * are not accredited and are outside the scope of the laboratories accreditation

Date Sampled	Sample No.	Test Location*	Soil Description*	Solid Density (t/m³) *	Vane ID		In-situ Vane Shear Strengths					Field and Laboratory Testing Data								Comments
					Head #	Blade # ①	Test 1 (kPa)	Test 2 (kPa)	Test 3 (kPa)	Test 4 (kPa)	Ave.	Gauge Wet Density (t/m³) **	Gauge Dry Density (t/m³)	Gauge Water Content (%)	Gauge Air Voids (%)	Gauge Probe Depth (mm)	Oven Water Content (%)	Oven Dry Density (t/m³)	Oven Calculated Air Voids (%) *	
26/01/2024	N26	Lot 14	CLAY FILL	2.60	3661	3661	220	193	237+	207	214+	1.76	1.25	40.9	1	300	37.9	1.28	3	
	N27	Lot 13	CLAY FILL	2.60	3661	3661	220	122	153	220	179	1.74	1.22	42.8	1	300	35.6	1.28	5	
13/02/2024	N28	Gully Base Fill	CLAY FILL	2.60	3863	3863	199	232+	199	232+	216+	1.78	1.32	35.0	3	300	30.4	1.37	6	
16/02/2024	N29	Lot 9	CLAY FILL	2.60	3661	3661	207	142	220	180	187	1.81	1.30	39.3	-1	300	37.4	1.32	0	
	N30	Lot 9	CLAY FILL	2.60	3661	3661	176	173	237	237	206	1.76	1.20	46.1	-2	300	43.2	1.23	0	
22/02/2024	N31	Lot 15	CLAY FILL	2.60	3661	3661	UTP	UTP	UTP	UTP	UTP	1.80	1.34	34.5	2	300	24.6	1.45	9	
	N32	Lot 15	CLAY FILL	2.60	3661	3661	UTP	UTP	UTP	UTP	UTP	1.84	1.42	29.4	3	300	22.0	1.51	9	
2/04/2024	N33	Lot 1	CLAY FILL	2.60	3661	3661	237+	237+	237+	237+	237+	1.81	1.25	45.0	-4	300	31.7	1.37	4	
	N34	Lot 1	CLAY FILL	2.60	3661	3661	237+	UTP	UTP	UTP	237+	1.82	1.40	30.6	4	300	32.1	1.38	3	

** Gauge Wet Densities outside of the calibrated range of 1.754 to 2.611 t/m³ are not accredited and are outside the laboratories scope of accreditation.

Created By: JP Date: 31/01/2024
Checked By: JP Date: 11/09/2024
Authorised Signatory (KTP): JLM Date: 11/09/2024



CMW Geosciences
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CLIENT: CABRA LAND & PROPERTY DEVELOPMENT — CABRA GROUP JOINT VENTURE

PROJECT: 47 URUMARAKI AVENUE HELENSVILLE

CAPTURE Land Development Consultants

REV	DATE	REVISION DETAILS	ISSUED
A	12/06/23	ISSUE FOR EPA	TL

DRAWING TITLE: PROPOSED CONTOURS OVERALL

STATUS	SCALE	SIZE
FOR APPROVAL	1:1000	A3

PROJECT NO	DRAWING NO	REVISION
1081	EPA-EW200	A

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LF14 Dynamic Cone Penetration (DCP) Test Report (Rev 18)

NZS 4402: 1988 Test 6.5.2

CMW Geosciences
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Project:	47 Urumaraki Ave
Project No:	AKL2022-0088
Location:	Helensville
Report No:	AKL2022-0088LAD Rev.0
Test Date:	6/03/2024
Tested By:	ZW
DCP ID#:	DCP31
Client:	Cabra Developments Ltd
Client Address:	19 Tamariki Ave, Orewa, Auckland 0931
CBR Test Calculation:	Austroads (2010) (fine grained cohesive)

Auckland Laboratory
CMW Geotechnical NZ Limited
11/63, Arrenway Drive, Rosedale, NZ 0632
PO Box 300206, Albany, Auckland, NZ 0752
Phone: +64 (09) 4144 632

Testing Locations Selected By: CMW Field Staff

ACCREDITED IANZ TESTING LABORATORY

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

*** Equivalent CBR Values are not accredited and are outside the scope of the laboratory's accreditation**

Test No	1		2		3		4		5	
Test Location	Access 2		Access 2		Access 2		Access 2		Access 2	
Chainage & Offset	CH60 RHS		CH50 LHS		CH40 RHS		CH30 LHS		CH20 RHS	
Material & Layer	CLAY		CLAY		CLAY		CLAY		CLAY	
Depth (mm)	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100	2	4	2	4	1	2	1	2	2	4
100 - 200	3	6	4	8	2	4	4	8	2	4
200 - 300	2	4	9	20	5	10	4	8	2	4
300 - 400	3	6	4	8	3	6	3	6	4	8
400 - 500	4	8	7	15	3	6	2	4	2	4
500 - 600	3	6	7	15	4	8	2	4	4	8
600 - 700	6	13	7	15	5	10	2	4	3	6
700 - 800	7	15	6	13	6	13	3	6	3	6
800 - 900	7	15	6	13	7	15	1	2	5	10
900 - 1000										

Test No	6		7		8		9		10	
Test Location	Access 2		Access 1		Access 1		Access 1		Access 1	
Chainage & Offset	CH10 LHS		CH60 LHS		CH50 RHS		CH40 LHS		CH30 RHS	
Material & Layer	CLAY		CLAY		CLAY		CLAY		CLAY	
Depth	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100	1	2	3	6	2	4	4	8	2	4
100 - 200	2	4	5	10	3	6	5	10	5	10
200 - 300	2	4	4	8	4	8	5	10	5	10
300 - 400	4	8	4	8	4	8	3	6	4	8
400 - 500	6	13	7	15	3	6	3	6	4	8
500 - 600	4	8	8	18	4	8	3	6	3	6
600 - 700	4	8	8	18	4	8	3	6	4	8
700 - 800	3	6	9	20	4	8	3	6	6	13
800 - 900	4	8	8	18	6	13	4	8	6	13
900 - 1000										

Created by:	JP	Date:	13/03/2024
Checked by:	JP	Date:	2/04/2024
Authorised Signatory (KTP):	JLM	Date:	3/04/2024

* Equivalent CBR values are taken from Fig 5.3, Austroads Guide to Pavement Technology, Part 2: Pavement Structural Design, Austroads 2010. Values are relevant to fine grained soils only.

LF14 Dynamic Cone Penetration (DCP) Test Report (Rev 18)

NZS 4402: 1988 Test 6.5.2

Project:	47 Urumaraki Ave
Project No:	AKL2022-0088
Location:	Helensville
Report No:	AKL2022-0088LAD Rev.0
Test Date:	6/03/2024
Tested By:	ZW
DCP ID#:	DCP31
Client:	Cabra Developments Ltd
Client Address:	19 Tamariki Ave, Orewa, Auckland 0931
CBR Test Calculation:	Austroads (2010) (fine grained cohesive)

Auckland Laboratory
CMW Geotechnical NZ Limited
11/63, Arrenway Drive, Rosedale, NZ 0632
PO Box 300206, Albany, Auckland, NZ 0752
Phone: +64 (09) 4144 632

Testing Locations Selected By: CMW Field Staff

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

*** Equivalent CBR Values are not accredited and are outside the scope of the laboratory's accreditation**

Test No	11		12		13		14		15	
Test Location	Access 1		Access 1		Road 1		Road 1		Road 1	
Chainage & Offset	CH20 LHS		CH10 RHS		CH200 LHS		CH190 RHS		CH180 LHS	
Material & Layer	CLAY		CLAY		CLAY		CLAY		CLAY	
Depth (mm)	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100	2	4	3	6	1	2	1	2	1	2
100 - 200	9	20	6	13	1	2	1	2	2	4
200 - 300	7	15	10	20+	1	2	1	2	2	4
300 - 400	4	8	6	13	2	4	2	4	3	6
400 - 500	6	13	3	6	2	4	1	2	2	4
500 - 600	6	13	6	13	3	6	2	4	3	6
600 - 700	6	13	7	15	3	6	2	4	3	6
700 - 800	6	13	4	8	3	6	3	6	4	8
800 - 900	10	20+	7	15	4	8	3	6	4	8
900 - 1000										

Test No	16		17		18		19		20	
Test Location	Road 1		Road 1		Road 1		Road 1		Road 1	
Chainage & Offset	CH170 RHS		CH160 LHS		CH150 RHS		CH140 LHS		CH130 RHS	
Material & Layer	CLAY		CLAY		CLAY		CLAY		CLAY	
Depth	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100	1	2	2	4	2	4	4	8	6	13
100 - 200	2	4	1	2	3	6	2	4	3	6
200 - 300	2	4	3	6	3	6	3	6	3	6
300 - 400	3	6	3	6	2	4	4	8	5	10
400 - 500	4	8	3	6	3	6	4	8	5	10
500 - 600	5	10	4	8	3	6	3	6	4	8
600 - 700	5	10	5	10	2	4	4	8	3	6
700 - 800	8	18	7	15	3	6	4	8	4	8
800 - 900	7	15	9	20	5	10	5	10	6	13
900 - 1000										

Created by: JP Date: 13/03/2024

Checked by: JP Date: 2/04/2024

Authorised Signatory (KTP): JLM Date: 3/04/2024

* Equivalent CBR values are taken from Fig 5.3, Austroads Guide to Pavement Technology, Part 2: Pavement Structural Design, Austroads 2010. Values are relevant to fine grained soils only.

LF14 Dynamic Cone Penetration (DCP) Test Report (Rev 18)

NZS 4402: 1988 Test 6.5.2

Project:	47 Urumaraki Avenue
Project No:	AKL2022-0088
Location:	Helensville
Report No:	AKL2022-0088LAD Rev.0
Test Date:	6/03/2024
Tested By:	ZW
DCP ID#:	DCP31
Client:	Cabra Developments Ltd
Client Address:	19 Tamariki Ave, Orewa, Auckland 0931
CBR Test Calculation:	Austroads (2010) (fine grained cohesive)

Auckland Laboratory
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Testing Locations Selected By: CMW Field Staff

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Test No	21		22		23		24		25	
Test Location	Road 1		Road 1		Road 1		Road 1		Road 1	
Chainage & Offset	CH120 LHS		CH110 RHS		CH100 LHS		CH90 RHS		CH80 LHS	
Material & Layer	CLAY		CLAY		CLAY		CLAY		CLAY	
Depth (mm)	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100	3	6	4	8	4	8	4	8	3	6
100 - 200	3	6	4	8	4	8	4	8	4	8
200 - 300	3	6	2	4	4	8	4	8	5	10
300 - 400	4	8	4	8	4	8	4	8	4	8
400 - 500	5	10	4	8	5	10	4	8	3	6
500 - 600	6	13	5	10	6	13	3	6	5	10
600 - 700	6	13	6	13	8	18	4	8	4	8
700 - 800	6	13	9	20	10	20+	4	8	5	10
800 - 900	11	20+	8	18	10	20+	8	18	6	13
900 - 1000										

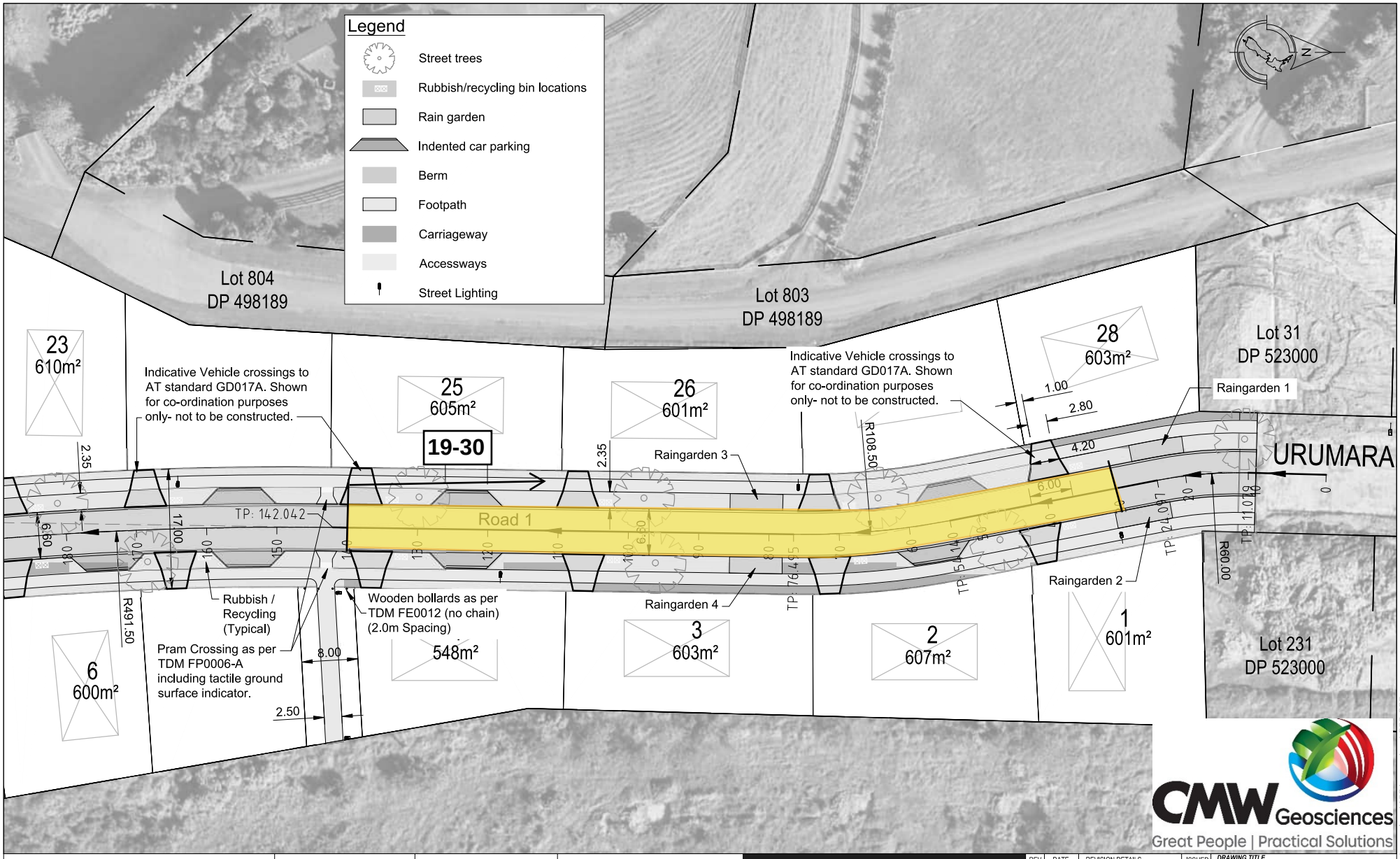
Test No	26		27		28		29		30	
Test Location	Road 1		Road 1		Road 1		Road 1		Road 1	
Chainage & Offset	CH70 RHS		CH60 LHS		CH50 RHS		CH40 LHS		CH30 RHS	
Material & Layer	CLAY		CLAY		CLAY		CLAY		CLAY	
Depth	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100	4	8	5	10	2	4	4	8	5	10
100 - 200	4	8	4	8	3	6	5	10	3	6
200 - 300	3	6	5	10	4	8	6	13	2	4
300 - 400	6	13	7	15	6	13	4	8	3	6
400 - 500	4	8	6	13	4	8	3	6	2	4
500 - 600	5	10	8	18	7	15	3	6	4	8
600 - 700	6	13	7	15	5	10	3	6	4	8
700 - 800	6	13	7	15	6	13	2	4	5	10
800 - 900	11	20+	6	13	5	10	3	6	5	10
900 - 1000										

Created by: JP Date: 13/03/2024

Checked by: JP Date: 2/04/2024

Authorised Signatory (KTP): JLM Date: 3/04/2024

* Equivalent CBR values are taken from Fig 5.3, Austroads Guide to Pavement Technology, Part 2: Pavement Structural Design, Austroads 2010. Values are relevant to fine grained soils only.



