GEOTECHNICAL INVESTIGATION:

New Semi-Detached Houses and Pools at **103 Ocean Street, Narrabeen**

1. Proposed Development

1.1 Demolish the existing house and construct two new semi-detached houses.

1.2 Install two pools on the E side of the property by excavating to a maximum depth of ~1.5m.

1.3 Details of the proposed development are shown on 11 drawings prepared by DesignOC, drawing numbered DA-00 to DA-10, dated 7.2.25.

2. Site Description

2.1 The site was inspected on the 27th January, 2025.

2.2 This residential property is on the E side of the road and is located on the near-level to gentle terrain on the W side of Narrabeen Beach.

2.3 At the road frontage, a paved driveway runs to a garage on the ground-floor of the house (Photo 1). In between the road frontage and the house is a near level lawn area (Photos 2). The two-storey brick house is supported on brick walls. The external brick walls show no significant signs of movement (Photo 3). The house is to be demolished as part of the proposed works. A near level lawn area extends off the E side of the house to the E common boundary. (Photo 4).

3. Geology

The Sydney 1:100 000 Geological Sheet indicates the site is underlain by Medium to fine “marine” sand (Qhf) of the foredune.

4. Subsurface Investigation

Four hand Auger Holes (AH) were put down to identify the soil materials. Four Dynamic Cone Penetrometer (DCP) tests were put down to determine the relative densities of the sands through the profile. 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 be an issue for the testing on this site. However, excavation and foundation budgets should always allow for the possibility that the interpreted ground conditions in this report vary from those encountered during excavations. See the appended "Important information about your report" for a more comprehensive explanation. The results are as follows:

AUGER HOLE 1 (~RL9.3) **–** AH1 (Photo 7)

Depth (m)	Material Encountered
0.0 to 0.4	**SAND**, brown, fine to coarse grained, dry.
0.4 to 0.8	**SAND**, light brown, medium grained, dry.
0.8 to 1.2	**SAND**, yellow, medium grained, dry.
1.2 to 2.5	**SAND**, orange, medium grained, dry.
2.5 to 5.0	**SAND**, yellow and orange, medium grained, dry.

End of Hole @ 5.0m in sand. No water table encountered

AUGER HOLE 2 (~RL9.3) **–** AH2 (Photo 2)

Depth (m)	Material Encountered
0.0 to 0.4	**SAND**, brown, fine to coarse grained, dry.
0.4 to 0.8	**SAND**, light brown, medium grained, dry.
0.8 to 2.0	**SAND**, yellow, medium grained, dry.

End of Hole @ 2.0m in sand. No water table encountered.

AUGER HOLE 3 (~RL9.5) **–** AH3 (Photo 3)

0.0 to 0.7	**SAND**, brown, fine to coarse grained, dry.
0.7 to 1.4	**SAND**, light brown, medium grained, dry.
1.4 to 2.0	**SAND**, yellow, medium grained, dry.

End of Hole @ 2.0m in sand. No water table encountered.

AUGER HOLE 4 (~RL9.5) **–** AH4 (Photo 4)

Depth (m)	**Material Encountered**
0.0 to 0.3	**TOPSOIL**, dark brown, sandy, dry, fine to medium grained.
0.3 to 2.0	**SAND**, orange, dry, fine to medium grained.

End of hole @ 2.0m in sand. No water table encountered.

DCP RESULTS ON THE NEXT PAGE

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** (~RL9.3)	**DCP 2** (~R9.3)	**DCP 3** (~RL9.5)	**DCP 4** (~RL9.5)
0.0 to 0.3	2	1	2	1
0.3 to 0.6	8	2	8	4
0.6 to 0.9	5	7	9	5
0.9 to 1.2	7	5	6	8
1.2 to 1.5	8	8	8	11
1.5 to 1.8	12	15	9	9
1.8 to 2.1	9	16	12	9
2.1 to 2.4	10	18	15	9
2.4 to 2.7	#	17	#	15
2.7 to 3.0		#		22
3.0 to 3.3				30
3.3 to 3.6				#
	End of Test @ 2.4m	End of Test @ 2.7m	End of Test @ 2.4m	End of Test @ 3.3m

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

DCP Notes:

DCP1 – End of test @ 2.4m, DCP still going down slowly, orange sand on dry tip.
DCP2 – End of test @ 2.7m, DCP still going down slowly, yellow sand on dry tip.
DCP3 – End of test @ 2.4m, DCP still going down slowly, yellow sand on dry tip.
DCP4 – End of test @ 3.3m, DCP still going down slowly, clean dry tip.

