

Submissions and
Preferred Project Report
Riverside Tourist Cabins



quality solutions sustainable future

This page has been left intentionally blank

Submissions and Preferred Project Report Riverside Tourist Cabins

Prepared for: Shannon Pacific Pty Ltd
© GeoLINK, 2012



PO Box 119
Lennox Head NSW 2478
T 02 6687 7666

PO Box 1446
Coffs Harbour NSW 2450
T 02 6651 7666

info@geolink.net.au

<i>Version History</i>				
<i>UPR</i>	<i>Description</i>	<i>Date Issued</i>	<i>Issued By</i>	<i>Reviewed By</i>
1291449	Version 1	13/01/2012	Ali McCallum	Simon Waterworth
1291354	Version 2	07/02/2012	Tim Ruge	Simon Waterworth

Table of Contents

1	Introduction	1
2	Response to Public Submissions	3
2.1	Summary of Submissions	3
2.2	Response to submissions	4
2.2.1	Wetland Impact	4
2.2.2	Flooding	6
2.2.3	Zone/LEP Inconsistency	6
2.2.4	Amenity	7
2.2.5	Bushfire	8
2.2.6	Over Supply of Accommodation	8
2.2.7	Traffic	9
2.2.8	Ecology	9
2.2.9	Climate Change	9
2.2.10	Acid Sulfate Soils	10
2.2.11	Water Quality	10
2.2.12	Noise	11
2.2.13	Property Values	11
2.2.14	Views	11
2.2.15	Infrastructure	11
2.2.16	Economic	12
2.2.17	Tourism	12
2.2.18	Parking	12
2.2.19	Site Suitability	12
2.2.20	Miscellaneous Impacts	12
3	Government Submissions	15
3.1	Response Government Agency Submissions	15
4	Amended Development Proposal	41
4.1	Summary of Amendments to the Development Proposal	41
4.1.1	Constructed Wetland	41
4.1.2	Cabin Layout/Site Plan	41
4.1.3	Sewage System	41
4.2	Tourist Cabins	41

4.3	Site Fill Levels	42
4.4	Urban Design and Sustainability	42
4.5	Development Staging	43
4.6	Management of Adjoining Wetlands.....	43
4.6.1	Restoring Tidal Flows to the SEPP 14 Wetland	45
4.6.2	Acid Sulfate Soil Monitoring and Management for Tidal Flow Restoration.....	46
4.7	Access and Parking.....	47
4.8	Integrated Water Cycle Management.....	47
4.8.1	Proposed IWCM System.....	47
4.8.2	Water Supply	49
4.8.3	Stormwater.....	49
4.8.4	Sewerage.....	50
4.9	Services and Infrastructure Provision.....	51
4.10	Building Management Plan.....	51
5	Revised Statement of Commitments	53
5.1	Revised Statement of Commitments	53

Illustrations

Illustration 3.1	APZ and Radiant Heat Offsets	39
------------------	------------------------------------	----

Tables

Table 2.1	Summary of Public Submissions.....	3
Table 3.1	Summary of Government Agency Submissions.....	15
Table 3.2	Response to Government Agency Submissions.....	16
Table 3.3	APZ Performance Criteria and Acceptable Solutions for SFPP	37
Table 4.1	Summary of Wetland Management Plan management actions	44
Table 4.2	Council Stormwater Management Objectives – Post Construction Phase.....	49
Table 4.3	Building Management Plan	51
Table 5.1	Revised Statement of Commitments.....	54

Plates

Plate 2.1	Existing Riparian Area in front of Cabin Site	7
Plate 4.1	Indicative Examples of an Automatic Floodgate	45
Plate 4.2	Indicative Illustrations of Sewage Pumping Units.....	51

Appendices

A	APZ Calculator Report
B	Assessment of Impact Significance on the Migratory Species Latham's Snipe as Listed Under the EPBC ACT
C	Seven Part Test for Bousfields Marsh-hopper <i>Microrchestia bousfieldi</i> as a Vulnerable Species under the Fisheries Management Act 1994
D	Amended Architectural Drawings
E	Amended Stormwater Management Plan
F	Flood Evacuation Route

This page has been left intentionally blank

Introduction

This Preferred Project Report (PPR) has been prepared following the public exhibition of the Part 3A Project Application for a tourist facility including 9 tourist cabins and associated wetland improvement works at New Entrance Road, South West Rocks (Project Number 09_0019). The Part 3A Project Application and associated Environmental Assessment Report (EAR) were placed on public exhibition by the Department of Planning and Infrastructure from 29 July 2011 until 7 September 2011. The Department received 18 public submissions and 7 government submissions to the project. The government submissions were received from:

- Kempsey Shire Council;
- NSW Crown Lands;
- Office of Environment and Heritage;
- NSW Office of Water;
- NSW Primary Industries;
- NSW Rural Fire Service; and
- Northern Rivers Catchment Management Authority.

The Department of Planning and Infrastructure also provided a Statement of Key Issues.

The proponent, Shannon Pacific Pty Ltd, has reviewed and considered the submissions and in accordance with Clause 75 h(6) of the *Environmental Planning and Assessment Act 1979* (EP&A Act 1979) has responded to the issues raised in each of the submissions through the preparation of this PPR. This PPR sets out the proponents response to each of the issues raised and amends the original environmental assessment report, including the project description and statement of commitments. This PPR should be read in conjunction with the exhibited EAR for Riverside Tourist Cabins prepared by GeoLINK and dated July 2011.

This page has been left intentionally blank

Response to Public Submissions

2.1 Summary of Submissions

A total of 18 public submissions were received by the Department of Planning and Infrastructure as a result of the exhibition of the Part 3A Application and associated documentation. These submissions have been numbered from C1 to C18 and are referred to as such throughout this report. A summary of the submissions is provided in Table 2.1.

Table 2.1 Summary of Public Submissions

<i>Issues raised</i>	<i>No. of Submissions who raised issue</i>	<i>Submission who raised each particular issue</i>	<i>Supports or objects</i>	<i>Section</i>
Wetland impact	11	C1, C2, C4, C5, C6, C10, C11, C13, C15, C16, C17	object	2.2.1
Flooding impact	15	C2, C3, C4, C5, C6, C8, C9, C10, C11, C12, C13, C15, C16, C17, C18	object	2.2.2
Zone/LEP inconsistency	8	C4, C10, C11, C12, C13, C15, C16, C17	object	2.2.3
Amenity impact	8	C2, C3, C4, C5, C8, C9, C10, C13	object	2.2.4
Bushfire impact	8	C2, C4, C5, C10, C16, C17	object	2.2.5
Over supply of accommodation	7	C2, C3, C6, C8, C9, C12, C13	object	2.2.6
Traffic impact	7	C1, C2, C3, C6, C8, C9, C14	C14 supports, all others object	2.2.7
Ecology impact	6	C2, C3, C6, C8, C10, C14	C14 supports, all others object	2.2.8
Climate Change impact	7	C4, C5, C10, C14, C15, C16, C17	C14 supports, all others object	2.2.9
Acid Sulfate Soils	5	C4, C5, C10, C16, C17	object	2.2.10
Water quality	5	C2, C6, C10, C11, C18	object	2.2.11
Noise impact	3	C6, C9, C18	object	2.2.12
Property value impacts	2	C2, C6	object	2.2.13

<i>Issues raised</i>	<i>No. of Submissions who raised issue</i>	<i>Submission who raised each particular issue</i>	<i>Supports or objects</i>	<i>Section</i>
View impacts	2	C2, C6	object	2.2.14
Infrastructure capacity	2	C3, C18	object	2.2.15
Economic impacts	1	C7	supports	2.2.16
Tourism impacts	1	C7	supports	2.2.17
Parking	4	C1, C8, C14, C18	C14 supports, all others object	2.2.18
Site Suitability	2	C16 and C17	object	2.2.19
Other miscellaneous issues	7	C4, C5, C7, C8, C9, C11, C18	object	2.2.20

2.2 Response to submissions

2.2.1 Wetland Impact

11 submissions identified concerns about the development and the adjoining wetland. The issues raised and a response to each concern is outlined below.

- The site is a SEPP 14 Wetland/Endangered Ecological Community (EEC). The development has been designed and sited outside of the mapped SEPP 14 Wetland No. 436, in an area that contains mostly exotic grasses. A Wetland Management Plan (WMP) has been prepared that aims to improve the SEPP 14 Wetland and EEC through conservation, protection and management.

The proposed 9 cabins and associated infrastructure including driveways, landscaping and sewerage system is not within the SEPP 14 Wetland No. 436. There is a small area of highly degraded coastal saltmarsh EEC within the proposed constructed wetland. It is considered that the loss of this small degraded area of coastal saltmarsh EEC is not significant compared the environmental improvements that will occur as a result of rehabilitating the SEPP 14 wetland.

The boundary of the SEPP 14 wetland was surveyed and ground truthed by the Department of Planning and Infrastructure in conjunction with the proponent's ecologist. The constructed wetland for the proposed 9 tourist cabins will be outside of the surveyed SEPP 14 wetland boundary.

As discussed previously the project proposes to improve the existing degraded SEPP 14 wetland by reintroducing the tidal influence to the wetland which was previously blocked by the construction of Government road. Other mitigation measures to ensure protection of the SEPP 14 wetland include:

- vegetation rehabilitation within the SEPP 14 wetland;
- vegetation rehabilitation in the area between the cabins and the SEPP 14 wetland including weed control;
- planting within the buffer between the cabins and SEPP 14 wetland to ensure compliance with both asset protection zones and provision of a vegetated buffer to the EEC's and SEPP14 wetland;
- a comprehensive stormwater management plan including construction of a wetland (outside of the SEPP 14 wetland boundary) to provide treatment and improve quality of stormwater runoff from the development into the SEPP 14 wetland; and

- a physical barrier created by the stormwater wetland between the development and SEPP 14 wetland, friendly fauna fencing (such as bollards) and signage saying that the area is an Environmental Protection area and warning people to keep out.
- The development will have a deleterious impact on the wetland from fill, pollution, stormwater and sewerage trampling from occupants and invasion from exotic plant species.

As mentioned previously the project proposes the rehabilitation of the SEPP 14 wetland by the introduction of tidal flows into the wetland. There has been significant mitigation measures and commitments made within the project application to ensure that the wetland is improved and protected. The following is a response to the issues raised by submissions about potential deleterious impact on the wetland:

- Fill – all fill will be outside of the SEPP 14 wetland. The placement of fill on the site will be the subject of a comprehensive erosion sediment control plan to ensure impacts on the SEPP14 wetland are mitigated;
 - Pollution/Stormwater – the constructed wetland proposed by the proponent has been oversized to accommodate any potential impacts from the proposed tourist cabins including stormwater and other associated impacts. The MUSIC modelling prepared in the EAR and as amended by this PPR has demonstrated that the proposed construction wetland will treat stormwater from the proposed development to required levels prior to it entering into the SEPP 14 wetland; and
 - Trampling from occupants – a constructed boardwalk has been proposed to assist in preventing humans entering the SEPP 14 wetland. Educational signage is also proposed to encourage occupants to not enter the SEPP 14 wetland area. This will be a significant improvement to what exists at the moment where residents and users of the adjoining facilities have unrestricted access to the SEPP 14 wetland.
- There is insufficient/incomplete modelling of the potential impacts to the wetland.
- The impact of water quality from stormwater runoff on the wetland was assessed using MUSIC, an industry standard stormwater model which shows the proposed stormwater treatment measures will improve the water quality of runoff from the site in comparison to existing conditions.

In respect to the potential impacts of tidal restoration on the SEPP 14 wetland, an assessment of potential impacts to groundwater / acid sulfate soil finds that tidal restoration will not result in the export of acid water due to minimal impact on groundwater levels. This is due to the following reasons:

- the groundwater in the SEPP 14 wetland within the site has not been altered (lowered) by construction of deep drains as experienced in other areas of the Macleay floodplain;
- the groundwater levels are still hydraulically connected with groundwater levels downstream of the floodgate / Government Road which assists in preventing any significant alteration in groundwater levels as a result of the floodgates; and
- the existing floodgate is partially damaged resulting in some limited tidal flows currently entering the site.

The above explains that groundwater levels have not been significantly altered by the construction of the existing floodgates. Consequently, there has not been any significant impact on acid sulfate soils in the SEPP 14 wetland within the site. This is supported by: no evidence of major ASS scalds on site; Back Creek does not have any fish kills on records which indicate no major ASS export at present from runoff events that would export acid water if present.

The restoration of tidal flows will mainly introduce surface waters but have no major impact on groundwater levels, therefore it will not result any changes in ASS export from the site.

- Past actions by the owner have altered the wetland.
The past actions of the owner are not the subject of this proposal, however, the owner of the land maintains the existing opened grassed area where the 9 cabins are proposed. This maintenance has not impacted on or changed the structure of the SEPP 14 wetland.

2.2.2 Flooding

14 submissions identified concerns about the sites suitability for the proposed development given that the land is flood prone. The issues raised and a response to each concern is outlined below.

- The site is not suitable for the development as it is flood prone.
The design of the proposed development and mitigation measures outlined in the flood assessment and the EA adequately addresses this issue through measures including filling of the site, appropriately engineered foundations, building materials will be flood compatible and suitable to withstand occasional flood inundation and all electrical installations are to be above floor level. The floor level has been set in accordance with Kempsey Shire Council's flood policy and includes an allowance for climate change. A strategy has also been developed to ensure that the buildings can be raised in the future to address the impacts of climate change (refer Section 6.3).
- Safety/access concerns for occupants in times of flood.
A Flood Emergency Plan was prepared for the development and submitted with the EA to address safety and access concerns during flood events (Refer to Appendix F of the EAR). A flood evacuation route is detailed later in this report as a response to government agency submissions. The site of the cabins adjoins and has direct access to land above the 1% AEP event and the Probable Maximum Flood (PMF) via a Marlin Drive. Responsibility of evacuation in time of flood will be with the managers of the cabins (who also operate the Riverside Tavern). An evacuation plan will be permanently located within the cabins which will provide clear instructions to occupants on when evacuation is required, what to do in and where to go when evacuation is required. Given that the cabins are located in the lower reaches of the Macleay River the Flood consultant considers that there is sufficient time to ensure evacuation occurs in a safe and stress free manner.
- The proposed amount of fill will impact on the flow of waters.
This issue was considered in the Flood Study submitted with the EA which used modelling to assess the impact of the proposed filling of the site. The flood study concluded that the position of the site adjacent to the high ground to the south is such that the fill does not significantly impede the existing flood flow paths (refer Section 6.3 and Appendix F of EAR).
- Additional strain on SES resources.
SES resources will not be impacted on. Evacuation of the cabins will occur well before inundation of the site occurs.
- Moving of vehicles in times of flood will impact on the adjoining residential area.
This is not considered a valid concern. The additional nine vehicles travelling via a collector road through the adjoining residential area will not impact on residents.

2.2.3 Zone/LEP Inconsistency

8 submissions identified concerns about the inconsistency of the development with the zone of the site under Kempsey Local Environmental Plan 1987. The issues raised and a response to each concern is outlined below.

- The proposal is inconsistent with the objectives of the 7d Scenic Protection Zone.
The proposal is not inconsistent with objectives of the zone. The objectives of the 7(d) Scenic Protection zone are:
 - to conserve the scenic quality and natural characteristics of foreshore land; and
 - to permit productive use of such land where the use does not prejudice its conservation value.

The proposed development has been designed to ensure the scenic quality and natural qualities of the area (refer Visual Impact Assessment contained in Section 6.3 and Appendix L of the EAR. The development will also improve the conservation value of the land the area through rehabilitation of the SEPP 14 wetland in accordance with an approved Wetland Management Plan.

- Height of the cabins is not consistent with the Zone Objectives.
The zone objectives do not specify a height limit. The height of the cabins will be consistent with the adjoining Riverside Tavern and also with other residential dwellings in the locality.
- The proposal is in contravention to KLEP 1987 land size map.
It is assumed that this objector is referring to the minimum lot size requirements contained with KLEP 1987. These requirements relate to subdivision of land. No subdivision is proposed as part of this project. It is therefore considered that this is not a valid concern.

2.2.4 Amenity

9 submissions identified concerns about the proposed development impact on the amenity of the area. The issues raised and a response to each concern is outlined below.

- The proposal is not in keeping with homes in the surrounding area and will impact on the amenity of the area.
The proposed cabins have been designed to be compatible with the surrounding environment will have a light-weight, contemporary appearance incorporating pitched metal roofs and timber cladding to generate an easy going holiday ambience that will complement the visual character of the surrounding natural landscape. The cabins will be comprehensively landscaped to ensure that they blend into the existing environment. These issues are addressed in Sections 4.4 and 6.13 and Appendix L of the EAR.
- The development would detract from the aesthetic riparian qualities.
The existing riparian quality in front of the Cabins site is considered to be low in aesthetic value (refer to Plate 2.1 below. It is considered the proposal will enhance the aesthetic qualities of the riparian area by adding vegetation and landscaping to the locality.



Plate 2.1 Existing Riparian Area in front of Cabin Site

- The proposed development would impact on the amenity of the area with regard to height, design of cabins on stilts and location.
Refer to comments above in regard to amenity and consistency with zone objectives. These matters have been comprehensively addressed in Sections 4.4 and 6.13 and Appendix L of the EAR.

2.2.5 Bushfire

Six submissions identified concerns about the proposed development on bushfire risk. The issues raised and a response to each concern is outlined below.

- The proposed boardwalk will add more fuel to potential fires.
The proposed internal road and constructed wetland will reduce the fuel available in potential fires. The boardwalk will not significantly affect bushfire behaviour.
- There will be a danger to human life.
The Bushfire Hazard Assessment, and amendments outlined further in this report, have been developed in accordance with Planning for Bushfire Protection 2006, Addendum: Appendix 3 of PBP (2010) and AS 3959-2009 Construction of Buildings in Bushfire Prone Areas. Adequate and appropriate bushfire protection measures are proposed, and the proposal conforms to the standards, specific objectives and performance criteria.
- The proposal will add to responsibilities of the local bushfire brigade.
Additional development in the South West Rocks area will increase demand on bushfire fire fighting services and will result in the need to expand existing services. The proposed development will be required to pay Section 94 contributions under the South West Rocks Contribution Plan which incorporates a contribution for Bushfire Services.
- The timber cladding, balustrades and balconies increase bushfire risk.
The bushfire attack levels of the cabins have been calculated in accordance with Planning for Bushfire Protection 2006, Addendum: Appendix 3 of PBP 2010 and AS 3959-2009 Construction of Buildings in Bushfire Prone Areas. Buildings will have appropriate bushfire construction levels to improve protection of building elements from attack by bushfire.
- Additional vegetation will increase bushfire risk.
Landscaping on the site will comply with Appendix 5 of PBP and asset protection zones will be established and maintained in accordance with NSW RFS Standards for Asset Protection Zones (2005) to mitigate against impacts of bushfire risk.
- Has not been adequately addressed in the proposal.
A Bushfire Hazard Assessment (BHA) was prepared for the site prepared in accordance with Planning for Bushfire Protection 2006, Addendum: Appendix 3 of PBP (2010) and AS 3959-2009 Construction of Buildings in Bushfire Prone Areas. Adequate and appropriate bushfire protection measures are proposed to provide for the protection of human life and minimise impacts on property from the threat of bushfire. The proposal conforms to the required standards, specific objectives and performance criteria.
- There is a high risk of bush fire on the site.
A Bushfire Hazard Assessment (BHA) was prepared for the site, and further amendments are outlined further in this report. The BHA was prepared in accordance with Planning for Bushfire Protection 2006, Addendum: Appendix 3 of PBP (2010) and AS 3959-2009 Construction of Buildings in Bushfire Prone Areas. Adequate and appropriate bushfire protection measures are proposed to provide for the protection of human life and minimise impacts on property from the threat of bushfire. The proposal conforms to the standards, specific objectives and performance criteria.

2.2.6 Over Supply of Accommodation

- There is an oversupply of Tourist Accommodation in South West Rocks and current caravan parks struggle outside peak periods.
South West Rocks is holiday destination and has been so for some time. The proposed cabins offer a unique type of accommodation given their proximity to the Macleay River, Riverside Tavern and fishing

and other infrastructure that exists in this locality. This is considered to be a market determined matter and not for consideration under the EP&A Act, however, it is not considered that the addition of nine cabins will have a significant impact on other tourist accommodation in the locality.

2.2.7 Traffic

- The proposal will not remain at 9 cabins and will therefore bring excess traffic.
Only 9 cabins are being proposed as part of this project.
- The proposed entry point for the Cabins is unsafe.
There are adequate sight distances to cater for the safe egress and ingress of vehicles to and from the site. The access has been designed and located to ensure compliance with Council policy and required standards and to ensure the safest location is provided for vehicular access. Access off Marlin Street as opposed to New Entrance Road also avoids directly impacting on public access along the river foreshore.
- The Road system is not suitable for heavy traffic use - increased traffic will further deteriorate these roads and impact on the local residents.
The proposed nine cabins will generate three to four vehicle trips per hour during evening peak hour and 27 vehicle trips per day based on allowances for motels (0.4 peak hour trips per unit and 3 daily trips per unit) listed in RTA's Guide to Traffic Generating Developments (RTA, 2002). These numbers are negligible in reference to the capacity of Marlin Drive and existing peak vehicle trip estimates. Therefore, the existing road network has sufficient capacity to cater for the small increase in traffic movements associated with the development (refer to Section 6.8 in EAR).
- Better access for car trailer combinations is required if the area is to be developed in a methodical and planned fashion.
This is not a matter for consideration as part of the proposed development. Although it should be noted that the proposed development will be providing car and trailer parking on site so the proposed development will not be increasing demand for external car parking in the locality.

2.2.8 Ecology

- Loss of kangaroo habitat will push them into urban areas creating increased human fauna conflict.
The loss of a small section of habitat sporadically utilised by the Eastern Grey Kangaroos is not considered to have a significant impact on this population (refer Appendix D Ecological Assessment). The Eastern grey kangaroo population will continue to utilise the remainder of the site as well as other open areas in the locality. The revised Statement of Commitments contains strategies recommended by the ecological consultant to reduce risk of conflict between humans and the Eastern Grey Kangaroo.
- Impact on birds.
The location of the cabin has limited vegetation and would not provide any significant habitat for birdlife. The proposal seeks to rehabilitate the SEPP 14 Wetland which would improve existing bird (as well as other fauna) habitat.
- Owners of the land have regularly had the land slashed so flora and fauna studies will be flawed.
The owners have maintained the cleared area of the site as is their right to do so. This maintenance would have had little if any impact on the findings of the flora and fauna studies.

2.2.9 Climate Change

- Climate change makes it an inappropriate site for development.
Climate change has been considered throughout the EAR and specifically in Section 6.3 and in Appendix F. Although the site is likely to be affected by climate change, specific allowances have been

made in the design of the buildings to consider and plan for climate change. These allowances are in accordance with NSW Government guidelines for climate change.

- Sea Level Rise has not even been considered in the EAR.
Sea Level Rise has been considered throughout the EAR and specifically in Section 6.3 and in Appendix F. The EAR demonstrates the proposal is in accordance with NSW Government guidelines for climate change/sea level rise.
- Coastal Developments under 4m AHD are being discourage.
NSW Government guidelines for climate change set out the requirements for consideration of development potentially affected by climate change. The guidelines do not prohibit the use of land potentially impacted by climate change.
- A more practical floor height would be half a metre above the road level, which is about 1.5 m AHD giving a floor level about 2m AHD, given that in the event of a major flood any occupants would have been evacuated.
The floor level has been set in accordance with Council Policy and NSW Guidelines for Climate Change.

2.2.10 Acid Sulfate Soils

Five submissions identified concerns about the proposed development on acid sulfate soils (ASS). The issues raised and a response to each concern is outlined below.

- The site has high risk ASS present which should not be disturbed.
The presence of ASS at the site is located at greater than 1 m depth below the natural ground surface. ASS is a constraint that can be adequately managed with development design and mitigation. An Acid Sulfate Soil Management Plan has been prepared in accordance with the Acid Sulfate Soil Management Advisory Committee (ASSMAC) Management Guidelines (1998) for the proposed works and was submitted with the Environmental Assessment. The ASSMP provides a detailed assessment, outlines avoidance, minimisation and neutralisation techniques for managing ASS.
- Disturbance of ASS will cause contamination and increased scalding in the SEPP 14 Wetland and EEC saltmarsh areas.
Disturbance of ASS will be limited by avoidance techniques (i.e. most excavation works will not be beyond 1 m below the natural ground surface. The ASSMP additionally provides measures for neutralising exposed ASS. A Sediment and Erosion Control Plan will be prepared for the works and will include measures to prevent the export of soil into the SEPP 14 Wetland. The ASSMP was prepared in accordance with the *Acid Sulfate Soil Management Advisory Committee (ASSMAC) Management Guidelines* (1998) and provides a detailed assessment, outlines avoidance, minimisation and neutralisation techniques for managing ASS.

2.2.11 Water Quality

- Construction of roads and buildings will make it harder for water to dissipate.
This has been addressed in the EAR and in the Response to Government Submissions within this PPR (refer Section 3). The music modelling carried out demonstrates that the infiltration will improve as a result of the proposed artificial wetlands.
- Fertilisers and poisons will be dispersed into Macleay River impacting on marine environment in flood times
Only endemic native plants are proposed to be utilised within the development which will not require fertiliser use. A low maintenance landscaping design is also proposed as part of the landscape design for the development. Any use of poisons will be minimal and will need to be in accordance with the

manufactures instructions. It is considered that any impacts from the use of poisons and fertilisers will therefore be insignificant.

- Stormwater control will be difficult to prevent polluted runoff entering the river and the wetlands
The stormwater modelling prepared as part of the EAR and this PPR demonstrates that any stormwater pollution as a result of the proposed cabins can be adequately treated in accordance with Council policy and relevant standards.

2.2.12 Noise

Three public submissions identified concerns about the proposed development on noise. The issues raised and a response to each concern is outlined below.

- Noise from tourists will impact on the surrounding residences.
Noise from the development is not likely to impact on the noise amenity expected of a residential area.
- Increases in traffic noise.
Traffic increase will be negligible compared to the existing traffic levels and traffic carrying capacity of the existing road system. It is not considered that the proposed development will significantly increase traffic noise.
- Noise impacts from proposed internal sewerage pumps.
This issue is addressed in Section 6.10 of the EAR. Manufacturer's details indicate that noise measurements taken 1 metre above the lid of a pumping unit during pump operation recorded a noise level of 55 dBA (Mono Pumps Australia, 2010). This level would be reduced with distance to the proposed building and the existing tavern. The nearest building to the pumping units (approximately 7 m distance) would experience a noise level of approximately 40 dBA or less allowing for noise attenuation with distance. This reduced level does not exceed noise amenity levels for suburban areas.

2.2.13 Property Values

- Extra Trees will lower Property values.
There is no evidence to support that the planting of additional trees on a property will significantly lower property values.
- Traffic noise will lower property values.
The issue of traffic noise has been discussed previously. Noise from the proposed increase in traffic will not be significant and will not lower property values.

2.2.14 Views

- Extra trees will interrupt property views.
This is not considered to be a valid objection. Growing vegetation will often interrupt property owner's views. There is no legislation to prevent people from planting vegetation on private land.

2.2.15 Infrastructure

- There is not enough sewer capacity.
There are capacity issues in this locality however the proposal seeks to overcome this by pumping sewerage at off peak times. The project will also be required to pay sewer contributions for future augmentation of the reticulated sewer system.

- Infrastructure cannot cope.
Other than sewer (refer to comments above) there is existing capacity in all existing serviced (water and electricity) to accommodate the development.

2.2.16 Economic

- The proposal will have a positive impact on the South West Rocks Community.
It is agreed that the proposal will have a positive impact in terms of capital investment and provision of unique tourist accommodation for South West Rocks.

2.2.17 Tourism

- More fisherman specific accommodation will be a positive for the local community.
It is agreed that the proposal will have a positive impact on tourism in terms of provision of unique tourist accommodation for South West Rocks.

2.2.18 Parking

- The area is a popular boat launch site and can attract up to 150 cars and boat trailers and there is insufficient parking available in the locality.
The proposed development provides for its own car and trailer parking onsite and will therefore not impact on the perceived shortage of parking external to the site. Car parking onsite is in excess of Council policy.
- The site is utilised currently for parking and the proposed development will increase demand.
The site is privately owned and although may be used as informal parking for cars and trailers, the owner has no obligation to continue to provide car / trailer parking for the general public.

2.2.19 Site Suitability

- The site is not suitable for the proposed development.
The proposed cabins are located adjacent to the existing Riverside Tavern, existing boating infrastructure and the Macleay River. The area has very high level of amenity and is ideally suited to tourist accommodation. The site does have constraints with respect to flooding, bushfire, ASS, proximity to wetland, however, the development has been designed to ensure that impacts from these constraints have been adequately addressed and mitigated.

2.2.20 Miscellaneous Impacts

- The proposed development would also create the potential for permanent low cost housing.
The application is proposed for tourist accommodation and its use as permanent residential accommodation (low cost or otherwise) is not permissible under Kempsey Local Environmental Plan 1987.
- The previous DA was refused so why is this proposal being considered.
The proposed development is significantly different to the previous development. There is also no legislation that prevents the proponent from lodging the subject application.
- If development is allowed it will set precedence for this area and further development along the coastal edge and New Entrance Road.
It is considered that the approval of this proposal is unlikely to set such a precedent. The site is considered to be infill development between the Riverside Tavern and the existing residential land.

- Question the calculation on jobs as most of the cabins are going to be built in stages.
Job calculations were worked out on full time equivalent over period of construction. Staging the cabins would not impact on this calculation.
- There does not appear in the plans to be any facilities for the collection of garbage.
Garbage bins will be provided in accordance with Council requirements.

This page has been left intentionally blank

Government Submissions

3.1 Response Government Agency Submissions

Submissions were received from government agencies by the Department of Planning and Infrastructure as a result of the exhibition of the Part 3A Application and associated documentation. These submissions have been numbered from G1 to G8 and are referred to as such throughout this report. Submissions were received from:

- G1 - Kempsey Shire Council (KSC);
- G2- NSW Department of Primary Industries – Crown Lands;
- G3 - Northern Rivers Catchment Management Authority (NRCMA);
- G4 - NSW Office of Environment and Heritage (OEH);
- G5 - NSW Office of Water (NOW);
- G6 - NSW Rural Fire Service (RFS);
- G7 - NSW Department of Planning and Infrastructure (DoPI); and
- G8 - NSW Department of Primary Industries – Fisheries Ecosystems.

Table 3.1 provides a summary of the government agency submissions. Table 3.2 outlines the detailed issues and responds accordingly.

Table 3.1 Summary of Government Agency Submissions

<i>Issues</i>	<i>No. of Submissions who raised issue</i>	<i>Submission who raised each particular issue</i>
General	1	G5
Bushfire	2	G6 and G7
Acid Sulfate Soil	2	G3 and G5
Heritage	1	G4
Landscaping	2	G1 and G3
Groundwater	1	G5
Infrastructure	2	G1 and G5
Roads	1	G1
Developer Contributions	1	G1
Noise	1	G1
Mosquito Risk	1	G7
Stormwater	4	G1, G3, G5, and G7
Flooding	5	G1, G3, G4, G5 and G7
SEPP 14 Wetland	6	G1, G2, G3, G5, G7 and G8
Ecology	4	G1, G3, G4 and G8

Table 3.2 Response to Government Agency Submissions

Agency	Issue	Response
General		
NOW	The area to be developed is not suitable for urban development because of regular flooding, waterlogging and the PASS risk and foundation hazards from the low wet bearing strength of the soil profile.	Whilst these issues present constraints to the development of the site, the design of the proposed development adequately addresses and mitigates each of these constraints, e.g. filling of the site to address flooding and waterlogging, avoidance of acid sulfate soil, and appropriately engineering foundations. These design measures are detailed in the EA report. Further details regarding flooding and PASS risk are provided elsewhere in this report.
Bushfire		
P&I	NSW Planning and Infrastructure request a copy of the NSW RFS APZ Calculator modelling report showing radiant heat level calculated for the site	The NSW RFS APZ Calculator modelling report showing radiant heat level calculated for the site is attached at Appendix A .
RFS	The NSW Rural Fire Service (RFS) does not support justification for reduced Asset Protection Zones (APZs) and requires further evidence demonstrating how the proposed cabins can achieve the performance criteria for special fire protection purposes in accordance with PBP.	In response to Issue 3 demonstration of the projects' compliance with the performance criteria for asset protection zones for a special fire protection purpose as outlined in section 4.2.7 of PBP is provided in Table 3.3 below. The proposal achieves compliance with the intent of the performance criteria.
RFS	Additionally, any point on the buildings must not be exposed to radiant heat levels greater than 29 kW/m ² .	In response to Issue 4, separation distances between the nine proposed cabins and the SEPP 14 boundary are between 30.5 m to 57.8 m. Based on a slope of 0.5°, forested wetland vegetation and an FDI of 80, the minimum separation distance required to achieve radiant heat levels of less than 29 kW/m ² at all points on the buildings is 27 m, (from PBP Addendum: Appendix 3, and Table 2.4.3 in AS3959-2009 <i>Construction of buildings in bushfire prone areas</i>). Illustration 3.1 shows the 27 m offset from the SEPP 14 boundary, and that the cabins achieve more than 27 m separation. Therefore radiant heat exposure of less than 29 kW/m ² is achieved for the proposed cabins as outlined in PBP and AS3959-2009.

