Love Project Management

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24th December, 2018

General Manager
Port Macquarie – Hastings Council
PO Box 84
PORT MACQUARIE NSW 2444
Delivered by hand at Port Macquarie offices

Attn: Leanne Fuller

Dear Leanne,

RE: Planning Proposal – Mumford St, Port Macquarie

Reference is made to the abovementioned planning proposal. Please find attached a USB containing a secondary copy of the reports lodged with Council via email on Friday, 21st December, 2018. This electronic copy is provided simply to ensure the documents have been received by Council – and therefore the reports are being lodged with Council via two methods.

Wishing you a Merry Christmas. I will be on leave until Monday, 7th January, 2019.

Please don't hesitate to contact the project manager for this Planning Proposal, Alan Taylor, regarding these matters.

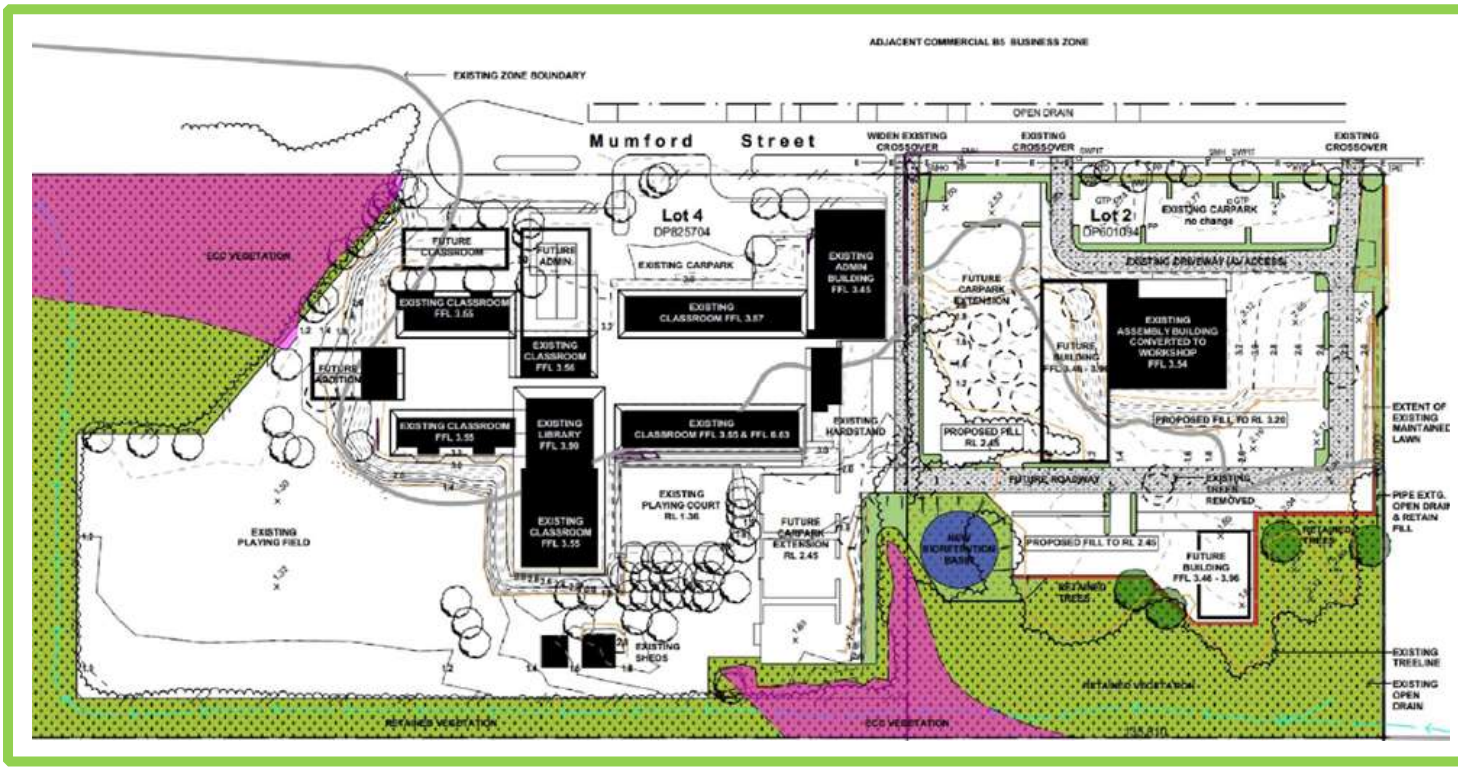
Regards

MLove.

Michelle Love

Love Project Management
PO Box 161 Wauchope NSW 2446 Phone: 0400953101
ABN: 26 108 622 745

Planning Proposal Application
Mumford Street
PORT MACQUARIE



Michelle Love, Project No 6563
Love Project Management

December, 2018

Document Details

Document Version Date: December, 2018

Authorised by: Michelle Love

Signed: 

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All parties must acknowledge that conditions of approval at time of consent, post development application and approvals, and other matters, may modify the outcomes described in this report. The information and conclusions presented in this report apply to the subject land at the time of the assessment. All parties must take into account the above information when making decisions on the basis of the findings and conclusion of this report.

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Executive Summary

This report is a revision and updated report based on the document provided in February 2018. This report refers to the legislation which came into force since the February 2018 reports and assessments were completed and lodged with Council. The legislative change since that time includes the introduction of State Environmental Planning Policy (Coastal Management) 2018. The additional information provided includes a modified concept plan which has reduced the footprint of the proposal and rationalised the stormwater controls. The revised engineering plans address the Coastal SEPP and the comprehensive ecological assessment has been the driving force behind the revised development footprint. Based on these investigations, a zone plan has been included with this information.

Council now has sufficient information to consider the planning proposal and utilise this information to correct the historic inaccuracies that exist in the current planning controls over the subject land.

Contents

1. Introduction & Background

The subject land is comprised of two parcels of land with the western property being a long established primary and secondary school with several buildings and a large sporting area / playground. The eastern property was previously developed as a community church with a sealed carpark. The majority of the land has been maintained as a mown lawn. At the rear of both lots is a manmade drainage channel which drains to the west into a large wetland area.

This Planning Proposal application responds to the apparent discrepancy in the existing landuse zones for the subject land. A large area of the southern section of land is zoned for Environmental Conservation, however this zone boundary does not appear to relate to any physical features of the subject land. The northern area of the land is zoned for residential development.

The sale of the church site based on the ultimate use of the land as an extension of an adjacent vehicle sales and service business operation, led to the need to review the zone boundaries and identify suitable zoning for the land. As part of a comprehensive review of the context, it was noted that the adjoining school needed to also review their zone boundaries due to approvals to increase student numbers and a requirement for additional onsite parking.

Therefore, a Planning Proposal was first discussed with Council in 2014, and property negotiations and discussions commenced. The culmination of the required investigations is now the basis of this Planning Proposal application.

It is noted that the information sought by the Department of Planning at this stage of the Planning Proposal application is not intended to be to the level required for a development application.

The Department of Planning & Environment set out the following in their Guide to Preparing Planning Proposals:

> *It is not expected that a Council or proponent will provide comprehensive information to support a request for a Gateway determination. As a minimum, a planning proposal before a Gateway determination has been issued must identify relevant environmental, social, economic and other site specific considerations. The planning proposal document may identify the need for investigations and an approach for addressing the issues.*

By way of further explanation, the Guidelines provide the following Explanatory Note:

> *Where vegetation management is an issue for a large site to be rezoned, it would be sufficient for the planning proposal to be submitted to the Gateway to identify the issue and indicate what environmental studies may be necessary to assess and analyse the value and location of the vegetation and how the matter(s) could be addressed.*

2. Subject Land & Locality

The subject land may be identified as Lot 2 DP 601094 and Lot 4 DP 825704, 11 – 33 Mumford Street, Port Macquarie. The locality plan is shown in the following figure.

Figure 1: Locality Plan (Source: DavidPensiniReport)

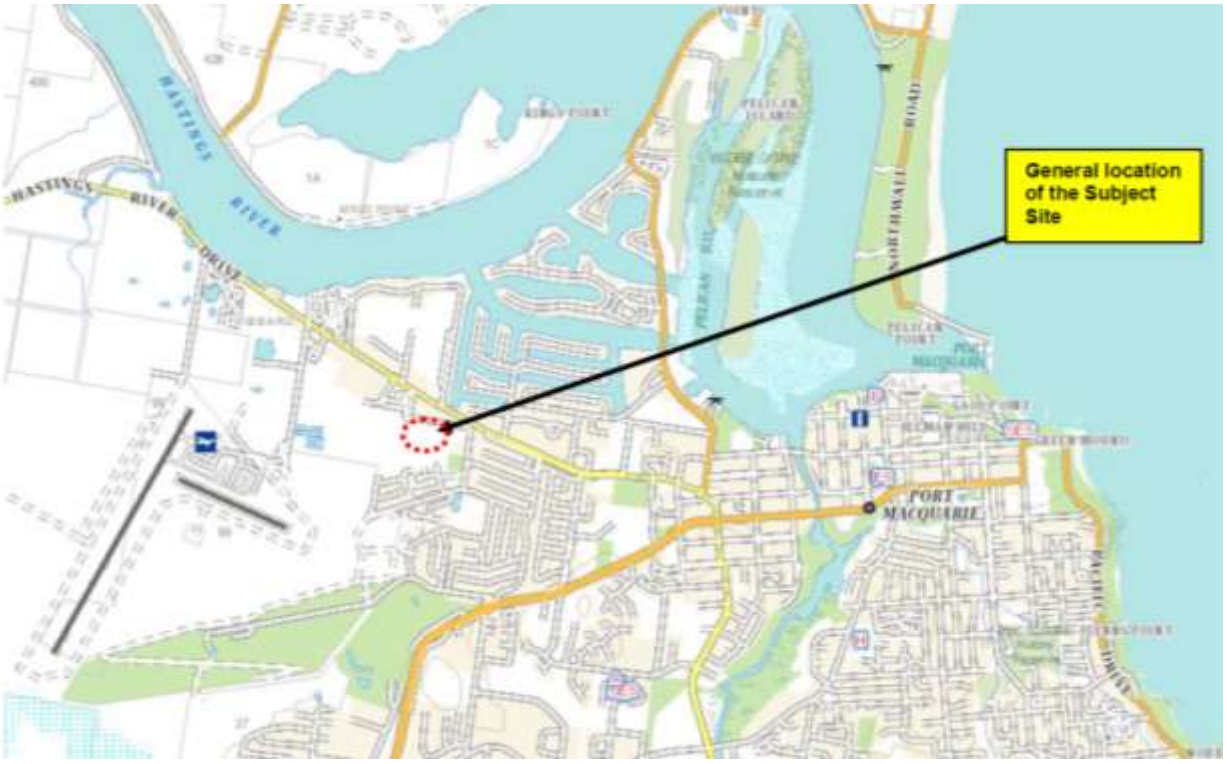


Figure 2: Subject Land outlined in red

The subject land is currently occupied by a primary and high school on Lot 4 (western lot) with associated onsite parking, bus stop at the front of the school, and onsite playgrounds and sporting facilities for students. Lot 2 (eastern lot) is occupied by a large building which has previously been used as a church, with a sealed carpark on the northern side of the property, and mown areas which have been used for overflow parking previously. This western lot has more recently been used for overflow parking by the new owner of the property, in connection with a vehicles sales and repair yard on adjacent land.

The subject land adjoins wetland and low lying scrub vegetation on land to the west and south-western areas. The south-eastern adjoining land is a large lot residential site. The eastern neighbouring properties are currently occupied by a variety of urban uses including boarding kennels, local church, residential development, and a large recreation facility being T's Tennis Centre.

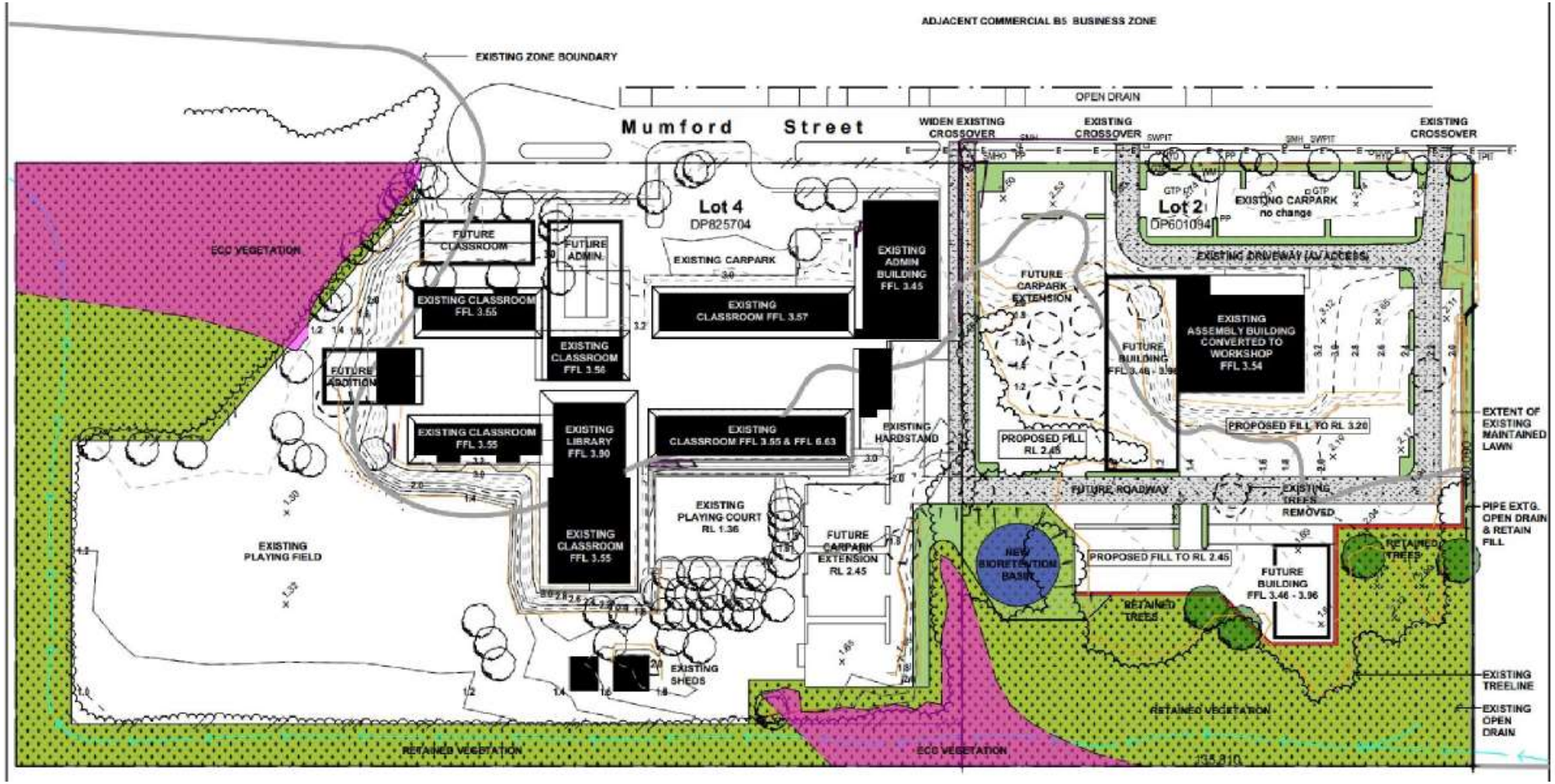
The northern boundary of the land is Mumford Street, with the properties on the other side of this road being the rear of the Melaleuca Village manufactured home park to the very north-western side, and the majority of the northern boundary being the various vehicle sales and repair yards.

Therefore, it may be seen that there is quite a wide variance in landuses in this locality.

3. Proposed Landuse

The proposal is to amend the landuse zones to facilitate additional onsite parking as part of the approved expansion to the existing school, and to rezone the eastern allotment to allow expansion of the vehicle sales and repair operations as currently exist on the adjacent land. The Concept Plan for this proposal is as shown in the following plan. This Concept Plan has been modified a number of times as a result of the site investigations, and particularly in response to flooding and environmental matters.

Figure 3: Concept Plan



The proposal for Lot 4 (School Site) is based on the number of additional students approved for the school. In order to achieve the approved number of students, there is a requirement for additional onsite parking. The school has existing use rights which provides for minor additions, however, in order to achieve the use of the existing cleared area of the school site, changes to the zone boundaries will be required.

The existing zone line is shown on the Concept Plan, and it is obvious that this line does not reflect the environmental significance of the land. There are a number of approved school buildings and playing fields located within the area currently zoned for environment protection. Therefore, the proposal is to map the environment protection zone to align with the areas of Lot 4 which actually contain environmentally significant vegetation and communities. This includes the coastal wetland area in the far north-western corner of the property, and the strip of vegetation along the southern drainage line.

The proposal for Lot 2 (ex Church site) is to utilise this property as part of the vehicle sales and repair business operations which currently exist on the adjacent property. The existing church building is a large hall which may be readily converted to vehicle repairs, and the existing carpark and open lawn areas of the property may be utilised for vehicle storage and parking.

Council's Flood Policy requires the proposed landuses to include filling of floodprone land, and a detailed flood analysis has been undertaken by qualified consultants. The Concept Plan has been modified to reflect the outcome of various flood modelling concepts to ensure the final design was compliant with flood standards such that no adverse impacts on adjoining lands would occur as a result of the filling of the subject land.

The proposal seeks the rezoning of the Lot 2 land to IN2 - Light Industrial, such that the following landuses are permissible with consent: vehicle body repair workshop, vehicle repair station and vehicle sales or hire premises. This would enable Council to consider a development application for such landuses, subject to the proposal is managed and conditioned to ensure it did not have any adverse impact on adjoining landuses.

Both properties require an amendment to the height limit, such that a maximum building height of 11.5m is sought. This reflects the development on the adjacent land in Mumford Street, and also enables the proposed developments to be undertaken with the inclusion of land filling – noting that building height is measured from the existing ground level. The floor space ratio is not proposed to be altered and would remain at 0.65:1 This ensures that the long term development of the subject land will have significant side setbacks and would be required to retain large areas of open space on the land.

4. Analysis of Subject Land & Proposal

The subject land has been investigated in relation to the required filling of the land, the additional traffic demands on the road network, the extension of infrastructure, the building bulk impacts, and the culminative impacts on the environment. The impact on downstream wetland and buffer areas has also been assessed. The Concept Plan has been amended a number of times to address the various modelling required to ensure the correct balance of the site development is achieved.

The outcome of these investigations and modifications is a Concept Plan which satisfies the most current of legislative requirements and data modelling. The separate consultant reports and consultations are attached as appendices to this Planning Proposal application, and discussed in summary as follows.

4.1 Traffic Impact Assessment

The Traffic Impact Assessment was based on criteria set oout in the RMS Guide to Traffic Generating Developments, Austroads Guide to Traffic Management, as well as Port Macquarie – Hastings Development Control Plan.

The report notes that Lot 2 contains an existing large assembly building, and an existing sealed carpark for 60 vehicles. The assessment of future impacts was based on a Concept Plan to utilise the existing assembly building as a vehicle repair station comprising a number of workbays and associated staff, plus onsite parking area for vehicle storage.

The development of Lot 4 (School) was based on traffic surveys completed previously, with the most recent being in May 2017. The previous study noted the approval for student numbers to reach 500 students, and that additional onsite carparking would be required when the student numbers exceeeded 444 students.

The Traffic Impact Assessment included morning and afternoon peak traffic movements, and the results are included in the report. The report concluded that the proposals would not adversely impact on traffic flows, however the full development of Lot 2 may require an upgrade of the nearest intersection to better manage traffic flows in this location.

4.2 Acid Sulphate Soils Assessment

The Acid Sulphate Soils Assessment report notes the aim is to "*demonstrate that the future development of the land can be undertaken without negative impacts associated with the disturbance of acid sulphate soils beyond that which would be associated with existing conditions"*.

The potential acid sulphate soils mapping for the locality identified the site as containing Classes 2, 3 and 5 soils. Based on the assessment undertaken, it was noted that there was a high probability of Acid Sulphate Soil conditions on the subject land, and thus, an Acid Sulphate Soils Management Plan would be required to address soil disturbance. The report notes that the "*active management of future construction activities will be required in order to respond to the risks associated with the disturbance of ASS on the subject site*".

The report further notes: "*…based upon the nature and scale of the proposed development it is possible for the future development of the subject site to be undertaken so as to not result in acid sulphate soil impacts which could not be mitigated through the adoption of best practice ASS management principles. In this regard the filling of the subject site to provide for flood free building platforms can significantly reduce the potential impacts associated with ASS*".

The report concludes: "*Based upon the information contained within this report, there are no Acid Sulphate Soil related constraints to the proposed rezoning of portion of the subject site*".

4.3 Noise Impact Report

A Noise Impact Report was undertaken with the aim to "*determine the potential noise impacts associated with the future development of the subject site and its impct on sensitive residential receivers in the area*".

The assessment has been based on the Concept Plan and typical noise level information, as this application relates to a rezoning proposal and not a development application.

The acoustic environment of the locality is not a typical urban residential area, but rather a mixture of commercial, business, light industrial, educational and open space areas of land. The DECC's Noise Policy for Industy was applied, noting that intrusive noise is limited to 5dB(A) above background noise level, as well as protection of amenity.

The report concluded "*It is possible for the future development of the subject site to be undertaken so as to not result in noise related landuse conflicts which could not be mitigated through the adoption of best practice noise management principles. In this regard the acoustic impacts associated with anyfuture development of the subject site should be the subject of development specific noise impact assessment. Based upon the information contained within this report there are no noise related constraints to the proposed rezonig of portion of the subject site*".

As previously noted, the density of development has been limited by the proposed floor space ratio, and this will assist in ensuring adequate setbacks are achievable to provide separation between landuses, as well as providing adequate area for noise mitigation if required.

4.4 Stormwater Management

The standards for Stormwater Management are that there should not be any increase over predevelopment flows. The development of the land will require the placement of fill material on the land. The period of time during these earthworks will require erosion and sediment controls in place, and this is a standard requirement for any development consent issued by Council. All finished batters will be maintained in a scour free state.

A BioRetention Basin forms part of the Concept Plans and this is included in the Stormwater Management Plan. Gross pollutant traps form part of these structures. The sizing of the area for the BioRention Basin on site has been modified based on the calculations undertaken by Advisian. The more detailed stormwater management works are included in the Advisian Hydrology Impact Assessment Report.

The Stormwater Management Plan prepared by Alan Taylor & Associates notes that the:

Receiving catchment will be protected from

(a) Filling works for any hardstand or carpark by Erosion and Sediment Controls to Council standard;
(b) Long term carpark / hardstand runoff by a Bio Retentio Basin;
(c) Roofwater by detention tanks and scour / velocity outlets to Council standard; and
(d) Scour and particle loss of batters by concrete kerbs directing runoff to pits.

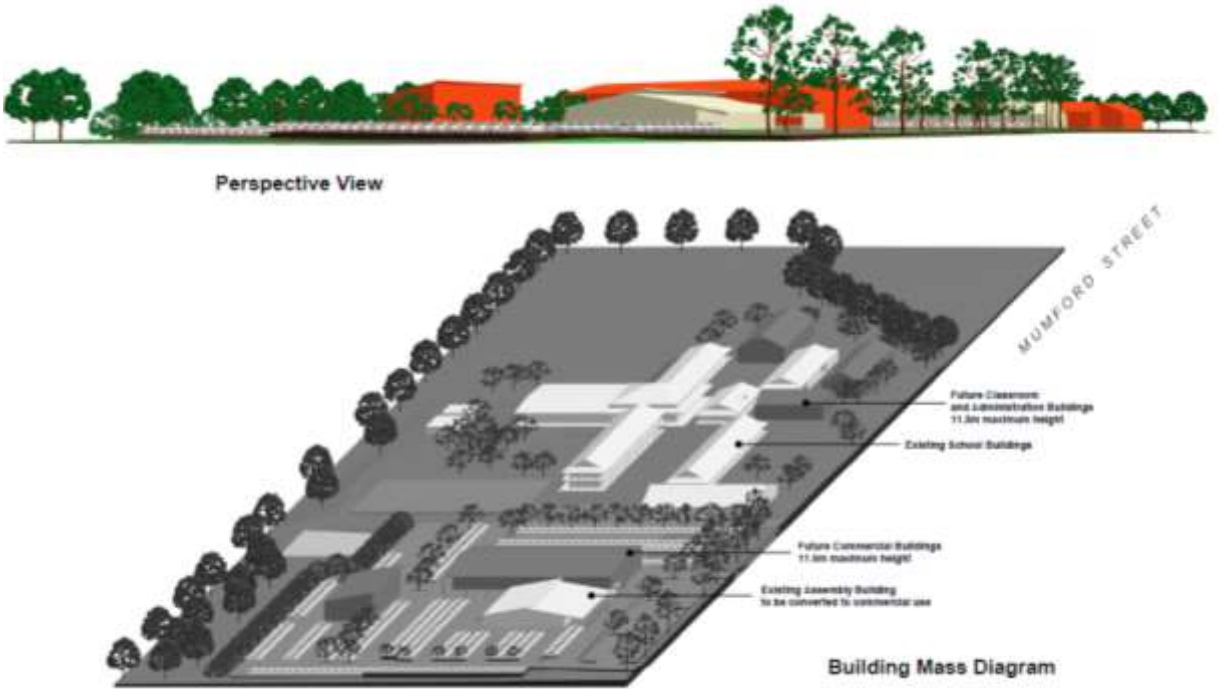
A full copy of the Stormwater Management Plan is included with the appendices to this Planning Proposal application.

4.5 Building Mass

As previously noted, the overall building height for the subject land is to be increased to 11.5 metres. This is the same as the adjacent land on the other side of Mumford Street. This is also reflective of the buildings heights in this locality. The building height will enable the development to be achieved in addition to the required filling works on floodprone land.

The proposal does not involve any change to the floor space ratios. This effectively constrains development on the subject land and minimises building mass. Modelling of the Concept Plan has been undertaken to demonstrate the building mass which would arise from the proposal. It may be seen that the development would not adversely impact on the adjoining sites, and there is sufficient area available to incorporate screen planting.

Figure 4: Building Mass of Concept Plan



4.6 Flood Impact and Risk Assessment

The subject land is identified as flood prone. The Concept Plan requires an extensive area of land filling over the eastern allotment. The school site has been the subject of land filling for the previous developments, and some additional filling will be required for the proposed works on that site. Only minor filling is required for carpark areas.

An analysis of the Concept Plan was undertaken by Advisian (incorporating Worley Parsons). This company has previously been engaged by Port Macquarie – Hastings Council to undertake the flood modelling for the Hastings River, including the increased levels associated with climate change. This data was used to update the current flood maps, as well as update Council's flood policy. Therefore, the data used for this proposal is based on the latest flood information and is compliant with Council's flood policy provisions.

The report considers the impact of the proposed filling on local flood characteristics including peak flood levels and flow velocities. The report also documents the potential mechanisms for evacuating the site during major floods including available warning times and potential evacuation routes.

The report notes the following with regard to Council's Flood Policy Compliance: Minimum 8 hours warning time – the modelling estimates between 8.5 – 13.5 hours warning time available. A safe reliable evacuation route is available and is not cut by the 5% AEP flood level. This evacuation route grades upwards to the approved Flood Evacuation Centre (Westport High School).

The report concludes that the proposal is compliant with Council's requirements and SES evacuation requirements. The proposed development is predicted to cause no change in 1% AEP flood hazards across adjoining properties.

A full copy of the report is included in the Appendices section.

4.7 Hydrology Impact Assessment

The introduction of State Environmental Planning Policy (Coastal Management) 2018, provided additional hydrological matters to be considered for landuses on the subject land. The relevant section 117 Direction for planning proposal matters, requires the consent authority to be satisfied that the future development of the land is likely to be able to satisfy the provisions of the Coastal SEPP.

Therefore, whilst the proposal for the subject land is conceptual only at this stage, the concept plan has been assessed by Advisian in relation to the provisions of the Coastal SEPP, and their Hydrological Assessment is included with the information lodged with this Planning Proposal.

The Hydrological Assessment considered both the provisions of the Coastal SEPP, as well as Council's stormwater controls and setout in the Design Specification D7.

The stormwater controls designed by Advisian were modelled. The reports notes that the function of the bioretention basin "*is to filter stormwater runoff via a densely vegetated layer and sand and loam filter media. As the water moves through the system pollutants are captured by filtration, adsorption and biological processing. Bioretention systems area effective at removing litter, fine sediment, phosphorous, nitrogen, metals and hydrocabons from stormwater. The treated water discharges to groundwater or is conveyed via subsoil pipes to a downstream drainage system or receiving water*".

In regards to the potential impact of the proposed works on local groundwater and the nearby coastal wetland, the installation of the proposed bioretention / detention basin was found the reduce the impacts of the development by both treating and controlling the discharge of runoff from the site. The assessment determined the following:

- *The post development peak flows do not exceed the pre-development peak flows, and the difference between them has been minimised to reduce the impact on the local groundwater and the downstream wetland;*
- *Both Council's pollutant reduction targets are met, as well as Council's eco-system concentration targets. Therefore, from a quality perspective the impact on local groundwater and the downstream wetland will be minimal.*

Therefore, this assessment by Advisian has demonstrated that the proposal is capable of being compliant with the provisions of the Coastal SEPP.

4.8 Environmental Assessment

A complete environmental assessment has been undertaken for the Concept Plan. The report notes that most of the site is dominated by lawns, with a few remnant native trees and planted native and exotic trees and shrubs. The swamp forest areas are dominated by Broad-leaved Paperbark with a lesser abundance of Swamp Mahogany. No threatened plants were detected. An analysis of soils was somewhat inconclusive in regards to alluvial soil classification, and therefore a precautionary approach has been taken and some areas of the swamp forest have been assumed to qualify as the Endangered Ecological Community – Swamp Sclerophyll Forest on Coastal Floodplains.

The site was identified as having a lack of hollow bearing trees and also very limited connectivity due to the urbanisation of the locality. A 2005 survey identified koala and squirrel glider on site, however these species were not identified in the 2018 fieldwork. The site qualifies as core koala habitat and therefore any future development proposals will require the preparation of a Koala Plan of Management (KPOM), unless Council's coastal KPOM is adopted in the meantime.

The Coastal SEPP provisions with regards to Coastal Wetland and Coastal Wetland Proximity areas was considered in the ecological assessment. It was noted that no works within the wetland areas would be undertaken, and it was considered that the proposal was unlikely to significantly impact the attributes of the wetland.

The Biodiversity Conservation Act 2016 and the Commonwealth Environment Protection Biodiversity Conservation Act 1999 were considered with regard to the Concept Plan. It was determined that referral to the Commonwealth Department of Environment and Energy was not likely to be required under the EPBC Act. The final assessment under the relatively new Biodiversity Conservation Act would depend on the final plans for Lot 2, whilst the development on Lot 4 was considered to only require a five part test.

The Ecological Assessment identified a number of ameliorative measures, which are summarised as follows:

- Offset loss of some areas of swamp forest on Lot 2 and a reduction in the DCP 2013 guideline for EEC buffer, to be offset via bush regeneration works. Control of lantana and winter senna infestation as well as planting current pasture areas on Lot 2 to widen the and of vegetation in the south. These works to be undertaken via a Vegetation Management Plan with any future development approval;
- Two koala food trees to be removed are to be replanted at a 5:1 replacement ratio with a 5m x 5m spacing.
- Retained vegetation to be fenced off and protected during site works;
- Pre clearing koala surveys to be undertaken;
- Erosion and sediment control measures required during construction works, including silt fences and hay bales to protect downstream aquatic habitats.

- Donation of trees to local organisations;
- If security fencing is replaced or upgraded, then the new fencing should be designed to not pose an entanglement risk and include A frame structure to facilitate koala movement;
- Artificial lighting should minimise light spillage onto retained habitat areas and no lighting should be directed towards haitat areas.

These ameliorative measures may be incorporated into any future development approvals on the subject land.

4.9 Aboriginal Cultural Heritage

The Birpai Aboriginal Land Council were engaged to inspect the subject land and provide a response regarding whether the subject land contained any objects or was a place of importance or part of any wider cultural landscape for local Aboriginal people and the area. The consultation was also to determine whether any potential harm would arise to Aboriginal cultural heritage, and if so, the significance of any such potential harm.

Following the site inspection, and consultation with local Aboriginal peoples, the report noted that no sites were known or identified on the subject land. The report conclusion is as follows:

"*Based on the site inspection and other investigation, there is no reason from an Aboriginal Cultural and Heritage perspective that this rezoning cannot proceed. However, during any earthworks, in the event of any items of Aboriginal significance being found on the site, work is to cease and a Sites Office from the Birpai Local Aboriginal Land Council is to be engaged to determine how best to proceed*".

The requirement to cease work should any artefacts be identified during site works is a legal and standard requirement for any future development proposal for the subject land.

4.10 Bushfire

A Bushfire Hazard Assessment has been undertaken for the subject land based on the Concept Plan design. The report found that a portion of the subject land was mapped as being bushfire prone. The recommendations include adopting Landscape Principles as set out in the report, adopting the Asset Protection Zones required for existing and future development (particularly the special uses developments – being schools), Preparing and adopting a Vegetation Management Plan for the southern area of vegetation, constructing buildings to the required standards to satisfy the Bushfire Attack Levels identified in the report, and ensuring internal access roads comply with the Bushfire Standards. Any Vegetation Management Plan will need to have regard to the requirements for Asset

Protection Zone maintenance. As noted in the Bushfire Hazard Assessment, the school development is considered infill development, however the buildings will likely require construction to a BAL standard or other mechanisms used to ensure compliance with the provisions of the Planning for Bushfire Protection document.

A full copy of the report is included in the Appendices section.

4.11 Retail Hierarchy / Employment Lands

Council's recently exhibited Urban Growth Management Strategy, included a number of supporting documents including a review and analysis of the retail hierarchy across the Port Macquarie – Hastings area. The strategy is essentially to maintain Port Macquarie as the Regional City and ensure that other retail areas do not usurp this status.

This Planning Proposal is for a minor additional to light industrial land. The landuse proposal is not considered to have any function in reducing the retail hierarchy of the Port Macquarie town centre. This precinct of Hastings River Drive has a long established pattern of containing the majority of vehicle sales and service businesses. This proposal is a reinforcement of this pattern, and will support an existing business operation.

The expansion of the school will not adversely impact on the established retail hierarchy, or create any additional employment lands.

Therefore, the Planning Proposal is not considered to adversely alter or impact on the Retail Hierarchy or location of Employment Lands as set out in Council's most recently exhibited Urban Growth Management Strategy.

5. Purpose of the Planning Proposal (Objectives or Intended Outcomes)

The intended outcome of this Planning Proposal is set out as follows:

The intended outcome is urban development across the subject land that is:

- able to be serviced with essential infrastructure;
- compatible with the local environment;
- well designed to facilitate social wellbeing; and
- compatible with surrounding landuses.

The objective is to provide planning based controls which enable urban development to be undertaken whilst achieving the above outcomes.

The secondary objectives are as follows:

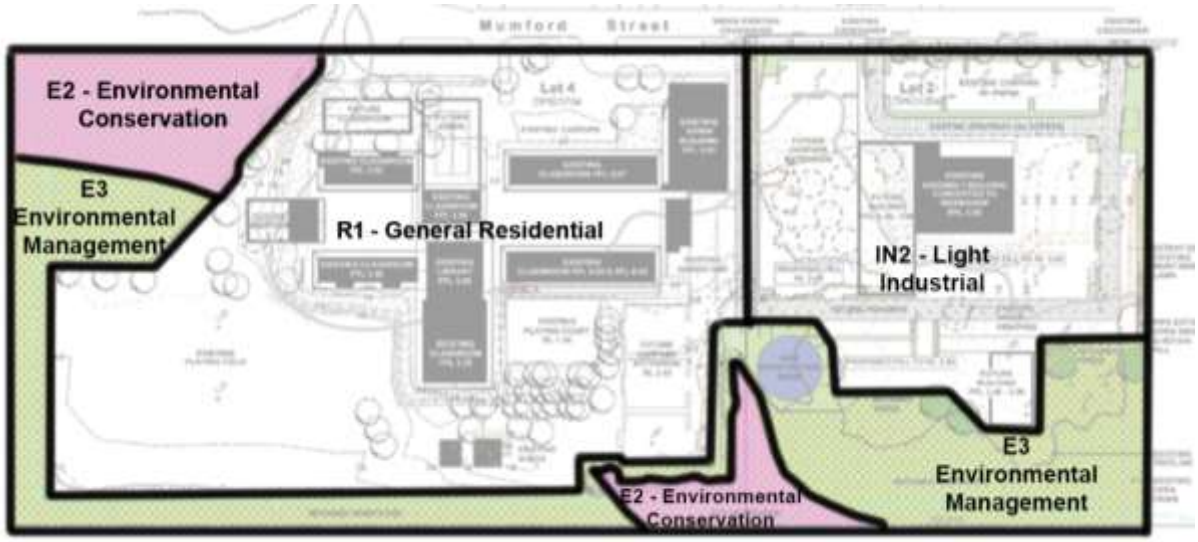
- to apply an E2 – Environmental Conservation zone over the parts of the subject land identified as containing environmental features.

The Planning Proposal will rectify the current anomaly in the alignment of the zone boundaries, and also facilitate the long term use of the subject land.

The Planning Proposal will require amendments to the LEP mapping including the Land Zoning Map, the Lot Size Map, Height of Building Map, and Koala Habitat Map.

The proposed zone map is shown as follows:

Figure 5: Proposed zone map with Concept Plan



6. Strategic Justification of Proposal

The Department of Planning & Environment issued a Guide to Preparing Planning Proposals, which refers to the questions to be considered when demonstrating a justification for the Planning Proposal.

(a) Need for the Planning Proposal

- *Is the planning proposal a result of any strategic study or report?*

The subject land is not specifically identified in Council's Urban Growth Management Strategy, nor in the North Coast Regional Plan map. The proposal makes a correction to a zone map error and a minor change to the zoning of part of the subject land.

- *Is the planning proposal the best means of achieving the objectives or intended outcomes, or is there a better way?*

  Amending the zone boundaries to reflect the actual attributes and features of the subject land is the only means of achieving the objectives or intended outcomes. Therefore, this Planning Proposal is the best means of achieving the objectives and intended outcomes.

(b) Relationship to strategic planning framework

- *Is the Planning Proposal consistent with the objectives and actions of the North Coast Regional Plan 2036?*

  The Planning Proposal is consistent with the objectives and actions of the North Coast Regional Plan.

- *Is the Planning Proposal consistent with Council's Community Strategic Plan and Urban Growth Management Strategy 2010 – 2031?*

  The Planning Proposal is not specifically identified in Council's Urban Growth Management Strategy. This is a minor matter which primarily addresses a mapping anomaly.

- *Is the Planning Proposal consistent with applicable State Environmental Planning Policies?*

  This Planning Proposal is consistent with the provisions of SEPP 44, and a Koala Plan of Management will form part of the long term management of the subject land.

- *Is the Planning Proposal consistent with applicable Ministerial Directions (s117 Directions)?*

  Environment Protection Zones: This direction is to protect and conserve environmentally sensitive areas by aligning the zone boundaries with areas of environmental significance. A Planning Proposal may be inconsistent only if justified by a study prepared in support of the Planning Proposal. The Planning Proposal provides the opportunity to introduce Voluntary Planning Agreements and Vegetation Management Plans for the subject land where there are currently no protections. Thus the Planning Proposal provides a greater overall environmental benefit and rectifies the current mapping error for the zone lines.

(c) **Environmental, social and economic impact**

- *Is there any likelihood that critical habitat or threatened species, populations or ecological communities, or their habitats, will be adversely affected as a result of the proposal?*
  The environmental investigations undertaken have been a comprehensive investigation of the environmental values of the subject land, which are now clearly

mapped. These investigations are also based on the most up to date (and recently amended) environmental legislation. The report has noted that the proposal is not likely to adversely impact on areas of critical habitat, or threatened species, or coastal wetland areas.

- *Are there any other likely environmental effects as a result of the Planning Proposal and how are they proposed to be managed?*
-

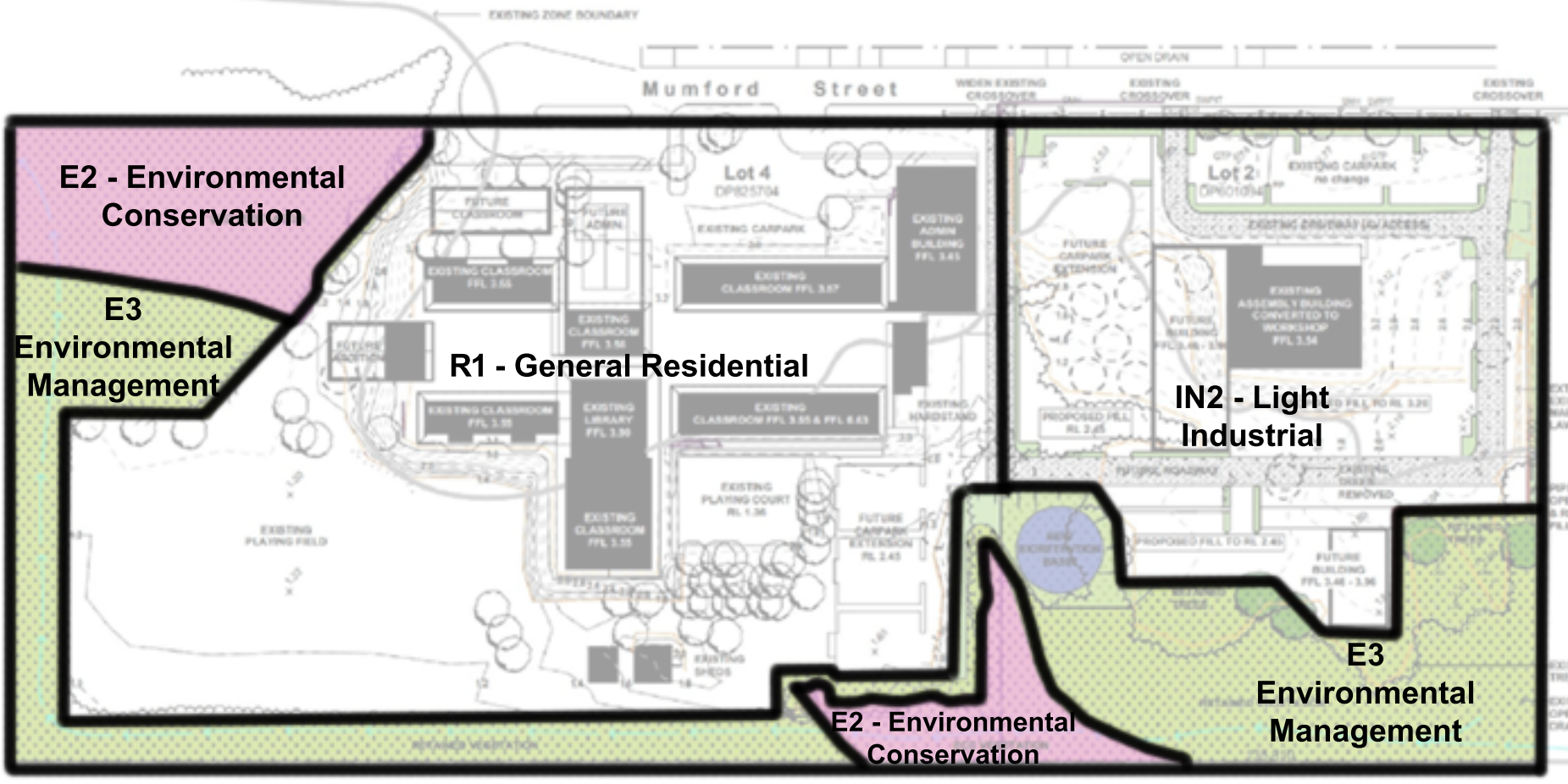
  There are no other likely environmental effects which have not already been considered in the environmental assessments undertaken to date.

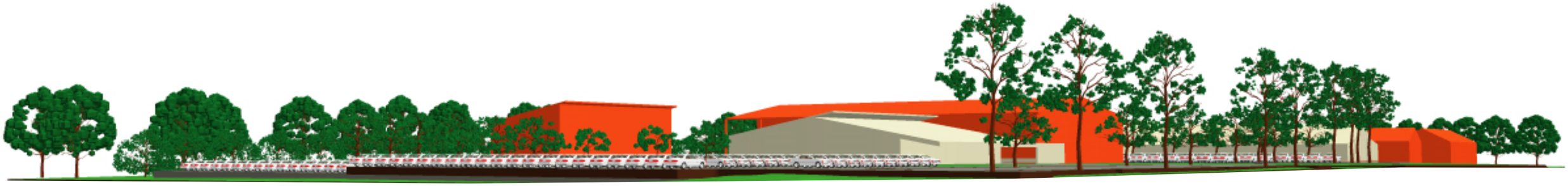
- *How has the Planning Proposal adequately addressed any social and economic effects?*

  The Planning Proposal will allow the school to achieve the approved increase in student numbers. This will have a positive social impact by facilitating access to this educational establishment for additional families who seek a Christian based education for their children. The Planning Proposal will also provide for the use of a parcel of land which was previously occupied by a church and is no longer required by that community organisation. The proposal will have a positive economic benefit by facilitating the long term use of a large parcel of land which otherwise would be under utilised. It will also facilitate the business operations in this locality which require additional land to operate. Thus, the Planning Proposal has adequately addressed the social and economic effects.

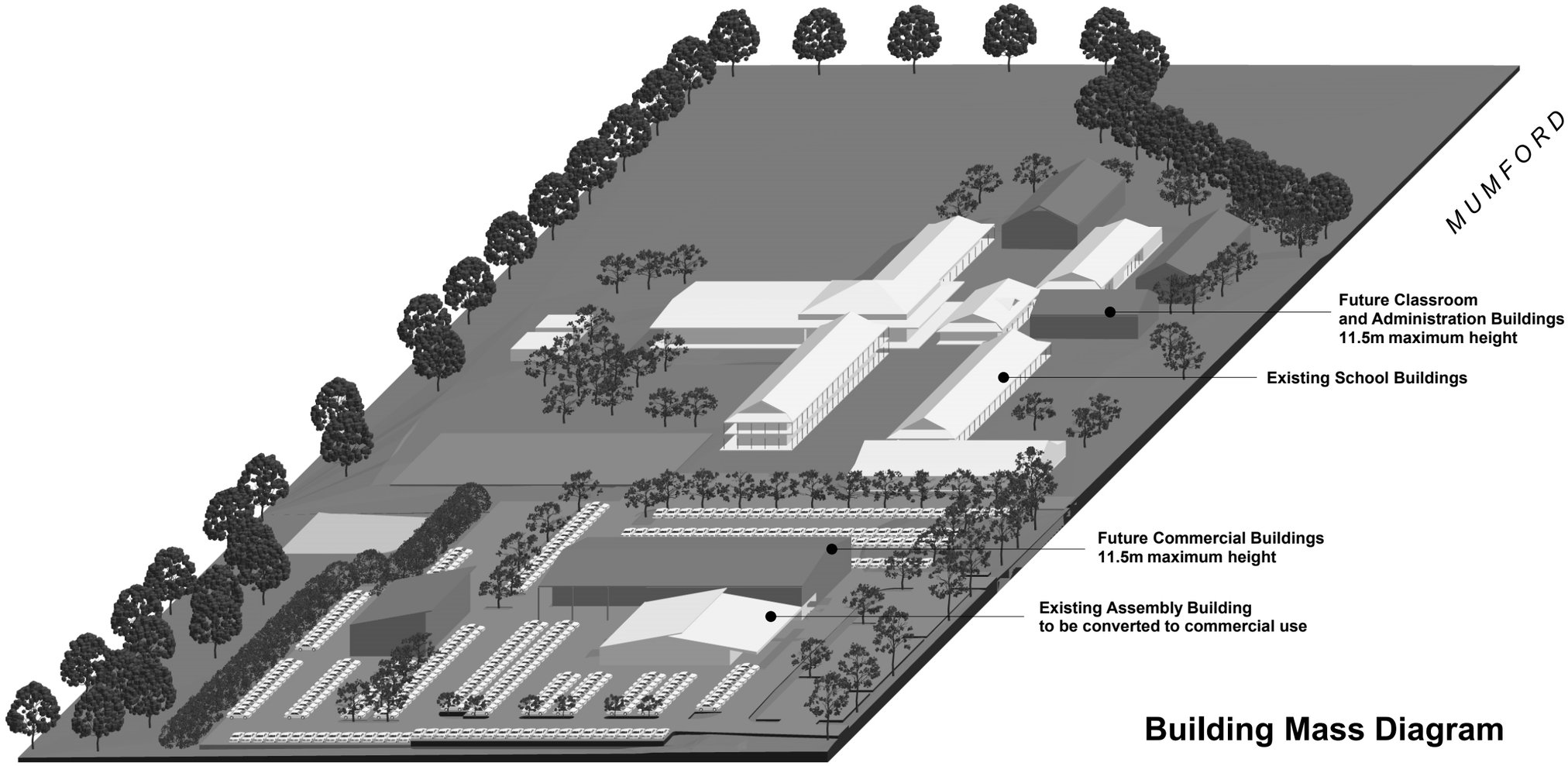
7. Conclusion

This Planning Proposal application will rectify an anomaly in the existing zone boundaries. The current zone lines do not reflect the physical features of the subject land. The Planning Proposal has also provided a mechanism to investigate and document the environmental features of the land, and provides a basis for future Vegetation Management Plans which may be implemented via future development applications. There are significant social and economic benefits to this Planning Proposal and the supporting studies and investigations are based on current knowledge and standards, including flood modelling which includes climate change allowances, and the most recent environmental legislation. Therefore, there is no reason not to support the proposal, which will have significant environmental, social and economic benefits.


E2 - Environmental Conservation
E3 Environmental Management
R1 - General Residential
IN2 - Light Industrial
E3 Environmental Management
E2 - Environmental Conservation
Mumford Street
Lot 4
DP825704
Lot 2
EXISTING CARPARK
EXISTING ADMIN BUILDING
EXISTING CLASSROOM
EXISTING LIBRARY
EXISTING PLAYING COURT
EXISTING PLAYING FIELD
EXISTING ASSEMBLY BUILDING CONVERTED TO WORKSHOP
FUTURE CARPARK EXTENSION
FUTURE BUILDING
PROPOSED FILL
EXISTING SHEDS
EXISTING HARDSTAND



Perspective View

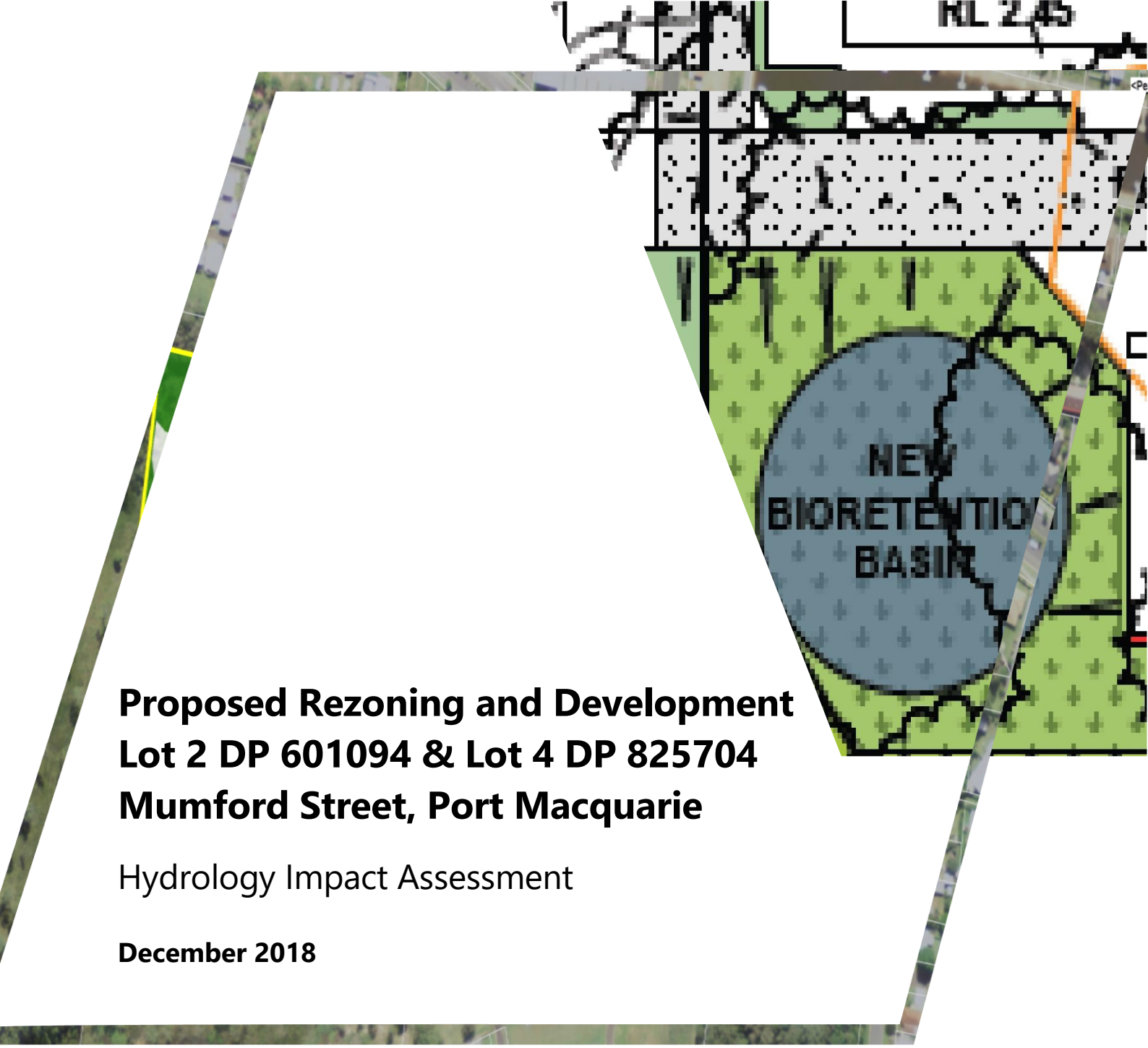


Building Mass Diagram

Proposed Rezoning
Lot 2 DP601094 & Lot 4 DP825704
Mumford Street PORT MACQUARIE

A B 3 D
Building Design
0438 499629 ab3d@bigpond.com

Date 13/02/2018
Drawing No
A02



Proposed Rezoning and Development Lot 2 DP 601094 & Lot 4 DP 825704 Mumford Street, Port Macquarie

Hydrology Impact Assessment

December 2018

Level 17, 141 Walker St
North Sydney NSW 2060
Australia

rp301015-03852ajd_crt181219-Mumford St Hydrologic Assess. Port Macquarie RevB.docx

Revision B

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Project: Proposed Rezoning and Development of Lot 2 DP 601094 & Lot 4 DP 825704, Mumford Street, Port Macquarie
Hydrology Impact Assessment

Rev	Description	Author	Review	Advisian Approval	Date
A	**Draft Report**	AJD	CRT		18/12/2018
B	**Final Draft Report**	AJD	CRT		19/12/2018

Table of Contents

Appendices

1. INTRODUCTION

East Coast Screw Piers Pty Ltd plans to rezone and develop Lot 2 DP 601094 and Lot 4 DP 825704 at Mumford Street, Port Macquarie. Lot 2 is currently operated as a Christian Outreach Centre (*also referred to as the Gantons Pty Ltd site*) while Lot 4 is the Heritage Christian School. The location of the site is shown in **Figure 1**.

The proposal will see the capacity of the Heritage Christian School (*Lot 4*) increase through the construction of additional buildings which will serve as classrooms and administration buildings, as well as an additional car parking facility. Lot 2 will be redeveloped to become an automotive workshop and detailing business. The change will involve construction of additional buildings to act as workshops and spray facilities, as well as spaces for parking and vehicle storage. Details of the proposal for redevelopment of the site including filling details, are included within **Appendix A**.

An application for rezoning of the site is currently being assessed by Port Macquarie-Hastings Council. However, since submission of the rezoning application, the *State Environmental Planning Policy (Coastal Management) 2018* has come into effect. The Coastal Management SEPP requires consideration of the potential for development to significantly impact on the hydrology of adjacent coastal wetlands. As the proposed development site is located upstream of a coastal wetland, there is a need to understand the potential for the proposed development to impact on the hydrology of the area and the wetland.

This report and the associated investigations have been undertaken to determine the potential for the proposed development to impact on the hydrology of the wetland, including the water quantity and quality.

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Project
Proposed Development of Lot 2 DP 601094 and Lot 4 DP 825704, Mumford St, Port Macquarie

Consultant
Advisian

Client
East Coast Screw Piers

Title
Hydrologic Assessment
Location of the Subject Site

Figure No.
1

Date
December 2018

2. DESIGN REQUIREMENTS

Clause 11(1)(b) of *State Environmental Planning Policy (Coastal Management) 2018*, requires that the proposed development must not significantly impact on *"the quantity and quality of surface and groundwater flows to and from an adjacent wetland or littoral rainforest"*.

The following is noted in Port Macquarie-Hastings Council's Development Design Specification entitled *D7 Stormwater Management* and dated February 2004.

- **Section D7.05 Design Requirements Clause 1**

  Works to capture pollutants from stormwater runoff shall be designed to accommodate a design storm equivalent to a 3 month ARI storm event (for calculation purposes 40% of the 1 in 100 year ARI storm event is to be adopted).

- **Section D7.10 Stormwater Runoff Clause 3**

  Detention facilities shall be designed to attenuate the change in peak flow rate due to a change in landuse within a catchment to a level equal to the pre developed flow rate.

- **Section D7.11 Water Quality Clause 6**

  High risk developments are classified according to the following criteria. Any development or development proposal:
  b. located within the catchment of a wetland area.

- **Section D7.11 Water Quality Clause 7**

  The long-term water quality sustainability of a high-risk development shall be based on viable protection levels of aquatic ecosystems. The classification of protection levels of aquatic ecosystems is defined as:

  *a. Pristine ecosystem or **unmodified ecosystem**, having high conservation values and 'protection' status.*

  *b. Slightly to moderately **modified ecosystem**, where the ecosystem is largely intact (habitats, limited catchment clearing) such that some 'restoration' of the original values is viable.*

  *c. **Highly modified ecosystem**, where the original ecosystem is so disturbed that it cannot be restored to a slightly to moderately disturbed condition but is capable of sustaining some ecological and conservation values with appropriate 'management'.*

- **Section D7.11 Water Quality Clauses 10, 11 and 12**

  Ecosystem median pollutant levels shall be below those indicated in Tables D7.4 to D7.6 (of the specification). Of the receiving water classifications presented in the tables Lowland Stream is the most applicable.

  Table 1 lists the median pollutant levels for Lowland Streams as presented in the abovementioned tables for unmodified, modified and highly modified ecosystems.

Table 1 Median Pollutant Levels for Lowland Streams

Ecosystem Type	Total Phosphorus (TP) (g/L)	Total Nitrogen (TN) (g/L)	Dissolved Oxygen (%) Sr	pH	Suspended Solids (mg/L)
Unmodified	10 -20	100 - 250	80 – 90	6.5 – 7.5	50
Modified	50	500	85 – 110	6.5 - 8	50
Highly Modified	60	620	75 – 110	6.2 – 8.6	62

- **Section D7.11 Water Quality Clause 13**

  In addition to the aforementioned median pollutant levels, any stormwater treatments shall be designed to meet the minimum level of pollutant load objectives in accordance with Table D7.7 (of the specification).

  The pollutant load objectives are listed in **Table 2**.

Table 2 Council's Stormwater Treatment Pollutant Loads

Pollutant	Objective
Total Suspended Solids (TSS)	80% retention of average annual load
Total Phosphorus (TP)	45% retention of average annual load
Total Nitrogen (TN)	45% retention of average annual load
Litter	100% retention of litter greater than 5 mm for flows up to the 3 month ARI peak flow
Sediment	100% retention of sediment greater than 0.125 mm for flows up to the 3 month ARI peak flow
Oil & Grease	No visible oils for flows up to the 3 month ARI peak flow

Note: ARI = average recurrence interval

3. SITE CONSTRAINTS

The key site constraint that is relevant to this hydrology impact assessment is that the proposed stormwater management measures will need to discharge to an existing drainage flow path on the southern side of the lots.

Ground surface elevations have been estimated using Light Detection and Ranging (*LiDAR*) survey obtained via Geoscience Australia's ELVIS portal. The LiDAR information is considered to provide the most reliable contemporary description of the variation in topography across the Port Macquarie-Hastings Council local government area. During future design phases of the project a detailed survey should be undertaken to confirm the surface levels at the proposed discharge point from the proposed stormwater management system.

4. PROPOSED STORMWATER MANAGEMENT SYSTEM

It is proposed that a combined bioretention / detention basin be used to manage stormwater at the sites. The proposed arrangement is shown in **Figure 2** and an indicative section through the basin is provided in **Figure 3**.

4.1 Concept for Stormwater Detention

The pre-development and post-development runoff conditions were modelled using the DRAINS hydraulic modelling software in order to determine the size and configuration of the required stormwater detention basin.

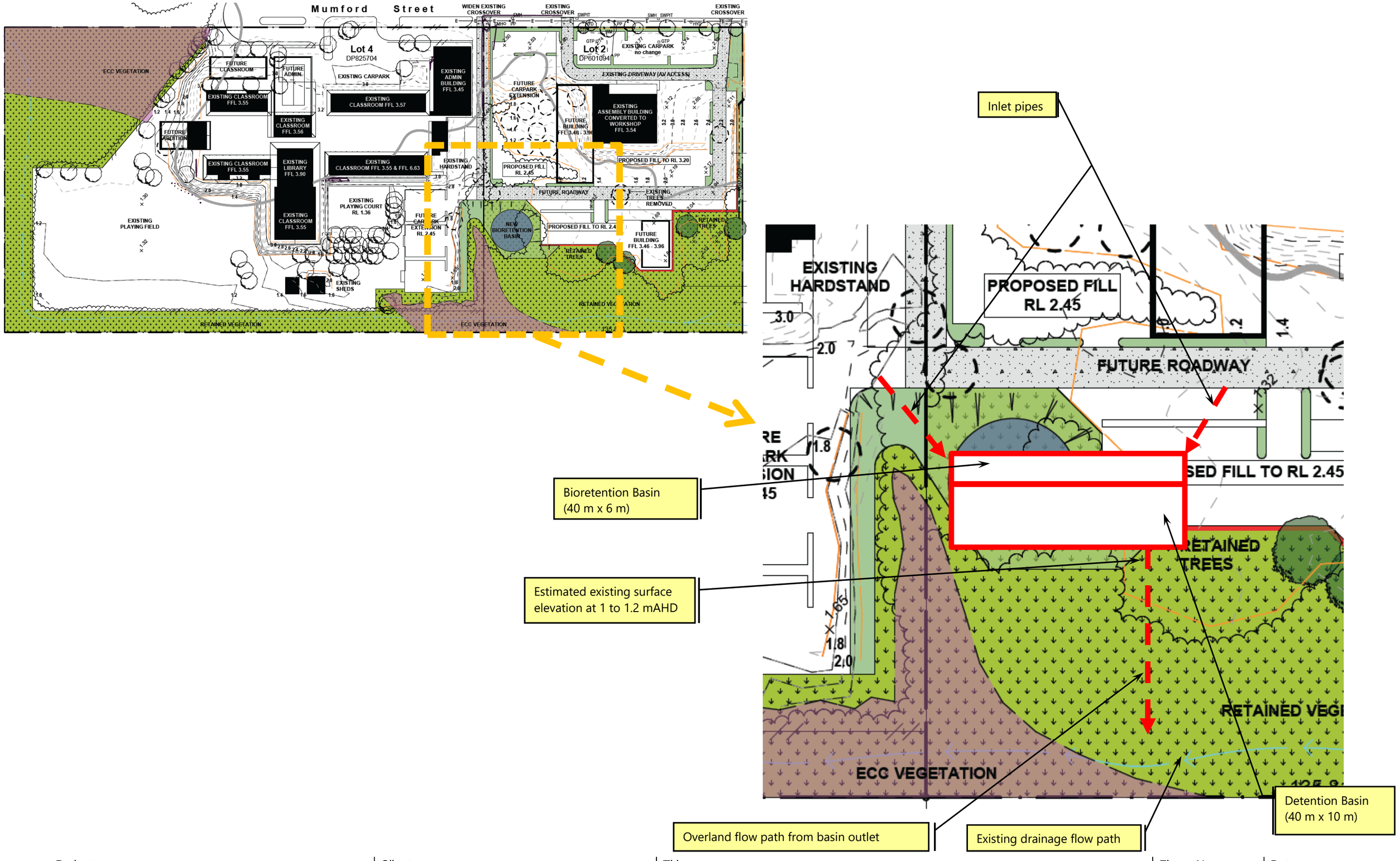
4.1.1 Model Setup

A summary of the data that were input into the DRAINS model is as follows.

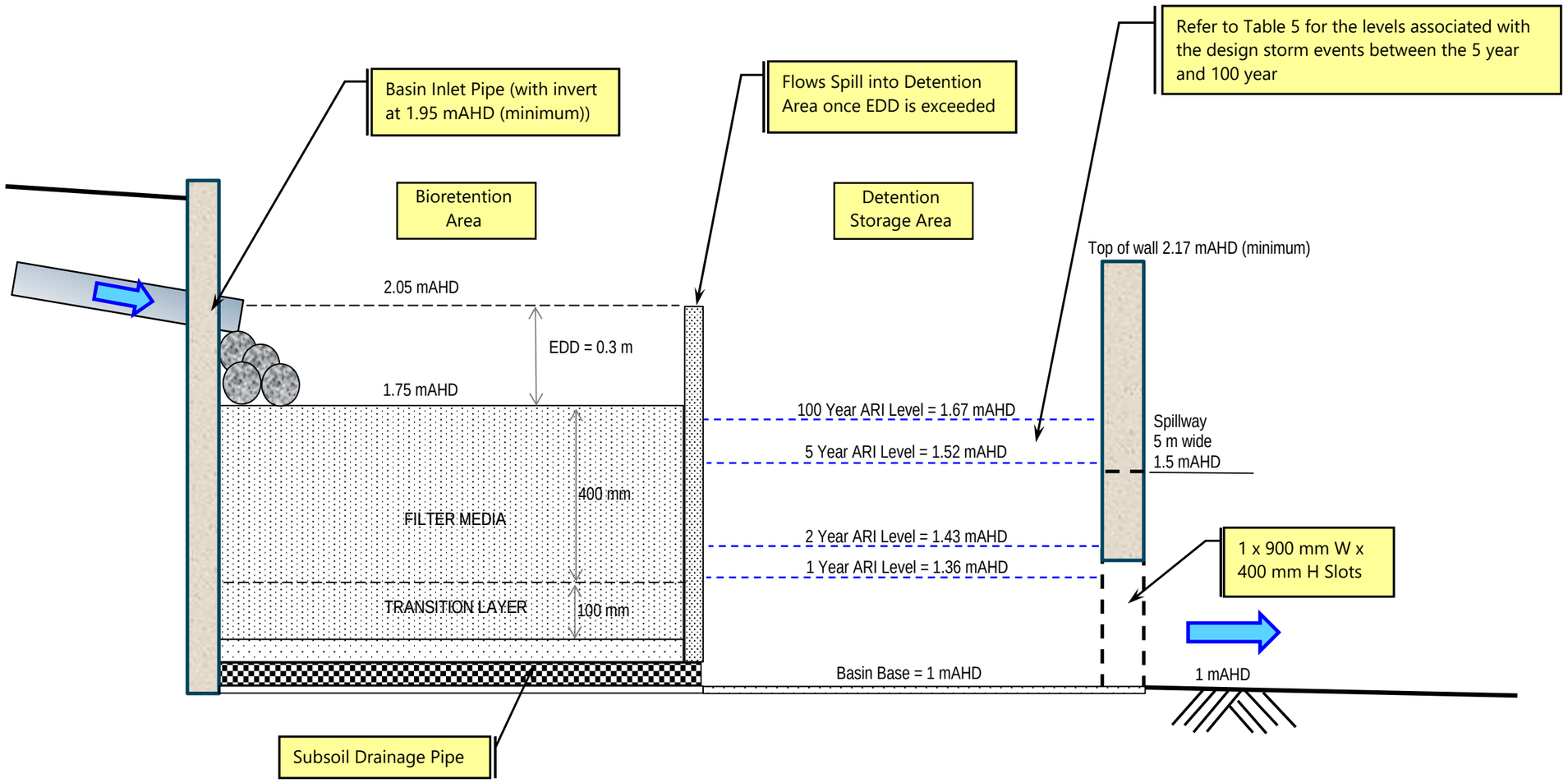
- Rainfall Intensity–Frequency–Duration (*IFD*) data was sourced from the Bureau of Meteorology website (BOM, 2017). The latitude and longitude of the proposed development was input into the online ARR 2016 IFD data generator to obtain the applicable data.
- The details of the modelled pre and post development catchments are presented in **Table 3**. All areas draining to the basin in both the pre and post development scenarios have been modelled. Of the areas that are not draining to the basin only those areas where the land use has changed have been modelled.
- At the proposed discharge point from the basin, the ground surface elevation is estimated to be between 1 and 1.2 mAHD based on the available LiDAR information. Due to the uncertainty with the ground surface elevations on the downstream side of the basin it has been assumed that at the discharge point the ground surface elevation is 1 mAHD (*refer* **Section 3**) and therefore the basin floor is at 1 mAHD. Note, a DRAINS model was also developed whereby the surface elevations on the downstream side of the basin were assumed to be at 1.2 mAHD. Comments relating to this alternate model are included in the commentary that follows.

Table 3 DRAINS Model Catchment Details

Catchment No.	Catchment Label in DRAINS Model	Area (ha)	Imperviousness (%)
Pre-Development			
1	SCHOOL (not via basin)	0.118	100
2	SCHOOL (via basin)	0.376	62
3	GANTONS	1.587	74
Post-Development			
1	SCHOOL (not via basin)	0.118	100
2	SCHOOL (via basin)	0.376	0
3	GANTONS	1.587	0



Project Proposed Development of Lot 2 DP 601094 and Lot 4 DP 825704, Mumford St, Port Macquarie Consultant Advisian	Client East Coast Screw Piers Pty Ltd	Title Hydrologic Assessment **Detention / Bioretention Basin Indicative General Arrangement**	Figure No. 2	Date December 2018



Note: *Not to scale*

Project Proposed Development of Lot 2 DP 601094 and Lot 4 DP 825704, Mumford St, Port Macquarie Consultant Advisian	Client East Coast Screw Piers	Title Hydrologic Assessment **Detention / Bioretention Basin Indicative Section**	Figure No. 3	Date December 2018

4.1.2 Simulation of Detention Basin

Several iterations of the DRAINS modelling were completed to determine suitable design features and parameters for the proposed detention basin.

Inflows to the basin will first enter the bioretention system (*refer* **Section 4.2**). The bioretention area will cover nearly 40% of the floor area of the basin. Once the Extended Detention Depth (*EDD*) has been exceeded *(i.e., the capacity of the bioretention system is exceeded*), flows will overtop into the detention storage area of the basin.

During the 1 year average recurrence interval (*ARI*) storm event the discharge from the basin will be controlled by a slot located in the base of the basin wall that has been sized to attenuate the peak flow during this event.

During larger events, discharge from the basin will be controlled by a spillway included in the wall of the basin. After passing through the slot or over the spillway, flows will continue overland across the lot and will meet with the existing drainage flow path on the southern side of Lot 2.

Localised scour protection works, such as rock rip rap, are to be installed immediately downstream of the discharge point from the basin to prevent downstream scour and erosion.

The details of the basin are summarised in **Table 4**.

4.1.3 Model Results

The pre-development flows discharging from the site and the post-development peak flows from the proposed detention basin are listed in **Table 5**. This table also includes the peak detention basin water level for each storm event as determined using DRAINS.

As shown in **Table 5**, the post-development peak flows do not exceed the pre-development peak flows. The outlet discharge arrangement has been adjusted to minimise the difference between the pre- and post-development flows and therefore minimise the impact on the downstream wetlands.

If the basin floor is positioned at 1.2 mAHD, the peak flows are similar to those presented in **Table 5**. However, the peak water levels in the basin are approximately 200 mm higher than the levels in **Table 5**. This correlates with the slot and spillway also being 200 mm higher than the basin when the floor is at 1 mAHD.

To ensure that stormwater can be conveyed both to and from the basin a combination of both surface drains and pipes should be used across the site so that the basin ties in with the surrounding surface levels.

Table 4 Stormwater Detention Basin Details

Parameter	Value	Comments
Base Length	40 m	
Base Width	16 m	
Area – Total	640 m^2	
Bioretention Area		***In the area vertically above the extended detention depth (EDD) of the bioretention system, detention volume is available. However due to the level constraints at the site this area will not be used.***
Area	240 m^2	Refer to **Section 4.2** for further details about the proposed bioretention system.
Top of extended detention depth RL (*also level of overflow weir between bioretention area and detention area*)	2.05 mAHD	Refer Note 1. An EDD of 300mm is required for the quality control measure.
Base of extended detention depth	1.75 mAHD	
Minimum incoming pipe invert level	1.95 mAHD	The incoming pipes must connect with the basin a minimum of 200 mm above the surface level of the top of the bioretention media. The Water by Design *Bioretention Technical Design Guidelines* (2014) indicate that this is required to minimise sediment build up within the incoming pipes.
Detention Only Area		
Area	400 m^2	
Floor RL	1 mAHD	
Low flow outlet	1 mAHD	One 900 mm W x 400 mm H rectangular slot
Spillway RL	1.5 mAHD	
Spillway length	5 m	100 year ARI capacity
Crest level of basin (minimum)	2.17 mAHD	Assuming a minimum of 500 mm freeboard above the 100 year ARI peak water level in the basin

*Note 1: The basin will operate as both a quantity and quality control measure. Further details about quality control are provided in **Section 4.2**. Storage is required in the basin to assist with the quality aspect of the basin (referred to as extended detention depth). This storage (i.e., the volume associated with the EDD) has not been included in the quantity related investigations.*

Table 5 DRAINS Model Results

Design Storm Event (ARI) (years)	Pre-Development Peak Flow (m^3/s)	Post-Development Peak Flow (with effect of basin) (m^3/s)	Peak Water Level Basin (mAHD)
1	0.353	0.345	1.36
2	0.506	0.450	1.43
5	0.679	0.568	1.52
9.49	0.885	0.786	1.58
20	1.05	0.978	1.61
50	1.21	1.15	1.64
100	1.40	1.30	1.67

4.2 Concept for Stormwater Treatment

The software package called *Model for Urban Stormwater Improvement Conceptualisation* (*MUSIC*) was used to determine the size and configuration of the required bioretention basin.

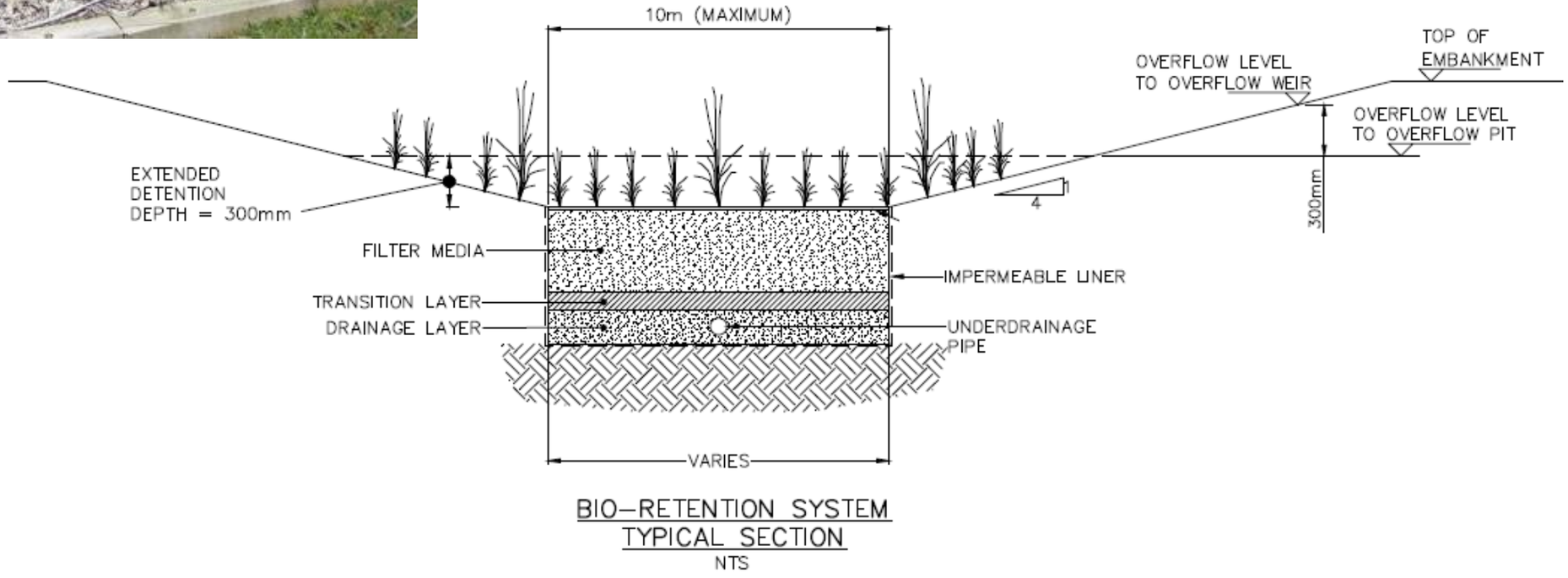
The function of a bioretention basin is to filter stormwater runoff via a densely vegetated layer and sand and loam filter media. As the water moves through the system pollutants are captured by filtration, adsorption and biological processing. Bioretention systems are effective at removing litter, fine sediment, phosphorus, nitrogen, metals and hydrocarbons from stormwater. The treated water discharges to groundwater or is conveyed via subsoil pipes to a downstream drainage system or receiving water.

An example of a typical bioretention basin and a typical section through a basin is shown in **Figure 4**.

4.2.1 Model Setup

A summary of the data that were input into the MUSIC model is outlined in the following.

