GEOTECHNICAL INVESTIGATION REPORT

PROPOSED NEW DWELLING
30 ABERNETHY STREET, SEAFORTH NSW

PREPARED FOR ADAM MCDOUGALL
REPORT ID: G22061SEA-R01F

Date: 6th September 2022
Revision No.: 0

Client:
Adam McDougall
30 Abernethy Street
Seaforth NSW 2092

Author: S. McCormack (B.Eng Civil) – MIEAust, CPEng, NER (geotechnical & environmental), CEnvP
Field Engineer / Scientist: M. Kilham (B.Sc Hons Geology), MSC EngSc

PHONE +61 (0) 2 9420 3361 MOBILE +61 (0) 431 480 980
ADDRESS 82 bridge street, lane cove nsw 2066 WEB www.geoenvironmental.com.au
geotechnical • environmental • landfills

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

1 PROJECT INFORMATION

1.1 INTRODUCTION AND OBJECTIVES

Geo-Environmental Engineering (GEE) was commissioned by Adam McDougall to undertake a geotechnical investigation relating to the proposed construction of a new dwelling and associated structures at 30 Abernethy Street, Seaforth New South Wales (herein referred to as the 'site'). A survey plan showing existing site features is provided for reference in **Appendix A**.

The objective of the investigation was to support a Development Application with the Northern Beaches Council for the proposed development and to provide relevant geotechnical advice to assist with the design of the development. The investigation was also required to address potential landslide risk, as Council's published 'Landslip Hazard mapping' indicates that the site lies within an area defined as 'G1' for landslip risk.

The report presents the factual and interpreted results of the field investigations and provides interpretation and recommendations regarding the ground conditions at the site, in accordance with client requirements and the agreed scope of work.

1.2 NORTHERN BEACHES COUNCIL DCP

The Northern Beaches Council, Manly LEP 2013-Landslide Risk Map for Manly requires a geotechnical assessment for land subject to Hazard Mapping (Landslide Risk). Council's mapping shows the land at this site is within a geotechnical area classified as G1. According to the Manly LEP 2013 for land in Area G1, a Geotechnical Report must be submitted where the proposed development involves:

◊ any land identified on the LEP Landslide Risk Map. In this regard a DA for development on land identified on the LEP Landslide Risk Map must consider certain matters under LEP clause 6.8,

◊ any excavation greater than 1m below natural ground level for a basement or basement car parking area,

◊ building works (load bearing) on land contained in geotechnical area 'G1' in the Potential Geotechnical Landslip Hazard Map at Schedule 1 to this plan.

The following report provides an assessment of landslide risk in accordance with Council's DCP.

1.3 PROPOSED DEVELOPMENT

According to the architectural plans, a copy of which is provided in **Appendix A**, the proposed development involves the demolition of the existing dwelling, swimming pool and associated structures with the construction of a new three storey dwelling and carport, swimming pool, cabana, decking and general landscaping.

According to the development plans the building footprint will require a cut and fill excavation into the natural slope, with the finished floor level (FFL) of the lower ground floor of the development being approximately 50.65m above Australian Height Datum (AHD). Considering the existing site elevations shown on the survey plans, and the over-excavation required to facilitate construction of the lower ground floor slab, a maximum excavation of approximately 6.0m below the existing ground surface (bgs) will be required.

1.4 SCOPE OF WORK

To satisfy the above objective, GEE completed the following scope of work:

- ◊ Dial-Before-You-Dig (DBYD) desktop search for buried services,
- ◊ Visual appraisal of the site conditions and locality,
- ◊ Review of published geological and acid sulphate maps for the area,
- ◊ Drilling and logging of a hand auger borehole in an accessible area of the site to assess the nature and consistency of subsurface soils and the depth of the underlying bedrock for the determination of site suitability for stormwater infiltration,
- ◊ Mapping of the slope condition to identify geotechnical hazards using AGS 2007 guidelines,
- ◊ Engineering assessment and reporting including:
    - description of surface and subsurface conditions,
    - excavation conditions,
    - recommendations for support of the proposed excavation,
    - recommendations for footing systems, founding depths, allowable bearing pressures,
    - Assessment of the geotechnical hazards using AGS 2007 guidelines.
    - geotechnical feasibility of the development.

2 Site Information

2.1 *Site Description*

The site is located on the western side of Abernethy Street and is bounded by low-density residential properties. The site covers an area of 689.2m² (by DP) and is legally defined as Lot A in Deposited Plan DP358783.

The existing dwelling has been constructed at the crest of a steep stepped sandstone cliffline to about 9.0m in height that strikes approximately north-south. The area below the cliffline forms a westerly sloping bench that has been terraced with areas of retained fill comprising paved areas, decking and the current swimming pool. The slope falls away gently to the west to the rear boundary with another sandstone cliffline to a height of about 4.0m located immediately downslope from the boundary. The upper cliffline has several developed overhangs with detached boulders located below.

The area immediately to the north of the site forms a narrow easement that accesses both No.28 and No.32a located downslope (west) of No.30. The garage located at street within the easement belongs to No.32. Both sites are accessed by an inclinator that runs down the boundary with No.30. The single garage is supported on concrete piers that are in proximity to the site boundary. The founding condition of the garage piers was not determined during the investigation.

The sandstone cliffline becomes broken and less continuous across the northern boundary, possibly due to this area being a developed shallow drainage line.

The area immediately to the south of the site also forms a narrow easement that allows access to the property located immediately downslope of No.26 and presumably is No.26a. The inclinator used to access this property runs down this easement. The upper section of the inclinator has been directly founded onto the outcropping sandstone clifflines that continue from No.30 southwards into No.26. The slope beneath the shared carport for No.26/No.26a? has been excavated into the sandstone bedrock to a height of about 2.0m to create a storage area. The excavation extends to the boundary with No.30 with the concrete carport for No.26 currently supported on concrete piers.

At the time of the investigation the front portion of the site was occupied by a single storey clad dwelling that had been constructed along the crest of the upper sandstone cliffline. Brick wall support for the dwelling and steel post supports for the verandah extend and are founded onto a stepped section of the sandstone cliffline below.

As noted, the existing swimming pool and decking have been constructed on a natural gentle sloping bench below the upper cliffline which has been terraced with fill retained by concrete block and rough drystone walls. The existing pool appeared to be mostly located above ground however some excavation into the rock bench has likely been undertaken.

Photos showing the site features, taken on the 15th June 2022 are detailed below in **Plates 1 to 12**.

Plate 1 – Front yard of No.30, facing north.

Plate 2 – Front yard of No.30, facing south.

Plate 3 – Rear of the dwelling showing the central sandstone cliffline and natural benched area below, facing east.

Plate 4 – Brick and steel post supports for dwelling and decking founded on crest of central cliffline.

Plate 5 – Piers supporting dwelling founded directly onto upper sandstone cliffline.

Plate 6 – Central sandstone cliffline downslope of dwelling facing south.

Plate 7 – Slope below the pool and decking showing sandstone outcrop.

Plate 8 – Slope below timber decking.

Plate 9 – Sandstone outcrop in proximity to site boundary.

Plate 10 – Sandstone outcrop to west of site boundary.

Plate 11 – View of concrete pier supporting No.32 garage located on the northern boundary.

Plate 12 – View of inclinator founded on insitu detached sandstone boulder within easement located along the southern boundary.

2.2 TOPOGRAPHY

The site is situated on a moderate to steep westerly dipping hillslope with an average grade of approximately 50% to 60%. A review of the site survey plan (**Appendix A**) indicates that the site surface elevation falls from 59.2m AHD at the eastern (front) boundary of the site to approximately 42.8m AHD along the western (rear) boundary of the site.

2.3 REGIONAL GEOLOGY AND SOILS

A review of the regional geological map (reference 1) indicates that the site is underlain by the Middle Triassic aged Hawkesbury Sandstone formation which typically consists of "*…medium to coarse-grained quartz sandstone, very minor shale and laminite lenses".*

A review of the regional soils map (reference 2) indicates that the site is located within the Hawkesbury Soil Landscape Group. The Hawkesbury landscape group is associated with rugged, rolling to very steep hills on Hawkesbury Sandstone. Local reliefs are generally between 40-200m, slopes typically >25% in gradient, with occasional rock outcrops (>50%). Soils of the Hawkesbury Group typically comprise discontinuous lithosols/siliceous sands associated with rock outcrops, have very low soil fertility and form an extreme soil erosion hazard.

Rock outcrop and sub-surface soils identified during the fieldwork were consistent with the published mapping.

2.4 REGIONAL HYDROGEOLOGY

Based on the regional geological and soils information, the groundwater beneath the site is likely to be confined or partly confined, discrete, water-bearing zones within the bedrock formation. However, intermittent water seepage may also occur along colluvial / residual soil and residual soil/bedrock contacts and from defects within the bedrock formation.

2.5 ACID SULFATE SOIL RISK

Acid Sulfate Soil is naturally occurring sediments and soils containing iron sulfides (principally iron sulfide, iron disulfide or their precursors). Oxidation of these soils through exposure to the atmosphere or lowering of groundwater levels results in the generation of sulfuric acid.

Land that may contain potential acid sulfate soils was mapped by the NSW Department of Land and Water Conservation (DLWC) and based on these maps local Councils produced their own acid sulfate soil maps to be used for planning purposes.

The DLWC Acid Sulfate Soil Risk Map 'Prospect-Parramatta' which covers the site (reference 3), indicates that the site lies within an area with no known occurrences of acid sulphate soil and land activities within this area are "...*not likely to be affected by acid sulphate soil materials*".

The ASS Planning Map produced by the NSW Department of Planning and Environment for Council, and available via interactive online mapping, indicates that the site is situated within an area classified as 'Class 5'. According to Part 6.1 of the Manly Local Environment Plan (LEP) 2013 a preliminary assessment of acid sulfate soil, and potentially a management plan, is required for "…*works within 500m of adjacent Class 1, 2, 3 or 4 land that is below 5 metres Australian Height Datum and by which the watertable is likely to be lowered below 1 metre Australian Height Datum on adjacent Class 1, 2, 3 and 4 land*".

The surface elevation is greater than 5m AHD and the maximum depth of excavation is not extending below 1m AHD. In this regard, dewatering below 1m AHD is not required and therefore there is no need for an acid sulphate soil assessment or management plan.

3 FIELD INVESTIGATIONS

Fieldwork was undertaken on the 15th June 2022 by Mathew Kilham and Zachary Ziesel of GEE and the work comprised:

◊ General inspection of site features,

◊ The drilling and logging of one borehole (BH1) in an accessible area across the site to assess the soil conditions and depth to bedrock,

◊ Assessment of the sites suitability for an infiltration/absorption system to manage stormwater from the site, and

◊ Mapping of the slope condition to identify geotechnical hazards using AGS 2007 guidelines.

3.1 BOREHOLE DRILLING AND LOGGING

Prior to commencement of the bores a DBYD search for buried services was completed to assess the presence of underground services on the site.

The borehole was drilled using an 85mm diameter hand operated auger. During drilling, the encountered fill and natural soils were geologically logged by experienced geotechnical personnel, taking care to describe the presence and depth of any fill material / previously disturbed ground, the natural stratum, moisture, seepages or water bearing zones.

The hand auger borehole was advanced through topsoil and or fill material (previously disturbed) before terminating due to practical refusal on the weathered sandstone bedrock at 0.40m bgs.

The location of the borehole was estimated using measurements from existing features and is detailed on **Figure 1**. A copy of the borehole log is provided in **Appendix B**.

3.2 PERMEABILITY AND WATER INFILTRATION ASSESSMENT

The site was assessed to determine suitable locations for the placement of an infiltration system. Given the steep profile of the site and the proposed development there were limited locations for the placement of an infiltration system.

The area below the existing pool and decking had sporadic soil cover with sandstone bedrock observed outcropping at several locations. This is supported by the borehole drilled at this location which encountered a shallow soil profile of fill and disturbed material of approximately 0.40m over sandstone bedrock.

In summary, the site is considered to be unacceptable for an infiltration/absorption system due to the shallow soil profile and overall steepness of the slope.

3.3 LANDSLIP RISK ISSUES

3.3.1 MANLY DCP

According to the Manly LEP 2013 for land in Area G1, a Geotechnical Report must be submitted where the proposed development involves:

◊ any land identified on the LEP Landslide Risk Map. In this regard a DA for development on land identified on the LEP Landslide Risk Map must consider certain matters under LEP clause 6.8,

◊ any excavation greater than 1m below natural ground level for a basement or basement car parking area,

◊ building works (load bearing) on land contained in geotechnical area 'G1' in the Potential Geotechnical Landslip Hazard Map at Schedule 1 to this plan.

Council's mapping shows the land at this site is within Area G1. For land in Area G1, the geotechnical risk is to be addressed in accordance with AGS 2007 Guidelines (reference 4).

The site and slope features within and affecting the property were assessed at the time of the geotechnical site visit undertaken on 15th June 2022, to determine requirements under the Manly DCP in connection with the proposed development.

Our assessment and opinions on slope instability risk for the site and proposed development, presented in the following sections, are determined in accordance with the Australian Geomechanics Society's Landslide Risk Management Concepts and Guidelines (2007) (reference 4), as required by the DCP.

It should be noted that the Manly DCP (2.1.13.4 General Requirements for Site Stability Reports) does not define the level of "acceptable risk". In accordance with usual practice (refer Table 1 in AGS 2007), we have adopted Low Risk as the threshold for acceptable risk level for property damage/economic consequence, and 10^{-6} per annum for loss of life.

3.3.2 Assessment Requirements

Reference to the Manly Council LEP 2013, noted in Section 3.3.1 above confirm a landslide risk assessment is required by virtue of the proposed excavations for the new dwelling, with expected excavation depths of up to approximately 5.90m.

Our assessment is discussed in Section 4.2 below.

4 INVESTIGATION RESULTS

4.1 SUBSURFACE CONDITIONS

GEE notes that the sandstone bedrock profile was observable across the site with exposures noted in excavations adjacent to the front yard, beneath the existing dwelling, in exposed sandstone clifflines downslope and adjacent to the existing dwelling and on the slope below the existing pool and deck area. Elsewhere, as indicated by our borehole (BH1), the subsurface conditions comprised shallow disturbed topsoil and fill materials over Hawkesbury Sandstone bedrock. The benched area below the central cliffline is expected to contain shallow fill and colluvial soils over sandstone bedrock.

A copy of our borehole log is provided for reference in **Appendix B**, while A geological section which shows the interpreted units is provided for reference as **Figure 2**.

4.1.1 GROUNDWATER

Permanent groundwater (i.e. the water table) was not encountered in the borehole during drilling. However minor seepage water was observed within defects in the sandstone clifflines and along the fill/disturbed soil contact with the underlying sandstone bedrock in BH1.

4.2 LANDSLIP RISK ISSUES

4.2.1 PRESENT SLOPE CONDITIONS AND IDENTIFIED HAZARDS

4.2.1.1 Geology and Geomorphology

The natural slope across the site is comprised of stepped sandstone clifflines with minor shallow sandy colluvial soils. The clifflines generally strike in a northerly orientation and range from about 4.0 to 9.0 metres in height. Sections of the lower and central clifflines have developed overhangs with some detached boulders below the overhangs evident. The clifflines have developed along the predominant sub vertical joint set. Some insitu weathered boulders were observed across the site. The natural benched area below the central cliffline has been terraced with some fill retained by low concrete block and drystone retaining walls.

The existing dwelling was a single storey brick and weatherboard structure founded on a brick wall and brick piers above and into the stepped sandstone cliffline. The building was in a poor condition due to termite infestation, however the structural elements such as brick walls and piers where observed appeared to be in a sound condition.

Retaining structures observed mostly comprised low mortared rock walls and drystone walls to about 1.0m in height.

4.2.1.2 Geotechnical Issues

There were no observable signs of significant landsliding in proximity to the developed clifflines. Instability was generally limited to boulders detaching on weathered joint and bedding planes.

It is noted that sections of the cliffline were covered in vegetation or partly buried, and it is likely further detached or weathered insitu boulders are present across the site.

4.2.1.3 Groundwater

Active seepages were observed along the colluvial soil /bedrock contacts and from joint and bedding planes within the sandstone bedrock outcrop.

Seepages along the soil/bedrock contacts and within defects in the bedrock profile would be expected to be recharged by rainfall and are expected to be intermittent and variable in rate and volume.

4.2.1.4 Geotechnical Hazards

GEE notes that all the existing structures are to be removed prior to the construction of a new dwelling, garage, swimming pool, retaining walls and landscaping.

The geotechnical site hazards assessed comprised the global stability of the existing site, and the expected stability conditions in proximity to the proposed new dwelling, swimming pool and retaining structures. Each hazard was assessed using the current slope condition and again where engineered design has been taken into consideration. In addition the steep natural slope, fill and excavated cut batters, expected to be exposed during construction and the hazards presented by these batters were assessed.

The assessed hazards include;

- ◊ **Hazard 1:** Detach block from bedding/jointing from upper cliffline, (4*1*1.5). **Mechanism:** Failure along weathered back joint.
- ◊ **Hazard 2:** Detach block from developed overhang, (3*1*0.7). **Mechanism:** Failure along weathered back joint.
- ◊ **Hazard 3:** Detached boulder slide, (4*3*1.5). **Mechanism:** Weathering, rainfall event.
- ◊ **Hazard 4:** Detached boulder slide, (1.5*1*0.8). **Mechanism:** Weathering, rainfall event.
- ◊ **Hazard 5:** Failure drystone wall retaining fill, (2*1*1 = 2m³). **Mechanism:** Saturation of retained fill.
- ◊ **Hazard 6:** Detach block on bedding/jointing, (3*0.8*0.8). **Mechanism:** Failure along weathered back joint.
- ◊ **Hazard 7:** Detach block on bedding/jointing from excavated batter, (4*2*1.5). **Mechanism:** Failure along weathered back joint.

4.2.2 *Slope Risk Assessment Results*

There was no observable evidence the slope in this locality and within or adjacent to the site at No.30 Abernethy Street has experienced landsliding since its early settlement and development. In the absence of any direct or presumed evidence of recent slope instability (last several hundred years and more), the likelihood of landslide activity initiating on or adjacent to (but influencing) the site over a notional design life for the continuing existence of the present developments on these properties of 50 years, is considered 'UNLIKELY'.

Our slope risk assessment has been carried out based on the current slope conditions and how they would be expected to interact with the proposed development and also for the slope condition where engineering controls have been implemented during construction. The likelihoods for the assessments have been taken from Table 3 and Table 4 (refer attached risk matrix and other extracts from AGS 2007 – **Appendix C**).

For the existing and expected slope condition, the site has a 'POSSIBLE' consequence for property damage, with an assessed risk of HIGH. Where engineering controls are implemented, the site has a 'RARE' consequence for property damage, with an assessed risk of LOW.

For potential loss of life for the identified hazards, the risk to persons is assessed using the risk equation 4, in AGS 2007. For the existing slope condition, the hazard with the highest calculated risk level is 7.5×10^{-4} per annum, which under the AGS 2007 guidelines for new development is unacceptable. Where engineering controls are applied to the identified hazards the risk to life decreases to 7.5×10^{-7} which is acceptable (refer to Section 3.4.1).

Recommendations for the management of the geotechnical hazards are provided in Section 5.6 below.

5 DISCUSSION

5.1 SITE PREPARATION

Following demolition work and prior to construction of the new additions, all topsoil with organic matter and any pavement materials, should be removed from the footprint of the proposed new dwelling. Any stripped topsoil should be stockpiled for re-use as landscape material or disposed off-site.

Material removed from site will need to be managed in accordance with the provisions of current legislation and may include segregation by material type classification in accordance with NSW EPA (2014) *Waste Classification Guidelines* (reference 5) and disposal at facilities appropriately licensed to receive the particular materials. GEE notes that the natural soil and bedrock may be classified as Virgin Excavated Natural Material (VENM) and re-used on other sites rather than disposed at a landfill, although it must be proven to be free of contamination.

5.2 DILAPIDATION REPORT

As excavation works are being undertaken on the site, GEE recommends that a dilapidation report be carried out on neighboring buildings prior to commencing excavation. The purpose of a dilapidation report is to confirm that construction works, in particular excavation, are not causing damage and therefore may prevent future claims of damage arising from the works. Preferably these surveys should be agreed to, and the report signed, by the owners of the adjacent building prior to work commencing.

5.3 SITE CLASSIFICATION

The geotechnical site classification is Class P which stands for "Problem Site". The reason for this classification is:

◊ The presence of very loose and loose sandy colluvium in the upper soil profile which is incapable of providing a minimum allowable end bearing capacity of 100kPa required for the other classifications (Section 2.4.5 (a) of AS2870-2011 - reference 6),

◊ The depth of uncontrolled fill present in parts of the site which is not a suitable founding stratum (Section 2.5.3 of AS2870-2011), and

◊ The fact that the site is potentially prone to landslip (Section 2.1.3, (d) of AS2870-2011 - reference 6).

It is noted that the estimated soil classification, Section 2.1.2 where the underlying sandstone bedrock is encountered is considered to be Class A, where bearing capacity is greater than 100kPa and where little or no ground movement from moisture changes is expected.

5.4 EARTHWORKS

According to the development plans (**Appendix A**) the building footprint will require a cut and fill earthworks into the natural slope, with the finished floor level (FFL) of the lower ground floor of the development being approximately 50.65m above Australian Height Datum (AHD). Considering the existing site elevations shown on the survey plans, and the over-excavation required to facilitate construction of the lower ground floor slab, a maximum excavation of approximately 6.0m below ground surface (bgs) is expected.

The bulk excavation level for the swimming pool was not shown on the architectural drawings, however given the interpreted slope profile only minor excavations into the fill and natural slope would be expected.

Filling to a depth of 1.0 to 1.5m would be possible and probably cost effective beneath the proposed verandah and outdoor area between the dwelling and pool to achieve the proposed levels.

5.4.1 EXPECTED EXCAVATION CONDITIONS

Based on the ground conditions encountered across the site, the excavations for the proposed dwelling will extend into the exposed sandstone clifflines below the existing dwelling. Only minor soil materials are expected to be encountered.

The strength of bedrock has not been assessed as part of this investigation; however, GEE expects that the bedrock will be initially very low to low strength, becoming medium to high strength soon thereafter. To confirm the strength of the bedrock within the depth of proposed excavation, a more detailed investigation would be required and would need to include the coring and strength testing of the bedrock formation.

The excavation of the soil profile, and any very low to low strength bedrock is expected to be readily excavated using standard equipment such as excavators. However, the use of impact tools will be required upon encountering low to medium strength (or better) sandstone bedrock, especially when combined with unfavourable rock-defect geometry. When using impact tools, the effects of vibration should be considered and are discussed further in Section (5.4.5).

To ensure the structural adequacy of the existing and adjoining dwellings, the excavation works should proceed in a controlled manner. Furthermore, it is highly recommended that post removal of the existing structures and vegetation and prior to commencement of the excavation, the site be assessed by a geotechnical professional to ensure the recommendations on the expected excavation support and foundation advice considered in this report are applicable.

5.4.2 FILLING

Filling may be undertaken using soil and rock material sourced from the site or imported material. The importation of fill material should be undertaken in such a manner that all obligations under the *Protection of the Environment and Operations Act 1997* and the *Environmental Planning Assessment Act 1979,* are met. This includes ensuring that any material imported to site be classified as Virgin Excavated Natural Material (VENM) or is waste exempt under the NSW Resource Recovery Exemptions. Additionally, the imported fill should meet the requirements of suitable fill which is detailed in Section 4.4 of AS3798-2007 (reference 7). If importing fill, GEE recommends that the fill material comprise free-draining material such as sand and not clay-based soils which generally provide poor drainage and are prone to movement with changes in moisture content.

Prior to filling, the topsoil and any root affected soil should have been stripped as described in Section 5.1, and the subgrade test rolled to detect any weaker areas. Areas which show visible deformation or springing should be rectified and re-presented for test rolling. GEE notes that the existing fill and colluvial soils on the bench should be removed and checked for suitability for use as fill and where suitable placed in accordance with the advice below.

The areas of potential filling are not expected to be relied upon as a founding stratum. However, to minimise future slumping of the fill, it is recommended that it is placed in horizontal layers of approximately 200mm and some compaction applied. Finally, care will need to be taken when compacting within proximity to any retaining walls because vibrations from the compaction work may have an impact on the structure.

5.4.3 *Groundwater / Seepage Water Inflow*

Permanent groundwater was not encountered during this investigation and is not expected to be encountered by the proposed earthworks. However, perched seepage water was observed in some defects within the exposed bedrock and was also encountered at the interface of the soil and bedrock formation in BH1. Such seepage water is typically recharged directly by rainfall and therefore its occurrence and rate of seepage is expected to vary significantly.

The seepage water is expected to be sufficiently managed during the earthworks phase by pumping from a sump at the base of the excavation. In the long term, GEE recommends that any subsurface walls be watertight and conventional techniques such as strip drains, and ag-lines will need to be incorporated into the design of these walls to ensure that the flow is not impeded.

Furthermore, GEE notes that the sandy soil profile was saturated in the zone of seepage. Where a piered footing system is used to engage the underlying bedrock, the soil profile would be prone to collapsing. Support of the piering system during installation would be required.

5.4.4 *Excavation Support*

Due to the setback of the boundaries from the proposed excavation, the use of temporary batters is considered feasible to ensure the excavation is carried out safely. The following batter slopes are recommended for the sub-surface profile identified onsite.

◊ Topsoil/Colluvium: 2.0 Horizontal (H) to 1 Vertical (V).

◊ Residual Soil: 1H to 1V.

These batter slopes assume that the ground surface beyond the crest of the slope is horizontal and surcharge loads are not placed within a distance from the crest equal to the vertical height of the cut.

Notwithstanding the suitability of the above batters, GEE notes that shoring is generally recommended on all sides of the proposed excavation to minimise the amount of ground disturbance beyond the excavation perimeter.

GEE anticipates that vertical batters will be suitable in the sandstone bedrock, where the bedrock quality and strength have been confirmed during excavation of the batters by an experienced geotechnical professional. GEE notes that defects observed in the existing cliffline (open joints and weathered seams) have a high potential to form potential rockfall hazards from the excavated batters.

GEE recommends that where rockfall hazards are identified, remedial works should be undertaken to provide longterm stabilisation of the batters. These would be expected to include but not be limited to:

- ◊ Progressive scaling of the batters during excavation.
- ◊ Shotcreting of exposed soil profiles and weathered seams.
- ◊ Spot bolting of detached boulders and potential wedges.

