GEOTECHNICAL INVESTIGATION:

New Pool at **129 Upper Clontarf Street, Seaforth**

1. Proposed Development

1.1 Construct a new pool and parking platform on the E side of the property.

1.2 Details of the proposed development are shown on 11 drawings prepared by Alterre Design, Job number AD1902, drawings numbered AD 000 to 010, Revision A, dated 2/2/20.

2. Site Description

2.1 The site was inspected on the 18th December, 2019.

2.2 This residential property has a S aspect. The block runs longways to the W so the slope is a cross-fall. It is located on the edge of a sandstone ridge that steps down the site creating two level benches. The slope falls across the site at an average angle of ~29°. The slope above the property continues at gentle angles. The grade below the property continues at moderate angles.

2.3 At the road frontage, a concrete driveway runs across the upper sandstone bench to a garage attached to the E side of the house (Photos 1 & 2). A sandstone cliff face falls from the downhill side of the driveway to a level lawn area at the lower common boundary (Photos 3 & 4). The cliff reaches a maximum height of ~6.0m. The majority of the cliff displays no significant geological defects. The W end of the cliff is undercut in two locations. The E location is undercut ~2.0m and has a relatively thin cantilever arm in relation to its overhang length (Photo 5). The undercut has been remediated in the past with three steel posts and a rough, stack rock blade wall. Only one of the steel posts still makes contact with the underside of the undercut joint block. This undercut is immediately adjacent to the proposed pool. See **Section 13** for recommendations regarding this undercut. The W location is undercut ~1.5m, has a

relatively thick cantilever arm in relation to its overhang length, and displays no signs of cracking through the cantilever arm as viewed from above or below (Photo 6). Thus, it is considered stable. The part three-storey brick house is supported on brick walls (Photo 2). No significant signs of movement were observed in the supporting brick walls. Some of the supporting walls were observed to be supported directly off outcropping sandstone.

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

As Medium Strength Sandstone was observed to be outcropping across the location of the proposed pool, no subsurface investigation was undertaken (Photo 4).

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. The rock is typically overlain by sandy soils and firm to stiff sandy clays that fill the bench-step formation. Medium Strength Sandstone was observed to be outcropping across the location of the proposed pool and, as sandstone bedrock was observed to be outcropping immediately downslope of the base of the cliff, is expected at a maximum depth of ~1.0m below the base of the cliff. 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 works.

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 construction of the proposed pool impacting on the undercut cliff face is a potential hazard (**Hazard One**).

Risk Analysis Summary

HAZARDS	Hazard One
TYPE	The construction of the proposed pool impacting on the undercut cliff face causing failure (Photos 5 & 6).
LIKELIHOOD	'Unlikely' (10^{-4})
CONSEQUENCES TO PROPERTY	'Medium' (35%)
RISK TO PROPERTY	'Low' (2×10^{-5})
RISK TO LIFE	4.2×10^{-6}/annum
COMMENTS	This level of risk is 'ACCEPTABLE' provided the recommendations in **Sections 12 & 13** are 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

No significant stormwater runoff will be created by the proposed development.

11. Excavations

Apart from those for footings, no excavations are required.

12. Foundations

Piers supported off Medium Strength Sandstone are suitable footings for the proposed pool and parking platform. This material is expected to be exposed at the current surface or is expected at a depth of ~1.0m below the current surface at the base of the cliff. No portion of the pool is to be supported on the undercut portion of the exposed rock outcrop. Where footings are over an exposed sloping rock surface, they may be supported off level pads cut into the rock. Assume a maximum allowable bearing pressure of 1000kPa for footings supported off 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.

13. Remedial Works

See the site plan attached showing the location of each undercut joint block. The E undercut joint block is undercut ~2.0m and has a relatively thin cantilever arm in relation to its overhang length (Photo 5). The undercut has been supported in the past with three steel posts and a rough, stack rock blade wall. Only one of the steel posts still makes contact with the underside of the undercut joint block.

It is recommended that two spaced blade walls be installed to support the overhanging joint block. This work is to be carried out before the construction of the pool commences. The blade walls are to be a minimum of 0.4m wide and are to be supported on foundations taken to rock. The top of the wall is to be in full contact with the underside of the undercut rock so non-shrink grout will be required to achieve this. The blade walls are to be designed by the Structural Engineer in consultation with Geotechnical Consultant.

Once the walls are in place, the tip of the undercut joint block may then be sawn off to not further back than the line of the joint block above (downhill edge of the rock above) and picked out without the use of pneumatic hammers.

If the W undercut joint block (Photo 6) is to be trimmed for the pool construction or excavated in anyway or will be supporting any structures or foundations, it is also to be underpinned following the process outlined above.

