SouthmetroConnect

Roe Highway Extension

Response to Public Submissions

31 May 2013

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GOVERNMENT OF WESTERN AUSTRALIA

mainroads WESTERN AUSTRALIA

AECOM

Seeking **collaborative solutions** for extending Roe Highway

Response to Public Submissions

Project Brief

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Contents

List of Figures

List of Tables

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1. Introduction

1.1. Background

Main Roads Western Australia (Main Roads) proposes to construct the Roe Highway Extension ("the project") by extending Roe Highway approximately five kilometres from its current terminus at the Kwinana Freeway in Jandakot to Stock Road in Coolbellup. In August 2009, Main Roads and industry partner, AECOM Australia, formed the South Metro Connect (SMC) alliance. SMC was created for the development phase of the project to work collaboratively with stakeholders and regulatory authorities to develop an environmentally, socially and economically acceptable project design and obtain relevant statutory environmental and heritage approvals.

The project is located approximately 14 kilometres south of Perth within the Swan Coastal Plain Bioregion. The project area is largely contained within the City of Cockburn, however, parts of the design extend northward in to the City of Melville along Murdoch Drive and Kwinana Freeway. Generally, the proposed project is oriented east-west largely, within a road reserve that was set aside in the Metropolitan Region Scheme (MRS) in 1963. The alignment is between North and Bibra Lakes, which are part of the Eastern Chain of the Beeliar Wetlands.

The project will consist of a dual carriageway with two lanes in each direction, separated by a concrete barrier in place of a median strip. The preferred design was selected following an extensive options analysis and consultative process. Once selected, the preferred design was optimised to avoid and minimise environmental impacts to the maximum extent possible.

1.2. Public Environmental Review and response to submissions

In 2009 the project was referred to the Environmental Protection Authority (EPA) under the *Environmental Protection Act 1986* (EP Act), and to the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) under the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act). The project was set a level of assessment of Public Environmental Review (PER) and the bilateral agreement between the State and Commonwealth governments was enacted. SMC submitted the PER to the Office of the Environmental Protection Authority (OEPA) on 20 June 2011 for a 12 week public review period.

A total of 3283 submissions were received in response to the Roe Highway Extension PER document. Of these, 29 submissions were from organisations and government agencies and a further 420 were from members of the public. This included a single submission of a petition with 189 signatures. This includes 2834 submissions which contained "pro forma" text from the Conservation Council of Western Australia website, as well as individual comments.

The OEPA summarised these submissions and provided this summary to SMC to address. From the 3283 submissions, a total of 275 separate questions were identified in the OEPA summary to be addressed by SMC. The OEPA's "Summary of Public Submissions" is included as Appendix A for the information of the reader.

Each point raised in the Summary of Public Submissions has been addressed. Those responses form the basis of this document.

1.2.1. OEPA Request for Additional Information

SMC submitted a draft Response to Submissions document to the OEPA on 13 July 2012. The OEPA replied to SMC on 20 Nov 2012, following consultation with various decision making authorities (Appendix B). The OEPA requested additional information on seven items:

- Groundwater Dependent Ecosystems – Construction Impacts
- Drainage
- Wetlands
- Flora and vegetation
- Fauna
- Aboriginal Heritage
- General

These items are addressed specifically in Section 5. Where there is a change between this document and the previous draft of the response to submissions document submitted on 13 July 2012, this has been listed in Appendix C.

1.3. Structure of this Document

This Response to Submissions document has five components. Those components and their purposes are:

1) Introduction – this introduction is intended to provide the context of the Response to Submissions document.
2) Description of the project –the project has not changed significantly since the issue of the PER, but the description of the project has been amended to more clearly define the project activities and the environmental impacts of the project.
3) Responses to Submissions – all points raised in the OEPA's "Summary of Public Submissions" (Appendix A) are addressed in this section. Many responses are of a similar nature, so rather than repeat the same response, submissions that have a similar answer have been grouped together. Submission numbers in the Response to Submissions reflect the numbering of the OEPA summary in Appendix A. The numbering is arranged by topic and not by submitter.
4) OEPA Request for Additional Information – the seven items of additional information requested by the OEPA are addressed in a separate section. In addressing these requests for additional information, other parts of the previously submitted draft response to submissions document may have been edited
5) Appendices – The appendices contain a number of new management strategies and reports that support the responses to submissions and better define how the project will manage environmental impacts. Appendices include:
    a) Appendix A – Summary of Public Submissions;
    b) Appendix B – OEPA Correspondence 20 November 2012
    c) Appendix C – Amendments
    d) Appendix D – Wetland Buffer Study;
    e) Appendix E – Water Management Strategy (WMS);
    f) Appendix F – Flora, Vegetation and Fauna Management Strategy (FVFMP);
    g) Appendix G – Rehabilitation Strategy;
    h) Appendix H – Targeted Sucking Millipede Survey;
    i) Appendix I – Offset Strategy;
    j) Appendix J – Noise Management Plan;
    k) Appendix K – Consultation with DoW;
    l) Appendix L – Technical Note: Potential impacts to groundwater flows from sub-surface compaction from road embankments
    m) Appendix M – Flora Consultation
    n) Appendix N – Consultation with WA Museum, and
    o) Appendix O – Aboriginal Heritage Surveys.

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2. Description of the Project

2.1. Background

SMC has continued to develop the project since the release of the PER. While there has been no substantial change to the project since the release of the PER, there have been some minor amendments to the description of the proposal that require clarification. The proposal description has been amended to more clearly reflect the requirements of the *Environmental Assessment Guideline No 1 Defining a Proposal*.

Section 2.2 contains the revised description of the project. All changes to the description from the PER are listed and explained in Section 2.3.

2.2. Description of the Project

Main Roads proposes to extend Roe Highway from its current terminus at Kwinana Freeway in Jandakot to Stock Road in Coolbellup, located approximately 14km south of Perth. The proposed project will consist of a dual carriageway with two lanes in each direction; separated by a concrete barrier in place of a median strip.

The road will be constructed entirely within government-owned land; however a short section will be constructed outside the MRS Primary Regional Roads boundary in order to accommodate an alignment that minimises environmental impacts. There will be no resumption of privately owned land. Construction of the proposed project will require the following key activities:

- Clearing of vegetation;
- Removal and stockpiling of topsoil;
- Construction of:
    - Road formation;
    - Earthworks, pavement and bituminous surfacing;
    - Drainage pipes and stormwater basins;
    - Principal Shared Paths (PSPs) and other pedestrian and cycle paths;
    - Retaining walls;
    - Bridges, underpasses and overpasses;
    - Fencing;
    - Fauna underpasses, pedestrian underpasses and culverts; and
    - Noise attenuation barriers.
- Relocation of powerlines and other services;
- Installation of street and PSP lighting;
- Installation of electrical infrastructure including but not limited to: traffic signals, variable message signs and cameras;
- Standard road signs; and
- Rehabilitation of areas disturbed for construction.

The operation of the proposed project will include the following key activities:

- Freight transport;
- Private and commercial vehicle movements;
- Stormwater management;
- Operation of street lighting and other electrical infrastructure; and
- Maintenance.

In order to accommodate the proposed works where they will occur outside the existing MRS boundary, a scheme amendment will be required and will be prepared following the Part IV impact assessment process (this process).

A summary of key details of the proposed project is provided in the key characteristics table below (**Error! Reference source not found.**).

Table 1: Key Characteristics Table

Summary of the Proposal

Proposal Title	Roe Highway Extension (Kwinana Freeway to Stock Road)
Short Description	The proposal is to extend Roe Highway from its current terminus at Kwinana Freeway in Jandakot to Stock Road in Coolbellup. The proposed project will consist of the construction of a dual carriageway road with two lanes in each direction; separated by a concrete barrier in place of a median strip and all associated road furniture, lighting, drainage and structures.

Location and authorised extent of physical and operational elements

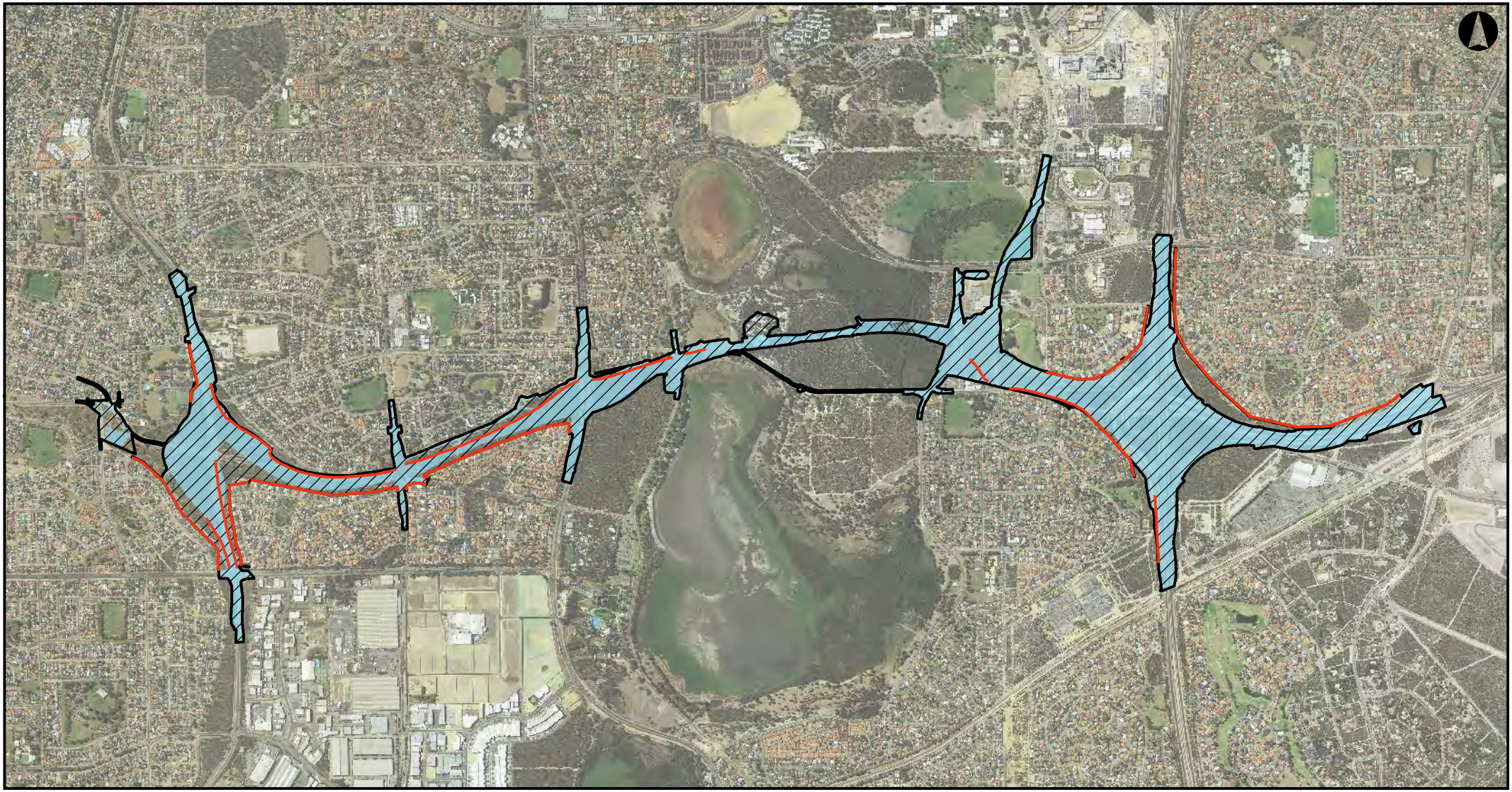
Column 1	**Column 2**	**Column 3**
Element	**Location**	**Authorised Extent**
Project Development Envelope	Figure 1	• Disturbance of up to 148ha within a 167ha development envelope • Clearing of 79.3ha of native vegetation • Disturbance of 78.3ha of Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo habitat • 5.8ha of Conservation Category Wetland • 0.95ha of Environmental Protection Policy Lakes
Groundwater Abstraction		• 140,000kL • No groundwater abstraction bores are to be located within 1.5km of North Lake or Bibra Lake • No dewatering is to occur
Noise Walls	Figure 1	• Maximum height of noise walls: • 4.4m on residential boundary • 5.0m on roadside