5. Geological Observations/Interpretation

The site is underlain by sand that was encountered to the extent of the testing. To summarise the test results, Loose Sands occupy the top ~0.6m of the profile. These overlie Medium Dense to Dense Sands that extend to at least the extent of the testing. Rock was not encountered to the extent of the tests at 5.0m. See the Type Section attached for a diagrammatical representation of the expected ground materials.

6. Groundwater

Normal ground water seepage is expected to descend rapidly through the sand profile towards the water table. The water table is not expected to be encountered during the proposed excavation

7. Surface Water

No evidence of significant surface flows were observed on the property during the inspection. Normal sheet wash that is generated on the property will be quickly absorbed into the sandy soil where surfaces are unsealed.

8. Geotechnical Hazards and Risk Analysis

No geotechnical hazards were observed above, below, or beside the property. The proposed excavation for the pools is a potential hazard until retaining structures are in place (**Hazard One**).

Risk Analysis Summary

HAZARDS	Hazard One
TYPE	The excavation (up to a maximum depth of 1.5m) collapsing onto the work site before retaining structures are in place.
LIKELIHOOD	'Possible' (10^{-3})
CONSEQUENCES TO PROPERTY	'Medium' (25%)
RISK TO PROPERTY	'Moderate' (2×10^{-4})
RISK TO LIFE	5.9×10^{-5}/annum
COMMENTS	This level of risk to life and property is 'UNACCEPTABLE'. To move risk to 'ACCEPTABLE' levels, the recommendations in **Section 13** 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 away from the street. The stormwater engineer is to refer to council stormwater policy for suitable options for stormwater disposal.

11. Excavations

An excavation to a maximum depth of ~1.5m is required for the proposed pools.

The excavations are expected to be through sandy soils and Loose to Medium Dense Sand. It is envisaged that excavations through soil and sand can be carried out with an excavator and bucket.

The water table is not expected to be encountered during the proposed excavations.

12. Vibrations

No excessive vibrations will be generated by excavation through soil and sand. Any vibrations generated by a domestic machine and bucket up to 20 ton carrying out excavation works will be below the threshold limit for infrastructure or building damage.

13. Excavation Support Requirements

The excavation for the proposed pools will reach a maximum depth of ~1.5m. The setbacks from the proposed excavation to the existing structures/boundaries are as follows:

- ~2.5m from the E common boundary.
- ~5.7m from the N common boundary.
- ~5.7m from the S common boundary.

Provided the pools are dug and installed prior to the construction of the proposed houses, no structures or boundaries are expected to lie within the zone of influence of the proposed excavation.

The sides of the proposed pool excavations are expected to stand at near-vertical angles for short periods of time until the pool structure is installed, provided the cut batters are kept from becoming saturated. If the cut batters remain unsupported for more than a day before pool construction commences, they are to be supported with typical pool shoring until the pool structure is in place.

Upslope runoff is to be diverted from the cut faces by sandbag mounds or other diversion works. All unsupported cut batters 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 pool structure are to be organised so on completion of the excavations they can be constructed as soon as possible. The excavations are to be carried out during a dry period. No excavations are to commence if heavy or prolonged rainfall is forecast.

The geotechnical consultant is to inspect the drilling process of the entire first pile and the ground materials at the base of all the piers before any steel or concrete is placed.

14. Retaining Walls

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

TABLE 1 ON THE NEXT PAGE

Table 1 – Likely Earth Pressures for Retaining Walls

Unit	Earth Pressure Coefficients			
	Unit weight (kN/m^3)	'Active' K_a	'At Rest' K_0	Passive Pressure 'Ultimate'
Soil	20	0.40	0.55	N/A
Loose Sands	20	0.45	0.55	K_p = 3.0
Medium Dense to Dense Sands	20	0.40	0.55	K_p = 4.0

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, and assume retaining walls are fully drained.

It should be noted that passive pressure is an ultimate value and should have an appropriate safety factor applied. No passive resistance should be assumed for the top 0.4m to account for any disturbance from the excavation.

Rock strength and relevant earth pressure coefficients are to be confirmed on site by the geotechnical consultant.

All retaining walls 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 walls, the likely hydrostatic pressures are to be accounted for in the structural design.

15. Site Classification

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

16. Foundations

The proposed semi-detached houses can be supported on a raft slab supported on the underlying Medium Dense Sand. The footing walls are to be shored with timber to prevent collapse.

