Calderwood Modification 4 to Part 3A Concept Plan – Detailed response to submissions - Biodiversity

Lendlease Communities (Calderwood) Pty Ltd

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Template 2.8.1

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1. Introduction

Eco Logical Australia Pty Ltd (ELA) was engaged by Lendlease Pty Ltd to prepare a Biodiversity Assessment of the proposed modification to the Approved Concept Plan for the Calderwood Urban Development Project. Lendlease proposed to increase the density of residential dwellings from approximately 4,800 to approximately 6,500 across the Project area (study area).

The reports were submitted and exhibited. About 70 submissions were received from local government, State Government agencies and the public.

This report outlines the detailed responses to the matters raised regarding terrestrial and aquatic biodiversity. As part of the response to submissions process, Lendlease will seek to reduce the yield to approximately 6,000 residential dwellings across the Project area.

The Biodiversity Assessment report concludes that the proposed modification (Mod 4) would not result in additional direct or indirect impacts to any threatened ecological values than those originally listed in the Calderwood Concept Plan (2010). This includes direct, indirect and cumulative impacts arising from the proposed changes because of the proposed modification. The proposed modification recognises and conserves biological diversity and ecological integrity by not increasing or altering impacts on these values from the Concept Plan approved in 2010.

2. Detailed responses

Table 1: Detailed responses to Wollongong City Council submission

Issue raised	Response
Biodiversity	
The Ecological [sic] (2018) desktop assessment of threatened ecological communities has failed to identify MU13 Moist Box-Red Gum Foothills Forest by NPWS (2002) as part of the EPBC Act listed critically endangered ecological community Illawarra and South Coast Lowland Forest and Woodland as described in Section 2.7 of the Environment Protection Biodiversity Conservation (EPBC) Act Approved Conservation Advice (incorporating listing advice) for the Illawarra and South Coast Lowland Forest and Woodland Ecological Community (TSSC 2016).	The Federal Conservation Advice does include MU13, but only part of it. The conservation advice expressly excludes where rainforest species are dominant. Accordingly, areas on site where rainforest species were dominant were excluded from the mapping exercise of EPBC Act listed threatened ecological communities. Where MU13 has been mapped as per the original Concept Plan, there are no impacts on that vegetation type.
Based on the vegetation condition assessment (Section 3.1.3), Fig 5 of Ecological (2018) where all areas of MU13 adjoin or are close to MU23 or MU24, and the absence of detailed assessment including field surveys according to Section 2.6 of the Approved Conservation Advice (TSSC 2016), a precautionary approach requires the inclusion of all MU13 in the study area as EPBC Act Illawarra and South Coast Lowland Forest and Woodland in addition to all MU23 and MU24	Data collected during the Concept Plan field assessments indicated where there was a dominance of rainforest and mesic species contained in the mapping area. These areas therefore do not conform to the EPBC Act threatened matter.
The suggestion by Ecological (2018) that 'Significant impacts on Illawarra and South Coast Lowland Forest and Woodland are unlikely' are based on general discussion points rather than detailed impact assessment according to EPBC Act MNES Significant Impact Guidelines (DotE 2013) and Section 2.6.5 of the Approved Conservation Advice for the critically endangered ecological community (TSSC 2016). The absence of full surveys and detailed impact assessment, according to the Approved Conservation Advice (TSSC 2016) and legislated process is a failure of the Ecological (2018) report.	The SEARs do not require consideration or assessment of EPBC Act listed matters as it is a separate jurisdiction under the Commonwealth. As such, it will be separately addressed in accordance with the EPBC Act. The area where the proposed yield increase would occur had already been approved for removal under the Concept Plan and subsequent modifications. That is, despite the increase in yield the areas affected had already been approved for clearing. The yield increase would result in smaller lot sizes, more vehicles, a greater number of residents and potentially greater numbers of domestic animals. There would not be an increase in the area of native vegetation or potential threatened species habitat to be removed because of the yield increase. Assessment of indirect impacts included examining the impact of increases in traffic,

Issue raised	Response
	numbers of people, potential for increases in rubbish and numbers of domestic animals.
The Lowland Dry-Subtropical Rainforest (MU4) noted in Tables 3 and 7 likely equates to the soon to be EPBC Act listed Illawarra-Shoalhaven subtropical rainforest ecological community	Noted. While this may be listed at some point in the future, the matter is not currently listed.
The Ecological (2018) report has misinterpreted the definition of an Action under the EPBC Act [see EPBC Act Policy Statement Definition of 'action' DSEWPaC (2013)]. In addition, Ecological (2018) have overlooked the requirement to assess the likely impacts to EPBC Act listed threatened entities prior to an EPBC Act Action commencing (including series of activities in a project) regardless of, and subsequent to, the previous 2010 EPBC Act Referral for the 'Calderwood Urban Development Project' (CUDP). The statement in Section 4.2 that 'The activity to be carried out pursuant to the proposed modification is generally consistent with the action referred to the Commonwealth on 2 March 2010 (EPBC 2010/5381) in terms of area and impacts on the listed matters.' is false as the Action will impact on an additional MNES that have not been previously assessed and are identified in the project site. The Actions associated with the existing approved DA's [sic] where no clearing of the CEEC has yet commenced and current proposed modification is considered a 'new or increased impact' as defined by the Department of Environment and Energy (2017) in Guidance on 'new or increased impact' relating to changes to approved management plans under EPBC Act environmental approvals.	The SEARs do not require consideration or assessment of EPBC Act listed matters as it is a separate jurisdiction under the Commonwealth. As such, it will be separately addressed in accordance with the EPBC Act. See also s158A of the EPBC Act; which provides that the determination that an action is Not Controlled Action can be relied upon, despite subsequent new listings and uplistings. The guideline mentioned by Council refers to plans of management, not planning approvals plans or reports. .
Recent EPBC Act impact assessments of Illawarra and South Coast Lowland Forest and Woodland CEEC in the locality including the Albion Park Rail Bypass (EPBC Referral No's 2018/8192, 2017/8048 and 2017/7909) which will directly impact areas of much less than that of the of the 'Calderwood Urban Development Project' (CUDP) (see EPBC Referral No 2018/8192), have been found to result in significant impacts and have accordingly been determined by the Department of Environment and Energy as 'Controlled Actions'	Noted. That project is entirely different, and the two projects should not be conflated. EPBC Act matters are a separate jurisdiction to those being assessed here.
Based on recent assessments, its [sic] considered that direct impacts (and not accounting for indirect impacts) to close to 11 ha of vegetation equating to EPBC Act Illawarra and South Coast Lowland Forest and Woodland, comprising approximately 36% of all Illawarra and South Coast Lowland Forest and Woodland within the project site, would be assessed by the Department of Environment and Energy as triggering a Controlled Action.	Noted. The SEARs do not require consideration or assessment of EPBC Act listed matters as it is a separate jurisdiction under the Commonwealth. As such, it will be separately addressed in accordance with the EPBC Act. This report does not pre-suppose what the Federal Minister for the Environment would consider as a Controlled Action.
In view of Council's comments, and as part of the stakeholder agency consultation, it is recommended that the Department of Planning and Environment invite the Commonwealth	The SEARs do not require consideration or assessment of EPBC Act listed matters as it is a separate jurisdiction under the Commonwealth. As such, it will be separately addressed in