- Six-minute rainfall data and potential evapotranspiration (*PET*) data for the period from September 1952 to December 1973 were obtained from the Port Macquarie DMR (*Station no. 060076*) rain gauge and used in the model. This data was sourced using the online eWater *Pluviograph Rainfall Data Tool* (2018). This tool provides access to rainfall data from stations all over Australia that is compatible with MUSIC models.
- The areas, percent imperviousness and rainfall threshold rates that have been adopted for the modelled stormwater sources are listed in **Table 6**. The rainfall threshold values have been adopted from the NSW MUSIC Modelling Guidelines (2015).
- To assess whether Council's post-development pollution reduction targets are met (*refer* **Section 2** *for additional background information*) of the areas that are not draining to the basin only those where the land use is changing have been modelled. This is because this assessment is based on comparing post-development loads with and without treatment measures for stormwater. The pollutant loads are not changing from the areas where the land use is not changing and therefore these areas have been excluded from the assessment.



BIO–RETENTION SYSTEM
TYPICAL SECTION
NTS

Project	Client	Title	Figure No.	Date
Proposed Development of Lot 2 DP 601094 and Lot 4 DP 825704, Mumford St, Port Macquarie	East Coast Screw Piers	Hydrologic Assessment Bioretention Basin – Typical Section	4	December 2018

Consultant
Advisian
WorleyParsons Group

- Whereas, to assess whether Council's concentration targets (*maximum allowed*) for ecosystems (*refer* **Section 2** *for additional background information*) are met, all areas have been modelled as the targets need to be compared with what is ultimately being discharged from the site.
- The pervious area and groundwater properties for medium clay conditions were adopted in the MUSIC model. The values presented in the NSW MUSIC Modelling Guidelines (2015) were adopted. A sensitivity analysis was undertaken to determine the impact of any variability in soil type. This established that a change in soil type did not significantly impact the results.
- The Pollutant Event Mean Concentrations (*EMCs*) for base flow and storm flow scenarios were adopted from the NSW MUSIC Modelling Guidelines by BMT WBM (2015).

4.2.2 Simulation of Bioretention Basin

Several iterations of the MUSIC modelling were completed to determine suitable design features and parameters for the proposed bioretention basin. The details of the bioretention basin are summarised in **Table 7**.

Table 6 MUSIC Catchment Details

Catchment Number	Catchment Label in MUSIC Model	Land Use	Area (ha)	Imperv-iousness (%)	Rainfall Threshold (mm/day)
Pre-Development					
1	SCHOOL Buildings / Sheds	Roofs	0.532	100	0.3
2	SCHOOL Playing Field and Surrounds	Rural	1.39	35	1
3	SCHOOL Carpark / Road (Existing Northern)	Sealed road pavement	0.3	85	1.5
4	SCHOOL Carpark / Road (Existing Hardstand)	Sealed road pavement	0.097	85	1.5
5	SCHOOL Playing Court	Sealed road pavement	0.096	95	1.5
6	SCHOOL Open Space	Rural	0.48	35	1
7	GANTONS Buildings / Sheds	Roofs	0.103	100	0.3
8	GANTONS Carpark / Road	Sealed road pavement	0.308	85	1.5
9	GANTONS Open Space	Rural	1.176	35	1
10	Retained Vegetation	Forest	1.84	20	1
Post-Development					
1	SCHOOL Buildings / Sheds	Roofs	0.65	100	0.3
2	SCHOOL Playing Field and Surrounds	Rural	1.39	35	1
3	SCHOOL Carpark / Road (Existing Northern)	Sealed road pavement	0.3	85	1.5
4	SCHOOL Carpark / Road (Existing Hardstand)	Sealed road pavement	0.097	85	1.5
5	SCHOOL Future Carpark Extension	Sealed road pavement	0.161	85	1.5
6	SCHOOL Playing Court	Sealed road pavement	0.096	95	1.5
7	SCHOOL Open Space	Rural	0.201	35	1
8	GANTONS Buildings / Sheds	Roofs	0.241	100	0.3
9	GANTONS Carpark / Road	Sealed road pavement	1.346	85	1.5
10	Retained Vegetation	Forest	1.84	20	1

Table 7 Bioretention Basin Details

Parameter	Value	Comments
Inlet properties		
Low flow bypass	0	
High flow bypass	0.2	Assumed to be 40% of the 1 year ARI peak flow. Value obtained from the DRAINS model.
Storage properties		
Extended detention depth (EDD)	0.3 m	
Surface area	240 m^2	Vertical walls are proposed to surround the bioretention / detention basin and therefore the values adopted for the bioretention basin 'surface area' and 'filter area' are equal.
Filter and media properties		
Filter area	240 m^2	Vertical walls are proposed to surround the bioretention / detention basin and therefore the values adopted for the bioretention basin 'surface area' and 'filter area' are equal.
Unlined filter media perimeter	0.01 m	Nominally zero as basin is lined.
Saturated hydraulic conductivity	100 mm/hr	Value recommended in the *NSW MUSIC Modelling Guidelines* (BMT WBM, 2015)
Filter depth	0.4 m	
TN content of filter media	400 mg/kg	Value recommended in the *NSW MUSIC Modelling Guidelines* (BMT WBM, 2015)
Orthophosphate content of filter media	40 mg/kg	Value recommended in the *NSW MUSIC Modelling Guidelines* (BMT WBM, 2015)
Infiltration properties		
Exfiltration rate	0 mm/hr	The base of the bioretention system is lined
Lining Properties		
Is base lined?	Yes	
Vegetation properties		
Vegetated with effective nutrient removing plants	Yes	
Outlet properties		
Overflow weir length	40	
Underdrain present?	Yes	
Submerged zone with carbon present?	No	

4.2.3 Model Results

The results of the MUSIC simulations are summarised in **Table 8** and **Table 9** for pollutant loads and concentrations, respectively. In addition, **Table 9** lists the concentration targets (*maximum allowed*) for compliance with Council's Design Specification D7 Stormwater Management (2004) (*refer* **Section 2** *for additional background information*). Where the concentration achieved is less than the target the cell is highlighted green.

Table 8 Pollutant Loads – MUSIC Model Results

Parameter	Load (kg/yr)	
	Pre-Development	Post-Development
Total Suspended Solids (TSS)	2,150	735
Total Phosphorus (TP)	4.22	2.43
Total Nitrogen (TN)	28.1	20.8
Gross Pollutants	288	32.8

Table 9 Pollutant Concentrations – MUSIC Model Results and Council Targets

Parameter	Concentration (mg/L)				
	Achieved		Target (maximum)		
	Pre-Development	Post-Development	Unmodified Ecosystem	Modified Ecosystem	Highly Modified Ecosystem
Total Suspended Solids (TSS)	10.6	6.89	50	50	62
Total Phosphorus (TP)	0.038	0.047	0.01 – 0.02	0.05	0.06
Total Nitrogen (TN)	0.354	0.44	0.1 – 0.25	0.5	0.62

The aim is for post-development pollutant loads and concentrations to be kept as close as possible to the pre-development loads and concentrations, and thereby minimise the potential impact on the water quality of the downstream wetlands.

If considering pollutant loads only, it could be argued that the bioretention basin footprint of 240 m^2 could be reduced as the post-development loads are all less than the pre-development loads. However, both the TP and TN post-development concentrations are greater than the pre-development concentrations and any further reduction in the basin footprint would increase post-development concentrations to above the concentrations determined for pre-development conditions.

Comparing Council's concentration targets based on ecosystem type with the concentrations achieved as part of the modelling found that for both the Modified Ecosystem and Highly Modified Ecosystem classifications the concentration targets for TSS, TP and TN are met. Only the TSS targets are met for the Unmodified Ecosystem. However, the wetlands are downstream of a developed catchment and modifications to the flow conveyance arrangement at Boundary Street mean that it is reasonable to assume that the downstream wetlands are not classified as an Unmodified Ecosystem.

The post-development pollutant percentage reductions are presented in **Table 10**. With the installation of a 240 m^2 bioretention basin Council's pollutant load percentage reduction targets are met (*refer* **Section 2** *for additional background information*).

Table 10 MUSIC Model Results – Pollutant Load Percentage Reductions

Parameter	Load (kg/yr)		Reduction (%)	
	Source	Residual	Target	Achieved
Total Suspended Solids (TSS)	4,690	735	80	84.3
Total Phosphorus (TP)	8.25	2.43	45	70.5
Total Nitrogen (TN)	39.1	20.8	45	46.8
Gross Pollutants	400	32.8	-	91.8

4.2.4 Consideration of Other Pollutants

A limitation of the MUSIC modelling software is that it only considers TSS, TP, TN and gross pollutants. These pollutants can occur in runoff from carparks, roads and roof areas in urban environments and therefore are relevant for the proposed development. However, as an automotive workshop and detailing business is proposed on Lot 2, consideration must also be given to hydrocarbons and heavy metals which could be carried by runoff from this land use type.

Bioretention systems are able to remove both heavy metals and hydrocarbons from stormwater, as outlined in the following.

- Heavy metals occur in stormwater in particulate (*attached to sediments*) and soluble (*dissolved*) forms. Bioretention systems remove particulate metals from stormwater via physical filtration within the filter media. Soluble metals are removed via sorption onto finer particles within the filter media and to a lesser extent biological uptake by plants.
- Bioretention systems remove hydrocarbons from stormwater by volatilisation and processing by microorganisms.

To assist with the removal of oils and grease (*which are a source of hydrocarbons*) an oil and water separator, such as UltraSpin units or similar, will be installed as part of the workshop for the automotive facility. The specification of the UltraSpin, or similar, will vary depending on the flow of oily water generated and will be specified at the detailed design stage.

Each of the areas requiring oil and water separators will be roofed where possible, to prevent rainfall mixing with pollutants. Low lying bunds will surround these areas to reduce the potential for runoff to enter the area and will also serve as spill containment to prevent any spills reaching the stormwater system. The separated oils will be decanted and stored for safe disposal.

Of the parameters listed as part of Council's targets (*maximum allowed*) for ecosystems (*refer* **Section 2** *for additional background information*) pH and dissolved oxygen have not been discussed as yet.

A comprehensive study was undertaken by Duncan (2005) whereby he investigated stormwater runoff quality in relation to land use and catchment characteristics. As part of this study Duncan found that for an industrial land use the pH ranges between 6.2 and 8 and for all urban catchments (*i.e. including the industrial catchments*) the pH ranges between 6.25 and 7.6. Both these ranges are within Council's targets for a Highly Modified Ecosystem (*refer* **Table 11**), and are not significantly different to those reported for the other ecosystem types, particularly the Modified Ecosystem.

Therefore, stormwater runoff from the site is not anticipated to significantly impact on the pH of the downstream wetlands.

Table 11 Council Targets – pH

Parameter	Target		
	Unmodified Ecosystem	Modified Ecosystem	Highly Modified Ecosystem
pH	6.5 – 7.5	6.5 - 8	6.2 – 8.6

Pollutants, such as oil and grease, can adversely affect dissolved oxygen levels by limiting oxygen transfer from the atmosphere and by the oxygen demand of their own breakdown. The stormwater treatment management measures proposed for the site will ensure that the pollutants that may impact on dissolved oxygen levels are managed such that the downstream wetlands are not significantly impacted.

5 POTENTIAL IMPACT OF PROPOSED WORKS ON LOCAL GROUNDWATER AND NEARBY COASTAL WETLAND

The proposed development will lead to an increase in impervious areas across the site, as well as an increase in pollutants generated from the site. However, the installation of the proposed bioretention / detention basin will reduce the impacts of the development by both treating and controlling the discharge of runoff from the site. The investigations documented in **Section 4** show the following.

- The post-development peak flows do not exceed the pre-development peak flows, and the difference between them has been minimised to reduce the impact on the local groundwater and the downstream wetland.
- Both Council's pollutant reduction targets are met, as well as Council's ecosystem concentration targets. Therefore, from a quality perspective the impact on local groundwater and the downstream wetland will be minimal.

However, what the DRAINS modelling does not consider is the impacts of smaller storm events (*i.e. less than 1 year ARI events*). These events occur numerous times over the course of a year and generate relatively small flows. However, the site represents a relatively small portion (*less than 5%*) of the entire catchment (*approximately 135 ha*) that drains to the downstream wetlands. Therefore, the flows from the site are small relative to those generated from the larger contributing catchment. Hence, the impact on local groundwater and the downstream wetland will be minimal.

6 CONCLUSIONS

Under Clause 11(1)(b) of *State Environmental Planning Policy (Coastal Management) 2018* the proposed development at Lot 2 DP 601094 and Lot 4 DP 825704 at Mumford Street, Port Macquarie must not significantly impact on *"the quantity and quality of surface and groundwater flows to and from the adjacent wetland or littoral rainforest"*. A combined detention / bioretention basin is therefore proposed within Lot 2 to both treat and manage the release of stormwater from Lot 2 and the adjacent Lot 4 such that surface and groundwater flows and the downstream wetland are not significantly impacted. In addition, to assist with the removal of oils and grease an oil and water separator, such as UltraSpin units or similar, will be installed within the automotive workshop that is proposed for construction on Lot 2.

A concept design for the combined detention / bioretention basin has been developed using a DRAINS model to size the required detention area and a MUSIC model to size the bioretention system. The layout of the combined detention / bioretention basin is shown in **Figures 2** and **3**.

Outflows from the 640 m^2 detention / bioretention basin will be controlled by a low flow slot and a spillway in the basin wall. A bioretention system with an area of 240 m^2 is proposed to sit within the detention basin to treat stormwater flows. It is proposed to have a 400 mm deep filter media layer and an extended detention depth of 300 mm. The system is to be lined, with the bioretention subsoil collection drains installed above the liner and positioned to discharge to the detention area of the basin.

The assessment found that the minimum invert level of the inlet pipes to the bioretention basin is 1.95 mAHD (*assuming the basin floor is at 1 mAHD to tie in with the adjacent existing ground surface*). A sensitivity analysis showed that if required, this level could be raised by 200 mm to tie in with the bed level of the downstream drainage channel. To ensure that the basin can tie in with both upstream and downstream surface levels a combination of surface drains and pipes should be used across the site to convey stormwater to the basin.

It should be noted that the above advice is based solely on hydrologic and water quality elements. Geotechnical conditions / constraints and associated retaining wall structural design have not been considered and would need to be addressed during the detailed design phase.

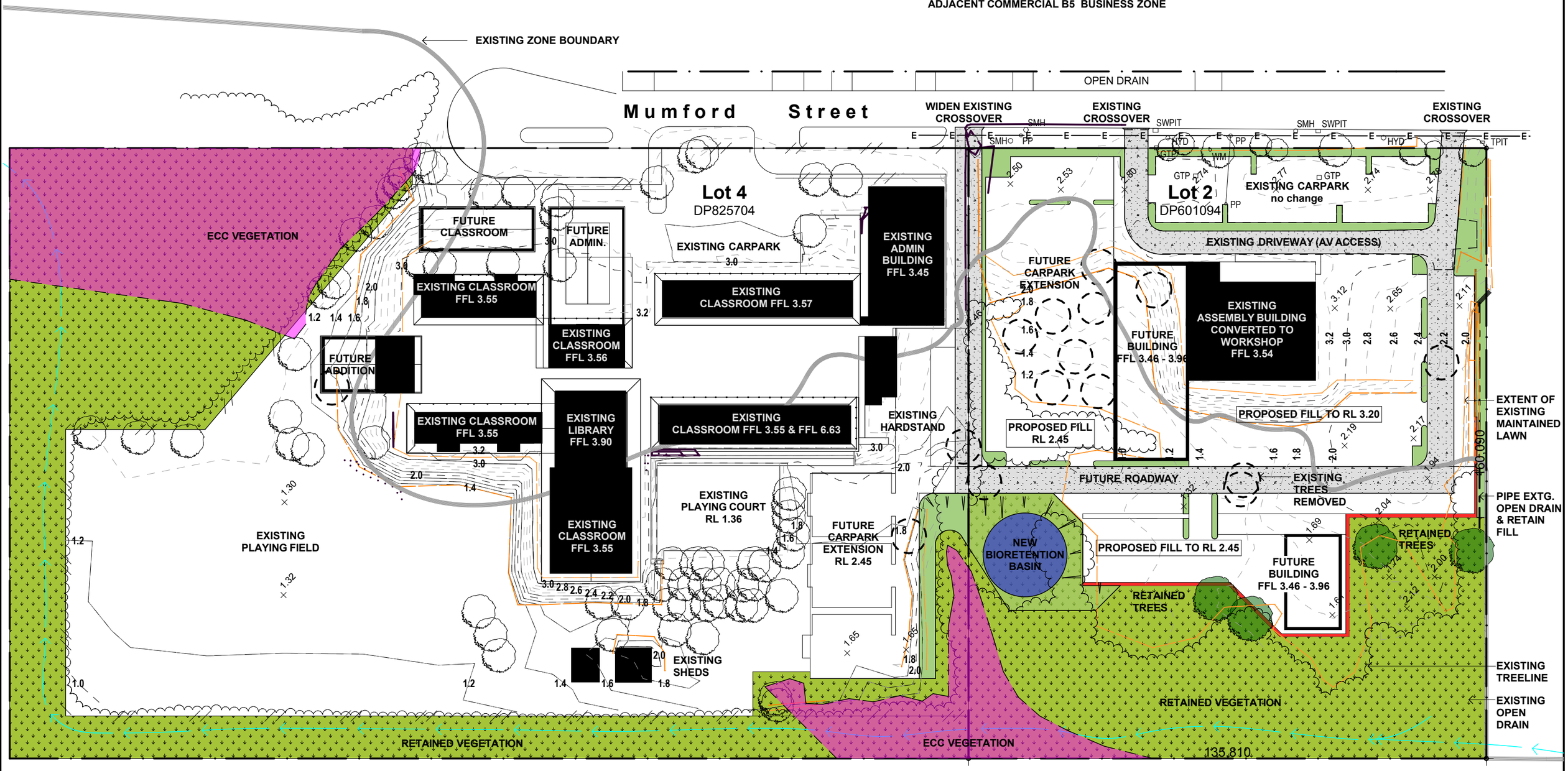
7 REFERENCES

- BMT WBM, 2015, *NSW MUSIC Modelling Guidelines,* August 2015
- Bureau of Meteorology (BOM), 2018, *AR&R 2016 IFDs* [Online]. Available: http://www.bom.gov.au/water/designRainfalls/revised-ifd/?year=2016 http://www.bom.gov.au/water/designRainfalls/ifd-arr87/index.shtml [Accessed: 5th December 2018]
- Duncan, H.P., 1999, *Urban Stormwater Quality: A Statistical Overview*, Cooperative Research Centre for Catchment Hydrology, Melbourne, Australia
- eWater, 2018, *Pluviograph Rainfall Data Tool* [Online]. Available: https://ewater.org.au/products/music/related-tools/pluviograph-rainfall-data-tool/ [Accessed: 5th December 2018]
- Port Macquarie-Hastings Council, 2004, *Development Design Specification: D5 Stormwater Drainage Design*
- Port Macquarie-Hastings Council, 2004, *Development Design Specification: D7 Stormwater Management*
- Water by Design, 2014, *Bioretention Technical Design Guidelines*.

Appendix A

Site Plan

Source: AB3D Building Design



Site Plan

Proposed Rezoning
Lot 2 DP601094 & Lot 4 DP825704
Mumford Street PORT MACQUARIE

A B 3 D
Building Design
0438 499629 ab3d@bigpond.com

Site Plan
Scale 1:1000
Date 3/12/2018
Drawing No
A01 'C'

DAVID PENSINI
Building Certification and
Environmental Services

BUSHFIRE PLANNING REPORT

PROPOSED REZONING

LOT 4 DP 825704 &
LOT 2 DP 601094
11 – 33 MUMFORD STREET,
PORT MACQUARIE

CLIENT:

EAST COAST SCREW PIERS

DECEMBER 2017

3 Blair Street, Port Macquarie NSW 2444 – PO Box 5581, Port Macquarie NSW 2444 – Phone 0434 166 150 – Email kdpensini@bigpond.com
ABN 55 183 050 741

This report has been prepared by David Pensini – Building Certification and Environmental Services with all reasonable skill, care and diligence for East Coast Screw Piers.

The information contained in this report has been gathered from discussions with representatives of East Coast Screw Piers, a review of the plans provided on behalf of East Coast Screw Piers and experience.

No inspection or assessment has been undertaken on other aspects of the proposed development outside the scope of this report.

This report does not imply, nor should it be implied, that the proposed development will comply fully with relevant legislation.

The report shall not be construed as relieving any other party of their responsibilities or obligations.

David Pensini – Building Certification and Environmental Services disclaims any responsibility East Coast Screw Piers and others in respect of any matters outside the scope of this report.

The report is confidential, and the writer accepts no responsibility of whatsoever nature, to third parties who use this report, or part thereof is made known. Any such party relies on this report at their own risk.

For and on behalf of David Pensini – Building Certification and Environmental Services.

Prepared by: *David Pensini*

Signed: 

Dated: *14th December 2017*

Version	**Date**	**Information relating to report**			
		Reason for issue			
1.0	17th November 2017		Draft		
2.0	14th December 2017		Issued to Client		
3.0	21st December 2017		Amendments to Table 1		
4.0	27th February 2018		Updating of APZ requirements to reflect performance approach to compliance		
			Prepared by	**Verified by**	**Approved by**
		Name	David Pensini		David Pensini
		Signature			

Table of Contents

1.0 INTRODUCTION

The land which comprises the subject site is known as Lot 4 DP 825704 and Lot 2 DP 601094, 11 – 33 Mumford Street, Port Macquarie.

It is proposed to rezone portion of the subject site so as to support the future development of the land.

This report is based on site assessments carried out on 13th December 2017.

The purpose of this report is to demonstrate that the bushfire risk is manageable for the proposed rezoning of the subject site and to determine the bushfire protection management measures which are applicable to the future development of the subject site.

NOTE

The report has been prepared with all reasonable skill, care and diligence.

The information contained in this report has been gathered from field survey, experience and has been completed in consideration of the following legislation.

1. Rural Fires Act 1997.
2. Environmental Planning and Assessment Act 1979.
3. Building Code of Australia.
4. Council Local Environment Plans and Development Control Plans where applicable.
5. NSW Rural Fire Services, Planning for Bushfire Protection, 2006.
6. AS 3959 - 2009 Construction of Buildings in Bushfire Prone Areas.

The report recognizes the fact that no property and lives can be guaranteed to survive a bushfire attack. The report examines ways the risk of bushfire attack can be reduced where the site falls within the scope of the legislation.

The report is confidential, and the writer accepts no responsibility of whatsoever nature, to third parties who use this report or part thereof is made known. Any such party relies on this report at their own risk.

This report has been based upon the vegetation characteristics observed at the time of site inspection. No responsibility is taken where the vegetation characteristics of the subject site or surrounding areas is changed or modified beyond that which is presented within this report.

1.1 Objectives

The objectives of this report are to:

- Ensure that the proposed rezoning of the land has measures sufficient to minimize the impact of bushfires; and
- Ensure that any development of the land has measures sufficient to minimize the impact of bushfires; and
- Reduce the risk to property and the community from bushfire.

1.2 Legislative Framework

On 1st August 2002, the Environmental Planning and Assessment Act 1979 and the Rural Fires Act 1997 were both amended to enhance bush fire protection through the development assessment process.

In broad terms, the planning considerations provide two main steps. These involve:

(a) Strategic Planning through;

• the mapping of bush fire prone;
• determining suitable bush fire requirements during the preparation of a Local Environmental Plan and/or Development Control Plan; and
• the identification of the extent to which land is bushfire prone.

(b) Development assessment through;

• obtaining a bush fire safety authority for residential or rural-residential subdivision and special fire protection purpose developments in bushfire prone areas from the Rural Fire Service (RFS);

• seeking advice from the RFS in relation to infill and other developments in bushfire prone areas that cannot comply with the requirements of NSW Rural Fire Service**, *Planning for Bushfire Protection***, 2006; and

• the application of additional requirements of the Building Code of Australia (BCA) in relation to construction standards for Class 1, 2, 3, 4 and some Class 9 buildings in bushfire prone areas.

It is noted that this report focuses upon the strategic planning processes associated with the proposed rezoning of portion of the subject site.

1.2.1 Strategic Planning Considerations

Local Environmental Plans, (LEP's), and Development Control Plans, (DCP's), are the best way of strategically achieving bush fire protection objectives. Inclusion of bush fire planning provisions in an LEP:

• gives weight to bush fire management planning principles, ensuring they are considered at subdivision and construction stages;

• can allow for sufficient space to be incorporated into land use zones for setbacks and adequate access for firefighting and evacuation; and

• controls inappropriate land uses in Bushfire Prone Areas.

LEP amendments that affect Bushfire Prone Areas are required to address the planning principles of NSW Rural Fire Service, ***Planning for Bushfire Protection***, 2006. Where appropriate the proposed land uses must be considered with respect to bush fire protection, (including appropriate setbacks).

If a proposed amendment to land use zoning or land use affects a designated Bushfire Prone Area, then the Section 117(2) Direction No 19 must be applied, (Section 117 of the Environmental Planning and Assessment Act, 1979) provides for the Minister for Planning to direct a council, in relation to the preparation of a draft LEP, to apply the planning principles specified in that direction. The Section 117 Direction No 19 requires councils to:

• *consult with the Commissioner of the Rural Fire Service (RFS) under section 62 of the Environmental Planning and Assessment Act, 1979, and to take into account any comments by the Commissioner; and*

• *have regard to the relevant planning principles of NSW Rural Fire Service, **Planning for Bushfire Protection**, 2006.*

If a council proceeds with a draft LEP that does not comply with the provisions in the Section 117 Direction, the council must obtain written advice from the Commissioner of the Rural Fire Service to the effect that the RFS does not object to that non-compliance.

The requirement to review LEP's in accordance with the Standard LEP is an opportunity to consider appropriate uses on Bush Fire Prone Land as well as exempt and complying development provisions.

1.2.2 Objectives for Special Fire Protection Purpose Developments

In accordance with NSW Rural Fire Services, ***Planning for Bushfire Protection***, 2006, alterations or additions to existing Special Fire Protection Purpose (SFPP) facilities (e.g. existing school), requires an appropriate combination of bushfire protection measures and compliance with the intent and performance criteria of each measure within Section 4.3.5 (infill development).

In cases where existing circumstances make the preferred standards difficult to achieve, the specific objectives in Section 4.2.3 of NSW Rural Fire Services, ***Planning for Bushfire Protection***, 2006 are to be followed.

The specific objectives for Special Fire Protection Purpose developments as provided for by NSW Rural Fire Service, ***Planning for Bushfire Protection***, 2006 are to**;**

- provide for the special characteristics and needs of occupants. Unlike residential subdivisions, which can be built to a construction standard to withstand the fire event, enabling occupants and firefighters to provide property protection after the passage of fire, occupants of SFPP developments may not be able to assist in property protection. They are more likely to be adversely affected by smoke or heat while being evacuated.

- provide for safe emergency evacuation procedures. SFPP Developments are highly dependent on suitable emergency evacuation arrangements, which require greater separation from bush fire threats.

  During emergencies, the risk to firefighters and other emergency services personnel can be high through prolonged exposure, where door-to-door warnings are being given and exposure to the bush fire is imminent.

The possible Special Fire Protection Purpose development of the existing school infrastructure which is the subject of this report must demonstrate that it is able to meet the above objectives together with the relevant acceptable solutions/standards which are applicable to any future development.

1.2.3 Objectives for Commercial/Industrial Developments

As set out in NSW Rural Fire Services, ***Planning for Bushfire Protection***, 2006;

*'for other classes of building, (such as factories, shops and warehouses), bushfire protection measures will only apply at the Development Application stage. Consent will be developed on a case by case basis without the need to refer the development application to the RFS. However, if the council is concerned that the development does not meet the aim and objectives of NSW Rural Fire Services, **Planning for Bushfire Protection**, 2006, then the matter may be referred to the RFS for advice. The provisions under the Building Code of Australia for fire safety will be accepted for bushfire purposes where the aims and objectives of NSW Rural Fire Services, **Planning for Bushfire Protection**, 2006 can be met'.*

It is noted that all non-residential and non-Special Fire Protection Purpose developments, (including industrial and commercial), within bushfire prone areas are required to meet the general aims and objectives of NSW Rural Fire Services, ***Planning for Bushfire Protection***, 2006 rather than meeting the specific bushfire threat management objectives which are relevant to residential subdivision, Special Fire Protection developments and infill developments.

The general aims and objectives of NSW Rural Fire Services, ***Planning for Bushfire Protection***, 2006 which are therefore relevant to any future commercial/industrial development on the subject site are as follows;

(i) afford occupants of any building adequate protection from exposure to a bush fire;
(ii) provide for a defendable space to be located around buildings;
(iii) provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent direct flame contact and material ignition;
(iv) ensure that safe operational access and egress for emergency service personnel and residents is available;
(v) provide for ongoing management and maintenance of bush fire protection measures, including fuel loads in the asset protection zone (APZ); and
(vi) ensure that utility services are adequate to meet the needs of firefighters (and others assisting in bush firefighting).

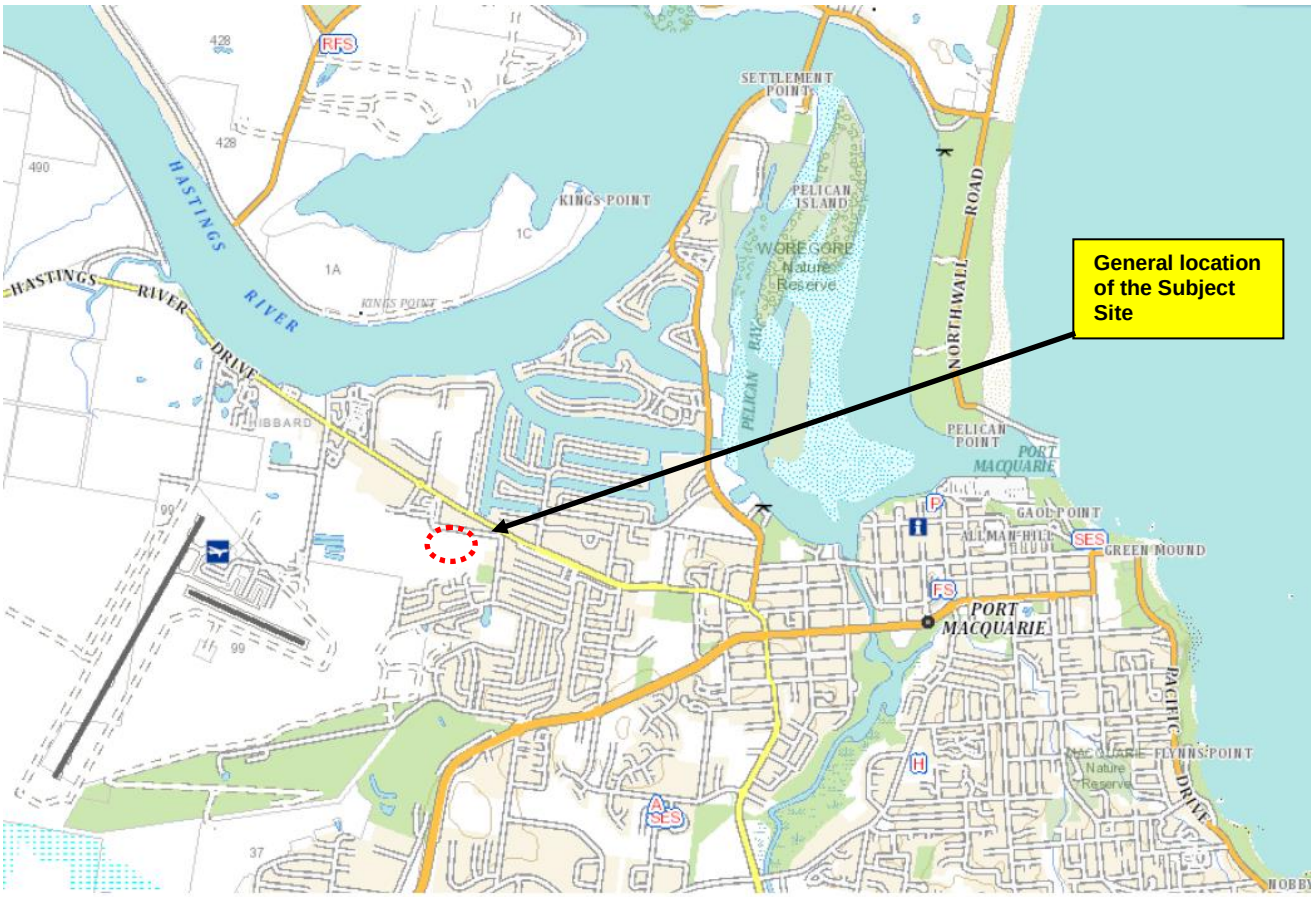
1.3 Location and Site Description

The subject site is known as Lot 4 DP 825704 and Lot 2 DP 601094, 11 – 33 Mumford Street, Port Macquarie and is situated within the Port Macquarie-Hastings local government area. With a population of approximately 45,000 Port Macquarie serves as the regional centre for the Port Macquarie-Hastings local government area.

The subject site is located approximately 2.2km west of the Port Macquarie CBD, within a geographic area known as Hibbard which is a historical urban area on the western fringes of the developed areas of Port Macquarie. Being located in a historical area land use in the locality is a mixture of residential, larger vegetated bushland lots and a mix of commercial and business and recreational uses.

It is noted that the subject site comprises two (2) separate Torrens Title allotments which share a common east/west property boundary; refer **Figure 1** below.

Figure 1 - Site Location



The character of the locality is that of a business fringe area with a mixture of residential, commercial, educational and open space areas of land. The subject site forms part of a historical subdivision with the majority of lots having been developed as part of the urban

expansion of Port Macquarie. It is however noted that large undeveloped areas of land are present to the south and west of the subject site. A mixture of commercial, residential and recreational development is present to the north and east of the subject site.

The subject site is located within the flood plain of the Hastings River and accordingly the topography of the subject site and adjoining and adjacent land is relatively flat. However, reflecting the presence of extensive areas of wetland on adjoining and adjacent land to the south and west some very gentle north to south downslopes are present in the locality. It is noted that the topography of the subject site may have been altered over time with filling providing for more elevated land. Slope conditions on adjoining and adjacent land are similar to that of the subject site.

The subject site has been cleared of the majority of vegetation with grasslands and scattered and clusters of trees predominant over much of the subject site. It is however noted that an area of Forested Wetland is present in the north-western portion of Lot 4 DP 825704 whilst narrow remnants of Forested Wetland vegetation are also present adjacent to the southern boundaries of the subject site and the western boundary of Lot 2 DP 601094. Extensive areas of Forested Wetland are present on adjoining and adjacent land to the west and southwest whilst a narrow band of Forested Wetland vegetation separates Lot 2 DP 601094 from managed grasslands within developed residential properties in the southern eastern aspect. Vegetation associated with managed gardens and landscaping are present on adjoining and adjacent land to the north and east of the subject site.

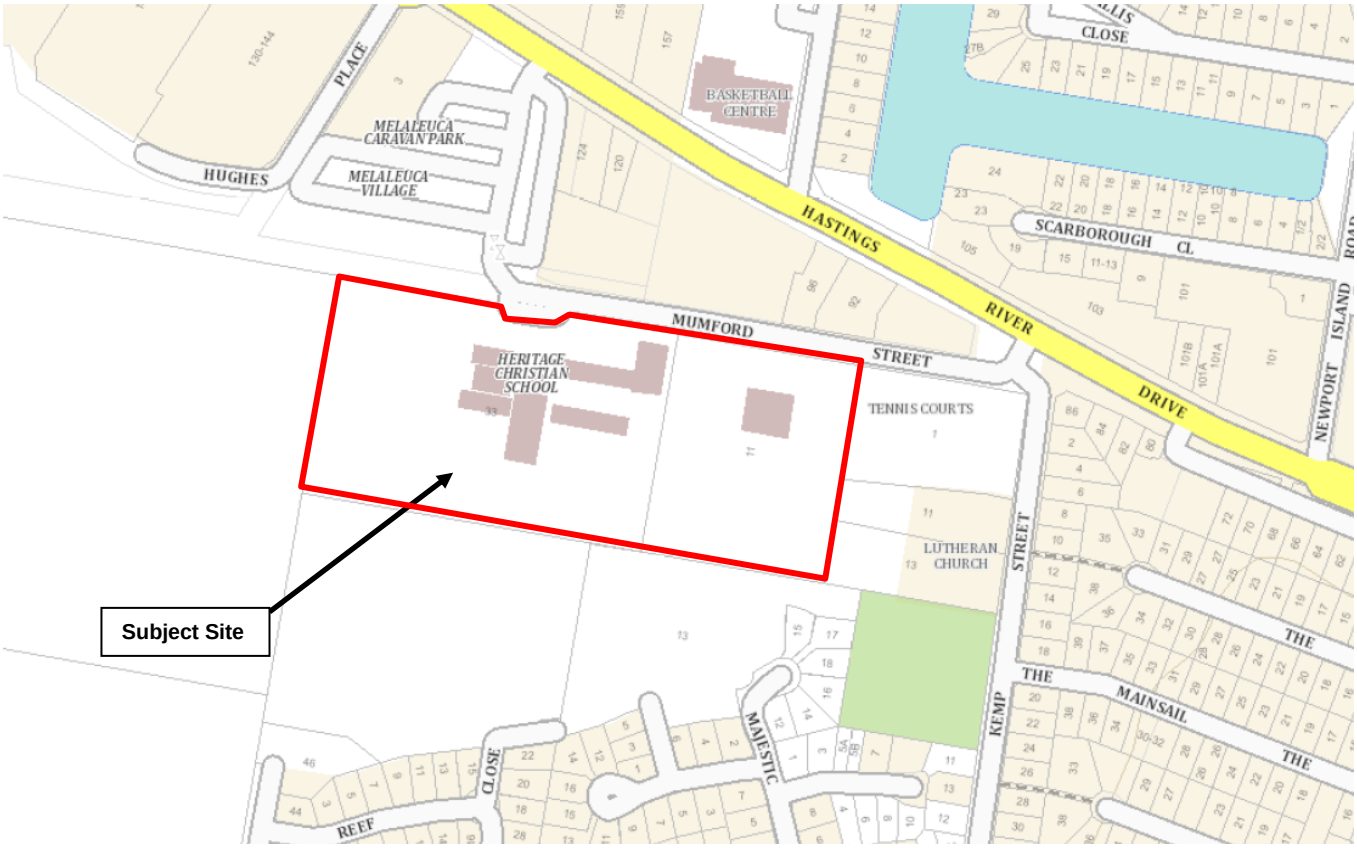
Access to the subject site is available via Mumford Street which adjoins the subject site to the north.

The closest Fire Service is located approximately 2km to the southeast of the subject site, (Port Macquarie Fire Brigade), with the closest Fire Control Centre being at Wauchope which is 21 kilometres west or 20 minutes by car from Port Macquarie.

1.4 Site History

The subject site comprises two Torrens Title lots each of which is rectangular in shape with a combined area of 6.23 hectares, refer to **Figure 2**.

Figure 2 – Subject Site



It is noted that the subject site has been developed for educational and religious purposes with Lot 4 DP 825704 supporting the operation of the Port Macquarie Heritage Christian School whilst Lot 2 DP 601094 supports the presence of a church building

Heritage Christian School on 33 Mumford Street, Port Macquarie

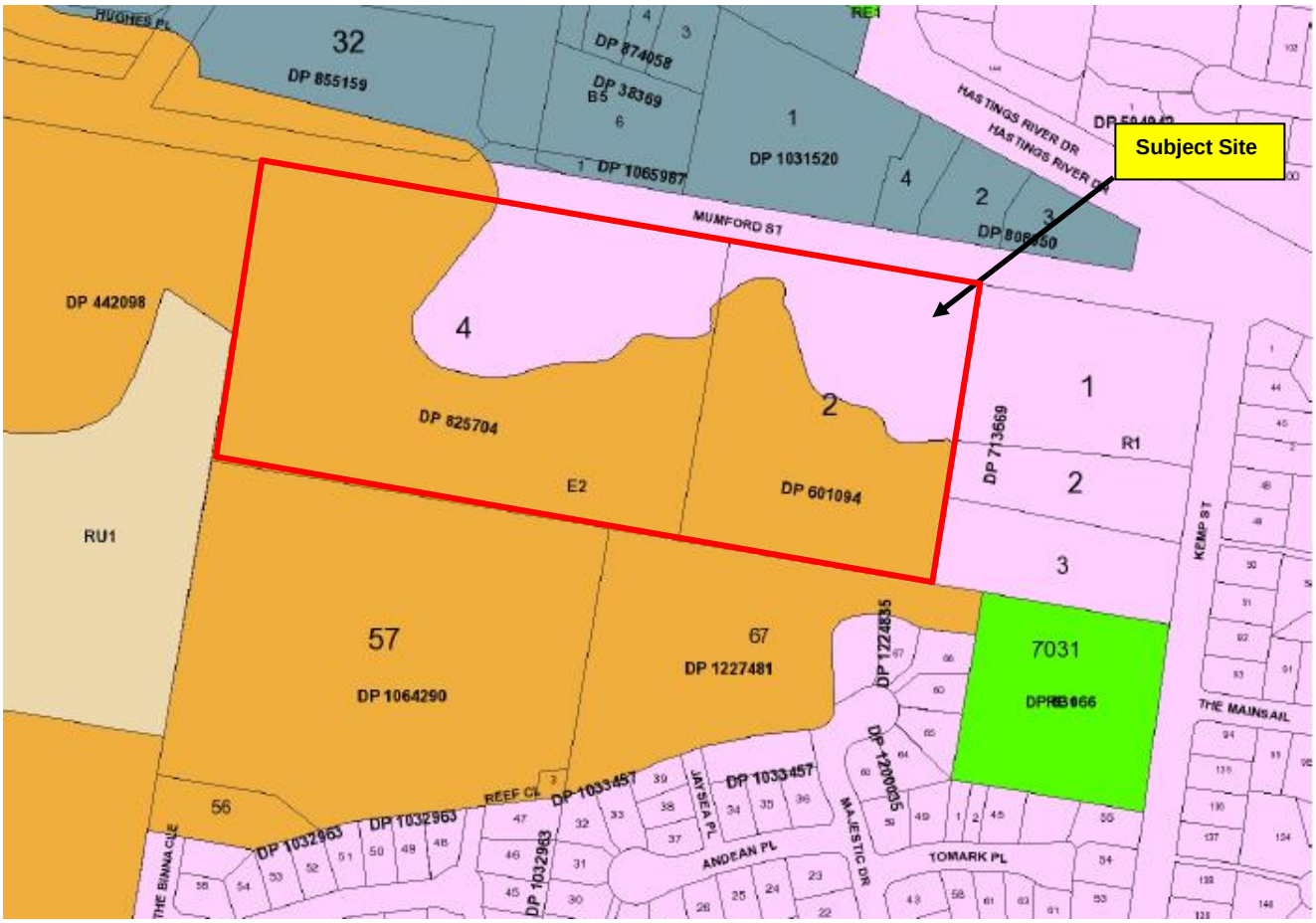
Church building on 11 Mumford Street, Port Macquarie

The subject site is positioned on the western fringe of the urbanized area of Port Macquarie in an area which is known locally as Hibbard. Being a historical area of Port Macquarie land use within the immediate area has not changed considerably although it is noted that some urban expansion has occurred on land to the south of the subject site whereby residential subdivision has occurred on what was historically rural land.

The character of the locality is that of a business fringe area with a mixture of residential, commercial, educational and open space areas of land. The subject site forms part of a historical subdivision with the majority of lots having been developed as part of the urban expansion of Port Macquarie. It is however noted that large undeveloped areas of land are present to the south and west of the subject site. A mixture of commercial, residential and recreational development is present to the north and east of the subject site.

The subject site is rectangular in shape and in accordance with Port Macquarie Hastings Local Environmental Plan 2011 has a mixed land use zoning comprising Residential (R1) along the northern central and eastern portions of the subject with an Environmental Conservation (E2) land use zoning applying to the remainder of the subject site. Business (B5) and Residential (R1) land use zonings apply to adjoining and adjacent land to the north and east respectively whilst an Environmental Conservation (E2) land use zoning is present to the south and northwest of the subject site. A Rural (RU1) land use zoning is present to the southwest. The relationship of the subject site with surrounding land use is depicted in **Figure 3** below;

Figure 3 – Landuse Zoning

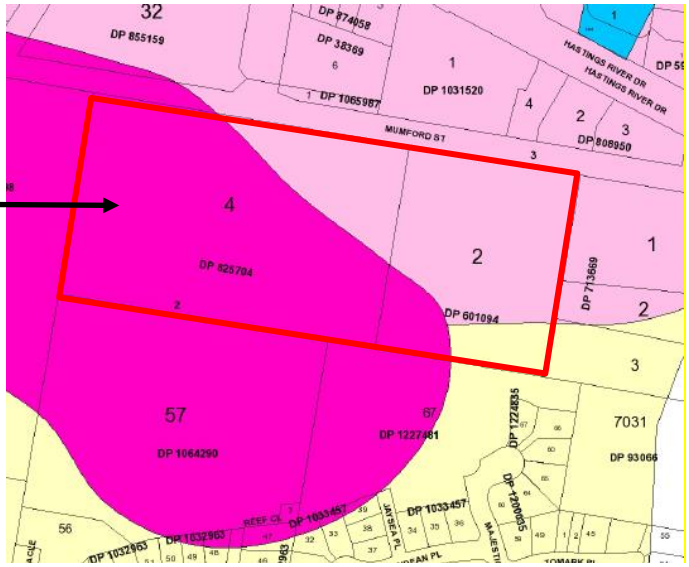


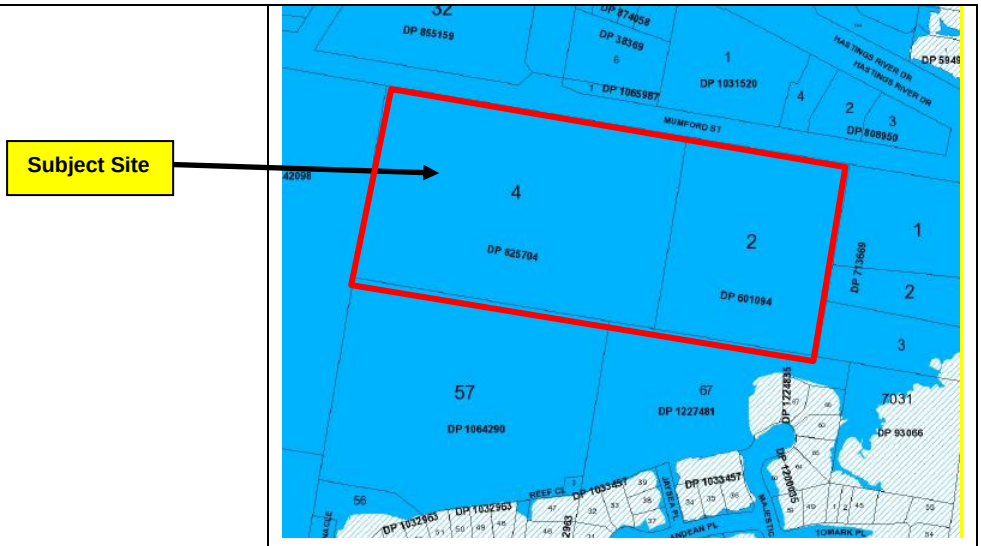
Fire has not recently occurred on the subject site or on adjoining and adjacent land.

The environmental and heritage features of the area of the subject site which forms the basis of this report are summarized as follows;

Table 1 – Environmental and Heritage Features

ENVIRONMENTAL/HERITAGE FEATURE	COMMENT
Riparian Corridors	The subject site does not contain any identified riparian corridors.
SEPP 14 – Coastal Wetland	The subject site is not identified as being subject to SEPP 14 – Coastal Wetlands.
SEPP 26 – Littoral Rainforest	The subject site is not identified as being subject to SEPP 26 – Littoral Rainforest.
SEPP 44 – Koala Habitat	Given the highly disturbed nature of the subject site areas of Potential Koala Habitat have been highly modified with the active use of the site a factor in assessing the extent and significance of habitat for Koalas. This issue is to be the subject of a separate specific assessment.
Areas of geological interest	The subject site is identified as potentially containing Class 2, 3 and 5 Acid Sulphate Soils in accordance with Port Macquarie - Hastings Local Environmental Plan,

	2011.  Given that the subject site may have been historically filled and the nature of future development, the presence of Acid Sulphate Soils is not expected to be of any significance to the proposed rezoning or future development. Based upon previous land use it is expected that no land contamination issues will be relevant to the subject site.
Environmental Protection Zones	The northern central and north-eastern areas of the subject site subject site are zoned Residential (R1) with the remaining areas of the subject site zoned environmental conservation (E2), refer to **Figure 2** above.
Land slip	Given the gentle topography of the subject site and surrounding areas land slip is not considered to be an issue for the subject site.
Flood prone land	The subject site is identified as being flood prone land and as such is affected by the probable maximum flood level. As such the flood planning provisions of Port Macquarie-Hastings Councils LEP, 2011 are applicable to the subject site.

 This issue is to be the subject of separate assessment.
National Park Estate or other Reserves	The subject land does not form part of the National Park Estate or other Reserves.
Threatened species, populations, endangered ecological communities and critical habitat	Threatened species, populations, endangered ecological communities and critical habitat are unlikely to be present as the subject site has been the subject of significant modification over time however this issue is to be the subject of separate assessment.
Ecologically Endangered Communities (EEC's)	Given the level of historic disturbance of the subject site in the areas of the proposed development it is unlikely to contain or support EEC's however this issue is to be the subject of separate assessment.
OEH Key Habitats and Corridors	The subject site in the area of the proposed development is unlikely to form part of OEH key habitats and corridors due to the level of historic habitat disturbance however this issue is to be the subject of separate assessment.
Aboriginal Heritage	Items of aboriginal heritage are unlikely to be present in the area of the proposed development as the subject site has been the subject of significant disturbance and alteration over time however this issue is to be the subject of separate assessment.

1.5 Development Proposal

It is proposed to rezone portion of the subject site in order to support the ongoing development of the general area.

The proposed rezoning reflects the continued development of the existing school complex in the western and central portions of the subject site whilst the existing church use of the subject site is to be converted to a commercial/business/light industrial use with an expansion of the development footprint associated with the proposed commercial/business/light industrial use. In this regard a development concept for the subject site is provided for in **Appendix 2**.

It is noted that the development concept provided in **Appendix 2** is considered to be indicative only with the ultimate development of the subject site requiring compliance with the relevant requirements of NSW Rural Fire Service, ***Planning for Bushfire Protection***, 2006.

The purpose of the development concept is to provide context to the identification of the relevant bushfire threat management requirements which are applicable to the subject site.

In this regard the rezoning of the land is required to demonstrate that there is sufficient land within the subject site in which to accommodate the minimum required bushfire threat management requirements which would be applicable to the future development and occupation of the subject site.

Access to subject site will be via the existing Mumford Street road reserve which adjoins the subject site to the north.

This report will focus upon identifying the bushfire threat management requirements which will be applicable to any future development, (using the development concept in **Appendix 2** for context), so as to allow for an assessment of the subject sites suitability for rezoning.

It is noted that in demonstrating the sites suitability for future development the requirements which are applicable to Special Fire Protection Purpose Developments have been considered in relation to the expansion of the existing school use.

1.6 Fauna and Flora Issues

A fauna and flora evaluation has not been undertaken in conjunction with this bushfire planning assessment and as such issues pertaining to fauna and flora are outside the scope of this report.

2.0 BUSHFIRE HAZARD ASSESSMENT

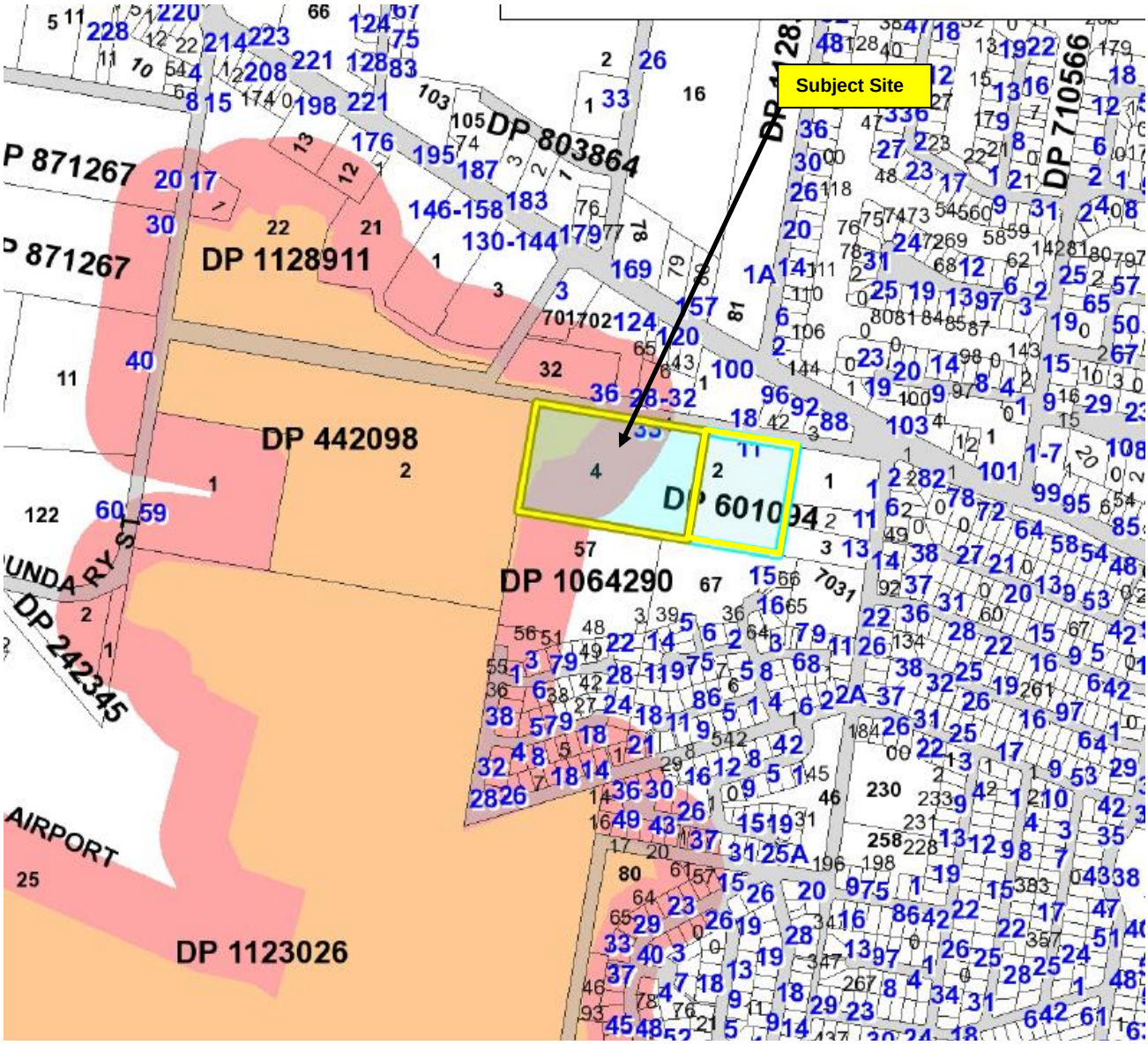
2.1 Procedure

Several factors need to be considered in determining the bushfire hazard for the proposed rezoning of the subject site being slope, vegetation type, distance from vegetation and access/egress. Each of these factors has been reviewed in determining a bushfire hazard rating for the subject site and proposed rezoning.

2.2 Hazard Vegetation

Port Macquarie-Hastings Councils Bushfire Prone Land Risk Mapping provides that areas of Category 1 bushfire hazard vegetation are located in the north-western portion of the subject site and on adjoining and adjacent land to the west with the subject site being affected by the 100m buffer zone to the Category 1 vegetation; refer to **Figure 4**.

Figure 4 – Extract from Port Macquarie – Hastings Bushfire Risk Mapping



The aforementioned mapping does not however indicate the presence of;

- a narrow band of remnant Forested Wetland vegetation along the far southern portion of the subject site and on adjoining and adjacent land to the south; and
- small remnant areas of Forested Wetland on Lot 2 DP 601094, 11 Mumford Street, Port Macquarie; and
- significant regrowth of Forested Wetland vegetation on adjacent land to the south of Lot 4 DP 825704, 33 Mumford Street, Port Macquarie; and
- an isolated area of Forested Wetland vegetation at distance to the southeast of the subject site.

The above vegetation associations were considered when assessing the required defendable spaces and indicative Bushfire Attack Levels, (BAL's), for any future development/s.

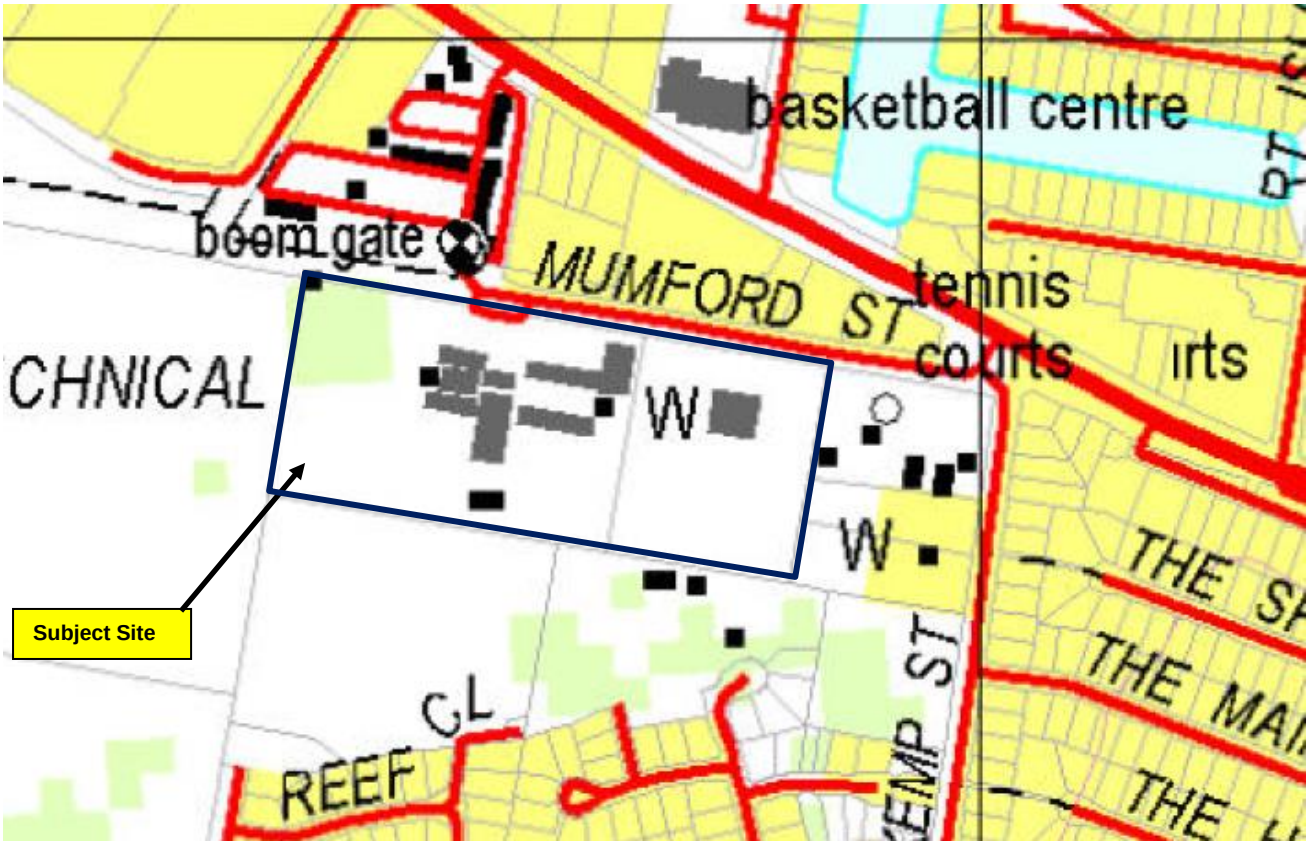
2.3 Slope Assessment

Slope is a major factor to consider when assessing the bushfire risk of any development which is subject to compliance with the requirements of NSW Rural Fire Service, ***Planning for Bushfire Protection***, 2006. Therefore, the slope of the subject site and surrounding area, (to a distance of 100m), was measured using a Suunto PM-5/360 PC Clinometer.

The subject site is located within the flood plain of the Hastings River and accordingly the topography of the subject site and adjoining and adjacent land is relatively flat. However, reflecting the presence of extensive areas of wetland on adjoining and adjacent land to the south and west some very gentle north to south downslopes are present in the locality. It is noted that the topography of the subject site may have been altered over time with filling providing for more elevated land. Slope conditions on adjoining and adjacent land are similar to that of the subject site.

The topographic features of the subject site and adjoining and adjacent land can be seen in **Figure 5** below;

Figure 5 – Topographic Conditions



The following table indicates the slopes measured within the vegetation affecting the site.

Table 2 - Slope Assessment Results

DIRECTION OF HAZARD	SLOPE degrees)	UPSLOPE/DOWN SLOPE
South	0˚ - 1˚	Down slope
West	0˚ - 1˚	Down slope

***Note: In accordance with NSW Rural Fire Services, Planning for Bushfire Protection, 2006 and AS3959 – 2009 all upslope vegetation is considered to be 0˚.**

The above slopes were considered when assessing the required defendable spaces and indicative Bushfire Attack Levels, (BAL's), for any future development/s.

2.4 Vegetation Assessment

The vegetation on and surrounding the subject site was assessed over a distance of 140m from the proposed development.

The vegetation formations were classified using the system adopted as per Keith (2004) and in accordance with Appendix 3 of NSW Rural Fire Service, ***Planning for Bushfire Protection***, 2006 and Table 2.3 of AS 3959 - 2009.

The following information is provided in relation to the floristic characteristics of the subject site and adjoining and adjacent land. In adopting a conservative approach to bushfire hazard assessment worst case vegetation characteristics have been identified.

2.4.1 Vegetation within Subject Site

The subject site has been cleared of the majority of vegetation with grasslands and scattered and clusters of trees predominating over much of the subject site. It is however noted that an area of Forested Wetland is present in the north-western portion of Lot 4 DP 825704 whilst narrow remnants of Forested Wetland vegetation are present adjacent to the southern boundary of the subject site and the western boundary of Lot 2 DP 601094.

Narrow band of Forested Wetland adjacent to southern boundary of the subject site

Remnant areas of Forested Wetland on the subject site

Areas of Forested Wetland in north-western portion of the subject site

The development concept for the subject site provides that existing vegetation, (Forested Wetland), will be retained adjacent to the southern boundary of the subject site together with the area of Forested Wetland vegetation in the north-western portion of Lot 4 DP 825704. Given the narrow width, (<20m), of the Forested Wetland vegetation which is present in the southern aspect of the subject site and the presence of grasslands on either side of the Forested Wetland vegetation this area of vegetation was assessed as being similar in context to the subject site as riparian vegetation and accordingly a Rainforest specification has been adopted for this area of vegetation (south-eastern aspect). A Forested Wetland vegetation classification has been adopted for the north-western aspect of the subject site.

Managed vegetation to the southeast of the Forested Wetland vegetation adjacent to the southern boundary of the subject site

It is also noted that the development concept also provides for the construction of a vegetated stormwater quality detention basin. Whilst no floristic information is available in relation to the stormwater management infrastructure a specification similar to Rainforest has been adopted for the purposes of this assessment.

2.4.2 Vegetation on Adjoining and Adjacent Land to Subject Site

The following vegetation characteristics were identified as being relevant to the proposed rezoning having regard to the vegetation characteristics of adjoining and adjacent land.

Managed vegetation associated with the gardens and landscaping of the developed commercial and residential properties are present on adjoining and adjacent land to the north and east of the subject site for a distance in excess of 140mm. Accordingly no areas of bushfire hazard vegetation are present in these aspects.

Existing commercial development to the north of the subject site

Existing caravan park development to the northwest of the subject site

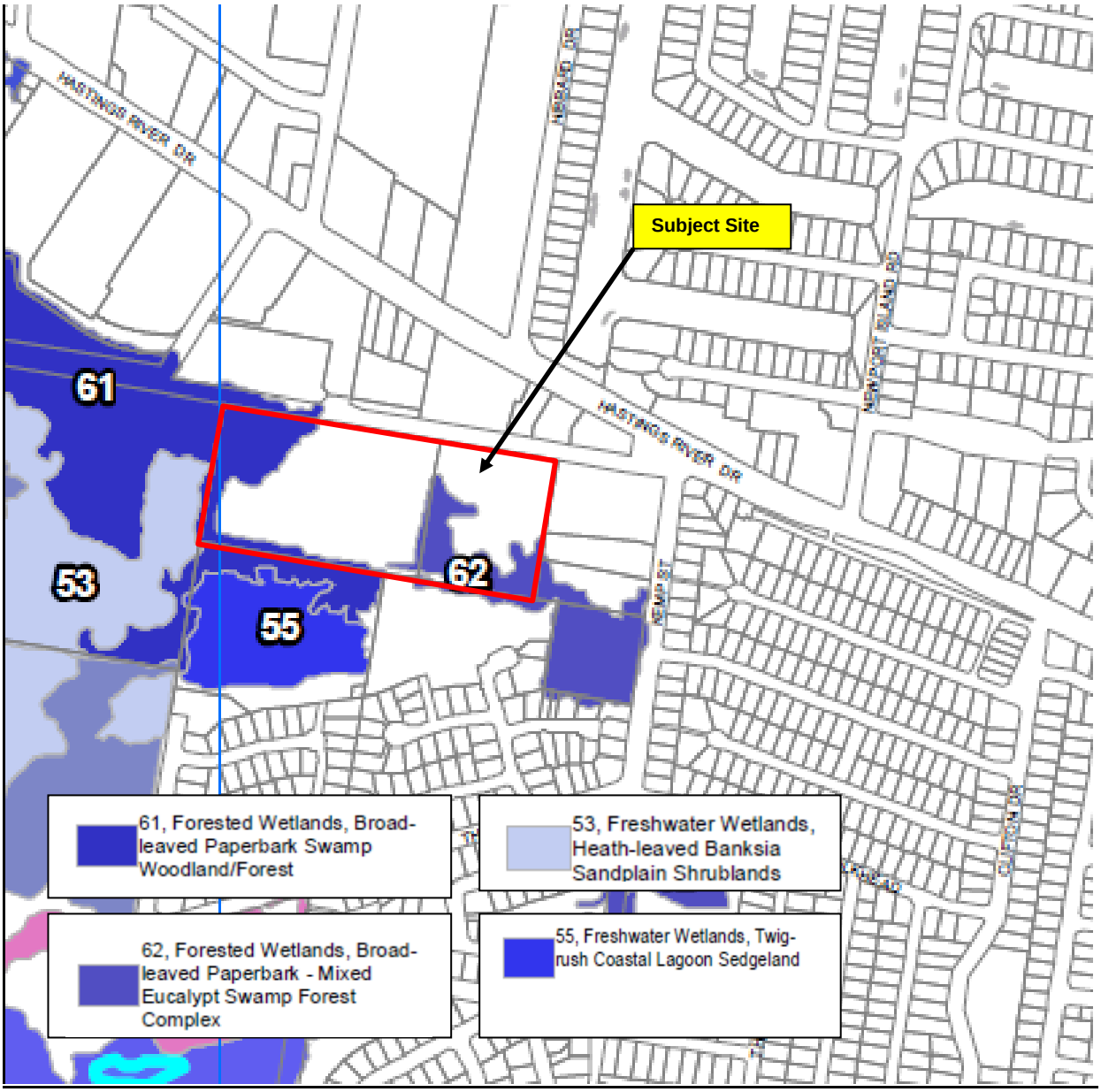
Existing tennis centre and motel development to the east of the subject site

Extensive areas of Forested Wetland are present on adjoining and adjacent land to the west and southwest of the subject site.

Forested Wetland regrowth to the southwest of the subject site

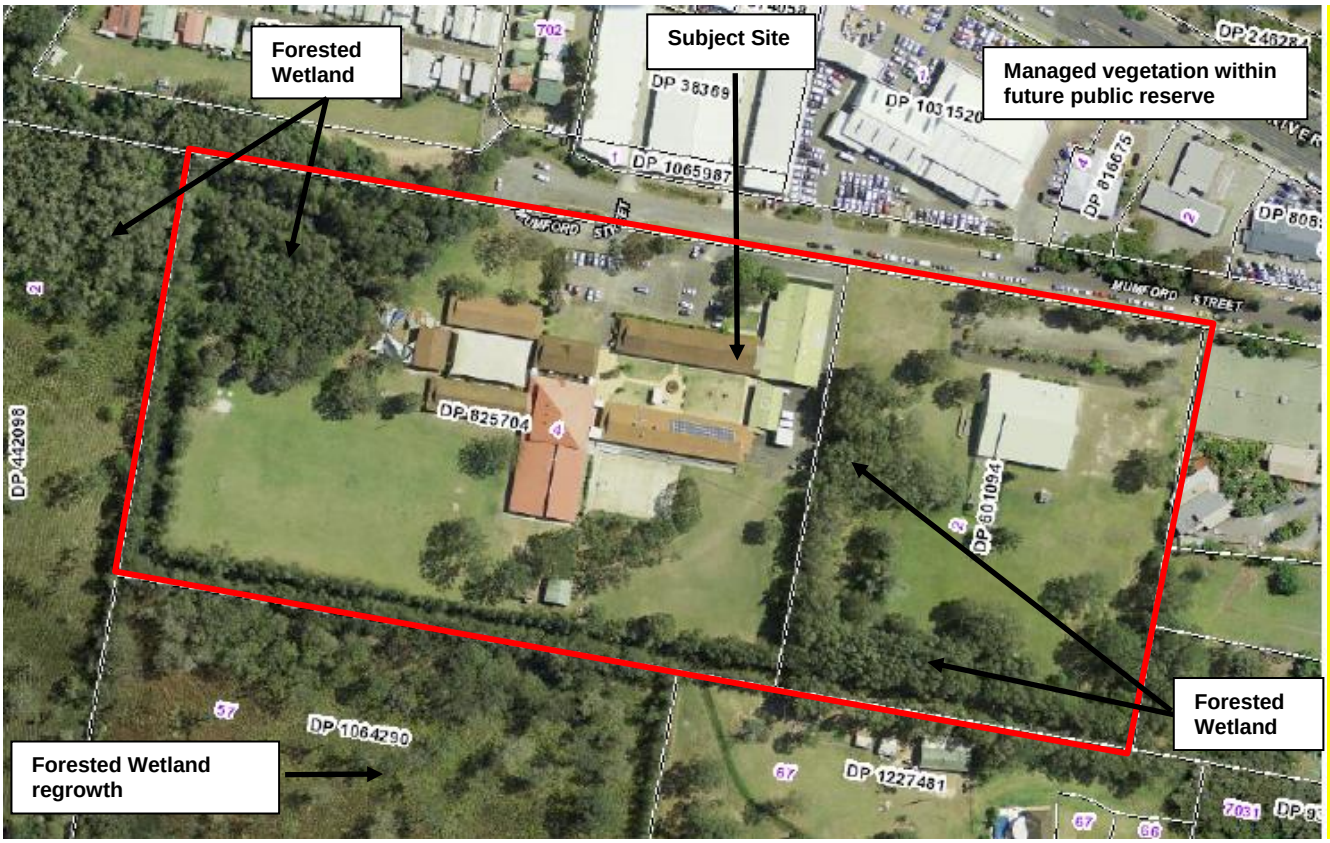
The initial and subsequent identification of vegetation of bushfire significance to the subject site and the individual residential allotments of land is consistent with the vegetation mapping which has been undertaken for the area by Port Macquarie Hastings Council, refer to **Figure 6**.

Figure 6 – Vegetation Mapping



An indication of the relationship of the vegetation of bushfire significance to the subject site and its future development is presented in **Figure 7** below.

Figure 7 - Vegetation Relationships to the Subject Land



The following table summarizes the various vegetation structures which are of bushfire significance to the proposed rezoning of the subject site.

Table 3 – Summary of Vegetation Characteristics

ASPECT	VEGETATION DESCRIPTION	VEGETATION CLASSIFICATION – (Keith, 2004)
Southeast	Narrow band of Forested Wetland on subject site and proposed vegetation within proposed stormwater quality management wetland	Similar in specification to Rainforest
Southwest	Forested Wetland adjacent to southern boundary of the subject site.	Forested Wetland
West	Forested Wetland on subject site and on adjoining and adjacent land	Forested Wetland

2.5 Fire Danger Index

The fire weather for the site is assumed on the worst-case scenario. In accordance with NSW Rural Fire Services, ***Planning for Bushfire Protection***, 2006 and Table 2.1 of AS 3959 - 2009, the fire weather for the site is based upon the 1:50 year fire weather scenario and has a Fire Danger Index (FDI) of 80.

3.0 BUSHFIRE THREAT REDUCTION MEASURES

3.1 NSW Rural Fire Services, *Planning for Bushfire Protection*, 2006

The following issues and constraints have been identified through considering the requirements of NSW Rural Fire Service, ***Planning for Bushfire Protection***, 2006 as they apply to the rezoning of portion of the subject site and the future development of the subject site.

3.1.1 Defendable Space/Asset Protection Zone

To ensure that the aims and objectives of NSW Rural Fire Service, ***Planning for Bushfire Protection***, 2006 are achieved for the proposed rezoning, a Defendable Space/Asset Protection Zone (APZ) between the asset and the hazard should be provided.

The APZ provides for; minimal separation for safe fire fighting, reduced radiant heat, reduced influence of convection driven winds, reduced ember viability and dispersal of smoke. The APZ consists of an Inner Protection Area (IPA) and Outer Protection Area (OPA). The IPA is an area closest to the buildings that incorporates defendable space and is used for managing heat intensities at the building surface. The OPA is positioned adjacent to the hazard and the purpose of the OPA is to reduce the potential length of flame by slowing the rate of spread, filtering embers and suppressing the crown fire.

It is noted that the requirements for APZ are relevant to any future development of infrastructure within the existing school.

NSW Rural Fire Service**,** ***Planning for Bushfire Protection*****,** 2006 provides that a defendable space is;

'an area within the asset protection zone that provides an environment in which a person can undertake property protection after the passage of a bush fire with some level of safety'.

It is noted that the requirements for a defendable space are relevant to any future commercial/industrial buildings erected on the subject site.

The following assessment of APZ/defendable space requirements which are relevant to the proposed rezoning is provided as follows;

(i) Special Fire Protection Purpose Development (School Infrastructure)

It is noted that the future development of the existing school infrastructure on the subject site provides for APZ's in accordance with Special Fire Protection Purposes (SFPP) requirements of NSW Rural Fire Service, ***Planning for Bushfire Protection***, 2006. APZ's in SFPP situations must be such that radiant heat levels of greater than 10kW/m² will not be experienced by occupants or emergency workers entering or exiting a building.

The following table indicates the minimum 'deemed to satisfy' Asset Protection Zones required from the hazard vegetation to SFPP buildings. The table is based upon the vegetation type, slopes, and fire weather (FDI) which is applicable to this assessment.

Table 4 – Minimum SFPP Development Asset Protection Zone Requirements (PfBP 2006)

DIRECTION OF HAZARD	VEGETATION TYPE	SLOPE	IPA	OPA	TOTAL REQUIRED APZ
Southeast	Specification similar to Rainforest	0˚ - 1˚ Down slope	40m	-	40m
Southwest	Forested Wetland	0˚ - 1˚ Down slope	40m	20m	60m
West	Forested Wetland	0˚ - 1˚ Down slope	40m	20m	60m

Having regards to the above the positioning of any future school infrastructure on the subject site must be such that compliance with the minimum APZ requirements provided for in **Table 4** can be achieved or alternatively any future development must demonstrate compliance with the performance objectives of NSW Rural Fire Service, ***Planning for Bushfire Protection***, 2006.

The APZ performance criteria and acceptable solution provisions which would apply to any future Special Fire Protection Purpose development on the subject site are detailed in the following table:

Table 5 – APZ SFPP Development Performance Requirements

Intent of measures: to provide sufficient space for fire fighters and other emergency services personnel, ensuring radiant heat levels permit operations under critical conditions of radiant heat, smoke and embers, while supporting or evacuating occupants.		
Performance Criteria	**Acceptable Solutions**	**Compliance Comment**
The intent may be achieved where:		
Radiant heat levels of greater than 10kW/m² will not be experienced by occupants or emergency workers entering or exiting a building	An APZ is provided in accordance with the relevant tables/ figures in Appendix 2 of NSW RFS Planning for Bushfire Protection 2006	✔ To be complied with in relation to the design of future development
	Exits are located away from the hazard side of the building.	✔ To be complied with in relation to the design of future development
	The APZ is wholly within the boundaries of the development site. Exceptional circumstances may apply (see section 3.3 of NSWRFS Planning for Bushfire Protection 2006)	✔ To be complied with in relation to the design of future development
Applicants demonstrate that issues relating to slope are addressed: maintenance is practical, soil stability is not compromised and the potential for crown fire is negated.	Mechanisms are in place to provide for the maintenance of the APZ over the life of the development.	✔ All APZ's can be maintained over the life of the development.
	The APZ is not located on lands with a slope exceeding 18 degrees.	✔ All APZ's can be located on land with slopes not exceeding 5 degrees.
APZs are managed and maintained to prevent the spread of fire towards the building.	In accordance with the requirements of Standards for Asset Protection Zones (RFS, 2005) *Note: A Monitoring and Fuel Management Program should be required as a condition of development consent.*	✔ The land within the subject site is to be managed to the standards which are applicable to Inner Protection Areas.
Vegetation is managed to prevent flame contact and reduce radiant heat to buildings, minimise the potential for wind driven embers to cause ignition and reduce the effect of smoke on	Compliance with Appendix 5.	✔ Future landscaping and vegetation management will comply with the requirements of Appendix 5.

residents and fire fighters.		

It is noted that NSW Rural Fire Service, ***Planning for Bushfire Protection***, 2006, provides for no methodology as to how a performance-based approach to meeting the above objectives is to be determined nor assessed. Accordingly, the development of a performance-based approach to meeting the performance objectives will need to qualify the bushfire risk posed to future school building in conjunction with the development of bushfire threat management strategies which clearly demonstrate how future school building/s can be provided so as to be consistent with the requirements of NSW Rural Fire Service, ***Planning for Bushfire Protection***, 2006.

Given the ability to pursue merit/performance based solutions, particularly given that any additional school building infrastructure would be considered Infill Special Fire Protection Purpose development, it is considered that there are opportunities to position future buildings so as to comply with the relevant requirements of NSW Rural Fire Service, ***Planning for Bushfire Protection***, 2006 and accordingly the proposed rezoning of the subject site to allow for future development is appropriate as it will be necessary to demonstrate compliance with the APZ requirements in relation to any specific future development proposal.