2.3. Changes to project description

No substantial changes have been made to the project since the submission of the PER document in June 2011. Elements of the road design have been refined, but there has been no additional impact outside of the construction envelope designated in the PER. The changes in the description of the project in Section 2.2 are intended to provide greater clarity of the environmental impacts of the project.

2.4. Spatial data

The spatial extent of the project has not changed since the submission of the PER. The spatial extent of the proposed project is displayed in Figure 1. Digital spatial data was provided to OEPA upon submission of the PER, in accordance with Draft Environmental Assessment Guideline No.1 Defining a Proposal (EPA 2009).



Roe Highway Extension Construction Envelope

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Figure 1

0 250 500 750 1,000

Metres

1:27,500 (A4)

Proposed Development Envelope

Proposed Construction Footprint

Indicative Noise Walls

SouthmetroConnect

3. Responses to Submissions

3.1. Proposal

General Comments

Submission 1.1-1: The proposal will result in additional fragmentation of the wetland environment, loss of endangered and vulnerable species, habitat loss, fauna deaths and weed intrusion into adjoining vegetation resulting in long term degradation.

Submission 1.1-2: The proposal is a pointless act of environmental vandalism against a sanctuary from which people and fauna obtain peace, enjoyment and refuge. The proposal was drafted in an era when land clearing and extinction of endangered fauna was the norm. The proposal has not changed to reflect today's knowledge and attitudes. The proposal will destroy forever the beauty, tranquillity and amenity of the Beeliar Wetlands. Beeliar Wetlands should be retained as a green corridor.

Submission 1.1-4: The project cannot be approved because the protection of WA's biodiversity is one of the EPA's priority areas of concern. Protection of biodiversity is given the highest environmental priority rating in the WA State of the Environment report. The Swan Coastal Plain is one of the most critical areas under pressure in WA and land clearing is one of the greatest threats to biodiversity. MRWA has a role to play in the protection of biodiversity and must recognize that road reserves are some of the only 'green ribbons' of native vegetation remaining.

Submission 1.1-6: The proponent's own literature points to the ecological impossibility of mitigating the known and unknown impacts of the highway.

Submission 1.1-7: The road reservation should be removed from the planning scheme and the area added to Beeliar Regional Park and Bush forever.

Submission 1.1-8: The project breaches the principle of the conservation of biological diversity and ecological integrity. It also breaches every clearing principle of the Environmental Protection Act.

The project is a continuation of Perth's city and road network planning and has a significant purpose in maintaining east-west connectivity of the road network across the southern suburbs of Perth. It is required as part of Perth's highway network to allow sufficient east-west road access to meet increased traffic demand.

The route was planned in 1963 as part of the Metropolitan Region Scheme. Since that time, urban and industrial development has encroached closer to the road reserve. The east-west route is still required, but other development has restricted its location to the original alignment proposed for Roe Highway. The same urban and industrial development that has dictated the proposed alignment is also driving the need for Roe Highway to be extended.

The proposed project has changed to reflect today's knowledge and attitudes. Considerable effort has gone into engagement with community and stakeholders, to avoid and minimise impacts on Roe Swamp, Bibra Lake, North Lake and other wetlands within the project area. The original planning for Roe Highway included an interchange over Roe Swamp, effectively destroying the entire wetland. However, the proposed road alignment has been moved to the north and the interchange moved to the east, to avoid major impacts on Roe Swamp. This amendment to the design alone has reduced the impact on Roe Swamp from 14ha to 5.4ha.

Environmental impacts, mitigation and management were identified during the impact assessment process of the proposed project (documented in the PER) in accordance with EPA's hierarchy of mitigation—avoid, minimise, rectify and reduce over time. Where a residual impact remains after applying the mitigation hierarchy, offsets have been proposed as described in the Offset Strategy (Appendix I). Assessed impacts and proposed environmental management for the proposed project are summarised in Section 7.0 of the PER. The specific items raised in Submission1.1-1 are addressed in the following sections of the PER:

- Fragmentation of the wetland environment (Sections 6.2.3.1 and 6.8);
- Threatened Flora will not be affected (Section 6.6.1);
- Loss of endangered and vulnerable species (Sections 5.9.4, 6.7.2.1 and 8.1);
- Habitat loss (Section 6.7.2.1);
- Fauna deaths (Sections 6.7.2.2 and 10.4.7.4); and
- Weed intrusion into adjoining vegetation (Sections 6.6.3.2.1 and 6.6.4.4), which is also addressed in the Rehabilitation Strategy (Appendix G).

Submission 1.1-3: The full cost of the Roe Highway extension needs to consider the loss, in monetary terms, of the environment and eco-systems that will be lost as a result of the proposal. There is no evidence in the PER that any sort of valuation of environmental factors has been attempted.

Valuation of environmental factors has been considered in addressing the Principles of Environmental Protection (Section 4.5 of the PER). Calculation of a monetary value for the affected environment and ecology within the project area is not a requirement for the environmental impact process in Western Australia or the under Commonwealth legislation. Consequently, there is no recognised standard methodology for undertaking such analysis. Accordingly, it was not a requirement of the approved Environmental Scoping Document (ESD).

Submission 1.1-4: The project cannot be approved because the protection of WA's biodiversity is one of the EPA's priority areas of concern. Protection of biodiversity is given the highest environmental priority rating in the WA State of the Environment report. The Swan Coastal Plain is one of the most critical areas under pressure in WA and land clearing is one of the greatest threats to biodiversity. MRWA has a role to play in the protection of biodiversity and must recognize that road reserves are some of the only 'green ribbons' of native vegetation remaining.

See Submission 1.1-1.

Submission 1.1-5: The EPA has previously considered the Roe 8 proposal and concluded that the highway would have a damaging effect on the wetlands and suggested to Government that it find a different transport situation.

Submission 2.2-13: The Bibra Lake-North Lake wetland system is unique in its conservation values and should not be disturbed or changed.

EPA Bulletin 1088 (EPA 2003) was prepared under Section 16(j) of the Environmental Protection Act 1986 and does not constitute a formal assessment by the EPA. The purpose of the bulletin was to advise Government on the environmental factors associated with the Roe 8 alignment (not this proposed project) and the likely impacts arising if the road was constructed. The analysis undertaken by the EPA was based on the project construction impacting the entire MRS road reserve, as there was no design for the EPA to analyse at the time of the bulletin. EPA (2003) also accepted that through innovative design and construction, there is potential to manage and minimise potential impacts to a certain extent.

The PER has been prepared using the advice provided in EPA Bulletin 1088 as a guide to avoid, minimise and manage project impacts. The footprint of the current concept design has been significantly reduced from the MRS road reserve footprint and is significantly different to the footprint and alignment analysed by the EPA in 2003. Also, the alignment and the Bibra Drive/Roe Highway interchange have been moved to reduce the impact on Roe Swamp. The proposed project was re-aligned to the north of the MRS road reserve in the vicinity of Roe Swamp, avoiding the area of Roe Swamp that has the potential to become open water in wetter years. The interchange was moved to the east, out of the wetlands and into previously disturbed areas. These design modifications have reduced the area of Conservation Category Wetland (CCW) affected by the proposed project by approximately 9ha. Other design features that have reduced the footprint of the project include: reduction of median width; extensive use of retaining walls and bridging two sections of the wetlands.

Submission 1.1-6: The proponent's own literature points to the ecological impossibility of mitigating the known and unknown impacts of the highway.

Submission 1.1-7: The road reservation should be removed from the planning scheme and the area added to Beeliar Regional Park and Bush forever.

Submission 1.1-8: The project breaches the principle of the conservation of biological diversity and ecological integrity. It also breaches every clearing principle of the Environmental Protection Act.

See Submission 1.1-1.

Proposal Justification

Submission 1.2-1: The priority and timing of the Roe Highway Extension is not supported by the justification provided in the PER.

