FLOOD ADVICE
682 COLERIDGE ROAD, BATEAU BAY

3 October 2023

Prepared for:
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Prepared by:
Stantec

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Prepared by: V. Jofreh
Signature

VENUS JOFREH
Printed Name

Reviewed by: Brett C. Phillips
Signature

Dr BRETT C PHILLIPS
Printed Name

Approved by: Brett C. Phillips
Signature

Dr BRETT C PHILLIPS
Printed Name

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1 Introduction

1.1 Background

Stantec (formerly Cardno) was commissioned by Red Bus Services Pty Ltd to provide a flood advice for the proposed re-development of 682A The Entrance Road, Bateau Bay. This Report summarises the available data and existing flood behaviour and provides advice on design considerations in order to avoid flood impacts on adjacent properties and roads. The report also provides an outline for a Flood Emergency Response Plan.

The location of the study site is shown in Figure 1. The site is currently used as a bus depot and is proposed to be rezoned to Low/Medium and Medium Density Residential.

Figure 1 682A The Entrance Road, Bateau Bay

1.2 Scope of Work

The scope of work included:

> Undertaking detailed hydrological and hydraulic modelling to estimate flooding under existing site conditions (Existing Conditions);

> Modelling and mapping of the 50% Annual Exceedance Probability (AEP), 5% AEP, 1% AEP and Probable Maximum Flood (PMF) flood extents, flood levels, depths, velocity and hazards under Existing Conditions;
> Assessing the impacts of Climate Change on the flood behaviour within the site and surrounds;
> Providing advice on design considerations in order to avoid flood impacts on adjacent properties and roads; and
> Outlining a Flood Emergency Response Plan.

2 Available Studies

2.1 2020 Coastal Lagoon Catchments Overland Flood Study

The final report of the Coastal Lagoon Catchments Overland Flood Study was released on 5 November 2020[1].

As described by MHL, 2020, in part:

> *The Coastal Lagoons Catchments Overland Flood Study has been completed to provide a detailed flooding assessment of Avoca Lagoon, Cockrone Lagoon, Terrigal Lagoon and Wamberal Lagoon. The objective of this study is to improve understanding of flood behaviour and impacts, and better inform management of flood risk in the study area. The study also provides a sound technical basis for any further flood risk management investigation in the area. The previous studies while providing relevant information that relates to the lagoon levels do not provide hazard information in the upper catchments. The lagoons levels are largely dependent upon the berm beach levels and are a key consideration in this project. …..*
>
> *The flood maps appended to this report are presenting the flood levels, depths and velocities for the critical duration and rainfall pattern of a full set of events including the 50%, 20%, 10%, 5%, 2%, 1%, 1 in 200, 1 in 500 AEP and PMF events and represent an envelope of the critical duration/pattern of a selected representative upstream catchment and the critical duration/pattern at the lagoon. The upper catchments are very flashy with very short critical durations of less than 2h to reach the peak level while the downstream catchments (lagoons), have typical critical durations ranging between 2h and 9h. …..*
>
> *Sensitivity analysis highlighted the following points:*
>
> - *The lower catchments of the four lagoons are highly sensitive to the berm level at the time of the flood and maintaining the berm at a set level would minimise the risk of the lagoon reaching very high levels should mechanical opening of the berm not be possible during a storm.*
> - *Tailwater conditions (including sea level rise) typically have minimal impact on most lagoons flooding given the managed berm elevations. Only very large increases in tailwater levels such as the 0.74m sea level rise scenario would influence the lagoon level. The exception is Terrigal Lagoon that has a relatively low managed berm level and changes in tailwater level would have significant impact on the lagoon level as elevated ocean levels would flow into the lagoon. This identifies a significant potential issue with flooding becoming more common in Terrigal with rising sea level.*
> - *Increase in rainfall intensity due to climate change may exacerbate the overland flooding but would typically have a relatively low impact on the lagoon level.*

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[1] MHL (2020) “Coastal Lagoon Catchments Overland Flood Study”, Final Report, prepared for Central Coast Council, November, 133 pp + Apps

- *Changes in roughness or antecedent conditions of the catchment (wet/dry catchment leading to varying losses) could have minor to moderate impacts on the overland flooding.*
- *Blockages of structures can have severe impact in areas with no gravity flow that only relies on the drainage network (e.g. ponding area) and maintaining the pits and pipes network is essential to avoid exacerbating the flooding in such location.*
- *Intermittently Closed and Open Lakes and Lagoons (ICOLLs) entrance conditions are sensitive to ocean inundation. These processes need to be carefully considered in conjunction with this study.*

2.2 Hydrology

As described by MHL, 2020, in part:

> *The direct rainfall method was employed in this study. This method applies rainfall directly to the 2D hydraulic model cells which then determine the quantity, direction and velocity of flow on a highly local scale based on detailed surface material and topographic information. Therefore, development of a traditional hydrologic model was not required to complete the study.*
>
> *Although the direct rainfall method negates the need for hydrological models, hydrological models were still developed to:*
>
> - *Provide verification of the direct-rainfall method;*
> - *Identify critical design duration/pattern hyetographs from the ensemble of events specified by AR&R 2019; and*
> - *warning systems or flood information tools (e.g. MHLFIT).*
>
> *The hydrological model selected for this study is WBNM (version 2017). …..*
>
> *The design events modelled in this study include:*
>
> - *Frequent events - 50% AEP, 20% AEP and 10% AEP;*
> - *Rare events - 5% AEP, 2% AEP and 1% AEP;*
> - *Very rare events - 1 in 200 AEP and 1 in 500 AEP; and*
> - *Extreme event - Probable Maximum Flood (PMF).*

The adopted WBNM subcatchment layout for the Wamberal Lagoon catchment is plotted in Figure 2. The study site is located adjacent to and outside the Wamberal Lagoon catchment.

Figure 2 Wamberal Lagoon Subcatchments (after Figure 5.1, MHL, 2020)

2.3 Estimated Peak Design Flows up to 1 in 500 AEP

As described by MHL, 2020, in part:

> *The results of the WBNM model were processed using the Storm Injector software that allows a quick determination of the critical duration and critical patterns for each design storm event for both the upper and lower catchments.*
>
> *The selection of the critical duration for the lower catchment was based on the peak flow out of the lagoon rather than the peak inflow into the lagoon. This approach was adopted to consider the significant effect of the storage on attenuating flows through the lagoon. This would be equivalent to considering the peak water level into the lagoon (since the outflow of the lagoon is directly dependent on the water level).*
>
> *Each design event was modelled for 24 different duration ranging from 10 minutes to 168 hours (except for the PMF that was modelled for eight durations from 15 minutes to 6 hours). Each duration was run for 10 patterns as recommended by AR&R 2019.*

3 Flood Behaviour

While there was no hydrological or hydraulic model available for the study area, the modelling of the adjacent Wamberal Lagoon catchment reported in the 2020 Coastal Lagoon Catchments Overland Flood Study (MHL, 2020) provided guidance for the hydrological and hydraulic modelling undertaken for this study.

A 1D/2D TUFLOW floodplain model for the Study Area was assembled guided by the approach and parameters adopted for the 2020 Coastal Lagoon Catchments Overland Flood Study.

3.1 Floodplain Model

3.1.1 Model Extents

The study site has a relatively small contributing upstream sub-catchment. The TUFLOW model extent was defined by the upper ridges of the sub-catchment and was extended around 1.2 km downstream of the site to ensure the flood behaviour within the site is not influenced by the downstream boundary conditions.

Figure 3 shows the hydraulic model extents adopted for this study.

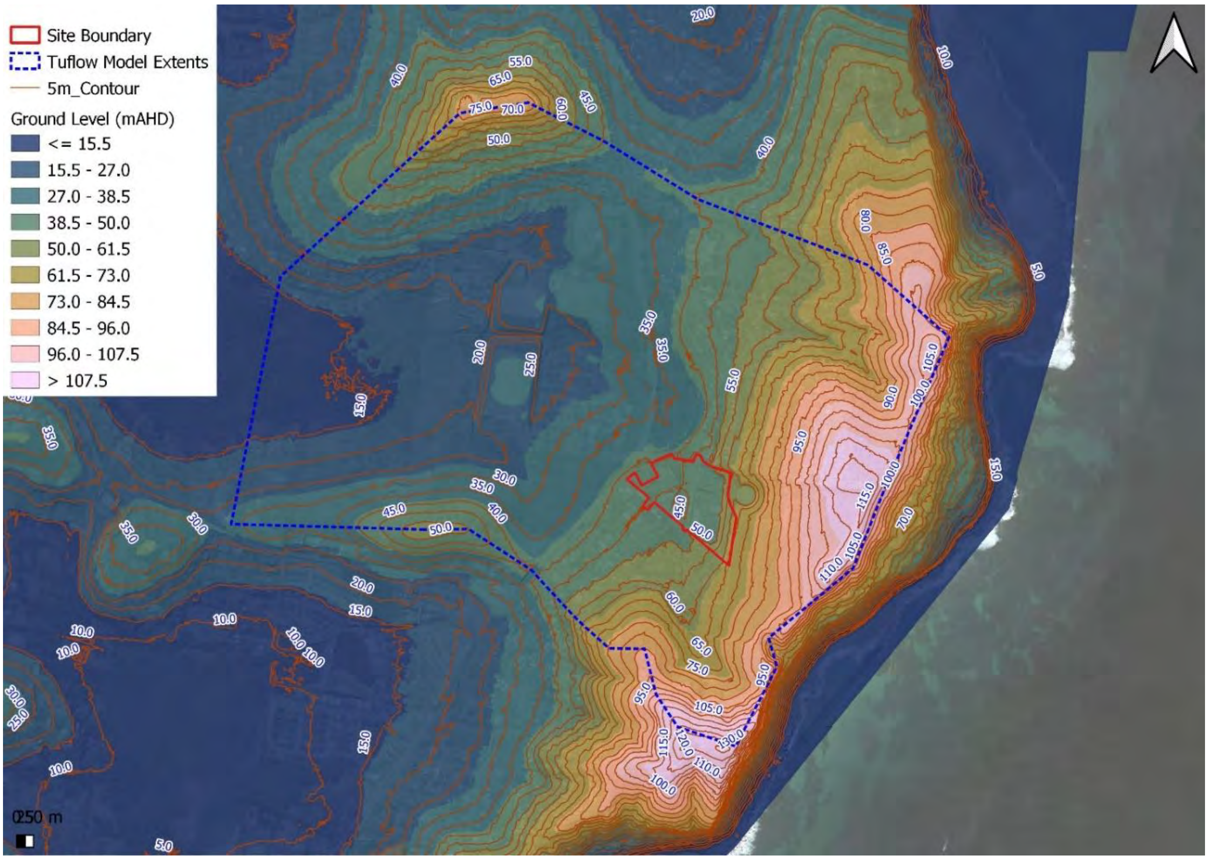


Figure 3 Floodplain (TUFLOW) Model Extent and Ground Level Contours

3.1.2 Model Topography

The existing terrain was created using the following data:

> 2011 Light Detection and ranging (Lidar) data downloaded from the Elevation and Depth - Foundation Spatial Data (ELVIS) website (https://elevation.fsdf.org.au/). Lidar data and terrain level contours for the existing ground level terrain for the subject site and surrounds is shown in Figure 3;

> Detailed site survey undertaken by Barry Hunt Associates on 23/10/2020 (provided in **Appendix A**).

A grid size of 1.5 m x 1.5 m was adopted for this study, considering the representative widths of the existing flowpaths within the Study Area.

Some existing fences were also included in the model using the Layered Flow Constriction component in TUFLOW.

3.1.3 Hydraulic Roughness

The spatial distribution of surface roughness was represented in TUFLOW floodplain model based on roughness zones. These were delineated using aerial photography. Table 1 summarises the surface types and land uses and the adopted hydraulic roughness values.

Table 1 Adopted Roughness (n) Values for Different Surface Types and Landuse

Surface Type / Land Use	Manning n Value
Roads	0.02
Thick Vegetation	0.1
Grass	0.04
Light Vegetation with Houses	0.08
General Residential (R1)	0.06
Parking (Study Site)	0.035

3.1.4 Hydrology

Hydrological modelling was undertaken using a ‘Rain on Grid’ approach. This means the hydrologic and hydraulic modelling were combined in the TUFLOW 1D/2D model.