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CLIENT: CABRA LAND & PROPERTY DEVELOPMENT — CABRA GROUP JOINT VENTURE

PROJECT: 47 URUMARAKI AVENUE HELENSVILLE

CAPTURE Land Development Consultants

REV	DATE	REVISION DETAILS	ISSUED
A	12/06/23	ISSUE FOR EPA	TL

DRAWING TITLE: ROADING PLAN (SHEET 1 OF 2)

STATUS	SCALE	SIZE
FOR APPROVAL	1:500	A3

PROJECT NO	DRAWING NO	REVISION
1081	EPA-RD301	A

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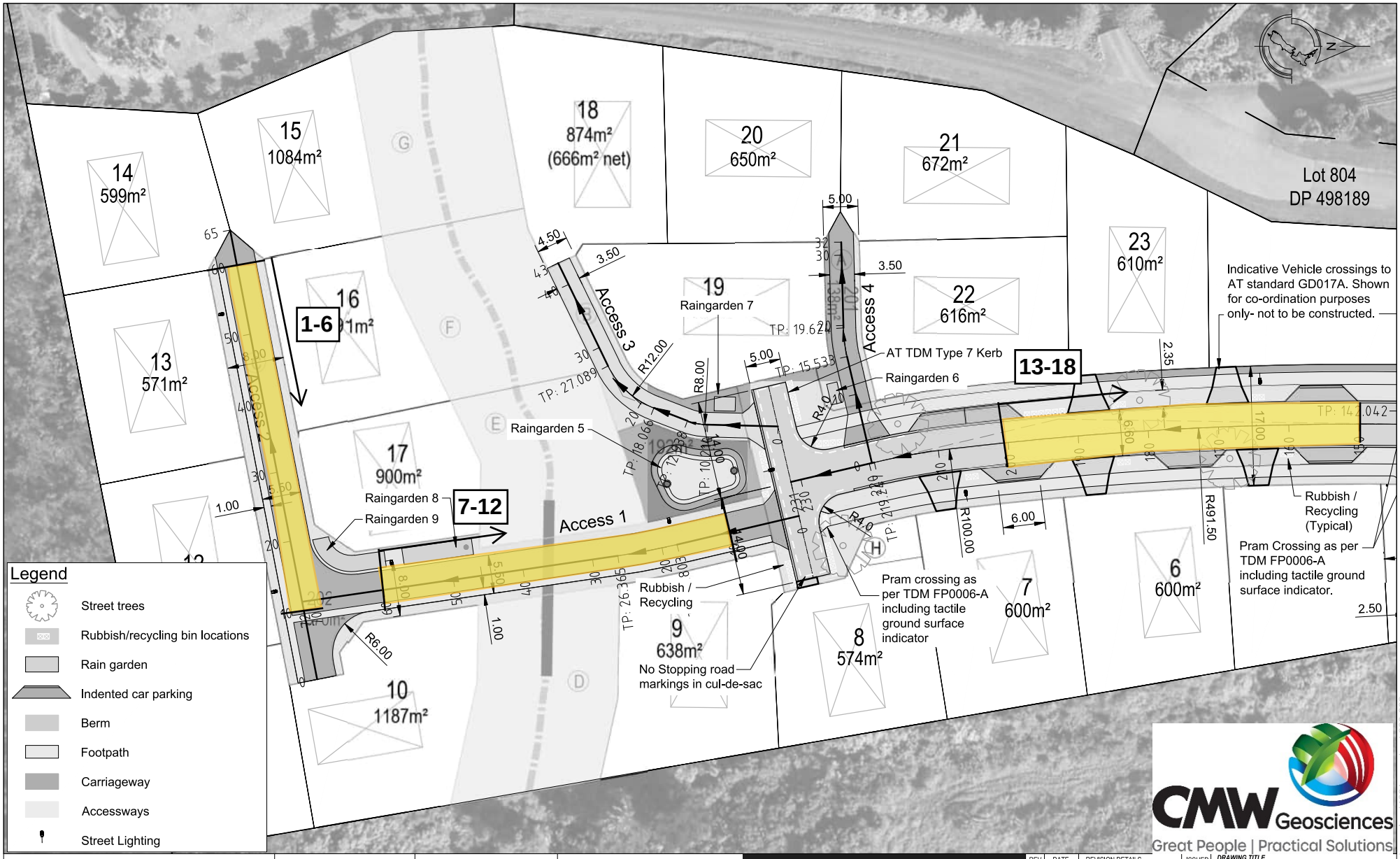

CLIENT: CABRA LAND & PROPERTY DEVELOPMENT — CABRA GROUP JOINT VENTURE

PROJECT: 47 URUMARAKI AVENUE HELENSVILLE

CAPTURE Land Development Consultants

CMW Geosciences — Great People | Practical Solutions

REV	DATE	REVISION DETAILS	ISSUED
A	12/06/23	ISSUE FOR EPA	TL

DRAWING TITLE: ROADING PLAN (SHEET 2 OF 2)

STATUS	SCALE	SIZE
FOR APPROVAL	1:500	A3

PROJECT NO	DRAWING NO	REVISION
1081	EPA-RD302	A

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LF14 Dynamic Cone Penetration (DCP) Test Report (Rev 18)

NZS 4402: 1988 Test 6.5.2

CMW Geosciences
Great People | Practical Solutions

Project:	47 Urumaraki Avenue
Project No:	AKL2022-0088
Location:	Helensville
Report No:	AKL2022-0088LAE Rev.0
Test Date:	6/03/2024
Tested By:	ZW
DCP ID#:	DCP31
Client:	Cabra Developments Ltd
Client Address:	19 Tamariki Ave, Orewa, Auckland 0931
CBR Test Calculation:	Austroads (2010) (fine grained cohesive)

Auckland Laboratory
CMW Geotechnical NZ Limited
11/63, Arrenway Drive, Rosedale, NZ 0632
PO Box 300206, Albany, Auckland, NZ 0752
Phone: +64 (09) 4144 632

Testing Locations Selected By: CMW Field Staff

ACCREDITED IANZ TESTING LABORATORY

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

*** Equivalent CBR Values are not accredited and are outside the scope of the laboratory's accreditation**

Test No	1		2		3					
Test Location	Road 1		Road 1		Road 1					
Chainage & Offset	CH230		CH220		CH210					
Material & Layer	CLAY		CLAY		CLAY					
Depth (mm)	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100	1	2	1	2	1	2				
100 - 200	1	2	1	2	1	2				
200 - 300	1	2	2	4	1	2				
300 - 400	2	4	2	4	1	2				
400 - 500	3	6	3	6	1	2				
500 - 600	4	8	2	4	2	4				
600 - 700	5	10	2	4	1	2				
700 - 800	8	18	4	8	2	4				
800 - 900	6	13	5	10	1	2				
900 - 1000										

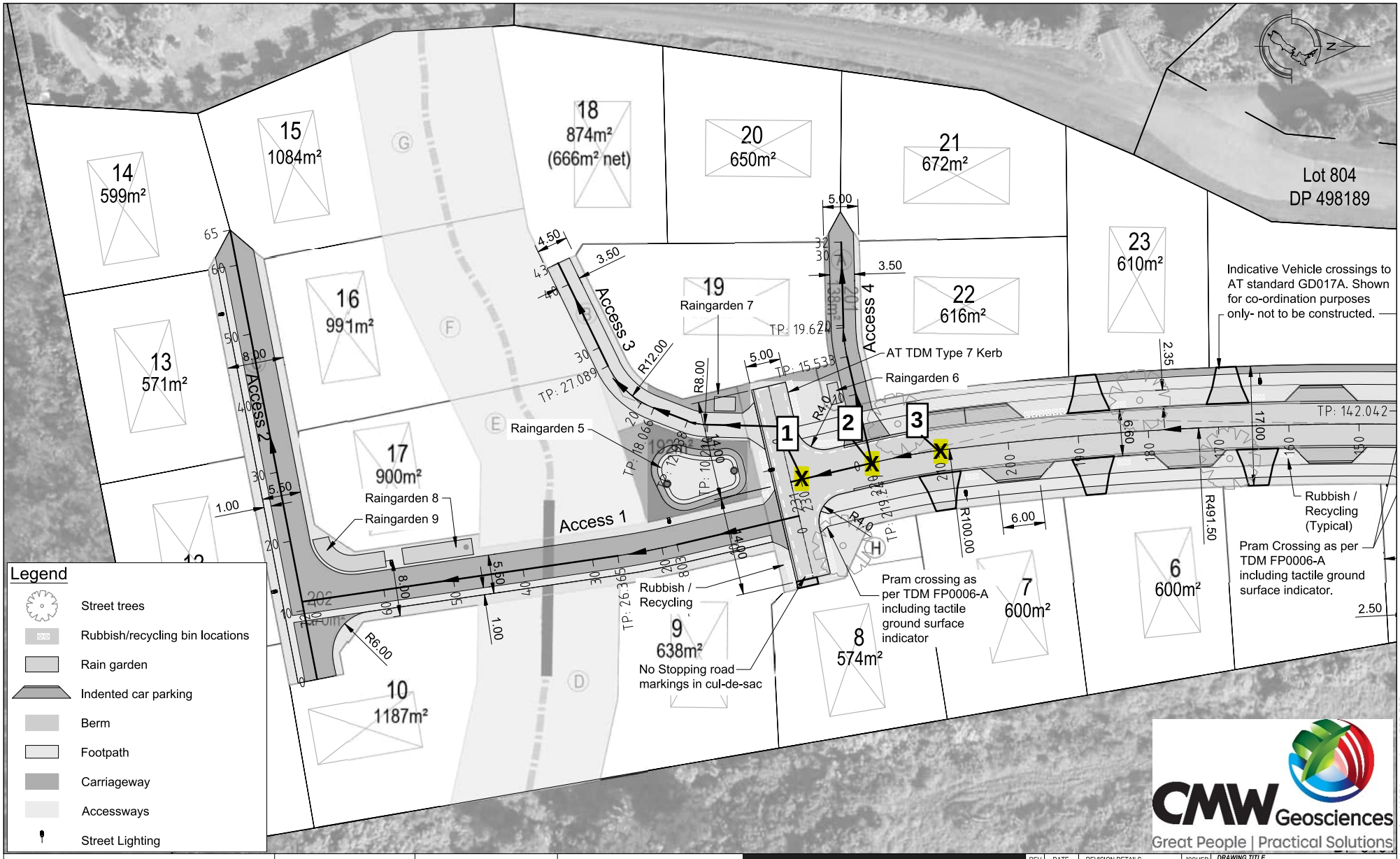
Test No										
Test Location										
Chainage & Offset										
Material & Layer										
Depth	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100										
100 - 200										
200 - 300										
300 - 400										
400 - 500										
500 - 600										
600 - 700										
700 - 800										
800 - 900										
900 - 1000										

Created by: JP Date: 13/03/2024

Checked by: JP Date: 2/04/2024

Authorised Signatory (KTP): JLM Date: 2/04/2024

* Equivalent CBR values are taken from Fig 5.3, Austroads Guide to Pavement Technology, Part 2: Pavement Structural Design, Austroads 2010. Values are relevant to fine grained soils only.



CLIENT: CABRA LAND & PROPERTY DEVELOPMENT — CABRA GROUP JOINT VENTURE

PROJECT: 47 URUMARAKI AVENUE HELENSVILLE

CAPTURE Land Development Consultants

REV	DATE	REVISION DETAILS	ISSUED
A	12/06/23	ISSUE FOR EPA	TL

DRAWING TITLE: ROADING PLAN (SHEET 2 OF 2)

STATUS	SCALE	SIZE
FOR APPROVAL	1:500	A3

PROJECT NO	DRAWING NO	REVISION
1081	EPA-RD302	A

CMW Geosciences
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LF14 Dynamic Cone Penetration (DCP) Test Report (Rev 18)

NZS 4402: 1988 Test 6.5.2

Project:	47 Urumaraki Avenue
Project No:	AKL2022-0088
Location:	Helensville
Report No:	AKL2022-0088LAF Rev.0
Test Date:	26/03/2024
Tested By:	ZW
DCP ID#:	DCP31
Client:	Cabra
Client Address:	19 Tamariki Ave, Orewa, Auckland 0931
CBR Test Calculation:	Austroads (2010) (fine grained cohesive)

Auckland Laboratory
CMW Geotechnical NZ Limited
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PO Box 300206, Albany, Auckland, NZ 0752
Phone: +64 (09) 4144 632

Testing Locations Selected By: CMW Field Staff

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*** Equivalent CBR Values are not accredited and are outside the scope of the laboratory's accreditation**

Test No	1		2		3		4		5	
Test Location	Road 1		Road 1		Road 1		Road 1		Road 1	
Chainage & Offset	CH220 LHS		CH210 RHS		CH200		CH190 RHS		CH180 LHS	
Material & Layer	Stabilised Clay		Stabilised Clay		Stabilised Clay		Stabilised Clay		Stabilised Clay	
Depth (mm)	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100	6	13	8	18	7	15	7	15	6	13
100 - 200	7	15	7	15	5	10	5	10	5	10
200 - 300	4	8	4	8	4	8	3	6	4	8
300 - 400	4	8	3	6	5	10	3	6	4	8
400 - 500	3	6	3	6	3	6	2	4	3	6
500 - 600	3	6	3	6	5	10	2	4	1	2
600 - 700	3	6	4	8	7	15	2	4	2	4
700 - 800	5	10	8	18	9	20	2	4	2	4
800 - 900	7	15	9	20	10	20+	3	6	4	8
900 - 1000										

Test No	6		7		8		9		10	
Test Location	Road 1		Road 1		Road 1		Road 1		Road 1	
Chainage & Offset	CH170 RHS		CH160 LHS		CH150 RHS		CH140 LHS		CH130 RHS	
Material & Layer	Stabilised Clay		Stabilised Clay		Stabilised Clay		Stabilised Clay		Stabilised Clay	
Depth	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100	5	10	6	13	6	13	7	15	9	20
100 - 200	6	13	4	8	5	10	5	10	9	20
200 - 300	4	8	2	4	3	6	3	6	5	10
300 - 400	3	6	2	4	2	4	3	6	5	10
400 - 500	1	2	2	4	3	6	2	4	4	8
500 - 600	2	4	1	2	3	6	2	4	5	10
600 - 700	2	4	2	4	4	8	2	4	4	8
700 - 800	3	6	3	6	5	10	2	4	3	6
800 - 900	4	8	3	6	6	13	2	4	3	6
900 - 1000										

Created by: JP Date: 26/03/2024

Checked by: JP Date: 27/03/2024

Authorised Signatory (KTP): JLM Date: 27/03/2024

* Equivalent CBR values are taken from Fig 5.3, Austroads Guide to Pavement Technology, Part 2: Pavement Structural Design, Austroads 2010. Values are relevant to fine grained soils only.

LF14 Dynamic Cone Penetration (DCP) Test Report (Rev 18)

NZS 4402: 1988 Test 6.5.2

CMW Geosciences
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Project:	47 Urumaraki Avenue
Project No:	AKL2022-0088
Location:	Helensville
Report No:	AKL2022-0088LAF Rev.0
Test Date:	26/03/2024
Tested By:	ZW
DCP ID#:	DCP31
Client:	Cabra
Client Address:	19 Tamariki Ave, Orewa, Auckland 0931
CBR Test Calculation:	Austroads (2010) (fine grained cohesive)

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Testing Locations Selected By: CMW Field Staff

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*** Equivalent CBR Values are not accredited and are outside the scope of the laboratory's accreditation**

Test No	11		12		13		14		15	
Test Location	Road 1		Road 1		Road 1		Road 1		Road 1	
Chainage & Offset	CH120 LHS		CH110 RHS		CH100 LHS		CH90 RHS		CH80 LHS	
Material & Layer	Stabilised Clay		Stabilised Clay		Stabilised Clay		Stabilised Clay		Stabilised Clay	
Depth (mm)	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100	8	18	9	20	8	18	6	13	6	13
100 - 200	5	10	6	13	6	13	6	13	5	10
200 - 300	5	10	4	8	5	10	4	8	6	13
300 - 400	6	13	4	8	4	8	4	8	5	10
400 - 500	2	4	3	6	2	4	3	6	5	10
500 - 600	3	6	5	10	5	10	4	8	5	10
600 - 700	3	6	4	8	6	13	4	8	7	15
700 - 800	5	10	3	6	4	8	5	10	7	15
800 - 900	5	10	5	10	4	8	5	10	6	13
900 - 1000										

Test No	16		17		18		19		20	
Test Location	Road 1		Road 1		Road 1		Road 1		Road 1	
Chainage & Offset	CH70 RHS		CH60 LHS		CH50 RHS		CH40		CH30	
Material & Layer	Stabilised Clay		Stabilised Clay		Stabilised Clay		Stabilised Clay		Stabilised Clay	
Depth	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100	10	20+	8	18	8	18	7	15	14	20+
100 - 200	5	10	5	10	5	10	5	10	10	20+
200 - 300	5	10	4	8	4	8	3	6	8	18
300 - 400	6	13	3	6	3	6	2	4	6	13
400 - 500	14	20+	3	6	3	6	2	4	2	4
500 - 600	20+	20+	3	6	4	8	2	4	1	2
600 - 700			3	6	5	10	3	6	2	4
700 - 800			2	4	3	6	4	8	2	4
800 - 900			2	4	3	6	5	10	2	4
900 - 1000										

Created by: JP Date: 26/03/2024

Checked by: JP Date: 27/03/2024

Authorised Signatory (KTP): JLM Date: 27/03/2024

* Equivalent CBR values are taken from Fig 5.3, Austroads Guide to Pavement Technology, Part 2: Pavement Structural Design, Austroads 2010. Values are relevant to fine grained soils only.

