GEOTECHNICAL INVESTIGATION:

Subdivision and New Houses at **10 Beverley Place, Curl Curl**

1. Proposed Development

1.1 Demolish the existing structures on the site, subdivide the lot into two, and construct a new house and a duplex by excavating to a maximum depth of ~8.6m and filling to a maximum height of ~3.2m.

1.2 Install three new pools on the downhill side of the properties.

1.3 Construct a new driveway on the downhill side of the properties.

1.4 Other minor internal and external additions and alterations.

1.5 Details of the proposed development are shown on 31 drawings prepared by ARCANARY, drawings numbered A-00.0001 to 0003, A-03.0001, A-06.0001, A-10.0000 to 0400, A-21.0100 to 0102, A-22.0100 to 101, A-71.0100, A-75.0100 to 300, A-90.0001 to 0002, and A-90.0010, A-90.0021 to 23, A-93.0100 to 0500, and A-99.0001. All revision P02. All dated 27/02/25.

2. Site Description

2.1 The site was inspected on the 25th February, 2025. And previously in July 2022, and August 2024.

2.2 This residential property is accessed off the high side of a turning circle at the end of Beverly Place. The property has an E aspect. It is located on the moderate to steeply graded middle reaches of a hillslope. The natural slope rises across the property at an average angle of 12° before stepping up some ~4.0m at a rock face and continuing at moderate angles to the upper common boundary. The slope above and below the property continues at similar angles.

2.3 At the road frontage, a concrete driveway runs to a garage underneath the downhill side of the house (Photo 1). Fill for the driveway on the downhill side is supported by a brick retaining wall reaching ~1.0m high (Photo 2). Fill for a lawn area in between the lower common boundary and the house is supported by a ~2.0m high stable sandstone flagging retaining wall which has been constructed with a tilt back into the slope (Photo 3). The two-storey house is supported on brick walls. No significant signs of movement were observed in the visible supporting walls. A cut to create a level platform for the house has been taken entirely through Competent Medium Strength Sandstone which outcrops and steps ~4m up the property in this location (Photo 4). Fill for a level patio above the house is supported by a stable ~1.0m high brick retaining wall which has been constructed directly on sandstone (Photo 5). The outcropping rock in this location was measured to be undercut in places by up to a depth of ~1.1m but is otherwise considered stable (Photos 6 & 7). A ~1.3m high stable stack rock retaining wall lines the upper common boundary (Photo 8). A pool which shows no signs of movement has been cut entirely into sandstone N of the house (Photo 9). The N side of the outcropping rock was observed to be overhanging (Photo 10). This outcrop is currently considered stable and the proposed works are sufficiently set back so as not to impact on its stability.

3. Geology

The Sydney 1:100 000 Geological sheet indicates the site is underlain by Hawkesbury Sandstone. It is described as a medium to coarse grained quartz sandstone with very minor shale and laminite lenses.

4. Subsurface Investigation

One hand Auger Hole (AH) was put down to identify the soil materials. Seven Dynamic Cone Penetrometer (DCP) tests were put down to determine the relative density of the overlying soil and the depth to bedrock. The locations of the tests are shown on the site plan attached. It should be noted that a level of caution should be applied when interpreting DCP test results.

The test will not pass through hard buried objects so in some instances it can be difficult to determine whether refusal has occurred on an obstruction in the profile or on the natural rock surface. This is not expected to have been an issue for this site. But due to the possibility that the actual ground conditions vary from our interpretation there should be allowances in the excavation and foundation budget to account for this. We refer to the appended "Important Information about Your Report" to further clarify. The results are as follows:

AUGER HOLE 1 (~RL37.6) **–** AH1 (Photo 11)

Depth (m)	**Material Encountered**
0.0 to 0.5	**FILL**, soil and crushed sandstone, brown, Medium Dense to Dense, dry, fine to coarse grained.

Refusal @ 0.5m in fill. Auger grinding. No water table encountered.

DCP TEST RESULTS – Dynamic Cone Penetrometer							
Equipment: 9kg hammer, 510mm drop, conical tip.					Standard: AS1289.6.3.2 - 1997		
Depth(m) Blows/0.3m	**DCP 1** (~RL37.6)	**DCP 2** (~RL36.0)	**DCP 3** (~RL38.6)	**DCP 4** (~RL39.5)	**DCP 5** (~RL43.9)	**DCP 6** (~RL42.5)	**DCP 7** (~RL45.7)
0.0 to 0.3	7	12	5	14	Rock Exposed at Surface	Rock Exposed at Surface	Rock Exposed at Surface
0.3 to 0.6	5	5	14	19			
0.6 to 0.9	11	#	20	4			
0.9 to 1.2	#		13	13			
1.2 to 1.5			19	8			
1.5 to 1.8			21	18			
1.8 to 2.1			10	15			
2.1 to 2.4			#	28			
2.4 to 2.7				30			
2.7 to 3.0				#			
	Refusal on Rock @ 0.8m	Refusal on Rock @ 0.4m	Refusal on Rock @ 1.9m	Refusal on Rock @ 2.7m			

#refusal/end of test. F = DCP fell after being struck showing little resistance through all or part of the interval.