Design rainfall data and rainfall losses were obtained from the 2019 edition of Australian Rainfall and Runoff (ARR2019) in accordance with advice from Council.

3.1.5 Boundary Conditions

The existing buildings located on the study site and surrounds were blocked out in the floodplain model. Removing the buildings from the 2D model domain meant that the model would not account for the rain falling on these buildings. To ensure the rainfall on the study area was not underestimated, the rainfall volume associated with each building was directly applied on the 2D domain using “2d_sa_rf” inflow boundaries. An example of blocked out buildings and compensatory building rainfall polygon is shown in Figure 4.

Figure 4 An Example of Removed Buildings and the Compensatory Building Rainfall Polygons

Figure 5 Layout of the Existing Drainage Network included in the TUFLOW Floodplain Model

The adopted downstream boundary condition was based on a water level versus flow (stage-discharge) curve. The TUFLOW model can automatically generate the stage-discharge (H-Q) curve based on an input friction slope. The H-Q approach was deemed suitable as the downstream model boundary is sufficiently distance from the study site to have no impact on the flow behaviour cross the study site.

3.1.6 Existing Drainage Network

The existing drainage network within the study site was included in the floodplain model. It was based on the detailed site survey and was represented in the TUFLOW floodplain model as 1D elements. Figure 5 shows the existing drainage network included in the floodplain model.

3.2 Existing Conditions Flood Behaviour

The floodplain model of Existing Conditions was run for the 50% AEP, 5% AEP, 1% AEP and PMF events. Considering the relatively small size of the upstream catchment the model was run for 15 minutes, 30 minutes, 45 minutes, 60 minutes and 90 minutes duration storm burst in order to identify the critical storm burst. Each event was run for its 10 temporal patterns. The results were used to identify the critical duration and mean temporal patterns for each event.

Table 2 shows the critical duration and mean temporal pattern identified for each of the modelled events.

Table 2 Identified Critical Storm Burst Durations and Mean Temporal Patterns for the assessed Events

Event	Critical Duration	Mean Temporal Pattern
50% AEP	60 minutes	TP03
5% AEP	60 minutes	TP03
1% AEP	45 minutes	TP06
PMF	30 minutes	-

The assessed flooding under 50% AEP, 5% AEP, 1% AEP and PMF events under Existing Conditions has been mapped for the peak flood depth, peak flood velocity, peak water levels and flood hazard categories (H1-H6). The flood hazard categories are adopted from the ARR2019 (Book 6: Flood Hydraulics, Section 7.2.7). The classification is based on depth and velocity and defines six categories based on the stability of children, adults, the elderly and vehicles in floodwaters.
These results are contained in Figures BE1 to BE12 which are attached in **Appendix B.**
These results indicate that:

Flood Depths

> An overland flowpath traverses the site from south to north;

> In the 50% AEP event the site is mostly flood free;

> In the 5% AEP event flood depths of up to 0.55m are observed in the eastern parts of the study site;

> In the 1% AEP event flood depths of up to 0.60m are observed at the eastern parts of the study site. In addition, localized flooding is observed on the western side of the study site; and

> In the PMF, the site is significantly flooded with the flood depths exceeding 1 m at some locations.

Flood Velocities

> In the 1% AEP event the flood velocities within the site are generally low with the exception of the flood velocities along the overland flowpath and also along the access road within the site; and

> In the PMF event, high velocities up to 4.0 m/s are observed within the study site mainly along the overland flowpath and along existing roads.

Flood Hazards

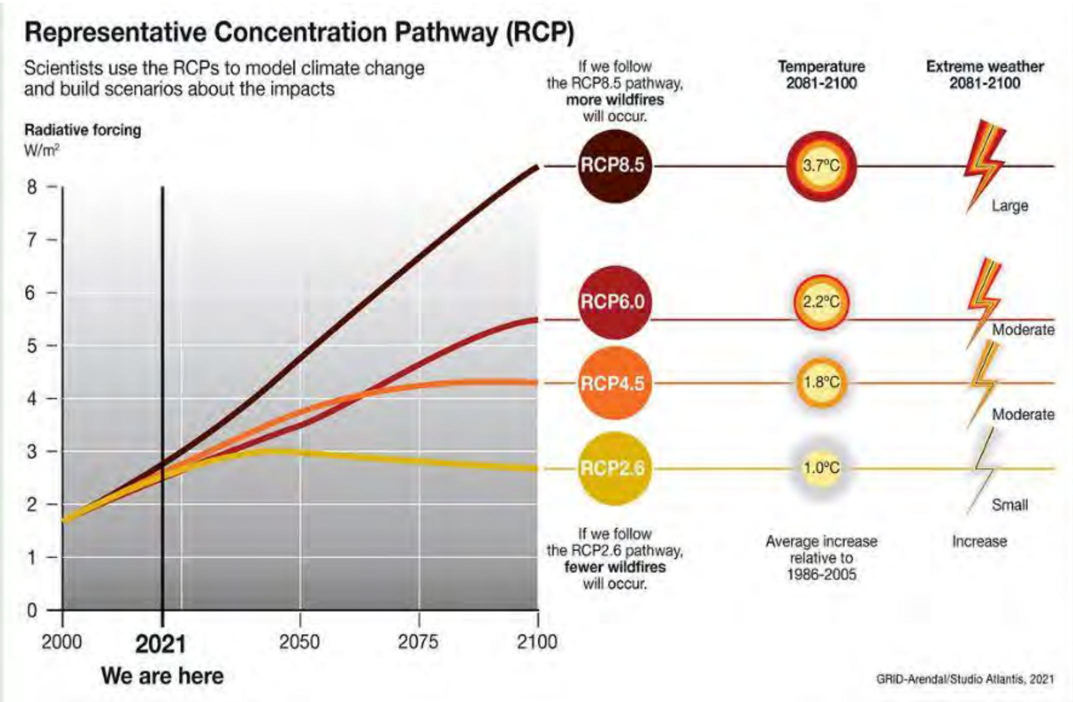
> In the 1% AEP event the majority of site is classified as a H1 hazard category which is safe for people and vehicles with some areas of H2 and H3 hazard category. Hazard category of H5 which is unsafe for people and vehicles was observed along the access road within the site and also along the flow path; and

> In the PMF event, significant areas of H5 and H6 hazard category are observed along the access road and along the flowpath.

4 Climate Change Flood Behaviour

As described, in part, by GRID-Arendal (a UNEP Partner):

> *Representative Concentration Pathway(s) (RCPs) are trajectories of greenhouse gas concentrations used for climate modelling in the IPCC Fifth Assessment Report (IPCC 2013). The numerical values of the RCPs (i.e., 2.6, 4.5, 6.0 and 8.5) refer to the possible range of radiative forcing values in the year 2100. RCPs are used to build future climate scenarios based on greenhouse gas emissions from human activities, depending on the efforts taken to limit greenhouse gas emissions (high efforts taken under RCP2.6, low efforts under RCP8.5)*



Source: Representative Concentration Pathway (RCP) | GRID-Arendal (grida.no), accessed 3 October 2023

Changes to the climate are expected to have adverse impacts on rainfall intensities. A feature of the ARR DataHub is the guidance provided on the Interim Climate Change Factors under Representative RCP 4.5, RCP 6 and RCP 8.5. The guideline values for Bateau Bay obtained from ARR2019 are shown in Table 3. ARR2019 further recommends that consideration be given to the RCP 4.5 and RCP 8.5 scenarios.

As disclosed in Table 3 the highest increase in rainfall (19.7%) is associated with RCP 8.5 in 2090. For the purpose of this assessment the following climate change scenarios are adopted:

> 2090 RCP 4.5 (rounded up to 10%)

> 2090 RCP 8.5 (rounded up to 20%)

Table 3 Interim Climate Change Factors for Bateau Bay (Source: ARR DataHub)

Year	RCP 4.5	RCP6	RCP 8.5
2030	0.869 (4.3%)	0.783 (3.9%)	0.983 (4.9%)
2040	1.057 (5.3%)	1.014 (5.1%)	1.349 (6.8%)
2050	1.272 (6.4%)	1.236 (6.2%)	1.773 (9.0%)
2060	1.488 (7.5%)	1.458 (7.4%)	2.237 (11.5%)
2070	1.676 (8.5%)	1.691 (8.6%)	2.722 (14.2%)
2080	1.810 (9.2%)	1.944 (9.9%)	3.209 (16.9%)
2090	1.862 **(9.5%)**	2.227 (11.5%)	3.679 **(19.7%)**

To evaluate the effects of increased rainfall intensity under this scenario, the hydraulic TUFLOW model was run for the 1% AEP event with 10% and 20% increase in rainfall intensities. The results indicate:

> Under the 10% Climate Change scenario flood level increases of up to 0.08 m are observed within the study site. Flood levels within the existing drainage increase up to 0.12 m;

> Under the 20% Climate Change scenario flood level increases of up to 0.14 m are observed within the study site. Flood levels within the existing drainage increase up to 0.23 m.

The flood behaviour maps as well as the differences in peak water levels between the Climate Change scenarios and current day climate are provided in Figures CC1 to CC8 in **Appendix C**.

The results show that impacts of climate change on the study area are minimal. Under the 20% Climate Change scenario flood depths upstream and through the study site slightly increase (up to 0.14m).

5 Future Flooding Considerations for Design

The concept development plan is provided in **Appendix D**.

Figure 6 presents the 1% AEP flood extents overlaid on the development concept plan. The figure shows that some areas of proposed Low/Medium and Medium Density residential areas are within the 1% AEP flood extents.

Figure 6 Proposed Concept Plan and 1% AEP Flood Depths

It is assumed that as far as possible overland flows will be contained within the road corridors and drainage easements. On this basis, the following design measures are proposed to avoid any flood impacts on adjacent properties:

- Road grading is recommended to convey the overland flows along the roads and towards the drainage easements. Additional drainage lines might be required to assist with conveyance of the flows;
- The existing 1050mm diameter pipe within the drainage easement needs to be upgraded to accommodate the additional flows diverted towards this drainage line;
- A drainage pipe or channel needs to be provided to convey upstream overland flows onto overland flow paths and/or into the drainage system.

Figure 7 shows the above potential design elements for consideration in the design stage of the project.

During the hydraulic modelling process, consideration should be given to the following issues:

> Model roughness values need to be updated across the study site to reflect the proposed concept development including roads and general residential development;

> Existing buildings within the study site need to be excluded from the model and to be replaced by the proposed building layouts;

> Proposed earthworks and the proposed drainage network will need to be included in the model;

> While climate change is expected to have minor impacts on the study site, it is recommended that the proposed conditions model being assessed both under current climate and future climate conditions to ensure that the design is resilient and that above design considerations will be adequate under future climate conditions.

Figure 7 Potential Design Considerations

6 Compliance with the DCP Requirements

6.1 2022 Central Coast Development Control Plan (DCP)

The flooding requirements are set out in Chapter 3.1 Floodplain Management and water Cycle Management of 2022 Central Coast Development Control Plan. The development will need to comply with a series of controls as outlined below:

"3.1.4.2 *Performance Based Assessment*

Council will consider development proposals that do not meet the prescriptive requirements of this DCP only if a report prepared by a suitably qualified engineering professional accompanies the application and addresses the following:

a. *is compatible with the established flood hazard of the land. In areas where flood hazard has not been established through previous studies or reports, the flood hazard must be established in accordance with the Floodplain Development Manual.*
b. *will not significantly adversely affect flood behaviour resulting in detrimental increases in the potential flood affectation of other development or properties;*
c. *incorporates appropriate measures to manage risk to life and property from flood;*
d. *will not significantly adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses;*
e. *is not likely to result in unsustainable social and economic costs to the community as a consequence of flooding.*
f. *is consistent with the principles of Ecologically Sustainable Development.*
g. *adequately considers the impact of climate change.*
    - *It is to be noted that with regard to climate change, appropriate benchmarks based on the best available current information have been used in producing the flood risk management studies and plans that inform this document.*
    - *Some prescriptive requirements such as flood planning level requirements may be relaxed if Council can be satisfied that the projected life of the proposed development is for a relatively short-term and therefore does not warrant the imposition of controls that consider impacts beyond the cessation of the proposed development. This will only be considered for uses where the residual risk to the occupation of the development is considered to be low. This may include certain temporary or demountable structures but would not include residential developments.*

3.1.5.3 Requirements for Filling of Flood Prone Land

a. Filling for any purpose (including the raising of a building platform in flood-prone areas) is not permitted in areas identified as Flood Planning Precinct 3 or Flood Planning Precinct 4, unless a Floodplain Risk Management Plan for the catchment has been adopted which allows filling to occur. In Flood Planning Precinct 2, filling will not be permitted unless a report from a suitably qualified engineer has been submitted and approved by Council that certifies that the development will not increase flood affectation elsewhere.

b. Filling of individual sites in isolation, without consideration of the cumulative effects is not permitted. Any proposal to fill a site must be accompanied by an analysis of the effect on flood levels of similar filling of developable sites in the area. This analysis would form part of a flood study prepared by a suitable qualified professional. "

6.2 Compliance of Concept Development

In the subsequent stages of the project when the earthworks plan is available, an updated flood impact assessment needs to be undertaken based on the earthworks plan to show compliance with the DCP requirements including:

> The proposed development should not cause significant flood level increases on adjacent properties and roads; and

> The proposed development should not cause significant increases in flood velocities along the waterways to ensure it will not cause erosion.