(ii) Industrial/Commercial Development

NSW Rural Fire Service, ***Planning for Bushfire Protection***, 2006 does not prescribe an acceptable solution for the provision of a defendable space in relation to commercial and industrial development with the acceptable solutions provided for by Section 4.1.3 of NSW Rural Fire Service**,** ***Planning for Bushfire Protection*****,** 2006 applying only to residential and Special Fire Protection Purpose developments. Accordingly, the provision of a defendable space to any future commercial/industrial development on the subject site must satisfy the general objectives of NSW Rural Fire Service, ***Planning for Bushfire Protection***, 2006.

In this regard the following objectives are relevant to the provision of a defendable space to any future commercial/industrial development;

- *afford occupants of any building adequate protection from exposure to a bush fire;*
- *provide for a defendable space to be located around buildings;*
- *provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent direct flame contact and material ignition;*
- *provide for ongoing management and maintenance of bush fire protection measures, including fuel loads in the asset protection zone (APZ);*

It is noted that NSW Rural Fire Service, ***Planning for Bushfire Protection***, 2006, provides for no methodology as to how a performance-based approach to meeting the above objectives is to be determined nor assessed. Accordingly, the development of a performance-based approach to meeting the objectives must have regard to qualifying the bushfire risk posed to future commercial/industrial buildings utilizing the "Deemed-to-Satisfy' provisions of the Building Code of Australia as the basis of determining a buildings resistance to the spread of fire. This approach recognizes that NSW Rural Fire Service, ***Planning for Bushfire Protection***, 2006 provides that;

The provisions under the Building Code of Australia for fire safety will be accepted for bushfire purposes where the aim and objectives of NSW Rural Fire Services, ***Planning for Bushfire Protection****, 2006 can be met'.*

In this regard given the performance nature of the determination of defendable space requirements for commercial/industrial development the determination of the spatial requirements for any future building development on the subject site will be the subject of development specific determination as a combination of bushfire threat management measures could be utilized so as to satisfy the performance objectives of NSW Rural Fire Service**,** ***Planning for Bushfire Protection*****,** 2006.

It is therefore considered that there are opportunities to position future commercial/industrial buildings on the subject site so as to comply with the relevant requirements of NSW Rural Fire

Service, ***Planning for Bushfire Protection***, 2006 and accordingly the proposed rezoning of the subject site to allow for future development is appropriate as it will be necessary to demonstrate compliance with the defendable space/APZ requirements in relation to any specific future development proposal.

Based upon the size and shape of the subject site it is considered that the intent of the requirement for the provision of Asset Protection Zones and Defendable Spaces as required by NSW Rural Fire Services, *Planning for Bushfire Protection*, 2006 can be satisfied for the future development of the subject site albeit that the location, nature and form of construction of future development must reflect the performance objectives of NSW Rural Fire Services, *Planning for Bushfire Protection*, 2006.

As such redesign of any future development proposal on the subject site may be required in order to achieve compliance.

It is however recommended that in order to reduce the requirements for the provision of Asset Protection Zones/Defendable Spaces a Vegetation Management Plan should be prepared for the vegetation within the proposed stormwater management wetland such that the vegetation meets the standard which is applicable to an APZ. This can assist in reducing the implications of providing compliant APZ's/Defendable Spaces in relation to future development.

3.1.2 Defendable Space/Asset Protection Zone Management

Areas identified as forming part of the minimum APZ/Defendable Space requirements for any future developments on the subject site must be created and managed so as to comply with the standards which are applicable to Asset Protection Zones as follows;

(i) Inner Protection Area (IPA)

An IPA should provide a tree canopy cover of less than 15% and should be located greater than 2 metres from any part of the roofline of a building.

Garden beds of flammable shrubs are not to be located under trees and should be no closer than 10m from an exposed window or door.

Trees should have lower limbs removed up to a height of 2 metres above the ground.

(ii) Outer Protection Area (OPA)

An OPA should provide a tree canopy cover of less than 30% and should have the understorey managed (mowed) to treat all shrubs and grasses on an annual basis in advance of the fire season (usually September).

3.1.3 Operational Access and Egress

Access to the subject site will be via the existing Mumford Street road reserve which adjoins the subject site to the north.

Mumford Street is a tar sealed all weather two-way public road which terminates in a cul de sac turning head adjacent to the western extent of the Heritage Christian School development footprint. In this regard travel is available to and from the subject site in an easterly/westerly direction along Mumford Street. Areas, which would be protected from the impact of bushfire, are present to the north and east of the subject site. Travel for a distance of 250m to the east of the subject site provides for connection with Hastings River Drive which is a major east to west connecting road which services the western urban area of Port Macquarie.

Mumford Street – immediately adjoining the northern boundary of the subject site

Hastings River Drive – to the north of the subject site

The existing public road infrastructure in the immediate area therefore provides for a number of access and egress options to and from areas that would be protected from any bushfire threat. Having regard to the relatively short travel distances involved to areas that would be protected from the effects of fire and the variety in access and egress options to and from the subject site it is considered that adequate access and egress is available.

The development concept for the subject site provides for the augmentation of the existing internal access road systems which service the existing school and church developments on the subject site.

It will be necessary to construct all new internal access roads within the subject site associated with any future commercial/business/industrial development so as to comply with the relevant provisions of the internal access road requirements of Section 4.1.3 of NSW Rural Fire Services**, *Planning for Bushfire Protection***, 2006. The specific internal road design requirements provided for in Section 4.2.7 of NSW Rural Fire Services**, *Planning for Bushfire Protection***, 2006 are also required to be complied with were infrastructure is associated with a Special Fire Protection Purpose development.

The relevant internal road provisions which are applicable to the future commercial/business/industrial development of the subject site are summarized as follows;

Table 6 - Acceptable Solutions (Access/Internal Roads)

Intent of measures: to provide safe access to/from the public road system for fire fighters providing property protection during a bush fire and for occupants faced with evacuation.		
Performance Criteria	**Acceptable Solutions**	**Compliance Comment**
The intent may be achieved where:		
Access to properties is provided in recognition of the risk to fire fighters and/ or evacuating occupants.	At least one alternative property access road is provided for individual dwellings (or groups of dwellings) that are located more than 200 metres from a public through road	N/A
The capacity of road surfaces and bridges is sufficient to carry fully loaded fire fighting vehicles. All weather access is provided.	Bridges clearly indicate load rating and pavements and bridges are capable of carrying a load of 15 tonnes.	✔ To be complied with in relation to the design of future development No bridges are likely to be required.
	Roads do not traverse a wetland or other land potentially subject to periodic inundation (other than a flood or storm surge).	✔ To be complied with in relation to the design of future development
Internal road widths and design enable safe access for emergency services and allow crews to work with equipment about the vehicle	Internal roads are two-wheel drive, sealed, all weather roads. Internal perimeter roads are provided with at least two traffic lane widths (carriageway 8 meters minimum kerb to kerb) and shoulders on each side, allowing traffic to pass in opposite directions; Roads are through roads. Dead end roads are not more than 100m in length from a through road, incorporate a minimum 12 meters outer radius turning circle, and are clearly signposted as a dead end; Traffic management devices are constructed to facilitate access by emergency service vehicles; A minimum vertical clearance of four meters to any overhanging obstructions, including tree branches, is provided; Curves have a minimum inner radius of six meters and are minimal in number to allow for rapid access and egress; . The minimum distance between inner and outer curves is six meters;	✔ The design and construction of access roads is to provide for compliance with the relevant design and construction provisions.

	Maximum grades do not exceed 15 degrees and average grades are not more than 10 degrees; Cross fall of the pavement is not more than 10 degrees; Roads do not traverse through a wetland or any other land potentially subject to periodic inundation (other than flood or storm surge); Roads are clearly sign posted and bridges clearly indicate load ratings; The internal road surfaces and bridges have a capacity to carry fully-loaded fire fighting vehicles (15 tonnes).	

Given the existing nature of the public road infrastructure and the nature of the proposed future development of the subject site it is considered that access and egress arrangements for the future development of the subject site can be consistent with the relevant performance requirements of NSW Rural Fire Services**,** ***Planning for Bushfire Protection***, 2006.

3.1.4 Services - Water, Gas and Electricity

As set out in Section 4.1.3 of NSW Rural Fire Services**,** ***Planning for Bushfire Protection***, 2006, developments in bushfire prone areas must maintain a water supply reserve dedicated to firefighting purposes.

Given that the proposed rezoning provides for Special Fire Protection Purpose and commercial/business/industrial development, any future buildings will have access to the reticulated water supply, the extension of which will be required by Port Macquarie-Hastings Council to service development within an urban context. It is however noted that in accordance with NSW Rural Fire Services**,** ***Planning for Bushfire Protection***, 2006 the determination of a guaranteed water supply is to be made by the water supply authority where mains water supply is available.

Electricity supply is available and will be accessible to the future development of the land.

Reticulated gas services are not available in the locality and are therefore not available to the subject site.

The incorporation into any future development of the subject site of the relevant provisions of the following acceptable solutions as provided for by Sections 4.1.3 and Sections 4.2.7 of NSW Rural Fire Services**,** ***Planning for Bushfire Protection***, 2006 will ensure compliance with the intent for the provision of services to any future development of the subject site.

Table 7 – Service Provision Requirements

Intent of measures: to provide adequate services of water for the protection of buildings during and after the passage of a bush fire, and to locate gas and electricity so as not to contribute to the risk of fire to a building		
Performance Criteria	**Acceptable Solutions**	**Compliance Comment**
The intent may be achieved where:		
Reticulated water supplies Reticulated water	Access points for reticulated water supply to SFPP developments incorporate a ring main system for all internal roads.	✔ Future development will have access to the reticulated

supplies are easily accessible and located at regular intervals	Fire hydrant spacing, sizing and pressures comply with AS 2419.1 – 2005. Where this cannot be met, the RFS will require a test report of the water pressures anticipated by the relevant water supply authority, once development has been completed. In such cases, the location, number and sizing of hydrants shall be determined using the fire engineering principles. No services or hydrants are located within the parking bays	water supply which services the urban area. The water supply is to be designed and constructed so as to comply with the relevant requirements.
Electricity Location of electricity services will not lead to ignition of surrounding bushland or the fabric of buildings or risk to life from damaged electrical infrastructure	Electrical transmission lines are underground	✔ To comply.
Gas Location of gas services will not lead to ignition of surrounding bushland or the fabric of buildings	Reticulated or bottled gas is installed and maintained in accordance with AS 1596 and the requirements of relevant authorities. Metal piping is to be used. All fixed gas cylinders are kept clear of all flammable materials to a distance of 10 metres and shielded on the hazard side of the installation. If gas cylinders need to be kept close to the building, the release valves are directed away from the building and at least 2 metres away from any combustible material, so that they do not act as a catalyst to combustion. Connections to and from gas cylinders are metal. Polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not used.	✔ Reticulated gas supplies are not available within the area. Gas bottles and other sources of ignition are stored away from the hazard and in positions to reduce the risk.

3.1.5 Emergency Evacuation Planning

Special Fire Protection Purpose developments should have suitable management arrangements and structures capable of developing and implementing an Emergency Plan.

Before occupation of any future Special Fire Protection Purpose development on the subject site an Emergency Evacuation Plan incorporating bushfire evacuation will be required to be produced for the proposed development.

Compliance with the following acceptable solutions as provided for by Section 4.2.7 of NSW Rural Fire Services, ***Planning for Bushfire Protection***, 2006 will ensure compliance with the intent for Emergency Evacuation Planning before the occupation of any future Special Fire Protection Purpose development on the subject site.

Table 8 - Acceptable Solutions for Emergency and Evacuation (SFPP Developments)

Intent of measures: to provide suitable emergency and evacuation (and relocation) arrangements for occupants of special fire protection purpose developments		
Performance Criteria	**Acceptable Solutions**	**Compliance Comment**
The intent may be achieved where:		
An Emergency and Evacuation Management Plan is approved by the relevant fire authority for the area.	An emergency evacuation plan is prepared consistent with the RFS Guidelines for the preparation of *Emergency/Evacuation Plan*. Compliance with AS 3745-2002 'Emergency control organization and procedures for buildings, structures and workplaces for residential accommodation.'	✔ To comply
Suitable management arrangements are established for consultation and implementation of the emergency and evacuation plan.	An Emergency Planning Committee is established to consult with residents (and their families in the case of schools) and staff in developing and implementing an Emergency Procedures Manual. Detailed plans of all Emergency Assembly Areas including "onsite" and "offsite" arrangements as stated in AS 3745-2002 are clearly displayed, and an annual (as a minimum) trial emergency evacuation is conducted.	✔ To comply

3.1.6 Landscaping

Landscaping is a major cause of fire spreading to buildings, and therefore any landscaping proposed in conjunction with the future development of the subject site will need consideration when planning, to produce gardens that do not contribute to the spread of a bushfire.

When planning any future landscaping surrounding any future development on the subject site, consideration should be given to the following:

- The choice of vegetation – consideration should be given to the flammability of the plant and the relation of their location to their flammability and ongoing maintenance to remove flammable fuels.

- Trees as windbreaks/firebreaks – Trees in the landscaping can be used as windbreaks and also firebreaks by trapping embers and flying debris.
- Vegetation management – Maintain a garden that does not contribute to the spread of bushfire.
- Maintenance of property – Maintenance of the property is an important factor in the prevention of losses from bushfire.

Appendix 5 of NSW Rural Fire Services**, *Planning for Bushfire Protection***, 2006, contains standards that are applicable to the provision and maintenance of landscaping. Any landscaping proposed to be undertaken in conjunction with any future development of the areas which are the subject of this report is to comply with the principles contained in Appendix 5 of NSW Rural Fire Services**, *Planning for Bushfire Protection***, 2006**.**

Compliance with Appendix 5 of NSW Rural Fire Services**, *Planning for Bushfire Protection***, 2006, will satisfy the intent of the bush fire protection measures that are applicable to the provision of landscaping.

3.1.7 Construction Requirements

It is noted that Appendix 3 of NSW Rural Fire Service, ***Planning for Bushfire Protection***, 2006 now contains specific construction requirements which the NSW Rural Fire Service will seek to impose, through the development control process, in addition to the construction requirements contained within AS3959 – 2009.

Accordingly, the determination of the construction requirements which will be applicable to any specific future development proposal will need to have regard to the construction requirements nominated in Appendix 3 of NSW Rural Fire Service, ***Planning for Bushfire Protection***, 2006 in addition to the requirements of AS3959 – 2009.

It is however noted that due to the unknown nature and extent of the future development of the subject site the application of the requirements of Appendix 3 of NSW Rural Fire Service, ***Planning for Bushfire Protection***, 2006 is not considered relevant at this stage of the planning process.

Notwithstanding the above based upon the size of the subject site and the spatial relationship with areas of bushfire hazard vegetation it is considered that the requirements of NSW Rural Fire Services**, *Planning for Bushfire Protection***, 2006 for the siting, design and construction of any future buildings can be satisfied**.** The relevant requirements of NSW Rural Fire Services**, *Planning for Bushfire Protection*,** 2006, are summarized as follows;

Table 9 – Building Siting and Design Requirements (PfBP 2006)

PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS
in relation to siting and design: • buildings are sited and designed to minimize the risk of bush fire attack.	• buildings are designed and sited in accordance with the siting and design principles
in relation to construction standards: • it is demonstrated that the proposed building can withstand bush fire attack in the form of wind, smoke, embers, radiant heat and flame contact	• construction determined in accordance with Appendix 3 and the *Requirements for attached garages and other structures*

3.2 Construction of Buildings in Bushfire Prone Areas

3.2.1 General

In NSW, the bushfire protection provisions of the Building Code of Australia, (BCA), are applied to Class 1, 2, 3, Class 4 parts of buildings, some Class 10 buildings and Class 9 buildings that are Special Fire Protection Purposes (SFPP's).

The BCA references AS3959 – 2009 as the Deemed-to-Satisfy (DTS) solution for construction requirements in bushfire prone areas for NSW.

It is however noted that there are a number of NSW variations to the application of AS3959 – 2009 including a restriction on the utilization of the Bushfire Attack Level – Flame Zone requirements of the Australian Standard as a 'deemed to satisfy solution' for these situations. Consequently, in NSW all situations which are determined as being subject to the Bushfire Attack Level – Flame Zone requirements of AS3959 – 2009 must be treated on merit with construction requirements being determined on a specific site assessment basis.

As the development concept involves Class 9b buildings the requirements of AS3959 – 2009 would typically be applicable to the future development of the subject site.

It is however noted that the BCA does not provide for any bush fire specific performance requirements in relation to other non-residential or SFPP development and as such AS 3959 does not apply as a set of 'deemed to satisfy' provisions. The general fire safety construction provisions are of the BCA are taken as acceptable solutions. This would be specifically relevant where commercial/business/industrial developments are undertaken on the subject site as a consequence of the proposed rezoning.

Notwithstanding the above the following preliminary assessment of Bushfire Attack Levels is provided as it applies to Special Fire Protection Purpose developments on the subject site. This assessment is based upon the provision of the minimum required APZ as provided for by **Table 4** of this report.

3.2.2 Vegetation

To complete the assessment under AS 3959 (2009) the vegetation, as originally assessed in accordance with Keith, has to be converted to Specht. The following table shows the conversion:

Table 10 – Summary of Vegetation Characteristics

ASPECT	VEGETATION CLASSIFICATION – (Keith, 2004)	VEGETATION CLASSIFICATION – (Specht)
Southeast	Similar in specification to Rainforest	Rainforest
Southwest	Forested Wetland	Forest
West	Forested Wetland	Forest

3.2.3 AS3959 – 2009 Construction of Buildings in Bushfire Prone Areas

The following construction requirements in accordance with AS 3959 – 2009 *Construction of Buildings in Bushfire Prone Areas* is required for the bushfire attack level categories.

Table 11 – Bushfire Attack Levels

BUSHFIRE ATTACK LEVEL (BAL)
No construction requirements under AS 3959-2009
BAL - 12.5
BAL - 19
BAL - 40

BAL - FZ

Based upon the information presented in Section 2 of this report the worst-case Bushfire Attack Levels pursuant to AS3959 – 2009 have been determined as being applicable to the proposed rezoning and any future Special Fire Protection Purpose development of the subject site.

It is noted that the following BAL assessment has been based upon the provision of the required Asset Protection Zones to Special Fire Protection Purpose development as provided for by **Table 4**.

Table 12 – Worst Case Bushfire Attack Levels for Nominated Vegetation Classifications and Slopes (SFPP Development)

ASPECT	VEGETATION CLLASSIFICATION	DISTANCE (of proposed Lot from Hazard Vegetation)	SLOPE	BUSHFIRE ATTACK LEVEL (BAL)
Southeast	Rainforest	40m	0˚ - 1˚ Down slope	BAL 12.5
Southwest	Forest	60m	0˚ - 1˚ Down slope	BAL 12.5
West	Forest	60m	0˚ - 1˚ Down slope	BAL 12.5

The information presented in the above table indicates that where the minimum required APZ's are provide in accordance with **Table 4** of this report, future Special Fire Protection Purpose development would be subjected to a worst-case Bushfire Attack Level of BAL 12.5. This is consistent with the acceptable solution requirements of NSW Rural Fire Service, ***Planning for Bushfire Protection***, 2006. (It is noted that the design concept in **Appendix 2** does not provide for compliance with the minimum required APZ requirements).

The Bushfire Attack Level (BAL) 12.5 construction requirements of AS3959 – 2009 (as amended by NSW Rural Fire Service, ***Planning for Bushfire Protection***, 2006), are included as **Appendix 3**.

It is noted that the general fire safety construction provisions are of the BCA are taken as acceptable solutions where commercial/business/industrial developments are undertaken on the subject site and accordingly the requirements of AS3959 – 2009 would not be applicable to future commercial/business/industrial buildings constructed on the subject site.

4.0 SUMMARY OF FINDINGS

The following recommendations are provided in response to the proposed rezoning of land known as Lot 4 DP 825704 and Lot 2 DP 601094, 11 – 33 Mumford Street, Port Macquarie having regard to the development concept provided as **Appendix 2**.

(i) Adopt Landscaping principals in accordance with Section 3.1.4 of this report.

(ii) Asset Protection Zones are to be provided in accordance with this report. Specifically;

- The positioning of any future Special Fire Protection Purpose developments on the subject site must demonstrate compliance with the relevant performance objectives of NSW Rural Fire Service, ***Planning for Bushfire Protection***, 2006; and

- Defendable Spaces to any future commercial/industrial buildings on the subject site are to be the subject of individual assessment in accordance with the general objectives of NSW Rural Fire Services**,** ***Planning for Bushfire Protection***, 2006

(iii) Water and other services are to be provided to the subject site in accordance with the requirements detailed in Section 3.1.3 of this report.

(iv) The determination of the Bushfire Attack level (BAL) and corresponding construction standards for any future development of the subject site should be the subject of an individual bushfire hazard assessment conducted in conjunction with the development of the subject site.

(v) Where internal access road infrastructure is required, its design and construction must comply with the relevant internal road design requirements provided for in Section 4.1.3 and 4.2.7 of NSW Rural Fire Services**,** ***Planning for Bushfire Protection***, 2006.

(vi) The development of a Vegetation Management Plan for the vegetation within the proposed stormwater management wetland such that the vegetation meets the standard which is applicable to an APZ can assist in reducing the implications of providing compliant APZ's/Defendable Spaces in relation to future development.

5.0 CONCLUSION

It is considered that the proposed rezoning of land known as Lot 4 DP 825704 and Lot 2 DP 601094, 11 – 33 Mumford Street, Port Macquarie is at risk of bushfire attack; however, it is in our opinion that with the implementation of the bushfire threat reduction measures and consideration of the recommendations in this report, the bushfire risk is manageable for the proposed rezoning albeit that the design and construction of any future development will need to demonstrate compliance with the relevant requirements of NSW Rural Fire Service**,** ***Planning for Bushfire Protection*****,** 2006**.**

Given the ability to pursue merit/performance based solutions, it is considered that there are opportunities to position future school and commercial/industrial buildings on the subject site so as to comply with the relevant requirements of NSW Rural Fire Service, ***Planning for Bushfire Protection***, 2006 and accordingly the proposed rezoning of the subject site to allow for future development is appropriate as it will be necessary to demonstrate compliance with the bushfire threat management requirements in relation to any specific future development proposal.

With the implementation of the recommendations it is considered that it will be possible for the future development of the subject site to meet the applicable performance objectives and acceptable solutions as provided for in NSW Rural Fire Service**,** ***Planning for Bushfire Protection*****,** 2006**.**

This report is however contingent upon the following assumptions and limitations.

Assumptions

(i) For a satisfactory level of bushfire safety to be achieved regular inspection and testing of proposed measures, building elements and methods of construction, specifically nominated in this report, is essential and is assumed in the conclusion of this assessment.

(ii) There are no re-vegetation plans in respect to hazard vegetation and therefore the assumed fuel loading will not alter.

(iii) It is assumed that the building works will comply with the DTS provisions of the BCA including the relevant requirements of Australian Standard 3959 – 2009.

(iv) Any future developments are constructed and maintained in accordance with the risk reduction strategy in this report.

(v) The vegetation characteristics of the subject site and surrounding land remains unchanged from that observed at the time of inspection.

(vi) The information contained in this report is based upon the information provided for review, refer to **Appendix 2.**

No responsibility is accepted for the accuracy of the information contained within the above plans.

Limitations

(i) The data, methodologies, calculations and conclusions documented within this report specifically relate to the building and must not be used for any other purpose.

(ii) A reassessment will be required to verify consistency with this assessment if there is building alterations and/or additions, change in use, or changes to the risk reduction strategy contained in this report

6.0 REFERENCES

NSW Rural Fire Services, ***Planning for Bushfire Protection***, 2006

AS 3959-2009, ***Construction of Buildings in Bushfire Prone Areas***

Keith David 2004, Ocean ***Shores to Desert Dunes, The Native Vegetation of New South Wales and the ACT***, Department of Environment and Conservation

NSW State Government***, Rural Fires Act***, 1997

Port Macquarie-Hastings Councils, ***Bushfire Prone Land Mapping***

NSW Rural Fire Service, ***Guideline for Bushfire Prone Land Mapping***, 2002

Australian Building Codes Board, ***Building Code of Australia***, 2011
NSW Rural Fire Service – *Guideline for Bushfire Prone Land Mapping 2002*

Disclaimer

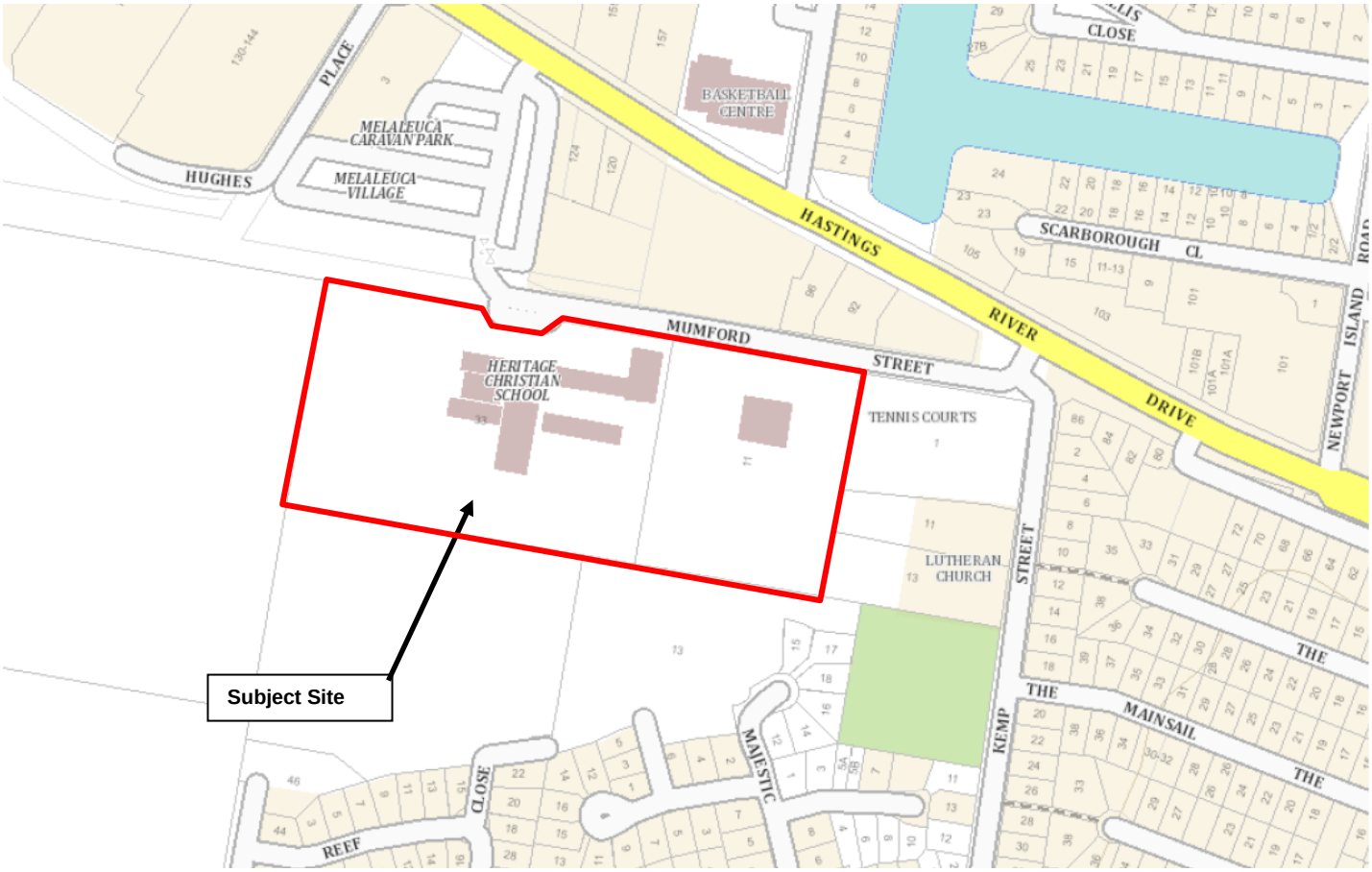
The findings referred to in this report are those which, in the opinion of the author, are required to meet the requirements of NSW Rural Fire Service, ***Planning for Bushfire Protection***, 2006. It should be noted that the Local Authority having jurisdiction for the area in which the property is located may, within their statutory powers, require different, additional or alternative works/requirements to be carried out other than those referred to in this report.

This report has been prepared partially on information provided by the client. Information provided by the client in respect of details of construction.

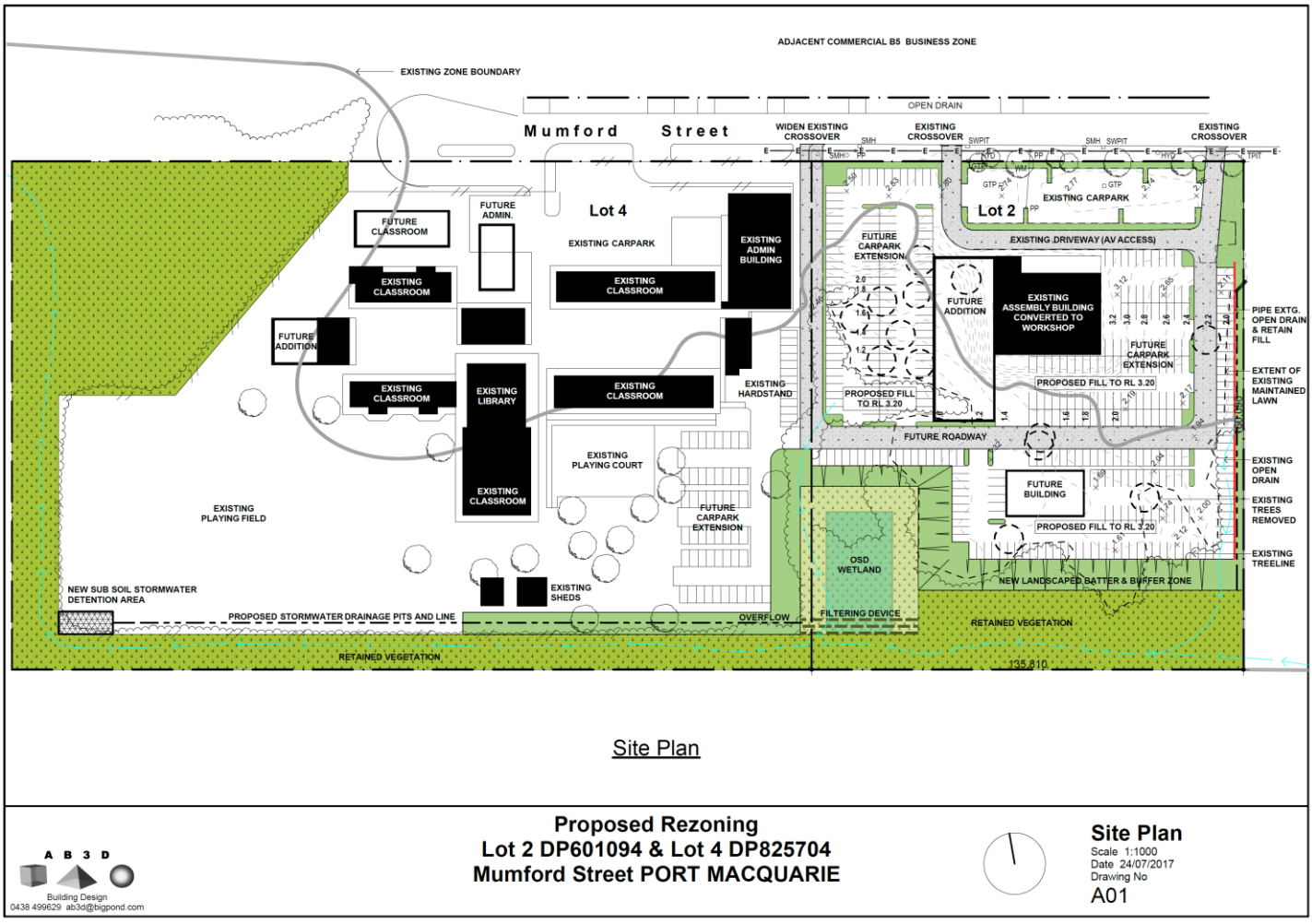
The author denies any legal liability for action taken as a consequence of the following:

- The Local Authority requiring alternative or additional requirements to those proposed or recommended in this report.
- Incorrect information, or mis-information, provided by the client with regard the proposed development which is in good faith included in the strategies proposed in this report and later found to be false.

APPENDIX 1
Subject Site



APPENDIX 2
Indicative Development Concept



Site Plan

A B 3 D
Building Design
0438 499629 ab3d@bigpond.com

Proposed Rezoning
Lot 2 DP601094 & Lot 4 DP825704
Mumford Street PORT MACQUARIE

Site Plan
Scale 1:1000
Date 24/07/2017
Drawing No
A01

APPENDIX 3
Bushfire Attack Level 12.5 (Construction Requirements)

CONSTRUCTION FOR BUSHFIRE ATTACK LEVEL 12.5 (BAL-12.5)

Version 2.2

Part of Building	Specifically	Construction requirements in accordance with AS 3959-2009 and Appendix 3 (2010) of Planning for Bushfire Protection (2006)
Subfloor supports		This standard does not provide construction requirements for subfloor supports where the subfloor space is enclosed with: (a) a wall that complies with Clause 7.4 of AS 3959-2009; or (b) Corrosion resistant steel, bronze or aluminium mesh or perforated sheet with a maximum aperture size of 2 mm; or (c) a combination of items above. Where the subfloor space is unenclosed, the support posts, columns, stumps, piers and poles shall be: (i) of non-combustible material; or (ii) of bushfire-resisting timber (see Appendix F of AS 3959-2009); or (iii) a combination of items above. NOTE: This requirement applies to the principal building only and not to verandas, decks, steps, ramps and landings (see Clause 7.7)
Floors	**Concrete slabs on ground**	This Standard does not provide construction requirements for concrete slabs on the ground.
	Elevated floors	**Enclosed subfloor** This standard does not provide construction requirements for elevated floors, including bearers, joists and flooring, where the subfloor space is enclosed with (a) a wall that complies with Clause 7.4 of AS 3959-2009; or (b) corrosion-resistant steel, bronze or aluminium mesh or perforated sheet with a maximum aperture size of 2 mm; or (c) a combination of items above. **Unenclosed subfloor space** Where the subfloor space is unenclosed, bearers, joists and flooring, less than 400 mm above finished ground level, shall be one of the following: (a) Materials that comply with the following: (i) Bearers and joists shall be- (A) non-combustible; or (B) bushfire-resisting timbers (see Appendix F of AS 3959-2009) ; or (C) a combination of items above. (ii) Flooring shall be- (A) non-combustible; or (B) bushfire-resisting timbers (see Appendix F of AS 3959-2009); or (C) timber (other than bushfire-resisting timber), particle board or plywood flooring where the underside is lined with sarking-type material mineral wool insulation; or (D) a combination of items above; or (b) A system complying with AS 1530.8.1

		This standard does not provide construction requirements for elements which are 400 mm or more above finished ground level.
External walls	**Walls**	The exposed components of an external wall that are less than 400 mm from the ground or less than 400 mm above decks, carport roofs, awnings and similar elements or fittings having an angle less than 18 degrees to the horizontal and extending more than 110 mm in width from the wall (see Figure D3, Appendix D of AS3959 - 2009) shall be: (a) Non-combustible material. NOTE: Examples include, but are not limited to, the following (with a minimum of 90 mm in thickness): (a) Full masonry or masonry veneer walls with an outer leaf of clay, concrete, calcium silicate or natural stone. (b) Precast or in situ walls of concrete or aerated concrete. (c) Earth wall including mud brick. or (b) Timber logs of a species with a density of 680 kg/m3 or greater at a 12 percent moisture content; of a minimum nominal overall thickness of 90 mm and a minimum thickness of 70 mm (see Clause 3.11 of AS3959 - 2009); and gauge planed. or (c) Cladding that is fixed externally to a timber-framed or a steel-framed wall and is— (i) non-combustible material; or (ii) fibre-cement a minimum of 6 mm in thickness; or (iii) bushfire-resisting timber (see Appendix F of AS3959 - 2009); or (iv) a timber species as specified in Paragraph E1, Appendix E of AS3959 - 2009; or (v) a combination of any of Items (i), (ii), (iii) or (iv) above. or (d) A combination of any of Items (a), (b) or (c) above. This Standard does not provide construction requirements for the exposed components of an external wall that are 400 mm or more from the ground or 400 mm or more above decks, carport roofs, awnings and similar elements or fittings having an angle less than 18 degrees to the horizontal and extending more than 110 mm in width from the wall (see Figure D3, Appendix D of AS3959 - 2009).
	Joints	All joints in external surface material of walls be covered, sealed, overlapped, backed or butt jointed to prevent gaps greater than 3 mm.
	Vents and weep holes	Vents and weepholes in external walls shall be screened with a mesh with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium, except where the vents and weepholes have an aperture less than 3 mm (see Clause 3.6 of AS3959-2009), or are located in an external wall of a subfloor space.
External glazed elements and assemblies and external doors.	**Bushfire shutters**	Where fitted, bushfire shutters must comply with Clause 3.7 of AS 3959-2009 and be made from- (a) Non-Combustible material; or (b) A timber species as specified in Paragraph E1 Appendix E of AS 3959-2009; or (c) Bushfire-resisting timber (see Appendix F of AS 3959-2009); or (d) A combination of any items (a) (b) or (c) above.

	Screens for windows and doors	Where fitted, screens for windows and doors shall have corrosion-resisting steel, bronze or aluminium mesh or perforated sheet with a maximum aperture size of 2 mm. Gaps between the perimeter of the screen assembly and the building elements to which it is fitted shall not exceed 3 mm. The frame supporting the mesh or perforated sheet shall be made from— (a) metal; or (b) bushfire-resisting timber (see Appendix F of AS3959 - 2009); or (c) a timber species as specified in Paragraph E2, Appendix E of As3959 – 2009).
	Windows	Window assemblies shall comply with one of the following: (a) They shall be completely protected by a bushfire shutter that complies with Clause 5.5.1 of AS 3959-2009; or (b) They shall be completely protected externally by screens that comply with Clause 5.5.1A of AS 3959-2009; or (c) They shall comply with the following; (i) For window assemblies, less than 400 mm from the ground or less than 400 mm above decks, carport roofs, awnings and similar elements or fitting having an angle less than 18 degrees to the horizontal and extending more than 110 mm in width from the window frame (see figure D3, Appendix D of AS 3959-2009), window frames and window joinery shall be made from: (A) Bushfire resisting timber (see Appendix F of AS 3959-2009); or (B) A timber species as specified in Paragraph E2, Appendix E of AS 3959-2009; or (C) Metal; or (D) Metal reinforced PVC-U. The reinforcing members shall be made from aluminium, stainless steel or corrosion- resistant steel and the frame and sash shall satisfy the design load, performance and structural strength of the member. (ii) Externally fitted hardware that supports the sash in its functions of opening and closing shall be metal. (iii) Where glazing is less than 400 mm from the ground or less than 400 mm above decks, carport roofs, awnings and similar elements or fittings having an angle less than 18 degrees to the horizontal and extending more than 110 mm in width from the window frame, the glazing shall be Grade A safety glass minimum 4 mm thickness, or glass blocks with no restrictions on glazing methods. (iv) Where glazing is other than specified in (iii), annealed glass can be used. (v) Openable portions of windows shall be screened internally and externally with screens that apply with Clause 5.5.1A of AS 3959-2009.
	Doors- Side hung external doors (including French doors, panel fold and bi-fold doors)	These doors must comply with one of the following: (a) Doors and door frames shall be protected by bushfire shutters that comply with Clause 5.5.1 of AS3959 - 2009. or (b) Doors and door frames shall be protected externally by screens that comply with Clause 5.5.1A AS3959 - 2009. or (c) Doors and door frames shall comply with the following: (i) Doors shall be—

		(A) non-combustible; or (B) a solid timber, laminated timber or reconstituted timber door, having a minimum thickness of 35 mm for the first 400 mm above the threshold; or; (C) a door, including a hollow core door, with a non-combustible kick plate on the outside for the first 400 mm above the threshold; or (D) a door, including a hollow core door, protected externally by a screen that complies with Clause 5.5.1A AS3959 - 2009; or (E) a fully framed glazed door, where the framing is made from materials specified for bushfire shutters (see Clause 5.5.1 of AS3959 - 2009), or from a timber species as specified in Paragraph E2, Appendix E of AS3959 - 2009. Where doors incorporate glazing, glazing must comply with glazing requirements for windows. Doors must be tight fitting to the door frame and to an abutting door, if applicable. Where any part of the door is less than 400 mm from the ground or less than 400 mm above decks, carport roofs, awnings and similar elements or fittings having an angle less than 18 degrees to the horizontal and extending more than 110 mm in width from the door (see figure D3, Appendix D of AS 3959-2009), that part of the door frame shall be made from; (a) Bushfire resisting timber (see Appendix F of AS 3959-2009); or (b) A timber species as specified in Paragraph E2, Appendix E of AS 3959-2009; or (c) Metal; or (d) Metal reinforced PVC-U. The reinforcing members shall be made from aluminium, stainless steel or corrosion resistant steel and the door assembly shall satisfy the design load, performance and structural strength of the member. Weather strips, draught excluders or draught seals shall be installed at the base of side-hung external doors.
	Doors- sliding doors	Sliding doors shall comply with one of the following; a) They shall be completely protected by a bushfire shutter that complies with Clause 5.5.1 of AS 3959-2009; or b) They shall be completely protected externally by screens that comply with Clause 5.5.1A of AS 3959-2009; or c) They shall comply with the following: (i) Any glazing incorporating in sliding doors shall be Grade A safety glass complying with AS 1288. (ii) Both the door frame supporting the sliding door and the framing surrounding any glazing shall be made from: (a) Bushfire resisting timber (see Appendix F of AS 3959-2009); or (b) A timber species as specified in Paragraph E2, Appendix E of AS 3959-2009; or (c) Metal; or (d) Metal reinforced PVC-U. The reinforcing members shall be made from aluminium, stainless steel or corrosion resistant steel and the frame must be able to hold the design load and structural strength.

		(iii) No requirements to screen the openable part of the sliding door. However, if screened must comply with Clause 5.5.1A of AS 3959-2009. (iv) Sliding doors shall be tight-fitting in the frames.
	Doors- vehicle access doors (garage doors)	The following applies: (a) Lower portion of vehicle access door that is within 400 mm of the ground when door is closed shall be made from: (i) Non-combustible material; or (ii) Bushfire resisting timber (see Appendix F of AS 3959-2009); or (iii) Fibre cement sheet, a minimum of 6 mm in thickness; or (iv) A timber species as specified in Paragraph E1, Appendix E of AS 3959-2009; or (v) A combination of any item above. b) Panel lift, tilt doors or side-hung doors shall be fitted with weather strips, draught excluders, draught seals or guide tracks, as appropriate to the door type with maximum gap no more than 3 mm. c) Roller doors shall have guide tracks with maximum gap no greater than 3 mm and fitted with a nylon brush that is in contact with the door, (see figure D4, Appendix D of AS 3959-2009). d) Vehicles access doors shall not include ventilation slots.
Roofs (Including veranda and attached carport roofs, penetrations, eaves, fascias, gutters and downpipes)	**General**	The following apply to all types of roofs and roofing systems. Roof tiles, roof sheets and roof covering accessories shall be non-combustible. The roof/wall junction must be sealed to prevent openings greater than 3 mm, by using fascia and eaves lining or by sealing between the top of wall and underside of roof and between the rafters at the line of the wall. Roof ventilation openings such as gable and roof vents, shall be fitted with ember guards made of non-combustible material or a mesh or perforated sheet with a maximum aperture of 2mm, made of corrosion-resistant steel, bronze or aluminium.
	Tiled roofs	Tiled roofs shall be fully sarked. The sarking shall— (a) be located on top of the roof framing, except that the roof battens may be fixed above the sarking; (b) cover the entire roof area including ridges and hips; and (c) extend into gutters and valleys.
	Sheet roofs	Sheet roofs shall— (a) be fully sarked in accordance with Clause 5.6.2, except that foil-backed insulation blankets may be installed over the battens; and (b) have any gaps greater than 3 mm (such as under corrugations or ribs of sheet roofing and between roof components) sealed at the fascia or wall line and at valleys, hips and ridges by— (i) a mesh or perforated sheet with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium; or (ii) mineral wool; or (iii) other non-combustible material; or (iv) a combination of any of Items (i), (ii) or (iii) above.
	Veranda, carport awning roofs	The following apply to veranda, carport and awning roof: A veranda, carport or awning roof forming part of the main roof space, (see figure D1 (a), Appendix D of AS 3959-2009), shall meet all requirements for the main roof, as specified in Clauses 5.6.1,

		5.6.2,5.6.3, 5.6.5 and 5.6.6 of AS 3959-2009. A veranda, carport or awning roof separated from the main roof space by an external wall, (see figures D1 (b) and D1 (c), Appendix D of AS 3959-2009), complying with clause 5.4 of AS 3959-2009, shall have a non-combustible roof covering.
	Roof penetrations	The following applies to roof penetrations: Roof penetrations, including roof lights, roof ventilators, roof mounted evaporative cooling units, aerials, vent pipes and supports for solar collectors, shall be adequately sealed at the roof to prevent gaps greater than 3 mm. The material used to seal the penetration shall be non-combustible. Openings in vented roof lights, roof ventilators or vent pipes shall be fitted with ember guards made from a mesh or perforated sheet with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium. This requirement does not apply to the exhaust flues of heating or cooking devices with closed combustion chambers. In the case of gas appliance flues, ember guards shall not be fitted. NOTE: Gasfitters are required to provide a metal flue pipe above the roof and terminate with a certified gas flue cowl complying with AS 4566. Advice may be obtained from State gas technical regulators. Grade A safety glass complying with as 1288 is required for all overhead glazing. Glazed elements in roof lights and skylights may be a polymer provided a Grade A safety glass diffuser, complying with as 1288, is installed under the glazing. Where glazing is an insulating glazing unit (IGU), Grade A toughened safety glass minimum 4 mm thickness, shall be used in the outer pane of the IGU. Flashing elements of tubular skylights may be of a fire-retardant material, provided the roof integrity is maintained by an under-flashing of a material having a flammability index no more than 5. Evaporative cooling units shall be fitted with non-combustible butterfly closers as close as practicable to the roof level or the unit shall be fitted with non-combustible covers with a mesh or perforated sheet with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium. Vent pipes made from PVC are permitted.
	Eaves lining, fascia's and gables.	The following apply to eaves linings, fascia's and gables: (a) Gables shall comply with Clause 5.4 of AS 3959-2009. (b) Eaves penetration shall be protected the same as for roof penetrations, as specified in Clause 5.6.5. (c) Eaves ventilation openings greater than 3 mm shall be fitted with ember guards made of non-combustible material or a mesh or perforated sheet with a maximum aperture or 2mm, made of corrosion-resistant steel, bronze or aluminium. Joints in eaves linings, fascia's and gables may be sealed with plastic joining strips or timber storm moulds. This Standard does not provide construction requirements for fascia's,

		bargeboards and eaves linings.
	Gutters and downpipes.	This Standard does not provide requirements for— (a) Gutters, with the exception of box gutters; and (b) Downpipes. If installed, gutter and valley leaf guards shall be non-combustible. Box gutters shall be non-combustible and flashed at the junction with the roof with non-combustible material.
Verandas, Decks, Steps, Ramps and landings.	**General**	Decking may be spaced. There is no requirement to enclose the subfloor spaces of verandas, decks, steps, ramps or landings.
	Enclosed subfloor spaces of verandas, decks, steps, ramps and landings.	**Materials to enclose a subfloor space** The subfloor spaces of verandas, decks, steps, ramps and landing are considered to be 'enclosed' when- (a) the material used to enclose the subfloor space complies with Clause 7.4 of AS 3959-2009; and (b) all openings greater than 3 mm are screened with a corrosion-resistant steel, bronze or aluminium mesh with a maximum aperture of 2mm. **Supports** This standard does not provide construction requirements for support posts, columns, stumps, stringers, piers and poles. **Framing** This standard does not provide construction requirements for the framing of verandas, decks, ramps or landing (i.e., bearers and joists). **Decking, stair treads and the trafficable surfaces of ramps and landings** Decking, stairs treads and trafficable surfaces of ramps and landings shall be- (a) of non-combustible material; or (b) of bushfire-resisting timber (see Appendix F); or *(c)* a combination of items above.
	Unenclosed subfloor spaces of verandas, decks, ramps and landings.	**Supports** Support posts, columns, stumps, stringers, piers and poles shall be; (a) of non-combustible material; or (b) of bushfire-resisting timber (see Appendix F of AS 3959-2009); or (c) a combination of items above. **Framing** Framing of verandas, decks, ramps or landing (i.e. bearers and joists), shall be: (a) of non-combustible material; or (b) of bushfire-resisting timber (see Appendix F of AS 3959-2009); or (c) a combination of the items above **Decking, stair treads and the trafficable surfaces of ramps and landings** Decking, stair treads and the trafficable surfaces of ramps and landings shall - (a) of non-combustible material; or (b) of bushfire-resisting timber (see Appendix F of AS 3959-2009); or

		(c) a combination of items above
	Balustrades, handrails or other barriers	Those parts of the handrails and balustrades less than 125 mm from any glazing or any combustible wall shall be- (a) of non-combustible material; or (b) of bushfire-resisting timber (see Appendix F of AS 3959-2009); or (c) a combination of items above Those parts of the handrails and balustrades that are 125 mm or more from the building have no requirements.
Water and gas supply pipe		Above-ground water and gas supply pipes shall be metal.

Note: Any sarking shall be:
a. Non-combustible; or
b. Breather-type sarking complying with AS/NZS 4200.1 and with a flammability index of not more than 5 (see AS1530.2) and sarked on the outside frame; or
c. An insulation material conforming to the appropriate Australian Standard for that material.

*** This includes Addendum: Appendix 3 of *Planning for Bushfire Protection, 2006.***

December | 18

ECOLOGICAL CONSTRAINTS ASSESSMENT
Rezoning of Lot 2 DP 601094 and Lot 4 DP825704, Mumford Street, Port Macquarie

Prepared For: **East Coast Screw Piers Pty Ltd**
Port Macquarie

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User Notice

This report is presented on an objective basis to fulfill the stated legislative obligations, consideration and requirements in order to satisfy the client's instructions to undertake the appropriate studies and assessments. It is not directly intended to advocate the proponent's ambitions or interests, but is to provide information required in the determination of development consent by the decision-making authority for the subject proposal.

To the best of our knowledge, the proposal described in this assessment accurately represents the proponent's intentions when the report was completed and submitted. However, it is recognised and all users must acknowledge that conditions of approval at time of consent, post development application modification of the proposal's design, and the influence of unanticipated future events may modify the outcomes described in this document. Completion of this report has depended on information and documents such as surveys, plans, etc provided by the proponent. While checks were made to ensure such information was current at the time, this consultant did not independently verify the accuracy or completeness of these information sources.

The ecological information contained within this report has been gathered from field survey, literature review and assessment based on recognised scientific principles, techniques and recommendations, in a proper and scientific manner to ensure thoroughness and representativeness. The opinions expressed and conclusions drawn from this report are intended to be objective, based on the survey results and this consultant's knowledge, supported with justification from collated scientific information, references/citations or specialist advice.

Furthermore, it is clarified that all information and conclusions presented in this report apply to the subject land at the time of the assessment, and the subject proposal *only*.

This report recognises the fact, and intended users must acknowledge also, that all ecological assessments are subject to limitations such as:

- Information deficits (eg lack of scientific research into some species and availability of information)
- Influences on fauna detectability eg season in which survey is undertaken
- Influences on species occurrence eg stage of lifecycle, migratory, etc
- Time, resource and financial constraints.

All users should take into account the above information when making decisions on the basis of the findings and conclusions of this report.

Document Status	Distribution	Date	Authorised By
Draft 1	East Coast Screw Piers, Love Project Management	13/2/2018	JB
Draft 2	East Coast Screw Piers, Love Project Management	5/12/2018	JB
Final	East Coast Screw Piers, Love Project Management	11/12/2018	JB

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EXECUTIVE SUMMARY

This firm has been requested to undertake an ecological constraints assessment of Lot 2 DP601094 and Lot 4 DP825704, Mumford St, Port Macquarie. The subject land is intending to be rezoned under the Port Macquarie-Hastings Council (PMHC) Local Environmental Plan (LEP) 2011).

Constraints have been identified via a field survey, database review, assessment under State Environmental Planning Policy 44 – *Koala Habitat Protection*; preliminary review of potential planning pathways under the *Biodiversity Conservation Act 2016*; and an overview assessment under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

The proposal is to expand the existing developments on site via amending the existing E2 boundaries to increase the available development footprints, and changing the R1 zoning on Lot 2 to IN2 Light Industrial.

The site is located in the northwest urban precinct of Port Macquarie, and falls under the 1:100 ARI. It is currently occupied by a school on Lot 4 and former church now a workshop/parking area on Lot 2 associated with the adjacent car dealership and workshop to the north. The site has been substantially filled in the past with table drains established around the boundaries, and clearing of most of the original vegetation.

Most of the site is dominated by lawns, a few remnant native trees and planted native and exotic trees and shrubs. The remainder supports a swamp forest dominated by Broad-leaved Paperbark with a lesser abundance of Swamp Mahogany. No threatened plants were detected, but parts of the swamp forest appear to fall on alluvial soils, and hence qualify as the EEC – *Swamp Sclerophyll Forest on Coastal Floodplains*.

Some habitat values on site are limited due to the disturbance history e.g. lack of hollows on site, and connectivity is limited by existing urban growth and previous clearing. Lot 2 was subject to a full fauna survey in 2005 and hence limited survey was undertaken for this assessment. The Koala and Squirrel Glider were recorded in 2005, complimenting records in adjoining habitat, as well as several bats. A number of other mostly mobile species were also considered potential occurrences, generally using the site as a small part of their lifecycle requirements.

The site in total contains Potential Koala Habitat, and there is sufficient evidence to meet the SEPP 44 criteria to qualify as Core Koala Habitat. A Koala Plan of Management is thus required with a future DA, unless a Comprehensive Koala Plan of Management is adopted by PMHC prior to lodgment of any Development Application.

The site also has vegetation mapped as Coastal Wetland under the Coastal SEPP. The proposal seeks to undertake development within a Coastal Wetland proximity zone, however it is considered unlikely to significantly impact the attributes of this wetland.

A concept development layout for Lot 2 and Lot 4 was reviewed in terms of likely planning pathways under the new *Biodiversity Conservation Act 2016*, and the Commonwealth *Environment Protection Biodiversity Conservation Act 1999*. Referral to the Commonwealth Department of the Environment and Energy was not considered likely to be required for the latter. Potential pathways under the BC Act will depend on the final extent of vegetation clearing on Lot 2, while the development concept on Lot 4 may only need a Five Part Test assessment unless an Asset Protection Zone is required in land mapped as Sensitive Biodiversity Value Land in the northwest.

1 INTRODUCTION

This firm has been requested to undertake an ecological constraints assessment of Lot 2 DP601094 and Lot 4 DP825704, Mumford St, Port Macquarie. The subject land is intending to be rezoned under the Port Macquarie-Hastings Council (PMHC) Local Environmental Plan (LEP) 2011.

Constraints have been identified via a field survey, database review, assessment under State Environmental Planning Policy 44 – *Koala Habitat Protection*; preliminary review of potential planning pathways under the *Biodiversity Conservation Act 2016*; and an overview assessment under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. Comment has also been provided on Part 2 Division 1 (11) of the Coastal SEPP and relevant provisions of the PMHC Development Control Plan (DCP) 2013.

2 BACKGROUND INFORMATION

2.1 Project Description

The proposal is to seek amendment of the current zoning boundaries of the subject land from under the PMHC LEP 2011 to allow expansion of the current developments.

The proposed development on Lot 2 (which is 2.185ha in area) is to convert the existing church to a dedicated automobile workshop, as an extension of the adjacent business premises to the north. This will eventually see two extra buildings plus extensive carparking established. The concept proposes to remove part of the patch of swamp forest along the western side of the site and the northeast tip in the east for a bioretention basin, filling above the flood level, and establishment of extra carparking and additional buildings.

On Lot 4 (approximately 4.044 ha), the existing school is proposed to be expanded via a number of new buildings and carparking to support the expansion. To enable this, the existing R1 zone will be changed to IN2 Light Industrial and the E2 zone will be amended to exclude stormwater management works, etc.

Figure 2 shows the concept, stormwater infrastructure and indicative area of vegetation to be cleared.

2.2 Location of the Study Site and Key Definitions

See **Figure 1** for location of the study site.

The **study site** is Lot 2 and Lot 4. The **study area** is nominated as the land within 100m of the site. The **locality** is nominated as the land within a 10km radius of the site.

Figure 1: Location of the study site

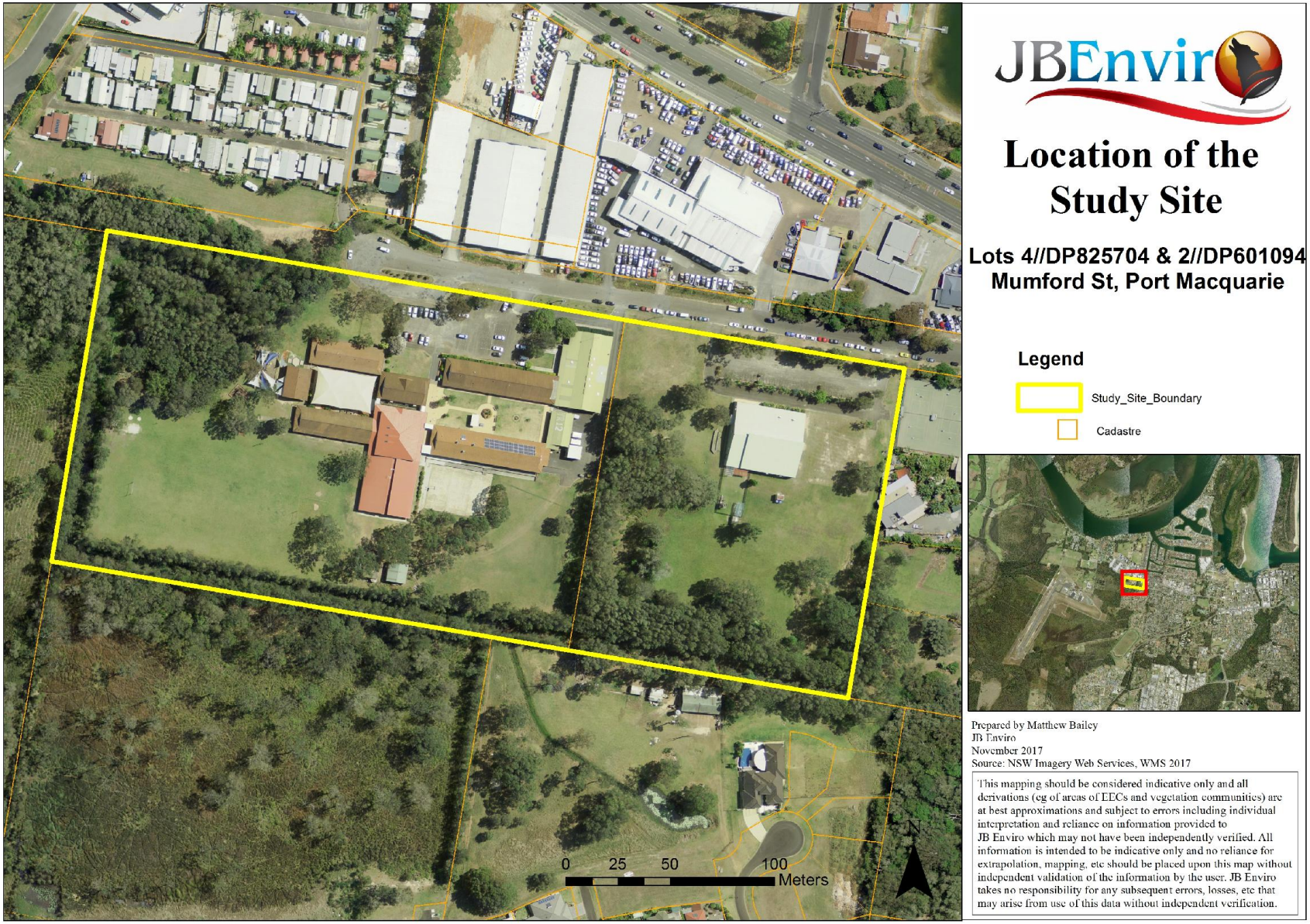
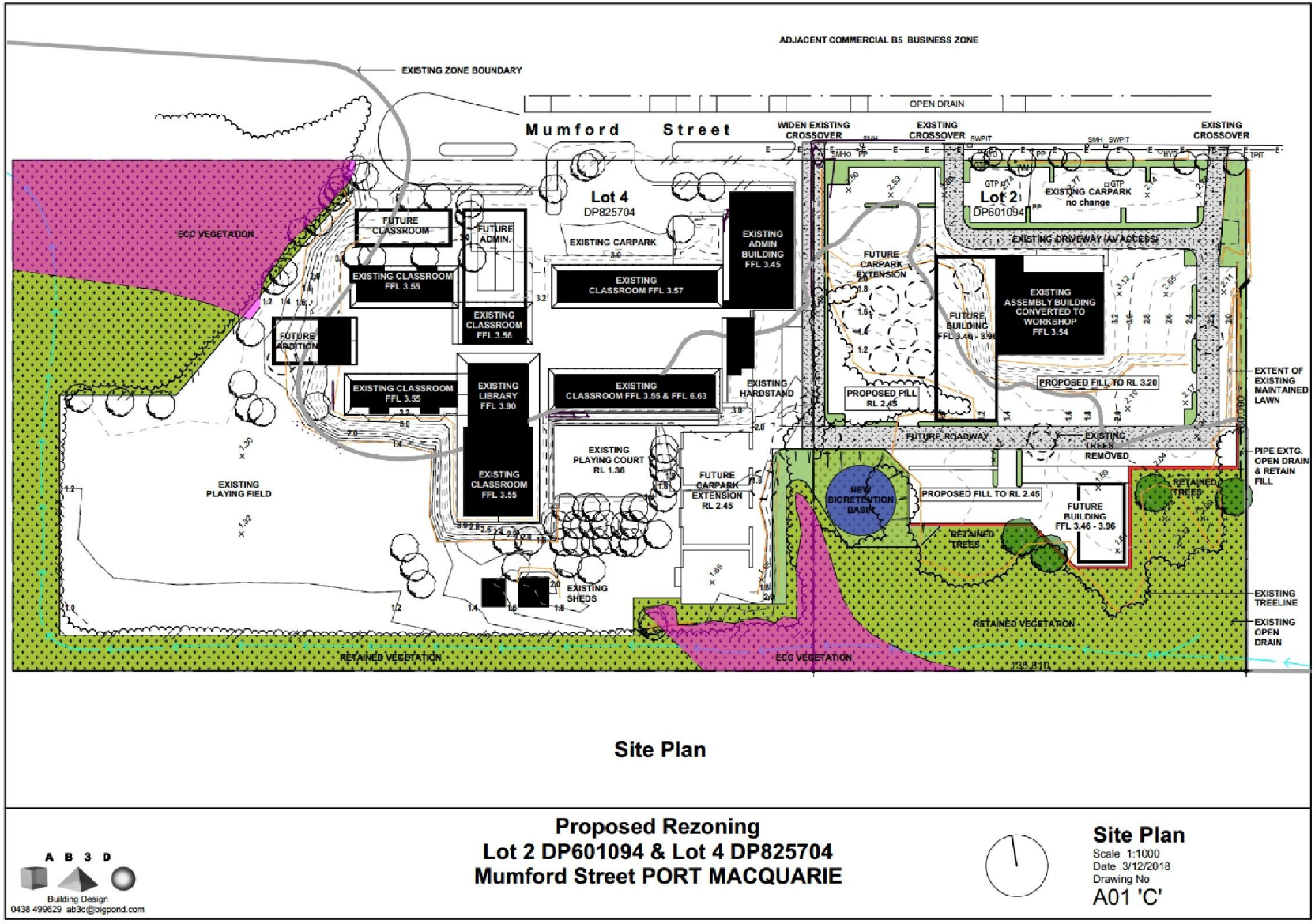


Figure 2: Development concept plan



2.2.1 Topography

Aside from the wetland in the northwest, a large proportion of the site's topography has been modified as a result of the previous development (e.g. introduction of fill material to establish a building pad, etc).

The site is located on low lying land, with a present elevation ranging from 3.2m AHD (Australian Height Datum) in the central north (around the existing building on Lot 2) to around 1m ADH in the southwest. The site is flood prone and below the 1:100 ARI as shown in Figure 4.

A permanent forested wetland dominates the northwest corner. A possibly sub-tidal channel runs through this wetland, existing off site to the west.

Runoff on site drains predominantly to the south/southwest to existing open drains (which appear to near permanently contain water) on the southern boundaries of both lots, and eastern and western side of both lots (these appear to be predominantly dry on Lot 2 and the eastern side of Lot 4). It appears that during construction of the drains, the excavated materials were deposited onto the adjacent areas.

Limited drainage is directed northwest to the wetland here, but it receives stormwater from the caravan park to the north and from Mumford St.

A depression (probably artificial) occurs in the southwest of Lot 2, creating a small area of freshwater wetland. Post rain, surface water may be present in small depressions in the southwest portion of the swamp forest on Lot 2; throughout the entire wetlands on Lot 4; and in depression in the gardens and lawns adjacent to the swamp forest and wetland.

2.2.2 Geomorphology and Soils

Refer to the map in Figures 1 and 3.

The site has been subject to some importation of fill and other disturbances of the surface under the current building footprint, but Quaternary soil landscape mapping at the 1:25 000 scale shows the study area is characterised by a complex intergrade over geological time of fluvial/estuarine and aeolian geomorphological processes (Hashimoto and Troedson 2007), with a confluence of fluvial and marine geomorphological processes on the boundary of Lot 4 and 2.

This is in-line with mapping by Cohen (2005) of the northern Hastings to Macleay which shows that a large estuarine lagoon dominated the coastal plains in the Holocene due to a sand barrier forming around former islands (now headlands) from South West Rocks to Port Macquarie. This large lagoon provided a low energy environment ideal for settling of fine materials, with gradual filling by the rivers with alluvial sediment from the upper catchments eventually overlaying much of this lagoon via infill by rivers and forming a deltaic plain. The remainder is mapped as disturbed, reflecting commercial and residential development.

The 1:25 000 near surface mapping (Hashimoto and Troedson 2007) shows a Pleistocene coastal backbarrier flat (Qpbf) dominates the site's southwest and northern fringe, with a more recent Holocene estuarine plain (a fluvial delta front) of fluvial provenance (Qhemd) crossing Lot 4's northwest corner, to merge on Lot 2 with a Holocene estuarine plain (Qhef, a tidal-delta flat of marine provenance). The merge zone of these geomorphological processes may see complex mix of alluvial (fluvial sand to mud) and estuarine (marine sand) soils, depending on the order of magnitude of the former and geological time (Cohen 2005).

On-site soil profile sampling (see Appendix 3 for logs and map of sample locations) of the Qhef soil landscape recorded shell pieces throughout the consistently sandy soil profile in the southern end of Lot 2 on the tidal delta flat, confirming a dominant estuarine not alluvial deposition (Hackett 2017). Almost white sand occurs along the table drain along the rear boundary of Lot 2 as shown in **Photo 1**, with black sandy in spoil pile adjacent on which the swamp forest has regenerated on.

Photo 1: White sand at rear of Lot 2 along drain

Soil profile testing on the Qhemd soil landscape forming a band over Lot 4 and crossing the southwest corner of Lot 2 however recorded no shells or consistent sand (Hackett 2017). Underneath a layer of imported fill about 0.5m deep from a local residual soil landscape (e.g. Thrumster as per Atkinson 1999), is a silty clay grading to clayey sands and eventually a sandy clay loam. This suggests a potentially complex history of geomorphological processes, but could possibly also be considered layering indicating of alluvial processes, in line with the fluvial provenance assigned to this soil landscape. It is considered that this soil landscape is predominantly alluvial in origin in line with the Precautionary Principle.

2.3 Site and Local Landuse and Disturbance History

The subject land and surrounding area is likely to have been cleared sometime over the last century for agricultural purposes (primarily pastoralism).

Drains to the south are likely to have been established 2-3 decades ago (as suggested by tree age on the spoil) possibly originally to enhance pastoralism via lowering the watertable and reducing the hydroperiod after flooding or use of the land after filling.

The school was established in the early 1990s and the Church appears to have been established at the same time. Development to the north has largely been present for well over 30 years, as has the tennis courts and residential areas to the east. Land to the south and west has largely remained unchanged for at least 20 years, with residential development further south largely occurring from the early 1990s (pers. obs.).

Fire appears to have been long excluded from all vegetation on the site and study area. The existing lawns and gardens are the only vegetation maintained. A former walkway used for school education occurs in the northwest wetland, but has not been used for some time.

Weeds and ornamental species (both exotic and non-endemic) occur throughout the site in the understorey, shrub and groundcover vegetation. In the swamp forest, there are extensive patches of Lantana in the shrub layer. Other weeds present include Cassia (**Senna pendula*), Tobacco Bush (**Solanum mauritianum*) and Large-Leaved Privet (**Ligustrum lucidum*) in the understorey/shrub layer; and Rhodes Grass (**Chloris gayana*), Pigeon Grass (**Setaria sphacelata*) and Whisky Grass (**Andropogon virginicus*) in the groundcover. The odd garden escapee is also present (e.g. Umbrella Tree).

2.4 Coastal SEPP

Prior to introduction of the Coastal SEPP, SEPP 14 Coastal Wetlands mapped swamp forest, saltmarsh and mangroves to the northwest of the site as SEPP 14 #508. This former wetland also comprises the swamp forest in the northwest corner of the site, but the SEPP 14 mapping erroneously fell over part of the existing school (including buildings and cleared playgrounds. Such errors are generally a relic of the mapping methodology used for the SEPP (Adams et al 1985).

The updated Coastal SEPP mapping appears to have corrected this error, and now maps swamp forest on the western and southwestern boundaries of Lot 4 as wetland under the Coastal SEPP (see **Figure 4**). Most of Lot 4 and the southwest of Lot 2 is also in the Proximity Area for Coastal Wetlands. Consideration of the requirements for the latter is provided in **section 7.5**.

As part of the rezoning and zone boundary adjustment process, the formal boundary of the Coastal SEPP is to be verified by site survey.

Figure 3: 1:25 000 Quaternary soil landscapes

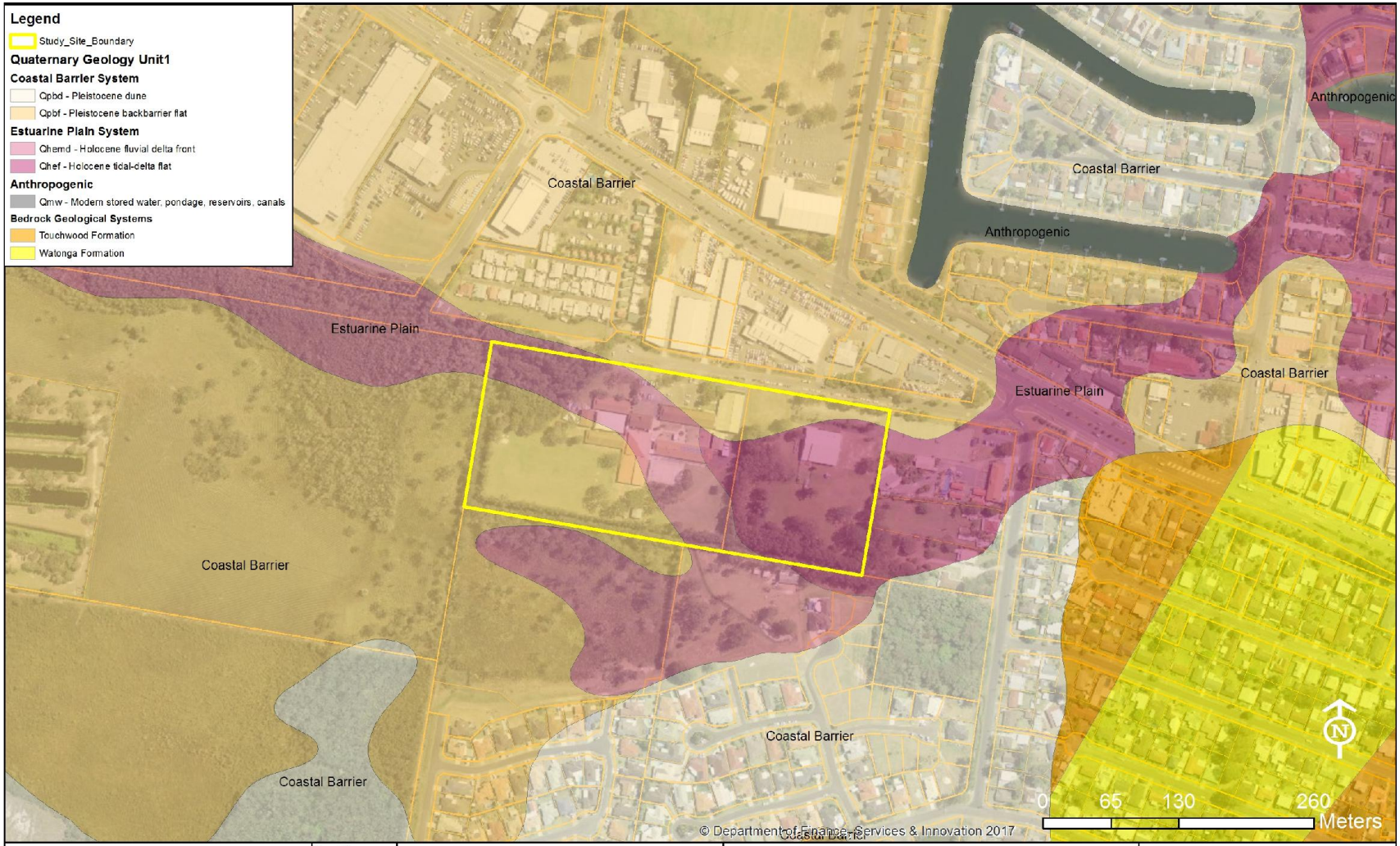


Figure 4: Coastal SEPP wetland mapping and 1:100 ARI in study area

3 FLORA

3.1 Known Threatened Flora Records

No threatened flora species were detected on site. The following threatened flora species have been recorded within 10km of the site (OEH 2018a).

Table 1: Threatened flora species recorded in the locality

Species	Common Name	Legal Status
Acronychia littoralis	Scented Acronychia	E-BCA, EEPBCA
Allocasuarina defungens	Dwarf Heath She-oak	E-BCA, E-EPBCA
Asperula asthenes	Trailing Woodruff	V-BCA, V-EPBCA
Dendrobium melaleucaphilum	Spider orchid	E-BCA
Chamaesyce psammogeton	Sand Spurge	V-BCA
Maundia triglochinoides	-	V-BCA
Melaleuca biconvexa	Biconvex Paperbark	V-BCA, V-EPBCA
Oberonia titania	Red-flowered King of the Fairies	V-BCA
Senna acclinis	Rainforest Cassia	E-BCA
Sophora tomentosa	Silverbush	V-BCA

The Narrow-leaved Black Peppermint (*Eucalyptus nicholii*) is also recorded in the locality, but these are only landscape plantings outside the species native range, hence are not considered further.

3.2 Survey Methods

The flora survey routinely consists of two components:

- Identification, description and mapping of the major vegetation communities and any Endangered Ecological Community listed under the *Biodiversity Conservation Act 2016* (TSC Act), and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- Searches for, identification of, and (if found) mapping of any threatened species and their habitat.

3.2.1 Vegetation Mapping and Identification

The survey was undertaken in November 2017. As the study site is relatively small, has full access to all areas, and limited diversity in vegetation types, survey was undertaken via a random meander undertaken throughout all extent vegetation stands to identify associations

and structure, as well as and compile a species list, with limited use of aerial photo interpretation. Any opportunistic sightings of plant species while performing other survey methods on the study site were also recorded.

The advantages of this method are:

- Provides the most amount of information for given input.
- Provides a means to sample vegetation boundaries.
- Provides a means for assessing floristic diversity and possible presence of threatened species (Forest Fauna Surveys *et al* 1997).

3.2.2 Vegetation Classification and Species Identification

3.2.2.1 General

The vegetation communities were described from data collected by the random meander transects over the study area. Classification was based the OEH Plant Community Type (PCT) system.

Species identification was made with the assistance of PlantNET, GTCC (2007), Bale (1993), Beadle (1982), Harden (1990, 91, 92, 93, 2000), Williams and Harden (1984), Williams and Harden (1980), Williams and Harden (unknown), Robinson (1994), and Brooker and Kleinig (1999). Plant species were identified to species or subspecies level and nomenclature conforms to that currently recognized by the Royal Botanic Gardens and follows Harden and PlantNET for changes since Harden (1990-1992, 2000).

Identification of possible Threatened Ecological Communities (TECs) was based on the data collected by the survey and review of the relevant listings on the Office of Environment and Heritage (OEH) website (OEH 2018b).

3.2.2.2 PCT Identification

The PCTs were identified as follows utilizing the Bionet Vegetation Classification tool as follows in line with the Biodiversity Assessment Methodology (BAM):

(a) PCT1724 'Paperbark Swamp Forest'

- Search criteria IBRA Region: NSW North Coast (NCC)
- Search criteria Community Species (Upper stratum): *Melaleuca quinquenervia, Eucalyptus robusta*
- Search criteria Community Species (Mid stratum): *Glochidion ferdinandi, Archontophoenix cunninghamiana*
- Search criteria Community Species (Ground stratum): *Gahnia clarkei, Blechnum indicum, Christella dentata*
- Resulted in 391 PCT records generated with PCT1724 scoring 6 matches, PCT1230 5 matches and PCT 1717 5 matches.
- The community profile reports were reviewed for the top six matching PCT's in detail, and on the basis of best matching floristics for all stratum (with priority to the upper stratum), diagnostic species and community descriptions: PCT_ID1724 was determined to be the best match.