Agency	Issue	Response
Acid Sulfate Soil		
NRCMA NOW	NRCMA requests preparation of an ASS Management Plan prior to any development on the site.	An Acid Sulfate Soil Management Plan has been prepared in accordance with the <i>Acid Sulfate Soil Management Advisory Committee (ASSMAC) Management Guidelines</i> (1998) for the proposed works and was submitted with the EA (refer to Appendix J of the EA). The ASSMP provides a detailed assessment, outlines avoidance, minimisation and neutralisation techniques for managing ASS and recommends measures to mitigate impacts. In regard to ASS management in respect to proposed tidal restoration, an assessment of potential impacts to groundwater / acid sulfate soil finds that tidal restoration will not result in the export of acid water due to minimal impact on groundwater levels. This is due to the following reasons: - the groundwater in the SEPP 14 wetland within the site has not been altered (lowered) by construction of deep drains as experienced in other areas of the Macleay floodplain; - the groundwater levels are still hydraulically connected with groundwater levels downstream of the floodgate / Government Road which assists in preventing any significant alteration in groundwater levels as a result of the floodgates; - the existing floodgate is partially damaged resulting in some limited tidal flows currently entering the site. The above explains that groundwater levels have not been significantly altered by the construction of the existing floodgate and levy. Consequently, there has not been any significant impact on acid sulfate soils in the SEPP 14 wetland within the site. This is supported by: no evidence of major ASS scalds on site; Back Creek does not have any fish kills on records which indicate no major ASS export at present from runoff events that would export acid water if present. The restoration of tidal flows will mainly introduce surface waters but have no major impact on groundwater levels, therefore it will not result any changes in ASS export from the site.
	NOW recommends the proponent prepare an Acid Sulfate Soil Management Plan (ASSMP).	

Agency	Issue	Response
NOW	NOW recommends that any low PASS material excavated and used for landfill be treated with lime up to 4 kg/m ³ and/or in accordance with the Acid Sulfate Soil Management Advisory Committee (ASSMAC) Management Guidelines (1998).	The findings of the ASS assessment indicate the brown sandy soils on the site to a depth of approximately 1 m are naturally occurring acid soils, <u>not</u> acid sulfate soils (ASS). Liming is not recommended for these acid soils as noted in the EA. The deeper dark grey sands on the site (below 1 m depth) are ASS and the ASSMP in the EA recommends liming of these soils at a standard rate of 30 kg/m³ based on laboratory analysis and stoichiometry derived liming rates for neutralisation of ASS at the site. No amendment is proposed for the liming rates outlined in the ASSMP in the EA.
NOW	In accordance with standard practice, NOW may require a Security Deposit (Bond or Bank Guarantee) which will enable remediation of any ASS impacts should they occur.	A security deposit to enable remediation for potential ASS impacts is considered to be onerous given the low risk / minimal consequences resulting from: ▪ The small scale of the development; ▪ The very limited disturbance of ASS achieved by avoidance and minimisation techniques during construction as outlined in the ASSMP; and ▪ The appropriate mitigation measures proposed by the ASSMP.
Heritage		
OEH	The proponent must continue to consult with and involve all the registered local Aboriginal representatives for the project in the ongoing management of the Aboriginal cultural heritage values. Evidence of this consultation must be collated and provided to the consent authority on request.	The Statement of Commitments (refer Section 6 of this PPR) has been revised to incorporate recommendations made by OEH.
OEH	The proponent is to provide fair and reasonable opportunities for the registered Aboriginal stakeholders to monitor any initial ground disturbance works. In the event that additional Aboriginal objects are uncovered during the monitoring program, the objects are to be recorded and managed in accordance with the requirements of sections 85A and 89A of the National Parks and Wildlife Act 1974.	
OEH	In the event that surface disturbance identifies a new Aboriginal object, all works must halt in the immediate area to prevent any further impacts to the object(s). A suitably qualified archaeologist and the registered Aboriginal representatives must be contacted to determine the significance of the objects. The site is to be	

Agency	Issue	Response
	registered in the Aboriginal Heritage Information Management System (AHIMS) and the management outcomes for the site included in the information provided. The proposed will consult with the Aboriginal community representatives, the archaeologist and OEH to develop and manage strategies for all objects/sites.	
OEH	If human remains are located all works must cease in the immediate area to prevent any further impacts to the remains. NSW Police are to be notified immediately. Not action is to be undertaken until police provide written notification. If the skeletal remains are identified as Aboriginal, the proponent must contact OEH Enviroline on 131555 and representatives of the local Aboriginal community. No works are to continue until OEH provide written notification to the proponent.	
OEH	All reasonable efforts must be made to avoid impacts to Aboriginal cultural heritage at all stages of the development works.	
OEH	An Aboriginal Cultural Education Program must be developed for the induction of all personnel and contractors involved in the construction activities on site. Records are to be kept of which staff/contractors were inducted and when for the duration of the project. The program should be developed and implemented in collaboration with the local Aboriginal community.	
Landscaping		
KSC	Council requests a Landscape Plan indicating the use of only native endemic species is to be provided for the development proposal.	A landscape plan was submitted with the Environmental Assessment that proposes the use of a native plant species mix. A predominance of these plants will be locally indigenous to ensure the successful integration of the new landscape setting with the surrounding coastal swamp forest community. A small number of other native species that are not endemic were also selected for their robust and reliable habit to provide certainty of addressing key design objectives such as screen planting and spatial definition. GeoLINK has liaised with Kempsey Shire Council who has advised that the species list is suitable.
NRCMA	NRCMA requests that any landscaping planting includes only locally occurring native species.	

Agency	Issue	Response
Groundwater		
NOW	The proponent is to prepare a Groundwater Management Plan in consultation with and to the satisfaction of the NOW prior to the commencement of works.	The mitigation measures and management plans documented in the EA adequately constitute a groundwater management plan – refer to Appendix E in this report which includes amended Section 4.9 - “Integrated Water Cycle Management” of the EA and the stormwater and groundwater sub-sections of the water quality assessment (Section 6.4) in the EA.
NOW	The proponent is to obtain relevant licenses under the Water Act (1912) and the Water Management Act (2000) for all activities that intercept or extract groundwater prior to commencement of these activities.	Activities that intercept or extract groundwater are not proposed, and therefore the works do not require licensing.
NOW	A security deposit of an amount specified by the NOW for the proposed development shall be paid.	The basis for the security deposit outlined in the NOW letter is as follows: <i>“In the event that a groundwater or surface water licence is required under the WA for the excavation or any other major works that intercept groundwater or capture surface water runoff..., it is a standard practice within the NOW that a security deposit ... be sought ... to remediate any potential or unforeseen impact(s) to the surface and/or groundwater source to a value of \$250,000.”</i> A licence under the Water Act is not required for the proposal, and therefore a security deposit is not required.
NOW	The proponent must ensure that there are no infiltration or detention basins to be located within a 1 m buffer above the highest predicted groundwater table.	The base of the wetland has been redesigned to ‘lift’ the base of the constructed wetland to 0.5 m AHD, approximately 0.8 to 1.0m above the groundwater levels measured at the site during the geotechnical investigation (the groundwater level was measured at a level ranging from -0.3 to -0.5 m AHD). This 0.8 to 1.0m buffer is considered more than adequate for the purpose of protecting groundwater quality and ensuring the constructed wetland does not intercept the groundwater table. It is noted that the existing surface levels in the vicinity of the proposed constructed wetland are as low as 0.6 m AHD, therefore it is not considered practical to ‘lift’ the level of the constructed wetland any higher. Furthermore, MUSIC modeling indicates there is more than adequate treatment of water that may infiltrate down to the underlying watertable. The modeling

Agency	Issue	Response
		indicates that with a 1.0 m buffer between the base of the wetland and the watertable, the reductions in pollutants reaching the watertable from the pollutant load entering the constructed wetland is 98%, 70% and 80% for TSS, TP and TN respectively. For a 0.5 m buffer the reductions in pollutants reaching the watertable are 97%, 66% and 77% for TSS, TP and TN respectively. These pollutant reductions are considered satisfactory.
NOW	The proponent must consult with the NOW if there are any future works that intercept subsurface water.	Noted
NOW	The applicant must contact the Licensing Branch at the NOW's Grafton office on (02) 6641 6642 to authorise three bore holes sunk during the geotechnical assessment, under Part 5 of the WA if the bores are to remain or otherwise they must be decommissioned.	The test pits were decommissioned by backfilling immediately after boring for the geotechnical assessment. Contact with the NOW office in Grafton indicated that as the boreholes were decommissioned and were only open during the duration of the investigation (one day), authorisation was not required retrospectively in this case.
NOW	Monitoring bores should be strategically placed on the site prior to the development to enable proper groundwater quality and quantity investigations and to provide a baseline level of information. The groundwater monitoring bores are required to be appropriately authorised by the NOW before installation. Monitoring must be undertaken prior to and at construction and operational stages of the proposed development.	Monitoring of groundwater (and surface water quality) is considered an ineffective and onerous method for ensuring water quality outcomes in this instance. This is due to the nature of the potential pollutants (stormwater runoff from a minor development – nine cabins and access road) and the high degree of stormwater treatment provided. The more effective approach for preventing impacts to groundwater in this instance is to ensure: ▪ the design is based on best practice measures; ▪ the treatment train is constructed to design specification; and ▪ maintenance of the system as detailed in the wetland management plan. This is considered a more effective approach because: ▪ the design guidelines / modeling used to develop the proposed stormwater treatment measures is based on extensive research and field testing/monitoring undertaken by industry leaders(e.g. cooperative research centres)

<i>Agency</i>	<i>Issue</i>	<i>Response</i>
Infrastructure		
KSC	What measures will be used to ensure stored waste does not become septic;	Pumping from the package sewer pump stations was proposed to occur from 11pm to 5am to avoid any increase in peak flows at the downstream pump station. However additional pumping during the daytime / evening can also be programmed to avoid peak pumping times of 6am – 10 am and 3pm-8pm. These additional pumping times will ensure the sewage does not become septic in the package sewer pump stations at the site.
KSC	What emergency measures will be enforced in the case of pump failure;	Pump failure is mitigated with the following measures: ▪ provision of a standby pump in each package pump station. The standby pump will automatically pump in the event of the duty pump failing; and ▪ the pump stations will include an alarm system that will alert attention to any malfunction of the pumping system.
KSC	Insufficient peak holiday season storage and unsatisfactory plan ignore time delay when storage is full; and	The proposal outlined in the response above in regard to pumping a number of times throughout the day (at non-peak times) will adequately address this issue.
KSC	Provide additional storage and justification of storage sizing.	This issue is adequately addressed in the above responses.
NOW	The EA needs to further address the issue of a sustainable water supply for the project.	The water supply system proposed in the EA is a sustainable system that maximizes rainwater capture and use to reduce the demand on the Macleay Water reticulation system. Additionally, the release of treated runoff to the SEPP 14 Wetland and infiltration to the water table is considered an appropriate use for this stormwater resource with regard to minimizing impacts on the natural hydraulic regime of the adjacent SEPP 14 Wetland. A balance of the system has been provided in the EA with regard to maintaining the natural hydraulic regime.
Roads		
KSC	Council states that approval is required under Section 138 of the Roads Act for the driveway.	A Roads Act application will be submitted at the construction certificate stage of the project
Developer Contributions		
KSC	Contributions were current for the 2009/2010 financial year and will need to be indexed to the current financial year.	It is understood that DoPI will consult with KSC to determine developer contributions.

<i>Agency</i>	<i>Issue</i>	<i>Response</i>
Noise		
KSC	Confirmation that the noise levels taken between 6pm and 10 pm and 10pm and 7am were taken whilst a band with amplified music was occurring at the tavern.	Noise monitoring data used to assess noise impacts at the site were recorded on 25 January 2011 on the eve of the Australia Day public holiday, and Saturday 29 January 2011 for the evening and night time periods. These periods are considered to represent peak tavern usage being the eve of a public holiday and a weekend in the summer holiday period.
KSC	Address other noise sources such as car parking noise from the car park adjacent to the proposed cabins.	Noise monitoring undertaken for the proposal included recording of noise levels at the location of the cabin closest to the tavern from any source. Potential noise sources identified included: ▪ road traffic along New Entrance Road adjacent to the site; ▪ noise from the tavern; ▪ insect noise in the evenings/night; ▪ boat noise to a minor extent; ▪ wind noise including noise associated with wind blowing through the large stands of casuarinas adjoining the eastern portion of the proposed development area; ▪ background noise from the river and surf from the river entrance/coastline; and ▪ background noise from the residential area to the east of the site. Noise monitoring does not distinguish between noise sources, however records the noise levels. Therefore as noise monitoring was undertaken during peak summer holiday period, the impact of car parking noises associated with the tavern is considered to have been included.
KSC	Consideration be given to noise attenuation measures such as screens or mounds.	As indicated in the noise assessment, the noise levels measured for each time period (day/evening/night) exceed the project-specific criteria by 0.3 dB(A), 2.8 dB(A), and 8.4 dB(A). However exceedance in the order of 2 to 3 dB(A) are not considered significant. The night time noise levels comply with the maximum levels recommended for sleeping areas in AS/NZS 2107:2000. The noise assessment concluded that noise levels at the site are considered acceptable

<i>Agency</i>	<i>Issue</i>	<i>Response</i>
		without the requirement for additional mitigation measures such as screens or mounds.
KSC	The noise levels under the liquor licence for surrounding residents appear from your noise assessment will not be achieved.	Noise monitoring undertaken for this proposal provides an assessment of noise levels in the vicinity of the proposed cabins, from numerous sources, of which the tavern is one. The assessment does not however provide evidence of noise exceedences in liquor licensing conditions for the tavern. Further, noise levels under the tavern liquor licence are not part of this proposal and are a separate issue regulated by Council.
<i>Mosquito Risk</i>		
DoPI	An assessment of the risk of disease and nuisance should be undertaken by a qualified person and provided as part of the response to submissions. A management plan should be prepared to mitigate any risk identified.	The subject site contains a wetland that forms part of a larger wetland to the north-east of the subject property. There are also other extensive wetland areas within the locality associated with the McLeay River estuary to the north and west of the subject site. These wetlands are considered potential mosquito breeding habitat. No assessment has been undertaken on whether or not these wetlands are actual mosquito breeding habitats. It has been assumed that mosquitoes exist and breed in these wetland areas. Kempsey Shire Council's Development Control Plans do not specifically deal with or require mosquito risk to be assessed for new development. Reference is made to Chapter 11 – Mosquito Management of Ballina Shire Council Development Control Plan. This document states that the most effective action that can be taken to minimise mosquito nuisance is to allow as greater an open buffer around mosquito breeding areas as is possible. Mosquitoes usually travel along well vegetated routes where they are relatively protected from the desiccating effects of sun and wind. Consequently an open, lightly treed buffer is preferable to heavily foliated buffers. The subject site has a buffer containing a roadway and lightly vegetated areas to achieve a 44 m asset protection zone for bushfire risk. This buffer is consistent with minimising mosquito nuisance and is consistent minimum buffers for other recently approved residential subdivisions in NSW. Cabins will have installed

Agency	Issue	Response
		effective insect screening to all windows, doors and other openings. The subject site adjoins the existing residential areas of South West Rocks. The proposal creates no increased risk than what is experienced by the existing occupants of these adjoining areas.
Stormwater		
It is noted the proposed stormwater management plan has been amended in response to some comments. The main amendment is decreasing the depth of the constructed wetland from 0.4 m to 0.2 m. The plan layout of the constructed wetland has also been modified, however the total area of the constructed wetland remains the same. The amendments are detailed in Appendix E.		
NOW	The land is not suitable for the construction of dams, because of the potential of the spoil to produce acid leachate and water in the storage will possibly become acidic, saline and/or have toxic levels of aluminium.	The potential impact of construction of the wetland (the dam) on acid sulfate soils (ASS) and associated consequences has been addressed in the design of the constructed wetland. The design avoids construction in ASS with minimal excavation - approximately 200 mm excavation depth for the amended wetland design compared to ASS occurring only at depths in excess of 1,000 mm. This is detailed further in the ASSMP and this report. Therefore there will be no spoil that will produce acid leachate, and the water in the storage will not be influenced by acidification.
NOW	NOW recommends a 1 m buffer above the highest predicted groundwater table for all excavations, in particular infiltration/detention basins. If the base of the excavation is within this 1 m buffer the applicant will need to implement impermeable liners to prevent direct infiltration to the groundwater.	Impermeable liners are not proposed for the constructed wetland. The base of the constructed wetland has been redesigned to provide a 0.8 to 1.0 m buffer to the watertable based on watertable levels measured during the geotechnical investigations. This buffer is considered adequate for protection of groundwater. It is noted that during periods of high watertable levels this buffer will be reduced however during these wet periods the outflow from the constructed wetland will be largely surface flow to the SEPP 14 wetland and the MUSIC modeling indicates that the proposed stormwater management measures provide an improvement in water quality for flows exiting the site in comparison to existing (undeveloped) conditions (refer to Appendix E in this report). Therefore this is not considered an issue. Furthermore, MUSIC modeling indicates there is more than adequate treatment of

Agency	Issue	Response
		water that may infiltrate down to the underlying watertable. The modeling indicates that with a 1.0 m buffer the reductions in pollutants reaching the watertable from the pollutant load entering the constructed wetland is 98%, 70% and 80% for TSS, TP and TN respectively. For a 0.5 m buffer the reductions in pollutants reaching the watertable are 97%, 66% and 77% for TSS, TP and TN respectively. These pollutant reductions are considered satisfactory.
NOW	NOW requires the applicant to provide more detail regarding the design of the bioretention system installed especially at the base of the swales and constructed wetland in a SWMP to ensure stormwater infiltration does not cause contamination of connected groundwater sources and the adjacent SEPP 14 wetland.	Details of the constructed wetland are shown in the wetland design drawing in Appendix E of this report. The base of the swales and constructed wetland are unlined. Additionally as stated in the previous response, MUSIC modelling indicates there is more than adequate treatment of the infiltrated water prior to interception with the watertable.
NOW	NOW advocates that the proposed bioretention swales must be designed in accordance with the principles of Water Sensitive Urban Design and satisfy Council's objectives for suspended solids and nutrients (i.e. <i>Kempsey Shire Council Stormwater Management Plan Technical Supplement (2004)</i>) and compliance must be demonstrated in a SWMP and/or GWMP prepared by the applicant in consultation with NOW.	The swales and constructed wetland have been designed in accordance with WSUD principles. The swales form part of the overall treatment train which has been modelled using MUSIC and shown to significantly exceed the required pollutant removal requirements of Council's and general WSUD objectives (refer to Appendix E in this report). The mitigation measures and management plans documented in the EA adequately constitute ground water and surface water management plans.
DoPI	Provide construction details of the proposed constructed wetland. Clarification is required as to whether the wetland will be lined or will act as a bioretention basis.	Details of the constructed wetland are shown in the wetland design drawing in Appendix E of this report. The base of the constructed wetland is unlined. As stated in previous responses, MUSIC modelling indicates there is more than adequate treatment of the infiltrated water prior to interception with the watertable.
NOW	NOW requires the applicant in addition to what has already been addressed in the EA to provide more detail regarding the concept (i.e. methods and/or models for water quality treatment), design (including all bioretention systems), construction (works and machinery), operation and maintenance of the constructed wetland in the SWMP or GWMP.	Details of the constructed wetland are shown in the wetland design drawing in Appendix E of this report. The concept is outlined in Appendix E and includes water quality modelling using MUSIC – the industry standard for modelling of these systems. Operation and maintenance of the constructed wetland is detailed in the Wetland Management Plan in Appendix C of the EA.

<i>Agency</i>	<i>Issue</i>	<i>Response</i>
KSC	Council requests clarification of how the ongoing maintenance of stormwater infrastructure (swales, drains and constructed wetland) will be ensured.	Refer to Statement of Commitments in this report in regard to wetland management.
NOW	NOW considers a more comprehensive water quality modelling and monitoring program must be implemented.	In regard to water quality modeling: MUSIC has been used to model the proposed stormwater treatment system. The MUSIC program is the industry-standard /most appropriate modelling program for assessing the system. Therefore a more comprehensive water quality modelling program is not necessary. Additionally there are no readily available programs for this application that would provide a more comprehensive assessment than the MUSIC program. In regard to a monitoring program: Monitoring is not recommended or proposed in respect to assessing the effectiveness of the stormwater treatment measures. Due to the natural high variance of stormwater quality, any meaningful monitoring of the treatment performance of the measures would require an overly onerous and logistically difficult undertaking (e.g. ensuring someone is monitoring rainfall events and available to travel to the site when rainfall events occur). To gain a representative set of data would require a large number of sampling runs. Therefore monitoring is not considered an appropriate tool for ensuring the treatment performance of the measures. The general industry approach to ensuring satisfactory treatment performance of the stormwater measures is based on correct design and construction of the measures based on best-practice standards. These best-practice standards are based on extensive research and monitoring and are outlined in various guidelines such as those produced by Water By Design. These guidelines have been employed in the design of the proposed measures and assessed using the industry-standard MUSIC software which shows the measures to exceed normal standards. Therefore, the best method to ensure satisfactory performance of the proposed treatment measures is ensuring the proposed design is constructed and maintained in accordance with the proposal.

<i>Agency</i>	<i>Issue</i>	<i>Response</i>
NOW	NOW recommends baseline monitoring for a minimum of 2 years fortnightly sampling for surface and groundwater quality and/or quantity for all aquifers, watercourses and wetlands within and adjacent to the development site. The range of baseline water quality data for surface and groundwater must include but is not necessarily limited to the following parameters: turbidity, pH, temperature, electrical conductivity, dissolved oxygen, total suspended solids, nutrients (TP, TN, filtered N & NOx), oil and grease, cations/anions (Ca, Mg, Na, K/HCO ₃ , SO ₄ and Cl), soluble aluminium, ammonium ion, chlorophyll-a, faecal coliforms, enterococci, algae and blue-green algae.	This is not considered necessary on the basis of the proposed design is in accordance with best-practice measures and modelling indicates the proposed system will perform beyond Council objectives and provide an improvement in water quality exiting the site to the downstream SEPP 14 wetland compared to existing conditions.
NOW	Until the baseline data has been reviewed and evaluated, the default trigger levels for ANZECC and ARMCANZ (2000) guidelines should be applied. Following review and evaluation of the baseline data, consideration can be given to revising the trigger levels in consultation with NOW.	As above. It is also noted that default trigger levels for ANZECC and ARMCANZ (2000) guidelines applies to downstream water bodies such as the SEPP 14 wetland and the aquifers not the water quality emanating from the constructed wetland. The water quality in the SEPP 14 wetland is more significantly influenced by stormwater runoff from the existing residential development in Marlin Drive etc. As such any detected changes in the water quality in the SEPP 14 wetland will not necessarily relate to the subject development and would more likely be a result of the stormwater runoff from other areas.
NOW	NOW also recommends that surface water quality at all discharge points must be monitored and that the quality of water discharged from the constructed wetland is of similar or better quality than the receiving SEPP 14 wetlands adjacent and outside of the project site prior to development.	Monitoring is not considered necessary and is not recommended or proposed as noted above. As noted above, the MUSIC modeling shows that the proposed design will provide an improvement in water quality exiting the site to the downstream SEPP 14 wetland compared to existing conditions. It is considered unreasonable and unrealistic for the water discharged from the constructed wetland is of similar or better quality than the receiving SEPP 14 wetland.
NRCMA	NRCMA recommends that strict water quality controls are incorporated into the design of the development to ensure no negative impact on catchment or estuarine water quality, no changes to hydrology of the native vegetation communities.	Strict water quality controls have been adopted as described previously. These controls (the proposed stormwater treatment train) provide a positive impact on water quality exiting the site and adequately mitigate changes to the hydrology resulting from the impervious surfaces of the proposed development.
NOW	The proponent is to prepare a Surface Water Management Plan in consultation with and to the satisfaction of the NOW prior to the commencement of works.	The mitigation measures and management plans documented in the EA adequately constitute ground water and surface water management plans.

Agency	Issue	Response
NOW	The proponent may be required to prepare a Blue-green Algae Management Plan following the NOWs review of baseline data.	The proposed swale and wetland design incorporates endemic native vegetation, utilises the natural infiltration capacity of the soils and thereby replicates the natural wetland systems of the locality. A Blue-green Algae Management Plan is not considered necessary as it is considered unlikely that water would be ponded for long periods and the endemic native vegetation will also buffer hot / stagnant conditions that are likely to give rise to blue-green algae.
NOW	The proponent must adhere to the Core Riparian Zone widths on both sides of watercourses and the additional vegetated buffers to allow for edge effects detailed in the NOWs <i>Guidelines for Controlled Activities</i> (2010/2011).	Buffers of 20 to 40 m are required from the Macleay River. New Entrance Road and road reserve of approximately 20 m width is situated between the site boundary and the Macleay River, and constitutes a highly modified core riparian zone. The cabins are set back from the site boundary further, and this setback will be landscaped with predominantly endemic native species.
NOW	NOW also recommends that the applicant be consistent with the Blue Book - Managing Urban Stormwater: Soils and Construction, Volume 1, 4th Edition, 2004 (Landcom) ("blue book") with respect to an erosion and sediment control plan for the project and evidence of such must be outlined in the GWMP and/or SWMP.	The proposal is consistent with the Blue Book – Managing Urban Stormwater: Soils and Construction. As stated in the EA: <i>'The proposed constructed wetland will be used as a sediment retention basin during the construction phase. Flows from the majority of the site will be directed to the basin. The location of the basin will facilitate interception of any sediment to the SEPP 14 Wetland. The large size of the sediment retention basin will adequately cater for settlement of the sandy soils of the site. The western fringe of the site may flow to New Entrance Road. Sediment control fences will be erected along this boundary to prevent any sediment loss to the road drainage system. The erosion and sediment control plan for the development was provided in the EA (Drawing 1291/004 in Appendix B)'</i> .
NOW	The proponent is to obtain relevant licenses under the Water Act (1912) and the Water Management Act (2000) for all activities that intercept or extract surface water prior to commencement of these activities.	No activities are proposed that intercept or extract surface water (the base of the wetland is approximately 0.8 – 1.0 m above measured groundwater levels). Therefore a licence under the Water Act is not required.
NOW	The applicant must make application for a surface water licence under Part 2 of the WA to authorise the excavation for conservation of water for environmental purposes.	A licence is not required as the constructed wetland is not conserving water for environmental purposes. Its purpose is the detention and treatment of stormwater.
NOW	NOW does not consider the excavation an "excluded work" on a "minor stream" as defined in the Water Management (General) Regulation 2011 (WMR) and as a	The constructed wetland is designed to simply detain and treat stormwater runoff from the proposed development areas of the site. There is some hydraulic

Agency	Issue	Response
	consequence a licence under Part 2 of the WA may be required for the following reasons. The constructed wetland will act as a buffer for increases in potential stormwater runoff from the proposed site providing a sediment and filtration system prior to discharge into the SEPP 14 wetland via drainage channels (refer to Illustration 4.1 & 4.6 of EA). NOW considers the constructed wetland has a strong hydrologic connection with the SEPP 14 wetland as the excavation will benefit from the proposed restoration of tidal flow and inundation from floods, especially when catchment runoff exceeds the capacity of the main river channel of the Macleay River. In schedule 2 of the NSW Government Gazette No.37 (24 March 2006, pg 1500) a "river" in section 5(1) of the WA for the purposes of Part 2 of the WA is defined as any stream or part of a stream which at any time carries flows emanating from a third, fourth or higher order stream (e.g. Macleay River).	connectivity between the constructed wetland and the SEPP 14 wetland via infiltration through the soil and surface water discharges from the constructed wetland. However, there will be no exchange of surface water from the SEPP 14 wetland to the constructed wetland in association with the proposed restoration of tidal flow. This is due to the constructed wetland being higher than the estimated inundation levels associated with the proposed restoration of tidal flow. Estimated inundation levels are in the range of 0.41 m AHD to 0.48 m AHD on spring tides in the SEPP 14 wetland. The proposed outlet level of the 'upstream' constructed wetland is approximately 0.7 m AHD. Additionally, increases in watertable levels associated with the restoration of tidal flow will not directly impact on the constructed wetland due to the base of the wetland being higher than the maximum inundation levels. The constructed wetland is not defined as a river as it does not 'carry flows' emanating from the Macleay River, it is simply inundated by these flows. The proposition that this constitutes a river would mean any depression, open channel or even kerb and gutter system inundated by floods is a 'river'. This is not considered to be the intent of the referenced clause.
NOW	A security deposit of an amount specified by the NOW for the proposed development shall be paid.	Refer to the comment immediately above. A licence under Part 2 of the WA is not required and therefore a security deposit is also not required.
Flooding		
DoPI	Fill should be confined to exotic grassed areas.	Illustration 4.1 from the EA provided details of proposed fill for the development. Fill is confined to exotic grassed areas. It is not anticipated that filling proposed will result in changes to hydrology of neighbouring vegetation communities. The fill is under the immediate footprint of the development, which will have a constructed drainage system into the constructed wetland.
NRCMA	NRCMA requests that the fill level of 1.9 m is restricted to the area of vegetation community 5 – grassland with scattered trees. Any fill should not be allowed to result in changes to the hydrology of the neighbouring vegetation communities.	

<i>Agency</i>	<i>Issue</i>	<i>Response</i>
DoPI	A detailed evacuation route plan should be prepared in combination with the Flood Emergency Management Plan, provided to the SES for their input.	A detailed evacuation route plan is provided in Appendix F of this report. It is our experience that the SES will not comment on Private Flood Emergency Management Plans.
OEH	A detailed evacuation route map/plan be prepared for the site and reviewed by SES to satisfy their requirements.	As above
OEH	Part of the site has a high hazard which may affect the proposed evacuation route. It should be noted that if the site is evacuated as planned, then it would be complete prior to these hazard conditions being realised.	Part of the site has a high hazard, however the primary evacuation route (the access road for the cabins to Riverview Place and then Marlin Drive – refer to evacuation route plan in Appendix F) does not traverse any high hazard areas.
OEH	The sufficiency of 24 hours flood warning for the site should be reviewed by SES to satisfy their requirements.	SES do not comment on Private Flood Emergency Management Plans.
DoPI	Flood proofing of structures below 2050 1% AEP must be addressed.	Drawings have been amended to include the requirement for all building materials below floor level to be of a type suitable to withstand occasional flood inundation. All electrical installations are to be above floor level.’ This has also been included in the revised Statement of Commitments.
OEH	Consideration be given to flood proofing the cabin structures below the 3.25 m habitable floor level.	
NOW	Development on coastal land of very low relief flooding is an issue especially considering the longer term possibility of sea level rise and increases in the range of inundation depths.	This issue has been addressed in the flooding assessment in the EA and Flood Study prepared by WMA Water including consideration of sea level rise in accordance with NSW Government policy.
DoPI	Detail is required about how adaptation will be achieved post 2050.	Adaptation for floor levels will be achieved by raising the sub-floor of the cabins by extension of the supporting columns. Cabin stair access, plumbing, etc will be modified accordingly. Adaptation for site fill levels relates to raising of the access road in the site. This will involve reconstruction of the pavement and batters to raise the pavement level in 2050 by the same height as the predicted sea level rise over the period from the year 2050 to 2100 (current estimates indicate the pavement level will need to be raised by 0.5 m in 2050). These actions have been included in the statement of commitments.

Agency	Issue	Response
NRCMA	NRCMA requests that full consideration of climate change impacts on this site in accordance with the <i>NSW Coastal Planning Guideline: Adapting to Sea Level Rise</i> (2010).	Full consideration of climate change impacts on this site has been included in the EA in accordance with the <i>NSW Coastal Planning Guideline: Adapting to Sea Level Rise</i> (2010)
KSC	Council requires that the recommendations from the flood assessment by WMA are included as conditions of consent and the statement of commitments is enforced if the development is to be approved.	The recommendations from WMA Water have been included in the Statement of Commitments.
SEPP 14 Wetland No. 436		
NOW	NOW recommends the water quality monitoring program and reporting protocol for the Government Rd culvert must be provided in the SWMP prepared by the applicant in consultation with NOW. Further, the applicant needs to notify NOW if any activity may impact on surface and groundwater.	As detailed previously, monitoring of groundwater and surface water quality is considered an ineffective and onerous method for ensuring water quality outcomes in this instance. In respect to water quality issues associated with stormwater management for the development, the nature of the potential pollutants (stormwater runoff from a minor development – nine cabins and access road) and the high degree of stormwater treatment provided do not warrant the need for a water quality monitoring program. The more effective approach for preventing impacts to groundwater in this instance is to ensure: ▪ the design is based on best practice measures; ▪ the treatment train is constructed to design specification; and ▪ maintenance of the system as detailed in the wetland management plan. This is considered a more effective approach because the design guidelines / modeling used to develop the proposed stormwater treatment measures is based on extensive research and field testing/monitoring undertaken by industry leaders(e.g. cooperative research centres). In respect to water quality issues associated with the proposed tidal restoration an assessment of potential impacts to groundwater / acid sulfate soil finds that tidal restoration will not result in the export of acid water due to minimal impact on groundwater levels as detailed further in the following responses.