GEE recommends that an experienced geotechnical professional be engaged prior to and during the excavation works to undertake the following:

- ◊ Mapping of excavated batters with the identification of any potential hazards,
- ◊ Design of remedial measures required as they become apparent during the excavation works, and
- ◊ Supervision and approval of remedial measures as they are undertaken to ensure the longterm stability of the cut batters is maintained.

Notwithstanding the suitability of the above batters, GEE notes that shoring is generally recommended on all sides of the proposed excavations to minimise the amount of ground disturbance beyond the excavation perimeter.

Considering the subsurface conditions encountered during the field investigations, options for shoring include the use of the use of evenly spaced mass concrete piles (soldier piles), with a pile cap. For piles, open bored piles or Continuous Flight Auger (CFA) piles, are both considered to be feasible. The shoring should be designed by a suitably experienced structural engineer in accordance with AS 4678-2002 *Earth Retaining Structures* (reference 8) and should consider the short- and long-term configurations. In the short term, should the shoring walls be cantilevered or supported by a single row of anchors and some wall movements can be tolerated (flexible wall), the pressure acting on the wall can be estimated on the basis of a triangular earth pressure distribution.

When internal props, such as the ground floor slab, restrain retaining wall movement, or where significant movements cannot be tolerated, such as immediately adjacent to adjoining buildings, an 'at-rest' earth pressure coefficient (Ko) should be adopted with either a uniform or trapezoidal pressure distribution. This may also include the lengths of wall immediately adjacent to adjoining structures that bound the site. It should be noted that shoring which is designed for this 'at rest' coefficient may still undergo some lateral movements, depending on the final configuration of the wall and construction sequence.

The design of any retaining structures should make allowance for all applicable surcharge loadings including construction activities around the perimeter of the excavation and adjacent buildings. Consideration should be given to the possibility of a hydrostatic pressure due to build-up of water behind the wall (*e.g.* from broken services), unless permanent subsurface drainage can be provided.

Computer aided analysis may be carried out to assess potential ground movements based on different wall designs and construction sequence, so as to control deflections to within tolerable limits. It is also considered prudent to carry out surveys before and after installation to measure the actual movement of the wall or adjacent soil profile. Preliminary design parameters for shoring are provided below.
GEE notes that a more detailed investigation of the bedrock profile to determine the rock quality and strength would be required to provide detailed parameters.

Table 1: Preliminary Geotechnical Earth Pressure Design Parameters – Retaining Walls / Shoring

Units	**Bulk Unit Weight (kN/m^3)[1]**	**Earth Pressure Coefficients**		
		Active (Ka)	Rest (Ko)	Passive (Kp)[2]
Fill / Colluvium / Residual Soil	18	0.33	0.50	3.0
Bedrock	22	0.25	0.40	3.5

Note 1: Unit weights are based on visual assessment only – order of accuracy approximately ±10%.
Note 2: The passive earth pressure coefficients for rock have been reduced to allow for potential defects in the rock mass.

5.4.5 CONSTRUCTION / EXCAVATION INDUCED VIBRATION

Structures and utilities adjacent to the excavation area are potentially sensitive to vibrations above certain threshold levels (regarding potential for cracking). From site observations these would be expected to include the inclinator and garage for No.32 along the northern boundary and piled carport, inclinator and adjacent dwellings located in proximity to the southern boundary.

When using a hydraulic hammer, vibrations will be transmitted through the ground and potentially impact on adjoining structures. Where possible, the use of other techniques not involving impact (*e.g*. rock saws), should be adopted as they would reduce or possibly eliminate risks of damage due to vibrations.

Where vibration intensive works such as hydraulic hammering of competent rock is proposed, contractors should assess the potential impact of their works based on the borehole logs and local knowledge of similar bedrock formations. Monitoring of construction induced vibration should be undertaken at the commencement of such activities at the nearest vibration receptor and in consultation with the project superintendent and geotechnical engineer so that excessive vibration effects are not generated.

Peak Particle Velocity (PPV) is usually the adopted measure of ground vibration, and the safe limits depend on the sensitivity of the adjoining structures. There are several Australian and overseas publications which provide vibration velocity guideline levels (or safe limits) including:

◊ Australian Standard AS2187.2-2006 Explosives - Storage and use - Use of explosives - Appendix J: Ground Vibrations and Airblast Overpressure (reference 9).

◊ Australian Standard AS2670.2-1990 Evaluation of human exposure to whole-body vibration - Part 2: Continuous and shock-induced vibration in buildings (1 to 80 Hz) (reference 10).

◊ DIN 4150 – Part 3 – 1999. Effects if Vibration on Structures (reference 11).

◊ Department of Environment and Conservation NSW, 2006. Assessing Vibration: a technical guideline (reference 12.

◊ British Standard BS 7385-1:1990. Evaluation and measurement for vibration in buildings. Guide for measurement of vibrations and evaluation of their effects on buildings (reference 13).

◊ British Standard BS 7385-2:1993. Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration (reference 14).

Furthermore, the owners of adjoining assets/utilities sometimes have their own limits. In the absence of PPV guidelines from affected asset owners, GEE recommends the following limits be placed on vibrations:

◊ 5 mm/s for the adjoining residential structures.

If vibration levels are found to be unacceptable during the earthworks, it may be necessary to adopt vibration mitigation measures such as:

◊ The use of smaller excavation plant and hydraulic hammers,

◊ The use of a rock sawing or grinder adjacent to the site boundaries. GEE notes that this equipment also reduces the possibility of over-break and loosening of the rock mass.

◊ Hammering at 50% capacity in short bursts to prevent the buildup of resonant frequencies,

◊ The use of low vibration techniques such as rotary grinders or chemical rock splitting,

◊ Progressive breakage from open excavated faces,

◊ Selective breakage along open joints, where present, and

◊ Orientation of the rock hammer pick away from property boundaries and into the existing open excavation.

Finally, human discomfort levels caused by vibration are typically less than the levels that are likely to cause cosmetic or structural damage to structures. Therefore, complaints may be lodged by neighbours before any cosmetic or structural damage occurs. In this regard, consideration may be given to adopting more stringent vibration limits recommended for human amenity or, as a minimum, ensuring that vibration monitoring is undertaken as reassurance to confirm that vibrations are within safe limits. Acceptable vibration limits for human comfort caused by construction and excavation equipment are provided in DEC (2006) (reference 12). Specifically, maximum acceleration limits as specified in Table 2.2 of the guideline should be adopted.

5.5 STORMWATER ABSORPTION SYSTEM

As previously noted, the site was assessed to determine suitable locations for the placement of an infiltration system. Given the steep profile of the site and the proposed development there were limited locations for the placement of an infiltration system. The area below the existing pool and decking had sporadic soil cover with sandstone bedrock observed outcropping at several locations. In summary, the site is considered to be unsuitably for an infiltration/absorption system to manage stormwater from the site.

5.6 MANAGEMENT OF LANDSLIP RISK ISSUES

5.6.1 PRESENT SLOPE CONDITION

The natural slope across the site is comprised of stepped sandstone clifflines with minor shallow sandy colluvial soils. The clifflines generally strike in a northerly orientation and range from about 4.0 to 9.0 metres in height. Sections of the lower and central clifflines have developed overhangs with some detached boulders below the overhangs evident. The clifflines have developed along the predominant sub vertical joint set. Some insitu weathered boulders were observed across the site.

The natural benched area below the central cliffline has been terraced with some fill retained by low concrete block and drystone retaining walls.

5.6.2 CONTROL OF IDENTIFIED HAZARDS AND POTENTIAL NEW HAZARDS

The majority of identified hazards were associated with the existing cliffline. It is expected that the proposed excavation will remove most of these hazards.

Gee notes that due to the vegetation cover and structures located over the sandstone outcrop further hazards within the bedrock formation within and adjacent to the proposed excavation area are likely to be present. It is recommended that the site be mapped in detail after demolition of the dwelling and associated structures to ensure these hazards are identified and remediated where required.
Examples of potential hazards that are present and require assessment include,

1) Assessment of the foundation bedrock below inclinator along the southern boundary for potential impact from vibration,
2) Assessment of the footing system of No.32 garage along the northern boundary for potential impact from vibration, and
3) Assessment of adverse bedding and jointing within the cliffline in proximity to the proposed excavation, currently hidden by vegetation and structures.

5.6.3 CONSTRUCTION STAGE HAZARDS

Risk of instability during construction needs to be considered in regard to the excavations necessary for the proposed development. A construction methodology plan (CMP) is recommended to detail the hazards and recommended remedial options.

As outlined in Section 5.4.4, GEE recommends that an experienced geotechnical professional be engaged prior to and during the excavation works to undertake the following:

- ◊ Mapping of excavated batters with the identification of any potential hazards,
- ◊ Design of remedial measures for identified hazards required as they become apparent during the excavation works,
- ◊ Supervision and approval of constructed remedial measures as they are undertaken to ensure the longterm stability of the cut batters is maintained, and
- ◊ Assessment of the potential effects vibrations will have on the surrounding slope and adjacent structures.
- ◊ Assessment of foundation condition where structures are in proximity to exposed clifflines (dwelling and swimming pool).

In our opinion, with the above controls properly detailed as part of the engineering design for the Construction Certificate, and implemented, the stability of the construction-stage excavations can be maintained at appropriate levels by suitable engineering design for permanent support systems and staging, backed up by a robust Excavation Methodology Statement prepared for the work as part of the usual documentation for a Construction Certificate.

A copy of LRM2007 – Australian Geoguide LR8, (Construction Practice) detailing examples of good hillside construction practice is provided in **Appendix D**.

5.6.4 COMPLETED DEVELOPMENT

It is our opinion that the proposed development can be completed so that the slope conditions and structural elements will have a low risk or lower regarding slope instability, when assessed in accordance with the guidelines in AGS 2007.

This is contingent on the following:

- ◊ All recommendations of this report being faithfully implemented, and
- ◊ The engineering design, construction controls and monitoring, and final engineering verifications as appropriate, being properly undertaken in accordance with the normally accepted practice and regulation for this type of development.

5.7 FOUNDATIONS

Following excavation works, the bulk excavation level for the lower ground floor level will comprise both sandstone bedrock and shallow colluvial and fill soils associated with the benched area below.

It is noted that the verandah and open area between the dwelling and pool will require filling to achieve the finished floor levels. The swimming pool will be constructed partly over the existing fill platform and partly into or over the exposed sandstone bedrock which forms a stepped cliffline at this location. The fill materials will require retaining below the verandah, adjacent outdoor area and beneath the swimming pool.

To achieve a uniform bearing stratum across the dwelling footprint and associated structures and swimming pool it is recommended that all footings be extended on/into the sandstone bedrock which at this preliminary stage is expected to have a minimum serviceability bearing capacity of 500kPa, (reference 15).

The expected depth of fill/colluvial soils on the benched area are expected to be shallow and strip footings cut into the bedrock profile are expected to be suitable. Where deeper soils are encountered piering/piling into the bedrock profile would also be considered feasible.

GEE notes that some footings for the dwelling and pool will be in proximity to exposed sandstone clifflines and these areas should be inspected to ensure that that the bedrock profile has no adverse defects that may affect the footing system.

GEE notes that moderate seepages were identified on the soil profile/bedrock contact in the area downslope from the pool. Where piles or piers are utilised, drilled holes may require lining to prevent the soil profile from collapsing.

Where higher bearing capacities are required for the development additional geotechnical investigations will be required to confirm the strength and quality of the bedrock formation. This work will require the use of a drilling rig and it is recommended that the work be undertaken after the demolition of the existing dwelling and structures to allow the rig to investigate the area in proximity to the proposed excavation.

Footing systems should be designed by a suitably qualified and experienced structural engineer. Due to the variable founding conditions expected across the site, GEE highly recommends that inspection by a geotechnical engineer is undertaken during the footing excavation stage to confirm the design foundation conditions have been achieved.

6 CONCLUSION AND RECOMMENDATIONS

GEE considers that sufficient information has been gained to be confident of the subsurface conditions across the site, to allow final design of the proposed development and to provide Council with assurances regarding the geotechnical feasibility of the proposed development and the risk of instability.

Based on the results of the investigation, it is concluded that the development can be undertaken with appropriate engineering design and construction controls, such that the risks of slope instability associated with the works and the completed development will be acceptable, i.e. low risk, in accordance with AGS Guidelines.

Additionally, GEE concludes that the existing rock formation can withstand the proposed loads to be imposed, and standard shoring works (provided they are designed by experienced geotechnical and structural engineers), will ensure the stability of the excavation and provide protection to the proposed development.

Further investigation (preferably post demolition) is recommended to more accurately define any potential features that may affect the stability of the slope during the proposed excavation which will minimise the uncertainty for earthworks contractors and structural design engineers when planning and designing the proposed excavation and foundations. GEE recommends that a construction methodology plan for the development be undertaken to ensure that the identified slope hazards are adequately planned for and remediated during the construction phase of the development.

The geotechnical issues associated with the proposed development have been addressed by the investigation and are discussed in this report. If, during construction, any conditions are encountered that vary significantly from those described or inferred in the above report, it is a condition of the report that we be advised so that those conditions, and the conclusions discussed in the report, can be reviewed and alternative recommendations assessed, if appropriate.

GEE will be pleased to assist with any further advice or geotechnical services required in regard to the proposed development.

7 GENERAL LIMITATIONS

Soil and rock formations are variable. The logs or other information presented as part of this report indicate the approximate subsurface conditions only at the specific test locations. Boundaries between zones on the logs or stratigraphic sections are often not distinct, but rather are transitional and have been interpreted.

The precision with which subsurface conditions are indicated depends largely on the frequency and method of sampling, and on the uniformity of subsurface conditions. The spacing of test sites also usually reflects budget and schedule constraints. Groundwater conditions described in this report refer only to those observed at the place and under circumstances noted in the report. The conditions may vary seasonally or as a consequence of construction activities on the site or adjacent sites.

Where ground conditions encountered at the site differ significantly from those anticipated in the report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that GEE be notified of any variations and be provided with an opportunity to review the recommendations of this report. Recognition of changed soil and rock conditions requires experience and it is recommended that a suitably experienced geotechnical engineer be engaged to visit the site with sufficient frequency to detect if conditions have changed significantly.

The comments given in this report are intended only for the guidance of the design engineer, or for other purposes specifically noted in the report. The number of boreholes or test excavations necessary to determine all relevant underground conditions which may affect construction costs, techniques and equipment choice, scheduling, and sequence of operations would normally be greater than has been carried out for design purposes. Contractors should therefore rely on their own additional investigations, as well as their own interpretations of the borehole data in this report, as to how subsurface conditions may affect their work.

8 REFERENCES

1. Department of Mineral Resources, 1983: Sydney 1:100,000 *Geological Series Map Sheet 9130 (Edition 1).*
2. Department of Land and Water Conservation (DLWC), 2004: Sydney 1:100 000 Soil Landscape Series Sheet 9130 (second edition).
3. DLWC, 1997: Department of Land and Water Conservation of NSW, 1997: Prospect / Parramatta Acid Sulfate Soil Risk Map – Edition Two.
4. Practice Note Guidelines for Landslide Risk Management 2007 [and Commentary], Australian Geomechanics, Vol.42, No.1, March 2007.
5. New South Wales Environmental Protection Authority (NSW EPA), 2014: *Waste classification guidelines – Part 1 classifying waste.* November 2014.
6. Australian Standard: AS2870-2011. Residential slabs and footings.
7. Australian Standard (AS) 3798 – 2007: Guidelines on earthworks for commercial and residential developments.
8. Australian Standard AS4678-2002: Australian Standard, 2002: *Earth Retaining Structures*.
9. Australian Standard AS2187.2-2006 Explosives - Storage and use - Use of explosives - Appendix J: Ground Vibrations and Airblast Overpressure.
10. Australian Standard AS2670.2-1990: Evaluation of human exposure to whole-body vibration - Part 2: Continuous and shock-induced vibration in buildings (1 to 80 Hz).
11. DIN 4150 – Part 3 – 1999. Effects if Vibration on Structures.
12. Department of Environment and Conservation NSW, 2006. Assessing Vibration: a technical guideline.
13. British Standard BS 7385-1:1990. Evaluation and measurement for vibration in buildings. Guide for measurement of vibrations and evaluation of their effects on buildings.
14. British Standard BS 7385-2:1993. Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration.
15. Pells et al, 2019: *Classification of Sandstones and Shale in the Sydney Region: A Forty Year Review.* Australian Geomechanics Society, 2019.

FIGURES

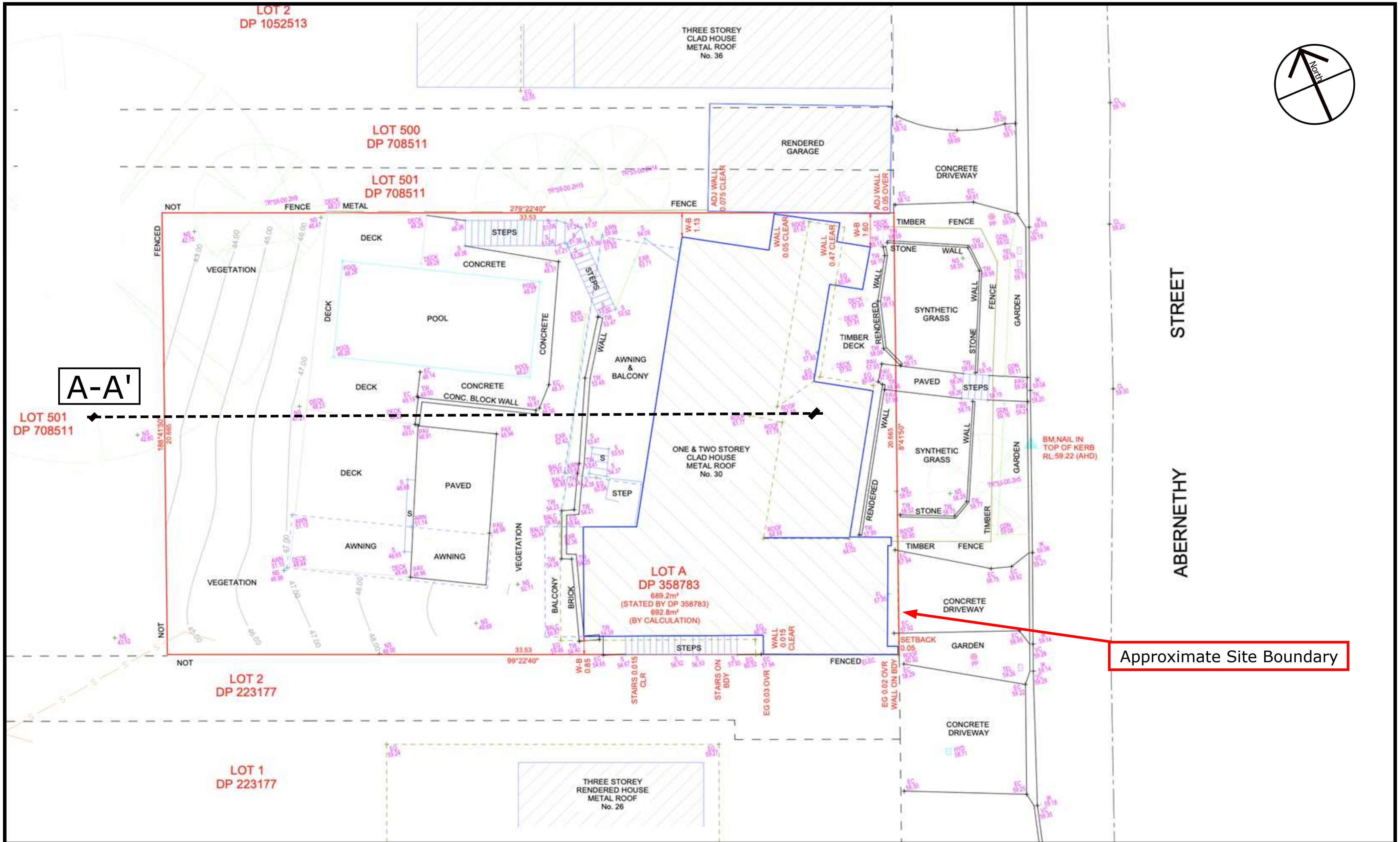
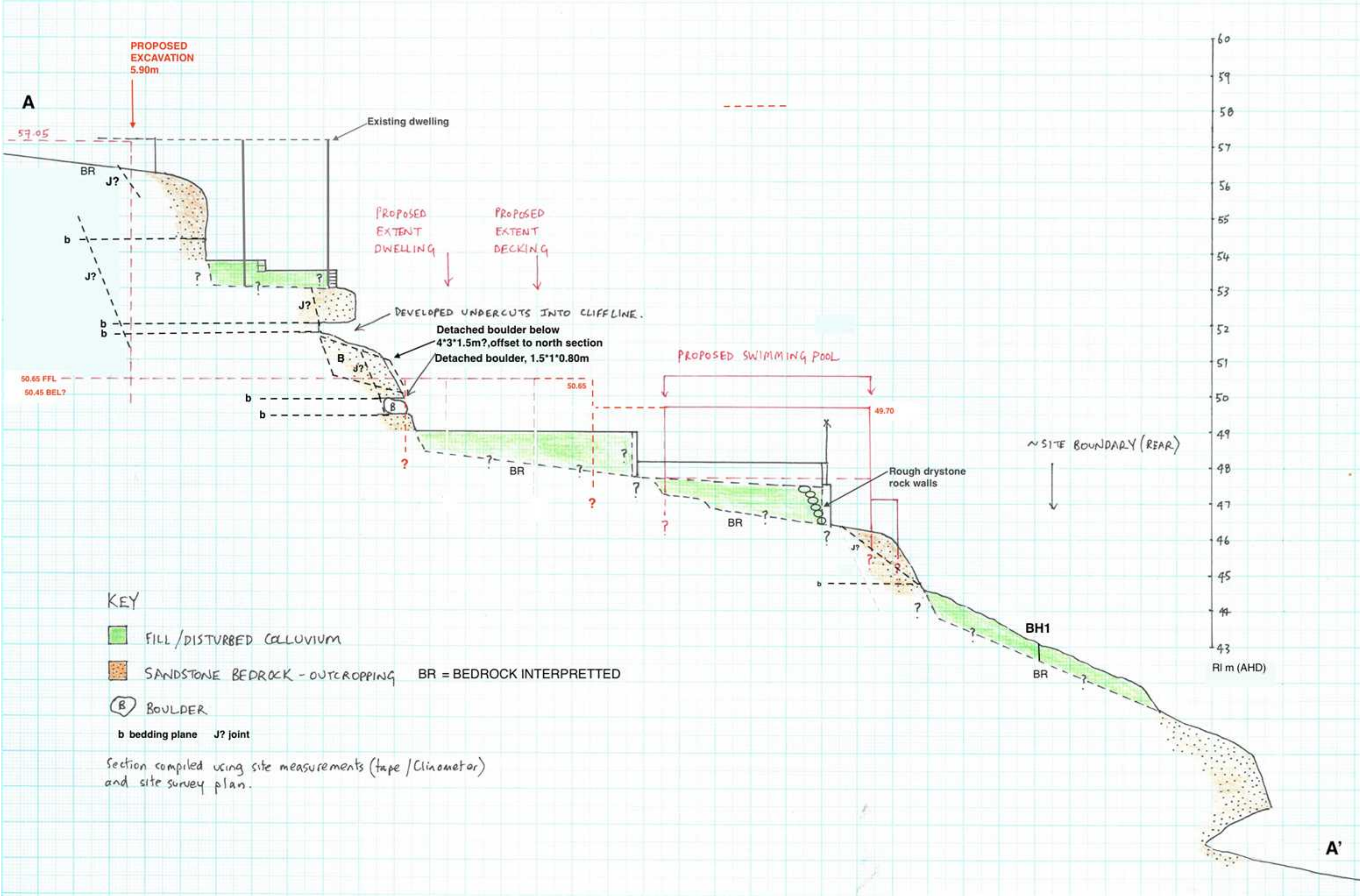
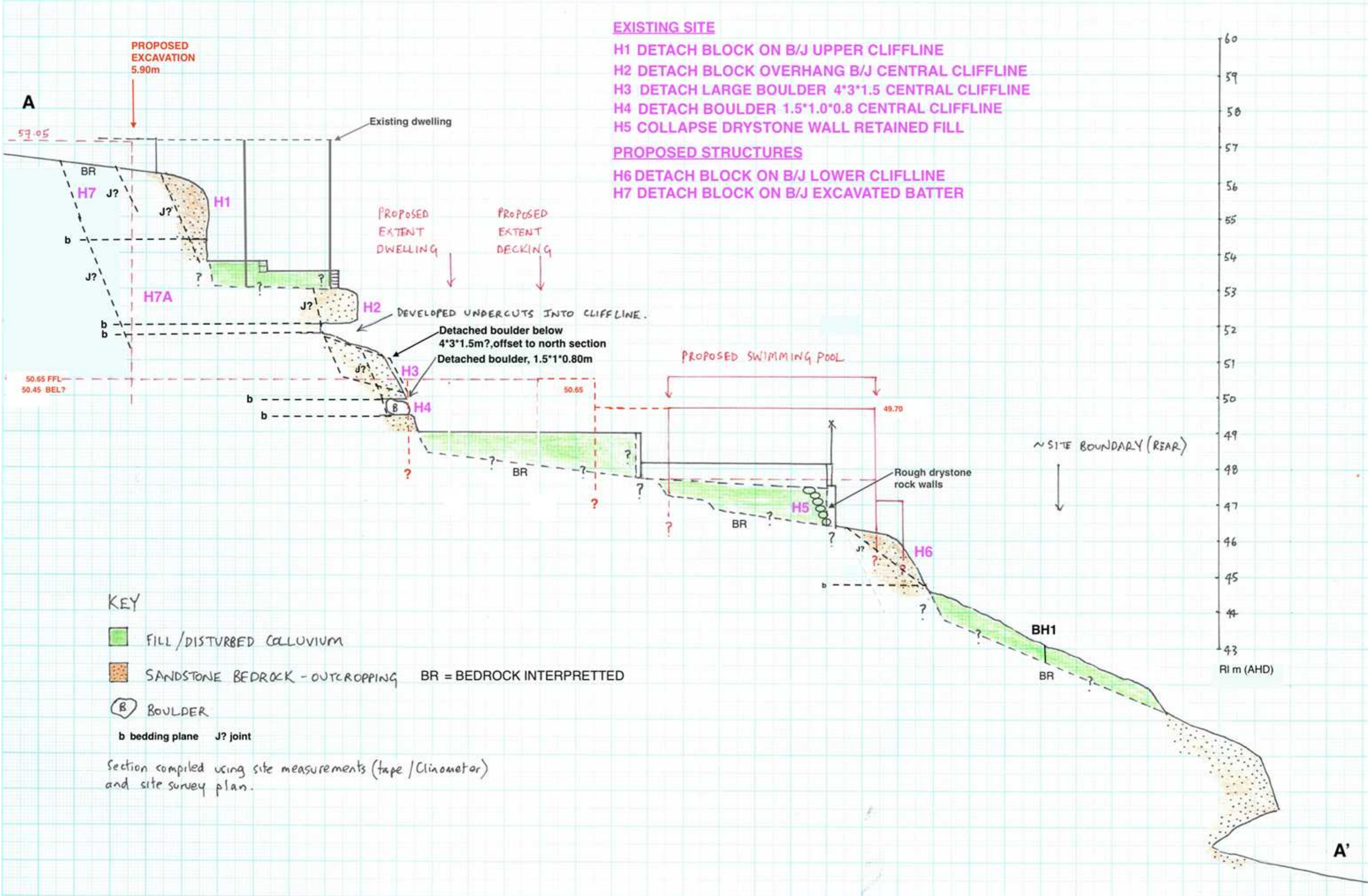