(b) PCT1724- 'Freshwater Wetland (derived)'

- Search criteria IBRA Region: NSW North Coast (NCC)
- Search criteria Community Species (Mid stratum): *Melaleuca quinquenervia*
- Search criteria Community Species (Ground stratum): *Enhydra woolsii, Persicaria strigosa, Blechnum indicum, Baumea juncea, Centella asiatica, Philydrum lanuginosum*
- Resulted in 383 PCT records generated with PCT 783 scoring 4 matches, PCT 781 3 matches and PCT 1724 3 matches.
- The community profile reports were reviewed for the top six matching PCTs, and on the basis of best matching floristics for all stratum, diagnostic species, community descriptions and occurrence within IBRA subregion NCC (PCT 783 and PCT 781 are not described for the NCC): PCT_ID1724 was determined to be the best match.

3.2.2.3 PMHC Vegetation Communities

Two vegetation communities are mapped for the site as per PMHC vegetation mapping. These communities are;

- PMVC 61 Broad-leaved Paperbark Swamp Woodland/Forest – Mapped on Lot 4 (School sub-site) block.
- PMVC 62 Broad-leaved Paperbark - Mixed Eucalypt Swamp Forest Complex – Predominantly mapped on Lot 2 (former Coastside Church sub-site).

3.2.3 Threatened Flora Species Searches and Occurrence Assessment

3.2.3.1 Searches

Searches for threatened flora recorded in the Local Government Area (LGA) and/or in regionally similar habitats to that on the site were carried out over the entire area of the study site during specific targeted searches. A total of 3 dedicated hours were spent on searches for threatened flora on the site during the survey.

3.2.3.2 Potential Occurrence Assessment:

Potential occurrence assessment of threatened flora species is provided in Appendix 1. This section assesses all threatened species (TSC Act 1995 and EPBC Act 1999) known to occur within range of the area for their potential to occur on the site based on the following factors:

- Presence/absence of suitable habitat.
- Condition and disturbance history of habitat.
- Local and regional records (eg. OEH 2018a).
- Location of site within known distribution of the species.

3.3 Site Vegetation Communities

As shown in **Figure 5**, the vegetation on the subject land is comprised of regrowth paperbark swamp forest (including a derived small wetland area) and lawns/miscellaneous vegetation. These vary predominantly due to disturbance regimes and history.

A species list is provided in Appendix 3. Photos follow the tables.

3.3.1 PCT 1724 Paperbark Swamp Forest

PCT 1724	Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Location	Dominates the site in the northwest, and forms variable width bands of vegetation along the western boundary, the eastern boundary and the (internal) boundary between Lot 4 and Lot 2.
Description	(a) Canopy: *Structure and Species*: This stratum has a dense cover with Broad-leaved Melaleuca (*Melaleuca quinquenervia*) occurring as the dominant species. Swamp Mahogany (*Eucalyptus robusta*) occurs frequently while Swamp Oak (*Casuarina glauca*) occurs less commonly (mostly in the northern extent of the northwest patch). Cheese Tree (*Glochidion ferdinandi*) occurs commonly in the understorey while Hickory Wattle (*Acacia implexa*), Snow-in-Summer (*Melaleuca linariifolia*), Willow Bottlebrush (*Callistemon salignus*) and Bangalow Palm (*Archontophoenix cunninghamiana)* occasionally occur. The exotic species, Camphor laurel (*Cinnamomum camphora*) occurs occasionally also and is common in patches. Canopy/understorey height ranges predominantly between 6 and 20m. Trunk DBH (diameter at breast height) generally ranges between 10 and 50cm. (b) Shrub Layer: *Structure and Species*: Varies from negligible to well-developed depending upon light availability, disturbance and floristics. Ranges between 0.5 to 5m high. Cheese Tree (*Glochidion ferdinandi*) is the dominant species in patches. Swamp Hibiscus (*Hibiscus diversifolius*), Coffee Bush (*Breynia oblongifolia*) and the exotics Lantana (*Lantana camara*) Easter Cassia (*Senna pendula var. glabrata*) occur occasionally. Elsewhere young canopy/understorey species are generally dominant. A variety of other species including Sweet Pittosporum (*Pittosporum undulatum*) uncommonly occur. (c) Ground Layer: *Structure and Species:* Varies with light availability, soil moisture content and disturbance from negligible to moderately dense. Height generally ranges from 0.2-0.7m. Consists of a mix of species including Saw Sedge *(Gahnia clarkei*), *Ottochloa gracillima,* Swamp Water Fern *(Blechnum indicum), Christella dentata,* Twig rush *(Baumea juncea),* Drooping Sedge (*Carex longebrachiata), Centella asiatica,* False Bracken *(Calochlaena dubia)* and Kurnell Curse *(Hydrocotyle bonariensis).* On the edges Bladey Grass*, (Imperata cylindrica),* Rhodes Grass *(Chloris gayana),* Pigeon Grass *(Setaria sphacelata)* and Whisky Grass *(Andropogon virginicus)* also occasionally occur. (e) Lianas, scramblers, epiphytes, mistletoe etc.: Climbers generally occur throughout, though diversity is limited. Monkey Rope (*Parsonsia straminea*) is the most commonly occurring vine, while Mile-a-Minute (*Ipomoea cairica*) occurs frequently. Other vines such as Snake Vine (*Stephania japonica*), Native Raspberry (*Rubus moluccanas*) and Cockspur Thorn (*Maclura cochinchinensis*) uncommonly occur.
Comments	This community primarily consists of regrowth vegetation, with the eldest being the clump between Lot 2 and 4 and a handful of Swamp Mahogany on the fringes of the swamp forest in the southern end of Lot 2. Floristic diversity is medium-low, which is to be expected given the site and general area's disturbance history. The patches in the northwest and to a lesser extent, the patch in the southwestern corner on Lot 2 (Coastside sub-site) show a higher and developing diversity but have high levels of weed infestation due to edge effects associated with the adjacent stormwater drains i.e. deposition of propagules and nutrients. The dumping of garden waste, fill soil and mulch on some of the edges of this community has led to some garden escapees and other exotic weeds establishing.

	This community in the southeastern quadrant of Lot 2 exhibits an elevated disturbance history evident in the presence of fill soil, higher weed density, lower native diversity and a simplified structure. This community is a likely match for PMVC_61 Broad-leaved Paperbark Swamp Woodland/Forest which is mapped on part of the site.

3.3.2 PCT 1724 Freshwater Wetland (derived)

PCT_ID1724	Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Location	This community occurs in a small area in the southwest of Lot 2, Coastside sub-site. It is mostly surrounded by swamp forest.
Description	(a) Canopy: Absent. (b) Understorey/shrub layer: *Structure and Species*: Scarce containing only a couple of stunted Broad-Leaved Melaleucas around 1m high depending on slashing regime. (c) Ground Layer: *Structure and Species*: Generally not well developed. Consist of a mix of native grasses and forbs Varies generally between 10 and 50cm high but occurs mostly in the 10-25cm height range. Generally is moderately dense. Dominated by *Enhydra woolsii* and Spotted Knotweed (*Persicaria strigose*), Buffalo Grass, Pennywort and Kurnell Curse also commonly occur with the occasional Native Gipsywort (*Lycopus australis*), River Buttercup (*Ranunculus inundatus*) and Swamp Water Fern (the latter mainly along the western edge).
Comments	This community appears likely to have been established by originally borrowing material for nearby filling due to its unusual shape. The high watertable and regular slashing is considered likely to have prevented any substantial shrub layer and excluded a canopy/understorey stratum from re-establishing post disturbance. This community is a likely match for PMVC_61 Broad-leaved Paperbark Swamp Woodland/Forest which is mapped elsewhere on the site.

3.3.3 Lawns/Miscellaneous Vegetation (non-PCT)

PCT	Cleared land (non-PCT)
Location	This general association occurs over the remainder of the site encompassing lawns, gardens and miscellaneous vegetation.
Description	(a) Canopy/understorey: *Structure and species*: Open, consisting mostly of scattered individual or small groups of trees. It is dominated by a mix of exotic, non-endemic and local ornamental species with mostly planted (few remnant) Swamp Mahogany and Broad-Leaved Melaleuca being most prevalent. Other species present include Forest Red Gum (*Eucalyptus tereticornis*), Small-fruited Grey Gum (*Eucalyptus propinqua*), an ornamental Palm, Swamp Oak and a Blackbutt (*Eucalyptus pilularis*). A number of non-indigenous eucalypts occur on the northern side of the school. Trunk DBH is 10-60cm. (b) Shrub-layer:

	Structure and species: Generally a sparse stratum, occurring between 0.5 and 5m. It is predominantly restricted to the carpark gardens and garden beds around buildings Mostly consists of a mix of ornamental species including Orange Jessamine (**Murraya paniculata)*, **Hibiscus sp*., wattle (*Acacia sp*.,), Heath Banksia (*Banksia ericifolia*), an ornamental palm and a tea tree (*Leptospermum sp*.). Camphor laurel, Native Tobacco, Cassia and Cheese Tree were also present in the south. (c) Groundcover: *Structure*: As the grounds are maintained, the majority of this stratum is <10cm tall. Some un-mowed areas in the south (primarily on the edge of the swamp forest) are up to around 75cm high. *Species*: Carpet Grass is the dominant species throughout most of this association. Rhodes Grass and Whisky Grass are common in the un-mowed areas. Other frequently occurring weed species (at least in some areas) include Broad-leaf Paspalum, Kurnell Curse, Cudweed (**Gnaphalium americanum*), Fireweed (**Senecio madagascariensis*) and Catsear (**Hypochaeris radiata*). **(d) Scramblers:** Only Monkey Rope was noted in this community.
Comments	This vegetation association is overall very open with the total number of trees being relatively low for its area. The two notable patches of trees, mostly Koala Food Tree species are in a belt south of the school in the vicinity of the rear shed and a smaller patch west of the school adjoining the swamp forest remnant in the northwest corner. Most of these were planted in the 1990s during early stages of the school's establishment.

Figure 5: Site PCTs and non-PCT vegetation

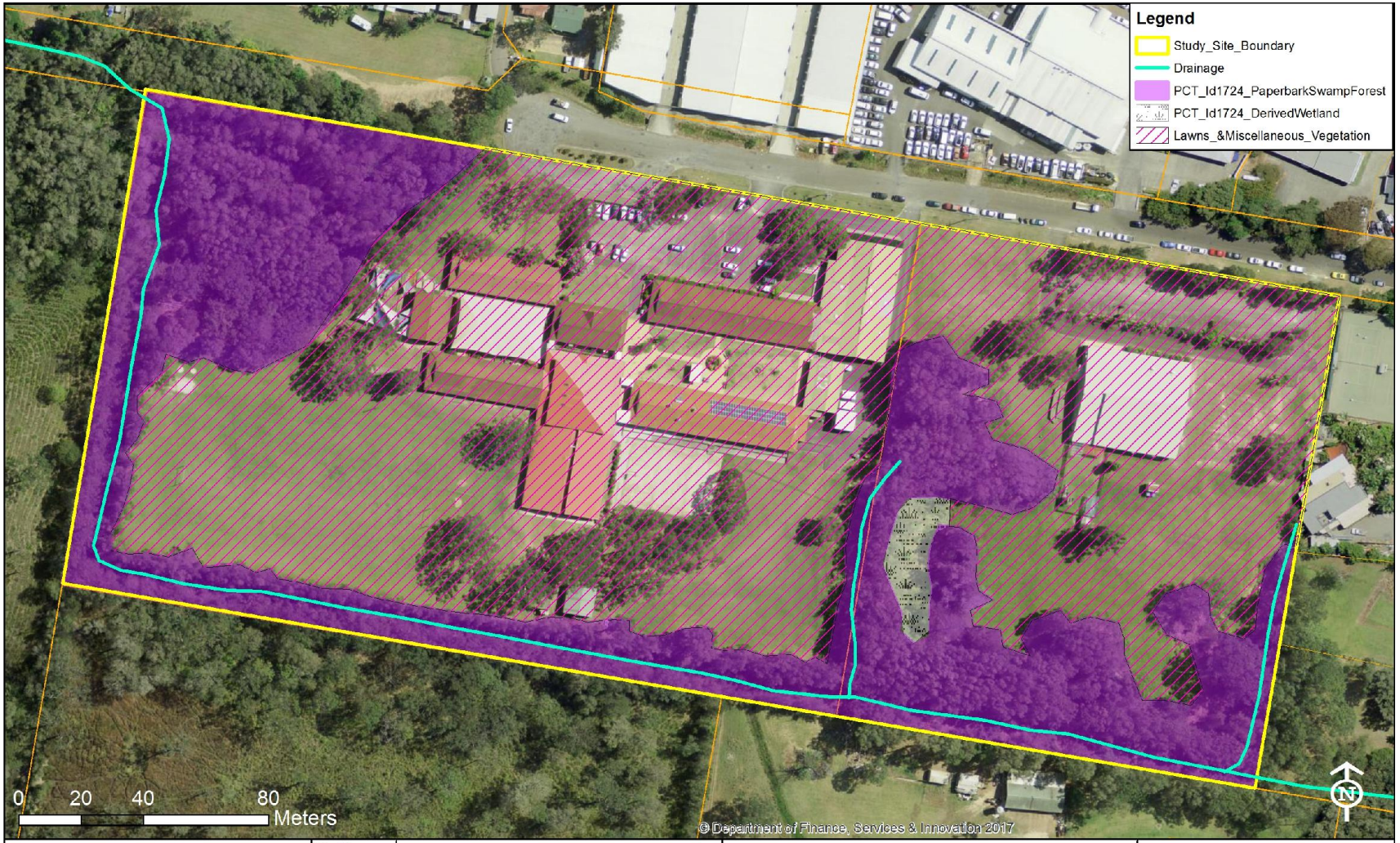


Photo 2: Swamp forest along southern boundary of Lot 2

Photo 3: Clump of swamp forest in mid-west corner of Lot 2

Photo 4: Derived wetland in southwest corner of Lot 2

Photo 5: Planted Swamp Mahogany on Lot 4 viewing towards regrowth in southeast

3.4 Threatened Ecological Communities

3.4.1 BC Act 2016

3.4.1.1 Darkheart 2005

Darkheart (2005) previously identified the paperbark swamp forest and derived freshwater wetland as the EEC *Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions"* on the basis of the following:

- Paperbark swamp forest and wetland match the floristics and structural description listed in the Final Determination (NSWSC 2004d).
- Site met the elevation and local government area (LGA) criteria
- Location below the 1:100 ARI.
- Mapping at the 1:100 000 scale (Atkinson 1999) suggested suitable soils.

3.4.1.2 PMHC EEC Mapping

Biolink (2013) undertook LGA wide mapping of vegetation communities and identified EECs based on this mapping. This was refined by Darkheart (2014) with correlation to the 1:25 000 Quaternary soil landscape mapping.

Coastal Floodplain EECs were primarily by Darkheart (2014) via correlating vegetation associations identified by Biolink (2013) with alluvial soil landscapes in line with both the Final Determination and key Land and Environment Court (LEC) precedents (*Gales Holdings Pty Limited v Tweed Shire Council [2008] NSWLEC 209, Motorplex (Australia) Pty Limited v Port Stephens Council [2007] NSWLEC 74*).

However, the Final Determinations for the Coastal Floodplain EECs however lack clarity in interpreting occurrences of qualifying vegetation communities on estuarine soil landscapes which fall below the 1:100 ARI.

Aside from being a merge zone of alluvial and aeolian geomorphological processes with associated influences on fill patterns (e.g. marine fill, central basin fill and bay head delta/fluvial fill), geomorphological processes which define estuarine soil landscapes are heavily influenced by other processes such as tides (Cohen 2005).

Darkheart (2014) adopted the Precautionary Principle in lieu of *in situ* soils data, and used the criteria of fluvial provenance as defined by Troedson and Hashimoto (2008) as indicative of alluvial geomorphology (as marine is associated with aeolian and true estuarine geomorphology) in line with NSW Land and Environment Court precedents (e.g. *Gales Holdings Pty Limited v Tweed Shire Council [2008] NSWLEC 209*) for the purposes of defining EECs using Biolink's (2013a) vegetation community mapping for PMHC.

For this reason, the PMHC EEC mapping shows *Swamp Sclerophyll Forest on Coastal Floodplains* EEC located on the site as shown in **Figure 6**.

The mapping was also caveated with the advice that the 1:25 000 mapping is based on modelling based on limited landscape sampling, elevation, topography, expert interpretation, etc, and hence site-based soil profile examinations may be required to verify the presence of alluvial soils in marginal or complex geomorphological situations, such as the study area.

3.4.1.3 Updated Evaluation

To verify the geomorphological origins of the original soils where potential EEC habitat is affected by future development proposals, geotechnical investigations were undertaken by Hackett laboratories (2017) and reviewed by Regional Geotech Solutiuons (2018) which are provided in Appendix 3.

As detailed in section 2.2.2, soil profile examination of the Qhef soil landscape which dominates the southern end of Lot 2 is clearly of estuarine geomorphology. This evidences an estuarine environment not alluvial, hence it appears that a 'coastal floodplain' is not present in this area as alluvial geomorphological processes do not appear to dominate the soil profile, especially the zone which supports the ecosystem (*Gales Holdings Pty Limited v Tweed Shire Council [2008] NSWLEC 209,* EPA 2016). Consequently, the supported vegetation appears to be disqualified as an EEC.

Cores taken on the Qhemd soil landscape which is mapped as being of fluvial provenance appear to have been confirmed as having an alluvial geomorphology as it lacked the typical sand and shell indicators of dominant estuarine processes, with a more complex layering of contrasting textures noted under a layer of fill. The Precautionary Principle is applied, and it is presumed that the swamp forest on this soil landscape unit is predominantly alluvial in geomorphology, and hence qualifies as the EEC – *Swamp Sclerophyll Forest on Coastal Floodplains*. The updated EEC map for the site is shown in **Figure 7**.

3.4.2 EPBC Act 1999

The site vegetation is not a Threatened Ecological Community listed under the *Environment Protection and Biodiversity Conservation Act 1999* as the site vegetation does not match the specified habitat or floristic criteria.

The recently nominated EEC - *Coastal Swamp Oak (Casuarina glauca) Forest of South-east Queensland and New South Wales* does not match the site vegetation as Swamp Oak is a lesser associate.

3.5 Threatened Flora

3.5.1 Result of Threatened Flora Survey

Despite targeted searches, no threatened plants were recorded on the study site.

3.5.2 Potential Occurrence Assessment

Searches of relevant literature and databases (OEH BioNet 2017a) found records of 8 threatened flora species in the locality. Potential habitat (see Appendix 1) occurs for *Maundia triglochinoides* and Trailing Woodruff, but targeted survey failed to detect either plant.

The vegetation on site shows at times intensive disturbances including complete clearing to compaction, as well as at times intensive weed invasion (via pastoralism). Given this and failure to detect any threatened species, none are considered likely potential occurrences.

Figure 6: Current PMHC EEC mapping

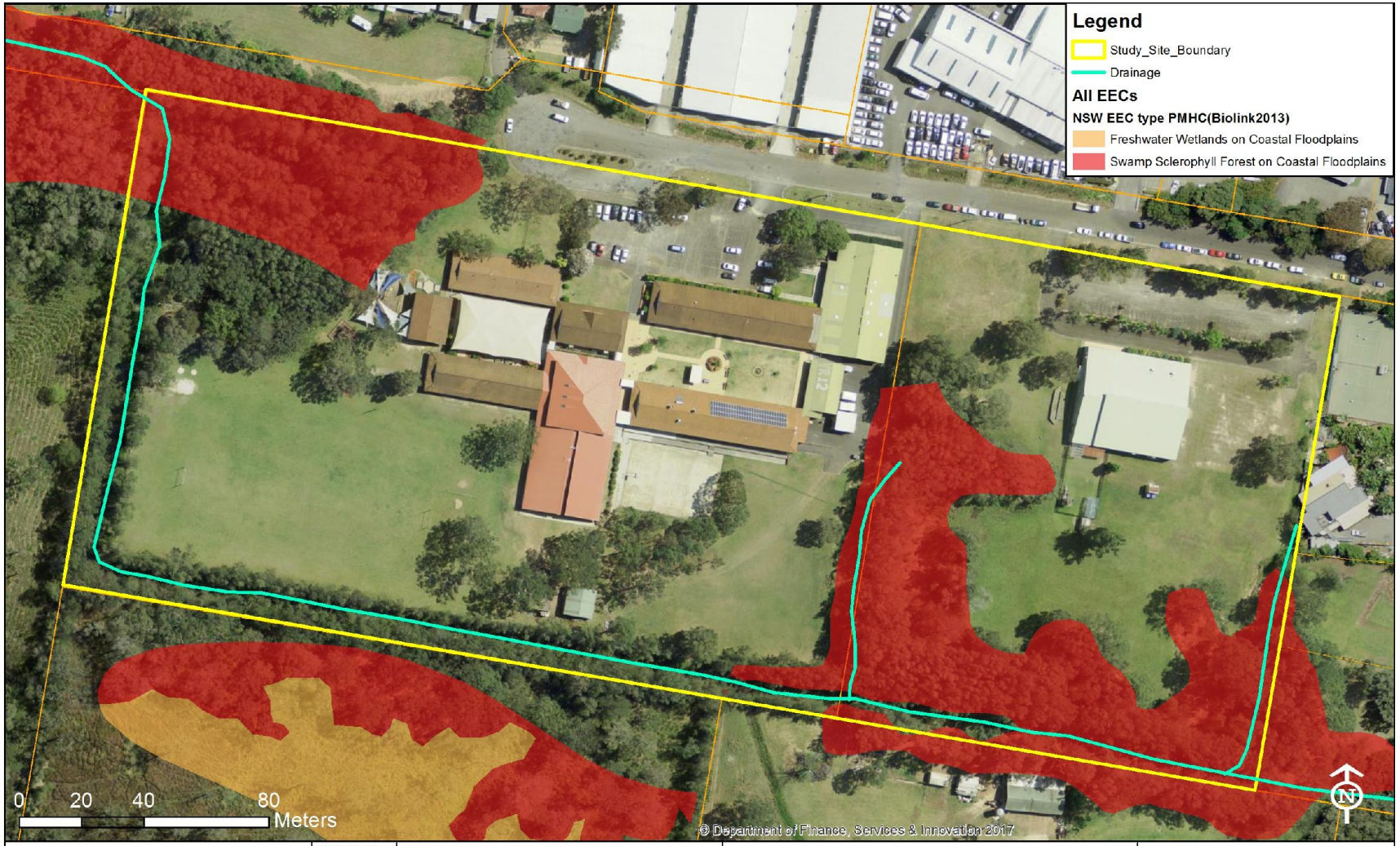
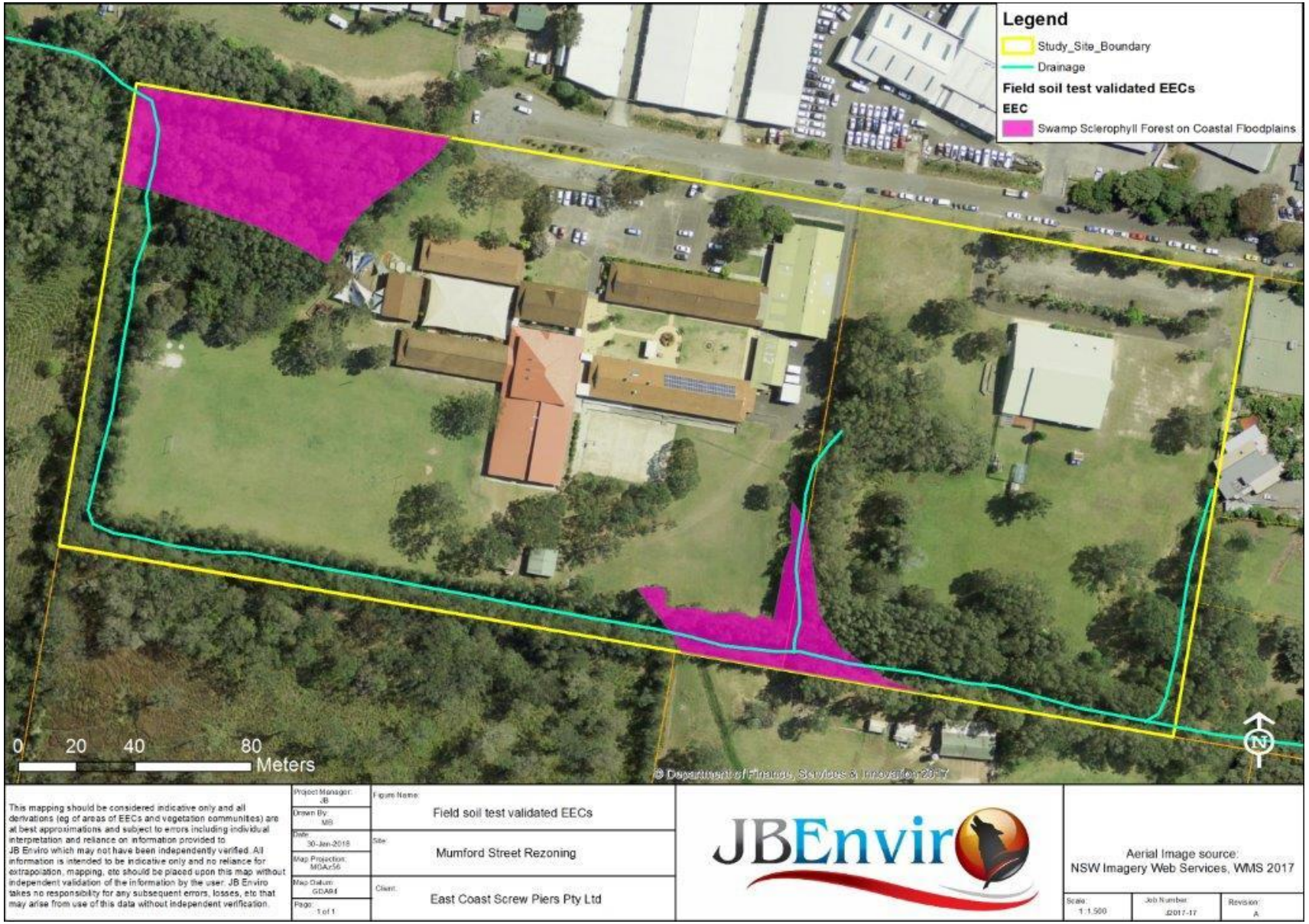


Figure 7: EECs based on site soil tests



4 FAUNA

4.1 Survey Methods

4.1.1 2005 Survey

Lot 2 was originally surveyed in 2005 (Darkheart 2005) via the following methods:

- 80 Elliot A trap nights
- 40 Elliot B trap nights
- 5hrs spotlighting and torch searches
- 6.5hrs Anabat call detection for microchiropteran bats.
- 3hrs of call playback for frogs, forest owls, Masked Owl, Powerful Owl, Barking Owl, Koala, Yellow-bellied Glider, Squirrel Glider, Wallum Froglet, Green-thighed Frog.
- 4 hours searching for scats, scratches, sap incisions, etc.

4.1.2 Updated Survey

Given the intensity of the previous survey and its results which remain valid; no significant change to site or study area habitats that may have altered conditions beneficially; and adjacent studies to the west which provided relevant data (Darkheart 2005a, Biolink 2012): additional survey was limited to:

- Updated habitat evaluation including targeted survey for hollow-bearing trees.
- A Spot Assessment Technique (SAT) in the clump of Swamp Mahogany in the rear of the school on Lot 4, as well as a search under all trees on the school site during Koala Food Tree (KFT) marking.
- Targeted survey for Koala via a three diurnal surveys over three consecutive weeks (1 day per search) over the site. All trees on site and the fringes of the SEPP 14 wetland were inspected for Koalas.
- Opportunistic observations of fauna during the survey.

4.1.2.1 Habitat Evaluation

The site was inspected to determine the available potential habitats, and the support value of these habitats for threatened species. Habitats were defined according to parameters such as:

- Structural and floristic characteristics of the vegetation, such as species mix, understorey type and development, maturity, groundcover density, etc.
- Degree and extent of disturbance, eg fire, logging, weed invasion, modification to structure and diversity, key threatening processes, etc.
- Soil type and suitability, eg for digging and burrowing.
- Presence of water in any form, eg dams, creeks, drainage lines, soaks.
- Size and abundance of hollows and fallen timber
- Availability of shelter, eg rocks, logs, hollows, undergrowth.

- Wildlife corridors, refuges and proximate habitat types.
- Presence of mistletoe, nectar, gum, seed and sap sources.
- Presence of preferred browse or sap species

Following assessment of the habitat and other survey work, threatened species recorded in the locality and in the region in similar habitats were evaluated for their potential to occur on the site. This is presented in Appendix 1.

4.1.2.2 Spot Assessment Technique

A single SAT was undertaken in the clump of trees at the rear of the school, as this was the only location where scats were found. The methodology was in line with Phillips and Callaghan (2011).

4.1.2.3 Targeted Koala Survey

This consisted of three separate days over three weeks of inspecting the site for Koalas in trees. A single ecologist traversed the site, targeting Koala Food Trees but also inspecting all other trees for Koalas. Aside from the interior of the swamp forest in the northwest corner, this saw 100% coverage of the site.

4.1.2.4 Direct Observation and Secondary Evidence

Physical habitat searches were undertaken for 8 hours. This involved lifting up of timber and debris, inspection of dense vegetation and leaf litter for frogs and reptiles, binocular inspection of potential hollows, observation of likely basking sites and searches for scats, tracks and scratches. This time was also devoted to searching under preferred/potential forage species for Koala scats, opportunistically for owl regurgitation pellets, etc.

Birds were generally surveyed by detecting calls and searching by binoculars at dawn and dusk (when call chorus and peak activity occurs); while walking around the entire site; and opportunistically during other activities.

Species identification was assisted by Simpson and Day (1996), Wilson and Knowles (1992), Strahan (1992), Briggs (1996), Robinson (1996), and Schode and Tideman 1990).

4.1.3 Survey Limitations

All surveys are limited in their ability to fully document all species of flora and fauna likely or actually occurring on a site. Surveys such as these are merely “snapshots” in time, and can only be expected to provide an indicative not absolutely comprehensive representation of a site’s species assemblage. To counter this limitation, this survey has employed methods recommended in literature and known from personal experience to best detect the target species or assess their potential to occur.

4.1.3.1 Flora

The study site was intensively traversed by foot during specific flora surveys and during other survey activities. This survey was undertaken in spring is suitable for detection of all locally occurring threatened plant species. The 2005 survey was undertaken in winter.

Regardless, any short-term survey will only provide a list of plants detected during a brief interval of time (DEC 2004). The total species list of an area is usually much greater than

can be detected in such a short time and it can be influenced by factors such as: size of the property, fire history, time since disturbance, flowering season (particularly orchids), and presence of reproductive material (DEC 2004). As the focus was on detection of threatened species, a comprehensive inventory of all species present was not obtained.

4.1.3.2 Fauna

Fauna detectability is limited by seasonal, behavioural or lifecycle of each species, and even habitat variations (eg flowering periods), which can vary within a year, between years, decades, etc. Habitat evaluation is used to counter this limitation by assessing the potential occurrence of threatened species based on potentially suitable habitat in the study area and local records.

Darkheart (2005) undertook an intensive survey to confidently confirm threatened species with small home ranges were absent, and although over 10 years have passed since the original survey, there has been no significant change in habitat quality or connectivity on site or in adjoining habitat south and west.

To counter standard survey limitations, habitat evaluation was used as well as a brief fauna survey. Habitat evaluation conservatively assesses the potential occurrence of threatened species based on potentially suitable habitat in the study area and local records, and provides a prediction of the likelihood of a particular threatened species occurring in the study area.

4.2 Corridors and Habitat Links

See Figure 8 showing the following.

4.2.1 Regional Corridors

Regional corridors are typically >500m wide and provide a link between major and/or significant areas of habitat in the region. Ideally they are of sufficient size to provide habitat in their own right and at least twice the width of the average home range area of fauna species identified as likely to use the corridor (OEH 2014c, Scotts 2002).

The site falls within the Limeburners-Lake Innes Regional Corridor, which extends north across the northwest side of the urban precincts of Port Macquarie and the Hastings River to Limeburners Creek Nature Reserve, south to Lake Innes Nature Reserve. Within a kilometer radius of the site, this regional corridor has the major limitations of the Hastings River and urban areas of Port Macquarie. Only the most mobile of species (ie. birds, bats, some insects) are likely to undertake landscape movements via this modelled corridor.

4.2.2 Sub-Regional Corridors

Sub-regional corridors connect larger landscaped features and are of sufficient width to allow movement and dispersal (generally >300m), but may not provide substantial species habitat (OEH 2014c, Scotts 2002).

The site is not identified as forming part of any sub-regional corridors. The nearest is just over a kilometer southwest (Lake Innes – Cowarra), extending via fragmented but large tracks of vegetation west to Cowarra State Forest. The Pacific Highway is the major barrier to fauna in this corridor, severely limiting terrestrial and arboreal fauna.

4.2.3 Local Corridors and Habitat Links

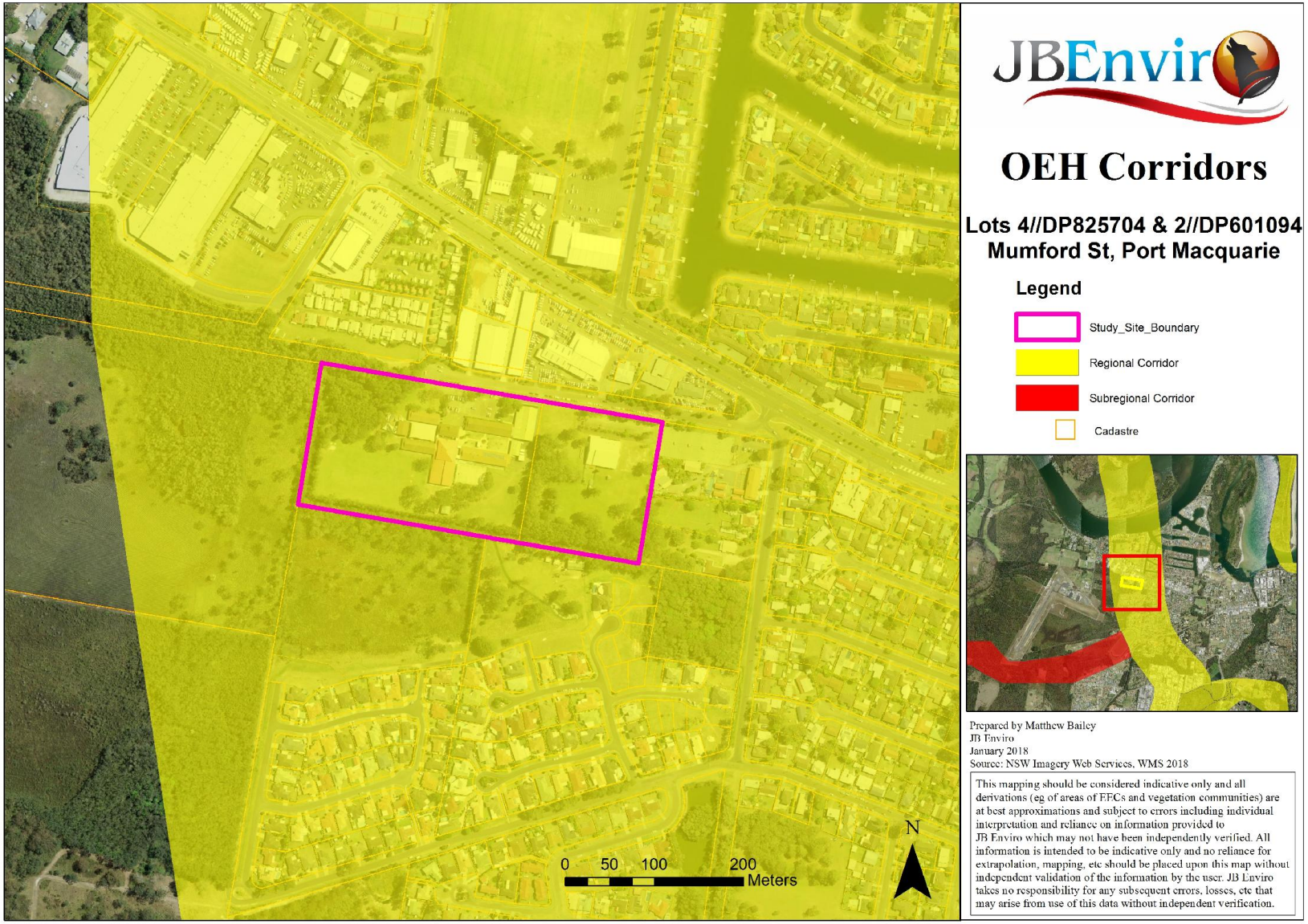
Local corridors provide connections between remnant patches of habitat and landscape features. Due to their relatively small area and width (they may be <50m) these corridors are subject to edge effects (OEH 2017c, Scotts 2002). Habitat links are evaluated in this report as links from habitat on-site directly to similar habitat on adjacent land. These would be used by fauna, which depend solely or at least partially on the site for all of their lifecycle requirements, and/or dispersal (Gibbons and Lindenmayer 2002).

Local corridors provide connections between remnant patches of habitat and landscape features. Due to their relatively small area and width (they may be <50m) these corridors are subject to edge effects (DEC 2004b).

The site adjoins a relatively sizeable tract of native vegetation mostly dominated by swamp forest to heathland to the west and south around the eastern side of the Port Macquarie airport. This area has been subject to major studies (Darkheart 2005a, Biolink 2012), indicating it supports Core Koala Habitat, Squirrel Glider, Wallum Froglet and probably *Allocasuarina defungens*. This vegetation has linkage to a similar and larger tract of forest west of the airport, which eventually links to Lake Innes Nature Reserve. It is thus a very significant local corridor.

The remnant vegetation on the site's southern side and northwest links to the habitat east of the airport and to remnant vegetation to the south, and thus has habitat linkage and local corridor values. Linkage however deteriorates rapidly to the north due to long established commercial and residential development, and similarly to the east into only urban woodland with limited value for any but tolerant species. The site is thus not a key interlink in a local corridor for species intolerant of urban woodland habitats, but would readily support the Koala which can use as little as 1 tree/ha (Wilkes and Snowden 1998).

Figure 8: OEH Regional Corridors



4.3 Survey Results

4.3.1 Fauna Habitat Description and Evaluation

Table 2: Habitat evaluation summary

Habitat attribute	On-site values	Significance
Aquatic/wetland habitat	Present in three forms: • Northwest wetland: Consists of a sub-tidal channel (possibly artificial) with tannin stained water, and at times flooded sedgeland in wetter years. • Artificial drains: Occur on all but northern boundaries. Southern and eastern drains appear to hold tannin stained water at all times in deeper sections (lot of sedimentation in some areas), with eastern boundary drains ephemeral. All are linked to urban stormwater outlets hence subject to pollutants, high nutrients and scouring flows. • Derived wetland: In southwest corner of Lot 2, this ephemeral wetland only holds water deeper than 5cm for short periods after rainfall or in wetter years. A depression dominated by paperbarks occurs just north of it, with similar tendencies.	All habitats unsuitable for Jabiru and threatened ducks and the Magpie Goose due to dense forest. Some generic potential for bitterns in northwest forest, but more remote and extensive habitat occurs extensively in the locality. Marginal potential for Wallum Froglet in dense swamp forest in northwest despite records on adjoining land to west as appears to prefer more open, sedge-dominated habitats with solar access. Stormwater inputs also likely to impact pH and water quality, further limited potential to occur.
Marine/estuarine habitats eg estuarine, rocky foreshores, open beaches, open ocean.	Absent	N/A
Caves, cliffs, overhangs, etc	Absent	N/A
Logs and stumps	Logs are scant and what is present is of smaller size offering poor refugia.	None large enough for Quoll dens. Limited generic refugia for prey species.
Groundcover/shrub layer/undergrowth	Maintained over most of site. Only well developed as a narrow band along the southern boundary and less so the eastern boundaries, where its mostly weed dominated. Some dense sedgeland on edges of SEPP 14 area.	No particular threatened species considered likely to occur. Potential habitat for exotic rodents which may add to prey base.

Habitat attribute	On-site values	Significance
Leaf Litter	Leaf litter was generally shallow and moist, and limited to the swamp forest only.	No potential for any significant fauna.
Wattles, Melaleucas, Callistemons and Banksias (shrub layer)	No Banksias, but other species common. These offer a nectar and insect attractant.	Source of prey attractant in form of insects and honeyeaters, to offering habitat for Squirrel Glider and Grey-headed Flying Fox.
Yangochiropteran bat habitats	In general, the site forms part of a wider modified landscape which contains a mosaic of remnant forest, pasture, modified patches of forest and scattered trees. The site offers a small area of suitable structure for bat species capable of foraging along the forest/grassland interface, and across medium sized remnants. Potential roosts occur very limited as no hollow-bearing trees and limited accumulation of decorticating bark in paperbarks.	Little and Eastern Bent-Wing Bats, East-Coast Freetail Bat, Greater Broad-Nosed Bat considered low to highly likely to use site as minute to minor portion of their wider local range.
Fruiting species	Limited to some Bangalow Palm and Cheese Trees. Bangalow Palm is a preferred food species of frugivorous birds and bats.	Not preferred vegetation type for potential foraging habitat for Wompoo Fruit-Dove, Rose-Crowned Fruit-Dove and Barred Cuckoo Shrike. Some low value as potential forage habitat for Grey-headed Flying Fox.
Flowering canopy trees.	Swamp Mahogany flowers in autumn to winter, with Broad-leaved Paperbark flowering from late January to mid-winter. These species are important to nectar dependent species, some of which range interstate.	Species present preferred by Squirrel Glider, Grey Headed Flying Fox, Yellow-Bellied Glider, Little Lorikeet, Swift Parrot (low abundance) plus passerine birds which offer potential prey to diurnal raptors.
Sap sources	Forest Red Gum and Grey Gum are a potential preferred sap sources for the Yellow-Bellied Glider and Squirrel Glider (Lindenmayer 2002, NPWS 1999, Smith et al 1995, NPWS 2002c, Gibbons 2002). These are however limited to single trees.	Extremely limited potential sap source range for gliders, with no sap incisions noted.
Allocasuarinas	Absent	These oaks generally provide nesting material for birds, and useful quantities of leaf litter, but their greatest value is to the Glossy Black Cockatoo, whose diet in this region is primarily based on Black She-oak and Forest Oak (NPWS 1999, OEH 2018b, Clout 1989, Birds Australia 2017, pers. obs.). The site does not offer any potential value to this bird.

Habitat attribute	On-site values	Significance
Tree hollows	Absent	Major constraint on hollow-obligate fauna.
Prey species	Known presence of Squirrel Gliders, rabbits, House Mouse, Swamp Rat, Ringtail Possum and a low abundance Brown Antechinus. Passerine birds in low diversity and abundance – dominance by medium sized woodland species.	Small terrestrial and passerine prey species may support mostly common diurnal raptors and snakes. Low chance for rare visitation by local pair of forest owls which are known to use peri-urban habitats. Likely to form part of range for locally recorded threatened raptors such as the Square-tailed Kite and Little Eagle, with site only forming minute part of a large area of potential foraging habitat within these species very large foraging range.

4.3.2 Observed fauna

The 2005 survey recorded the following threatened species on site:

- Squirrel Glider: V-BCA
- Koala: V-BCA, V-EPBCA
- Grey-headed Flying Fox: V-BCA
- Little and Eastern Bent-wing Bats (Confident and probable/possible call identification): V-BCA
- East-coast Freetail Bat (probable/possible call identification): V-BCA
- Eastern Cave Bat (default possible call identification): V-BCA

These results are discussed further in section 4.3.4. All fauna recorded to date on site are listed in the following table:

Table 3: Fauna detected on site to date

Group	Common Name	Scientific Name
Birds	Straw-necked Ibis	*Threskiornis spinicollis*
	Australian White Ibis	*Threskiornis molucca*
	Australian Wood Duck	*Chenonetta jubata*
	Rainbow Lorikeet	*Trichoglossus haematodus*
	Black-faced Cuckoo-shrike	*Coracina novaehollandiae*
	Laughing Kookaburra	*Dacelo novaeguineae*

Group	Common Name	Scientific Name
	Grey Fantail	*Rhipidura fuliginosa*
	Crested Pigeon	*Ocyphaps lophotes*
	Bar-Shouldered Dove	*Geopelia humeralis*
	Australian Raven	*Corvus coronoides*
	Magpie	*Gymnorhina tibicen*
	Magpie Lark	*Grallina cyanoleuca*
	Lewins Honeyeater	*Meliphaga lewinii*
	Galah	*Cacatua roseicapilla*
	Scaly-breasted Lorikeet	*Trichoglossus chlorolepidotus*
	Tawny Frogmouth	*Podargus strigoides*
	White-browed Scrubwren	*Sericornis frontalis*
	Noisy Friarbird	*Philemon corniculatus*
	Red Wattlebird	*Anthochaera carunculata*
	Eastern Whipbird	*Psophodes olivaceus*
	Grey Butcherbird	*Cracticus torquatus*
Mammals	Common Ringtail Possum	*Pseudocheirus peregrinus*
	Squirrel Glider	*Petaurus norfolcensis*
	Brown Antechinus	*Antechinus stuartii*
	Koala	*Phascolarctos cinereus*
	Eastern Grey Kangaroo	*Macropus giganteus*
	Swamp Wallaby	*Wallabia bicolor*
	Swamp Rat	*Rattus lutreolus*
	Bandicoot	-
	Grey-headed Flying-fox	*Pteropus poliocephalus*
	House Mouse	**Mus musculus*
	European Rabbit	**Oryctolagus cuniculus*
	Deer*	-
	Little Bent-wing Bat	*Miniopterus australis*
	Common Bent-wing Bat	*M. schreibersii*[1]

Group	Common Name	Scientific Name
	Large Forest Bat	*Vespadelus darlingtoni*
	Eastern Forest Bat	*Vespadelus pumilus*
	Eastern Cave Bat	*Vespadelus troughtoni*[1]
	Little Forest Bat	*Vespadelus vulturnus*[1]
	Chocolate Wattled Bat	*C. morio*[1]
	Gould's Wattled Bat	*C. gouldii*[1]
	A Freetail Bat	*Mormopterus spp.*
	East Coast Freetail Bat	*Mormopterus norfolkensis*[1]
	White-striped Mastiff Bat	*Tadarida australis*
	A Broad-nosed Bat	*Scoteanax sp.* [1]
	Eastern Broad-nosed Bat	*Scoteanax orion*[1]
Reptiles	Garden Sun-skink	*Lampropholis delicata*
Frogs	Common Eastern Froglet	*Crinia signifera*
	Striped Marsh Frog	*Limnodynastes peronii*
	Dwarf Tree Frog	*Litoria fallax*
	-	*Litoria dentata*

*feral species
[1]probable/possible call identification only

4.3.3 Koala Survey

No Koala were found on the study site despite targeted searches by the survey for this updated report. Scats were only found under two trees in the planted patch behind the school on Lot 4, resulting in a low activity level (see section 5.2.3).

4.3.4 Discussion of Fauna Survey Results

4.3.4.1 Success of Methodology

The 2005 survey results illustrate the importance of using a range of survey techniques to maximise the potential of recording target threatened species. For example Squirrel Gliders are readily detected via spotlighting, however were only detected by survey on site via Elliot B trapping.

Overall, the fauna assemblage (including the threatened species) detected is generally typical of the habitats sampled and are very similar to results on adjacent land with similar habitats (Biolink 2012, Darkheart 2005a).

Most of the species recorded were habitat generalist, capable of inhabiting areas with extensive disturbance histories. Some species groups were poorly represented eg reptiles, etc. This is possibly due to either a lack of suitable habitat, season, life cycle stage (eg migratory period, torpor, etc) or non-contact with the consultants (eg raptors). During peak flowering periods the diversity and abundance of fauna on site (particularly birds) is likely to increase substantially.

4.3.4.2 Recorded threatened species

Four threatened species were confirmed to occur in the study site by this survey: the Little Bent-Wing Bat, Koala, Grey-Headed Flying Fox and Squirrel Glider. The Eastern Freetail Bat and Common Bent-Wing Bat were "possible/probable" recordings, while the Eastern Cave Bat was a tentative "possible" detection.

(a) Koala

The Koala was reasonably expected to occur prior to the 2005 survey given local records, which includes Core Koala Habitat 500m to the west of the site (Darkheart 2005a, Biolink 2012); and the common presence of Swamp Mahogany. The Koala was recorded in 2005 as follows:

- A female Koala and joey were detected on the 1st, 5th and 6th of September via spotlighting and/or opportunistic sightings.
- An adult male Koala was detected via call playback on the 7th of September.

The consultant also made an anecdotal sighting of a Koala in a non-endemic eucalypt at the front of the school in 2011.

This survey recorded no Koalas and few scats in contrast to the previous assessment. This may simply indicate the limited range of survey techniques used for this survey and the limitations of 'snap shot' surveys (DEC 2004).

As discussed in section 5.2, the site is considered to be form part of the nearby Core Koala Habitat to the west and southwest identified by previous studies (Biolink 2012, Darkheart 2005a).

(b) Grey Headed Flying Fox:

Grey Headed Flying Foxes were readily observed flying over the site during the 2005 survey. This species ranges over a vast area following the fruiting/flowering pattern of preferred forage species. The species is dependent on year-round flows of nectar, pollen and fruit, and facilitates a few specific roosts for key lifecycle functions.

The site has potential to seasonally support a small number of Grey Headed Flying Foxes as a small part of their wider foraging range. The site thus potentially forms part of a much larger range used for opportunistic foraging, but is not known or considered to be key or temporary roosting habitat.

(c) Squirrel Glider:

The 2005 survey recorded a single female Squirrel Glider on two occasions via Elliot B trapping in the southwestern and western portions of the swamp forest on Lot 2.

While the site does not contain this species cited preferred habitat, this recording was not unexpected given recordings of this species in close proximity to the west of the site (Darkheart 2005f, 2004q) in floristically similar habitat which are linked to the site. Furthermore such records are not unprecedented with animals recorded in similar marginal habitat in other areas of Port Macquarie (Darkheart 2005d, 2005g), Sancrox (Darkheart 2005c, 2005h), and near Kempsey (Berrigan 1999a, 2003f, Darkheart 2004a, 2004b, 2004r). The co-occurrence of Sugar and Squirrel Gliders is also not unusual (Quin 1995), with the species observed in similar situations by this consultant (Berrigan 1999a, 2003f, Darkheart 2005c, 2005h, 2004a, 2004b, 2004r).

It is difficult to know the exact dynamics and nature of the group/s using the site without the implementation of a long term study eg. to determine movements according to availability of food. However given the recordings of this species on and to the west of the site; the lack of trees hollow on site and limited and marginal state of the vegetation present; the gliding distance (up to 50m (Lindenmayer 2002) and the cited home range sizes of this species, core habitat for the group/s using the site is likely to be concentrated in the forest along the southern boundary and northwest corner which adjoins known habitat to the west near Boundary Street; and extend into adjacent areas of woodlands and swamp forest to the south and west.

As the Squirrel Glider has been recorded foraging (and possibly even denning) in scattered parklands/partial woodlands consisting of isolated trees (Darkheart 2005d), the swamp forest and adjacent scattered trees in the gardens and lawns on site may provide potential foraging sources. Overall the site is considered to form part of the local Squirrel Glider group/s foraging range.

(d) Little and Eastern Bent-wing Bats:

These species are known to share roosting and nursery habitats. Both species roost in caves, mines, buildings etc generally located close to or within dense vegetation, although recent research has detected the Little Bent-Wing Bat roosting in banana bunches during winter (Hulm 1994) and tree hollows (Schultz 1996). Both species are limited by the availability of nursery caves. The Macleay valley has the southernmost population of Little-Bent Wing Bats, which seem to depend on a larger nursery colony of Common Bent-Wing Bats to provide environmental conditions (Dwyer 1991). These nursery and maternity caves are protected in Willi Willi National Park and Yessabah Nature Reserve.

The Little Bent-Wing Bat reportedly forages above and beneath the canopy of tropical rainforest, warm temperate rainforest, riparian forest and dry sclerophyll forest, and in clearings adjacent to forest (Dwyer 1991). The Common Bent-Wing Bat forages above and beneath the canopy, and also along tracks within tropical rainforest, warm temperate rainforest, riparian forest and dry sclerophyll forest, and in clearings or ecotones adjacent to forest (Dwyer 1991). It is even found foraging in urban-modified habitats (Hoye 1995).

The consultant has often recorded both species in rural, semi-rural areas, regrowth forest and rural-residential areas; most commonly foraging on the edge of vegetation or along tracks under the canopy (eg Darkheart 2004u, 2004t, 2004p, Berrigan 1998f, 1998c), and in even small urban remnants (eg Darkheart 2004l).

The “confident” detection of the Little Bent-Wing and “probable/possible” detection of the Eastern Bent-Wing on site, given the potential habitat and local records (OEH 2017) was not unexpected. The site thus forms part of the vast area of foraging habitat of the population centred on the maternity caves in the upper Macleay (Dwyer 1968, 1966).

(e) East-coast Freetail Bat:

Specific habitat requirements of the Eastern Freetail Bat are poorly known. The species has been recorded in habitats ranging from rainforest to dry sclerophyll and woodland, with most recorded in the latter (State Forests 1995, Allison 1991, Darkheart 2004d, 2004p). The species roosts in small colonies in tree hollows and under loose bark and under house eaves, in roofs and metal caps on telegraph poles. A colony was recorded roosting in roof in Hat Head village (Macleay Argus 1998). This species most probably forages above forest or woodland canopy, and in clearings adjacent to forest. Most records are of single individuals, and the species is likely to occur at low densities over its range.

Due to the "probable/possible" detection of this species during the survey, local records (Bionet 2017, Darkheart 2004d, 2004p, etc) and the presence of structurally suitable habitat on site, this species is considered a likely occurrence on site. The site is thus considered to form a small part of the local population's opportunistic foraging range.

(f) Eastern Cave Bat:

A particularly rare and poorly known bat, with populations in the southern part of its range appearing to be localised (Parnaby 2000). It is a cave dwelling bat roosting in small (5) to large (500) groups in sandstone overhangs, caves, boulder piles, mines, tunnels and sometimes buildings. It tends to roost in well lit portions of caves in avons, domes, cracks and crevices. Typically, it inhabits warm temperate to tropical mixed woodland and wet sclerophyll forest on the coast and dividing range, but extends into drier forest on western slopes and inland areas (Churchill 2009, Parnaby 2000). It hunts below the canopy down to about 2m above the ground for insects such as mosquitoes, flies and moths (Smith et al 1995).

The nearest known caves are crevices at Jolly Nose Hill to the south (near Bonny Hills) and Broken Bago State Forest and Bago Bluff National Park to the west. Marginally structurally suitable foraging habitat occurs on the site however more optimum and extensive potential foraging habitat occurs between the site and the potential roosts. The species is considered a default "possible" occurrence as its call cannot be separated from the common Vespadelus species (which are likely to occur on site).

Overall it is considered a very low to unlikely chance of occurrence on the site due to the limited habitat potential and lack of local records.

4.4 Potential Occurrence Assessment

Database searches were made of BioNet (OEH 2018a) and the EPBC Act Protected Matters tool (DotEE 2018a). These combined with a literature review of previous ecological studies provided a list of known locally recorded threatened fauna. In addition, a number of regionally recorded species are considered potential occurrences in the locality. In total, these species were evaluated for potential to occur in Appendix 1. Potentially occurring migratory species listed under the EPBC Act 1999 were also assessed.

4.4.1 Potential Occurring Threatened Species

Habitat for the majority of the above listed species does not occur on near the site (see previous references and Appendix 1 for justification).

Due to potential habitat on and/or adjacent to the site, the following are considered at least low potential occurrences on or very near (within 100m) the site and thus require formal statutory assessment (see section 9 and 10):

Table 4: Threatened species potentially occurring in the study area

Species	Legal Status	Occurrence type and likelihood
Square-tailed Kite	V-BCA	Fair. Minute portion of large foraging territory. Generic nest potential.
Little Eagle	V-BCA	Low to fair. Not preferred habitat hence at most minute portion of large area of potential foraging territory, with generic potential nesting trees.
Little Lorikeet	V-BCA	Low at best forming small portion of foraging and breeding habitat within adjacent forest, falling within a wider foraging range. No potential nest sites.
Masked Owl Powerful Owl Barking Owl	V-BCA	Low chance of occurrence foraging using site as outermost fringe of larger territory. No potential to nest on site.
Greater Broad-nosed Bat	V-BCA	Fair chance of using site and study area as minute portion of large foraging territory with extensive potential habitat beyond study area. No potential roost sites.

5 SEPP 44 KOALA HABITAT ASSESSMENT

5.1 Potential Koala Habitat

5.1.1 Introduction

The identification of an area of land as SEPP 44 Potential Koala Habitat is determined by the presence of Primary Preferred Koala Browse tree species. These species are listed under Schedule 2 of SEPP 44: Koala Habitat Protection.

Potential Koala Habitat is defined as areas where the tree species listed under Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component. SEPP 44 Primary preferred food species occurring in the Hastings Valley are: Tallowwood (*Eucalyptus microcorys*), Scribbly Gum (*E. signata*), Swamp Mahogany and Forest Red Gum.

An area of land to which the policy applies to must be at least 1ha (and may include adjoining land in the same ownership). According to a Land and Environment Court ruling (*St Ives Bus Services Ltd V. Ku-Ring-Gai Council* 15/11/95), it may also refer to a minimum of 1ha of habitat within a larger property containing sufficient Schedule 2 species to qualify as Potential Koala Habitat.

5.1.2 Assessment

Schedule 2 species on site comprise Swamp Mahogany and a single Forest Red Gum.

Figure 9 shows the approximate location of these trees on site (subject to GPS error). A one hectare polygon including >20 KFTs behind the school on Lot 4 readily meets the SEPP 44 definition of Potential Koala Habitat.

5.2 Core Koala Habitat

5.2.1 Introduction

Under SEPP 44, Core Koala Habitat is defined as "an area of land with a resident population of Koalas, as evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a Koala population" (Source: State Environment Planning Policy No. 44 - Koala Habitat Protection).

The definition "an area of land" is interpreted as the land to which the development application applies (if it exceeds 1ha in area, together with any land in the same ownership).

5.2.2 Literature and Database Review

5.2.2.1 Bionet 2017

Bionet (2018) records 6020 Koala records in the locality. The closest (1km radius) are shown in **Figure 10**.

5.2.2.2 Biolink 2013b

Biolink (2013b) undertook a broad-scoping study of Koalas and their habitat within the coastal Local Government Area. This major study had the primary aims of:

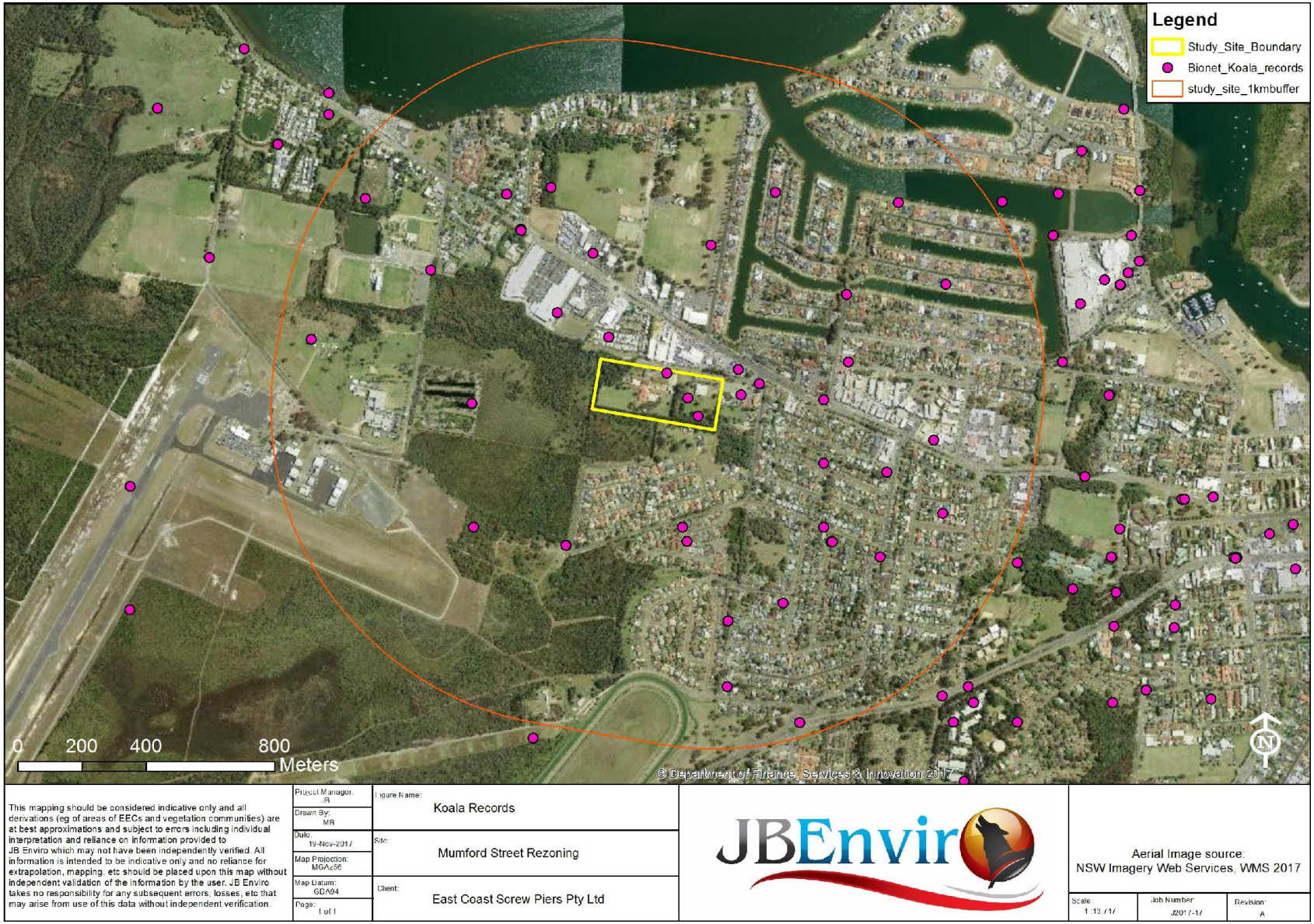
a) survey and analysis of current (and past) koala distribution and population size;
b) identification of preferred koala food trees;
c) delineation of vegetation communities and other areas considered to be important for Koalas;
d) assessment of key threats to Koalas and their habitat.

The study included a large-scale regularized grid-based Spot Assessment Technique (RGSAT) to identify Koala habitat.

Relevant to the site, the study identified a cell of high Koala activity to the southwest in habitat east of the airport (indicating Core Koala Habitat). Biolink only map the swamp forest vegetation site, with the west and southwest habitat mapped as non-Koala habitat, and the swamp forest on Lot 2 mapped as Secondary Class A. This mapping underestimates the habitat quality of the swamp forest to the west and south, where Swamp Mahogany is locally common.

Figure 9: Location of KFTs on site

Figure 10: Site and local Koala records



5.2.2.3 Biolink 2012

Biolink undertook an ecological survey and assessment of the Port Macquarie airport precinct. The study site extended over 162ha, extending east, west and south of the airport.

The study identified swamp forest to the east of the airport was a significant area of Core Koala Habitat.

5.2.2.4 Darkheart (2005a)

Darkheart (2005a) assessed Lot 2 DP 442098 to the west, which is 13 ha in extent. The site contains Swamp Mahogany along the southern margins of the larger swamp forest remnant, and a small patch in the central south.

Three Koala sightings (two in one night) as well as medium to high activity levels indicated this site was Core Koala Habitat. Given proximity to high quality habitat to the south (also a long term release area for rehabilitated Koalas from the Koala Hospital), this was reasonably expected.

5.2.3 Site Evidence

As detailed in section 5.2, during the 2005 survey of Lot 2, a female Koala with a joey was recorded on site, a male responded to call playback nearby, and 35 trees were found to have scats.

A diurnal survey was undertaken on Lot 4 and Lot 2 for this survey, with a Spot Assessment Technique (SAT) taken under the clump of mostly planted Swamp Mahogany behind the school (the swamp forest was constrained by dense groundcover and water for scat searches and SAT assessment) on Lot 4 (given sufficient evidence had been collected previously on Lot 2).

No Koalas were recorded and only low activity was recorded on Lot 4. While this result is in contrast to the 2005 survey, survey did not include spotlighting and call playback and hence this is acknowledged as a limitation.

5.2.4 Conclusion

SEPP 44 defines Core Koala Habitat as "*an area of land with a resident population of Koalas, as evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a Koala population*". The attributes are provided as examples of only some of characteristics a Core Koala Habitat may demonstrate, and thus to meet the definition of Core Koala Habitat, a site does not necessarily need to show all of these attributes, and may even show other evidence indicating the site is Core Koala Habitat.

In regards to the identified attributes though, the following is provided:

1) "*Breeding females (that is, females with young)"*. Breeding activity was recorded on Lot 2 in the form of a female with joey in 2005. Call playback also recorded a male to the west at the time.

2) "*Recent sightings and historical records of a Koala population*". While no Koalas and limited evidence was recorded for this recent survey, scats and scratches were found, indicating a continuing association of the Koala with the site. This combined with the

previous site observations, Bionet records (OEH 2018a) and directly adjoining Core Koala Habitat within a locality well known to support a large Koala population indicate a Koala population is present.

Note that the term “population” is not defined by SEPP 44, and it does not distinguish between a site that contains *all* of a population, or *part* of it. Hence, it is not necessary for an area to contain the entire local population to qualify as Core Habitat.

In view of the above information, it was concluded that the site is Core Koala Habitat, and hence a Koala Plan of Management is required.

6 AMELIORATIVE MEASURES

The following measures are expected to be implemented in future development, many under the Koala Plan of Management which will be required to accompany a future Development Application/s.

6.1 Offset Bush Regeneration

The loss of swamp forest on Lot 2 and reduction of the buffer to the EEC in the southern end of the site is to be offset via bush regeneration of the residual which is infested with lantana and Winter Senna; and planting out of the current pasture infill areas on Lot 2 with swamp forest species to widen the band of vegetation in the south.

This will be undertaken under a Vegetation Management Plan (VMP) as part of a future DA.

6.2 Koala Food Trees Offsets

The concept plan indicates one tree potentially removed on Lot 4 for a building extension, and one on the mid-west boundary on Lot 2. All other trees are to be retained.

The KFTs removed for the proposal are to be replanted at a ratio of 1:5 in the southern end of Lot 2 where an existing gap occurs (currently occupied by weeds or pasture), and margins of the swamp forest to maintain proximity to existing habitat. This will reinforce this habitat link and the carrying capacity of this habitat. The offset plantings will be planted at a minimum of 5m x 5m spacings to allow maximum crown development.

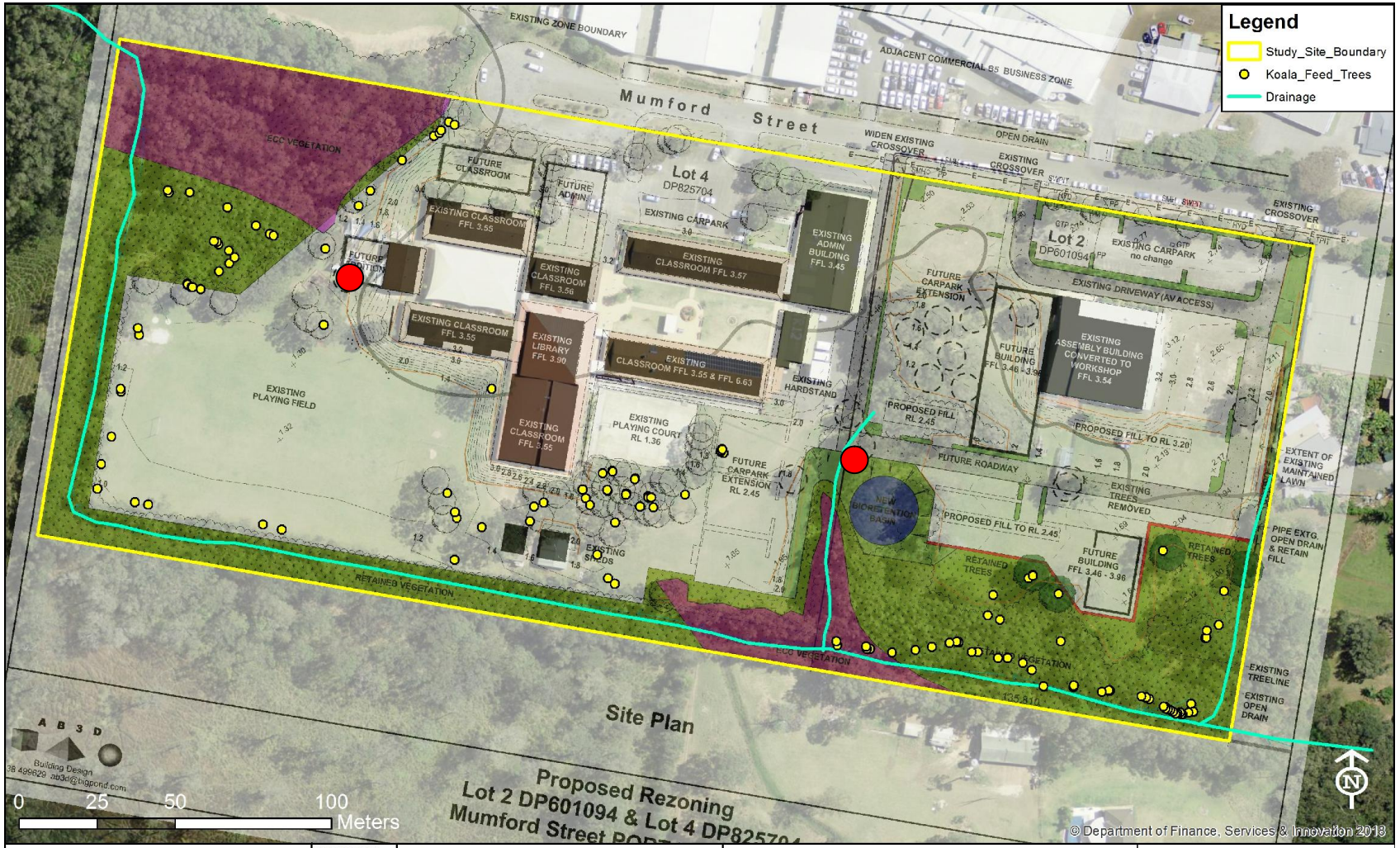
The plantings will be implemented under a Vegetation Management Plan (VMP) which will include removal of lantana and other transformer weeds from the remnant habitat.

6.3 Clearing Management

The KFTs and habitat to be retained are to be clearly flagged and temporarily fenced off to prevent accidental damage during clearing or minimise compaction under the drip line. Such fencing is to retain Koala access.

Site induction is to specify that no clearing is to occur beyond the designated area, and vehicles are only to be parked in the designated areas. Similarly, any construction materials are to be stored within designated areas to avoid any inadvertent encroachment or otherwise into adjacent forest.

Figure 11: Koala food trees to be removed (red circles) and development concept



This mapping should be considered indicative only and all derivations (eg of areas of EECs and vegetation communities) are at best approximations and subject to errors including individual interpretation and reliance on information provided to JB Enviro which may not have been independently verified. All information is intended to be indicative only and no reliance for extrapolation, mapping, etc should be placed upon this map without independent validation of the information by the user. JB Enviro takes no responsibility for any subsequent errors, losses, etc that may arise from use of this data without independent verification.

Project Manager: JB	Figure Name: Koala Feed Trees & Site Plan AO1'C' 3/12/2018
Drawn By: MB	
Date: 4-Dec-2018	Site: Mumford Street Rezoning
Map Projection: MGA256	
Map Datum: GDA94	Client: East Coast Screw Piers Pty Ltd
Page: 1 of 1	

Aerial Image source: NSW Imagery Web Services, WMS 2018

Scale:	Job Number:	Revision:
1 :1,500	J2017-17	A

6.4 Pre-Clearing Koala Survey

The following ameliorative measures should be carried out to minimise the risk of injury or stress to Koalas during clearing works on site.

1. The area of works is to be inspected for Koalas by an approved ecologist immediately prior to commencement of any vegetation removal involving machinery and/or tree-felling.

2. If a Koala is present in an area subject to vegetation removal/modification, it is preferred works are suspended until the Koala moves along on its own volition. If the Koala is located in a position that a 25m buffer may be established, works may proceed outside this buffer.

6.5 Erosion and Sediment Control

Council's standard sediment and erosion control measures will be required during construction to ensure on site and nearby watercourses are not impacted upon.

This includes the use of silt fences and hay bales to ensure downstream aquatic habitats are not impacted. Particular care should be taken when conducting earthworks near watercourses.

6.6 Donation of Koala Food Trees

The Port Macquarie Koala Hospital and the Billabong Wildlife Park both have a constant need for sections of rough-barked trees for 'gunyas' (wooden poles in enclosures which the Koala roosts) and Koala browse species.

Both organisations should be contacted for interest in collecting these materials (subject to WH&S considerations) during clearing.

6.7 Security Fencing and Koalas

Currently, the southern boundary is fenced with a chain mesh fence topped with barbed wire as shown in the following photo. This poses a barrier and entanglement risk to Koalas and Squirrel Gliders. Other KFTs occur on adjoining land to the south of this fence and arboreal fauna appear likely to be able to cross the fence via inter-connected canopy.

If replaced or upgraded, the new fencing must:

- Not be of a design or include materials that pose an entanglement risk.
- Include structures such as a timber A-frame to enable Koalas to circumvent the fencing and not isolate habitat.

6.8 Artificial Lighting

Lighting may potentially discourage particularly nocturnal native species from foraging near areas of development (e.g. Squirrel Gliders and Yellow-bellied Gliders), especially given light may travel significant distances and it can have a similar effect to a full moon on the hunting success of predators such as owls, or a behavioural avoidance impact by potential prey species (DEC 2004a, Andrews 1990, Grayson and Calver 2004). Wallabies, kangaroos, Tawny Frogmouth Owls, Kookaburras, Magpies and possums have been noted foraging under artificial lighting in residential areas eg. around Lake Innes, Port Macquarie and Kendall

(personal observations). Conversely Squirrel Gliders have been recorded foraging within urban woodland within a caravan park at Bonny Hills (Darkheart 2005b).

Artificial lighting may also be beneficial to Yangochiropteran bats by localised aggregation of insects, with these animals being observed foraging under streetlights, and even landing on lit footpaths in Horton St Port Macquarie to scamper for insects (personal observations). Conversely, studies have also shown that artificial lighting can modify bat assemblages i.e. some species avoiding lit areas (Hourigan et al 2009, Scanlon and Petit 2008).

Artificial lighting may be used for security, particularly on the future expansion of industrial enterprise on Lot 2. Lighting technology should utilise environmental designs that are not only energy efficient, but minimize spillage onto adjacent retained habitat.

No lighting should be directed towards habitat to avoid impacts on normal behaviour and habitat use in the adjacent habitat.

Photo 6: Existing boundary fence of Lot 2 posing a barrier to KFTs on adjoining land

7 STATUTORY OVERVIEW

The site has four major constraints under the legislative framework:

- Core Koala Habitat: A Koala Plan of Management will be required.
- PMHC LEP 2011 DCP 2013: Offset requirements for Koala Food Trees.
- BC Act 2016: Biodiversity credits may be required.
- Coastal SEPP: Needs to demonstrate compliance with Part 2 Division 1 (11).

7.1 Biodiversity Conservation Act 2016

7.1.1 Introduction

As of August 25th 2017, the *Threatened Species Conservation Act 1995* was superseded by the NSW *Biodiversity Conservation Act 2016* (BC Act) and the associated *Biodiversity Conservation Regulation 2017*.

For Development Applications (DAs) under Part 4 of the *Environmental Planning and Assessment Act* (EP&A) *1979*, there are now several triggers for an assessment under the Biodiversity Assessment Methodology (BAM) and hence the need to secure offset credits via the Biodiversity Offset Scheme (BOS). These are:

- Clearing of a prescribed area limit of native vegetation designated for the minimum lot size for the LEP zoning of the subject land.
- Clearing of land mapped as having Sensitive Biodiversity Values Land (SBVL).
- Determined as likely to have a significant after assessment under the Five Part Tests.

Figure 12 shows the Coastal SEPP 14 area is SBVL. The SBVL trigger for the BOS is however not activated if the proposed development is not a subdivision and the land is zoned R1-R4, RU5, B1-B8, or IN1-IN3 under the LEP, as per Clause 7.3(4) of the *Biodiversity Conservation Regulation 2017*. Regardless, the concept does not require clearing of SBVL.

If the area threshold is triggered however, the BOS will apply.

If the area threshold is not triggered, the DA will be assessed under the Five Part Tests. This is discussed further in section 7.1.3.

The Biodiversity Offset Scheme (BOS) may apply to future development of Lot 2 if the final design exceeds the area threshold for clearing of native vegetation. Native vegetation is defined under s. 60B of the *Local Land Services Amendment Act 2016* as follows (OEH 2017e):

1. For the purposes of this Part, native vegetation means any of the following types of plants native to New South Wales:
    a. trees (including any sapling or shrub or any scrub),
    b. understorey plants
    c. groundcover (being any type of herbaceous vegetation)
    d. plants occurring in a wetland.

Figure 12: Sensitive Biodiversity Value Lands in the study area

2. A plant is native to New South Wales if it was established in New South Wales before European settlement. The regulations may authorise conclusive presumptions to be made of the species of plants native to New South Wales by adopting any relevant classification in an official database of plants that is publicly accessible.

3. For the purposes of this Part, native vegetation extends to a plant that is dead or that is not native to New South Wales if:
    a. the plant is situated on land that is shown on the native vegetation regulatory map as category 2 – vulnerable regulated land, and
    b. it would be native vegetation for the purposes of this Part if it were native to New South Wales.

Hence disturbed areas such as a paddock with clusters of trees may still comprise native vegetation (and are assessed under the Streamlined Module of the BAM).

This is discussed further in section 7.1.2.

7.1.2 Biodiversity Offset Scheme

When the Biodiversity Offset Scheme (BOS) is triggered by one or more of the thresholds above, a development must be assessed under the Biodiversity Assessment Methodology (BAM). The BAM assessment will be detailed in Biodiversity Development Assessment Report (BDAR) which will detail the following:

1. Assessment of the biodiversity values (as defined in s1.5 of the BC Act) of the land the subject of the proposed DA, in accordance with the BAM,
2. Assessment of the impact of the proposed DA, proposed activity or proposed clearing on the biodiversity values of that land,
3. Measures the proponent proposes has or will take to avoid or minimise the impact,
4. Specifies the number and class of biodiversity credits that are required to be retired to offset the residual impacts on biodiversity values of actions to which the BOS applies.