Agency	Issue	Response
NOW	Although Part 3A Major Projects are exempt from requiring a controlled activity approval (s75U of the Environmental Planning and Assessment Act 1979) assessment of the proposal is required to take into account the requirements of relevant water related legislation and NOW's <i>Guidelines for Controlled Activities</i> .	It is understood that issues relating to any approval for a required controlled activity will be dealt with separately from this Part 3 A Application. It is also considered that the proposal is generally consistent with the guidelines given the: - highly disturbed nature of the Tourist Cabins proposed footprint; and - need to ensure compliance with comply with other legislation.
DoPI	Long-term ownership, maintenance and management of SEPP 14 Wetland. Maintenance for first 5 years to be funded by the proponent. However it is unclear what will become of the wetland area after this time.	The wetland is to be maintained for a period of 5 years after the proposed rehabilitation works. After this rehabilitation it is considered that the rehabilitation works will be generally self maintaining and will require very little maintenance.
DoPI	It is unclear whether installation of the tidal floodgate will be undertaken as part of this application or whether separate approval will be sought.	Installation of the floodgate is part of this proposal this is stated in the EA in section 4.6 of the EA.
DPI-CL	The DPI-CL request clarification of the approval process for flood gate / restoring tidal flow.	The Part 3A application request approval for the flood gate, restoring tidal flow and rehabilitating the wetland.
KSC	Council noted the potential changes to hydrology and ecology that may result from increased tidal flows into the SEPP 14 area. Further Council commented on previous legal advice obtained for increased tidal flows into the Yarrahappini area that indicated an EIS was required.	The proposal is being assessed under Part 3A and an EIS is therefore not required.
NRCMA	NRCMA requests a comprehensive investigation into the potential for tidal restoration to export acid water to Back Creek.	An assessment of potential impacts to groundwater / acid sulfate soil finds that tidal restoration will not result in the export of acid water due to minimal impact on groundwater levels. This is due to the following reasons:

<i>Agency</i>	<i>Issue</i>	<i>Response</i>
DPI-CL	DPI-CL states that the EA and proposed monitoring programs need to include impacts on lands downstream of the flood gate, including the Crown Reserve.	- the groundwater in the SEPP 14 wetland within the site has not been altered (lowered) by construction of deep drains as experienced in other areas of the Macleay floodplain; - the groundwater levels are still hydraulically connected with groundwater levels downstream of the floodgate / Government Road which assists in preventing any significant alteration in groundwater levels as a result of the floodgates; - the existing floodgate is partially damaged resulting in some limited tidal flows currently entering the site. The above explains that groundwater levels have not been significantly altered by the construction of the existing floodgates. Consequently, there has not been any significant impact on acid sulfate soils in the SEPP 14 wetland within the site. This is supported by no evidence of major ASS scalds on site; Back Creek does not have any fish kills on records which indicate no major ASS export at present from runoff events that would export acid water if present. The restoration of tidal flows will mainly introduce surface waters but have no major impact on groundwater levels, therefore it will not result any changes in ASS export from the site.
DPI-CL	DPI-CL request clarification that consultation and/or concurrence with the appropriate agencies including NSW Office of Water, Northern Rivers Catchment Management Authority, DPI Fisheries and DPI Crown Lands, has taken place directly considering this aspect of the project.	DoPI has referred the proposal to these agencies as required under Part 3A projects, and all of them have responded.
DPI-F	A list of appropriate stakeholders in the form of a steering committee be developed. These stakeholders are to be consulted during the rehabilitation process and monitoring program to ensure appropriate advice on management actions is being provided and assist in keeping key stakeholders advised of progress and adaptive management issues.	Noted and adopted. DPI-F will be included in the stakeholder list. This has been included in the Statement of Commitments
DPI-F	DPI-F requests that it be included on the list and receive progress reports for consideration and/or comment.	

Agency	Issue	Response
DPI-F	DPI-F recommend that the Wetland Management Plan and particularly the monitoring and maintenance programs as outlined in the plan, be conditions of approval.	The proponent is committed to implementation of the Wetland Management Plan the recommendations of which have been included into the Statement of Commitments.
Ecology		
DPI-F	Environmental buffers proposed are not consistent with those set out in the <i>Policy and Guidelines for Aquatic Habitat Management and Fish Conservation</i> (1999). However, it is acknowledged and DPI – Fisheries support rehabilitation of the SEPP 14 wetland No. 436, and considers this sufficient to off-set any inconsistency with desired buffer distances.	Noted
KSC	Council requests the position of the Latham's snipe recorded on the site to be identified, and the impacts of the development on this species, including a Seven Part Test.	The Latham's snipe was observed at: 501921E/6582400N (1 individual); and 501973E/6582325N (1 individual). Latham's snipe (<i>Gallinago hardwickii</i>) is not a listed species under the Threatened Species Conservation Act 1995 (TSC Act) and therefore a Seven-part test is not appropriate. This species is of national significance, being listed as a migratory species under the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act). If the proposal is likely to have a significant impact on a listed migratory species, approval under the EPBC Act is required. An assessment of significant impact was undertaken (refer to Appendix B) in accordance with Matters of National Environmental Significance: Significant Impact Guidelines 1.1 (DWA 2009). The proposal will not have a significant impact upon the Latham's Snipe on the basis of the scale of the impact and the nature of the species' ecology.
KSC	Council requests information on tree species that will be cleared as part of the development proposal, including a Koala Habitat Assessment if any Preferred Koala Food Trees are to be removed.	There are no trees proposed for removal. As a result of the Ecological Assessment (JWA 2010), no potential koala habitat was found on the site.

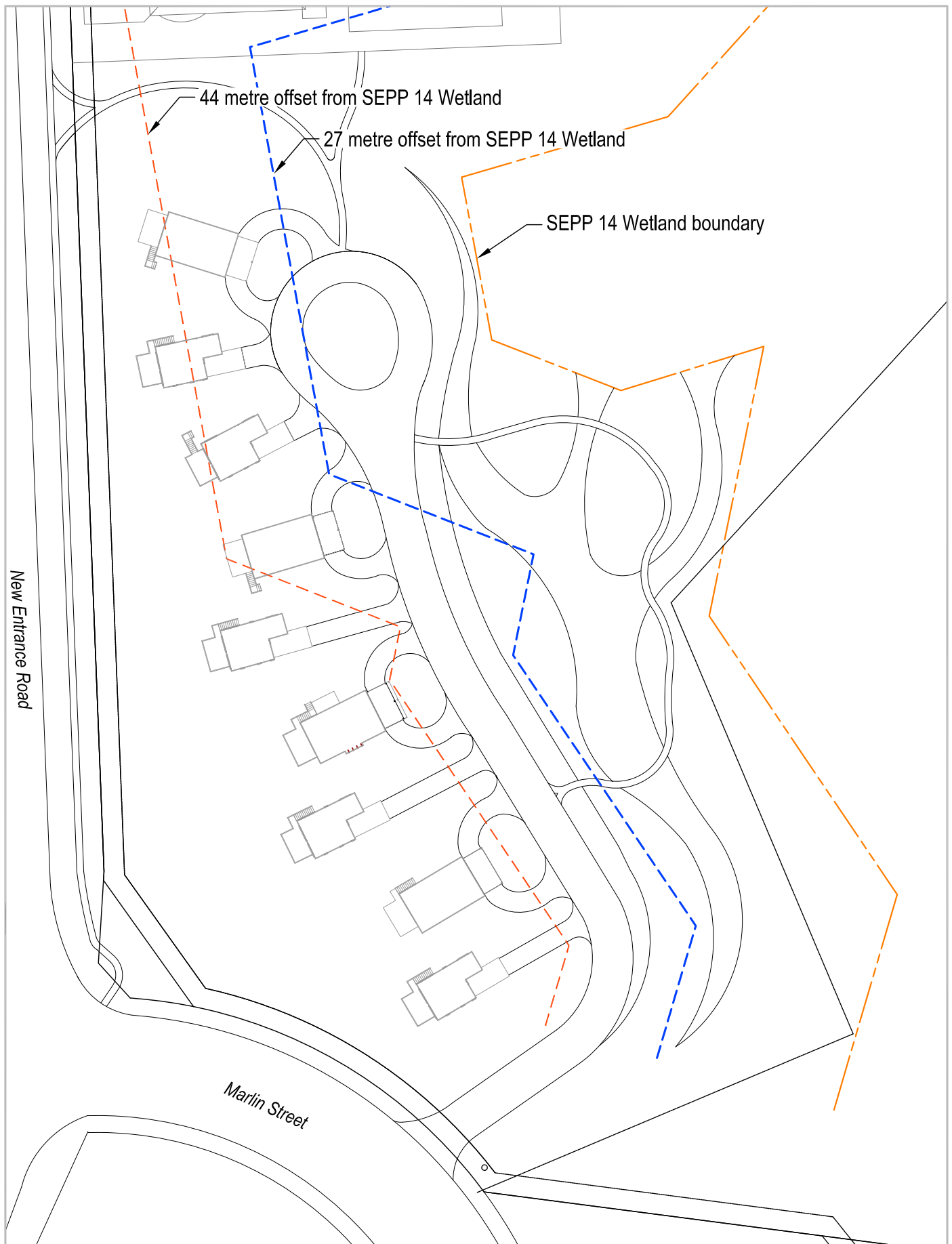
Agency	Issue	Response
KSC	An assessment of the proposal's impact on the newly listed Fisheries Management Act (1994) vulnerable species Bousfields marsh-hopper (<i>Microchestia bousfieldi</i>) which has been described and collected from a small isolated location at South West Rocks Creek is required.	A Seven-part Test for Bousfields marsh-hopper has been prepared (refer to Appendix C). This species is unlikely to be significantly impacted by the Proposal.
NRCMA	NRCMA request that any clearing of native vegetation is offset by revegetating a larger area of the same vegetation type in an appropriate adjacent area to satisfy provisions of the Native Vegetation Act (2003).	There are no trees proposed for removal. The wetland Management Plan proposes significant enhancement planting as part of the SEPP14 wetland rehabilitation and the proposed artificial wetland/stormwater management area.
NRCMA	NRCMA encourages every effort to protect and enhance the EECs saltmarsh and swamp oak floodplain forest on the site. NRCMA further requests that the proposal is modified to eliminate any impact on saltmarsh, and to achieve a 50 m buffer between the proposed development and the saltmarsh.	The Wetland Management Plan sets out how the project will protect and enhance the EECs saltmarsh and swamp oak floodplain forest on the site. There will be a minor impact on a small section of saltmarsh (within the proposed artificial wetland stormwater treatment area) which is considered unavoidable. The project proposes rehabilitation and significant improvements to all other saltmarsh areas. The Ecological Assessment in the EA has assessed the impact on the saltmarsh which has been determined to be not significant.
NRCMA	Small area impacted by constructed wetland will be revegetated to a similar species. Restoring tidal flows to the SEPP 14 Wetland is expected to enhance saltmarsh.	Noted
OEH	OEH is generally supportive of the project, in particular the plan to restore saltmarsh/wetland areas, provided appropriate targets, benchmarks and reporting mechanisms are clearly in place to ensure that the project successfully achieves a naturally self-maintaining condition.	Noted – refer to Wetland Management Plan.
OEH	OEH recommend that prohibition of domestic animals in the proposed wetland management plan should be extended to the operation of the cabins.	Noted and adopted.

Table 3.3 provides an assessment demonstrating compliance with the performance criteria for asset protection zones for a special fire protection purpose as outlined in section 4.2.7 of PBP.

Table 3.3 APZ Performance Criteria and Acceptable Solutions for SFPP

<i>Performance Criteria</i>	<i>Acceptable Solutions</i>	<i>Compliance</i>
The intent may be achieved where:		
Radiant heat levels of greater than 10 kW/m ² will not be experienced by occupants or emergency services workers entering or exiting a building.	An APZ is provided in accordance with the relevant tables and figures in Appendix 2 of this document.	APZ requirements for the development were modelled using the NSW Rural Fire Service APZ calculator, (a copy of the modelling report is attached at Appendix A). A 44 m APZ for is required for a special fire protection purpose on the site, based on a slope of 0.5°, forested wetlands vegetation and FDI area 80. The modelling report provides an expected radiant heat exposure of 10 kW/m² for a 44 m APZ. Illustration 3.1 defines the 44 m offset from the SEPP 14 boundary. APZs of 44 m are achieved for cabins 5 to 9. Reduced APZs are proposed for cabins 1 to 4. Exit and entry from the cabins is via doors on the western façade, a veranda and stairs. Cabin 2 achieves greater than 44 m between the foot of the stairs and the SEPP 14 boundary. The stairs on Cabins 1, 3 and 4 have been reconfigured to achieve greater than 44 m from the SEPP 14 boundary (refer to Illustration 3.1). Amended architectural drawings are attached Appendix D showing the reconfiguration of the stairs. A radiant heat exposure of 10 kW/m² or less will be achieved for occupants or emergency services workers entering or exiting the cabins. Compliance with the intent of the performance criteria is therefore achieved.
	Exits are located away from the hazard side of the building.	Doors from the cabins are located on the western façade of each cabin, away from the hazard side of the building. The doors open onto a veranda, which is exited via stairs. To achieve radiant heat exposure of 10 kW/m² or less, the entire stairs of the cabins will be located greater than 44 m from the SEPP 14 boundary. Occupants or emergency services workers entering or exiting the cabins will be exposed to radiant heat of 10 kW/m² or less. Compliance with the intent of the performance criteria is achieved
	The APZ is wholly within the boundaries of the development site. Exceptional circumstances may apply	Proposed APZs are wholly within the boundaries of the development site. Compliance with the intent of the performance criteria is achieved.

<i>Performance Criteria</i>	<i>Acceptable Solutions</i>	<i>Compliance</i>
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. The APZ is not located on lands with a slope exceeding 18 degrees.	Landscaping and general property maintenance will comply with Appendix 5 of PBP. Compliance with the intent of the performance criteria is achieved. The APZ is located on lands with slopes of 0.00525% (equating to 0.5 degrees). Compliance with the intent of the performance criteria is achieved.
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).	APZs will be established and maintained in accordance with the requirements of 'Standards for Asset Protection Zones' (RFS 2005). Compliance with the intent of the performance criteria is achieved.
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 residents and fire fighters.	Compliance with Appendix 5	Landscaping and general property maintenance will comply with Appendix 5 of PBP. Compliance with the intent of the performance criteria is achieved.



APZ and Radiant Heat Offsets

This page has been left intentionally blank

Amended Development Proposal

4.1 Summary of Amendments to the Development Proposal

The following is a summary of the amendments to the Development Proposal as a result of the submissions received to the advertising of the application.

4.1.1 Constructed Wetland

The depth of the constructed wetland has been changed from 0.4m to 0.2 down to a level of approximately 0.5 m AHD as a result of comments from NSW Office of Water. The constructed wetland has also been amended to ensure no trees will be removed or impacted upon.

Further details of the amendments to the constructed wetland are shown Appendix E of this report.

4.1.2 Cabin Layout/Site Plan

The layout of the cabins has been slightly amended to comply with bushfire requirements (refer Table 3.2 in Section 3 of this report). An amended set of plans for the cabins is contained in the amended set of drawings for this project (refer Appendix D)

4.1.3 Sewage System

Pumping from the two package pump stations shall be timer controlled to pump at off-peak times to avoid any increase in peak flows at the downstream pump station. Off-peak pumping will be undertaken at various intervals throughout the day and evening to prevent prolonged retention of sewage in the package pump stations.

4.2 Tourist Cabins

Project Approval is sought for the use of the land as a tourist facility, involving the construction of nine self-contained tourist cabins. The cabins will be located adjacent to the existing Riverside Tavern.

The amended design drawings of the cabins are attached as Appendix D, together with a development site plan.

The project has an estimated capital investment value of \$2.7 million and will result in 20 full time equivalent construction jobs and 10 full time equivalent operational jobs.

The project consists of 5 x 1 bedroom cabins and 4 x 2 bedroom cabins. Each cabin will be fully self-contained, with toilet and bathroom facilities, and all cabins will be of light weight construction utilising the following materials:

- custom orb metal roof;
- fibre cement external cladding; and
- timber decks.

The proposed Riverside Tourist Cabins provide for a high quality development at South West Rocks. The key elements of proposal include:

- creation of nine contemporary holiday cabins for tourist accommodation providing 5 x 1 bedroom and 4 x 2 bedroom accommodation;

- all cabins will have a minimum habitable floor level of 3.25 m AHD which is equivalent to the 1 in 100 year flood level under the 2050 climate change scenario plus 0.5 m freeboard. The cabins should be raised by the year 2050 to the projected 1 in 100 year flood level under the 2100 climate change scenario plus 0.5 m freeboard as part of an adaptive management strategy;
- all cabins will be serviced by bitumen sealed internal roads with crushed rock driveways. One new access point is proposed off Marlin Drive;
- the site of the proposed development will be comprehensively landscaped to provide a high level of amenity and privacy for occupants and also to reduce the visual impact of the cabins on the surrounding locality;
- includes construction of a wetland buffer between the cabins and the SEPP14 wetland filtering the stormwater;
- internal paths will be provided to allow for ease of access to the existing local footpath network, the adjoining tavern, the Macleay River foreshore and the existing nearby community infrastructure;
- all cabins will be connected to the reticulated sewerage and water systems. Stormwater will be disposed of via contemporary Water Sensitive Urban Design measures;
- stormwater management measures developed for the project will protect the SEPP 14 Wetland from any direct or indirect impacts of the project; and
- rehabilitation of the wetland in accordance with an approved Wetland Management Plan.

4.3 Site Fill Levels

The developed portion of the site will be filled to a minimum level of 1.9 m AHD based on flood evacuation considerations and avoidance of nuisance flooding. This is approximately 1.0 m higher than existing surface levels on the site. The finished surface levels of the roadway and the areas surrounding the cabins will gently rise from a level of 1.9 m AHD at the northern end of the development to approximately 2.4 m AHD at the southern end where the internal road intersects with Marlin Street. The volume of fill on the site is approximately 7,500 m³.

The depth of excavation associated with the wetland is approximately 0.2 m down to a level of approximately 0.5 m AHD. This level is above the level of acid sulfate soils and the groundwater as indicated by geotechnical testing. The volume of excavation is approximately 200 m³.

4.4 Urban Design and Sustainability

The vision for the Riverside Tourist Cabins has been developed by the owner, Shannon Pacific P/L, Paul Smith Building Design, Hadlow Design Services and GeoLINK as a result of the design outcomes and community issues uncovered during the previous development application. The design statement includes the following key design characteristics.

- cabins will have a light-weight, contemporary appearance incorporating pitched metal roofs and timber cladding to generate an easy going holiday ambience that will complement the visual character of the surrounding natural landscape;
- the cabins will be elevated to satisfy council's minimum flood level requirements creating an open undercroft that will accentuate the buildings as floating objects on the landscape. This sense of openness will be further enhanced by the use of timber handrails with wire balustrades, louvre windows, wide eaves and a large covered veranda along the cabin front that will cast deep shadows into the building facades;
- cabin footprints will occupy only a small proportion of the overall site with the vast majority of the area retained for open space. Cabins will have a narrow frontage to the street and each structure will be approximately 10 metres apart providing optimal scope for extensive new planting. Cabins to the west of the tavern will also have alternating set backs to minimise the visual prominence of building facades to the street;

- proposed new vegetation will incorporate a dominance of locally indigenous native plants to ensure that the existing landscape character prevails. Planting of casuarinas in particular will envelope the site and integrate it with the surrounding remnant forest;
- planting of trees and shrubs will be strategically located around cabins to create a dominant canopy above roof lines that will help disguise and visually absorb the structures. Planting will also create private spaces between cabins, screen unwanted views and provide shelter to the front verandas from undesirable south-western summer sun;
- surface drainage will be facilitated by open swales to provide opportunity for passive treatment through a bioretention system prior to discharging into the natural wetland area further east. The most significant swale will align with the southern access road and adjoining parking areas to prevent undesirable vehicle access into the wetland area further east; and
- the existing undeveloped area east of the swale will be rehabilitated to restore the natural values of the original wetland environment. New tree planting within this area will incorporate buffer zones and clearances between canopies as required satisfying bushfire regulations.

4.5 Development Staging

It is proposed that the development will be constructed in stages as demand dictates. The development will commence through construction of the wetland and then move to the civil works and finally construction of the cabins. A general list of the construction items is provided in chronological order:

- Stage 1 - general site preparation, earth works, construction of the wetland and construction of the floodgate and commencement of the wetland rehabilitation;
- Stage 2 - civil services (power, water and sewerage) and road;
- Stage 3 –Cabins 1 and 2 (closest to tavern) and Cabin 6 (disabled cabin) and landscaping and foot paths;
- Stage 4 Cabins 3 and 4 and landscaping and foot paths ;
- Stage 5 Cabins 5 and 7 and landscaping and foot paths;
- Stage 6 Cabins 8 and 9 and landscaping and foot paths
- Complete all landscaping; and
- Boardwalk and pathway into constructed wetland.

The site is currently cleared, devoid of any significant vegetation and relatively flat. The proposed earthworks would be minimal in nature and would be largely related to construction of the wetland, filling of the site and road formation.

4.6 Management of Adjoining Wetlands

The Department of Planning in conjunction with Amos and McDonald Surveyors and Darkhart Eco Consultancy resurveyed SEPP 14 No. 436 boundary within the vicinity of the cabins on 25 June 2009 (refer to Environmental Assessment Report).

James Warren and Associates Pty Ltd prepared a Wetland Management Plan (WMP) for SEPP 14 Wetland 436 within the site. The WMP is attached in the Environmental Assessment Report. The aims of the WMP are to:

- direct the conservation, protection and management of SEPP 14 Wetland on the Subject site;
- reintroduce tidal flows to the SEPP 14 Wetland;
- re-establish a healthy Saltmarsh ecosystem;
- protect the SEPP 14 Wetland from storm water runoff with the establishment of a suitable vegetated buffer between the proposed development and the SEPP 14 Wetland (i.e. by way of a constructed freshwater wetland);

- manage the SEPP 14 Wetland area (including protection of Endangered Ecological Communities) through weed control and assisted natural regeneration; and
- prepare a detailed monitoring and maintenance program.

Issues identified by the WMP as requiring management are:

- stormwater and restricted tidal flows;
- Endangered Ecological Communities; and
- weed infestation.

The WMP has identified six management areas:

- Management Area 1 (MA1) – Constructed freshwater wetland;
- Management Area 2 (MA2) – Stormwater outlet dispersal area;
- Management Area 3 (MA3) – Buffer to adjacent residential area;
- Management Area 4 (MA4) – Area between Saltmarsh and Macleay River;
- Management Area 5 (MA5) – Central Swamp Oak Forest; and
- Management Area 6 (MA6) – Saltmarsh and Mudflats.

Management Areas 2, 3, 4, 5 and 6 will cover SEPP 14 Wetland number 436 on the subject site.

The WMP proposes a number of management measures aimed at resolving environmental issues currently affecting the SEPP 14 wetland, and further, to mitigate any potential impacts of the proposed development. Management measures are summarised in Table 4.1 below.

Table 4.1 Summary of Wetland Management Plan management actions

MANAGEMENT AREA	MA1	MA2	MA3	MA4	MA5	MA6
Staging	1st	2nd	3rd	4th	5th	6th
MANAGEMENT ACTION						
Temporary Fencing		✓		✓	✓	
Weed control		✓	✓	✓	✓	✓
Primary Weeding		✓	✓	✓	✓	✓
Secondary Weeding	✓	✓	✓	✓	✓	✓
Natural Regeneration	✓	✓	✓	✓	✓	✓
Enhancement Planting	✓	To be determined	To be determined	To be determined	To be determined	To be determined
Monitoring		✓	✓	✓	✓	✓
Adaptive Management	✓	✓	✓	✓	✓	✓
Permanent Fencing		✓		✓	✓	
Interpretive Signage		✓				

A five year maintenance and monitoring program is outlined in the WMP. Maintenance will be carried out by an experienced Bush Regeneration company. Long term monitoring of the overall vegetation communities within MA1 (the SEPP 14 Wetland on the site) is to be completed using aerial photography and ground truthing of the vegetation composition. A plan for the long term monitoring is also included in WMP. Monitoring data can be used by project managers to demonstrate the ability of the project to meet stated goals and objectives.

4.6.1 Restoring Tidal Flows to the SEPP 14 Wetland

Tidal flow will be restored to the SEPP 14 Wetland by modification to the existing floodgate beneath Government Road along the northern boundary of the site (refer to Environmental Assessment Report for location).

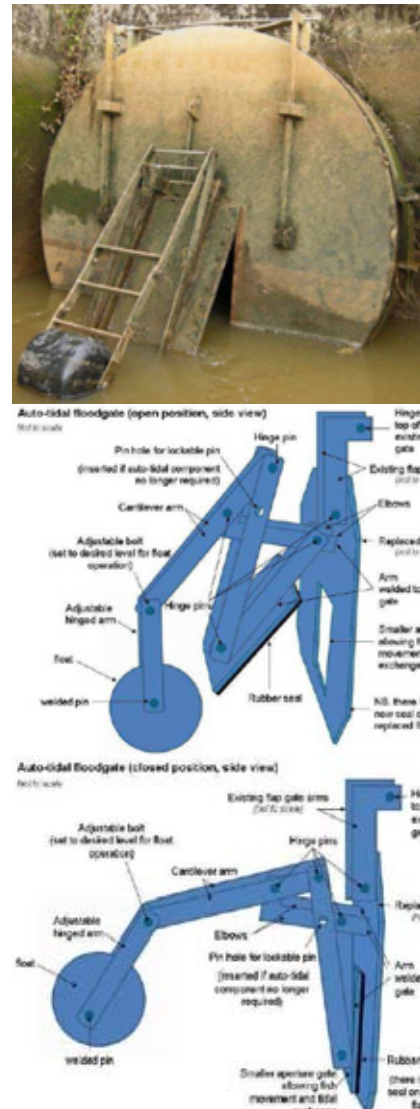
Currently, the levee created by Government Road blocks tidal flow entering the SEPP 14 Wetland on the south side of the road (in the subject site). An existing floodgate on a 375 mm pipe beneath Government Road allows flood or stormwater flows to discharge out of the subject site to the north into Back Creek. It is noted the existing floodgate is currently broken, allowing a limited amount of tidal flow into the site.

It is proposed that tidal flow will be restored to the SEPP 14 wetland within the site by construction of a new 900 mm diameter culvert pipe beneath Government Road (adjacent to the existing pipe). The new pipe will be fitted with an automatic tide floodgate similar to the design shown in Plate 4.1. The automatic tide floodgate includes a secondary gate with an aperture that opens and closes with an adjustable floating arm to allow a degree of tidal flushing and fish passage whilst providing flood protection (if required). This design is used in the rehabilitation of wetland environments that have been damaged by excessive floodplain drainage (NSW Department of Industry and Investment, 2009).

The opening and closing of the aperture on the secondary gate is triggered by the water level on the downstream side (north side) of the system. When the water level drops below the float during low tide events, the weight of the float arm causes it to fall and the secondary gate to open, resulting in the exchange of water. This continues until the incoming tide lifts the float to its maximum height and causes the gate to seal. The gate is held closed by the rising action of the float and the back pressure applied to the gate once overtopped, providing protection against flood water flowing upstream (NSW Department of Industry and Investment, 2009:17).

The secondary gate can be manually adjusted to set the level at which the aperture closes during an incoming tide. This provides control on the amount of tidal inflow and the subsequent extent of inundation of the SEPP 14 Wetland in the subject site.

The automatic tide floodgate will be owned and managed by the proponent. The initial phase of the floodgate operation will involve restricting the amount of tidal inflow to confine tidal inundation of the SEPP 14 Wetland in the subject site to the extent of vegetation with a full salt tolerance. This is based on management objectives outlined in the Wetland Management Plan (James Warren & Associates, 2010).



Source: NSW Department of Industry and Investment (2009)

Plate 4.1 Indicative Examples of an Automatic Floodgate

Three stages are proposed for the restoring tidal flow to the SEPP 14 Wetland in the site:

1. construction of a new 900 mm diameter culvert pipe with an automatic tide floodgate beneath Government Road (adjacent to the existing pipe);
2. remove the floodgate from the existing 375 mm pipe to convert it to an open pipe culvert for increased tidal flow exchange (this stage will only be implemented if deemed appropriate following monitoring of the response of the SEPP 14 Wetland in Stage 1 above); and

3. remove the automatic floodgate from the new 900 mm pipe to also convert it to an open pipe culvert for increased tidal flow exchange (similar to above, this stage will only be implemented if deemed appropriate following monitoring of the response of the SEPP 14 Wetland to Stage 2).

The amount of tidal inflow for the above stages has been modelled to estimate the extent of tidal inundation (refer to Environmental Assessment Report for modelling details). The estimated extent of tidal inundation for the above three stages is shown in the Environmental Assessment Report. Modelling indicates that for Stage 1 with a fully open aperture gate in the automatic tide floodgate a maximum tide level of 0.41 m AHD can be achieved on spring tides in the site. This corresponds to the existing extent of vegetation with a full salt tolerance which is the boundary for initial tidal inundation suggested by Sainty in the Wetland Management Plan (James Warren & Associates, 2010). The extent of tidal inundation for Stage 2 and 3 is estimated to be approximately 0.44 m AHD and 0.48 m AHD respectively.

Tide levels in the site generally follow the same pattern as the tidal variations on the downstream side of Government Road with a fully open aperture gate. However the magnitude of the tidal variations in the site is reduced due to the dampening effect of flow restriction through the aperture gate. This is beneficial for restricting tidal inundation levels the existing extent of vegetation with a full salt tolerance.

The initial phase of the floodgate operation (Stage 1) will involve restricting the amount of tidal inflow to confine tidal inundation of the SEPP 14 Wetland in the subject site to the extent of vegetation with a full salt tolerance (approximately the 0.4 m AHD contour). Commencement of operation of the automatic tide floodgate will require gradual adjustment of the secondary gate over the period of a couple of months to determine the appropriate amount of tidal inflow. This will be determined by observing the extent of inundation for different tidal phases (i.e. spring and neap tides).

Appropriate culvert design and scour protection will be provided on the upstream and downstream side of the pipe beneath Government Road to address scour issues associated with the reintroduction of tidal flows.

4.6.2 Acid Sulfate Soil Monitoring and Management for Tidal Flow Restoration

Due to the past blocking of tidal flows to the wetland area in the site, the watertable will have been lowered which has been potentially exposed shallow actual acid sulfate soil (ASS) horizons resulting in oxidation of sulphides within the soils and generation of sulphuric acid and acid leachate. The soils would then be referred to as actual ASS (AASS). The generated sulphuric acid would be stored as acid pools within the soils and potentially on the soil surface.

Restoring tidal flows to the SEPP 14 wetland area in the site has the potential to export acidic water and other products of ASS oxidation into Back Creek. This could occur due to tidal water infiltrating into shallow actual acid sulfate soil horizons and draining out these products as tidal waters recede.

If AASS are present it is anticipated this impact is currently occurring during significant rainfall events via stormwater inflows to the wetland infiltrating into the shallow actual acid sulfate soil horizons and draining out these products as the stormwater flows discharge to Back Creek via the culvert beneath Government Road.

Preliminary research included a search of the NSW DPI fish kill database, a review of the Back Creek South West Rocks Sustainability Assessment Report (SWRSAR), and a discussion with Mr Matthew Birch, a contributor of the Coastal Lake Assessment and Management (CLAM) for Back Creek. The research indicated that there are no records of fish kills occurring in Back Creek. Export of acidic water and other ASS by-products were not considered a significant issue in the CLAM for Back Creek and the SWRSAR. However it is understood that the wetland area above the floodgates may have contained acid scalds. It is considered that restoring tidal flows in the wetland would have less capacity to export acid water and leachates when compared to storm events.

Restoring tidal flows to the SEPP 14 wetland area in the site also has the potential to provide beneficial water quality impacts by providing some buffering of acidic water exiting the site during significant stormwater events.

To confirm that there is no significant export of acidic water and other ASS by-products, particularly in the initial stages of tidal restoration, the following water quality monitoring is proposed:

- Water quality monitoring within the wetland at the upstream end of the Government Road culvert, and at the New Entrance Road culvert, Back Creek (monitoring to be undertaken on the outgoing tide):
 - before the restoration of tidal flows to provide baseline levels (to be undertaken weekly over two weeks);
 - during the initial inundation (to be undertaken weekly for a minimum period of six weeks); and
 - at each significant increase in tidal exchange capacity (at the commencement of Stage 2 and Stage 3) to be undertaken weekly for a minimum period of six weeks.