Image Provided by C&A Surveyors - Ref.No, 18958-21 DET/ID: 15th September 2021

geo-environmental ENGINEERING 82 BRIDGE STREET LANE COVE NSW 2066 P - 61 (2) 9420 3361 E - info@geoenvironmental.com.au www.geoenvironmental.com.au	TITLE: SITE PLAN 30 Abernethy Street, Seaforth NSW	SCALE: **N.T.S**	DATE: **5 August 2022**	FIGURE No.: **1**
		DRAWN: **M.Kilham**	JOB No.: **G22061SEA**	REVISION: **A**



geo-environmental ENGINEERING 82 BRIDGE STREET LANE COVE NSW 2066 P - 61 (2) 9420 3361 E - info@geoenvironmental.com.au www.geoenvironmental.com.au	TITLE: SECTION A - A' 30 Abernethy Street, Seaforth NSW	SCALE: **N.T.S** DRAWN: **M.Kilham**	DATE: **5 August 2022** JOB No.: **G22061SEA**	FIGURE No.: **2** REVISION: **A**



geo-environmental ENGINEERING 82 BRIDGE STREET LANE COVE NSW 2066 P - 61 (2) 9420 3361 E - info@geoenvironmental.com.au www.geoenvironmental.com.au	TITLE: SECTION A - A' 30 Abernethy Street, Seaforth NSW	SCALE: **N.T.S**	DATE: **5 August 2022**	FIGURE No.: **3**
		DRAWN: **M.Kilham**	JOB No.: **G22061SEA**	REVISION: **A**

APPENDIX A

SURVEY AND ARCHITECTURAL PLANS (22 SHEETS)

A1

LEGEND:

AHD	AUSTRALIAN HEIGHT DATUM
AWN	AWNING
BB	BOTTOM OF BANK
BM	BENCH MARK
BOW	BOTTOM OF WALL
CL	CENTER LINE OF ROAD
CONC	CONCRETE
CS	CONCRETE SURFACE
D/H/S	DIAMETER/HEIGHT/SPREAD
D	DOOR
EC	EDGE OF CONCRETE
EG	EAVE & GUTTER
EXR	EXPOSED ROCK
FL	FLOOR LEVEL
GDN	GARDEN
HYD	HYDRANT
IL	INVERT LEVEL
IK	INVERT OF KERB
LH	LAMP HOLE
NS	NATURAL SURFACE
PAV	PAVERS
PP	POWER POLE
RL	REDUCED LEVEL
S	STEPS
SL	SURFACE LEVEL
SILL	WINDOW SILL
SV	STOP VALE
TB	TOP OF BANK
TEL	TELSTRA PIT
TK	TOP OF KERB
TW	TOP OF WALL
TRW	TOP OF RETAINING WALL
VC	VEHICLE CROSSING
W	WINDOW
WM	WATER METER
WTOP	TOP OF WINDOW
W-B	WALL TO BOUNDARY

DIAL BEFORE YOU DIG
www.1100.com.au

THE SUBJECT TITLE NOTES : AS AT 13/9/2021

1) RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S)
2) AP328648 MORTGAGE TO WESTPAC BANKING CORPORATION

NOTES:

A) SERVICES SHOWN HAVE BEEN DERIVED FROM VISUAL EVIDENCE APPARENT AT THE TIME OF SURVEY. SERVICES MAY EXIST WHICH ARE NOT SHOWN. THE RELEVANT SERVICE AUTHORITY SHOULD BE CONTACTED TO VERIFY THE EXISTENCE AND POSITION OF SERVICES PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION OR EXCAVATION.
B) DIAMETER, HEIGHT & SPREAD OF TREES ARE APPROXIMATE ONLY.
C) LEVELS SHOWN ARE OF AUSTRALIAN HEIGHT DATUM. ORIGIN OF LEVELS : SSM 84, RL 81.657 (AHD), CLASS LB.
D) USE STATED DIMENSIONS. DO NOT SCALE.
E) THESE NOTES FORM PART OF THIS PLAN AND CANNOT BE REMOVED.
F) NO COVENANTS AND/OR RESTRICTIONS HAVE BEEN INVESTIGATED BY C & A SURVEYORS PTY LTD.

C&A SURVEYORS
30 Grose Street, Parramatta,NSW 2150
Ph: 96309299 email: info@candasurveyors.com.au
www.candasurveyors.com.au

DETAIL & BOUNDARY IDENTIFICATION SURVEY OF LOT A IN DP 358783 , LOCATED AT No.30, ABERNETHY STREET, SEAFORTH.

S — S	APPROXIMATE LOCATION OF BURIED SEWER MAIN BY SYDNEY WATER RECORDS
W — W	WATER MAIN (WM)
E — E	ELECTRIC LINE
TELSTRA PIT	
WATER METER	
STOP VALE	
HYDRANT	
POWER POLE	
TREE	

D/H/S DIAMETER/HEIGHT/SPREAD

INSTRUCTING PARTY:	ADAM SCOTT MCDOUGALL			SURVEYED BY:	RT	DATUM:	AHD
LGA:	NORTHERN BEACHES	AREA BY DP:	689.2 m²	DRAWN BY:	SU	CHECKED BY:	JD
SURVEY DATE:	14/9/2021	AREA BY CALC:	692.8 m²	SCALE:	1:100@A1	REF.NO:	18958-21 DET/ID
DATE DRAWN:	15/9/2021	CONTOUR INTERVAL	1.0 m	REV NO:	00	SHEET:	1 OF 1

30 ABERNETHY STREET, SEAFORTH
FOR DEVELOPMENT APPLICATION
PROPOSED DWELLING

COUNCIL: NORTHERN BEACHES COUNCIL
Lot: A DP: 358783 Zoning: R2 Low Density Residential

DRAWING LIST

A001	COVER SHEET	04.02.22	1
A002	BASIX COMMITMENTS	04.02.22	1
A003	SHADOW DIAGRAMS JUNE 21ST 9AM	04.02.22	1
A004	SHADOW DIAGRAM JUNE 21ST 12PM	04.02.22	1
A005	SHADOW DIAGRAM JUNE 21ST 3PM	04.02.22	1
A008	SITE ANALYSIS PLAN	04.02.22	1
A009	SITE PLAN	04.02.22	1
A101	LOWER GROUND FLOOR	04.02.22	1
A102	GROUND FLOOR PLAN	04.02.22	1
A103	FIRST FLOOR PLAN	04.02.22	1
A104	ROOF PLAN	04.02.22	1
A105	DIMENSIONED FLOOR PLANS	04.02.22	1
A107	CONSTRUCTION MANAGEMENT PLAN	04.02.22	1
A108	DEMOLITION PLAN	04.02.22	1
A200	ELEVATIONS	04.02.22	1
A201	ELEVATIONS	04.02.22	1
A202	ELEVATIONS	04.02.22	1
A203	ELEVATIONS	04.02.22	1

DRAWING LIST

A300	SECTIONS	04.02.22	1
A301	SECTIONS	04.02.22	1
A302	DRIVEWAY SECTION	04.02.22	1
A401	AREA CALCULATIONS PLAN	04.02.22	1
A403	SOLAR STUDY	04.02.22	1
A404	SOLAR STUDY	04.02.22	1
A501	MATERIAL FINISHES SCHEDULE	04.02.22	1
A502	3D PERSPECTIVES	04.02.22	1
A503	3D PERSPECTIVE INTERIORS	04.02.22	1
A504	3D RENDERS	04.02.22	1
A505	POOL PLAN AND SECTIONS	04.02.22	1
A506	POOL PLAN AND SECTIONS	04.02.22	1
A601	WINDOW SCHEDULE	04.02.22	1
A602	WINDOW SCHEDULE	04.02.22	1
A603	WINDOW SCHEDULE	04.02.22	1
A604	WINDOW SCHEDULE	04.02.22	1

SATELLITE MAP

SITE

NOTE : ARTIST IMPRESSION ONLY. DESIGN, ITEMS AND MATERIALS TO BE CONFIRMED WITH BUDGETARY REQUIREMENTS AND SUBJECT TO BUILDERS QUOTE

FOR REVIEW

Notes

1) Do not scale from drawing, use marked dimensions and levels. To be read in conjunction with all consultants' documentation. Luxitecture. is to be immediately notified of any discrepancies.
2) Contractor to verify all dimensions, coordinate services and components prior to commencement of site work or off-site fabrication and installation.
3) All construction must be built to minimum requirement set outs by the Building Code of Australia and relevant Australian Standards. Luxitecture. is to be notified immediately of any discrepancies to the above, and confirmation sought.
4) Copyright on this drawing and design retained by Luxitecture.

Issue	Description	Date
1	DEVELOPED DESIGN	04.02.22

www.luxitecture.com.au
anthony@luxitecture.com.au

LUXITECTURE

True North

Drawn: JF Checked: AM

Project
2129 SEAFORTH

Client
ADAM MCDOUGALL

Address
30 ABERNETHY STREET SEAFORTH

Drawing Title
COVER SHEET

DEVELOPED DESIGN

Scale @A3 Date: 04.02.22

Project no.	Drawing Phase.	Drawing No.	Rev
2011	SK	A001	1

LEGEND

Proposed Shadows
Neighbour Shadows

1 9AM JUNE
1 : 300

FOR REVIEW

Notes

1) Do not scale from drawing, use marked dimensions and levels. To be read in conjunction with all consultants' documentation.
Luxitecture. is to be immediately notified of any discrepancies.
2) Contractor to verify all dimensions, coordinate services and components prior to commencement of site work or off-site fabrication and installation.
3) All construction must be built to minimum requirement set outs by the Building Code of Australia and relevant Australian Standards.
Luxitecture. is to be notified immediately of any discrepancies to the above, and confirmation sought.
4) Copyright on this drawing and design retained by Luxitecture.

Issue	Description	Date
1	DEVELOPED DESIGN	04.02.22

www.luxitecture.com.au
anthony@luxitecture.com.au

LUXITECTURE

True North

Drawn: JF
Checked: AM

Project
2129
SEAFORTH
Client
ADAM MCDOUGALL
Address
30 ABERNETHY STREET
SEAFORTH

Drawing Title
SHADOW DIAGRAMS JUNE 21ST 9AM

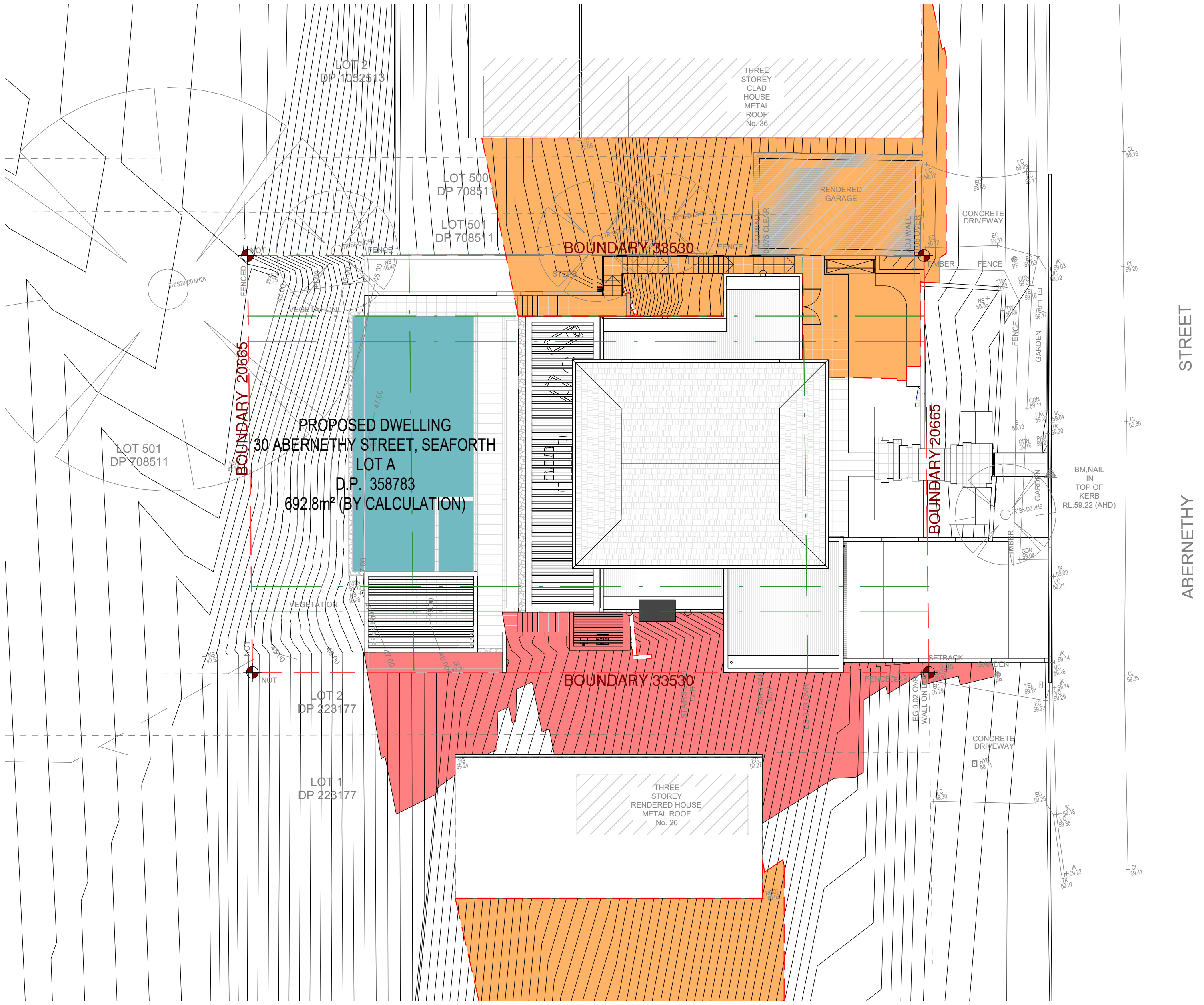
DEVELOPED DESIGN

Scale As indicated @A3
Date: 04.02.22

Project no.	Drawing Phase.	Drawing No.	Rev
2011	SK	A003	1

LEGEND

Proposed Shadows
Neighbour Shadows



1 12PM JUNE
1 : 300

FOR REVIEW

Notes

1) Do not scale from drawing, use marked dimensions and levels. To be read in conjunction with all consultants' documentation.
Luxitecture. is to be immediately notified of any discrepancies.
2) Contractor to verify all dimensions, coordinate services and components prior to commencement of site work or off-site fabrication and installation.
3) All construction must be built to minimum requirement set outs by the Building Code of Australia and relevant Australian Standards.
Luxitecture. is to be notified immediately of any discrepancies to the above, and confirmation sought.
4) Copyright on this drawing and design retained by Luxitecture.

Issue	Description	Date
1	DEVELOPED DESIGN	04.02.22

www.luxitecture.com.au
anthony@luxitecture.com.au

LUXITECTURE

True North

Drawn: JF
Checked: AM

Project
2129
SEAFORTH
Client
ADAM MCDOUGALL
Address
30 ABERNETHY STREET
SEAFORTH

Drawing Title
SHADOW DIAGRAM JUNE 21ST 12PM

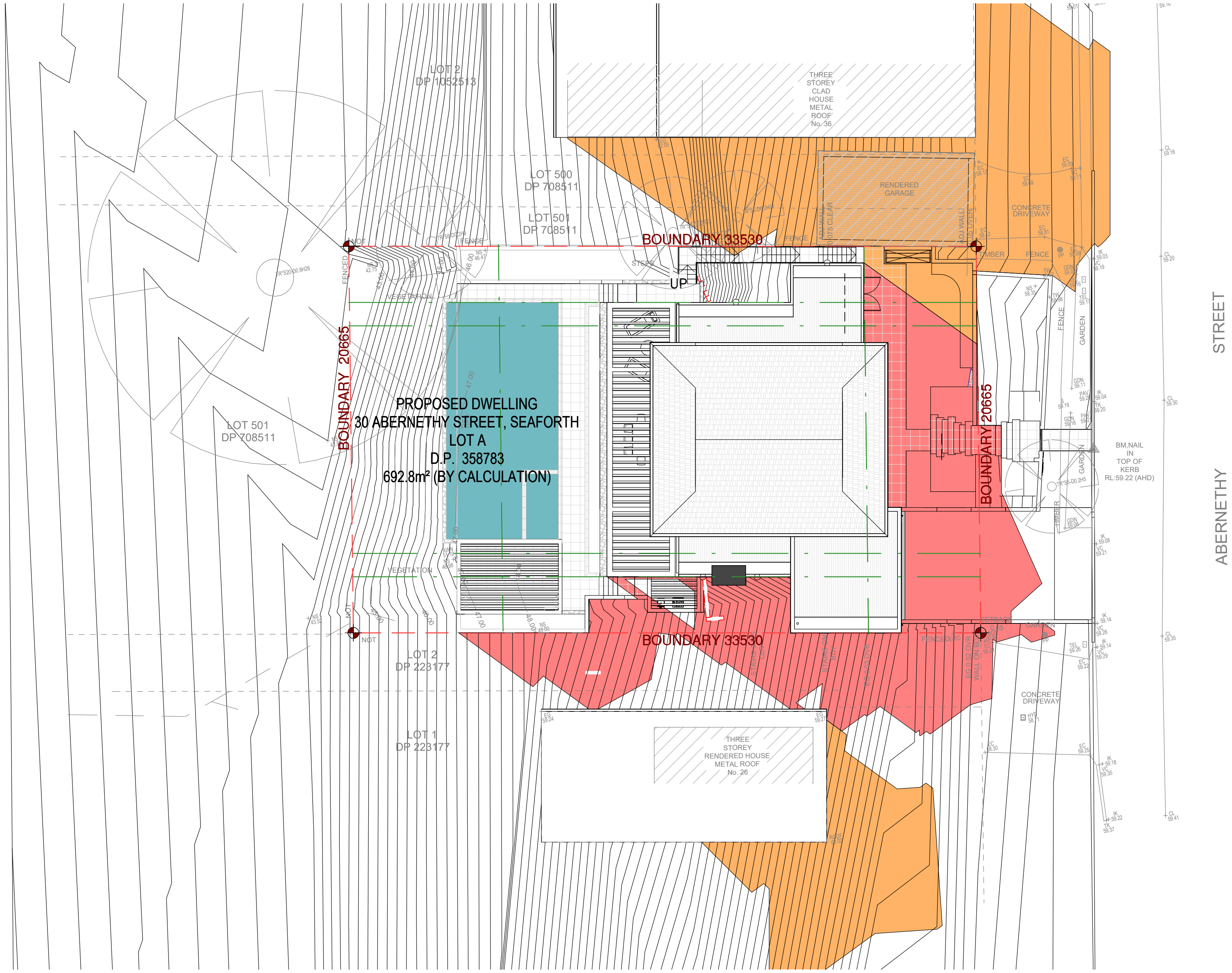
DEVELOPED DESIGN

Scale As indicated @A3
Date: 04.02.22

2011 Project no.
SK Drawing Phase.
A004 Drawing No.
1 Rev

LEGEND

Proposed Shadows
Neighbour Shadows



1 3PM JUNE
1 : 300

FOR REVIEW

Notes

1) Do not scale from drawing, use marked dimensions and levels. To be read in conjunction with all consultants' documentation.
Luxitecture. is to be immediately notified of any discrepancies.
2) Contractor to verify all dimensions, coordinate services and components prior to commencement of site work or off-site fabrication and installation.
3) All construction must be built to minimum requirement set outs by the Building Code of Australia and relevant Australian Standards.
Luxitecture. is to be notified immediately of any discrepancies to the above, and confirmation sought.
4) Copyright on this drawing and design retained by Luxitecture.

Issue	Description	Date
1	DEVELOPED DESIGN	04.02.22

www.luxitecture.com.au
anthony@luxitecture.com.au

LUXITECTURE

True North

Drawn: JF
Checked: AM

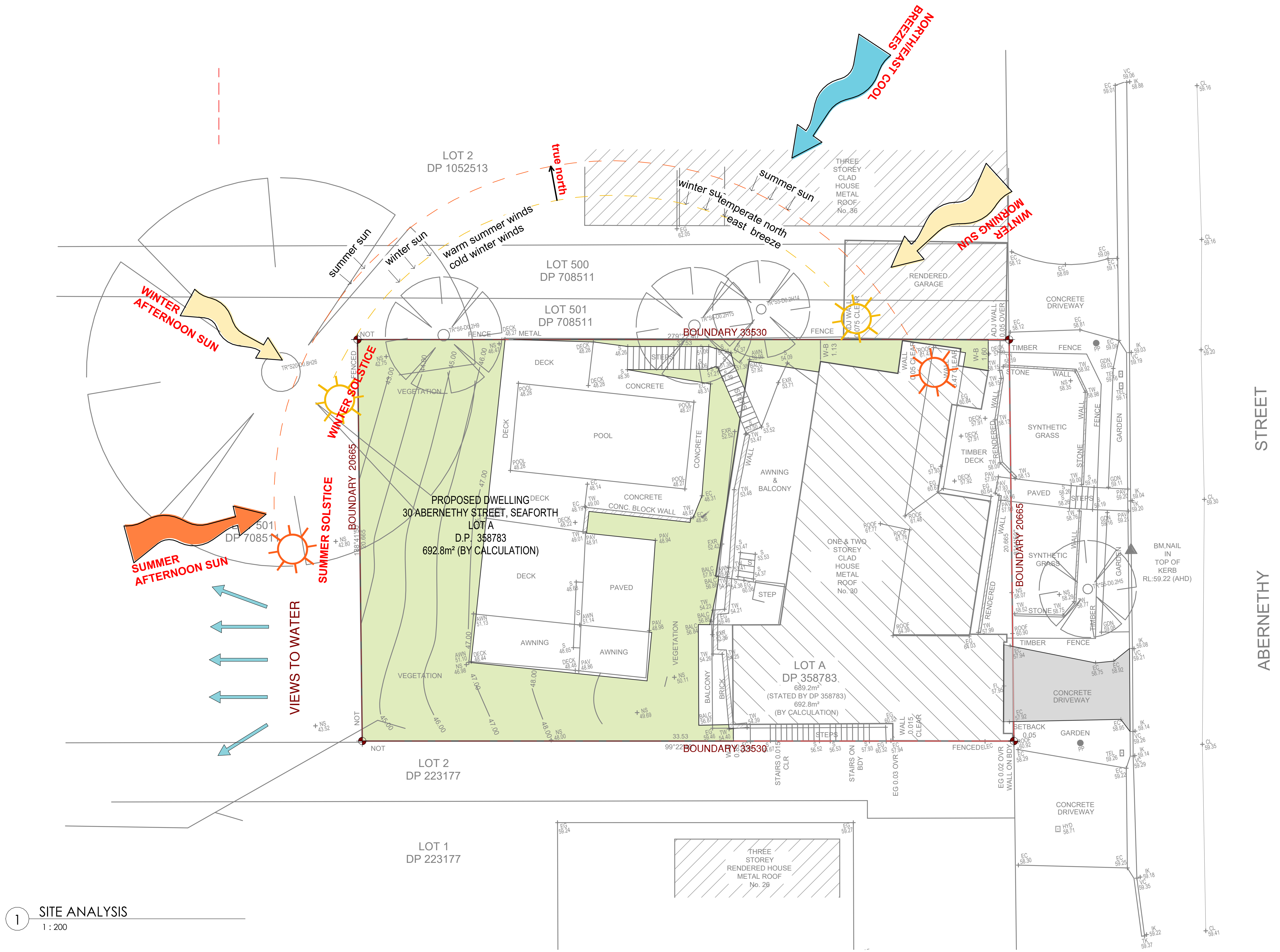
Project
2129
SEAFORTH
Client
ADAM MCDOUGALL
Address
30 ABERNETHY STREET
SEAFORTH

Drawing Title
SHADOW DIAGRAM JUNE 21ST 3PM

DEVELOPED DESIGN

Scale As indicated @A3
Date: 04.02.22

Project no.	Drawing Phase.	Drawing No.	Rev
2011	SK	A005	1



- PROPERTY BOUNDARY LINE
- VIEW CORRIDORS FROM ADJOINING SITES
- VIEWS FROM SUBJECT SITE
- PREVAILING WINDS
- LANDSCAPED AREA
- HARD SURFACE AREA

NOTES

1. THIS IS NOT A BOUNDARY SURVEY, IMPROVEMENTS SHOWN HEREON IN RELATION TO BOUNDARIES ARE DIAGRAMATIC ONLY.
2. FULL DETAILS OF SEWER AND OTHER SERVICES SHOULD BE OBTAINED FROM THE RELEVANT AUTHORITIES.
3. CONTOURS ARE APPROXIMATE ONLY, PREFERENCE TO BE GIVEN TO SPOT HEIGHTS.
4. MAJOR TREES SHOWN ONLY.
5. DIMENSIONS AND AREA ARE SUBJECT TO SURVEY.
6. THIS PLAN HAS BEEN PREPARED FOR THE SOLE PURPOSE OF LODGING A DEVELOPMENT APPLICATION WITH THE LOCAL COUNCIL. THIS PLAN IS NOT TO BE USED FOR ANY OTHER PURPOSE.