The priority and timing of the construction of the project is a Government decision. As presented in Section 2.0 of the PER, information on the project justification highlights the need for the project; rather than its priority and timing. The priority and timing of the proposal stems from the State Government's election commitment to develop the extension of Roe Highway between Kwinana Freeway and Stock Road. More recent traffic studies by the Department of Transport have concluded that Roe Highway Extension is required by 2016, unless various elements of the existing road network are significantly upgraded, and it is required by 2021 to meet traffic demand regardless of other road improvements (AECOM 2011).

Submission 1.2-2: The no build option should be assessed against the precautionary principle as required by the Environmental Protection Act.

The 'no-build' option was used comparatively during the development of the PER (see Section 2.2.4). The precautionary principle does not preclude development. It requires proponents to consider, where practical, options to avoid serious or irreversible environmental damage and to conduct an assessment of the risk-weighted consequence of various options. The principle states: "*where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation*".

As considered in Section 4.5 and Table 4.5-1 of the PER, the precautionary principle has been applied to the proposed project. Essentially the proposal and the PER addresses the precautionary principle by:

- Eliminating or reducing any scientific uncertainty regarding the proposal and its impacts. This has been done through the scientific study of the area and has been compiled into the PER and its appendices.
- Evaluating the impacts on the environment in order to avoid impacts where practicable. An example of this is where the interchange of Roe Highway with Bibra Drive has been moved to the east of its original location in the MRS over Roe Swamp to reduce the impacts on CCW.
- Assessing and evaluating a number of options through community and stakeholder engagement and the Multi-Criteria Analysis (MCA) process (Section 3.4 and appendices B and C of the PER).

Submission 1.2-3: The existence of current road and power infrastructure cannot be used as an argument to support the expansion of the infrastructure corridor.

Existing degraded areas – the current road and power infrastructure corridors – are being used as part of the proposed road alignment to avoid and minimise impacts to other areas of greater environmental value. See Section 3.4.2.3 and 3.5 of the PER.

Submission 1.2-4: The government should continue to develop and support programs to address vehicle dependence in the Perth metro area. This road should not be built and other transport alternatives including more freight on rail and public transport should be considered. Numerous studies have recommended existing rail and rail freight infrastructure be upgraded instead. A tunnel from the harbour for freight rail should also be considered. Measures should be introduced to improve efficiency and impact of traffic, which include improving public transport, promoting cycling and walking, manage travel demand and moderating car use. The proponent has not demonstrated that alternatives to this road have been properly investigated. A study should be undertaken on the comparative cost and efficiency of upgrading the existing double tracked railway for freight, and an improved and enlarged public transport network.

Submission 1.2-5: Building more roads will not relieve traffic congestion. This road will shift the traffic congestion problems from one place to another. The proposal was designed to connect Fremantle Port with Kewdale, Welshpool and Canning Vale industrial areas. The proposal only replicates a small section of Leach Highway and vehicles will have to return to local roads. Existing rail freight infrastructure already connects Fremantle Port with these areas. Existing traffic problems will remain and be exacerbated by the proposal. Leach Hwy will still be the primary access route used to access the port.

Submission 1.2-6: Population growth causing traffic congestion should not be used to justify the proposal. Considering the population, Perth has an extensive road network. All of the planned urban growth areas are already connected to existing rail and future rail and rapid bus transit.

Submission 1.2-7: Current rail freight targets aim for 30% of port related traffic to be moved by rail. Also 80% of freight is made by small to medium trucks unrelated to the port.

Submission 1.2-9: The PER shows that the proposal makes no significant difference in daily traffic flows and no reduction in daily heavy vehicles by 2021. Forecasts to changes to congestion do not take into consideration changes to freight infrastructure and public transport. It also does not consider fuel price rise. Traffic flows will only be slightly lower, with congestion worsening in half the areas surveyed. Intersection improvements and congestion management solutions along Leach Hwy and South Street would ease congestion.

Submission 1.2-11: The project is unsustainable. The proponents have not honoured their promise to find a sustainable solution to the transport needs.

Submission 1.3-2: The proponent notes that 'the primary purpose of constructing an extension to Roe Highway is to improve vehicle mobility within the region'. The document provides a comparison between the Roe Highway Extension and the 'no build scenario'. It is noted that this is not a comparison between alternate options for resolving congestion and improving vehicle (i.e. passenger and freight) mobility. It is therefore difficult to qualitatively evaluate the relative merits of this proposal even if the assumed benefits are valid. There may be other options - such as mode shifting of heavy vehicle freight to rail, light rail expansion or utilisation of bus rapid transit systems - that would deliver benefits in terms of mobility, reduced emissions and improved air quality.

Submission 1.3-4: The 'no build option' is the preferred option from an environmental and social perspective. Improving rail infrastructure for freight, public transport and existing roads will achieve a better outcome. The community was never consulted with regards to the 'no build' option.

The scope of the environmental impact assessment process does not require the PER to be an evaluation of the relative merits of various transport options for the Perth Metropolitan Area. The case for the preferred option is an assessment against current and predicted road traffic needs. Public transport and rail options, as well as roads, are part of an integrated transport solution to improving mobility and easing congestion. Unless there are significant upgrades to the existing road network, Roe Highway Extension will be required by 2016 to meet traffic demand. Even with these upgrades, Roe Highway Extension will be required by 2021 to avoid serious traffic congestion (AECOM 2011).

As stated in Section 2 of the PER, *Directions 2031* (WAPC 2010) identifies a hierarchy and spatial distribution of core growth centres to meet the anticipated population expansion of Perth to more than 2.2 million by 2031. The population of Perth's south-west metropolitan area, where the project is located, is forecast to experience population growth of approximately 34% during that period.

While *Directions 2031* identifies the potential for a reduction in the proportion of car use by 2031 from 57% to 50%, this would still result in an overall increase in the number of vehicle trips due to the forecast increase in the population of the metropolitan area. Furthermore, the increase in the complexity of vehicle movements within the metropolitan area is due to the diversification of existing land uses. This will increase the demand for business use and background trips, which cannot be easily accommodated by public transport. Therefore, there will remain a requirement for efficient and safe road corridors for all kinds of traffic movements.

The implementation of *Directions 2031* seeks to enhance the efficiency of the freight transport system. It recognises that freight transport facilities and routes must be protected and that measures are needed to address problems on existing transport corridors. Presently, various roads that are identified as urban corridors also function as freight routes, such as the sections of South Street and Leach Highway west of the Kwinana Freeway. As urban corridors are developed to create commercial and residential precincts, the freight network will need to be restructured to eliminate non-local road freight.

Section 2.2.2 of the PER notes that activity at Fremantle Port is predicted to expand from 550,000TEU (20 foot container equivalent) in 2008/09 to 1.2 million TEU per year. It is envisaged that the construction of a second rail freight track, together with night-time running and double container stacking, could increase the proportion of rail freight from a peak of 18% to 33%. Additional rail upgrades may not be economically viable but could increase the proportion to 50%. Nevertheless, this will leave a requirement for 600,000 TEU to be moved by road freight, which represents a substantial increase on current throughput.

As noted in the PER, much of the freight traffic in Perth is not port-related and travels short distances in the metropolitan area to highly dispersed origins and destinations. Road and rail freight therefore serve different needs and are both integral parts of the transport system.

The project will also increase the efficiency of freight movements to and from a number of other key generators highlighted in Figure 2.2-1 of the PER, including:

- Kwinana Industrial Area;
- Australian Marine Complex;
- Latitude 32 Industrial Area;
- Fremantle Outer Harbour (Kwinana Quay); and
- James Point Private Port.

The future shifting of some bulky freight tasks from the inner harbour to the outer harbour will mean these freight movements would no longer need to use Leach Highway.

The project design is a balance between optimising the economic viability and technical feasibility of the project while ensuring the project is publicly acceptable, with minimal environmental impact. The main purpose of this project is to redistribute heavy vehicles away from the local road network to a relatively enclosed system so that freight and general traffic can both move more efficiently and safely. Rail and public transport alone cannot meet all the future transport needs.

Submission 1.2-8: The proposal will not improve access to the Murdoch Activity Centre. South Street provides efficient access, and is also the closest access point to the Fiona Stanley Hospital.

As noted in Section 2.2.3.3 of the PER, the Murdoch Activity Centre (MAC) is one of Perth's planned urban growth areas. It will include Fiona Stanley Hospital and a number of health and educational institutions, producing one of the largest concentrations of employment (35,000 jobs) outside the central business district (WAPC 2010). Traffic modelling shows that the MAC is expected to generate a significant increase in traffic in the area, contributing to additional demand on the currently stressed accesses along South Street. In particular, the Murdoch Drive/South Street Intersection and the Kwinana Freeway/South Street Interchange are expected to struggle to cope with the additional demand from the MAC, with primary access only provided by the Murdoch Drive/South Street Intersection.

In order to accommodate expected increases in traffic demand due to employment and visitors to the MAC, a new southern access is required via an extension of Murdoch Drive south of the Farrington Road Intersection. The proposed project would significantly improve access to this route by providing a link from the west, and by accommodating efficient traffic movement from the south (via the Kwinana Freeway), as well as from the east via Roe Highway. Connection with the proposed project would therefore reduce congestion on South Street and provide efficient access to the MAC (including Fiona Stanley Hospital).

To date, all the traffic studies carried out by Department of Planning, Main Roads, Department of Transport and Department of Housing and Works, showed that by 2021, access to the MAC would be the subject of lengthy delays during the peak periods without the Roe Highway/Murdoch Drive southern connection. The studies have shown that South Street alone cannot cope with the traffic demands when the MAC traffic is added to existing traffic volumes. The proposed project will therefore vastly improve the accessibility of the MAC, and will ease congestion on South Street by removing some of the heavy vehicles and through traffic from this road.

Submission 1.2-9: The PER shows that the proposal makes no significant difference in daily traffic flows and no reduction in daily heavy vehicles by 2021. Forecasts to changes to congestion do not take into consideration changes to freight infrastructure and public transport. It also does not consider fuel price rise. Traffic flows will only be slightly lower, with congestion worsening in half the areas surveyed. Intersection improvements and congestion management solutions along Leach Hwy and South Street would ease congestion.

See Submission 1.2-4.

Submission 1.2-10: The Liberal government election commitment is the main rationale behind this project. The rationale for the proposal is built on engineering models and social values that are now out dated. The previous Labour Government developed a six point plan to address and improve traffic flows without the need for extending the highway.

