GEOTECHNICAL RISK MANAGEMENT POLICY FOR PITTWATER
FORM NO. 1 – To be submitted with Development Application

Development Application for _____
Name of Applicant

Address of site 87 Alexandra Crescent, Bayview

The following checklist covers the minimum requirements to be addressed in a Geotechnical Risk ***Declaration made by geotechnical engineer or engineering geologist or coastal engineer (where applicable) as part of a geotechnical report***

I, Ben White *on behalf of* White Geotechnical Group Pty Ltd
(Insert Name) (Trading or Company Name)

on this the 13/7/20 certify that I am a geotechnical engineer or engineering geologist or coastal engineer as defined by the Geotechnical Risk Management Policy for Pittwater - 2009 and I am authorised by the above organisation/company to issue this document and to certify that the organisation/company has a current professional indemnity policy of at least $10million.

I:
Please mark appropriate box

☒ have prepared the detailed Geotechnical Report referenced below in accordance with the Australia Geomechanics Society's Landslide Risk Management Guidelines (AGS 2007) and the Geotechnical Risk Management Policy for Pittwater - 2009

☒ am willing to technically verify that the detailed Geotechnical Report referenced below has been prepared in accordance with the Australian Geomechanics Society's Landslide Risk Management Guidelines (AGS 2007) and the Geotechnical Risk Management Policy for Pittwater - 2009

☐ have examined the site and the proposed development in detail and have carried out a risk assessment in accordance with Section 6.0 of the Geotechnical Risk Management Policy for Pittwater - 2009. I confirm that the results of the risk assessment for the proposed development are in compliance with the Geotechnical Risk Management Policy for Pittwater - 2009 and further detailed geotechnical reporting is not required for the subject site.

☐ have examined the site and the proposed development/alteration in detail and I am of the opinion that the Development Application only involves Minor Development/Alteration that does not require a Geotechnical Report or Risk Assessment and hence my Report is in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009 requirements.

☐ have examined the site and the proposed development/alteration is separate from and is not affected by a Geotechnical Hazard and does not require a Geotechnical Report or Risk Assessment and hence my Report is in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009 requirements.

☐ have provided the coastal process and coastal forces analysis for inclusion in the Geotechnical Report

Geotechnical Report Details:

Report Title: Geotechnical Report **87 Alexandra Crescent, Bayview**

Report Date: 13/7/20

Author: BEN WHITE

Author's Company/Organisation: **WHITE GEOTECHNICAL GROUP PTY LTD**

Documentation which relate to or are relied upon in report preparation:

Australian Geomechanics Society Landslide Risk Management March 2007.

White Geotechnical Group company archives.

I am aware that the above Geotechnical Report, prepared for the abovementioned site is to be submitted in support of a Development Application for this site and will be relied on by Pittwater Council as the basis for ensuring that the Geotechnical Risk Management aspects of the proposed development have been adequately addressed to achieve an "Acceptable Risk Management" level for the life of the structure, taken as at least 100 years unless otherwise stated and justified in the Report and that reasonable and practical measures have been identified to remove foreseeable risk.

Signature _____

Name Ben White

Chartered Professional Status MScGEOLAusIMM CP GEOL

Membership No. 222757

Company White Geotechnical Group Pty Ltd

GEOTECHNICAL RISK MANAGEMENT POLICY FOR PITTWATER
FORM NO. 1(a) - Checklist of Requirements for Geotechnical Risk Management Report for Development Application

Development Application for _____
Name of Applicant

Address of site 87 Alexandra Crescent, Bayview

The following checklist covers the minimum requirements to be addressed in a Geotechnical Risk Management Geotechnical Report. This checklist is to accompany the Geotechnical Report and its certification (Form No. 1).

Geotechnical Report Details:

Report Title: Geotechnical Report **87 Alexandra Crescent, Bayview**

Report Date: 13/7/20

Author: BEN WHITE

Author's Company/Organisation: WHITE GEOTECHNICAL GROUP PTY LTD

Please mark appropriate box

☒ Comprehensive site mapping conducted **29/06/20**
(date)

☒ Mapping details presented on contoured site plan with geomorphic mapping to a minimum scale of 1:200 (as appropriate)

☒ Subsurface investigation required
- ☐ No Justification _____
- ☒ Yes Date conducted **29/06/20**

☒ Geotechnical model developed and reported as an inferred subsurface type-section

☒ Geotechnical hazards identified
- ☒ Above the site
- ☒ On the site
- ☒ Below the site
- ☐ Beside the site

☒ Geotechnical hazards described and reported

☒ Risk assessment conducted in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009
- ☒ Consequence analysis
- ☒ Frequency analysis

☒ Risk calculation

☒ Risk assessment for property conducted in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009

☒ Risk assessment for loss of life conducted in accordance with the Geotechnical Risk Management Policy for Pittwater - 2009

☒ Assessed risks have been compared to "Acceptable Risk Management" criteria as defined in the Geotechnical Risk Management Policy for Pittwater - 2009

☒ Opinion has been provided that the design can achieve the "Acceptable Risk Management" criteria provided that the specified conditions are achieved.

☒ Design Life Adopted:
- ☒ 100 years
- ☐ Other _____
specify

☒ Geotechnical Conditions to be applied to all four phases as described in the Geotechnical Risk Management Policy for Pittwater - 2009 have been specified

☒ Additional action to remove risk where reasonable and practical have been identified and included in the report.

☐ Risk assessment within Bushfire Asset Protection Zone.

I am aware that Pittwater Council will rely on the Geotechnical Report, to which this checklist applies, as the basis for ensuring that the geotechnical risk management aspects of the proposal have been adequately addressed to achieve an "Acceptable Risk Management" level for the life of the structure, taken as at least 100 years unless otherwise stated, and justified in the Report and that reasonable and practical measures have been identified to remove foreseeable risk.