1 SITE ANALYSIS
1 : 200

FOR REVIEW

Notes

1) Do not scale from drawing, use marked dimensions and levels. To be read in conjunction with all consultants' documentation. Luxitecture. is to be immediately notified of any discrepancies.
2) Contractor to verify all dimensions, coordinate services and components prior to commencement of site work or off-site fabrication and installation.
3) All construction must be built to minimum requirement set outs by the Building Code of Australia and relevant Australian Standards. Luxitecture. is to be notified immediately of any discrepancies to the above, and confirmation sought.
4) Copyright on this drawing and design retained by Luxitecture.

Issue	Description	Date
1	DEVELOPED DESIGN	04.02.22

www.luxitecture.com.au
anthony@luxitecture.com.au

LUXITECTURE

True North

Drawn: JF
Checked: AM

Project
2129
SEAFORTH

Client
ADAM MCDOUGALL

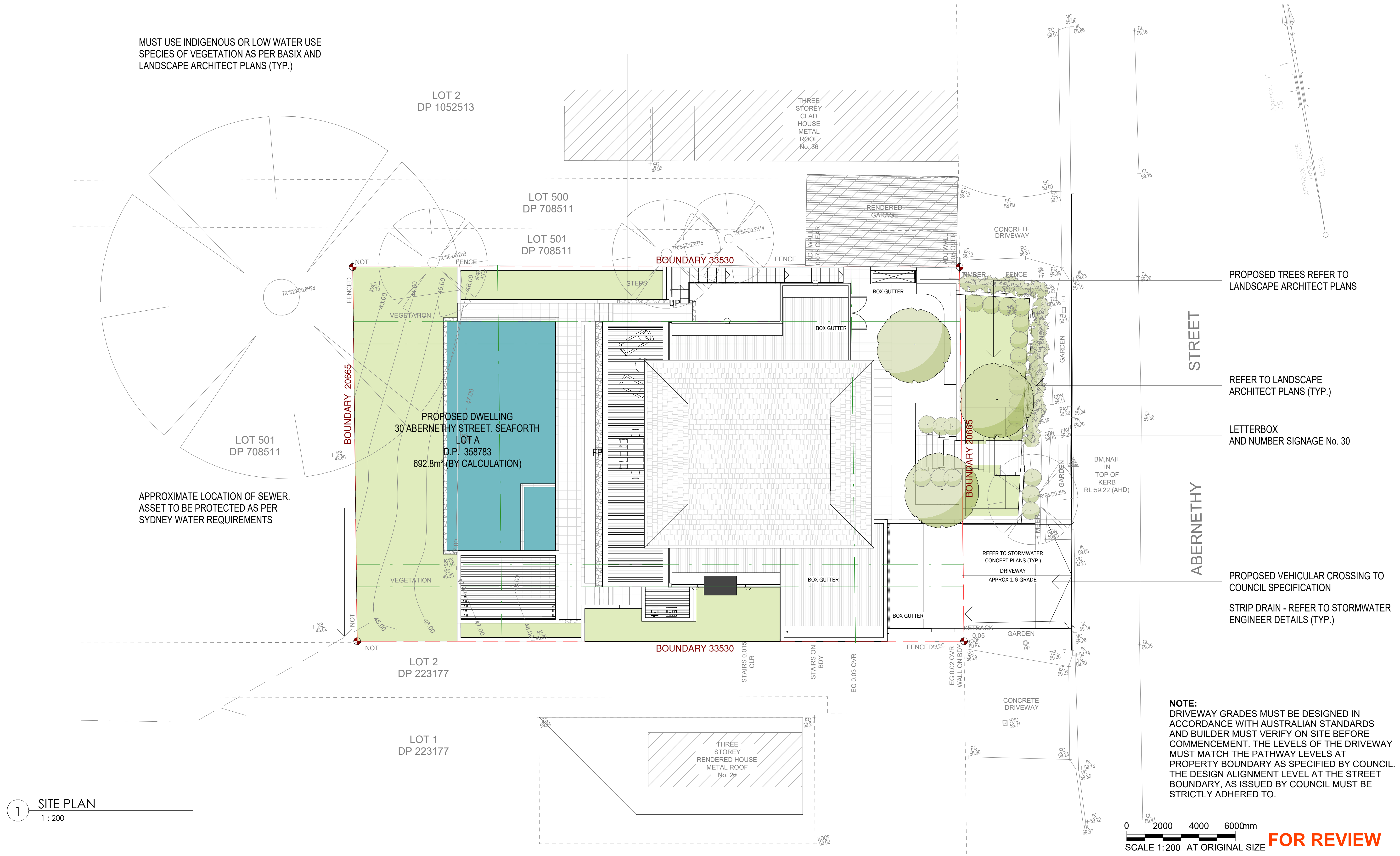
Address
30 ABERNETHY STREET
SEAFORTH

Drawing Title
SITE ANALYSIS PLAN

DEVELOPED DESIGN

Scale As indicated @A3
Date: 04.02.22

Project no.	Drawing Phase.	Drawing No.	Rev
2011	SK	A008	1



1 SITE PLAN
1 : 200

NOTE:
DRIVEWAY GRADES MUST BE DESIGNED IN ACCORDANCE WITH AUSTRALIAN STANDARDS AND BUILDER MUST VERIFY ON SITE BEFORE COMMENCEMENT. THE LEVELS OF THE DRIVEWAY MUST MATCH THE PATHWAY LEVELS AT PROPERTY BOUNDARY AS SPECIFIED BY COUNCIL. THE DESIGN ALIGNMENT LEVEL AT THE STREET BOUNDARY, AS ISSUED BY COUNCIL MUST BE STRICTLY ADHERED TO.

FOR REVIEW

Notes

1) Do not scale from drawing, use marked dimensions and levels. To be read in conjunction with all consultants' documentation.
Luxitecture. is to be immediately notified of any discrepancies.
2) Contractor to verify all dimensions, coordinate services and components prior to commencement of site work or off-site fabrication and installation.
3) All construction must be built to minimum requirement set outs by the Building Code of Australia and relevant Australian Standards.
Luxitecture. is to be notified immediately of any discrepancies to the above, and confirmation sought.
4) Copyright on this drawing and design retained by Luxitecture.

Issue	Description	Date
1	DEVELOPED DESIGN	04.02.22

www.luxitecture.com.au
anthony@luxitecture.com.au

LUXITECTURE

True North

Drawn: JF
Checked: AM

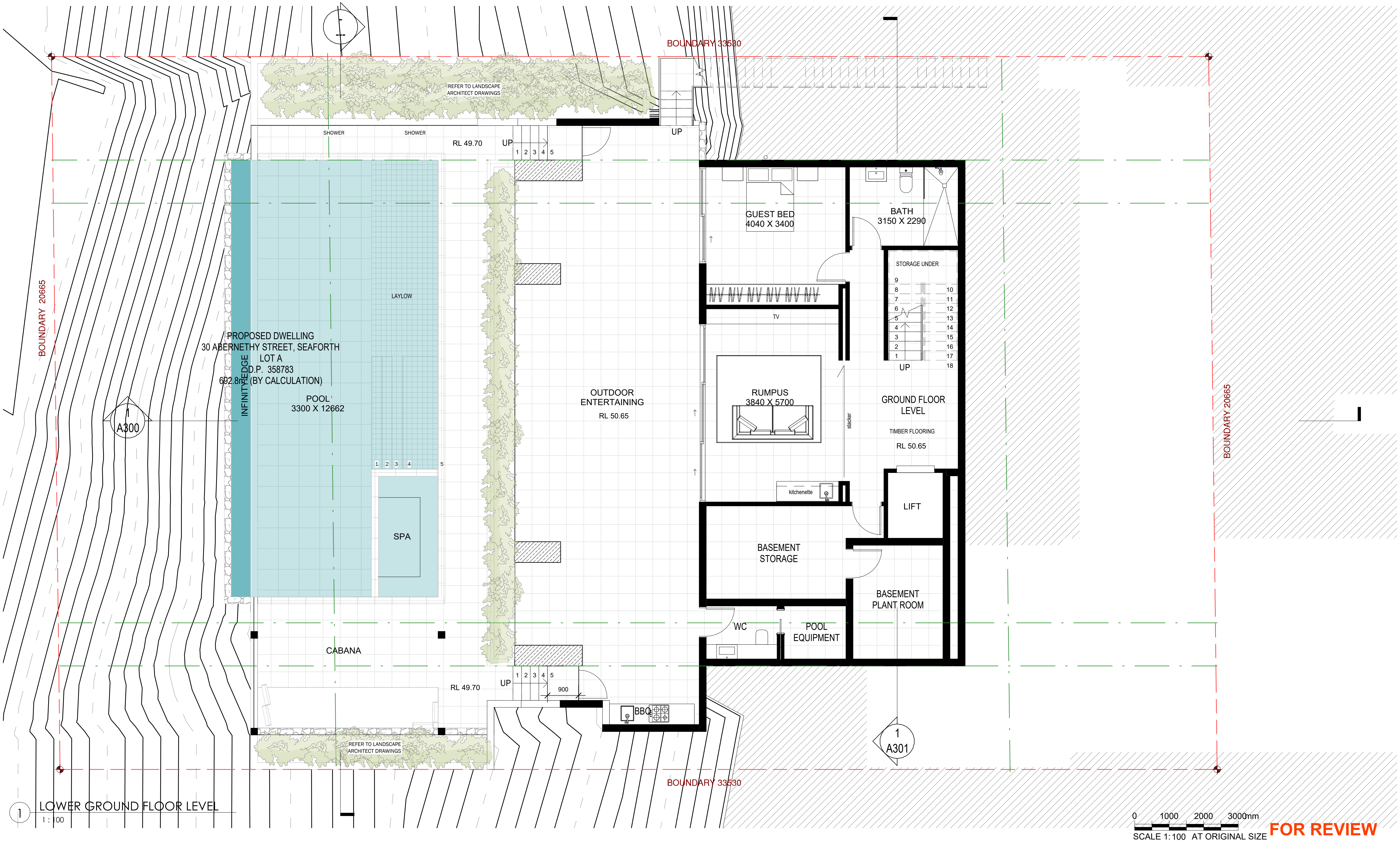
Project
2129 SEAFORTH
Client
ADAM MCDOUGALL
Address
30 ABERNETHY STREET SEAFORTH

Drawing Title
SITE PLAN

DEVELOPED DESIGN

Scale 1 : 200 @A3
Date: 04.02.22

Project no.	Drawing Phase.	Drawing No.	Rev
2011	SK	A009	1



FOR REVIEW

Notes

1) Do not scale from drawing, use marked dimensions and levels. To be read in conjunction with all consultants' documentation.
Luxitecture. is to be immediately notified of any discrepancies.
2) Contractor to verify all dimensions, coordinate services and components prior to commencement of site work or off-site fabrication and installation.
3) All construction must be built to minimum requirement set outs by the Building Code of Australia and relevant Australian Standards.
Luxitecture. is to be notified immediately of any discrepancies to the above, and confirmation sought.
4) Copyright on this drawing and design retained by Luxitecture.

Issue	Description	Date
1	DEVELOPED DESIGN	04.02.22

www.luxitecture.com.au
anthony@luxitecture.com.au

LUXITECTURE

True North

Drawn: Author

Checked:

Project
2129
SEAFORTH

Client
ADAM MCDOUGALL

Address
30 ABERNETHY STREET
SEAFORTH

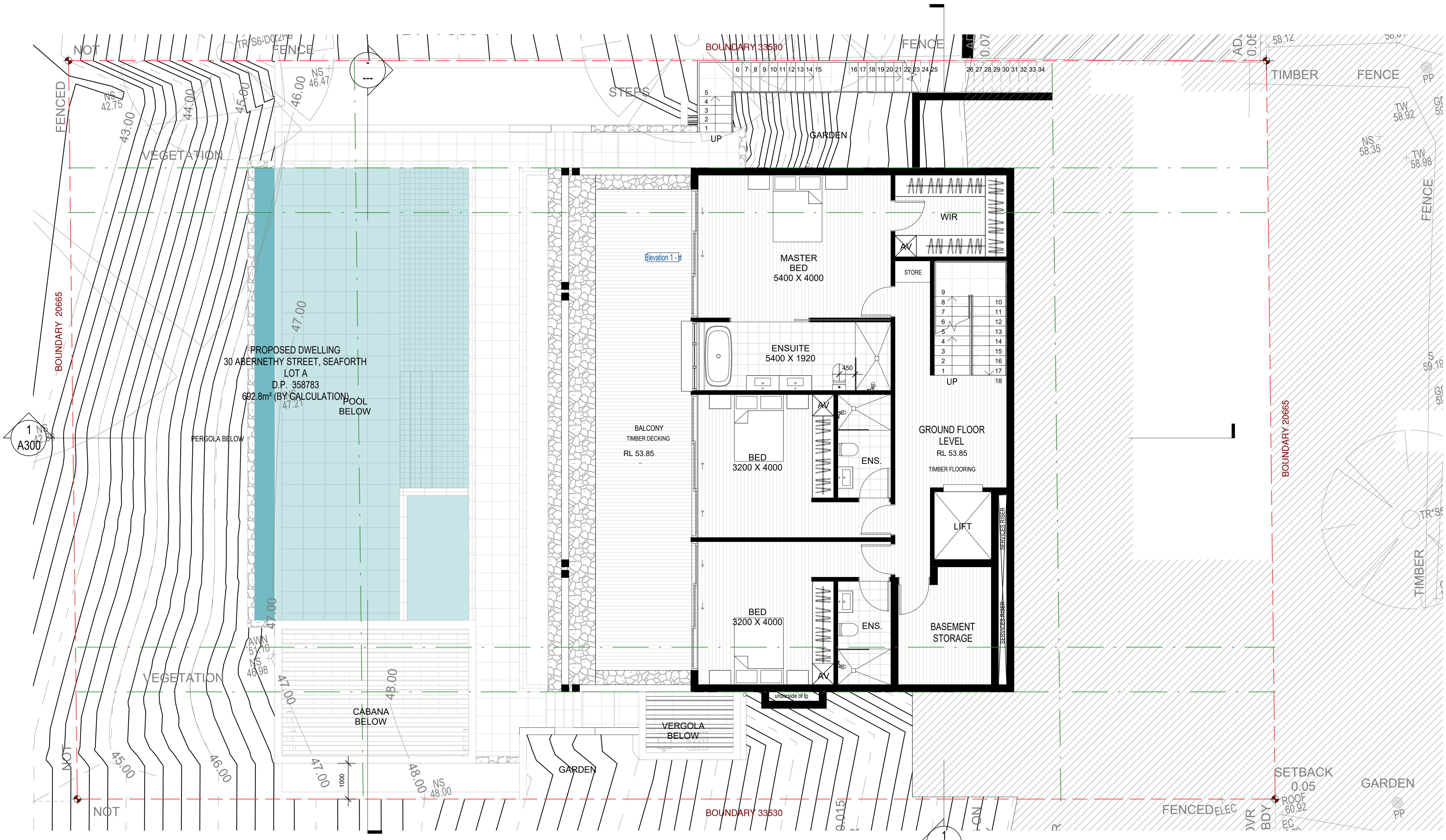
Drawing Title
LOWER GROUND FLOOR

DEVELOPED DESIGN

Scale 1 : 100 @A3

Date: 04.02.22

Project no.	Drawing Phase.	Drawing No.	Rev
2011	SK	A101	1



1 GROUND FLOOR
1 : 100

0 1000 2000 3000mm
SCALE 1:100 AT ORIGINAL SIZE

FOR REVIEW

Notes

1) Do not scale from drawing, use marked dimensions and levels. To be read in conjunction with all consultants' documentation.
Luxitecture. is to be immediately notified of any discrepancies.
2) Contractor to verify all dimensions, coordinate services and components prior to commencement of site work or off-site fabrication and installation.
3) All construction must be built to minimum requirement set outs by the Building Code of Australia and relevant Australian Standards.
Luxitecture. is to be notified immediately of any discrepancies to the above, and confirmation sought.
4) Copyright on this drawing and design retained by Luxitecture.

Issue	Description	Date
1	DEVELOPED DESIGN	04.02.22

www.luxitecture.com.au
anthony@luxitecture.com.au

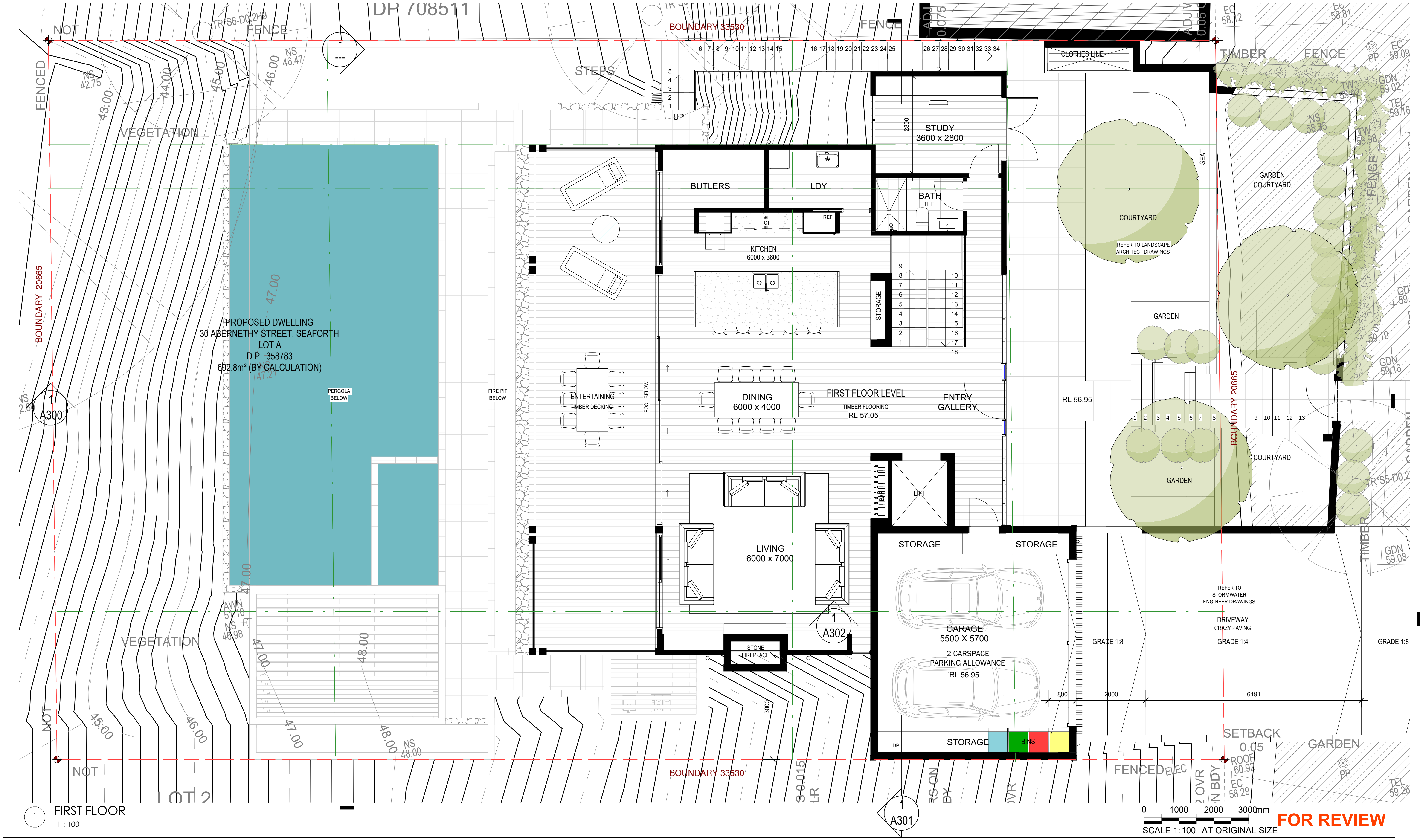
LUXITECTURE

True North

Drawn: JF
Checked: AM

Project
2129
SEAFORTH
Client
ADAM MCDOUGALL
Address
30 ABERNETHY STREET
SEAFORTH

Drawing Title
GROUND FLOOR PLAN
DEVELOPED DESIGN
Scale 1 : 100 @A3
Date: 04.02.22
Project no. 2011
Drawing Phase. SK
Drawing No. A102
Rev 1



1 FIRST FLOOR
1 : 100

Notes

1) Do not scale from drawing, use marked dimensions and levels. To be read in conjunction with all consultants' documentation.
Luxitecture. is to be immediately notified of any discrepancies.
2) Contractor to verify all dimensions, coordinate services and components prior to commencement of site work or off-site fabrication and installation.
3) All construction must be built to minimum requirement set outs by the Building Code of Australia and relevant Australian Standards.
Luxitecture. is to be notified immediately of any discrepancies to the above, and confirmation sought.
4) Copyright on this drawing and design retained by Luxitecture.

Issue	Description	Date
1	DEVELOPED DESIGN	04.02.22

www.luxitecture.com.au
anthony@luxitecture.com.au

LUXITECTURE

True North

Drawn: JF
Checked: AM

Project
2129 SEAFORTH

Client
ADAM MCDOUGALL

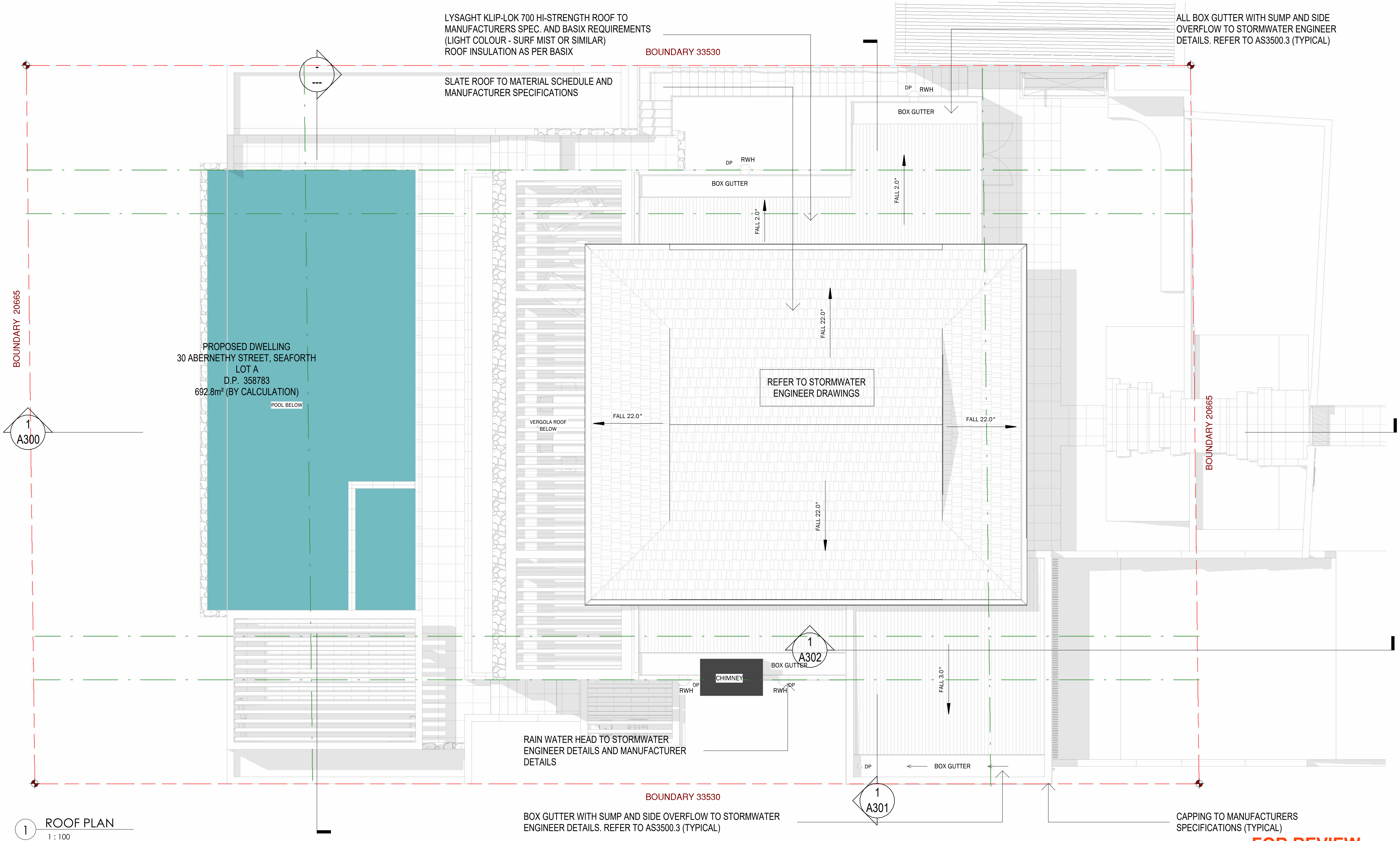
Address
30 ABERNETHY STREET SEAFORTH

Drawing Title
FIRST FLOOR PLAN

DEVELOPED DESIGN

Scale 1 : 100 @A3
Date: 04.02.22

Project no.	Drawing Phase.	Drawing No.	Rev
2011	SK	A103	1



FOR REVIEW

Notes

1) Do not scale from drawing, use marked dimensions and levels. To be read in conjunction with all consultants' documentation.
Luxitecture. is to be immediately notified of any discrepancies.
2) Contractor to verify all dimensions, coordinate services and components prior to commencement of site work or off-site fabrication and installation.
3) All construction must be built to minimum requirement set outs by the Building Code of Australia and relevant Australian Standards.
Luxitecture. is to be notified immediately of any discrepancies to the above, and confirmation sought.
4) Copyright on this drawing and design retained by Luxitecture.