REQUIRED INSPECTIONS ARE ON THE NEXT PAGE

14. 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 footings for the blade walls are to be inspected and approved by the geotechnical consultant while the excavation equipment is still onsite and before steel reinforcing is placed or concrete is poured.

- The geotechnical consultant is to inspect the completed blade walls prior to the commencement of any construction work on the pool.

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

White Geotechnical Group Pty Ltd.

Ben White M.Sc. Geol.,
AusIMM., CP GEOL.
No. 222757
Engineering Geologist

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

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.

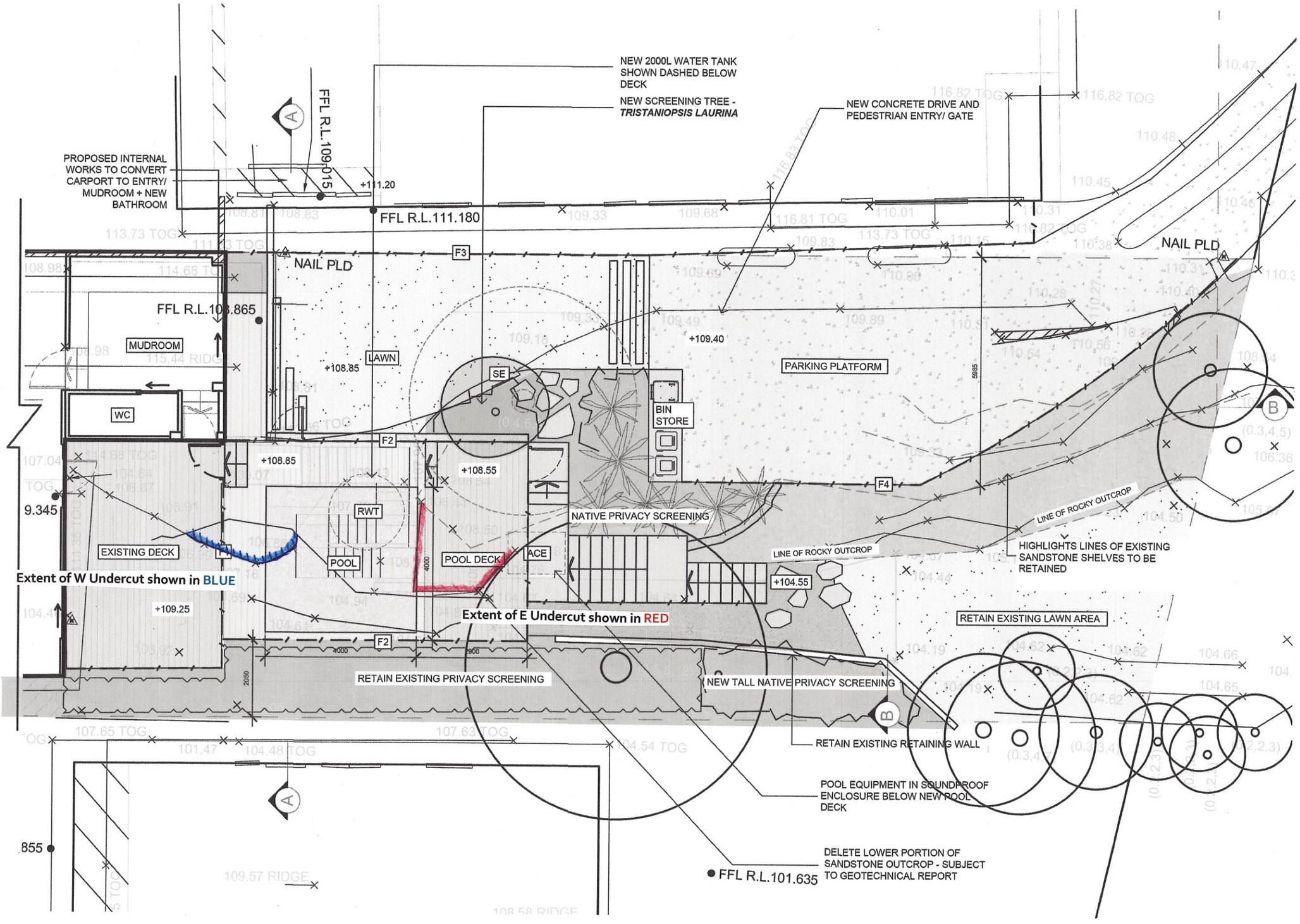
- The report addresses issues relating to your specific design and site. If the proposed project design changes, aspects of the report may no longer apply. Contact White Geotechnical if this occurs.