Section 2.2.3 of the PER demonstrates the transport rationale behind the project; specifically, from a transport capacity, sustainable development and road safety viewpoint.

Submission 1.2-11: The project is unsustainable. The proponents have not honoured their promise to find a sustainable solution to the transport needs.

See Submission 1.2-4.

Submission 1.2-12: It is inappropriate to spend $750 million on an extension when the congestion is not predicted to improve but rather get worse.

As noted in Section 2.2.4 of the PER, the delivery of the proposed project will provide congestion relief on road segments and intersections on the surrounding road network, particularly on South Street. Recent traffic studies have concluded that without the project there will be a significant increase in congestion by 2021 (AECOM 2011).

Preferred Option Development

Submission 1.3-1: There is inadequate justification for the decision to locate a bridge over only a portion of Roe Swamp, instead of over the entire wetland portion. Section 2.2.5 discusses the decision on the preferred option of a bridge over the entire wetlands section between Bibra Drive and Progress Drive. It does not discuss why the bridge does not extend over the entire Roe Swamp wetland rather than just over a portion of it. Provide justification for the decision to locate a bridge over only a portion of Roe Swamp instead of over the entire wetland portion.

Section 2.2.5 of the PER provides justification for the decision to locate a bridge over a portion of the wetland. The option to build a bridge over the entire wetland portion was rejected because:

- The environmental benefits are minimal:
  - There would be limited reduction in clearing impacts;
  - The weight of the structure would require deep piling, or spread footings, increasing the impacts on groundwater and wetland sediments;
- The bridge would be significantly higher than a road embankment and a larger visual impact than a road; and
- It is cost prohibitive. Bridges are more expensive to build than a road. A bridge across the entire wetland portion would have doubled the cost of the project.

Submission 1.3-2: The proponent notes that 'the primary purpose of constructing an extension to Roe Highway is to improve vehicle mobility within the region'. The document provides a comparison between the Roe Highway Extension and the 'no build scenario'. It is noted that this is not a comparison between alternate options for resolving congestion and improving vehicle (i.e. passenger and freight) mobility. It is therefore difficult to qualitatively evaluate the relative merits of this proposal even if the assumed benefits are valid. There may be other options - such as mode shifting of heavy vehicle freight to rail, light rail expansion or utilisation of bus rapid transit systems - that would deliver benefits in terms of mobility, reduced emissions and improved air quality.

See Submission 1.2-4.

Submission 1.3-3: DEC believes that a reasonably thorough landscape and visual impact assessment (appendices X1 and X2) has been undertaken, however the design options for the bridges over the wetlands are unclear. DEC recognises that bridge design will be finalised later in the process and is willing to provide further advice/assistance when options are being considered. DEC is supportive of the Public Art Scoping Document included as an Appendix in Section 9.0 of the LUDF. Given that the regional park has high landscape value, the need to look further at the design of the bridge sections through the regional park should be emphasised in the Landscape and Urban Design Framework (LUDF) (Appendix X2).

The design for the bridges over the wetlands will be finalised in the final design process just prior to construction. Commitments have been made in sections 7.1 and 9.2 of the PER to ensure urban design principles are appropriately considered and applied to bridge design. In particular, reference is made in Section 9.2.11.2 to considerations of the form of infrastructure (including bridges) and how infrastructure should be integrated into the surrounding public domain. This is reinforced in Section 6.12.5. It is proposed that DEC and other relevant agencies will be invited to comment on design guidelines that will be developed as part of the final detailed design.

Submission 1.3-4: The 'no build option' is the preferred option from an environmental and social perspective. Improving rail infrastructure for freight, public transport and existing roads will achieve a better outcome. The community was never consulted with regards to the 'no build' option.

See Submission 1.2-4.

Submission 1.3-5: The lack of transparency makes it very difficult to understand how different options were considered and how the sustainability details were developed and considered. The process has not followed any identifiable outline that could be considered 'best practice'.

Transparency of the community consultation process has been a critical component of the community and stakeholder engagement programme for the project. The programme has been outlined in Section 3.0 and Appendix B of the PER.

The process for considering how different options were considered can potentially be considered as 'best practice'. The community and stakeholder engagement programme (which includes the preferred option development) used by SMC is highly regarded by peers in the field of public participation. SMC's community engagement process was awarded *Project of the Year* for Western Australia and runner-up *Project of the Year* for Australasia in the 2011 International Association for Public Participation Australasia Core Values Awards.

Submission 1.3-6: The road design is determined by minimising the economic and political costs, rather than ecological and hydrological considerations.

Section 3 of the PER describes the process of how the preferred option was developed. All factors, and not just economic and political costs, were considered in developing the preferred option within the project scope to extend Roe Highway from the Kwinana Freeway to Stock Road.

Submission 1.3-7: The seven options for the alignment were not all considered in the PER. It was recommended that Option 7 would have the least environmental impact.

Only four options were considered in the MCA process (see Section 3.4.2.3 of the PER). It appears that "Option 7" refers to Transect 7 of Appendix D of the PER. This is a transect along the southern boundary of Bibra Lake for the assessment of wetland sediments. It was never an option considered at any stage, as it was outside the scope of the project.

Community Consultation

Submission 1.4-1: It is important that appropriate funding is allocated to the implementation of public interpretation which is linked to the values of Beeliar Regional Park and the Aboriginal heritage of the area. The proponent must continue to involve the community in each aspect of the design process, as specified in the Landscape and Urban Design Framework (LUDF) (Appendix X2).

Main Roads is committed to the ongoing involvement of community and stakeholders in this project. In the Landscape and Urban Design Framework (LUDF - Appendix X2 of the PER), one of the rationales for Objective 3.3 of Principle 3 states: Actively involve the community in design decisions.

Submission 1.4-2: The consultation never included a 'no extension' option. Because of this a number of key stakeholders were excluded and a low number of participants contributed to the design options.

Submission 1.4-4: Important major stakeholders have not been consulted as part of the stakeholder engagement, and important information has not been included about their activities and knowledge of the project area.

Submission 9.0-11: There is no option to reject the extension outright and therefore no way to represent Noongar concerns.

The "no extension" or "no build" option was not an alignment option for consideration at stakeholder workshops, but it was able to be discussed. However some project opponents felt that as a consequence of the "no build" option not being considered as an alignment option, the community engagement process was invalid. The full summary of the stakeholder and community engagement process is described in Appendix B of the PER. This document highlights the concerns of stakeholders regarding the "no build" option in a number of locations.

At all times the engagement process was open to all interested parties. Stakeholder workshops were advertised locally and regionally. Major stakeholders were contacted individually where possible to ensure that they were consulted, however not all were contactable or wished to be consulted. Opponents and supporters of the project entered into the engagement process to discuss their issues

Submission 1.4-3: The consultation provided no presentation on Aboriginal heritage values, matter of national environmental significance, threatened ecological communities or threatened species. MRWA was dismissive of community concerns. The economic value of the wetlands was not provided.

Submission 1.4-5: Workshop facilitators modified input by participants and left out key points. The choice of options was not made on environmental grounds, and was insulting of community participants.

Appendix B of the PER describes in detail the stakeholder and community engagement process. Presentations at the community design workshops included information on environmental and Aboriginal heritage values within the project area. The community engagement process determined the preferred alignment for the wetlands section of the project.

Main Roads engaged in an extensive stakeholder and community engagement process for the project that has been highly regarded by peers in the field of public participation. The stakeholder and community engagement process was awarded *Project of the Year* for Western Australia and runner-up *Project of the Year* for Australasia in the 2011 International Association for Public Participation Australasia Core Values Awards.

The provision of an economic value of the wetlands was not a requirement of the ESD.

Submission 1.4-4: Important major stakeholders have not been consulted as part of the stakeholder engagement, and important information has not been included about their activities and knowledge of the project area.

See Submission 1.4-2.

Submission 1.4-5: Workshop facilitators modified input by participants and left out key points. The choice of options was not made on environmental grounds, and was insulting of community participants.

See Submission 1.4-3.

Submission 1.4-6: The Cockburn Wetlands Centre was not pursued vigorously for consultation despite its pivotal role in the functioning of the wetlands.

Cockburn Wetlands Centre was considered a key stakeholder in the project development phase for the project. SMC project personnel met with Cockburn Wetlands Centre staff at the start of the project to enable them to highlight their concerns. At this meeting, the centre staff stated their intent to not participate in the process.

Staff at the centre participated in the ESD focus group, which helped determine the scope of the environmental assessment work to be undertaken. This included the opportunity to review the preliminary draft ESD document.

Centre staff were invited to attend the MCA workshop to determine the values by which the project's decision-making criteria would be formed, as well as the community design workshops. However, they did not attend.

In late 2009, SMC staff met at the Cockburn Wetlands Centre to be taken on an extensive site tour of Roe Swamp and North Lake. The tour was conducted by the Coordinator of Friends of North Lake/Save Beeliar Wetlands, who highlighted the significant values and issues in the area.

SMC tried, on several occasions, to arrange meetings with staff at the Cockburn Wetlands Centre. When SMC staff arrived at a scheduled meeting in early 2010, they were advised by a centre representative that the staff member SMC had arranged to meet had another matter to attend to.

3.2. Wetland

Wetlands buffer requirements

Submission 2.1-1: Conservation category and resource enhancement wetlands (REW) require buffers. The role of the buffer is to limit impacts on the wetland. The statement on page 360 'The area of mapped Lakes EPP wetland impacted by the proposed project (approximately 1.0ha) has limited ecological value as a functional wetland' is not supported, because this area is within the buffer to the REW, and thus the development is impacting on the buffer protection for the REW. It is recommended that all wetlands of conservation significance, including conservation category wetlands and resource enhancement wetlands, be afforded an appropriate buffer distance determined on a site specific basis and taking into account modelling information relating to predicted impacts on the wetlands from the development.