DCP Notes:

DCP1 – Refusal on Rock @ 0.8m, DCP bouncing off rock surface, white impact dust on dry tip, brown sandy clay in collar above,
DCP2 – Refusal on Rock @ 0.4m, DCP bouncing off rock surface, clean dry tip.
DCP3 – Refusal on Rock @ 1.9m, DCP bouncing off rock surface, maroon sandy clay on dry tip.
DCP4 – Refusal on Rock @ 2.7m, DCP bouncing off rock surface, sugary textured grey sandy clay on damp tip.
DCP5 – Medium Strength Sandstone exposed below the base of the pool.
DCP6 – Medium Strength Sandstone exposed at cut for house.
DCP7 – Medium Strength Sandstone exposed at surface.

5. Geological Observations/Interpretation

The surface features of the block are controlled by the outcropping and underlying sandstone bedrock that steps down the property forming sub-horizontal benches between the steps. Where the grade is steeper, the steps are larger and the benches narrower. Where the slope eases, the opposite is true. Where the rock is not exposed, it is overlain by shallow soils over clays that fill the bench step formation. Filling has been placed to a height of ~1.1m in the location of the proposed works. In the test locations, where the rock is not exposed, it was encountered mainly at shallow depths of between 0.8 to 0.4m below the current surface, with DCP test 3 & 4 encountering rock at between ~1.9 and ~2.7m depth. This variation in depth is due to the presence of fill in some locations, as well as the stepped nature and variable weathering profile of the underlying bedrock. The outcropping sandstone on the property is estimated to be Medium Strength or better and similar strength rock is expected to underlie the entire site as all the DCP tests bounced at refusal. It is interpreted that a thin layer of Very Low Strength Sandstone overlies the buried rock immediately below the house, as the DCP ended after a high blow count for tests 3 & 4. The Very Low Strength Rock is expected to be encountered at depths of between 1.2m and 2.1m below the current surface. See Type Section attached for a diagrammatical representation of the expected ground materials.

6. Groundwater

Normal ground water seepage is expected to move over the buried surface of the rock and through the cracks. Due to the slope and elevation of the block, the water table is expected to be many metres below the base of the proposed excavation.

7. Surface Water

No evidence of surface flows were observed on the property during the inspection. It is expected that normal sheet wash will move onto the site from above the property during heavy down pours.

8. Geotechnical Hazards and Risk Analysis

No geotechnical hazards were observed beside the property. The moderate to steeply graded slope that rises across the property and continues above and below is a potential hazard (**Hazard One**). The vibrations from the proposed excavation are a potential hazard (**Hazard Two**). A loose boulder, wedge, or similar geological defect toppling onto the work site during the excavation process is a potential hazard (**Hazard Three**). The proposed excavation undercutting the N neighbouring brick wall and garage and S block retaining wall is a potential hazard (**Hazard Four**).

RISK ANALYSIS SUMMARY ON THE NEXT PAGE

Risk Analysis Summary

HAZARDS	Hazard One	Hazard Two
TYPE	The moderate to steeply graded slope that rises across the property and continues above and below failing and impacting on the proposed works.	The vibrations produced during the proposed excavation impacting on the surrounding structures.
LIKELIHOOD	'Unlikely' (10^{-4})	'Possible' (10^{-3})
CONSEQUENCES TO PROPERTY	'Medium' (12%)	'Medium' (25%)
RISK TO PROPERTY	'Low' (2×10^{-5})	'Moderate' (2×10^{-4})
RISK TO LIFE	8.3×10^{-7}/annum	5.3×10^{-7}/annum
COMMENTS	This level of risk is 'ACCEPTABLE'.	This level of risk to property is 'UNACCEPTABLE'. To move risk to 'ACCEPTABLE' levels, the recommendations in **Section 12** are to be followed.

RISK ANALYSIS SUMMARY CONTINUED ON THE NEXT PAGE

HAZARDS	Hazard Three	Hazard Four
TYPE	A loose boulder, wedge, or similar geological defect toppling onto the work site during the excavation process.	The proposed excavation undercutting the footings of the N brick wall and garage (Photo 12), and S block retaining wall (photo 13), causing damage or failure.
LIKELIHOOD	'Possible' (10^{-3})	'Possible' (10^{-3})
CONSEQUENCES TO PROPERTY	'Medium' (20%)	'Medium' (35%)
RISK TO PROPERTY	'Moderate' (2×10^{-4})	'Moderate' (2×10^{-4})
RISK TO LIFE	6.6×10^{-5}/annum	5.3×10^{-5}/annum
COMMENTS	This level of risk to life and property is 'UNACCEPTABLE'. To move risk to 'ACCEPTABLE' levels, the recommendations in **Section 13 and 15** are to be followed.	This level of risk to life and property is 'UNACCEPTABLE'. To move risk to 'ACCEPTABLE' levels, the recommendations in **Section 13** are to be followed.

(See Aust. Geomech. Jnl. Mar 2007 Vol. 42 No 1, for full explanation of terms)

9. Suitability of the Proposed Development for the Site

The proposed development is suitable for the site. No geotechnical hazards will be created by the completion of the proposed development provided it is carried out in accordance with the requirements of this report and good engineering and building practice.

10. Stormwater

The fall is to Beverly Place. Roof water from the development is to be piped to the street drainage system through any tanks that may be required by the regulating authorities.

11. Excavations

An excavation to a maximum depth of ~8.6m at the NW portion of the basement excavation is required to construct the proposed houses.