LF14 Dynamic Cone Penetration (DCP) Test Report (Rev 18)

NZS 4402: 1988 Test 6.5.2

Project:	47 Urumaraki Avenue
Project No:	AKL2022-0088
Location:	Helensville
Report No:	AKL2022-0088LAF Rev.0
Test Date:	26/03/2024
Tested By:	ZW
DCP ID#:	DCP31
Client:	Cabra
Client Address:	19 Tamariki Ave, Orewa, Auckland 0931
CBR Test Calculation:	Austroads (2010) (fine grained cohesive)

Auckland Laboratory
CMW Geotechnical NZ Limited
11/63, Arrenway Drive, Rosedale, NZ 0632
PO Box 300206, Albany, Auckland, NZ 0752
Phone: +64 (09) 4144 632

Testing Locations Selected By: CMW Field Staff

PRELIMINARY

*** Equivalent CBR Values are not accredited and are outside the scope of the laboratory's accreditation**

Test No	21									
Test Location	Road 1									
Chainage & Offset	CH20									
Material & Layer	Stabilised Clay									
Depth (mm)	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100	6	13								
100 - 200	5	10								
200 - 300	4	8								
300 - 400	3	6								
400 - 500	3	6								
500 - 600	1	2								
600 - 700	1	2								
700 - 800	2	4								
800 - 900	1	2								
900 - 1000										

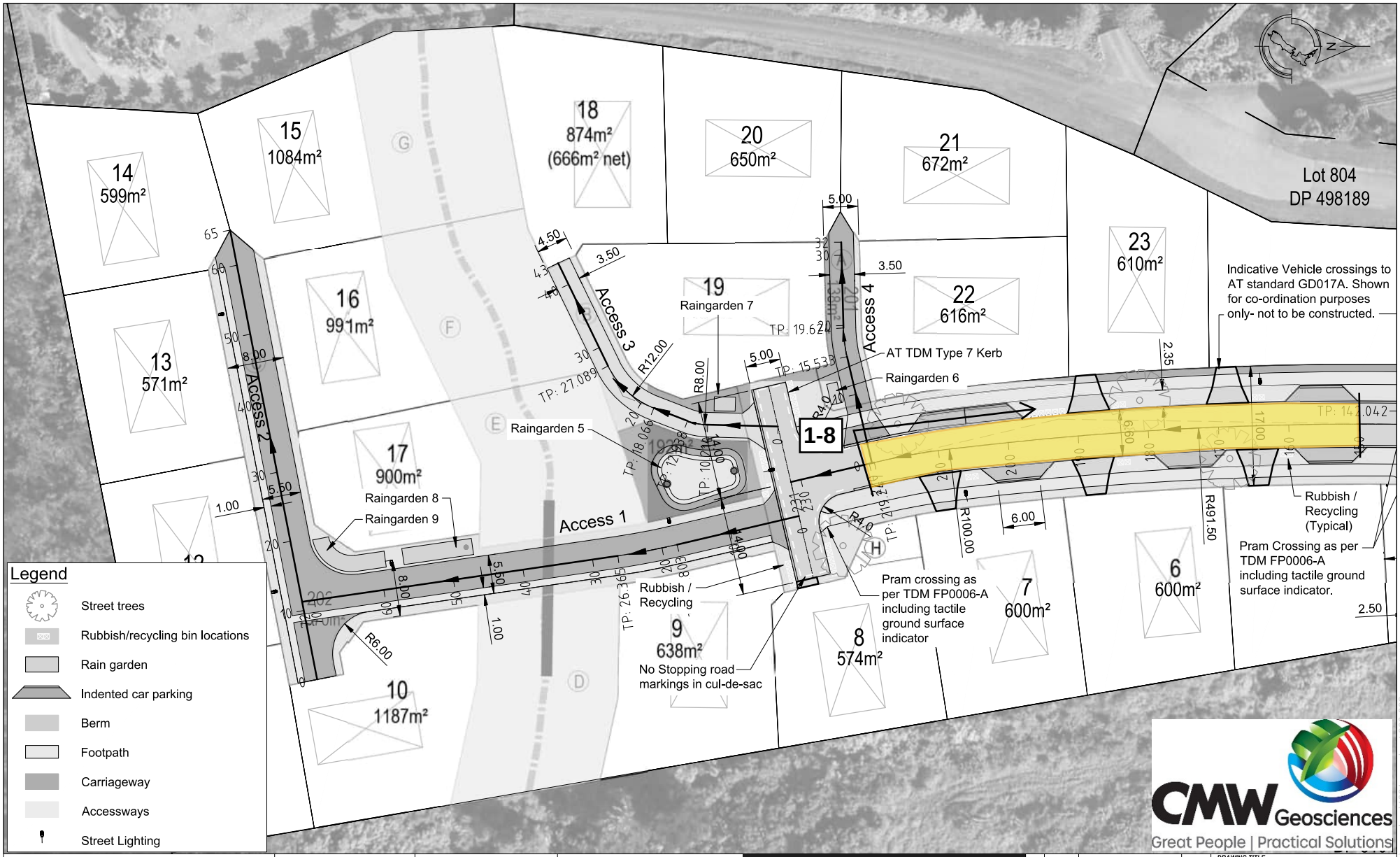
Test No										
Test Location										
Chainage & Offset										
Material & Layer										
Depth	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*	Blow Count	Equiv CBR*
0 - 100										
100 - 200										
200 - 300										
300 - 400										
400 - 500										
500 - 600										
600 - 700										
700 - 800										
800 - 900										
900 - 1000										

Created by: JP Date: 26/03/2024

Checked by: JP Date: 27/03/2024

Authorised Signatory (KTP): JLM Date: 27/03/2024

* Equivalent CBR values are taken from Fig 5.3, Austroads Guide to Pavement Technology, Part 2: Pavement Structural Design, Austroads 2010. Values are relevant to fine grained soils only.



CLIENT: CABRA LAND & PROPERTY DEVELOPMENT — CABRA GROUP JOINT VENTURE

PROJECT: 47 URUMARAKI AVENUE HELENSVILLE

CAPTURE Land Development Consultants

REV	DATE	REVISION DETAILS	ISSUED
A	12/06/23	ISSUE FOR EPA	TL

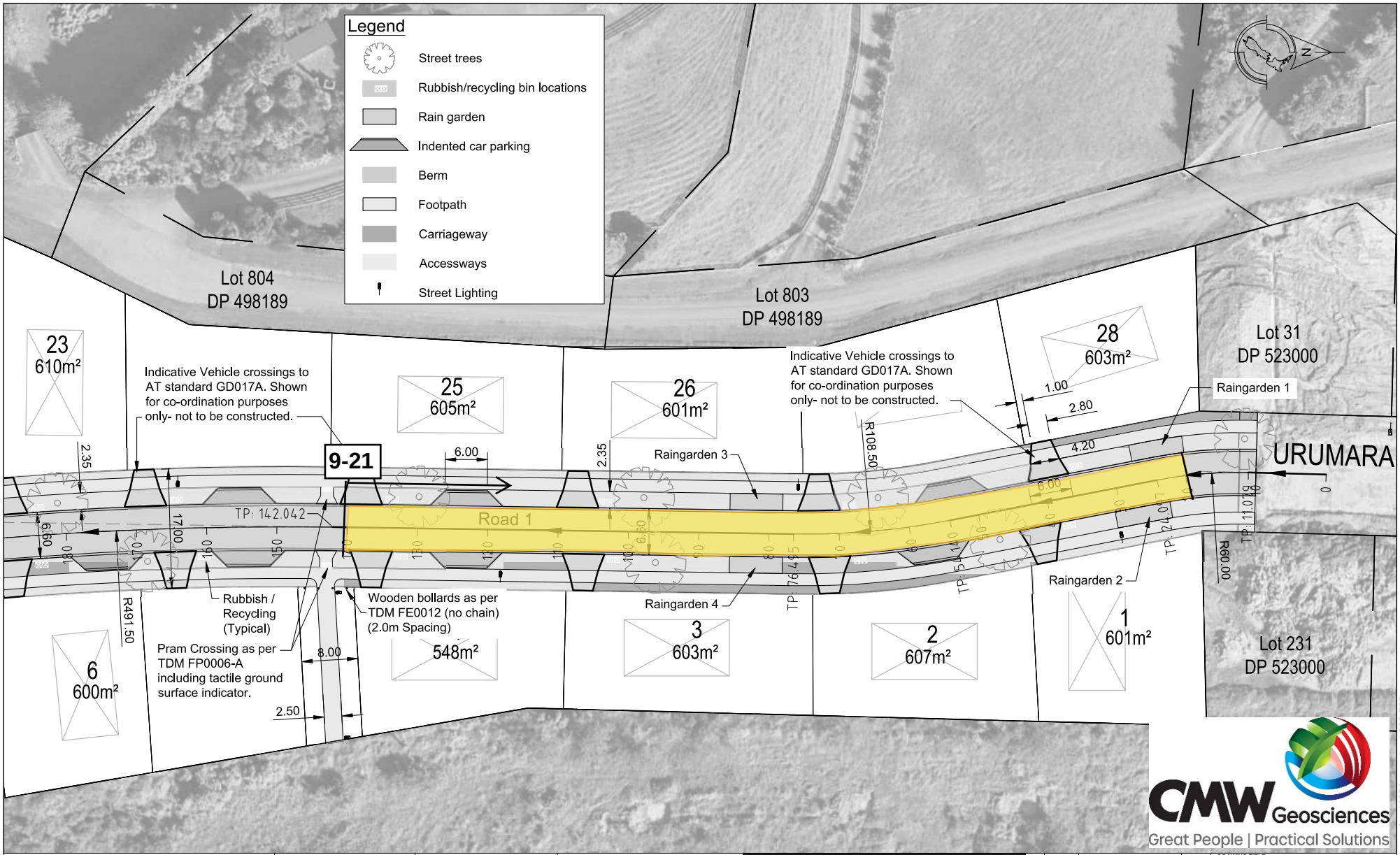
DRAWING TITLE: ROADING PLAN (SHEET 2 OF 2)

STATUS	SCALE	SIZE
FOR APPROVAL	1:500	A3

PROJECT NO	DRAWING NO	REVISION
1081	EPA-RD302	A

CMW Geosciences — Great People | Practical Solutions

c:_cam_jobs\helensville\epa plans\1081 epa sheet 300-302



CMW Geosciences
Great People | Practical Solutions

CLIENT: CABRA LAND & PROPERTY DEVELOPMENT — CABRA GROUP JOINT VENTURE

PROJECT: 47 URUMARAKI AVENUE HELENSVILLE

CAPTURE Land Development Consultants

REV	DATE	REVISION DETAILS	ISSUED
A	12/06/23	ISSUE FOR EPA	TL

DRAWING TITLE: ROADING PLAN (SHEET 1 OF 2)

STATUS	SCALE	SIZE
FOR APPROVAL	1:500	A3

PROJECT NO	DRAWING NO	REVISION
1081	EPA-RD301	A

c:_cam\jobs\helensville\epa plans\1081 epa sheet 300-302

APPENDIX E: LABORATORY TEST DATA

ROADTEST LTD

Revision: 1

DETERMINATION OF THE WATER CONTENT, CONE PENETRATION LIMIT, PLASTIC LIMIT, PLASTICITY INDEX & LINEAR SHRINKAGE

TEST METHOD NZS 4402 : 1986 TEST 2.1, 2.3, 2.4, 2.5 & 2.6

Project Name :	**47 Urumarakai Avenue, Helensville**		
		Project No :	24 0001 05
Client :	CMW Geosciences Ltd	Page :	1 of 1
Address :	PO Box 300206 Albany, Auckland	Date of Order :	2.02.2024
		Sample Method :	Hand auger
Attention :	Matt Illingworth	Sample Date :	31.01.24
		Sampled By :	CMW Geosciences Ltd

Test Details :

Test performed on : Whole Sample
History : Natural

Sample No.	Location	Depth (m)	Cone Penetration (CPL)	Plastic Limit (PL)	Plasticity Index (PI)	Linear Shrinkage (LS)	Natural Water Content (%)
693S	Lot 15	0.4 to 0.8	99	43	56	22	57.9
694S	Lot 12	0.4 to 0.8	68	33	35	16	42.2
695S	Lot 23	0.4 to 0.8	80	32	48	19	53.6
696S	Lot 7	0.4 to 0.8	63	32	31	13	46.2
697S	Lot 4	0.4 to 0.8	96	41	55	18	43.9
698S	Lot 28	0.4 to 0.8	66	36	30	12	58.5
699S	Lot 10	0.4 to 0.8	73	32	41	16	39.9

Comments :

Tested By:	KC	Date :	02 to 09.02.24
Calculated By :	MQ	Date :	12.02.24
Checked By :	ZH	Date :	13.02.24

APPENDIX F: RETAINING WALL PRODUCER STATEMENTS

19 September 2024 Document Ref: AKL2022-0088AG | Rev 0

Cabra Developments Limited
9B/30 Foundry Road
Silverdale
Auckland 0931

Attention: Will Stone

RE: CONSTRUCTION REVIEW OF RETAINING WALLS – CONSENT NO. BCO10372370

47 URUMARAKI AVENUE, HELENSVILLE

CMW Geosciences (CMW) visited the 47 Urumaraki Avenue, Helensville development, legally described as Lot 3 DP 523000, on a regular basis from November 2023 to March 2024 to observe the site works for the construction of cantilever pole retaining walls for the formation of the subdivision.

Our work has included review of the following documents and drawings:

- Conditions of Auckland Council Building Consent referenced BCO10372370, issued 25 October 2023.
- Consented construction drawings, prepared by Capture Land Development Consultants Limited referenced 1081, dated 11 September 2023.
- Geotechnical Investigation Report for 47 Urumaraki Avenue, Helensville prepared by CMW Geosciences, referenced AKL2022-0088AB Rev. 1, dated 1 September 2022.
- Cantilever Timber Pole Retaining Wall Design Report for 47 Urumaraki Avenue, Helensville prepared by CMW Geosciences, referenced AKL2022-0088AD Rev. 3, dated 6 October 2023.
- Capture As-built drawings ref 1081-AB-PSAB-0, dated 13 September 2024.

The site works observed and/or tested by CMW staff comprised construction observations of ground conditions and design specifications for the timber retaining walls.

Our testing demonstrated shear vane strengths surpassing the minimum requirements as per the CMW retaining wall design. Pile hole dimensions and spacings, timber dimensions and treatment stamps, drainage installation and handrail installation were also observed.

On lot 18, final wall extents have been removed from the original design location in conjunction with minor changes to final ground levels.

In addition, fence fixings were altered from the stainless steel specified to galvanised. Additional design documentation was provided to us for this variation and is appended.

On the basis of our observations and testing, we consider that the works observed and/ or tested have been completed in accordance with the approved Building Consent and related approved documentation described above, are in accordance with the requirements and/or recommendations of the geotechnical report and provide the basis for our attached PS4 Construction Review producer statement.

During our visits, where groundwater was encountered in pile holes, we discussed with the contractors the need to either pump the pile holes dry prior to pumping concrete, or to tremmie pour the concrete. We were not contacted prior to the pouring of the concrete to confirm this had been completed.

For and on behalf of CMW Geosciences

Prepared by:

Matt Illingworth
Project Engineering Geologist

Reviewed and authorised by:

Richard Knowles
Principal Geotechnical Engineer

Distribution: 1 electronic copy to Cabra Developments Limited via email
Original held at CMW Geosciences

Attachments: Producer Statement (PS4)
Structural Engineers New Zealand Limited Fence Connection Detail
Structural Engineers New Zealand Limited PS1 Addendum

PRODUCER STATEMENT – PS4
CONSTRUCTION REVIEW

BUILDING CODE CLAUSE(S): B1 **JOB NUMBER:** AKL2022-0088

ISSUED BY: CMW Geotechnical NZ Limited
(Construction Monitoring Firm)
TO: Cabra Developments Limited
(Owner/Developer)
TO BE SUPPLIED TO: Auckland Council
(Building Consent Authority)
IN RESPECT OF: Construction of Retaining Walls
(Description of Building Work)
AT: 47 Urumaraki Avenue, Helensville
(Address, Town/City)
LEGAL DESCRIPTION: Lot 3, DP 523000 **N/A** ☐

We have been engaged by the owner/developer referred to above to provide CM 3 **level of construction monitoring relating to** the Clause(s) named above of the Building Code for the building work which is covered by PS1(s) issued by CMW Geotechnical NZ Limited (*Engineering Design Firm*) and which is described in the documents relating to the Building Consent No. BCO10372370 and those relating to Building Consent Amendment(s) No. N/A issued during the course of the works, .

We have sighted these Building Consents and the conditions attached to them.
If any of the fields above are too small, please write "refer the Schedule".

Authorised instructions/variation(s) detailed/listed in the Schedule have been issued during the course of the works.

On the basis of these review(s) and information supplied by the contractor during the course of the works and **on behalf of the engineering firm** undertaking this Construction Monitoring, **I believe on reasonable grounds** that the building works covered by the above-mentioned PS1(s) have been completed in accordance with the relevant requirements of the Building Consent and Building Consent Amendments identified above or in the Schedule on page 2, with respect to Clause(s) B1 of the Building Code. I also believe on reasonable grounds that the persons who have undertaken this construction review have the necessary competency to do so.

I, *(Name of Construction Monitoring Professional)* Richard Knowles (AC Author #2342) , am:

- CPEng number 160049
- I hold the following qualifications BE Civil ,

The Construction Monitoring Firm holds a current policy of Professional Indemnity Insurance no less than $200,000 The Construction Monitoring Firm Is a member of ACE New Zealand.

SIGNED BY *(Name of Construction Monitoring Professional)*: Richard Knowles (AC Author #2342)
(Signature below):

ON BEHALF OF *(Construction Monitoring Firm)*: CMW Geotechnical NZ Limited Date: 11/9/24

Note: This statement has been prepared solely for the Building Consent Authority named above and shall not be relied upon by any other person or entity. Any liability in relation to this statement accrues to the Construction Monitoring Firm only. As a condition of reliance on this statement, the Building Consent Authority accepts that the total maximum amount of liability of any kind arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in tort or otherwise, is limited to the sum of $200,000.