The proposed pool is expected to be seated in Medium Dense Sand. This is a suitable foundation material.

A maximum allowable bearing pressure of 100kPa can be assumed for footings supported on Medium Dense Sand.

The base of the footing excavations in sand should be compacted as the excavation will loosen the upper sands. This can be carried out with a hand-held plate compactor. Water may be used to assist in compaction in sand but footing materials should be kept damp but not saturated. As a guide to the level of compaction required a density index of >85% is to be achieved.

The geotechnical consultant is to inspect and test the compacted base of the footings to ensure the required density has been achieved during compaction.

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.

17. 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 geotechnical consultant is to inspect and test the compacted base of footing excavations while the compaction equipment is still on site. This is to ensure the required density has been achieved during compaction.

White Geotechnical Group Pty Ltd.

Tyler Jay Johns
BEng (Civil)(Hons),
Geotechnical Engineer.

Reviewed By:

Nathan Gardner B.Sc. (Geol. & Geophys. & Env. Stud.)
AIG., RPGeo Geotechnical & Engineering.
No. 10307
Engineering Geologist & Environmental Scientist.

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5- top to bottom

Photo 6 - top to bottom

Photo 7 - top to bottom

Photo 8 – top to bottom

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.

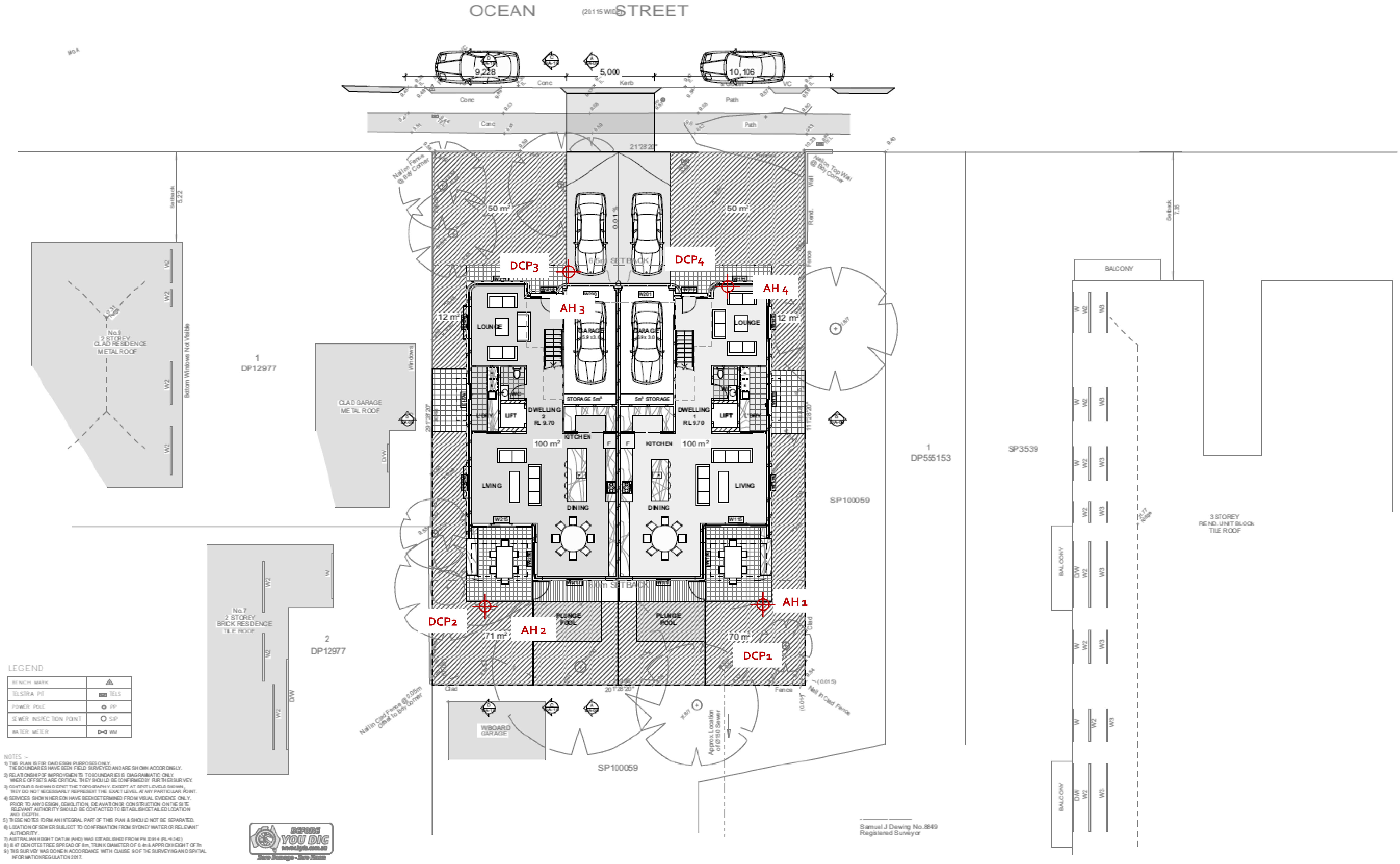
- The report addresses issues relating to your specific design and site. If the proposed project design changes, aspects of the report may no longer apply. Contact White Geotechnical if this occurs.