Signature _____

Name Ben White

Chartered Professional Status MScGEOLAusIMM CP GEOL

Membership No. 222757

Company White Geotechnical Group Pty Ltd

GEOTECHNICAL INVESTIGATION:

Alterations and Additions at **87 Alexandra Crescent, Bayview.**

1. Proposed Development

1.1 Demolish the existing carport. Extend the existing carport to the S and construct a new lift connecting the carport to the house by excavating to a maximum depth of ~6.4m.

1.2 Extend the lower ground floor of the house and construct a new lift connecting the lower ground floor to the first floor by excavating to a maximum depth of ~2.5m.

1.3 Extend the E side of the first floor of the house adjacent to the proposed upper lift.

1.4 Various other minor internal and external alterations to the existing house.

1.5 Details of the proposed development are shown on 10 drawings prepared by Lindsay Little & Associates, job number 1281/19, drawings numbered A02 to A11, dated June 2020.

2. Site Description

2.1 The site was inspected on the 29th of June, 2020.

2.2 This residential property is located off the turning circle at the end of the street. It is on the high side of the road and has a N aspect. It is located on the steeply graded upper middle reaches of a hillslope. The natural slope rises at an angle of ~29° from the downhill property boundary to the downhill side of the house. The slope then eases to an angle of ~19° before reaching a sandstone bedrock cliff face up to ~7m

high. The slope above the property decreases in grade and the slope below the property gradually eases.

2.3 At the road frontage a concrete driveway runs to a carport cut into the slope (Photo 1). The cut is supported by sandstone block, brick and concrete block retaining walls up to ~3.4m high (Photos 1 to 3). The highest portion of the sandstone block wall is supported by a brick wall in front of the base of the retaining wall (Photo 2). The retaining walls are considered to be stable. Between the carport and the house is a steep and thickly vegetated slope (Photo 1). The part three storey rendered brick and weatherboard clad house is supported by brick walls and brick piers Photos (1 & 4). The supporting walls and piers stand vertical and show no significant signs of movement (Photo 5). Uphill of the house a cut in the slope provides a level platform for the house. The cut is supported by concrete block and sandstone flagging retaining walls up to ~2.7m high. (Photos 6 & 7). The W portion of the concrete block retaining wall is tilting at up to ~4° from vertical. See 'Section 16 Ongoing Maintenance'. A Medium Strength Sandstone bedrock cliff face up to ~7m outcrops above the cut for the house (Photo 8). A portion of the cliff face is undercut by up to ~4.4m (Photo 9). The undercut is considered stable. No geotechnical hazards were observed on the neighbouring properties that could impact on the subject property as seen from the street and subject property.

3. Geology

The Sydney 1:100 000 Geological sheet indicates the site is underlain by the Newport Formation of the Narrabeen Group with the contact point of Hawkesbury Sandstone expected to be at the base of the sandstone rock face above the house. It is interpreted from ground tests and observations of the outcropping rock that the proposed works are underlain by the Newport Formation of the Narrabeen Group.

4. Subsurface Investigation

One cored bore hole to 9m deep had been drilled on the site previously by another firm in the location of the proposed lower lift. Six Dynamic Cone Penetrometer (DCP) tests were put down to determine the relative density of the overlying soil and the depth to weathered rock. The locations of the tests are shown on the site plan. 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 may have occurred for DCP4. 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:

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** (~RL72.7)	**DCP 2** (~RL72.9)	**DCP 3** (~RL71.5)	**DCP 4** (~RL75.5)	**DCP 5** (~RL77.8)	**DCP 6** (~RL74.8)
0.0 to 0.3	2	3	4	18	3	16
0.3 to 0.6	9	11F	6	4	12	13
0.6 to 0.9	8	5	14	#	19	17
0.9 to 1.2	15	6	12		25	22
1.2 to 1.5	30	8	40		#	20
1.5 to 1.8	20	12	#			31
1.8 to 2.1	21	13				36
2.1 to 2.4	40	33				#
2.4 to 2.7	#	#				
2.7 to 3.0						
	End of Test @ 2.4m	End of Test @ 2.4m	End of Test @ 1.5m	Refusal @ 0.4m	Refusal @ 1.0m	End of Test @ 2.1m

#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 very slowly going down, white impact dust on dry tip.
DCP2 – End of Test @ 2.4m, DCP still very slowly going down, dark brown rock fragments on moist tip.
DCP3 – End of Test @ 1.5m, DCP still very slowly going down, dark brown sandy soil on moist tip.
DCP4 – Refusal @ 0.4m, DCP thudding, orange and white rock fragments on dry tip.
DCP5 – Refusal @ 1.0m, DCP bouncing, orange impact dust on moist tip.
DCP6 – End of Test @ 2.1m, DCP still very slowly going down, light and dark brown sandy soil on damp tip.

5. Geological Observations/Interpretation

The slope materials are colluvial at the near surface and residual at depth. In the test locations, the ground materials consist of fill and soil over firm to stiff clays. Fill provides a level platform on the downhill side of the house. Below the filled areas the clays merge into the weathered zone of the under lying rocks at depths of between ~1.0m to ~2.4m below the current surface. In the locations of DCP1 to DCP3 and DCP6 the weathered zone of the underlying rock is interpreted as Extremely Low Strength Shale. It is to be noted that this material is a soft rock and can appear as a mottled stiff clay when it is cut up by excavation equipment. A cored borehole near the location of DCP1 completed by another firm during 2004 shows that Very Low to Low Strength shale extends to a depth of ~7.2m, with Very Low to Low Strength Sandstone encountered below the shale to the extent of the testing at a depth of 9m. In the locations of DCP4 and DCP5 the weathered zone of the underlying rock is interpreted as Low to Medium Strength Rock.

6. Groundwater

Normal ground water seepage is expected to move over the buried surface of the rock and through the cracks in the rock.

Due to the slope and elevation of the block, the water table in the location is expected to be many metres below 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. Due to the steep slope above this is expected to flow at high velocities.