This form is to accompany **Forms 6 or 8 of the Building (Forms) Regulations 2004** for the issue of a Code Compliance Certificate.

SCHEDULE to PS4

Please include an itemised list of all referenced documents, drawings, or other supporting materials in relation to this producer statement below:

CMW letter referenced AKL2022-0088AG Rev. 0 dated 11 September 2024

Consented construction drawings, prepared by Capture Land Development Consultants Limited referenced 1081, dated 11 September 2023.

Geotechnical Investigation Report for 47 Urumaraki Avenue, Helensville prepared by GMW Geosciences, referenced AKL2022-0088AB Rev. 1, dated 1 September 2022.

Cantilever Timber Pole Retaining Wall Design Report for 47 Urumaraki Avenue, Helensville prepared by GMW Geosciences, referenced AKL2022-0088AD Rev. 3, dated 6 October 2023.

Capture As-Built Drawings

GUIDANCE ON USE OF PRODUCER STATEMENTS

Information on the use of Producer Statements and Construction Monitoring Guidelines can be found on the Engineering New Zealand website
https://www.engineeringnz.org/engineer-tools/engineering-documents/producer-statements/

Producer statements were first introduced with the Building Act 1991. The producer statements were developed by a combined task committee consisting of members of the New Zealand Institute of Architects (NZIA), Institution of Professional Engineers New Zealand (now Engineering New Zealand), Association of Consulting and Engineering New Zealand (ACE NZ) in consultation with the Building Officials Institute of New Zealand (BOINZ). The original suite of producer statements has been revised at the date of this form to ensure standard use within the industry.

The producer statement system is intended to provide Building Consent Authorities (BCAs) with part of the reasonable grounds necessary for the issue of a Building Consent or a Code Compliance Certificate, without necessarily having to duplicate review of design or construction monitoring undertaken by others.

PS1 DESIGN Intended for use by a suitably qualified independent engineering design professional in circumstances where the BCA accepts a producer statement for establishing reasonable grounds to issue a Building Consent;

PS2 DESIGN REVIEW Intended for use by a suitably qualified independent engineering design review professional where the BCA accepts an independent design professional's review as the basis for establishing reasonable grounds to issue a Building Consent;

PS3 CONSTRUCTION Forms commonly used as a certificate of completion of building work are Schedule 6 of NZS 3910:2013 or Schedules E1/E2 of NZIA's SCC 2011[2]

PS4 CONSTRUCTION REVIEW Intended for use by a suitably qualified independent engineering construction monitoring professional who either undertakes or supervises construction monitoring of the building works where the BCA requests a producer statement prior to issuing a Code Compliance Certificate.

This must be accompanied by a statement of completion of building work (Schedule 6).

The following guidelines are provided by ACE New Zealand and Engineering New Zealand to interpret the Producer Statement.

Competence of Engineering Professional
This statement is made by an engineering firm that has undertaken a contract of services for the services named, and is signed by a person authorised by that firm to verify the processes within the firm and competence of its personnel.

The person signing the Producer Statement on behalf of the engineering firm will have a professional qualification and proven current competence through registration on a national competence-based register such as a Chartered Professional Engineer (CPEng).

Membership of a professional body, such as Engineering New Zealand provides additional assurance of the designer's standing within the profession. If the engineering firm is a member of ACE New Zealand, this provides additional assurance about the standing of the firm.

Persons or firms meeting these criteria satisfy the term "suitably qualified independent engineering professional".

Professional Indemnity Insurance
As part of membership requirements, ACE New Zealand requires all member firms to hold Professional Indemnity Insurance to a minimum level.

The PI Insurance minimum stated on the front of this form reflects standard practice for the relationship between the BCA and the engineering firm.

Professional Services during Construction Phase
There are several levels of service that an engineering firm may provide during the construction phase of a project (CM1-CM5 for engineers[3]). The building Consent Authority is encouraged to require that the service to be provided by the engineering firm is appropriate for the project concerned.

Requirement to provide Producer Statement PS4
Building Consent Authorities should ensure that the applicant is aware of any requirement for producer statements for the construction phase of building work at the time the building consent is issued as no design professional should be expected to provide a producer statement unless such a requirement forms part of the Design Firm's engagement.

Refer Also:

1 Conditions of Contract for Building & Civil Engineering Construction NZS 3910: 2013
2 NZIA Standard Conditions of Contract SCC 2011
3 Guideline on the Briefing & Engagement for Consulting Engineering Services (ACE New Zealand/Engineering New Zealand 2004)
4 PN01 Guidelines on Producer Statements

www.acenz.org.nz
www.engineeringnz.org

STRUCTURAL ENGINEERS NEW ZELAND
CONSULTING STRUCTURAL ENGINEERS

RESIDENTIAL, COMMERCIAL, INDUSTRIAL
SEISMIC, TEMPORARY WORKS

LEVEL 1, 52 HIGHBROOK DRIVE, EAST TAMAKI
AUCKLAND 2161
info@structural-engs.co.nz www.structural-engs.co.nz
Phone: +64 9 275 6029, Evening: +64 9 889 9350

055-109
ALUMINIUM RESDIENTIAL CLASS BALUSTRADES FOR URBAN GROUP

47 URUMARAKI AVENUE, HELENSVILLE 0875, AUCKLAND
SENZ STUCTURAL PS1
Feb 2024

STRUCTURAL ENGINEERS NZ PS1

BUILDING CODE CLAUSE(S): B1 **JOB NUMBER:** 055-109

ISSUED BY: STRUCTURAL ENGINEERS NZ LTD
(Engineering Design Firm)

TO: URBAN GROUP
(Owner/Developer)

TO BE SUPPLIED TO: Auckland Council
(Building Consent Authority)

IN RESPECT OF: Structural Design Of Aluminium Balustrades For Residential Class Barrier Loading
(Description of Building Work)

AT: 47 Urumaraki Avenue, Helensville 0875, Auckland
(Address, Town/City)

LEGAL DESCRIPTION: LOT: 3 DP: 523000 N/A ☐

We have been engaged by the owner/developer referred to above to provide *(Extent of Engagement)* :
Structural Engineering Services As Per Attached Drawings
in respect of the requirements of the Clause(s) of the Building Code specified above for Part Only , as specified in the Schedule, of the proposed building work.

The design carried out by us has been prepared in accordance with:
- ☑ Compliance documents issued by the Ministry of Business, Innovation & Employment (Verification method/acceptable solution) B1-VM1/AS1 and/or;
- ☐ Alternative solution as per the attached Schedule.

The proposed building work covered by this producer statement is described on the drawings specified in the Schedule, together with the specification, and other documents set out in the Schedule.

On behalf of the Engineering Design Firm, and subject to:
- Site verification of the following design assumptions: Schedule to PS1 and inspection schedule appended
- All proprietary products meeting their performance specification requirements;

I believe on reasonable grounds that:
- the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the Schedule, will comply with the relevant provisions of the Building Code and that;
- the persons who have undertaken the design have the necessary competency to do so.

I recommend the CM1 level of **construction monitoring**.

I, Sadeer Kattan , am:
(Name of Engineering Design Professional)
- CPEng number 1013983
- and hold the following qualifications: BE(Hons), CMEngNZ(Structural), CPEng

The Engineering Design Firm holds a current policy of Professional Indemnity Insurance no less than $200,000.
The Engineering Design Firm is not a member of ACE New Zealand.

SIGNED BY: Sadeer Kattan
(Name of Engineering Design Professional)

(Signature):

ON BEHALF OF: STRUCTURAL ENGINEERS NZ LTD DATE: 19/02/2024

Note: This statement has been prepared solely for the Building Consent Authority named above and shall not be relied upon by any other person or entity. Any liability in relation to this statement accrues to the Engineering Design Firm only. As a condition of reliance on this statement, the Building Consent Authority accepts that the total maximum amount of liability of any kind arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in tort or otherwise, is limited to the sum of $200,000.

This form is to accompany **Form 2 of the Building (Forms) Regulations 2004** for the application of a Building Consent.

GUIDANCE ON USE OF PRODUCER STATEMENTS

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Producer statements were first introduced with the Building Act 1991. The producer statements were developed by a combined task committee consisting of members of the New Zealand Institute of Architects (NZIA), Institution of Professional Engineers New Zealand (now Engineering New Zealand), Association of Consulting and Engineering New Zealand (ACE NZ) in consultation with the Building Officials Institute of New Zealand (BOINZ). The original suite of producer statements has been revised at the date of this form to ensure standard use within the industry.

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This must be accompanied by a statement of completion of building work (Schedule 6).

The following guidelines are provided by ACE New Zealand and Engineering New Zealand to interpret the Producer Statement.

Competence of Engineering Professional

This statement is made by an engineering firm that has undertaken a contract of services for the services named, and is signed by a person authorised by that firm to verify the processes within the firm and competence of its personnel.

The person signing the Producer Statement on behalf of the engineering firm will have a professional qualification and proven current competence through registration on a national competence-based register such as a Chartered Professional Engineer (CPEng).

Membership of a professional body, such as Engineering New Zealand provides additional assurance of the designer's standing within the profession. If the engineering firm is a member of ACE New Zealand, this provides additional assurance about the standing of the firm.

Persons or firms meeting these criteria satisfy the term "suitably qualified independent engineering professional".

Professional Indemnity Insurance

As part of membership requirements, ACE New Zealand requires all member firms to hold Professional Indemnity Insurance to a minimum level.

The PI Insurance minimum stated on the front of this form reflects standard practice for the relationship between the BCA and the engineering firm.

Professional Services during Construction Phase

There are several levels of service that an engineering firm may provide during the construction phase of a project (CM1- CM5 for engineers[3]). The building Consent Authority is encouraged to require that the service to be provided by the engineering firm is appropriate for the project concerned.

Requirement to provide Producer Statement PS4

Building Consent Authorities should ensure that the applicant is aware of any requirement for producer statements for the construction phase of building work at the time the building consent is issued as no design professional should be expected to provide a producer statement unless such a requirement forms part of the Design Firm's engagement.

Refer Also:

1. Conditions of Contract for Building & Civil Engineering Construction NZS 3910: 2013
2. NZIA Standard Conditions of Contract SCC 2011
3. Guideline on the Briefing & Engagement for Consulting Engineering Services (ACE New Zealand/Engineering New Zealand 2004)
4. PN01 Guidelines on Producer Statements

www.acenz.org.nz
www.engineeringnz.org

SCHEDULE TO PRODUCER STATEMENT - PS1 DESIGN

Alternative Solutions

SENZ Documentation

1) Drawings 055-002-02G-000 to 055-002-02S-102 rev 2 & 055-109-SK01 rev0

Design assumptions, Proprietary products and Other exclusions:

1) Site verification of the following design assumptions:

   0

   Inspections as per SENZ schedule and all SED elements including the provision for a corresponding PS4.

2) All proprietary products meeting their performance specification requirements; in particular this Producer Statement excludes:

3) Other exclusions; this producer statement excludes all aspects of:

   Supporting structure is adequate to resist the applied loads
   Design of retaining wall laggings supporting balustrades

The Producer Statements issued should not be relied on to establish compliance with the building code clauses E1, E2, E3.
Weathertightness and waterproofing design, materials, proprietary products, construction and/or inspections are specifically excluded from these producer statements.

To the Building Official,

Auckland Council

Structural Design Of Aluminium Balustrades For Residential Class Barrier Loading At 47 Urumaraki Avenue, Helensville 0875

Compliance with the Building Code Clause B2 - Durability

The purpose of this letter is to demonstrate how compliance with Clause B2 (Durability) of the Building Code will be achieved for the above project. We can confirm that for specifically designed structural elements that are included within our design documentation:

Material	Means of Compliance	Details
Aluminium	B2/AS1	Aluminium protection (painting and separation from dissimilar metals), shall be specified in accordance with clauses 6.6 and 6.7 of AS/NZS 1664.1

Yours faithfully,

Sadeer Kattan

For and on behalf of

STRUCTURAL ENGINEERS NZ LTD

Structural Maintenance Schedule

Project: Structural Design Of Aluminium Balustrades For Residential Class Barrier Loading At 47 Urumaraki Avenue, Helensville 0875, Auckland

This schedule of ongoing inspection and maintenance of structural elements shall be included with the Operations and Maintenance manuals and provided to the Owner/Body Corporate and building managers.

Inspection/maintenance timeframe and item	
Half-yearly	Wash down all exposed steelwork that is not in a fully interior environment including: • Veranda steelwork • Steel Carpark structure (beams, columns, braces etc) • Deck and balcony steelwork • Exposed façade steelwork, both primary and secondary structure • Plantrooms and plenums with fresh-air intakes • External structural components such as Buckling Restrained Braces, Viscous Dampers, Eccentrically Braced Frames and the like • Sub-ground floor mild-steel structures such as beams, isolation bearings etc.
(b) 5 yearly	Inspect and repair sealant that encloses structural mild-steel components and/or timber with mild-steel fixings
(c) 10 yearly	Check exposed timber fixings for corrosion, repair as required.
	Inspect/replace sealant that encloses structural mild-steel components and/or timber with mild-steel fixings. This will typically include sealants around the perimeter of precast panels. Note that 10 years is the expected useful life for many sealants
	Check exposed structural steel within plantrooms and plenums for corrosion. Repair protective coatings as required.
	Check all exposed steelwork that is not in a fully interior environment for signs of corrosion. Repair protective coatings as required.
	Audit of damage to exposed intumescent coatings. Repair as required.
(d) 25 yearly	Inspect samples of structural steel that is hidden from view but not enclosed within a vapour barrier, and repair protective coatings as necessary. A typical example is a veranda with built-in steelwork. (Such steelwork should typically have duplex protective coatings). Inspection may typically require removal of claddings and/or the drilling of holes for borescope access. Repair as required.
	Inspect all exposed, external timber. Repair as required.
	Inspect all exposed, external reinforced concrete for signs of spalling or cracking. Repair as required.
	Audit of damage to enclosed intumescent coatings. Repair as required.
Following fit-out or alterations	Audit of damage to intumescent coatings. Repair as required.
Following seismic shaking > SLS1 event	Inspections and repair as per b), c) and d) above

The durability of structural building work is reliant on protection from external water and moisture being achieved and maintained throughout the life of the building or structure. Protection against external water and moisture is dependent on appropriate detailing, materials, proprietary products and construction practices which SENZ does not design/inspect for compliance with the requirements of the building code.

SENZ accepts no liability in contract, tort, or otherwise (including negligence) for the failure of the building or structure to meet or perform to the requirements of the Building Act 2004 (or any subsequent Act) and any regulations made there under (or any amendment or substitution thereof) in relation to: External water and/or moisture, the loss of structural durability or strength to the building or sturcture as a result of external moisture entering the building or structure, or the effects thereof.

Construction Monitoring Schedule

Schedule of inspections for:

Address: 47 Urumaraki Avenue, Helensville 0875, Auckland

The inspections required are also dependant on the conditions of the building consent as per local building authority requirements. We would advise checking with council when in doubt.

We confirm that SENZ have been engaged to undertake construction monitoring of the specific engineering design items to an Engineering New Zealand/ACENZ CM1 level and propose to undertake at least the following site inspections:

Inspections to be completed by:

Geotechnical Inspections		Geotech as engaged by the developer/owner	By SENZ
Site scrape	Inspection to confirm topsoil removal and subgrade/strength and/or sub/base compaction as per the geotechnical report.	☐	☐
Engineered fill or Gravel raft	Site geotextile and/or geogrid as required by design drawings and certify compaction as per design and geotechnical report.	☐	☐
Bridging parameters (if applicable)	Site geotextile and/or geogrid as required by design drawings and certify compaction as per design and geotechnical report.	☐	☐

No.	Item of inspection	Timeframe
1	SED Balustrades	As built inspection

Notes:

a) The above items of inspection are the minimum required to enable STRUCTURAL ENGINEERS NZ LTD to issue a PS4 - Producer Statement Construction Review for the specific engineering design items.

b) The above items of inspection do not cover work constructed in accordance with NZS 3604:2011, for which inspections are to be undertaken by the Building Consent Authority.

c) The Contractor/Builder is to provide STRUCTURAL ENGINEERS NZ LTD at least 24 hours' notice of the requirement for an inspection. The above timeframes are indicative, the Engineer and Contractor are to agree the timing of inspection prior to work commencing on site.

d) A copy of this inspection schedule is to be held on site during the works, and the Contractor/Builder is to provide reasonable and safe access to enable works to be inspected according to the schedule.

e) The above schedule does not necessarily represent the actual number of inspections to be undertaken. The number of inspections will depend on the construction method, sequence of the works and whether or not unforeseen conditions or difficulties are encountered on site.