Issue	Description	Date
1	DEVELOPED DESIGN	04.02.22

www.luxitecture.com.au
anthony@luxitecture.com.au

LUXITECTURE

True North

Drawn: JF
Checked: AM

Project
2129 SEAFORTH

Client
ADAM MCDOUGALL

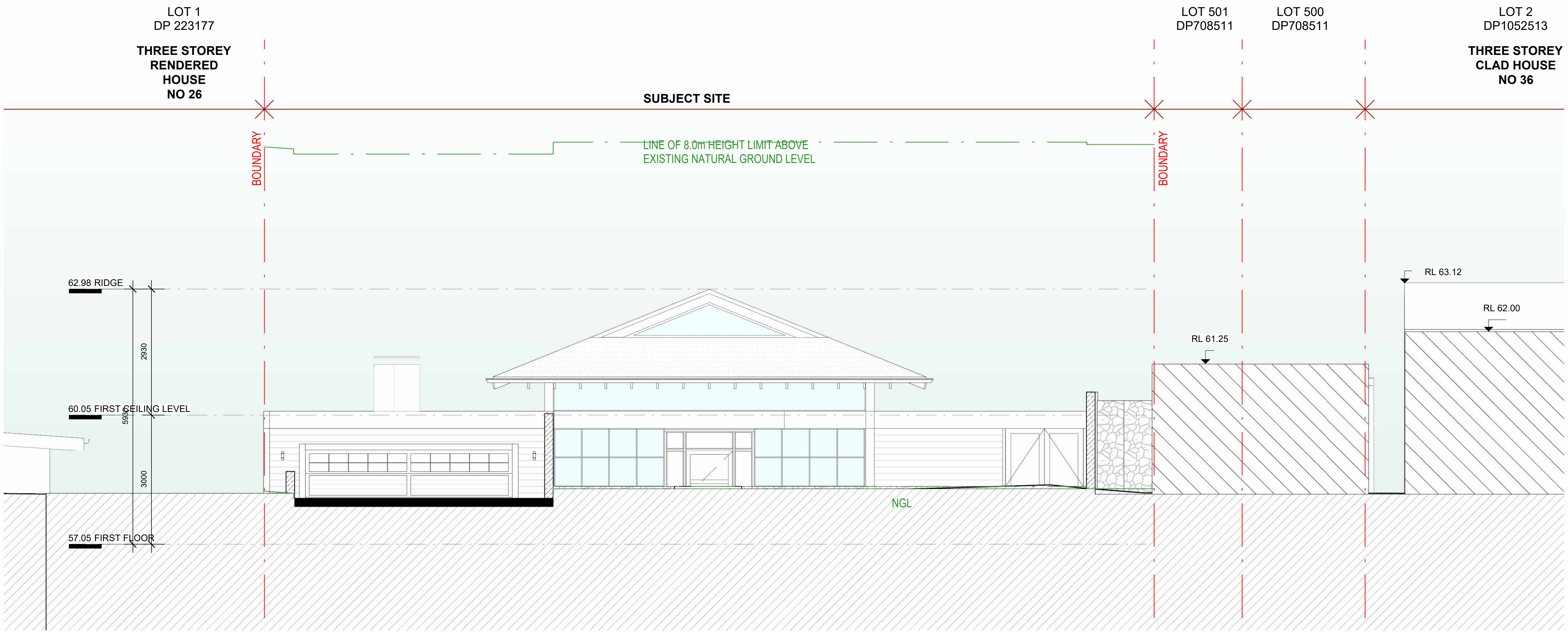
Address
30 ABERNETHY STREET SEAFORTH

Drawing Title
ROOF PLAN

DEVELOPED DESIGN

Scale 1 : 100 @A3
Date: 04.02.22

Project no.	Drawing Phase.	Drawing No.	Rev
2011	SK	A104	1



1 EASTERN ELEVATION
1 : 100

FOR REVIEW

Notes

1) Do not scale from drawing, use marked dimensions and levels. To be read in conjunction with all consultants' documentation.
Luxitecture. is to be immediately notified of any discrepancies.
2) Contractor to verify all dimensions, coordinate services and components prior to commencement of site work or off-site fabrication and installation.
3) All construction must be built to minimum requirement set outs by the Building Code of Australia and relevant Australian Standards.
Luxitecture. is to be notified immediately of any discrepancies to the above, and confirmation sought.
4) Copyright on this drawing and design retained by Luxitecture.

Issue	Description	Date
1	DEVELOPED DESIGN	04.02.22

www.luxitecture.com.au
anthony@luxitecture.com.au

LUXITECTURE

True North

Drawn: Author
Checked:

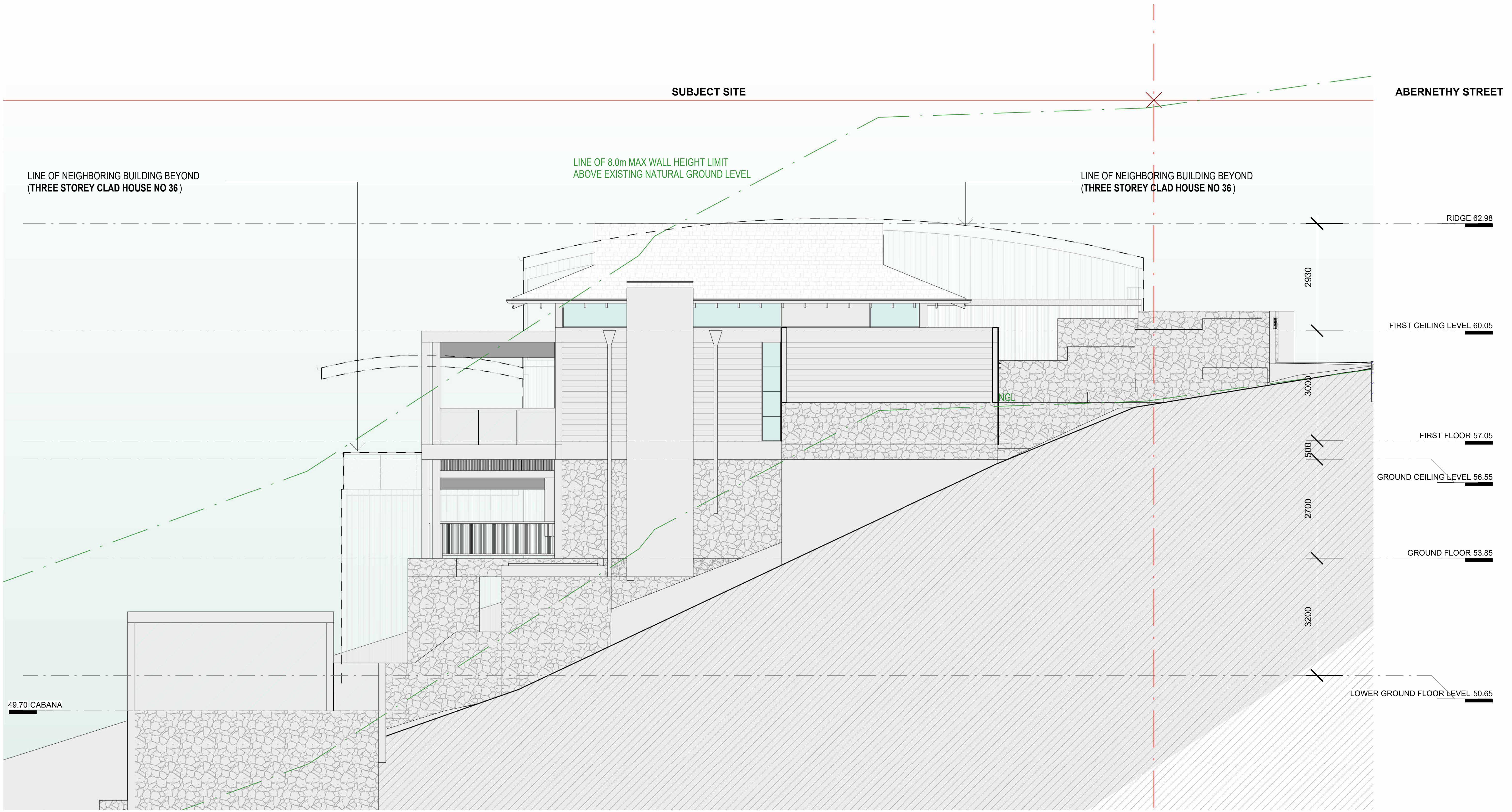
Project
2129
SEAFORTH
Client
ADAM MCDOUGALL
Address
30 ABERNETHY STREET
SEAFORTH

Drawing Title
ELEVATIONS

DEVELOPED DESIGN

Scale 1 : 100 @A3
Date: 04.02.22

Project no.	Drawing Phase.	Drawing No.	Rev
2011	SK	A200	1



1 SOUTHERN ELEVATION
1 : 100

FOR REVIEW

Notes

1) Do not scale from drawing, use marked dimensions and levels. To be read in conjunction with all consultants' documentation.
Luxitecture. is to be immediately notified of any discrepancies.
2) Contractor to verify all dimensions, coordinate services and components prior to commencement of site work or off-site fabrication and installation.
3) All construction must be built to minimum requirement set outs by the Building Code of Australia and relevant Australian Standards.
Luxitecture. is to be notified immediately of any discrepancies to the above, and confirmation sought.
4) Copyright on this drawing and design retained by Luxitecture.

Issue	Description	Date
1	DEVELOPED DESIGN	04.02.22

www.luxitecture.com.au
anthony@luxitecture.com.au

LUXITECTURE

True North

Drawn: JF
Checked: AM

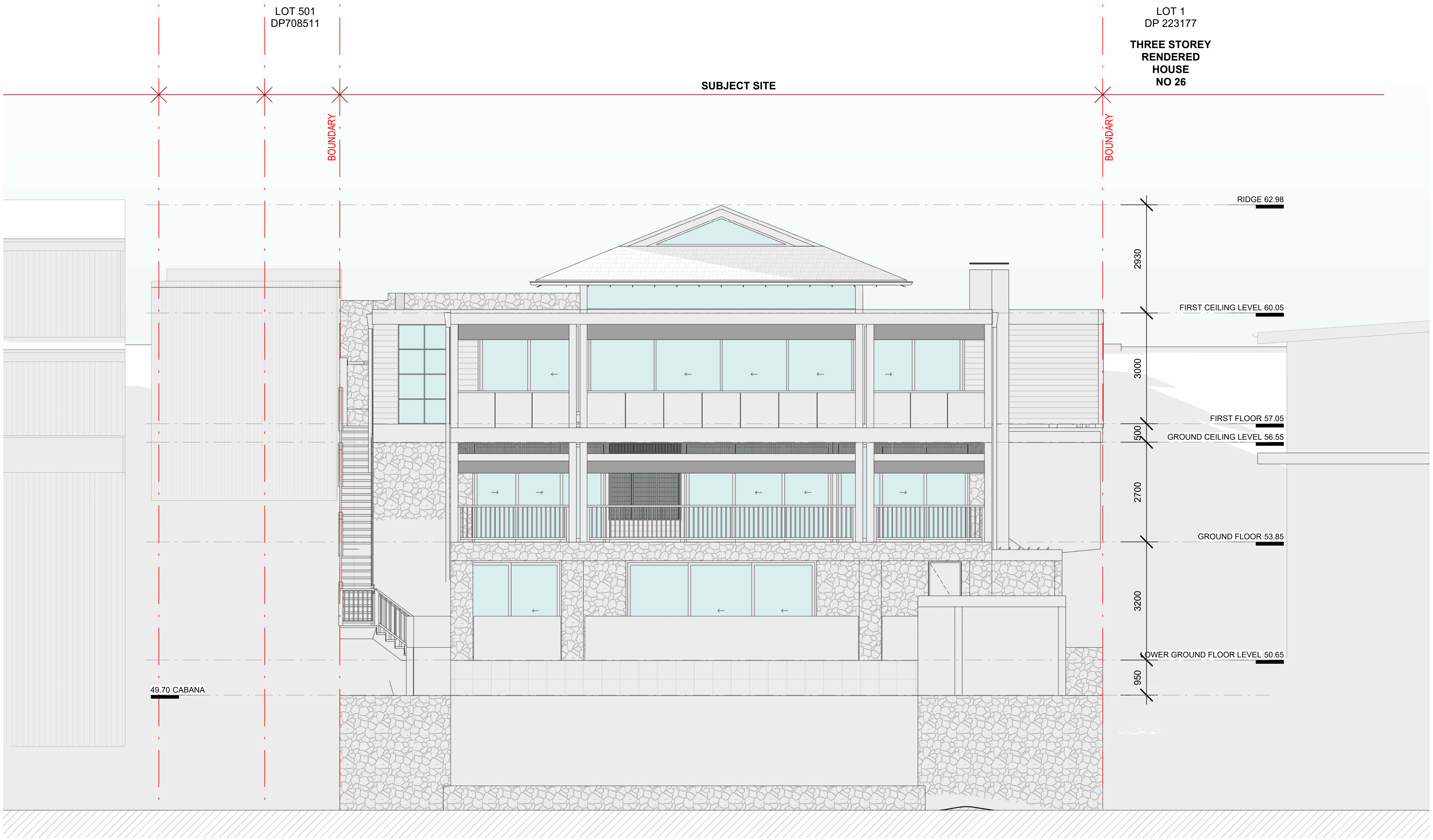
Project
2129
SEAFORTH
Client
ADAM MCDOUGALL
Address
30 ABERNETHY STREET
SEAFORTH

Drawing Title
ELEVATIONS

DEVELOPED DESIGN

Scale 1 : 100 @A3
Date: 04.02.22

2011	SK	A201	1
Project no.	Drawing Phase.	Drawing No.	Rev



1 WESTERN ELEVATION
1 : 100

FOR REVIEW

Notes

1) Do not scale from drawing, use marked dimensions and levels. To be read in conjunction with all consultants' documentation.
Luxitecture. is to be immediately notified of any discrepancies.
2) Contractor to verify all dimensions, coordinate services and components prior to commencement of site work or off-site fabrication and installation.
3) All construction must be built to minimum requirement set outs by the Building Code of Australia and relevant Australian Standards.
Luxitecture. is to be notified immediately of any discrepancies to the above, and confirmation sought.
4) Copyright on this drawing and design retained by Luxitecture.

Issue	Description	Date
1	DEVELOPED DESIGN	04.02.22

www.luxitecture.com.au
anthony@luxitecture.com.au

LUXITECTURE

True North

Drawn: Author
Checked:

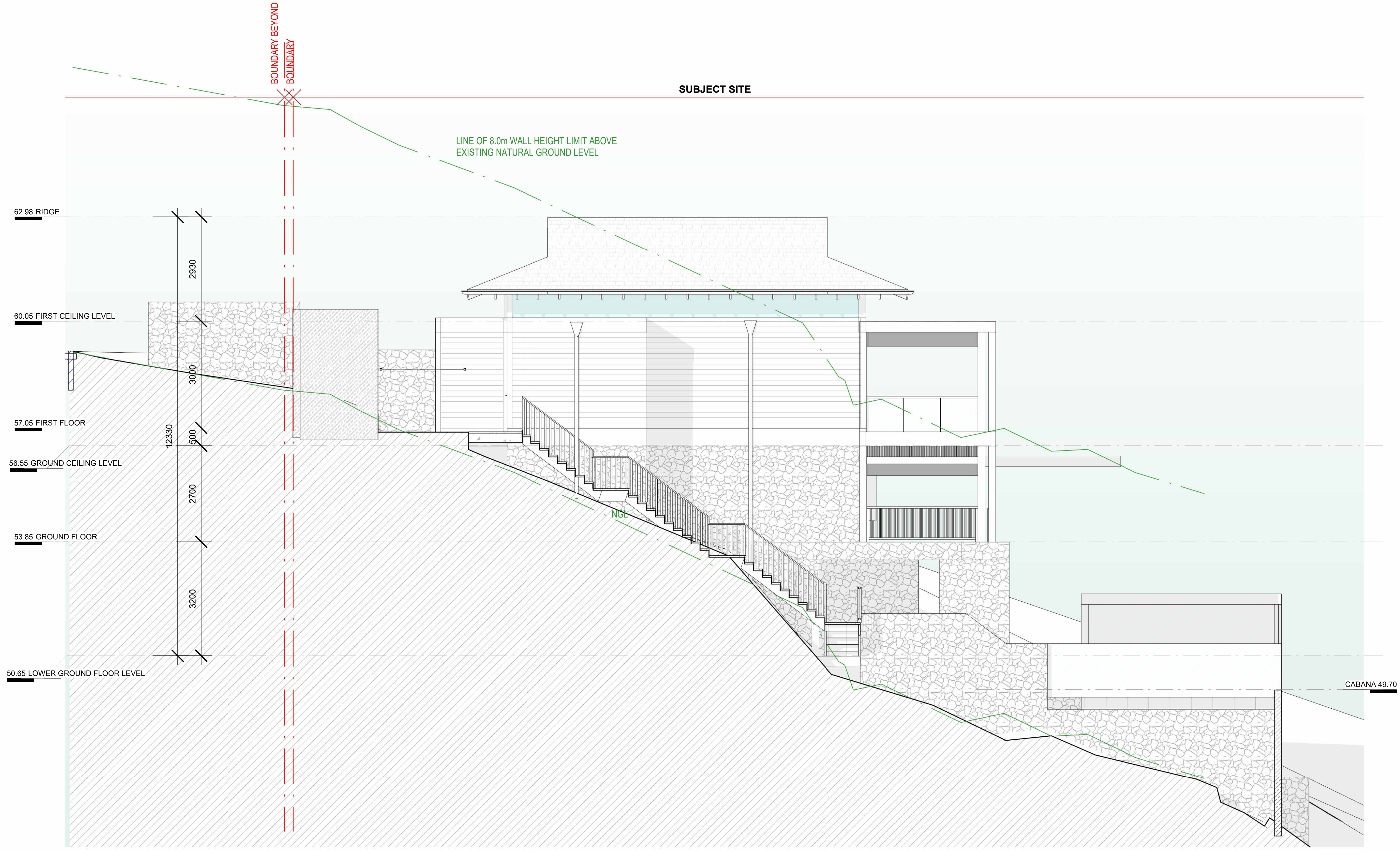
Project
2129
SEAFORTH
Client
ADAM MCDOUGALL
Address
30 ABERNETHY STREET
SEAFORTH

Drawing Title
ELEVATIONS

DEVELOPED DESIGN

Scale 1 : 100 @A3
Date: 04.02.22

Project no.	Drawing Phase.	Drawing No.	Rev
2011	SK	A202	1



1 NORTHERN ELEVATION
1 : 100

FOR REVIEW

Notes

1) Do not scale from drawing, use marked dimensions and levels. To be read in conjunction with all consultants' documentation.
Luxitecture. is to be immediately notified of any discrepancies.
2) Contractor to verify all dimensions, coordinate services and components prior to commencement of site work or off-site fabrication and installation.
3) All construction must be built to minimum requirement set outs by the Building Code of Australia and relevant Australian Standards.
Luxitecture. is to be notified immediately of any discrepancies to the above, and confirmation sought.
4) Copyright on this drawing and design retained by Luxitecture.

Issue	Description	Date
1	DEVELOPED DESIGN	04.02.22

www.luxitecture.com.au
anthony@luxitecture.com.au

LUXITECTURE

True North

Drawn: JF | Checked: AM

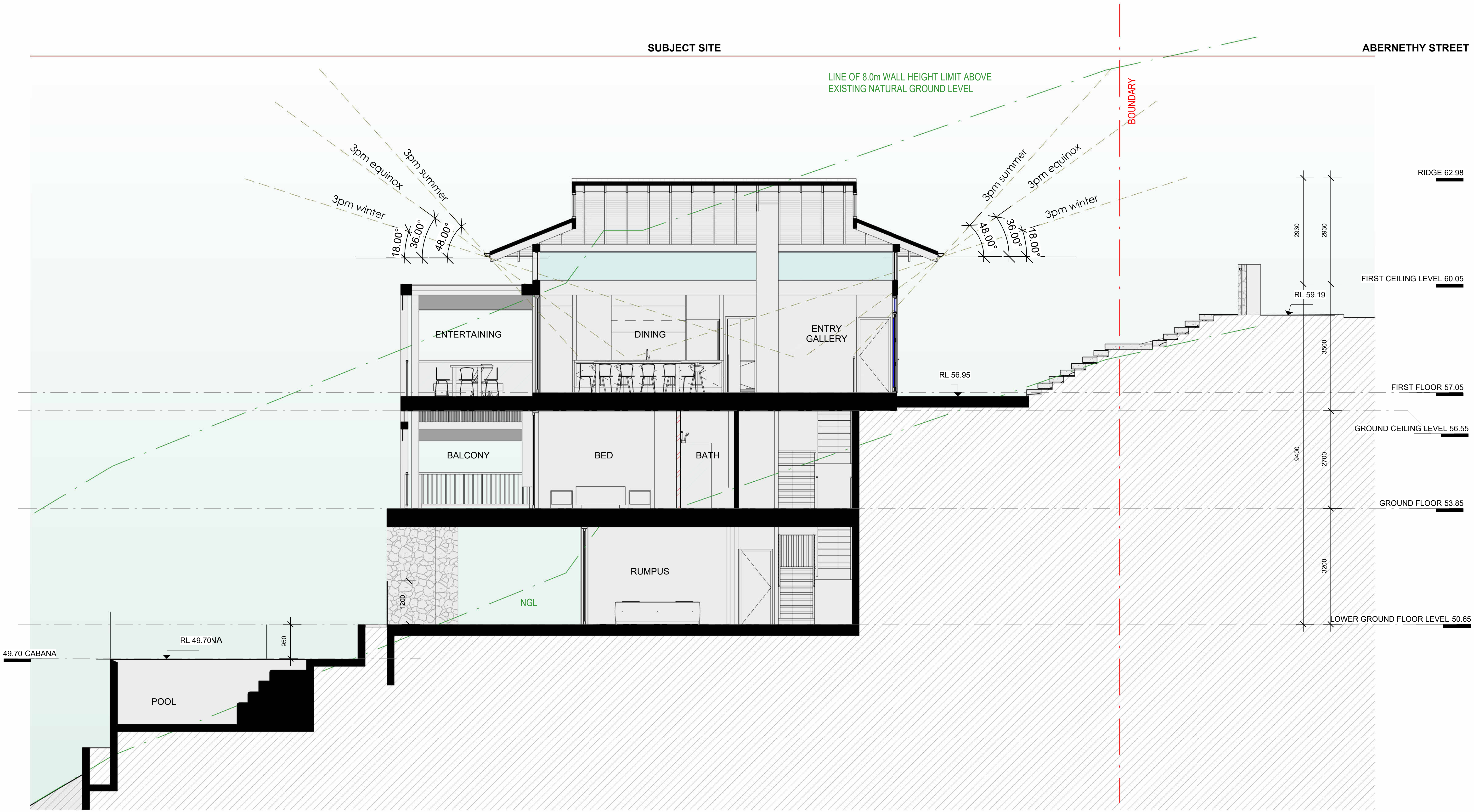
Project
2129 SEAFORTH
Client
ADAM MCDOUGALL
Address
30 ABERNETHY STREET SEAFORTH

Drawing Title
ELEVATIONS

DEVELOPED DESIGN

Scale 1 : 100 @A3 | Date: 04.02.22

Project no.	Drawing Phase.	Drawing No.	Rev
2011	SK	A203	1



SECTION 1
1 : 100

FOR REVIEW

Notes

1) Do not scale from drawing, use marked dimensions and levels. To be read in conjunction with all consultants' documentation.
Luxitecture. is to be immediately notified of any discrepancies.
2) Contractor to verify all dimensions, coordinate services and components prior to commencement of site work or off-site fabrication and installation.
3) All construction must be built to minimum requirement set outs by the Building Code of Australia and relevant Australian Standards.
Luxitecture. is to be notified immediately of any discrepancies to the above, and confirmation sought.
4) Copyright on this drawing and design retained by Luxitecture.

Issue	Description	Date
1	DEVELOPED DESIGN	04.02.22

www.luxitecture.com.au
anthony@luxitecture.com.au

LUXITECTURE

True North

Drawn: JF
Checked: AM

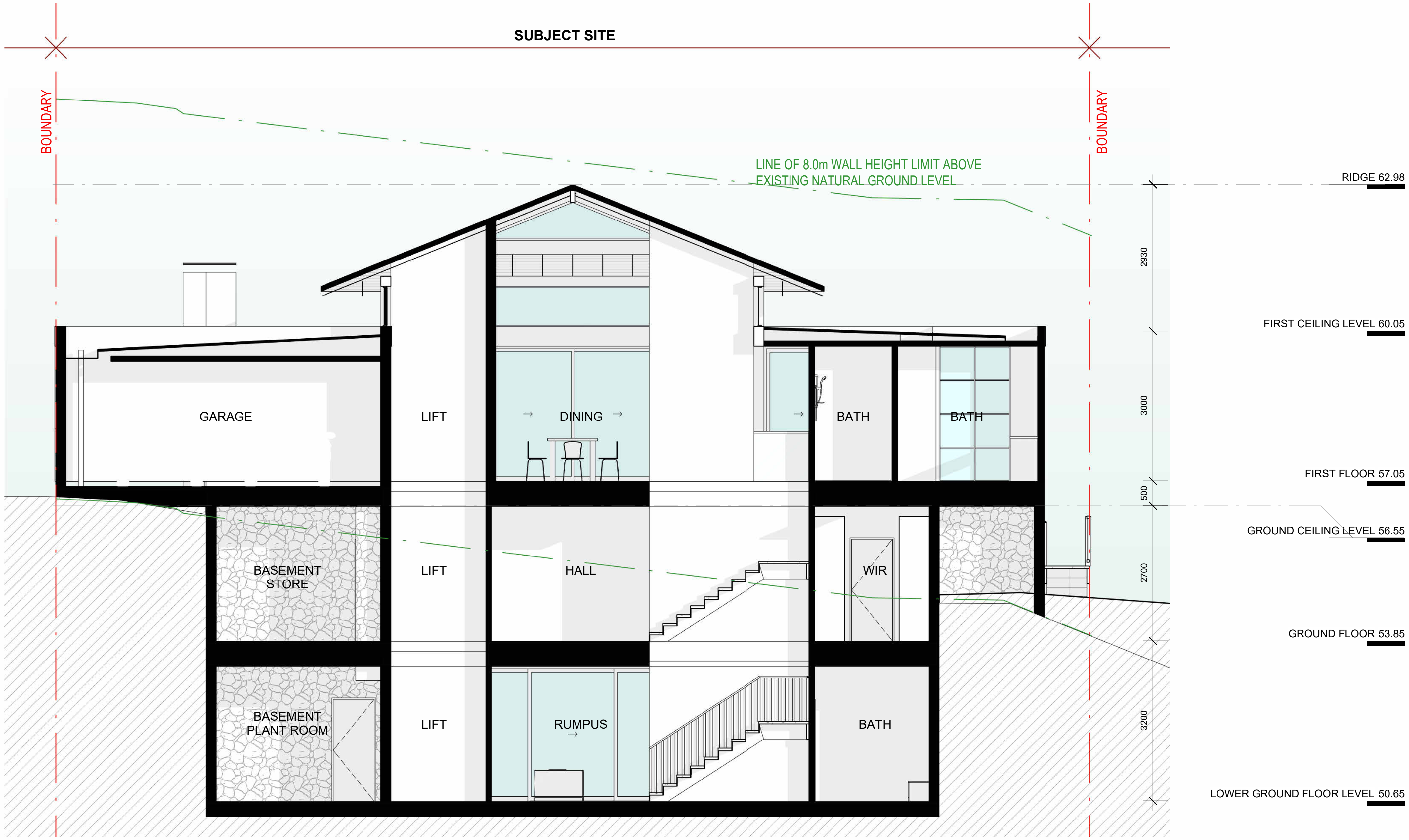
Project
2129 SEAFORTH
Client
ADAM MCDOUGALL
Address
30 ABERNETHY STREET SEAFORTH

Drawing Title
SECTIONS

DEVELOPED DESIGN

Scale 1 : 100 @A3
Date: 04.02.22

2011	SK	A300	1
Project no.	Drawing Phase.	Drawing No.	Rev



1 SECTION 2
1 : 100

FOR REVIEW

Notes

1) Do not scale from drawing, use marked dimensions and levels. To be read in conjunction with all consultants' documentation.
Luxitecture. is to be immediately notified of any discrepancies.
2) Contractor to verify all dimensions, coordinate services and components prior to commencement of site work or off-site fabrication and installation.
3) All construction must be built to minimum requirement set outs by the Building Code of Australia and relevant Australian Standards.
Luxitecture. is to be notified immediately of any discrepancies to the above, and confirmation sought.
4) Copyright on this drawing and design retained by Luxitecture.