8. Geotechnical Hazards and Risk Analysis

No geotechnical hazards were observed beside the property. The steep slope that falls across the property and continues above and below is a potential hazard (**Hazard One**). The excavation for the proposed carport and lower lift is a potential hazard until retaining structures are in place (**Hazard Two**). The excavation for the proposed carport and lower lift undercutting the supporting structures of the existing house is a potential hazard (**Hazard Three**). The excavation for the proposed lower ground floor extension and upper lift is a potential hazard until retaining structures are in place (**Hazard Four**). The excavation for the proposed lower ground floor extension and upper lift undercutting the supporting structures of the existing house is a potential hazard (**Hazard Five**). The vibrations from the excavation for the proposed lower ground floor extension and upper lift are a potential hazard (**Hazard Six**).

RISK ANALYSIS SUMMARY ON NEXT PAGE

Geotechnical Hazards and Risk Analysis - Risk Analysis Summary

HAZARDS	Hazard One	Hazard Two	Hazard Three
TYPE	The steep slope that falls across the property and continues above and below failing and impacting on the property.	The excavation for the proposed carport and lower lift (up to a depth of ~6.4m) partially collapsing onto the worksite before retaining walls are in place.	The excavation for the proposed carport and lower lift undercutting the supporting structures of the existing house causing damage.
LIKELIHOOD	'Unlikely' (10^{-4})	'Likely' (10^{-2})	'Possible' (10^{-3})
CONSEQUENCES TO PROPERTY	'Medium' (12%)	'Medium' (30%)	'Medium' (35%)
RISK TO PROPERTY	'Low' (2×10^{-5})	'High' (2×10^{-3})	'Moderate' (2×10^{-4})
RISK TO LIFE	8.3×10^{-7}/annum	8.3×10^{-4}/annum	8.3×10^{-6}/annum
COMMENTS	This level of risk is 'ACCEPTABLE' provided the recommendations in **Section 16** are carried out.	This level of risk to life and property is 'UNACCEPTABLE'. To move the risk to 'ACCEPTABLE' levels, the recommendations in **Section 13** 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)

RISK ANALYSIS SUMMARY CONTINUES ON NEXT PAGE

Geotechnical Hazards and Risk Analysis - Risk Analysis Summary

HAZARDS	Hazard Four	Hazard Five	Hazard Six
TYPE	The excavation for the proposed lower ground floor extension and upper lift (up to a depth of ~2.5m) collapsing onto the worksite before retaining walls are in place.	The excavation for the proposed lower ground floor extension and upper lift undercutting the supporting structures of the existing house causing failure.	The vibrations produced during the excavation for the proposed lower ground floor extension and upper lift impacting on the surrounding structures.
LIKELIHOOD	'Possible' (10^{-3})	'Possible' (10^{-3})	'Possible' (10^{-3})
CONSEQUENCES TO PROPERTY	'Medium' (15%)	'Medium' (35%)	'Medium' (15%)
RISK TO PROPERTY	'Moderate' (2×10^{-4})	'Moderate' (2×10^{-4})	'Moderate' (2×10^{-4})
RISK TO LIFE	8.3×10^{-6}/annum	8.3×10^{-6}/annum	8.3×10^{-7}/annum
COMMENTS	This level of risk to life and property is 'UNACCEPTABLE'. To move the risk to 'ACCEPTABLE' levels, the recommendations in **Section 13** 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.	This level of risk to property is 'UNACCEPTABLE'. To move risk to 'ACCEPTABLE' levels the recommendations in **Sections 11 & 12** 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 Alexandra Crescent. All stormwater from the proposed 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 ~6.4m is required for the proposed carport and lower lift. The excavation is expected to be through fill, soil and clay with Extremely Low Strength Shale expected at depths of between ~1.5m to ~2.4m below the current surface. Extremely Low to Low Strength Shale is expected to extend to the base of the excavation.

Another excavation to a maximum depth of ~2.5m is required for the proposed lower ground floor extension and upper lift. The excavation is expected to be through soil and sandy clay with Extremely Low to Low Strength Shale expected at depths of between ~1.0m and ~2.1m.

It is envisaged that excavations through fill, soil, clay and rock up to Low Strength can be carried out with an excavator and bucket. If Medium Strength Rock is encountered it will require grinding or rock sawing and breaking.

12. Vibrations

It is expected the proposed excavations will be carried out with an excavator and bucket and the vibrations produced will be below the threshold limit for building or infrastructure damage.

If harder rock is encountered, excavations through Medium Strength Rock or better should be carried out to minimise the potential to cause vibration damage to the subject house and neighbouring structures. Close controls by the contractor over rock excavation are recommended so excessive vibrations are not generated.

Excavation methods are to be used that limit peak particle velocity to 10mm/sec at the subject house and property boundaries. Vibration monitoring will be required to verify this is achieved.

If a milling head is used to grind the rock, vibration monitoring will not be required. Alternatively, if rock sawing is carried out around the perimeter of the excavation boundaries in not less than 1.0m lifts, a rock hammer up to 300kg could be used to break the rock without vibration monitoring. Peak particle velocity will be less than 10mm/sec at the subject house and property boundaries using this method provided the saw cuts are kept well below the rock to broken.

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

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. We recommend a pre-construction meeting between the structural engineer, the builder, and the geotechnical consultant to discuss and confirm the excavation plan and to ensure suitable excavation equipment will be on site.

Bulk Excavation for Carport and Lower Lift

An excavation to a maximum depth of ~6.4m is required for the proposed carport and lower lift. The excavation will come flush with the downhill side of the house and deck. Allowing for backwall drainage, the downhill portion of the excavation will be set back ~1.6m from the W common boundary and the uphill portion of the excavation will be set back ~4.1m from W common boundary. The downhill side of the house and W common boundary will be within the zone of influence of the excavation.