STRUCTURAL DRAWINGS
TYPICAL BALUSTRADE
RESIDENTIAL LOADING CLASS
JOB NUMBER - 055 - 002

Structural Engineers New Zealand

DWG NO	TITLE	REV	REV DATE
055-002-02G-000	DRAWING SCHEDULE	2	03/05/2023
055-002-02S-000	GENERAL NOTES	0	24/02/2021
055-002-02S-001	GENERAL ARRANGEMENT	0	24/02/2021
055-002-02S-100	CONNECTION DETAILS - 1	0	24/02/2021
055-002-02S-101	CONNECTION DETAILS - 2	2	03/05/2023
055-002-02S-102	CONNECTION DETAILS - 3	0	24/02/2021

REV	Issue	By	Chk	Appd	Date
2	FOR CONSTRUCTION	MW	SK	SK	03/05/23
1	FOR CONSTRUCTION	MW	SK	SK	18/03/22
0	FOR CONSTRUCTION	MW	SK	SK	24/02/21

Business Address: Level 1 52 Highbrook Drive, East Tamaki, Auckland
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E-mail Address: info@structural-engs.co.nz
Website: www.structural-engs.co.nz

Structural Engineers New Zealand
Chartered Civil & Structural Engineers

Client: UrbanGroup™

Project: RESIDENTIAL LOADING CLASS TYPICAL BALUSTRADES

FOR CONSTRUCTION

Title: DRAWING SCHEDULE

Drawing No. 055 - 002 - 02G - 000

Rev. 2

GENERAL NOTES

1. THESE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE STRUCTURAL ENGINEERS NZ DESIGN FEATURES REPORT, ARCHITECTURAL DRAWINGS, CIVIL ENGINEERING DRAWINGS, AND THE GEOTECHNICAL REPORT FOR THE PROPERTY. COPIES OF ALL THE LISTED DOCUMENTS ARE TO BE KEPT ON SITE AT ALL TIMES.

2. ALL WORKS ARE TO COMPLY WITH THE MOST RECENT VERSIONS OF THE NEW ZEALAND BUILDING ACT AND THE BUILDING CODE.

3. DIMENSIONS ARE TO BE READ FROM DRAWINGS, NOT SCALED FROM THEM. ALL DIMENSIONS ARE TO BE CHECKED ON-SITE PRIOR TO SETTING OUT.

4. ALL DIMENSIONS ARE IN MILLIMETRES (mm), ALL LEVELS ARE IN METRES (m), UNLESS OTHERWISE NOTED.

5. THE CONTRACTOR SHALL TAKE PRECAUTIONS TO ESTABLISH LOCATION OF EXISTING SERVICES AT SITE. SERVICES SHOWN ON DRAWINGS ARE IN APPROXIMATE LOCATIONS ONLY. SERVICES OTHER THAN THOSE SHOWN MAY EXIST ON SITE. ONLY HAND EXCAVATION ALLOWED WITHIN ONE METRE OF SERVICES.

6. THE CONTRACTOR IS RESPONSIBLE FOR THE DESIGN, INSTALLATION AND MAINTENANCE OF ALL NECESSARY TEMPORARY WORKS INCLUDING TEMPORARY STRUCTURAL SUPPORTS TO ENSURE STRENGTH AND STABILITY OF THE STRUCTURE AND ADEQUATE SUPPORT TO THE STRUCTURES WITHOUT ANY ADVERSE EFFECT TO THE STRUCTURES OR ADJACENT STRUCTURES..

7. THE CONTRACTOR SHALL ENSURE THAT ALL REGULATORY CONSENT DOCUMENTATION AS REQUIRED BY THE COUNCIL OR OTHERS HAS BEEN ISSUED BEFORE COMMENCING CONSTRUCTION WORKS.

8. ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE CURRENT CODES OF PRACTICE EXCEPT WHERE VARIED BY THE DESIGN FEATURES REPORT AND/OR DRAWINGS.

9. THE LOCATION, SIZE AND DETAILS OF ALL PENETRATIONS, RECESSES, SLEEVES, HOLES ETC IN STRUCTURAL MEMBERS MUST BE APPROVED BY THE ENGINEER PRIOR TO CONSTRUCTION UNLESS SHOWN ON THE STRUCTURAL DRAWINGS. THESE ITEMS SHALL BE CAST-IN, FORMED, OR SHOP FABRICATED AND SHALL NOT BE CUT OR COVED ON SITE, UNLESS NOTED OTHERWISE OR APPROVED BY THE ENGINEER.

10. SUBSTITUTION FOR OR AMENDMENT OF SPECIFIED DETAILS OR MATERIALS SHALL NOT BE CARRIED OUT WITHOUT APPROVAL OF THE ENGINEER.

11. WHERE PROPRIETARY PRODUCTS ARE SPECIFIED IN THE DOCUMENTS THE CONTRACTOR MAY SUBMIT AN ALTERNATIVE PRODUCT FOR APPROVAL BY THE ENGINEER.

12. VERIFY ALL DIMENSIONS WITH ARCHITECTURAL, SERVICES, AND ALL OTHER PROJECT DRAWINGS PRIOR TO CONSTRUCTION COMMENCING. ANY DISCREPANCIES WITH THE ARCHITECTURAL DRAWINGS RELATING TO THE CONSTRUCTION WORKS SHOWN ON THESE DRAWINGS MUST BE REFERRED TO THE ENGINEER FOR CLARIFICATION..

13. ALL WORKS SPECIFIED IN THE FOLLOWING DRAWINGS ARE CLASSIFIED AS RESTRICTED BUILDING WORK.

14. THE ENGINEER AND THE LOCAL COUNCIL ARE TO BE NOTIFIED IMMEDIATELY UPON THE DISCOVERY OF ARCHAEOLOGICAL REMAINS ON SITE. ALL WORKS ON SITE MUST BE STOPPED UNTIL APPROVAL HAS BEEN GIVEN BY CCC AND THE ENGINEER.

SITE CLEARANCE AND DEMOLITION

15. ALL WORK SHOULD BE IN ACCORDANCE WITH THE HEALTH AND SAFETY IN EMPLOYMENT ACT 1992.

INSTALLATION OF COMPACTED HARDFILL

16. THE EXCAVATION SHOULD BE AS INDICATED ON DRAWINGS OR TO A LEVEL WHERE THE SOIL ACHIEVES A GEOTECHNICAL ULTIMATE BEARING CAPACITY OF 300kPa.

17. COMPACTED HARDFILL WHERE REQUIRED SHALL BE IN ACCORDANCE WITH NZS 4402:1998 WITH REGARDS TO MOISTURE CONTENT.

18. COMPACTION WHERE REQUIRED SHALL BE CARRIED OUT IN CONTROLLED LAYERS OF NOT MORE THAN 150MM COMPACTED DEPTH, USING A 4-7 TONNE VIBRO-ROLLER UNTIL THE SITE IS BROUGHT TO A LEVEL SUITABLE FOR CONSTRUCTION OF A CONCRETE SLAB ON GRADE. TARGET COMPACTION CIV OF 18 IS REQUIRED. A19 GEOTEXTILE SHALL BE PLACED ON THE SUBGRADE LEVEL PRIOR TO PLACEMENT OF HARDFILL.

CONCRETE WORK

19. ALL CONCRETE WORK SHOULD BE IN ACCORDANCE WITH THE STANDARDS AND CODE OF PRACTICES SPECIFIED IN THE DESIGN FEATURES REPORT.

20. CONCRETE STRENGTHS ARE SPECIFIED 28 DAY COMPRESSIVE STRENGTHS AS DEFINED IN NZS 3109:1987. WHERE NOT SPECIFIED, THE CONCRETE STRENGTH SHALL BE 20MPa, 100 MM SLUMP MIX WITH EITHER 13 MM OR 19 MM NOMINAL AGGREGATE SIZE U.N.O.

21. SURFACE FINISHES ARE F4 AND U2

22. MINIMUM CONCRETE COVERS ARE NOT LESS THAN 60MM.

23. NO SAW CUTS OR CONSTRUCTION JOINTS ARE TO BE FORMED IN THE SLAB UNLESS NOTED OR SHOWN ON THE DRAWINGS.

24. POLYSTYRENE UNDER SLAB FOUNDATIONS SHALL BE EXPANDED POLYSTYRENE DOW STYROFOAM RTM-X OR APPROVED EQUIVALENT

REINFORCEMENT

25. STAGGER LAPS WHERE POSSIBLE. WHERE LAPS ARE NOT STAGGERED INCREASE LAP LENGTH BY 30%. WHERE GAPS BETWEEN LAP BARS EXIST, THE LAP LENGTH SHALL BE EXTENDED BY 1.5xGAP.

26. MINIMUM LAP FOR FABRIC SHALL BE ONE MESH BAR SPACING PLUS 50mm.

27. PLACING AND SPACING OF REINFORCEMENT – GENERAL

    a) SPLICING OF REINFORCEMENT, WHETHER BY LAPPING, WELDING OR MECHANICAL SPLICE SHALL ONLY BE CARRIED OUT AS SHOWN ON THE DRAWINGS OR AS SPECIFICALLY APPROVED BY THE ENGINEER.
    – WELDED WIRE MESH SHALL BE SPLICED AS REQUIRED, BUT NOT THROUGH SLAB JOINTS.

    b) ALL HOOKS ON STIRRUP AND TIES MUST FIT CLOSELY AROUND MAIN BARS U.N.O.
    FIRST STIRRUP TO BE PLACED NOT FURTHER THAN THE LESSER OF 1/2 STIRRUP SPACING OR 50mm FROM SUPPORT FACE.

28. LAP SPLICES IN REINFORCEMENT

    a) LAP LENGTHS FOR DEFORMED BARS SHALL BE AS SHOWN IN THE FOLLOWING TABLES U.N.O.
    c) NOTE RE USE OF THE FOLLOWING TABLES:

    – TOP BAR FACTOR IS 1.0 FOR ALL VERTICAL BARS (COLUMNS, WALLS) AND FOR HORIZONTAL BARS WITH LESS THAN 300mm OF FRESH CONCRETE CAST BENEATH BAR (TYPICALLY BEAM BOTTOM BARS AND SLAB BARS).
    – TOP BAR FACTOR IS 1.3 FOR ALL HORIZONTAL BARS WITH MORE THAN 300mm OF FRESH CONCRETE CAST BENEATH THE BAR (TYPICALLY BEAM TOP BARS AND HORIZONTAL WALL BARS).

	25 MPa CONCRETE	GRADE 300 DEFORMED	GRADE 500 DEFORMED
12mm BAR	1.0 FACTOR	400	600
12mm BAR	1.3 FACTOR	500	800
16mm BAR	1.0 FACTOR	500	800
16mm BAR	1.3 FACTOR	650	1050
20mm BAR	1.0 FACTOR	650	1000
20mm BAR	1.3 FACTOR	800	1300

29. BARS ARE TO BE TO AS/NZS 4671 – GRADE 500E DEFORMED, OTHER THAN FOR TIES, STIRRUPS AND SPIRALS, THAT COULD BE MICRO ALLOY GRADE 300E UNLESS NOTED OR SHOWN OTHERWISE ON THE DRAWINGS.

30. ALL MASONRY REINFORCEMENT LAP LENGTH = 70 BAR DIAMETERS U.N.O.

31. ALL CELLS OF MASONRY WALLS SHALL BE FILLED WITH 17.5 mPa GROUT

32. WELDING OF HIGH STRENGTH REINFORCEMENT IN NOT PERMITTED.

STRUCTURAL STEEL

33. STEEL MEMBERS SHALL BE THE FOLLOWING GRADES U.N.O.

MOVE	GRADE
CHS, SHS, RHS	350
UB's, UC's, PFC's, TFC's & ANGLES (125 x 125 OR LARGER)	300
ANGLES (100 x 100 OR SMALLER)	250

34. FABRICATION SHALL COMPLY WITH NZS 3404:2009.

    a) STRAIGHTNESS OF MEMBERS AFTER FABRICATION AND BEFORE ERECTION U.N.O. SHALL NOT DEVIATE MORE THAN:
    STRUTS, COLUMNS = L/1000
    OTHER MEMBERS = L/600

    b) LENGTH SHALL NOT DEVIATE FROM THE TRUE LENGTH BY:
    STRUTS WITH END BEARING = x1mm
    OTHER MEMBERS UP TO L=9.0m = +0mm, -3mm
    OTHER MEMBERS OVER L=9.0m = +0mm, -5mm

35. BOLTING

    a) ALL HOLES SHALL BE DRILLED AND SHALL BE 2mm LARGER THAN THE BOLT DIAMETER U.N.O. HOLES IN BASEPLATES MAY BE 4mm LARGER THAN THE BOLT DIAMETER FOR CAST IN BOLTS ONLY.
    b) ALL BOLTS SHALL HAVE AT LEAST ONE THREAD PROJECTING THROUGH BOTH SIDES OF NUT.
    c) ALL BOLTS SHALL BE GRADE 4.6/s U.N.O.
    d) TIGHTENING PROCEDURE SHALL COMPLY WITH AS 1511. BOLTING ABBREVIATIONS ARE TO AS 1511 AND AISC PROCEDURES.

36. WELDING

    a) ALL WELDS SHALL BE 6mm CONTINUOUS FILLET U.N.O.
    b) ALL WELDS TO BE CLASS SP TO AS 1554 U.N.O.
    c) WELDING ELECTRODES SHALL BE E48XX TO AS 1583 U.N.O.
    d) ALL WELDS SHALL BE CARRIED OUT, OR SUPERVISED BY QUALIFIED WELDERS TO NZS4711 FOR THE POSITION USED.

37. STEEL WORK TO BE SUPPLIED FULLY HOT DIP GALVANIZED.

38. PLUMBNESS OF STRUTS/COLUMNS SHALL BE WITHIN L/1000 OF TRUE VERTICAL.

39. ALL GUSSET PLATES, CLEATS AND STIFFENERS SHALL BE GRADE 250 STEEL TO AS 3678 OR EQUIVALENT U.N.O.

TIMBER WORK

40. ALL TIMBER MATERIAL SHALL BE GRADE SG8 U.N.O.

41. ALL TIMBER TREATMENT AND CONNECTIONS SHALL BE TO NZS 3604 U.N.O.

42. ALL TIMBER FIXINGS SHALL BE TO NZS 3604:2011 U.N.O.

ABBREVIATIONS

BGL = BELOW GROUND LEVEL
C/C = CENTRE TO CENTRE
E.W = EACH WAY
F.F = FAR FACE
F.F.L. = FINISHED FLOOR LEVEL
F.G.L = FINISHED GROUND LEVEL
F.W. = FILLET WELD
F.W.A.R. = FILLET WELD ALL ROUND
G.W.L. = GROUND WATER LEVEL
HORIZ. = HORIZONTAL
L.A.R. = LAP AT RANDOM
N.F. = NEAR FACE
STRP = STIRRUP
T & B = TOP AND BOTTOM
T.O.C. = TOP OF CONCRETE
T.O.S. = TOP OF STEEL
VERT. = VERTICAL
CHS = CIRCULAR HOLLOW SECTION
EA = EQUAL ANGLE
PFC = PARALLEL FLANGE CHANNEL
RHS = RECTANGULAR HOLLOW SECTION
SHS = SQUARE HOLLOW SECTION
TFB = TAPER FLANGE BEAM
UA = UNEQUAL ANGLE
UB = UNIVERSAL BEAM
UC = UNIVERSAL COLUMN
C.O.S = CONFIRM ON SITE
UBC = ULTIMATE BEARING CAPACITY
U/S = UNDERSIDE

REV	Issue	By	Chk	Appd	Date
0	FOR CONSTRUCTION	MW	SK	SK	24/02/21

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Mobile Number: (+64) 021 967 977
E-mail Address: info@structural-engs.co.nz
Website: www.structural-engs.co.nz