Issue	Description	Date
1	DEVELOPED DESIGN	04.02.22

www.luxitecture.com.au
anthony@luxitecture.com.au

LUXITECTURE

True North

Drawn: JF
Checked: AM

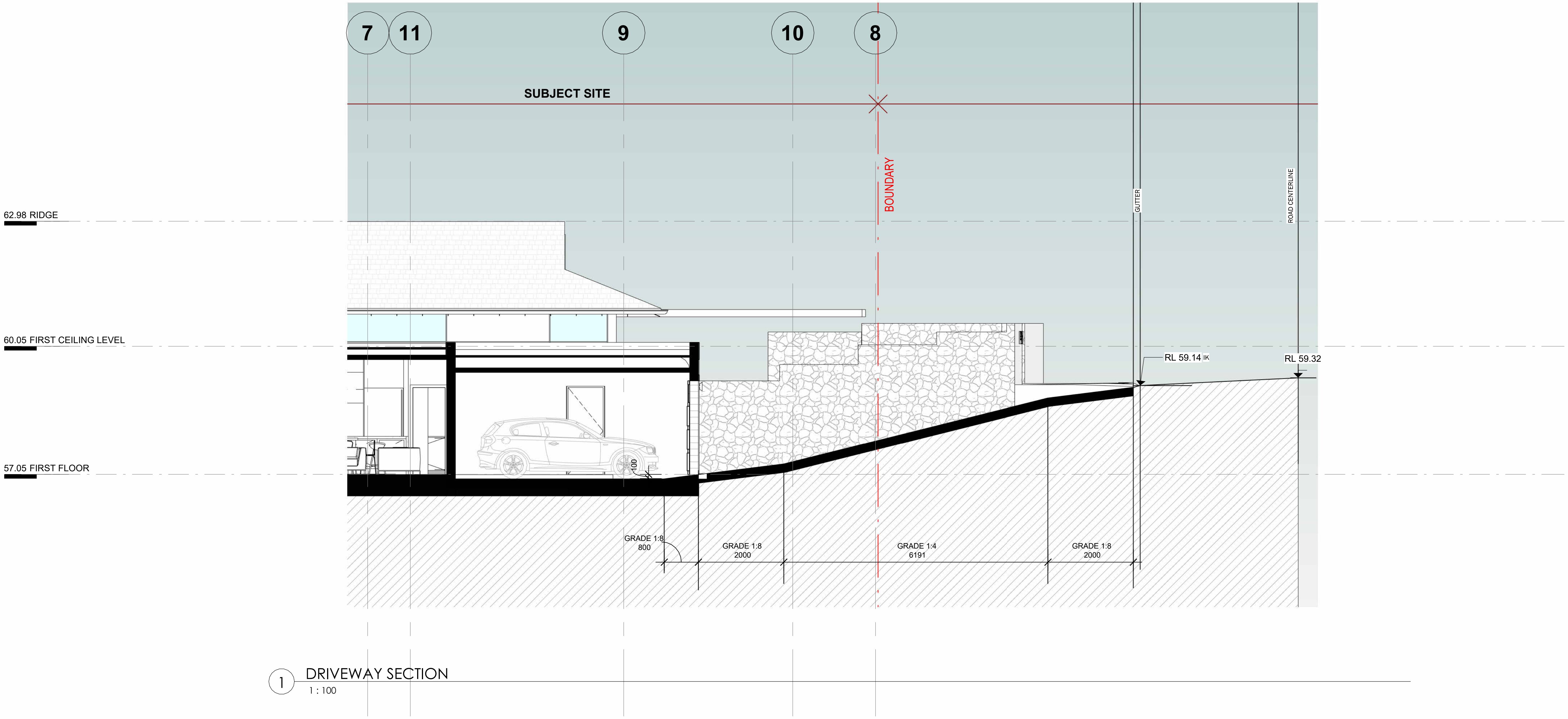
Project
2129
SEAFORTH
Client
ADAM MCDOUGALL
Address
30 ABERNETHY STREET
SEAFORTH

Drawing Title
SECTIONS

DEVELOPED DESIGN

Scale 1 : 100 @A3
Date: 04.02.22

2011	SK	A301	1
Project no.	Drawing Phase.	Drawing No.	Rev



1 DRIVEWAY SECTION
1 : 100

FOR REVIEW

Notes

1) Do not scale from drawing, use marked dimensions and levels. To be read in conjunction with all consultants' documentation.
Luxitecture. is to be immediately notified of any discrepancies.
2) Contractor to verify all dimensions, coordinate services and components prior to commencement of site work or off-site fabrication and installation.
3) All construction must be built to minimum requirement set outs by the Building Code of Australia and relevant Australian Standards.
Luxitecture. is to be notified immediately of any discrepancies to the above, and confirmation sought.
4) Copyright on this drawing and design retained by Luxitecture.

Issue	Description	Date
1	DEVELOPED DESIGN	04.02.22

www.luxitecture.com.au
anthony@luxitecture.com.au

LUXITECTURE

True North

Drawn: JF
Checked: AM

Project
2129
SEAFORTH
Client
ADAM MCDOUGALL
Address
30 ABERNETHY STREET
SEAFORTH

Drawing Title
DRIVEWAY SECTION
DEVELOPED DESIGN
Scale 1 : 100 @A3
Date: 04.02.22

Project no.	Drawing Phase.	Drawing No.	Rev
2011	SK	A302	1

FSR MAP: 0.40:1 MAXIMUM = SITE AREA 692.8, MAX GFA = 277.12m2
BASED ON CLAUSE 4.1.3.1 = 750m2 SITE AREA = 300m2

LANDSCAPE

OPEN SPACE

GFA

SITE CALCULATIONS

SITE AREA: 692.8m²

MIN OPEN SPACE:
MINIMUM:60 % OF SITE AREA = 415.68m²
PROPOSED: 93% OF SITE AREA = 524m² complies

LANDSCAPING:
MIN REQUIRED:40 % OF OPEN SPACE = 166.m²
PROPOSED: 58% OF OPEN SPACE = 238m² complies

FLOOR SPACE RATIO:
MAX ALLOWED: CLAUSE 4.1.3.1 = 300m²
PROPOSED: 300m² (COMPLIES)

GFA

LOWER GROUND FLOOR GFA = 72.2 SQM
GROUND FLOOR = 101.8 SQM
FIRST FLOOR = 126 SQM

TOTAL GFA = 300 SQM

34 SQM CAR SPACE ALLOWANCE

OPEN SPACE

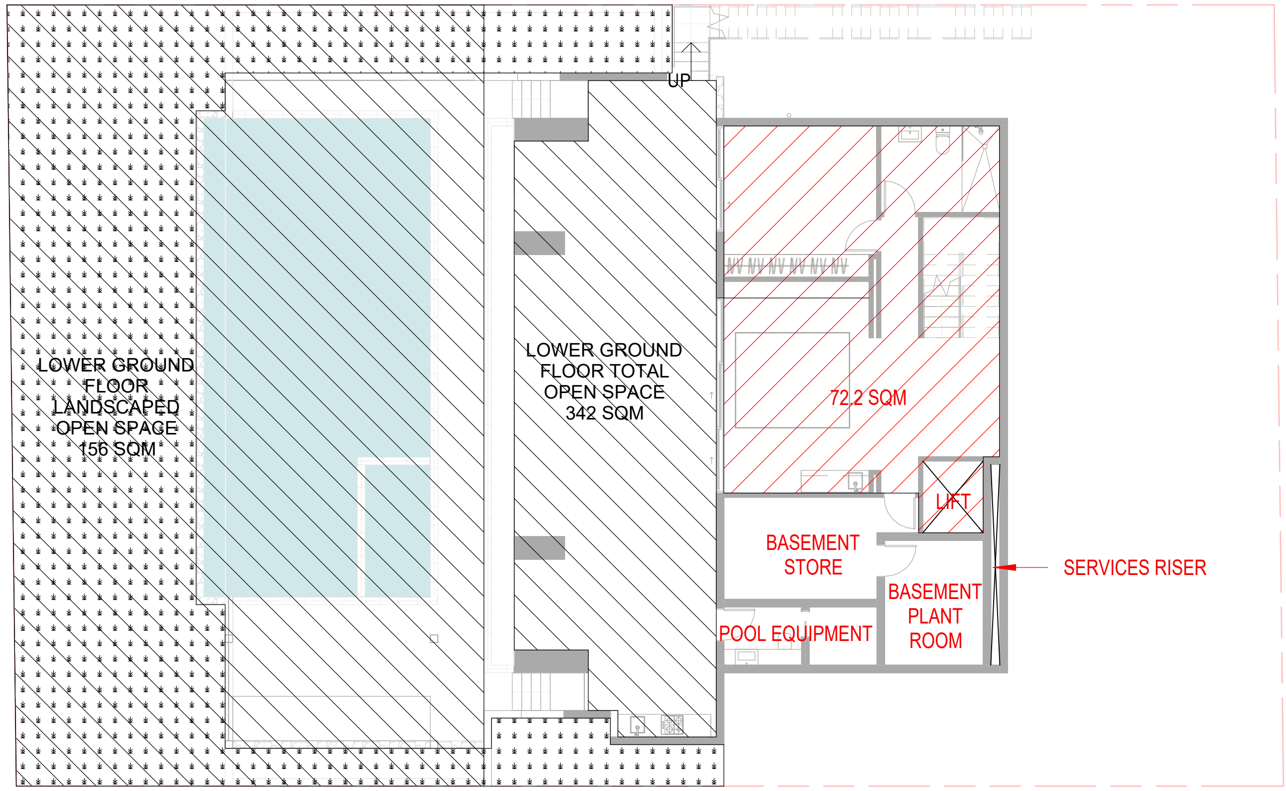
LOWER GROUND FLOOR GFA = 340 SQM
GROUND FLOOR = 56 SQM
FIRST FLOOR = 128 SQM

TOTAL OPEN SPACE = 524 SQM

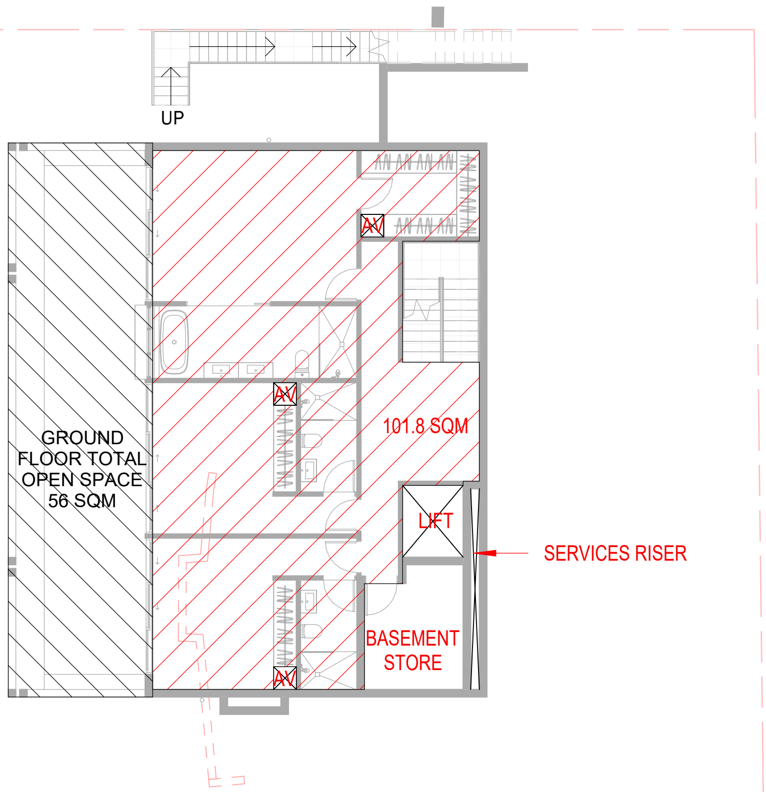
LANDSCAPED OPEN SPACE = MINIMUM 40% OF OPEN SPACE
MINIMUM REQUIREMENT = 166.2 SQM

LOWER GROUND FLOOR GFA = 144 SQM
GROUND FLOOR = 0 SQM
FIRST FLOOR = 82 SQM

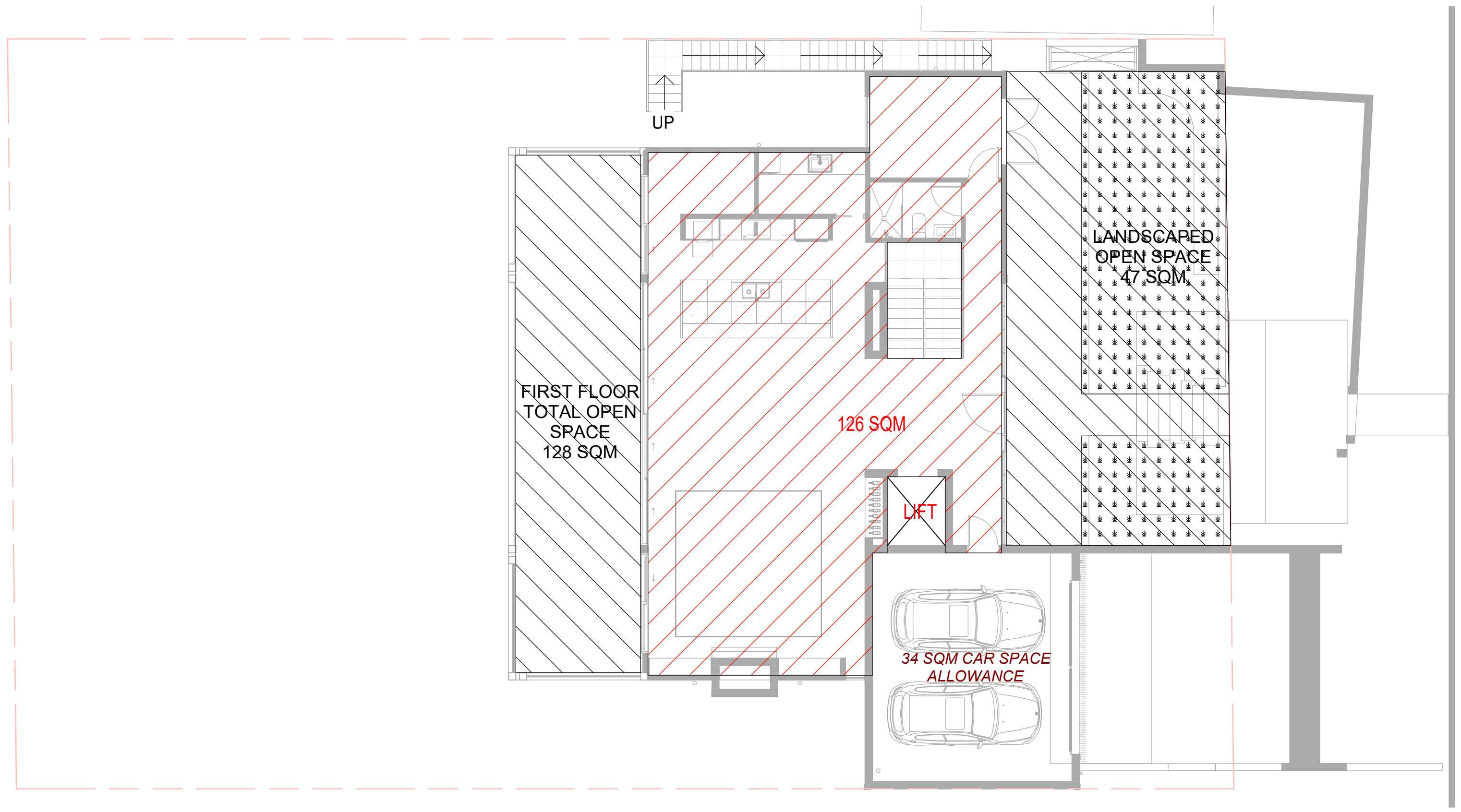
TOTAL OPEN SPACE = 226 SQM COMPLIES



1 LOWER GROUND FLOOR LEVEL
1 : 200



2 GROUND FLOOR
1 : 200



3 FIRST FLOOR
1 : 200

FOR REVIEW

Notes

1) Do not scale from drawing, use marked dimensions and levels. To be read in conjunction with all consultants' documentation.
Luxitecture. is to be immediately notified of any discrepancies.
2) Contractor to verify all dimensions, coordinate services and components prior to commencement of site work or off-site fabrication and installation.
3) All construction must be built to minimum requirement set outs by the Building Code of Australia and relevant Australian Standards.
Luxitecture. is to be notified immediately of any discrepancies to the above, and confirmation sought.
4) Copyright on this drawing and design retained by Luxitecture.

Issue	Description	Date
1	DEVELOPED DESIGN	04.02.22

www.luxitecture.com.au
anthony@luxitecture.com.au

LUXITECTURE

True North

Drawn: JF
Checked: AM

Project
2129
SEAFORTH

Client
ADAM MCDOUGALL

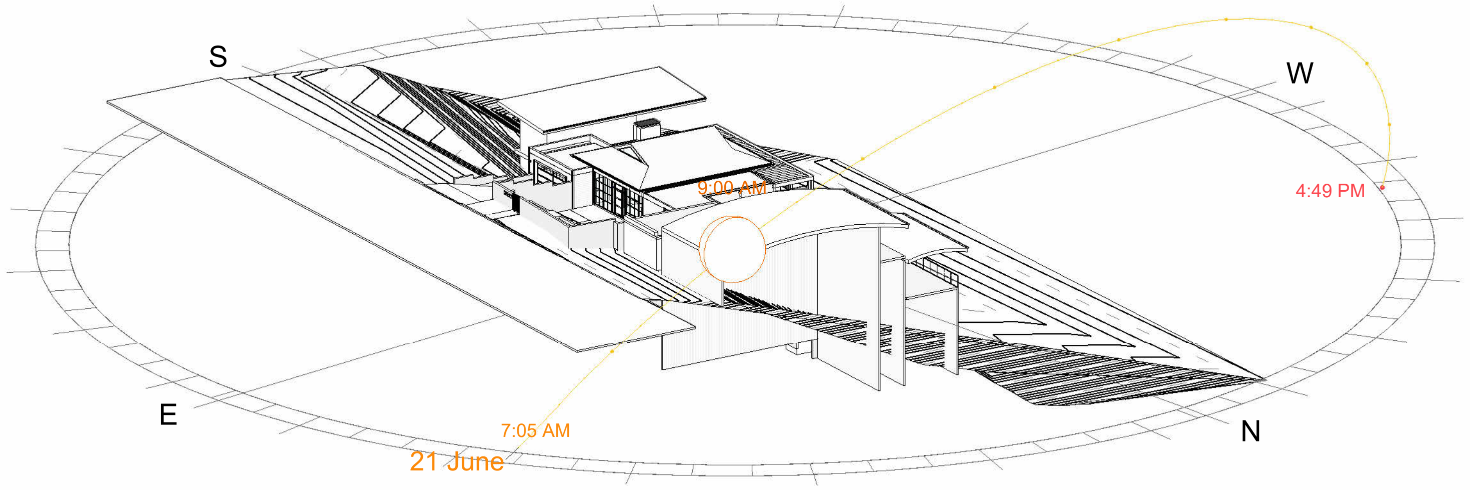
Address
30 ABERNETHY STREET
SEAFORTH

Drawing Title
AREA CALCULATIONS PLAN

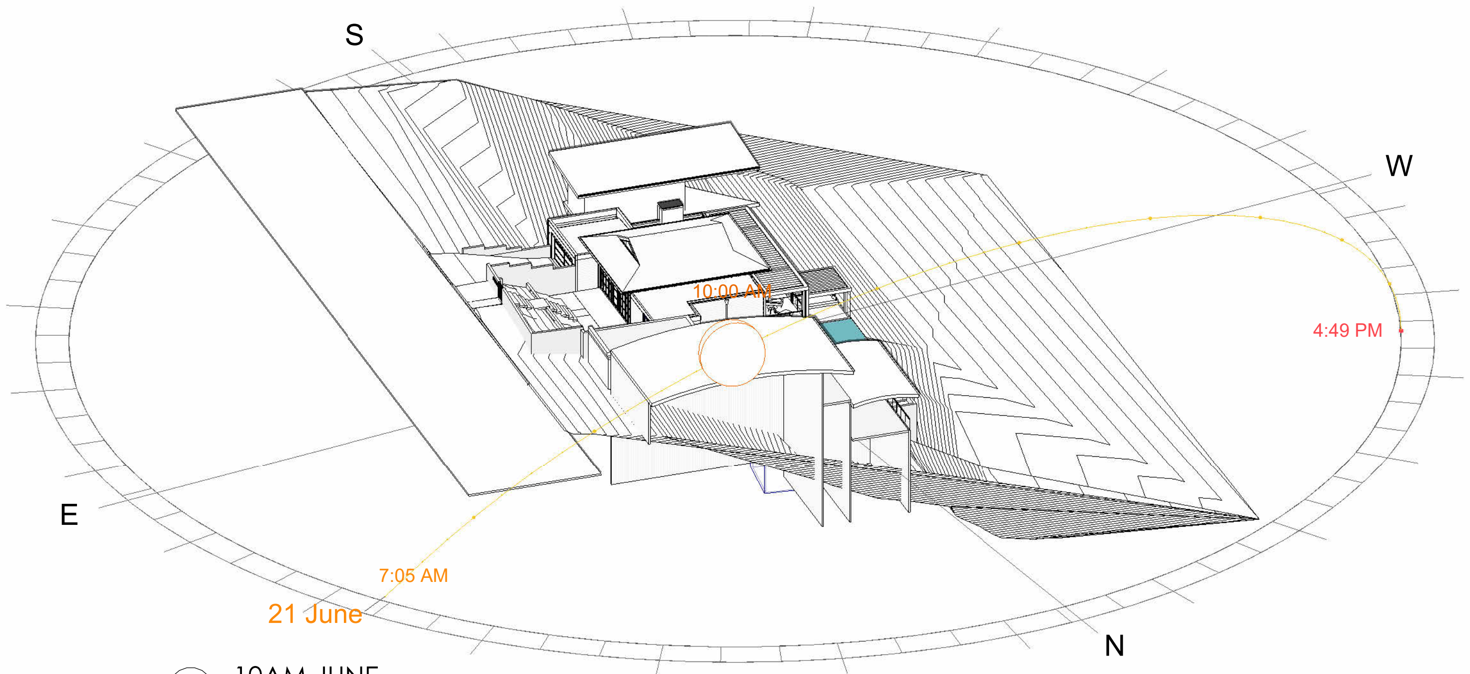
DEVELOPED DESIGN

Scale As indicated @A3
Date: 04.02.22

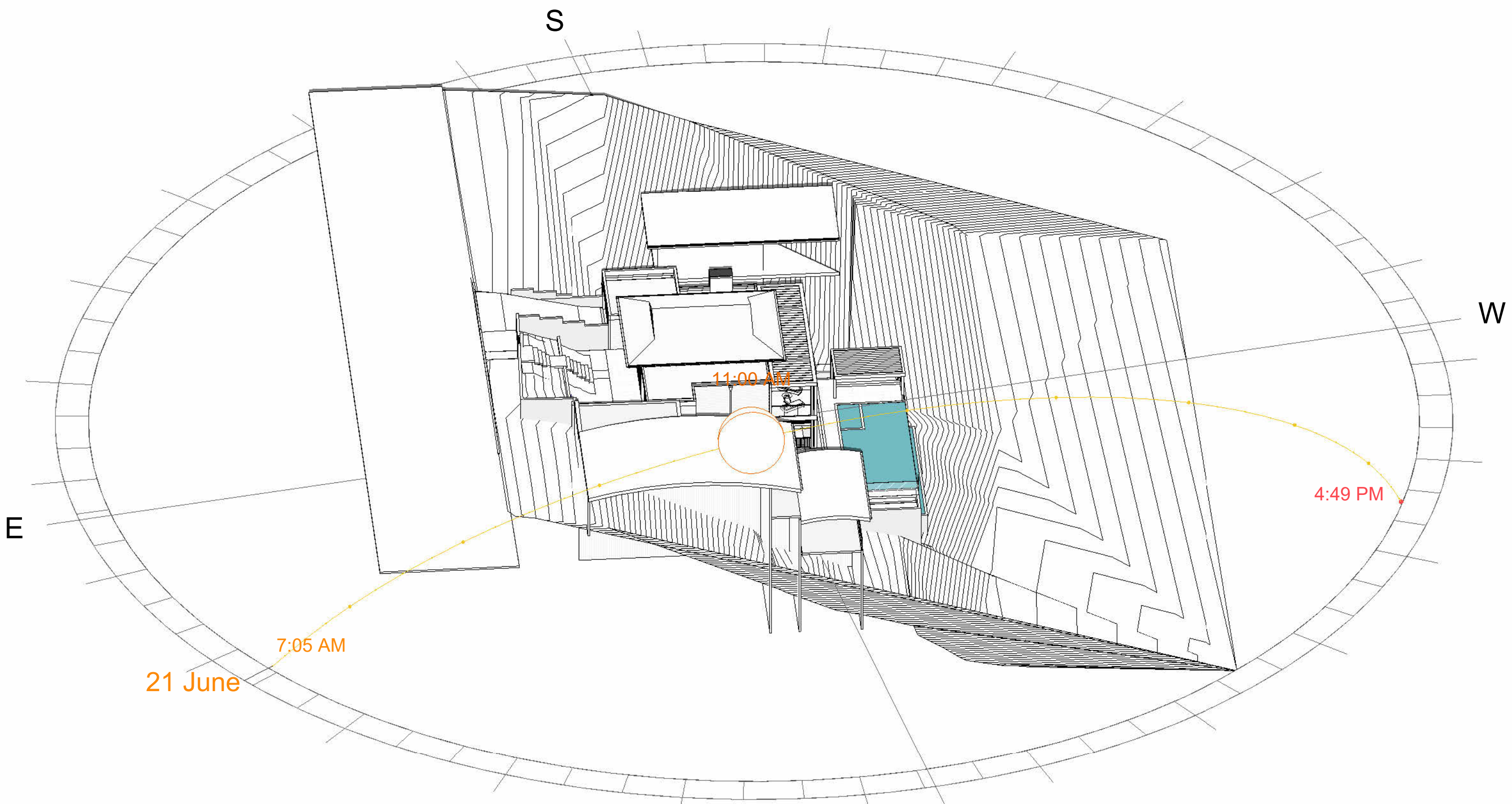
Project no. 2011
Drawing Phase. SK
Drawing No. A401
Rev 1