If the deck on the downhill side of the house is to remain, it is to be propped and supported with beams where required prior to the excavation commencing.

Due to the depth of the excavation and its proximity to the subject house and W common boundary, we recommend ground support be installed on all sides of the excavation prior to the commencement of the excavation to ensure the safety of any workers below the cut and the integrity of the subject house W neighbouring property. See the site plan attached for the minimum required extent of the shoring shown in blue.

A Spaced Pile Retaining Wall is one of the suitable methods of support. Piers will need to be drilled with a mini piling rig or similar to reach the required depth. Pier spacing is typically ~2.0m but can vary between 1.6 to 2.4m depending on the design. The piers can be supported by embedment, temporary, or permanent rock anchors (depending on the location of the excavation) installed as the excavation is lowered. As the excavation is lowered in 1.5m lifts infill sprayed concrete panels or similar are added between the piers to form the wall. Drainage is installed behind the panels.

The geotechnical consultant is to inspect the drilling process of the entire first pile and the ground materials at the base of all pier holes/excavations for ground support purposes.

Bulk Excavation for Lower Ground Floor and Upper Lift

An excavation to a maximum depth of ~2.5m is required for the proposed lower ground floor extension and upper lift. The excavation will come flush with the supporting structures of the existing house.

The supporting structures of the house within the zone of influence of the excavation are to be underpinned to the base of the excavation prior to the excavation commencing. Alternatively the structure can be propped and supported with beams founded beyond the zone of influence of the proposed excavation.

Advice Applying to Both Excavations

During the excavation process, the geotechnical consultant is to inspect the cut face in 1.5m intervals as it is lowered to ensure ground materials are as expected and that additional support is not required.

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.

All excavation spoil is to be removed from site or be supported by engineered retaining walls.

14. 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	Passive
Soil and Fill	20	0.40	0.55	N/A
Residual Clays	20	0.35	0.45	Kp 2.0 ultimate
Rock up to Low Strength Rock - Jointed	24	0.25	0.35	Kp 2.5 ultimate
Medium Strength Rock	24	0.00	0.01	2.0MPa ultimate

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 structures 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 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.

15. Foundations

The proposed carport extension and lower lift are expected to be seated in Very Low to Low Strength Shale. This is a suitable foundation material. The proposed house additions can be supported on a raft slab supported on the underlying Extremely Low to Low Strength Shale. This ground material is expected to be exposed across the base of the excavation on the uphill side. On the downhill side where the rock drops away with the slope, piers will be required to maintain a uniform bearing pressure across the structure. A maximum allowable bearing pressure of 600kPa can be assumed for footings on Extremely Low Strength Shale or better.

The foundations of the existing carport and house are currently unknown. Ideally, footings should be founded on the same footing material across the structure. Where the footing material does change across the structure construction joints or similar are to be installed to prevent differential settlement, where the structure cannot tolerate such movement in accordance with a class M site.

As the bearing capacity of shale reduces when it is wet, we recommend the footings be dug, inspected, and poured in quick succession (ideally the same day if possible). If the footings get wet, they will have to be drained and the soft layer of wet shale on the footing surface will have to be removed before concrete is poured.

If a rapid turnaround from footing excavation to the concrete pour is not possible, a sealing layer of concrete may be added to the footing surface after it has been cleaned.

NOTE: If the contractor is unsure of the footing material required it is more cost effective to get the geotechnical professional 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.

16. Ongoing Maintenance

The concrete block retaining wall (Photo 6) is to be monitored by the owners on an annual basis or after heavy prolonged rainfall events, whichever occurs first. A photographic record of these inspections is to be kept. Should further movement occur the wall is to be remediated so it meets current engineering standards. We can carry out these inspections upon request.

Where slopes are steep and approach or exceed 30°, such as on this site, it is prudent for the owners to occasionally inspect the slope (say annually or after heavy rainfall events, whichever occurs first). Should any of the following be observed: movement or cracking in retaining walls, cracking in any structures, cracking or movement in the slope surface, tilting or movement in established trees, leaking pipes, or newly observed flowing water, or changes in the erosional process or drainage regime, then a geotechnical consultant should be engaged to assess the slope. We can carry out these inspections upon request.

The risk assessment in **Section 8** is subject to this ongoing maintenance being carried out.

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 Occupation Certificate if the following inspections have not been carried out during the construction process.

- The geotechnical consultant is to inspect the ground materials while the first pile for the pile wall is being dug to assess the ground strength and to ensure it is in line with our expectations. All finished pier holes are to be inspected and measured before concrete is placed.

- During the excavation process, the geotechnical consultant is to inspect the cut face in 1.5m intervals as it is lowered to ensure ground materials are as expected and that additional support is not required.