7 Flood Emergency Response Plan

7.1 Flood Risks

In the 1% AEP flood a hazard category of H5 (which is unsafe for people and vehicles) was observed along the access road within the site and also along the flow path. In the PMF event, significant areas of H5 and H6 hazard category are observed along the access road and at the intersection of the access road with Coleridge Road.

7.2 Duration of Inundation

Figure 8 shows two Key Locations adopted to assess the Duration of Inundation.

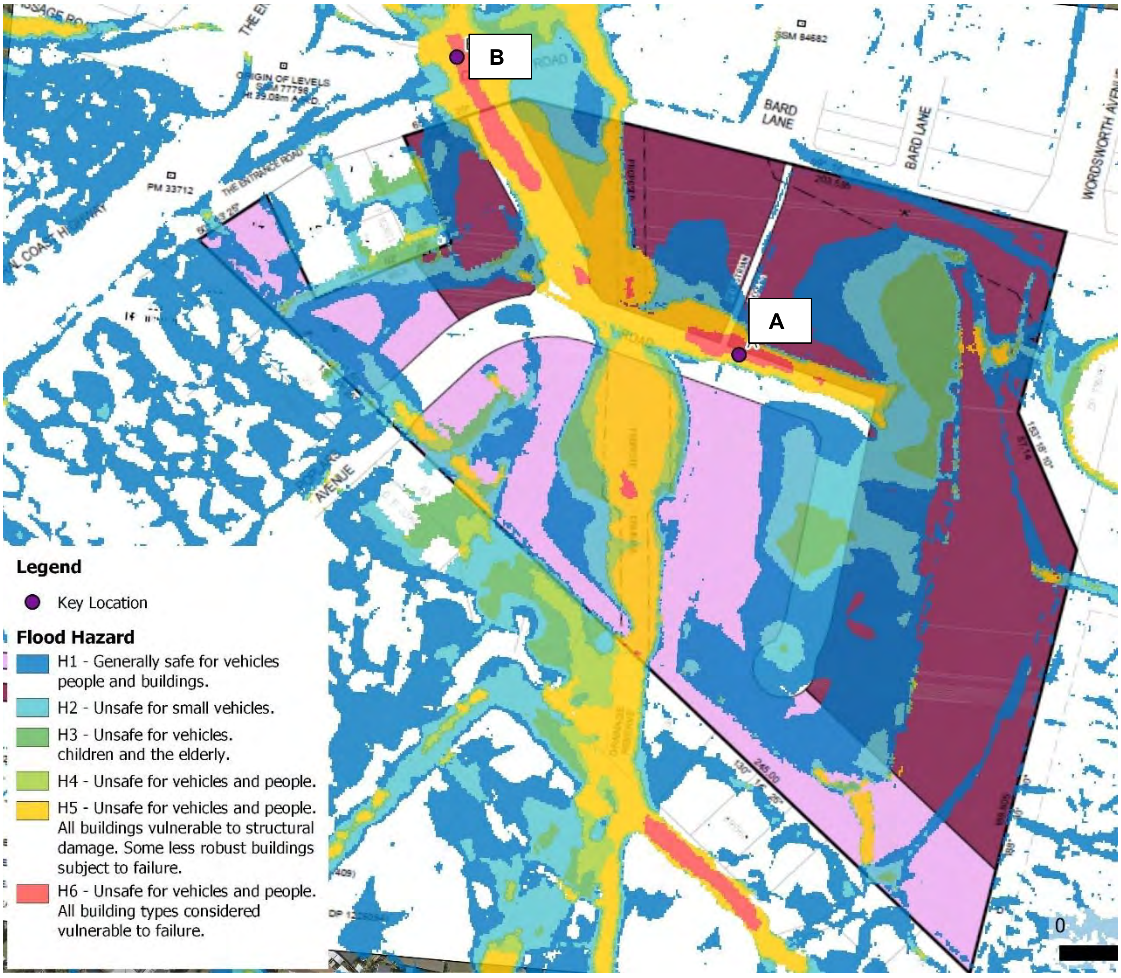


Figure 8 PMF Hazard and Reference Locations

Figure 9 to 12 show the flood depth hydrographs at Reference Locations A and B for the 1% AEP and PMF events. The pots shows that duration of inundation at the reference locations are shorter than 30 mins in both 1% AEP and PMF event.