- 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 and minimum extent of required shoring



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1:100 — 0, 1000, 2000, 3000, 4000, 5000 SCALE
1:200 — 0, 2000, 4000, 6000, 8000, 10000 SCALE

NOTES
The builder shall check and verify all dimensions and verify all errors and omissions to the Architect.
Do not scale the drawings.

AMENDMENTS
A ORIGINAL ISSUE 07.02.25

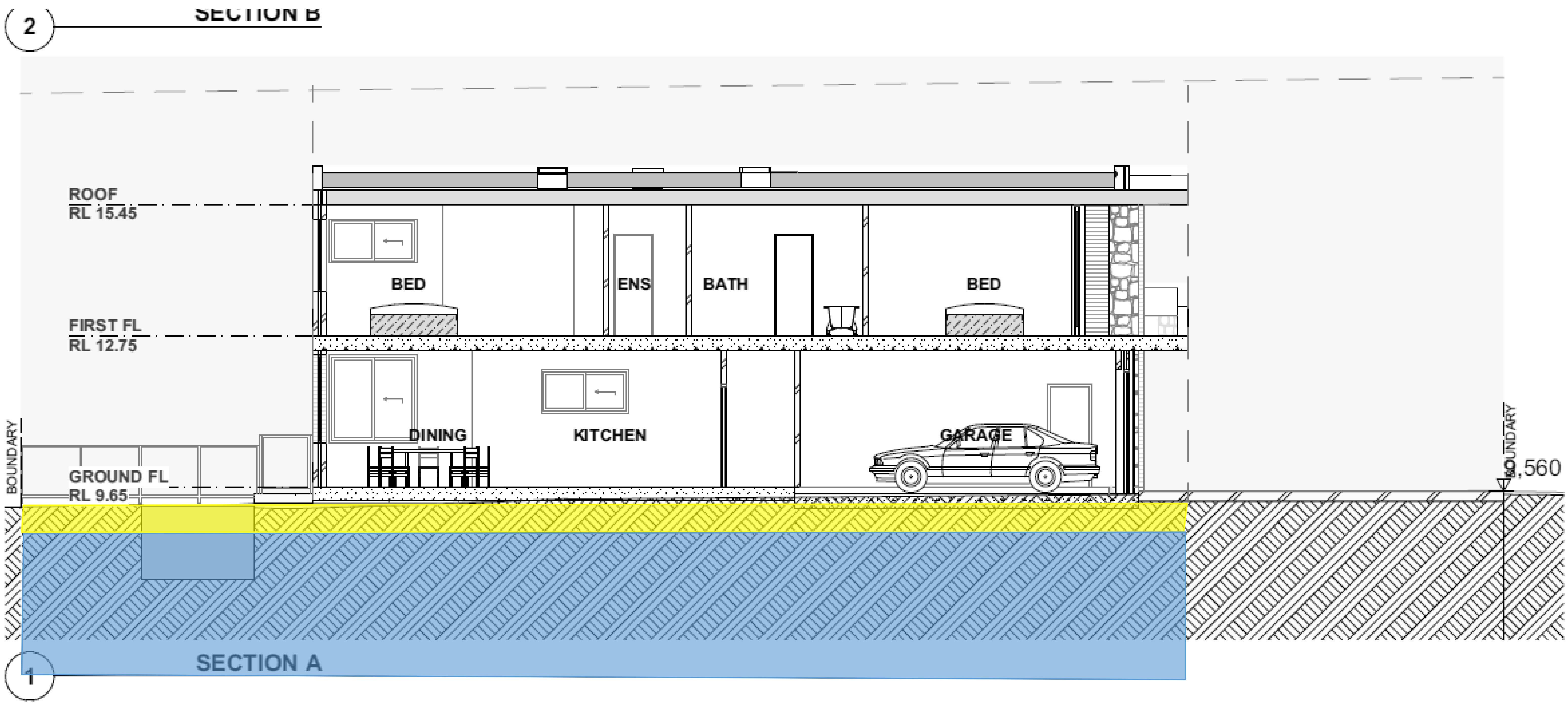
DRAWING NAME
SITE PLAN
DEVELOPMENT APPLICATION

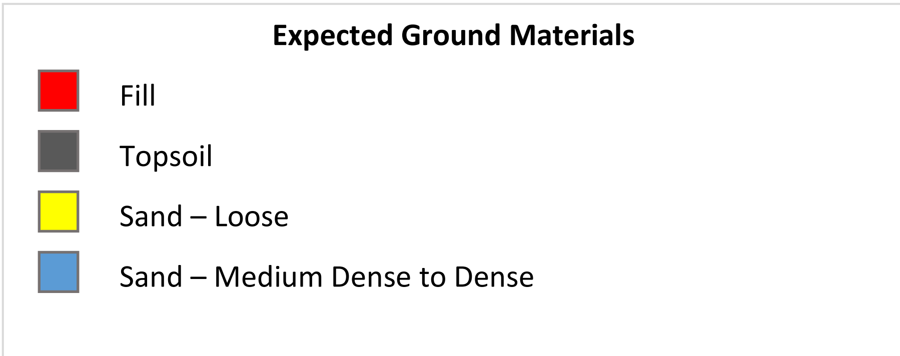
PROJECT
NARRABEEN DWELLINGS
DATE 07.02.25
SCALE 1:200