- 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

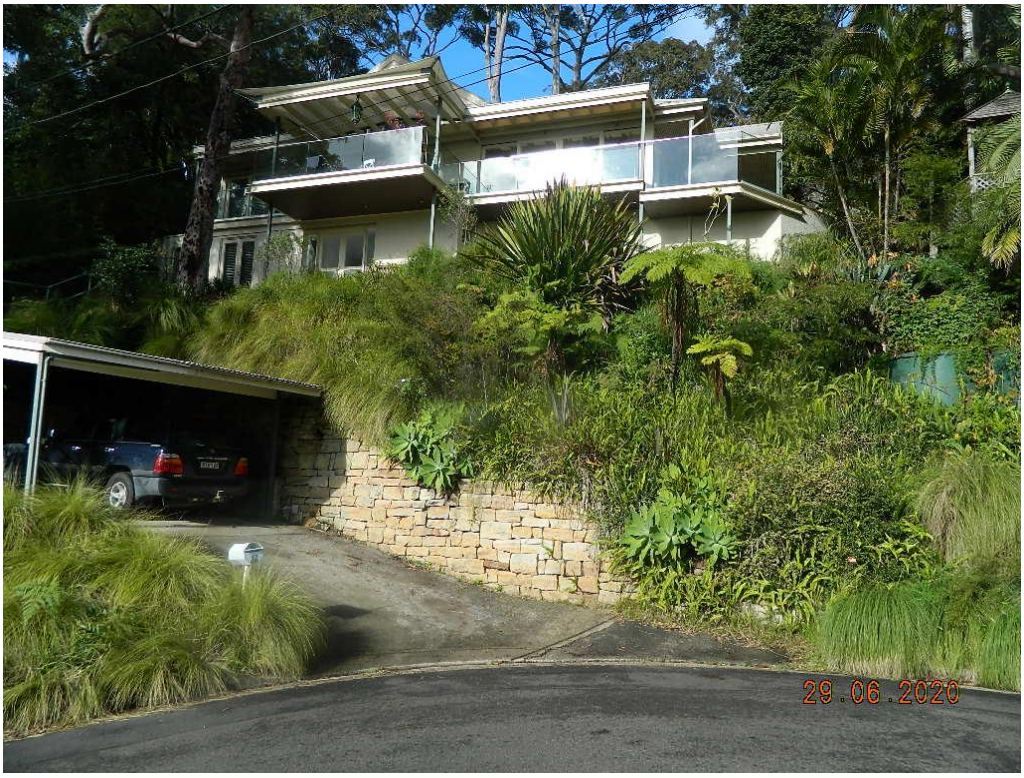
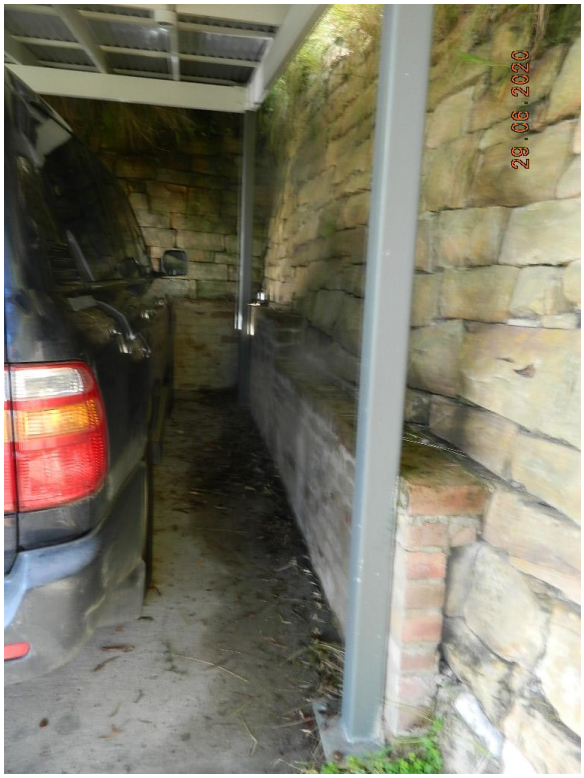


Photo 1



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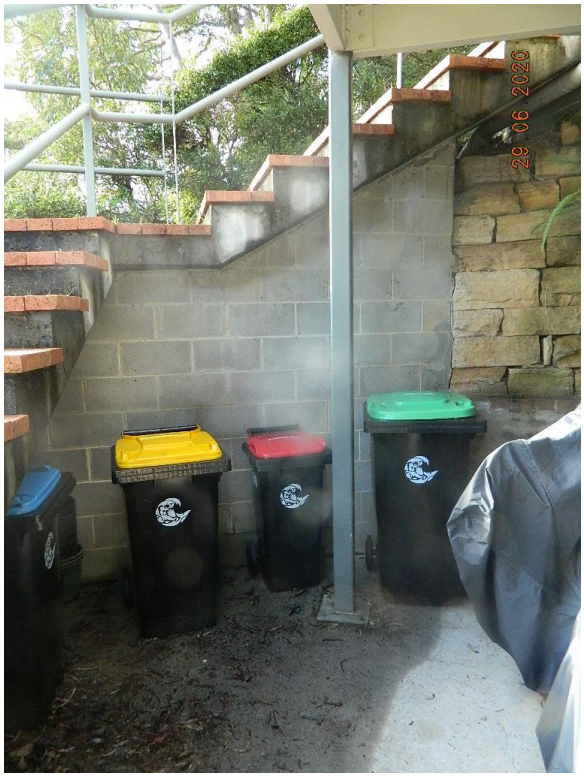


Photo 3

Photo 4

Photo 5

Photo 6

Photo 7

Photo 8

Photo 9

Photo 10

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.