Submission 2.1-2: Buffers are a key component of wetland conservation regardless of the condition of the vegetation and habitats surrounding the wetlands. A buffer study to assess the threats, risks and potential impacts on the wetlands is provided in Appendix D and ascertained that a hydrological buffer of 200m was necessary to protect the wetlands from the impacts of the development. However, the PER allows for a maximum of 50m buffer around some of the wetlands and also allows for construction inside this buffer and onto wetland boundaries. Justify the reduction of the recommended buffer distances provided in Appendix 0 and illustrate how these reductions will not deleteriously impact on the wetlands.

Submission 2.1-3: The wetlands and their buffers extend over the whole construction footprint. These buffers are not explained and the 50m is used without reasoning. This buffer should be increased because of the potential heavy vehicle use close to the wetlands.

In response to these submissions, a Wetland Buffer Study has been conducted since the PER. See Appendix B.

Impacts to wetlands

Submission 2.2-1: The statement that there 'is no anticipated loss or reduction in current wetland function' is not considered to be correct for the direct impact on Horse Paddock Swamp due to infrastructure, as this statement does not consider hydrological and ecological linkage values. It is recommended that the hydrological and ecological linkage values should be factored in when assessing potential loss and reduction in wetland function.

As stated in the PER, Section 6.2.2.2, Horse Paddock Swamp has been assessed as having limited ecological value. The wetland is devoid of native vegetation and the vegetation condition has been assessed as 'Completely Degraded'. There is little to no fauna habitat of any value. Ecological linkage values are directly related to the degree of native vegetation cover. The current ecological linkage value of Horse Paddock Swamp is therefore low due to the lack of vegetation cover.

The hydrological values of Horse Paddock Swamp will be maintained. There will be little to no impact on groundwater hydrology due to the project (see PER Section 6.3; Appendix G of the PER and the Water Management Strategy (Appendix E)). Surface water connections to Horse Paddock Swamp will not be altered by the project. Horse Paddock Swamp and Bibra Lake are very rarely, if ever, connected by surface water flows due to topography and the raised embankment of Hope Road. Culverts under the road embankment will enable surface water flows to be maintained.

Submission 2.2-2: These natural wetland systems are already under stress. Increasing the fragmentation and further reducing the connectivity of these systems threatens their viability, especially of the smaller portions of wetland and vegetation. Section 6.2.3.1.2 notes that Roe Swamp has previously been fragmented by Farrington Road, the powerline access track and Hope Road. This is in conflict with the wetland's hydrology description in Section 5.2.2.2.3 which states that Roe Swamp has remained relatively unaltered in terms of its hydrological regime. The proposed project will reduce the connectivity between some of the surface areas and the relatively intact vegetation within the Roe Swamp conservation category wetland. It is not sufficient to assume that a previously robust system can sustain any and all impacts, particularly when the extent of disturbance this wetland has already sustained is also unclear. Limits of acceptable change should be set and adhered to for these natural wetland systems.

Submission 2.2-11: The proposal will result in additional fragmentation of the wetland environment, loss of endangered and vulnerable species, habitat loss, fauna deaths and weed intrusion into adjoining vegetation resulting in long term degradation.

Submission 2.2-12: Limits of acceptable change (LAC) to wetland function should be established in order to measure impacts over time.

Submission 2.2-16: The highway will sever the North Lake-Bibra Lake wetlands, cutting wildlife migration routes and disrupting the hydrology of this habitat area.

Roe Swamp has been fragmented by the construction of infrastructure in the past, but despite this the hydrologic regime has remained relatively unaltered (EPA 2003 and SMC 2011). Impacts from previous road construction (both Hope Road and Farrington Road), powerline construction and residential development around and through Roe Swamp have fragmented the vegetation communities, but have not significantly impacted the hydrology of the area. Section 6.3 of the PER shows that the hydrological regime will be maintained following construction of the project. Both surface and groundwater flows will be maintained at, or close to, existing levels, and well within the range of natural variation in water levels (see Figures 5.6-6 and 5.5-7 of the PER).

It is acknowledged that the project will result in further fragmentation of wetland environments. The project design has incorporated underpasses and culverts to minimise habitat fragmentation by maintaining hydrological and fauna habitat connectivity.

Habitat loss will predominantly occur as a result of project clearing activities. Clearing has been minimised through the application of mitigation measures as outlined in Section 7 of the PER.

Weed management will minimise impacts on the ecology of the project area and will be conducted in accordance with the FVFMP (Appendix F) and the Rehabilitation Strategy (Appendix G). Weed management of retained degraded areas will aim to achieve overall improvement of the condition of remnant vegetation in accordance with the Offset Strategy (Appendix I). Monitoring of revegetation and weed control will manage the effectiveness of weed control.

There are no "Limits of Acceptable Change" proposed for the project. During construction and operation of the project, impacts on the hydrological regime will be monitored and managed through the WMS (Appendix E) and impacts on vegetation will be monitored and managed through the FVFMP (Appendix F).

Submission 2.2-3: Impacts on the hydrology of Bibra Lake, Horse Paddock Swamp and Roe Swamp due to the proposed construction being located on wetland boundaries and buffers are not considered. The impacts on wetland water regime due to construction in and on wetlands and their buffers should be considered and presented. Development on conservation category wetlands and their buffers is considered highly likely to result in significant ecological detriment to these wetlands.

Submission 2.2-18: Roe Swamp is an integral part of the linked hydrological, geomorphic and ecological systems within the Bassendean Dunes that drains towards North and Bibra Lakes. The proposal will destroy these wetlands. Roe Swamp is the only sumpland in the area which is intact hydrologically and vegetationally.

Submission 2.2-19: The Beeliar Wetlands are a source of the source of 6 wetland ecosystems in a biodiversity hot-spot with significance of global endemic importance.

Submission 3.1-7: The proposal should be rejected due to the severe hydrological impacts listed in the PER. Building a highway between lakes will impede groundwater flow and disrupt the hydrology of Roe Swamp and North Lake.

Impacts on wetlands are considered in Section 6.2 of the PER. Impacts on surface and groundwater movement are considered in Section 6.3. Appendix D of the PER describes impacts on wetlands by the project in further detail. Detailed surface and groundwater modelling is presented in Appendix G of the PER. Further management of water and wetlands will be in accordance with the WMS (Appendix E).

Submission 2.2-4: Baseline water quality and/or sediment data are required for Roe Swamp to ensure it is not detrimentally impacted by the proposal. If there was no water in the wetland in 2010, a sediment sample should still have been collected. Baseline data should be collected for Roe Swamp, especially for the portions proposed to contain a bridge. A sediment sample should be collected prior to construction if the rainfall in 2011 has not been sufficient to provide a surface expression in this portion of the wetlands system.

Sediment samples were collected at the south-eastern edge of Roe Swamp during two sampling events in May 2010 and August 2010 (close to Hope Road and Bibra Drive intersection). These samples contained higher concentrations of contaminants than data collected from other project area wetlands (see Section 5.5.3 of the PER). More detailed sediment and water quality monitoring results are presented in Appendix I of the PER.

A water monitoring regime will be implemented during and post-construction as per the Water Management Strategy (Appendix E).

Submission 2.2-5: Figure 53 illustrates the areas of high risk if hydrological patterns and/or hydrochemical conditions are impacted by the proposed Roe Highway Extension, and shows much of the construction footprint is located within the high risk area. It concludes that 'the combination of these maps clearly demonstrates that the placement of any road through this area is contrary to the intent of a number of Commonwealth and Western Australian policies for protection of wetlands, determination of buffers, and protection of regionally significant vegetation.' Table 12 also lists a variety of impacts on the wetlands that are likely to be localised but intense and to affect groundwater flow and flow paths, flushing and wetland water levels. Examples include:

- the conduits under the bridge over Roe Swamp assisting surface water flow but not facilitating groundwater recharge which is the dominant flow for this wetland;
- adjustments to Bibra Lake groundwater movement and through flow due to raising height of road with infill; and
- impacts on flushing mechanisms; impacts of edging and retaining walls on general water flow through the system; dewatering; drain discharge.

The potential impacts and changes to natural predevelopment wetland water regimes should be quantified, including identification of areas likely to have altered water regimes such that the wetland classification may change, including from sumpland to dampland and loss of wetland area to dry land. Describe how these impacts will be managed and mitigated. Explain how environmental water requirements for the wetlands of conservation significance and the groundwater dependent ecosystems will be met in the future, should groundwater levels decline or flow path direction change. These risks to the wetlands, as well as others included in Appendix D should be used to inform the buffer distances to be applied around conservation category and resource enhancement wetlands and EPP lakes.

Submission 3.1-3: Modelling of subsurface compaction shows the impact is likely to be in the top 1 to 2m. The proponent states on page 385 that 'Most of the change in porosity is expected to occur in the top one to two metres of the soil immediately beneath the embankment. Therefore, the proposed infrastructure is expected to have a minimal, if any, discernible impact on groundwater levels beneath and adjacent to the road formation. Generally, groundwater levels or the water table is at least several metres below for the majority of the alignment. However in this case the groundwater expresses at the surface. Additionally the top 1 to 2m is intrinsically linked to wetland hydrology for surface runoff, infiltration and local groundwater flow. The compaction and loss of porosity should be discussed in terms of its effect on water flow and direction in relation to the wetlands.

The hydrologic regime of the wetland area is not expected to be altered regionally. While there may be localised alterations, it is expected that any deviations will be within the natural variation of the system such that there will be no adverse hydrological impacts experienced within the wetland systems. There is a significant natural variation in groundwater and lake surface levels in the project area, both annually and over greater periods of time, which will be only be marginally affected for a short period by the project (see Figures 5.6-6 and 5.6-7 of the PER). The result will be that the hydrological regime for wetland areas and groundwater dependent ecosystems will be maintained such that there will be no adverse impacts experienced as a result of the project. The Water Management Strategy (Appendix E) outlines management, monitoring and mitigation measures that will be employed during the construction and operation phases of project delivery.

It is unlikely that this project will impact a wetland in such a way as to cause the wetland classification to change from sumpland to dampland. Any impacts on groundwater or hydrology as a result of this project will be negligible when compared the natural variation experienced by the wetland system, both annually and over longer periods of time (see Figures 5.6-6 and 5.6-7 of the PER).