Issue raised	Response
Department of Environment and Energy to review and comment on the direct impact to over 10ha of an EPBC Act listed critically endangered ecological community as part of the CUDP.	accordance with the EPBC Act.
Ecological (2018) has failed to take into account the need for further specialist studies to assess the impact to groundwater and GDE's[sic] (expressing as aquatic ecosystems) from increased hardstand and impervious surfaces and cut any fill on the alluvial floodplains from the proposed project modification and future development applications. (JWP 2019, Douglas Partners 2010 & 2018, Cardno 2010 and Ethos Urban 2018).	The Douglas Partners report states that there will not be a change in the post-development flows of groundwater compared with the pre-development flows. The extent of impervious surface area is determined by the amount of fill used across the project. The extent of fill is the same proposed by this modification as the area approved previously. The impact on GDEs will be the same. Groundwater infiltration of Marshall Mount Creek at the upstream extent of the project boundary, is shown as being groundwater dependent (Figure 4) and this was confirmed by a site visit on 3 April 2019 by Dr Peter Hancock (Groundwater Ecologist). There will be no increase in impermeable surface area adjacent to this reach, nor in the upstream part if the floodplain, so groundwater recharge will not be affected. Likewise, the reaches of Macquarie Rivulet that are indicated as being groundwater dependent are located adjacent to areas where groundwater infiltration of the shallow alluvial aquifer will be ether unaffected or only minimally affected by an increase in impermeable surfaces. One terrestrial GDE is mapped as occurring on the site (Figure 4). A site inspection found that the vegetation community here is unlikely to depend on groundwater. This area will be an environmental reserve (ER4), and the vegetation retained in its current condition.
The EA by Ethos Urban (2018) states that 'Flows to and from terrestrial groundwater dependent ecosystems are expected to be maintained'. This statement does not appear to have basis as the EA also notes that the detailed impact assessments on groundwater and therefore GDE's [sic] (such as the aquatic ecosystems of Marshall Mount Creek, Macquarie Rivulet and Lake Illawarra) have not been completed.	The development footprint poses a low – moderate risk with respect to groundwater. The Concept Plan Modification Comment (Douglas Partners 2018) and Watercycle and Flood Management Strategy Updates (JWP 2019) are consistent in their conclusions that the proposed increase in yield would be unlikely to affect GDEs, assuming that detailed design for areas above RL-20 is undertaken at the DA stage. These assessments have remained consistent with the initial Water Cycle Management Study (Cardno 2010), Flood Modelling Report (2011) and Groundwater Assessment (2010) initially prepared for the CUDP. The Ethos Urban Statement is based on these results and the recommendation that detailed study is undertaken for areas of moderate groundwater risk and is therefore consistent with the results of the technical studies. A site inspection by Dr Peter Hancock on 3 April 2019 revealed that the reaches of Marshall Mount Creek and Macquarie Rivulet that are dependent on groundwater (Figure 4) occur at the upstream end of the Project boundary. Therefore, recharge of the aquifer supporting these river baseflow GDEs will occur outside of the area proposed for fill.

Issue raised	Response
The conclusion 'Below RL 20 or in localised low lying areas adjacent to creek-lines, groundwater may present itself as a moderate constraint due to its proximity to the ground surface. This will require further assessment in the subsequent development stages.'	This conclusion was made by Douglas Partners (2010) in their Groundwater Assessment. As above response indicates, the conclusion in the updated report by Douglas Partners (2018) is consistent with the conclusions made in 2010.
Local groundwater present in 'shallow aquifers' generally 'contained in the alluvial deposits of Marshall Mount Creek and Macquarie Rivulet' and 'limited by the underlying bedrock' (Douglas Partners, 2010) are considered likely to be providing base flow into both waterways (i.e. base flow stream ecosystem). This hydrological connectivity is considered to form an important functional element in the maintenance of the aquatic biodiversity values and services and the persistence of the Marshall Mount Creek and Macquarie Rivulet GDE's [sic]. It's clear from the preliminary geotechnical investigations that there is a very high probability of alteration of spatial and temporal flows into the shallow aquifers and GDE's [sic] these are expected to support.	The reaches of Marshall Mount Creek and Macquarie Rivulet that are dependent on groundwater (Figure 4) occur at the upstream end of the Project boundary, so recharge of the aquifer supporting these river baseflow GDEs will occur outside of the area proposed for fill. The Groundwater Assessment concluded that areas of above RL-20 (i.e. areas of alluvial deposits) would require careful planning when deep cuts (>2m) are expected to occur (Douglas Partners 2010). Further, this risk was considered a moderate groundwater constraint (Douglas Partners 2010). The Assessment also concluded that with careful planning at these stages and strategic placement of basins, impacts on above RL-20 could be avoided. Increased flows from hard stand surfaces is expected, however these would be managed through measures outlined in the Water Cycle Management Study (Cardno 2010). The updated Watercycle and Flood Management Study assessed the impact of increased lot yield on flood impacts (JWP 2019). The study concluded that utilising the latest TUFLOW model and WSUD model the increase in lot yield would still meet water quality objectives, would not alter flow regimes and would not increase flood risk (JWP 2019). Provided appropriate groundwater and water cycle management measures are implemented development in areas of above RL-20 changes to spatial and temporal flows would be minimal and would not significantly affect the GDEs. This is because most of the recharge areas occur outside the project area and the use of compacted material in the floodplain was approved in the Concept Plan. Compacted fill is likely to intercept rainwater. However, the use of compacted fill has not arisen due to this proposed increase in yield. The use of fill is consistent with the Approved Concept Plan and subsequent modifications.
There is no mention or assessment of potential impacts to DPI mapped Key fish habitat of Marshall Mount Creek, Macquarie Rivulet and Lake Illawarra in accordance with the Policy and guidelines for fish habitat - conservation and management (DPI, 2013) in the Ecological (2018) report.	Marshall Mount Creek and Macquarie Rivulet are mapped as Key Fish Habitat and would likely be classified as Class 2 – Moderate Key Fish Habitat. Portions of these watercourses are located in the study area. No development within the Key Fish Habitat areas are expected, and the implementation of measures to manage indirect impacts would be implemented. These include the management of water quality, restoration and improvement of riparian vegetation along waterways and removal of significant agricultural nutrient inputs. If any impacts to Key Fish Habitat were to occur, a permit under Section 200 / 201 of the *Fisheries*

Issue raised	Response
	Management Act 1994 would be required at the DA stage. However, impacts on these habitats are not expected and would be actively avoided to minimise any potential harm to the environment.
It is clear that Marshall Mount Creek, Macquarie Rivulet and Lake Illawarra are important aquatic habitats and significant and ecologically sensitive areas. Consistent with Actions of the Illawarra-South Coast Regional Plan (I-SRP, DPE 2015), although the SEAR's require inclusion of Lake Illawarra in the impact assessment, the study area of the aquatic ecology impact assessment has generally overlooked Lake Illawarra. The statement by Ecological (2018) that 'The lake [Lake Illawarra] is an important ecological and recreational feature in the region and some of the fringing wetlands are unlikely to be influenced by flows from this site.' presents a vague impact assessment and needs clarification eg identify (by mapping) what CM Act Coastal wetlands, Key fish habitat and DPI (2009) mapped seagrass beds in Lake Illawarra are likely to be impacted and what would be the severity and timeframe for the impacts.	Key Fish Habitat is mapped along Marshall Mount Creek and Macquarie Rivulet in the development footprint (Figure 1). The Coastal Management SEPP maps Marshall Mount Creek as a Coastal Wetland (Figure 2). There are no estuarine macrophytes mapped within the development footprint. The closest aquatic macrophytes are mapped along the edges of Lake Illawarra (Figure 3). Direct impacts on coastal wetlands, estuarine macrophytes or Key Fish Habitat is not expected. Indirect impacts would be managed through a range of environmental management measures implemented throughout the life of the project. These would include sediment and erosion control measures prior to and during construction, implementation of Vegetation Management Plans, water sensitive urban design (WSUD) features to treat hard surface runoff, prevention of runoff into existing waterways, flood management measures and strategic placement of water quality basins. These decisions have been based on the results of numerous studies including a Water Management Study (Cardno 2010), Flood Study (Rienco Consulting 2010). Floodplain Risk Management Study (Cardno 2011), Groundwater Assessment (Douglas Partners 2010) and the updated Watercycle and Flood Management Strategy Update (JWP 2019). The Water Management Study concluded that the WSUD features implemented would improve stormwater quality for any water originating at the site, and reduce pollutant loads such that they would meet the annual load reduction targets (Cardno 2010). The management of pollutant loads, and stormwater runoff described, are consistent with the national water quality guideline Australian Runoff Quality and meet the then Director General's Requirements for water quality and water sensitive urban design related issues (Cardno 2011). The Watercycle and Flood Management Study assessed the impact of increased lot yield on flood impacts (JWP 2019). The study concluded that an increase in lot yield would increase the pollutant loads generated from the development. However, water quality objectives can still be met by increasing the size of treatment devices within some areas in the footprint. Updated modelling of expected pollutant loads into wetlands 6a, 6b and 6c concluded that the current size of the wetlands was sufficient to support an increased pollutant load and ensure that minimum water quality objectives are still met (JWP 2019). In addition,