4.7 Access and Parking

The site is bounded to the west and south west by New Entrance Road and Marlin Street respectively. Marlin Street is an 8 metre wide road corridor and Marlin Street is a 15 metres providing access along the waterfront of the Macleay River.

A single access to the cabins is provided off Marlin Street with a turning head at the end for circling vehicles. The internal access road will be an 11 metre wide road constructed of asphalt connecting to gravel driveways for access to cabins. Four of the cabins have double access forward drive in/drive out access and five have traditional single access. Located on the eastern side of the access road is a gravel verge for additional car and trailer parking. The access road will be initially filled to a minimum level of 1.9 m AHD at the northern end of the site, with a consistent rising grade of at least 0.3% from north to south to provide flood evacuation to the high ground at Marlin Drive.

A gravel path from the rear of the cabins to the tavern and through the wetland area would be constructed. This would allow a pedestrian connection enhancing passive recreational opportunities and enable visitors to interpret and interact with the wetland environment.

4.8 Integrated Water Cycle Management

Integrated Water Cycle Management (IWCM) is a holistic approach to the planning and design of urban development that aims to minimise negative impacts on the natural water cycle and protect the health of aquatic ecosystems. It promotes the integration of stormwater, water supply and sewage management at the development scale. IWCM considers ways in which urban infrastructure and the built form can be integrated with a site's natural features. In addition, IWCM seeks to optimise the use of water as a resource (Moreton Bay Waterways and Catchments Partnership, 2006:1-2).

The key principles of IWCM are to:

- protect existing natural features and ecological processes;
- maintain the natural hydrologic behaviour of catchments;
- protect water quality of surface and ground waters;
- minimise demand on the reticulated water supply system;
- minimise sewage discharges to the natural environment; and
- integrate water into the landscape to enhance visual, social, cultural and ecological values.

4.8.1 Proposed IWCM System

As a general principle the area of hard surface has been minimized in order to maintain the existing drainage patterns within the land. Roadways and access ways will be sealed and constructed to shed water into pervious gravel areas and shallow grassed swale drains. All road edges will be adjoined by grassed and landscaped areas and actions that tend to concentrate flows will be avoided. Areas that are dedicated for

visitor parking and all sealed areas will also be drained to swales. The drainage system will exclude drainage from the tavern to ensure the system

Roof water from cabins will be harvested for re-use. This practice also functions to retard and dissipate stormwater flows during rainfall events and will assist in minimizing erosion and preventing the contamination of existing watercourses with sediment.

The proposed IWCM elements for the development comprise:

- **Rainwater tanks** at each cabin: water captured in the tanks will be used for toilet flushing and laundry to reduce water usage from the reticulated supply system;
- **Swale drainage**: grassed or vegetated swales will provide preliminary treatment of stormwater, promote infiltration of stormwater to groundwater and direct stormwater runoff to the constructed wetland for further treatment;
- **Pervious parking area**: a gravel visitor parking area is located between the bitumen roadway and the SEPP 14 wetland to promote infiltration / filtering of the road runoff with excess runoff directed to the constructed wetland for further treatment. Cabin parking areas are also gravel surface to promote infiltration. Runoff from these parking areas are directed to swale drains; and
- **Constructed wetland**: for final treatment of stormwater to ensure that water reaching the SEPP 14 wetland is of a high quality. All swale drains discharge to the constructed wetland for further treatment.

The above measures address the key principles of IWCM in the following manner:

- *protect existing natural features and ecological processes*: the extensive treatment process provides high quality runoff to ensure no significant impacts on the SEPP 14 wetland;
- *maintain the natural hydrologic behaviour of catchments*: the proposed stormwater treatment train maximises the use of overland flow / natural flow paths as opposed to piped flow to promote infiltration to groundwater, provide filtration of sediments in flows, and minimise flow velocities and peak discharge rates. Rainwater tanks and detention in the constructed wetland will also detain flows to compensate for increased flow rates associated with impervious areas on the site;
- *protect water quality of surface and ground water*: the extensive treatment process provides high quality water suitable for discharge to the SEPP 14 wetland. Water infiltrated to groundwater will also be treated via the filtration process through the grassed swales, gravel parking areas and the base of the constructed wetland;
- *minimise demand on the reticulated water supply system*: The use of rainwater tanks to provide rainwater for toilet flushing and laundry use will minimise demand on the reticulated water supply system;
- *minimise sewage discharges to the natural environment*: the installation of general water-saving devices in the cabins (tap fittings, showerheads, etc) will minimise discharges to the sewerage system;
- *integrate water into the landscape to enhance visual, social, cultural and ecological values*:
 - the area of hard surface has been minimized in order to maintain the existing drainage patterns within the site;
 - surface drainage will be facilitated by open swales to provide treatment and a 'softer' visual appearance in comparison to standard kerb and gutter;
 - proposed new vegetation in the constructed wetland will incorporate a dominance of locally indigenous native plants to ensure that the existing landscape character prevails; and
 - the constructed wetland combined with walkway / boardwalk adds recreational interest to the site and provides opportunity for education regarding water quality and the value and protection of locally significant wetlands.



4.8.2 Water Supply

Domestic water supply will be provided by two sources: individual rainwater tanks at each cabin and connection to the Macleay Water reticulation system.

The rainwater tanks will be above ground at each cabin. The captured roofwater will be used for laundry use and toilet flushing, therefore the rainwater tanks will be connected to the Macleay Water reticulation system for top-up purposes when there is insufficient rainwater. The top-up connection will be fitted by a licensed plumber and will include a dual check device to the water meter (pers. comm. T. Castle, email 26/11/2009).

Water supply for other uses in the dwelling (and top-up supply for the laundry and toilet flushing) will be supplied directly from the Macleay Water reticulation system. There is an existing 100 mm diameter main along the frontage with New Entrance Road. The adequacy of supply is assessed in Environmental Assessment Report.

Water supply for fire-fighting will be supplied from the Macleay Water reticulation system. Fire hydrants will be installed in accordance with AS 2419.1 (2005). This will provide the principle source of water for fire fighting in the event of a bushfire.

4.8.3 Stormwater

4.8.3.1 Design Criteria

The design criteria for the stormwater strategy considered Council's general stormwater management objectives (Table 4.2) and project specific objectives of improving current water quality discharges to the SEPP 14 wetland. Council's general stormwater management objectives were obtained from *Kempsey Shire Council Stormwater Management Plan Technical Supplement* (2004).

Table 4.2 Council Stormwater Management Objectives – Post Construction Phase

<i>Pollutant / Issue</i>	<i>Suggested Retention Criteria</i>
<i>Suggested Quantitative Objectives Post Construction – applicable to subdivisions and all medium – large scale development (generally defined as greater than 2500 m² total area).</i>	
Course Sediment	80% of average annual load for particles 0.5 mm or less
Fine Particles	50% of average annual load for particles 0.1 mm or less
Total Phosphorous	45% retention of average annual load
Total Nitrogen	45% retention of average annual load
Litter	70% retention of annual litter load greater than 5 mm
Hydrocarbons, motor oils, fuels and grease	90% of average annual pollutant load

A quantitative assessment of water quality improvements provided by the proposed stormwater treatment train is detailed in Appendix E. The quantitative assessment indicates that the water quality from the site will be significantly improved in comparison the current runoff from the site.

4.8.3.2 Stormwater Management Plan

The proposed stormwater management plan consists of the following measures:

- rainwater tanks with a volume of approximately 3 k L at each cabin to capture roof runoff to detain flows and reduce runoff volumes;
- grassed or vegetated swales will receive overflows from the rainwater tanks and runoff from the road surfaces, gravel areas and other impervious areas. The swales will convey the flows to the constructed wetland and in the process provide some infiltration of stormwater to groundwater and removal of coarse and medium sediment. The basic swale dimensions are a base width of 300 mm, depth of 200 mm with gentle side slopes of approximately 1(vertical):6(horizontal);

- gravel parking areas to promote infiltration / filtering of the road runoff with excess runoff directed to the swales and constructed wetland for further treatment;
- grassed buffer strips between the entrance road / visitor parking and the constructed wetland to provide some infiltration of stormwater to groundwater and removal of coarse and medium sediment;
- constructed wetland for final treatment of stormwater via enhanced sedimentation, fine filtration and biological uptake processes to remove pollutants. Details of the constructed wetland include:
 - a surface area of approximately 1,000 m² which is approximately 7% of its catchment area. This size provides a high quality treatment suitable for release to the SEPP 14 wetland. This size is approximately double the standard sizing of constructed wetlands;
 - no permanent pool volume. The base of the constructed wetland will comprise the native soils which are sandy silts / silty sands which have a relatively high permeability and would not retain any significant permanent pool;
 - detention time of approximately 5 hours based on an equivalent outlet diameter of 100 mm; and
 - the maximum depth of the wetland is 0.4m (including extended detention depth). The embankment slopes of in the wetland are gentle with a grade of 1:10 to enable public egress from the water in the event of someone falling into the water when the wetland is full. Dense vegetation within the wetland will deter public access. The vegetation will consist of macrophyte zone planting of ephemeral marsh zones. The maximum water depth in the wetland will be approximately 0.4 m (a water level of 0.9 m AHD) which is controlled by the level of the outlet weir.

4.8.4 Sewerage

Sewerage services for the proposed cabins will be provided by connection to the Macleay Water sewerage system. Initial investigation of gravitating sewer flows to the Riverside Tavern pump station indicates the distance to the cabins is too excessive to grade the sewer therefore on-site sewage pumping systems will be provided as part of the development.

GeoLINK wrote to Macleay Water and requested advice on the capacity of the existing system on 26 August 2009. A copy of this letter was forwarded to Macleay Water again on the 14 May 2010 and again on the 25 May 2010 however no response has been received.

However Macleay Water has indicated verbally that an on-site sewage pumping system will need to provide adequate on-site storage capacity to hold cabin sewage flows during peak periods in the day. The sewage will be pumped from the on-site systems into Council's sewer system during low flow periods - off-peak pumping will be undertaken at various intervals throughout the day/evening to prevent prolonged retention of sewage in the package pump stations.

Two small package pump stations are proposed to service all nine cabins. Each pump station has 2,200 litre storage capacity and duplex pumps (one operating / one standby). The two pumps will operate simultaneously for greater flow rate when required. These pump stations are typically used for multiple connections of four x four-bedroom houses. The proposed locations are shown in the Environmental Assessment Report.

The package pump stations will be connected to the existing private sewer rising main from the Riverside Tavern pump station using "boundary kit" connections with a non-return and isolation valve. The pump stations will be installed below-ground with a 1.0 m diameter access lid and dry well housing the pumping equipment and a 1.7 m diameter storage chamber. The depth of the pump stations is 2.0 m. Indicative details are provided in Environmental Assessment Report based on the Mono system.

The grinder pumps ensure solids are ground into fine particles that pass easily through the pump, valves and small-diameter pipe lines.

Pumping from the two package pump stations would be timer controlled to pump at off-peak times to avoid any increase in peak flows at the downstream pump station. The package pump stations will be designed with sufficient capacity to store the equivalent of one-day flow from the cabins.

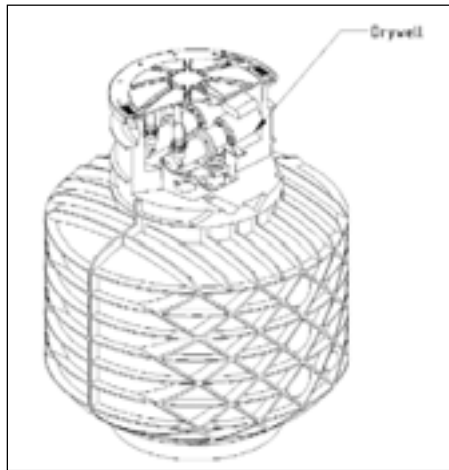


Plate 4.2 Indicative Illustrations of Sewage Pumping Units

4.9 Services and Infrastructure Provision

A full range of services and infrastructure will be provided for the development. These include standard services such as water, sewer, telecommunications, electricity and roads:

- water and sewer services are described in the previous section;
- electricity will be provided by connection to the Country Energy supply available to the lot; and
- telecommunication will be provided by connection to the infrastructure along New Entrance Road.

4.10 Building Management Plan

The proposed development seeks to facilitate the establishment of tourist accommodation in the form of self-contained cabins in a natural coastal setting. This development seeks to provide a high quality tourist experience for the travelling public, at a scale that does not adversely impact on the amenity of the local area or the surrounding environment. The intent of this section is to provide the content of what will be a Building Management Plan which will be attached to the title of the land as a 'Restriction as to User' pursuant to Section 88B of the Conveyancing Act 1919. The Building Management Plan sets out the framework for the operation of the tourist cabins, ensures consistency with tourism principles and demonstrates that the buildings are not used for permanent occupation.

Table 4.3 Building Management Plan

Issue	Principles for inclusion in the Building Management Plan
Management Systems	The Cabins will be operated as part of the Riverside Tavern. The Licensee of the Riverside Tavern will be responsible for: ▪ all bookings and enquiries; ▪ cleaning and day to day servicing of the cabins; ▪ customer complaints, requests and general maintenance; and ▪ gardening and landscape maintenance.

<i>Issue</i>	<i>Principles for inclusion in the Building Management Plan</i>
Occupancy	Occupancy of the cabins will be for short term holiday accommodation only. The tourist cabins have been specifically designed in terms of size provision of amenities to accommodate short-term tourist occupation. Any occupation of the cabins for permanent accommodation is prohibited. Cabins are not permitted to have: ▪ an individual electric meter box; ▪ an individual mailbox; or ▪ an individual rural/residential address number.
Use of amenities and facilities	Use of amenities and facilities will be for use of holiday tenants only.
Ownership	Ownership of the cabins and ancillary infrastructure will remain with the owner of Lot 4 DP 1022342.
Subdivision of Lot 4 DP 1022342	Subdivision of Lot 4 DP 1022342 to create separate titles for any of the cabins is not permitted.
Restrictive covenants proposed to control use and occupation of the site for tourism	A 'restriction as to user' will be registered against title pursuant to Section 88B of the Conveyancing Act 1919 prohibiting any permanent occupation of the cabins.

Revised Statement of Commitments

5.1 Revised Statement of Commitments

Table 5.1 sets out a revised Statement of Commitments to be undertaken by Shannon Pacific P/L as identified throughout this Environmental Assessment and the supporting reports. These commitments will ensure that the project is carried out in a manner that minimises environmental, social and economic impacts. They also confirm Shannon Pacific's commitment to complying with all legislative requirements.

Table 5.1 Revised Statement of Commitments

<i>Issue</i>	<i>Commitment</i>	<i>Actions</i>	<i>Timing</i>	<i>Responsibility</i>
General	The developer will carry out the development in accordance with this Environmental Assessment, prepared by GeoLINK and dated May 2010; in accordance with plans prepared by Paul Smith Building Design and GeoLINK; and in accordance with the specialist supporting reports.	Any required documentation/plans will be submitted to the relevant approval body for approval prior to issue of any construction certificate demonstrating full compliance with the Part 3A Approval.	Life of project	Proponent
Wetland Management	The wetland will be managed in accordance with the Wetland Management Plan (WMP)	Implementation of management measures for Management Area 1 of the WMP (SEPP 14 Wetland) including: - restoring tidal flow; - weed control; - facilitation of natural regeneration; - enhancement plantings (Adaptive management); and - monitoring and maintenance.	Construction	Proponent
		Implementation of management measures for Management Area 2 of the WMP including: - construction of a freshwater wetland for stormwater treatment; - buffer planting and landscaping; - fencing to restrict access to the SEPP 14 Wetland; - educational signage; and - monitoring and maintenance.	Construction	Proponent
		Implementation of the approved maintenance and monitoring program contained in the WMP including: - five years program; and - long term monitoring of the vegetation communities within the WMFA to be completed using aerial photography and ground truthing of the vegetation composition.	In accordance with the WMP	Proponent

<i>Issue</i>	<i>Commitment</i>	<i>Actions</i>	<i>Timing</i>	<i>Responsibility</i>
	Stakeholder Steering Committee	A list of stakeholders will be developed and will be consulted during the wetland rehabilitation process and monitoring program to ensure appropriate advice on management actions is being provided and assists in keeping key stakeholders advised of progress and adaptive management issues. Stakeholders will include NOW, NRCMA, DPI-F and DPI-CL.	Construction through to wetland maintenance period	Proponent
Ecology	Ecology will be managed through management of the wetland, stormwater, and landscaping.	▪ areas included in the WMP will be revegetated and rehabilitated with appropriate native vegetation in accordance with the WMP; ▪ natural regeneration will be encouraged as a priority; ▪ vegetation rehabilitation in the area between the cabins and the SEPP 14 wetland, including weed control; ▪ planting within the buffer between the cabins and the SEPP 14 Wetland to ensure compliance with both the bushfire APZ requirements, and provision of a vegetated buffer to the EECs and SEPP 14 wetland; ▪ implementation of the Stormwater Management Plan, including construction of a wetland (outside of the SEPP 14 Wetland boundary) to provide treatment and improved quality of stormwater runoff from the development into the SEPP 14 Wetland; ▪ prevention of trampling caused by humans by restricting access to the SEPP 14 Wetland. The physical barrier created by the stormwater wetland between the development and SEPP 14 Wetland, fauna friendly fencing (such as bollards) and signage stating the area is an environmental protection area, and instructing people to keep out; ▪ retention of all the vegetation representative of EECs within the SEPP14 Wetland on the subject site.	In accordance with the WMP	Proponent

<i>Issue</i>	<i>Commitment</i>	<i>Actions</i>	<i>Timing</i>	<i>Responsibility</i>
Bushfire	Bushfire hazard will be managed in accordance with the Bushfire Hazard Assessment.	▪ APZs of 44 m to the east to be established and maintained for the five southern most cabins in accordance with PBP; ▪ All cabin exits including all parts of the stairs will be greater than 44 m to the SEPP 14 boundary; ▪ APZs to be established and maintained for the four northern most cabins to the SEPP 14 Coastal Wetland and in accordance with PBP; ▪ APZs of 10 m to the north of the proposed cabins to be established and maintained for the northern most cabin; ▪ landscaping and general property maintenance to comply with Appendix 5 of PBP 2006; ▪ APZs to be established prior to occupation and at the landscaping stage; ▪ a specific bushfire construction level of BAL-29 for the eastern façade and BAL-19 for all other façades for cabins 1 to 4; ▪ a specific bushfire construction level of BAL-19 for the eastern façade and BAL-12.5 for all other façades of cabins 6 and 8; ▪ a specific bushfire construction level of BAL-12.5 for all façades of cabins 5, 7 and 9; and ▪ an emergency and evacuation plan to be prepared for the cabins for the purposes of bushfire protection in accordance with <i>A guide to Developing a Bushfire Evacuation Plan</i> (RFS 2004); and ▪ the bushfire emergency and evacuation plan to be prepared prior to occupation of the cabins.	Construction Life of project Life of project Life of project Construction Prior to Occupation Construction Construction Construction Prior to occupation Prior to occupation	Proponent

<i>Issue</i>	<i>Commitment</i>	<i>Actions</i>	<i>Timing</i>	<i>Responsibility</i>
Flooding	Flood management will be in accordance with the: ▪ Flood Assessment; and ▪ Flood Emergency Plan.	An adaptive management strategy to be implemented to address potential flooding and climate change impacts. The strategy is to include provision for: ▪ all building materials below floor level will be of a type suitable to withstand occasional flood inundation. ▪ all electrical installations are to be above floor level.' ▪ habitable floor levels of the cabins to be initially set at equivalent to the 1% AEP flood level under the 2050 climate change scenario plus 0.5 m freeboard; ▪ by the year 2050, the floor level of the cabins should be reviewed in accordance with updated sea level rise predictions at the time of review. Subject to this review the floor level of the cabins should be raised to the projected 2100 1% AEP flood level plus 0.5 m freeboard; ▪ the filled level of the site is to be set at a minimum level of 1.9 m AHD; ▪ the access/evacuation routes through the site will also be initially filled to a minimum level of 1.9 m AHD at the northern end of the site, with a consistent rising grade of at least 0.3% from north to south to provide evacuation to the high ground at Marlin Drive; and ▪ by the year 2050, the fill levels will be raised by the same height as the predicted sea level rise over the period from the year 2050 to 2100. This will be based on updated sea level rise predictions at the time of review. ▪ implementation of the detailed Flood Emergency Plan prepared by WMA water for the site. ▪ adaptation for floor levels will be achieved by raising the sub-floor of the cabins by extension of the supporting columns. Cabin stair access, plumbing, etc will be modified accordingly.	Construction Construction Construction 2050 Construction Construction 2050 Construction 2050	Proponent

Issue	Commitment	Actions	Timing	Responsibility
		Adaptation for site fill levels relates to raising of the access road in the site. This will involve reconstruction of the pavement and batters to raise the pavement level in 2050 by the same height as the predicted sea level rise over the period from the year 2050 to 2100 (current estimates indicate the pavement level will need to be raised by 0.5 m in 2050).	2050	
Stormwater Management	Stormwater will be managed in accordance with the Stormwater Management Plan.	- provision of rainwater tanks with a volume of approximately 3 kL at each cabin to capture roof runoff to detain flows and reduce runoff volumes; - grassed or vegetated swales to receive overflows from the rainwater tanks and runoff from the road surfaces, gravel areas and other impervious areas; - gravel parking areas to promote infiltration / filtering of the road runoff with excess runoff directed to the swales and constructed wetland for further treatment; - grassed buffer strips between the entrance road / visitor parking and the constructed wetland to provide some infiltration of stormwater to groundwater and removal of coarse and medium sediment; - constructed wetland for final treatment of stormwater via enhanced sedimentation, fine filtration and biological uptake processes to remove pollutants, sized to provide high quality treatment suitable for release to the SEPP 14 wetland; - the constructed wetland to be used as a sediment retention basin during the construction phase. Flows from the majority of the site will be directed to the basin. The location of the basin will facilitate interception of any sediment to the SEPP 14 wetland; and - the western fringe of the site may flow to New Entrance	Construction Construction Construction Construction Construction	Proponent

Issue	Commitment	Actions	Timing	Responsibility
		Road. Sediment control fences will be erected along this boundary to prevent any sediment loss to the road drainage system.		
Coastal Hazard	Coastal Hazard will be managed in accordance with recommendations outlined in EA under this issue.	As per Flooding Commitments	Construction and 2050	Proponent
Geotechnical		Not applicable		
Acid Sulfate Soil	Acid Sulfate Soil will be managed according to the Acid Sulfate Soil Management Plan, and applies to excavation greater than 1 m below natural ground surface. The project will be managed so as to ensure that the development will not cause transference of Acid Sulfate soils into the existing freshwater wetland or SEPP 14 Wetland during and after construction	▪ excavated ASS material is to be separated from overlaying topsoil and temporarily stockpiled for treatment; ▪ treatment should directly follow excavation; ▪ the treatment of ASS must be carried out in accordance with standard Occupational Health and Safety Guidelines; ▪ when ASS material must be stockpiled temporarily, the stockpile area must be located away from waterways and bunded to prevent any runoff to receiving waters; ▪ the following liming and treatment procedure for ASS to be implemented: 1 lime the base of the stockpile pad 5 mm thick layer of fine grade-1 agricultural lime; 2 spread excavated ASS onto the pad in layers 10 – 30 cm thick; 3 apply lime at a standard rate of: a. 3.0 kg of lime per tonne of soil from within 0.5 m of the ground surface; b. 3.6 kg of lime per tonne of soil from within 1.0 m of the ground surface; and c. 30.1 kg of lime per tonne of soil from between 1 m and 2 m depth below ground surface. Note: 1 bag of lime = 25 kg; Note: Windy conditions should be avoided for	Construction Construction Construction Construction	Proponent

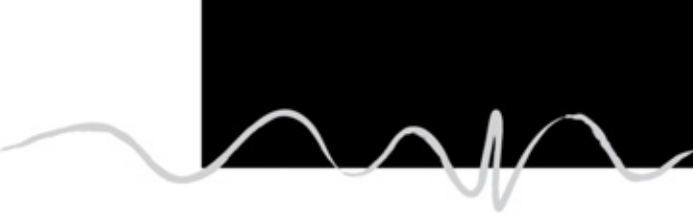
Issue	Commitment	Actions	Timing	Responsibility
		safety and efficiency; 4 cultivate lime into the ASS layer well, preferably using a rotary hoe. Ensure an even homogenous mix of soil and lime is created before spreading the next soil layer; and 5 repeat steps 2 – 4 as required. - ASS treated in this way can be used as fill; - where service trenches can be refilled within 24 hours, excavated ASS material should be separated from overlying topsoil and temporarily stockpiled; - once trenching and laying of services is completed, ASS material should be returned to the trench first followed by the topsoil; - where ASS burial cannot be completed within 24 hours, or if there is surplus of ASS material, the liming procedure above should be adopted; and - ASS management will be required during construction for any works that involve excavation works and soil disturbance.	Construction Construction Construction Construction Construction	
Traffic and Access	Traffic and Access will be managed in accordance with measures outlined in the Environmental Assessment	- internal access road to be 11 metres wide, constructed of asphalt connecting to gravel driveways for access to cabins; - four of the cabins have double access forward drive in/drive out access and five have traditional single access; - a gravel path from the rear of the cabins to the tavern and through the wetland area would be constructed; - The roadway will be sealed and constructed to shed water to their edges and into open shallow grassed swale drains; - all road edges will be adjoined by grassed and landscaped areas and actions that tend to concentrate flows will be avoided;	Construction Construction Construction Construction Construction	Proponent

Issue	Commitment	Actions	Timing	Responsibility
		- areas that are dedicated for visitor parking and are sealed will also be drained to open swales; and - the pathways in the development will generally be 1.2 m wide and have compacted gravel surfaces.	Construction Construction	
Heritage and Archaeology	Heritage and Archaeology will be managed in accordance with the Archaeological Report and mitigation measures outlined in the Environmental Assessment.	- implementation of a comprehensive stormwater, erosion and sedimentation controls to prevent run-off into wetland, watercourses creeks and river so as not to contaminate the flathead breeding grounds opposite the Riverside Tavern; - if any items defined as relics under the NSW Heritage Act 1977 are uncovered during the works, all works will cease in the vicinity of the find and an archaeologist and the Project manager will be contacted immediately. - consultation with and involvement of all the registered local Aboriginal representatives for the project will continue in the ongoing management of the Aboriginal cultural heritage values. Evidence of this consultation will be collated and provided to the consent authority on request. - fair and reasonable opportunities will be provided for the registered Aboriginal stakeholders to monitor any initial ground disturbance works. In the event that additional Aboriginal objects are uncovered during the monitoring program, the objects will be recorded and managed in accordance with the requirements of sections 85A and 89A of the National Parks and Wildlife Act 1974. - In the event that surface disturbance identifies a new Aboriginal object, all works will cease in the immediate area to prevent any further impacts to the object(s). A suitably qualified archaeologist and the registered Aboriginal representatives will be contacted to determine the significance of the objects. The site is to be registered in the Aboriginal Heritage Information Management System	Construction Construction Construction Construction	Proponent

Issue	Commitment	Actions	Timing	Responsibility
		(AHIMS) and the management outcomes for the site included in the information provided. Development and management strategies for all objects/sites will be done in consultation with the Aboriginal community representatives, the archaeologist and OEH. ▪ If human remains are located all works will cease in the immediate area to prevent any further impacts to the remains. NSW Police are to be notified immediately. No action will be undertaken until police provide written notification. If the skeletal remains are identified as Aboriginal, the proponent must call OEH Enviroline on 131555 and representatives of the local Aboriginal community. No works are to continue until OEH provide written notification to the proponent. ▪ All reasonable efforts will be made to avoid impacts to Aboriginal cultural heritage at all stages of the development works. ▪ An Aboriginal Cultural Education Program will be developed for the induction of all personnel and contractors involved in the construction activities on site. Records will be kept of which staff/contractors were inducted and when for the duration of the project. The program will be developed and implemented in collaboration with the local Aboriginal community.	Construction Construction Construction	
Infrastructure Provision	Provision of all essential services to the Cabins in accordance with Section 6.12.	▪ The rainwater tanks shall be used for laundry and toilet flushing which will significantly reduce demand on the reticulated supply water when rainwater is available. ▪ Pumping from the two package pump stations shall be timer controlled to pump at off-peak times to avoid any increase in peak flows at the downstream pump station. Off-peak pumping will be undertaken at various intervals throughout	Life of Project Life of Project	Proponent

Issue	Commitment	Actions	Timing	Responsibility
		the day and evening to prevent prolonged retention of sewage in the package pump stations. - Use of timer controls for pumping from the package pump stations will enable the flows to be pumped into the private rising main from the Riverside Tavern pump station to avoid peak pumping periods from the Tavern. Pumping at off-peak times will also ensure there is no additional peak loading on the Macleay Water sewerage system. - Electricity - the cabins shall be supplied by the same electricity supply as the Riverside Tavern. The tavern is supplied by the sub-station to the north of the tavern.	Life of Project Life of Project	
Visual Impact	Impacts to visual amenity will be managed in accordance with the Visual Amenity Assessment	- Cabins will include the use of timber handrails with wire balustrades, louvre windows, wide eaves and a large covered veranda along the cabin front; - cabins will have a narrow frontage to the street and each structure will be approximately 10 metres apart providing optimal scope for extensive new planting. Cabins will have alternating setbacks to minimise the visual prominence of building facades to the street; - planting of trees and shrubs will be strategically located around cabins to create a dominant canopy above roof lines that will help disguise and visually absorb the structures; - planting will also create private spaces between cabins, screen unwanted views and provide shelter to the front verandas from undesirable south-western summer sun; - surface drainage will be facilitated by open swales to provide opportunity for passive treatment through a bioretention system prior to discharging into the natural wetland area further east; - the most significant swale will align with the southern access road and adjoining parking areas to prevent	Construction Construction Construction Construction Construction Construction	Proponent

<i>Issue</i>	<i>Commitment</i>	<i>Actions</i>	<i>Timing</i>	<i>Responsibility</i>
		undesirable vehicle access into the wetland area further east; - the existing undeveloped area east of the swale will be rehabilitated to restore the natural values of the original wetland environment; and - new tree planting within this area will incorporate buffer zones and clearances between canopies as required satisfying bushfire regulations.	Construction Construction	
Equitable Access	To cater and provide people with disabilities by ensuring equitable access and facilities.	Construct one of the two bedroom cabins to provide access and facilities for people with disabilities in accordance with Building Code of Australia and relevant standards and the Disability Discrimination Act 1992.	Construction	Proponent
Cumulative Impacts		Not applicable		



Project Team

The project team members included:

Simon Waterworth
Senior Planner / Principal

Anna Lloyd
Ecologist

Tim Ruge
Environmental Engineer

Ali McCallum
Environmental Scientist

Garry Murray
Landscape Architect

Richard Elliot
Landscape Designer

Sub-consultants
Paul Smith Building Design
WMA Water

This page has been left intentionally blank



Copyright and Usage

©GeoLINK, 2012

This document, including associated illustrations and drawings, was prepared for the exclusive use of Shannon Pacific Pty Ltd to accompany a Part 3A Application to Department of Planning for approval for the development of land described herein. It is not to be used for any other purpose or by any other person, corporation or organisation without the prior consent of GeoLINK. GeoLINK accepts no responsibility for any loss or damage suffered howsoever arising to any person or corporation who may use or rely on this document for a purpose other than that described above.

The contours shown on the plans to this document are suitable only for the purpose of this application. No reliance should be placed upon topographic information contained in this report for any purpose other than for the purposes of this application.

The dimensions, number, size and shape of lots shown on plans to this document are subject to detailed engineering design, final survey and may vary subject to Council conditions of consent.

Plans accompanying this document may not be reproduced, stored or transmitted in any form unless this note is included.

GeoLINK declares that it does not have, nor expects to have, a beneficial interest in the subject project.

No extract of text of this document may be reproduced, stored or transmitted in any form without the prior consent of GeoLINK.



Appendix A

APZ Calculator Report



ASSET PROTECTION ZONE MODELLING REPORT

For Site Located At: **New Entrance Road, South West Rocks**

Created By: **RFS APZ Calculator**

1. User's Inputs

Development Purposes: **Special Fire Protection**

Local Government Area: **Kempsey**

In Alpine Areas: **No**

Vegetation: **Forested wetlands**

Effective Slope (Percent): **0.00525** (downslope)

2. Program's Settings

Flame Width (m) : **100**

Flame Angle (degree): **80** (determined by the built-in algorithm)

Flame Temperature (K) : **1200**

Flame Emissivity: **0.95**

Surface Available Fuel Load (t/ha): **15**

Overall Fuel Load (t/ha): **20**

Fire Danger Index: **80** (Fire Weather Area: North Coast)

Relative Humidity (%): **25**

Ambient Temperature (K): **308**

Heat of Combustion (kJ/kg): **18600**

Elevation of Receiver (m): **5.79** (determined by the built-in algorithm)

3. Program Outputs

Asset Protection Zone (m): **44** (IPA=44m, OPA=0m)

Rate of Fire Spread (km/h): **1.44** (Noble et al., 1980)

Fire Intensity (kW/m): **14880**

Transmissivity: **0.788** (Fuss and Hammins, 2002)

Flame Length (m): **11.76** (RFS PBP, 2001)

Expected Radiant Heat Exposure (kW/m²): **10**

Assessment Date: **19/11/2009**

Modelled By: **Ali McCallum**



Appendix B

Assessment of Impact Significance on the Migratory Species Latham's Snipe as Listed Under the EPBC ACT

Appendix B: Assessment of Impact Significance on the Migratory Species Latham's Snipe as Listed Under the EPBC ACT

The site provides a small area of suitable foraging habitat for the Latham's snipe (*Gallinago hardwickii*) as part of an extensive area of similar and better quality habitat throughout the general locality and broader Macleay River floodplain. Two individuals of this species were observed utilising an ecotone between *Casuarina glauca* forest and saltmarsh in the centre of the site in 2010.