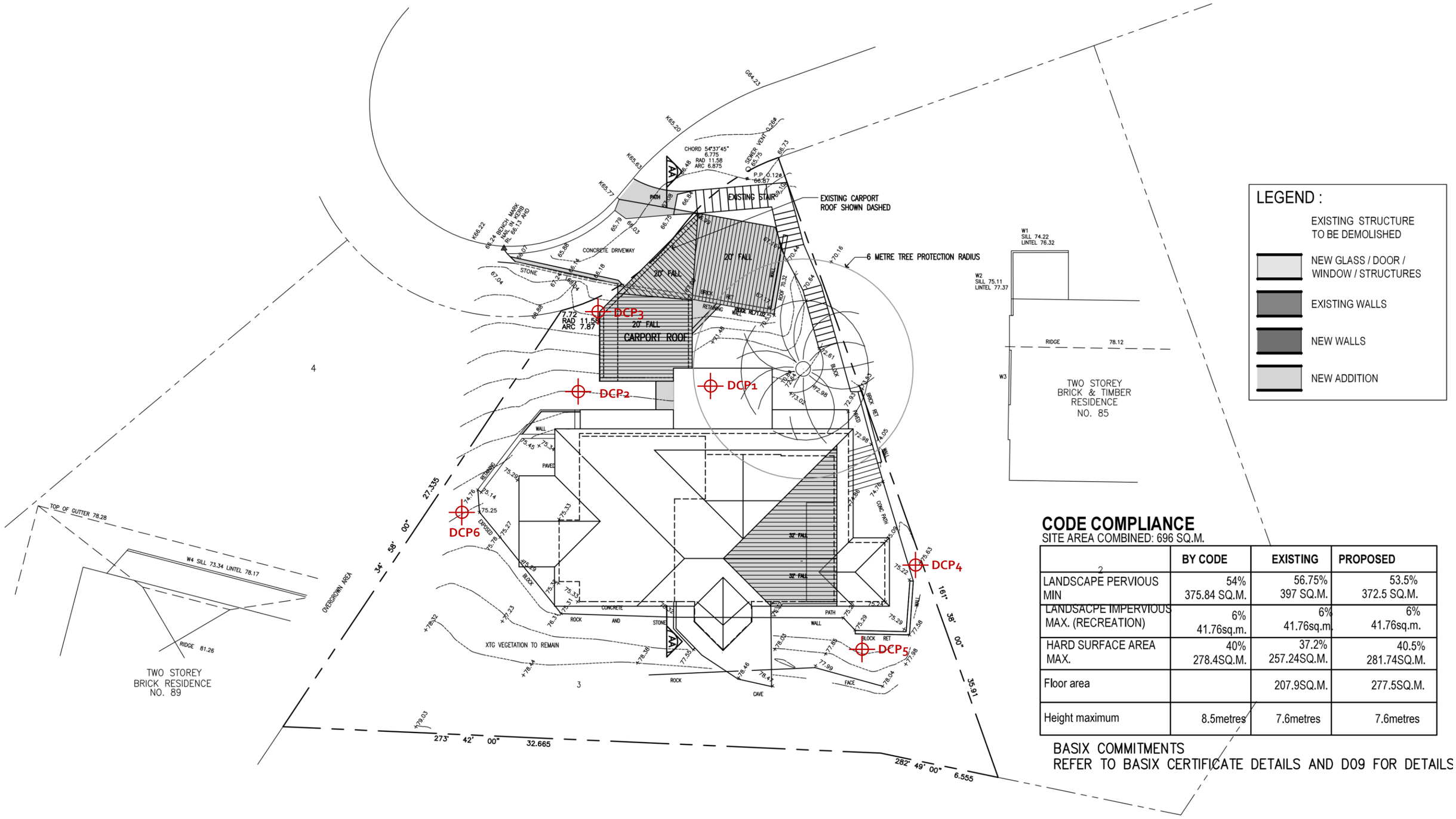
- The report addresses issues relating to your specific design and site. If the proposed project design changes, aspects of the report may no longer apply. Contact White Geotechnical if this occurs.

- 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



CODE COMPLIANCE

SITE AREA COMBINED: 696 SQ.M.

	BY CODE	EXISTING	PROPOSED
LANDSCAPE PERVIOUS MIN	54% 375.84 SQ.M.	56.75% 397 SQ.M.	53.5% 372.5 SQ.M.
LANDSACPE IMPERVIOUS MAX. (RECREATION)	6% 41.76sq.m.	6% 41.76sq.m.	6% 41.76sq.m.
HARD SURFACE AREA MAX.	40% 278.4SQ.M.	37.2% 257.24SQ.M.	40.5% 281.74SQ.M.
Floor area		207.9SQ.M.	277.5SQ.M.
Height maximum	8.5metres	7.6metres	7.6metres

BASIX COMMITMENTS
REFER TO BASIX CERTIFICATE DETAILS AND D09 FOR DETAILS

AMENDMENTS

ALL DIMENSIONS TO BE CHECKED ON SITE BY BUILDER PRIOR TO CONSTRUCTION
FIGURE DIMENSIONS TO BE USED IN PREFERENCE TO SCALE
ALL BOUNDARIES AND LEVELS SUBJECT TO SURVEY PLAN
RETAIN ALL TREES UNLESS OTHERWISE NOTED