The impact on groundwater recharge from the bridge over part of Roe Swamp is expected to be minimal. There will be no net loss of groundwater infiltration as a result of the bridge, although the exact location of the rainfall infiltration will be altered. The bridge deck will intercept rainfall over an area of 0.4ha. This water will be returned to the groundwater system after being piped to a drainage basin prior to infiltration into the groundwater system. Groundwater recharge is the dominant flow for recharging of Roe Swamp. However the groundwater recharge comes from the entire groundwater catchment (Jandakot Mound) feeding the wetland. The loss of 0.4ha of direct at source groundwater recharge will not have any noticeable adverse impact on the wetland hydrology.

The impacts on groundwater flow by road compaction and the construction of retaining walls will be minimal (Section 6.3.2.4 of the PER, Section 5.3 and Appendix L). Groundwater and surface water modelling have shown the general direction of the groundwater flow is parallel to the road direction (Appendix G of the PER). The top few metres of the water table could 'accommodate' a large reduction in porosity and permeability without significantly changing aquifer flows or levels, as the aquifer is of the order of 35 – 40 m thick and highly permeable (10 – 20 m/day typically). In light of this aspect, the alignment of the highway with respect to the overall groundwater flow direction is not a significant factor in terms of the overall groundwater balance beneath embankment areas.

No dewatering will be undertaken during construction. Therefore there will be no impact on hydrology or groundwater dependent ecosystems as a result of dewatering.

Drainage management is outlined in the Water Management Strategy (Appendix C). In general, small rainfall events will be infiltrated at source where possible. Larger events will be transported to drainage basins for storage and infiltration. Where the road, or the road drainage, traverses a wetland, the road will be kerbed and all road drainage will be piped to infiltration or bioretention basins for storage and infiltration.

A wetland buffer study has been completed to determine existing wetland buffers (Appendix B).

"Environmental Water Requirements" are not proposed for the project. During construction and operation of the project, impacts on the hydrological regime will be monitored and managed through the Water Management Strategy (Appendix E)

Submission 2.2-6: The low permeability lakebed sediments extend further westwards than depicted in Figure 5.6-1. These are probably a westward extension of wetland silts, muds, diatomaceous sediments (as is the case for many wetlands on SCP), not associated with the Tamala limestone.

Submission 2.2-7: Some important references that report thickness of Bibra Lake lacustrine sediments are missing (Pickett 1997).

Lower permeability lake bed sediments (identified as "L" on Figure 5.6-1 of the PER) continue westward and are identified as "Lower Permeability Sediments". This figure is conceptual only and has no scale. A more detailed description, including a literature review of the geology, is presented in Appendix G of the PER. More accurate depictions of the diagenetic plume are shown in Transect Stratigraphies in Figures 8 through 14 of Appendix D of the PER.

It is noted that Pickett (1997) is an unpublished PhD thesis and is available for research purposes only. An examination of this report shows that the stratigraphical profile is limited to approximately the upper 4m. In the context of Appendix G of the PER and conceptualisation of the project area, the detail and complexity of the upper 4m of the soil profile is summarised using only one layer within the model to represent the lacustrine sediments. This simplifies the model significantly to improve stability and run times. The addition and analysis of this information would have proven useful and is acknowledged.

Submission 2.2-8: No use was made of very recent DoW groundwater and lake water chemistry data, available in the WIN database, particularly in and around North Lake which shows pH in the lake has been as low as 4.4 and -4 at the watertable.

The DoW data was evaluated during the PER (Appendix I of the PER). ANZECC/ARMCANZ (2000) does not provide tools for benchmarking groundwater quality in terms of defined guideline values. In order to benchmark groundwater quality against relevant data, groundwater quality data was obtained from DoW bores in the immediate vicinity of the project area wetlands and up hydraulic gradient from Bibra Lake and North Lake to the top of the Jandakot Mound.

The DoW groundwater data set used to derive groundwater guideline values was obtained in 2010. The latest monitoring date in the data set for North Lake was 28 January 2010. However, no chemistry readings were taken on the date. The data set recorded a pH of 4 at the North Lake water table on 10 September 2007 and 20 November 2007. A pH reading as low as 2.59 was recorded at North Lake on 6 June 2007.

Recent data for North Lake was requested on numerous occasions from DoW. DoW is in the process of publishing the data and would not release the data prior to publishing.

Submission 2.2-9: The DoW is bound by Ministerial conditions to protect the ecological values of Bibra and North lakes (Ministerial Statement No. 688). The Department is bound to criteria water levels, based on ecological water requirements, which are the water regimes necessary to maintain a low level of risk to the ecological values of the lakes. The Roe Highway extension must not affect the Department's ability to meet Ministerial criteria water levels for Bibra and North lakes and all effort must be made to limit the impact on the ecological values of these lakes. Specify how the development may potentially impact the Department's ability to meet Ministerial criteria levels. Specify how the development may potentially impact on the habitat for wading birds and the fringing vegetation at the northern end of Bibra Lake and how potential impacts will be managed or mitigated. Evaluate options for drainage to be used to assist the Department to meet Ministerial criteria water levels at Bibra and North lakes. Ensure any draw down is within the 'low' impact category as per Table 1 (See DoW Submission).

Submission 3.3-2: The PER discusses potential changes to local groundwater levels due to drawdown associated with dewatering but fails to identify the potential impacts from the abstraction of groundwater for dust suppression and other construction purposes. The use of groundwater for construction purposes including dust suppression and other construction needs should be discussed; including approximate volumes required and source options. Modelling should be used to determine drawdown associated with abstraction for dust suppression and construction.

The project is not expected to affect DoW's ability to meet their criteria water levels under Ministerial Statement 668. Due to the deep, unconfined aquifer flowing under the project area, there will be little impact on groundwater flow, groundwater dependent ecosystems or lake standing water by the presence of road infrastructure at the surface. The hydrologic regime of the wetland area is therefore not expected to be altered (Section 6.3.5.1 of the PER).

Approximately 0.3ha of wading bird habitat will potentially be impacted by this project through the loss of **Typha orientalis* herbland at the northern end of Bibra Lake. In June 2012 the City of Cockburn has undertaken a *Typha orientalis* control program on Bibra Lake and has poisoned several hectares of *Typha orientalis* at the northern end of Bibra Lake. Appendix O of the PER and Section 6.7.2.1.5 contain more information on the impact of the project on wetland and migratory birds.

There is limited opportunity for road drainage to be used to assist DoW in meeting its Ministerial criteria water levels. All road run off from roads through wetland areas will be detained and infiltrated to groundwater in an infiltration or bioretention basin. Further discussion with DoW will occur at final design to examine opportunities to direct run off from high rainfall events into wetland areas, subject to any environmental conditions imposed on the project.

An assessment of the drawdown impacts from groundwater abstraction has been conducted since the publication of the PER. This information is presented in more detail in the Water Management Strategy (Appendix E), but is summarised below.

Groundwater Abstraction Assessment

Assuming that the superficial aquifer in the project area has the following hydraulic properties:

- Specific yields of between 0.2 (Bassendean Sands) and 0.3 (Tamala Limestone);
- Saturated thickness of between 35 – 40 m;
- Aquifer transmissivities of between 600 – 800 m^2/day;
- Hydraulic conductivities in the range from 15 – 23 m/day; and
- Abstraction schedule of 384 kL/day for 1 year and 192 kL/day for 2 years (note these equate to the same total volume of ~140,000 kL. We have simulated a one year period as means of providing some conservatism and sensitivity to the 'base case' pumping period of 24 – 30 months.

Then the maximum drawdown at the abstraction point will be 0.5m (Figure 2). DoW's Table 1 has as a "low impact drawdown" as 0.25m for wetland vegetation. Provided any bores for groundwater abstraction are located at least 150m from any wetland, then the impact of drawdown will be in the "low" impact category.

On the basis of advice from the Department of Water, abstraction will not occur within 1.5km of Bibra Lake or North Lake. Any abstraction bores located near Groundwater Dependent Ecosystems will also be at a sufficient distance so any potential impacts are in the low category (less than 0.25m of drawdown). Prior to any abstraction, the Department of Water's Peel Regional Hydrogeologist will be consulted on the location of abstraction bores and what baseline groundwater monitoring may be required to inform the groundwater abstraction licence.

There will be no dewatering during the project and therefore no impact from dewatering.