The excavation is expected to be through fill, soil, clay, and Very Low Strength Rock, with Medium Strength Sandstone, where it is not already exposed, expected at up to ~1.1m depth through fill on the uphill side of the proposed excavation where the cut is greater in depth.

And between ~0.4m and ~2.7m on the downhill side of the property where deep weathered rock may be encountered.

It is envisaged that excavations through fill, soil, clay, and Very Low Strength Rock can be carried out with an excavator and toothed bucket, and excavations through rock will require grinding or rock sawing and breaking.

12. Vibrations

Possible vibrations generated during excavations through fill, soil, clay, and Very Low Strength Rock will be below the threshold limit for building damage utilising a domestic-sized excavator up to 16 tonnes. It is expected that the majority of the excavation will be through Medium Strength Sandstone or better.

The demolition of the existing house, and excavations through Medium Strength Rock or better should be carried out to minimise the potential to cause vibration damage to the Downhill (No. 11), as well as the SE (No. 5 Batho St), SW (No. 1 Batho St), two uphill (12 & 14 Seaview Avenue) and N (No. 7) neighbouring properties.

Allowing ~0.5m for backwall drainage where necessary, the setbacks from the proposed excavation to the existing structures are as follows:

- ~1.2m from the N neighbouring house (No. 7).
- ~1.9m from the SW neighbouring outbuilding (No. 1 Batho St).
- ~2.0m from the N neighbouring garage (No. 7).
- ~4.0m from the SE neighbouring house (No. 5 Batho St).
- ~5.5m from the uphill neighbouring pool (No. 14 Seaview Ave).
- ~6.6m from the downhill neighbouring house (No. 11).
- ~6.6m from the uphill neighbouring pool (No. 12 Seaview Ave).
- ~8.6m from the SW neighbouring house (No. 1 Batho St).

Dilapidation reporting carried out on the above neighbouring properties is recommended prior to the excavation/demolition works commencing to minimise the potential for spurious building damage claims.

Close controls by the contractor over rock excavation are recommended so excessive vibrations are not generated.

Demolition and excavation methods are to be used that limit peak particle velocity to 5mm/sec at the neighbouring structures. Vibration monitoring will be required to verify this is achieved. Vibration monitoring must include a light/alarm so the operator knows if vibration limits have been exceeded. The equipment is to log and record vibrations throughout the demolition/excavation works.

In Medium Strength rock or better techniques to minimise vibration transmission will be required. These include:

- Rock sawing the excavation perimeter to at least 1.0m deep prior to any rock breaking with hammers, keeping the saw cuts below the rock to be broken throughout the excavation process.
- Limiting rock hammer size.
- Rock hammering in short bursts so vibrations do not amplify.
- Rock breaking with the hammer angled away from the nearby sensitive structures.
- Creating additional saw breaks in the rock where vibration limits are exceeded, as well as reducing hammer size as necessary.
- Use of rock grinders (milling head).

Should excavation induced vibrations exceed vibration limits after the recommendations above have been implemented, excavation works are to cease immediately and our office is to be contacted.

It is worth noting that vibrations that are below thresholds for building damage may be felt by the occupants of the subject and neighbouring houses.

13. Excavation Support Requirements

As this job is considered technically complex and due to the depth of the excavation, we recommend it be carried out by builders and contractors who are well experienced in similar work and can provide a proven history of completed work.

The excavation for the proposed houses will reach a maximum depth of ~8.6m. Allowing 0.5m for back wall drainage, the setbacks are as follows:

- ~Flush with a block retaining wall on the S neighbouring property (Photo 13).
- ~Flush with a brick wall on the N neighbouring property (photo 12).
- ~0.2m from a garage on the N neighbouring property (Photo 12).

As such, the N brick retaining wall and garage, as well as the S block retaining wall will lie within the zone of influence of the proposed excavation. In this instance, the zone of influence is the area above a theoretical 45° line (from horizontal) from the base of the excavation or top of Medium Strength Rock, whichever is encountered first, towards the surrounding structures and boundaries. This line reduces to 30° through the fill and soil.

Given the shallow depth to rock on the uphill side of the property, we think it is likely the S boundary retaining wall is supported on rock, this is less likely to be the case near the N boundary brick wall and garage where medium strength rock was encountered at a greater depth. However, to be sure, Where the N and S boundary walls fall within the zone of influence of the excavation, exploration pits along the wall will need to be put down by the builder to determine the foundation depth and material. These are to be inspected by the geotechnical consultant.

If the foundations are confirmed to be supported on rock, the excavation may commence. If they are not, the walls will need to be shored prior to the commencement of the excavation with concrete piles or similar. Alternatively, the walls may be underpinned to rock with the neighbours' permission. See the site plan attached for the minimum extent of the required exploration pits/underpinning.

Underpinning is to follow the underpinning sequence 'hit one miss two'. Under no circumstances is the bulk excavation to be taken to the edges of the walls and then underpinned. Underpins are to be constructed from drives that should not exceed 0.6m in width along strip footings and should be proportioned according to footing size for other foundation types. Allowances are to be made for drainage through the underpinning to prevent a build-up of hydrostatic pressure. Underpins that are not designed as retaining walls are to be supported by retaining walls. The void between the retaining walls and the underpinning is to be filled with free-draining material such as gravel.