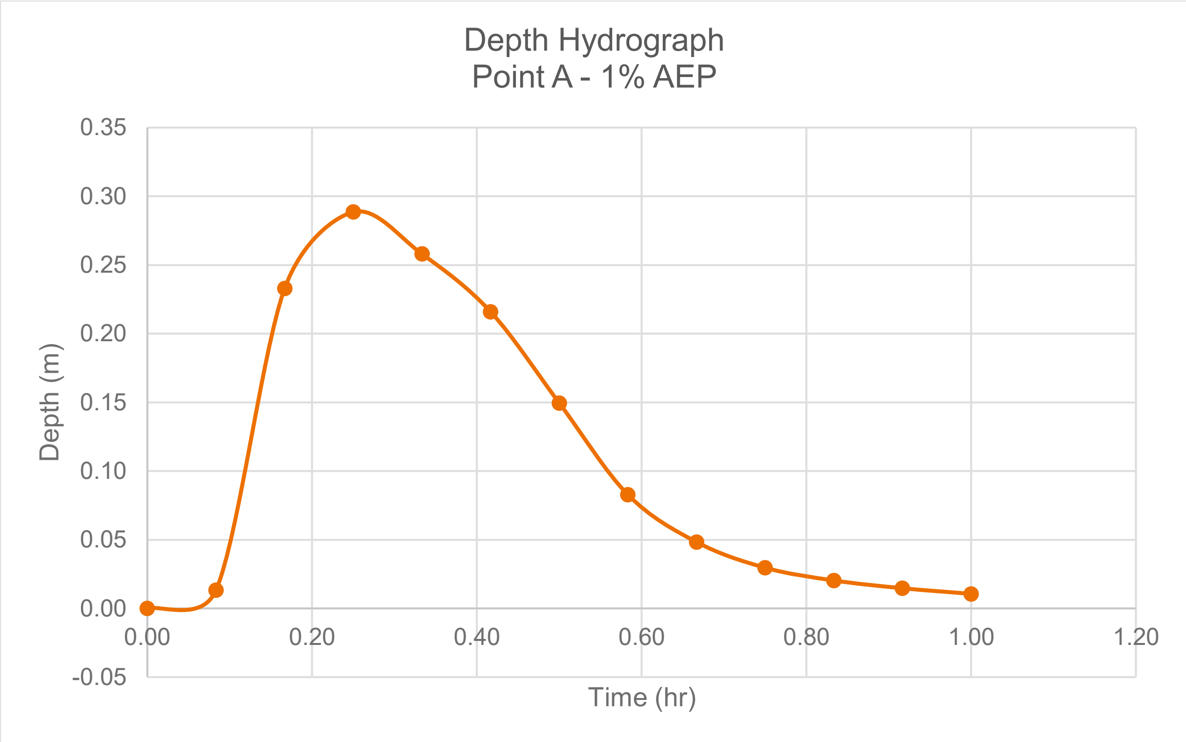


Figure 9 1% AEP Depth Hydrograph at Reference Location A

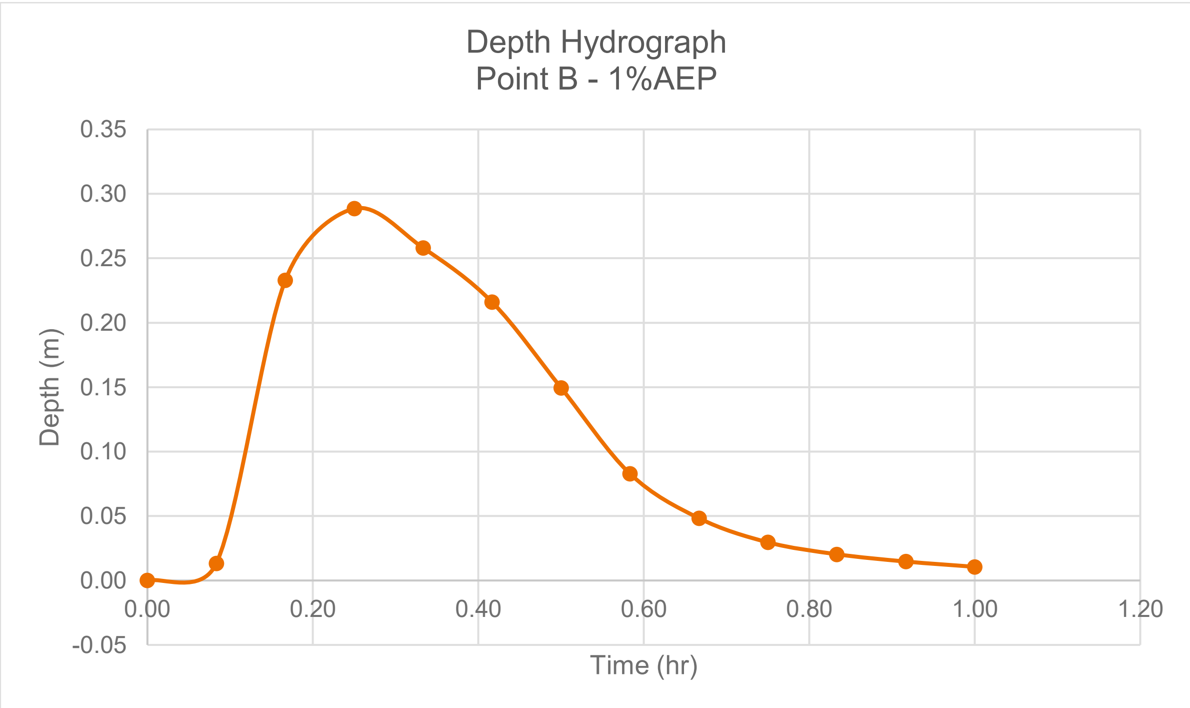


Figure 10 1% AEP Depth Hydrograph at Reference Location B

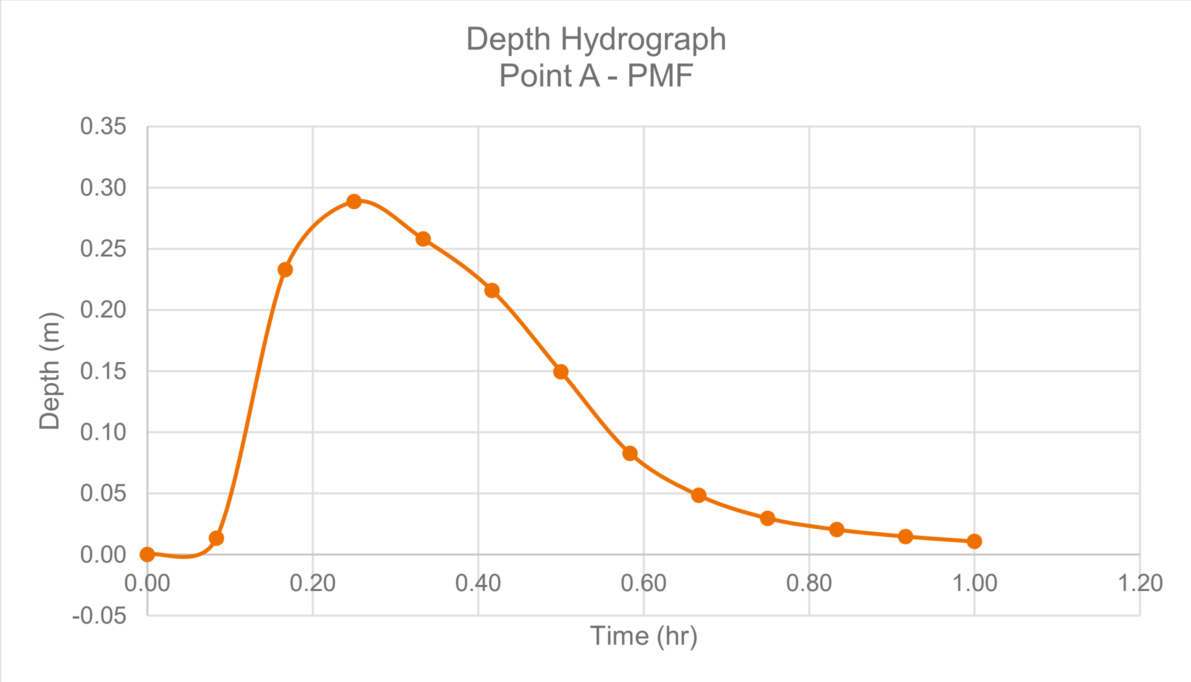


Figure 11 PMF Depth Hydrograph at Reference Location A

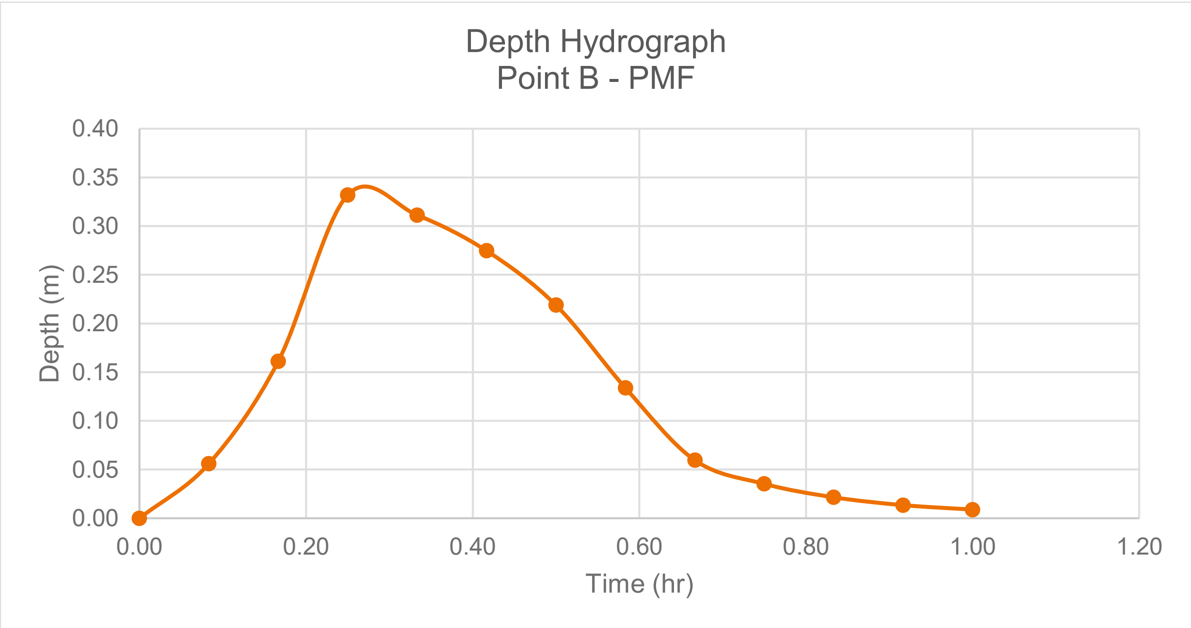


Figure 12 PMF Depth Hydrograph at Reference Location B

7.3 Flood Emergency Response

A concise Flood Emergency Response Plan (FERP) for the proposed development would describe:

- Flood behaviour at the site for the 1% AEP and Probable Maximum Flood (PMF),
- A generic Flood Emergency Response Plan for the development, including:
  - Flood risks both on the site and external to the site;
  - Evacuation strategy, measures, procedures and plan
  - A FloodSafe Plan

An outline of the FERP is given as follows.

Flood Threat

The current flood risks are:

Flood Depths

> An overland flowpath traverses the site from south to north;
> In the 50% AEP event the site is mostly flood free;
> In the 5% AEP event flood depths of up to 0.55m are observed in the eastern parts of the study site;
> In the 1% AEP event flood depths of up to 0.60m are observed at the eastern parts of the study site. In addition, localized flooding is observed on the western side of the study site; and
> In the PMF, the site is significantly flooded with the flood depths exceeding 1 m at some locations.

Flood Velocities

> In the 1% AEP event the flood velocities within the site are generally low with the exception of the flood velocities along the overland flowpath and also along the access road within the site; and
> In the PMF event, high velocities up to 4.0 m/s are observed within the study site mainly along the overland flowpath and along existing roads.

Flood Hazards

> In the 1% AEP event the majority of site is classified as a H1 hazard category which is safe for people and vehicles with some areas of H2 and H3 hazard category. Hazard category of H5 which is unsafe for people and vehicles was observed along the access road within the site and also along the flow path; and
> In the PMF event, significant areas of H5 and H6 hazard category are observed along the access road and along the flowpath.

Responsibilities

While in a flood emergency the NSW State Emergency Service (SES) has responsibilities including to:

- Direct the evacuation of persons and/or communities at risk of flood inundation.
- Issue evacuation warnings for individual communities that describe possible local effects, suggested actions and evacuation arrangements.

It is expected that residents will be responsible for implementing the actions defined in the generic Flood Emergency Response Plan and should not rely on the SES for any evacuation warnings. These actions would include monitoring the SES website and any flood warnings, maintaining regular communication with any resident's association and initiating actions as documented in the generic Plan.

Preparedness

Residents shall be advised of the potential flood threat in their locality, and recommended management and procedures in case of a flood event. They will comply with all lawful directions.

Warning

While in a flood event, the SES will prepare, authorise and distribute evacuation warnings it is expected that the short warning times mean that in the case of extreme floods that there would be insufficient time to evacuate any residents and/or visitors from the site and that instead residents and/or visitors would need to shelter in place.

Response

In the case of extreme weather events eg. a PMF event it is expected that there would be insufficient time to evacuate any residents and/or visitors from the site and that instead residents and/or visitors should to shelter in place.

Recovery

The NSW SES will issue an 'all clear' message when the immediate danger to life and property has passed.

8 Conclusions

This Report summarises the available data, existing flood behaviour and provides advice on design considerations in order to avoid flood impacts on adjacent properties and roads. The report also outlines a Emergency Response Plan.

A 1D/2D TUFLOW hydraulic model was established for the study site to investigate the flood behaviour under the Existing Conditions and Proposed Conditions. The flood model was developed using the available data including detailed site survey, proposed design, 2011 Lidar data and aerial images.

Hydrological modelling was undertaken using a ‘Rainfall on Grid’ approach. This means the hydrologic and hydraulic modelling were combined in the TUFLOW 1D/2D model. Design rainfall inputs were obtained from ARR2019.

The Existing Conditions model was run for the 50% AEP, 5% AEP, 1% AEP and PMF flood events for 15 minute, 30 minute, 45 minute, 60 minute and 90 minute storm burst durations and 10 Temporal Patterns for each duration. The identified critical duration and mean temporal patterns for each event are presented in Table 2.

The impacts of climate change on the flood behaviour within the study site was assessed through increasing rainfall intensities by 10% (CC10) and 20% (CC20). The results showed that:

> Under the 10% Climate Change Scenario increased flood levels of up to 0.08 m are observed within the study site. Flood levels within the existing drainage increase up to 0.12 m;

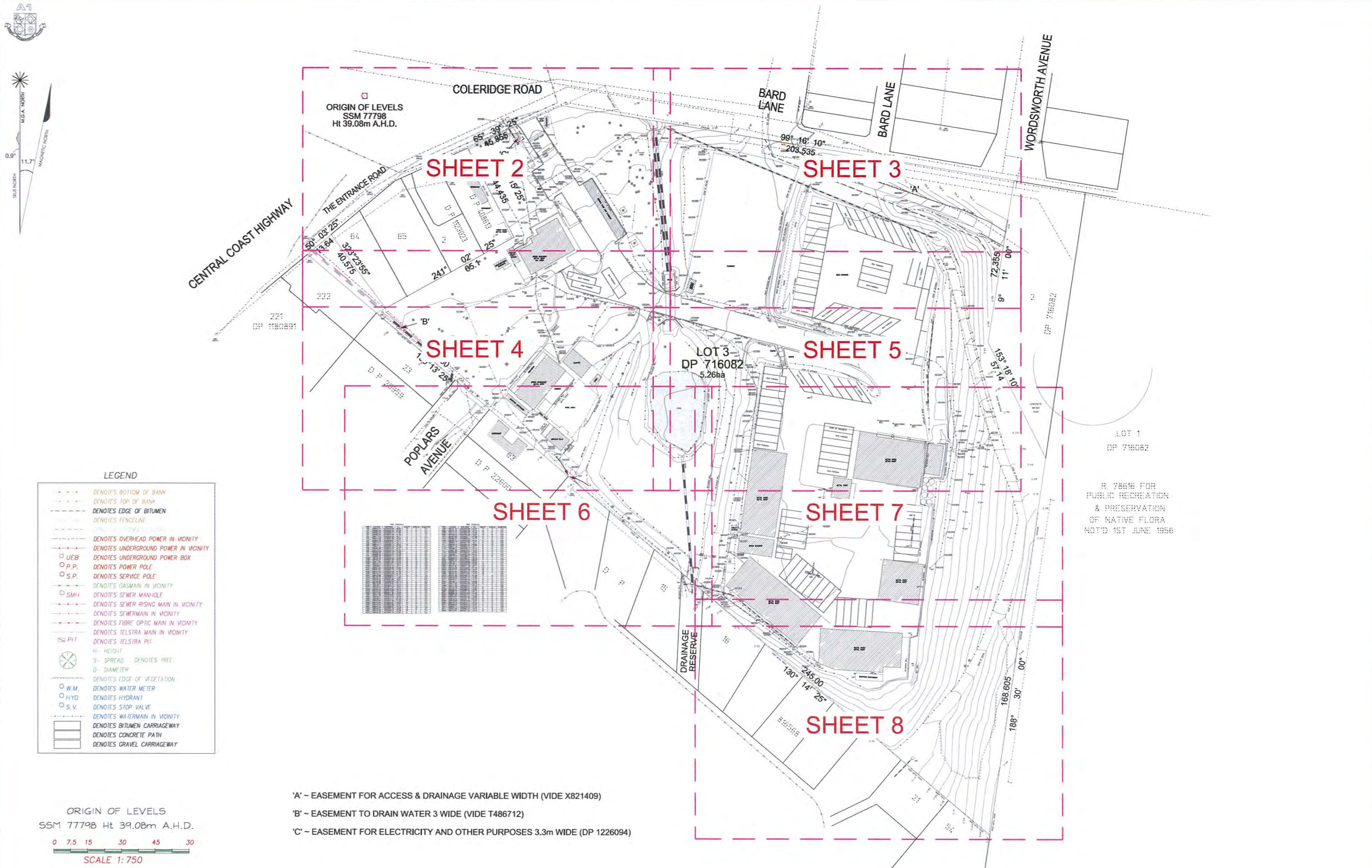
> Under the 20% Climate Change Scenario increased flood levels of up to 0.14 m are observed within the study site. Flood levels within the existing drainage increase up to 0.23 m.

In the absence of any detailed concept or earthworks plan, a number of potential design considerations were proposed for the later stages of the project. In addition, potential key elements for the purpose of future flood modelling were discussed. It is recommended that proposed development being assessed under the current and future climate conditions.

The 1%AEP and PMF flood depth hydrographs were extracted at two reference locations at and around the site and showed that the duration of inundation in both the 1% AEP and PMF events is short (less than 30 mins).

It was concluded that Shelter-in-place is the recommended flood emergency response strategy for the study site.