- 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 locations of undercut joint blocks



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PROJECT:
UPPER CLONTARF

LOCATION
129 UPPER CLONTARF STREET
SEAFORTH, NSW
2096

CLIENT
JUSTIN + ROWENA

TITLE
LANDSCAPE SITE PLAN

SCALE
1:100 @A3

NORTH

DATE
11.12.2019

JOB NO.
AD 1902

DRAWING NO.
AD 001

REV
A

LEGEND

- Retain/ protect existing tree
- Existing tree removed TBC w/arborist report
- Proposed tree Refer key & notes
- Planted areas Refer key & notes
- Timber decking
- Gravel areas
- Existing stone wall
- Proposed stone wall
- Paving
- Steel garden edging
- Fence type 1 - Glass pool fence
- Fence type 2 - Palisade pool fence
- Fence type 3 - Timber boundary fence
- Existing levels
- Proposed levels
- Stone steppers
- Turf areas
- Concrete

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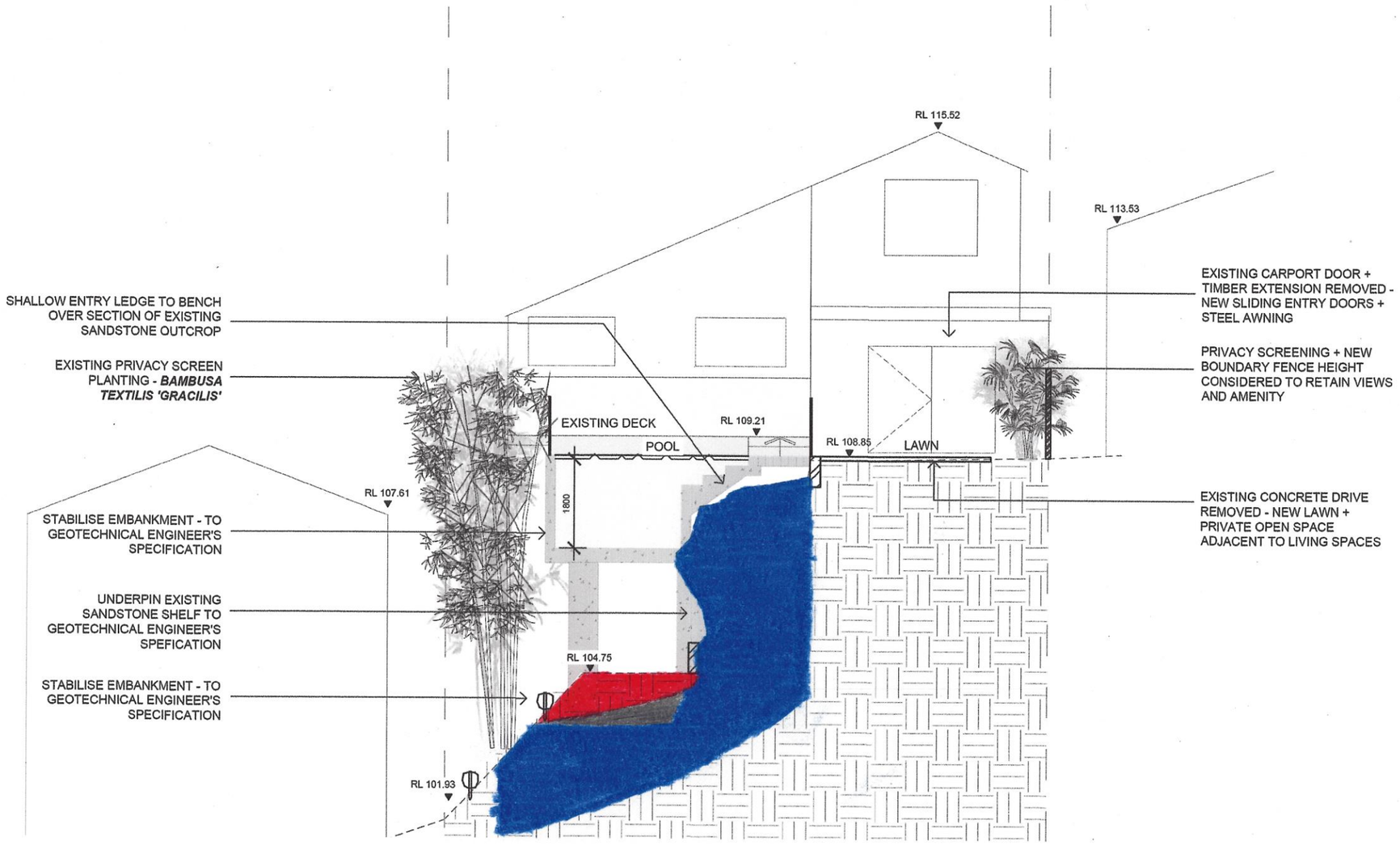
TYPE SECTION – Diagrammatical Interpretation of expected Ground Materials