SENZ Structural Engineers New Zealand
Chartered Civil & Structural Engineers

Client: UrbanGroup™

Project: RESIDENTIAL LOADING CLASS TYPICAL BALUSTRADES

FOR CONSTRUCTION

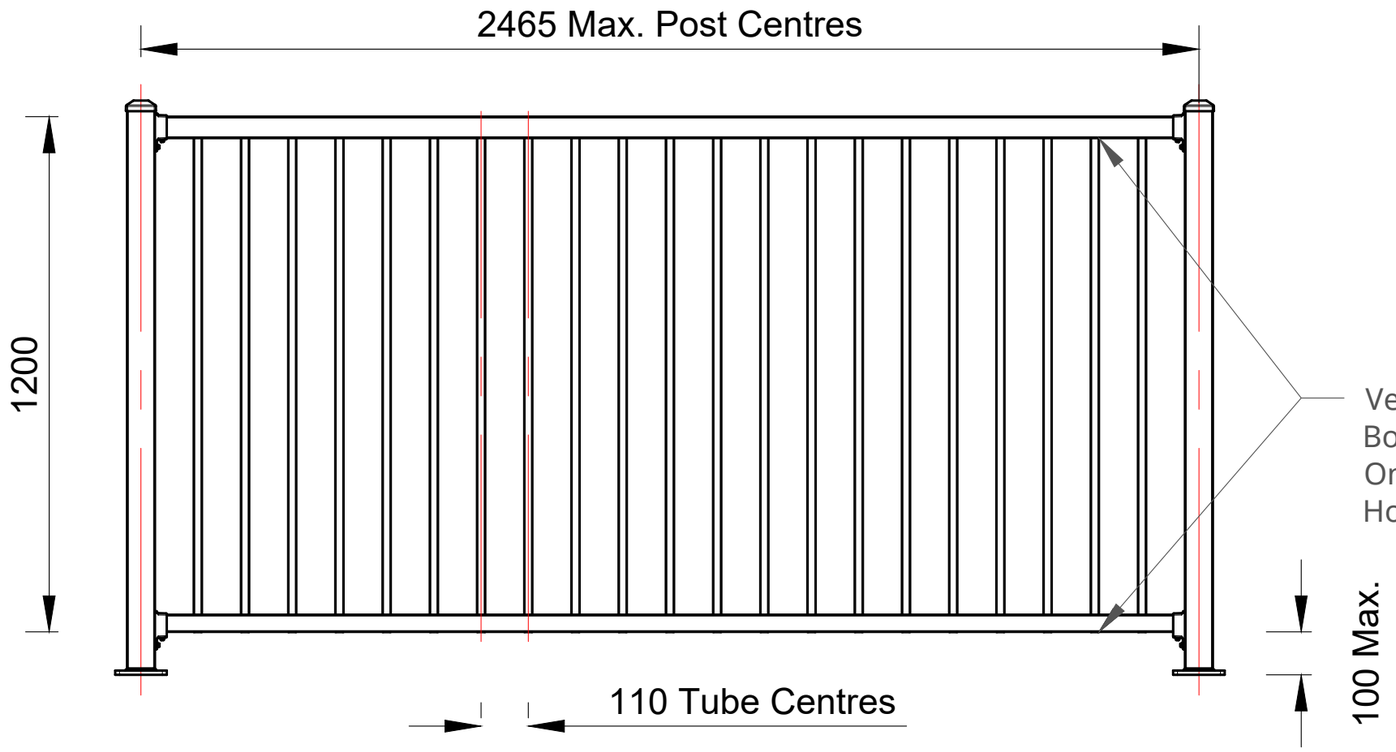
Title: GENERAL NOTES

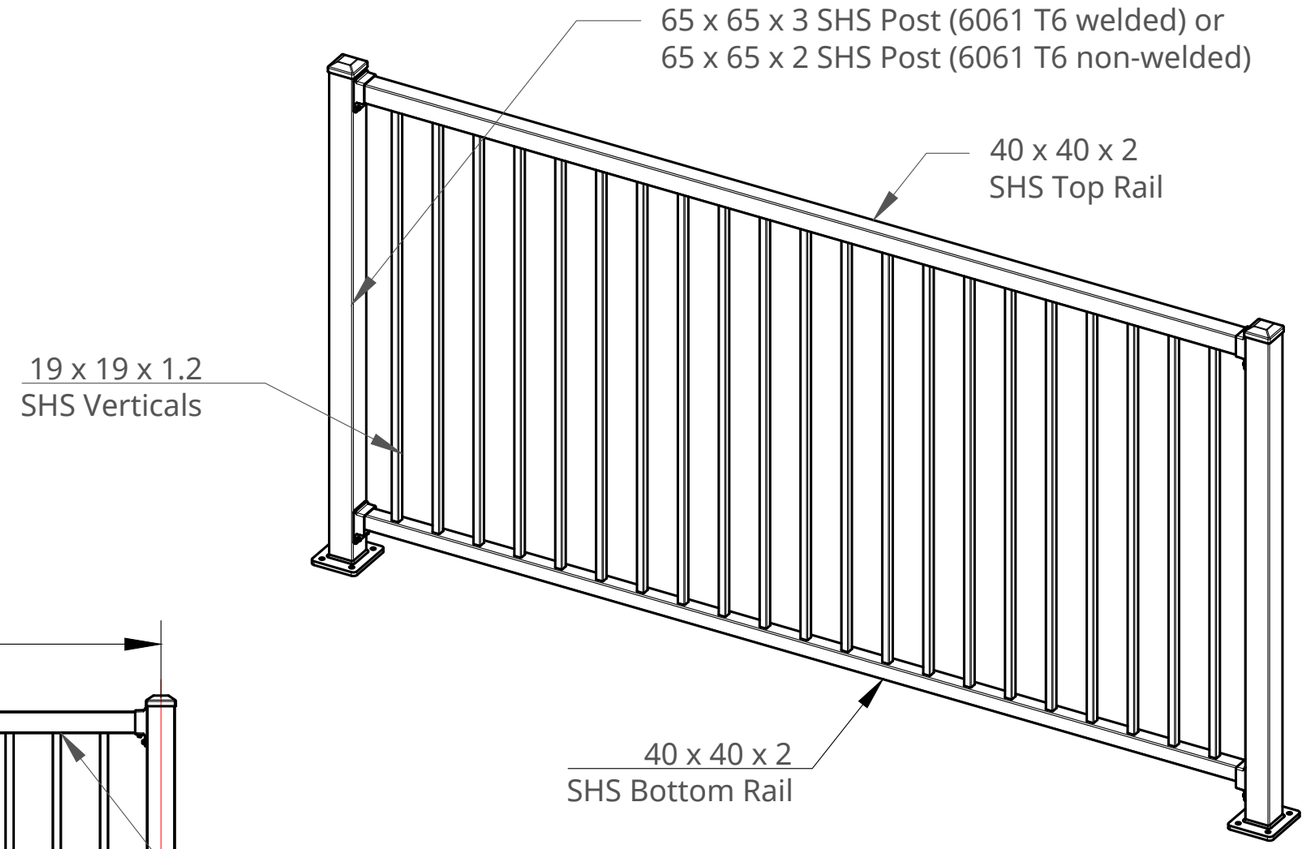
Drawing No. 055 - 002 - 02S - 000

Rev. 0

NOTES:

1. Balustrades shall be Aluminum Alloy 6060 T5, non welded except where the vertical balusters welding unless noted otherwise.
2. Isolation rubber or similar shall be provided between aluminum and Galvanised steel.
3. All connections shall be stainless steel or hot dip galvanised.
4. Existing Structure is assumed to be adequate to resist the applied handrail loads.





TOP RAIL LOAD = 0.35 kN/m OR 0.6 kN

INFILL LOAD = 0.5 kPa OR 0.25 kN

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SENZ Structural Engineers New Zealand
Chartered Civil & Structural Engineers

Client: UrbanGroup™

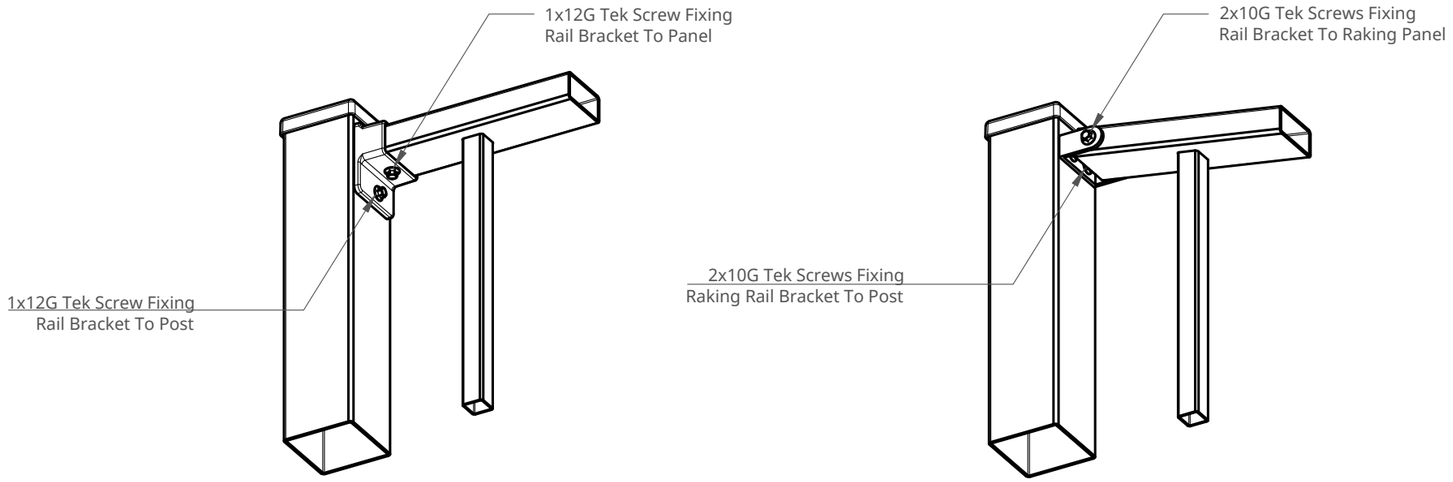
Project: RESIDENTIAL LOADING CLASS TYPICAL BALUSTRADES

FOR CONSTRUCTION

Title: GENERAL ARRANGEMENT

Drawing No. 055 - 002 - 02S - 001

Rev. 0



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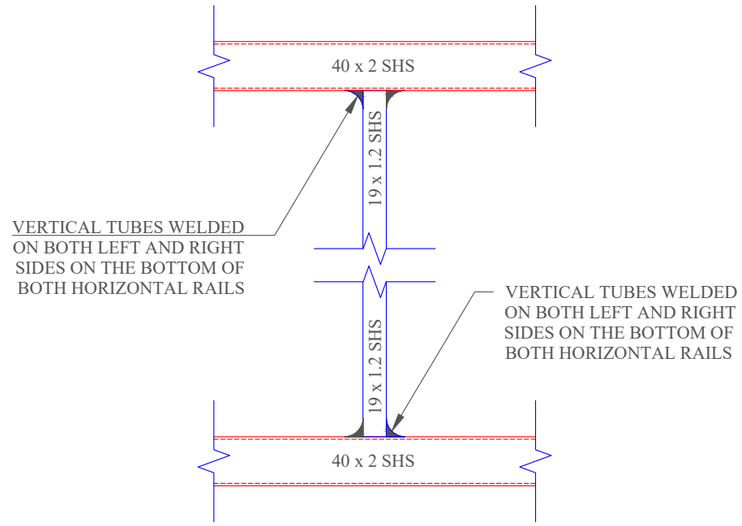

02 VERTICAL TUBES CONNECTION DETAIL
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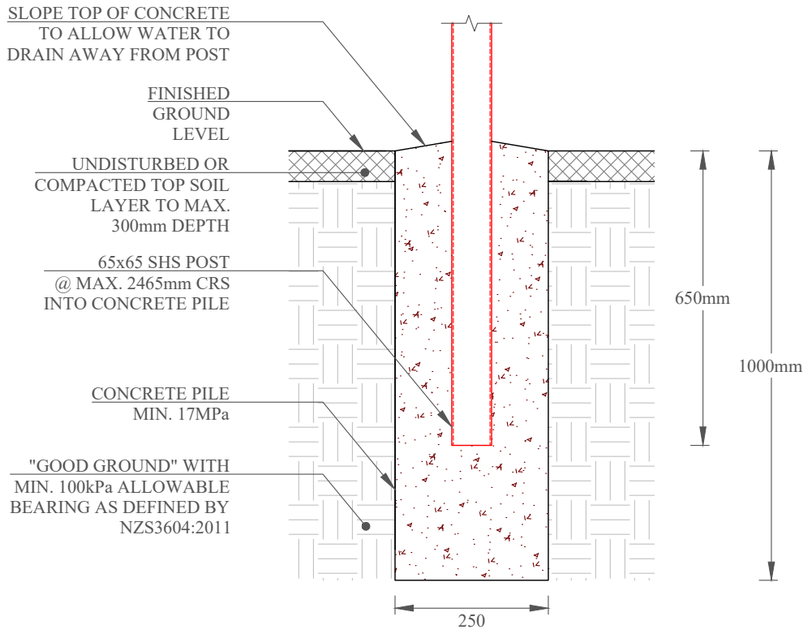

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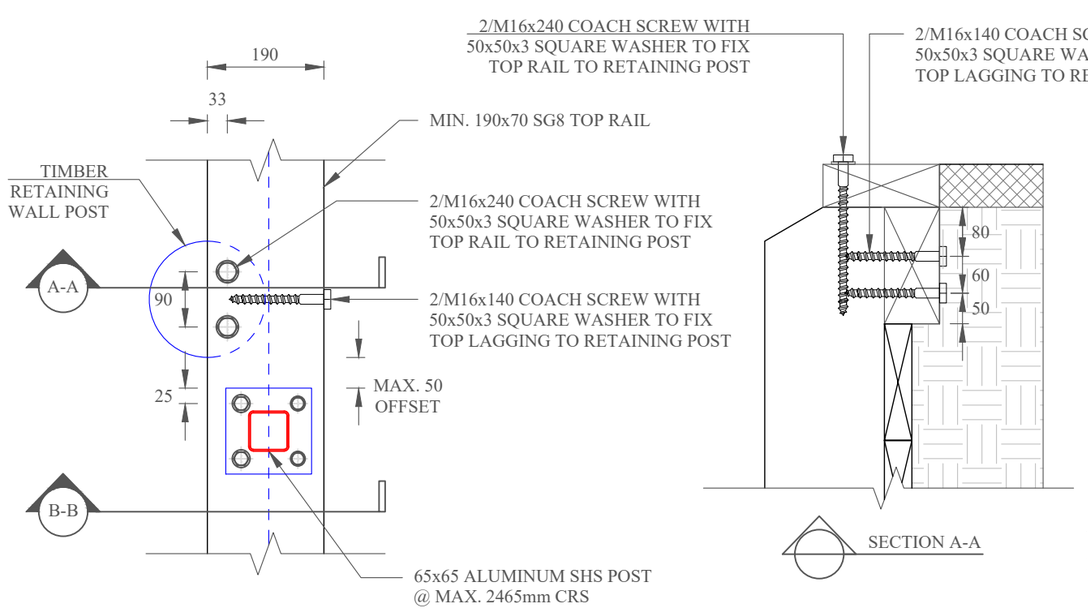

04 POST TOP-FIX TO TIMBER RETAINING WALL
Scale - 1:10 @ A3

REV	Issue	By	Chk	Appd	Date
0	FOR CONSTRUCTION	MW	SK	SK	24/02/21

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SENZ Structural Engineers New Zealand
Chartered Civil & Structural Engineers

Client: UrbanGroup™

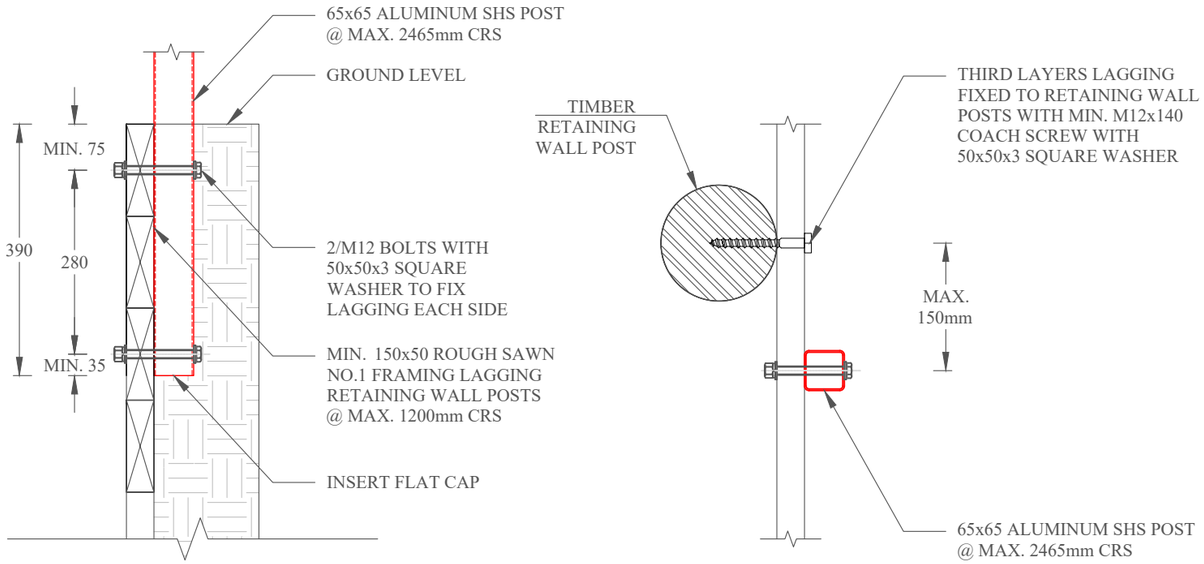
Project: RESIDENTIAL LOADING CLASS TYPICAL BALUSTRADES