Migratory Species Significant Impact Criteria Assessment

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

- *substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;*

The EPBC Act Significant Impact Guidelines 1.1 (DEHWA 2009a) states that "an area of 'important habitat' for a migratory species is:

- a) *habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or*
- b) *habitat that is of critical importance to the species at particular life-cycle stages; and/or*
- c) *habitat utilised by a migratory species which is at the limit of the species range; and/or*
- d) *habitat within an area where the species is declining."*

Furthermore, specifically for Latham's snipe, the following has been nominated as the criteria for identifying important habitat (Significant Impact Guidelines for 36 Migratory Shorebird Species DEHWA 2009b):

- *sites that support at least 18 individuals of the species; and*
- *that has the following characteristics: a naturally occurring freshwater wetland with vegetation cover nearby...*

Surveys conducted on the site for waders and migratory species found the presence of 1 individual of Latham's snipe. The 21.6 ha site contains 14 ha of mudflats, saltmarsh, sedgelands and rushlands, which are currently providing foraging and, possibly, roosting habitat for small numbers of Latham's snipe. The area has not been recorded to, nor has been recently observed as, supporting significant numbers of Latham's snipe, which for this species, is said to be 18 or more individuals (DEHWA 2009b). Furthermore, important habitat for this species has also been defined as naturally occurring freshwater wetlands with vegetation cover nearby (DEHWA 2009). Curiously, the habitat described for this species by others also includes saline environments such as saltmarshes and mangrove fringes (Pizzey & Knight 2007). This site contains a highly modified wetland which, approximately 30 years ago, was subjected to a levee and a floodgate which effectively reduced the level of saltwater influence available to the area. Since then, the floodgate has become partly ineffective and some transfer of tidal saltwater has been entering the system for an extended period of time. It is most likely that the site provides a supplementary foraging resource for Latham's snipe and is not 'important habitat' as described for this species (DEHWA 2009). Despite the availability of foraging habitat of the site for Latham's snipe, given the species' ecology, this provides only a small area of low quality opportunistic foraging habitat, as part of an extensive area of similar and better quality habitat throughout the general locality (e.g. Yarrahippini Wetlands, Hat Head National Park and various freshwater wetlands across the Kempsey Shire). Areas nominated as better quality habitat have reduced levels of disturbance from humans and domestic predatory animals, and are larger in size, providing greater amounts of resources migratory birds require to support their exceptional movements between foraging areas in the south and breeding habitat in the northern hemisphere (e.g. movements of up to 25,000 km).

The Latham's Snipe breed in Japan and no breeding habitat is known or has been recorded in Australia.

Of the suitable foraging and resting habitat available for this species on this site, 0.0334 ha of saltmarsh is proposed for redevelopment into a constructed freshwater wetland and will therefore become unavailable in

its current form for the Latham's Snipe. The 'developed' area of the site is restricted to managed grasslands which do not provide any habitat for the Latham's Snipe. As part of the development, the remaining undeveloped area will be subject to a Wetland Management Plan which aims to protect, enhance and management the current wetland areas, which are also listed as SEPP 14 wetlands within NSW's statutory framework. The Wetland Management Plan will address the current degraded nature of the site (e.g. weed distribution) and will ensure the return of appropriate hydrological cycles, nutrient flows and fire regimes to the area as well actions to manage introduced species. The actual constructed development portion of the proposal occurs within those parts of the site that are closest to and most impacted by pre-existing developments on and adjacent to the site. Therefore, no additional fragmentation will occur as a result of this proposal.

Consequently the proposal is not considered likely to substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species – Latham's Snipe.

- *result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or*

The proposal does not affect habitat that constitutes important habitat for the Latham's snipe. Additionally, the nature of the proposal is such that no invasive species are considered likely to be introduced. The proposal is accompanied by a Wetland Management Plan which will provide a framework for the management and removal of weeds from the site and particularly those areas containing suitable foraging habitat for the Latham's Snipe.

The proposal involves infrastructure that will be operated as tourist cabins. A mitigation measure applying to this proposal is the exclusion of dogs, cats and other domestic pets from the site. The areas suitable for Latham's snipe on the site will be fenced off from public access. This will further assist with providing roosting habitat for a range of birds, including Latham's Snipe.

- *seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.*

The site only provides a small area of (currently) low quality opportunistic foraging habitat for the Latham's Snipe as part of an extensive area of similar and better quality habitat throughout the general locality and beyond. Australia is an import foraging area for this species, which escapes the northern hemisphere winter to forage in warmer climates. Latham's Snipe does not rely on this site as a significant foraging or roosting area and extensive areas of mudflats and similar intermittently submerged areas available along the eastern seaboard and particularly so within Kempsey Shire which has extensive floodplains associated with the Macleay River. Extensive mitigation measures stated within the Environmental Assessment Report and the corresponding Ecological Assessment Report (James Warren & Associates 2010) aim to minimise any potential environmental impacts of the proposal. Overall the proposal is not considered likely to seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of this migratory species.

Conclusion

While the proposal involves the removal of 0.0334 ha of saltmarsh, which contributes to the available foraging area for the Latham's snipe on this site, it is considered highly unlikely to result in a significant impact on this migratory listed species. Consequently referral to DSEWPac and approval by the Minister is not required.

Reference

DEWHA (2009a). *EPBC Act Policy Statement 1.1: Significant Impact Guidelines - Matters of National Environmental Significance*. Australian Government Department of the Environment and Heritage.

DEWHA (2009b). *Significant Impact Guidelines for 36 Migratory Shorebird Species: Background paper to EPBC Act Policy Statement 3.21*. Australian Government Department of the Environment and Heritage.

Pizzey G. and Knight, F. (2007). The Field Guide to the Birds of Australia. Ed. Peter Menkhorst. Eighth Edition. Harper Collins Publishers. Sydney Australia.



Appendix C

Seven Part Test for Bousfields Marsh- hopper *Microrchestia bousfieldi* as a Vulnerable Species under the Fisheries Management Act 1994

Bousfields marsh-hopper (*Macrorchestia boudfieldi*) is listed as Vulnerable in Part 1 of Schedule 5 of the FM Act 1994. Little is known about this tiny (10 mm long) marine talitrid amphipod, complicating assessment of any impact upon this species. No species profile, Priority Action Statements or Recovery Plans have been prepared for this species. This Seven-part Test was undertaken because the only verified location for this species to date is the lower reaches of South West Rocks Creek (SWRC; refer to Plate C.1), despite collections being undertaken at many sites along the NSW coast (Williamson 2010). “It is likely that the species is confined to the population living in the mangroves along the South West Rocks Creek” (Williamson 2010). The site where the proposed activities are to occur encompasses the headwaters of this particular creek.

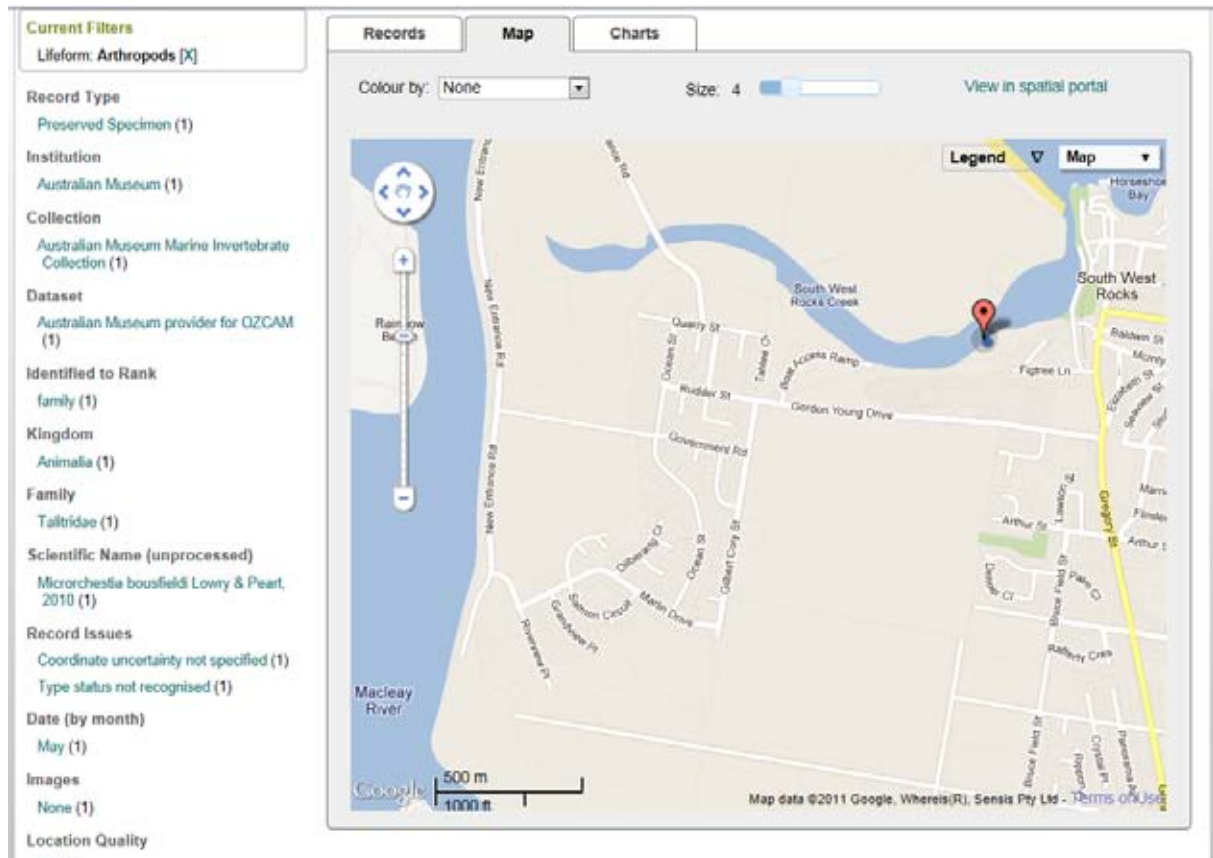


Plate C.1 Our Living Atlas Bousfields Marsh-hopper Records

Source: Our Living Atlas: <http://biocache.ala.org.au>

Bousfields marsh-hopper is one of 4 species belonging to the genus *Microrchestia*. Belonging to the family Talitridae (Peracarida: Amphipoda), these marine crustaceans are found in PNG and Lizard Island QLD, with Bousfields marsh-hopper known only from SWRC. *Microrchestia* juveniles develop in a special brood pouch until released as young adults (Williamson 2010). There is no other known information about the lifecycle of *Microrchestia*. All 4 species are found in the supralittoral (intertidal) zone and shelter under rotting logs and accumulated mangrove debris found along the edge of mangrove stands along the coastal regions of eastern PNG and eastern Australia (Williamson 2010, Lowry & Peart 2010). It appears these species have very restricted habitats, very small geographic distributions and the method by which the juveniles develop all combine to make these marine taxa vulnerable to becoming extinct (Williamson 2010).

All the known specimens of Bousfields marsh-hopper have been collected from the same location at the lower reaches of SWRC. Twenty individuals were collected from here in 1999 and none have been collected since. Collections were made from under the bark of dead *Avicennia marina* branches.

- (a) *in the case of a threatened species, whether the action proposed 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,*

This species is at threat from reduction in available habitat as a result of:

- damage and/or alteration of habitat as a result of urban development; and
- pollution resulting from increased stormwater run-off and pesticide inputs associated with urban development ; and
- pollution resulting from recreational activities, particularly boating and potentially from the old oil terminal (in the SWR locality).

Amphipods are particularly sensitive to oil pollution (Williamson 2010).

There are two components of the proposal; the construction of the nine tourist cabins and associated infrastructure and, secondly, the implementation of a restorative Wetland Management Plan. Both components affect different areas of the 21.6 ha site.

In considering the development and operation of the nine tourist cabins, the section of the site which will undergo modification for this part of the proposal does not provide any habitat for the Bousfields marsh-hopper. The area being affected comprises of intensively managed grass fields and a small area (0.0334 ha) of saltmarsh. None of these areas comprise of mudflats or mangroves and none are near the mean tidal zone. Furthermore, approximately 30 years ago, a levee was built along the northern edge of the site and a flood gate was installed, reducing the tidal influence on the site and creating an environment containing more freshwater than would otherwise have naturally occurred. This is a result of the flood gate limiting tidal incursion, but is also a result of urban expansion higher in the catchment of SWRC, above the site and the increase in stormwater that is likely to have resulted flowing across the site as an indirect impact. Therefore, there will be no direct loss of habitat as a result of the grassfields and small area of saltmarsh being replaced with built features and associated infrastructure (access road, walkways, fencing, constructed freshwater wetland).

In terms of indirect impact from the construction and operation of the nine tourist cabin facility upon the Bousfields marsh-hopper, a range of mitigation measures have been developed to specifically protect the majority of the site which will remain as a wetland. Specifically:

- a constructed freshwater wetland, separated from the natural saline-influenced wetland across the vast majority of the site, will treat, absorb and regulate the flow of stormwater resulting from the tourist cabin facilities. Therefore, there will be no significant increase in the amount of stormwater entering the natural wetlands which form the majority of the site. There will also be no increase in the velocity of stormwater moving across the natural wetlands on the site as a result of the tourist cabin facility, nor will there be any increased levels of pollution within the stormwater entering the natural wetlands;
- construction activities will be undertaken with best practice sedimentation and erosion control and design controls in place. It is expected that no water quality issues will arise as a result of the construction and implementation of this part of the proposal; and
- acid sulphate soils will be managed so as that no leachate escapes into the natural wetlands and also within the constructed wetland and the general site of the tourist cabin development also.

The second part of the proposal involves the implementation of a Wetland Management Plan (WMP) that will enhance and rehabilitate the mudflats, mangrove areas, sedge and rush lands and saltwater marsh areas on the site, collectively termed the natural wetland, to re-instate the former conditions within these areas prior to the levee and floodgate being installed and also to minimise the impacts of the urban development in the vicinity of the site. The WMP also provides for the monitoring of conditions to ensure WMP aims are met. In general terms, the WMP focuses on:

- removal of the floodgate (which has been ineffective for many years anyway) to re-establish tidal access into the site. This will increase the influence of saline water in the natural wetland. It is expected this will support the increase of saline tolerant species such as the mangroves to the detriment of less salt

tolerant species such as *Casuarina glauca*. It is also expected that the areas of saltmarsh will shift to slightly more elevated areas on the site;

- removal and/or reduction of weeds across the site; and
- introduction of structured mechanisms to control the impacts of urbanisation, including control of feral and domestic animals, management of disturbance to wetland birds from humans and educational signage to increase public awareness of the values of the area.

The impacts of the implementation of the WMP on the Bousfields marsh-hopper are, therefore, considered to be nil. The recorded location of the marsh-hopper is within mangrove swamp lower within the SWRC catchment, over 2 km along the main drainage channel from the closest part of the site, the floodgate on the north-eastern corner. Whilst there are no other known locations of this species, researchers working on this species suspect “*it must be located in other mangroves*” (Jim Lowry pers. comm. Nov 2011). Currently, mangroves are very sparse on the site and therefore it is highly unlikely that the marsh-hopper occurs in the site. Immediately to the north of the floodgate on the adjacent property, extensive areas of mangrove can be found. It is expected that the WMP will facilitate the development of suitable habitat for this species by providing suitable conditions for mangroves to re-colonise the site in a similar manner to which they were present prior to the installation of the floodgate, and possibly the levee bank (under Government Road). The re-instatement of the tidal flow will occur as a step-wise process, each incremental change being monitored to determine the response of the natural wetland. The weed removal programs will be undertaken with extreme sensitivity with respect to the application of herbicide, so as to reduce the spread of chemicals within the natural wetland and avoid any spread of chemical outside the site and lower into the catchment. Accredited Bush-regeneration staff will be made aware of the occurrence of the marsh-hopper prior to undertaking any works in the area. The WMP specifies that:

“Careful consideration will be given to the use of herbicides. Low toxicity herbicides will be used such as Roundup Biactive® and Fusilade®. These herbicides will also biodegrade quickly upon entering a natural system (Mann 1998; Woodcock et al 1993).”

It is also anticipated that the vast majority of the weed management work will be undertaken manually and that the re-instatement of the tidal flow will assist in the management and possibly removal of many of the weeds on the site. The management of feral and domestic animals and the management of pedestrian access to the site is not anticipated to have any negative impacts on the marsh-hopper population 2 km downstream, nor would it have any impacts if the species was to occur on the site in the future.

Therefore, it is not expected that the proposed development is likely to have an adverse effect on the life cycle of the subject species such that a viable local population is likely to be placed at risk of extinction.

- (b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,*

No consideration under this part of the assessment is required.

- (c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

(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,

No consideration under this part of the assessment is required.

- (d) in relation to the habitat of a threatened species, population or ecological community:*

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

The current known range of this species is confined to the area approximately 2.1 km downstream of the site, although little is known about this species, including its range and most aspects of its lifecycle. The site currently provides very limited, if indeed any, opportunities for utilisation by the Bousfields marsh-hopper. The restriction of tidal flow into the site approximately 30 years ago resulted in the reduction of mangroves on the site, to the extent that they are now almost non-existent within the natural wetland on the site. Therefore, there is no habitat on the site at the moment which would be affected by any component of the proposal.

However, the WMP will facilitate the staged introduction of tidal flow into the vast majority of the site that is known as the natural wetland (the area also identified as SEPP14 Wetland). This will favour salt-tolerant species such as *Avicennia marina* over species such as *Casuarina glauca*. It is therefore expected that the second component of the proposal will result in the creation of habitat for the marsh-hopper, or rather the re-introduction of habitat that would have occurred naturally approximately 30 years ago.

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

There is currently very limited or no habitat available for the Bousfields marsh-hopper on the site. Any mangroves are very young and isolated and do not establish as adults or into stands. There are no areas of organic matter build-up associated with dense and mature mangrove stands, which can support the Bousfields marsh-hopper. The site forms the upper catchment of SWRC and consequently there is no further habitat available higher in the catchment. To the south of the site, and in close proximity, the Macleay River extends inland and it is possible that within the direct catchment of this River, some areas supporting mangroves could provide habitat for the marsh-hopper. Downstream of the site, to the north and east, SWRC provides the only known habitat for this species approximately 2.1 km along the waterway.

Given the site currently does not support habitat that is likely to be used by the Bousfields marsh-hopper, the proposal will not fragment or isolate the habitat available for this species in the locality. The WMP will add to the habitat available for this species but re-introducing tidal flows and with that, increasing the opportunities for mangroves to establish healthy and organic-rich ecosystems on the site.

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

As discussed above, no habitat important to the Bousfields marsh-hopper is being removed, modified or isolated as a result of the proposal.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No areas of critical habitat are listed under the *Fisheries Management Act 1994* for this species. The site is not listed as Critical Habitat for any species under the *Fisheries Management Act 1994* or the *Threatened Species Conservation Act 1995*.

South West Rocks contains two areas of Critical Habitat for the Grey Nurse Shark. The proposal will not have any negative impacts on these areas due to the mitigation measures that will ensure water quality is maintained through all stages and aspects of the proposal.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

No recovery plan or threat abatement plan has been prepared for Bousfields marsh-hopper.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The following have been identified under the *Fisheries Management Act 1994* as key threatening processes for marine wildlife:

1. Current shark meshing program in NSW waters.
2. Hook and line fishing in areas important for the survival of threatened fish species.
3. Human-caused climate change.
4. The introduction of fish to fresh waters within a river catchment outside their natural range.
5. The removal of large woody debris from NSW rivers and streams.
6. The degradation of native riparian vegetation along New South Wales water courses.
7. Instream structures and other mechanisms that alter natural flow.
8. Introduction of non-indigenous fish and marine vegetation to the coastal waters of New South Wales.

The proposal does not constitute nor is part of, and nor would it contribute to the key threatening processes identified as 1, 2, 4 or 8 above.

Anthropogenic climate change involves modification of the environment by humans resulting in accelerated climate change over that experienced naturally. Outcomes of anthropogenic climate change may include increased frequency of extreme weather conditions or events and/or changes in average weather conditions. The use of construction machinery and the attraction of the site to visitors who will need to arrive by vehicles, etc, all rely on fossil fuel consumption, which, as part of all fossil fuel extraction and use activities, are known to contribute to anthropogenic climate change. In acknowledgement of this, however, the decision to not undertake the proposed works will not reduce the effect of anthropogenic climate change.

There will be no removal of large woody debris from drainage areas (5), degradation of riparian vegetation (6) or the introduction of instream structures that affect natural flow (7) as a result of the proposal. The tourist cabin component of the proposal will not have any effect on these key threatening processes. The secondary component of the proposal, the WMP, will act to repair and enhance the natural wetland by allowing accumulation of woody debris from riparian vegetation which has been managed towards that which occurred naturally on the site through the removal of a floodgate which has been altering the natural tidal flow into the area over that last 30 years.

Conclusion

It is highly unlikely that the proposal will adversely affect the Bousfields marsh-hopper. The proposal will not occur in areas that are currently likely to support marsh-hoppers. Mitigation measures have been designed specifically for this proposal to remove any potential for water pollution or degradation resulting from the implementation or operation of the proposal. A major component of the proposal is the implementation of a Wetland Management Plan which is expected to improve the suitability of the site for Bousfields marsh-hoppers.

References

Lowry, J.K. and Peart, R. (2010). The genus *Microrchestia* (Amphipoda: Talitridae) in eastern Australia. *Zootaxa*, 2349: 21-38.

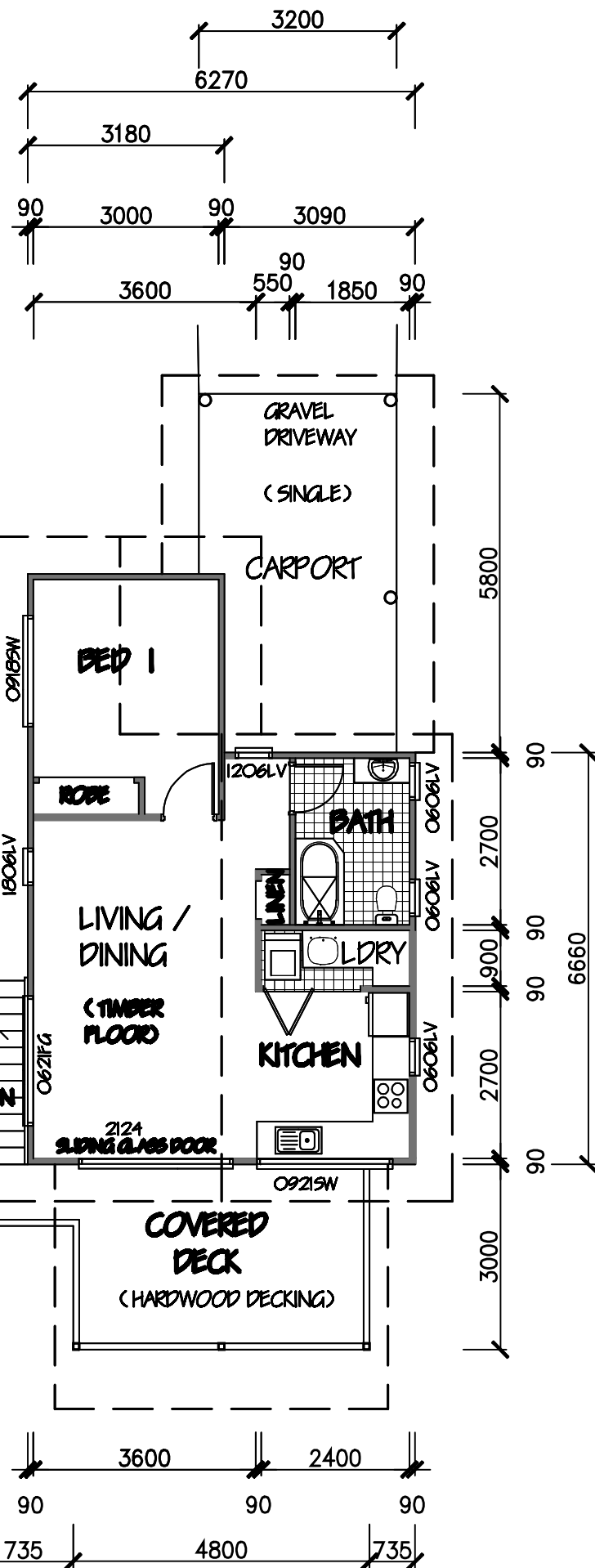
Williamson, J. (2010). Final Determination for Boursfields marsh-hopper – *Microrchestia bousfieldi* as a Vulnerable Species. November 2010. Fisheries Scientific Committee 10/05.

http://www.dpi.nsw.gov.au/_data/assets/pdf_file/0004/408280/Microrchestia-bousfieldi.pdf

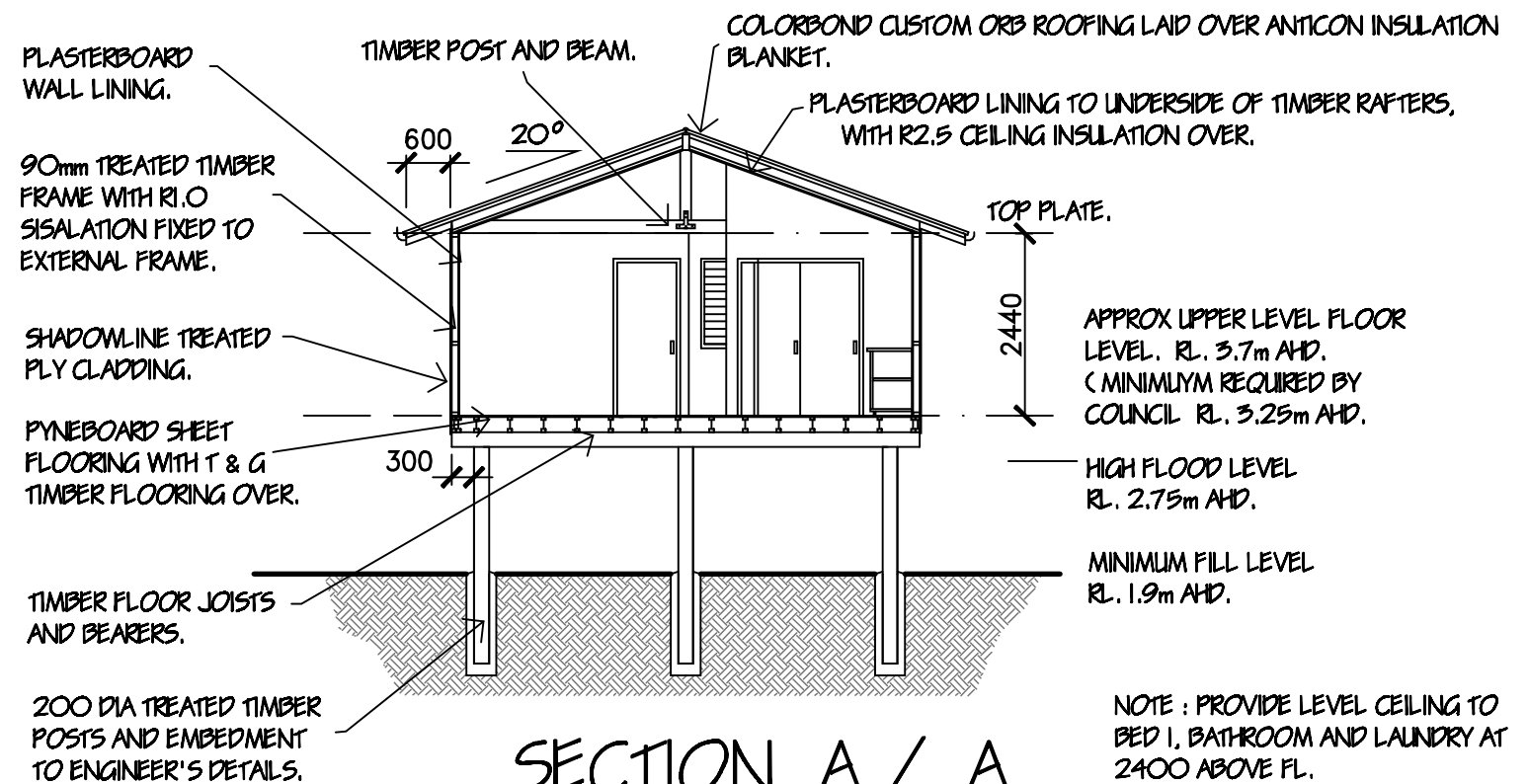


Appendix D

Amended Architectural Drawings



FLOOR PLAN



SECTION A / A

NOTE :
ALL BUILDING PRODUCTS USED BELOW FLOOR LEVEL ARE TO BE OF A TYPE SUITABLE TO WITHSTAND OCCASIONAL FLOOD INUNDATION.
ALL ELECTRICAL INSTALLATIONS ARE TO BE ABOVE FLOOR LEVEL.

1 BEDROOM CABIN.
(CABINS 2,5,7 & 9)

LIVING AREA / 50.9m²

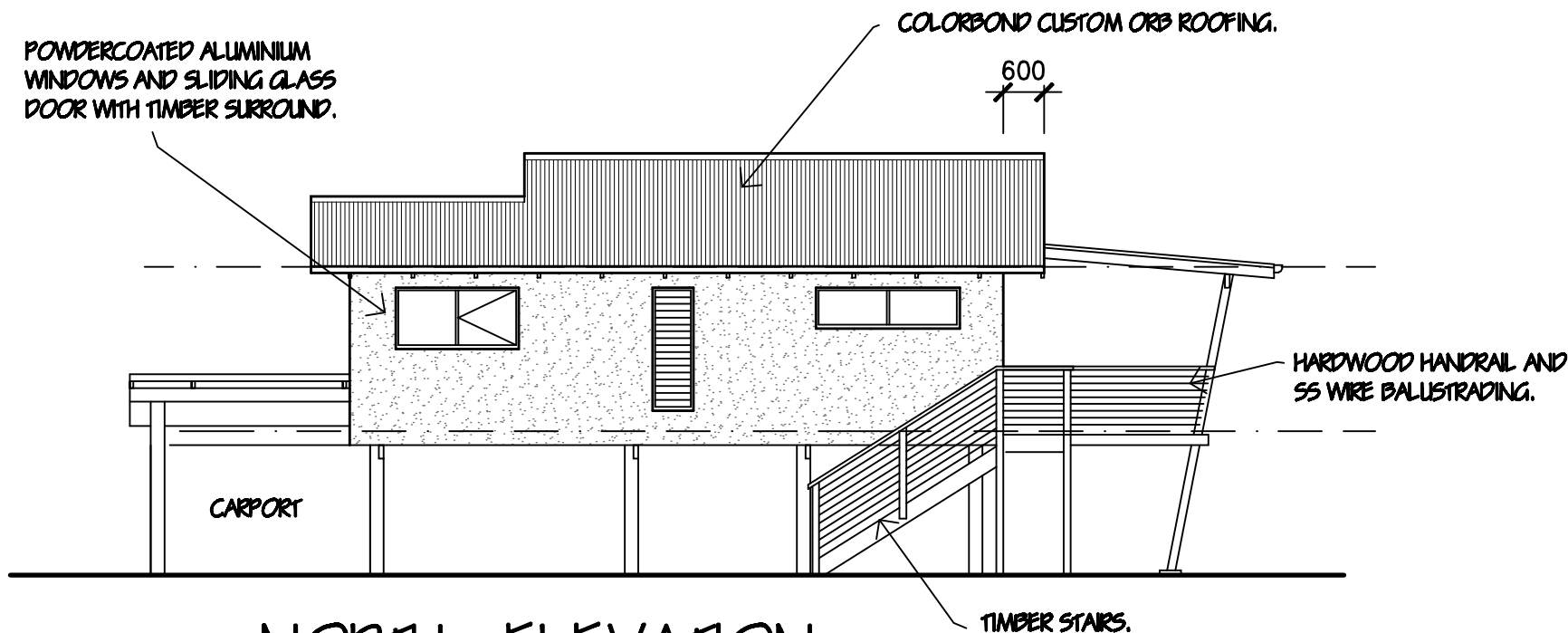
PROJECT
PROPOSED TOURIST CABINS
LOT 4 DP 1022342
NEW ENTRANCE ROAD,
SOUTH WEST ROCKS.
FOR SHANNON PACIFIC P/L & EASTLAND
CONSTRUCTIONS P/L.