Appendix A Site Survey



'A' ~ EASEMENT FOR ACCESS & DRAINAGE VARIABLE WIDTH (VIDE X821409)

'B' ~ EASEMENT TO DRAIN WATER 3 WIDE (VIDE T486712)

'C' ~ EASEMENT FOR ELECTRICITY AND OTHER PURPOSES 3.3m WIDE (DP 1226094)

DIAL 1100 BEFORE YOU DIG

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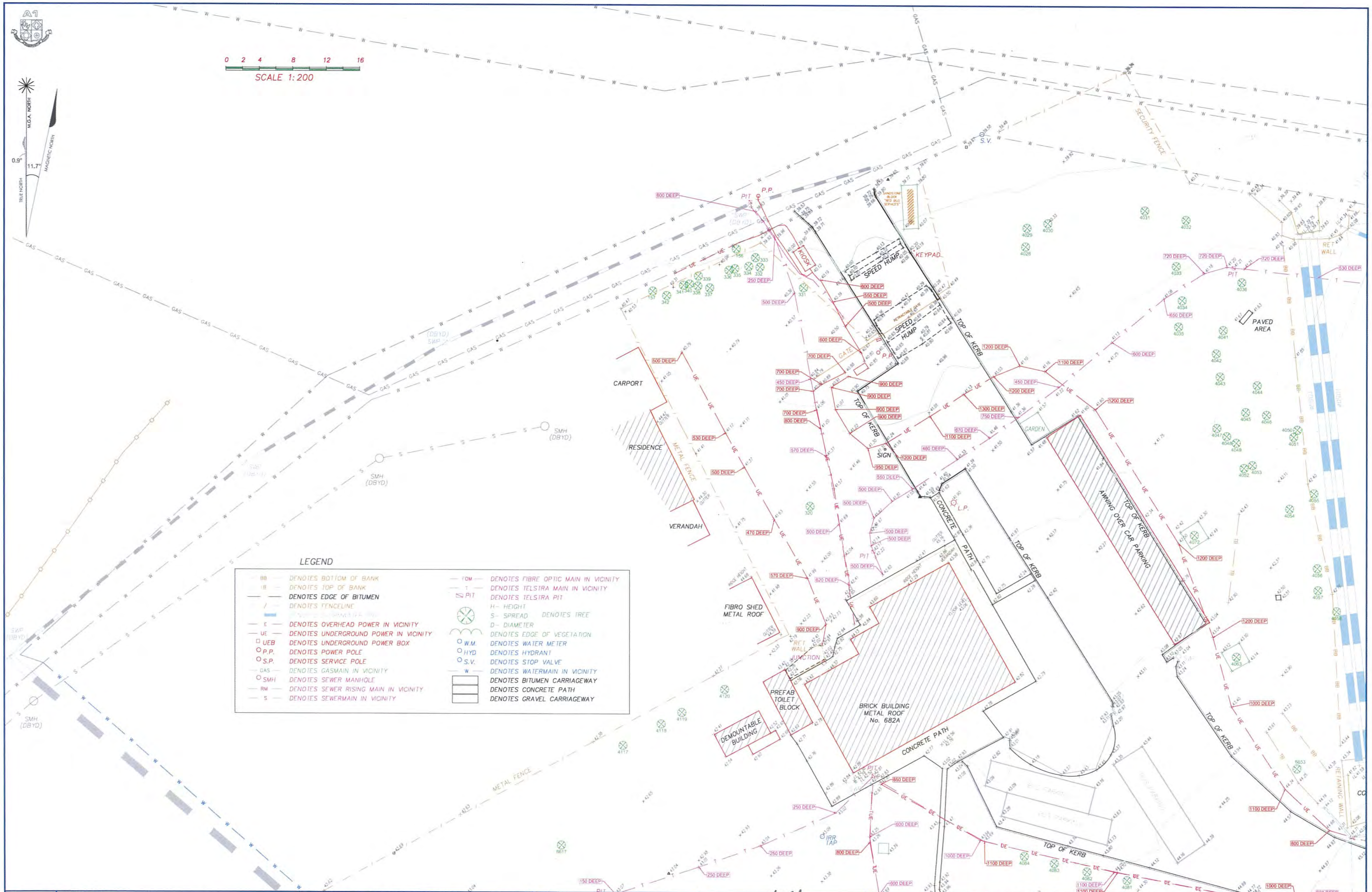
A	ORIGINAL ISSUE	27/10/20
	AMENDMENTS	DATE

REGISTERED SURVEYOR

DRAWN KDM	DATE 27/10/20
SURVEYED RD	DATE 23/10/20

Barry Hunt Associates
REGISTERED SURVEYORS AND LAND DEVELOPMENT CONSULTANTS
SUITE 4, 1 BOUNTY CL., TUGGERAH 2259
P.O. BOX 4144, BAY VILLAGE, 2261
PHONE (02) 43539644 FAX (02) 43533855
Email ~admin@surveyors.com.au

LOCALITY: 67 POPLARS AVENUE, BATEAU BAY, L.G.A. CENTRAL COAST		PLAN: SHEET LAYOUT	
		LOT 3 DP 716082	AREA 5.26ha
CLIENT: THE ENTRANCE RED BUS SERVICE PTY LTD		DATUM AUSTRALIAN HEIGHT DATUM	SCALE 1:750(A1)
PROJECT: COMMERCIAL DEVELOPMENT		CAD REF: 55283DETAIL	SHEET 1 OF 8



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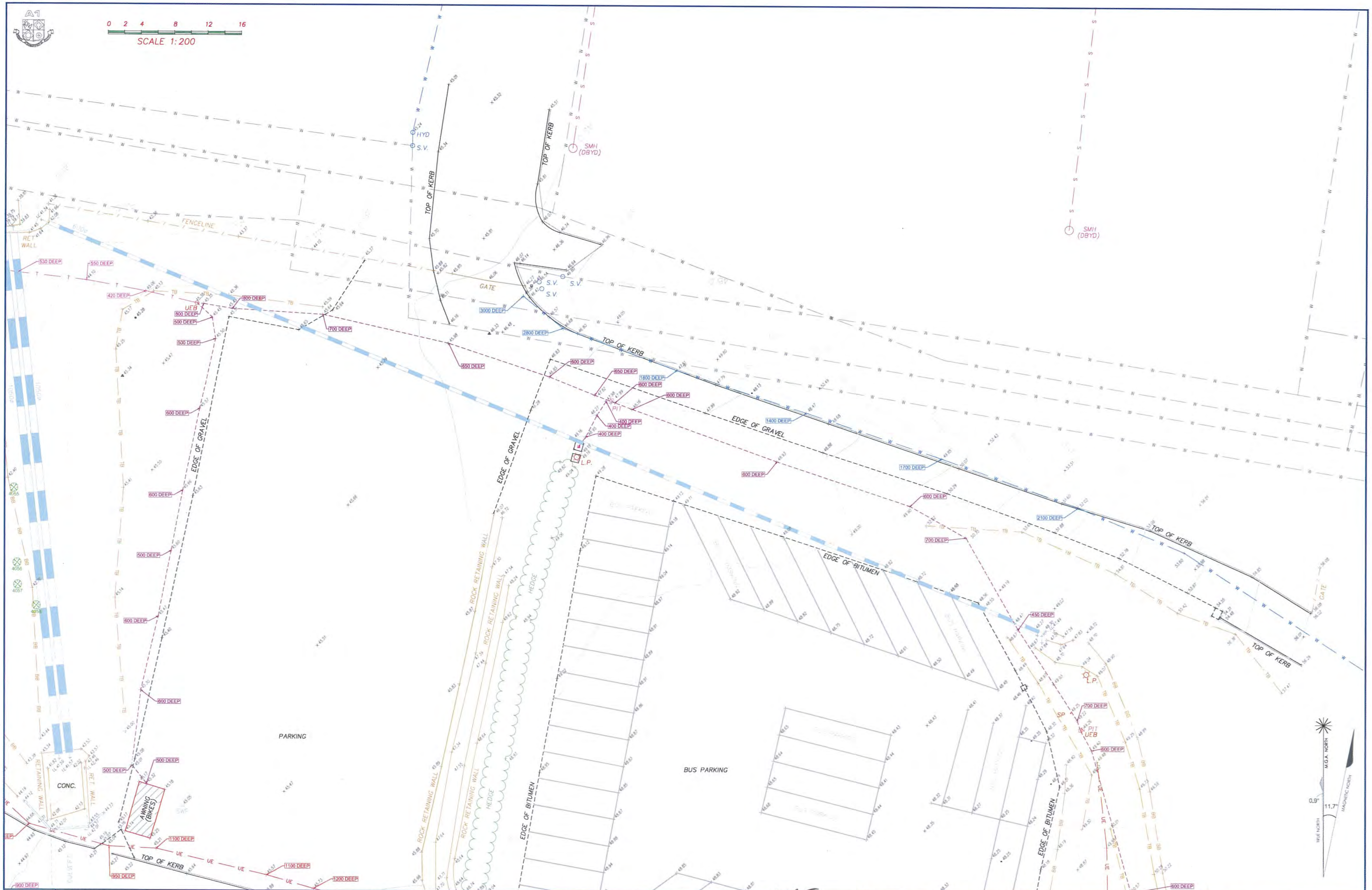
LOCALITY : 67 POPLARS AVENUE BATEAU BAY L.G.A. CENTRAL COAST	PLAN : DETAIL AND CONTOUR SURVEY		
	LOT 3	DP 716082	AREA 5.26ha
CLIENT : THE ENTRANCE RED BUS SERVICE PTY LTD	DATUM AUSTRALIAN HEIGHT DATUM		SCALE 1:200(A1)
PROJECT : COMMERCIAL DEVELOPMENT	CAD REF: 55283DETAIL		SHEET 2 OF 8



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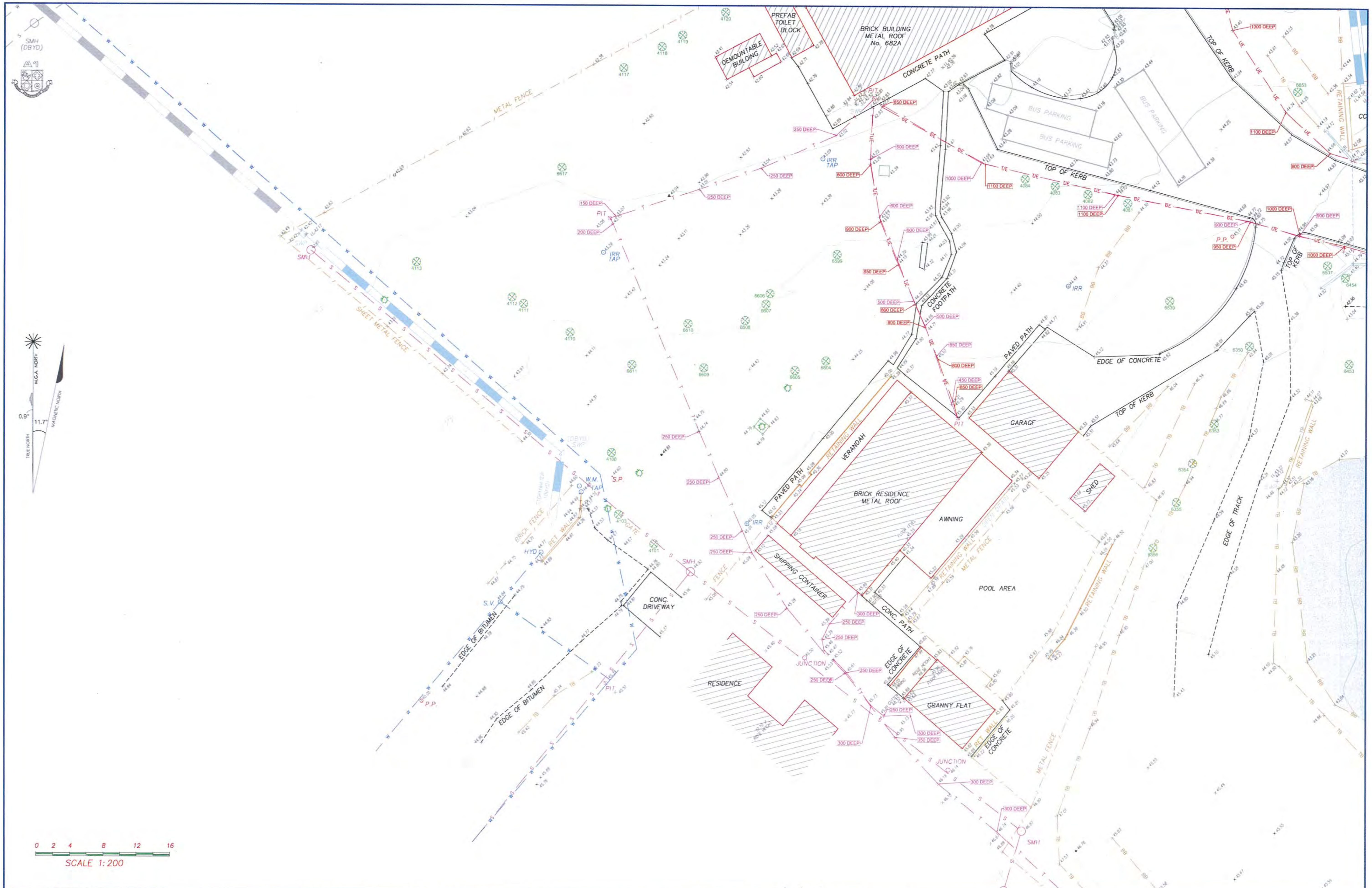
	LOT 3 DP 716082	AREA 5.26ha	
CLIENT: THE ENTRANCE RED BUS SERVICE PTY LTD	DATUM AUSTRALIAN HEIGHT DATUM	SCALE 1:200(A1)	
PROJECT: COMMERCIAL DEVELOPMENT	CAD REF: 55283DETAIL	SHEET 3 OF 8	