The proponent will be required to retire the necessary biodiversity credits. Credits are divided into either Ecosystem Credits (where a number of species associated with that specific Plant Community Type (PCT) can be addressed under one type of credit) or Species Credits (species for which ecosystems are not adequate surrogates).

Species Credit (SC) species known to occur on site comprises the Squirrel Glider, with dual credit (Ecosystem Credits for foraging habitat, SC for breeding habitat) species including the Koala and Grey-headed Flying Fox. The BAM will also identify species with potential to occur (including those listed in Table 4). SC species nominated by the BAM as having potential to occur may be subject to targeted survey, or an expert report to discount their occurrence and hence negate the need for species credits. Otherwise, they must be assumed present and credits secured.

There are a number of ways credits requirements can be met, including:

- Retiring biodiversity credits through establishing your own Biodiversity Stewardship (offset) site.
- Purchasing credits on the open market.

- Funding biodiversity actions for individual species or communities (limited opportunities).
- Making a payment to the Biodiversity Conservation Trust (BCT) as prescribed by the Biodiversity Offsets Payment Calculator.

The DA consent will specify the offset requirements, and the credits must be retired before commencement of the activity.

7.1.3 Five Part Test

Future development on Lot 4 would fall under the 5 Part Tests, if a separate DA is lodged for this development, and the area thresholds and intrusion into SBVL are thus also avoided by any potential APZ requirements.

The 5 Part Tests are used to determine whether a proposed development is likely to have a significant effect on threatened species, Endangered Ecological Communities, Endangered Populations and Critical Habitat listed under schedules of the *Biodiversity Conservation Act 2016* known or considered reasonably likely to occur in the area influenced by a development proposal. Considerations must be given to the possible significant impacts a proposed development may have on threatened species, populations, ecological communities, and their habitats (DECC 2007).

The content of the 5 Parts are specified by Section 7.3 of the *Biodiversity Conservation Act 2016.*

In addition to the EEC and threatened species currently known to occur on site, the following species (see Appendix 1) would need to be subject to the 5 Part Tests as they are considered to have at least a low potential to use some habitat on the site or study area at some time (eg. now or if they were to potentially recover and expand):

The guidelines currently associated with the revised factors have provided definitions for key terms with the most significant being that of the "*local population*" and "*local occurrence*" as follows (OEH 2018e):

> **"Local population**: the population that occurs in the study area. The assessment of the local population may be extended to include individuals beyond the study area if it can be clearly demonstrated that contiguous or interconnecting parts of the population continue beyond the study area, according to the following definitions.
>
> - The *local population* of a threatened *plant* species comprises those individuals occurring in the study area or the cluster of individuals that extend into habitat adjoining and contiguous with the study area that could reasonably be expected to be cross-pollinating with those in the study area.
> - The *local population* of *resident fauna* species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area.
> - The *local population* of *migratory or nomadic fauna* species comprises those individuals that are likely to occur in the study area from time to time or return year to year"

The local population of the potentially and known occurring threatened species is thus defined as follows:

Table 5: Definition of Local Populations

Species	Legal Status	Local Population
Square-tailed Kite	V-BCA	Any individuals potentially using habitat within site/study area depending on prey abundance as part of larger range. Local population requires much more habitat that found within study area to meet lifecycle requirements.
Little Eagle	V-BCA	
Powerful Owl	V-BCA	Any individuals potentially using habitat within site/study area depending on prey abundance as part of larger range. Local population requires much more habitat that found within study area to meet lifecycle requirements.
Masked Owl	V-BCA	
Barking Owl	V-BCA	
Little Lorikeet	V-BCA	Any individuals potentially using habitat within the site/study area depending on flowering incidences. Local population requires much more habitat that found within study area to meet lifecycle requirements.
Squirrel Glider	V-BCA	Local population would be those animals which use denning habitat in the study area, using the site forest as part of their outlying foraging habitat. Local population range thus extends beyond the study area to meet lifecycle requirements.
Koala	V-BCA, E-EPBCA	Local aggregate which includes the site and adjoining habitats as part of the local Core Koala Habitat. Local population range thus extends beyond the study area to meet lifecycle requirements.
Grey-Headed Flying Fox	V-BCA, V-EPBCA	Any individuals potentially using habitat within the study area depending on lifecycle stage/seasonal range and flowering/fruiting incidence. Due to its ecology, local population requires much more habitat that found within study area to meet lifecycle requirements.
Little and Eastern Bent-wing Bats	V-BCA	Any individuals known/potentially using habitat within site/study area depending on lifecycle stage/seasonal range. Due to the ecology of these species, the local population requires much more habitat that found within study area to meet lifecycle requirements.
Eastern Cave Bat	V-BCA	
Greater Broad-nosed Bat	V-BCA	
East-coast Freetail Bat	V-BCA	

The local occurrence of the EECs as per the OEH (2018d) definition are that within the study area.

The 5 Part Test is as follows:

> (a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,
>
> (b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

(c) in relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of Outstanding Biodiversity Value (either directly or indirectly),

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

A formal assessment is not provided in this constraints assessment, but assuming no loss/modification of the swamp forest in the northwest corner of Lot 4, a preliminary overview of the development nominated on Lot 4 suggest it is unlikely to have a significant impact as:

- Vegetation removal is minimal – only common weeds and the northern tip of the swamp forest along the eastern boundary for a driveway and parking area.
- Connectivity around the site is retained.
- No new barrier will be created, and Koala ladders can be installed if security fencing poses a barrier to Koala access to habitat within the school grounds.
- Nest boxes can be installed to enhance the habitat value of the swamp forest for the Squirrel Glider.
- No area of Outstanding Biodiversity Value is impacted.

7.1.4 Serious and Irreversible Impacts

Serious or Irreversible Impacts (SaII) are a new criterion the consent authority under Part 4 DAs must consider. The consent authority must determine if the proposal's residual impacts after avoid or mitigation measures have been undertaken are serious and irreversible. SaII's are defined for a discrete list of EECs and threatened species (OEH 2018d).

Thresholds have been nominated for the following relevant species: Little and Eastern Bent-wing Bats, Eastern Cave Bat and Swift Parrot.

The SaII thresholds for the bats relate to cave roosting habitat which is not affected by the proposal.

Areas mapped as SC areas for the Swift Parrot are potential SaII and need to be assessed. Other areas with potential food tree species are likely to be EC areas, and are unlikely to have potential serious and irreversible impacts.

The locality has recently seen a significant number of Swift Parrot records (OEH 2018a, Siossian and Scully 2018), most likely in response to drought conditions in its core non-breeding foraging areas (Slossian and Scully 2018, Saunders *et al* 2016). Swamp Mahogany is a preferred forage species, but only 2 be removed and these would be offset with additional plantings due to SEPP 44 obligations. Hence it is very unlikely that a SaII threshold will be exceeded.

7.2 EPBC Act 1999 Overview

The provisions of the EPBCA require determination of whether the proposal has, will or is likely to have a significant impact on a "*matter of national environmental significance"*. These matters are listed and addressed as follows:

1. **World Heritage Properties**: The site/study area is not listed as a World Heritage area nor does the proposal affect any such area.

2. **Ramsar Wetlands of International Significance**: No Ramsar wetland occurs on or adjacent to the site, nor does the proposal affect a Ramsar Wetland.

3. **EPBC Act listed Threatened Species and Communities**: The Koala (Vulnerable) and the Grey-Headed Flying Fox (Vulnerable) are known occurrences in the study area. The Swift Parrot is considered a very low potential occurrence – incidental in the locality if suitable flowering conditions occurred. As detailed below, neither are considered at risk of a significant impact.

4. **Migratory Species Protected under International Agreements**: No migratory species is likely to be significantly affected by the proposal, as detailed below.

5. **Nuclear Actions**: The proposal is not a nuclear action.

6. **The Commonwealth Marine Environment (CME)**: Listed as relevant to the site though is not within the CME nor does it affect such.

7. **The Great Barrier Reef Marine Park:** The proposal does not affect the Great Barrier Reef Marine Park.

8. **National Heritage**: The site does not contain an item of National Heritage.

9. **A water resource, in relation to coal seam gas development and large coal mining development**: The proposal is not a mining development.

The proposal thus is not considered to require referral to the Department of Environment and Energy (DotEE) for approval under the EPBC Act.

7.3 Threatened Species

7.3.1 Threatened Flora and EECs

No EPBC Act listed flora species were found on the study site or considered likely potential occurrences, and are thus not considered further.

No EECs listed under the Act occur on site or in the study area, and hence are not considered further.

7.3.2 Threatened Fauna

7.3.2.1 Koala

Under the Act, proposed actions must be assessed under the Commonwealth Department of the Environment (2014) guidelines, and hence assessment is required. The assessment is three stages:

1. Qualification as Critical Koala Habitat assessment.
2. Impacts on Critical Koala Habitat.
3. Assessment of other threats.

The habitat on site has been assessed using the Koala habitat assessment tool from the EPBC Act Referral Guidelines (DotE 2014) to determine if the site contains habitat critical to the survival of the Koala. To qualify as critical habitat, it must score 5 or more. This is shown in the following table:

Table 6: Critical Koala Habitat assessment

Attribute	Score	Reason	
Koala occurrence	2	Desktop	Recorded within 1km of the site on Bionet Atlas
		On-ground	Identified Core Koala Habitat.
Vegetation structure and composition	1	Desktop	Biolink (2013b) vegetation mapping of forest on site as only Secondary Koala Habitat.
		On-ground	Site surveys confirmed preferred Koala food trees species qualify site as Potential Koala Habitat (but only in localised area).
Habitat connectivity	1	Site is not part of a contiguous landscape >500ha	
Key existing threats	1	Desktop	OEH Bionet has records of Koala road kill in local area.
		On-ground	No evidence of Koala road kill found during survey. No evidence of wild or domestic dogs on
Recovery value	2	The following factors indicate that it is important for achieving the interim recovery objectives for the Koala: • Evidence of Koala activity in the study area • Presence of food trees interlinked to significant areas of known Koala habitat. • Risk of dog attack and car strike is very low • Risk of high intensity fire is very low.	
Total	7	Site qualifies as critical habitat	

As per the Koala habitat assessment tool, the site qualifies as critical habitat. An assessment has been undertaken to determine if the proposal will adversely affect this habitat and/or interfere substantially with the recovery of the Koala and require referral to the Minister.

The following table derived from the Koala Referral Guidelines (DotE 2014) assesses whether the proposal is likely to adversely affect habitat critical to the survival of the Koala.

Table 7: Critical habitat assessment

Factor	Y/N	Reason
Does impact area contain habitat critical to the survival of the Koala	Y	Site scores 7 as per the Koala habitat assessment tool.
Do the areas proposed to be cleared contain known Koala food trees	Y	Habitat to be removed contains primary preferred KFTs. Other browse species (*Melaleuca quinquenervia*) will also be removed.
Are you proposing to clear<2ha of habitat containing known Koala food trees in an area with a habitat score of ≤5	N	Proposal will remove <1ha of habitat containing Koala food trees in an area that scores 7.
Are you proposing to clear >20ha of habitat containing known Koala food trees in an area with a habitat score of ≥8	N	Proposal will only remove/modify <1ha of habitat containing Koala food trees in an area that scores 7.
Outcome	Impact unlikely to be significant	

The Guidelines also require consideration of whether the proposed action may interfere with the recovery of the Koala, as follows:

Table 8: Impact on recovery assessment

Threat	Likely to increase Y/N	Reason
Increasing Koala fatalities in habitat critical to the survival of the Koala due to dog attacks to a level that is likely to result in multiple, ongoing mortalities.	N	Dogs not a current feature of the development, nor proposed for future development.
Increasing Koala fatalities in habitat critical to the survival of the Koala due to vehicle-strikes to a level that is likely to result in multiple, ongoing mortalities.	N	No change to existing speed limit on Mumford St, and on-site access will continue to be <10km/h
Facilitating the introduction or spread of disease or pathogens for example Chlamydia or *Phytophthora cinnamomi*, to habitat critical to the survival of the Koala, that are likely to significantly reduce the reproductive output of Koalas or reduce the carrying capacity of the habitat.	N	Unlikely. *Phytophthora cinnamomi* introduction is a low risk that can be mitigated if required by implementation of standard hygiene protocols. Potential loss of two trees to be offset with 10 replacements, and overwhelming majority retained, hence risk of stress-induced disease is minimal.

Threat	Likely to increase Y/N	Reason
Creating a barrier to movement to, between or within habitat critical to the survival of the koala that is likely to result in a long-term reduction in genetic fitness or access to habitat critical to the survival of the Koala.	N	Existing security fences provide a barrier to access. Where necessary, these will be reviewed for providing Koala ladders. If habitat in the south of Lot 2 is fenced off to provide security to the development, structures to be provided to ensure habitat will not be isolated.
Changing hydrology which degrades habitat critical to the survival of the Koala to the extent that the carrying capacity of the habitat is reduced in the long-term.	N	Filling is required, but specialist studies will confirm this will not impact the retained vegetation.
Outcome	Referral not required as impact unlikely to be significant as: • Measures generally at least meet the low criteria for mitigation.	

7.3.2.2 Grey-Headed Flying Fox (V)

For the purposes of discussion, the "*important population*" of Grey-Headed Flying Foxes is defined as that population of the species likely to depend on colonial roosts in the locality or within foraging range of the site.

The proposed activity may only see the loss/modification of <1ha of paperbark swamp forest, which forms a minute fraction of the locally available habitat for an important population; and is not roosting habitat. No other aspect of the proposed activity is considered to pose a significant threat to this species.

7.3.2.3 Swift Parrot (CE)

The proposal may see loss of up to 2 Swamp Mahogany, which is a species that if flowering when the bird is present during its non-breeding season, it may use for foraging (subject to competition with other nectarivores). These comprise a small fraction of trees on site, and on adjoining land to the south and west. These will be offset by replantings at a ratio of 1:5.

Given this, the proposal is not considered likely to pose any significant threat to the species and hence not require referral to DotEE.

7.3.3 Migratory Species

No EPBC Act listed migratory species was recorded on the site. However several species (eg Rainbow Bee-eater, White-throated Needletail, Fork-tailed Swift) are considered potential occurrences.

The proposed activity will have minimal impact on these species as the affected habitat only comprises only a minute fraction of the locally available habitat, and breeding does not occur on site.

7.4 DCP 2013

7.4.1 - KFTs

Under the new Port Macquarie-Hastings Council Local Environmental Plan (PMHC LEP) 2011, Council has prepared and implemented the PMHC Development Control Plan (DCP) 2013.

The DCP has relevant provisions for Koala food trees. Section 2.6.3.2 specifies that Koala food tree removal must be replaced at ratio of 1:2.

The current concept plan suggests potential loss of 2 KFTs which will need to be offset to meet compliance with the DCP, unless the offsets via the BC Act and/or SEPP 44 are deemed to address this obligation.

7.4.2 EEC Buffers

Section 2.3.3.4 of DCP 2013 specifies that a vegetated buffer 35m wide to Coastal Floodplain EECs.

Figure 13 shows the extent of the DCP buffer on site to the areas identified to be Coastal Floodplain EEC.

7.4.2.1 Lot 4

The buffer width to the EEC in the northwest of Lot 4 generally encompasses the edges of the existing school plus two nominal new buildings which occur in a maintained lawn and parkland setting. The erection of these buildings will have negligible if any impacts on the adjacent EEC, and establishing a vegetated buffer here would create bushfire issues for the existing school. Hence literal compliance with the DCP here is considered impractical.

The buffer zone in the southeast falls over an area currently maintained as lawn with plantings of Swamp Mahogany. The lawn area is proposed to be converted to a car park, with stormwater drainage directed to the adjacent retention basin on Lot 2.

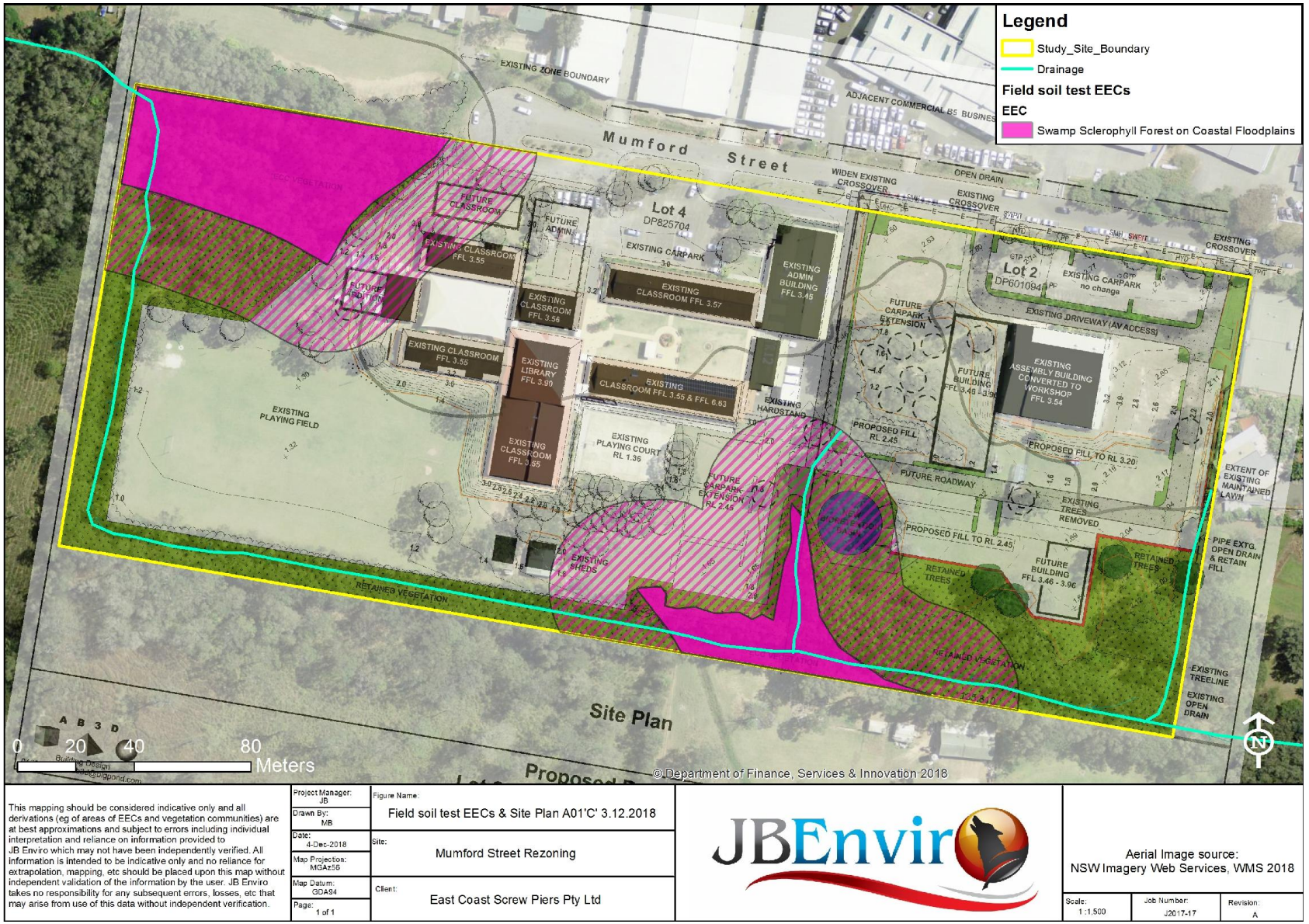
Again, literal compliance with the DCP is considered impractical due to the incurred bushfire issues to the existing school. The development also does not change current edges of the EEC and its current buffers.

7.4.2.2 Lot 2

The development concept on Lot 2 avoids the EEC, but intrudes into the buffer's north and northwest with a road and the stormwater detention basin on the northeast side.

This is however to be offset by bush regeneration to improve the condition of the EEC in the southern end of the site and widening of the remnant of swamp forest in the southern end. These combined actions are intended to maintain and enhance the ecological processes associated with the EEC and hence its viability in the long term, in line with the objectives of the SEPP.

Figure 13: DCP 2013 EEC buffer zones



This mapping should be considered indicative only and all derivations (eg of areas of EECs and vegetation communities) are at best approximations and subject to errors including individual interpretation and reliance on information provided to JB Enviro which may not have been independently verified. All information is intended to be indicative only and no reliance for extrapolation, mapping, etc should be placed upon this map without independent validation of the information by the user. JB Enviro takes no responsibility for any subsequent errors, losses, etc that may arise from use of this data without independent verification.

Project Manager: JB	Figure Name: Field soil test EECs & Site Plan A01'C' 3.12.2018
Drawn By: MB	
Date: 4-Dec-2018	Site: Mumford Street Rezoning
Map Projection: MGAz56	
Map Datum: GDA94	Client: East Coast Screw Piers Pty Ltd
Page: 1 of 1	

Aerial Image source: NSW Imagery Web Services, WMS 2018

Scale:	Job Number:	Revision:
1 :1,500	J2017-17	A

7.5 Coastal SEPP

Part 2 Division 1 (11) requires the consent authority to be satisfied that development on land mapped as within proximity to coastal wetlands and littoral rainforest does not significantly impact on:

a) the biophysical, hydrological or ecological integrity of the adjacent coastal wetland or littoral rainforest, or

b) the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest.

These are addressed as follows:

7.5.1 Lot 4

The proposal on Lot 4 has no impact on any of these attributes as:

- No clearing of any current buffering vegetation is required.
- No change to watertable required ie raising or lowering.
- No cutting below the watertable leading to changes in the adjacent wetland.
- No change to stormwater flows which will adversely impact recharge regimes.
- No adverse change to flooding regime which could lead to changes in drying/wetting regime, scouring, sedimentation or water depth which could lead to changes in the characteristics of the wetland.
- Stormwater is to be treated to the legislative standard to minimise water quality impacts on the wetland vegetation.

7.5.2 Lot 2

The proposal is similarly unlikely to have any significant impact on these attributes:

- No clearing of buffering vegetation directly adjacent to the wetland.
- No change to watertable required ie. raising or lowering.
- No cutting below the watertable leading to changes in the adjacent wetland.
- No change to offsite discharge of stormwater that is likely to lead to changes in drying/wetting regime in the adjacent wetland.
- Stormwater is to be treated to the legislative standard to minimise water quality impacts on the wetland vegetation.
- The proposed filling is not likely to lead to adverse flood behaviour patterns eg. significantly increased velocity leading to scouring or sedimentation (Advisian 2018) of the adjacent wetland.
- Increased width of intact vegetation identical to the Coastal Wetland in the buffer zone to improve ecological processes.

8 CONCLUSION

The subject land has a history of disturbance which has seen much of the original vegetation cleared, drainage infrastructure installed, and a substantial area filled to mitigate flooding.

The remnant and regrowth vegetation however has value for threatened fauna, most importantly for the Squirrel Glider and Koala, and parts of this vegetation qualify as the EEC – *Swamp Sclerophyll Vegetation on Coastal Floodplains*.

The final development concept will be subject to outcomes under the new BC Act 2016 which may require offsets for development of Lot 2 under the current concept. As the site also contains Core Koala Habitat, a Koala Plan of Management will also be required to accompany future Development Applications unless a Comprehensive Koala Plan of Management is adopted by PMHC in the interim.

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10 APPENDIX 1: TSCA – FIVE PART TEST ELIGIBILITY

10.1 POTENTIAL OCCURRENCE ASSESSMENT

10.1.1 FLORA

As mentioned previously, no threatened flora species were detected on site by the survey. Searches of relevant literature and databases (OEH 2018a) found records of the following threatened flora species in the locality. In the table below, these species are evaluated for their potential to occur on the site; significance of the proposal to this potential occurrence; and thus their eligibility/requirement for Five Part Test assessment.

Table 9: Eligibility for the Five Part Tests – Flora

Species	Legal Status	Records	Habitat Requirements	Likelihood Of Occurrence	Significance Of Impacts
Acronychia littoralis	E-BCA, E-EPBCA	4	An understorey tree found in littoral rainforest on sand.	No suitable habitat on site. Unlikely to occur	Modification of site of no significance as no habitat potential. No significant impact likely to occur. No Five Part Test required.
Dwarf Heath Casuarina *(Allocasuarina defungens)*	E-BCA, E-EPBCA	1	A straggly oak about 2m high with blue-green foliage found in heath on sand (sometimes clay and sandstone soils), and swamp sclerophyll forest margins.	No suitable habitat on site and not recorded on adjacent lands. Unlikely to occur	Modification of site of no significance as no habitat potential. No significant impact likely to occur. No Five Part Test required.
Trailing Woodruff *(Asperula asthenes)*	V-BCA, V-EPBCA	1	An herb found in damp sites along riverbanks and similar areas	Some generic potential habitat along drain to south and in swamp forest, but not found by survey. Not found by targeted survey of derived wetland on site. Unlikely to occur.	Modification of site of no significance as no significant habitat potential. No significant impact likely to occur. No Five Part Test required.

Species	Legal Status	Records	Habitat Requirements	Likelihood Of Occurrence	Significance Of Impacts
Chamaesyce psammogeton	V-BCA	2	An herb that grows on fore dunes and exposed sites on headlands.	Recorded in locality but no suitable habitat on site. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Five Part Test not required.
Spider Orchid *(Dendrobium melaleucaphilum)*	E-BCA	2	An epiphyte on *Melaleuca styphelioides*, rainforest trees or rocks in coastal districts north from the Blue Mountains. It has square stems, similar to *D. tetragonum* and it flowers Jul.-Oct.	Generic potential habitat in swamp forest on site but not found despite being relatively conspicuous. Unlikely to occur as only old record.	Modification of site of no significance as only generic habitat potential and overwhelming majority retained. No significant impact likely to occur. No Five Part Test required.
Slender Marsdenia *(Marsdenia longiloba)*	E-BCA, V-EPBCA	1	A slender climber with clear, watery latex (sap). Occurs in rainforest and moist eucalypt forest adjoining rainforest, at no particular altitude, sometimes in areas with rock outcrops. Found at scattered sites from Barrington Tops to SE Queensland (NPWS 2000).	No suitable habitat on site. Unlikely to occur	Modification of site of no significance as no habitat potential. No significant impact likely to occur. No Five Part Test required.
Narrow-leaved Black Peppermint (*Eucalyptus nicholii*)	V-BCA, V-EPBCA	3	Small tree found on the New England Tablelands in dry grassy woodland on shallow, infertile soils derived from granite or metasedimentary rock.	Planted as an ornamental widely around Port Macquarie – not indigenous. Not recorded on site.	Non-indigenous and not present. No Five Part Test required.
Maundia triglochinoides	V-BCA	6	A paperbark shrub/small tree found in damp places, often near streams, on the coast and adjacent tablelands from Jervis Bay to Coffs Harbour.	Generic potential habitat in swamp forest on site but not found despite being relatively conspicuous. Unlikely to occur	Modification of site of no significance as no known habitat and at best very marginal potential habitat impacted. No significant impact likely to occur. No Five Part Test required.
Biconvex Paperbark *(Melaleuca biconvexa)*	V-BCA, V-EPBCA	33	A paperbark shrub/small tree found in damp places, often near streams, on the coast and adjacent tablelands from Jervis Bay to Port Macquarie. Appears to be associated with the Cairnscross soil landscape in Port Macquarie.	No suitable habitat on site - wrong parent material/soil. Unlikely to occur	Modification of site of no significance as no habitat potential. No significant impact likely to occur. No Five Part Test required.

Species	Legal Status	Records	Habitat Requirements	Likelihood Of Occurrence	Significance Of Impacts
Oberonia titania	V-BCA	1	An epiphytic orchid that grows in a tight clump in a variety of habitats from subtropical to littoral rainforest, *Melaleuca* swamps, and gorges within dry sclerophyll forest.	Only marginal generic habitat on site, and this conspicuous plant was not detected. Unlikely to be present as site is accessable to orchid collectors and only single local record in Sea Acres NR. Unlikely to occur	Modification of site of no significance as no habitat potential. No significant impact likely to occur. No Five Part Test required.
Senna acclinis	E-BCA	1	A shrub found in or on the edges of subtropical and dry rainforest. Variable geology and soils are favoured	No suitable habitat on site. Unlikely to occur	Modification of site of no significance as no habitat potential. No significant impact likely to occur. No Five Part Test required.
Sophora tomentosa	E-BCA	6	A coastal shrub that occurs on recent sands on frontal coastal dunes northwards from Port Stephens. Port Macquarie has the largest known population eg Shelley and Nobby's Beaches	No suitable habitat on site. Unlikely to occur	Modification of site of no significance as no habitat potential. No significant impact likely to occur. No Five Part Test required.

10.1.2 FAUNA

As previously noted in section 4.3, a significant number of threatened fauna have been recorded in the locality, and a number of others are considered potential occurrences by the consultant. In the table below, these species (excluding marine species due to obvious lack of habitat) are evaluated for their potential to occur on the site; significance of the proposal to this potential occurrence; and thus their eligibility/requirement for Five Part Test or MNES assessment.

Table 10: Eligibility for Five Part Test Assessment – Fauna

Name	Legal Status	Records	Habitat Requirements	Likelihood Of Occurrence	Significance Of Impacts
Powerful Owl (*Ninox strenua*)	V-BCA	11	Wet and dry sclerophyll forests. Nests in tree hollows. Requires high diversity and abundance of medium-sized arboreal prey. Very large territory (500-5000ha).	Habitat in the study area comprises a relatively small isolated remnant with poor prey potential with no suitable potential nesting hollows. Very limited prey potential – at most comprising marginal fringe of larger territory. Only low potential to occur as rare foraging foray utilising it as minute fraction of wider territory.	Proposal only affects a small area of marginal potential foraging habitat that has been previously subject to similar periodic disturbances. Significant impact unlikely as vast majority of habitat retained. **Five Part Test required** to demonstrate no significant impact risk.
Barking Owl (*Ninox connivens*)	V-BCA	1	Well-forested hills and flats, eucalypt savannah (especially), and riverine woodland in coastal and subcoastal areas. Prefers hunting in more open country for mammals (rabbits, rats, mice, small bats and small marsupials) and birds (small up to Frogmouths and Magpies). Large territories. Nest in hollows.	Single record in Fernbank Creek area. Very limited prey potential – at most comprising marginal fringe of larger territory. Only low potential to occur as rare foraging foray utilising it as minute fraction of wider territory.	Proposal only affects a small area of marginal potential foraging habitat that has been previously subject to similar periodic disturbances. Significant impact unlikely as vast majority of habitat retained. **Five Part Test required** to demonstrate no significant impact risk.

Name	Legal Status	Records	Habitat Requirements	Likelihood Of Occurrence	Significance Of Impacts
Masked Owl (*Tyto novaehollandiae*)	V-BCA	2	Eucalypt forest and woodlands with sparse understorey. Nests in tree hollows. Requires high diversity and abundance of prey 200-600g weight. Large territory.	Habitat in the study area comprises a relatively small isolated remnant with poor prey potential with no suitable potential nesting hollows. Very limited prey potential – at most comprising marginal fringe of larger territory. Only low potential to occur as rare foraging foray utilising it as minute fraction of wider territory.	Proposal only affects a small area of marginal potential foraging habitat that has been previously subject to similar periodic disturbances. Significant impact unlikely as vast majority of habitat retained. **Five Part Test required** to demonstrate no significant impact risk.
Grass Owl (*Tyto capensis*)	V-BCA	27	Eastern population occurs on coastal floodplains in a variety of wet & dry heath, tall grass, swamps and sedgeland which may have common structure rather than floristics. Records in Port Macquarie area are all near wet sedgelands. Breeds year round. Known to nest near or surrounded by water. Forage near nest site. (summary in Redpath 2002) Dependant on good numbers of rodent prey, with possible nomadic link (NSW NPWS 2000).	No suitable habitat on or adjacent to the site. Recorded in locality. Unlikely to occur.	No suitable habitat affected. No risk of significant impact. Five Part Test not required.
Little Eagle (*Hieraaetus morphnoides*)	V-BCA	1	Occupies habitats rich in prey within open eucalypt forest, woodland or open woodland, sheoak or acacia woodlands and riparian woodlands of interior NSW are also used (Marchant and Higgins 1993; Aumann 2001a). For nest sites it requires a tall living tree within a remnant patch, where pairs build a large stick nest in winter and lay in early spring. It eats birds, reptiles and mammals, occasionally adding large insects and carrion (Marchant and Higgins 1993; Aumann 2001b; Debus et al. 2007). It is distributed throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment (Marchant and Higgins 1993). It occurs as a single	Some very marginal potential foraging habitat present on site, however species was not recorded on site and not known in urban fringe. Considered very low to unlikely chance of occurrence on site– more likely to occur in hinterland of LGA.	Modification of habitat on site considered insignificant, given lack of local records and amount of similar habitat available locally. Five Part Test not required.

Name	Legal Status	Records	Habitat Requirements	Likelihood Of Occurrence	Significance Of Impacts
			population throughout NSW.		
Square-Tailed Kite (*Lophoictinia isura*)	V-BCA	19	Open forests and woodlands in coastal and subcoastal areas. Forages low over, or in, canopy for eggs, nestlings, passerines, small vertebrates and invertebrates. Large home range (>100km^2). Observed foraging in residential areas of Port Macquarie. Large stick nest in high fork of living tree. Breeds July-December. Probably migrates to northern Australia in winter. (Debus 1998, NSW NPWS 2000).	Site provides potential foraging habitat. No nests found on or adjacent to the site and it was not detected by the survey. Recorded in locality. Fair chance of occurrence as part of a larger foraging range.	No critical or preferred habitat to be modified. Potential support for occurrence to be retained. Significant impact unlikely. However **Five Part Test undertaken** as fair chance of occurrence.
Spotted Harrier (C*ircus assimilis*)	V-BCA	12	Occurs in grassy open woodland including acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe (e.g. chenopods) (Marchant and Higgins 1993; Aumann 2001a). It is found mostly commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. The species builds a stick nest in a tree and lays eggs in spring (or sometimes autumn), with young remaining in the nest for several months. Diet includes terrestrial mammals, birds and reptiles, occasionally large insects and rarely carrion (Marchant and Higgins 1993; Aumann 2001b). Many of the remaining key prey species (e.g. terrestrial grassland birds such as quail, button-quail, pipits, larks and songlarks) require ground cover and are sensitive to habitat degradation from grazing (Marchant and Higgins 1993).	Some very marginal potential foraging habitat present on site, however species was not recorded on site and not known in urban fringe. Considered very low to unlikely chance of occurrence on site– more likely to occur in hinterland of LGA.	Modification of habitat on site considered insignificant, given lack of local records and amount of similar habitat available locally. Five Part Test not required.

Name	Legal Status	Records	Habitat Requirements	Likelihood Of Occurrence	Significance Of Impacts
Little Lorikeet (*Glossopsitta pusilla*)	V-BCA	8	Gregarious, usually foraging in small flocks, often with other species of lorikeet feeding primarily on nectar and pollen in the tree canopy, particularly on profusely-flowering eucalypts, but also on a variety of other species including, melaleucas and mistletoes. Mostly occurs in dry, open eucalypt forests and woodlands. They have been recorded from both old-growth and logged forests in the eastern part of their range, and in remnant woodland patches and roadside vegetation on the western slopes. In south-east Queensland (Smyth *et al*. 2002), were more likely to occupy forest sites with relatively short to intermediate logging rotations (15–23 years) and sites that have had short intervals (2.5– 4 years) between fires.	Not recorded on site. The site contains only a relatively small area of generic potential foraging within a locality with a relatively vast area of such habitat. Considered a low chance of occurrence as part of a wider foraging range.	Loss of small of low value potential foraging habitat but no potential nesting hollows. Extensive amount of similar habitat available locally, hence proposal unlikely to significantly impact. **Five Part Test required** however due to potential to occur.
Regent Honeyeater (*Anthochaera phrygia*)	CE-BCA E-EPBCA	1	Nomadic. Inhabits temperate eucalypt woodlands and open forest, including forest edges, woodland remnants on farmland and urban areas. Also uses *Casuarina cunninghamiana* gallery forests. Requires reliable and ample nectar supplies to support semi-permanent (core breeding) habitat. Favoured nectar sources are *E. sideroxylon, E. albens, E. melliodora, E. leucoxylon, E. robusta, E. planchoniana*, and heavy infestations of mistletoe. Also take insects and orchard fruits. Breeds in pairs or small colonies in open woodland/forest and occasionally more disturbed woodland near housing and farmland, depending on food availability, from August-January. Breeding less likely to occur if nectar flows are low or unreliable, or heavy competition with more aggressive honeyeaters eg Noisy Miner, Red Wattlebirds and Noisy Friarbirds.	Mistletoe absent but Swamp Mahogany present. Single record in locality this species makes very rare visits to the LGA in non-breeding migratory visits. Unlikely to very low chance of occurrence.	No critical or preferred habitat to be modified. Significant impact unlikely. Five Part Test Not required. MNES assessment not required.

Name	Legal Status	Records	Habitat Requirements	Likelihood Of Occurrence	Significance Of Impacts
Eastern Ground Parrot (*Pezoporus wallicus wallicus*)	V-BCA	4	Found from coastal southeastern to eastern Australia, with a highly fragmented distribution. Terrestrial bird, most often found in heathland or sedgeland with dense cover and high density of preferred food plants. Found from coast to 300m ASL. Heathland usually high diversity of heath species with scattered shrubs of Banksia and She-oaks, grass trees with abundant sedges and grasses. Sometimes found in open Bansksia woodlands with heath understorey, closed fernland around shallow creeks or plains or sedges at swamp margins. Nests on ground. Appears to prefer a fire regime that promotes plant growth and hence seed production. Breeds in spring-early autumn depending on latitude (in summer in colder areas). Feeds on seeds, some green shoots, leaves, buds, flowers and fruits. Diurnal and mainly sedentary with young dispersing in autumn, with movements of 80-220km recorded. Estimated to range over 8-20ha depending on habitat condition (eg fire) and quality.	Recorded locally in Fernbank Creek swamp but not suitable habitat on sire or study area. Unlikely to occur.	Significant impact unlikely as unlikely to occur. Five Part Test not required.
Swift Parrot (*Lathamus discolour*)	CE-BCA E-EPBCA	29	Breeds in Tasmania and winters in Victoria with some dispersal northwards. Feeds mostly on pollen and nectar of winter flowering eucalypts, but also feeds on fruit, seeds, lerps and insect larvae (Schodde and Tideman 1990). Also favours profusely flowering banksias. Favoured species are *E. robusta*, *Corymbia gummifera*, *E. globulus, E. sideroxylon, E. leucoxylon, E. labens, E. ovata, C. maculata, Banksia serrata* and *B. integrifolia*	Swamp Mahogany present but given extent of such habitat to the south and around Port Macquarie airport; and more suitable habitats near Lake Cathie and in Limeburners Creek NR, the probability of this extremely rare species utilising habitat on site is very low.	No critical or preferred habitat to be modified. Significant impact unlikely. Five Part Test Not required. MNES assessment not required
Varied Sittella (*Daphoenositta chrysoptera*)	V-BCA	16	Sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands, with a nearly continuous distribution in NSW from	Not preferred vegetation types on site or study area. Low chance of visitation. Given dominance by	Proposal only affects a small area of marginal potential habitat. Significant impact unlikely as unlikely to occur.

Name	Legal Status	Records	Habitat Requirements	Likelihood Of Occurrence	Significance Of Impacts
			the coast to the far west (Higgins and Peter 2002; Barrett et al. 2003). It inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees, and from small branches and twigs in the tree canopy. It builds a cup-shaped nest of plant fibres and cobweb in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.	medium sized woodland birds including Noisy Miner, is it unlikely to occur.	Five Part Test not required.
Dusky Woodswallow *(Artamus cyanopterus cyanopterus)*	V-BCA	3	Woodlands and dry open sclerophyll forest, usually eucalypts and mallee associations. Also have recordings in shrub and heathlands and various modified habitats, including regenerating forests. In western NSW, this species is primarily associated with River Red Gum/Black Box/Coolabah open forest/woodland and associated with larger river/creek systems. Widespread in NSW from coast to inland including the western slopes of the Great Dividing Range and farther west. Species have also been recorded in southern and southwestern Australia.	Not preferred vegetation types on site or study area. Low chance of visitation. Given dominance by medium sized woodland birds including Noisy Miner, is it unlikely to occur.	Proposal only affects a small area of marginal potential habitat. Significant impact unlikely as unlikely to occur. Five Part Test not required.

Name	Legal Status	Records	Habitat Requirements	Likelihood Of Occurrence	Significance Of Impacts
Scarlet Robin (*Petroica boodang*)	V-BCA	1	Small passerine bird usually found in open forests and woodlands from the coast to the inland slopes (Higgins and Peter 2002). Usually breeds in drier eucalypt forests and temperate woodlands, often on ridges and slopes, within an open understorey of shrubs and grasses and sometimes in open areas. Abundant logs and coarse woody debris are reported to be important structural habitat components. Migrates seasonally (Autumn and Winter) to more open habitats such as grassy open woodland or paddocks with scattered trees. Forages from low perches, feeding on invertebrates taken from the ground, tree trunks, logs and other coarse woody debris. Builds an open cup nest of plant fibres and cobwebs, sited in the fork of tree (often a dead branch in a live tree, or in a dead tree or shrub) which is usually more than 2 m above the ground (Higgins and Peter 2002; Debus 2006a,b, NSWSC 2009).	No preferred habitat. Only 1 local record. Unlikely to occur.	No critical or preferred habitat to be modified. Significant impact unlikely. Five Part Test Not required. MNES assessment not required
Bush Stone Curlew (*Burchinus grallaris*)	E-BCA	2	Nocturnal, sedentary and territorial (when breeding) species generally inhabiting open grassy woodlands with few or no shrubs. Abundant leaf litter and fallen debris such as tree branches required for foraging and roosting. Nests in more open areas with very little groundcover (even recorded on mown lawns and golf courses). Coastally, often associated with Swamp Oak groves, saltmarsh, mangroves, *Melaleuca quinquenervia* woodlands and even golf courses, etc. May travel as far as 3km from roost site to foraging grounds.	Some broadly generic potential habitat perhaps in lawns and swamp forest but no proximate records and not detected on urban fringe of Port Macquarie despite numerous surveys. Unlikely to occur.	No critical or preferred habitat to be modified. Significant impact unlikely. Five Part Test Not required. MNES assessment not required

Name	Legal Status	Records	Habitat Requirements	Likelihood Of Occurrence	Significance Of Impacts
Barred Cuckoo Shrike (*Coracina lineata*)	V-BCA	26	Gregarious rainforest/moist forest (especially creek gullies) species feeding mainly on fruit on tall rainforest trees and shrubs, and insects; generally moving with fruiting patterns	No suitable habitat on or adjacent to the site. Recorded in locality. Unlikely to occur.	No suitable habitat affected. No risk of significant impact. Five Part Test not required.
Wompoo Fruit Dove (*Ptilinopus magnificus*)	V-BCA	2	Sub-tropical, littoral, warm temperate and dry rainforest, and wet sclerophyll with rainforest understorey. Feeds on fruit. Known to feed on Camphor Laurel and Lantana.	No suitable habitat on or adjacent to the site. Recorded in locality. Unlikely to occur.	No suitable habitat affected. No risk of significant impact. Five Part Test not required.
Rose-Crowned Fruit Dove (*P. regina*)	V-BCA	2	Inhabits dense rainforest or vegetation containing fruit bearing trees, feeding on fruit. Migratory with fruiting patterns.	No suitable habitat on or adjacent to the site. Recorded in locality. Unlikely to occur.	No suitable habitat affected. No risk of significant impact. Five Part Test not required.
Glossy Black Cockatoo (*Calyptorhynchus lathami*)	V-BCA	21	Dry sclerophyll forest and woodland containing Allocasuarina and Casuarina, and large tree hollows. Preferred regional forage species are A. littoralis and A. torulosa. Requires sufficient extent of forage within home range to support breeding. Breeds Mar-Aug, takes 90 days to hatch and fledge (Lindsey 1992).	No potential food or nest trees. Unlikely to occur.	No loss of known foraging habitat or potential nest sites, hence no risk of significant impact. Five Part Test not required.
Osprey (*Pandion cristatus*)	V-BCA	37	Fish (mostly Mullet) and carrion eater. Forages along coastal rivers, lakes, beaches, creeks and inlets. Tall, dead tree for staging or feeding roost. Nests on exposed tree within 2km of water, but rarely adjacent, and with access to Paperbark or Swamp Oak for nest material. Breeds April-Sept. (Clancy, 1991)	No foraging, roosting or nesting habitat on or adjacent to site. Recorded in locality but not during survey. Unlikely to occur (possibly only flying over).	No suitable habitat affected. No risk of significant impact. Five Part Test not required.

Name	Legal Status	Records	Habitat Requirements	Likelihood Of Occurrence	Significance Of Impacts
White-bellied Sea Eagle *(Haliaeetus leucogaster)*	V-BCA	40	Freshwater swamps, rivers, lakes, reservoirs, billabongs, saltmarsh and sewage ponds and coastal waters. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, forest and urban areas. Distributed along the coastline of mainland Australia and Tasmania, extending inland along some of the larger waterways, especially in eastern Australia.	No foraging, roosting or nesting habitat on or adjacent to site. Recorded in locality but not during survey. Unlikely to occur (possibly only flying over).	No suitable habitat affected. No risk of significant impact. Five Part Test not required.
Black-Necked Stork/Jabiru (*Ephippiorhynchus asiaticus*)	E-BCA	24	Wetlands, mudflats, mangroves, floodplains, irrigated fields, farm dams. Forages in shallow water for small vertebrates. Shuns cover, prefers extensive open shallows. Nests in a tree, often above water in a secluded swamp. Eggs laid Aug-Nov in NSW. Adults resident, juveniles dispersive (DEC 2005a, Lindsey 1992).	No foraging, roosting or nesting habitat on or adjacent to site (avoids forest). Recorded in locality but not during survey. Unlikely to occur (possibly only flying over).	No suitable habitat affected. No risk of significant impact. Five Part Test not required.
Brolga (*Grus rubicunda)*	V-BCA	2	Inhabits coastal and inland wetlands, shallow lakes, grassland, saltmarsh, farm and dry open land. Forages for large invertebrates, frogs, fish, seeds, green shoots and bulbs. Breeding occurs predominantly in tropical wetland and large inland swamps and irrigated grasslands at inland and central northern Australia (eg Queensland and Northern Territory), though has been recorded in the northwest and north-eastern corner of NSW and Victoria.	No foraging, roosting or nesting habitat on or adjacent to site. Recorded in locality but not during survey. Unlikely to occur (possibly only flying over).	No suitable habitat affected. No risk of significant impact. Five Part Test not required.

Name	Legal Status	Records	Habitat Requirements	Likelihood Of Occurrence	Significance Of Impacts
Freckled Duck (*Stictonetta naevosa*)	V-BCA	13	Usually in small groups. Nomadic, breeds in densely vegetated freshwater wetlands with thickets of small trees, usually in western NSW. After breeding, disperses to open fresh or saline water, often in eastern NSW. Breeds Sept-Dec or after flooding rain. Nests in tree, low over water. (Morecombe 2000)	No foraging, roosting or nesting habitat on or adjacent to site. Recorded in locality but not during survey. Unlikely to occur (possibly only flying over).	No suitable habitat affected. No risk of significant impact. Five Part Test not required.
Blue-Billed Duck (*Oxyura australis*)	V-BCA	1	Deep, densely vegetated freshwater wetlands. Rarely comes ashore. Nests in vegetation over water. Nocturnal. Mainly inland. (Lindsey 1992)	No foraging, roosting or nesting habitat on or adjacent to site. Recorded in locality but not during survey. Unlikely to occur (possibly only flying over).	No suitable habitat affected. No risk of significant impact. Five Part Test not required.
Magpie Goose *(Anseranas semipalmata)*	V-BCA	3	Mainly found in shallow wetlands (less than 1 m deep) with dense growth of rushes or sedges. Equally at home in aquatic or terrestrial habitats; often seen walking and grazing on land; feeds on grasses, bulbs and rhizomes. Activities are centred on wetlands, mainly those on floodplains of rivers and large shallow wetlands formed by run-off; breeding can occur in both summer and winter dominated rainfall areas and is strongly influenced by water level; most breeding now occurs in monsoonal areas; nests are formed in trees over deep water; breeding is unlikely in south-eastern NSW. Often seen in trios or flocks on shallow wetlands, dry ephemeral swamps, wet grasslands and floodplains; roosts in tall vegetation.	No foraging, roosting or nesting habitat on or adjacent to site. Recorded in locality but not during survey. Unlikely to occur (possibly only flying over).	No suitable habitat affected. No risk of significant impact. Five Part Test not required.

Name	Legal Status	Records	Habitat Requirements	Likelihood Of Occurrence	Significance Of Impacts
Black Bittern (*Dupetor flavicollis*)	V-BCA	3	Coastal waterways, estuaries, swamps with densely wooded edges, Swamp Oak, Mangroves. Secretive, partly nocturnal. Roosts in trees overhanging water or in dense reeds. Critical breeding habitat is mangrove belts (Lindsey 1992). Breeds Dec-Mar, nests in trees over water. (NSW NPWS 2000, DEC 2007b)	Marginal potential to roost in the swamp forest to mangroves remnant west of the site but unlikely on site as low value potential foraging habitat. Recorded in locality but not during survey. Unlikely to occur (possibly only flying over).	No suitable habitat affected. No risk of significant impact. Five Part Test not required.
Australasian Bittern (*Botaurus poiciloptilus*)	E-BCA E-EPBCA	2	Wetlands, preferably with dense sedges, rushes, reeds. Prefers freshwater, but also uses densely vegetated saltmarsh and flooded grasslands. Roosts on the ground, forages in shallow water from a platform of trampled vegetation, nests above water on similar platform. Single or groups to 12. Usually sedentary, but nomadic in response to flood, drought. (DEC 2007b)	Marginal potential to roost in the swamp forest to mangroves remnant west of the site but unlikely on site as low value potential foraging habitat. Recorded in locality but not during survey. Unlikely to occur (possibly only flying over).	No suitable habitat affected. No risk of significant impact. Five Part Test not required.
Blue-Billed Duck (*Oxyura australis*	V-BCA	1	Deep, densely vegetated freshwater wetlands. Rarely comes ashore. Nests in vegetation over water. Nocturnal. Mainly inland. (Lindsey 1992)	No foraging, roosting or nesting habitat on or adjacent to site. Recorded in locality but not during survey. Unlikely to occur (possibly only flying over).	No suitable habitat affected. No risk of significant impact. Five Part Test not required.

Name	Legal Status	Records	Habitat Requirements	Likelihood Of Occurrence	Significance Of Impacts
Spotted-tail Quoll (*Dasyurus maculatus*)	V-BCA E-EPBCA	16	Various forested habitats with preference for dense forests. Requires tree hollows, hollow logs or caves for nesting. Large home range (>500ha) and may move over several kilometres in a few days. Tends to follow drainage lines.	Not preferred forest type and site lacks suitable tree hollows and logs for shelter/denning. Predator species (eg foxes, feral cats, etc) are present in the general area. Not recorded on site, but recorded in the locality. Unlikely to very low chance of transient occurrence as part of wider foraging range.	No significant habitat affected potential for occasional occurrence retained, no significant impact likely. Five Part Test not required.
Brushtailed Phascogale (*Phascogale tapoatafa*)	V-BCA	2	Range of forest habitats but prefers drier sclerophyll forest with sparse ground cover. Forages on large rough-barked trees for small fauna, also utilises eucalypt nectar. Rests in tree hollows, stumps, bird nests. Requires tree hollows for nesting. (NSW NPWS, 2000) Breeds May-July. Occupies territory of 20-100ha.	Not preferred forest type and site lacks suitable tree hollows and logs for shelter/denning. Predator species (eg foxes, feral cats, etc) are present in the general area. Not recorded on site, but recorded in the locality. Unlikely occurrence.	No suitable habitat affected. No risk of significant impact. Five Part Test not required.
Common Planigale (*Planigale maculata*)	V-BCA	2	Wide variety of habitats. Preference for areas of dense groundcover due to heat/dehydration problems. May prefer ecotones of dry/wet habitats (Denny 1982). Preys on arthropods, small vertebrates, shelters in nest under/in fallen timber or rock (Strahan 1995). Home range about 0.5ha. Breeds Oct-Jan (NSW NPWS 2000).	Virtually all of site is too disturbed. Swamp forest to west may offer some potential more so in the study area but limited groundcover in site portion likely to preclude this species. Unlikely to occur.	No suitable habitat affected. No risk of significant impact. Five Part Test not required.

Name	Legal Status	Records	Habitat Requirements	Likelihood Of Occurrence	Significance Of Impacts
Eastern Chestnut Mouse (*Pseudomys gracilicaudatus*)	V-BCA	13	Appears to prefer heathland especially dense wet heath and swampy areas usually occupied by Swamp Rat (AMBS,1996). Also recorded from mid-elevation grasslands, open dry and wet sclerophyll woodland. In the Port Macquarie area, associated with heathland with dense shrub layer of *Banksia ericifolia*, *B. serratifolia, Xanthorrhoea* spp, *Dillwynia floribunda, Boronia spp*, *Leptospermum flavescens* and *Melaleuca nodosa*. Requires specific fire regime, greatest density 3-4 years after fire. Omnivorous, seeds, fungi, green stem, arthropods. Home range <0.5ha (NSW NPWS 2000).	No structurally suitable habitat on site. Site has been subject to an extensive disturbance history and predators (eg foxes, feral cats, etc) are known to occur in the general area. Recorded in the locality but unlikely to occur on site.	No suitable habitat affected. No risk of significant impact. Five Part Test not required.
Squirrel Glider (*Petaurus norfolcensis*)	V-BCA	25	Dry, open forest and woodland, and occasionally wet eucalypt and rainforest. Most common in floriferous sub-coastal and coastal forests with abundant winter flowering trees and shrubs (coastal populations apparently rely heavily on *Acacia* sap and flowering Banksias	Recorded on **site and in directly adjacent** habitat. Appears to be no den sites hence home range must be larger than site.	Loss of portion of known home range. **Five Part Test required**
Yellow-Bellied Glider (*Petaurus australis*)	V-BCA	1	Moist and dry mature eucalypt forest and woodland. Tree hollows, diversity of winter-flowering and suitable sap-feeding eucalypt species required. Large territory.	Not recorded on-site, but recorded in the locality. Swamp forest not preferred habitat and not connected to a mosaic of other forest types. Given above and the disturbance history of the site and general area, this species is considered an unlikely occurrence.	Unlikely to occur. No risk of significant impact. Five Part Test not required.

Name	Legal Status	Records	Habitat Requirements	Likelihood Of Occurrence	Significance Of Impacts
Greater Glider (*Petauroides volans*)	V-EPBCA	2	Restricted to eucalypt forests and woodlands of eastern Australia. Its diet is mostly eucalypt leaves and occasional flowers and is found in highest abundance in taller, montane, moist eucalypt forests, with relatively old trees and abundant hollows. The distribution may be patchy even in suitable habitat. Forests with a diversity of eucalypt species, due to seasonal variation, is its preferred tree species.	Not recorded on-site, but recorded in the locality. Swamp forest not preferred habitat and not connected to a mosaic of other forest types. Given above and the disturbance history of the site and general area, this species is considered an unlikely occurrence.	Unlikely to occur. No risk of significant impact. MNES assessment not required.
Koala (*Phascolarctos cinereus*)	V-BCA V-EPCA	6020	Areas where preferred food species occur in sufficient concentrations and diversity With suitable edaphic conditions and presence of other Koalas.	**Previously recorded via scats and observed**. Core Koala Habitat	**Five Part Test and MNES assessment required**
Grey-Headed Fruit-Bat/Flying Fox (*Pteropus poliocephalus*)	V-BCA V-EPBCA	83	Nomadic frugivore and nectarivore on rainforest, eucalypt, melaleuca and banksia. Recorded flying up to 45km from roost (generally max. of 20km). Roosts colonially with short term individual or small groups, mostly near watercourses. Spring or Summer roosts are maternity sites. Dependant on Winter flowering species eg *E. robusta* and *E. tereticornis.*	**Previously recorded**. Site contains some potential nectar and pollen and fruit sources, and is considered likely to form a small part of the species wider foraging range. No roosting habitat on/adjacent to the site.	Proposal will remove some potential foraging resources **Five Part Test required** as known to occur.
Greater Broad Nosed Bat (*Scoteanax rueppellii*)	V-BCA	12	Forages over range of habitats including rainforests and moist forests, but prefers ecotones between riparian forest, woodland and cleared land. Requires sparse understorey and will forage over water. Roosts in tree hollows. Feeds on larger insects, small vertebrates and perhaps other bats.	Site's vegetation is considered potentially suitable as foraging habitat. No potential roosting habitat. Not recorded during survey, though recorded in the locality. Considered a fair potential occurrence at some stage.	Fair chance of occurrence. **Five Part Test required.**

Name	Legal Status	Records	Habitat Requirements	Likelihood Of Occurrence	Significance Of Impacts
East-Coast Freetail Bat (*Micronomus norfolkensis*)	V-BCA	13	Specific habitat requirements of this species are poorly known. Has been recorded in habitats ranging from rainforest to dry sclerophyll and woodland, with most recorded in the latter (State Forests 1994). Roosts in small colonies under tree hollows and under loose bark; has been found under house eaves, in roofs and metal caps on telegraph poles. Recorded roosting in roof in Hat Head village. Probably forages above forest or woodland canopy, and in clearings adjacent to forest. Most records are of single individuals, and is likely to occur at low densities over its range.	**Recorded on site**. Site's vegetation is considered suitable as foraging habitat. No potential roosting habitat..	Proposal will remove some potential foraging resources **Five Part Test required** as known to occur.
Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*)	V-BCA	18	Habitat generalist - forages above well-forested areas. Roosts in old buildings, caves, mines etc. Dependent on nursery caves and communal roosts.	**Recorded on site**. Site's vegetation is considered potentially suitable as foraging habitat. Tree hollows and trees with crevices/notches may provide marginal temporary non-breeding roosting opportunities, though such substrate is limited. Not recorded during survey, though recorded in the locality. Considered a fair potential occurrence at some stage.	Proposal will remove some potential foraging resources **Five Part Test required** as known to occur.
Little Bent-wing Bat (*M. australis*)	V-BCA	32	As for Eastern Bent-wing Bat.	**Recorded on site**. As for Eastern Bent-wing Bat.	Proposal will remove some potential foraging resources **Five Part Test required** as known to occur.

Name	Legal Status	Records	Habitat Requirements	Likelihood Of Occurrence	Significance Of Impacts
Dwyer's Bat/Large Eared Pied Bat (*Chalinobus dwyeri*)	V-BCA	0	Found in moderately wooded habitats such as dry sclerophyll forest, tall open eucalypt forests, woodlands, sub-alpine woodlands, edge of rainforest and wet sclerophyll forest. Roosts in caves, mines and abandoned bottle-shaped mud nests of Fairy Martins. In caves and mines, tend to roost in twilight sections near entrance. Insectivorous but habits poorly known. Fly relatively slowly, direct and maneuverable, low to ground or 6-10m above ground.	General foraging preferences of this poorly known species suggests locality potentially generically structurally suitable foraging habitat. No cave, mines, etc on or near site for roosting. Not recorded within 10km radius of site (or LGA, and very few regional records). Likelihood to occur on site considered unlikely.	Loss of extremely marginal structurally suitable potential habitat. Considered unlikely chance of occurrence. Five Part Test not taken as no risk of significant impact.
Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)	V-BCA	3	Occupies sclerophyll forest from the Great Dividing Range to the coast, typically wet tall forest at high elevations and is more common in northern NSW. It may migrate to coastal areas in Winter. Roosts typically in tree hollows, but also in caves, buildings. Roosts as single sex colonies of 3-36 bats. Forages in and below tree canopy on moths, beetles, bugs, flies & ants, up to 12km from roost site. Breeds in Summer (Churchill 2009, Smith *et al* 1995). Recently recorded at Thrumster west of Port Macquarie.	Site's vegetation is considered marginally potentially suitable as foraging habitat. No potential roosting habitat. Not recorded during the survey. Recorded in the locality, though records at low elevations are scant. Overall considered a very low potential occurrence.	Very low chance to occur and this potential will be retained post-development, hence no risk of significant impact. Five Part Test not required.
Hoary Bat (*Chalinolobus nigrogriseus*)	V-BCA	1	Occurs in a range of habitats, such as monsoon forest, tall open forest, open woodland, vine thickets, coastal scrub, sand dunes, grasslands, floodplains, watercourses and dams. Roosts in eucalypt tree hollows, as well as rock crevices. Breeding colonies have been recorded in roofs of buildings. Preferred prey is beetles and moths, but also spiders, mantids, crickets, grasshoppers, cicadas, bugs, diving beetles, flies and ants (thus may land and forage). Previously not recorded south of Kempsey	Not preferred habitat type and only 1 record at southern limit of its range. No potential roosts. Considered unlikely to potentially occur.	Considered unlikely chance of occurrence. Five Part Test not taken as no risk of significant impact.

Name	Legal Status	Records	Habitat Requirements	Likelihood Of Occurrence	Significance Of Impacts
Yellow-Bellied Sheathtail Bat (*Saccolaimus flaviventris*)	V-BCA	4	Ecology poorly known. Found in almost all habitats, particularly wet and dry sclerophyll forests and woodlands below 500m altitude, and also open woodland, Acacia shrubland, mallee, grasslands and desert. Roosts mainly in tree hollows, but also under bark, under roof eaves and in other artificial structures. Fast flying species, believed to forage above the canopy or closer to the ground in open areas. Insectivorous. May be Summer migrant.	Forest on site offers potential foraging habitat. Potential roosts in hollow-bearing trees. Recorded in locality, but not by survey on site. Low to fair chance of occasional occurrence.	Fair chance to occur and this potential will be retained post-development, hence no risk of significant impact. **Five Part Test required** as fair potential to occur**.**
Eastern Cave Bat (*Vespadelus troughtoni*)	V-BCA	6	Rare and poorly known bat. Cave dwelling bat roosting in small (5) to large (500) groups in sandstone overhang caves, boulder piles, mines, tunnels and sometimes buildings. Tend to roost in well lit portions of caves in avons, domes, cracks and crevices. Inhabits tropical mixed woodland and wet sclerophyll forest on the coast and dividing range, but extend into drier forest on western slopes and inland areas.	**Tentative call identification**. Site and general area may be marginally structurally suitable as foraging habitat. The nearest known caves are at Broken Bago State Forest/Bago Bluff National Park and Jolly Nose Hill. Considered at best a precautionary marginal "*possible*" recording during the survey though its call cannot be separated from the common *Vespadelus* species (which are likely to occur). Overall considered a very low to marginally fair occurrence.	Considered very low chance of occurrence however **Five Part Test required** as '*possible*' recording on site.
Southern Myotis (*Myotis macropus*)	V-BCA	7	Tunnel, cave, bridges, old buildings, tree hollow and dense foliage roosting bat which prefers riparian habitat over 500m long with nearby roosting habitat. Key habitats are streams, rivers, creeks, lagoons, lakes and other water bodies. Feeds on aquatic insects and small fish. Has recently been observed foraging in small bodies of water.	Some marginal potential along drain and in swamp forest but considered two dense and low prey values. No hollows or other structures for roosts. Recorded in locality but not on site. Unlikely chance of occurrence as not likely foraging habitat.	Unlikely to occur and this potential will be retained post-development, hence no risk of significant impact. Five Part Test not required.

Name	Legal Status	Records	Habitat Requirements	Likelihood Of Occurrence	Significance Of Impacts
Green and Golden Bell Frog (*Litoria aurea*)	E-BCA V-EPBCA	3	Found in permanent swamps and ponds. Prefers water bodies which are: still; shallow; unshaded; ephemeral; unpolluted; generally isolated; and free of native fish species or Plague Minnow (*Gambusia holbrooki)* and little macro-algae. Requires emergent vegetation, grass tussocks or rocks for shelter. May use disturbed sites opportunistically. Eats insects and other frogs. Spring-autumn breeder. (	No suitable breeding or refugia habitat on site Recorded in locality but unlikely to occur on site.	No impact likely as no potential or known habitat affected. Five Part Test not required.
Wallum Froglet (*Crinia tinnula)*	V-BCA	55	Predominantly confined to acidic paperbark swamps of coastal areas. Also found in wet heathland and Melaleuca sedgelands. Recorded breeding in flooded pasture adjacent to paperbark swamps.	No recorded on site, but suitable habitat on adjacent land to south-west and known habitat to west. Swamp forest on site generally too dense for this species.	No potential or known habitat directly affected, but risk of indirect impacts on known habitat in study area. **Five Part Test required.**
Laced Fritillary (*Argyreus hyperbius* spp. *inconstans*)	CE-EPBCA, E-BCA	2	Open, coastal grassy sedgelands, wetlands and swamps with *Viola betonicifolia* (the egg laying substrate and larval food species). Occasionally occurs in (swampy) disturbed areas (eg drainage ditches of sugarcane farms) where *Viola betonicifolia* is abundant, and may occur in other watercourse plant communities where *Viola betonicifolia* is present.	No suitable larvae habitat as *V. betongifolia* absent. Unlikely to occur.	No impact likely as no potential or known habitat affected. Five Part Test not required.
Coastal Petal-Tail Dragonfly (*Petalura litorea*)	E-BCA	3	Restricted to coastal and near coastal lowlands between Coffs Harbour and Ballina, where it is found in permanent swamps and bogs with some free water and open vegetation. Adults emerge from late October and are short-lived, surviving for one summer after emergence. Adults spend most of their time settled on low vegetation on or adjacent to the swamp, hunting for flying insects over the swamp and along its margins (OEH 2018b).	Not preferred habitat on site or adjacent – not found in dense swamp forest. Unlikely to occur.	No impact likely as no potential or known habitat affected. Five Part Test not required.

APPENDIX 2: SITE FLORA SPECIES LIST

Frequency:
D Dominant, at least in some areas
C Common
O Occasional
L Localised
U Uncommon
R Rare on site, few specimens

Association:
S PCT ID1724 Paperbark Swamp Forest
W PCT ID1724 Wetland
LM Lawns & Miscellaneous Vegetation

*denotes an introduced species

COMMON NAME	SCIENTIFIC NAME	FREQUENCY	ASSOCIATION
Canopy Trees			
Swamp Oak	*Casuarina glauca*	C	S
Small-fruited Grey Gum	*Eucalyptus propinqua*	R	LM
Swamp Mahogany	*Eucalyptus robusta*	C	S, LM
Forest Red Gum	*Eucalyptus tereticornis*	R	LM
Broad-Leaved Paperbark	*Melaleuca quinquenervia*	D	S, LM
Understorey Trees			
Hickory Wattle	*Acacia implexa*	O	S
Red Ash	*Alphitonia excelsa*	R	S
Bangalow Palm	*Archontophoenix cunninghamiana*	O, Common in places	S
Willow Bottlebrush	*Callistemon salignus*	O	S
Camphor laurel	*Cinnamomum camphora**	O, Common in places	S, LM
Tuckeroo	*Cupaniopsis anacardioides*	U	S, LM
Blueberry Ash	*Elaeocarpus reticulatus*	R	S
Common Coral Tree	*Erythrina × sykesii**	RL	S
Sandpaper Fig	*Ficus coronata*	R	S

COMMON NAME	SCIENTIFIC NAME	FREQUENCY	ASSOCIATION
Strangling Fig	*Ficus watkinsiana*	R	S
Cheese Tree	*Glochidion ferdinandi*	C	S, LM
Narrow-Leaved Paperbark	*Melaleuca linariifolia*	O	S
Broad-Leaved Paperbark	*Melaleuca quinquenervia*	D	S, W, LM
Shrubs			
Sydney Golden Wattle	*Acacia longifolia*	U	S
Ornamental Wattle	*Acacia sp.*	U	LM
Heath Banksia	*Banksia ericifolia*	R	LM
Coffee Bush	*Breynia oblongifolia*	O	S
Ornamental Callistemon	*Callistemon sp.*	U	LM
Green Cestrum	*Cestrum parqui**	U	S, LM
Cheese Tree	*Glochidion ferdinandi*	D	S
Swamp Hibiscus	*Hibiscus diversifolius*	C	S, W, LM
Lantana	*Lantana camara**	O	S
Ornamental Tea-tree	*Leptospermum sp.*	U	LM
Small-leaved Privet	*Ligustrum sinense**	R	S
Orange Jessamine	*Murraya paniculata**	U	S, LM
Brush Muttonwood	*Myrsine howitteana*	R	S
Mickey Mouse Plant	*Ochna serrulata**	U	S
Orange Thorn	*Pittosporum multiflorum*	U	S
Common Pittosporum	*Pittosporum undulatum*	U	S
Elderberry Panax	*Polyscias sambucifolia*	R	S
Easter Cassia	*Senna pendula var. glabrata**	O	S, LM
Wild Tobacco	*Solanum mauritianum**	U	S, LM
Cocos Palm	*Syagrus romanzoffiana**	U	S
Scentless Rosewood	*Synoum glandulosum*	U	S
Awabuki Sweet Viburnum	*Viburnum odoratissimum var. awabuki**	U	S

COMMON NAME	SCIENTIFIC NAME	FREQUENCY	ASSOCIATION
Ferns & Fern Allies			
Swamp Water Fern	*Blechnum indicum*	C	S, W
False Bracken	*Calochlaena dubia*	O	S
Binung	*Christella dentata*	C	S, W
Harsh Ground Fern	*Hypolepis muelleri*	O	S
Bracken Fern	*Pteridium esculentum*	U	S
Grasses			
Whisky Grass	**Andropogon virginicus*	O	LM, S
Carpet Grass	*Axonopus affinus**	D	LM, S
Rhodes Grass	**Chloris gayana*	O	LM, S
Wiry Panic	*Entolasia marginata*	O	S
Browns Lovegrass	*Eragrostis brownii*	U	S
Bladey Grass	*Imperata cylindrica*	C	S, LM
Weeping Grass	*Microlaena stipoides*	O	S, LM
Forest Grass	*Ottochloa gracillima*	O	S, LM
Paspalum*	**Paspalum dilatatum*	O	S
Broad-leaf Paspalum*	**Paspalum mandiocanum*	O	S
South African Pigeon Grass	*Setaria sphacelata**	O	S, LM
Buffalo Grass	*Stenotaphrum secundatum**	C	W
Sedges, Rushes,			
Bare Twig Rush	*Baumea juncea*	O	W,S
Tall Sedge	*Carex appressa*	U	W,S
Drooping Sedge	*Carex longebrachiata*	O	W,S
	*Cyperus eragrostis**	U	W,S
	Cyperus haspan	U	W, S
Saw Sedge	*Gahnia clarkei*	C	S
	Juncus mollis	U	W, S
	Juncus prismatocarpus	O	W, S

COMMON NAME	SCIENTIFIC NAME	FREQUENCY	ASSOCIATION
Spiny-Headed Matrush	*Lomandra longifolia*	O	S
Bog bulrush	*Schoenoplectus mucronatus*	O	W, S
Groundcovers			
Blue Billy Goat Weed*	*Ageratum houstonianum**	O	W, S, LM
Cunjevoi	*Alocasia brisbanensis*	U	S
Farmers Friend	*Bidens pilosa*	O	S, LM
Canna Lily*	*Canna indica**	O	LM
Pennywort	*Centella asiatica*	C	W, S
Taro*	*Colocasia esculenta**	U	S
Scurvy Weed	*Commelina cyanea*	O	W,S,LM
Fleabane*	*Conyza sp.**	O	W, S, LM
Blue Dampiera	*Dampiera stricta*	U	S
Purple Flax-Lily	*Dianella caerulea*	O	S, LM
Kidney Weed	*Dichondra repens*	O	S, LM
Purple Cudweed	*Gamochaeta purpurea*	O	LM
White Root	*Pratia purpurascens*	O	S, LM
Asparagus Fern*	*Protasparagus aethiopicus**	U	S
Kurnell Curse*	*Hydrocotyle bonariensis**	C	S, W, LM
Pennywort	*Hydrocotyle peduncularis*	U	S, LM
Catsear*	*Hypochaeris radicata**	O	LM
Lamb's Tongue*	*Plantago lanceolata**	O	LM
River Buttercup	*Ranunculus inundatus*	O	S, W, LM
*Fireweed	**Senecio madagascariensis*	U	LM
*Paddys Lucerne	**Sida rhombifolia*	U	S, LM
*Purple Top	**Verbena bonariensis*	O	S, W, LM
Ivy-leaved Violet	*Viola hederacea*	C	S, LM
Lianas, Scramblers and Twiners			
Devils Twine	*Cassytha glabella*	U	S

COMMON NAME	SCIENTIFIC NAME	FREQUENCY	ASSOCIATION
Whip Vine	*Flagellaria indica*	R	S
Scrambling Lily	*Geitonoplesium cymosum*	U	S
Coastal Morning Glory*	*Ipomoea cairica* *	C	S
Honeysuckle*	*Lonicera japonica**	U	S
Cockspur Thorn	*Maclura cochinchinensis*	O	S
Monkey Rope	*Parsonsia straminea*	D	S, LM
Native Sarsaparilla	*Smilax glyciphylla*	U	S
Snake vine	*Stephania japonica*	O	S
Aquatic Plants			
	Enhydra woolsii	D	S, W
Native Gipsywort	*Lycopus australis*	O	S, W
Water Lily	*Nymphaea sp.**	U	S
Spotted Knotweed	*Persicaria strigosa*	C	S, W
Frogmouth	*Philydrum lanuginosum*	O	S, W
Arrowhead*	*Sagittaria graminea ssp. Platyphylla**	C	S
Cumbungi	*Typha orientalis*	O	S

APPENDIX 3: SOIL PROFILE SAMPLE DATA

East Coast Screw Piers

Proposed Rezoning, Lot 2 DP601094 and Lot 4 DP825704, 17 – 33 Mumford Street, Port Macquarie

Geotechnical Assessment – Draft for Comment

Report No. RGS20683.1-AA

30 April 2018

REGIONAL
GEOTECHNICAL SOLUTIONS

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GEOTECHNICAL SOLUTIONS

Manning-Great Lakes

Port Macquarie

Coffs Harbour

RGS20683.1-AA

30 April 2018

East Coast Screw Piers
c-/ Alan Taylor & Associates
453 LAURIETON NSW 2443

Attention: Alan Taylor

Dear Alan,

RE: Proposed Rezoning, Lot 2 DP601094 and Lot 4 DP825704, 17 – 33 Mumford Street, Port Macquarie

Geotechnical Assessment – Draft for Comment

As requested, Regional Geotechnical Solutions Pty Ltd (RGS) has undertaken a geotechnical assessment of the upper soil profiles present in Lot 2 DP601094 and Lot 4 DP825704 at 17 – 33 Mumford Street, Port Macquarie.

Surface and subsurface conditions encountered at the site are discussed in the attached report.

If you have any questions regarding this project, or require any additional consultations, please contact the undersigned.

For and on behalf of

Regional Geotechnical Solutions Pty Ltd

Tim Morris

Associate Engineering Geologist

Regional Geotechnical Solutions Pty Ltd
ABN 51141848820

5C/23 Clarence Street
Port Macquarie NSW 2444
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Table of Contents

Figures

Appendices

1 INTRODUCTION

As requested, Regional Geotechnical Solutions Pty Ltd (RGS) has undertaken a geotechnical assessment of the upper soil profiles in Lot 2 DP601094 and Lot 4 DP825704 at 17 – 33 Mumford Street, Port Macquarie.

The purpose of the work described herein was to assess the origin of the soils present in the upper soil profiles and assess whether they are of alluvial or estuarine in origin. The presence of alluvial or estuarine soils is a factor in the determination of the ecological communities present at the site.

2 FIELD WORK

Field work for the assessment was undertaken on 27 April 2018 and was based on the supplied survey plan. Fieldwork included:

- Observation of site and surrounding features relevant to the geotechnical conditions of the site;
- Three boreholes excavated by hand tools;
- Boreholes were logged and sampled by an Associate Engineering Geologist.

Engineering logs of the boreholes are presented in Appendix A. The locations of the boreholes are shown on Figure 1. They were obtained on site by measurement relative to existing site features. Coordinates of each location were recorded by hand held GPS and are shown on the logs.

3 SITE CONDITIONS

3.1 Surface conditions

Lot 2 DP601094 and Lot 4 DP825704 at 17 – 33 Mumford Street, Port Macquarie are located in gently undulating low lying topography to the south of Mumford Street. The Heritage Christian School is located in Lot 4 and Lot 2 was previous occupied by the Coastside Church. Both lots have been modified by bulk earthworks comprising placement of fill. The supplied detail survey shows surface levels on the southern boundaries of both lots is approximately 1m AHD. Areas modified by filling works in both lots are up to approximately 3m AHD in elevation in the north and grade down towards the south and also to the west in Lot 4.

The site filling works have modified the natural landscapes that were previously present. A low lying depression is present to the east of Lot 4 and a low sand plain is present to the south of Lot 2. Fieldwork was undertaken following heavy rainfall and at the time there was surface water pooling in the north west corner of Lot 4 and in the south east corner of Lot 2. A shallow drain approximately 3m wide is present along the rear (southern) boundary of both lots and was flowing to the west at the time of the fieldwork.

An image of the site taken from the NSW Department of Property Information website that illustrates features of the subject area is presented below.

***Plate 1**: Lot 2 DP601094 and Lot 4 DP825704 at 17 – 33 Mumford Street, Port Macquarie*

Vegetation present in Lot 4 comprised low maintained grass areas with scattered eucalypts and grassed sports fields in the school grounds. Swamp forest dominated by melaleuca was present in the north west corner of the lot and casuarina trees were present along the southern boundary.

Vegetation in Lot 2 comprised open grassed area maintained by slashing with some swamp forest that included melaleuca and eucalypts along the southern boundary. Some tree regrowth and thick swamp grasses were present in the south west corner of the lot where surface water was pooling.

A selection of images of the site is presented below.

BH1 - Looking west across south west corner of Lot 2. Maintained grasses in centre of lot grading to thick vegetation to the west.

BH2 - Looking south to southern boundary of Lot 2.

BH3 – North west corner of Lot 4. Swamp forest present to west of fence.

South east corner of Lot 4. Bund of mulch present on edge of sports field.

3.2 Subsurface conditions

Reference to the Port Macquarie Coastal Quaternary Geology 1:25,000 Sheet (Troedson et al 2008) indicates the site contains an estuarine fluvial delta front (Qhemd) that crosses the site from north west to south east, a backbarrier sandplain (Qpbf) in the south west and a tidal delta flat to the east (Qhef). An excerpt of the Sheet is reproduced in Plate 3.