Paul Smith
building design

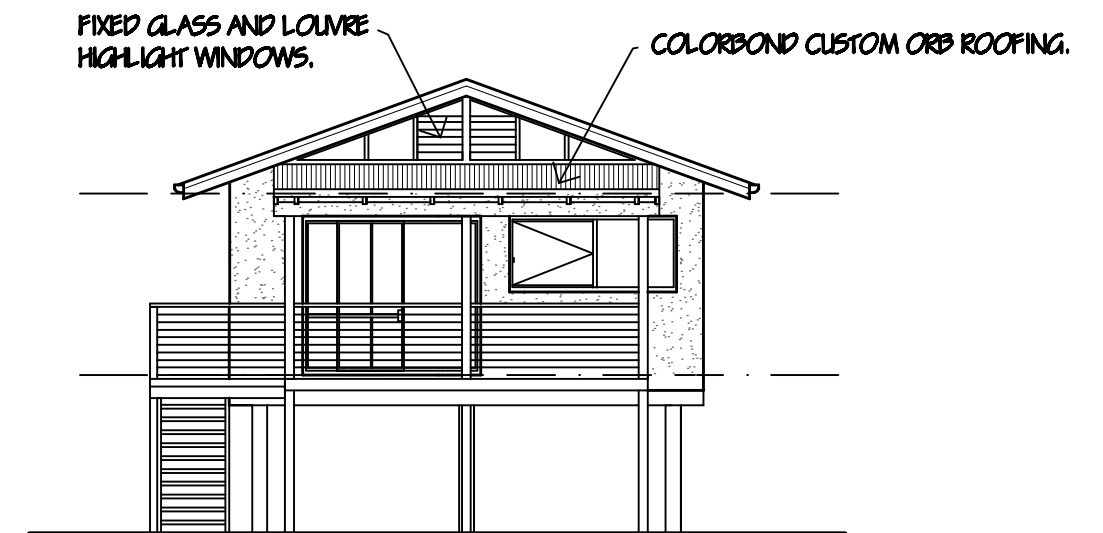
4 / 24 CLYDE STREET, KEMPSEY NSW
P.O. BOX 3683 WEST KEMPSEY NSW 2440
PHONE (02) 65622 580 FAX (02) 6562 7615
EMAIL psbd@bigpond.com.au

DRAWING PRELIMINARY ENVIRONMENTAL
ASSESSMENT FOR PART 3A
PROJECT APPLICATION.

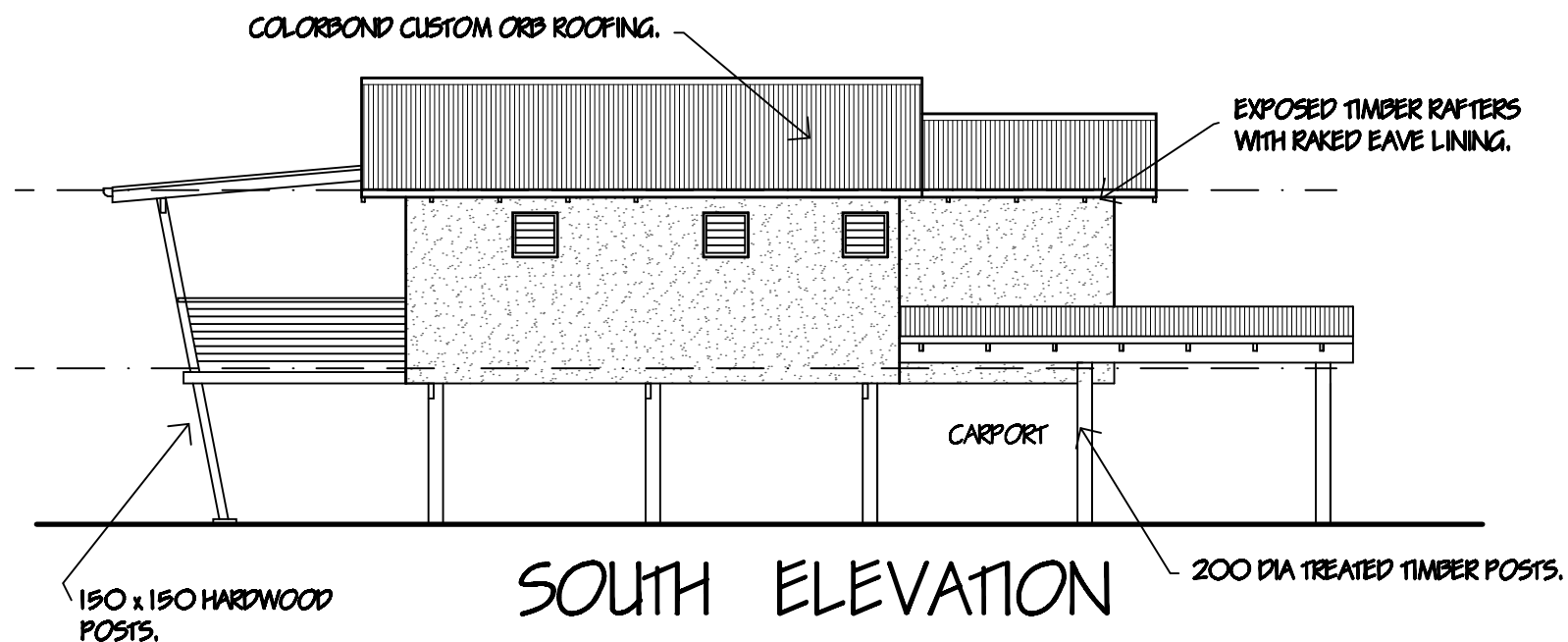
SCALE : 1 : 100 AT A3 JOB No. 08 - 129
DRAWN : P.W.S. AMENDMENT 'F'
DATE : 06.12.11 SHEET No. 2 OF 11



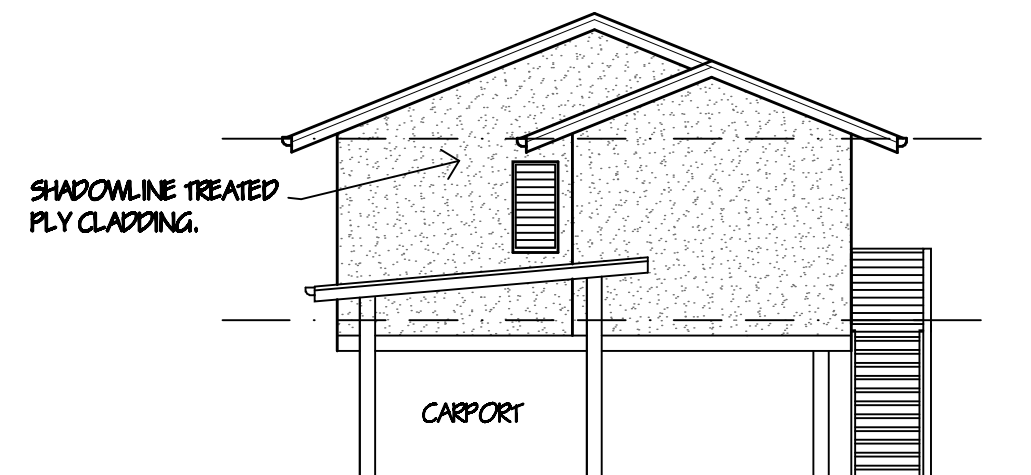
NORTH ELEVATION



WEST ELEVATION



SOUTH ELEVATION



EAST ELEVATION

NOTE :
ALL BUILDING PRODUCTS USED BELOW FLOOR LEVEL
ARE TO BE OF A TYPE SUITABLE TO WITHSTAND
OCCASIONAL FLOOD INUNDATION.
ALL ELECTRICAL INSTALLATIONS ARE TO BE ABOVE
FLOOR LEVEL.

1 BEDROOM CABIN.
(CABINS 2,5,7 & 9)

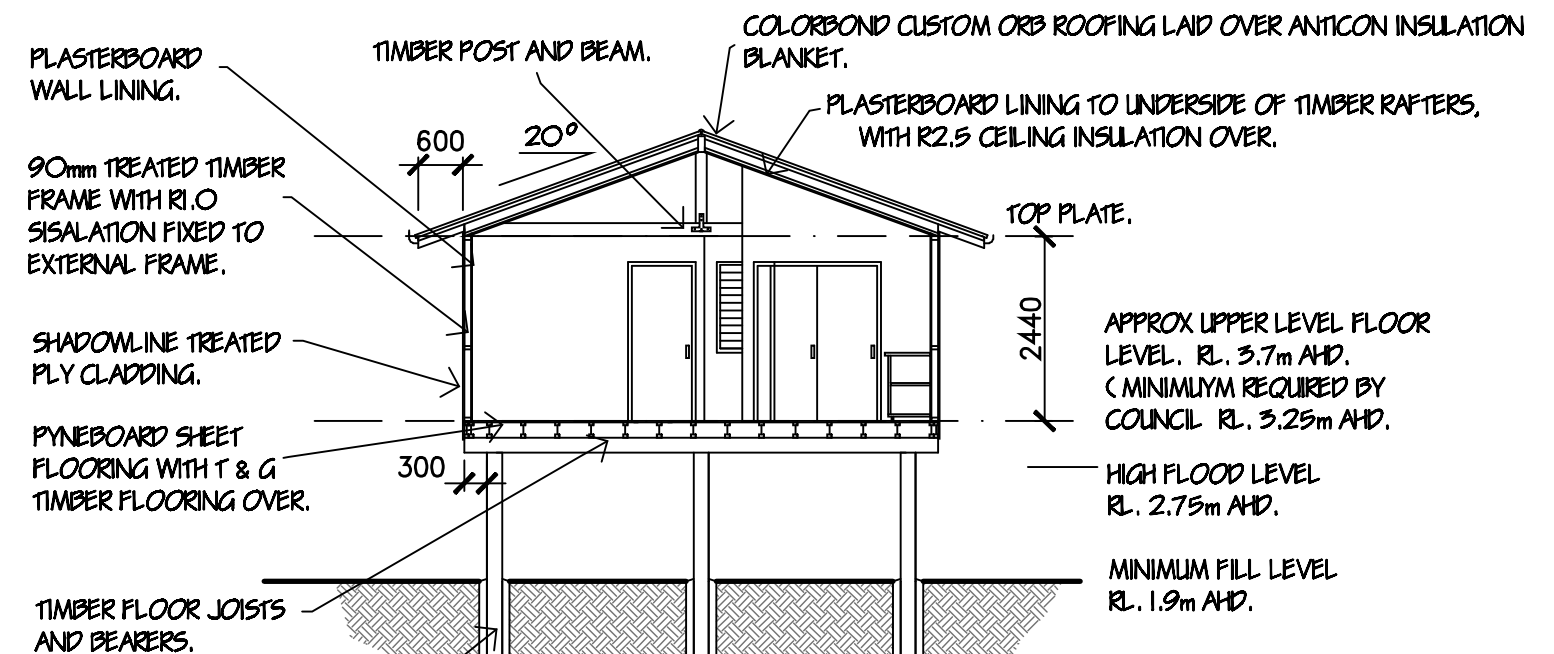
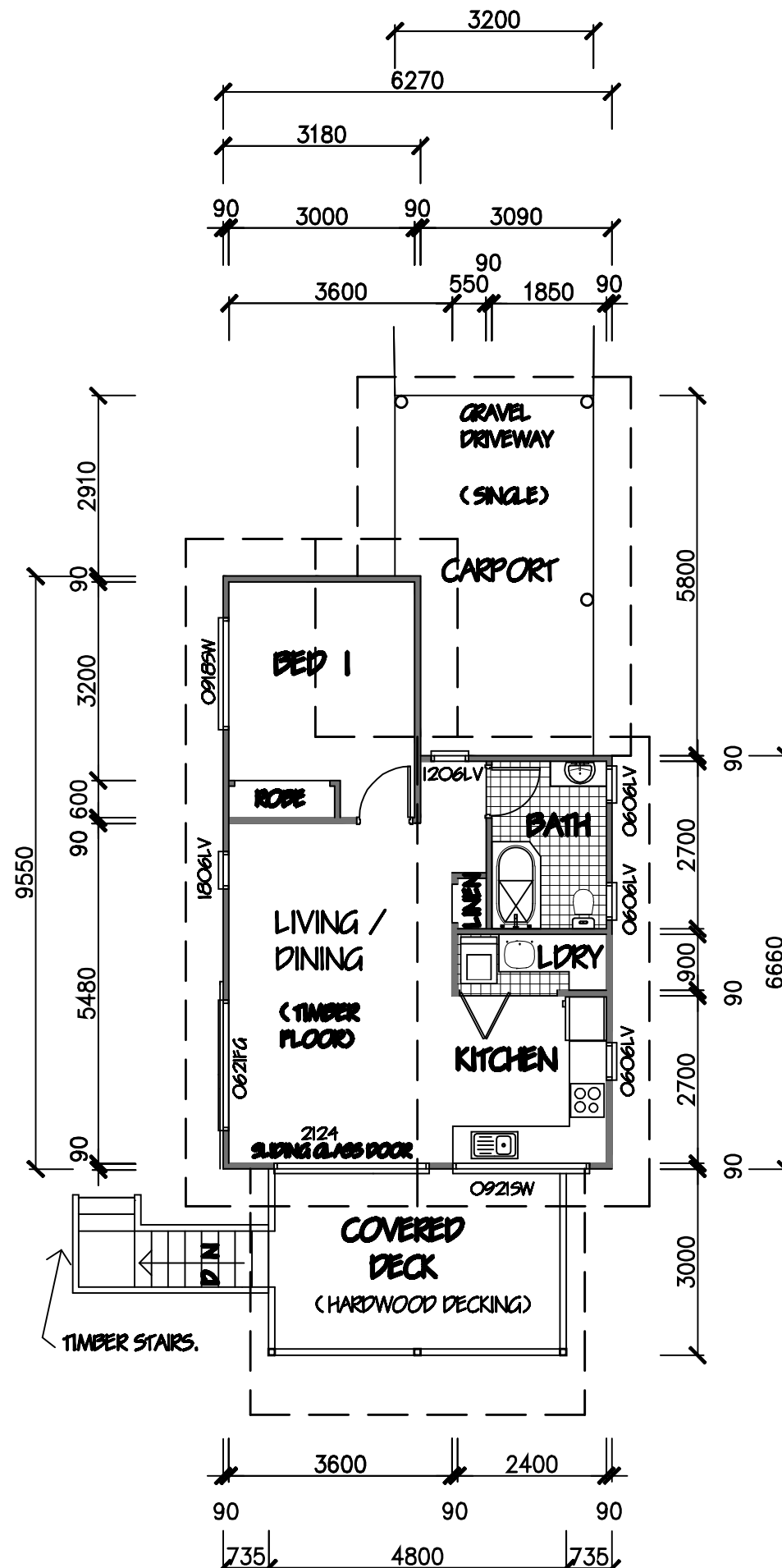
Paul Smith
building design

4 / 24 CLYDE STREET, KEMPSEY NSW
P.O. BOX 3683 WEST KEMPSEY NSW 2440
PHONE (02) 65622 580 FAX (02) 6562 7615
EMAIL psbd@bigpond.com.au

PROJECT
PROPOSED TOURIST CABINS
LOT 4 DP 1022342
NEW ENTRANCE ROAD,
SOUTH WEST ROCKS.
FOR SHANNON PACIFIC P/L & EASTLAND
CONSTRUCTIONS P/L.

DRAWING PRELIMINARY ENVIRONMENTAL
ASSESSMENT FOR PART 3A
PROJECT APPLICATION.

SCALE : 1 : 100 AT A3	JOB No. 08 - 129
DRAWN : P.W.S.	AMENDMENT 'F'
DATE : 06.12.11	SHEET No. 3 OF 11



NOTE :
 ALL BUILDING PRODUCTS USED BELOW FLOOR LEVEL
 ARE TO BE OF A TYPE SUITABLE TO WITHSTAND
 OCCASIONAL FLOOD INUNDATION.
 ALL ELECTRICAL INSTALLATIONS ARE TO BE ABOVE
 FLOOR LEVEL.

**1 BEDROOM CABIN.
 (CABIN 3)**

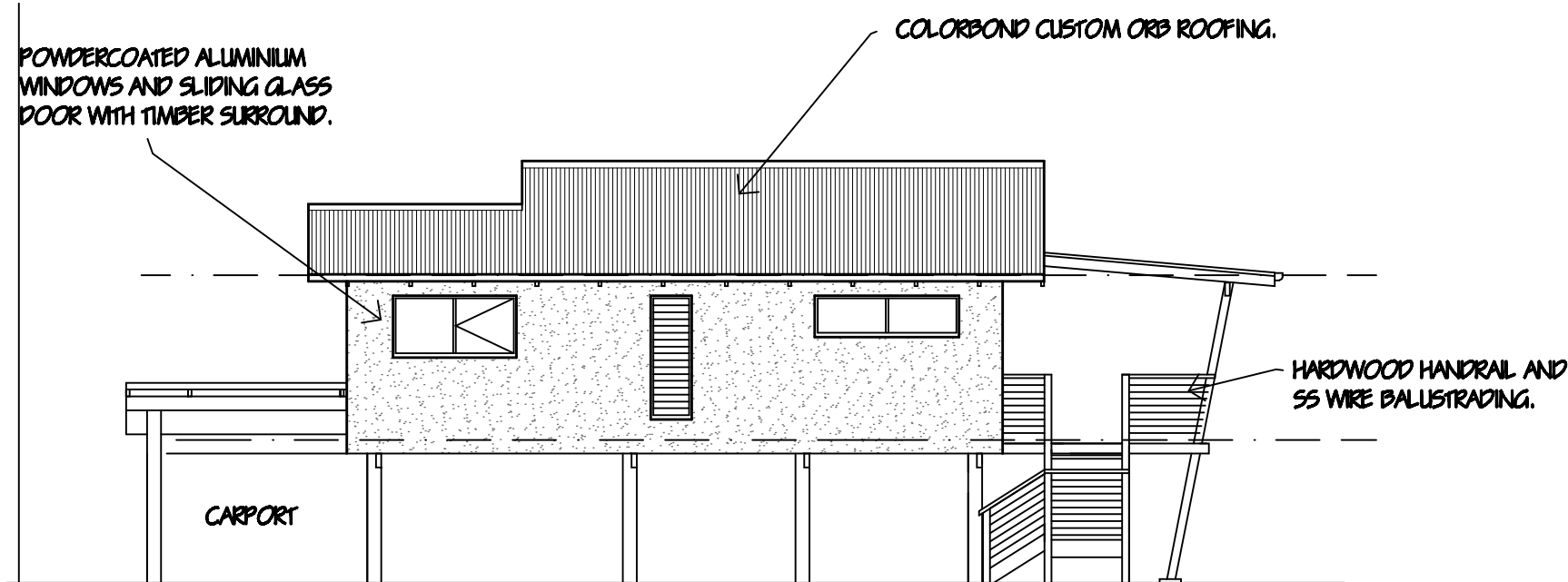
PROJECT
 PROPOSED TOURIST CABINS
 LOT 4 DP 1022342
 NEW ENTRANCE ROAD,
 SOUTH WEST ROCKS.
 FOR SHANNON PACIFIC P/L & EASTLAND
 CONSTRUCTIONS P/L.

LIVING AREA / 50.9m²

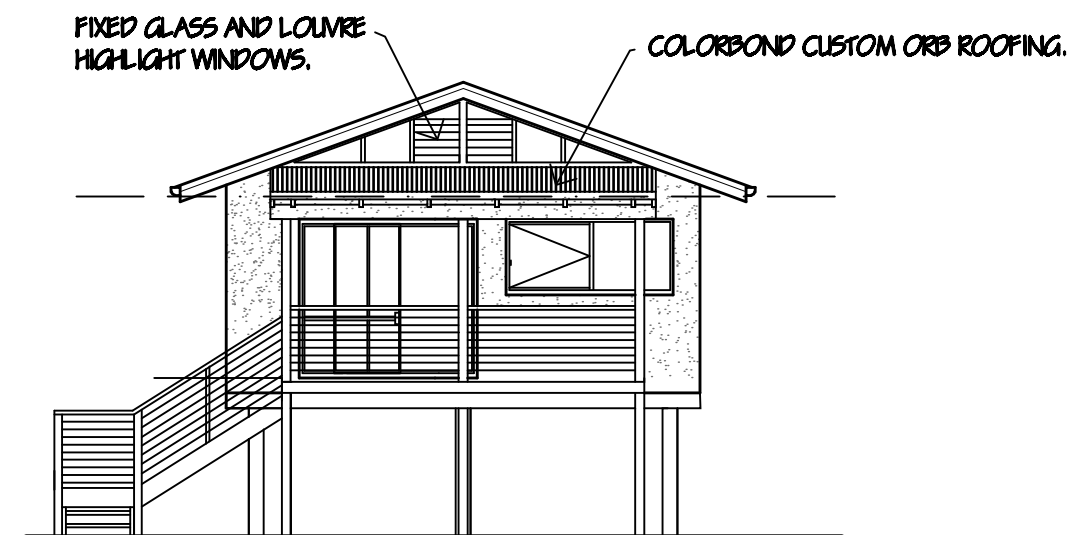
Paul Smith
 building design

76 TOZER STREET, WEST KEMPSEY NSW
 P.O. BOX W683 WEST KEMPSEY NSW 2440
 PHONE (02) 65622 580 FAX (02) 6562 7615
 EMAIL psbd@bigpond.com.au

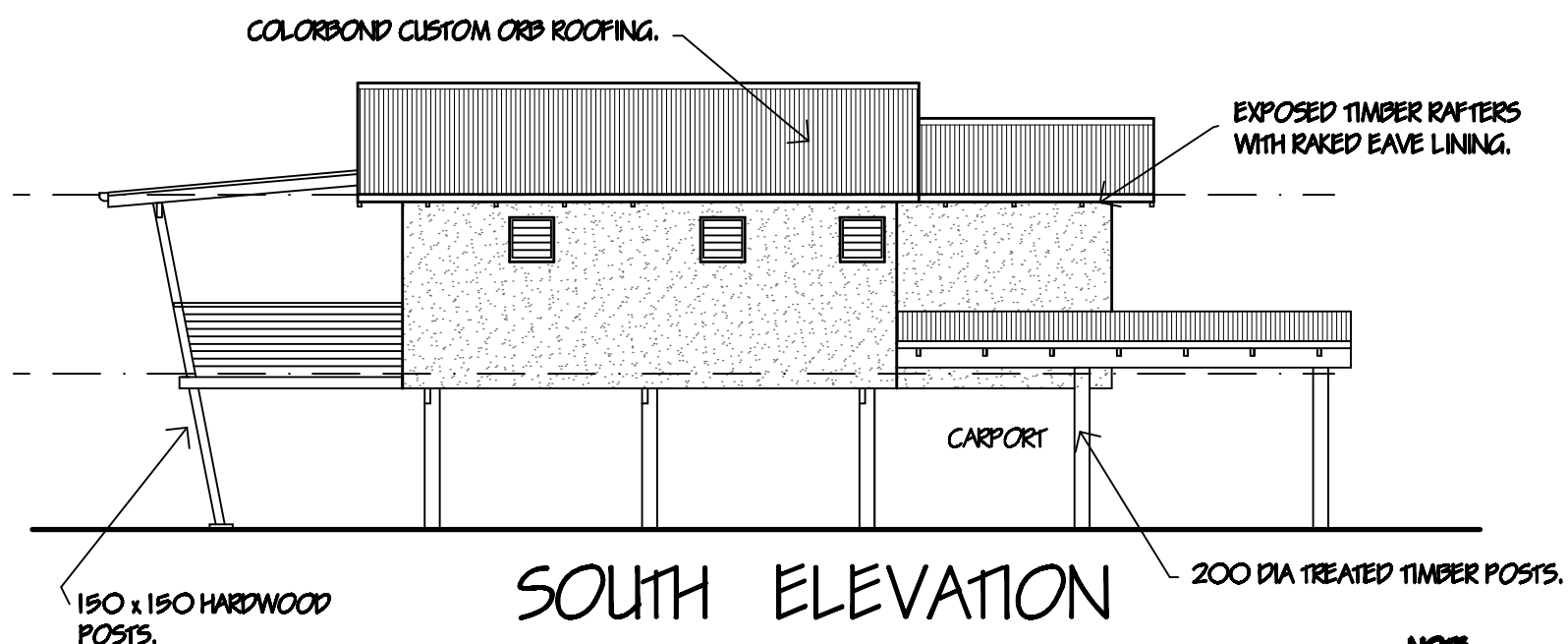
DRAWING	PRELIMINARY ENVIRONMENTAL ASSESSMENT FOR PART 3A PROJECT APPLICATION.		
SCALE : 1 : 100 AT A3	JOB No.	08 - 129	
DRAWN : P.W.S.	AMENDMENT	'F'	
DATE : 06.12.11	SHEET No.	4 OF 11	



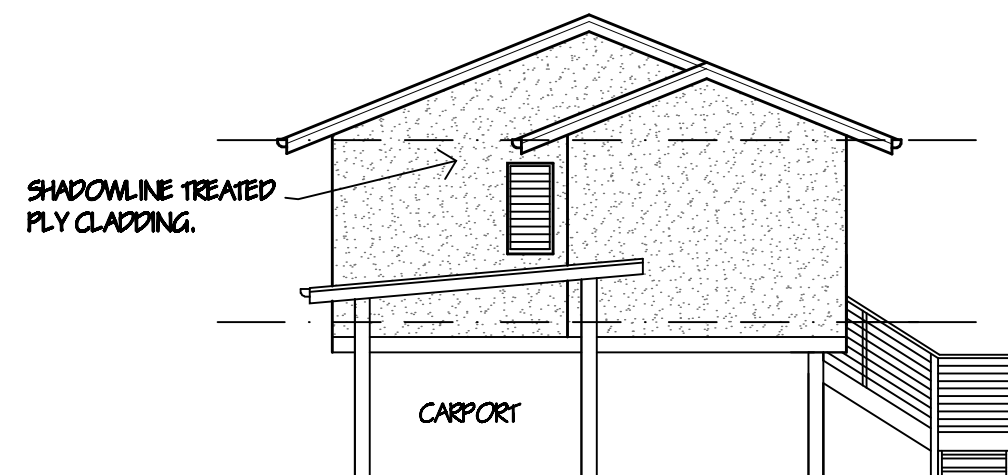
NORTH ELEVATION



WEST ELEVATION



SOUTH ELEVATION



EAST ELEVATION

NOTE :
ALL BUILDING PRODUCTS USED BELOW FLOOR LEVEL
ARE TO BE OF A TYPE SUITABLE TO WITHSTAND
OCCASIONAL FLOOD INUNDATION.
ALL ELECTRICAL INSTALLATIONS ARE TO BE ABOVE
FLOOR LEVEL.

1 BEDROOM CABIN.
(CABIN 3)

Paul Smith
building design

4 / 24 CLYDE STREET, KEMPSEY NSW
P.O. BOX 3683 WEST KEMPSEY NSW 2440
PHONE (02) 65622 580 FAX (02) 6562 7615
EMAIL psbd@bigpond.com.au

PROJECT
PROPOSED TOURIST CABINS
LOT 4 DP 1022342
NEW ENTRANCE ROAD,
SOUTH WEST ROCKS.
FOR SHANNON PACIFIC P/L & EASTLAND
CONSTRUCTIONS P/L.

DRAWING PRELIMINARY ENVIRONMENTAL
ASSESSMENT FOR PART 3A
PROJECT APPLICATION.

SCALE : 1 : 100 AT A3 JOB No. 08 - 129
DRAWN : P.W.S. AMENDMENT 'F'
DATE : 06.12.11 SHEET No. 5 OF 11



Paul Smith
building design

PLASTERBOARD WALL LINING.

90mm TREATED TIMBER FRAME WITH R1.0 SISALATION FIXED TO EXTERNAL FRAME.

SHADOWLINE TREATED PLY CLADDING.

PYNEBOARD SHEET FLOORING WITH T & G TIMBER FLOORING OVER.

TIMBER FLOOR JOISTS AND BEARERS.

200 DIA TREATED TIMBER POSTS AND EMBEDMENT TO ENGINEER'S DETAILS.

COLORBOND CUSTOM ORB ROOFING LAID OVER ANTICON INSULATION BLANKET.

PLASTERBOARD LINING TO UNDERSIDE OF TIMBER RAFTERS, WITH R2.5 CEILING INSULATION OVER.

600

20°

TOP PLATE.

2440

**APPROX UPPER LEVEL FLOOR LEVEL. RL. 3.7m AHD.
(MINIMUM REQUIRED BY COUNCIL RL. 3.25m AHD.)**

**HIGH FLOOD LEVEL
RL. 2.75m AHD.**

**MINIMUM FILL LEVEL
RL. 1.9m AHD.**

300

SECTION A / A

NOTE : PROVIDE LEVEL CEILING TO BATHROOM AND LAUNDRY AT 2400 ABOVE FL.

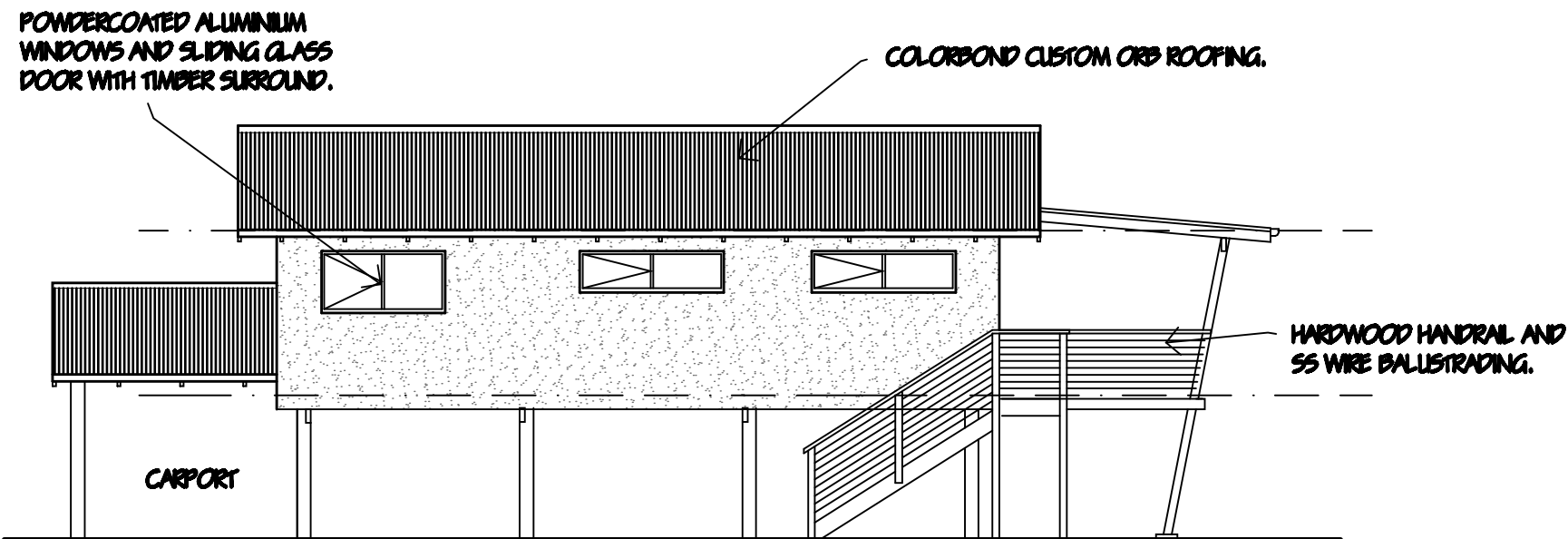
SECTION A / A

NOTE :
ALL BUILDING PRODUCTS USED BELOW FLOOR LEVEL
ARE TO BE OF A TYPE SUITABLE TO WITHSTAND
OCCASIONAL FLOOD INUNDATION.
ALL ELECTRICAL INSTALLATIONS ARE TO BE ABOVE
FLOOR LEVEL.