During the excavation process, the geotechnical consultant is to inspect the excavation as is approaches no less than 1.0m horizontally from foundations of the walls/underpins to confirm the stability of the cut to go flush with the footings.

The excavation requires the removal the two ~1.0m brick retaining wall which support fill for landscaping above the house and below driveway (Photos 2 & 5), as well as the ~2.0m mortared sandstone retaining wall below the house (Photo 3). The walls are to be demolished from the top down in an orderly manner with the fill behind the walls being systematically lowered at the same time. The soil batter slope is not to exceed 1.0 Vertical to 1.7 Horizontal (30°) as the walls are demolished.

The overhanging rock around the BBQ will be immediately above the proposed excavation (Photo 7). We recommend the overhanging portions of the rock (approximately 1.1m) be removed prior to the commencement of the bulk excavation for the houses.

Due to the depth of the proposed excavation, the fill, soil, clay, and Very Low Strength Rock portions will need to be temporarily or permanently supported prior to the commencement of the excavation through rock, or during the excavation process in a staged manner, so cut batters are not left unsupported. The support will need to be designed / approved by the structural engineer in consultation with the Geotechnical Consultant.

Excavations through Medium Strength Rock or better will stand at vertical angles unsupported subject to approval by the geotechnical consultant.

The rain water tanks are shown on the plans to be excavated horizontally into the rock at the RL of the Basement excavation. To simplify the engineering and building process it is recommended these be cut vertically from the surface.

To ensure no defects or unstable cut faces are present that require support, the geotechnical consultant is to inspect the excavation as it is lowered in not more than 1.5m intervals or on encounter of softer sections of rock, whichever occurs first. Should any weak sections of rock be encountered, works are to stop until temporary or permanent support is in place. Our office is to be informed of any unexpected changes in the ground conditions that may occur during the excavation process.

Upslope runoff is to be diverted from the cut faces by sandbag mounds or other diversion works. All unsupported cut batters through fill, soil, clay, and Very Low Strength Rock are to be covered to prevent access of water in wet weather and loss of moisture in dry weather. The covers are to be tied down with metal pegs or other suitable fixtures so they cannot blow off in a storm. The materials and labour to construct the retaining walls are to be organised so on completion of the excavation they can be constructed as soon as possible. The excavation is to be carried out during a dry period. No excavations are to commence if heavy or prolonged rainfall is forecast.

Upon completion of the excavation, it is recommended all cut faces be supported with retaining walls to prevent any potential future movement of joint blocks in the cut face that can occur over time, when unfavourable jointing is obscured behind the excavation face. Additionally, retaining walls will help control seepage and to prevent minor erosion and sediment movement.

All excavation spoil is to be removed from site following the current Environmental Protection Agency (EPA) waste classification guidelines.

15. Fill

Fill will be placed along the S common boundary to raise it to the RL of the ground Floor of the house. No fills are to be laid until retaining walls are in place. The fills will reach a maximum height of ~3.2m. The surface is to be prepared before any fills are laid by removing any organic matter and topsoil. Fills are to be laid in a loose thickness not exceeding 0.3m before being moderately compacted. Tracking the machine over the loose fill in 1 to 2 passes should be sufficient. Immediately behind the retaining walls (say to 1.5m), the fills are to be compacted with light weight equipment such as a hand-held plate compactor so as not to damage the retaining walls. Where light weight equipment is used, fills are to be laid in a loose thickness not exceeding 0.15m before being compacted. No structures are to be supported on fill.

15. Retaining Structures

For cantilever or singly propped retaining structures it is suggested the design be based on a triangular distribution of lateral pressures using the parameters shown in Table 1.

Table 1 – Likely Earth Pressures for Retaining Structures

Unit	Earth Pressure Coefficients		
	Unit weight (kN/m^3)	'Active' K_a	'At Rest' K_0
Fill and Topsoil	20	0.40	0.55
Residual Clays	20	0.35	0.45
Very Low Strength Rock	22	0.22	0.35
Medium Strength Rock	24	0.00	0.01

For rock classes refer to Pells et al "Design Loadings for Foundations on Shale and Sandstone in the Sydney Region". Australian Geomechanics Journal 1978.

It is to be noted that the earth pressures in Table 1 assume a level surface above the structure, do not account for any surcharge loads from structures immediately above and assume retaining structures are fully drained. Rock strength and relevant earth pressure coefficients are to be confirmed on site by the geotechnical consultant.

All retaining structures are to have sufficient back-wall drainage and be backfilled immediately behind the structure with free draining material (such as gravel). This material is to be wrapped in a non-woven Geotextile fabric (i.e. Bidim A34 or similar), to prevent the drainage from becoming clogged with silt and clay. If no back-wall drainage is installed in retaining structures the full hydrostatic pressures are to be accounted for in the retaining structure design.

16. Site Classification

The site classification is Class A in accordance with AS2870-2011.

17. Foundations

The proposed house excavation is expected to be entirely seated in Medium Strength Sandstone or better. This is a suitable foundation material. Where the footprint of the proposed house does not fall over the footprint of the excavation, shallow piers taken to this material will be required to maintain a uniform foundation material across the structure.