PROJ. ADDRESS
103 OCEAN STREET, NARRABEEN, 2102
CLIENT
PHIL & LORRAINE SCOTT

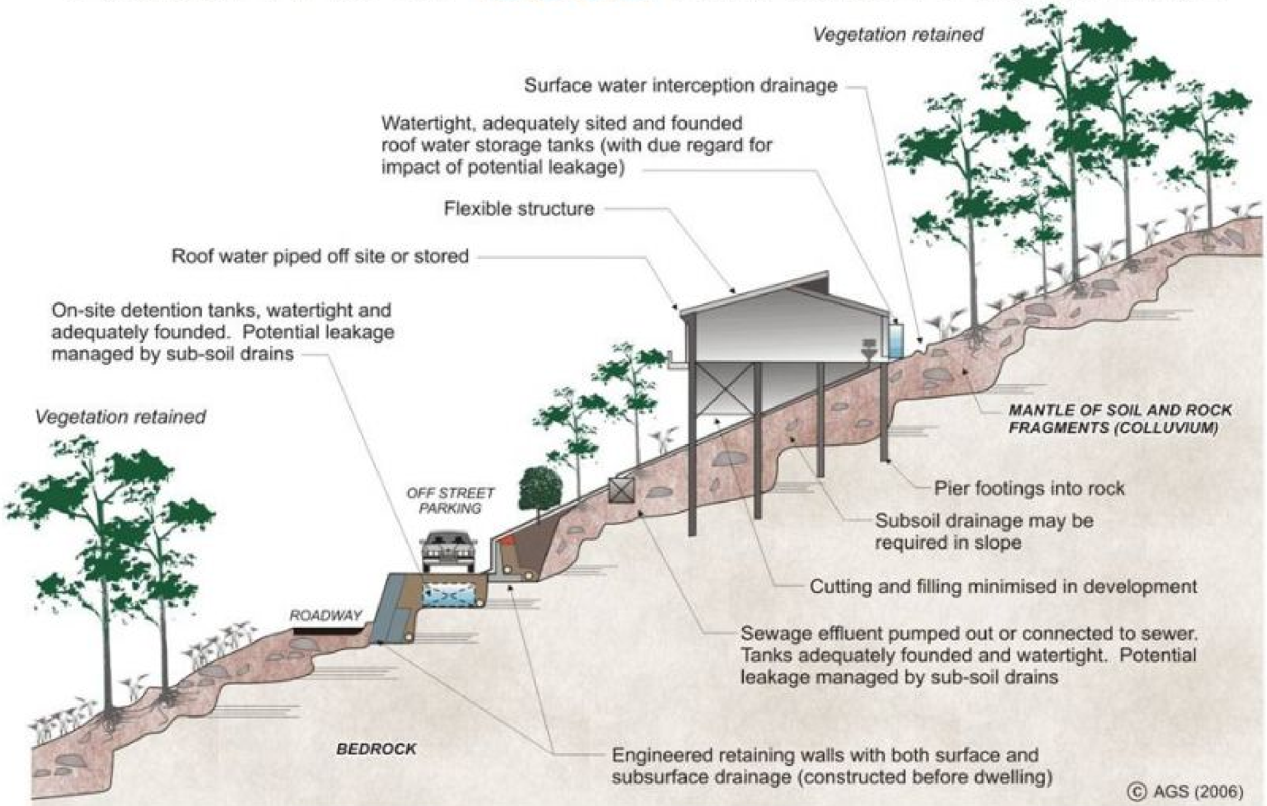
PROJ. CODE
OCE103
DWG NO. DA-02
REV A

TYPE SECTION – Diagrammatical Interpretation of expected Ground Materials

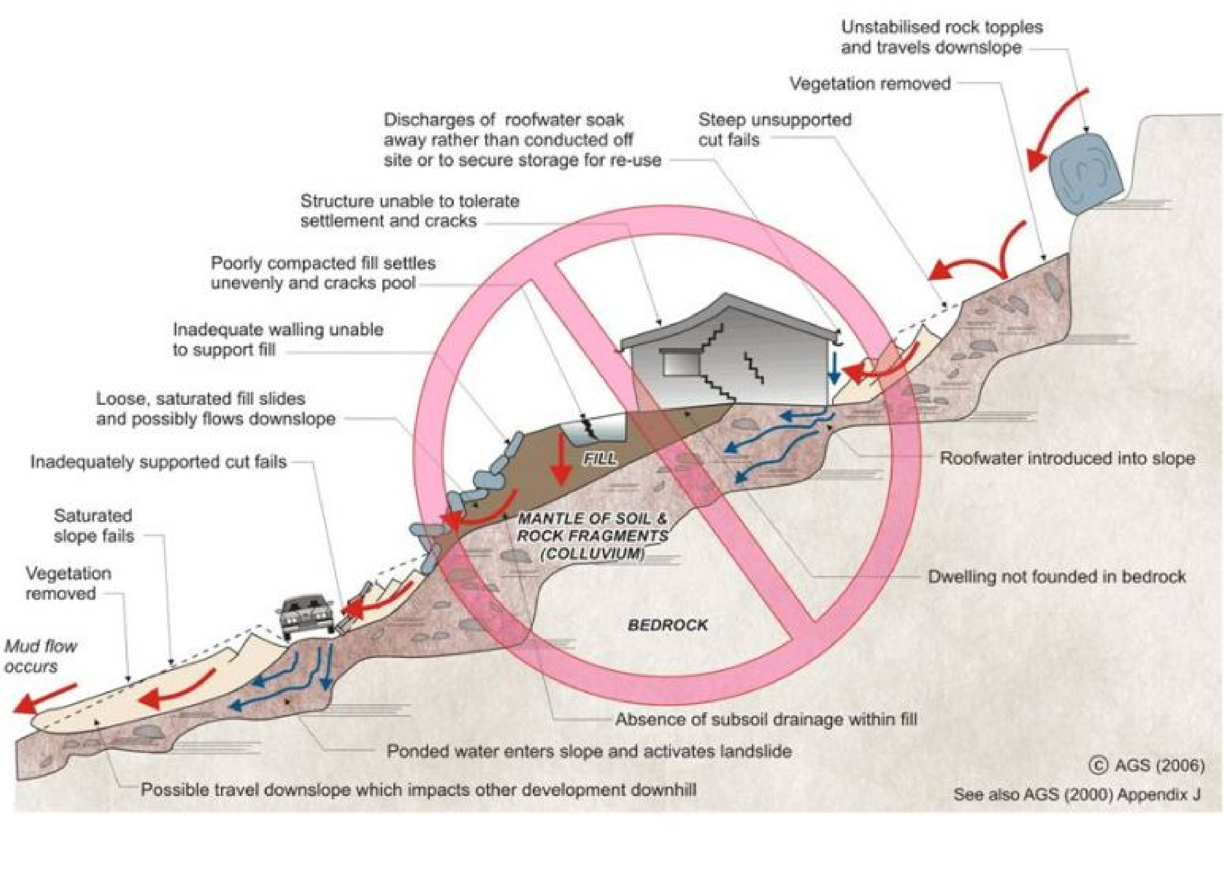




EXAMPLES OF GOOD HILLSIDE PRACTICE



EXAMPLES OF POOR HILLSIDE PRACTICE



INFILTRATION TESTING:

For Proposed Infiltration Trench at **103 Ocean Street, Narrabeen**

1. Site Description

The site was inspected on the 26th February, 2025.