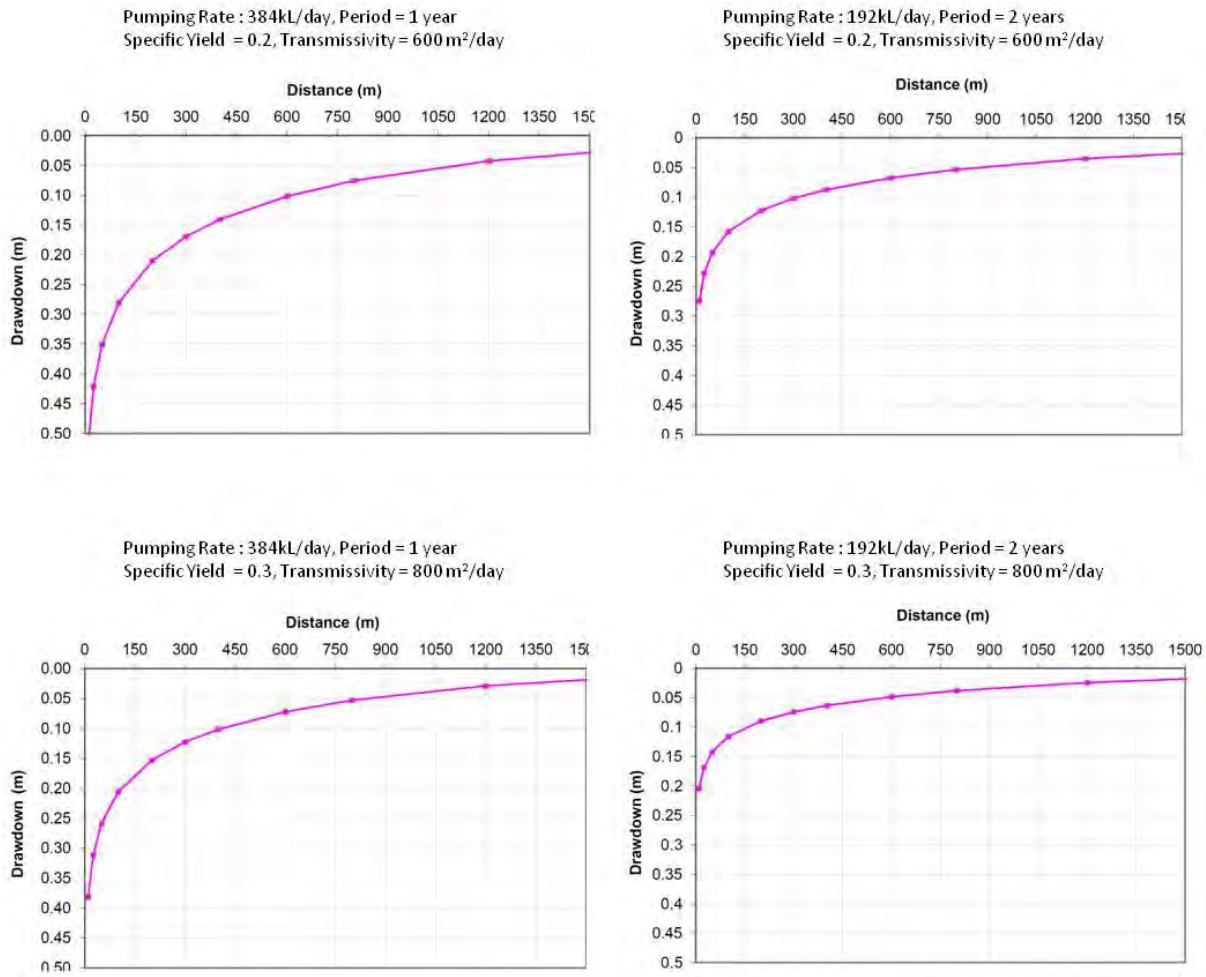


Figure 2: Predicted drawdown impacts for abstraction of groundwater for Roe Highway Extension. Modelling was conducted for the abstraction of 140,000kL over a one or two year period, assuming no recharge of groundwater over the period of abstraction. Specific yields were assumed for Bassendean Sands (0.2) and Tamala Limestone (0.3).

Submission 2.2-10: With regards to Wetland Ecological Investigations, it appears that not all major ions were analysed (or at least not reported) and no ion balances were presented so no assessment can be made on the reliability of the results. Provide full ion balances, and/or QA/QC methods used and their results.

For the Wetland Ecological Investigations (Appendix D of the PER), not all major ions were analysed. Section 4.9 of Appendix D of the PER provides the methodology and rationale for the selected sampling program.

A more detailed water quality assessment was conducted separately to the Wetland Ecological Investigations in Appendix I of the PER.

Submission 2.2-11: The proposal will result in additional fragmentation of the wetland environment, loss of endangered and vulnerable species, habitat loss, fauna deaths and weed intrusion into adjoining vegetation resulting in long term degradation.

See Submission 2.2-2.

Submission 2.2-12: Limits of acceptable change (LAC) to wetland function should be established in order to measure impacts over time.

See Submission 2.2-2.

Submission 2.2-13: The Bibra Lake-North Lake wetland system is unique in its conservation values and should not be disturbed or changed.

See Submission 1.1-5.

Submission 2.2-14: The wetlands need to be seen from a global perspective. Remnant urban wetlands have direct benefits to the surrounding area, treating wastes and pollution from storm water run-off and improving air quality. These wetlands include a diversity of water bodies and vegetation communities. The wetland upland Banksia woodland is currently listed as an Endangered community under the EPBC Act. The North Lake reserve also contains four priority listed plant species.

There is no EPBC Act listed Threatened Ecological Community (TEC) within the project area. See Section 5.8.4.2.1 of the PER.

North Lake is not part of the project area and will not be directly impacted. Direct impacts on priority flora species within the project footprint have been minimised by design methods that avoid or minimise clearing around populations of Priority flora. Priority flora found within, or impacted by, the project area are listed in Table 6.6-5 of the PER and are addressed further in Section 5.4 of this document. Management measures are described in the FVFMP (Appendix F).

Submission 2.2-15: Is the uncertainty of the environmental impacts on the wetlands justifiable in terms of the impacts on the wetlands and the legacy for future generations?

Submission 13.3-6: The project breaches the principle of intergenerational equity.

The principle of intergenerational equity is addressed in Table 4.5-1 of the PER. The health, diversity and productivity of the environment is maintained or enhanced for future generations by:

1) Implementation of sustainability and innovation initiatives, including the use of an MCA workshop with community and stakeholders to arrive at a preferred option for the wetlands alignment (see Section 3 of the PER);
2) Achieving a net environmental gain through (see Sections 6.2, 6.3, 6.6 and 9.0 of the PER):
    - Incorporation of redundant road reserve within Roe Swamp to Beeliar Regional Park;
    - Rehabilitation of presently degraded wetland/vegetated areas;
    - The introduction of water treatment for road runoff through infiltration and bioretention basins;
    - Improving wetland function to degraded areas adjacent to North Lake;
    - Restoration of wetland values and functionality at Horse Paddock Swamp; and
    - Contractors and construction materials will be selected based on the principles of environmental protection in an effort to reduce the carbon footprint of the proposed project, and the project will be implemented within a sustainable framework.

Submission 2.2-16: The highway will sever the North Lake-Bibra Lake wetlands, cutting wildlife migration routes and disrupting the hydrology of this habitat area.

See Submission 2.2-2.

Submission 2.2-17: 80% of wetlands on the Swan Coastal Plain have already been cleared, degraded or filled since European settlement.

This fact is acknowledged and addressed in the PER Section 6.1.1.1.

Submission 2.2-18: Roe Swamp is an integral part of the linked hydrological, geomorphic and ecological systems within the Bassendean Dunes that drains towards North and Bibra Lakes. The proposal will destroy these wetlands. Roe Swamp is the only sumpland in the area which is intact hydrologically and vegetationally.

See Submission 2.2-3.

Submission 2.2-19: The Beeliar Wetlands are a source of the source of 6 wetland ecosystems in a biodiversity hot-spot with significance of global endemic importance.

See Submission 2.2-3.

Management of impacts to wetlands

Submission 2.3-1: The road design includes apertures to aid shallow sub-surface and sheet flow movement when natural flows occur. However, apertures do not mimic natural sheet flow across the landscape; by definition they work to funnel water through in pipe flow. Neither is there discussion on this flow, specifically in relation to frequency of flow, flow rates and volumes, nor is there discussion of potential impacts due to heightened flow rates and volumes such as erosion, stirring of sediments and increases of contaminants flow. The post development flow behaviour of water through these apertures should be included in the modelling of the proposed development, and the potential impacts on the wetland water regimes and water quality should be investigated. Triggers for action and mitigation measures should also be provided to ensure the protection of wetland water quality and quantity.

Consistent over-land surface water movement (i.e. sheet flow) is not a dominant characteristic of the project area catchment. Much of the rainfall infiltrates directly through the sandy soils that have a high hydraulic conductivity and into the superficial aquifer, rather than becoming surface water runoff. The culverts are intended to aid surface sheet flow movement when natural surface flows occur (Section 6.3.5.1 of the PER).

When present, surface water within the project area is usually slow moving or standing water. Sheet flow is expected to occur occasionally in localised areas during heavy rain events. It is not expected that the proposed culverts will affect sheet flow. The culverts may cause heightened flow rates and volumes, potentially causing scours and sedimentation. This is considered to be a low risk and will be managed by design and modelling at the final design phase. Monitoring and management measures for minimising and monitoring assessed impacts on wetland water quality and quantity are described in the WMS (Appendix E).

Submission 2.3-2: Bioretention basins, infiltration basins and directing stormwater away from wetlands are not management and mitigation measures for alteration in groundwater distribution in response to altered water availability. An additional impact of vegetation removal is the change in hydrological processes and potential impacts on wetland water regime and quality. Modelling of local groundwater systems should include the predicted changes in groundwater levels due to altered water availability and the predicted changes in local groundwater flows due to the construction of bioretention and infiltration basins. These impacts should in tum be used to predict potential/coupled impacts on the wetland water regimes and wetland function. Justification should be provided to show that the location of the bioretention basins is suitable and appropriate to limit the impacts on nearby wetlands due to alterations in the groundwater flows and quality.

See Submission 3.2-3.

Submission 2.3-3: Specify how modifications to Murdoch Drain are likely to affect water levels at North Lake and propose suitable mitigation measures for any potential impacts.

Submission 2.3-4: Specify how nutrient inputs from Murdoch drain will affect nutrient levels in Frog Swamp and North Lake and how likely impacts will be managed or mitigated.

Submission 3.1-2: Modelling should be presented that investigates the local impacts on wetlands as a result of filling and relocating Murdoch Drain.

Submission 6.1-12: The relocation of Murdoch Drain will severely impact on the quality of vegetation. The drain has natural vegetated features.

At the time of submission of the PER, it was proposed that a section of Murdoch Drain was to be relocated. It is now proposed that Murdoch Drain is partially filled in situ and not relocated. This option is preferred, as it has less of a direct impact on native vegetation and wetlands.

The impact of filling of a portion of Murdoch Drain is considered to be minor on the project area hydrologic regime, due to the following reasons:

- Surface water flows in the drain are minimal;
- Surface water flow during larger events follows a different flow path to the previously proposed drain relocation;
- There is an existing channel 'blockage' further down Murdoch Drain which prevents surface water connectivity;
- Alterations to evaporation rates are considered insignificant when compared to other elements of the water balance; and
- Additional recharge in this area will ultimately discharge to North Lake.

Historically, Murdoch Drain carried groundwater and surface runoff from Murdoch University Veterinary Farm, entering North Lake via a swamp in the south-east corner of the lake (Bayley et al 1989). The flow of water from Murdoch Drain to Lower Swamp and North Lake has been disconnected resulting in reduced water and nutrient inflow.

Murdoch Drain can be filled without any impacts on hydrology. Current survey information indicates that it does not currently function as a drain connecting Melaleuca Swamp to North Lake, as the open drain does not have a positive grade in either direction. There is also an obstruction in the form of a 1.5m high earth blockage within the drain, which appears to dam flows from moving further west under most conditions. There does not appear to be a culvert connecting either side; however, this possibility cannot be ruled out. If a culvert exists, it is likely blocked as water levels were significantly higher east of the blockage. The purpose of the blockage is unclear, but it forms a makeshift bridge allowing pedestrian access from one side of the drain to the other.