Fill
Sandy Soil
Sandy Clay – Firm to Stiff
Hawkesbury Sandstone – Medium Strength

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PROJECT:
UPPER CLONTARF

LOCATION
129 UPPER CLONTARF STREET
SEAFORTH, NSW
2096

CLIENT
JUSTIN + ROWENA

TITLE
SECTION ELEVATION AA

SCALE
1:100 @A3

NORTH

DATE
11.12.2019

JOB NO.
AD 1902

DRAWING NO.
AD 002

REV
A

LEGEND

- Retain/ protect existing tree
- Existing tree removed TBC w/arborist report
- Proposed tree Refer key & notes
- Planted areas Refer key & notes
- Timber decking
- Gravel areas
- Existing stone wall
- Proposed stone wall
- Paving
- SE Steel garden edging
- F1 Fence type 1 - Glass pool fence
- F2 Fence type 2 - Palisade pool fence
- F3 Fence type 3 - Timber boundary fence
- 21.52 Existing levels
- RL 21.50 Proposed levels
- Stone steppers
- Turf areas
- Concrete

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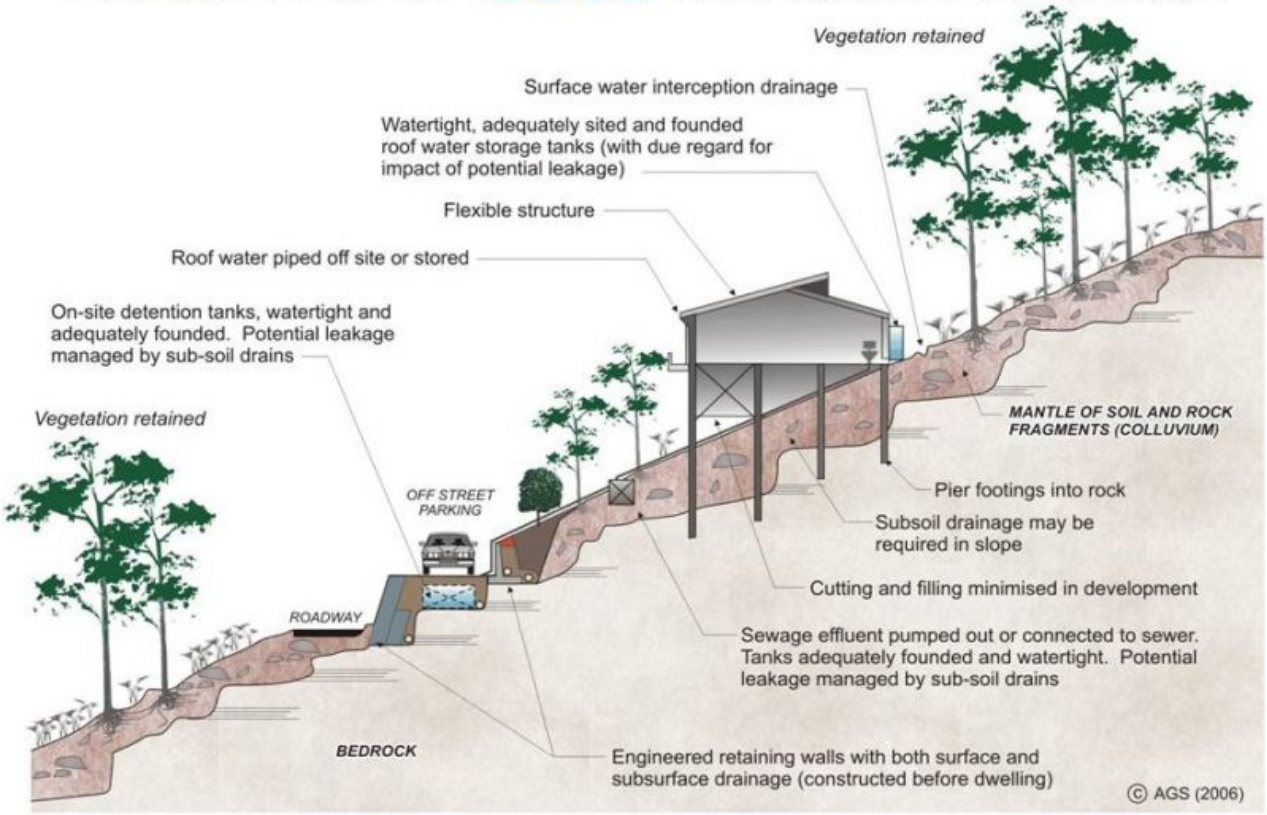
EXAMPLES OF **GOOD** HILLSIDE PRACTICE



EXAMPLES OF **POOR** HILLSIDE PRACTICE