Where the proposed driveway is cut into Medium Strength Sandstone, it can be supported off this ground material. Where this material is not exposed, the driveway can be supported off the natural clays as well as the natural surface after any organic matter has been stripped. A maximum allowable bearing pressure of 200kPa can be assumed for footings on clays. A maximum allowable bearing pressure of 100kPa can be assumed for soil of the natural surface. Where the foundation material changes across the driveway, construction joints are to be installed to separate the different foundation materials and to accommodate minor differential movement. Alternatively, the entire driveway can be supported on bedrock.

A maximum allowable bearing pressure of 1000kPa can be assumed for footings on Medium Strength Sandstone.

Naturally occurring vertical cracks (known as joints) commonly occur in sandstone. These are generally filled with soil and are the natural seepage paths through the rock. They can extend to depths of several metres and are usually relatively narrow but can range between 0.1 to 0.8m wide. If a footing falls over a joint in the rock, the construction process is simplified if, with the approval of the structural engineer, the joint can be spanned or, alternatively, the footing can be repositioned so it does not fall over the joint.

NOTE: If the contractor is unsure of the footing material required, it is more cost effective to get the geotechnical consultant on site at the start of the footing excavation to advise on footing depth and material. This mostly prevents unnecessary over-excavation in clay like shaly rock but can be valuable in all types of geology.

18. Inspections

The client and builder are to familiarise themselves with the following required inspections as well as council geotechnical policy. We cannot provide geotechnical certification for the owner or the regulating authorities if the following inspections have not been carried out during the construction process.

- The exploration pits to determine the foundation material along the N and S boundary walls (Photos 12 & 13) are to be inspected by the geotechnical consultant to determine if underpinning is necessary. This is to occur before the bulk excavation commences.

- During the excavation process, the geotechnical consultant is to inspect the excavation as it approaches no less than 1.0m horizontally from foundations of the walls/underpins to confirm the stability of the cut to go flush with the footings.

- During the excavation process, the geotechnical consultant is to inspect the cut for the house in 1.5m intervals as it is lowered or on encounter of softer sections of rock, whichever occurs first. While the machine/excavation equipment is on site, to ensure the ground materials are as expected and that the support is adequate.

- All footings are to be inspected and approved by the geotechnical consultant while the excavation equipment and contractors are still onsite and before steel reinforcing is placed or concrete is poured.

White Geotechnical Group Pty Ltd.

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Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

Photo 7

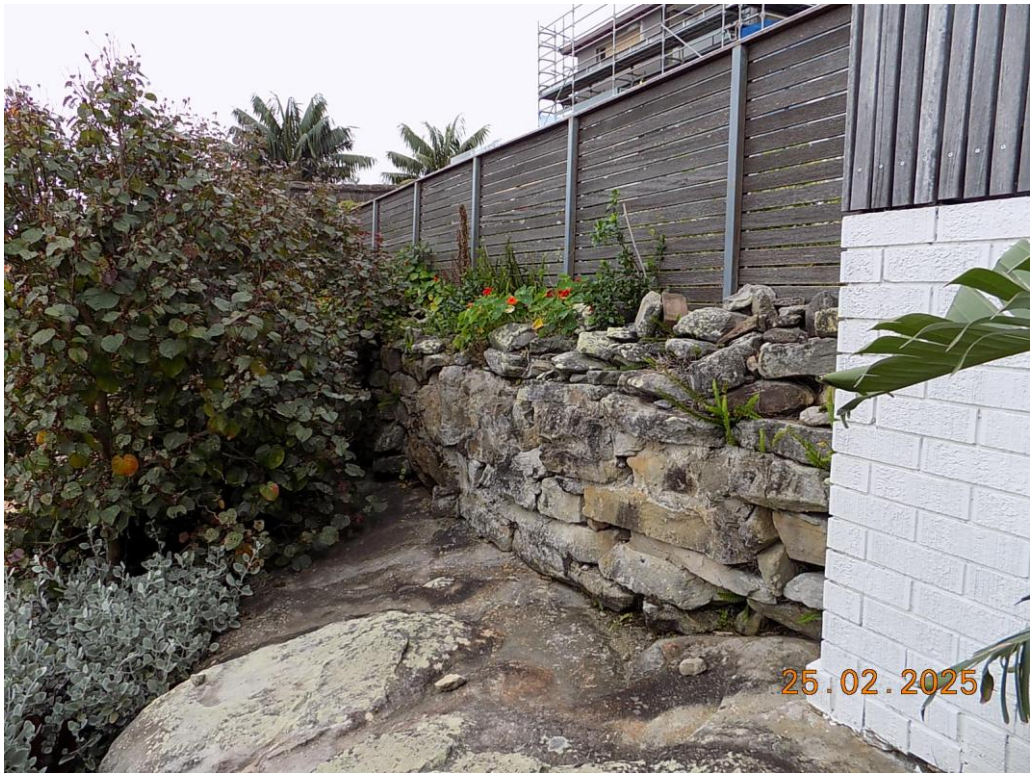


Photo 8

Photo 9

Photo 10

Photo 11 – downhole is top to bottom

Photo 12

Photo 13

Important Information about Your Report

It should be noted that Geotechnical Reports are documents that build a picture of the subsurface conditions from the observation of surface features and testing carried out at specific points on the site. The spacing and location of the test points can be limited by the location of existing structures on the site or by budget and time constraints of the client. Additionally, the test themselves, although chosen for their suitability for the particular project, have their own limiting factors. The testing gives accurate information at the location of the test, within the confines of the test's capability. A geological interpretation or model is developed by joining these test points using all available data and drawing on previous experience of the geotechnical consultant. Even the most experienced practitioners cannot determine every possible feature or change that may lie below the earth. All of the subsurface features can only be known when they are revealed by excavation. As such, a Geotechnical report can be considered an interpretive document. It is based on factual data but also on opinion and judgement that comes with a level of uncertainty. This information is provided to help explain the nature and limitations of your report.