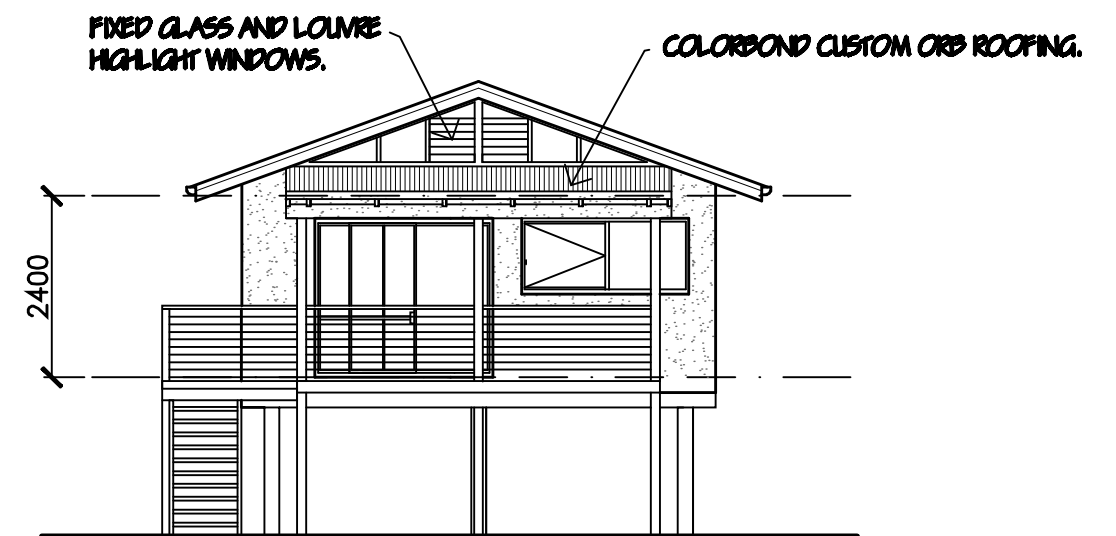
2 BEDROOM CABIN.
(CABIN 8)

PROJECT
PROPOSED TOURIST CABINS
LOT 4 DP 1022342
NEW ENTRANCE ROAD,
SOUTH WEST ROCKS.
FOR SHANNON PACIFIC P/L & EASTLAND
CONSTRUCTIONS P/L.

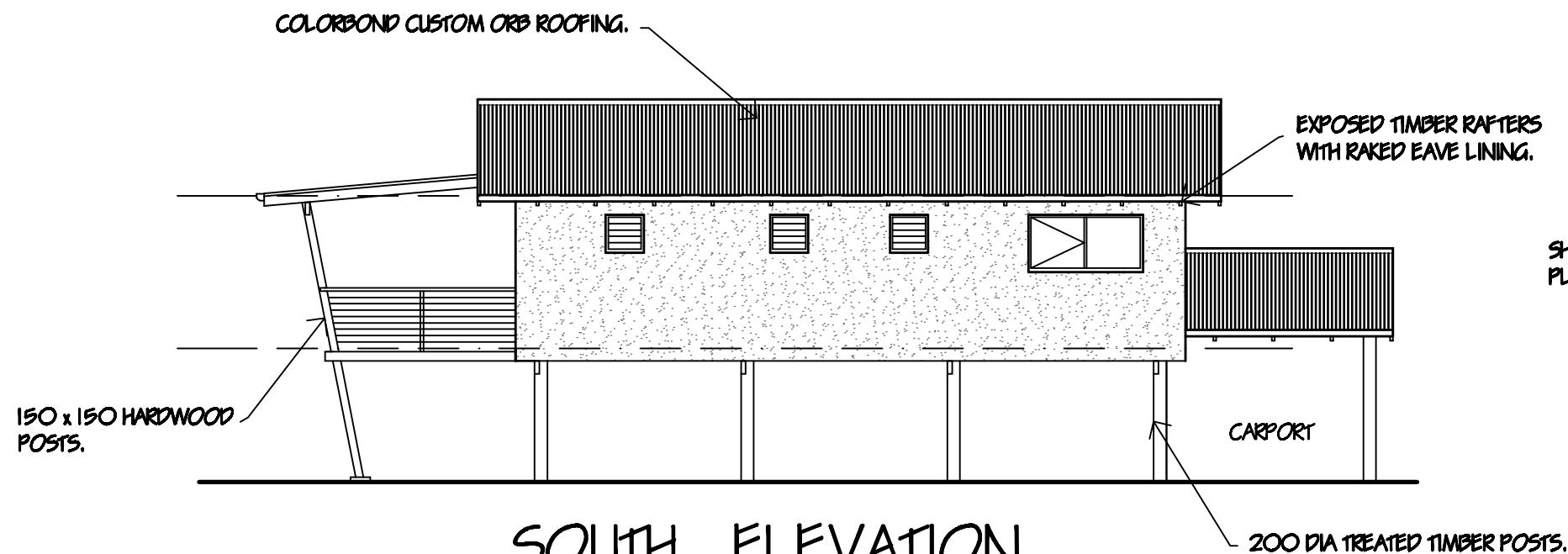
DRAWING		PRELIMINARY ENVIRONMENTAL ASSESSMENT FOR PART 3A PROJECT APPLICATION.	
SCALE :	1 : 100 AT A3	JOB No.	08 - 129
DRAWN :	P.W.S.	AMENDMENT	'F'
DATE :	06.12.11	SHEET No.	6 OF 11



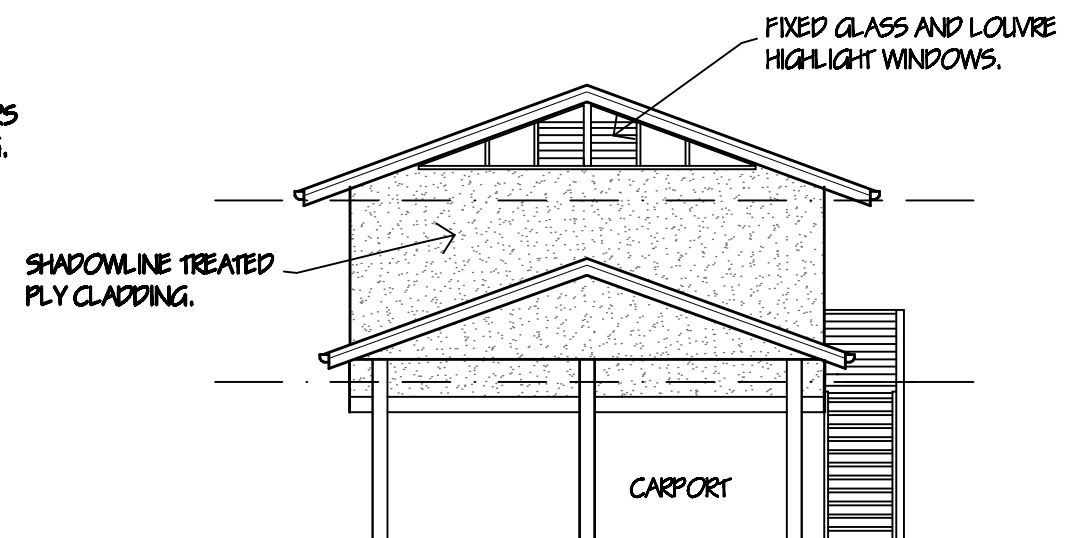
NORTH ELEVATION



WEST ELEVATION



SOUTH ELEVATION



EAST ELEVATION

NOTE :
ALL BUILDING PRODUCTS USED BELOW FLOOR LEVEL
ARE TO BE OF A TYPE SUITABLE TO WITHSTAND
OCCASIONAL FLOOD INUNDATION.
ALL ELECTRICAL INSTALLATIONS ARE TO BE ABOVE
FLOOR LEVEL.

2 BEDROOM CABIN.
(CABIN 8)

Paul Smith
building design

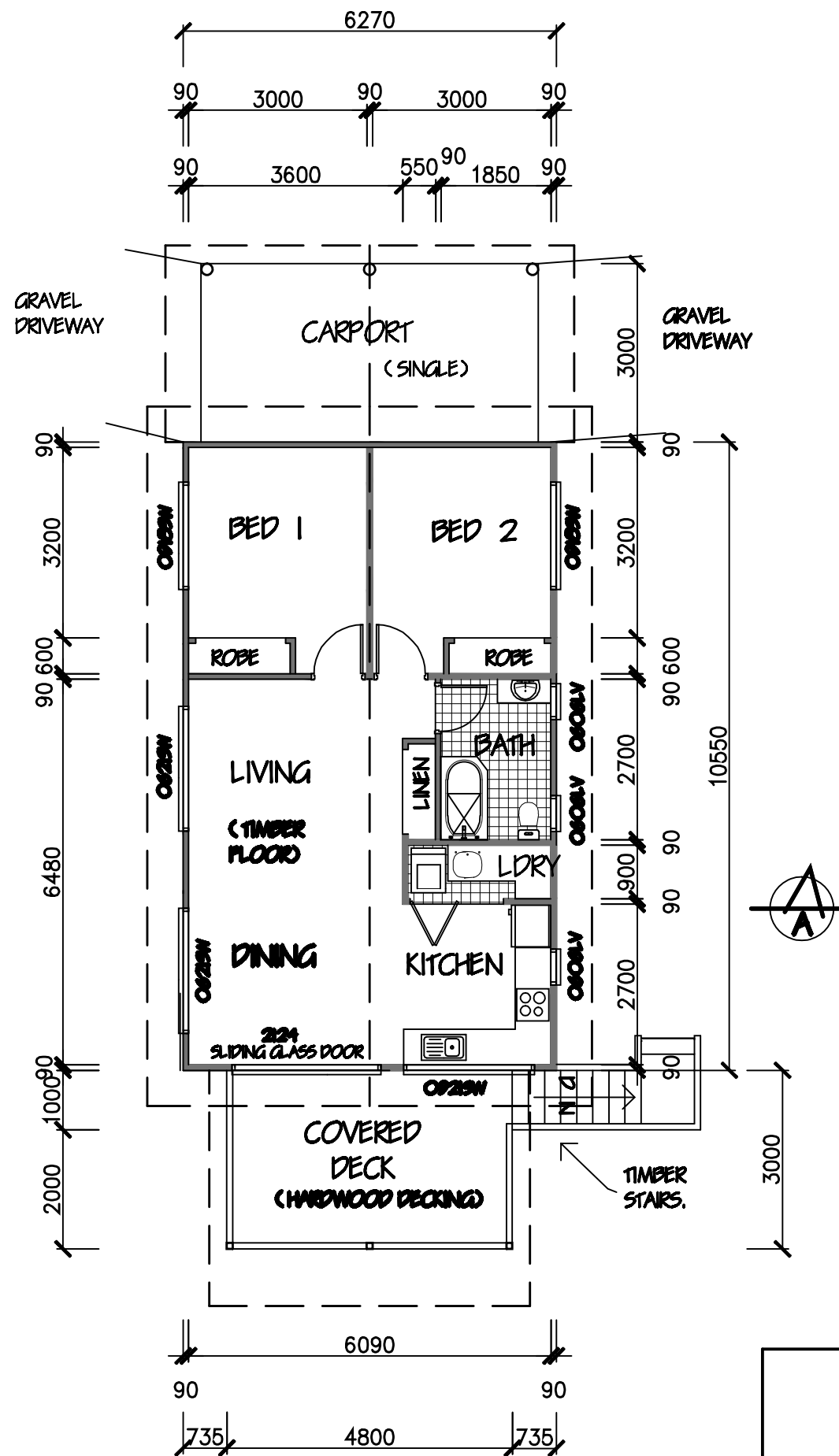
4 / 24 CLYDE STREET, KEMPSEY NSW
P.O. BOX 3683 WEST KEMPSEY NSW 2440
PHONE (02) 65622 580 FAX (02) 6562 7615
EMAIL psbd@bigpond.com.au

PROJECT
PROPOSED TOURIST CABINS
LOT 4 DP 1022342
NEW ENTRANCE ROAD,
SOUTH WEST ROCKS.
FOR SHANNON PACIFIC P/L & EASTLAND
CONSTRUCTIONS P/L.

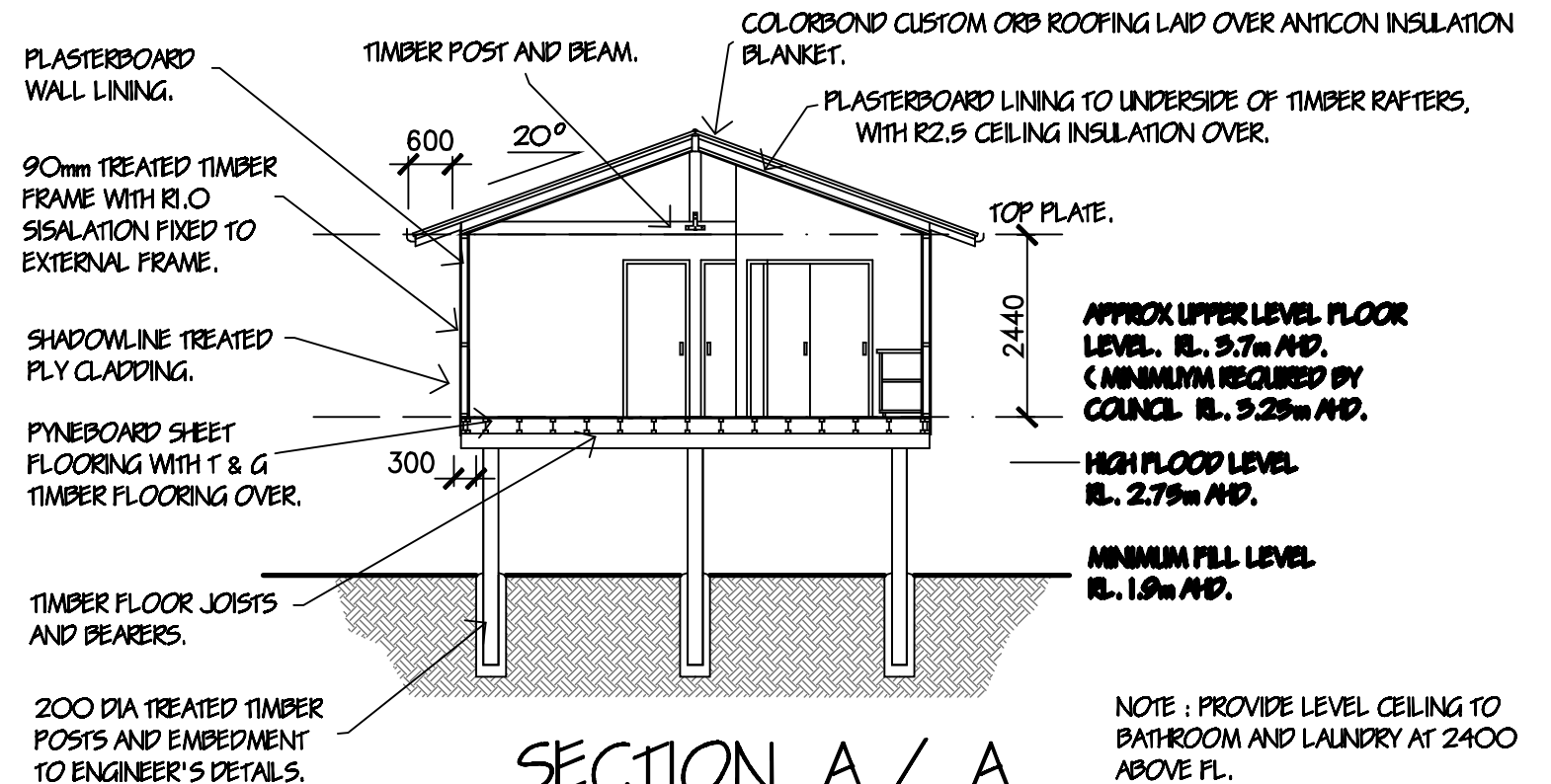
DRAWING

PRELIMINARY ENVIRONMENTAL
ASSESSMENT FOR PART 3A
PROJECT APPLICATION.

SCALE : 1 : 100 AT A3	JOB No. 08 - 129
DRAWN : P.W.S.	AMENDMENT 'F'
DATE : 06.12.11	SHEET No. 7 OF 11



LIVING AREA / 66.1m²



NOTE:
 ALL BUILDING PRODUCTS USED BELOW FLOOR LEVEL
 ARE TO BE OF A TYPE SUITABLE TO WITHSTAND
 OCCASIONAL FLOOD INUNDATION.
 ALL ELECTRICAL INSTALLATIONS ARE TO BE ABOVE
 FLOOR LEVEL.

**2 BEDROOM CABIN.
 (CABINS 1 AND 4)**

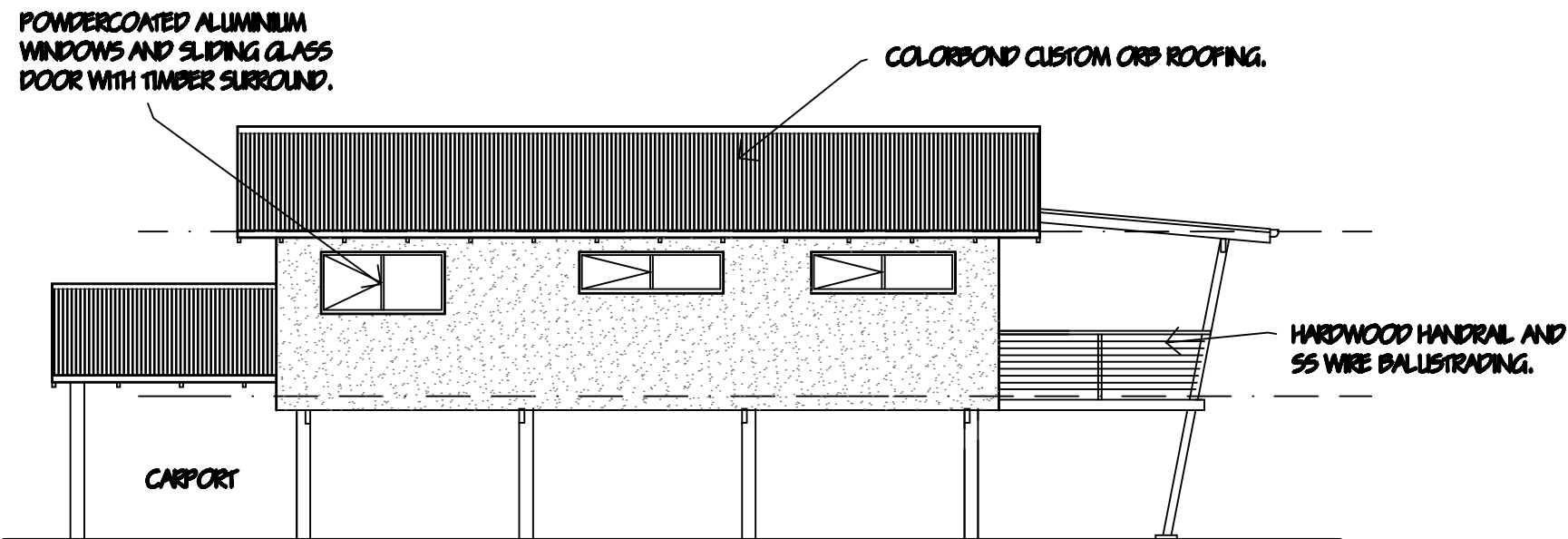
PROJECT
 PROPOSED TOURIST CABINS
 LOT 4 DP 1022342
 NEW ENTRANCE ROAD,
 SOUTH WEST ROCKS.
 FOR SHANNON PACIFIC P/L & EASTLAND
 CONSTRUCTIONS P/L.

Paul Smith
 building design

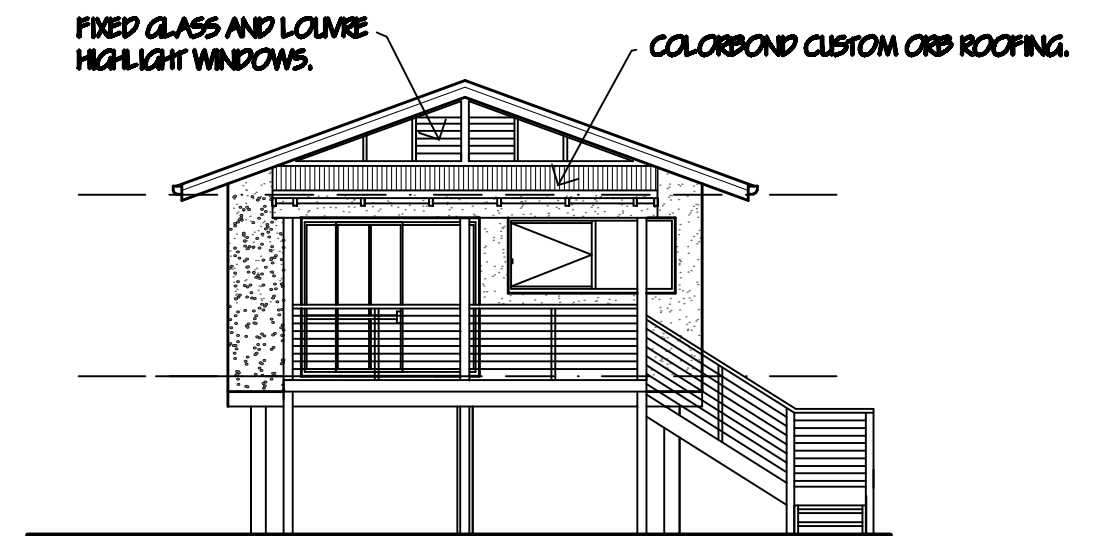
4 / 24 CLYDE STREET, KEMPSEY NSW
 P.O. BOX 3683 WEST KEMPSEY NSW 2440
 PHONE (02) 65622 580 FAX (02) 6562 7615
 EMAIL psbd@bigpond.com.au

DRAWING PRELIMINARY ENVIRONMENTAL
 ASSESSMENT FOR PART 3A
 PROJECT APPLICATION.

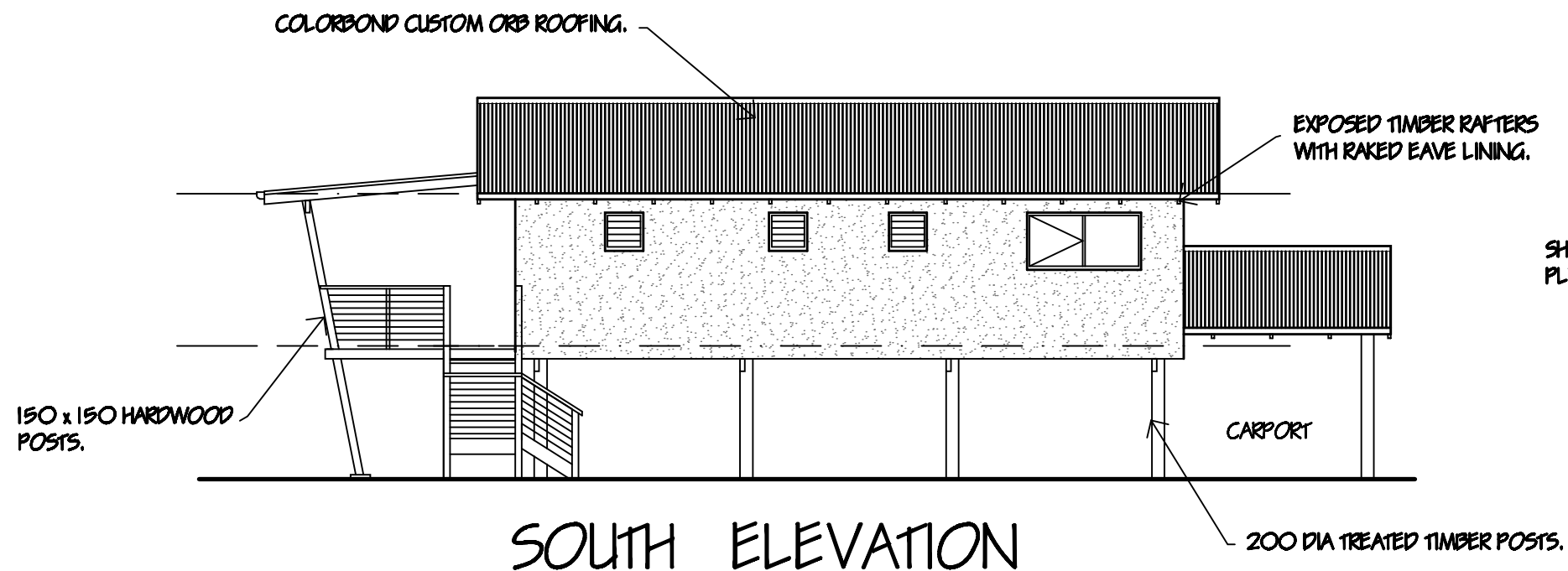
SCALE : 1 : 100 AT A3	JOB No. 08 - 129
DRAWN : P.W.S.	AMENDMENT 'F'
DATE : 06.12.11	SHEET No. 8 OF 11



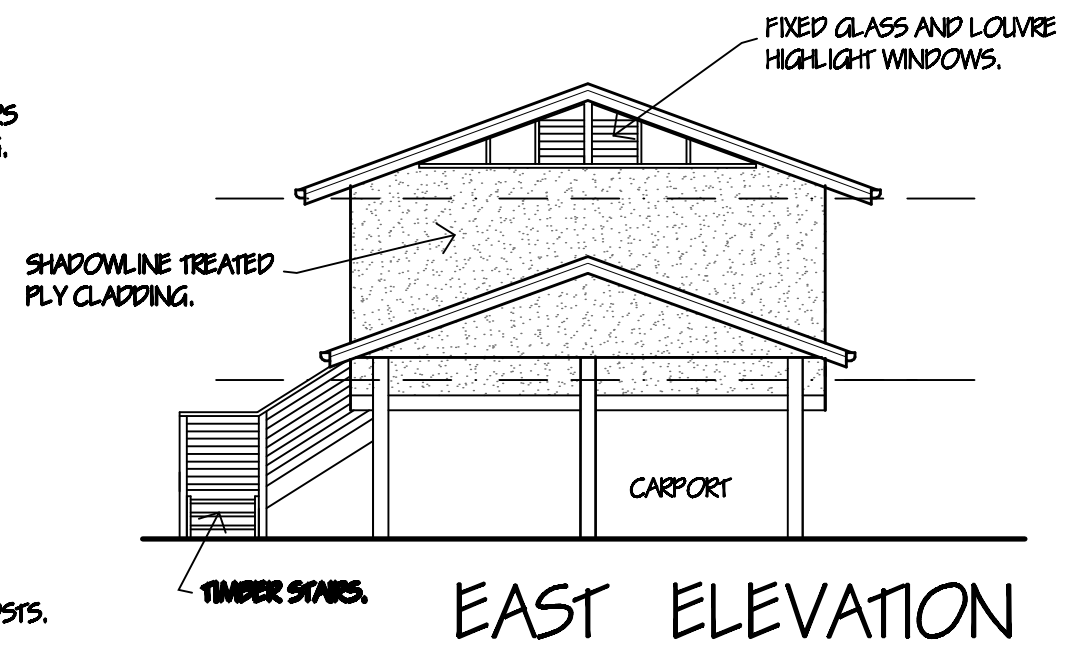
NORTH ELEVATION



WEST ELEVATION



SOUTH ELEVATION



EAST ELEVATION

NOTE :
ALL BUILDING PRODUCTS USED BELOW FLOOR LEVEL
ARE TO BE OF A TYPE SUITABLE TO WITHSTAND
OCCASIONAL FLOOD INUNDATION.
ALL ELECTRICAL INSTALLATIONS ARE TO BE ABOVE
FLOOR LEVEL.

2 BEDROOM CABIN.
(CABINS 1 AND 4)

Paul Smith
building design

4 / 24 CLYDE STREET, KEMPSEY NSW
P.O. BOX 3683 WEST KEMPSEY NSW 2440
PHONE (02) 65622 580 FAX (02) 6562 7615
EMAIL psbd@bigpond.com.au

PROJECT
PROPOSED TOURIST CABINS
LOT 4 DP 1022342
NEW ENTRANCE ROAD,
SOUTH WEST ROCKS.
FOR SHANNON PACIFIC P/L & EASTLAND
CONSTRUCTIONS P/L.

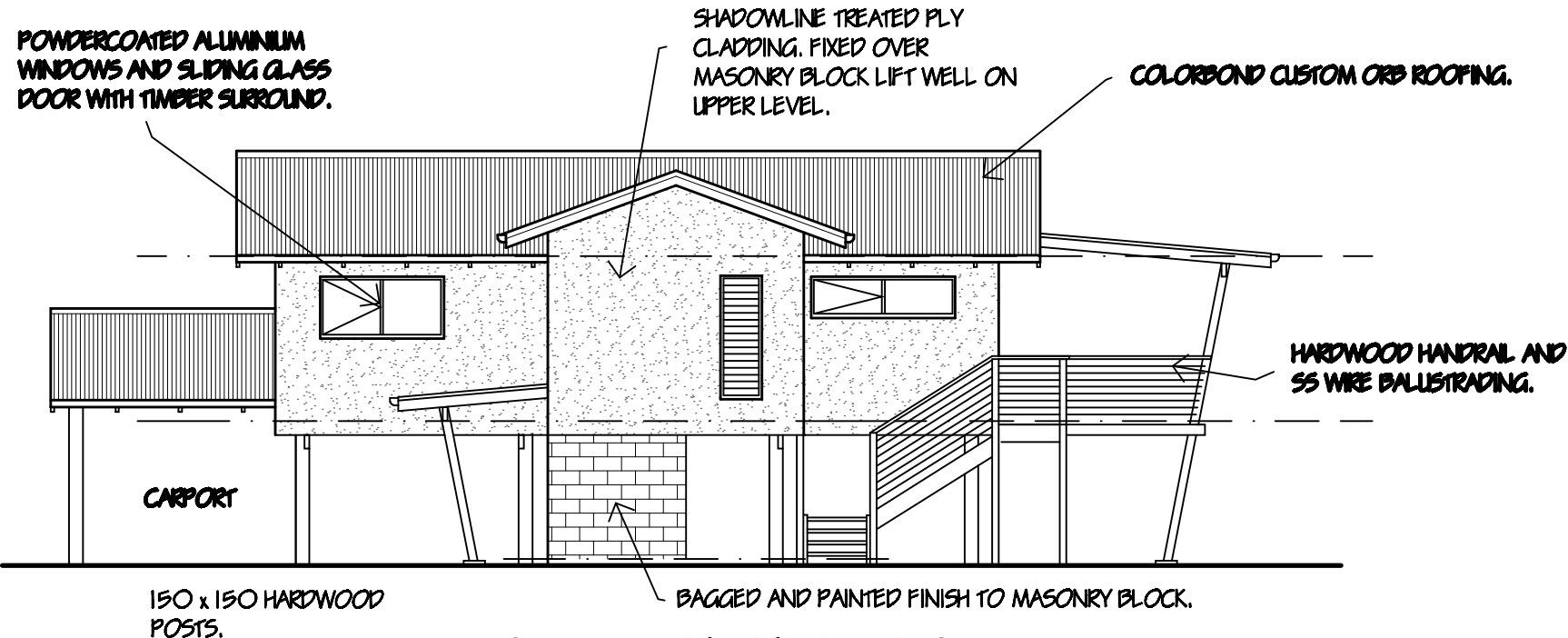
DRAWING

PRELIMINARY ENVIRONMENTAL
ASSESSMENT FOR PART 3A
PROJECT APPLICATION.