This residential property is on near level ground that falls very gently to the E. The area surrounding the footprint of the house is lawn covered with some paving. The weather had been dry in the days prior to the inspection and the soil was dry at the time of the inspection.

2. Geology

The Sydney 1:100 000 Geological Sheet indicates the site is underlain by Medium to fine “marine” sand (Qhf) of the foredune.

The NSW Environment and Heritage mapping program (eSpade) maps the soil landscape of the property as ‘Narrabeen’.

3. Subsurface Investigation

One Hand Auger Hole (SP1) was put down for the stand pipe used in the infiltration testing. Four Dynamic Cone Penetrometer (DCP) test was put down to determine the relative density of the overlying soil and depth to rock. The locations of the tests are shown on the site plan and the logs and results are as follows:

Stand Pipe 1 (~RL9.3) **–** SP1

Depth (m)	Material Encountered
0.0 to 0.4	**SAND**, brown, fine to coarse grained, dry.
0.4 to 0.8	**SAND**, light brown, medium grained, dry.

End of Hole @ 0.8m in medium dense sand. 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** (~RL9.3)	**DCP 2** (~R9.3)	**DCP 3** (~RL9.5)	**DCP 4** (~RL9.5)
0.0 to 0.3	2	1	2	1
0.3 to 0.6	8	2	8	4
0.6 to 0.9	5	7	9	5
0.9 to 1.2	7	5	6	8
1.2 to 1.5	8	8	8	11
1.5 to 1.8	12	15	9	9
1.8 to 2.1	9	16	12	9
2.1 to 2.4	10	18	15	9
2.4 to 2.7	#	17	#	15
2.7 to 3.0		#		22
3.0 to 3.3				30
3.3 to 3.6				#
	End of Test @ 2.4m	End of Test @ 2.7m	End of Test @ 2.4m	End of Test @ 3.3m

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

DCP Notes:

DCP1 – End of test @ 2.4m, DCP still going down slowly, orange sand on dry tip.
DCP2 – End of test @ 2.7m, DCP still going down slowly, yellow sand on dry tip.
DCP3 – End of test @ 2.4m, DCP still going down slowly, yellow sand on dry tip.
DCP4 – End of test @ 3.3m, DCP still going down slowly, clean dry tip.

4. Geological Interpretation

Loose Sands occupy the top ~0.6m of the profile. These overlie Medium Dense to Dense Sands that extend to at least the extent of the testing. Rock was not encountered to the extent of the tests.

5. Water Table

The water table was not encountered during the testing. Due to the elevation of the block, the water table is not expected to be encountered during the proposed works.

6. Infiltration Rate

A Constant head infiltration test was carried out within a slotted PVC stand pipe. The stand pipe was filled with water and a constant head maintained until the flow rate of water into the borehole equalled the flow rate out of the borehole into the ground.

To create a saturated bulb in the testing zone the hole was repeatedly filled with water and the drop in water level measured relative to time. This process was repeated until successive tests gave different readings by <5%. It was this run that was used to determine the infiltration rate.

The results of the testing are as follows:

Auger Location	Depth of Test (m)	Measured Infiltration Rate $L/m^2/s$	Design Infiltration Rate (long term) $L/m^2/s$
STANDPIPE1	0.8	0.45	0.225
Note: The Design Infiltration Rate is based on bore hole geometry.			

7. Recommendations

Minimum Distance from Boundaries

Trenches should follow the natural slope contours (i.e., run perpendicular to the slope direction) and be at least 3.0m from downhill structures and downslope common boundaries.

Impact on Surrounding Structures

The existing stormwater is piped underground and discharged to a location that could not be visually determined on-site, but probably goes to an existing pit. We are not aware of any seepage issues impacting on the surrounding properties. Given the nature of the sandy soil and the relatively high infiltration rate we are of the opinion that the installation of the proposed trench will not detrimentally impact the neighbouring properties, provided good engineering and building practises are carried out in its design and construction.

Subsurface Waterproofing

No subsurface water proofing will be required.

Design Requirements for walls or Footings

There are no special design requirements for footings.