Issue raised	Response
	increasing the size of treatment devices in other areas would ensure that the increase in lot yield would not affect water quality objectives (JWP 2019). Therefore, any likely impacts expected to occur would be indirect and of very low severity over the life of the development.
In view of the significant limitations of BoM Groundwater Dependent Ecosystems Atlas geospatial database 'potential' GDE mapping of 'Aquatic Ecosystems' for the Sydney Basin Bioregion, the Ecological (2018) two paragraph discussion on GDE's is unsatisfactory and not considered to be 'a detailed assessment of the potential impacts of the proposal'	There are three Groundwater Dependent Ecosystems (GDE) mapped in the Project area footprint (Figure 4). A site inspection confirmed that the two river baseflow reaches are likely to be connected to shallow groundwater, as the stream water level corresponded to the approximate water level in nearby bores. It is unlikely that the vegetation community indicated as groundwater dependent and dominated by *Eucalyptus tereticornis* (ER4) is groundwater dependent. This is because the area is elevated and probably has no connection to the floodplain. A Groundwater assessment (Douglas Partners 2010) was conducted across the entire Project area. The Groundwater Assessment provides further detail on GDE. The assessment concluded that generally, groundwater would be unlikely to present a constraint to development in areas of above RL 20.
Further surveys and impact assessments are required by specialist aquatic ecologists who are experienced in impact assessment of the full range of ecosystems that fall into the definition of GDE's either as part of the current investigation or to accompany future investigations as Statement of Commitment (SoC) requirement. Given the scale of the project modification it is not unreasonable that the same level of detail for impacts on GDE's be investigated and assessed as required in the SEAR's for the Albion Park Rail Bypass (SSI 6878).	A site inspection was conducted by groundwater ecologist Dr Peter Hancock on 3 April 2019. Two river baseflow GDEs occurred along short reaches of Marshall Mount Creek and Macquarie Rivulet. These would be partially dependent on groundwater during dry periods but would also depend on overland flow during periods where flow is present. Sections of the aquifers responsible for providing baseflow to these waterways are outside of the areas proposed for fill, so their recharge regime will be unaffected and connectivity between the river and aquifer will be maintained. Groundwater assessment indicates that there is not likely to be a significant change in groundwater flows as a result of the change in yield for this proposed modification. The vegetation community at ER4 is not likely to be dependent on groundwater, as it is raised above the floodplain. Earthworks adjacent to this location also indicate that the water table is below the likely rooting depth of the trees. Further, Statement of Commitment 69 was included to specifically address future development below RL 20 as follows: *Future detailed applications will include a commitment, that where cuts greater than 2 metres in depth are proposed in areas located below RL 20, during detailed design and construction activities a suitably qualified PCA will certify that wetland base levels are appropriately positioned relative to the level of the ground water*

Issue raised	Response
	table, lining of wetlands has been provided if necessary, and, should the base of the wetlands intercept the groundwater table, then the groundwater table will be temporarily lowered to facilitate construction.
Given the Directions and Actions of the I-SRP (DPE 2015) and current priority Actions that relate to Lake Illawarra, the revised aquatic ecosystems impact assessments need to have significantly more content on the probable construction and in perpetuity impacts of the project on Lake Illawarra that incorporates the impacts of Albion Park Rail Bypass as part of the cumulative impact assessment	The Illawarra Shoalhaven Regional Plan (the Plan) outlines one Action specifically relating to Lake Illawarra: "*Implement a risk-based decision-making framework to manage water quality and waterway health outcomes for Lake Illawarra"* (NSW DP&E 2015). According to the Plan, Office of Environment and Heritage would assist Council in ensuring that the water quality of Lake Illawarra is maintained or improved. No specific water quality or river flow objectives are contained within this plan (NSW DP&E 2015). The *Risk-based Framework for Considering waterway Health Outcomes in Strategic Land-use Planning* (Dela-Cruz et al 2017) included a case study for Lake Illawarra. That report stated: [T]*he post-development stormwater TN load-reduction targets specified in the local council's DCP improve the micro-algal concentration in the lake, but not enough to meet the sustainable TN load. The 'no net increase' or 'no worsening' management response provides no improvements, if used ubiquitously. To meet the sustainable TN load, post-development stormwater TN load-reduction targets must be at least 20 per cent less than the existing load from the planned sites of development.* The Water Cycle Management Study concluded that the *"development will improve stormwater quality for water originating from the site. The pollutant load reduction also meets the required annual load reductions of 80%, 45%, 45% TSS, TP and TN respectively from urban developed areas, in accordance with the national water quality guideline Australian Runoff Quality"* (Cardno 2010). The updated Water Cycle Management Study has re-designed the Water Sensitive Urban Design model (WSUD) to manage increased surface runoff and pollutant loads associated with the increase in lot density (JWP 2019). These design iterations have been modelled on maintaining the same pollutant load reduction achieved in the Cardno 2010 Water Cycle Management Study (JWP 2019). Further, the WSUD model has been developed consistent with both Wollongong City Council and Shellharbour City Council traditional water quality objectives which aim at post development flows that achieved an 85% reduction in Total Suspended Solid (TSS), 65% reduction in Total Phosphorous (TP) and 45 % reduction in Total Nitrogen (TN) (JWP 2019). This would meet or exceed the targets as identified in the Dela-Cruz et al report (2017). Further, the benefit map as shown in the Dela-Cruz (2017) report identifies that the area