LINDSAY LITTLE & ASSOCIATES PTY LTD
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ARCHITECTS BUILDING CONSULTANTS PROJECT MANAGERS
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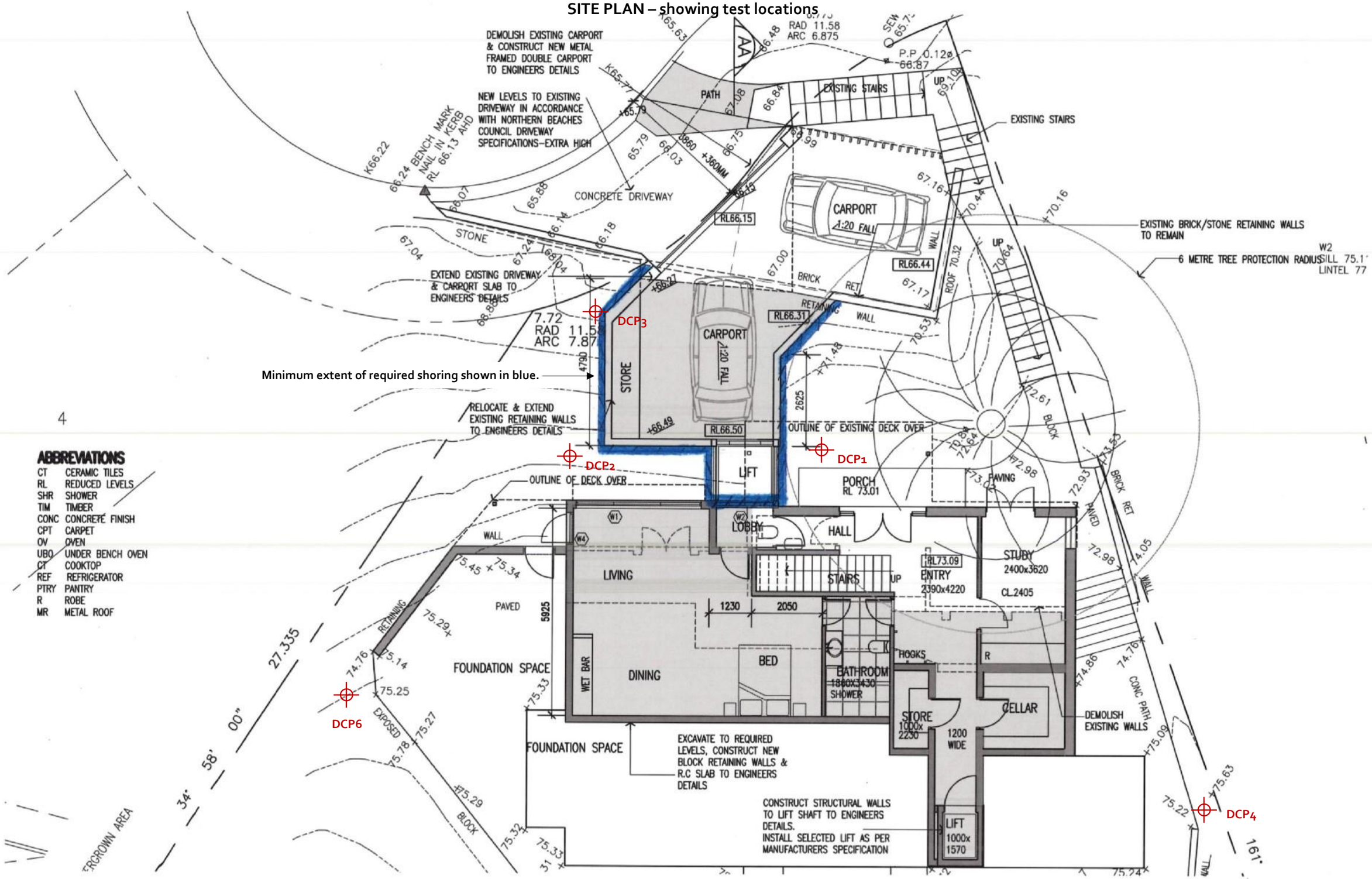
Directors: Denis Leach – Nominated Architect Reg No. 3980; Harvey Little – Licence No.36549; Email: harveylittle@lindsaylittle.com.au

ALTERATIONS AND ADDITIONS TO EXISTING RESIDENCE
87 ALEXANDRA CRESCENT BAVIEW
FOR: ARNAUD AND JANE DIEMONT

JOB No.	SCALE	DRAWN	DATE	DRAWING TITLE	DRAWING NO
1281/19	1:200	J.S.	JUNE 2020	SITE ANALYSIS PLAN	A02

SITE PLAN – showing test locations



ABBREVIATIONS

CT	CERAMIC TILES
RL	REDUCED LEVELS
SHR	SHOWER
TIM	TIMBER
CONC	CONCRETE FINISH
CPT	CARPET
OV	OVEN
UBO	UNDER BENCH OVEN
CT	COOKTOP
REF	REFRIGERATOR
PTRY	PANTRY
R	ROBE
MR	METAL ROOF

AMENDMENTS

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87 ALEXANDRA CRESCENT BAVIEW
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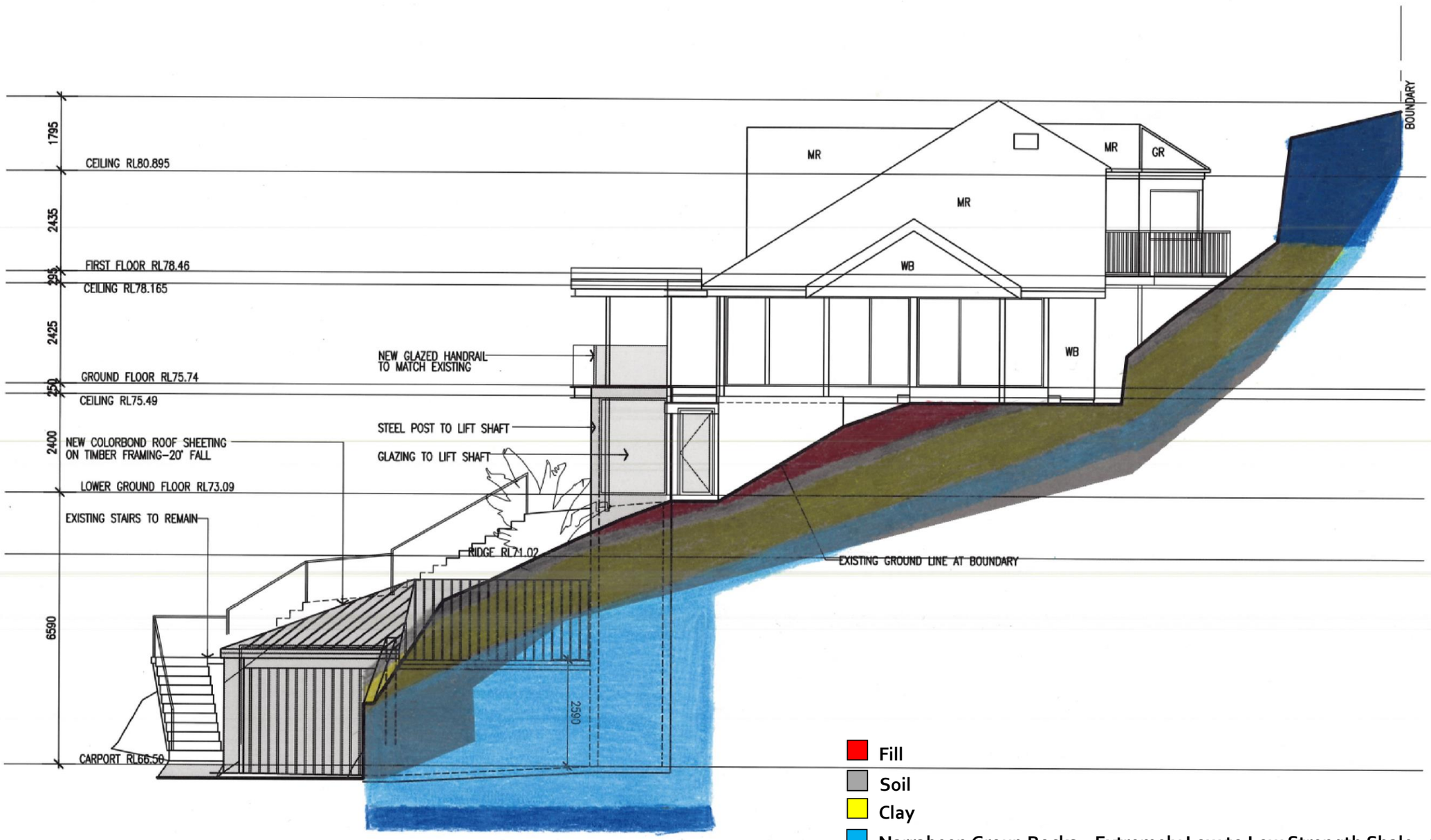
JOB No.	SCALE	DRAWN	DATE	DRAWING TITLE	DRAWING NO
1281/19	1:100	J.S.	JUNE 2020	LOWER GROUND FLOOR PLAN	A04