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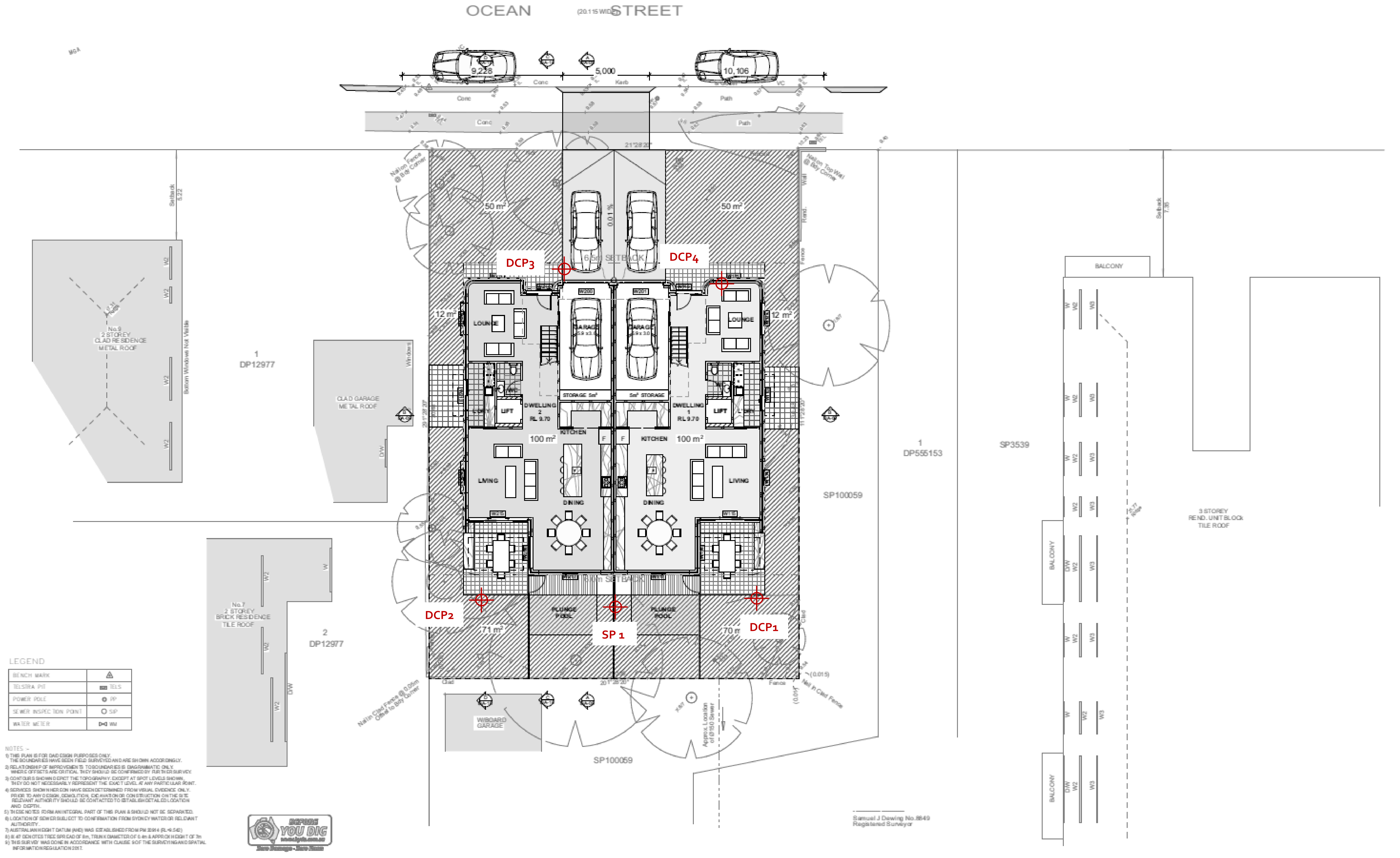
SITE PLAN – showing test locations and minimum extent of required shoring



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SCALE	1:100 — 0, 1000, 2000, 3000, 4000, 5000 1:200 — 0, 2000, 4000, 6000, 8000, 10000
NOTES	The builder shall check and verify all dimensions and verify all errors and omissions to the Architect. Do not scale the drawings.
AMENDMENTS	A ORIGINAL ISSUE 07.02.25
DRAWING NAME	SITE PLAN DEVELOPMENT APPLICATION
PROJECT	NARRABEEN DWELLINGS
DATE	07.02.25
SCALE	1:200
PROJ. ADDRESS	103 OCEAN STREET, NARRABEEN, 2102
CLIENT	PHIL & LORRAINE SCOTT
PROJ. CODE	OCE103
DWG NO.	DA-02
REV	A