Issue raised	Response
	within which the Calderwood project sits, should aim for a maintain or improve outcome. The modelling as shown in the Cardo and JWP reports show that improvement is feasible. Flood modelling was updated using recently available data that was not available at the time of the 2010 Flood Management Study (Rienco 2010). The updated Water Cycle Management Study concluded that the increase in development density would have comparable flood impacts to those outlined in the Concept Approval and subsequent development applications (JWP 2019). Further, the updated Water Cycle Management Study concluded that "*…the development of CUDP in accordance with this strategy will be consistent with the controls and principles established by the NSW Government…. Though there has been a refinement of design, the revised water cycle and flood management strategy remains consistent in philosophy with the original 2010 concept approval"* (JWP 2019). There is no requirement as part of the Plan or other water quality guidelines to assess cumulative impacts of a project to water quality or flooding.
The Modification to Calderwood Part 3A Concept Plan Biodiversity Assessment (Ecological, 2018) states it will outline any consultation with relevant government stakeholders including WCC. It is noted that there is no discussion of consultation on biodiversity and riparian matters with WCC in the Ecological (2018) report as none has occurred.	Noted.
Riparian	
The Ecological (2018) and JWP (2018) reports have entirely overlooked the Illawarra Water Quality and River Flow Objectives for the Illawarra catchments including but not limited to the Water Quality Objectives for protection of, aquatic ecosystems and secondary and primary recreation contact and River Flow Objectives for maintaining 'natural rates of change in water levels' through measures to, 'Maintain natural flow variability' and 'Manage groundwater for ecosystems' amongst other things.	The Illawarra Water Quality and River Flow Objectives are synonymous to the ANZECC 2000 Guidelines (DECCW 2010) which were used as a basis to determine required pollutant reductions in the Water Cycle Management Study (Cardno 2010) and the subsequent updated Water Cycle Management Study (JWP 2019). The pollutant reduction targets identified in the Water Cycle Management Study would result in reduced pollutant loads below the ANZECC triggers. Thus, the development could be considered consistent with the Illawarra Water Quality and River Flow Objectives.
Given the incompleteness of the GDE impact assessment and other issues highlighted above, the riparian impacts assessment is considered to be equally incomplete and further impact assessments are required either as part of the current investigation or to accompany future investigations as SoC requirements.	Two riparian corridors originally marked for retention (reaches 15 and 35) are proposed for removal. Reaches 15 and 35 are both first order streams. A water quality basin is proposed to replace part of reach 35. The installation of a basin would allow the modification to proceed without increasing flood risk (JWP 2019). Reach 15 would be partially removed, with only the terminating arm to be affected. An additional basin would be installed adjacent to the portion of the reach that would be retained to accommodate for the changes to the

Issue raised	Response
	reach (JWP 2019). The changes to reach 15 were part of the assessment conducted by JWP (2019). The assessment concluded that additional impacts to watercycle management and flooding are not expected to occur. The Water Cycle Management Study concluded that the development would improve stormwater runoff for water that originates from the site (Cardno 2010). The updated Water Cycle Management Study has re-designed the Water Sensitive Urban Design model (WSUD) to manage increased surface runoff and pollutant loads associated with the increase in lot density (JWP 2019). These design iterations have been modelled on maintaining the same pollutant load reduction achieved in the Cardno 2010 Water Cycle Management Study (JWP 2019). Further, the WSUD model has been developed in accordance with best practice water quality objectives which aim at post development flows that achieved an 85% reduction in Total Suspended Solid (TSS), 65% reduction in Total Phosphorous (TP) and 45 % reduction in Total Nitrogen (TN) (JWP 2019). Flood modelling was updated using recently available data that was not available at the time of the 2010 Flood Management Study (Rienco 2010). The updated Water Cycle Management Study concluded that the increase in development density would have comparable flood impacts to those outlined in the Concept Approval and subsequent development applications (JWP 2019). Further, the updated Water Cycle Management Study concluded that "*…the development of CUDP in accordance with this strategy will be consistent with the controls and principles established by the NSW Government…. Though there has been a refinement of design, the revised water cycle and flood management strategy remains consistent in philosophy with the original 2010 concept approval"* (JWP 2019). As such, additional assessments of potential impacts to riparian corridors is not considered necessary. Further there are about 18 Statements of Commitment that relate to riparian assessments and management measures. In addition, Statement of Commitment 69 specifically relates to the requirement to assess impacts on GDE at the design stage.

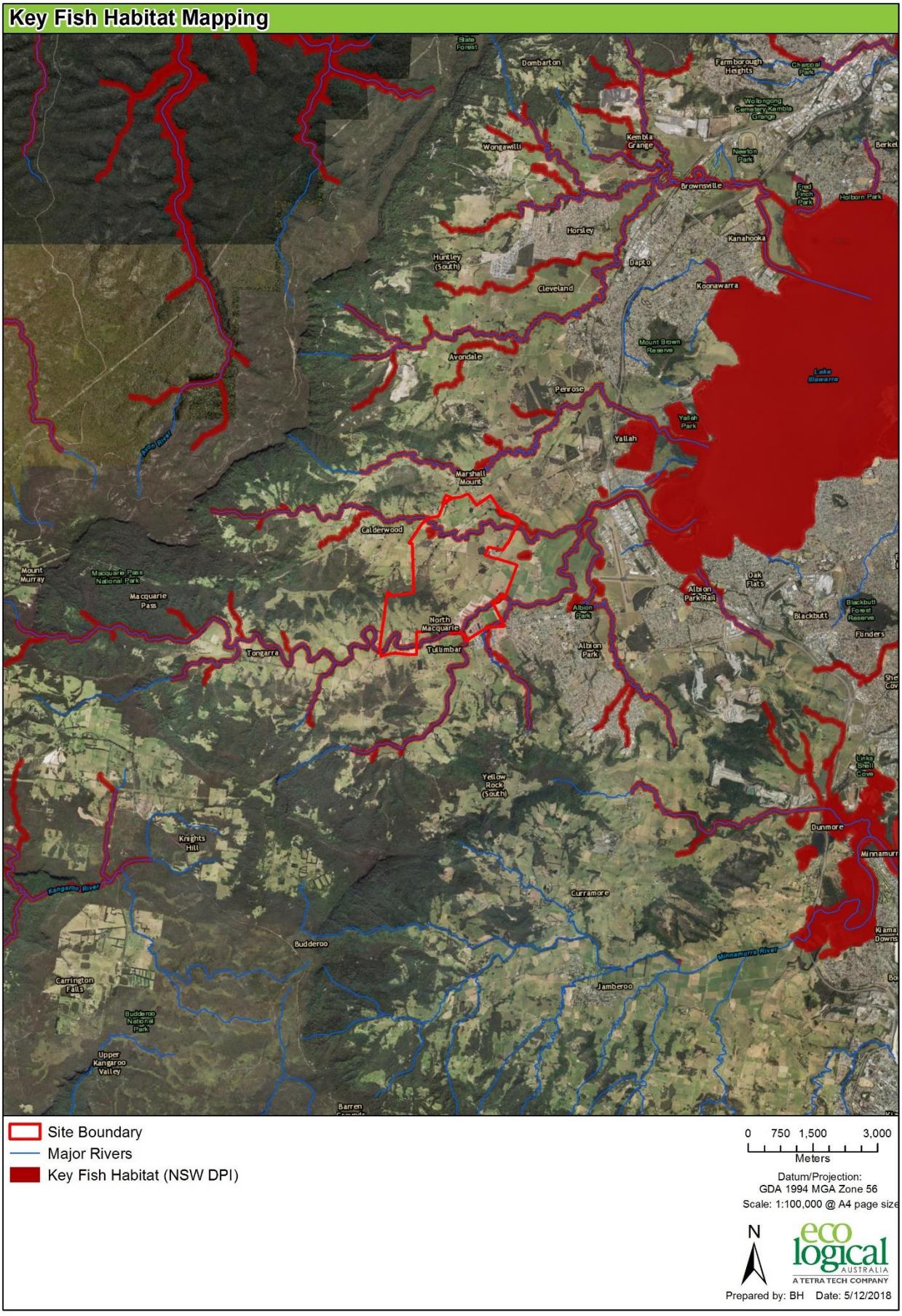

Figure 1: Key Fish Habitat within the study area and locality (source: NSW DPI)