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CLIENT:	THE ENTRANCE RED BUS SERVICE PTY LTD
PROJECT:	COMMERCIAL DEVELOPMENT
PLAN:	DETAIL AND CONTOUR SURVEY
LOT	3
DP	716082
AREA	5.26ha
DATUM	AUSTRALIAN HEIGHT DATUM
SCALE	1:200(A1)
CAD REF:	55283DETAIL
SHEET	4 OF 8

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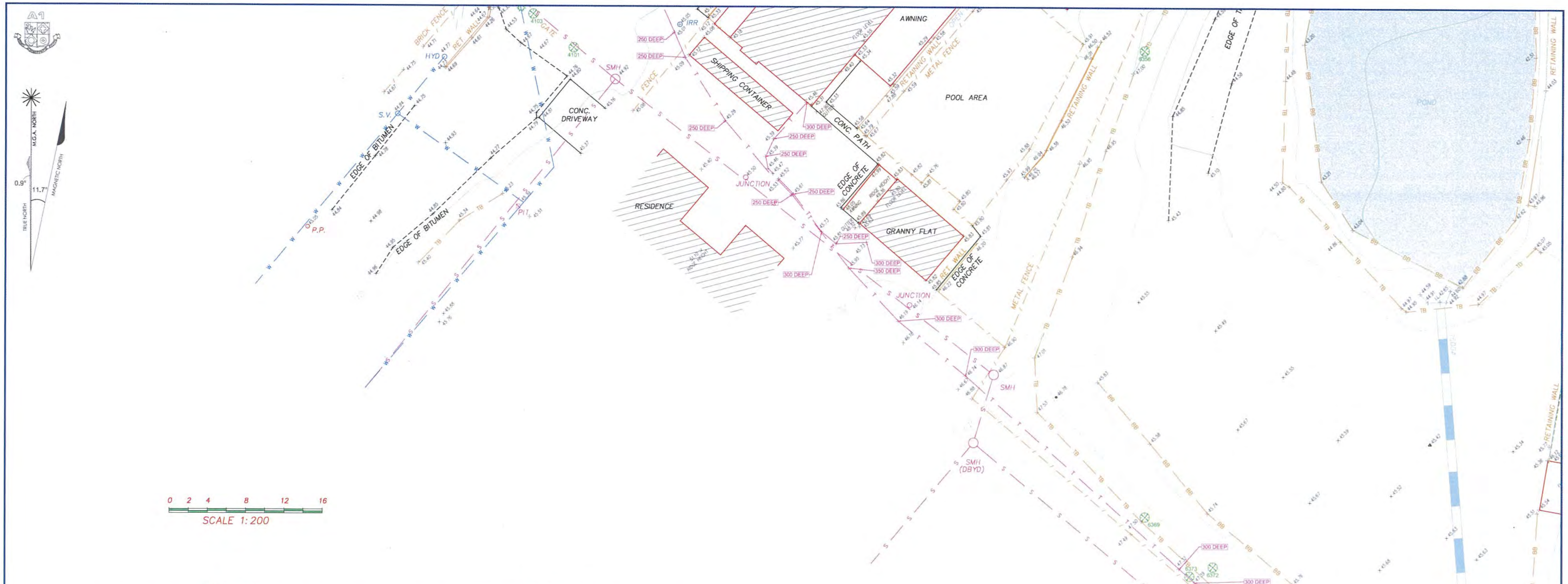
CLIENT :	THE ENTRANCE RED BUS SERVICE PTY LTD
PROJECT :	COMMERCIAL DEVELOPMENT

PLAN :	DETAIL AND CONTOUR SURVEY		
LOT 3	DP 716082	AREA	5.26ha
DATUM	AUSTRALIAN HEIGHT DATUM	SCALE	1:200(A1)
CAD REF:	55283DETAIL	SHEET	5 OF 8



TREE SCHEDULE

TREE	EASTING	NORTHING	G.L.	HEIGHT	SPREAD	DIAMETER
156	358074.57	6303638.69	39.92	10	5	0.4
157	358064.58	6303633.63	40.22	5	2	0.3
320	358083.46	6303608.07	41.60	12	4	0.6
331	358082.63	6303634.08	40.39	4	2	0.1
332	358077.43	6303636.52	40.17	8	4	0.3
333	358076.88	6303637.66	40.09	12	6	0.7
334	358076.08	6303636.61	40.17	5	2	0.2
335	358074.41	6303636.34	40.13	7	3	0.3
336	358073.71	6303636.14	40.21	10	5	0.4
337	358071.41	6303634.04	40.39	4	2	0.2
338	358069.98	6303634.25	40.37	8	4	0.4
339	358070.03	6303635.45	40.34	7	4	0.6
340	358068.98	6303634.48	40.28	4	3	0.2
341	358068.25	6303634.34	40.38	5	3	0.2
342	358066.25	6303633.10	40.35	4	2	0.1
4028	358109.18	6303639.08	40.42	15	8	0.6
4029	358109.34	6303641.30	40.30	15	10	0.6
4030	358111.84	6303641.86	40.33	15	10	0.9
4031	358123.47	6303643.44	40.31	15	10	0.9
4032	358128.41	6303642.33	40.71	15	8	0.6
4033	358127.25	6303636.83	40.94	15	10	0.9
4034	358127.97	6303632.75	41.26	10	6	0.3
4035	358127.55	6303629.62	41.45	15	6	0.4
4036	358135.10	6303634.93	41.48	8	8	0.4
4041	358132.89	6303629.21	41.73	15	15	0.9
4042	358132.07	6303626.43	41.89	8	6	0.3
4043	358132.53	6303623.68	42.01	6	4	0.2
4044	358136.98	6303622.66	42.15	10	6	0.3
4045	358135.59	6303619.46	42.14	15	8	0.5
4046	358138.11	6303619.13	42.14	15	8	0.4
4047	358132.15	6303617.54	42.01	10	6	0.4
4048	358133.34	6303616.58	42.10	10	6	0.4
4049	358134.48	6303615.80	42.18	15	6	0.4
4050	358141.84	6303617.38	42.26	15	6	0.4
4051	358141.39	6303616.53	42.20	15	6	0.4
4052	358135.41	6303612.79	42.36	15	6	0.4
4053	358136.41	6303613.14	42.32	15	6	0.5
4054	358140.90	6303607.96	42.32	8	6	0.4
4055	358143.84	6303609.81	42.52	15	10	0.7
4056	358144.25	6303600.89	42.61	10	6	0.3
4057	358144.33	6303598.27	42.72	15	10	0.5
4058	358146.57	6303595.78	42.90	15	15	0.7
4063	358134.55	6303590.31	43.38	15	4	0.4
4072	358129.50	6303604.79	42.60	6	6	0.4

TREE SCHEDULE

TREE	EASTING	NORTHING	G.L.	HEIGHT	SPREAD	DIAMETER
4081	358121.49	6303563.66	44.27	10	4	0.3
4082	358116.70	6303564.68	44.12	10	6	0.4
4083	358112.76	6303565.65	43.99	10	6	0.4
4084	358109.16	6303566.48	43.93	10	8	0.5
4101	358064.82	6303522.71	44.88	6	6	0.2
4103	358060.57	6303526.22	44.77	6	6	0.4
4108	358059.72	6303533.60	44.57	8	10	0.6
4110	358054.71	6303547.93	44.11	8	10	0.8
4111	358049.14	6303551.32	43.84	8	10	0.8
4112	358047.76	6303552.10	43.77	8	10	0.8
4113	358036.31	6303556.27	43.19	8	6	0.5
4117	358061.08	6303579.51	42.51	8	6	0.4
4118	358065.65	6303582.07	42.48	8	6	0.4
4119	358068.11	6303583.45	42.54	8	6	0.6
4120	358073.24	6303586.21	42.45	8	6	0.3
6021	358283.16	6303406.37	59.45	8	1	0.2
6022	358281.22	6303403.90	58.83	7	4	0.5
6315	358173.11	6303458.88	48.23	4	4	0.4
6350	358136.14	6303546.68	45.96	10	4	0.5
6353	358131.94	6303537.38	46.77	10	2	0.3
6354	358129.36	6303532.65	47.03	10	2	0.3
6355	358127.44	6303527.99	46.91	10	2	0.3
6356	358124.64	6303522.57	47.08	10	2	0.3
6369	358124.82	6303473.93	47.31	30		0.5
6372	358131.98	6303468.74	47.09	4	2	0.3
6373	358129.53	6303467.77	47.50	4	2	0.3
6377	358149.47	6303453.50	47.21	5	2	0.2
6453	358148.11	6303544.57	43.08	6	3	0.2
6454	358147.63	6303554.85	42.70	6	3	0.2
6488	358171.55	6303531.51	44.79	7	7	0.8
6537	358145.49	6303556.31	45.53	8	6	0.6
6539	358126.57	6303552.01	45.80	6	7	0.5
6599	358086.70	6303557.35	44.13	10	7	0.8
6604	358085.39	6303544.63	44.28	8	6	0.5
6605	358081.68	6303543.47	44.36	8	6	0.3
6606	358078.67	6303552.62	43.98	8	6	0.5
6607	358078.19	6303551.37	44.05	8	8	0.6
6608	358075.69	6303549.40	43.91	8	6	0.5
6609	358070.75	6303543.74	44.42	7	5	0.4
6610	358068.85	6303549.03	43.87	9	5	0.8
6611	358062.14	6303544.10	44.32	7	5	0.8
6617	358053.69	6303567.61	42.91	6	8	0.6
6653	358141.84	6303577.04	44.16	10	6	0.6

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PLAN: DETAIL AND CONTOUR SURVEY