TYPE SECTION – Diagrammatical Interpretation of expected Ground Materials



2 WEST ELEVATION
Scale: 1:100

ABBREVIATIONS

BW	BRICKWORK
FC	FIBRE CEMENT
MR	METAL ROOFING
RL	REDUCED LEVELS
RT	ROOF TILES
WB	WEATHERBOARDS
CR	CEMENT RENDER
TIM	TIMBER

- **Fill**
- **Soil**
- **Clay**
- **Narrabeen Group Rocks – Extremely Low to Low Strength Shale - after being cut up by excavation equipment can resemble a stiff to hard clay.**
- **Hawkesbury Sandstone – Very Low to Medium Strength**

AMENDMENTS

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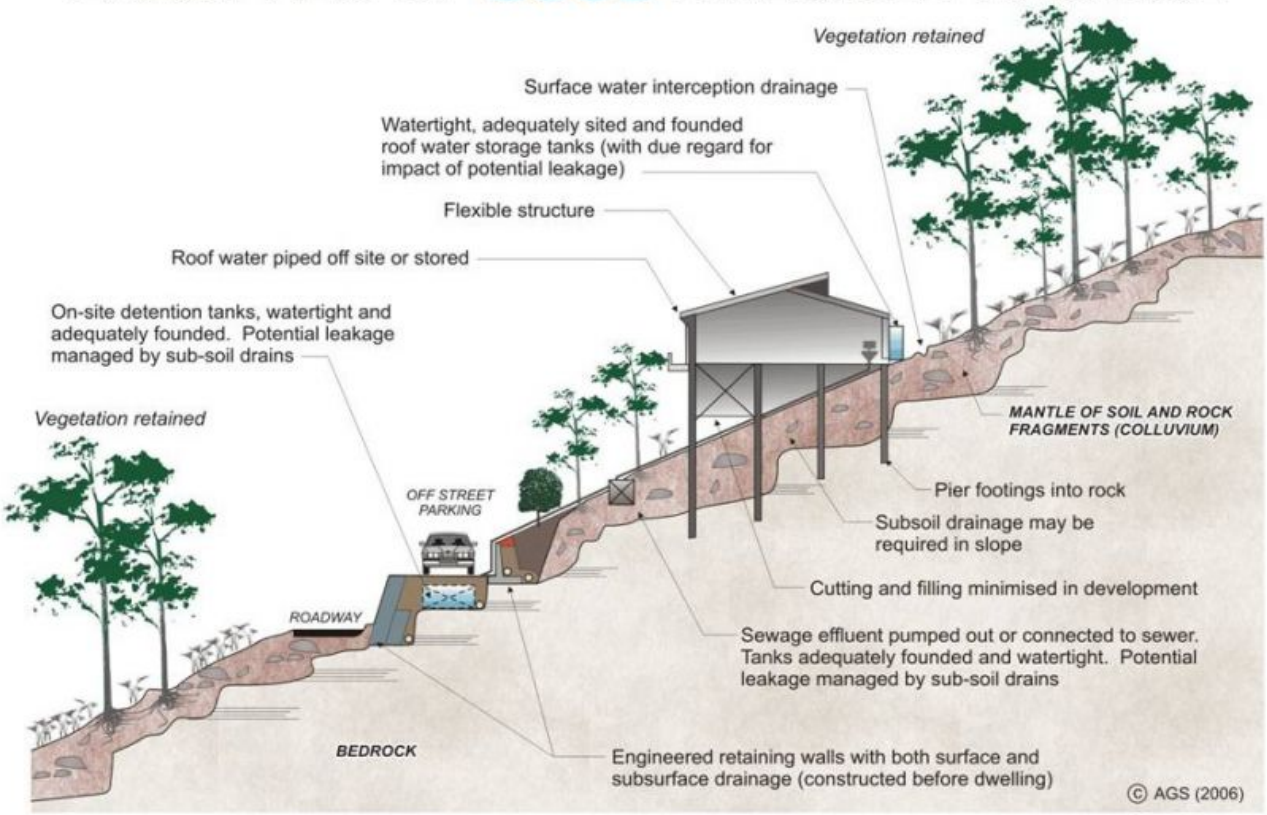
JOB No.	SCALE	DRAWN	DATE	DRAWING TITLE	DRAWING NO
1281/19	1:100	J.S.	JUNE 2020	WEST ELEVATION	A08

EXAMPLES OF **GOOD** HILLSIDE PRACTICE



EXAMPLES OF **POOR** HILLSIDE PRACTICE