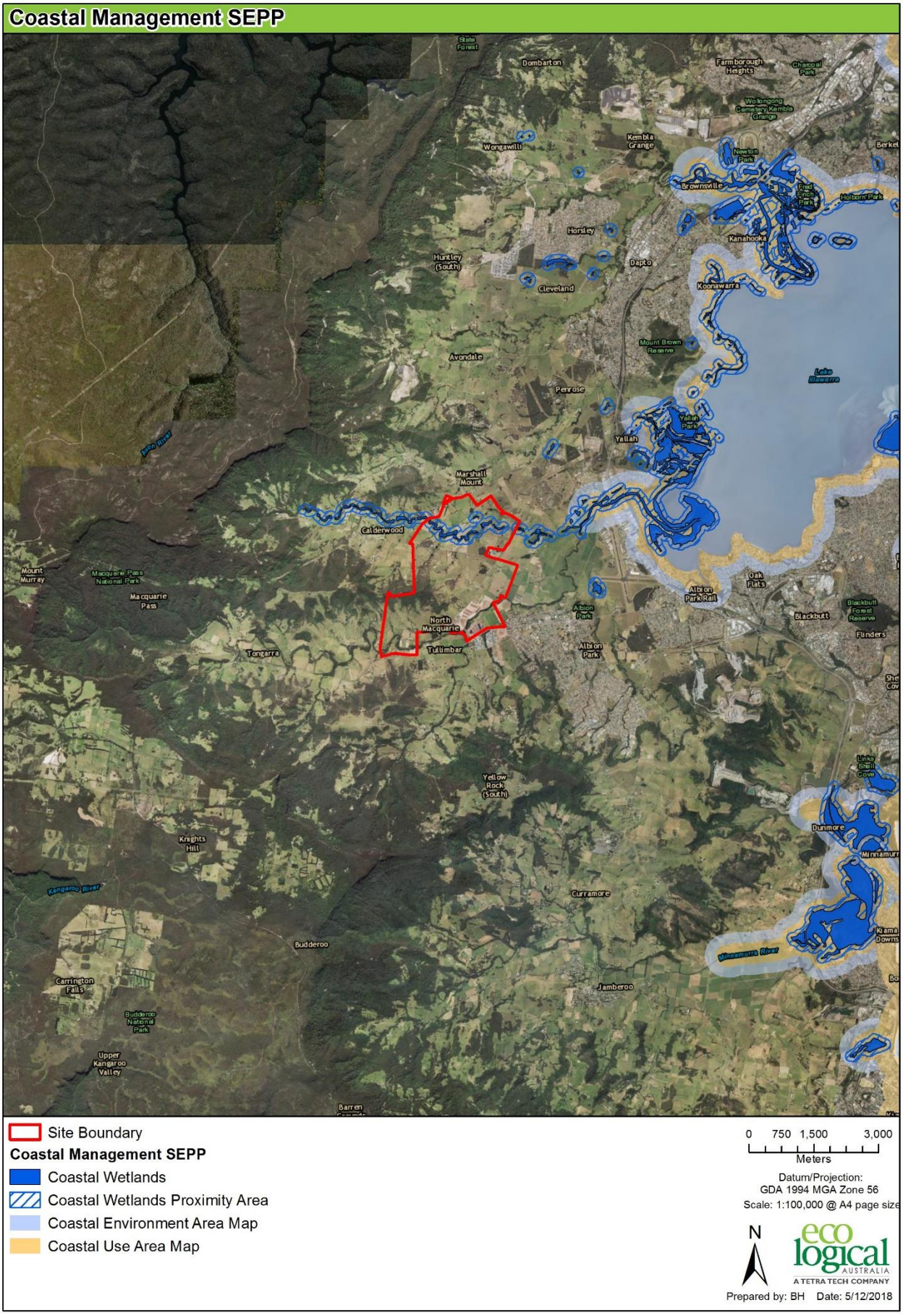

Figure 2: Coastal Management SEPP mapping in the study area and locality (Source: Coastal Management SEPP)

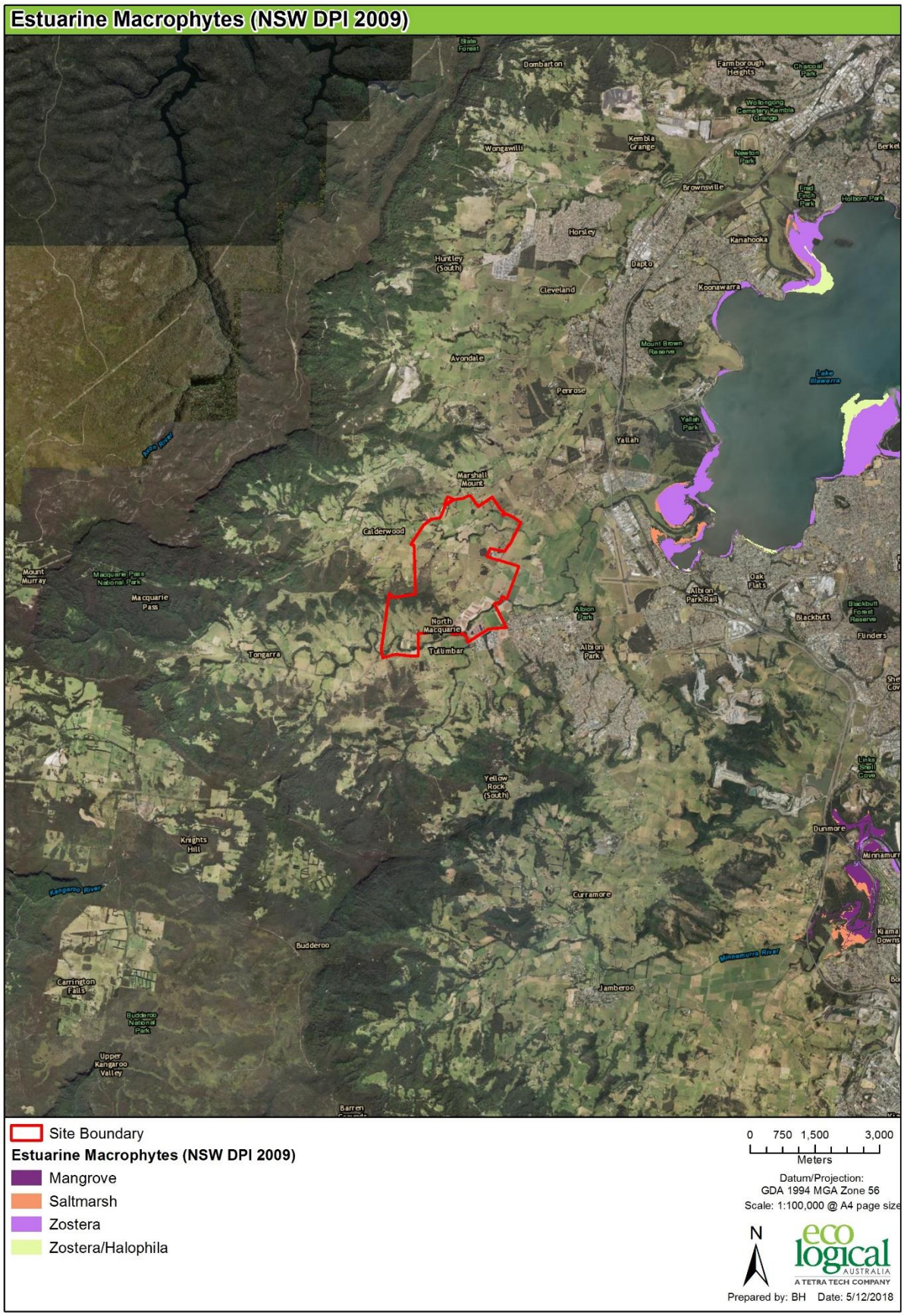

Figure 3: Estuarine Macrophytes mapped by NSW DPI (2009) in the locality and study area (Source: NSW DPI 2009)