With this in mind, the following points are to be noted:

- If upon the commencement of the works the subsurface ground or ground water conditions prove different from those described in this report, it is advisable to contact White Geotechnical Group immediately, as problems relating to the ground works phase of construction are far easier and less costly to overcome if they are addressed early.

- If this report is used by other professionals during the design or construction process, any questions should be directed to White Geotechnical Group as only we understand the full methodology behind the report's conclusions.

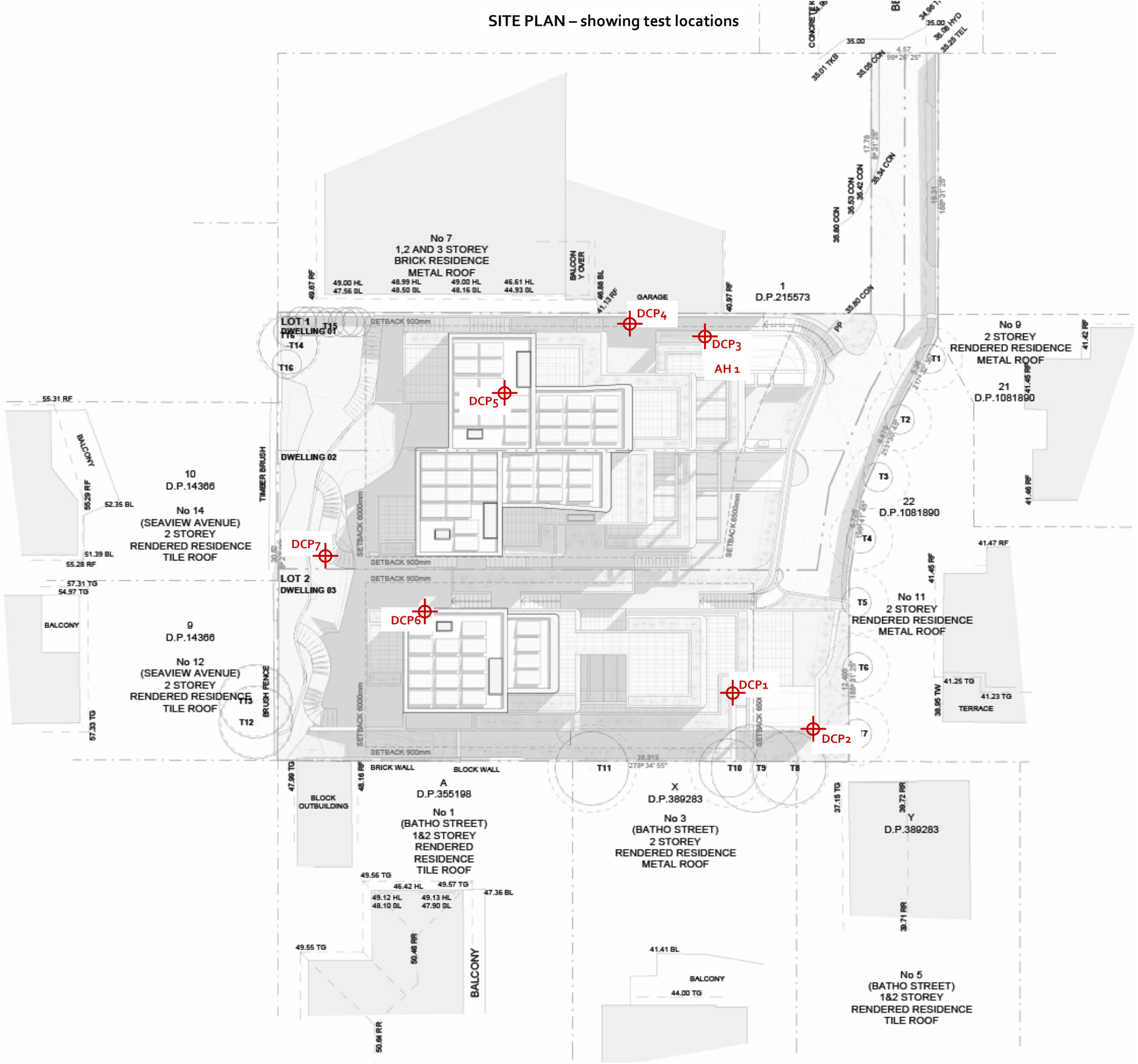
- The report addresses issues relating to your specific design and site. If the proposed project design changes, aspects of the report may no longer apply. Contact White Geotechnical if this occurs.

- This report should not be applied to any other project other than that outlined in section 1.0.