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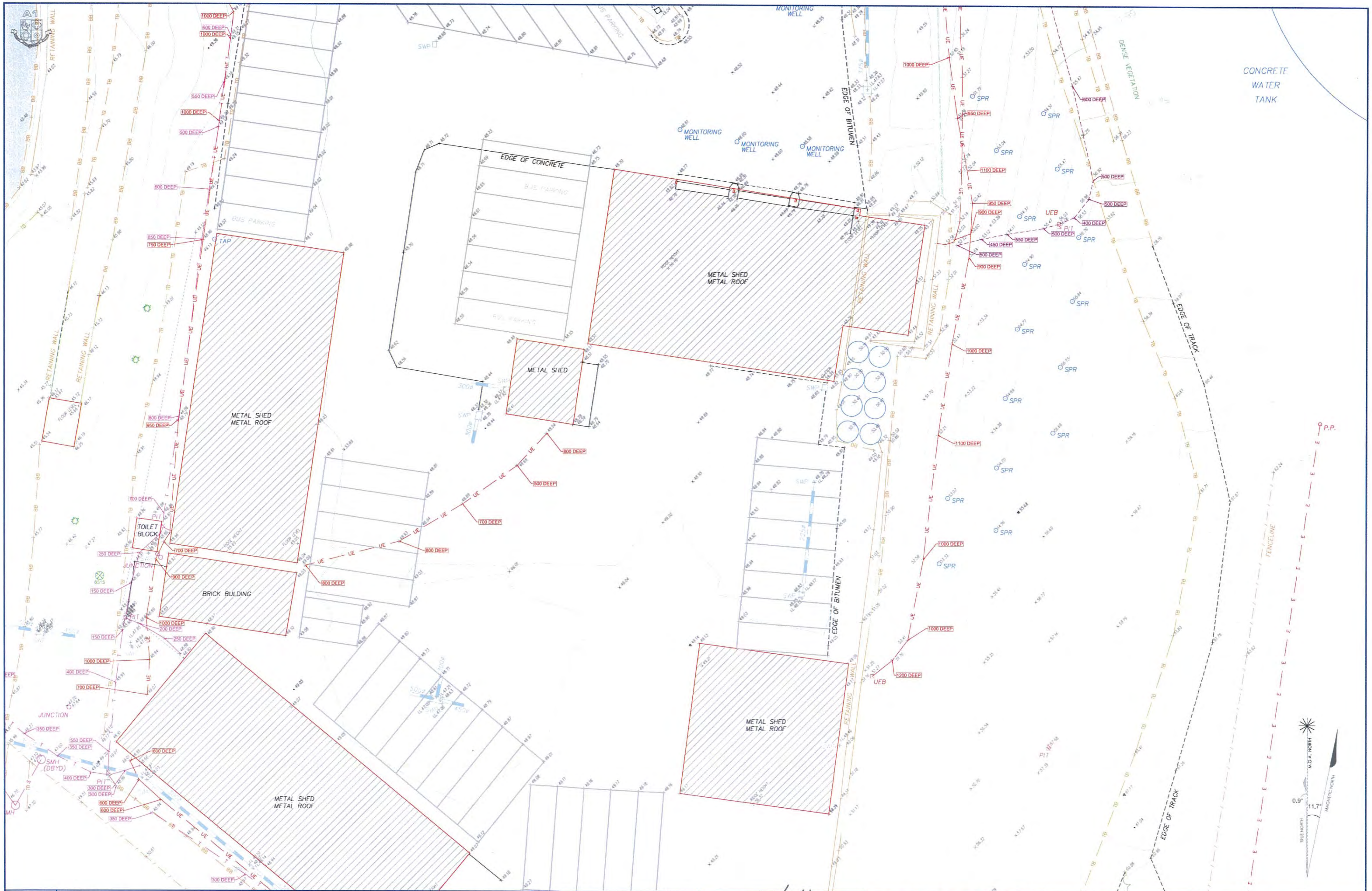
DATUM AUSTRALIAN HEIGHT DATUM		SCALE 1:200(A1)
CAD REF: 55283DETAIL		SHEET 6 OF 8



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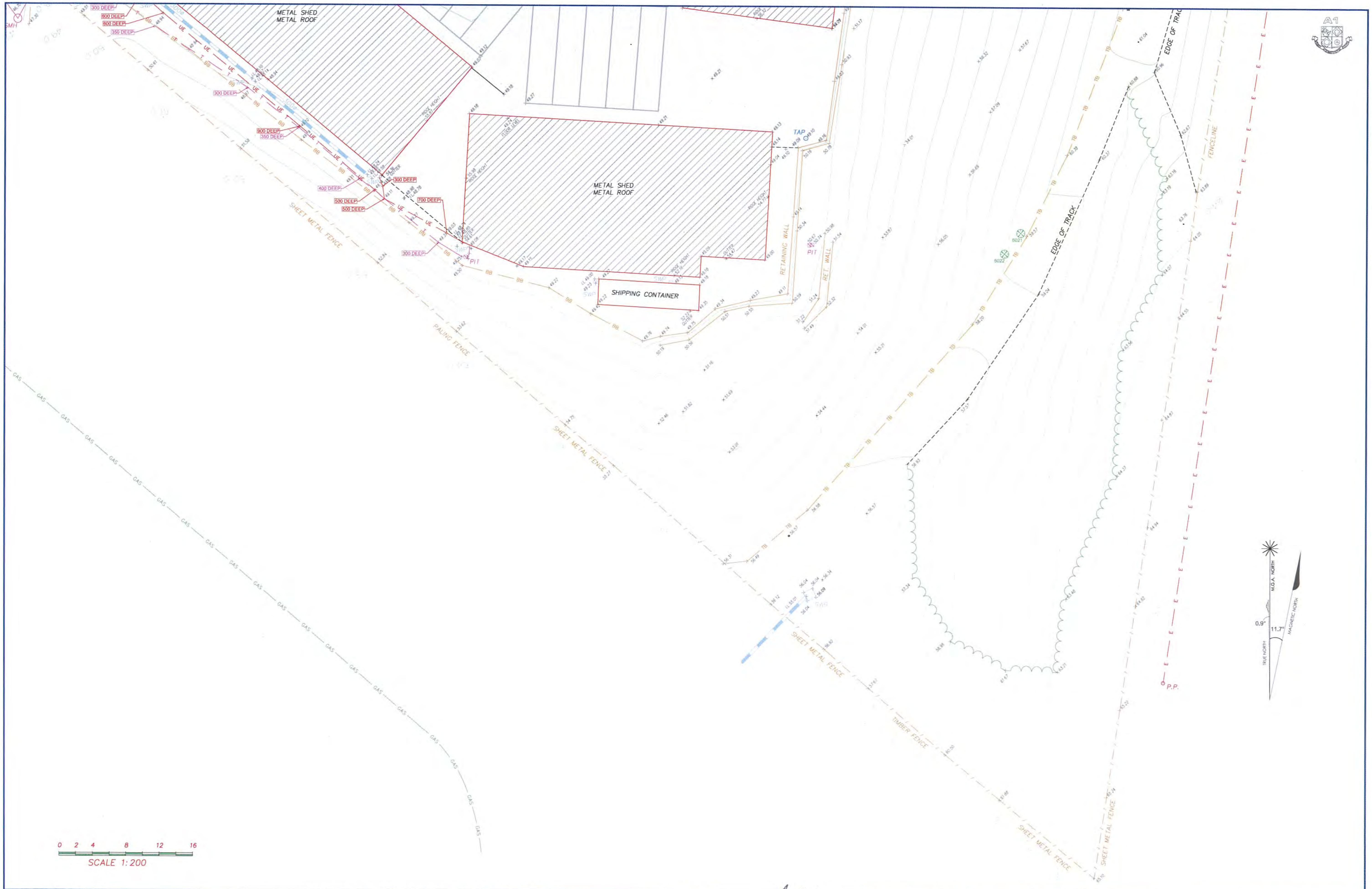
PHONE (02) 43539644 FAX (02) 43533855
Email ~admin@surveyors.com.au

LOCALITY: 67 POPLARS AVENUE, BATEAU BAY, L.G.A. CENTRAL COAST	PLAN: DETAIL AND CONTOUR SURVEY
	LOT 3 DP 716082 / AREA 5.26ha
CLIENT: THE ENTRANCE RED BUS SERVICE PTY LTD	DATUM: AUSTRALIAN HEIGHT DATUM / SCALE 1:200(A1)
PROJECT: COMMERCIAL DEVELOPMENT	CAD REF: 55283DETAIL / SHEET 7 OF 8



DIAL 1100 BEFORE YOU DIG

IMPORTANT NOTES:

1. THIS PLAN HAS BEEN PREPARED FOR THE CLIENT LISTED ON THIS PLAN ONLY, FOR THE PURPOSE OF SHOWING PHYSICAL FEATURES OF THE LAND TO ASSIST IN DESIGNING THE FUTURE DEVELOPMENT DESCRIBED HEREON AS THE PROJECT AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE.
2. UTILITY SERVICES SHOWN HEREON HAVE BEEN LOCATED WHERE POSSIBLE BY FIELD SURVEY. IF NOT ABLE TO BE LOCATED, KNOWN SERVICES HAVE BEEN SHOWN FROM THE RECORDS OF RELEVANT AUTHORITIES OR SERVICE PROVIDERS WHERE AVAILABLE.

PRIOR TO EXCAVATION OR CONSTRUCTION ON THE SITE, THE RELEVANT AUTHORITY SHOULD BE CONTACTED FOR CONFIRMATION OF LOCATION OF SERVICES.
****** DIAL BEFORE YOU DIG (CALL 1100) ******

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4. FOR ANY CONSTRUCTION ACTIVITIES PROPOSED IN CLOSE PROXIMITY TO THE BOUNDARIES OR PRESCRIBED SETBACKS, IT IS RECOMMENDED THAT THOSE BOUNDARIES BE MARKED TO AVOID THE POSSIBILITY OF ENCROACHMENT.

	AMENDMENTS	DATE
A	ORIGINAL ISSUE	27/10/20

REGISTERED SURVEYOR

DRAWN	KDM	DATE	27/10/20
SURVEYED	RD	DATE	23/10/20

Barry Hunt Associates
REGISTERED SURVEYORS AND LAND DEVELOPMENT CONSULTANTS
SUITE 4, 1 BOUNTY CL., TUGGERAH 2259
P.O. BOX 4144, BAY VILLAGE. 2261
PHONE (02) 43539644 FAX (02) 43533855
Email ~admin@surveyors.com.au
bha

LOCALITY: 67 POPLARS AVENUE, BATEAU BAY, L.G.A. CENTRAL COAST

CLIENT: THE ENTRANCE RED BUS SERVICE PTY LTD

PROJECT: COMMERCIAL DEVELOPMENT

PLAN: DETAIL AND CONTOUR SURVEY

LOT	DP	AREA
3	716082	5.26ha

DATUM: AUSTRALIAN HEIGHT DATUM

SCALE: 1:200(A1)

CAD REF: 55283DETAIL

SHEET 8 OF 8

Appendix B Existing Conditions Flood Behaviour

682 Coleridge Roas, Bateau Bay, FIA

Existing 50% AEP Flood Depth and Water Level Contours

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2023-08-29)
Figure No: BE1

Stantec

Legend

Site Boundary
0.5m Water Level Contour (mAHD)

Flood Depth (m)

- <=0.1
- 0.1 - 0.3
- 0.3 - 0.6
- 0.6 - 0.9
- 0.9 - 1.2
- > 1.2

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

682 Coleridge Roas, Bateau Bay, FIA

Existing 5% AEP Flood Depth and Water Level Contours

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2023-08-29)
Figure No: BE2

Legend

Site Boundary
0.5m Water Level Contour (mAHD)

Flood Depth (m)

- <= 0.1
- 0.1 - 0.3
- 0.3 - 0.6
- 0.6 - 0.9
- 0.9 - 1.2
- > 1.2

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Stantec

682 Coleridge Roas, Bateau Bay, FIA

Existing 1% AEP Flood Depth and Water Level Contours

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2023-08-29)
Figure No: BE3

Stantec

Legend

Site Boundary

0.5m Water Level Contour (mAHD)

Flood Depth (m)

- <= 0.1
- 0.1 - 0.3
- 0.3 - 0.6
- 0.6 - 0.9
- 0.9 - 1.2
- > 1.2

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

682 Coleridge Roas, Bateau Bay, FIA

Existing PMF Flood Depth and Water Level Contours

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2023-08-29)
Figure No: BE4

Stantec

Legend

Site Boundary
0.5m Water Level Contour (mAHD)

Flood Depth (m)

<= 0.1
0.1 - 0.3
0.3 - 0.6
0.6 - 0.9
0.9 - 1.2
> 1.2

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

682 Coleridge Roas, Bateau Bay, FIA

Existing 50% AEP Flood Velocity

Legend

Site Boundary

Flood Velocity (m/s)

- 0.00 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- 1.50 to 2.00
- 2.00 to 3.00
- > 3.00

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2023-08-29)
Figure No: BE5

Stantec

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

682 Coleridge Roas, Bateau Bay, FIA

Existing 5% AEP Flood Velocity

Legend

Site Boundary

Flood Velocity (m/s)

- 0.00 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- 1.50 to 2.00
- 2.00 to 3.00
- > 3.00

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2023-08-29)
Figure No: BE6

Stantec

682 Coleridge Roas, Bateau Bay, FIA

Existing 1% AEP Flood Velocity

Legend

Site Boundary

Flood Velocity (m/s)

- 0.00 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- 1.50 to 2.00
- 2.00 to 3.00
- > 3.00

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2023-08-29)
Figure No: BE7

Stantec

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

682 Coleridge Roas, Bateau Bay, FIA

Existing PMF Flood Velocity

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2023-08-29)
Figure No: BE8

Stantec

Legend

Site Boundary

Flood Velocity (m/s)

- 0.00 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- 1.50 to 2.00
- 2.00 to 3.00
- > 3.00

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

682 Coleridge Roas, Bateau Bay, FIA

Existing 50% AEP Flood Hazard

Legend

Site Boundary

Flood Hazard

- H1 - Generally safe for vehicles, people and buildings.
- H2 - Unsafe for small vehicles.
- H3 - Unsafe for vehicles. children and the elderly.
- H4 - Unsafe for vehicles and people.
- H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.
- H6 - Unsafe for vehicles and people. All building types considered vulnerable to failure.