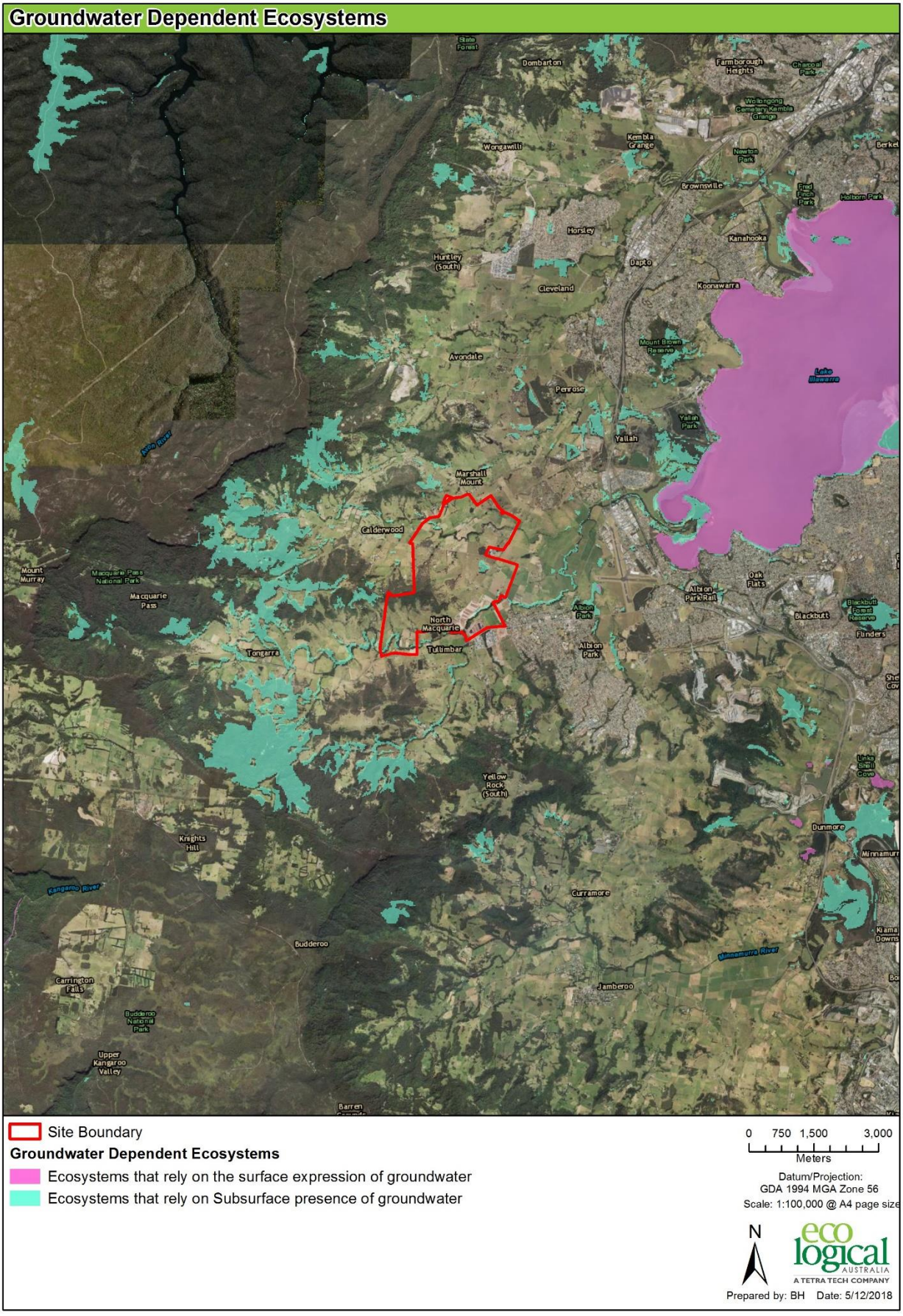

Figure 4: Groundwater dependent ecosystems in the development footprint and locality (Source: Bureau of Meteorology 2018)

Table 2: Detailed response to issues raised by Shellharbour City Council

Issue raised	Response
The Proponent for the proposed modification has not appropriately addressed the environmental impacts of the proposed changes, especially riparian corridors, threatened endangered communities, and threatened flora and fauna.	The SEARs do not require consideration or assessment of EPBC Act listed matters as it is a separate jurisdiction under the Commonwealth. As such, it will be separately addressed in accordance with the EPBC Act. Eco Logical Australia undertook an assessment of the 2010 lot layout and the proposed lot layout to determine whether any additional impacts on threatened ecological values would be likely. The assessment determined that no additional native vegetation, threatened flora or threatened fauna or their habitats would be affected. This included consideration of change in listings to threatened ecological values known to occur across the study area. Detailed assessments for impacts on threatened ecological values will be conducted for each relevant stage DA. However, it should be noted that the proposed modification in terms of impacts on threatened matters is consistent with impacts assessed for the current and approved Concept Plan.
It is considered that the proposal requires referral to the Commonwealth under the Environmental Protection and Biodiversity Conservation Act	The SEARs do not require consideration or assessment of EPBC Act listed matters as it is a separate jurisdiction under the Commonwealth. As such, it will be separately addressed if required.
The Biodiversity Report prepared by Ecological states that 'Significant impacts on Illawarra and South Coast Lowland Forest and Woodland are unlikely'. Full surveys detailing the extent of EPBC Act listed matters are required to support this statement and to Council's knowledge they have not been conducted. It is proposed to remove over 11 hectares of potential Illawarra and South Coast Lowland Forest and Woodland and cause habitat disturbance to both The Australian Painted Snipe and Swift Parrot. Referral to the Commonwealth regarding EPBC is required as these species have been listed since the original concept plan. EPBC listing is retrospective and impacts on Matters of National Environmental Significance must be considered prior to any works commencing.	The SEARs do not require consideration or assessment of EPBC Act listed matters as it is a separate jurisdiction under the Commonwealth. As such, it will be separately addressed if required.
An assessment of the impact of the proposal on DPI Fisheries mapped key fish habitat of Marshall Mount Creek, Macquarie Rivulet and Lake Illawarra is required in accordance with the Policy and guidelines for fish habitat - conservation and management (DPI, 2013) in the Ecological (2018) report.	Marshall Mount Creek and Macquarie Rivulet are mapped as Key Fish Habitat and would likely be classified as Class 2 – Moderate Key Fish Habitat. Portions of these watercourses are located in the study area. No development within the Key Fish Habitat areas are expected, and the implementation of measures to manage indirect impacts would be implemented. These include the management of water quality, restoration and improvement of riparian vegetation along waterways and removal of significant agricultural nutrient inputs. If any