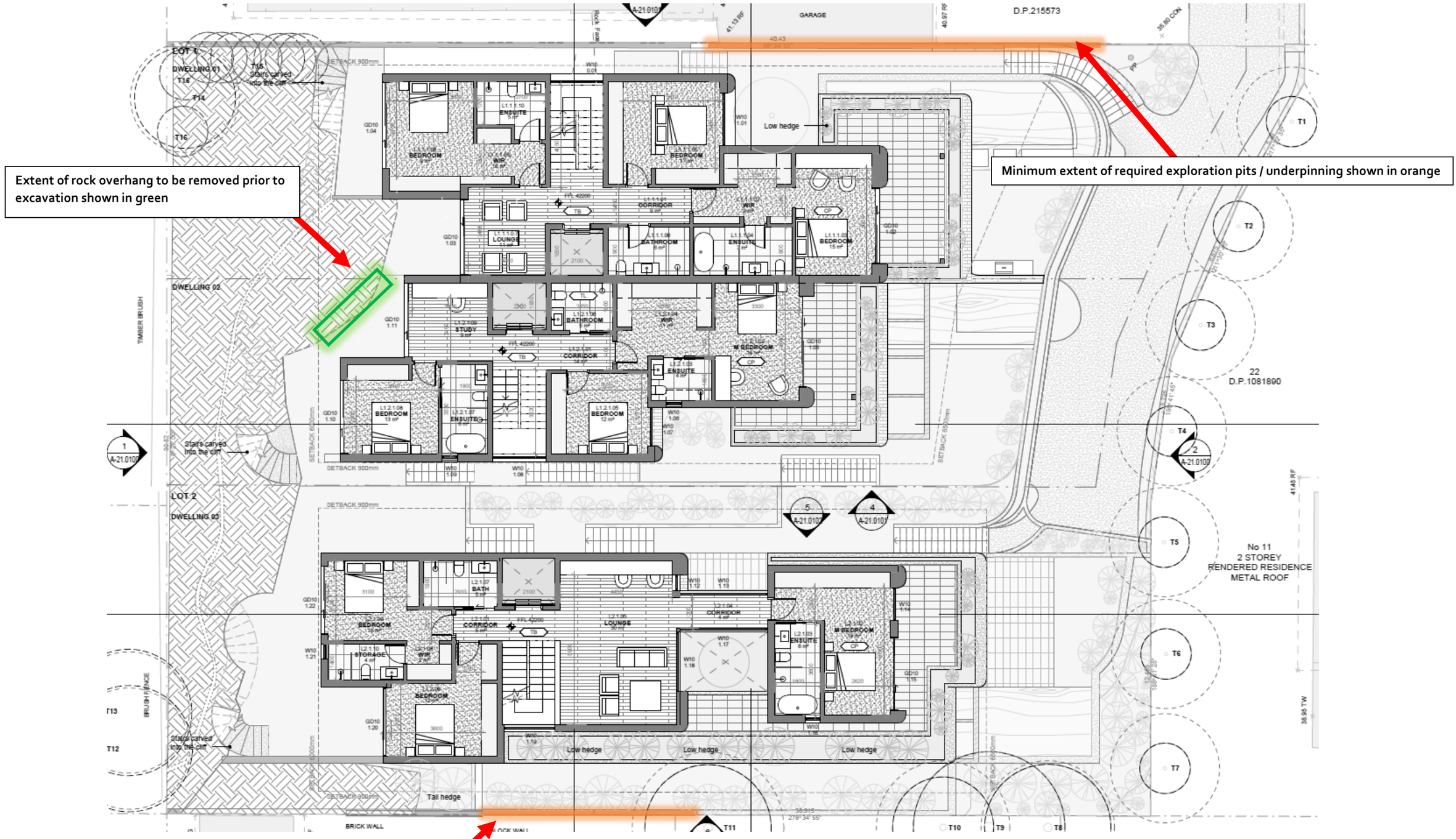
- This report is to be read in full and should not have sections removed or included in other documents as this can result in misinterpretation of the data by others.

- It is common for the design and construction process to be adapted as it progresses (sometimes to suit the previous experience of the contractors involved). If alternative design and construction processes are required to those described in this report, contact White Geotechnical Group. We are familiar with a variety of techniques to reduce risk and can advise if your proposed methods are suitable for the site conditions.