FOR CONSTRUCTION

Title: CONNECTION DETAILS - 1

Drawing No. 055 - 002 - 02S - 100

Rev. 0



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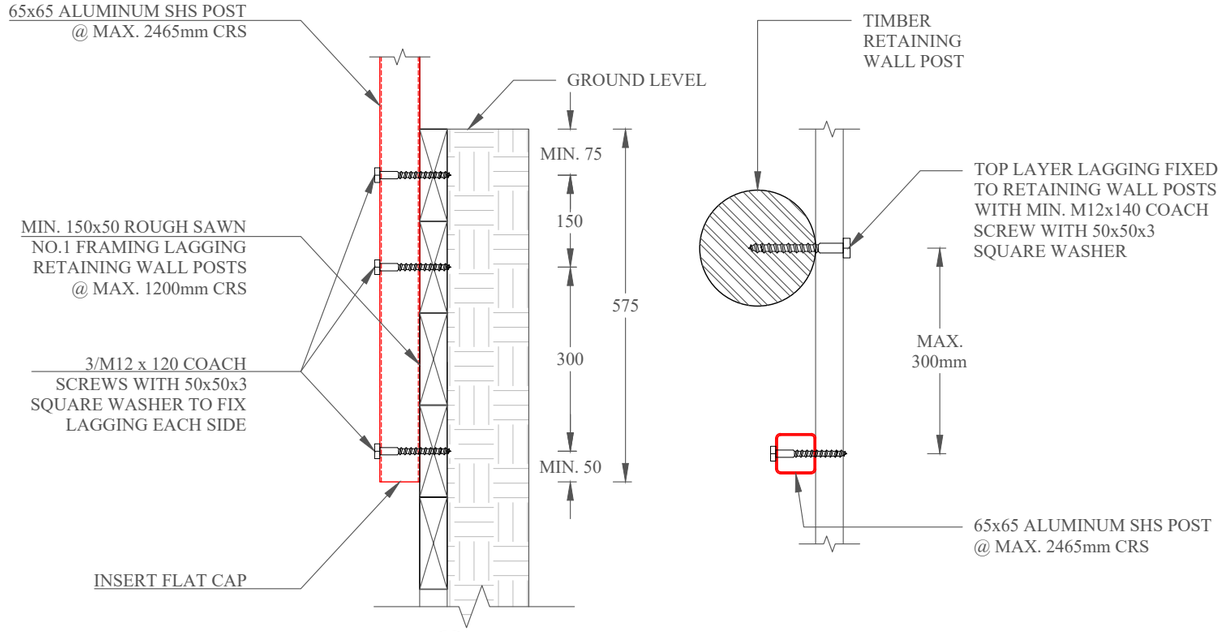
Scale - 1:10 @ A3



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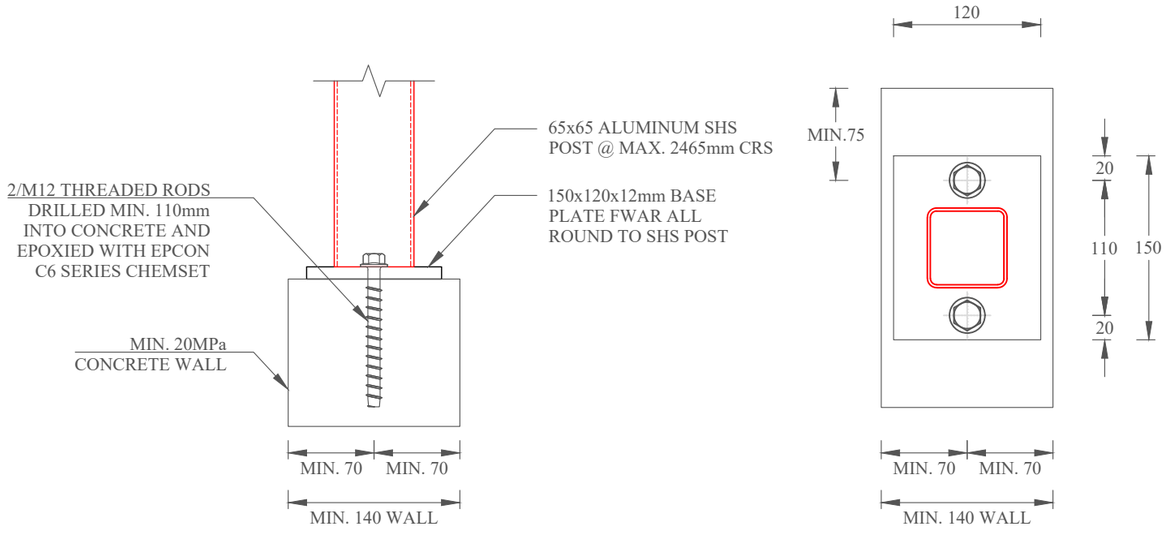

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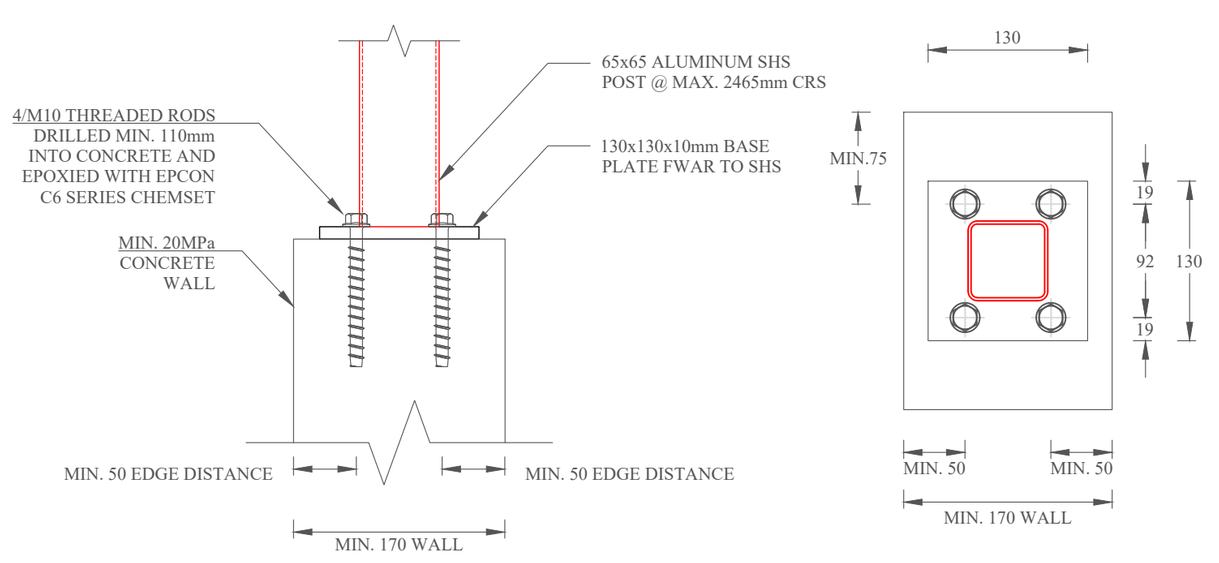

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Scale - 1:5 @ A3

REV	Issue	By	Chk	Appd	Date
2	FOR CONSTRUCTION	MW	SK	SK	03/05/23
1	FOR CONSTRUCTION	MW	SK	SK	18/03/22
0	FOR CONSTRUCTION	MW	SK	SK	24/02/21

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SENZ Structural Engineers New Zealand
Chartered Civil & Structural Engineers

Client: UrbanGroup™

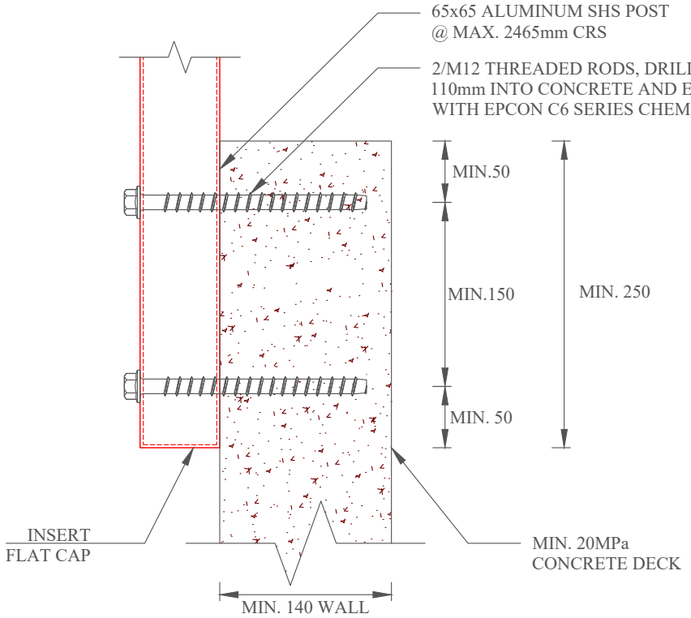
Project: RESIDENTIAL LOADING CLASS TYPICAL BALUSTRADES

FOR CONSTRUCTION

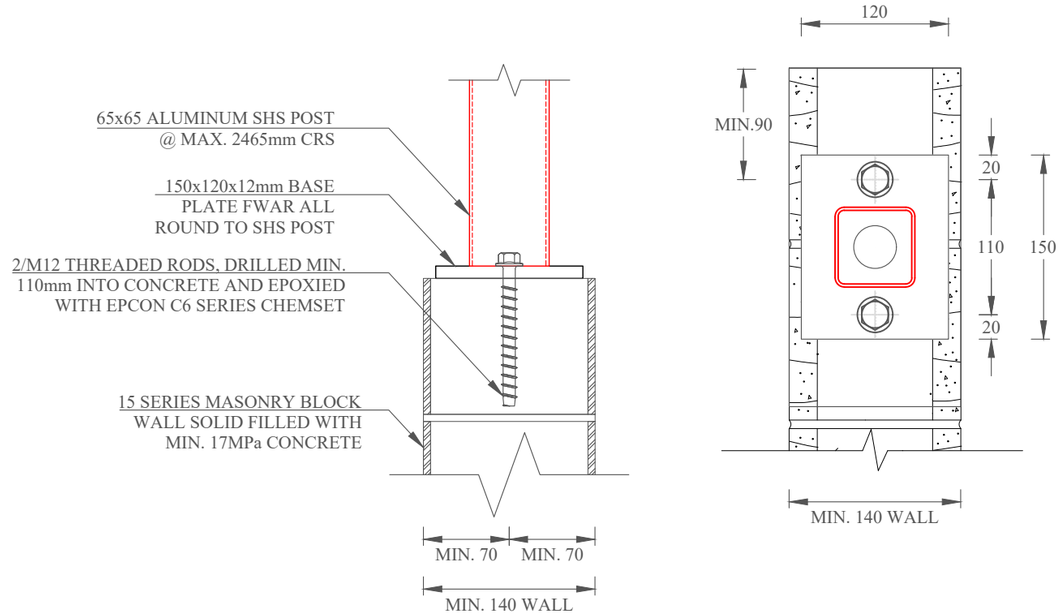
Title: CONNECTION DETAILS - 2

Drawing No. 055 - 002 - 02S - 101

Rev. 2



01 POST SIDE-FIX TO CONCRETE WALL
Scale - 1:5 @ A3



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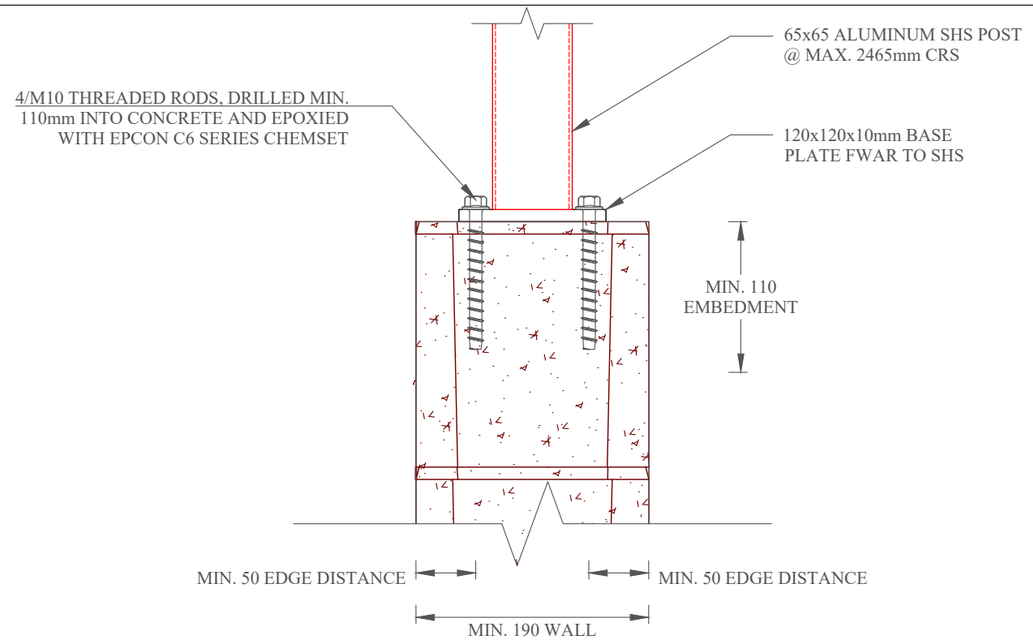

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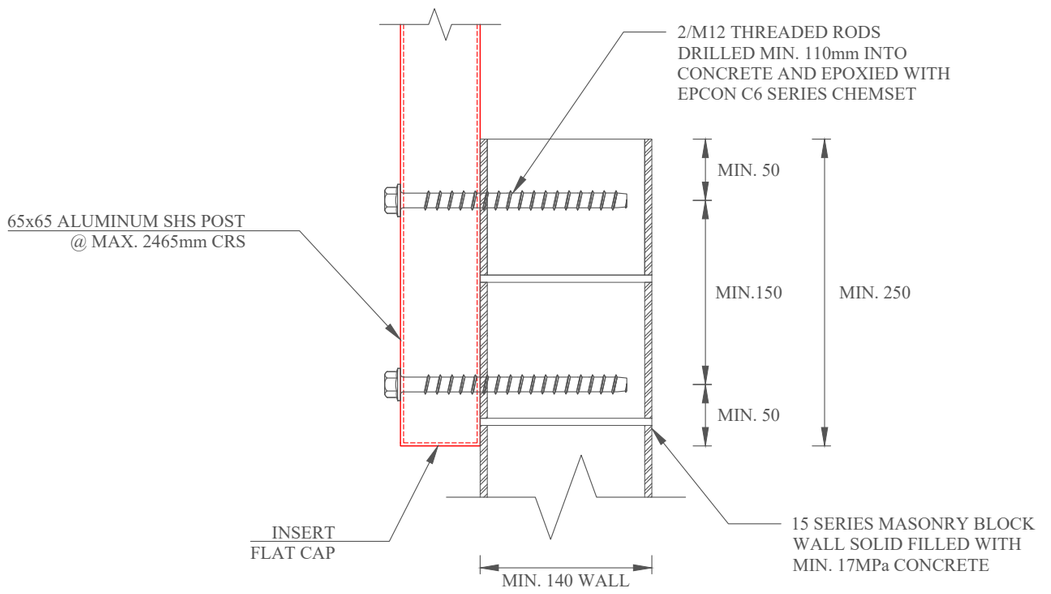

04 POST SIDE-FIX TO MASONRY WALL
Scale - 1:5 @ A3

REV	Issue	By	Chk	Appd	Date
0	FOR CONSTRUCTION	MW	SK	SK	24/02/21

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SENZ Structural Engineers New Zealand
Chartered Civil & Structural Engineers

Client: UrbanGroup™

Project: RESIDENTIAL LOADING CLASS TYPICAL BALUSTRADES

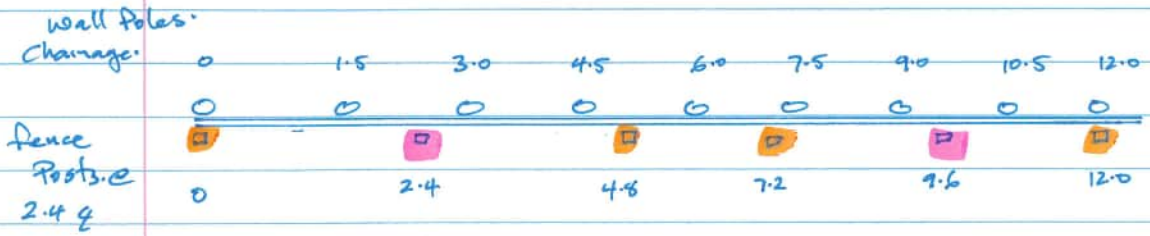
FOR CONSTRUCTION

Title: CONNECTION DETAILS - 3

Drawing No. 055 - 002 - 02S - 102

Rev. 0

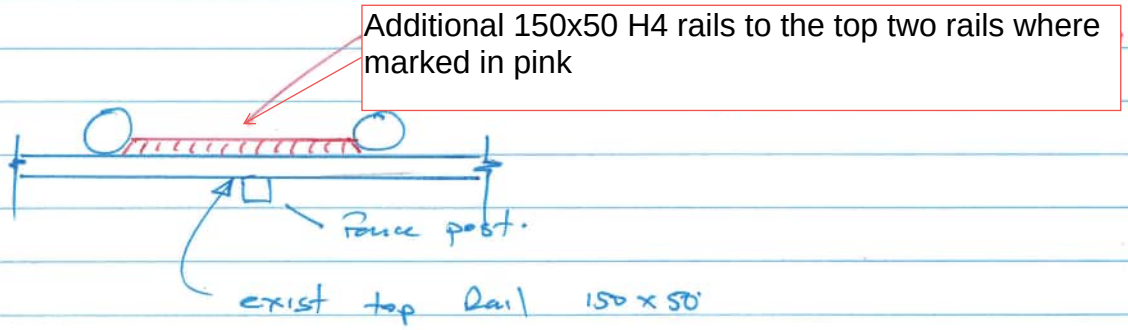
47 Urumaraki Ave. — Wall fencing. 31/01/24



Post less than 300mm from wall Pole.

Post > 300mm from wall pole. = 2 post per 12m

Possible solution. where fence post is further than 300mm. from wall Pole.



NOTE:
Retaining wall design is by others.