Issue raised	Response
	impacts on Key Fish Habitat were to occur, a permit under Section 200 / 201 of the *Fisheries Management Act 1994* would be required at the DA stage. However, impacts on these habitats are not expected and would be actively avoided to minimise any potential harm to the environment.
A number of Statements of Commitment are proposed to be changed which will have negative impacts on the long-term management of significant biodiversity at the site. Details on changes and their impacts are provided earlier in this submission: Commitment 28 – Proposed to be deleted. This commitment must remain as it refers specifically to Environmentally Significant Lands, which are not referred to in the Condition C3 of the Concept Plan.	Statement of Commitment 28 will be modified not deleted. This will be reflected in the Proposed Riparian Corridor Network drawing at Appendix B of the Response to Submissions prepared by Ethos Urban (dated 31 May 2019)..
Commitment 35 – Proposed to be deleted. This commitment must remain as it refers specifically to Environmentally Significant Lands, which are not referred to in the Condition C3 of the Concept Plan.	The revised statement of commitment proposes to retain SoC 35 following commentary from agencies including Shellharbour Council. The revised condition states that vegetation management plans shall be submitted at each relevant application stage for lands identified on the Special Subdivision Area map (SSA map) (Lendlease 2017). The SSA map is generally consistent with the areas of ESL originally mapped within the approved concept plan. The SSA map is largely consistent with the riparian corridor network within the approved concept plan.
Commitment 37 – Refers to surveying for the Illawarra Greenhood Orchid which is proposed to be deleted as surveys have been conducted. As the project spans 20 years, surveys conducted at the start of the project are no longer valid. Surveys must be conducted as required at each stage of the development and the commitment must remain.	Eco Logical Australia has conducted full surveys of all areas of potential habitat for *Pterostylis gibbosa*. Surveys were undertaken when the species was known to be in flower. Survey effort is as follows: • September 2012 across all patches of good quality Illawarra and South Coast Lowland Forest and Woodland consistent with the SoC • October 2016 across all boundaries of ESL Land • December 2016 across all patches of potential habitat within Stage 3C. The remaining stages that have not been developed do not contain potential habitat for this species and would not require survey consistent with Statement of Commitment 37. This SoC has been fully adhered to and does not require further action.
Impacts on Riparian corridors and ESL by the increasing of flood mitigation has not been adequately assessed. Areas proposed for regrading- decreased elevation, adjacent to ESL require further assessment for impacts on ESL and biodiversity of Riparian River Oak Forest.	Potential additional impacts from flooding to riparian corridors and ESL has been addressed in the Water Management Report (JWP 2019). The study re-modelled the potential flood risk using the latest version of Shellharbour Council's flood model. The flood model concluded that the increase in density will have minimal impacts on flood affection for Marshall Mount

Issue raised	Response
	Creek and Macquarie Rivulet (JWP 2019). No direct impacts are expected to occur to riparian corridors or areas of ESL. Indirect impacts would be managed through a range of environmental management measures implemented throughout the life of the project. These would include sediment and erosion control measures prior to and during construction, implementation of Vegetation Management Plans, water sensitive urban design (WSUD) features to treat hard surface runoff, prevention of runoff into existing waterways, flood management measures and strategic placement of detention basins. These decisions have been based on the results of numerous studies including a Water Management Study (Cardno 2010), Flood Study (Rienco Consulting 2010). Floodplain Risk Management Study (Cardno 2011), Groundwater Assessment (Douglas Partners 2010) and a Watercycle and Flood Management Strategy Update (JWP 2019). The Water Management Study concluded that the WSUD features implemented would improve stormwater quality for any water originating at the site, and reduce pollutant loads such that they would meet the annual load reduction targets (Cardno 2010). The management of pollutant loads, and stormwater runoff described, are consistent with the national water quality guideline Australian Runoff Quality and meet the then Director General's Requirements for water quality and water sensitive urban design related issues (Cardno 2011). The Watercycle and Flood Management Study reassessed and re-modelled the impact of increased lot yield on flood impacts (JWP 2019). The study concluded that an increase in lot yield would increase the pollutant loads generated from the development. Water quality objectives can still be met by installing proprietary GPT units at each stormwater discharge point and creating 28 wetlands (or other suitable treatment devices) scattered across the development, which will range in size from 500 m^2 to 14,000 m^2. The number of devices proposed to manage stormwater runoff and associated pollutants has not increased since the original 2010 Concept Plan (JWP2019). Based on the above, JWP (2019) concluded that the increase in lot yield would not impact water quality objectives (JWP 2019). Therefore, any likely impacts expected to occur would be indirect and of very low severity over the life of the development.
The removal of Stream Reach 15 has not been addressed. The Proponent states that there is no modification to the Concept Plan Approval Riparian Corridor Network. This is incorrect. The removal of Stream Reach 15 must be included in the Riparian Corridor Network and an	The entire length of Reach 15 is not proposed for removal. Partial removal of stream 15 was included in the Environmental Assessment Report (Ethos Urban 2018) and addressed by Eco Logical Australia (2018). The portion of Reach 15 to be removed is the terminating arm of the

Issue raised	Response
updated Riparian Consistency Report is required.	stream. Both the EAR and the Biodiversity Assessment Report concluded that the removal of the terminating arm of this reach would be unlikely to significantly impact the overall functioning of the riparian network throughout the site. A water quality basin is proposed adjacent to the portion of reach 15 that would be retained.
CW3- has been moved into Citywide Bushland (from the 2011 Landscape Masterplan), this area is unsuitable for Open Space- Passive due to the steepness of the terrain CW3- extension- Part of Johnson's Spur is proposed to be changed to open space from ESL and E2, E3 to passive open space. This is conflicts with the objectives of ESL and the zoning. The altered management regime to accommodate passive open space requires environmental assessment. The SOC's require Vegetation Management Plans (VMP's) to regenerate these areas, the objectives of which would be inconsistent should the area be passive open space. Additionally, a number of areas have approved VMP's, which are currently being implemented. A change in land use would conflict with the objectives of the VMP's.	The VPA states that CW3 would be 3.43 ha of hilltop bushland park with embellishment in E2 and E3 land including a range of amenities and sports spaces. CW3 was then included in the Landscape Masterplan (Taylor Brammer 2016). The proposed park would be consistent with the Voluntary Planning Agreement, and its final location would be agreed to via consultation with Council. The location of CW3 in the current masterplan and Landscape Masterplan is consistent with the location outlined in the VPA, which was signed by Shellharbour City Council.
D4- Non-core Land. This District Park is located in a Riparian Corridor, Evidence as to how this land use aligns to riparian corridor objectives is required.	D4 is mapped as a district park. This remains consistent with the approved Concept Plan (JBA 2010). Schedule 4 of the VPA lists D4 as forming 3.8 ha of park within the Village Centre. The VPA was signed by Shellharbour City Council on 15 September 2014.
CW2 is located in a water body (see Figure 6- Watercycle Management), which is not consistent with the requirements of passive open space.	CW2 is not located within a water body. It is located to the south of Marshall Mount Creek. The northern portion of CW2 is a proposed location for a watercycle management device. The Landscape Master Plan permit waterbodies included as park features and assets. The CW2 park is proposed to include an urban waterbody – hard edge on the town centre side and soft of the Marshall Mount Creek side. This would form a passive, recreational community asset and contribute to health and well-being.
Link D4 to L11- this is a steep embankment leading to flood runners and unsuitable for passive open space.	Link D4 to L11 is mapped as a trail as part of the Landscape Masterplan (Taylor Brammer 2016) and was subject to the Stage 1 Approval (Delfin Lendlease 2009). The D4 to L11 link is not subject to the modification of the proposed yield increase and had been delivered as part of the Landscape Masterplan (Taylor Brammer 2016).
No areas of ESL should be utilised as public open space. Further assessment is required for any proposed creek/rivulet crossings. It is recommended that further consultation on suitable passive open space locations be undertaken with Council.	One area of ESL would be utilised as a citywide park (CW3). The location of CW3 within ESL and E2 / E3 formed part of the VPA that was signed by Shellharbour City Council on 15 September 2014. The exact location of the park would be determined through consultation with Council. No other areas of ESL are proposed to be utilised as public open space.