SITE PLAN – showing test locations



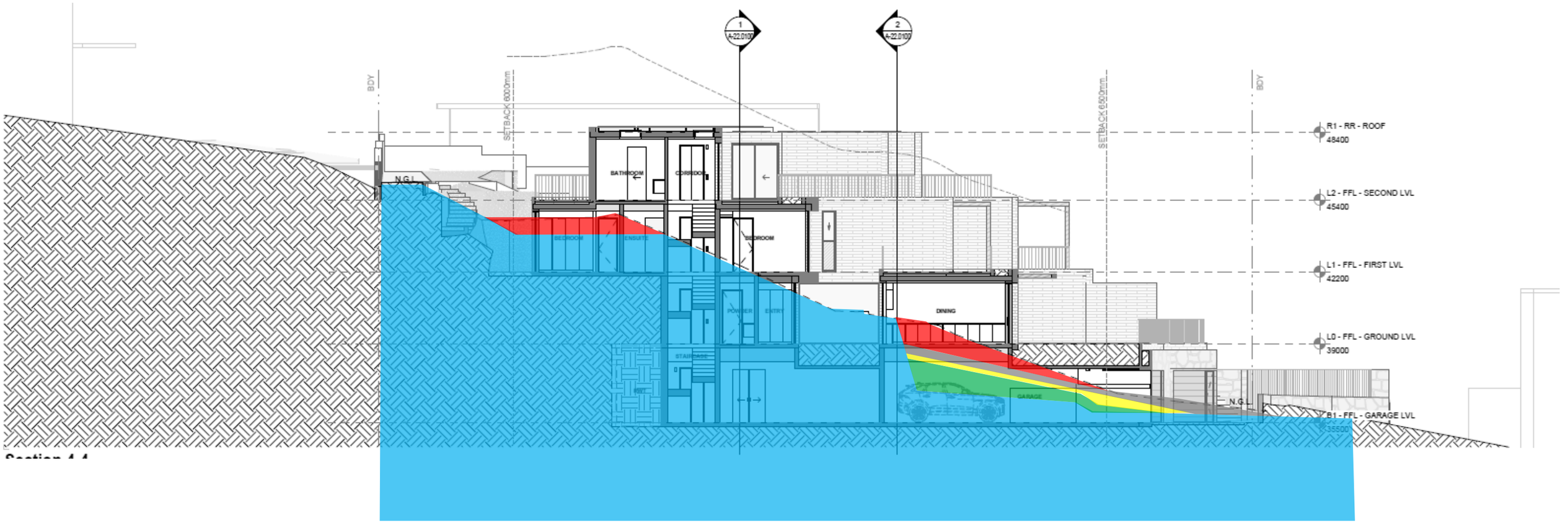
LEVEL 01 PLAN – showing minimum extent of required rock overhang removal / exploration pits / underpinning



TYPE SECTION – Diagrammatical Interpretation of expected Ground Materials

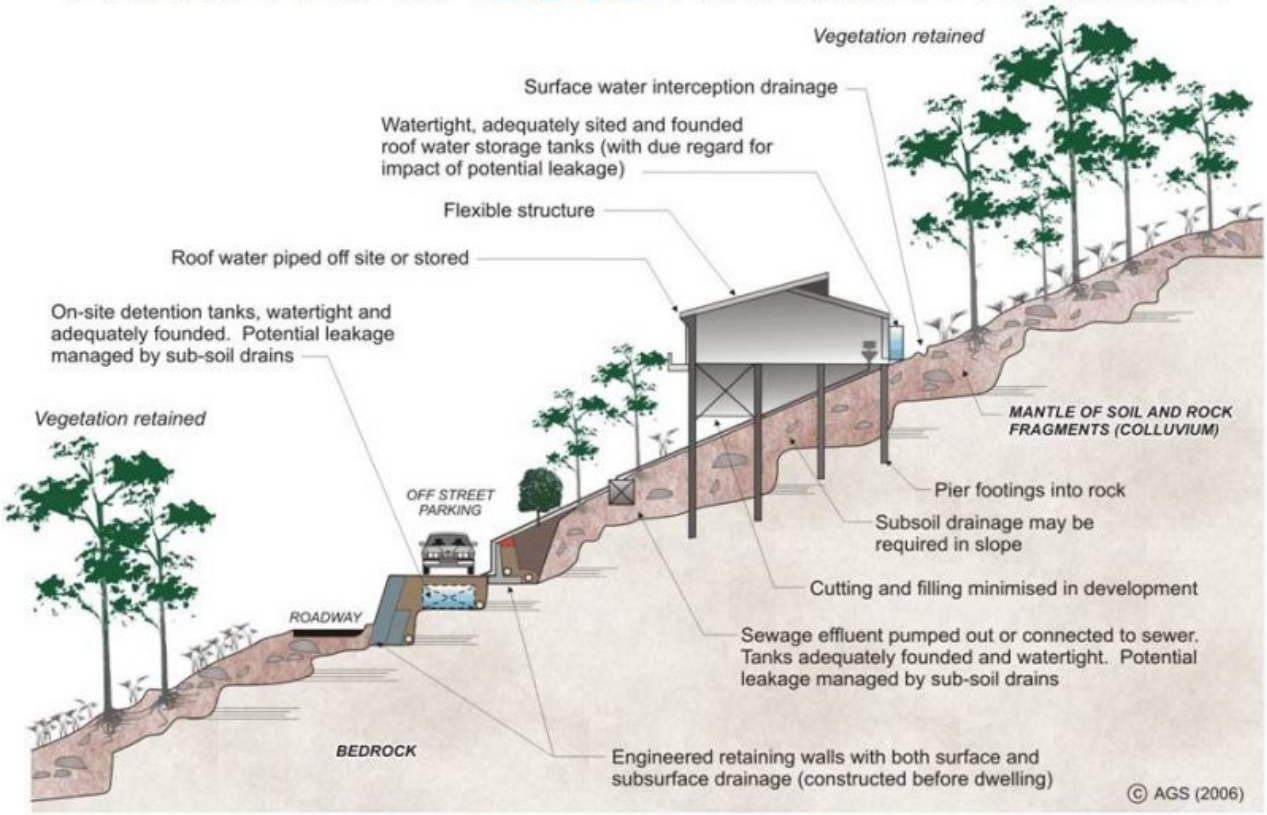
Expected Ground Materials

- Fill
- Topsoil
- Clay
- Very Low Strength Rock
- Hawkesbury Sandstone – Medium Strength



Section A-A

EXAMPLES OF **GOOD** HILLSIDE PRACTICE



EXAMPLES OF **POOR** HILLSIDE PRACTICE