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2023-08-29)
Figure No: BE9

Stantec

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

682 Coleridge Roas, Bateau Bay, FIA

Existing 5% AEP Flood Hazard

Legend

Site Boundary

Flood Hazard

- H1 - Generally safe for vehicles, people and buildings.
- H2 - Unsafe for small vehicles.
- H3 - Unsafe for vehicles. children and the elderly.
- H4 - Unsafe for vehicles and people.
- H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.
- H6 - Unsafe for vehicles and people. All building types considered vulnerable to failure.

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2023-08-29)
Figure No: BE10

20 0 20 40 60 80 m

Scale at A3: 1:1800

Stantec

682 Coleridge Roas, Bateau Bay, FIA

Existing 1% AEP Flood Hazard

Legend

Site Boundary

Flood Hazard

- H1 - Generally safe for vehicles, people and buildings.
- H2 - Unsafe for small vehicles.
- H3 - Unsafe for vehicles. children and the elderly.
- H4 - Unsafe for vehicles and people.
- H5 - Unsafe for vehicles and people All buildings vulnerable to structural damage. Some less robust buildings subject to failure.
- H6 - Unsafe for vehicles and people. All building types considered vulnerable to failure.

Notes:
1. Map displayed in EPSG:7855

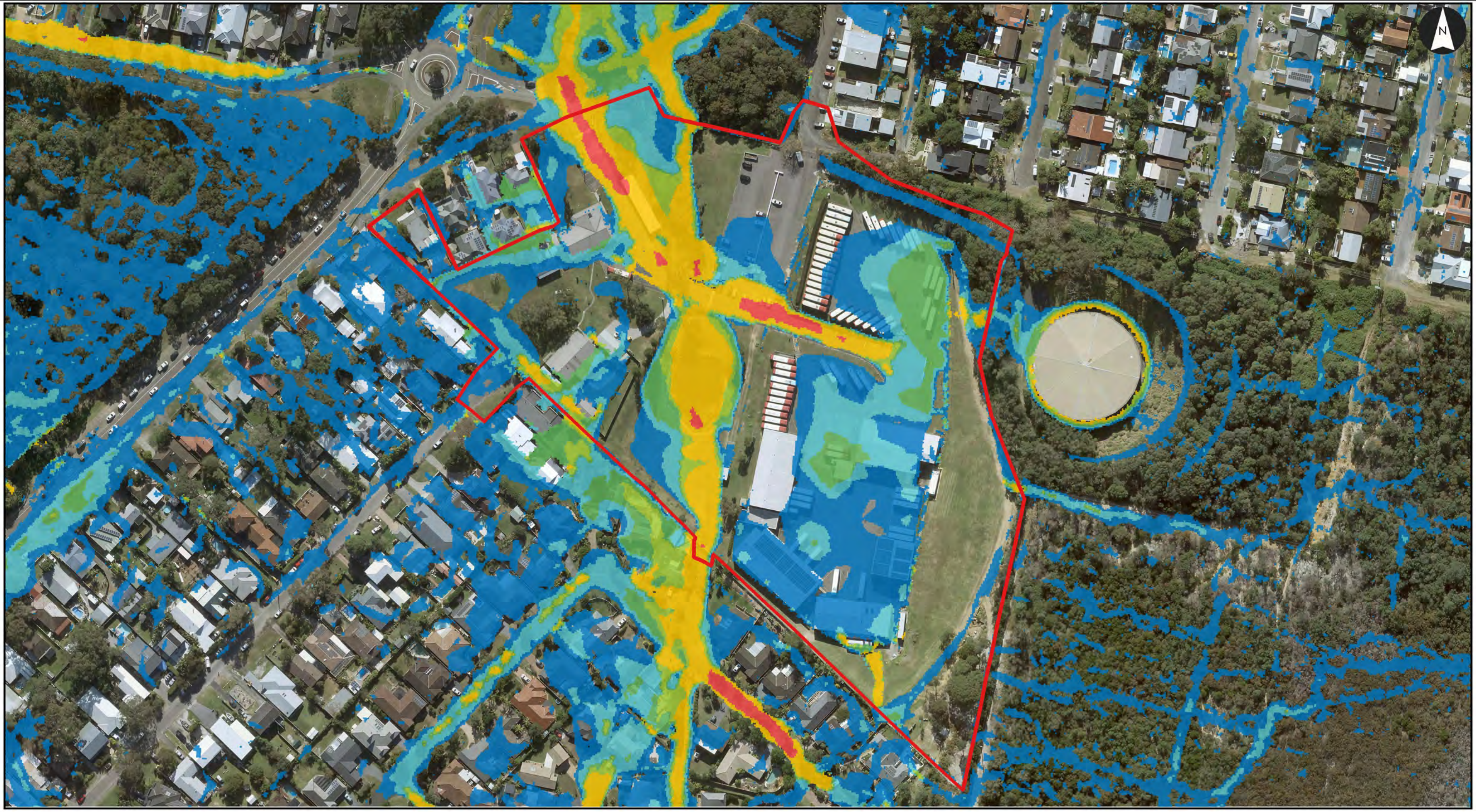
References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2023-08-29)
Figure No: BE11

Stantec



682 Coleridge Roas, Bateau Bay, FIA

Existing PMF Flood Hazard

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2023-08-29)
Figure No: BE12

Legend

Site Boundary

Flood Hazard

- H1 - Generally safe for vehicles, people and buildings.
- H2 - Unsafe for small vehicles.
- H3 - Unsafe for vehicles. children and the elderly.
- H4 - Unsafe for vehicles and people.
- H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.
- H6 - Unsafe for vehicles and people. All building types considered vulnerable to failure.

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Stantec

Appendix C Climate Change Flood Behaviour

682 Coleridge Roas, Bateau Bay, FIA

Climate Change CC10 Flood Depth and Water Level Contours

Legend

Site Boundary

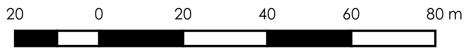
0.5m Water Level Contour (mAHD)

Flood Depth (m)

- <= 0.1
- 0.1 - 0.3
- 0.3 - 0.6
- 0.6 - 0.9
- 0.9 - 1.2
- > 1.2

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap



Scale at A3: 1:1800

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2023-08-30)
Figure No: CC1

Stantec

682 Coleridge Roas, Bateau Bay, FIA

Climate Change CC20 Flood Depth and Water Level Contours

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2023-08-30)
Figure No: CC2

Stantec

Legend

Site Boundary

0.5m Water Level Contour (mAHD)

Flood Depth (m)

- <= 0.1
- 0.1 - 0.3
- 0.3 - 0.6
- 0.6 - 0.9
- 0.9 - 1.2
- > 1.2

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

682 Coleridge Roas, Bateau Bay, FIA

Climate Change CC10 Flood Velocity

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2023-08-30)
Figure No: CC3

Stantec

Legend

Site Boundary

Flood Velocity (m/s)

- 0.00 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- 1.50 to 2.00
- 2.00 to 3.00
- > 3.00

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

682 Coleridge Roas, Bateau Bay, FIA

Climate Change CC20 Flood Velocity

Legend

Site Boundary

Flood Velocity (m/s)

- 0.00 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- 1.50 to 2.00
- 2.00 to 3.00
- > 3.00

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2023-08-30)
Figure No: CC4

20 0 20 40 60 80 m

Scale at A3: 1:1800

Stantec

682 Coleridge Roas, Bateau Bay, FIA

Climate Change CC10 Flood Hazard

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2023-08-30)
Figure No: CC5

Stantec

Legend

Site Boundary

Flood Hazard

- H1 - Generally safe for vehicles, people and buildings.
- H2 - Unsafe for small vehicles.
- H3 - Unsafe for vehicles, children and the elderly.
- H4 - Unsafe for vehicles and people.
- H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.
- H6 - Unsafe for vehicles and people. All building types considered vulnerable to failure.

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

682 Coleridge Roas, Bateau Bay, FIA

Climate Change CC20 Flood Hazard

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2023-08-30)
Figure No: CC6

Stantec

Legend

Site Boundary

Flood Hazard

- H1 - Generally safe for vehicles, people and buildings.
- H2 - Unsafe for small vehicles.
- H3 - Unsafe for vehicles, children and the elderly.
- H4 - Unsafe for vehicles and people.
- H5 - Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.
- H6 - Unsafe for vehicles and people. All building types considered vulnerable to failure.

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

682 Coleridge Roas, Bateau Bay, FIA

Climate Change CC10 less 1%AEP Water Level Difference

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2023-08-30)
Figure No: CC7

Stantec

Legend

Site Boundary

Wet/Dry Analysis

Was Wet, Now Dry

Was Dry, Now Wet

Water Level Difference (m)

< -0.50

-0.50 to -0.20

-0.20 to -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.20

0.20 to 0.50

> 0.50

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

682 Coleridge Roas, Bateau Bay, FIA

Climate Change CC20 less 1%AEP Water Level Difference

Client: Red Bus Services Pty Ltd
Project Code: 300203848
Drawn By: HR, Checked By: VJ
Date: (2023-08-30)
Figure No: CC8

Legend

Site Boundary

Wet/Dry Analysis

Was Wet, Now Dry
Was Dry, Now Wet

Water Level Difference (m)

< -0.50
-0.50 to -0.20
-0.20 to -0.10
-0.10 to -0.05
-0.05 to -0.01
-0.01 to 0.01
0.01 to 0.05
0.05 to 0.10
0.10 to 0.20
0.20 to 0.50
> 0.50

Notes:
1. Map displayed in EPSG:7855

References:
1. Australia Latest Metromap

20 0 20 40 60 80 m

Scale at A3: 1:1800

Key Map

Stantec

Appendix D Concept Development Plan

DIAL 1100 BEFORE YOU DIG

IMPORTANT NOTES:

1. THIS PLAN HAS BEEN PREPARED FOR THE CLIENT LISTED ON THIS PLAN ONLY, FOR THE PURPOSE OF SHOWING PHYSICAL FEATURES OF THE LAND TO ASSIST IN DESIGNING THE FUTURE DEVELOPMENT DESCRIBED HEREON AS THE PROJECT AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE.

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****** DIAL BEFORE YOU DIG (CALL 1100) ******

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	AMENDMENTS	DATE
E	PEDESTRIAN ACCESS	7/12/22
D	LOW/MEDIUM DENSITY ZONING	14/10/22
C	AMENDED PROPOSED LOTS	12/10/22
B	PRELIMINARY SERVICING LAYOUT	31/1/22
A	ORIGINAL ISSUE	2/11/21

REGISTERED SURVEYOR

DRAWN	KDM	DATE	2/11/21
SURVEYED	RD	DATE	23/10/20

Barry Hunt Associates
REGISTERED SURVEYORS AND LAND DEVELOPMENT CONSULTANTS
SUITE 4, 1 BOUNTY CL., TUGGERAH 2259
P.O. BOX 4144, BAY VILLAGE. 2261
PHONE (02) 43539644 FAX (02) 43533855
Email ~admin@surveyors.com.au

LOCALITY : 682A & 688 THE ENTRANCE RD
BATEAU BAY
L.G.A. CENTRAL COAST

CLIENT : THE ENTRANCE RED BUS SERVICE PTY LTD

PROJECT : PROPOSED DEVELOPMENT

PLAN : CONCEPT SUBDIVISION LAYOUT

LOT	3 64	DP	716082 22600	AREA	5.26ha 572m²
DATUM	AUSTRALIAN HEIGHT DATUM			SCALE	1:750(A1)
CAD REF:	55283DSUB			SHEET	1 OF 1