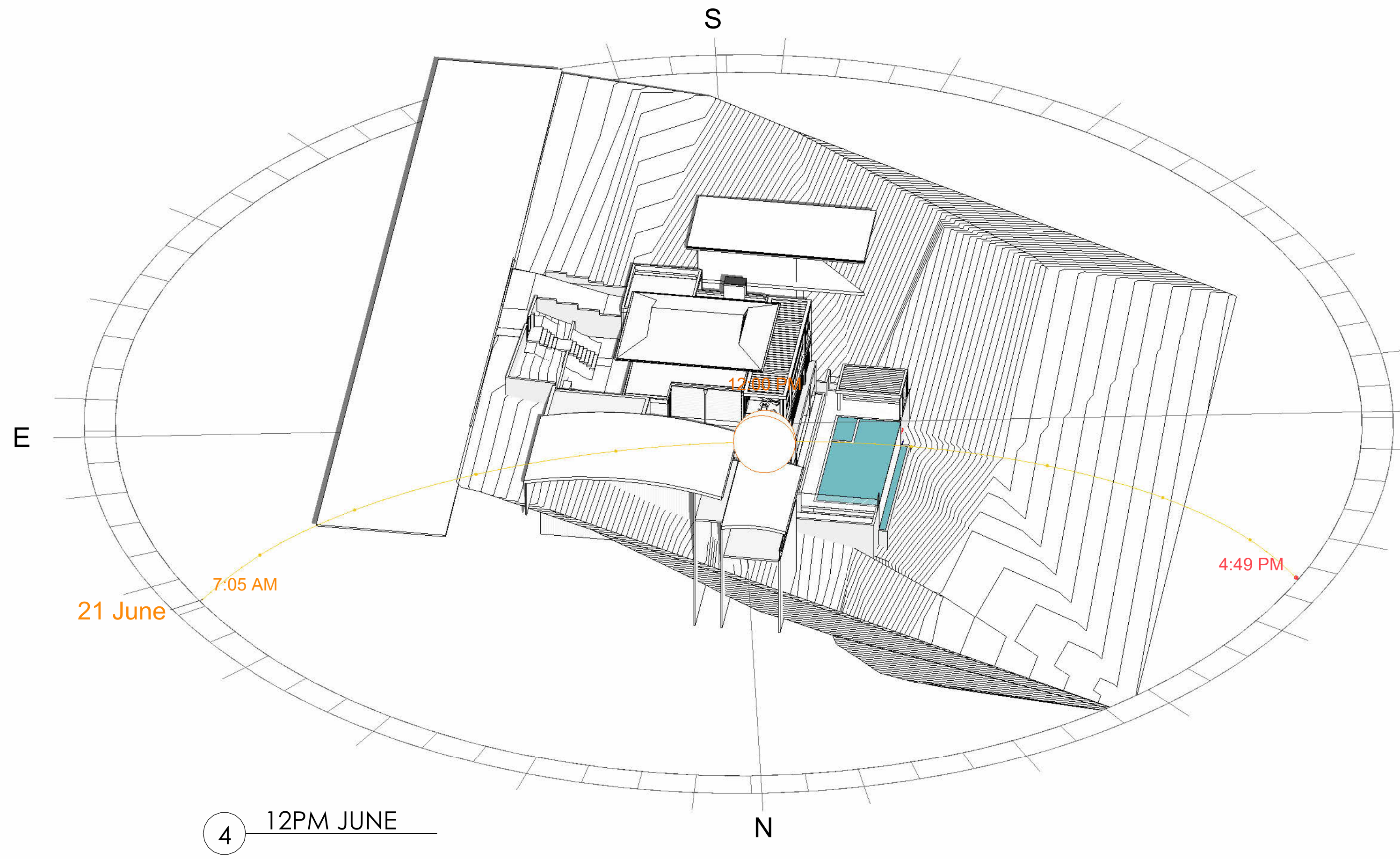
1 9AM JUNE



2 10AM JUNE



3 11AM JUNE



4 12PM JUNE

FOR REVIEW

Notes

1) Do not scale from drawing, use marked dimensions and levels. To be read in conjunction with all consultants' documentation.
Luxitecture. is to be immediately notified of any discrepancies.
2) Contractor to verify all dimensions, coordinate services and components prior to commencement of site work or off-site fabrication and installation.
3) All construction must be built to minimum requirement set outs by the Building Code of Australia and relevant Australian Standards.
Luxitecture. is to be notified immediately of any discrepancies to the above, and confirmation sought.
4) Copyright on this drawing and design retained by Luxitecture.

Issue	Description	Date
1	DEVELOPED DESIGN	04.02.22

www.luxitecture.com.au
anthony@luxitecture.com.au

LUXITECTURE

True North

Drawn: JF | Checked: AM

Project
2129 SEAFORTH

Client
ADAM MCDOUGALL

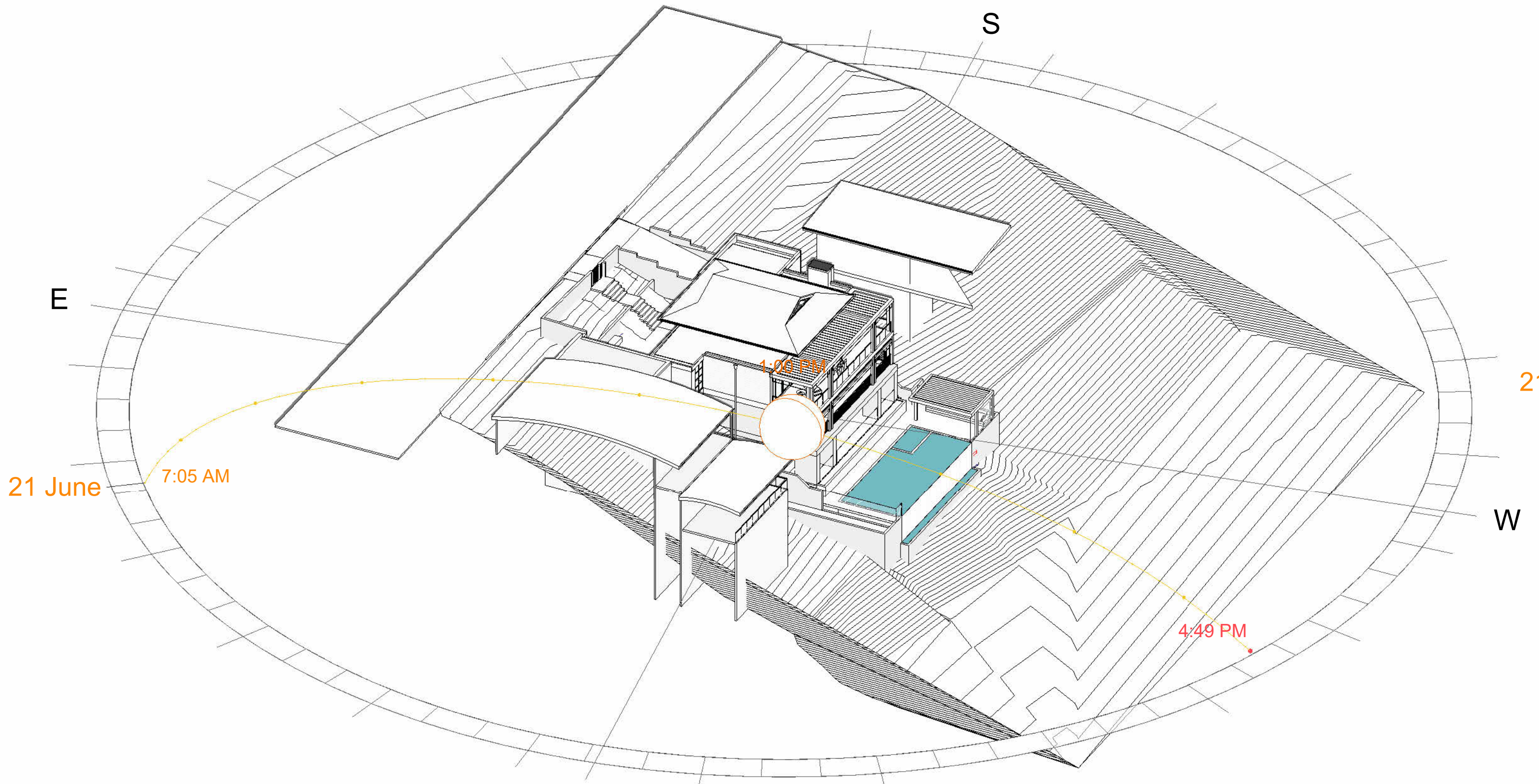
Address
30 ABERNETHY STREET SEAFORTH

Drawing Title
SOLAR STUDY

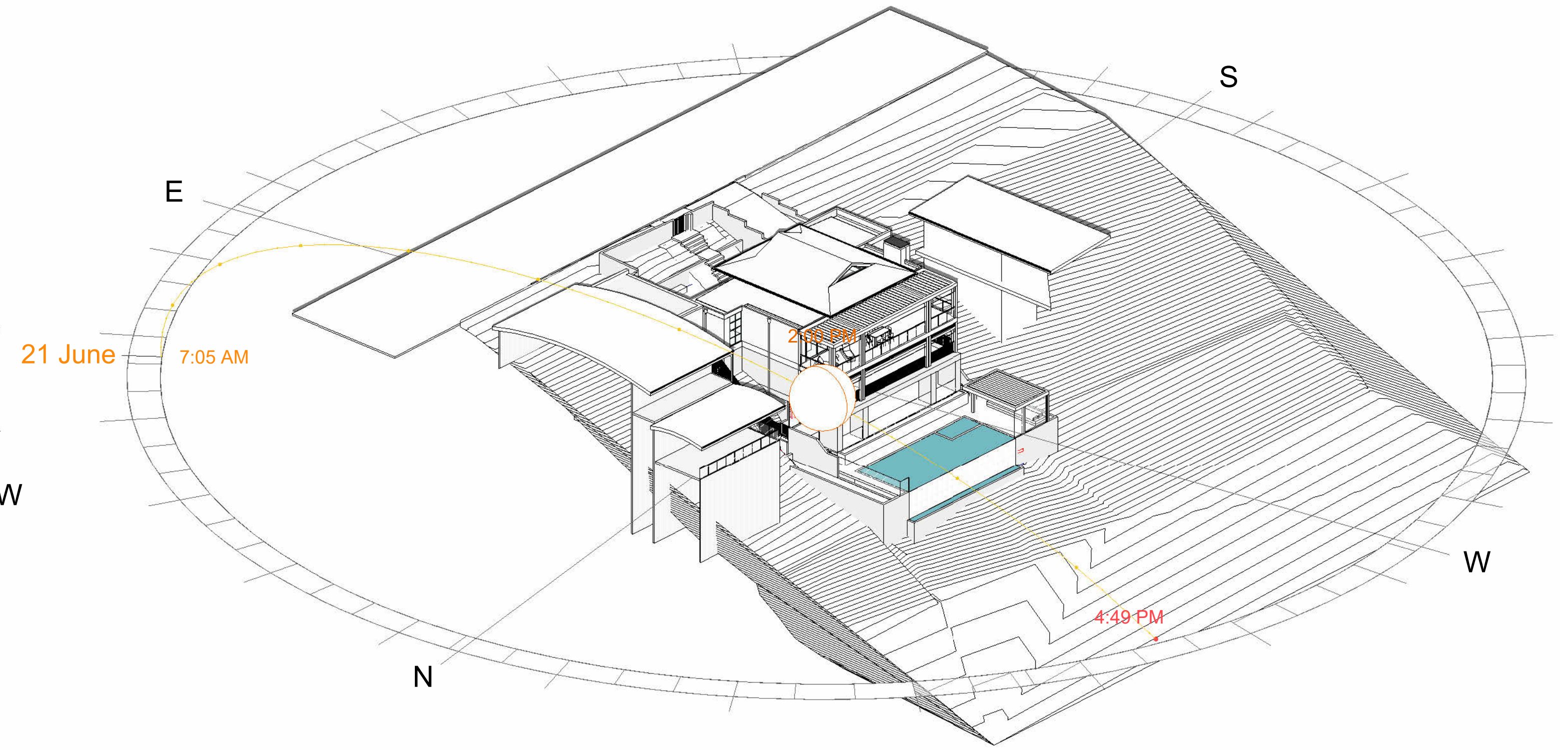
DEVELOPED DESIGN

Scale @A3 | Date: 04.02.22

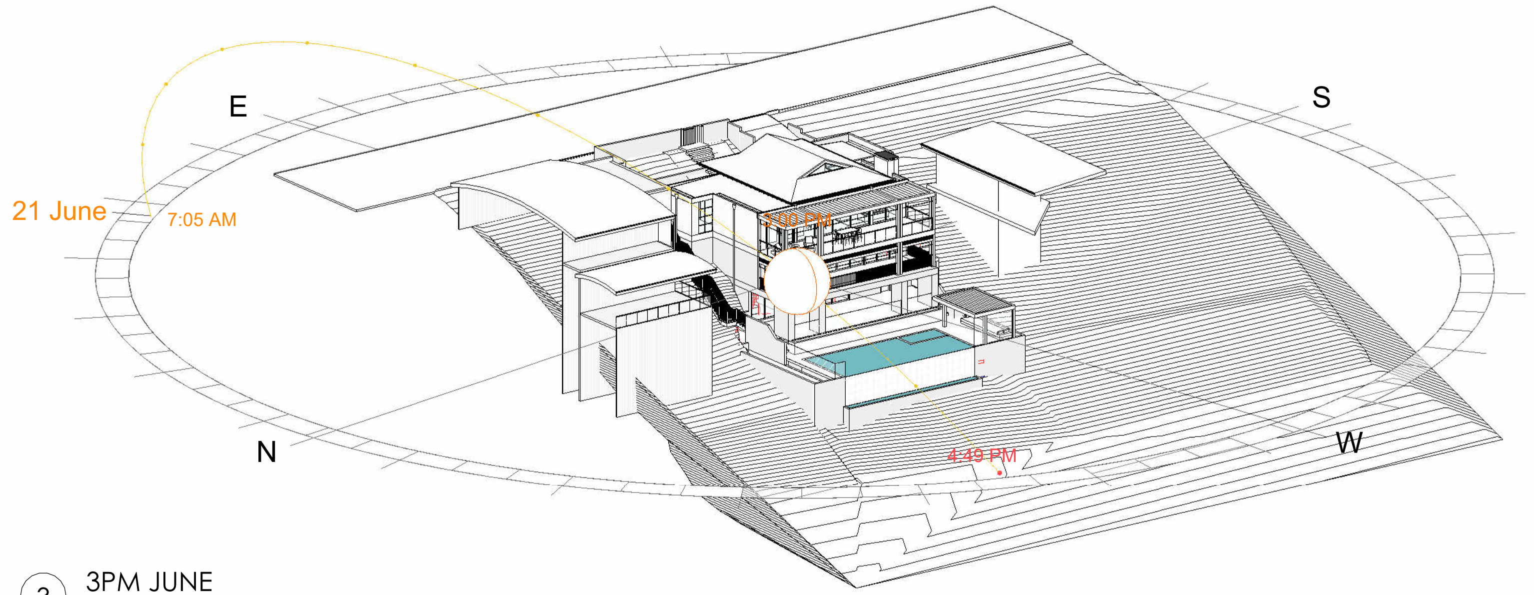
Project no.	Drawing Phase.	Drawing No.	Rev
2011	SK	A403	1



1 1PM JUNE



2 2PM JUNE



3 3PM JUNE

FOR REVIEW

Notes

1) Do not scale from drawing, use marked dimensions and levels. To be read in conjunction with all consultants' documentation. Luxitecture. is to be immediately notified of any discrepancies.
2) Contractor to verify all dimensions, coordinate services and components prior to commencement of site work or off-site fabrication and installation.
3) All construction must be built to minimum requirement set outs by the Building Code of Australia and relevant Australian Standards. Luxitecture. is to be notified immediately of any discrepancies to the above, and confirmation sought.
4) Copyright on this drawing and design retained by Luxitecture.

Issue	Description	Date
1	DEVELOPED DESIGN	04.02.22

www.luxitecture.com.au
anthony@luxitecture.com.au

LUXITECTURE

True North

Drawn: JF
Checked: AM

Project
2129
SEAFORTH

Client
ADAM MCDOUGALL

Address
30 ABERNETHY STREET
SEAFORTH

Drawing Title
SOLAR STUDY

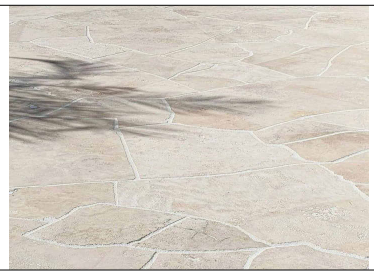
DEVELOPED DESIGN

Scale @A3
Date: 04.02.22

Project no.	Drawing Phase.	Drawing No.	Rev
2011	SK	A404	1

01. FREE FORM NATURAL STONE
WAMBERAL ECO OUTDOOR OR SIMILAR

02. SCYON LINEA WEATHERBOARD
CLADDING - MAGIC WHITE OR SIMILAR



03. DRIVEWAY
CRAZY PAVING

04. ALUMINIUM FRAMED WINDOWS WITH
BLACK POWDERCOAT FINISH OR SIMILAR

05. GARAGE DOOR
WHITE PANEL LIFT DOOR

06. BALUSTRADE
WHITE WROUGHT IRON

07. GLASS BALUSTRADE, WINDOWS & DOORS
NOTE: WINDOWS AND DOORS ALSO SUBJECT TO BASIX REQUIREMENTS

08. SELECTED PAINT FINISH WATTYL
MAGIC WHITE OR SIMILAR

09. EXTERNAL TILES
TRAVERTINE SCALA OR SIMILAR

10. ROOF TILES
SLATE SHINGLES OR SIMILAR

FOR REVIEW

Notes

1) Do not scale from drawing, use marked dimensions and levels. To be read in conjunction with all consultants' documentation.
Luxitecture. is to be immediately notified of any discrepancies.
2) Contractor to verify all dimensions, coordinate services and components prior to commencement of site work or off-site fabrication and installation.
3) All construction must be built to minimum requirement set outs by the Building Code of Australia and relevant Australian Standards.
Luxitecture. is to be notified immediately of any discrepancies to the above, and confirmation sought.
4) Copyright on this drawing and design retained by Luxitecture.

Issue	Description	Date
1	DEVELOPED DESIGN	04.02.22

www.luxitecture.com.au
anthony@luxitecture.com.au

LUXITECTURE

True North

Drawn: JF
Checked: AM

Project
2129 SEAFORTH

Client
ADAM MCDOUGALL

Address
30 ABERNETHY STREET SEAFORTH

Drawing Title
MATERIAL FINISHES SCHEDULE

DEVELOPED DESIGN

Scale @A3
Date: 04.02.22

Project no.	Drawing Phase.	Drawing No.	Rev
2011	SK	A501	1

APPENDIX B

BOREHOLE LOG (2 SHEETS)

Borehole Log Report

Geo Environmental Engineering Pty Ltd
82 Bridge Street
Lane Cove NSW 2066
T 02 9420 3361

Hole ID.	**BH1**
Hole Depth:	**0.40 m**
Sheet:	**1 of 1**

Project Name:	**Geotechnical**	Project Number:	**G22061SEA**
Location / Site:	**30 Abernethey Street, Seaforth NSW**	Client:	**Adam McDougall**

Drilling Company:	**Geo Environmental Engineering**	Date Started:	**15-JUN-22**	Ground Level:	**RL43.00m** (approx)
Drill Method:	**Hand Auger**	Date Completed:	**15-JUN-22**	Latitude:	**----------**
Equipment:	**Manual**			Longitude:	**----------**

Method	Water Level	Depth (m)	RL (m)	Graphic Log	USCS Symbol	Material Type	Material Description	Consistency / Density	Moisture	Observations / Comments
85mm Hand Auger					SP-SM	Fill	**TOPSOIL / FILL: Silty SAND**- brown, fine to coarse grained, fine to coarse Gravel (sandstone), roots.	very loose to loose	m	
85mm Hand Auger	0.4m Slight seepage 15-Jun-22				SP	Fill	**SAND trace Silt**- brown, fine to coarse grained, fine to coarse Gravel, trace cobbles (sandstone), roots.	loose	m to w	
		1.0	42.0				**Refusal at 0.40m** weathered sandstone bedrock			

Moisture		Additional Comments
D	Dry	
Dp	Damp	
SM	Slightly Moist	
M	Moist	
VM	Very Moist	
W	Wet	
Sd	Saturated	

Logged By:	**M.Kilham**	Date:	**15-Jun-22**	Checked By:	**Stephen McCormack**	Date:	**15-AUG-22**

Geo Environmental Engineering
82 Bridge Street
Lane Cove NSW 2066
E info@geoenvironmental.com.au

Log Report Legend

MATERIAL SYMBOL

FILL	CONCRETE	ASPHALT	TOPSOIL
ORGANICS	ESTUARINE MUD		

CLAY	SAND	SILT	GRAVEL
Sandy CLAY	Clayey SAND	Clayey SILT	Clayey GRAVEL
Silty CLAY	Silty SAND	Sandy SILT	Sandy GRAVEL
Gravelly CLAY	Gravelly SAND	Gravelly SILT	Silty GRAVEL
CLAY & SAND	SAND & CLAY	SILT & CLAY	GRAVEL & CLAY
CLAY & SILT	SAND & SILT	SILT & SAND	GRAVEL & SAND
CLAY & GRAVEL	SAND & GRAVEL	SILT & GRAVEL	GRAVEL & SILT
Sandy Silty CLAY	Clayey Silty SAND	Sandy Clayey SILT	Sandy Clayey GRAVEL
Silty Sandy CLAY	Silty Clayey SAND	Clayey Sandy SILT	Clayey Sandy GRAVEL
Sandy Gravelly CLAY	Clayey Gravelly SAND	Sandy Gravelly SILT	Silty Clayey GRAVEL
Silty Gravelly CLAY	Silty Gravelly SAND	Clayey Gravelly SILT	Clayey Silty GRAVEL
Gravelly Silty CLAY	Gravelly Silty SAND	Gravelly Clayey SILT	Sandy Silty GRAVEL
Gravelly Sandy CLAY	Gravelly Clayey SAND	Gravelly Sandy SILT	Silty Sandy GRAVEL

SANDSTONE	SHALE	GRANITE	BASALT	SHALE / SANDSTONE
PORCELLANITE	GNEISS	SHALE / CLAYSTONE	MUDSTONE	
CLAYSTONE	MUDSTONE / CLAYSTONE	SHALE / SILTSTONE	IRONSTONE	

WATER LEVELS

Encountered Water
Standing Water

ABBREVIATIONS

PT	Pushtube
SFA	Solid Flight Auger
PWS	Percussion Window Sampler
HA	Hand Auger
HFA	Hollow Flight Auger

WELL GRAPHICS

Cuttings	Bentonite	Screen
Gravel Pack	Grout	Cave-in

APPENDIX C

LANDSLIP RISK NOTES (6 SHEETS)

Assessment of Risk

In the absence of any direct or presumed evidence of recent slope instability (last several hundred years and more), the likelihood of landslide activity initiating on or adjacent to (but influencing) the site over a notional design life for the continuing existence of the present developments on these properties of 50 years, is considered 'UNLIKELY'.

The following geotechnical hazards were identified across the site and are considered to present both short and longterm risks associated with the proposed development . Hazards (1 to 5) are associated with geotechnical risks that exist on the slope with Hazards (6 to 7) associated with the short and long term stability of batters associated with the proposed excavations and new structures to be constructed into/on the natural slope.

◊ **Hazard 1:** Detach block from bedding/jointing from upper cliffline, (4*1*1.5). **Mechanism:** Failure along weathered back joint.

◊ **Hazard 2:** Detach block from developed overhang, (3*1*0.7). **Mechanism:** Failure along weathered back joint.

◊ **Hazard 3:** Detached boulder slide, (4*3*1.5). **Mechanism:** Weathering, rainfall event.

◊ **Hazard 4:** Detached boulder slide, (1.5*1*0.8). **Mechanism:** Weathering, rainfall event.

◊ **Hazard 5:** Failure drystone wall retaining fill, (2*1*1 = 2m^3). **Mechanism:** Saturation of retained fill.