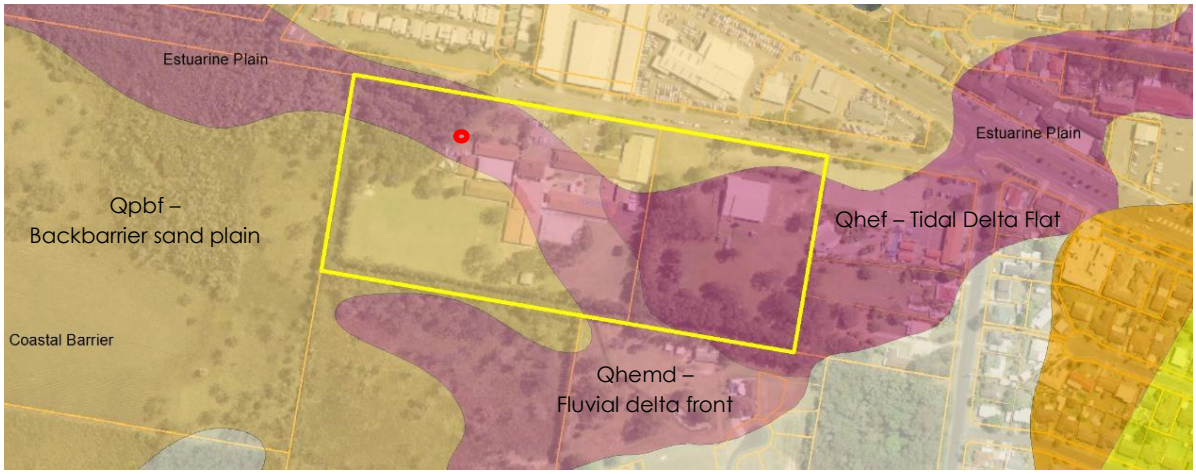


***Plate 2**: Excerpt from the 1:25,000 Port Macquarie Coastal Quaternary Geology Sheet. Approximate lot boundary is outlined in yellow.*

Reference to the Kempsey 1:100,000 Soil Landscape Sheet indicates the site contains the Delicate Swamp Landscape in the south west which comprises flat coastal swamps on backbarrier sand plains, the Limeburners Sandplain Landscape in the north east and a small area of the Torrens

Backbarrier Sandplain Landscape in the southeast corner. An excerpt of the Sheet is reproduced in Plate 3.

***Plate 3**: Excerpt from the 1:100,000 Kempsey Soil Landscape Sheet. Approximate lot boundary is outlined in yellow.*

The investigations encountered a variable soil profile as summarised in Table 1.

Table 1: Summary of Subsurface Conditions

Material Unit	Material Description	Depth to Base of Material Layer (m)		
		BH1	BH2	BH3
FILL	Sandy CLAY, low to medium plasticity, brown, some pockets of orange/red material, trace tree roots	--	--	0.2
TOPSOIL	Silty SAND, fine to medium, dark brown/ black, with organic fines, trace to some clay and trace tree roots	0.25	0.3	0.25
ALLUVIAL	SAND, fine to medium, pale brown/ brown, trace silt	--	--	0.3
ESTUARINE	CLAY, medium plasticity, firm /stiff, pale brown/ pale grey with trace pale orange mottling, trace to some sand, increasing with depth	0.4	--	0.9
MARINE	Clayey SAND to SAND, fine to medium, pale brown / pale grey, some brown mottling associated with indurated sand formation.	≥ 1.0	≥ 0.7	≥ 1.0

Table Notes: -- *Material not encountered*
≥ *Base of material layer not encountered*

Groundwater was encountered at the depths shown in the attached engineering logs. It should be noted that fluctuations in groundwater levels can occur as a result of seasonal variations, temperature, rainfall and other similar factors, the influence of which may not have been apparent at the time of the assessment.

The geotechnical units summarised above were defined taking into consideration the following:

- Alluvium: The general term for detrital deposits made by rivers or streams or found on alluvial fans, floodplains etc. – *Collins Geology Dictionary*
- Estuary: Where fresh water intermixes with sea water and where tidal influences occur – *Collins Dictionary*
- Marine: Backbarrier sand plain formed during storm washover deposition – *Coastal Quaternary Geology Troedson et al*

Selected images of excavated profiles that illustrate the subsurface profiles encountered are presented below.

	
BH1 – Topsoil overlying estuarine clays grading into marine sands.	*BH3 – Topsoil overlying marine sands.*

4 DISCUSSION

Boreholes were excavated using hand tools to assess the extent of alluvial soils. The published Coastal Quaternary mapping indicates estuarine and marine sand soils may be present.

The subsurface profiles encountered comprised soils of the following origins:

- Thin layer of alluvial sands draped over estuarine clay profile in north west corner of site (BH3);
- Estuarine clay deposits characterised by pale orange mottling which overlying reworked marine barrier sands (BH1);
- Marine barrier deposits (BH2).

5 LIMITATIONS

The findings presented in the report and used as the basis for recommendations presented herein were obtained using normal, industry accepted geotechnical design practises and standards. To our knowledge, they represent a reasonable interpretation of the general condition of the site. Under no circumstances, however, can it be considered that these findings represent the actual state of the site at all points. If site conditions encountered during construction vary significantly from those discussed in this report, Regional Geotechnical Solutions Pty Ltd should be contacted for further advice.

This report alone should not be used by contractors as the basis for preparation of tender documents or project estimates. Contractors using this report as a basis for preparation of tender

documents should avail themselves of all relevant background information regarding the site before deciding on selection of construction materials and equipment.

If you have any questions regarding this project, or require any additional consultations, please contact the undersigned.

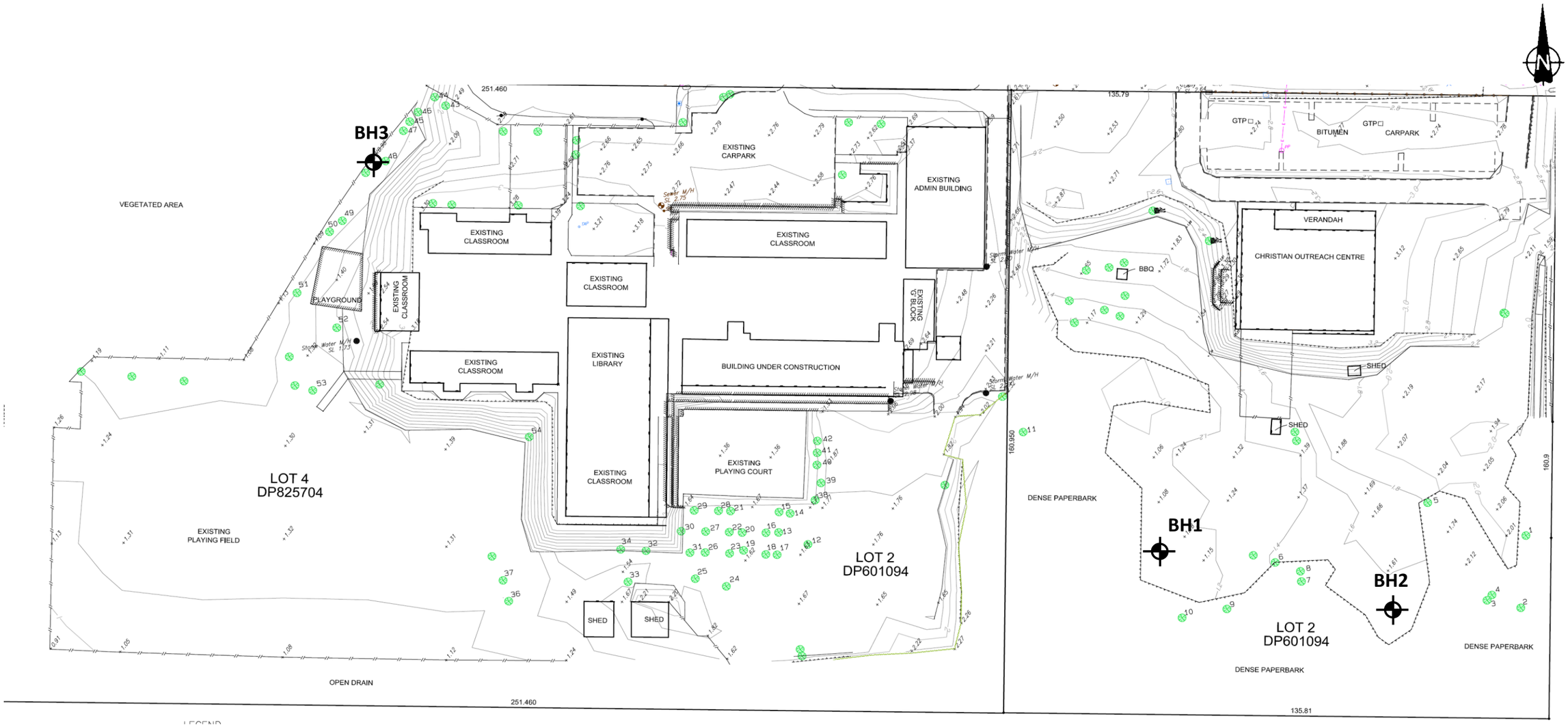
For and on behalf of

Regional Geotechnical Solutions Pty Ltd

Tim Morris

Associate Engineering Geologist

Figure



Based on supplied drawing titled "Field soil test validated EEC's" supplied by JB Enviro

Legend

BH Location

REGIONAL GEOTECHNICAL SOLUTIONS

Client	EAST COAST SCREW PIERS	Job No.	RGS20683.1
Project:	PROPOSED REZONING	Drawn By:	TM
	LOT 4 DP825704 AND LOT 2 DP601094, MUMFORD STREET, PORT MACQUARIE	Date:	26-Apr-18
Title:	INVESTIGATION LOCATION PLAN	Drawing No.	**Figure 1**

Appendix A

Results of Field Investigations

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: **BH1**

CLIENT: East Coast Screw Piers | **PAGE:** 1 of 1

PROJECT NAME: 17-33 Mumford Street | **JOB NO:** RGS20683.1

SITE LOCATION: | **LOGGED BY:** TLM

TEST LOCATION: Coast Side Church (17 Mumford St) | **DATE:** 27/4/18

DRILL TYPE: Hand Tools | **EASTING:** 488777 m | **SURFACE RL:** 1.1 m

BOREHOLE DIAMETER: 300 mm | **INCLINATION:** 90° | **NORTHING:** 6522674 m | **DATUM:** AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HAND TOOLS			1.0			SM	**TOPSOIL:** Silty SAND, fine to medium grained, dark brown/black, with organic fines, some Clay, trace tree roots to 30mm	W	Fb			TOPSOIL
							0.25m					
						CH	**CLAY:** Medium plasticity, pale brown, trace pale orange mottling, some Sand, fine grained, increasing with depth	$M > w_P$	St			ESTUARINE
							0.40m					
HAND AUGER						SC	**Clayey SAND:** Fine to medium grained, pale brown/pale grey	W				MARINE
				0.5								
			0.5				From 0.8m pale brown/brown					Staining associated with indurated Sand formation (?)
				1.0			1.00m					
							Hole Terminated at 1.00 m Refusal No sample return					
			0.0									
				1.5								
			-0.5									

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH2

REGIONAL GEOTECHNICAL SOLUTIONS

CLIENT: East Coast Screw Piers
PROJECT NAME: 17-33 Mumford Street
SITE LOCATION:
TEST LOCATION: Coast Side Church (17 Mumford St)

PAGE: 1 of 1
JOB NO: RGS20683.1
LOGGED BY: TLM
DATE: 27/4/18

DRILL TYPE: Hand Tools
BOREHOLE DIAMETER: 300 mm
INCLINATION: 90°
EASTING: 488116 m
NORTHING: 6522633 m
SURFACE RL: 1.4 m
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HAND TOOLS			1.4	0.0		SM	**TOPSOIL:** Silty SAND, fine to medium grained, dark brown/dark grey, trace Clay, grass roots	M / W	Fb			TOPSOIL
				0.30m								
			1.0			SP	**SAND:** Fine to medium grained, white trace pale brown mottling	W				MARINE
	▽			0.5			From 0.5m pale brown/pale orange mottling					
				0.70m								
							Hole Terminated at 0.70 m					
			0.5									
				1.0								
			0.0									
				1.5								
			-0.5									

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density		
V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition	
D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

ENGINEERING LOG - BOREHOLE

REGIONAL GEOTECHNICAL SOLUTIONS

BOREHOLE NO: BH3

CLIENT: East Coast Screw Piers | **PAGE:** 1 of 1

PROJECT NAME: 17-33 Mumford Street | **JOB NO:** RGS20683.1

SITE LOCATION: | **LOGGED BY:** TLM

TEST LOCATION: Heritage School (33 Mumford St) | **DATE:** 27/4/18

DRILL TYPE: Hand Tools | **EASTING:** 488603 m | **SURFACE RL:** 1.2 m

BOREHOLE DIAMETER: 300 mm | **INCLINATION:** 90° | **NORTHING:** 6522797 m | **DATUM:** AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HAND TOOLS			1.0			CL	**FILL:** Sandy CLAY, low to medium plasticity, brown, some pockets of orange/red, trace some tree roots to 15mm	M > w_P	Fb			FILL/TOPSOIL
							0.20m					
	▶					SM	**TOPSOIL:** Silty SAND, fine to medium grained, dark brown/black, with organic fines and trace tree roots	W	VL			TOPSOIL
							0.25m					
						SP		W				ALLUVIAL
							0.30m					
	▽					CH	**SAND:** Fine to medium grained, pale brown/brown, trace Silt	M > w_P	F / St			ESTUARINE
HAND AUGER							**CLAY:** Medium plasticity, pale grey/pale brown, trace orange mottling, trace Sand fine grained					
				0.5			From 0.5m pale grey/grey Increasing Sand content					
			0.5									
							0.90m					
							No sample recovery. Inferred SAND	W				ESTUARINE
				1.0								
							Hole Terminated at 1.00 m Refusal No sample return					
			0.0									
				1.5								
			-0.5									

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

HACKETT LABORATORY SERVICES PTY LTD

BAY 4/19 JAMBALI ROAD
PORT MACQUARIE N.S.W. 2444
PHONE: 02 6581-2415

NATA
ACCREDITED FOR
TECHNICAL
COMPETENCE

CLIENT

EAST COAST SCREW PIERS
3 BUNDARRA WAY
BONNY HILLS NSW 2445

CLIENT NO: K-2563
REPORT NO: DR-061
DATE SAMPLED: 18/12/2017
SAMPLED BY: B McDonnell

PROJECT: PROPOSED REZONING - MUMFORD STREET - PORT MACQUARIE
MATERIAL TYPE: IN-SITU
SAMPLING METHOD: AS 1289.1.2.1.6.5.3 SPECIFICATION: SITE SPECIFIC
PRE-TREATMENT METHOD: NIL

PARTICLE SIZE DISTRIBUTION

TEST METHOD: **AS 1289.3.6.1**

SIEVE SIZE %	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing
SAMPLE No.	**1**	**2**	**3**	**4**	**5**	*
75.0 mm	*	*	*	*	*	*
63.0 mm	*	*	*	*	*	*
53.0 mm	*	*	*	*	*	*
37.5 mm	*	*	*	*	*	*
26.5 mm	*	*	*	*	*	*
19.0 mm	*	*	*	*	*	*
13.2 mm	*	*	*	*	*	*
9.50 mm	*	*	*	*	*	*
6.70mm	*	*	*	*	*	*
4.75 mm	*	100	*	100	100	*
2.36 mm	100	100	100	100	98	*
1.18 mm	100	100	100	99	97	*
600 µm	99	98	99	96	90	*
425 µm	95	84	96	92	84	*
300 µm	68	19	66	56	66	*
150 µm	11	7	9	3	38	*
75µm	3	2	3	0	14	*

MATERIAL finer than 75 µm by WASHING - TEST METHOD AS 1141.12

<75 µm	*	*	*	*	*	*

REMARKS: *

APPROVED SIGNATORY: David Farr

POSITION: Laboratory Manager

SIGNATURE: .....

Accreditated for compliance
with ISO/IEC 17025.

DATE REPORTED: 18/01/2018

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PORT MACQUARIE N.S.W. 2444
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CLIENT

EAST COAST SCREW PIERS
3 BUNDARRA WAY
BONNY HILLS NSW 2445

CLIENT NO: K-2563
REPORT NO: DR-062
DATE SAMPLED: 08/01/2018
SAMPLED BY: B McDonnell

PROJECT: PROPOSED REZONING - MUMFORD STREET - PORT MACQUARIE - PIT 2

MATERIAL TYPE: IN-SITU

SAMPLING METHOD: AS 1289.1.2.1.6.5.3 SPECIFICATION: SITE SPECIFIC

PRE-TREATMENT METHOD: NIL

PARTICLE SIZE DISTRIBUTION

TEST METHOD: **AS 1289.3.6.1**

SIEVE SIZE %	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing
SAMPLE No.	**4.6m-6.0m**	**9.0m**	*	*	*	*
75.0 mm	*	*	*	*	*	*
63.0 mm	*	*	*	*	*	*
53.0 mm	*	*	*	*	*	*
37.5 mm	*	*	*	*	*	*
26.5 mm	*	*	*	*	*	*
19.0 mm	*	*	*	*	*	*
13.2 mm	*	*	*	*	*	*
9.50 mm	*	*	*	*	*	*
6.70mm	*	*	*	*	*	*
4.75 mm	100	100	*	*	*	*
2.36 mm	100	99	*	*	*	*
1.18 mm	99	98	*	*	*	*
600 µm	96	96	*	*	*	*
425 µm	89	94	*	*	*	*
300 µm	69	73	*	*	*	*
150 µm	12	6	*	*	*	*
75µm	0	1	*	*	*	*

MATERIAL finer than 75 µm by WASHING - TEST METHOD AS 1141.12

<75 µm	*	*	*	*	*	*

REMARKS: *

APPROVED SIGNATORY: David Farr

POSITION: Laboratory Manager

SIGNATURE: D. Farr

DATE REPORTED: 18/01/2018

Accreditated for compliance with ISO/IEC 17025.

HACKETT LABORATORY SERVICES PTY LTD

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EAST COAST SCREW PIERS
3 BUNDARRA WAY
BONNY HILLS NSW 2445

CLIENT NO: K-2563
REPORT NO: DR-062
DATE SAMPLED: 08/01/2018
SAMPLED BY: B McDonnell

PROJECT: PROPOSED REZONING - MUMFORD STREET - PORT MACQUARIE - PIT 3
MATERIAL TYPE: IN-SITU
SAMPLING METHOD: AS 1289.1.2.1.6.5.3 SPECIFICATION: SITE SPECIFIC
PRE-TREATMENT METHOD: NIL

PARTICLE SIZE DISTRIBUTION

TEST METHOD: **AS 1289.3.6.1**

SIEVE SIZE %	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing
SAMPLE No.	**4.0m**	**9.0m**	*	*	*	*
75.0 mm	*	*	*	*	*	*
63.0 mm	*	*	*	*	*	*
53.0 mm	*	*	*	*	*	*
37.5 mm	*	*	*	*	*	*
26.5 mm	*	*	*	*	*	*
19.0 mm	*	*	*	*	*	*
13.2 mm	*	*	*	*	*	*
9.50 mm	*	*	*	*	*	*
6.70mm	*	*	*	*	*	*
4.75 mm	100	100	*	*	*	*
2.36 mm	98	100	*	*	*	*
1.18 mm	96	99	*	*	*	*
600 µm	94	97	*	*	*	*
425 µm	90	93	*	*	*	*
300 µm	70	69	*	*	*	*
150 µm	8	11	*	*	*	*
75µm	1	2	*	*	*	*

MATERIAL finer than 75 µm by WASHING - TEST METHOD AS 1141.12

<75 µm	*	*	*	*	*	*

REMARKS: *

APPROVED SIGNATORY: David Farr

POSITION: Laboratory Manager

SIGNATURE: .....

DATE REPORTED: 18/01/2018

Accreditated for compliance with ISO/IEC 17025.

DESKTOP ACID SULPHATE SOIL ASSESSMENT REPORT

PROPOSED REZONING OF LOT 4 DP 825704 & LOT 2 DP 601094 11 – 33 MUMFORD STREET, PORT MACQUARIE

DAVID PENSINI – BUILDING CERTIFICATION AND ENVIRONMENTAL SERVICES

This report has been prepared by David Pensini – Building Certification and Environmental Services with all reasonable skill, care and diligence for East Coast Screw Piers.

The information contained in this report has been gathered from discussions with representatives of East Coast Screw Piers, a review of the plans provided on behalf of East Coast Screw Piers and experience.

No inspection or assessment has been undertaken on other aspects of the proposed development outside the scope of this report.

This report does not imply, nor should it be implied, that the proposed development will comply fully with relevant legislation.

The report shall not be construed as relieving any other party of their responsibilities or obligations.

David Pensini – Building Certification and Environmental Services disclaims any responsibility East Coast Screw Piers and others in respect of any matters outside the scope of this report.

The report is confidential and the writer accepts no responsibility of whatsoever nature, to third parties who use this report, or part thereof is made known. Any such party relies on this report at their own risk.

For and on behalf of David Pensini – Building Certification and Environmental Services.

Prepared by: David Pensini

Signed: 

Dated: 14th December 2017

Version	Date	Information relating to report			
		Reason for issue			
1.0	25th November 2017		Draft		
2.0	14th December 2017		Issued to Client		
			Prepared by	**Verified by**	**Approved by**
		Name	David Pensini		David Pensini
		Signature			

TABLE OF CONTENTS

PREFACE

The land which comprises the subject site is known as Lot 4 DP 825704 and Lot 2 DP 601094, 11 – 33 Mumford Street, Port Macquarie.

It is proposed to rezone portion of the subject site in order to support the ongoing development of the general area.

The proposed rezoning reflects the continued development of the existing school development on the subject site whilst the existing church use of the subject site is to be converted to a commercial/business/light industrial use with an expansion of the development footprint associated with the proposed commercial/business/industrial use.

The purpose of this report is to assess the potential Acid Sulphate Soil impacts associated with any future development of the subject site as a consequence of the rezoning of the subject site.

1. INTRODUCTION

1.1 Background

The subject site is known as Lot 4 DP 825704 and Lot 2 DP 601094, 11 – 33 Mumford Street, Port Macquarie and is situated within the Port Macquarie-Hastings local government area. With a population of approximately 45,000 Port Macquarie serves as the regional centre for the Port Macquarie-Hastings local government area.

This Acid Sulphate Soils Assessment Report has been prepared to accompany an application to Port Macquarie Hastings Council which seeks to have portion of the subject site rezoned in order to support the ongoing development of the general area.

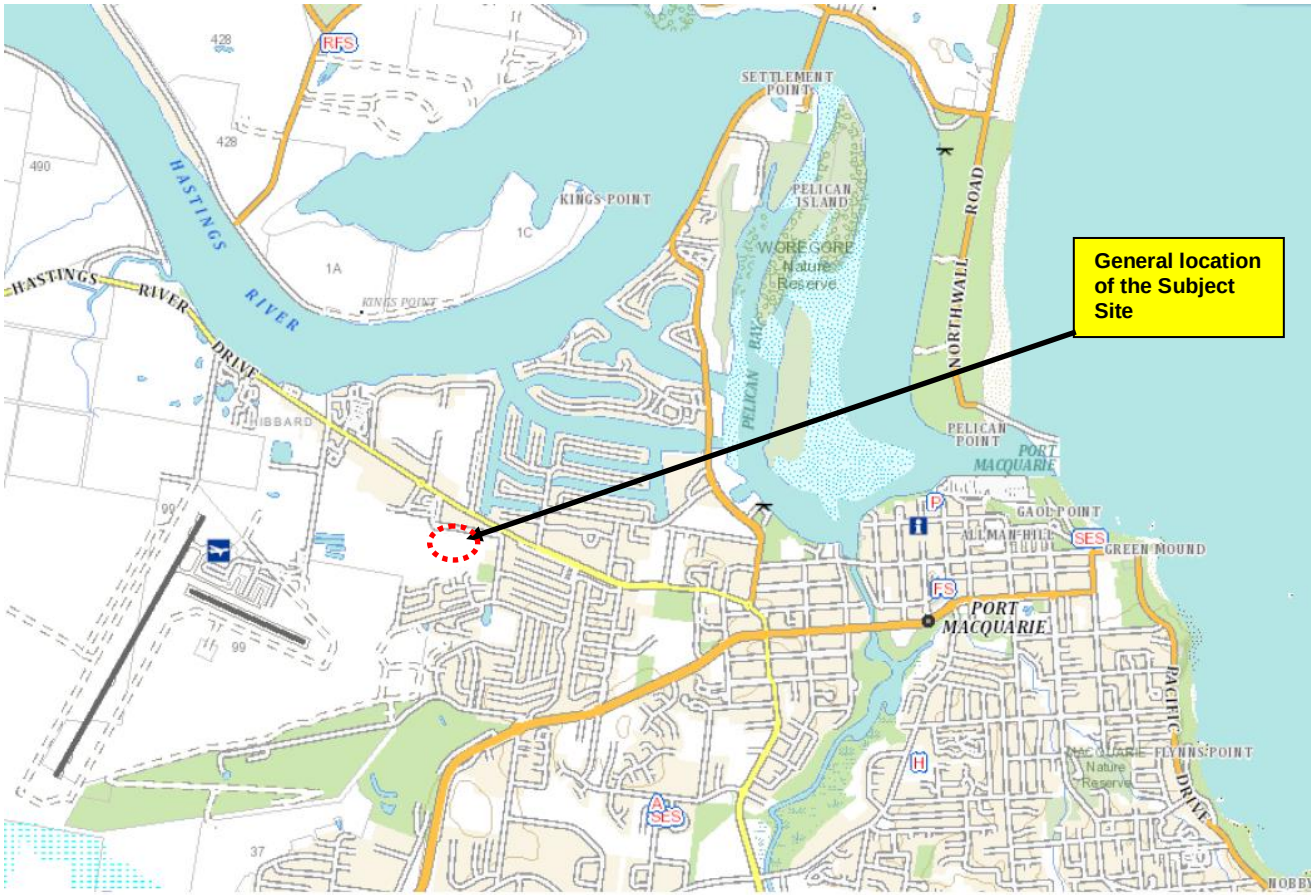
The proposed rezoning reflects the continued development of the existing school development on the subject site whilst the existing church use of the subject site is to be converted to a commercial/business/light industrial use with an expansion of the development footprint associated with the proposed commercial/business/light industrial use.

1.2 Site Location

The subject site is located approximately 2.2km west of the Port Macquarie CBD, within a geographic area known as Hibbard which is a historical urban area on the western fringes of the developed areas of Port Macquarie. Being located in a historical area land use in the locality is a mixture of residential, larger vegetated bushland lots and a mix of commercial business, light industrial and recreational uses.

It is noted that the subject site comprises two (2) separate Torrens Title allotments which share a common east/west property boundary; refer **Figure 1** below.

Figure 1 - Site Location

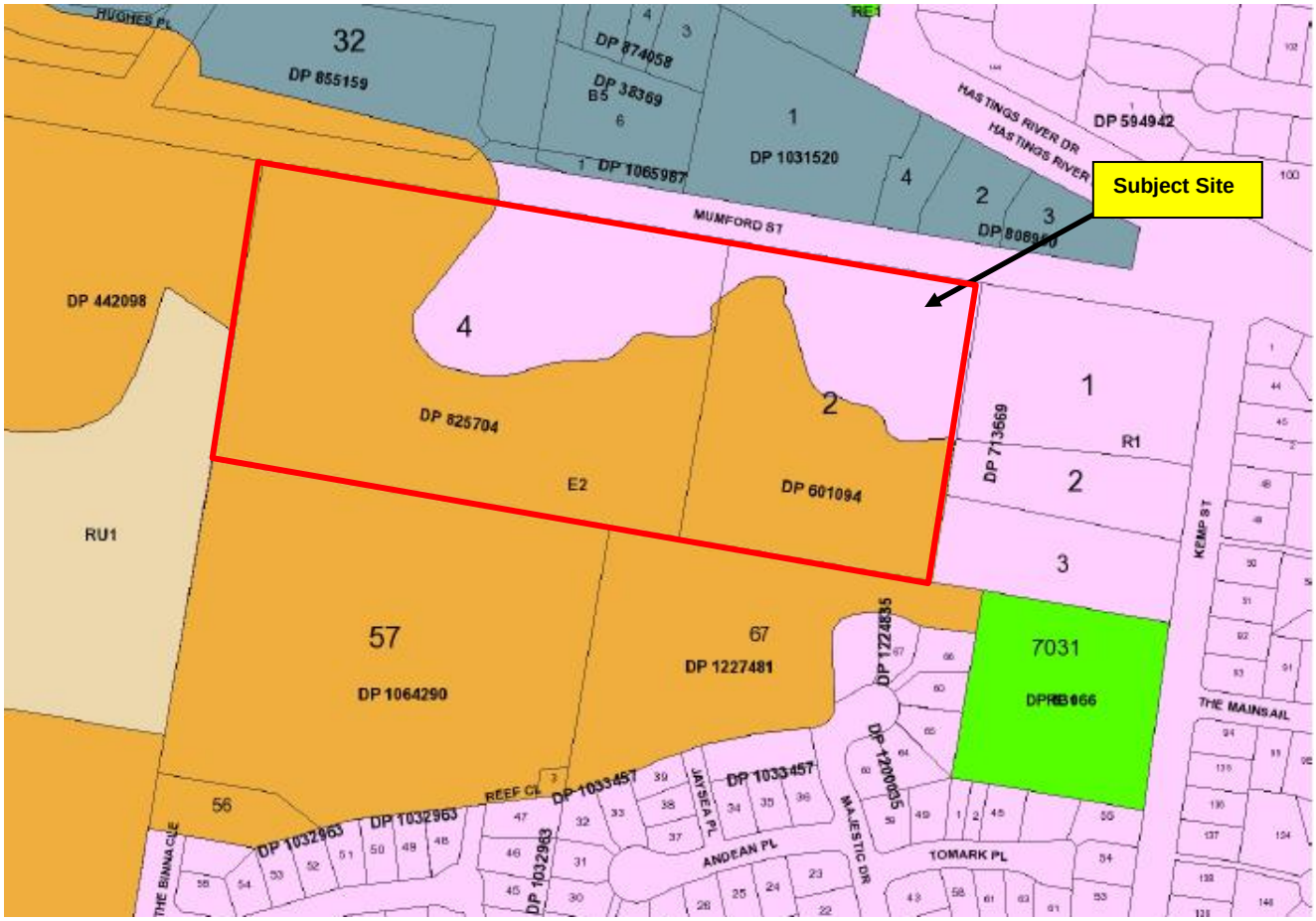


The subject site is positioned on the western fringe of the urbanized area of Port Macquarie in an area which is known locally as Hibbard. Being a historical area of Port Macquarie land use within the immediate area has not changed considerably although it is noted that some urban expansion has occurred on land to the south of the subject site whereby residential subdivision has occurred on what was historically rural land.

The character of the locality is that of a business fringe area with a mixture of residential, commercial, educational and open space areas of land. The subject site forms part of a historical subdivision with the majority of lots having been developed as part of the urban expansion of Port Macquarie. It is however noted that large undeveloped areas of land are present to the south and west of the subject site. A mixture of commercial, residential and recreational development is present to the north and east of the subject site.

The subject site is rectangular in shape and in accordance with Port Macquarie Hastings Local Environmental Plan 2011 has a mixed land use zoning comprising Residential (R1) along the northern central and eastern portions of the subject with an Environmental Conservation (E2) land use zoning applying to the remainder of the subject site. Business (B5) and Residential (R1) land use zonings apply to adjoining and adjacent land to the north and east respectively whilst an Environmental Conservation (E2) land use zoning is present to the south and northwest of the subject site. A Rural (RU1) land use zoning is present to the southwest. The relationship of the subject site with surrounding land use is depicted in **Figure 2** below;

Figure 2 – Landuse Zoning



1.3 Development Proposal

It is proposed to rezone portion of the subject site in order to support the ongoing development of the general area. The proposed rezoning reflects the continued development of the existing school development on the subject site whilst the existing church use of the subject site is to be converted to a commercial/business/light industrial use with an expansion of the development footprint associated with the proposed commercial/business/light industrial use. In this regard a development concept for the subject site is provided for in **Appendix 1**.

It is noted that the development concept provided in **Appendix 1** is considered to be indicative only.

Access to subject site will continue to be via the existing Mumford Street road reserve which adjoins the subject site to the north.

In this regard the rezoning of the land is required to demonstrate that the future development of the land can be undertaken without negative impacts associated with the disturbance of acid sulphate soils beyond that which would be associated with existing conditions.

This report will focus upon identifying the acid sulphate soil management requirements which will be applicable to any future development, (using the development concept in

Appendix 1 for context), so as to allow for an assessment of the subject sites suitability for rezoning.

2. ACID SULFATE SOILS

2.1 Background

Estuarine sediments of coastal NSW from the Holocene geological age may contain iron pyrite, the main constituent of ASS. These sediments are generally found below 5 metres (m) Australian Height Datum (AHD), typically in coastal and floodplain areas.

Pyritic sediments can be divided into classes based on their oxidised state. If the pyritic material is being oxidised it will generally have a pH of less than 4.0 and is called actual acid sulfate soil (AASS). If the pyrite material is below the water table and has not been oxidised, it is termed potential acid sulfate soil (PASS) and generally has a pH of greater than 4.0.

The pH has the potential to become much lower when the PASS is exposed to oxygen. Sediment which, after the addition of hydrogen peroxide, has a pH of less than 2.5 strongly indicates the presence of ASS (ASSMAC, 1998).

Disturbance or poor management and use of ASS can generate sulfuric acid and salts. ASS can lower soil and water pH and increase salinity, reducing or precluding vegetation growth and producing soil conditions which may be detrimental to concrete and steel components of structures.

The release of sulfuric acid from ASS often mobilises metals such as aluminium, iron and magnesium from otherwise stable soil matrices. Elevated concentrations of such elements in site runoff may result in changes which are potentially detrimental to receiving water bodies and associated aquatic organisms.

2.2 Indicators for AASS

Indicators of AASS soil conditions are typically;

- Unusually clear or milky blue-green drainage water within or flowing from the area (aluminium mobilised by the acid leachate acts as a flocculating agent).
- Extensive iron stains on any drain or pond surfaces, or iron-stained water and ochre deposits.
- Water of pH <4 in adjacent streams, drains, groundwater or ponding on the surface.
- Soil pH <4.
- Soil horizons containing Jarosite (a pale yellow, “straw coloured” mineral, which can. precipitate as pore fillings and coatings on fissures) or iron oxide mottling in auger holes or recently dug surfaces. With a fluctuating water table, jarosite may be found along cracks and root channels in the soil. Jarosite is not always found in actual acid sulfate soils.
- Jarosite present in surface encrustations or in any material dredged or excavated and left exposed.
- Dominance of mangroves, reeds, rushes and other salt/swamp-tolerant vegetation.

- Sulfurous (H2S) smell after rain following a dry spell, or when the soils are oxidised or disturbed.

2.3 Indicators for PASS

Indicators of PASS soil conditions are typically;

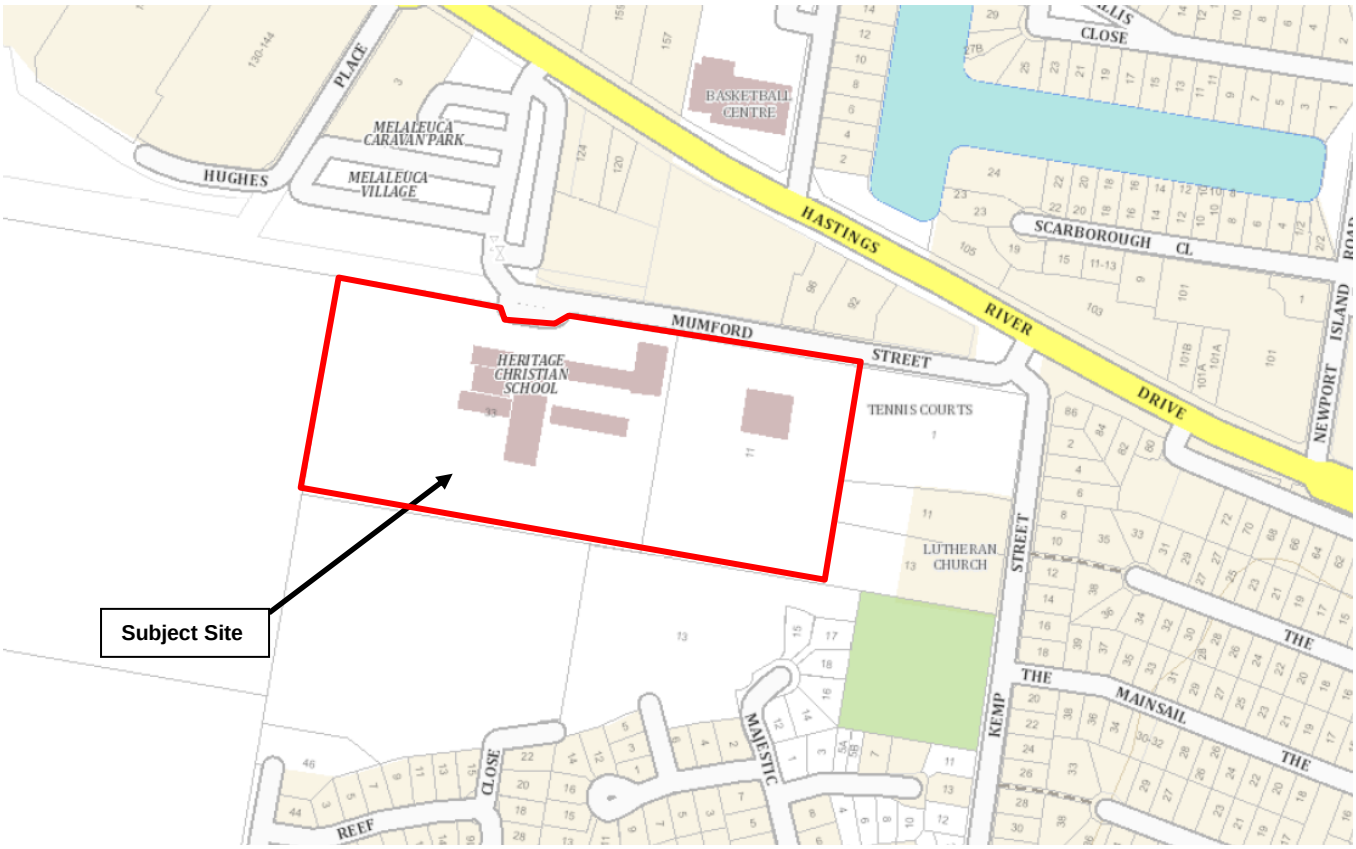
- Typically waterlogged coastal clayey sediments (soft, buttery texture, blue grey dark grey to black or dark green-grey) or silty sands or sands (mid to dark grey).
- pH of 6.5 – 7.5.
- Positive peroxide test.
- Offensive odour, predominantly due to hydrogen sulfide, H2S.

3. SUBJECT SITE

3.1 Site Description

The subject site comprises two Torrens Title lots each of which is rectangular in shape with a combined area of 6.23 hectares, refer to **Figure 3**.

Figure 3 – Subject Site



It is noted that the subject site has been developed for educational and religious purposes with Lot 4 DP 825704 supporting the operation of the Port Macquarie Heritage Christian School whilst Lot 2 DP 601094 supports the presence of a church building.

Heritage Christian School on 33 Mumford Street, Port Macquarie

Church building on 11 Mumford Street, Port Macquarie

The subject site has been cleared of the majority of vegetation with grasslands and scattered and clusters of trees predominant over much of the subject site. It is however noted that an area of Forested Wetland is present in the north-western portion of Lot 4 DP 825704 whilst narrow remnants of Forested Wetland vegetation are also present adjacent to the southern boundaries of the subject site and the western boundary of Lot 2 DP 601094. Extensive areas of Forested Wetland are present on adjoining and adjacent land to the west and southwest whilst a narrow band of Forested Wetland vegetation separates Lot 2 DP 601094 from managed grasslands within developed residential properties in the southern eastern aspect. Vegetation associated with managed gardens and landscaping are present on adjoining and adjacent land to the north and east of the subject site.

Access to the subject site is available via Mumford Street which adjoins the subject site to the north.

3.2 Climate

The local climate is considered to be temperate with summer dominant rainfall.

The average daily maximum temperature is around 21.5^{0}C, while the average daily minimum temperature is around 10^{0}C - 11^{0}C.

Long-term average annual rainfall is around between 1,500 mm.

Annual pan evaporation is estimated to be approximately 1,400 mm.

3.3 Topography

The subject site is located within the flood plain of the Hastings River and accordingly the topography of the subject site and adjoining and adjacent land is relatively flat. However, reflecting the presence of extensive areas of wetland on adjoining and adjacent land to the south and west some very gentle north to south downslopes is present in the locality.

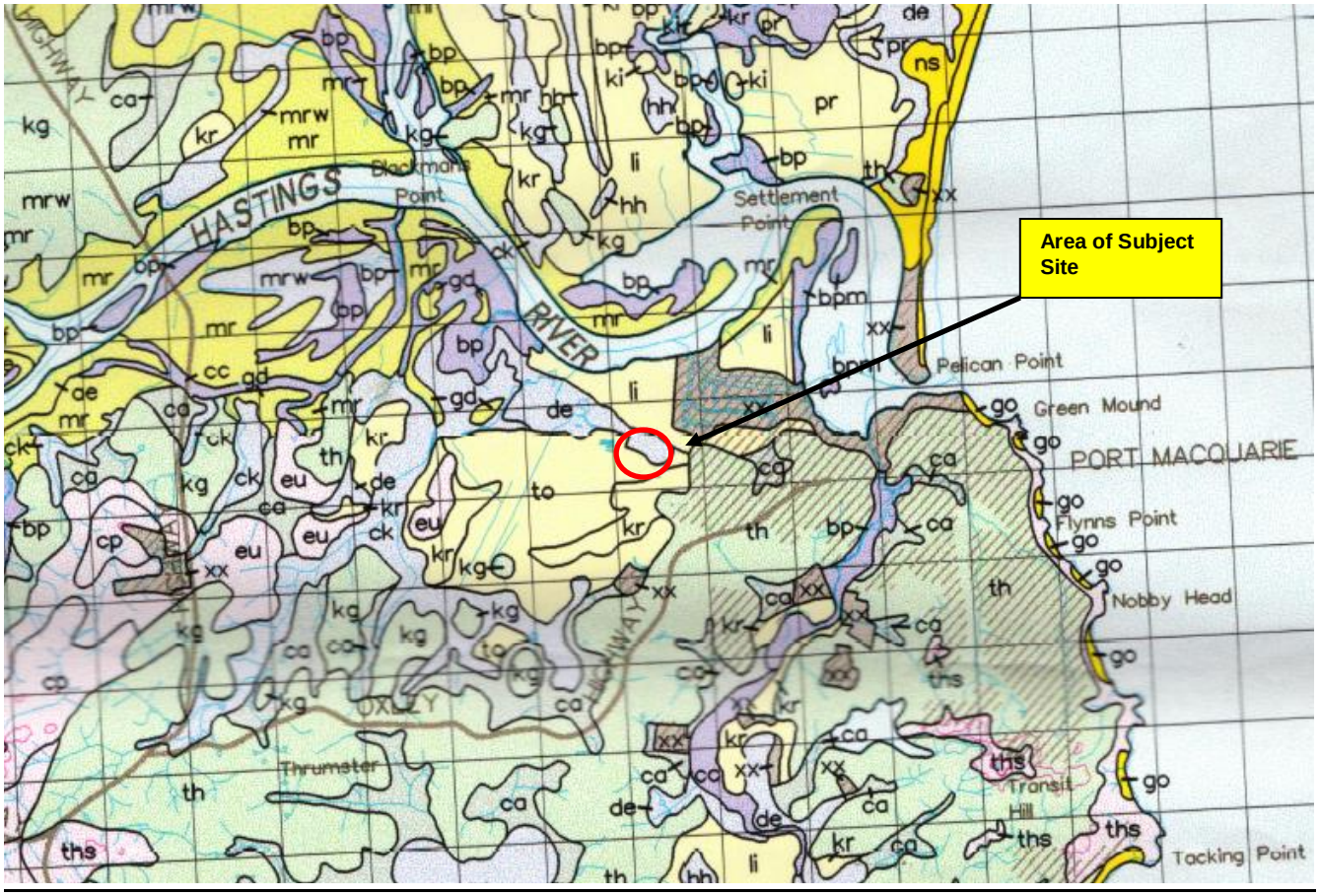
It is noted that the topography of the subject site has been altered over time with filling providing for more elevated land which supports the existing building infrastructure present on the subject site.

Slope conditions on adjoining and adjacent land are similar to that of the subject site.

3.4 Geology and Soils

Reference to the 1:100,000 Kempsey – Korogoro Point Soil Landscape Series Sheet 9435 (1999) indicates that two soil landscape groups are likely to be present in the – refer to **Figure 4**.

Figure 4 - Extract from the 1:100,000 Kempsey – Korogoro Point Soil Landscape Series Sheet 9435 (NSW DLWC, 1999)



Soils in the area of proposed development are primarily characterised as Delicate (de) and are comprised of flat coastal swamps of extremely low relief and elevation (<1m) on back barrier sand plains overlain by thin alluvial deposits. Limitations associated with this soil landscape group include the following:

o Flooding hazard
o Waterlogging
o Low wet bearing strength
o Acid Sulphate Soils
o Acidity
o Salinity

The subject site may also contains the Torrens (to) landscape; consisting of low relief, low elevation level sandplain on Pleistocene back barrier muddy sands. Limitations associated with this soil landscape group include the following:

o Localized flooding
o Seasonal waterlogging
o Low fertility
o Very strong acidity
o High aluminium toxicity potential
o Low available water holding capacity

3.5 Ground Water

No specific ground water information is available for the subject site and immediately surrounding areas however given the location of the subject site within the flood plain of the Hastings River and the presence of areas of Forested Wetland vegetation it is likely that ground water conditions would be expected within 1m of natural ground level.

4. POTENTIAL DISTURBANCE OF ACID SULFATE SOILS

4.1 Presence of Acid Sulphate Soils

In determining the need for and extent of ASS management on the subject site the presence and spatial characteristics of ASS on the subject site needs to be understood in the context of the proposed future development works.

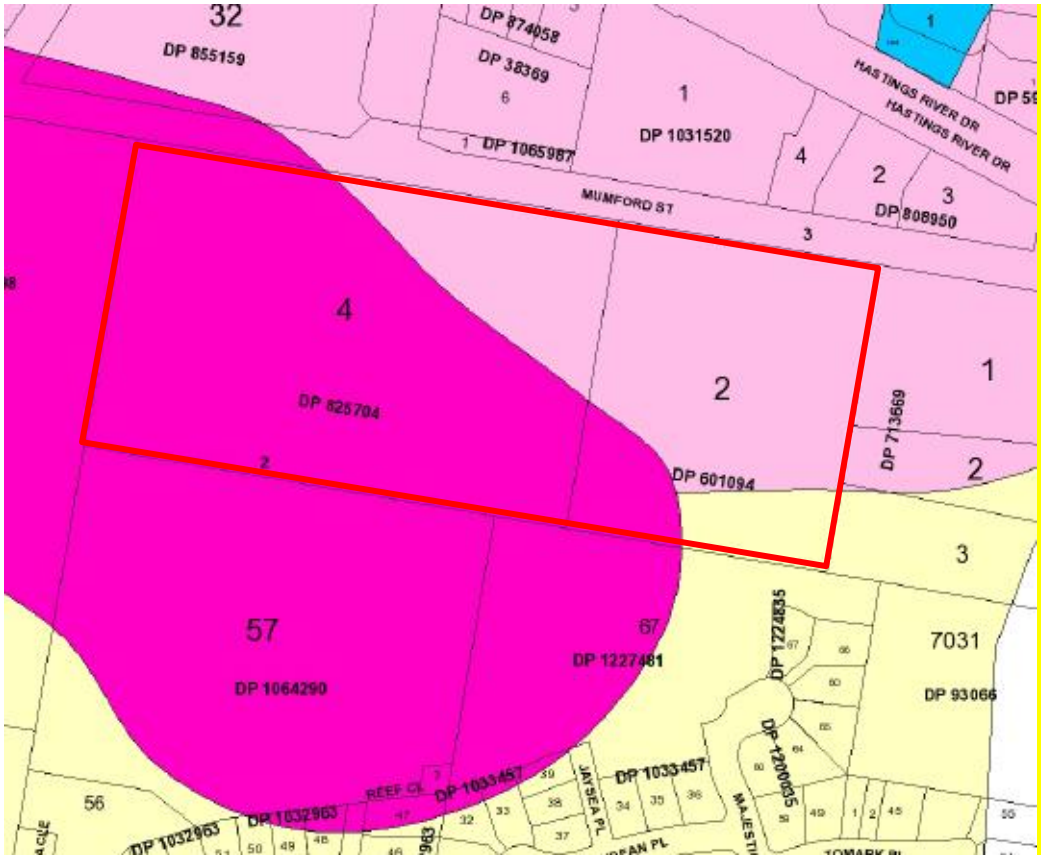
An understanding of the potential presence of ASS on the subject site is provided as follows;

4.1.1 Desk Top Assessment

According to the NSW Department of Natural Resources Acid Sulfate Soil Risk Maps, the subject site is categorised as being at risk of containing acid sulfate soils, refer to **Figure 5**.

Figure 5 indicates that Class 2, Class 3 and Class 5 land are shown to be present on and adjacent to the subject site.

Figure 5 - NSW DNR Acid Sulfate Soils Risk Map extract.



The significance of the Risk Map classifications as they relate to the proposed development of the subject site is indicated as follows;

- Works below natural ground level and works by which the watertable is likely to be lowered are likely to present an environmental risk if undertaken in Class 2 land;

- Works beyond 1 metre below natural ground level and works by which the watertable is likely to be lowered beyond 1 metres below natural ground level are likely to present an environmental risk if undertaken in Class 3 land; and

- Works which are likely to lower the watertable below 1 m AHD on adjacent Class 2 or 4 lands are likely to present an environmental risk if undertaken in Class 5 land.

4.2 Acid Sulphate Soils on the Subject Site

The ASSMAC (1998) Guidelines provides that a risk of acid generation and, therefore, a management plan is required, if soils exhibit one of the following criteria:

- Oxidisable sulphur (SPOS) is >0.03% or TPA or TSA is >18 mol H+/tonne if coarse texture soils (sands); or

- Oxidisable sulphur (SPOS) is >0.1% or TPA or TSA is >62 mol H+/tonne if fine texture soils (silty clays and clays).

It is noted that no infield assessment of acid sulphate conditions has been undertaken at this stage of the planning process. However based upon the information provided in Section 4.1.1 above there is a high probability of Acid Sulphate Soil conditions on the subject site and accordingly an Acid Sulfate Soils Management Plan (ASSMP) will be required to address the environmental risks associated with the disturbance of soils associated with the any future development of the subject site.

4.3 Acid Sulphate Soil Management Issues

Given the likely presence of PASS within the soil profile within 1m of the natural ground level, any bulk earthworks or services related excavations on the subject site has the potential to create AASS conditions and as such the management of the impacts of soil excavation on the subject site is required.

Additionally any site groundwater dewatering will result in the more frequent exposure of PASS and thus an increased risk of acid drainage. This increased risk of acid drainage also requires a management response.

4.3.1 Preliminary Risk Assessment

The following preliminary risk assessment has been undertaken in relation to the potential to cause adverse environmental impacts on soil and water quality of activities which are likely to be relevant to the any future development of the subject site.

Inherent risk will be assessed by combining the likelihood and consequence of the identified potential risk. In determining the assessment of the likelihood and consequence, the following rating processes was utilised.

Table 1 – Level of Likely Environmental Risk from PASS

Factors in deciding Level of Risk	No Risk	Low Risk	Increasing Risk (Moderate Risk)	High Risk
Volume of Material to be disturbed	<1 tonne	1 – 10 tonnes	11 – 50 tonnes	>50 tonnes
Distance between depth of PASS and depth of disturbance	>2m	>1m	0.5m – 1m	0m
Change of surface drainage	Nil, or reduction in depth of existing drainage	Shallow surface drainage well above ASS	Mid level drains within 0.5m of ASS	Deep drains >1m in depth
Duration of disturbance	Nil	<1 day	1 – 7 days	>7 days
Level of uncertainty with mitigation strategy	No mitigation as no disturbance	High certainty with method	Certainty with method but in clay soils	Method untested
Likely severity of PASS based upon peroxide reaction and final pH	Nil (pH>4.5)	Mild after 5 minutes (pH<4.5)	Medium (pH<3.0)	Vigorous (pH<3.0)
Connection to natural water bodies or wetlands	Nil	Areas totally bunded to prevent discharge	Water quality management infrastructure provide for some control	Connected directly to creek, drain or wetland

Based upon the above the following preliminary risk assessment for potential future development activities has been undertaken.

Table 2 – Construction Activities and Impact Risk Assessment

Activity	Potential Impact	Risk Assessment		
		Low	Medium	High
Shallow Ground Disturbance	Exposing ASS at the disturbed areas to surface run-off, thus causing release of acid into the environment in the short term			X
	Changing surface run-off behaviour and subsequent			X

	acid releases into the environment in the short and long term			
Excavation and stock piling of ASS in 'Dry Areas'	Exposing ASS to surface run-off, thus causing release of acid into the environment in the short term and long term		X	
	Exposing potential ASS to air and surface run-off, thus causing increased oxidation and increased release of acidity into the environment in the short term and long term			X
	Changing surface run-off behaviour and subsequent acid releases into the environment in the short and long term			X
	Leaching acid into the environment at the disposal/placement point			X
Construction of underground services, drains etc	Exposing ASS at/near the new alignment to surface run-off and services infrastructure, thus causing the release of acid into the environment in the short and long term			X
	Exposing potential ASS at/near the new alignment to air, surface runoff and water flows, thus causing increased oxidation and increased release of acid into the environment in the short and long term			X
	Changing surface run-off behaviour and subsequent acid releases into the environment in the short and long term			X
	Leaching acid into the environment at the disposal/placement point			X
Dewatering	Exposing potential ASS at/near the new alignment to air, surface runoff and water flows, thus causing increased oxidation and			X

	increased release of acid into the environment in the short and long term			
	Discharge of acid laden ground waters into the environment in the short term			X

The above risk assessment indicates that active management of future construction activities will be required in order to respond to the risks associated with the disturbance of ASS on the subject site.

Notwithstanding the above based upon the nature and scale of the proposed development it is possible for the future development of the subject site to be undertaken so as to not result in acid sulphate soil impacts which could not be mitigated through the adoption of best practice ASS management principles. In this regard the filling of the subject site to provide for flood free building platforms can significantly reduce the potential impacts associated with ASS.

5. ACID SULFATE SOIL MANAGEMENT

5.1 Objectives of Future ASSMP

The objective of an ASSMP is to consider both the existing and potential future environmental impacts relating to PASS material in and around the subject site and to detail mitigation measures to minimise the potential impacts on the subject site and on adjoining and adjacent land and waterways.

The control measures in an ASSMP aim to mitigate the environmental impacts of development to acceptable levels and should be based on the following objectives:

- Control and, where possible, minimisation of disturbance of ASS;
- Confirmation of the success of impact control measures by the means of validation monitoring;
- Compliance with statutory requirements; and
- Preservation of water quality on an ongoing basis.

It will be necessary that the management of Acid Sulphate Soils which are likely to be present on the subject site be addressed via an ASSMP which is specifically developed around the nature and scope of any future development proposal for the subject site.

5.2 Construction Management Controls

5.2.1 Management Strategy

Any future ASS management strategy which is developed adopted for any future development should be based upon the following key components;

(i) Avoidance – the disturbance of soils with an unknown ASS classification are to be avoided.

(ii) Neutralization of Acid Generating Capacity – The acid generating capacity of all soils which are excavated onsite is to be addressed prior to reuse on site or offsite disposal.

(iii) Water Management – the management of surface waters during the implementation of this management plan is important in ensuring that off site impacts associated with the disturbance and management of ASS are minimized.

(iv) Management of Dewatering – the impacts associated with site groundwater dewatering and the reduction in site groundwater recharge resulting from increased impervious surfaces will need to be considered as part of the development of any future ASSMP. This lowering of groundwater tables could result in the more frequent exposure of PASS and thus an increased risk of acid drainage. The impacts of this require a management response.

6. CONCLUSION

A conservative assessment of the impacts of existing and future uses of the land which is known as Lot 4 DP 825704 and Lot 2 DP 601094, 11 – 33 Mumford Street, Port Macquarie indicates that the proposed rezoning of portion of the subject site to support its use for educational and commercial/business purposes can be undertaken so as to not adversely impact upon acid sulphate soils.

It is possible for the future development of the subject site to be undertaken so as to not result in acid sulphate soil impacts which could not be mitigated through the adoption of best practice ASS management principles.

In this regard the Acid Sulphate Soil impacts associated with any future development of the subject site should be the subject of development specific assessment with the adoption of management strategies which reflect the nature and scale of future development.

Based upon the information contained within this report there are no Acid Sulphate Soil related constraints to the proposed rezoning of portion of the subject site.

Disclaimer

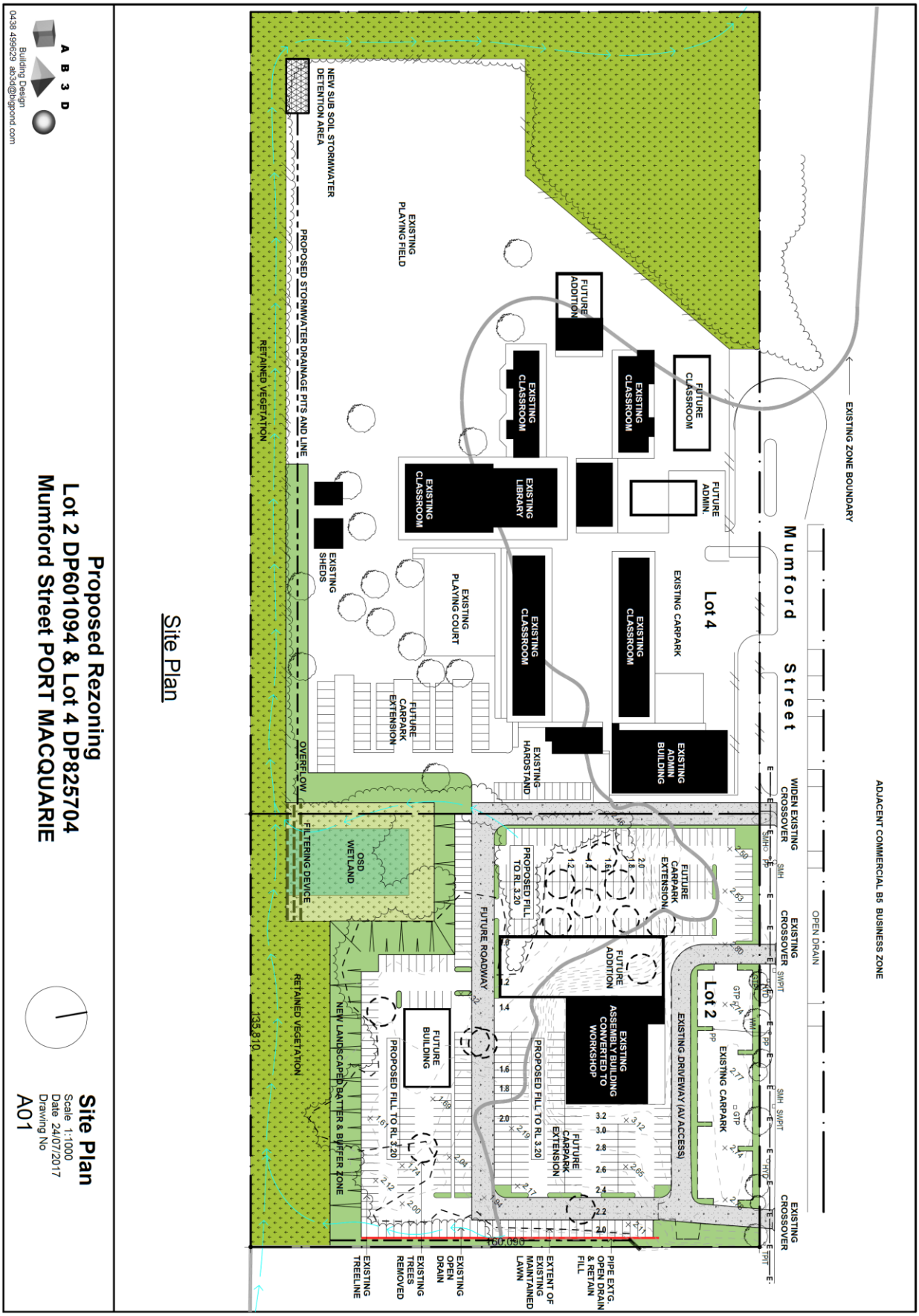
The findings referred to in this report are those which, in the opinion of the author, are required to meet the requirements for Acid Sulphate Soil management. It should be noted that the Local Authority having jurisdiction for the area in which the property is located may, within their statutory powers, require different, additional or alternative works/requirements to be carried out other than those referred to in this report.

This report has been prepared partially on information provided by the client. Information provided by the client in respect of details of construction.

The author denies any legal liability for action taken as a consequence of the following:

- The Local Authority requiring alternative or additional requirements to those proposed or recommended in this report.
- Incorrect information, or mis-information, provided by the client with regard the proposed development which is in good faith included in the strategies proposed in this report and later found to be false.

APPENDIX 1 – DEVELOPMENT CONCEPT



DESKTOP NOISE IMPACT REPORT

PROPOSED REZONING OF LOT 4 DP 825704 & LOT 2 DP 601094 11 – 33 MUMFORD STREET, PORT MACQUARIE

DAVID PENSINI – BUILDING CERTIFICATION AND ENVIRONMENTAL SERVICES

This report has been prepared by David Pensini – Building Certification and Environmental Services with all reasonable skill, care and diligence for East Coast Screw Piers.

The information contained in this report has been gathered from discussions with representatives of East Coast Screw Piers, a review of the plans provided on behalf of East Coast Screw Piers and experience.

No inspection or assessment has been undertaken on other aspects of the proposed development outside the scope of this report.

This report does not imply, nor should it be implied, that the proposed development will comply fully with relevant legislation.

The report shall not be construed as relieving any other party of their responsibilities or obligations.

David Pensini – Building Certification and Environmental Services disclaims any responsibility East Coast Screw Piers and others in respect of any matters outside the scope of this report.

The report is confidential and the writer accepts no responsibility of whatsoever nature, to third parties who use this report, or part thereof is made known. Any such party relies on this report at their own risk.

For and on behalf of David Pensini – Building Certification and Environmental Services.

Prepared by: *David Pensini*

Signed:

Dated: *14th December 2017*

Version	Date	Information relating to report			
		Reason for issue			
1.0	25th November 2017		Draft		
2.0	14th December 2017		Issued to Client		
			Prepared by	**Verified by**	**Approved by**
		Name	David Pensini		David Pensini
		Signature			

TABLE OF CONTENTS

PREFACE

The land which comprises the subject site is known as Lot 4 DP 825704 and Lot 2 DP 601094, 11 – 33 Mumford Street, Port Macquarie.

It is proposed to rezone portion of the subject site in order to support the ongoing development of the general area.

The proposed rezoning reflects the continued development of the existing school development on the subject site whilst the existing church use of the subject site is to be converted to a commercial/business/light industrial use with an expansion of the development footprint associated with the proposed commercial/business/light industrial use.

The purpose of this report is to assess the potential noise impacts associated with any future development of the subject site as a consequence of the rezoning of the subject site.

1. INTRODUCTION

1.1 Background

The subject site is known as Lot 4 DP 825704 and Lot 2 DP 601094, 11 – 33 Mumford Street, Port Macquarie and is situated within the Port Macquarie-Hastings local government area. With a population of approximately 45,000 Port Macquarie serves as the regional centre for the Port Macquarie-Hastings local government area.

This Noise Impact Report has been prepared to accompany an application to Port Macquarie Hastings Council which seeks to have portion of the subject site rezoned in order to support the ongoing development of the general area.

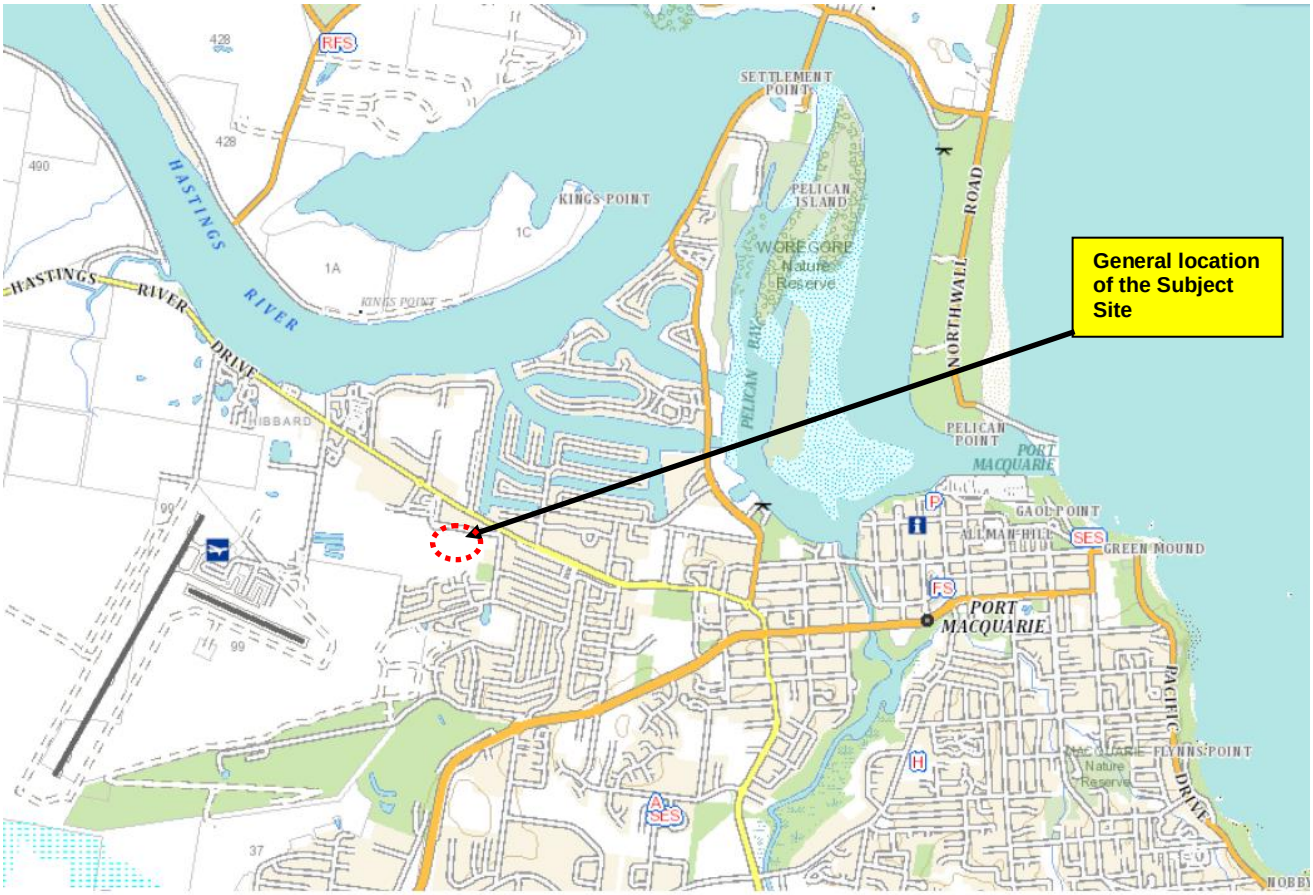
The proposed rezoning reflects the continued development of the existing school development on the subject site whilst the existing church use of the subject site is to be converted to a commercial/business/light industrial use with an expansion of the development footprint associated with the proposed commercial/business/light industrial use.

1.2 Site Location

The subject site is located approximately 2.2km west of the Port Macquarie CBD, within a geographic area known as Hibbard which is a historical urban area on the western fringes of the developed areas of Port Macquarie. Being located in a historical area land use in the locality is a mixture of residential, larger vegetated bushland lots and a mix of commercial and business and recreational uses.

It is noted that the subject site comprises two (2) separate Torrens Title allotments which share a common east/west property boundary; refer **Figure 1** below.

Figure 1 - Site Location



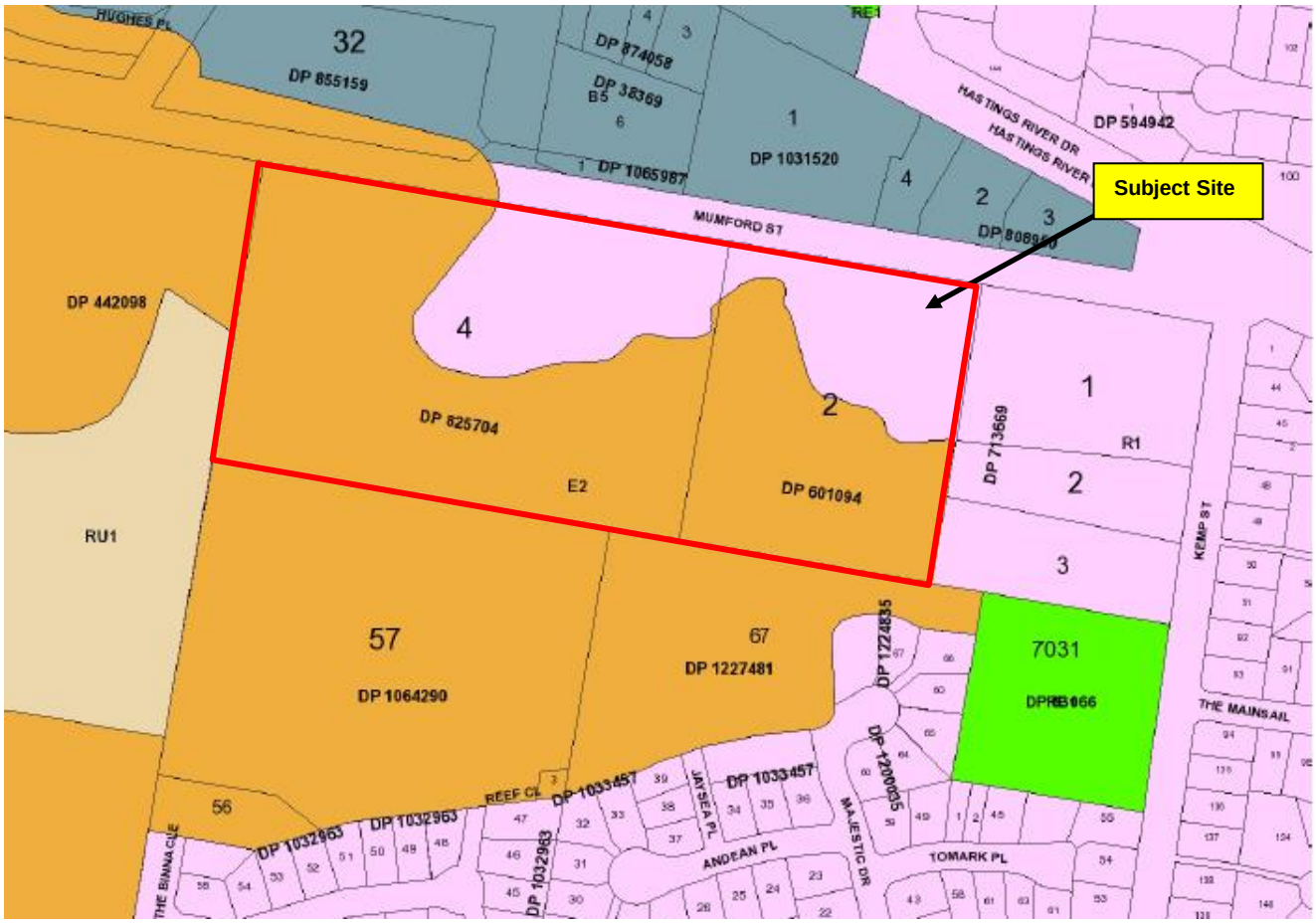
The subject site is positioned on the western fringe of the urbanized area of Port Macquarie in an area which is known locally as Hibbard. Being a historical area of Port Macquarie land use within the immediate area has not changed considerably although it is noted that some urban expansion has occurred on land to the south of the subject site whereby residential subdivision has occurred on what was historically rural land.

The character of the locality is that of a business fringe area with a mixture of residential, commercial, light industrial, educational and open space areas of land. The subject site forms part of a historical subdivision with the majority of lots having been developed as part of the urban expansion of Port Macquarie. It is however noted that large undeveloped areas of land are present to the south and west of the subject site. A mixture of commercial, , light industrial, residential and recreational development is present to the north and east of the subject site.

The subject site is rectangular in shape and in accordance with Port Macquarie Hastings Local Environmental Plan 2011 has a mixed land use zoning comprising Residential (R1) along the northern central and eastern portions of the subject with an Environmental Conservation (E2) land use zoning applying to the remainder of the subject site. Business (B5) and Residential (R1) land use zonings apply to adjoining and adjacent land to the north and east respectively whilst an Environmental Conservation (E2) land use zoning is present to the south and northwest of

the subject site. A Rural (RU1) land use zoning is present to the southwest. The relationship of the subject site with surrounding land use is depicted in **Figure 2** below;

Figure 2 – Landuse Zoning



1.3 Development Proposal

It is proposed to rezone portion of the subject site in order to support the ongoing development of the general area. The proposed rezoning reflects the continued development of the existing school development on the subject site whilst the existing church use of the subject site is to be converted to a commercial/business/light industrial use with an expansion of the development footprint associated with the proposed commercial/business/ light industrial use. In this regard a development concept for the subject site is provided for in **Appendix 1**.

It is noted that the development concept provided in **Appendix 1** is considered to be indicative only.

Access to subject site will continue to be via the existing Mumford Street road reserve which adjoins the subject site to the north.

In this regard the rezoning of the land is required to demonstrate that the future development of the land can be undertaken without negative impacts on the acoustic environment of the locality.

This report will focus upon identifying the acoustic management requirements which will be applicable to any future development, (using the development concept in **Appendix 1** for context), so as to allow for an assessment of the subject sites suitability for rezoning.

2. PURPOSE OF REPORT

The purpose of this report is to:

- Determine the potential noise impacts associated with the future development of the subject site and its impact on sensitive residential receivers in the area.

It should however be noted that the this report is reliant upon typical noise level information which would be applicable for the site and surrounding areas with no site specific sound pressure level determination or assessment undertaken.

Accordingly this report is to be viewed as providing for a qualitative assessment.

3. EXISTING ACOUSTIC ENVIRONMENT

As indicated in Section 1 above the subject site is located within a commercial/business/light industrial fringe area with a mixture of residential, commercial, light industrial, educational and open space areas of land. It is however noted that large undeveloped areas of land are present to the south and west of the subject site. A mixture of commercial, light industrial, residential and recreational developments are present to the north and east of the subject site and influence the existing acoustic environment. Given the mixture of land use and associated activities within the locality, the acoustic characteristics of the area are not considered to be typical of residential areas with a more commercial/light industrial environment influencing the setting.

The subject site currently supports the operation of the Port Macquarie Heritage Christian School and a church. These existing uses also influence the acoustic environment of the subject site and locality.

Heritage Christian School on 33 Mumford Street, Port Macquarie

Church building on 11 Mumford Street, Port Macquarie

Mumford Street and Hastings River Drive are located within 200m to the north of the subject site with traffic movements on the road infrastructure likely to influence the existing acoustic environment in particular Hastings River Drive which is a major connecting road within the western portion of Port Macquarie.

Having regards to the above the acoustic environment in the locality is not typical of urban residential areas and reflects the mixture of land uses and associated activities which is present in the area.

Whilst no specific quantitative noise level information is available for the subject site and surrounds it is likely that a conservative daytime background noise level in the locality is in the order of 45dB(A). Information available for other mixed use commercial/business/light industrial fringe localities suggests a daytime background noise level range of 42 – 47dB(A).

Nighttime background noise levels in the locality are likely to be in the order of 35 - 40dB(A). These noise levels reflect the nature of activities on the subject site and the presence of a mixture of land uses on adjoining and adjacent land.

4. ACOUSTIC QUALITY OBJECTIVES

Noise from educational and commercial/business/light industrial activity sources is assessed using the DECC's Noise Policy for Industrial, 2017 (NPI). However local Councils may also apply the criteria for land use planning, compliance and complaints management.

The NPI specifies two separate criteria designed to ensure existing and future developments meet environmental noise objectives. The first criteria limits intrusive noise to 5dB(A) above background noise level whilst the other criteria applies to the protection of amenity of particular land uses based on the existing (L_{eq}) noise level from industrial noise sources. Project specific noise levels are established for new developments by applying both criteria to the situation and adopting the more stringent of the two.

When land uses in an area are undergoing significant change the background noise levels would be expected to change, sometimes significantly. The impact of noise associated with a proposed new development should be made using the recommended amenity noise level for the residential land use, not the project intrusiveness noise level. It is however noted that the proposed rezoning of the subject site and the proposed future development concept would not be expected to represent a significant change to background noise levels beyond that which currently exists by virtue of;

- The future development of the subject site is consistent with an expansion of the existing uses of the subject site and the land uses within the immediate locality; and

- The spatial and barrier separation which is available between the areas of the subject site which would be subject to future development and adjacent residential receivers.

The following table specifies the applicable base objectives in relation to providing an acoustic environment for the occupants of residential dwellings which are present within the locality which would not give rise to justifiable complaint or land use conflict in relation to existing and future land uses of the subject site.

Table 1 - Base Noise Level Objectives

PERIOD	INTRUSIVENESS CRITERION (based upon Table 2.3 of the NPI plus 5 dB(A))	AMENITY CRITERION
Day (7am – 6pm)	$50_{Leq,15\ minutes}$	$60_{Leq,11hr}$
Evening (6pm – 10pm)	$45_{Leq,15\ minutes}$	$50_{Leq,4hr}$
Night (10pm – 7am)	$35_{Leq,15\ minutes}$	$45_{Leq,9h}$

Having regard to the above as the intrusiveness criteria is more stringent then these values should be used as the acoustic impact assessment objective.

5. NOISE LEVELS FROM FUTURE LANDUSES

It is noted that the future development concept for the subject site provides for an expansion of school building infrastructure and the change of use of eastern portion of the subject site so as to support commercial/business activities. This includes the provision of additional onsite vehicle access and parking infrastructure. Support infrastructure such as storm water management infrastructure is also proposed.