Issue raised	Response
Water Cycle and Flood Management Strategy – further detail is required on the level of cut and fill that is required in order to make a full assessment of the impacts on both Groundwater Dependent Ecosystems and wider biodiversity. Water quality targets outlined in the Risk Based Framework for Water Quality issued by the Office of Environment and Heritage, as included in the Illawarra Shoalhaven Regional Plan must be addressed. Not all ESL has been included in Figure 3 of the Water Cycle and Flood Management Strategy prepared by J Wydham Prince. This figure states it is for Marshall Mount Creek, however it covers the whole of the Concept Plan area including Macquarie Rivulet so all ESL should be illustrated.	This matter has been separately addressed by J Wyndham Price (JWP 2019). A site inspection was conducted by groundwater ecologist Dr Peter Hancock on 3 April 2019. Two river baseflow GDEs occurred along short reaches of Marshall Mount Creek and Macquarie Rivulet. These would be partially dependent on groundwater during dry periods but would also depend on overland flow during periods where flow is present. Sections of the aquifers responsible for providing baseflow to these waterways are outside of the areas proposed for fill, so their recharge regime will be unaffected and connectivity between the river and aquifer will be maintained. The groundwater assessment indicates that there is not likely to be a significant change in groundwater flows as a result of the change in yield for this proposed modification. The development footprint poses a low – moderate risk with respect to groundwater. The Concept Plan Modification Comment (Douglas Partners 2018) and Watercycle and Flood Management Strategy Updates (JWP 2018JWP 2019) are consistent in their conclusions that the proposed increase in yield would be unlikely to affect GDEs, assuming that detailed design for areas above RL-20 is undertaken at the DA stage. These assessments have remained consistent with the initial Water Cycle Management Study (Cardno 2010), Flood Modelling Report (2011) and Groundwater Assessment (2010) initially prepared for the CUDP. The Ethos Urban Statement is based on these results and the recommendation that detailed study is undertaken for areas of moderate groundwater risk and is therefore consistent with the results of the technical studies. The site inspection by Dr Peter Hancock on 3 April 2019 revealed that the reaches of Marshall Mount Creek and Macquarie Rivulet that are dependent on groundwater (Figure 4) occur at the upstream end of the Project boundary. Therefore, recharge of the aquifer supporting these river baseflow GDEs will occur outside of the area proposed for fill The Illawarra Water Quality and River Flow Objectives are synonymous to the ANZECC 2000 Guidelines (DECCW 2010) which were used as a basis to determine required pollutant reductions in the Water Cycle Management Study (Cardno 2010) and the subsequent updated Water Cycle Management Study (JWP 2019). The pollutant reduction targets identified in the Water Cycle Management Study would result in reduced pollutant loads below the ANZECC triggers. Thus, the development could be considered consistent with the Illawarra Water Quality and River Flow Objectives.
The proposal intends to remove the green corridor along North Macquarie Road between the Clover Hill development and Stage 3B south. No justification as to the removal is provided in	All riparian corridors, ESL and “green space” mapped in the approved concept plan (JBA 2010) forms part of the Special Subdivision Area.

Issue raised	Response
documentation.	
The proposal increases the width of Calderwood Road from 2 to 4 lanes. No environmental assessment on the impact of this has been conducted.	Modification C12(d) of the approved concept plan states that the upgrade of Calderwood Road from the site boundary to Tripoli Way would be required during future stages of work (JBA 2010). This has been recommended in the Traffic and Transport report prepared for the site (Cardno 2018). Impacts associated with the road upgrade would be provided as part of the relevant subdivision works (JBA 2010). Also note that Calderwood Road would remain two lanes with 6,000 dwellings.
Sportsfields & Detention basin – Stage 1. Conflicting land uses are illustrated on various plans. Clarification is sought on the exact proposal in this location.	There is no detention basin mapped adjacent to Stage 1A (Lendlease 2018).
Riparian Corridor SP1 south of Town Centre – School/Residential East. Concept Plan does not illustrate a riparian corridor to the north of proposed sportsfields. It is not clear how sportsfields can be accommodated in this area. The riparian corridor will be required to be regenerated in accordance with SOC requirements. The riparian corridor must be illustrated on all Concept Plans.	There is no riparian corridor south of the Town Centre. If Council is referring to the Environmental Reserve, this is not proposed as active open space, but passive /conservation land.

Table 3: Response to issues raised by Civil Aviation Safety Authority

Issue raised	Response
The potential for the development to introduce bird and wildlife hazards that may affect aviation safety should be considered.	The development would be unlikely to introduce new bird and wildlife hazards. The development would include landscaping of street trees and parklands. In some areas wetlands and water quality basins would be constructed. These features would likely attract birdlife to the locality. However, these features are currently present within the development footprint. The use of similar features in the proposed landscaping plan would be unlikely to increase the risk of bird strikes. A risk management approach would need to be taken when considering street tree plantings.
Wildlife hazard management plan: Consideration needs to be given to the final heights and bird attractions of landscaping provisions which potentially may cause a risk to aviation activities	The Landscape and Open Space Masterplan (Environmental Partnership 2010) outlines the overall treatments for the different public space zones in the project area. These include active recreation areas, natural bushland preservation and riparian corridors. Natural features such as Johnson's Spur would be retained. This feature is approximately 140 m above sea level and contains dense forest. The natural vegetation here would be retained.

Issue raised	Response
	The Landscape and Open Space Masterplan does not provide detailed lists of species to be planted. However, given there are currently large trees present across most of the existing elevations, there are unlikely to be any future plantings that would exceed the existing tree heights. A risk-based approach to managing any wildlife would be undertaken. It is not likely that any landscaping would attract birds to the extent that they would cause a hazard.

Table 4: Detailed response to issues raised by Department of Industry (Lands and Water Division)

Issue raised	Response
Appendix N of the Biodiversity Assessment Report identifies the mitigation measures for riparian land as (section 4.4.3 point 1) 'all lands covered by the ESL overlay or forming part of a riparian corridor would be managed consistent with the current Statement of Commitment 35 (SOC). The modified SOC proposes to remove commitment 35 as Vegetation Management Plans are required in accordance with Condition C3 of the Approved Concept Plan. It is recommended that the modification to the SOC maintains commitment 35 and include recommendations outlined in section 6 of the Biodiversity Assessment report prepared by eco logical Australia (July 2018).	The Biodiversity Assessment Report (ELA 2018) in section 4.4.3 does not suggest that SoC 35 should be removed. This is not suggested anywhere in the Biodiversity Assessment Report prepared by ELA (2018). The revised Statement of Commitments proposes to retain SoC 35 due to commentary from agencies. This was originally deleted under Mod 2, Condition C3.

Table 5: Detailed response to issue raised by Office of Environment and Heritage

Issue raised	Response
The proposed modification has addressed the SEARs requirement to consider likely offsetting implications under the NSW Biodiversity Conservation Act 2016. We recommend avoiding impacts to Illawarra Lowlands Grassy Woodland threatened ecological community in particular, insofar as possible for future development stages	The proposed increase in yield has been designed and undergone numerous iterations to avoid impacts on patches of Illawarra Lowlands Grassy Woodland in good condition. Impacts on this community have been minimised by concentrating the proposed lot yield increase in areas where the patches of the community are isolated and in poor condition. Further refinements at each individual lot stage will occur.

Table 6: Detailed response to issues raised in public submissions

Issue raised	Response
Restoration work needs to be carried out to remove silt from the river and revegetation work to restore the river banks and reduce any further erosion and sediment in the river and its banks	The intent of the Vegetation Management Plans which are committed to in Condition C3 of the approved concept plan that details a range of measures to demonstrate improvements to water quality and also detail requirements for rehabilitation / revegetation works. Further, the water studies provided for by other consultants show a range of environmental management measures which require that there are improvements to water quality entering these important riparian systems. Modelling has shown that through implementing these measures, there will be a net benefit to the waterways through improvements in a range of water chemistry attributes (JBA 2018).
Road upgrades cannot compromise habitat or have a detrimental impact on wildlife or vegetation corridors	The detailed design of road upgrades has not yet been completed. At the DA stage, there will be a requirement to demonstrate avoidance, then minimisation and mitigation of any impacts on native vegetation and habitat. Advice on constraints and opportunities for managing habitat and wildlife will be undertaken at the detailed design stage.

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