055-109-SK01 rev0
47 Urumaraki Avenue Handrails

Structural Engineers New Zealand

Consulting Civil & Structural Engineers
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• +64 275 6029 (Day) • +64 9 8899 350 (Evening)

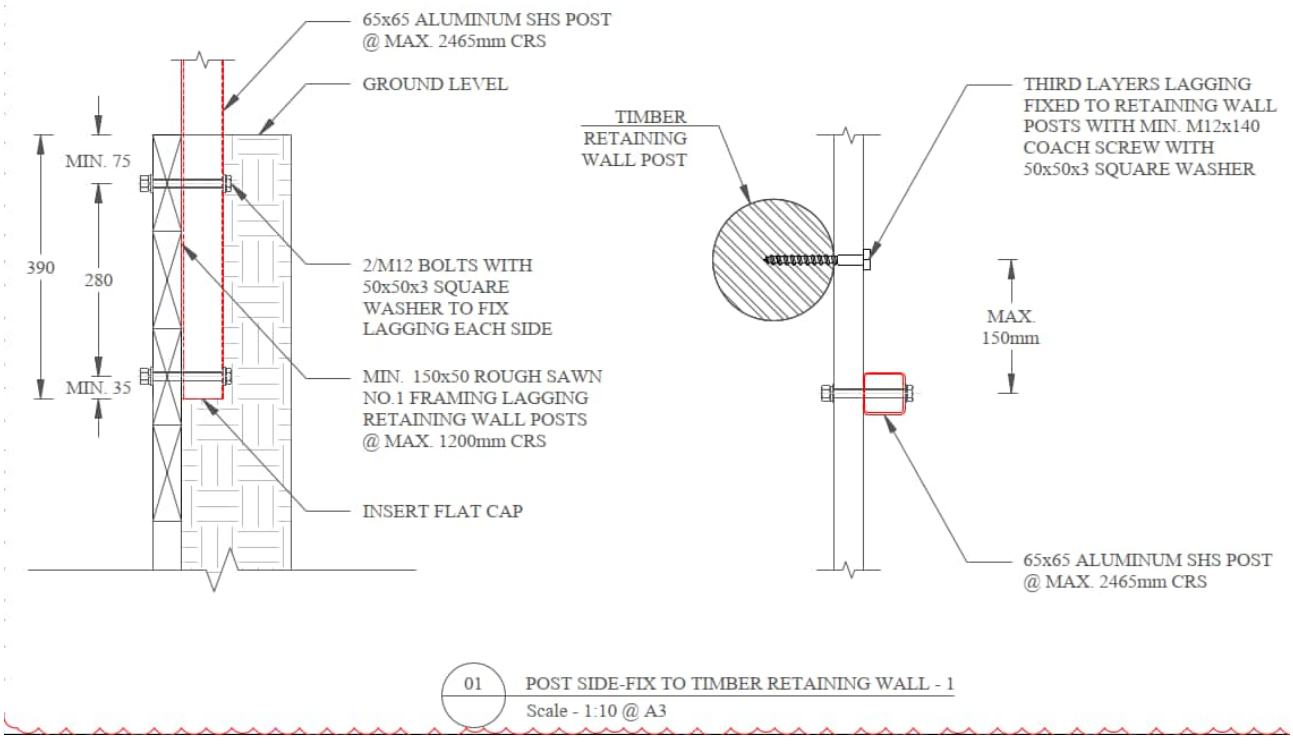
Jim Green
Urban Group (NZ) Ltd

24 June 2024

By email

Re: 47 Urumaraki Avenue – Use of HDG bolts for Urban Group Balustrades Fixings to Timber Retaining Wall

Structural Engineers New Zealand (SENZ) were requested by Urban Group to comment on the suitability of the use of hot dip galvanised bolts in terms of compliance with Clause B2 of the Building Code (Durability), as a fixing method of the Urban Group barrier system to an existing timber retaining wall. The detail is as shown below.



While NZS3604 does recommend the use of Stainless Steel for fasteners in such environment, SENZ have carried out a specific corrosion check in accordance with SNZ-TS-3404. Based on our calculations, which are appended in this letter, the expected loss of cross sectional area during the 50 year service life is approximately 1.16mm all around the bolt. Therefore, the expected diameter of the bolt will become approximately 12 – 2 x

1.16 = 9.68mm diameter by the end of the barrier's service life. Assuming the barrier system relies entirely on the tension of the bolts, a 9.68mm diameter bolt is adequate by inspection to resist am Ultimate Limit State (ULS) tension of approximately 5 KN.

Furthermore, the above assumption of the barrier system relying entirely on the bolts is somewhat conservative. The rotation at the base of the balustrade during service can also be resisted by the couple action of direct bearing on the timber laggings and passive pressure of the soil, thus providing additional capacity to the base support.

I trust you will find the above explanation satisfactory.

Sadeer Kattan **BE (Hons) CPEng CMEngNZ**
Chartered Professional Engineer
Structural Engineers NZ Ltd

Table 8 – Coatings for surface-specific corrosivity category C5-M

Years	System designation[a]	Surface preparation	Number of coats	Typical colour	Initial gloss
15	EHB6	Sa 2½	3	Limited range	Flat to semi-gloss
	PUR5			Wide range	Semi-gloss to full gloss
	TSZ150S[b]		2	Grey[c]	Flat
	HDG900	See AS/NZS 4680	1		
25	TSZ200S[b]	Sa 2½	2		
	TEC1[d]		1	Limited	Gloss
	HDG600-5D or 5I	Sweep abrasive blast to AS/NZS 4680 or etch prime	3	Wide range	Semi-gloss to full gloss
40	TSZ300S[b, e]	Sa 2½	2	Grey[c]	Flat
	TSA225S[e]	Sa 3			

a Based on AS/NZS 2312:2002.

b Only zinc/aluminium alloy (85% zinc, 15% aluminium) to be used in C5-M environment.

c Wide range when coloured sealer/topcoat is used.

d Thermoplastic ethylene copolymers with DFT > 300 µm.

e Thermal aluminium spray is mostly used for structures within 100 m from the sea due to the high corrosivity category and abrasiveness of the environment, while thermal zinc spray is used for structures in the < C5 categories.

MACROCLIMATE CORROSION CATEGORY (AS/NZS2312.1:2014)	TYPICALLY	LOCATION	CHARACTERISED BY	SURFACE-SPECIFIC ATMOSPHERIC CORROSIVITY				
				EXTERNAL			INTERNAL	
				EXPOSED	SHELTERED	WET	DRY	DAMP
C5-M	WITHIN 200 METRES OF BREAKING SURF ON THE WEST AND SOUTH COASTS OF THE SOUTH ISLAND. WITHIN 100 METRE OF BREAKING SURF ON WEST AND SOUTH COASTS OF THE NORTH ISLAND. WITHIN 50 METRES OF BREAKING SURF ON ALL OTHER COASTS. THIS ENVIRONMENT MAY BE EXTENDED INLAND BY PREVAILING WIND AND LOCAL CONDITIONS	ALL COASTS	HEAVY SALT DEPOSITS ALMOST CONSTANT SMELL OF SALT SEA SPRAY IN THE AIR	C5-M			C1	C4
C4	WITHIN 500 METRES INLAND OF BREAKING SURF. WITHIN 50 METRES OF CALM SALT WATER SUCH AS HARBOUR FORESHORES. THIS ENVIRONMENT MAY BE EXTENDED INLAND BY PREVAILING WINDS AND LOCAL CONDITIONS	ALL COASTS	MEDIUM SALT DEPOSITS FREQUENT SMELL OF SALT SEA SPRAY IN THE AIR	C4	C5-M			C3
C3	WITHIN 20 KM OF BREAKING SURF	WEST AND SOUTH COASTS OF SOUTH ISLAND	MINOR SALT DEPOSITS OCCASIONAL SMELL OF SALT IN THE AIR	C3	C5-M			
	WITHIN 5 KM OF SALT WATER	EAST COAST OF BOTH ISLANDS, WEST AND SOUTH COASTS OF NORTH ISLAND, AND ALL HARBOURS			C4	C5-M		
C2	MORE THAN 20 KM TO 50KM FROM SALT WATER	WEST AND SOUTH COASTS OF SOUTH ISLAND	NO MARINE INFLUENCE	C2	C3	C4		C3
	MORE THAN 5 KM TO 50KM FROM SALT WATER	EAST COAST OF BOTH ISLANDS, WEST AND SOUTH COASTS OF NORTH ISLAND, AND ALL HARBOURS		C2	C3	C4		
	INLAND, MORE THAN 50 KM FROM SALT WATER	NORTH AND SOUTH ISLANDS		C2		C3		
SEE NOTE 3	CLOSE TO GEOTHERMAL SOURCE < 500 METRES	GEOTHERMAL ZONE	CONSTANT SMELL OF HYDROGEN SULPHIDE	SEE NOTE 3				C4
-	BEYOND 500 METRES TO GEOTHERMAL SOURCE		MID GEOTHERMAL INFLUENCE					C3

NOTE:
(1) THE ATMOSPHERIC CORROSIVITY CATEGORIES GIVEN PROVIDE AN INDICATION OF THE ENVIRONMENT CORROSIVITY TO ASSIST IN THE SECTION OF A SUITABLE CORROSION PROTECTION SYSTEM; TAKING INTO ACCOUNT THE MACROCLIMATE AND WHERE REQUIRED MICROCLIMATE EFFECTS.

(2) FOR CONFIRMATION OF A SITE-SPECIFIC ATMOSPHERIC CORROSIVITY CATEGORY (FOR EXAMPLE, FOR SITES THAT ARE SHELTERED FROM MARINE INFLUENCE BY THE LOCAL TOPOGRAPHY), THEN SITE-SPECIFIC TESTING IS REQUIRED AS DESCRIBED IN HERA REPORT R4-133

(3) FOR AREAS IN THE GEOTHERMAL ZONES, BOTH THE MACROCLIMATE AND THE SURFACE-SPECIFIC CORROSIVITY CATEGORIES ARE DEPENDANT ON THE LEVEL OF GEOTHERMAL ACTIVITIES AND DISTANCE FROM THE GEOTHERMAL SOURCE. THE CORROSIVITY CATEGORY COULD RANGE UP TO CX WITH CONSIDERABLE VARIATION; THUS IN THOSE AREAS SITE SPECIFIC CORROSIVITY ASSESSMENT IS RECOMMENDED. FOR AREAS THAT ARE MORE THAN 500 METRES BYOND THE GEOTHERMAL SOURCE OR BOUNDARY (SUCH AS SUPLHUR BAY, ROTORUA), AND THAT HAVE BEEN ASSESSED USING THE SMELL TEST AS HAVING MINIMAL OR NON-EXISTENT GEOTHERMAL INFLUENCE, THE OTHER CORROSION ZONES OR CATEGORIES APPLY BASED ON DISTANCE FROM SEA.

SURFACE SPECIFIC CORROSIVITY CATEGORY C5-M			
EXPOSURE	COATING	NUMBER OF COATS	YEARS TILL FIRST MAJOR MAINTENANCE
INTERNAL DRY (FLOOR, INTERNAL WALL, ETC) - C1	PUR1	2	
	IZS1	1	
	AKL6	3	
INTERNAL DAMP (EXTERNAL WALL, ROOF CAVITY, ETC) - C4	TSZ100B	1	15
	PUR5	3	15
	ACC6	3	15
	IZS4	1	15
	HDG500	1	15
	HDG900	1	25
	HDG500 - 5D OR 5I	3	25
	HDG600 - 4D OR 4I	3	25
	TSZ150S	**2**	**40**
	HDG600 - 5D	**3**	**40**
EXTERNAL WET (CREVICES, UNDRAINED LOW POINTS, ETC) - C5-M	EHB6	3	15
	PUR5	3	15
	TSZ150SB	2	15
	HDG900	1	15
	TSZ200SB	2	25
	TEC1D	1	25
	HDG600 - 5D OR 5I	3	25
	TSZ300SB, E	**2**	**40**
	TSA225SE	**2**	**40**
EXTERNAL SHELTERED (UNWASHED, UNDER DECK/AWNING, ETC) - C5-M	EHB6	3	15
	PUR5	3	15
	TSZ150SB	2	15
	HDG900	1	15
	TSZ200SB	2	25
	TEC1D	1	25
	HDG600 - 5D OR 5I	3	25
	TSZ300SB, E	**2**	**40**
	TSA225SE	**2**	**40**
EXTERNAL EXPOSED (WASHED, EXTERNAL BALUSTRADES, ETC) - C5-M	EHB6	3	15
	PUR5	3	15
	TSZ150SB	2	15
	HDG900	1	15
	TSZ200SB	2	25
	TEC1D	1	25
	HDG600 - 5D OR 5I	3	25
	TSZ300SB, E	**2**	**40**
	TSA225SE	**2**	**40**

STRUCTURAL STEEL WITHIN THE C5-M, SURFACE SPECIFIC CORROSION CATEGORY (EXTERNAL EXPOSED (WASHED, EXTERNAL BALUSTRADES, ETC)) EXPOSURE ARE DESIGNED FOR 1.1575mm OF MATERIAL LOSS PER STEEL SURFACE, CONSIDERING 35 YEARS OF CORROSION.

CORROSION CATEGORY:	C5-M		
REAMINING YEARS FOR CORROSION:	35 years		
AVERAGE CORROSION RATE FOR THE FIRST 10 YEARS:	47.0µm	AVERAGE CORROSION RATE AFTER 10 YEARS:	27.5µm
SURFACE SPECIFIC CORROSIVE CATEGORY:	C5-M		
AMOUNT OF MATERIAL LOST TO CORROSION:	1.16mm	PER STEEL SURFACE EXPOSED TO THE ENVIRONMENT	

SURFACE SPECIFIC CORROSIVITY CATEGORY	AVERAGE CORROSION RATE, r_{av}, DURING THE FIRST 10 YEARS			STEADY-STATE CORROSION RATE, r_{lin}, ESTIMATED AS THE AVERAGE CORROSION RATE DURING THE FIRST 30 YEARS		
C1		r_{av} <=	0.4		r_{lin} <=	0.3
C2	0.4	< r_{av} <=	8.3	0.3	< r_{lin} < =	4.9
C3	8.3	< r_{av} <=	17	4.9	< r_{lin} < =	10
C4	17	< r_{av} <=	27	10	< r_{lin} < =	16
C5-M	27	< r_{av} <=	67	16	< r_{lin} < =	39
CX	67	< r_{av} <=	233	39	< r_{lin} < =	138

SURFACE SPECIFIC CORROSIVITY CATEGORY C1 & TEMPORARY PROTECTION DURING CONSTRUCTION

SYSTEM DESIGNATION[A]	SURFACE PREPERATION	NUMBER OF COATS	TYPICAL COLOUR	INITIAL CLOSS	ALLOWABLE SURFACE-SPECIFIC CORROSIVITY DURING CONSTRUCTION[B]
AKL6	Sa 2 1/2	3	WIDE RANGE	FLAT TO FULL GLOSS	C4
IZS1		1		FLAT	
PUR1	St 3	2		SEMI-GLOSS TO FULL GLOSS	C4
ALK1[C]	St 3/Sa 2	1	LIMITED RANGE	FLAT TO FULL GLOSS	C2[D]
ALK3		2	WIDE RANGE		C3

NOTE: (ALL GALVANIZED COATINGS ARE SUITABLE FOR INTERNAL STEEL WORK)
(A) BASED ON AS/NZS2312.1:2014

(B) BASED ON A MAXIMUM OF 1 YEAR'S EXPOSURE DURING CONSTRUCTION.

(C) THE ALKYD PRIMER SYSTEM ALK1 SHOULD NOT BE USED IN GREY COLOUR BECAUSE THE BREAKDOWN OF THE SYSTEM WILL BE HIGHLY VISIBLE. RED OXIDE COLOUR IS PREFERRED TO REDUCE THE VISUAL IMPACT OF MINOR AND STRUCTURALLY ACCEPTABLE RUSTING THAT MAY OCCUR ON THE ALK1 SYSTEM IN A FEW YEARS

(D) BASED ON A MAXIMUM OF 4 WEEKS' EXPOSURE DURING CONSTRUCTION

SURFACE SPECIFIC CORROSIVITY CATEGORY C2

YEARS	SYSTEM DESIGNATION[A]	SURFACE PREPERATION	NUMBER OF COATS	TYPICAL COLOUR	INITIAL GLOSS
15	EPM3	Sa 2	2	WIDE RANGE	LOW TO SEMI-GLOSS
	ACC2	Sa 2 1/2			SEMI-GLOSS TO FULL GLOSS
	PUR2				
25	MCU2	Sa 2 1/2	3	LIMITED RANGE	SEMI-GLOSS
	PUR3			WIDE RANGE	SEMI-GLOSS TO FULL GLOSS
	IZS2		1	MOSTLY GREY	FLAT
40	PUR5		3	WIDE RANGE	SEMI-GLOSS
	HDG390	SEE AS/NZS 4680	1	GREY[B]	FLAT TO SEMI-GLOSS
	TSZ100	Sa 2 1/2	1		FLAT

NOTE: (ALL GALVANIZED COATINGS PROVIDE 15 YEARS' CORROSION PROTECTION, FOR GALVANISED COATINGS > 18 µm PROVIDE 25 YEARS' CORROSION PROTECTION, AND GALVANISED COATINGS > 28 µm PROVIDE 40 YEARS' CORROSION PROTECTION)
(A) BASED ON AS/NZS2312.1:2002

(B) WIDE RANGE WHEN COLOURED SEALER/TOPCOAT IS USED.