Some changes in the local acoustic environment which may result as a consequence of the proposed rezoning are;

- An increase in vehicle movements to and from the subject site; and
- Increased noise generation associated with commercial/business/light industrial activities on the subject site; and
- Increased occupant numbers associated with future new building infrastructure on the subject site.

6. POTENTIAL NOISE IMPACTS

6.1 General

In providing information regarding the potential noise impacts associated with the future development of the subject site it is important to note that the responsibility for ensuring that noise impacts are acceptable in relation to surrounding land uses rests with the noise generator and not the noise receiver. In this regard burdening noise receivers with the responsibility for noise mitigation and management does not provide for the equitable utilization of land and is not consistent with the 'polluter pays' or responsible environmental management principles which underpin environmental protection legislation.

It is however acknowledged that local government has a role in ensuring that land use conflict does not occur as a result of inappropriate strategic and development control planning.

Accordingly the assessment of potential noise impacts associated with the proposed rezoning of the portion of the subject site and the potential future development of school and commercial/business activities on the subject land is focused upon demonstrating that any change in land use is able to mitigate any land use conflict which is relevant to noise and that acceptable strategic and development control outcomes can be achieved.

6.2 Proposed Rezoning

Having regards to the above it is considered that the proposed rezoning of portion of the subject site and its future development will not result in significant change in the acoustic environment and will not result in any unacceptable strategic and development control outcomes for the subject site and locality. This is based upon the following considerations;

- The mixture of uses within the general area of the subject site provides for an acoustic environment which is typical of commercial/business fringe areas with the existing acoustic environment reflecting a range of commercial, business and light industrial uses. The existing acoustic environment of the locality is also impacted upon by significant traffic movements associated with existing public road infrastructure. Accordingly the future development of the subject site is unlikely to have impacts upon the existing acoustic environment beyond that which currently exists; and

- The proposed development concept provides for a continuation of existing land with the nature of activities associated with the future development of the subject site remaining consistent with that which currently exist within the locality. In this regard the nature and characteristics of noise generation will remain relatively consistent despite any future development of the subject site; and

- The development concept continues to provide for significant separation between residential receivers and areas of the subject site where noise generating activities occur. The maintenance of separation between residential and non-residential activities provides for significant distance attenuation which would offset any minor increase in noise generation associated with the future development of that part of the subject site which is the subject of the rezoning proposal.

  In this regard worst case distances between proposed future commercial/business/light industrial developments and existing residential receivers, (adjoining land to the east of the subject site), could provide for up to a 36dB(A) attenuation in noise. Consequently noise levels of up to 86dB(A) could be generated by future commercial/business developments and meet the relevant daytime intrusiveness criteria, (refer to Section 4 above). This attenuation prediction does not consider barrier and climatic effects).

  Noise levels exceeding 86dB(A) would not typically be associated with commercial/business land uses and associated activities; and

- The nature of the existing and future development of the subject site provides for activities which do not generate significant noise. The continued operation of the school and the proposed commercial/business use together with associated activities such as vehicle movements do not in themselves generate high levels of noise.

  The barrier attenuation which can be provided through the design and construction of future buildings and associated infrastructure together with the low vehicle movement speeds associated with the use of future access and parking infrastructure, (by predominately passenger vehicles), can ensure that noise levels associated with the future development of the subject site will remain consistent with that which currently exists. In this regard the use of best practice noise management practices in combination with the available distance attenuation provided for above can ensure that the relevant intrusiveness criteria, (refer to Section 4 above) is achieved in relation to any future development of the subject site; and

- The nature of the existing and future use of the subject site provides for the use of infrastructure predominately during daylight hours and accordingly noise impacts during the more sensitive evening and nighttime periods would be negligible. Any evening uses of future building and access and parking infrastructure would be expected to be infrequent and for short duration and accordingly acoustic impacts would be expected to be negligible.

Notwithstanding the above based upon the nature and scale of the proposed development it is possible for the future development of the subject site to be undertaken so as to not result in unacceptable noise impacts which could not be mitigated through the adoption of best practice noise management principles.

7. CONCLUSION

A conservative assessment of the impacts of existing and future uses of the land which is known as Lot 4 DP 825704 and Lot 2 DP 601094, 11 – 33 Mumford Street, Port Macquarie indicates that the rezoning of portion of the subject site to support its continued use for educational and proposed new commercial/business/light industrial use purposes can be undertaken so as to not adversely impact upon the local acoustic environment.

It is possible for the future development of the subject site to be undertaken so as to not result in noise related land use conflicts which could not be mitigated through the adoption of best practice noise management principles.

In this regard the acoustic impacts associated with any future development of the subject site should be the subject of development specific noise impact assessment.

Based upon the information contained within this report there are no noise related constraints to the proposed rezoning of portion of the subject site.

8.0 REFERENCES

NSW Environment Protection Authority, *Noise Policy for Industry*, October 2017

9. TERMS AND CONDITIONS

Background Noise Level ..... Noise level determined for planning purposes as the one tenth percentile of the ambient LA90 noise levels.

dB(A) ..... Unit of sound pressure level, modified by the A-weighting network to represent the sensitivity of the human ear.

Leq ..... Equivalent continuous noise level averaged over time on an equivalent energy basis.

L1 ..... Average Peak Noise Level in a measurement period.

L10 ..... Average Maximum Noise Level in a measurement period.

L90 ..... Average Minimum Noise Level in a measurement period.

Lmax ..... Maximum Noise Level in a measurement period.
.
SPL ..... Sound Pressure Level (SPL), the incremental variation of sound pressure from the reference pressure level, 20 μPa, expressed in decibels.

Disclaimer

The findings referred to in this report are those which, in the opinion of the author, are required to meet the requirements for Noise Impact management. It should be noted that the Local Authority having jurisdiction for the area in which the property is located may, within their statutory powers, require different, additional or alternative works/requirements to be carried out other than those referred to in this report.

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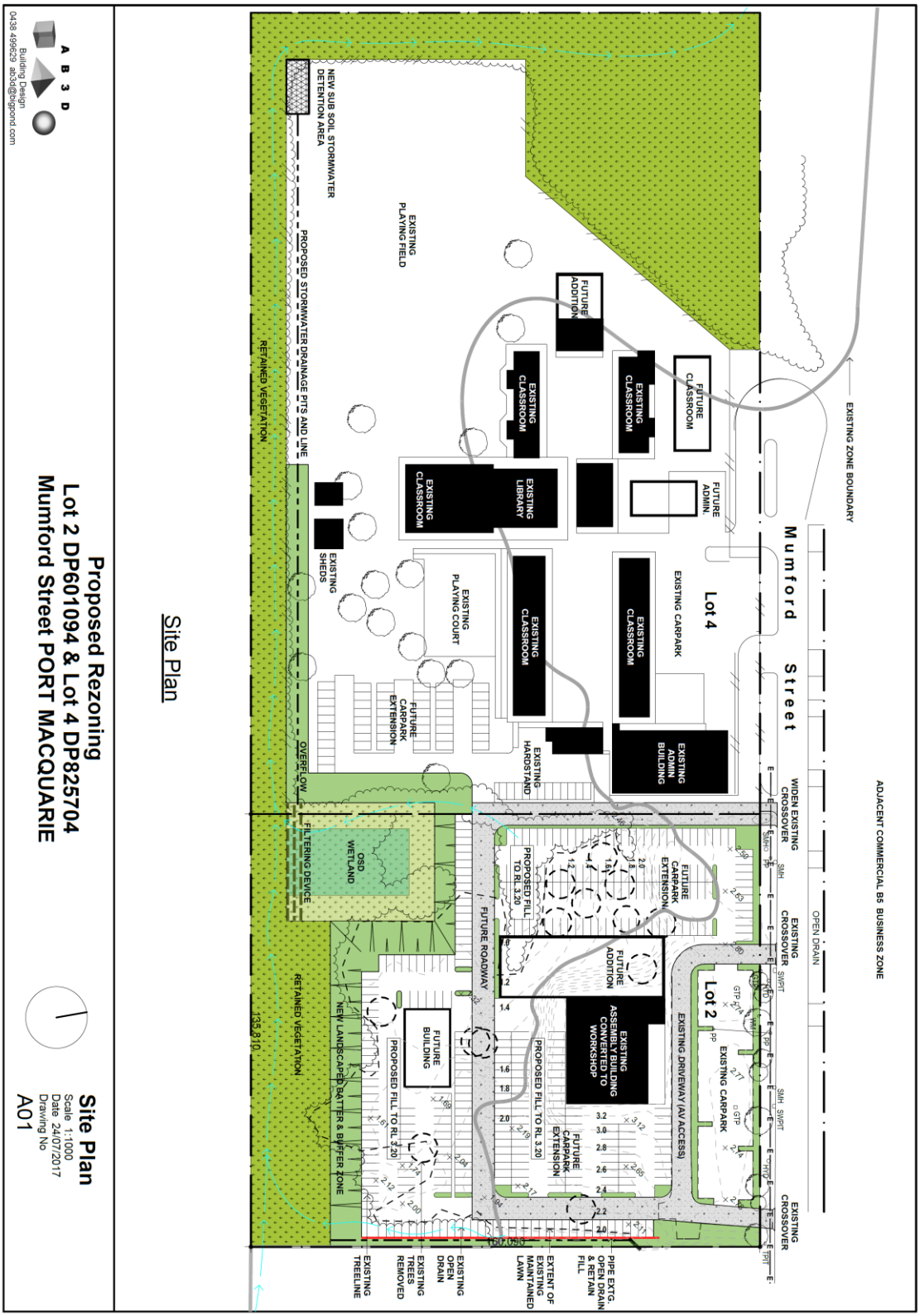
APPENDIX 1
PROPOSED DEVELOPMENT CONCEPT



ALAN TAYLOR & ASSOCIATES

TRAFFIC ASSESSMENT FOR

HASTINGS ASSOCIATION FOR CHRISTIAN EDUCATION (HACE) LTD

&

GANTONS PTY LTD

PROPOSED REZONING OF LOT 2 DP 601094

& LOT 4 DP 825704 MUMFORD STREET, PORT MACQUARIE

IMPACT OF ADDITIONAL TRAFFIC

CREATED BY THE PROPOSED DEVELOPMENT

Prepared by: ***Alan Taylor & Associates***
453 Ocean Drive
Laurieton

CONTENTS

1.0 INTRODUCTION

1.2 Preamble

This Traffic Impact Assessment has been prepared for an application to be made to Port Macquarie Hastings Council for the rezoning of Lot 2 DP 601094 and Lot 4 DP825704.

Lot 2 is presently owned by Gantons Pty Ltd.

Lot 4 is owned by the Hastings Association for Christian Education (HACE) Ltd, occupied by Heritage Christian School which is to continue and which wishes to add additional buildings at some point in the future.

The rezoning is to more accurately reflect the location of the Environment E2 zone, and amend the R1 zone to IN2 for Lot 2 to allow the intended use. These details are provided in more depth by Michelle Love – Planning Consultant.

This traffic study is not an in depth analysis of traffic impacts expected by the future full development of each site. It is a preliminary assessment of current traffic entering and leaving Mumford Street and an appraisal of the effect of additional facilities for the school and proposed workshops.

It is expected that a detailed Traffic Impact Assessment may be required to support a Development application in due course.

1.2 The Study Process

The objective of this report is to assess the traffic impacts of the proposed change of use and development of Lot 2 DP 601094 and the future addition to the Heritage Christian School on:

a) Lot 4, on the intersection of Kemp Street with Hastings River Drive
b) Mumford Street with Kemp Street
c) Mumford Street.

Vehicle traffic counts have been conducted at these intersections between 0700 and 0930 on 12 December 2017, to determine the existing traffic volumes flowing in each direction.

The traffic generation criteria has been determined by reference to the Roads & Maritime Guide to Traffic Generating Developments which includes information on traffic generation for specific development, Austroads Guide to Traffic Management Part 12 and Port Macquarie Hastings Council Development Control Plan.

2.0 EXISTING TRAFFIC CONDITIONS

2.1 Description of the Development Proposed

The proposed development of Lots 2 & 4 in Mumford Street is dependent on the two lots being rezoned from part R1 & E2 to part R1, E2 & IN2.

Lot 2: Workshops

The existing use of Lot 2 is a youth work-group and the proposed new use would be for motor workshops, and car panel repairs and painting. A major part is for the storage of motor vehicles prior to processing for sale. The balance is for staff parking.

The existing building is an "assembly building" with an area of 860m2 approximately. There are no other buildings on the site.

There is an existing carpark of 60 spaces and this is to remain in use.

The current workshop at Miedecke Motors (over the road) will be re-located to and housed in the existing building. This will operate under the Miedecke management. It will contain 15 work bays and employ 10 people.

It is also proposed that two additional buildings could be needed within about 5 years as follows:

- Workshop building 900m^2 area
- Paint shop & detailing 340m^2.

An existing car park has a capacity of 60 vehicles and an additional number of 300 is required for parking of pre-sale vehicles.

To provide for the near term 10 employees 13 car parks will be needed and in the longer term an additional 25 spaces in the workshop and 10 management staff.

2.6 The Heritage Christian School

Lot 4

The impact of traffic on the future development of the Heritage Christian School, Lot 4 DP 825704 was assessed by the school principal on 8 March 2017,as part of a Development Application on behalf of the school. This DA including the "traffic survey" was approved by Council on 5 May 2017.

The conclusion in this study is:

"*The capacity of the school with the existing car parking and infrastructure layout is 444 students. It is independent of the schools approved number of students which is set at 500 under the current approvals, which would still be permissible if sufficient parking is provided. The School is requesting the current approval of 500 students be maintained. The School does agree, however, that any expansion of car parking facilities would need to be assessed were it to exceed the current classroom capacity of 444 students.*

It is the School's view that additional car parking spaces are not required until it exceeds 444 students."

This study includes a count of the present car parking facilities used in the peak period for staff, students and dropping off of students.

At no time were the car parks utilised to capacity.

The provision of the car parking facility at the school is therefore seen to be adequate for its existing and short term needs.

2.3 Existing Road Network

The two sites are on the south side of Mumford Street which is a cul de sac with a turning area at its end.

Mumford Street is readily accessible by left turning vehicles from Hastings River Drive. Right turning vehicles entering Mumford Street have excessive waiting time due to the volume of traffic on Hastings River Drive and should proceed to a roundabout at Clifford Drive some 400m to the east and return to make a left hand turn.

Mumford Street is also readily able to be accessed via The Mainsail and The Boulevarde to Kemp Street, then Mumford Street.

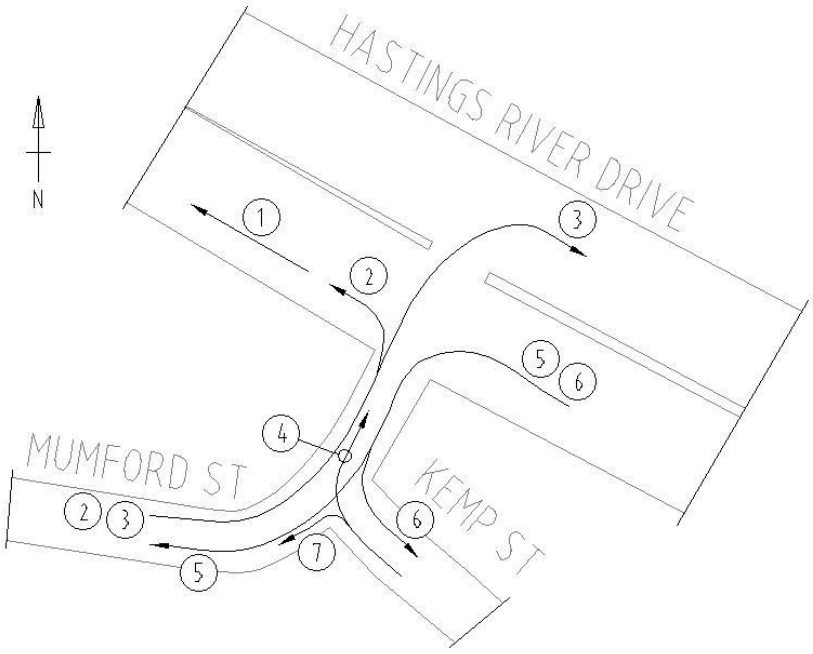
In summary there is a network of streets south of Hastings River Drive that can be utilised to access the sites and vehicles from north of Hastings River Drive should make use of the roundabouts to the east and west of Mumford street for expedience and safety.

2.4 Existing Traffic Volumes

The vehicle counts and movements taken on 12 December 2017 are shown on the sketch and table below.

The count was carried out through a morning peak between 0700 to 0930 hours, which indicates an hourly peak between 0745 & 0845.

EXISTING TRAFFIC VOLUME MUMFORD ST, KEMP ST & HASTINGS RIVER DRIVE INTERSECTION



ROUTE No.	DESCRIPTION	AM PEAK V/HR NUMBER OF VEHICLES
(1)	HASTINGS RIVER DRIVE THROUGH TRAFFIC	620
(2)	MUMFORD ST THEN WEST ON HASTINGS RIVER DRIVE	68
(3)	MUMFORD ST THEN EAST ON HASTINGS RIVER DRIVE	33
(4)	KEMP STREET TO HASTINGS RIVER DRIVE(DIRECTION NOT RECORDED)	63
(5)	HASTINGS RIVER DRIVE TO MUMFORD ST	86
(6)	HASTINGS RIVER DRIVE TO KEMP ST	20
(7)	KEMP ST TO MUMFORD ST	23

3. IMPACTS OF THE PROPOSED DEVELOPMENT

3.1 The Heritage Christian School

As noted in Section 2.2 the drop off zones and temporary and permanent car parks are not utilised to their maximum capacity at present.

The report prepared by the School Principal, attached, indicates that any additional school buildings or facilities is unlikely to have any significant impact on the school or Mumford Street and the surrounds.

3.2 Gantons Pty Ltd (Miedecke) Operations

The proposed buildings are to be utilised for workshop and car storage operations.

The conversion of the existing building to a workshop would result in 860m^2 of working area intended to provide 15 work bays. It is estimated that 20 employees would be needed and 5 management staff.

The proposed future building as shown on the site plan drawing are 900m^2 and 340m^2.

The total number of work bays could then be say 40. The number of staff required is estimated to be 20.

The total parking required on the basis of the above to comply with council's DCP would be 60 (1 per work bay plus 1 per employee).

It must be stated that the above is approximate only as no detailed planning has been undertaken at this stage.

3.3 Pedestrians & Cyclists

No detail study of pedestrians or cyclists was done for the rezoning as it is considered the situation will not change to any significant degree.

Mumford Street roadway pavement is 8m wide and a dead end. Small vehicles predominate the landscape. The road is clear, level and straight.

The southern verge/footpath is 6m wide, with few obstructions, clear and level.

The developments will not increase numbers of pedestrians and cyclists, however the road reserve could readily accommodate additional numbers.

4. CONCLUSION

The existing traffic count for a morning peak hour has been carried out and included in this report to give an indication of traffic numbers and movements.

The peak hour has been determined as from 0745 to 0845. Employees at a mechanical workshop would normally be expected to commence work before 0745 and not affect the morning peak.

The present situation regarding traffic movement seems to work satisfactorily and an additional say 40 vehicles accessing Mumford Street before 0745 (say 0700 – 0745) would not impact the current peak.

The present school has adequate and presumably approved parking facilities which operate satisfactorily. The church site has (presumably) approved parking for 60 vehicles. It is not anticipated that these numbers are likely to increase in the medium term. It is thought the parking now existing and approved would have taken traffic impact into account.

The proposed development on the rezoned land will have minimal impact on the loss of amenity or safety for pedestrians and cyclists. This issue can be addressed in detail at DA stage as the land resource is in place to accommodate any modification or improvement works.

It is further considered this overview should be adequate for processing of the application for rezoning. Further detailed analysis and planning of the future development of the Ganton's site may well reach a conclusion that the three road intersection should be reconstructed to better manage the traffic flow.

APPENDIX A

HERITAGE CHRISTIAN SCHOOL TRAFFIC SURVEY

These are the plans referred to in Development Application No.:

DA2016 - 695

and determined as APPROVED on: 5 May 2017
PORT MACQUARIE-HASTINGS COUNCIL

8 March 2017

Heritage Christian School
33 Mumford Street, Port Macquarie NSW 2444
Traffic Survey: Thursday 23rd February to Friday 3rd March 2017

The survey was conducted during the morning and afternoon 'peak' traffic times, and across the three school parking areas (Front Car Park; Back Car Park; and the 'Kiss and Drop' Zone at the eastern end of the Front Car Park area).

Attached are the records of each of the five days covered. Several key factors were identified:

1. There is a difference between peak traffic flows morning and afternoon. It is clear that the split start times for Primary and High School (High School commence at 8:40am; Primary at 9:00am) in the morning results in lower traffic flow.
2. There was a difference between the 'wet weather' peak traffic flows (particularly for Primary pick up) during the wet weather period from what is experienced normally. This was particularly evident with the 'Kiss and Drop' Zone on a number of occasions not being used, with parents wanting to drop their children in the Front Car Park as it is closer to the covered walkways.
3. The School currently has 270 of its 340 students utilising the 'bus pass' system (96 Primary; 174 High School). Unlike a State school where students are drawn from the immediate area surrounding the school, many within such a distance that they would not qualify for a bus pass, Heritage draws from a wide catchment with students travelling by bus into Port Macquarie. Anecdotally, a greater portion of our students utilise the bus system as a result of the far greater travel distances involved.

General Comments:

The H-Block building project is not designed to lift the capacity of the School beyond its current 500 approved limit. The Block Grant Authority recommends class room sizes ranging from 65sq metres to 75sq metres depending on the grade. Many of our classrooms are 55sq metres, and whilst the room count appears sufficient for 450 students, the floor area is considerably less as assessed by the Block Grant Authority.

The project adds three standard classrooms, but re-allocates two classrooms elsewhere to specialist rooms. In addition, the Visual Arts room that was located in the Woolshed has been relocated in to the new H-Block facility with its original location being converted to a store room for the assembly hall, meaning there is actually no 'net gain' in teaching facilities in the High School.

1. There are currently 30 Students in Year 12. With no plans (or additional specialist facilities) to 'dual stream' Stage 6 (Years 11 and 12) this number will not see any significant variation on the current projected numbers.
2. The School's current attendance rate is approximately 90%. This equates to an average daily attendance of 306 students.

33 Mumford Street
PO Box 5598
Port Macquarie NSW 2444
Phone 02 6583 8277
Fax 02 6583 6640

admin@heritage.nsw.edu.au
www.heritage.nsw.edu.au
Operated by the Hastings Association for Christian Education Ltd.
ABN 47 002 521 404

3. Whilst many parents choose to use the 'Kiss and Drop' Zone, a number of families are choosing to enter the Front Car Park and park for 2-3 minutes to drop their children off. This means we are seeing a consistent 'turnover' in very short term parking taking place both in the morning drop off and afternoon pick up. This was particularly evident during the wet weather experienced during the 'traffic survey'.
4. The School has staggered start times which spreads the load on traffic flow (8:40am High School, 9:00am Primary).
5. Since Miedecke Ford have purchased the Church site next door to the School and provided off-street parking for all of their staff and other vehicles the traffic issues in Mumford Street have eased considerably.
6. The Woolshed project relocated the existing Visual Arts Rooms from the Woolshed across to H-Block. Again, this is a 'curriculum delivery' decision, and does not increase the student capacity of the School.
7. Existing facilities and forward planning, including car parking, have capacity for 200 Primary and 244 High School students. This 'capacity number' does not involve any significant increase in staffing as it is simply maximising numbers in existing classes.

The capacity of the school with the existing car parking and infrastructure layout is 444 students. It is independent of the schools approved number of students which is set at 500 under the current approvals, which would still be permissible if sufficient parking is provided. The School is requesting the current approval of 500 students be maintained. The School does agree, however, that any expansion of car parking facilities would need to be assessed were it to exceed the current classroom capacity of 444 students. It is the School's view that additional car parking spaces are not required until it exceeds 444 students.

Sincerely

Geoff Brisby

Principal

Heritage Christian School

Educating...Nurturing...Empowering

Car Park Survey

Monday, 27 February to Friday, 3 March 2017

		(number of free car spaces)			
DAY/DATE	TIME	FRONT CAR PARK	BACK CAR PARK	KISS & DROP ZONE *	COMMENTS
Mon, 27 Feb	8:40am	18	3	7	1x D/A Park (Front C/P) free
	8:50am	14	2	4	
	9:00am	16	2	5	
	2:50pm	3	2	0 - 7	Showers
	3:00pm	0	2	0 - 9	Showers
	3:10pm	16	3	3	Showers
Tue, 28 Feb	8:40am	22	2	5	1 x D/A Park (Front C/P) & Heavy Showers
	8:50am	21	2	7	Heavy Showers
	9:00am	23	0	6	Heavy Showers & 9:10am = 26 Front C/P
	2:50pm	4	1	2	
	3:00pm	0	1	0	
	3:10pm	17	1	4	Heavy Showers
Wed, 1 Mar	8:40am	20	1	7	Light to Medium Rain
	8:50am	25	1	6	Light to Medium Rain
	9:00am	22	1	7	Light to Medium Rain
	2:50pm	1	2	1	Showers of Rain
	3:00pm	1	1	0	Showers of Rain
	3:10pm	22	2	6	Showers of Rain
Thu, 2 Mar	8:40am	22	1	7	
	8:50am	23	1	7	
	9:00am	17	1	7	
	2:50pm	6	0	0	
	3:00pm	1	1	0	
	3:10pm	17	1	3	1x D/A Park (Front C/P) free
Fri, 3 Mar	8:40am	27	6	7	1x D/A Park (Front C/P) free
	8:50am	26	6	7	
	9:00am	24	6	7	
	2:50pm	12	6	0	
	3:00pm	10	5	0	
	3:10pm	27	7	4	

*** Has highlighted families not using the "Kiss & Drop" Zone effectively**

*** Rain - more families dropping child/ren in main car park and not using the "Kiss & Drop" Zone**

Heritage Christian School

Educating...Nurturing...Equipping

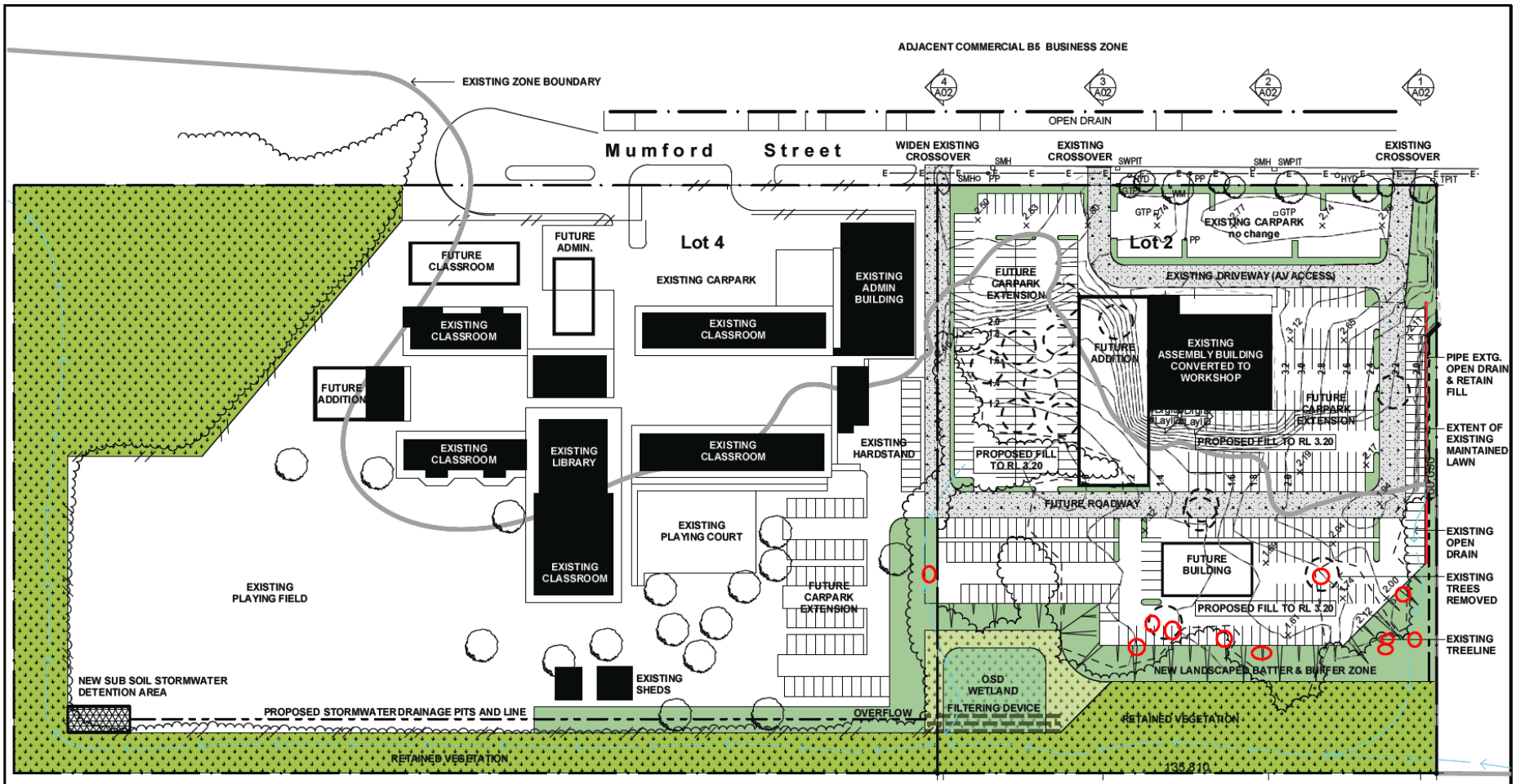
Car Park Survey

Thursday, 23 February to Friday, 24 February 2017

		(number of free car spaces)			
DAY/DATE	TIME	FRONT CAR PARK	BACK CAR PARK	KISS & DROP ZONE	COMMENTS
Thu, 23 Feb	8:40am	16	4	5	
	8:50am	15	2	5	
	9:00am	11	3	6	
	2:50pm	5	2	3	
	3:00pm	2	2	2	
	3:10pm	7	2	6	
Fri, 24 Feb	8:40am	19	4	7	
	8:50am	20	4	4	
	9:00am	19	2	6	
	2:50pm	4	2	5	
	3:00pm	3	2	4	
	3:10pm	16	3	6	

APPENDIX B

PROPOSED REZONING PLAN



Site Plan

A B 3 D
Building Design
0438 499629 ab3d@bigpond.com

Proposed Rezoning
Lot 2 DP601094 & Lot 4 DP825704
Mumford Street PORT MACQUARIE

Site Plan
Scale 1:1000
Date 19/12/2017
Drawing No
A01 A 'A'

ALAN TAYLOR & ASSOCIATES

STORMWATER MANAGEMENT PLAN AND REPORT FOR

HASTINGS ASSOCIATION FOR CHRISTIAN EDUCATION (HACE) LTD

&

GANTONS PTY LTD

PROPOSED REZONING OF LOT 2 DP 601094

& LOT 4 DP 825704 MUMFORD STREET, PORT MACQUARIE

Prepared by: ***Alan Taylor & Associates***
453 Ocean Drive
Laurieton

19 January 2018

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List of figures

STORMWATER MANAGEMENT PLAN

Executive Summary

This Stormwater Management Plan is prepared in support of a rezoning application for Lot 2 DP 601094 & Lot 4 DP 825704 Mumford Street, Port Macquarie.

This Plan discusses issues related to development following the successful re-zoning and addresses those.

1. Receiving catchment will be protected from:
    a. Filling works for any hardstand or carpark by Erosion and Sediment Controls to Council standard.
    b. Long term carpark/hardstand runoff by a Bio Retention Basin.
    c. Roofwater by detention tanks and scour/velocity outlets to Council standard.
    d. Scour and particle loss of batters by concrete kerbs directing run-off to pits.

The sites appear adequately serviced by existing infrastructure, however any infrastructure required, as a result of the development, will be paid for by the developer. Any existing infrastructure upgrades, required as a result of the development, will also be funded by the developer.

Introduction

This Stormwater Management Plan is prepared in support of a rezoning application for Lot 2 DP 601094 & Lot 4 DP 825704 Mumford Street, Port Macquarie.

The site area of both lots is approximately 6 hectares. The land is bordered by Mumford Street to the north, residential properties to the east and south, and low lying land to the west.

The land is flood prone and fill is proposed to provide flood proof use of part of the land. A separate Report by Advisian (formerly Worley Parsons) is submitted as part of the Rezoning Application.

The total catchment being received by the low lying land to the west is approx. 85 hectares.

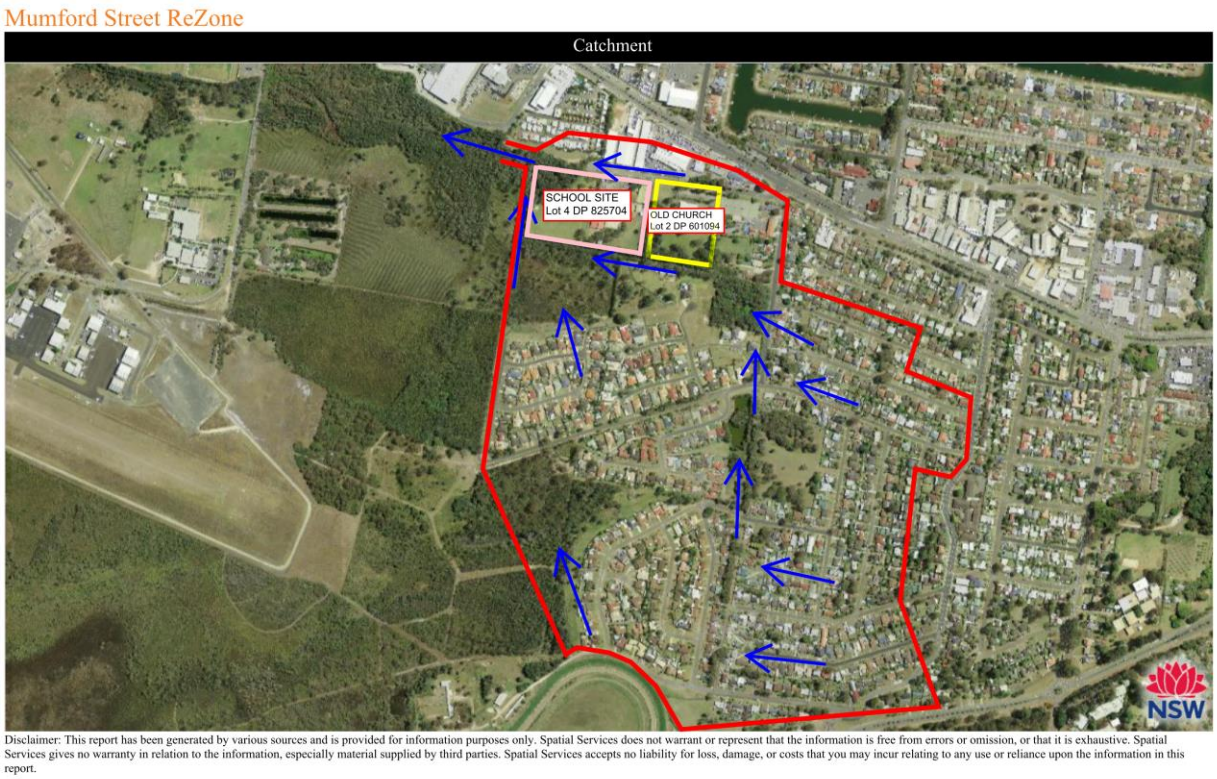

Figure 1: Location and Approximate Catchment Boundary

The above catchment was estimated by the author, using desk-top survey and some site investigation. The value is merely an estimate for the frequent local storm (not regional flood) to give an indication of the proportion of the total catchment that is occupied by the land, the subject of the rezoning. This proportion is about 7 - 10%.

The sites have been assessed in this report for their demand and suitability on servicing and infrastructure requirements and the likelihood that measures can be put in place to preserve the health of the receiving low lying land to the west as a consequence of their final developed form.

To quote Council's Development Control Plan – 2013 (DCP 2013) – *"The purpose … is to achieve a balance between assisting in appropriate development whilst conserving the most important bio-diversity assets and maintaining the ecological processes that sustain them"*

Performance Criteria – PMHC – DCP 2013

In respect and relevant to stormwater management, (and this includes earthworks during the construction phase) Council's DCP 2013 has the following Performance Criteria:

2.3.3.1 - Cut and Fill - Regarding

To ensure that design of any building or structure integrates with the topography of the land to:

- *Minimise the extent of site disturbance caused by excessive cut and fill to the site.*
- *Ensure there is no damage or instability to adjoining properties caused by excavation or filling.*
- *Ensure that there is no adverse alteration to the drainage of adjoining properties.*
- *Ensure the privacy of adjoining dwelling and private open space are protected.*
- *Ensure that adequate stormwater drainage is provide around the perimeter of buildings and that overflow paths are provided.*

2.3.3.2 – Retaining Walls –

To ensure retaining walls are functional, safe and positively contribute to the development and/or the streetscape.

2.3.3.3 - Cut and Fill - Landform Change

To minimise the extent of landform change to render a site suitable for subdivision.
To minimise adverse impact on other land, persons or public infrastructure from landform change.
To preserve levels at site boundaries.
To preserve significant natural watercourses, riparian vegetation, environmental and topographical features.
To preserve the visual character of the landform as viewed from within and outside the land site.
To preserve cross boundary drainage conditions.
To ensure runoff from upstream or upslope land is not adversely impeded.
To ensure there are no adverse geotechnical consequences to the site or to other land.
To ensure there are no adverse consequences to public infrastructure.

2.3.3.4 – Environmental Management Areas and Buffers

To conserve biological diversity and promote ecologically sustainable development.
To prevent the extinction and promote the recovery of threatened species, populations and ecological communities.
To protect the habitat of threatened species, populations and ecological communities.
To eliminate or manage processes that threatens the survival or evolutionary development of threatened species, populations and ecological communities.

To ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed.
To encourage the conservation of threatened species, populations and ecological communities by the adoption of measures involving co-operative management.
To mitigate against Key Threatening Process to Threatened Species and their Habitat.

2.3.3.5 - – *Environmental Management Areas and Buffers*

Environmental Areas are to be appropriately protected and managed.

2.3.3.6 – Waterways – Protect and Maintain

a) *Water quality within waterways;*
b) *Stability of the bed and banks of waterways;*
c) *Aquatic and riparian habitats, and*
d) *Ecological process within the waterways and riparian areas.*

Implementation Strategy - Proposed

The following outlines the strategy by the development to successfully implement the intent of Council's DCP 2013.

2.3.3.1 & 2.3.3.3: – Cut and Fill

Lot 2 proposes some 5,000 m3 of structural fill. This fill shape is finalised and identified in the flood report by Advisian to accompany the Rezoning application.

Risk of contamination of receiving land is greatest at periods of construction/placement. Any future DA submitted to Council, and Council's conditions of consent will cover the Erosion and Sediment Control (ESC) actions required during the fill placement work. At the least, the work will be in accordance with Landcom's "Managing Urban Stormwater: Soils and Construction" publication – (the Blue Book). These construction aspects are well documented, the local contractors have a good understanding of their importance and Council appears adequately resourced to enforce the requirements during construction.

At the completion of construction the batters would be maintained in a grassed, (or other surface) erosion stable state. A concrete kerb will have been placed at the top of all batters to catch and control stormwater into pits so that sheet flow is avoided. (Refer to Figure 5 Stormwater Management Site Plan).

During the life of the site, after construction, the batters will be maintained in a scour free state.

To manage kerb overflow in extreme storm events, the flow can be directed by overflow by-pass structures that are scour protected (grassed, rip-rap, matting etc, - depending on volume and velocities) to facilitate an extreme storm without sediment relocation. Council's ASD 600 series of details provide solutions to the issue.

Implementation Strategy – Proposed (Ctd)

Regional floods will immerse the total area with back-up floodwater. This issue is addressed in the Advisian Report, as part of this re-zoning application.

Gross pollutant traps will be incorporated in either the pit structures, or within the Bio Retention Basin. The following two examples (Figure's 2 & 3) of Bio Retention Basins show Gross Traps within the structure.

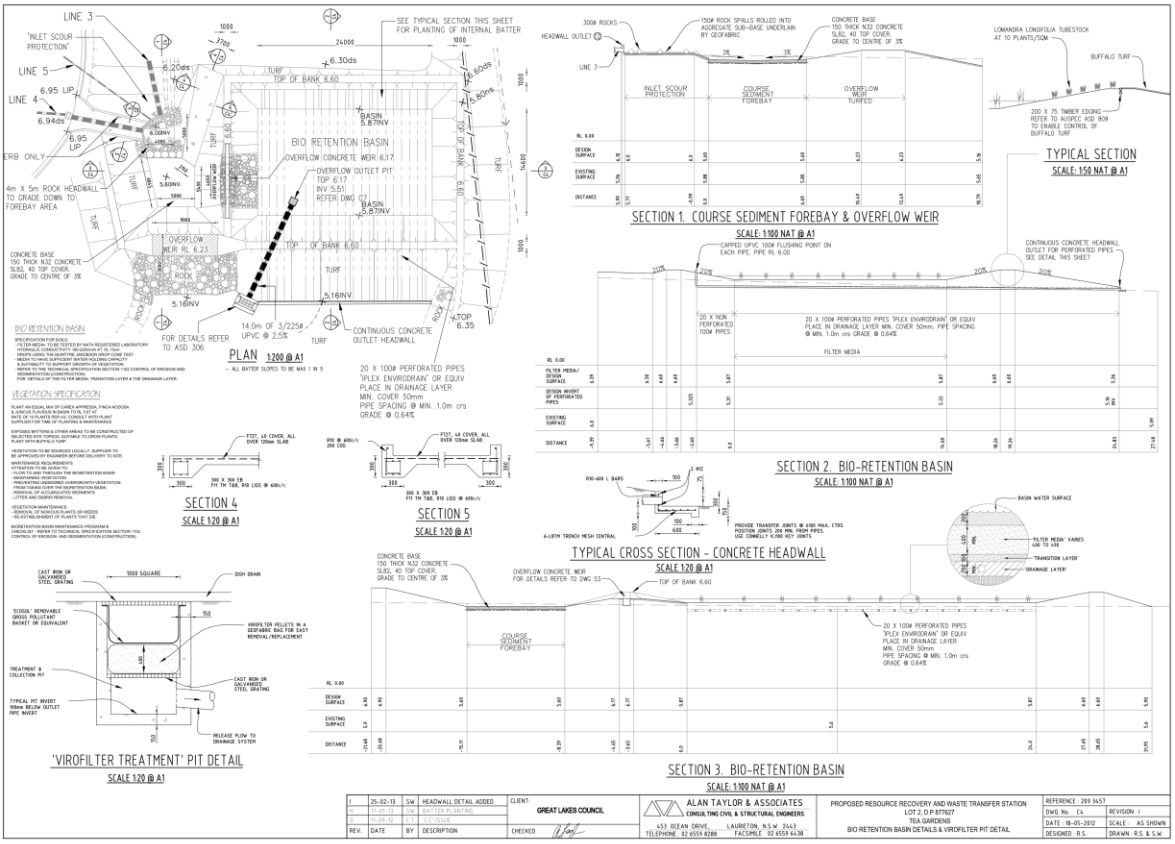

Figure 2: Bio Basin with Gross Pollution Trap

Note the above Basin has a "Course Forebay Area" for capture of Gross pollutants. Further, a "ViroFilter" to capture heavy metals and stabilse pH values. This structure is for a Regional Waste Transfer Station, and also deals with leachate. It's basin area is about 350m², 60% of the size of the area quarantined for such a structure in Mumford Street, the subject of this re-zoning.

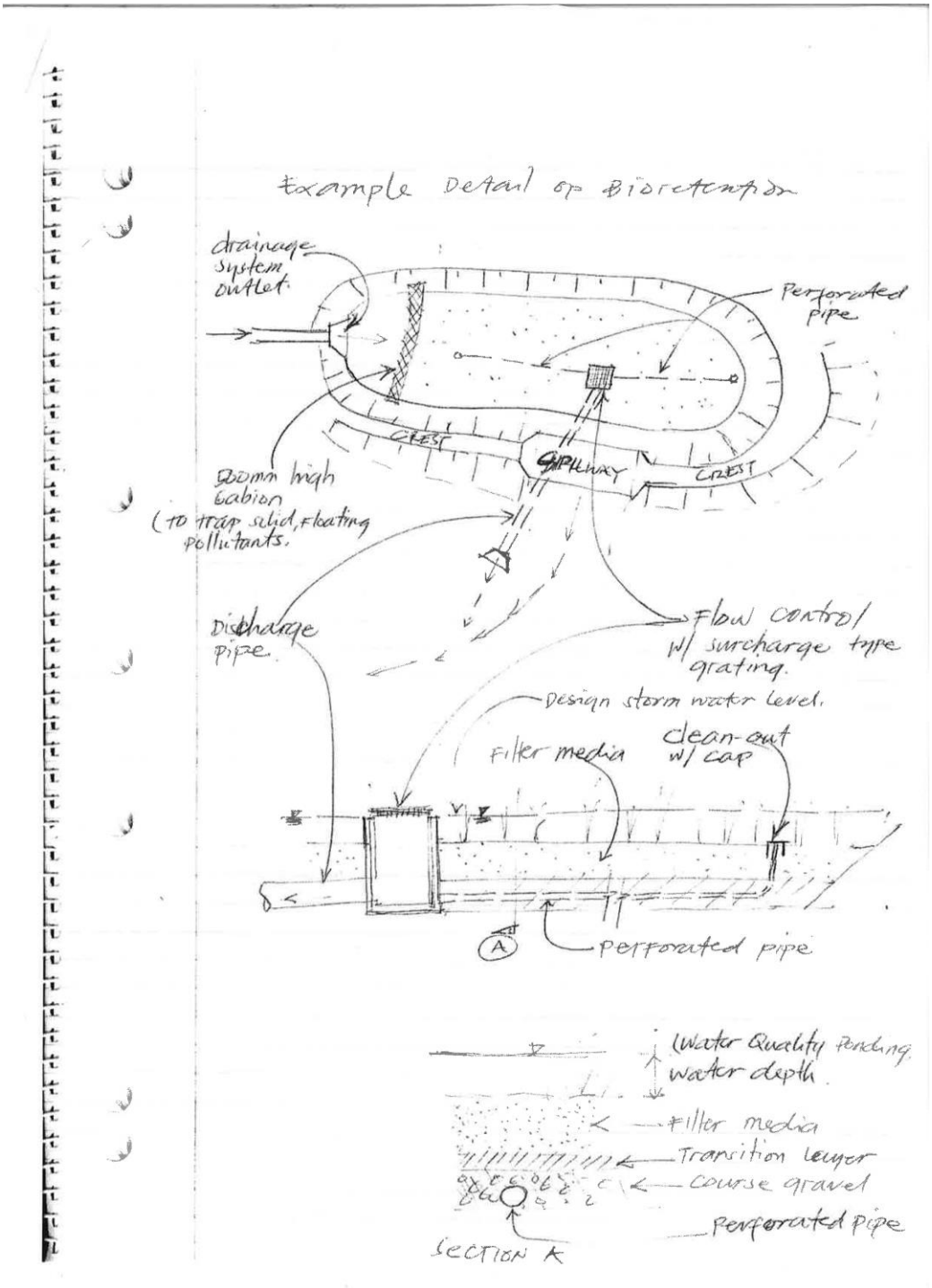

Figure 3: Bio Basin with Gross Pollution Trap

The above hand sketch (one of ours) shows a Bio Basin with adjoining/included GPT. These traps are effective as they are readily recognized/observed when cleaning is needed.

Lot 4 (the school) has some minor earthworks. However, any future DA to council for those works will carry with it actions required to satisfy ESC performance standards. The fill for the proposed carpark at the south west corner will have similar requirements and will be covered in the Council DA process. The proposed Bio Basin will receive stormwater from this carpark.

2.3.3.2 Retaining walls

The flood study by Advisian indicates the possibility of a retaining wall at the south east corner of Lot 2 – the old church site. (Refer to Advisian Report).

The wall, if constructed, will be about 0.8 – 1.0m high. It will not be part of the streetscape, and will overlook retained bushland and low lying land. The reason for it's inclusion is to open out a waterway to reduce backflow velocities, to match (or retain) Council's limits.

Construction material will be permanent, as the wall, if used, is to restrain fill for the site. A future DA to Council can satisfy these requirements.

2.3.3.4 & 2.3.3.5 Environmental Buffers are discussed in the Environmental Report of DarkHeart/Jason Berrigan to accompany the Rezoning Application, and will not be discussed here.

2.3.3.6 – Waterways

Lot 2 – Old Church Site - Gantons Pty Ltd

The site can be classified as follows:

1. Green field or natural bush
2. Carpark or hardstand
3. Building areas

We submit:

1. Run-off from greenfield or bushland will travel unhindered. There will be no attempt to reduce (detention structures) or re-direct (channels etc) discharge.

2. Run-off from the existing carpark will remain unchanged.

   Run-off from the proposed carpark and hardstand (storage) areas will be directed by concrete kerbs into kerb inlet pits. The concrete kerb will border all carparks/hardstand against the top of batter (or retaining wall), thus protecting the batter from receiving overland flow.

Implementation Strategy – Proposed (Ctd)

The run-off is controlled to a pit, then either to a detention structure underground to maintain pre-development discharge, or to the Bio-Retention Basin (Bio Basin). This Bio basin treats the water through a filtration media and can provide stormflow detention. (Refer Figure 4). Gross pollutants will be trapped in pits or as part of the Bio-retention structure. (These traps are seen as part of the Bio Retention Basin in Figures 2 & 3). The overall management is seen in Figure 5.

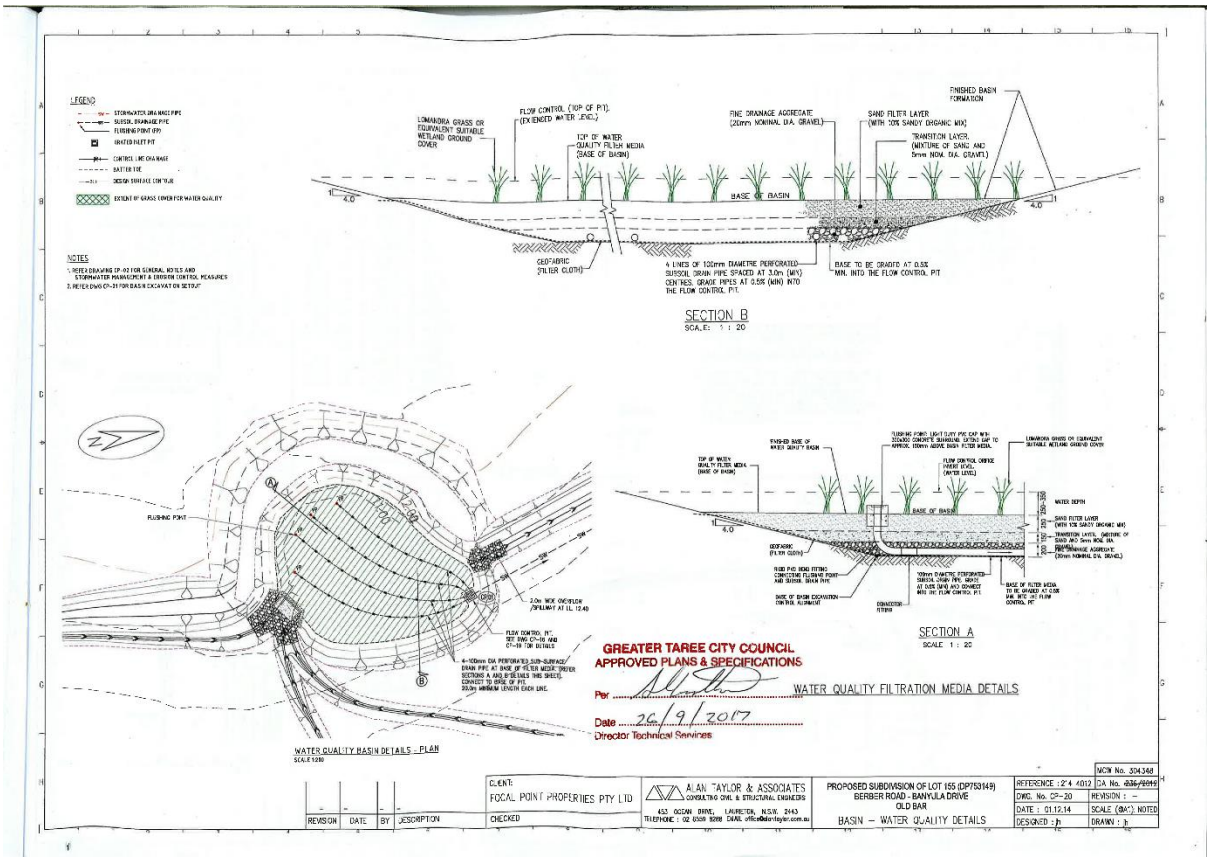

Figure 4: Bio Basin for 3 Ha Residential Catchment

The basin in the above example treats a residential catchment of some 3 hectares, whereas the hardstand site catchment for Lot 2 (and the proposed carpark for Lot 4) is approximately 1.5 hectares. (Refer Stormwater Management Site Plan – Figure 5) The area set aside for the Bio-retention basin on this re-zoning application is about 600m^2. The typical basin shown above is about 350m^2.

In summary, the Bio-retention basin area proposed is nearly double in size to a recently designed basin (see Figure 4), and caters for half the catchment. It is our opinion that the area proposed/set aside for the basin on Lot 2 & Lot 4 will be adequate for the developments purposes and can be final designed at the DA or CC stage for any proposed development.

After the basin, the flow will then slowly make its way via a broad crested weir to the vegetation corridor at the south boundary of the lots. From there, the water flows in an existing natural sandy channel to the west towards low lying Crown land.

The basin is contained on both lots, Lot 2 & Lot 4, as they both have proposed works that require its services. Lot 4 (the school) will be smaller scale, and as such, less of the Bio Basin is positioned within its boundary. A maintenance agreement will be established between the parties for the ongoing performance.

3. Buildings – roof water will be collected in above-ground water detention tanks. (Refer Stormwater Management Plan – Figure 5) The discharge is then reduced to pre-development flows before the water leaves the building footprint.

   It can then be decided at DA stage whether the water is run through the bio-retention basin or, after velocities are reduced by a scour protection basin or weir, it makes its way to the south boundary. The south boundary has a well defined sand based overland flow channel making its way to the west, to join low lying Crown land.

   This overland flow path will have “retained vegetation“ which is dealt with in more detail by the environmental report of Darkheart. (Berrigan). Stormwater has been flowing in this channel for many years, draining both these sites and the subdivision to the south.

Lot 4 – Heritage Christian School

The site can be classified as follows:

1. Green field or natural bush
2. Carpark or hardstand
3. Building areas

We submit:

1. Run-off from greenfield or bushland will travel unhindered. There will be no attempt to reduce (detention structures) or re-direct (channels etc) discharge.

2. Runoff from the existing carparks will be unchanged.

   The proposed carpark will be dealt with in the same way as Lot 2’s carpark/storage hardstand, in collaboration with Lot 2. The Bio-retention basin will overlap both sites and a maintenance agreement established between the parties.

Implementation Strategy – Proposed (Ctd)

3. Buildings. The building work for Lot 4 is a combination of extensions and new structures. To reduce peak discharge, above ground water detention tanks can be installed at each building location. (Refer Stormwater Management Plan – Figure 5) The discharge is then reduced before the water leaves the building footprint.

   Scour and velocity protection will be provided at all roof downpipe/drainage outlets, with a rubble outlet adequate in size to disperse flow and reduce velocity to ensure the receiving bushland is not damaged. Council's ASD 600 series details provide guidance on suitable structures.

   The existing roofwater outlets discharge into the bush, penetrating the bush by some 3-5m. This practice may be followed in the future DA proposal, or a scour/velocity structure may be established in the cleared "parkland" area before broad overland flow is resumed to the bush to the west.

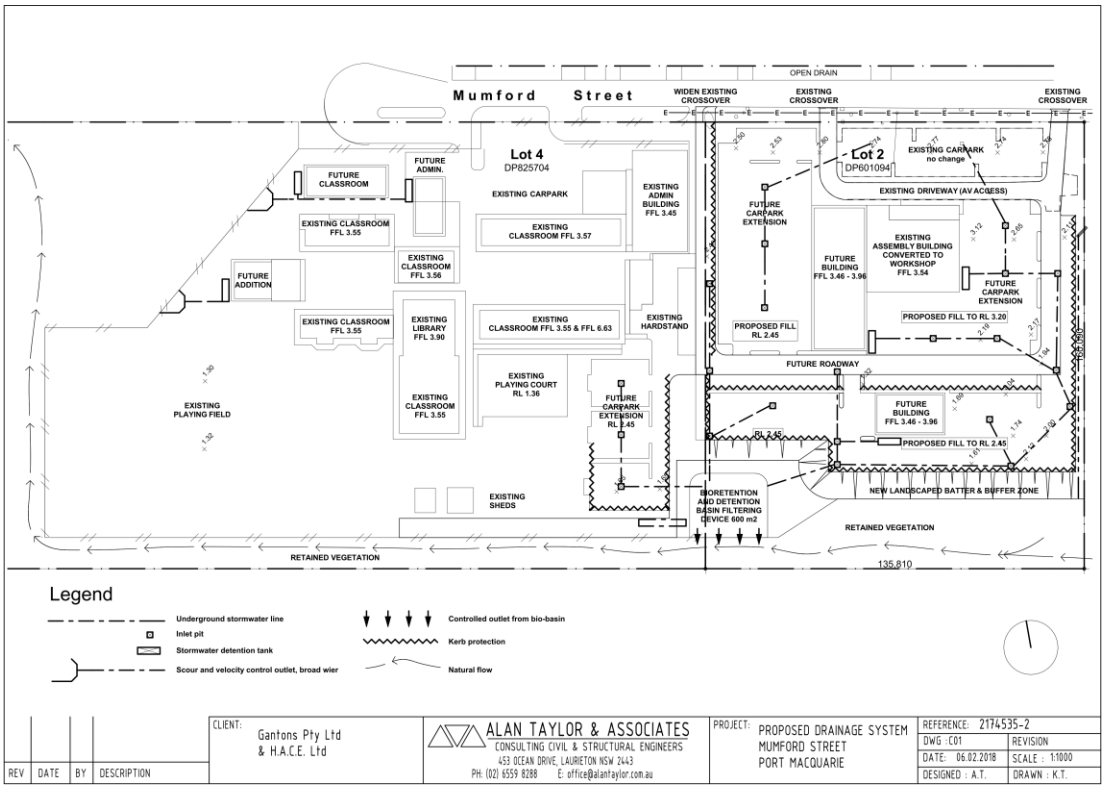

Figure 5: Stormwater Management Site Plan

No other environmental protection measures are proposed.

Servicing and Infrastructure

The intent of the future site applications remains clear.

Both properties are currently serviced by electricity, roads, sewer, water reticulation and data. Any future development, the subject of a Development Application, will recognize and agree with the need for (if required) the amplification of any infrastructure at the developer's cost. Also, contributions to Council for the upgrade of infrastructure due to the increased demands of the development will be addressed.

We trust the information in this report meets your requirements. Should you have any questions, please contact Alan Taylor at the office.

Yours faithfully
Alan Taylor & Associates

Alan Taylor

Birpai Local Aboriginal Land Council

Aboriginal Cultural Heritage Assessment

Lot 4 DP 825704 & Lot 2 DP 601094

Mumford Street

Port Macquarie

Prepared by

Birpai Local Aboriginal Land Council

In response to a

Rezoning Proposal

for East Coast Screw Piers

PO Box 876 Port Macquarie NSW 2444 Tel: 02 65849066 Email: birpailalc@midcoast.com.au

Table of Contents

1. Introduction

The subject land is located on Mumford Street, a Cul-de-sac off Hastings River Drive, approximately 3km west of the CBD. The land is currently used as a school and adjoins commercial land to the North.

The proposal is to realign the zone boundary that currently goes through the property. The proposal will also include some earthworks and placing of fill.

The objectives of the Cultural Heritage Assessment are:

- To identify whether the subject land contains objects or is a place of importance or a part of the wider cultural landscape pertaining to local aboriginal people and the area.

- To determine if any potential harm on identified Aboriginal Cultural heritage would be likely to occur from the proposed rezoning and future development of the southern fringe of the land for residential uses.

- To determine the significance of potential harm to any identified Aboriginal objects, places or wider cultural heritage that may be associated with the subject land, should that be the case.

This assessment has been prepared for East Coast Screw Piers for their proposed zoning realignment and earthworks of Lot 4 DP 825704 and Lot 2 DP 601094. It is not to be used for any other purpose.

2. Investigator and Contributors

The Site Investigations have been undertaken by:

Mr. Jason Holten, Sites Officer of the Birpai Local Aboriginal Land Council

The site investigator has significant local experience in carrying out site survey investigations and regularly undertakes Sites works in the Port Macquarie area. Mr. Holten has a wealth of knowledge of Aboriginal Culture and Heritage in the local area and is a descendant of the Birpai People.

Jason was accompanied by Mr. Alan Taylor, Director of East Coast Screw Piers on the inspection on the 23 November 2017

3. Previous Archaeological work

Search of the Aboriginal Heritage Information Management System (AHIMS) – Basic search conducted 16 January 2018 Lot 4, DP825704 with a buffer of 50 m.

- Basic search identified no Aboriginal Places and no Aboriginal Site in the vicinity of the 50 m buffer.

- Cultural Heritage records held with Birpai Land Council include:

  The Birpai Local Aboriginal Land Council holds no records of any items of cultural significance in the vicinity of the land in question.

Of the above resources, references to this area and the Birpai Aboriginal People were the primary search focus. Information relevant to the site or its immediate surrounds was identified as follows:

There are no known aboriginal cultural heritage sites within the subject land, including the area of the proposed zoning realignment and earthworks.

4. Landscape context

General Coastal character & predictive model

The results of reviews of archaeological investigations to date indicate that rocky shore, sandy beach, estuarine and hinterland environments were typically utilised by Aboriginal groups. The densest and most diverse archaeological remains are generally found along the coast where food resources were richer. Reliance on estuarine and adjacent hinterland areas was probably sporadic, possibly using freshwater swamps as a primary resource.

A large proportion of recorded sites indicate they have been found on flat terrain, predominantly in coastal heath, along estuarine stream banks, some woodland and dry sclerophyll eucalypt forest and in subtropical rainforest. Less commonly, sites are also found in undulating to hilly terrain either in dry sclerophyll eucalypt forest. Even less so in steep rugged terrain.

There is a greater likelihood of the existence and discovery of Aboriginal sites into the coastal plain. Particularly the crests and basal slopes of low spurlines that extend into and are situated adjacent to flood prone valley floors.

Stone artefacts may occur as open artefact scatters and isolated finds. Midden deposits may occur subsurface on former beach ridges and other alluvial or colluvial deposits which fringe valley floors. Including the former shoreline of the marine embayment and subsequent estuary which formed following the last sea level rise at around 6000 years BP.

Open artefact scatters (or campsites) are considered more likely to occur on relatively flat terrain, well-drained and not too distant from sources of freshwater or along the crests of low ridgelines.

Scarred trees may occur wherever old-growth trees remain. Potential locations include road reserves, remnant riparian vegetation on farmlands, and isolated trees within the state forests.

Prehistoric burial sites are most likely to be found in locally elevated landforms with a relatively deep profile of soft sediments of in the deposits of midden sites.

Local Aboriginal History

Before European settlement, Aboriginal people roamed the area and used the land to hunt and gather food. Aboriginal ties to the land can be identified with the significant sites in and around the Port Macquarie area with some sites recorded, including burial sites at the Town Green in the CBD.

Location of the site

The subject land is located approximately 3km west of the Port Macquarie CBD, ust off Hastings River Drive and adjoining commercial developments to the north.

On site, is predominantly developed as a school with minimal vegetation.

5. Site Survey & Results

Sampling Strategy

The sampling strategy is to attend the property by vehicle and undertake intensive walking inspection of the part of the site likely to be impacted upon by the proposed rezoning and earthworks.

The site survey was undertaken on 23 November 2017 by Mr Jason Holten, Senior Site Officer of Birpai Local Aboriginal Land Council.

Survey Coverage

On 23 November 2017 exposure and visibility across the site is described as generally good.

No text excavations were considered necessary and were not undertaken.

6. Results of Survey of 27 November 2017

After a lot of walking over the proposed subdivision area the senior site officer, Mr Holten noted that there had been a lot of disturbance on the Lot over the years, with the site being used as a school in a commercial area and the removal of trees and stumps from the site and movement of topsoil. Any sign of Aboriginal activity in the area is believed to have been lost or destroyed by early white settlers to the area or more recent development in the vicinity.

Mr Holten, Senior Sites Officer who attended the property and undertook the survey concluded that no evidence of Aboriginal activity that would be impacted by the proposal was located on either Lot 2 DP 601094 or Lot 4 DP 82570411.

Analysis & Discussion

Consultation with local Aboriginal peoples with a relationship to the area revealed no knowledge of occupation or cultural heritage associations with the subject land.

No site recording is required as there are no material traces, evidence or expressed knowledge of Aboriginal land use of the site.

The proposed rezoning and earthworks is not considered likely to impact upon or have any significance for the local Aboriginal community and their cultural heritage.

The assessing site officer can see no reason why the proposal cannot continue.

Recommendation

Based on the Site Inspection and other investigation, there is no reason from an Aboriginal Cultural and Heritage perspective that this rezoning cannot proceed. However during any earthworks, in the event of any items of Aboriginal significance being found on the site, work is to cease and a Sites Officer from the Birpai Local Aboriginal Land Council is to be engaged to determine how best to proceed.

Signed

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Mr David Carroll

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Proposed Rezoning and Development Lot 2 DP 601094 & Lot 4 DP 825704 Mumford Street, Port Macquarie

Flood Impact and Risk Assessment

9th February 2018

Level 17, 141 Walker St
North Sydney NSW 2060
Australia

rp301015-03852rg_crt180209_FIA_FRA Mumford Street Port Macquarie.docx

Revision B

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Project: Proposed rezoning And Development of Lot 2 DP 601094 & Lot 4 DP 825704, Mumford Street, Port Macquarie
Flood Impact & Risk Assessment

Rev	Description	Author	Review	Advisian Approval	Date
A	**Draft Report (*Issued for Internal Review*)**	RG	CRT		8/02/2018
B	**Final Report (*Issued for DA Submission*)**	RG	CRT	Chris Thomas	9/02/2018

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Appendices

1 INTRODUCTION

East Coast Screw Piers plans to rezone and develop Lot 2 DP 601094 and Lot 4 DP 825704 at Mumford Street, Port Macquarie. Lot 2 is currently operated as a Christian Outreach Centre while Lot 4 is the Heritage Christian School. The location of the site is shown in **Figure 1**.

The proposal will see the capacity of the Heritage Christian School (*Lot 4*) increase through the construction of additional buildings to function as classrooms and for administration and additional car parking facilities. The function of Lot 2 is proposed to change from the Christian Outreach Centre to an automotive workshop and detailing business. The change will involve construction of additional buildings to act as workshops and spray facilities, as well as spaces for parking and vehicle storage. A bio-retention basin is proposed on Lot 2 to treat runoff from the development.

Filling is proposed across parts of both lots in order to meet minimum surface and floor level requirements outlined in the *Port Macquarie Hastings Council Flood Policy* (*2015*). Detailed plans for the proposed development have been prepared by AB3D Building Design and are included as **Appendix A**.

During significant flooding along the Hastings River there is potential for floodwaters to inundate parts of the site and the surrounding floodplain. The extent of flooding has been previously investigated in detail as part of a number of studies including:

- '*Hastings River Flood Study*' (*2006*), undertaken by Patterson Britton & Partners (*since acquired by WorleyParsons*);
- the '*Hastings River Floodplain Risk Management Study*' (*2012*), undertaken by WorleyParsons; and,
- the '*Hastings River Flood Study – Climate Change Assessment*' (*in draft, 2017*) undertaken by Advisian (*part of the WorleyParsons Group*).

All three studies were undertaken for Port Macquarie-Hastings Council.

There is potential for the proposed development of the site to have an impact on local flood characteristics including peak flood levels and flow velocities. Any filling as part of the proposed development will remove a small portion of the flood storage of the Hastings River floodplain. Therefore, there is a need to assess the potential impact of the proposed development on flooding.

This report outlines the findings from Advisians' investigation of flooding at the site including an assessment of the potential impact that the proposed development may have on local flood characteristics. The report also documents potential mechanisms for evacuating the site during major floods including details of available warning times and preferred evacuation routes. This includes a comparison against the requirements of the '*Port Macquarie-Hastings Council Flood Policy*' (*2015*) and the '*Port Macquarie-Hastings Local Flood Plan*' (*2015*).

FIGURE 1

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301015-03852 – Mumford St, Port Macquarie
fg301015-03852rg180207_Fig 1 - Location.doc

LOCATION OF THE SUBJECT SITE

2 ASSESSMENT OF LOCAL FLOOD BEHAVIOUR

2.1 Background

Hastings Council commissioned WorleyParsons (*incorporating the former Patterson Britton and Partners*) to develop a 2-Dimensional flood model for the Hastings River floodplain as part of work that was undertaken to prepare the *'Hastings River Flood Study'* (*Issue No.3, August 2006*) and the '*Hastings River Floodplain Risk Management Study*' (*2012*).

As part of the Floodplain Risk Management Study, WorleyParsons undertook investigations for Council to assess the impact of sea level rise and increased rainfall intensities associated with climate change on design 100 year Average Recurrence Interval (*ARI*) flood levels. The findings from these investigations are documented in Chapter 12 of the Hastings Floodplain Risk Management Study and have been used to define Year 2050 and Year 2100 design 100 year ARI flood levels for the lower Hastings River.

Both the Flood Study and Floodplain Risk Management Study describe the flood characteristics of the river system for existing topographic and development conditions. Both studies were based on the results of simulations undertaken using a detailed two-dimensional hydrodynamic model. The model was developed from hydrographic survey data (river cross-sections) and detailed topographic data.

The computer model was used to simulate a range of historical and design floods such as the 100 year ARI flood. The results from the modelling were used to define flood characteristics along the Hastings River, and specifically to establish peak flood levels and flow velocities.

The computer model was created using the RMA suite of software. RMA is a finite element modelling software that employs a variable grid geometry in which elements with irregular and curved boundaries can be modified as required without the need for regeneration of the entire grid.

Therefore, any proposed development on the floodplain can be incorporated into the existing model and the associated impacts can be quantified by comparing model results from simulations of "pre-development" and "post-development" scenarios.

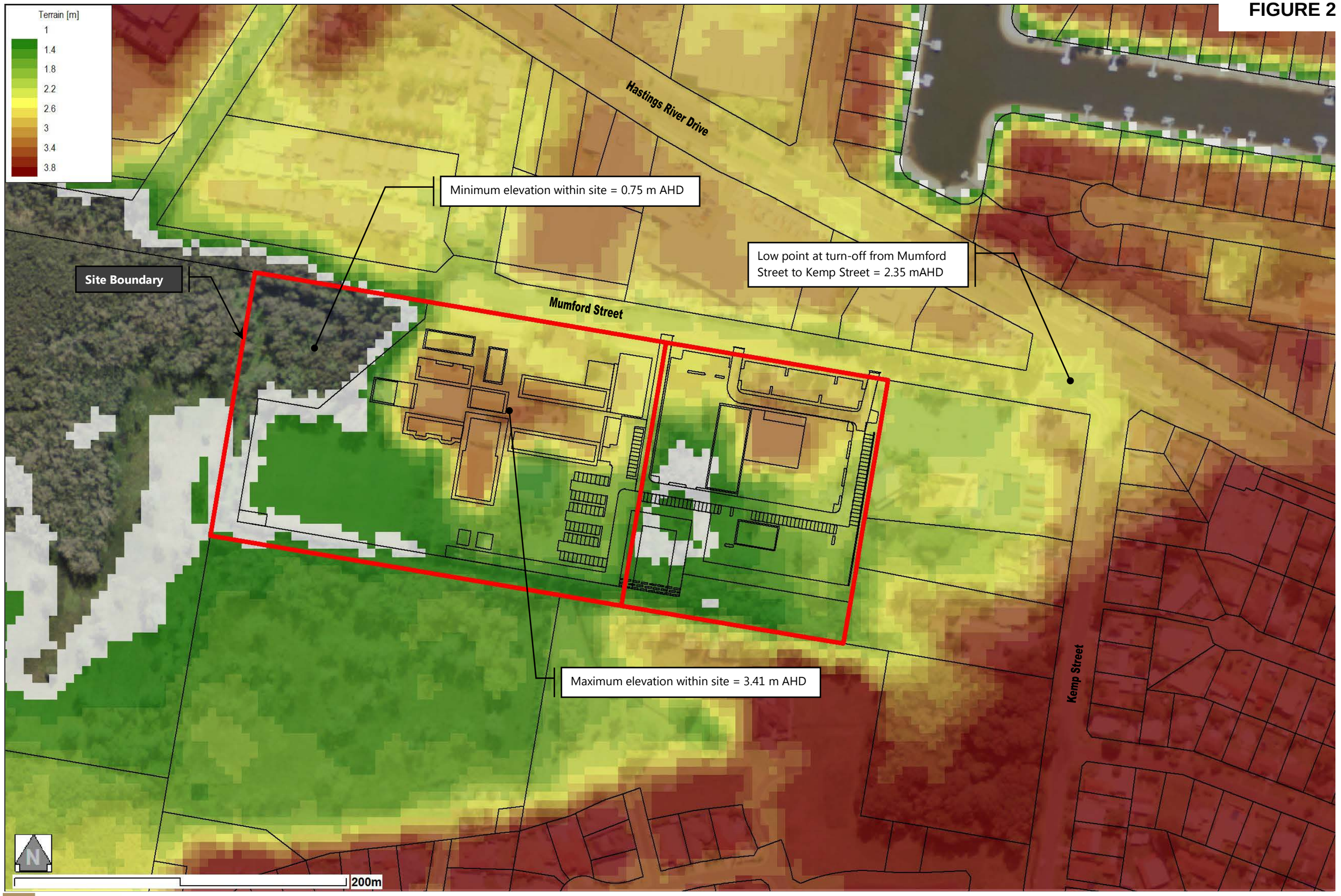
The RMA-2 model underwent upgrades recently as part of work completed by Advisian for Council as part of a detailed climate change impact assessment. The climate change assessment was to update the preliminary climate change assessment that had been completed as part of the FRMS (*2012*). The results of the climate change assessment are in draft at the time of preparing this report.

2.2 Description of the Development Site

Figure 1 shows that the site is located along the southern floodplain of the Hastings River just upstream of where the river turns to flow to the north and traverses around Settlement Point. The site is located on Mumford Street, to the west of Kemp Street and about 80-100 metres south of Hastings River Drive.

The existing topography in the vicinity of the site (refer **Figure 2**) is based on Light Detection and Ranging (*LiDAR*) survey obtained via the Geoscience Australia ELVIS portal. The LiDAR information is considered to provide the most reliable contemporary description of the variation in topography across the Port Macquarie-Hastings Council LGA.

FIGURE 2



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301015-03852 – Mumford Street, Port Macquarie
fg301015-03852rg180207_Fig 2 - Existing Topography.doc

TOPOGRAPHY IN THE VICINITY OF SUBJECT SITE AT MUMFORD STREET, PORT MACQUARIE

The elevations presented in **Figure 2** indicate that the topography across the site ranges between 0.75 mAHD and 3.41 mAHD. Elevations are shown to be typically lower in the western and southern areas of the site.

2.3 Existing Flood Characteristics at the Development Site

2.3.1 Hydraulic Modelling

The two-dimensional RMA-2 hydrodynamic model developed as part of the '*Lower Hastings River Flood Study*' (*2006*) and recently updated as part of the '*Hastings River Flood Study – Climate Change Assessment*' (*in draft, 2017*) was used to define flood characteristics at the development site.

In order to assess flooding on a "local scale" (*i.e., in the vicinity of Lot 2 and Lot 4*), the RMA-2 model that was developed for Council was modified and refined to incorporate additional network detail in the vicinity of the site. This involved modifying the network to incorporate additional elements and nodes to better represent the local topography.

2.3.2 Hydraulic Modelling Results

The refined RMA-2 hydrodynamic model was used to simulate the 1% Annual Exceedance Probability (*AEP*) flood for existing topographic conditions. The results of the modelling are presented in the following.

Peak Flood Levels and Depths

The results of the hydrodynamic modelling indicate that the peak 1% AEP flood level across the development site is predicted to be 3.13 mAHD (*refer* **Figure 3**). As discussed in **Section 2.2**, the topography within the extent of proposed development generally varies between 0.75 mAHD and 3.41 mAHD. Accordingly, the majority of the site is predicted to be inundated at the peak of the 1% AEP flood. Only the areas near the existing buildings on both lots remain flood free.

Peak floodwater depths and velocities were extracted from the results of the modelling for the 1% AEP flood and are presented in **Figure 4**.