◊ **Hazard 6:** Detach block on bedding/jointing, (3*0.8*0.8). **Mechanism:** Failure along weathered back joint.

◊ **Hazard 7:** Detach block on bedding/jointing from excavated batter, (4*2*1.5). **Mechanism:** Failure along weathered back joint.

Assessed Risk Level for Property Damage

A qualitative assessment for risk to property has been undertaken for the slope pre-development and post development. Qualitative measures for likelihood, consequences and the risk analysis matrix have been taken from AGS 2007c, Guidelines for Landslide Risk Management. Relevant tables utilised for the assessment include:

◊ Qualitative Measures of Likelihood

◊ Qualitative Measures of Consequences to property

◊ Qualitative Risk Analysis Matrix – Level of Risk to Property

◊ Risk Level Implications

The tables are included for reference below:

TABLE 1: Qualitative Assessment for Property Damage – Current Slope Condition

Hazard	Assessed Risk Level for Slope - Existing slope conditions		
	Likelihood (Indicative value of annual probability)	**Consequence (Indicative Range)**	**Assessed Risk Level For slope**
Hazard 1	Unlikely (1×10^{-4})	Major (60%)	**Moderate**
Hazard 2	Possible (1×10^{-3})	Medium (20%)	**Moderate**
Hazard 3	Possible (1×10^{-3})	Insignificant (0.5%)	**Very Low**
Hazard 4	Possible (1×10^{-3})	Insignificant (0.5%)	**Very Low**
Hazard 5	Possible (1×10^{-3})	Insignificant (0.5%)	**Very Low**
Hazard 6	Possible (1×10^{-3})	Medium (20%)	**Moderate**
Hazard 7a	Possible (1×10^{-3})	Major (60%)	**High**
Hazard 7b	Possible (1×10^{-3})	Major (60%)	**High**

TABLE 2 Qualitative Assessment for Property Damage – Where Engineering Controls have been implemented.

Hazard	**Assessed Risk Level for Slope – Where engineering controls have been implemented**		
	Likelihood (Indicative value of annual probability)	**Consequence (Indicative Range)**	**Assessed Risk Level For slope**
Hazard 1	Rare (1×10^{-5})	Major (60%)	**Low**
Hazard 2	Rare (1×10^{-4})	Medium (20%)	**Low**
Hazard 3	Rare (1×10^{-5})	Insignificant (0.5%)	**Very Low**
Hazard 4	Rare (1×10^{-5})	Insignificant (0.5%)	**Very Low**
Hazard 5	Rare (1×10^{-5})	Insignificant (0.5%)	**Very Low**
Hazard 6	Rare (1×10^{-5})	Medium (20%)	**Low**
Hazard 7a	Barely credible (1×10^{-6})	Major (60%)	**Very Low**
Hazard 7b	Barely credible (1×10^{-6})	Major (60%)	**Very Low**

Assessed Risk Level for Loss of Life

The assessed risk outcomes for loss of life for people accessing the area in proximity to the cut batters and people occupying the developed structures on the site, in accordance with AGS 2007c are presented in **Tables 1 to 7** below.

The assessment has been carried out based on the current slope conditions and how they would be expected to interact with the proposed development and also for the slope condition where engineering controls have been implemented during construction. The likelihoods for the assessments have been taken from **Tables 3 and 4**.

For loss of life, the individual risk can be calculated from:

R(LoL) = P(H) x P(S:H) x P(T:S) x P(NE:S) x V(D:T)

Where:

- R(LoL) is the risk (annual probability of loss of life (death) of an individual).
- P(H) is the annual probability of the landslide.
- P(S:H) is the probability of spatial impact of the landslide impacting a building (location) taking into account the travel distance and travel direction given the event.
- P(T:S) is the temporal spatial probability (e.g. of the building or location being occupied by the individual) given the spatial impact and allowing for the possibility of evacuation given there is warning of the landslide occurrence.
- P(NE:S) is the probability of not being able to evacuate.
- V(D:T) is the vulnerability of the individual (probability of loss of life of the individual given the impact).

The annual probability of loss of life for the person most at risk as a result of slope instability impacting the site in it's current condition is calculated to be 7.5 x 10^{-4}. The AGS Landslide Risk Management Concepts and Guidelines provide guidance on tolerable and acceptable risk for loss of life, for the person most at risk, indicating that a risk level of 1 x 10^{-5} is typically considered tolerable for (new constructed slope/new development or existing landslide) while 1 x 10^{-6} is typically considered acceptable.

TABLE 3 Quantitative Assessment for Loss of Life for the person most at risk for existing slope condition.

Hazard	Likelihood	Indicative Annual Probability, Note 3 $P_{(H)}$	Use of Affected Structure	Probability of Spatial Impact $P_{(S:H)}$	Occupancy	Case	Proportion of Time $P_{(T:S)}$ Refer Table 4 below	Probability of Not evacuating $P_{(NE;S)}$	Vulnerability Note 4 $V_{(D:T)}$
Hazard 1	Unlikely	1×10^{-4}	Existing Dwelling	0.20	4	(d1)	0.75	1.0	1.0
Hazard 1A	Unlikely	1×10^{-4}	Existing Dwelling	0.20	1	(b1)	0.01	1.0	1.0
Hazard 2	Possible	1×10^{-3}	Existing Dwelling	0.2	1	(b1)	0.01	1.0	1.0
Hazard 2A	Possible	1×10^{-3}	Existing Dwelling	0.3	1	(a1)	0.02	1.0	1.0
Hazard 2B	Possible	1×10^{-3}	Existing Dwelling	0.3	1	(a1)	0.02	1.0	1.0
Hazard 3	Possible	1×10^{-3}	Ex deck/pool	0.2	1	(a1)	0.02	1.0	1.0
Hazard 4	Possible	1×10^{-3}	Ex deck	0.1	1	(a1)	0.02	1.0	1.0
Hazard 5	Possible	1×10^{-3}	Ex deck	0.10	1	(a1)	0.02	1.0	1.0
Hazard 6	Possible	1×10^{-3}	New Pool	0.20	1	(a1)	0.02	1.0	1.0

Hazard 7	Likely	1 x 10^{-2}	Open excavation	0.25	1	(c1)	0.17	1.0	1.0
Hazard 7A	Possible	1 x 10^{-3}	New dwelling	0.25	1	(d1)	0.75	1.0	1.0
Hazard 7B	Possible	1 x 10^{-3}	New dwelling	0.25	1	(d1)	0.75	1.0	1.0

TABLE 4 Quantitative Assessment for Loss of Life for the person most at risk for existing slope condition where engineering controls have been implemented.

Hazard	Likelihood	Indicative Annual Probability, Note 3 $P_{(H)}$	Use of Affected Structure	Probability of Spatial Impact $P_{(S:H)}$	Occupancy	Case	Proportion of Time $P_{(T:S)}$ Refer Table 4 below	Probability of Not evacuating $P_{(NE;S)}$	Vulnerability Note 4 $V_{(D:T)}$
Hazard 1	Rare	1 x 10^{-6}	Existing Dwelling	0.20	4	(d1)	0.75	0.1	0.1
Hazard 1A	Rare	1 x 10^{-6}	Existing Dwelling	0.20	1	(b1)	0.01	0.1	0.1
Hazard 2	Rare	1 x 10^{-5}	Existing Dwelling	0.2	1	(b1)	0.01	0.1	0.1
Hazard 2A	Rare	1 x 10^{-5}	Existing Dwelling	0.3	1	(a1)	0.02	0.1	0.1
Hazard 2B	Rare	1 x 10^{-5}	Existing Dwelling	0.3	1	(a1)	0.02	0.1	0.1

Hazard 3	Rare	1×10^{-5}	Ex deck/pool	0.2	1	(a1)	0.02	0.1	0.1
Hazard 4	Rare	1×10^{-5}	Ex deck	0.1	1	(a1)	0.02	0.1	0.1
Hazard 5	Rare	1×10^{-5}	Ex deck	0.10	1	(a1)	0.02	0.1	0.1
Hazard 6	Rare	1×10^{-5}	New Pool	0.20	1	(a1)	0.02	1.0	1.0
Hazard 7	Rare	1×10^{-5}	Open excavation	0.25	1	(c1)	0.17	1.0	1.0
Hazard 7A	Barely Credible	1×10^{-6}	New dwelling	0.25	1	(d1)	0.75	1.0	1.0
Hazard 7B	Barely Credible	1×10^{-6}	New dwelling	0.25	1	(d1)	0.75	1.0	1.0

TABLE 5: Occupancy

Location	Case	Proportion of time	Comments
Persons in open area Decking/verandah	(a1)	0.02	Assume 0.5hr/day person in affected area of site, 7 days week
Pathway beneath house	(b1)	0.01	Assume 15 minutes / day person in affected area of site, 7 days a week
Persons in excavation	(c1)	0.17	Assume 4hr day person in affected part of excavation, 7 days a week
Persons in dwelling	(d1)	0.75	Assume 18hr day person in affected part of dwelling, 7 days a week

TABLE 6 Risk Outcomes (Note5). Where engineering controls have not been applied

Hazard	Person Most at Risk $R_{(DI)}$	Total Risk $R_{(T)}$	Sum of Total Risks	Average of Persons Most at Risk $R_{(AV)}$	Risk Evaluation (note 6)
Hazard 1	1.50E-05	6.00E-05	6.00E-05	1.50E-05	**tolerable**
Hazard 1A	2.00E-07	2.00E-07	2.00E-07	2.00E-07	**acceptable**
Hazard 2	2.00E-06	2.00E-06	2.00E-06	2.00E-06	**acceptable**
Hazard 2A	4.00E-06	4.00E-06	4.00E-06	4.00E-06	**acceptable**
Hazard 2B	4.00E-06	4.00E-06	4.00E-06	4.00E-06	**acceptable**
Hazard 3	4.00E-06	4.00E-06	4.00E-06	4.00E-06	**acceptable**
Hazard 4	2.00E-06	2.00E-06	2.00E-06	2.00E-06	**acceptable**
Hazard 5	2.00E-06	2.00E-06	2.00E-06	2.00E-06	**acceptable**
Hazard 6	4.00E-06	4.00E-06	4.00E-06	4.00E-06	**tolerable**
Hazard 7	4.25E-04	4.25E-04	4.25E-04	4.25E-04	**unacceptable**
Hazard 7A	1.88E-04	7.50E-04	7.50E-04	1.88E-04	**unacceptable**
Hazard 7B	1.88E-04	7.50E-04	7.50E-04	1.88E-04	**unacceptable**

TABLE 7 Risk Outcomes (Note5). Where engineering controls have been applied

Hazard	Person Most at Risk $R_{(DI)}$	Total Risk $R_{(T)}$	Sum of Total Risks	Average of Persons Most at Risk $R_{(AV)}$	Risk Evaluation (note 6)
Hazard 1	1.50E-08	6.00E-08	6.00E-08	1.50E-08	**acceptable**
Hazard 1A	1.50E-08	1.50E-08	1.50E-08	1.50E-08	**acceptable**
Hazard 2	2.00E-10	2.00E-10	2.00E-10	2.00E-10	**acceptable**
Hazard 2A	4.00E-10	4.00E-10	4.00E-10	4.00E-10	**acceptable**
Hazard 2B	4.00E-10	4.00E-10	4.00E-10	4.00E-10	**acceptable**
Hazard 3	4.00E-10	4.00E-10	4.00E-10	4.00E-10	**acceptable**
Hazard 4	2.00E-10	2.00E-10	2.00E-10	2.00E-10	**acceptable**
Hazard 5	2.00E-10	2.00E-10	2.00E-10	2.00E-10	**acceptable**
Hazard 6	4.00E-08	4.00E-08	4.00E-08	4.00E-08	**acceptable**
Hazard 7	4.25E-07	4.25E-07	4.25E-07	4.25E-07	**acceptable**
Hazard 7A	1.88E-07	7.50E-07	7.50E-07	1.88E-07	**acceptable**
Hazard 7B	1.88E-07	7.50E-07	7.50E-07	1.88E-07	**acceptable**

Notes:

1. The risk assessment addresses potential for fatality from possible landslide events considered relevant to the subject site. The risk assessment is based on a data provided from a geotechnical investigation and a visual appraisal of the site by the author, as discussed in the attached report. Further assessment or more detailed quantification of the assessed risks to life would require additional data and/or further investigation.
2. Refer to Section 5.3.2 for description of hazards. Refer to report for illustration of possible slope failure mechanisms.
3. P(H) based on values in table "Qualitative Measures of Likelihood" in Appendix C of AGS 2007.
4. Vulnerability factors derived from AGS 2007, Appendix F.
5. R(DI) = P(H) x P(S:H) x P(T:S) x P(NE:S) x V(D:T); R(T) = R(DI) x N; R(AV) = ΣR(T)/ΣN
6.Suggested Tolerable loss of life individual risk, from AGS2007-c, Table 1 with accompanying Notes.

Situation	Not Tolerable	Suggested Tolerable Loss of Life Risk for person most at risk
Existing Slope (1) / Existing Development (2):	Treatment options to be assessed and implemented	10^{-4} / annum
New Constructed Slope (3) / New Development (4) /Existing Landslide (5)	Treatment options to be assessed and implemented	10^{-5} / annum

Notes:
1. "Existing Slopes" in this context are slopes that are not part of a recognizable landslide and have demonstrated nonfailure performance over at least several seasons or events of extended adverse weather, usually being a period of at least 10 to 20 years.

2. "Existing Development" includes existing structures, and slopes that have been modified by cut and fill, that are not located on or part of a recognizable landslide and have demonstrated non-failure performance over at least several seasons or events of extended adverse weather, usually being a period of at least 10 to 20 years.

3. "New Constructed Slope" includes any change to existing slopes by cut or fill or changes to existing slopes by new stabilisation works (including replacement of existing retaining walls or replacement of existing stabilization measures, such as rock bolts or catch fences).

4. “New Development” includes any new structure or change to an existing slope or structure. Where changes to an existing structure or slope result in any cut or fill of less than 1.0m vertical height from the toe to the crest and this change does not increase the risk, then the Existing Slope / Existing Structure criterion may be adopted. Where changes to an existing structure do not increase the building footprint or do not result in an overall change in footing loads, then the Existing Development criterion may be adopted.

5. “Existing Landslides” have been considered likely to require remedial works and hence would become a New Constructed Slope and require the lower risk. Even where remedial works are not required per se, it would be reasonable expectation of the public for a known landslide to be assessed to the lower risk category as a matter of “public safety”.

6. Acceptable risks are usually considered to be one order of magnitude lower than the Tolerable Risks.
It is important to distinguish between “acceptable risks” and “tolerable risks”.
Tolerable Risks are risks within a range that society can live with so as to secure certain benefits. It is a range of risk regarded as non-negligible and needing to be kept under review and reduced further if practicable.
Acceptable Risks are risks which everyone affected is prepared to accept. Action to further reduce such risk is usually not required unless reasonably practicable measures are available at low cost in terms of money, time and effort.
AGS suggests that for most development in existing urban area criteria based on Tolerable Risks levels are applicable because of the trade-off between the risks, the benefits of development and the cost of risk mitigation.

7.Refer to report and attachments for definition and explanation of terms used in the risk assessment.

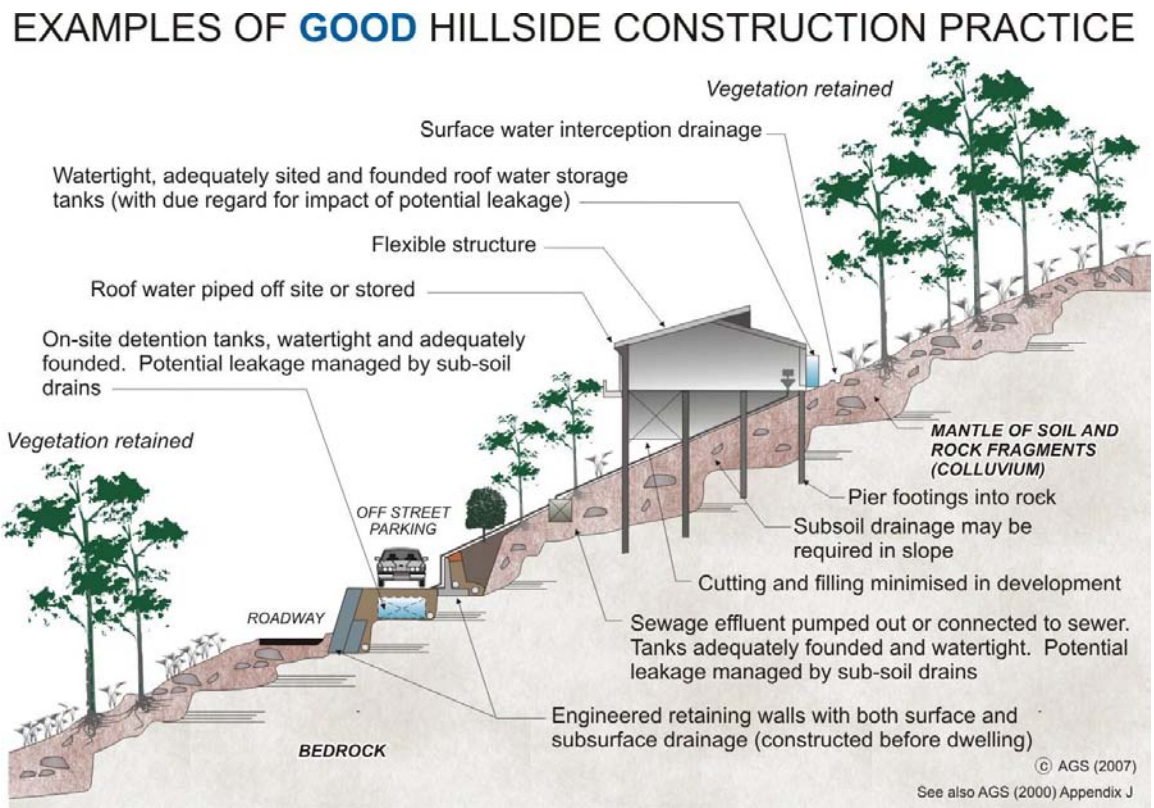
APPENDIX D

LRM2007 AUSTRALIAN GEOGUIDE LR8 (CONSTRUCTION PRACTICE – 2 SHEETS)

AUSTRALIAN GEOGUIDE LR8 (CONSTRUCTION PRACTICE)

HILLSIDE CONSTRUCTION PRACTICE

Sensible development practices are required when building on hillsides, particularly if the hillside has more than a low risk of instability (GeoGuide LR7). Only building techniques intended to maintain, or reduce, the overall level of landslide risk should be considered. Examples of good hillside construction practice are illustrated below.



WHY ARE THESE PRACTICES GOOD?

Roadways and parking areas - are paved and incorporate kerbs which prevent water discharging straight into the hillside (GeoGuide LR5).

Cuttings - are supported by retaining walls (GeoGuide LR6).

Retaining walls - are engineer designed to withstand the lateral earth pressures and surcharges expected, and include drains to prevent water pressures developing in the backfill. Where the ground slopes steeply down towards the high side of a retaining wall, the disturbing force (see GeoGuide LR6) can be two or more times that in level ground. Retaining walls must be designed taking these forces into account.

Sewage - whether treated or not is either taken away in pipes or contained in properly founded tanks so it cannot soak into the ground.

Surface water - from roofs and other hard surfaces is piped away to a suitable discharge point rather than being allowed to infiltrate into the ground. Preferably, the discharge point will be in a natural creek where ground water exits, rather than enters, the ground. Shallow, lined, drains on the surface can fulfil the same purpose (GeoGuide LR5).

Surface loads - are minimised. No fill embankments have been built. The house is a lightweight structure. Foundation loads have been taken down below the level at which a landslide is likely to occur and, preferably, to rock. This sort of construction is probably not applicable to soil slopes (GeoGuide LR3). If you are uncertain whether your site has rock near the surface, or is essentially a soil slope, you should engage a geotechnical practitioner to find out.

Flexible structures - have been used because they can tolerate a certain amount of movement with minimal signs of distress and maintain their functionality.

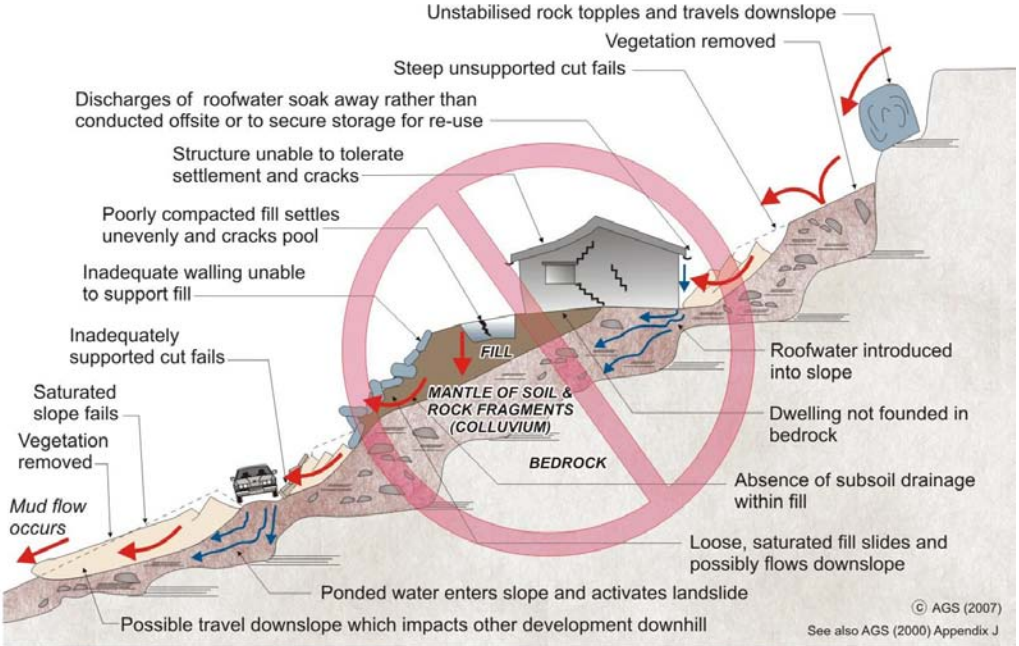
Vegetation clearance - on soil slopes has been kept to a reasonable minimum. Trees, and to a lesser extent smaller vegetation, take large quantities of water out of the ground every day. This lowers the ground water table, which in turn helps to maintain the stability of the slope. Large scale clearing can result in a rise in water table with a consequent increase in the likelihood of a landslide (GeoGuide LR5). An exception may have to be made to this rule on steep rock slopes where trees have little effect on the water table, but their roots pose a landslide hazard by dislodging boulders.

Possible effects of ignoring good construction practices are illustrated on page 2. Unfortunately, these poor construction practices are not as unusual as you might think and are often chosen because, on the face of it, they will save the developer, or owner, money. You should not lose sight of the fact that the cost and anguish associated with any one of the disasters illustrated, is likely to more than wipe out any apparent savings at the outset.

ADOPT GOOD PRACTICE ON HILLSIDE SITES

AUSTRALIAN GEOGUIDE LR8 (CONSTRUCTION PRACTICE)

EXAMPLES OF POOR HILLSIDE CONSTRUCTION PRACTICE



WHY ARE THESE PRACTICES POOR?

Roadways and parking areas - are unsurfaced and lack proper table drains (gutters) causing surface water to pond and soak into the ground.

Cut and fill - has been used to balance earthworks quantities and level the site leaving unstable cut faces and added large surface loads to the ground. Failure to compact the fill properly has led to settlement, which will probably continue for several years after completion. The house and pool have been built on the fill and have settled with it and cracked. Leakage from the cracked pool and the applied surface loads from the fill have combined to cause landslides.

Retaining walls - have been avoided, to minimise cost, and hand placed rock walls used instead. Without applying engineering design principles, the walls have failed to provide the required support to the ground and have failed, creating a very dangerous situation.

A heavy, rigid, house - has been built on shallow, conventional, footings. Not only has the brickwork cracked because of the resulting ground movements, but it has also become involved in a man-made landslide.

Soak-away drainage - has been used for sewage and surface water run-off from roofs and pavements. This water soaks into the ground and raises the water table (GeoGuide LR5). Subsoil drains that run along the contours should be avoided for the same reason. If felt necessary, subsoil drains should run steeply downhill in a chevron, or herring bone, pattern. This may conflict with the requirements for effluent and surface water disposal (GeoGuide LR9) and if so, you will need to seek professional advice.

Rock debris - from landslides higher up on the slope seems likely to pass through the site. Such locations are often referred to by geotechnical practitioners as "debris flow paths". Rock is normally even denser than ordinary fill, so even quite modest boulders are likely to weigh many tonnes and do a lot of damage once they start to roll. Boulders have been known to travel hundreds of metres downhill leaving behind a trail of destruction.

Vegetation - has been completely cleared, leading to a possible rise in the water table and increased landslide risk (GeoGuide LR5).

DON'T CUT CORNERS ON HILLSIDE SITES - OBTAIN ADVICE FROM A GEOTECHNICAL PRACTITIONER

More information relevant to your particular situation may be found in other Australian GeoGuides:

- GeoGuide LR1 - Introduction
- GeoGuide LR2 - Landslides
- GeoGuide LR3 - Landslides in Soil
- GeoGuide LR4 - Landslides in Rock
- GeoGuide LR5 - Water & Drainage
- GeoGuide LR6 - Retaining Walls
- GeoGuide LR7 - Landslide Risk
- GeoGuide LR9 - Effluent & Surface Water Disposal
- GeoGuide LR10 - Coastal Landslides
- GeoGuide LR11 - Record Keeping

The Australian GeoGuides (LR series) are a set of publications intended for property owners; local councils; planning authorities; developers; insurers; lawyers and, in fact, anyone who lives with, or has an interest in, a natural or engineered slope, a cutting, or an excavation. They are intended to help you understand why slopes and retaining structures can be a hazard and what can be done with appropriate professional advice and local council approval (if required) to remove, reduce, or minimise the risk they represent. The GeoGuides have been prepared by the Australian Geomechanics Society, a specialist technical society within Engineers Australia, the national peak body for all engineering disciplines in Australia, whose members are professional geotechnical engineers and engineering geologists with a particular interest in ground engineering. The GeoGuides have been funded under the Australian governments' National Disaster Mitigation Program.