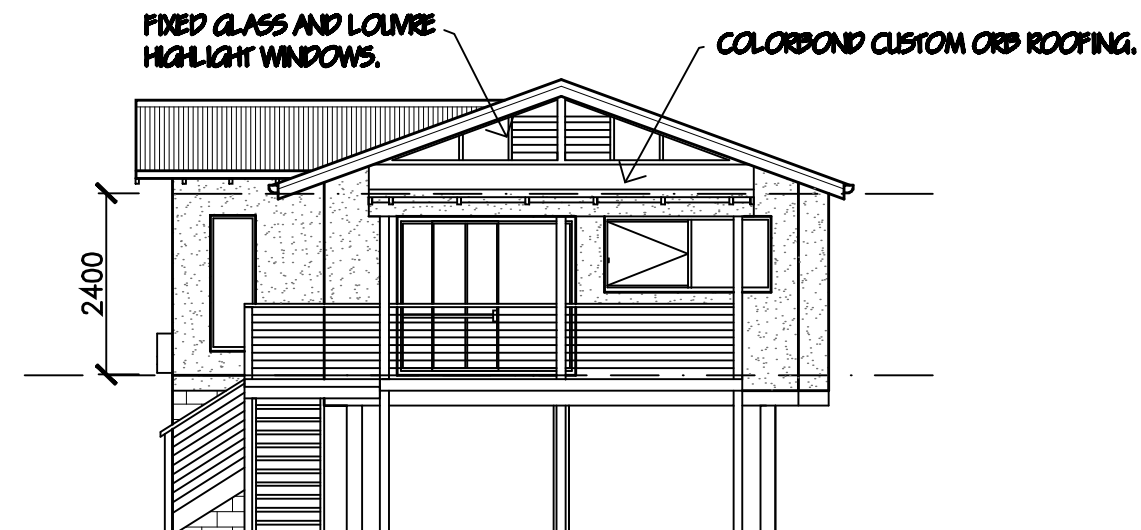
SCALE : 1 : 100 AT A3 JOB No. 08 - 129

DRAWN : P.W.S. AMENDMENT 'F'

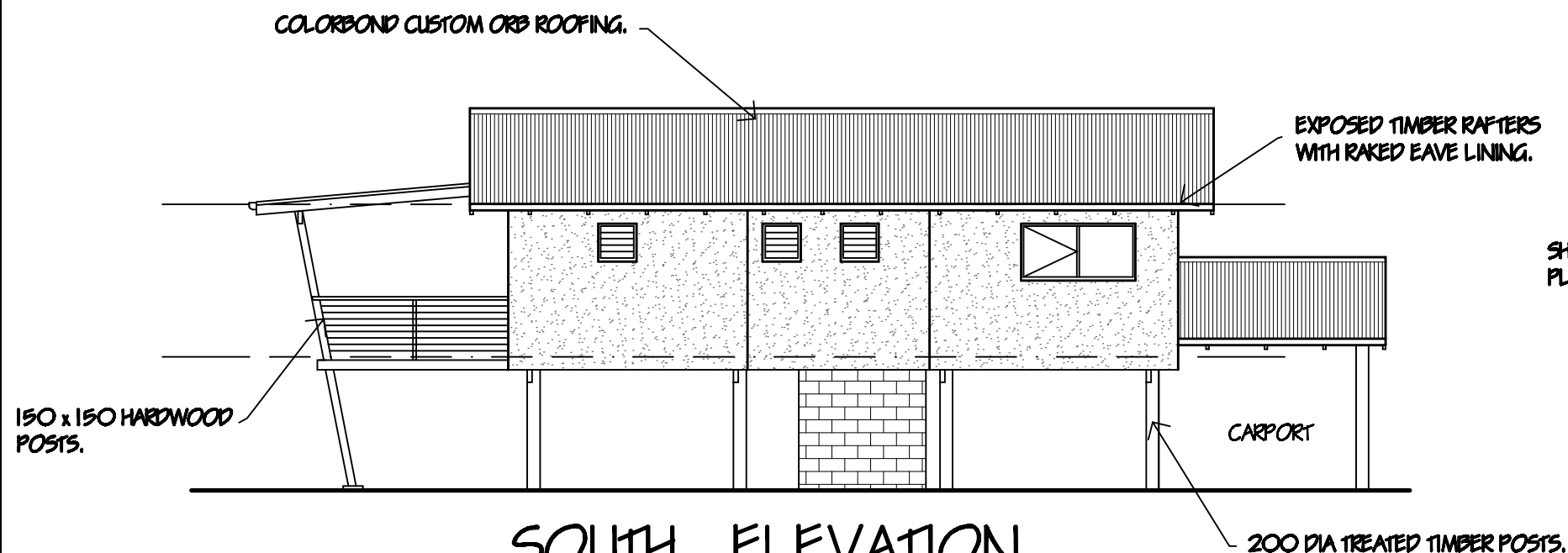
DATE : 06.12.11 SHEET No. 9 OF 11



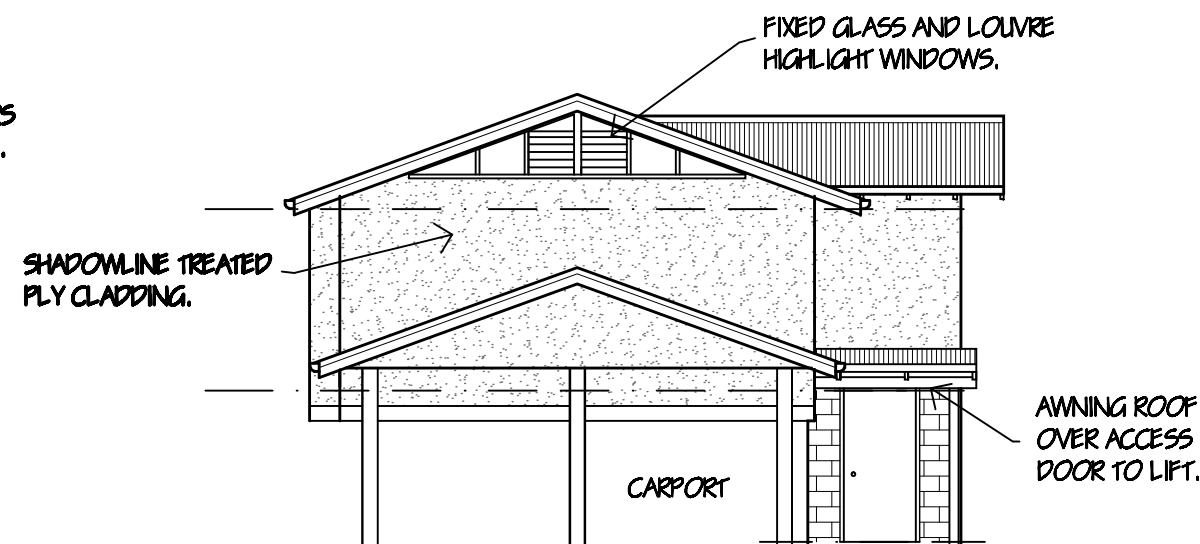
NORTH ELEVATION



WEST ELEVATION



SOUTH ELEVATION



EAST ELEVATION

NOTE :
ALL BUILDING PRODUCTS USED BELOW FLOOR LEVEL
ARE TO BE OF A TYPE SUITABLE TO WITHSTAND
OCCASIONAL FLOOD INUNDATION.
ALL ELECTRICAL INSTALLATIONS ARE TO BE ABOVE
FLOOR LEVEL.

LIVING AREA / 69.2m²

2 BEDROOM DISABLED
PERSON CABIN.
(CABIN 6)

Paul Smith
building design

4 / 24 CLYDE STREET, KEMPSEY NSW
P.O. BOX 3683 WEST KEMPSEY NSW 2440
PHONE (02) 65622 580 FAX (02) 6562 7615
EMAIL psbd@bigpond.com.au

PROJECT
PROPOSED TOURIST CABINS
LOT 4 DP 1022342
NEW ENTRANCE ROAD,
SOUTH WEST ROCKS.
FOR SHANNON PACIFIC P/L & EASTLAND
CONSTRUCTIONS P/L.

DRAWING PRELIMINARY ENVIRONMENTAL
ASSESSMENT FOR PART 3A
PROJECT APPLICATION.

SCALE : 1 : 100 AT A3	JOB No. 08 - 129
DRAWN : P.W.S.	AMENDMENT 'E'
DATE : 2.08.10	SHEET No. 11 OF 11



Appendix E

Amended Stormwater Management Plan

Amended Section 4.9.3.2 of EA (Stormwater Management Plan)

(amendments to EA are highlighted)

The proposed stormwater management plan consists of the following measures (refer to **Constructed Wetland Design Drawing**):

- rainwater tanks with a volume of approximately 3 k L at each cabin to capture roof runoff to detain flows and reduce runoff volumes;
- grassed or vegetated swales will receive overflows from the rainwater tanks and runoff from the road surfaces, gravel areas and other impervious areas. The swales will convey the flows to the constructed wetland and in the process provide some infiltration of stormwater to groundwater and removal of coarse and medium sediment. The basic swale dimensions are a base width of 300 mm, depth of 200 mm with gentle side slopes of approximately 1(vertical):6(horizontal);
- gravel parking areas to promote infiltration / filtering of the road runoff with excess runoff directed to the swales and constructed wetland for further treatment;
- grassed buffer strips between the entrance road / visitor parking and the constructed wetland to provide some infiltration of stormwater to groundwater and removal of coarse and medium sediment;
- constructed wetland for final treatment of stormwater via enhanced sedimentation, fine filtration and biological uptake processes to remove pollutants. Details of the constructed wetland include:
 - a surface area of approximately 1,000 m² which is approximately 7% of its catchment area. This size provides a high quality treatment suitable for release to the SEPP 14 wetland. This size is approximately double the standard sizing of constructed wetlands;
 - No permanent pool volume. The base of the constructed wetland will comprise the native soils which are sandy silts / silty sands which have a relatively high permeability and would not retain any significant permanent pool.
 - Detention time of approximately 5 hours based on an equivalent outlet diameter of 100 mm;
 - The maximum depth of the wetland is 0.4m (including extended detention depth). The embankment slopes of in the wetland are gentle with a grade of 1:10 to enable public egress from the water in the event of someone falling into the water when the wetland is full. Dense vegetation within the wetland will deter public access. The vegetation will consist of macrophyte zone planting of ephemeral marsh zones. The maximum water depth in the wetland will be approximately 0.4 m (a water level of 0.9 m AHD) which is controlled by the level of the outlet weir.

Amended Section 6.4.2 of EA (Stormwater Management)

(amendments to EA are highlighted)

6.4.2 Stormwater Management

The potential impact of stormwater runoff on the adjacent SEPP 14 wetland has been assessed in respect to water quality impacts using the MUSIC Version 4.0 program (eWater Limited, 2009). The modelling results indicate the water quality discharged to the SEPP 14 wetland will be significantly improved in comparison the current runoff from the site as a result of the proposed stormwater treatment train (between 70% and 90% reductions in sediments and nutrients entering the SEPP 14 wetland as a result of the proposed treatment measures).

6.4.2.1 Consideration of Adjoining Tavern

Stormwater management for the adjoining "The Riverside" Tavern was considered to determine if it needs incorporating into the stormwater management system for the subject site. All roofwater and carpark runoff from the tavern site is directed to the south-east corner of the site to a CDS® type gross pollutant trap and oil skimmer. The treated stormwater is discharged from the treatment system via a pipe and headwall in the south-east corner of the site. The discharge pipe has an invert level of approximately 0.5 m AHD. The system is shown in Illustration 4.4. Data on the CDS® gross pollutant trap and oil skimmer pollutant removal

efficiencies are shown in Table 6.2. Additional treatment would be provided via the informal swale system downstream of the treatment outlet prior to the flows entering the SEPP 14 wetland. Based on the pollutant removal efficiencies shown in Table 6.2 the existing treatment system for the tavern site is considered adequate. Therefore no additional measures are considered necessary for the tavern site and it is not considered necessary to incorporate the tavern stormwater into the stormwater management system for the subject site.

Table 6.2 CDS® Gross Pollutant Trap – Capture Performance Summary

<i>Pollutant / Items</i>	<i>Removal Efficiency</i>	<i>Independent Reference Source</i>
Suspended Solids (TSS)	70 %	CRCCH Report 99/2 Feb 1999
Total Phosphorous (TP)	30 %	CRCCH Report 99/2 Feb 1999
Total Nitrogen (TN)	0 %	Scattered results
Gross Pollutants (>5mm)	98 %	CRCCH Report 98/3 Apr 1998
Sediments >0.215mm	95 %	Portland State Uni, Oregon Oct 02
Fine sediment > 75 microns	90 %	Louisiana State University 2004
Heavy Metals	80 %	Louisiana State University 2004
Hydrocarbons, Oils & Grease	82-94 %	UCLA Report 1998

Source: Rocla, 2010.

6.4.2.2 MUSIC Modelling of Stormwater Treatment

A conceptual stormwater treatment model was developed using the MUSIC software in order to quantify the pollutant removal provided by the proposed stormwater strategy. The conceptual layout is shown in Plate 6.1.

The following design criteria have been adopted with regard to stormwater treatment:

- Council's general stormwater management objectives (refer to results in Table 6.3); and
- improve current water quality discharges to the SEPP 14 Wetland (refer to results in Table 6.4).

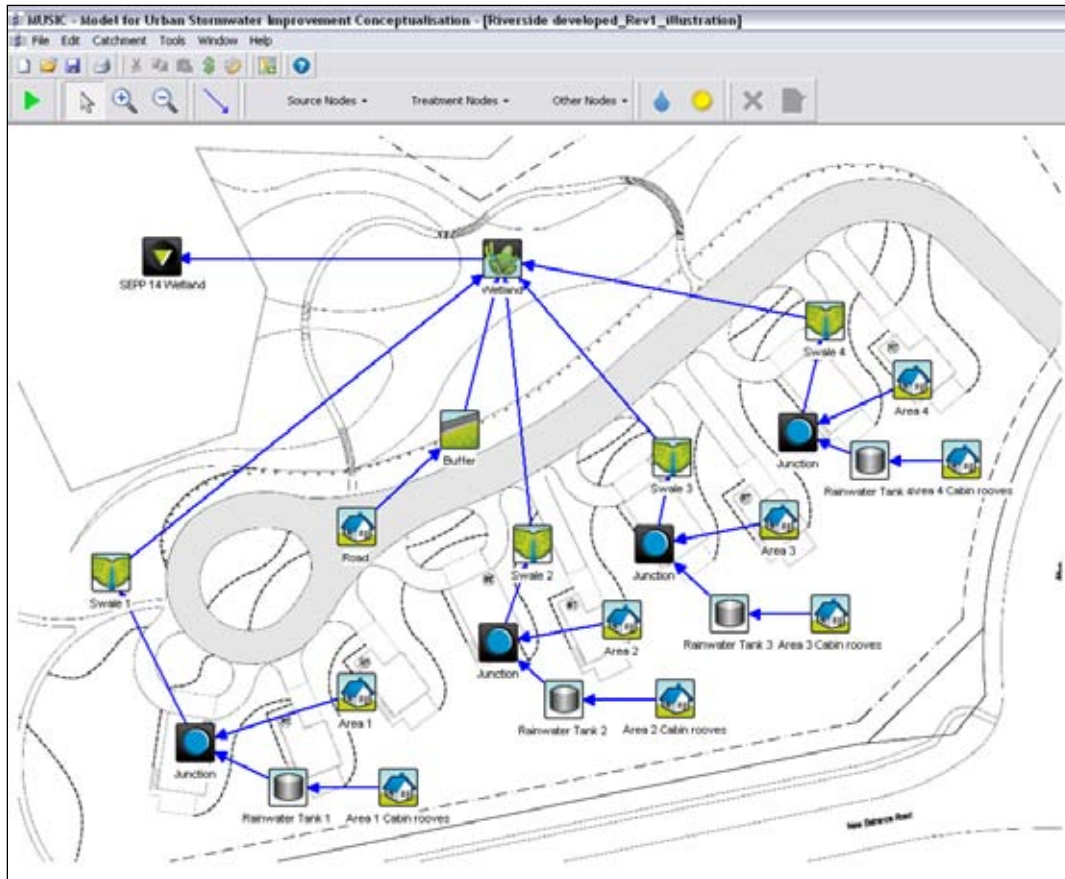


Plate 6.1 MUSIC Conceptual Layout of Stormwater Management Strategy

The predicted pollutant load reductions shown in Table 6.3 satisfy Council's water quality objectives and significantly improve the current water quality discharges to the SEPP 14 Wetland (refer to Table 6.4). It is not possible to quantify the treatment effectiveness for the other pollutants listed in council's objectives (litter, coarse sediment, oil and grease) because the MUSIC software, which is the industry-standard software, does not have the capability to assess these additional pollutants. Despite this, a stormwater treatment strategy that meets the adopted stormwater quality management objectives for TSS, TP and TN, will, by default, be capable of removing significant proportions of litter, coarse sediment, oil and grease. So, although a quantitative assessment of the level of treatment provided for these additional pollutants cannot be undertaken, the proposed stormwater treatment strategy should be capable of meeting the relevant objectives.

Table 6.3 Stormwater Pollutant Load Reductions

Pollutant	Post-Development Load – without treatment (kg/yr)	Post-Development Load – with treatment (kg/yr)	Load Reduction (%)	Council Objectives ¹ (%)
Total suspended solids	1,240	58	95	50 - 80 ²
Total Phosphorus	2.9	0.3	90	45
Total Nitrogen	14.8	4.2	72	45

Notes: 1. Post-Construction phase objectives – refer to Section 4.2;
2. 50% for fine particles (0.1 mm or less) and 80% for coarse particles (0.5 mm or less)

Table 6.4 Stormwater Pollutant Loads – Existing Versus Proposed Development

<i>Pollutant</i>	<i>Pre-Development Load (kg/yr)</i>	<i>Post-Development Load – with treatment (kg/yr)</i>	<i>Load Reduction (%)</i>
Total suspended solids	1,440	58	96
Total Phosphorus	2.7	0.3	89
Total Nitrogen	13.5	4.2	69

The modelling assumes the rainwater tanks will have a volume of approximately 3 kL per cabin. This size has been selected based on guidelines for small residential dwellings in WSUD Deemed to Comply Solutions for SE Queensland (Water By Design, 2009b).

6.4.2.3 Water Balance for Development Area

The MUSIC model described in the previous section was also used to assess the overall water balance for the site. The model includes ten years worth of climate data and is considered to be an appropriate tool for assessing the water balance.

The simulation of rainfall – runoff processes within the model is based on data entered for a range of soil properties. It is noted that limited soil data is available for the existing site, as such, it has been necessary to make a range of assumptions and adopt representative values for numerous parameters. These assumptions are based on contemporary guidelines for MUSIC (Water by Design, 2009c). The implication is that the results have a significant degree of uncertainty.

The average annual rainfall for the ten year period simulated by the MUSIC model is 1644 mm. This equates to approximately 15.6 ML/yr over the proposed development area. The MUSIC modelling results indicate that in the pre-development situation, 40 % of this volume leaves the site as surface runoff, with the remainder either infiltrating through the soil profile to recharge the groundwater or being 'lost' via evapotranspiration. If the site was developed in accordance with the current layout plan, but no water management measures were implemented (i.e. an 'unmitigated' scenario), the proportion of surface runoff would increase to 50 %. By incorporating the water management measures proposed in the current strategy, the proportion of surface runoff would reduce to 38 %, which is more reflective of the pre-developed scenario and is considered a satisfactory result in terms of having negligible impacts on the water cycle.

The annual flow volumes calculated by MUSIC for the pre-development and post-development scenarios are:

- Existing (undeveloped) condition: 6.5 ML/year annual runoff volume;
- Developed condition with no water management measures: 7.8 ML/year annual runoff volume;
- Developed condition with the water management measures: 5.9 ML/year annual runoff volume;

In respect to future annual runoff volumes taking into account impacts from climate change such as increased rainfall intensities, the above figures would increase by approximately 10%. Therefore, there is still no significant impact of the development on the water cycle in respect to future flows under climate change.

6.4.2.4 Peak Flow Rates

The objective for stormwater flows is to ensure no increase in peak flow rates from the site as a result of the development. An increase in peak flow rates results from the increase in impervious area associated with the roads and cabins and potentially from construction of the drainage system which can facilitate more efficient (faster) carriage of flows. To mitigate this impact detention storage is provided in the constructed wetland to provide sufficient temporary storage to 'hold back' flow rates to pre-development conditions.

The estimate of detention volume requirements are based on hand calculations of peak flow rates for existing conditions and post-development conditions for 1, 2, 5, 10, 20, 50 and 100 year average recurrence intervals (ARI) events. The detention volumes shown in Table 6.5 are the volumes required to detain flow rates for the various ARI events for both the present and for the year 2100. The maximum volume requirement is 91 m³.

The detention volume provided in the constructed wetland is approximately 200 m³. In addition, rainwater tanks at each cabin will provide additional detention. Therefore the provision of more than adequate detention volume will ensure there will be no increase in peak flow rates from the site as a result of the development. This conclusion is reinforced by the revised MUSIC results which now calculate peak flow rates. Comparison of the pre-development and post-development peak flow rates calculated in MUSIC indicates a 42% reduction in peak flow rates.

Table 6.5 Stormwater Flow Rates and Detention Requirements

<i>Storm Event Average Recurrence Interval (years)</i>	<i>Pre-Development Peak Flow Rate (m³/s)</i>	<i>Post-Development Peak Flow Rate (m³/s)</i>	<i>Detention Volume Requirement (m³)</i>
<i>Present Situation</i>			
1	0.54	0.61	21
2	0.73	0.83	29
5	1.02	1.16	41
10	1.20	1.36	48
20	1.43	1.62	57
50	1.82	2.06	72
100	2.09	2.37	83
<i>Year 2100 *</i>			
1	0.59	0.67	24
2	0.80	0.91	32
5	1.12	1.27	45
10	1.32	1.49	52
20	1.57	1.78	63
50	2.00	2.26	79
100	2.30	2.60	91

Note: * the figures for flow rates for the year 2100 have been estimated by increasing the 'present situation' flow rates by 10% to account for potential increased rainfall intensities associated with climate change similar to the climate change considerations for flooding (refer to Section 6.3.2)

6.4.2.5 Erosion and Sediment Control

The proposed constructed wetland will be used as a sediment retention basin during the construction phase. Flows from the majority of the site will be directed to the basin. The location of the basin will facilitate interception of any sediment to the SEPP 14 Wetland. The large size of the sediment retention basin will adequately cater for settlement of the sandy soils of the site. The western fringe of the site may flow to New Entrance Road. Sediment control fences will be erected along this boundary to prevent any sediment loss to the road drainage system. The erosion and sediment control plan for the development is shown on Drawing 1291/004 in Appendix B.

6.4.3 Groundwater

6.4.3.1 Existing Groundwater Levels

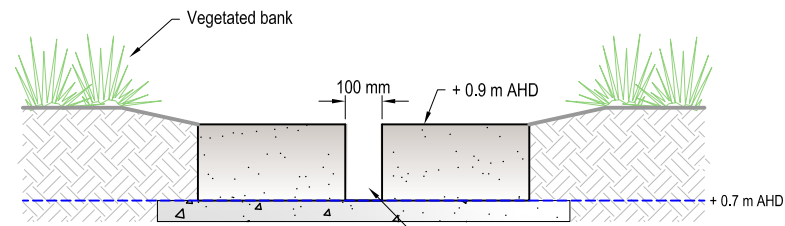
The watertable level at the site was approximately 1.3m below ground level in all three boreholes at the time of the geotechnical investigation by Australian Soil and Concrete Testing Pty Ltd in October 2009. This

equates to a watertable level of approximately -0.3 to -0.5 m AHD based on surface levels of approximately 0.8 to 1.0 m AHD at the location of the tests.

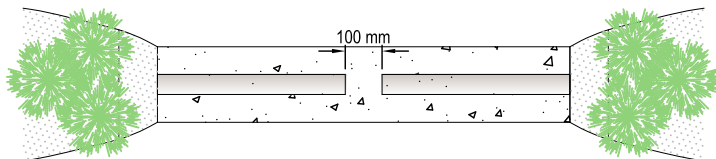
6.4.3.2 *Potential Impacts*

The main area of excavation on the site is the proposed constructed wetland. The depth of excavation associated with the wetland is approximately 0.2 m down to a level of approximately 0.5 m AHD. This level is approximately 0.8 to 1.0 m above the level of the groundwater as indicated by geotechnical testing. This is considered to be more than adequate buffer to the watertable.

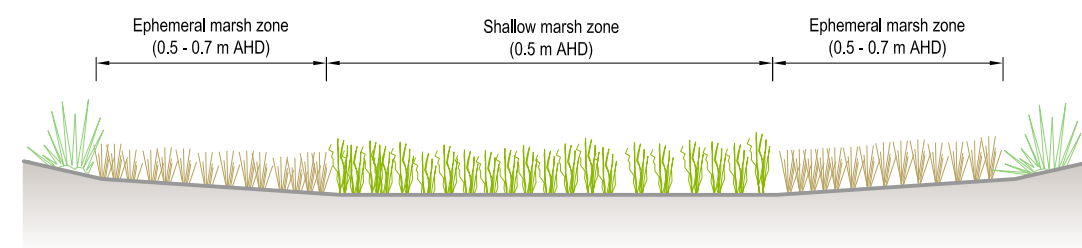
There will be some infiltration from the constructed wetland to the groundwater. This will be following treatment in the swale system and constructed wetland. Therefore there will be no significant water quality issues. The amount of infiltration will be similar to existing conditions, therefore there will be no significant groundwater mounding as a result of the development. MUSIC modeling indicates there is more than adequate treatment of infiltrated water prior to interception with the underlying watertable. The modeling indicates that with a 1.0 m buffer the reductions in pollutants reaching the watertable from the pollutant load entering the constructed wetland is 98%, 70% and 80% for TSS, TP and TN respectively. For a 0.5 m buffer the reductions in pollutants reaching the watertable are 97%, 66% and 77% for TSS, TP and TN respectively. These pollutant reductions are considered satisfactory.



Outlet Weir (Elevation)

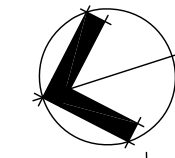


Outlet Weir (Plan)



Typical Section Through Constructed Wetland

Approximate SEPP 14 wetland boundary.
Precise boundary to be determined on site
and marked by survey.



- LEGEND
- Existing tree to be retained
 - Approximate SEPP 14 wetland boundary
 - Site boundary
 - Easement to drain water
 - Rainwater tank
 - Timber bollards
 - Indicative fall direction across ground levels
 - Headwall
 - Culvert
 - Swales showing direction of fall
 - Discharge into SEPP 14 wetland
 - Ephemeral marsh zone (0.5 - 0.7 m AHD)
 - Shallow marsh zone (0.5 m AHD)
 - Fill contours
 - + 2.3 Surface levels in m AHD

A	Wetland shape amended Existing trees to be retained identified	16/12/11	RE
No.	Description	Date	Initial
Amendments			

© GeoLINK 2009

This drawing must not be relied upon for any purpose other than that for which it was prepared or by any person or corporation other than the referred client.

This drawing was prepared under a quality system certified as complying with ISO/AS 9001 by an accredited certification body.

Quality Endorsed Company
AS 9001
18,000 hours
Surveillance Audits

GeoLINK
environmental management and design

Level 1, 64 Ballina Street
PO Box 9
LENNOX HEAD NSW 2478
T 02 6687 7666
F 02 6687 7782
info@geolink.net.au

33 Gordon Street
PO Box 1446
COFFS HARBOUR NSW 2450
T 02 6651 7666
F 02 6651 7733

www.geolink.net.au

quality solutions sustainable future

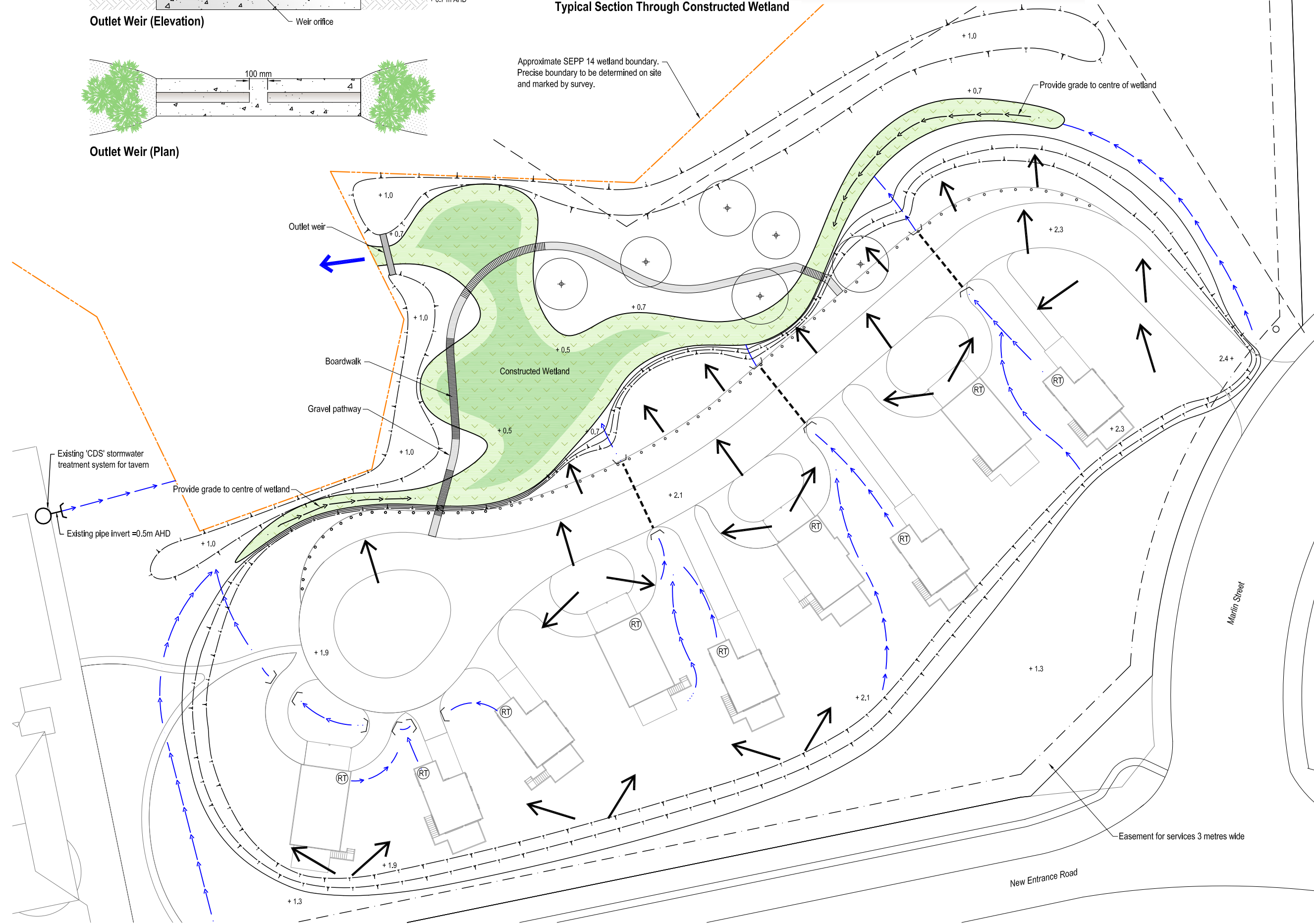
Project Title
Riverside Cabins

Client
Steve McEvoy

Designed	TIM	Drawn	RE	Checked
Approved		Date	Jan 2011	
XREFs				
Scale				
metres 0 2.5 5 7.5 10 12.5				

Drawing Title
Constructed Wetland Design

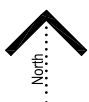
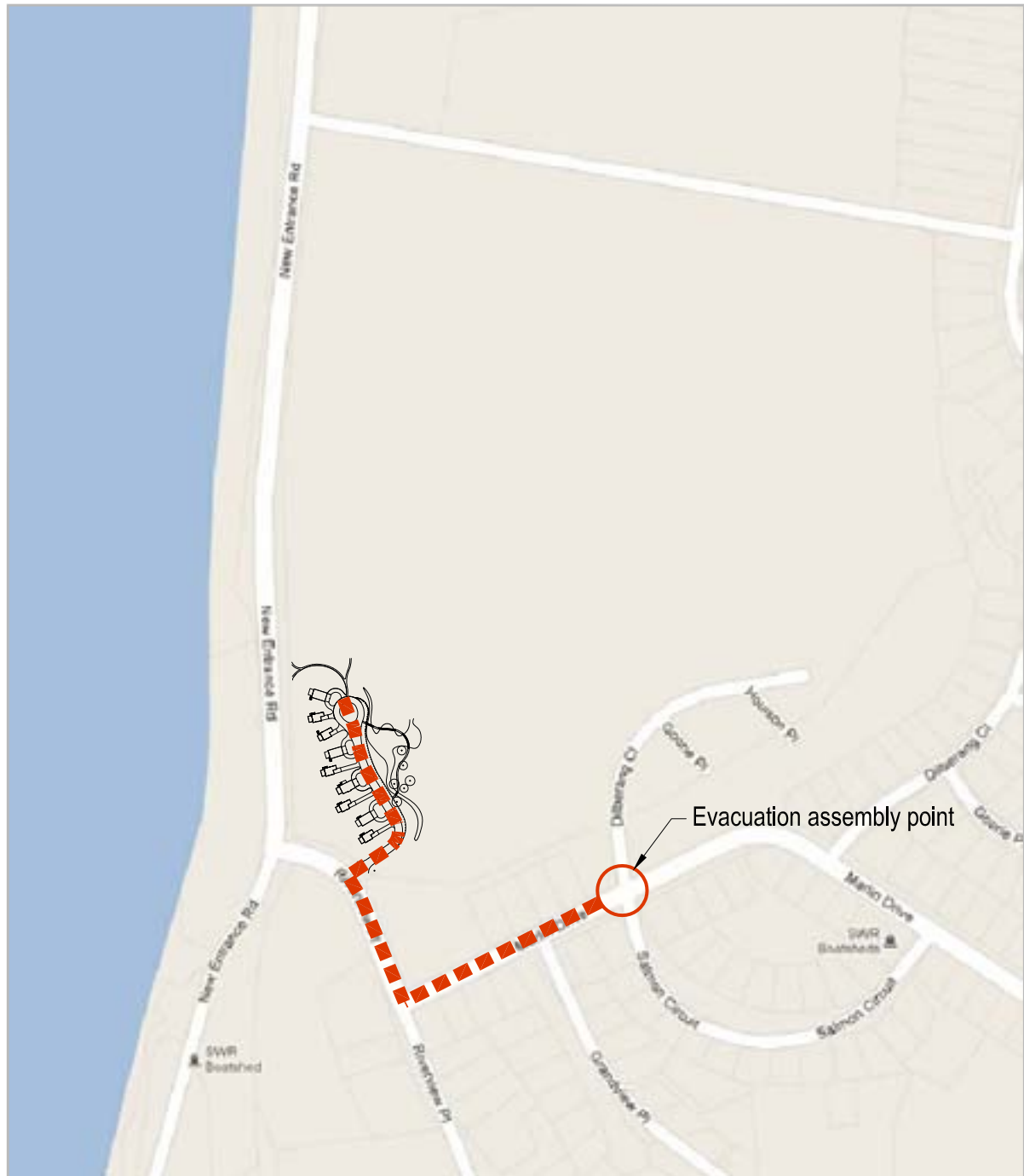
Drawing Number	1291109
Revision	E1 A





Appendix F

Flood Evacuation Route



0 100

GeoLINK
environmental management and design