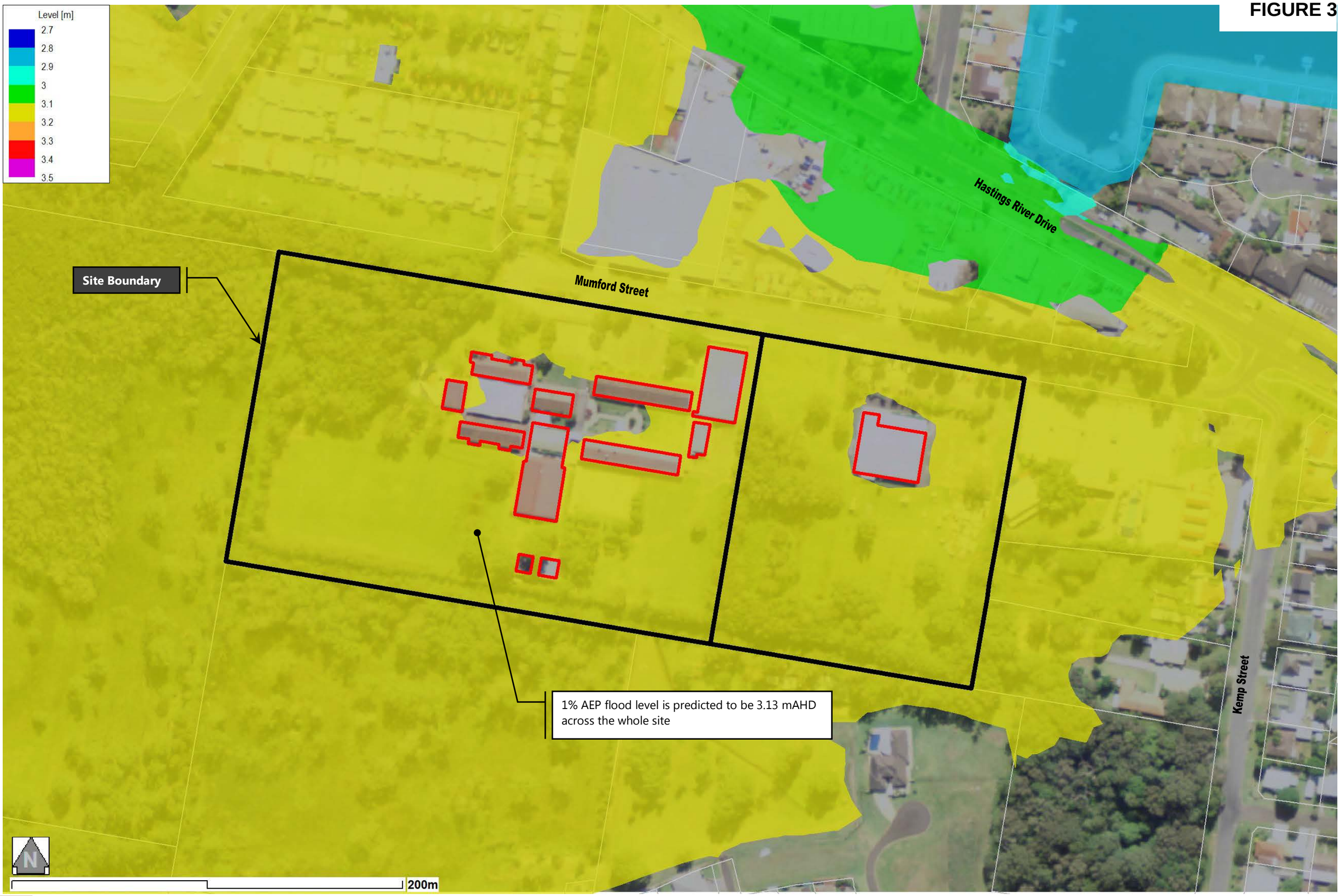
Figure 4 indicates that floodwater depths range from a maximum of 2.38 metres at the western boundary of the site, to zero as the terrain grades upwards towards the buildings in the centre of the site.

Peak Flow Velocities

Peak flow velocities for the 1% AEP flood event were also extracted from the results of the modelling and are presented in **Figure 4** as velocity vectors. The velocity vectors give an indication of the magnitude and direction of flow at the peak of the flood.

Peak flow velocities across the site are typically below 0.10 m/s. This is expected given the site is categorised as flood storage and flood fringe indicating there is minimal passage of floodwaters through the site. A maximum velocity of up to 0.19 m/s is predicted to occur within the site in an area immediately to the north of the school classrooms on Lot 4 near the Mumford Street boundary (*refer* **Figure 4**).

FIGURE 3



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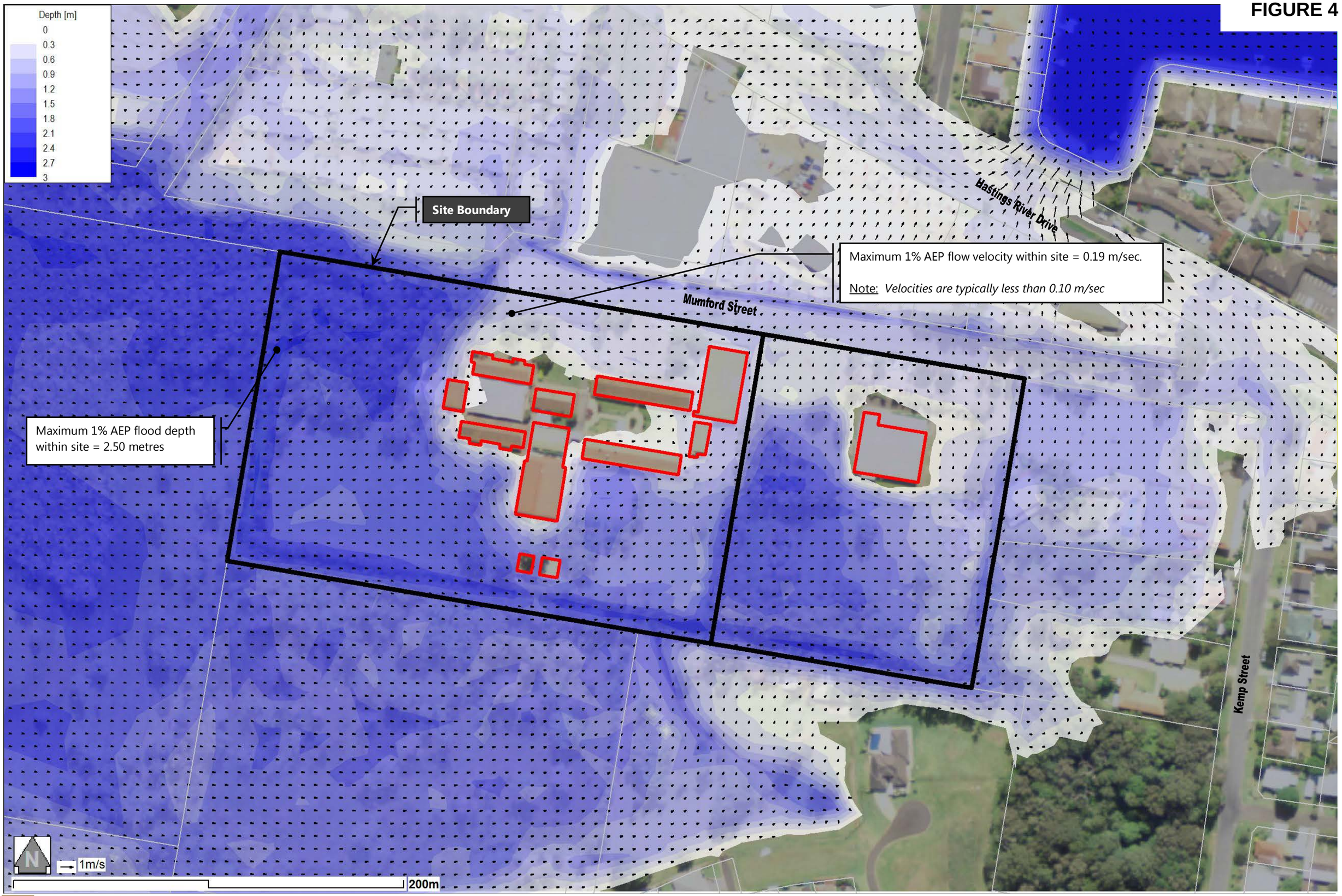
301015-03852 – Mumford Street, Port Macquarie
fg301015-03852rg180207_Fig 3 - 1% AEP Flood Levels.doc

PREDICTED 1% AEP FLOOD LEVELS AT MUMFORD STREET, PORT MACQUARIE

FIGURE 4



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301015-03852 – Mumford Street, Port Macquarie
fg301015-03852rg180207_Fig 4 - 1% AEP Flood Depths & Velocities.doc

PREDICTED 1% AEP FLOOD DEPTHS AND VELOCITIES AT MUMFORD STREET, PORT MACQUARIE

Provisional Flood Hazard

The flood hazard describes the potential impact that flooding would have on development and people in a particular area and reflects the risks to which people in that area could be exposed.

Flood hazard mapping for the Hastings River floodplain was prepared as part of the *'Hastings River Flood Study'* (*2006*). The criteria used to define the various hazard categories for the Flood Study are reproduced in **Table 1**.

Table 1 Definitions for Hazard Categories

HAZARD CATEGORY	CRITERIA	PRACTICAL APPLICATION
Low	• Depth (d) < 0.4m & Velocity (v) < 0.5m/s	• Suitable for cars
Medium	• exceeding Low criteria, and $d \leq 0.8$m, $v \leq 2.0$m/s, and $vxd \leq 0.5$	• Suitable for heavy vehicles and wading by able bodied adults
High	• exceeding Medium criteria, and $d \leq 1.8$m, $v \leq 2.0$m/s, and $vxd \leq 1.5$	• Suitable for light construction, timber frame, brick veneer etc
Very High	• exceeding High criteria, and 0.5m/s < velocity < 4m/s and $vxd \leq 2.5$	• Suitable for heavy construction, steel frame, concrete etc
Extreme	• exceeding Very High criteria and v > 5m/s	• Unsuitable for development - indicates significant conveyance of flow or floodway

As discussed, peak floodwater depths within the site are predicted to vary between zero and 2.38 metres. Peak flow velocities across the site are predicted to typically be less than 0.1 m/s with a localised maximum of 0.19 m/s.

Figure 5 shows that hazards across the site are predicted to range between '*low*' and 'very *high*'. The variations in hazard is depth dominated given the variation in velocities is negligible across the site and within the '*low*' threshold at all locations. All areas classified as 'very high' hazard are located along the edges of the site away from the existing and proposed development.

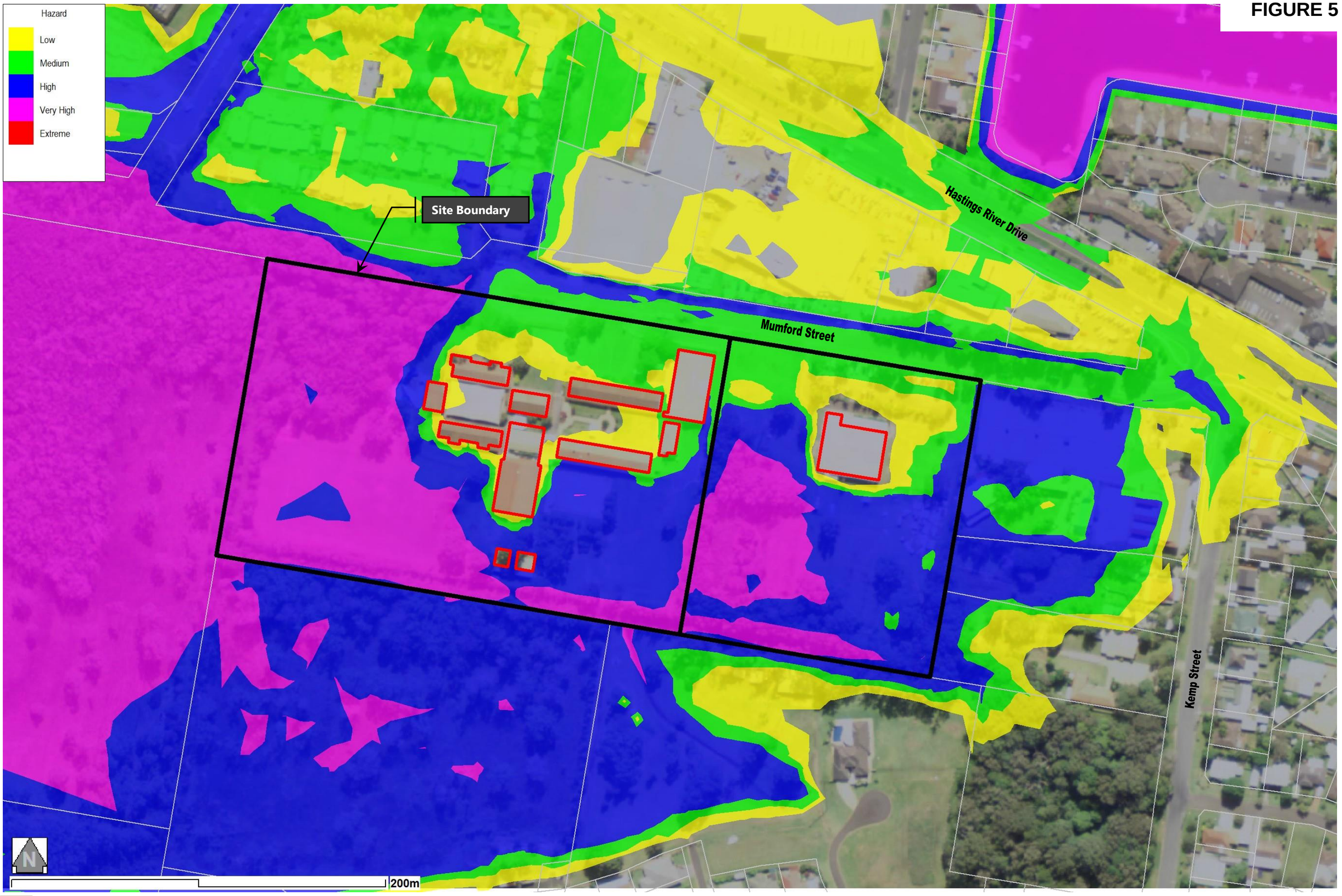
Figure 5 also indicates that flood hazards along Mumford St vary along the length of the site. The eastern end of Mumford Street is generally a '*medium*' hazard zone, which increases towards the west, becoming a '*very high*' hazard zone at the western end of the site.

Hydraulic Categories

The hydraulic category for a site identifies the potential for development to impact on existing flood behaviour. The '*Floodplain Development Manual' (2005)* divides flood prone land into three hydraulic categories; namely Floodway, Flood Storage and Flood Fringe.

As part of the Hastings River Floodplain Risk Management Study (*FRMS*) (*2012*), Advisian (*then WorleyParsons*) prepared a detailed assessment of floodway, flood storage and flood fringe areas for the Lower Hastings River Floodplain. This involved a detailed encroachment assessment to identify the extent of the floodway.

FIGURE 5



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301015-03852 – Mumford Street, Port Macquarie
fg301015-03852rg180207_Fig 5 - 1% AEP Hazard Categories.doc

1% AEP FLOOD HAZARD CATEGORIES AT MUMFORD STREET, PORT MACQUARIE

The relevant hydraulic category map for the site has been extracted from the FRMS (*2012*) and is included as **Appendix B**. The figure indicates that the hydraulic categories across the site are predicted to range between flood fringe near the eastern site boundary and flood storage for all remaining areas. The majority of the site, including those parts of the site on which development is proposed, is classified as flood storage.

Based on the hazard mapping and hydraulic category mapping the site is classified as low to high hazard flood storage. Those parts of the site on which development is proposed are low hazard flood storage.

3 IMPACT OF THE DEVELOPMENT ON LOCAL FLOOD BEHAVIOUR

3.1 Description of Proposed Development

East Coast Screw Piers plans to rezone and develop Lot 2 DP 601094 and Lot 4 DP 825704 at Mumford Street, Port Macquarie. Lot 2 is currently operated as a Christian Outreach Centre while Lot 4 is the Heritage Christian School.

The proposal will see the capacity of the Heritage Christian School (*Lot 4*) increase through the construction of additional buildings to function as classrooms and for administration and additional car parking facilities. The function of Lot 2 is proposed to change from the Christian Outreach Centre to an automotive workshop and detailing business. The change will involve construction of additional buildings to act as workshops and spray facilities, as well as spaces for parking and vehicle storage. A bio-retention basin is proposed on Lot 2 to treat runoff from the development (refer Figure 6).

Filling is proposed across parts of both lots in order to meet minimum surface and floor level requirements outlined in the *Port Macquarie Hastings Council Flood Policy* (*2015*); refer discussion under **Section 3.2**. Detailed plans for the proposed development have been prepared by AB3D Building Design and are included as **Appendix A**.

3.2 Flood Planning Level

The proposed rezoning of Lot 2 DP 601094 and the development of Lot 2 and Lot 4 will be required to comply with the minimum surface elevation and floor level requirements as specified in the Flood Policy (*2015*). The following criteria have been addressed for the proposed rezoning and development application:

- Rezoning of commercial/industrial land must have a minimum area of 400 m^2 at or above FPL2 – 3.53 mAHD; i.e., 1% AEP flood level (*3.13 mAHD*) + Climate Change Allowance (*400mm*).
- School buildings fall under '*Special Purpose Facilities*' which are required to be at or above FPL3 – 4.03 mAHD; i.e., 1% AEP flood level (*3.13 mAHD*) + Climate Change Allowance (*400mm*) + 500mm Freeboard.
- Minimum flood levels for industrial/commercial development to be at FPL2 (*3.53 mAHD*) with at least 25% of the ground floor area at or above FPL3 (*4.03 mAHD*).
- Open carparks must be at or above FPL1 (2.44 mAHD); the peak 5% AEP flood level.

3.3 Impacts of Proposed Development of Flood Behaviour

3.3.1 Model Modifications to Reflect Proposed Development

In order to quantify the potential impacts of the proposed development, the RMA-2 flood model that was developed to assess existing flood behaviour across the site was modified to incorporate the changed landform associated with the development proposal. In accordance with the development plans, new building footprints as well as existing building footprints were completely blocked-out of the model network. This means that no flow can pass through the extent of proposed works and that floodwaters cannot occupy that part of the site as temporary flood storage.

FIGURE 6

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fg301015-03852rg180207_Fig 6 - Proposed Development.doc

PROPOSED DEVELOPMENT LAYOUT

All changes to surface elevations throughout the site were also incorporated into the model network by modifying the elevations of model nodes. This was particularly important throughout Lot 2 and the proposed parking and vehicle storage areas.

3.3.2 Hydraulic Modelling Results

The modified model was used to simulate the 1% AEP flood in order to assess whether the development will have any impacts on peak flood levels, extents and velocities. The magnitude and location of any changes arising from the proposed development was established by comparing model results from the existing and post-development model simulations.

Impact on Peak Flood Levels

To quantify any off-site impacts of development, flood level difference mapping was prepared. Difference maps are created by comparing peak flood level estimates at each node in the hydrodynamic model from simulations undertaken for both existing and post-development scenarios. This effectively creates a contour map of predicted changes in peak flood levels (*i.e., increases and decreases*) and allows visual assessment of the impact of the filling on existing peak flood levels.

Flood level difference mapping was developed and is presented in **Figure 7**. As shown by the legend in the top-left hand corner, increases in peak flood level are represented as different shades of red and decreases in peak flood level are represented as shades of blue. The white shading indicates changes in peak flood level of no more than +/- 10 mm.

As shown in **Figure 7**, the proposed development is not predicted to generate any changes to peak flood levels within or outside of the site.

Impact on Peak Flow Velocity

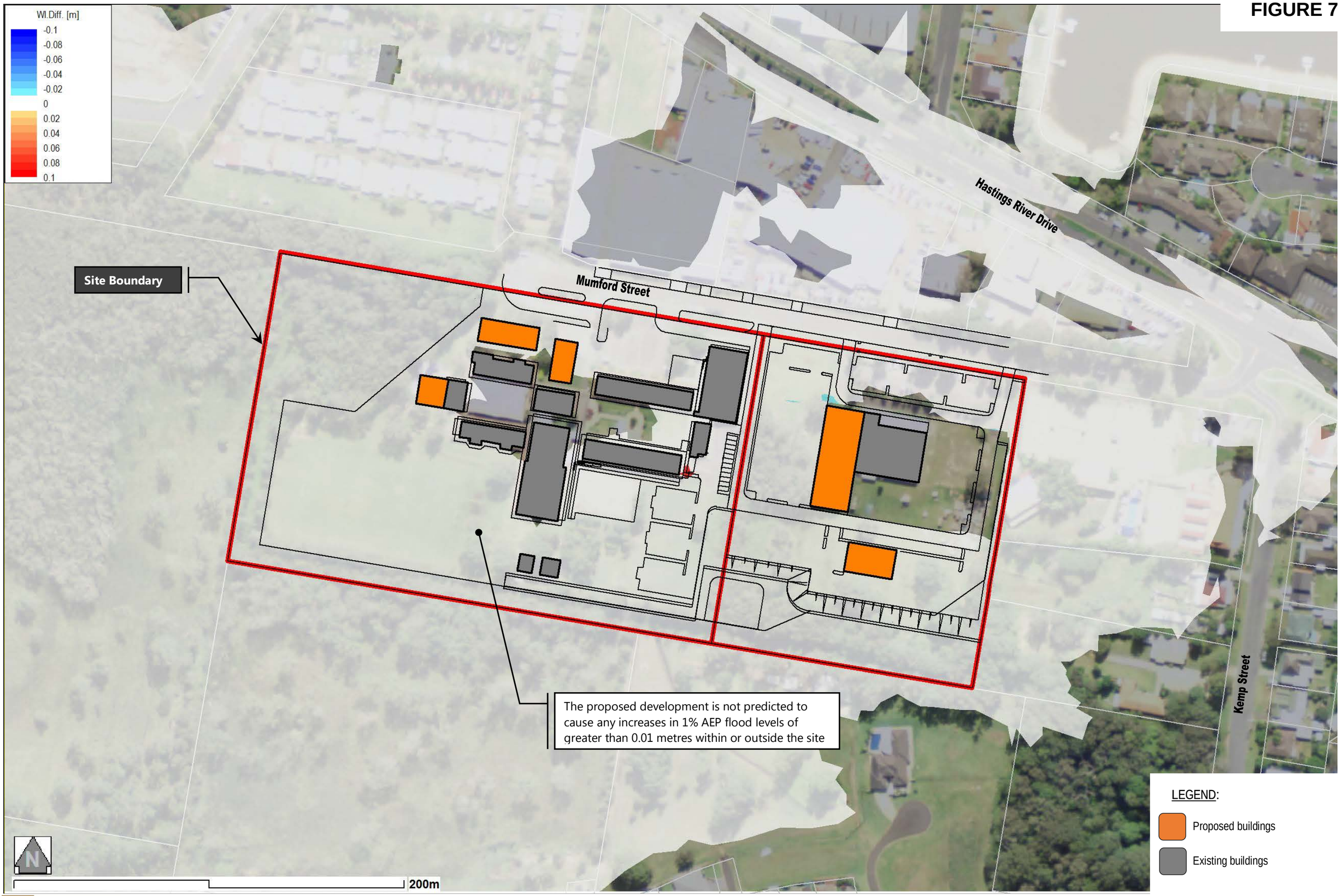
A difference map was also created to quantify any changes in peak flow velocities associated with the proposed development. The velocity difference mapping that was developed for the 1% AEP flood is presented in **Figure 8**.

The development is predicted to result in a maximum increase in peak 1% AEP flow velocities of 0.11 m/s. As shown in **Figure 8**, this maximum increase is predicted to occur within the site in the immediate vicinity of the northernmost proposed building. Pre and post-development flow velocities at this location are predicted to be 0.10 and 0.21 m/sec. Although this represents a significant increase, the post-development velocities are still low and within the 'low' hazard range.

The maximum increase in peak flow velocity outside of the site boundary is 0.08 m/s and is predicted to occur along the eastern site boundary (*refer* **Figure 8**). Pre-development velocities during the 1% AEP flood are predicted to be 0.12 m/s at this location. As the velocities are low, an increase in velocity from 0.12 to 0.20 m/s would not result in any change in hazard categorisation at the site; i.e., velocities are still within the 'low' hazard range of values.

The maximum velocity increase across Mumford Street is predicted to be 0.05 m/s occurring to the north-east of the site.

FIGURE 7



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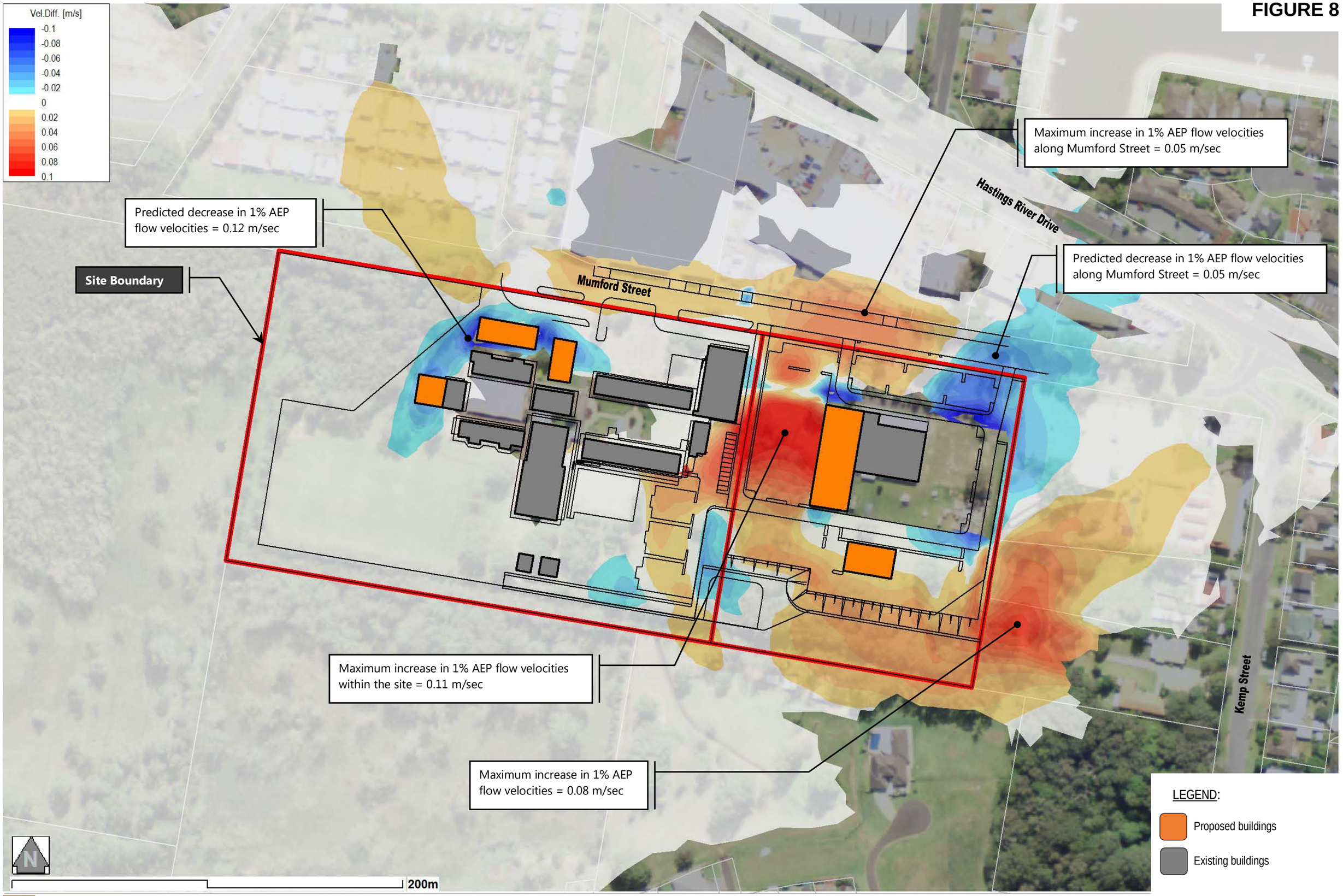
301015-03852 – Mumford Street, Port Macquarie
fg301015-03852rg180207_Fig 7 - 1% AEP Flood Level Impacts.doc

PREDICTED IMPACTS ON PEAK 1% AEP FLOOD LEVELS RESULTING FROM THE PROPOSED DEVELOPMENT

FIGURE 8



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301015-03852 – Mumford Street, Port Macquarie
fg301015-03852rg180207_Fig 8 - 1% AEP Flow Velocity Impacts.doc

PREDICTED IMPACTS ON PEAK 1% AEP FLOW VELOCITIES RESULTING FROM THE PROPOSED DEVELOPMENT

Impact on Flood Hazard

Peak 1% AEP flood hazard mapping was prepared for the post-development scenario and is shown in **Figure 9**. Comparison of **Figure 5** and **Figure 9** shows that the minor velocity increases of up to 0.08 m/s outside of the site would not result in any increase in the flood hazard classification across adjoining properties or within the Mumford Street road reserve.

This outcome was expected given the development is not predicted to increase flood levels and is only predicted to cause minor velocity increases.

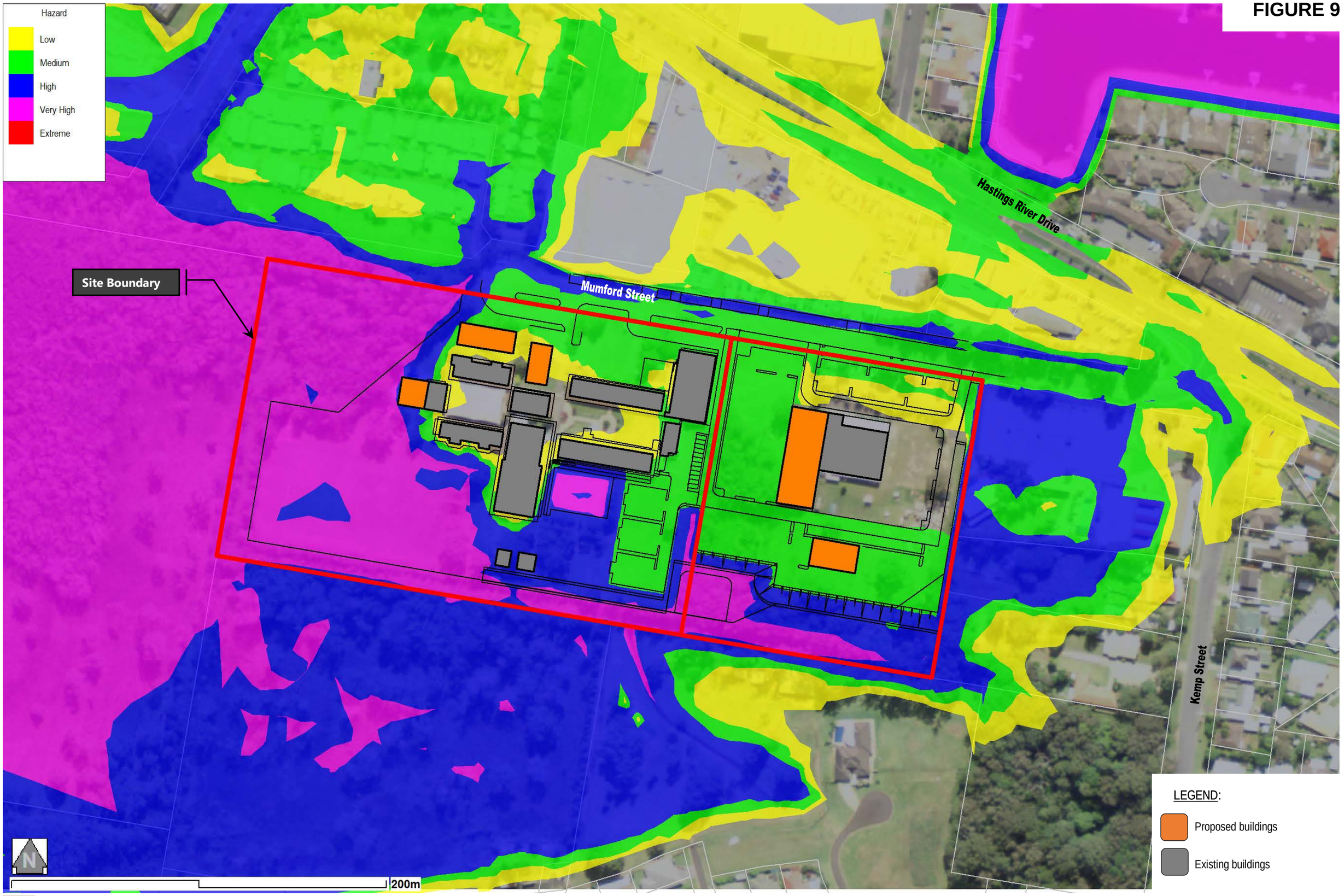
3.3.3 Assessment Criteria

Section 5.6 of Council's Flood Policy (*2015*) requires impacts associated with development within flood storage areas to be within the following limits:

- Flood level increases are to be less than 10 mm (*0.01 metres*) for the 1% AEP flood; and,
- Flow velocity increases are less than 0.1 m/s for the 1% AEP event for all locations outside of the subject site.

The predicted impacts as shown in **Figure 7** and **8** are within the allowances outlined above. In that regard, the proposed development is not predicted to result in any increases in peak 1% AEP flood levels greater than or equal to 0.01 metres across areas outside of the site. The maximum increase in 1% AEP flow velocity outside of the site is also within the maximum limit outlined above.

FIGURE 9



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301015-03852 – Mumford Street, Port Macquarie
fg301015-03852rg180207_Fig 9 - 1% AEP Hazard Categories (Post Dev).doc

1% AEP FLOOD HAZARD CATEGORIES AT MUMFORD STREET, PORT MACQUARIE FOR POST-DEVELOPMENT CONDITIONS

4 FLOOD RISK ASSESSMENT

The flood risk assessment for the proposed development is based on consideration of the relevant guideline documents and flood characteristics at the site and its surrounds for the full range of design events. The risk assessment also considers potential evacuation routes and any constraints such as low-points in roadways and whether or not there is adequate warning time available to safely effect evacuation.

4.1 Guideline Documents

4.1.1 Port Macquarie-Hastings Flood Policy (2015)

Port Macquarie-Hastings Council (*PMHC*) has indicated via pre lodgement advice that a Flood Risk Assessment (*FRA*) will be necessary for the development proposal that demonstrates that the requirements of Council's Flood Policy (*2015*) are met and that safe and reliable evacuation is provided. Section 5 of the policy applies to the proposed development given its location in an area designated as flood storage.

Section 5.4 applies to commercial development and specifies the following *Site Access and Flood Evacuation Requirements* (*refer* Section 5.4 (*d*)):

- A minimum of 8 hours warning time must be available.
- The flood immunity level for a '*safe reliable evacuation route*' must be no lower than FPL1 (*5% Annual Exceedance Probability AEP flood level*).
- The '*safe reliable evacuation route*' must grade upwards towards land above the peak level of the PMF, and preferably to an approved Flood Evacuation Centre.

4.1.2 Port Macquarie-Hastings Flood Emergency Sub-Plan (2015)

The Port Macquarie-Hastings Local Flood Plan (*2015*) was reviewed as part of investigations completed for the development of this FRA. The sub plan outlines the preparedness measures and the conduct of response and recovery operations from flooding within the Port Macquarie-Hastings Area.

The proposed development site falls within the Hibbard South Sub-Sector, which sits within the greater Hibbard Sector (*Sector 3*). The Hibbard South Sub-Sector is classified as an '*Area with Rising Road Access*', meaning the area has access roads that can be used for evacuation that steadily rise with distance away from floodwaters. Areas classified as having rising road access cannot be completely isolated in events up to and including the PMF. The extents of the Hibbard Sector and the Hibbard South Sub-Sector are shown in **Appendix C**.

The Settlement Point Gauge (*ARWC 207418*) (*refer* **Figure 1**) is monitored by the SES and relied upon for issuing flood warnings and managing evacuation and road closures in the lower Hastings Valley. The following gauge heights are important for flood warnings and closure of roads nearby to Hibbard:

- Gauge Height of 1.2 mAHD – Minor Flood Warning
- Gauge Height of 1.5 mAHD – Moderate Flood Warning
- Gauge Height of 1.75 mAHD – Major Flood Warning

- Gauge Height of 1.8 mAHD – Closure of Hastings River Drive at the Boundary Rd Intersection
- Gauge Height of 2.8 mAHD – Closure of Hastings River Drive at the Hibbard Drive (*East*) Intersection

Although the SES relies primarily on the Settlement Point Gauge to manage and co-ordinate flood evacuation in the Hibbard Sector, the sub-plan also references the Kindee Bridge Gauge (*ARWC 207004*) and Wauchope Railway Bridge Gauge (*ARWC 207041*) as options for advanced warning. In that regard, the sub plan indicates that approximately 14 hours and 8 hours advanced warning could be achieved if flood levels are monitored at Kindee and Wauchope, respectively.

The Westport High School on Finlay Avenue at Port Macquarie is assigned as the Evacuation Centre/Assembly area for the Hibbard South Sub-Sector (*refer* **Figure 1**). Evacuation to the High School would occur by directing evacuees east along Mumford Street to the Kemp Street intersection.

4.2 Predicted Flood Behaviour

Section 2 and **Section 3** of this report discuss the flood behaviour across the site and surrounds during a 1% AEP flood. The modelling and figures show that floodwaters inundate the site via the wetland located to the south-west. Once flood levels within the wetland reach 2.0 mAHD, floodwaters will start to enter the site near the south-west corner. Once flood levels within the wetland reach approximately 2.4 mAHD, they will start to overtop Mumford Street and parts of Kemp Street (*refer* **Figure 4**).

In order to understand the potential flood risks for the site and proposed development it is necessary to consider the full range of flood events and not just the 1% AEP flood. Detailed flood modelling of the full range of design flood events has been undertaken for the lower Hastings River as part of the *'Hastings River Flood Study'* (*WorleyParsons, 2006*), *'Hastings River Floodplain Risk Management Study'* (*WorleyParsons, 2012*) and more recently as part of the *'Hastings River Climate Change Assessment'* (*in draft, 2017*). The modelling for each of these studies has been based on the use of the RMA-2 two-dimensional flood model discussed in **Section 2**.

Predicted peak flood levels in the vicinity of the site as generated from the modelling, are listed overleaf in **Table 2**.

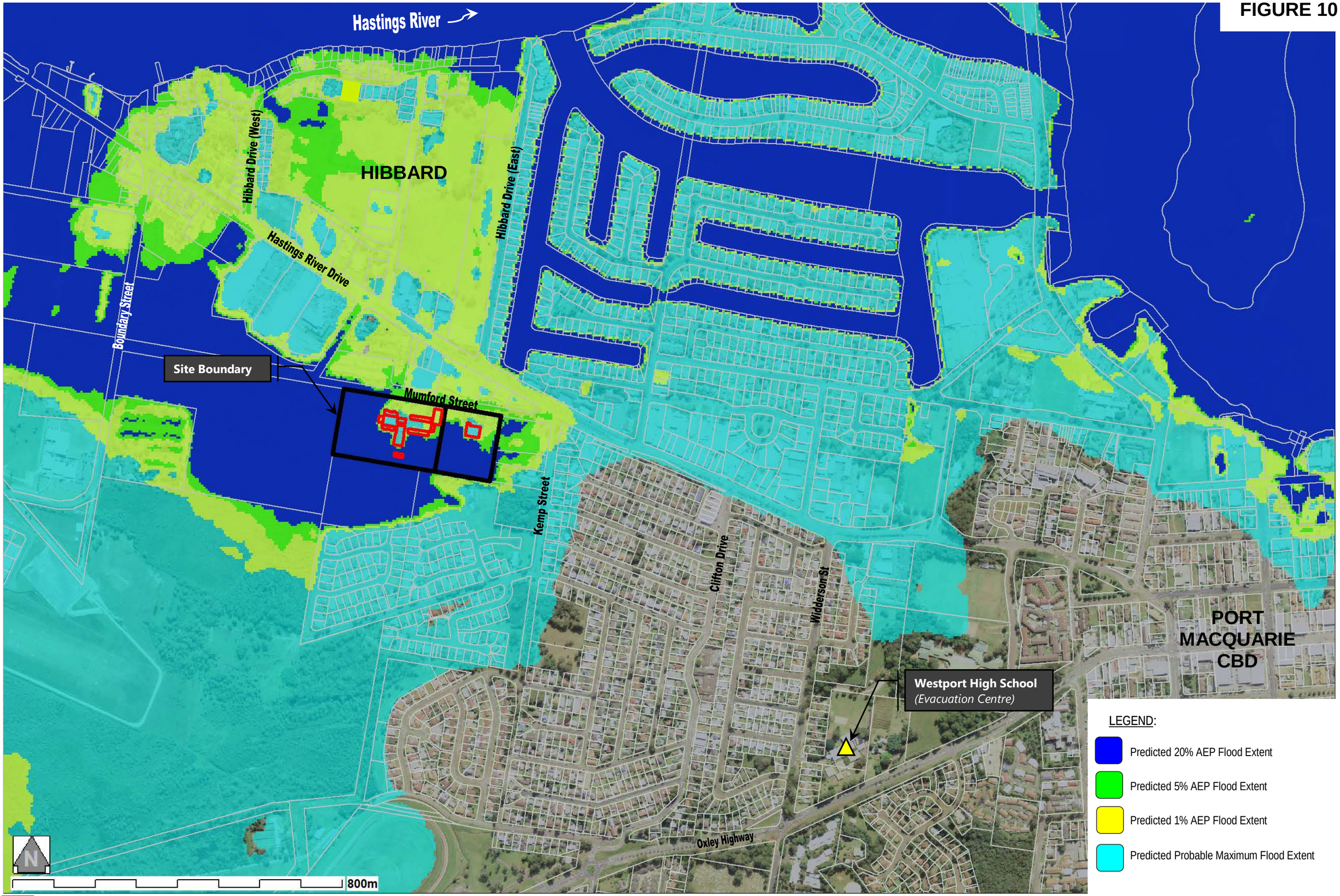
Existing terrain elevations across the site vary between 0.75 mAHD and 3.41 mAHD (*refer* **Figure 2**). Therefore, based on the data presented in **Table 2** parts of the site will be inundated to depths of up to 1.35 metres once flooding in the Hastings River reached the 20% AEP flood level (*2.10 mAHD*). Those areas that would be inundated are limited to the low-lying and undeveloped parts of the site.

In addition, the proposed development would raise elevations across the site to at least FPL1 which is at the peak flood level for the 5% AEP flood of 2.44 mAHD. Accordingly, all school buildings and workshop areas and surrounds would be at or above the peak 5% AEP level.

The central parts of Lot 2 will be raised to an elevation at or above FPL2 of 3.53 mAHD. At this elevation these areas would remain "*flood free*" at the peak of the 1% AEP flood and could be used for vehicle and machinery storage.

Peak flood extents for the 20%, 5%, and 1% AEP events and the PMF are shown in **Figure 10** for development site and its surrounds.

FIGURE 10



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fg301015-03852rg180207_Fig 10 - Flood Extents.doc

PREDICTED FLOOD EXTENTS IN THE VICINITY OF THE SITE

Table 2 Design Flood Levels in the vicinity of the Subject Site

DESIGN EVENT *(AEP)*	PEAK FLOOD LEVEL *(mAHD)*	
	FLOOD STUDY (2006) & FRMS (2012)	**CLIMATE CHANGE ASSESSMENT** (*in draft, 2017*)
20%	2.10	/
5%	2.44	/
2%	2.82	/
1%	3.09	3.13
0.2%	3.87	/
1% *With Provision for Climate Change (Year 2100)*	/	3.75
Probable Maximum Flood	6.28	/

4.3 Evacuation Route

The proposed evacuation route from the development to high ground to the south-east of the site is shown in **Figure 11**. The evacuation route can be followed to reach the evacuation centre at Westport High School (*location shown on* **Figure 1**).

As shown in **Figure 11**, evacuation commences along Mumford Street to the north of the site via the proposed entry and exit locations to the carparks. Once on Mumford Street, evacuees would be directed to the east and onto Kemp Street, and then onto The Bulkhead approximately 400 metres to the south of the site.

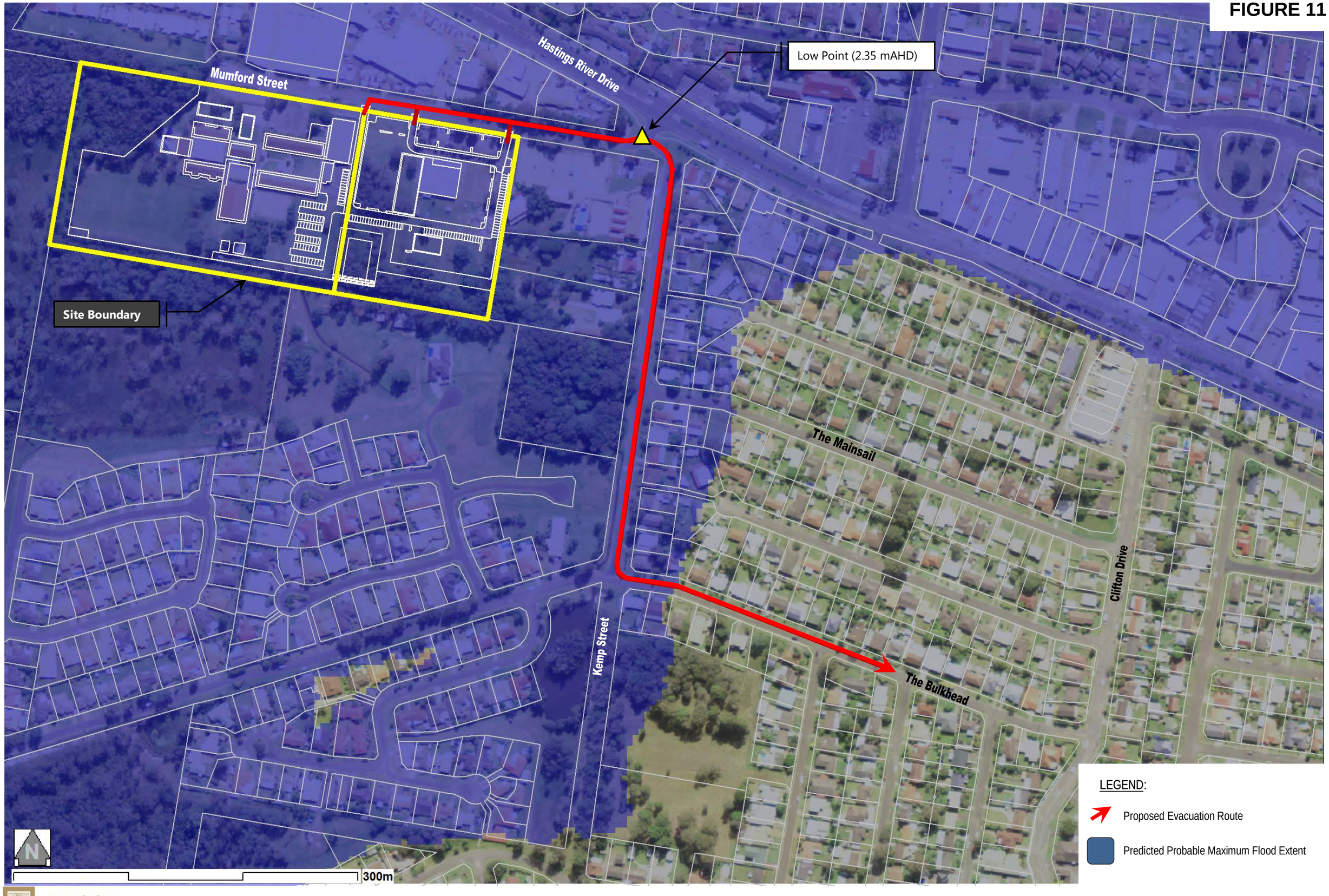
As shown in **Figure 11**, Mumford Street, Kemp Street and a short distance of The Bulkhead, are at risk of flooding during events up to and including the PMF. A longitudinal profile along the proposed evacuation route is shown in **Figure 12** and indicates that there is a low-point along the route at the turn-off from Mumford Street onto Kemp Street. The low-point has an elevation of 2.35 mAHD (*based on the ELVIS LiDAR*) which is 0.25 metres above the peak flood level for the 20% AEP flood and 0.09 metres below the peak 5% AEP flood level (*refer* **Figure 12**).

It is important to note that the low-point at the turn-off from Mumford Street to Kemp Street is surrounded by higher surface elevations that would prevent floodwaters reaching the low-point until flood levels exceed 2.45 mAHD (*refer* **Figure 2**). These higher surface elevations would act to increase the flood immunity of the evacuation route bringing it closer to the 5% AEP flood.

4.4 Available Flood Warning

The available flood warning has been determined for the evacuation route based on the elevation of the low-point and the rate-of-rise of floodwaters at the site and at the Settlement Point and Wauchope Railway Bridge Gauges. As discussed in **Section 4.1.2**, the Settlement Point Gauge is relied upon by the SES for the Hibbard Sector to issue flood warnings and to monitor and action road closures.

FIGURE 11



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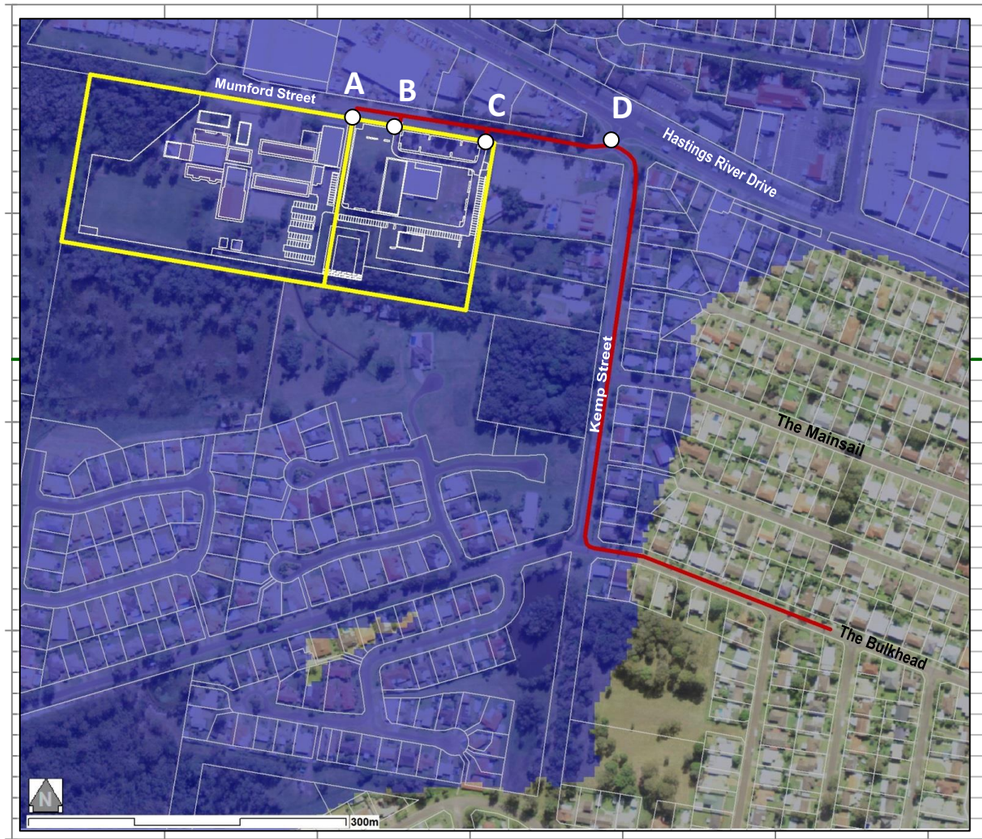
301015-03852 – Mumford Street, Port Macquarie
fg301015-03852rg180207_Fig 11 - Evacuation Route

PROPOSED EVACUATION ROUTE FROM THE SITE TO LAND ABOVE THE PMF

FIGURE 12

DRAFT



LEGEND

- Topography along Evacuation Route based on ELVIS LiDAR survey
- Topography along Evacuation Route based on 2005 Aerial Lase Survey (ALS)
- Predicted 20% AEP Flood Levels
- Predicted 5% AEP Flood Levels
- Predicted 2% AEP Flood Levels
- Predicted 1% AEP Flood Levels
- Predicted 0.5% AEP Flood Levels
- Predicted 0.2% AEP Flood Levels

Probable Maximum Flood Level = 6.28 mAHD

0.2% AEP Flood Level = 3.87 mAHD

1% AEP Flood Level = 3.13 mAHD

2% AEP Flood Level = 2.82 mAHD

5% AEP Flood Level = 2.44 mAHD

20% AEP Flood Level = 2.10 mAHD

Low Point at the turn-off to Kemp Street
Elevation = 2.35 mAHD

Mumford Street

Kemp Street

Intersection with The Mainsail

The Bulkhead

ELEVATION (mAHD)

8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0

0 50 100 150 200 250 300 350 400 450 500 550 600 650 700 750

DISTANCE ALONG EVACUATION ROUTE FROM SITE (m)

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Mumford Street, Port Macquarie
fg301015-03852rg180207_Fig 12 - Evacuation Route.xlsx

ELEVATIONS BASED ON ELVIS LIDAR AND ALS (2005) DATA FOR THE EVACUATION ROUTE

Nonetheless, the Wauchope Gauge is still relevant as it would also be monitored to give advanced warning of rising flood levels and information defining the rate-of-rise of floodwaters.

It is worth noting that even longer warning times could be achieved if flood levels were also monitored at the Kindee Bridge Gauge. The risk with this approach is that it increases the potential for false warnings due to the greater potential of differences in rainfall patterns and intensities in the upper and lower catchments. There is also the potential to miss rising water levels associated with flooding along the Wilson and Maria Rivers.

Flood level hydrographs at the site and the Wauchope and Settlement Point Gauges are plotted on **Figures 13**. Level hydrographs are included for both the 1% AEP flood and the PMF. It is important to note that all flood warning times indicated on the figure are based on stage hydrographs generated for the PMF. Consideration of the PMF ensures that a conservative assessment is applied because the rate-of-rise in the PMF is substantially faster than for the lower and more frequent floods such as the 1% AEP flood. Accordingly, the flood warning times presented for the PMF are considered to represent a worst-case assessment; i.e., they would typically be longer for smaller or more frequent events.

As shown in **Figure 13**, the rate-of-rise of flood levels at the site and in the vicinity of the evacuation route for the PMF event is closely mirrored by the rate of rise predicted at the Settlement Point Gauge, which reflects the closeness of the gauge to the site need to verify. In contrast, the Wauchope Gauge is located over 20 kilometres upstream of the site. This results in a substantial lag in the flood wave arriving at Hibbard, which is typically in the order of 8 hours.

Table 3 provides a summary of the predicted warning times for a PMF event before the evacuation route is inundated and then cut (*once inundation depths reach 0.2 metres*). The warning times are based on recorded flood level data for each of the Settlement Point and Wauchope Gauges. SES issues warning times when the minor, moderate and major flood warning levels are reached at these gauges.

Table 3 Flood Warning Assessment Based on Monitoring Flood Levels at the Settlement Point and Wauchope Gauges for the PMF

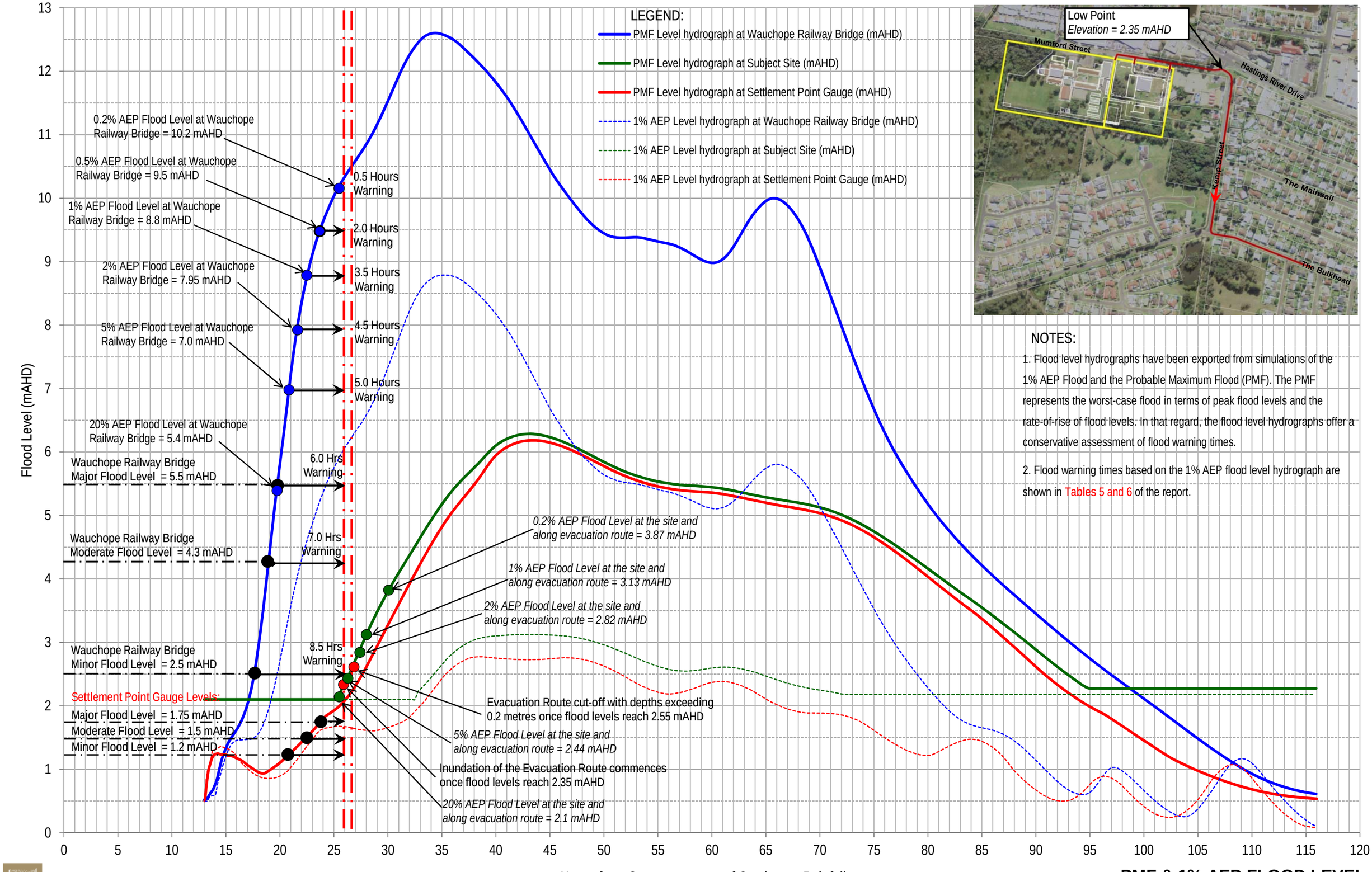
Gauge	Available Warning Time Based on PMF Hydrograph *(hrs)*^					
	Minor Flood level Reached		Moderate Flood level Reached		Major Flood level Reached	
	Before Inundation	Evacuation Route Cut^^	Before Inundation	Evacuation Route Cut^^	Before Inundation	Evacuation Route Cut^^
Settlement Point	5.5	6.0	3.5	4.0	2.5	3.0
Wauchope	8.5	9.0	7.0	7.5	6.0	6.5

^ *Warning times have been determined based on a comparison of the predicted rate-of-rise of floodwaters along each evacuation route to those at the Settlement Point Gauge (ARWC 207418) and Wauchope Railway Bridge Gauge (ARWC 207401).*

^^ *The evacuation route is considered to be 'cut' once floodwaters reach 0.2 metres at the low-point (low-point has an elevation of 2.35 mAHD).*

Table 3 indicates that during a PMF event 5½ hours warning time would be available after the Minor flood level is reached at the Settlement Point Gauge to when floodwaters would start to inundate the low-point along the evacuation route.

FIGURE 13



NOTES:

1. Flood level hydrographs have been exported from simulations of the 1% AEP Flood and the Probable Maximum Flood (PMF). The PMF represents the worst-case flood in terms of peak flood levels and the rate-of-rise of flood levels. In that regard, the flood level hydrographs offer a conservative assessment of flood warning times.

2. Flood warning times based on the 1% AEP flood level hydrograph are shown in Tables 5 and 6 of the report.

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Mumford Street, Port Macquarie
fg301015-03852rg180207_Fig 13 - Flood Hydrographs.xlsx

PMF & 1% AEP FLOOD LEVEL HYDROGRAPHS FOR THE THE EVACUATION ROUTE AND LOCAL GAUGES

The warning time increases to 6 hours if a depth of 0.2 metres over the low-point is assumed to define when the evacuation route would be "*cut*". Evacuation would need to be completed before this time.

Evacuation would still be possible once the Moderate and Major flood levels are reached at Settlement Point. However, the available warning times are much less and would typically be no more than 2 to 3 hours (*refer* **Table 3**). Based on this it is recommended that evacuation commence once the Minor flood level is reached and a Minor flood warning is issued by the SES.

The flood warnings presented in **Table 3** for the Wauchope Gauge indicate that between 3 and 3½ hours of additional warning time could be gained in addition to the warning times available from monitoring the Settlement Point Gauge alone. In that regard, there would be approximately 8½ hours warning available once the Minor flood level is reached at Wauchope.

As discussed above, the flood warning assessment presented in **Figure 13** and **Table 3** is based on assessment of warning times derived from flood level hydrographs for the PMF event; that is, for the worst-case flood scenario. The rate-of-rise of floodwaters is at its steepest and the resulting flood warning time at its shortest for this event.

A comparison of warning times for the 1% AEP event is also possible based on the 1% AEP flood level hydrographs that are also superimposed on **Figure 13**. As shown, the 1% AEP level hydrographs have a more gradual rate-of-rise and longer travel times between gauges leading to longer warning times for effecting evacuation. This is confirmed by the data in **Table 4** which lists available flood warning times as derived from the stage hydrograph for the 1% AEP flood at the Settlement Point and Wauchope Gauge.

Table 4 Flood Warning Assessment Based on Monitoring Flood Levels at the Settlement Point and Wauchope Gauges for the 1% AEP Flood

Gauge	Available Warning Time Based on 1% AEP Hydrograph *(hrs)*^					
	Minor Flood level Reached		Moderate Flood level Reached		Major Flood level Reached	
	Before Inundation	Evacuation Route Cut^^	Before Inundation	Evacuation Route Cut^^	Before Inundation	Evacuation Route Cut^^
Settlement Point	11.5	12.5	11.0	12.0	2.5	3.5
Wauchope	13.5	14.5	11.5	12.5	9.5	10.5

^ *Warning times have been determined based on a comparison of the predicted rate-of-rise of floodwaters along each evacuation route to those at the Settlement Point Gauge (ARWC 207418) and Wauchope Railway Bridge Gauge (ARWC 207401).*

^^ *The evacuation route is considered to be 'cut' once floodwaters reach 0.2 metres at the low-point (low-point has an elevation of 2.35 mAHD).*

Comparison of data in **Table 3** with corresponding data in **Table 4** indicates that on average, 5 hours of additional warning time would be available if the stage hydrographs for a 1% AEP flood were adopted.

4.5 Flood Policy Compliance

As outlined in **Section 4.1**, Council's Flood Policy (*2015*) outlines a set of criteria that is required to be met for all new commercial/industrial developments and special purpose facilities located on land designated as flood storage. This criteria is reviewed below with specific reference to the proposed development and whether or not the criteria is or can be satisfied.

Criteria 1 A minimum of 8 hours warning time must be available

The flood warning assessment presented in **Section 4.4** shows that:

- 8.5 hours warning time is available before the low-point along the proposed evacuation route begins to be inundated. This warning time is based on the time between the Minor flood level being reached at the Wauchope Gauge.
- 9 hours warning time is available before the evacuation route is "cut" by floodwaters to depths of 0.2 metres.
- If the 1% AEP flood hydrograph is adopted, more than 8 hours warning time is available after a Minor (*11.5 hours*) and Moderate (*11 hours*) flood level is reached at the Settlement Point Gauge. The available warning time increases slightly if monitoring is based on the Wauchope Gauge with 13.5 hours and 11.5 hours relative to Minor and Moderate warning, respectively.

As the PMF represents the worst-case scenario it is recommended that the flood warning times documented for the PMF be used for the assessment of evacuation potential. This recognises that although the warning time will for the majority of events be longer, residents will not be at risk of a flood rising at a faster rate.

Criteria 2 The flood immunity level for a 'safe reliable evacuation route' must be no lower than FPL1 (5% AEP flood level)

A terrain and flood level profile plot is presented as **Figure 12** for the proposed evacuation route. The profile plot indicates that there is a 30 metre length of Mumford and Kemp Streets that is 0.09 metres below the peak 5% AEP flood level. However, because depths of inundation would be less than 0.20 metres and the velocity of flow is low, the evacuation route could still be traversed by vehicle at the peak of the 5% AEP flood with guidance from emergency services personnel.

Although the low-point in the evacuation route is below the peak 5% AEP flood level, depths of inundation are less than 0.20 metres and hence the evacuation route would not be "cut".

It is also worth noting that the low-point at the turn-off from Mumford Street to Kemp Street is surrounded by higher surface elevations that would prevent floodwaters reaching the low-point until flood levels exceed 2.45 mAHD (*refer* **Figure 2**). These higher surface elevations would act to increase the flood immunity of the evacuation route bringing it closer to and marginally above the 5% AEP flood.

Criteria 3 The 'safe reliable evacuation route' must grade upwards towards land above the PMF, preferably to an approved Flood Evacuation Centre

The terrain and flood level profile for the evacuation route shows that the route generally grades upwards towards flood free land and to the evacuation centre at Westport High School.

Figure 12 shows the profile of the land surface along the route which indicates that it is not upwardly grading along its entire length. However, as the "dips" are gradual and the low-points get progressively higher they are not considered to be detrimental to the safe evacuation of the site.

5 CONCLUSIONS

Results extracted from the *Hastings River Flood Study* (*2006*) indicate that the development site lies within the 1% AEP flood extent of the Hastings River. Therefore, there is potential for the site to be inundated during large flood events. Accordingly, the effects of the proposed rezoning and development on local flood characteristics and the provision of adequate flood warning and evacuation for future occupants has been assessed.

The assessment has been based on the results of computer modelling undertaken using the RMA-2 hydrodynamic model that was originally developed for the Hastings River Flood Study. The model has been modified to better represent the topography local to the site and used to assess flood characteristics for both existing and post-development conditions (*i.e., incorporating the fill proposal and building footprint*). The results have been compared to establish whether any change in peak flood level or flow velocity can be expected at any location across the floodplain of the Hastings River.

The following conclusions can be drawn from the results of the modelling:

- The peak 1% AEP flood level in the vicinity of the site is predicted to be 3.13 mAHD.
- Under existing topographic conditions, the majority of the development site is predicted to be inundated during the 1% AEP flood. Peak floodwater depths are predicted to be up to 2.38 metres (*refer* **Figure 4**).
- Peak 1% AEP flow velocities across the site are low, with a maximum of 0.19 m/s which occurs in an area adjacent to the proposed building footprint. Velocities are typically less than 0.10 m/s elsewhere throughout the site (*refer* **Figure 4**).
- Flood hazards across the site for the 1% AEP event are predicted to range between Low and Very High hazard (*refer* **Figure 5**). This is largely a consequence of the depth of floodwaters with flow velocities at all locations within the 'low' hazard range.
- Hydraulic category mapping for the site as documented in the Hastings River Floodplain Risk Management Study (*2012*) shows that the majority of the site is categorised as flood storage with the exception of the eastern most parts of the site which are flood fringe. Those parts of the site on which the works are proposed are classified as flood storage (*refer* **Appendix B**).
- The proposed development is not predicted to result in any change to peak 1% AEP flood levels within or outside of the development site (*refer* **Figure 7**). This complies with Council's Flood Policy (*2015*) which requires off-site flood level increases to be less than 10 mm.
- The proposed development is predicted to cause a maximum increase in peak 1% AEP flow velocities of 0.11 m/s and 0.08 m/s for areas within and outside of the site, respectively (*refer* **Figure 8**). This complies with Councils Flood Policy (*2015*) which requires that any off-site increases in velocities are less than 0.1 m/s.
- The proposed development is predicted to cause no change in 1% AEP flood hazards across adjoining properties (*compare* **Figure 5** *and* **Figure 9**).

The proposed development meets the flood risk requirements of Port-Macquarie-Hastings Council as outlined in Council's Flood Policy (*2015*) and taking into consideration the evacuation protocols outlined in the SES Local Flood Plan (*2015*).

The flood risk assessment for the site determined the following:

- The proposed evacuation route is generally upwardly grading to land that is flood free (*above the PMF level*). Only one localised 'dip' occurs along the evacuation route. This occurs at the turn-off from Mumford Street onto Kemp Street (*refer* **Figure 12**) where elevations at the low-point are 0.09 metres below the peak 5% AEP flood level. The low-point is however shielded from flooding by higher terrain with elevations of at least 2.45 mAHD. On this basis, the low-point would be shielded from flooding during events up to and including the 5% AEP flood.
- At least 8.0 hours warning time is available for flood evacuation. This is based on the time taken for inundation of the low point to occur relative to the time when a Minor Flood Warning would be issued at Wauchope (based on the Wauchope Railway Bridge Gauge, refer **Figure 13** and **Table 3**). This is based on worst-case conditions which would occur during a PMF event. During a 1% AEP event the warning time is predicted to increase to over 13 hours (*refer* **Table 4**).

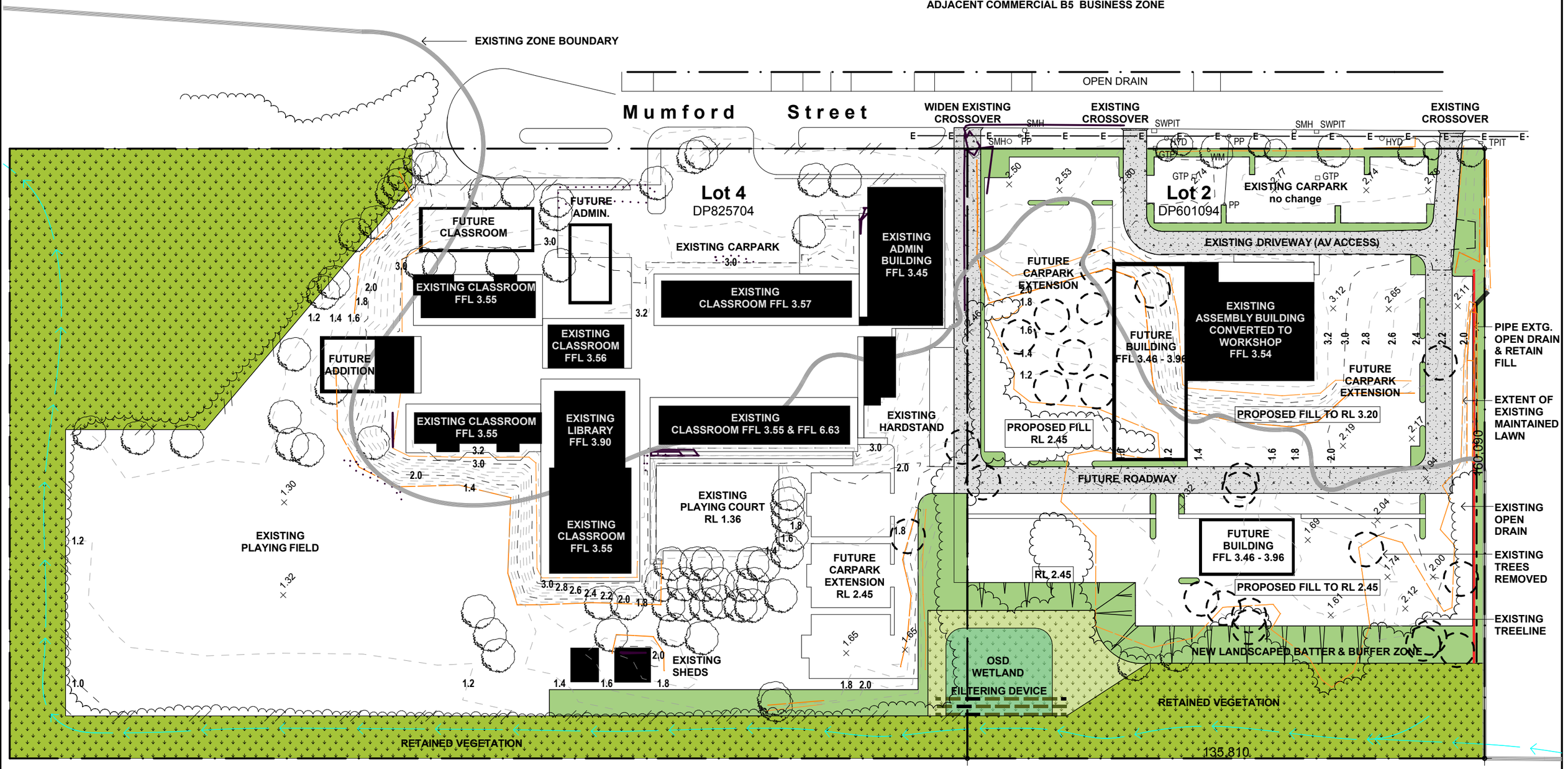
6 References

- Department of Environment & Climate Change (*October 2007*), *'Practical Consideration of Climate Change'*; DECC Floodplain Risk Management Guideline.
- Department of Environment & Climate Change (*2007*), '*SES Requirements from the Floodplain Risk Management Process*' DECC Floodplain Risk Management Guideline.
- Department of Environment & Climate Change (2007), '*Flood Emergency Response Planning Classification of Communities*'.
- Department of Infrastructure, Planning & Natural Resources (*May 2005*), *'Floodplain Risk Management Guideline No 5 – Ocean Boundary Conditions'*; Developed by the State Urban Flood Unit.
- Institution of Engineers (*1987*), *'Australian Rainfall and Runoff – A Guide to Flood Estimation'*; edited by DH Pilgrim.
- NSW Government (*April 2005*), *'Floodplain Development Manual: the management of flood liable land'*; ISBN 0 7347 5476 0.
- New South Wales Government (*2005*), *'Floodplain Development Manual: the management of flood liable land'*; ISBN 0 7347 5476 0.
- '*Hastings River Flood Study*' (2006) Port Macquarie-Hastings Council (*August, 2006*), *'Hastings River Flood Study'*; prepared by Patterson Britton & Partners Pty Ltd.
- The '*Hastings River Floodplain Risk Management Study*' Port Macquarie-Hastings Council (*2012*), prepared by WorleyParsons.
- Port Macquarie – Hastings Council (*2007*), *'Interim Port Macquarie-Hastings LGA Flood Policy'* (*adopted April 2007*)
- Port Macquarie – Hastings Council (*2015*), *'Port Macquarie-Hastings LGA Flood Policy'* (*adopted October 2015*)
- NSW State Emergency Service '*Port Macquarie-Hastings Local Flood Plan*' (*2015*).
- '*Hastings River Climate Change Assessment*' (*in draft, 2017*) Port Macquarie-Hastings Council; prepared by Advisian Pty Ltd.

Appendix A

Development Plans

Source: AB3D Building Design



Site Plan

Proposed Rezoning
Lot 2 DP601094 & Lot 4 DP825704
Mumford Street PORT MACQUARIE

A B 3 D
Building Design
0438 499629 ab3d@bigpond.com

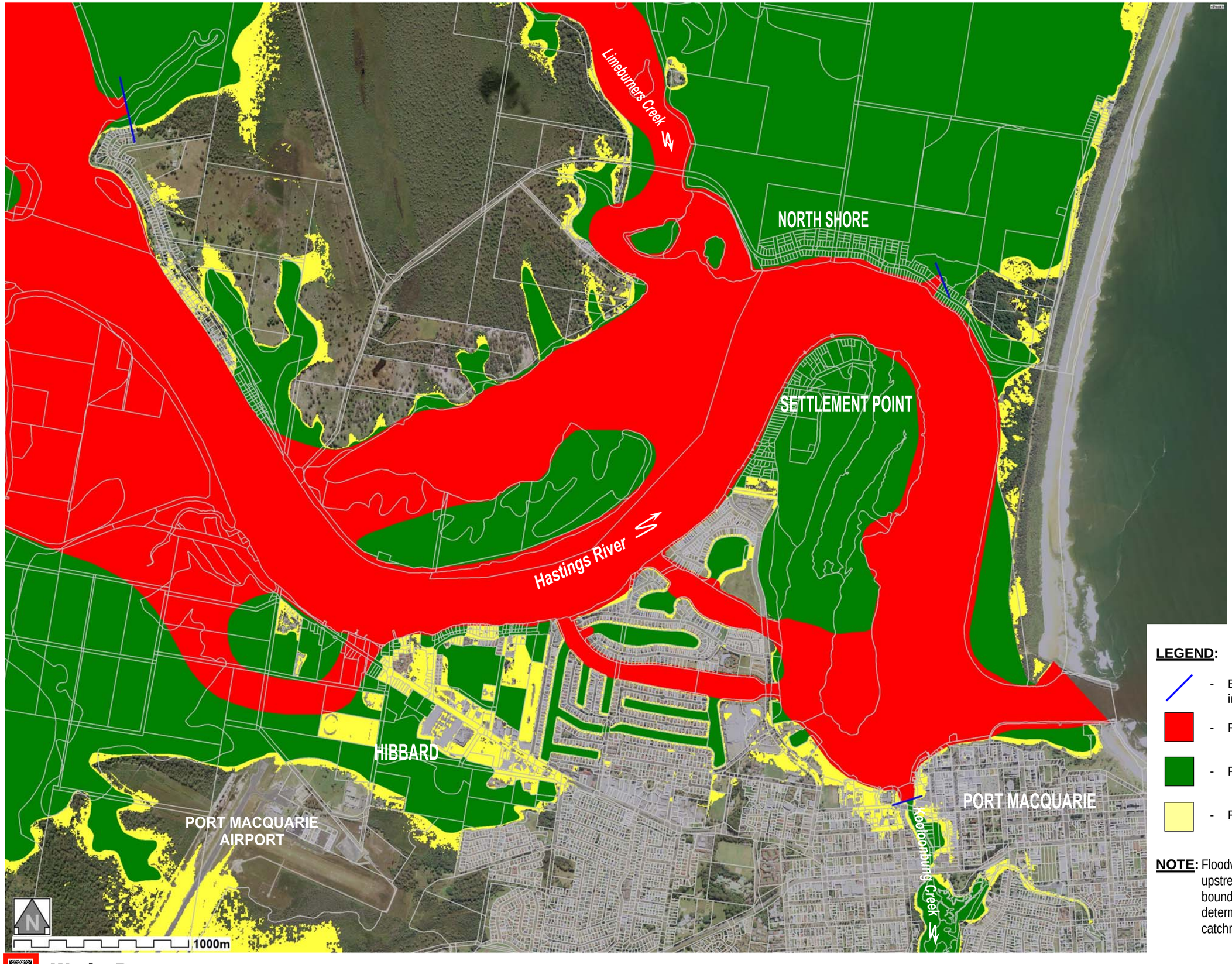
Site Plan
Scale 1:1000
Date 5/02/2018
Drawing No
A01 B

Appendix B

Hydraulic Category Mapping

Source: Hastings River Floodplain Risk Management Study (2012)

FIGURE 9.5



LEGEND:

- Boundary of Hastings River floodway investigations.
- Floodway
- Flood Storage
- Flood Fringe

NOTE: Floodway corridors for tributaries extending upstream from the floodway investigation boundaries are not shown and should be determined as an outcome of independent local catchment investigations.

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Rp3577_00 – Hastings FPRMS
fg3577_00rg110223-fig9.5_Hydraulic Categories [Zone 4].doc

HYDRAULIC CATEGORIES FOR THE 100 YEAR ARI FLOOD [ZONE 4]

Appendix C

Hibbard Sector Map

Source: Port Macquarie-Hastings Local Flood Plan (2015)

HIBBARD SECTOR MAP