Essentially this means that any water entering Murdoch Drain "sits" in the drain, until it is either evaporated, infiltrates into the groundwater or is flushed by a significant flow. Roe Swamp is connected to Frog Swamp when water levels are greater than 15.6m AHD, providing an overland route for any water in cut off sections of Murdoch Drain to flow into North Lake.

Simply filling a portion of Murdoch Drain, rather than relocating it, will reduce the overall impact on the environment and have a limited impact on the hydrology of the area. Partially filling the drain will result in around 5ha less clearing than relocating it. As Murdoch Drain does not function as a drain, and there are overland flow routes within the wetlands for higher water flows, the hydrology of the wetlands will not be altered by not relocating the drain. There is also a reduction in the risk of impacting ASS.

Submission 2.3-4: Specify how nutrient inputs from Murdoch drain will affect nutrient levels in Frog Swamp and North Lake and how likely impacts will be managed or mitigated.

See Submission 2.3-3.

Submission 2.3-5: Specify how stormwater discharge into Bibra and North lakes from the development will be managed to limit the impact of runoff contributing to poor water quality.

To manage the impact of road runoff contributing to poor water quality in Bibra Lake and North Lake, it is proposed that there will be no stormwater discharge directly into the lakes from Roe Highway. As a minimum, the drainage system has been designed to retain and infiltrate the five year average recurrence interval (ARI) storm event. Within the project area wetlands, roads will be kerbed and all road runoff will be piped to discrete basins. It is envisaged that oil/water separators and gross pollutant traps will be installed as part of the final design.

For more detailed information on stormwater management, refer to the WMS (Appendix E).

Submission 2.3-6: There are potential impacts to 'vegetation in very good condition or that has been determined to support flora of conservation significance or of other importance' during construction of the bridge over Roe Swamp, even through top-down method. Specify how these impacts will be managed or mitigated.

See Submission 6.1-4.

Submission 2.3-7: The management of stormwater and impacts on the Murdoch University wetlands is unclear. There is no information about the effects on Melaleuca Swamp or veterinary paddocks from construction and operation of the road.

Other than the land acquired from Murdoch University for the construction of Murdoch Drive Extension, there will be no adverse impact on Melaleuca Swamp or the veterinary paddocks from the construction and operation of the road. The road will be kerbed and runoff from the road network in the vicinity of Melaleuca Swamp (Murdoch University wetlands) will be directed to a basin located to the east of the road, between Farrington Road and the existing Murdoch Drive (see Basin L of the Murdoch Drive Catchment Plan in either Appendix A of the WMS, or Appendix H of the PER).

Submission 2.3-8: The project is not consistent with environmental policies like the Swan Coastal Plain Lakes EPP.

The project is consistent with the *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992* (EPP Lakes). This policy prevents the filling, mining, discharge of effluent or drainage of water into or out of lakes unless a person is "authorised under the Act" (the Act being the *Environmental Protection Act 1986*).

Clause 9 of the EPP Lakes defines "authorised under the Act" as: "a works approval, a requirement contained in a pollution abatement notice, section 40(1)(a) of the Act (by being informed under that section that a proposal does not need to be assessed under Part IV of the Act), a condition under section 45 of the Act, a direction under section 73 of the Act or an exemption under section 75 of the Act."

The environmental assessment process (Part IV of the EP Act) will, if the project is approved, result in conditions being imposed upon Main Roads under Section 45 of the EP Act. Therefore the proposed project will be "authorised under the Act" in accordance (consistent) with the requirements of the EPP Lakes, if approved.

3.3. Surface and Groundwater

Impacts to surface/groundwater

Submission 3.1-1: The proponent states on page 384 that 'during construction it may be necessary to undertake temporary groundwater dewatering to facilitate some construction activities. This can lead to a short-term lowering of local groundwater levels and potentially impact water levels in the groundwater dependent ecosystems.' However, information on dewatering and the potential impacts of this activity on groundwater dependent vegetation and wetlands has not been provided in the document. The location, volume, timeframe and timing of dewatering should be provided. Likely potential impacts and stress on wetlands and groundwater dependent ecosystems should also be presented.

The statement on page 384 of the PER is incorrect. There is a commitment that no dewatering will be conducted during the construction of the proposed road, see the amended Key Characteristics Table above (**Error! Reference source not found.**).

Submission 3.1-2: Modelling should be presented that investigates the local impacts on wetlands as a result of filling and relocating Murdoch Drain.

See Submission 2.3-3.

Submission 3.1-3: Modelling of subsurface compaction shows the impact is likely to be in the top 1 to 2m. The proponent states on page 385 that 'Most of the change in porosity is expected to occur in the top one to two metres of the soil immediately beneath the embankment. Therefore, the proposed infrastructure is expected to have a minimal, if any, discernible impact on groundwater levels beneath and adjacent to the road formation. Generally, groundwater levels or the water table is at least several metres below for the majority of the alignment. However in this case the groundwater expresses at the surface. Additionally the top 1 to 2m is intrinsically linked to wetland hydrology for surface runoff, infiltration and local groundwater flow. The compaction and loss of porosity should be discussed in terms of its effect on water flow and direction in relation to the wetlands.

See Submission 2.2-5.

Submission 3.1-4: Much of the knowledge on the relevant hydrological systems is based on data collected over 2010, or one year's worth of site specific hydrological data. Given 2010 was close to the driest year on record, this information provides little insight as to how the wetlands system functions in wet conditions. Hydrological data should continue to be collected and used to inform accuracy of model predictions.

Historical data and information, apart from project-specific monitoring conducted in 2010, have been used to develop an understanding of the wetland system functions within the project area. Appendix G of the PER and the WMS (Appendix E) demonstrate a robust understanding of the wetland system that is not solely based on 2010 conditions. Further hydrological data collection is ongoing.

Future planned monitoring is outlined in the WMS. The monitoring information will be used to re-calibrate/validate models with available data during final design.

Submission 3.1-5: The use of hydrogeological terms are somewhat confused, making some discussions difficult to follow. Hydrogeological evidence should be provided which shows that groundwater flow is impeded by limestone lenses.

It is acknowledged that use of the term 'limestone lenses' in the context of groundwater flows has not been clearly defined or discussed consistently in the PER. In a regional or sub-regional sense, the presence of 'limestone lenses' as diagentically altered zones of calcareous sands is not considered to significantly impede or affect the known westerly flow of groundwater in the superficial aquifer (i.e. Jandakot Mound). Davidson (1995) reports that regional hydraulic gradients in the vicinity of the Bassendean Sand—Tamala Limestone interface—are relatively steep, due largely to marginally lower hydraulic conductivities of the finer grained sands at the eastern margin of the Tamala Limestone. Additionally, this is also partially due to high hydraulic conductivities (100 to1,000 m/d) of the Tamala Limestone to the west, resulting in a draining effect of the groundwater from the east; as well as steeper gradients.

In a local sense, the project area wetland investigations (Appendix D of the PER) present variations in lithology and stratigraphy; as well as associated influences on localised vertical (perching) and lateral flows of water in the unsaturated and saturated zones. In terms of 'limestone lenses', they are not automatically associated with impedance of groundwater flow, as noted in project monitoring bores T-1D (no limestone) and T-1E (with limestone) (refer to Figure 5.2-3 of the PER). Data from these bores have similar groundwater levels consistent with the regional water table distribution.

Submission 3.1-6: Impacts to Groundwater Dependent Ecosystems should be further investigated. The absence of data to discount impacts on GDEs does not comply with the precautionary principle. In fact, the GDE sub community area to be cleared in three times the impact reported in the PER, at 16%.

GDEs will comprise 16% of the total clearing area of native vegetation of 79.3ha. The total GDE's to be cleared within the project study area is 13ha of the 310 ha of GDEs mapped during surveys, or 5% of the GDE's mapped within the study area.

Submission 3.1-7: The proposal should be rejected due to the severe hydrological impacts listed in the PER. Building a highway between lakes will impede groundwater flow and disrupt the hydrology of Roe Swamp and North Lake.

See Submission 2.2-3.

Submission 3.1-8: Groundwater should not be used for construction and dust suppression.

Groundwater will be used for construction and dust suppression. Groundwater is easily accessible in the project area, and the superficial aquifer is not at capacity (see WMS (Appendix E) for further details on the local and regional aquifers). Abstraction sites for groundwater will be located to avoid impacts on GDE's, wetlands and Acid Sulfate Soils (ASS) and also to minimise potential impacts to other bore users. Abstraction sites will not be located within 1.5km of Bibra Lake and North Lake in order to prevent any impact on groundwater levels at the lakes. Management measures for groundwater abstraction are described in the WMS.

Management of surface/groundwater movement

Submission 3.2-1: It should be confirmed whether the two areas where the road vertical profile will not be maintained at greater than 2m above the groundwater table are near or on the wetlands. If so, describe the potential impacts on the wetlands in relation to waterlogging, soil filtration and changes to local groundwater movement.

The locations where the road vertical profile is within 2m of the average annual maximum groundwater level are provided in Section 6.3.4.1.4 of the PER. Neither low point is within a wetland boundary.

Submission 3.2-2: The need to protect the existing wetland system from accidental spills and road pollutants by controlling the discharge point was considered a higher priority than retaining the small rainfall events at source. However the effect of this decision on the water regimes of the wetlands is not discussed in the PER. Discuss the impacts on the wetlands' water regimes of directing rainfall events away from Bibra Lake and Horse Paddock Swamp.

It is agreed that protecting the wetlands from accidental spills and road pollutants was given a higher priority than infiltrating small rainfall events at the source. The risk of adverse impacts on the wetlands is considered to be greater from a reduction in water quality through pollution or accidental spills as opposed to a change in the location of groundwater infiltration.

Rainfall events will not be directed away from Bibra Lake and Horse Paddock Swamp – only road runoff will be directed away. Other than rain falling directly on the road surface, all rainfall will follow the existing flow paths. Generally this means the rainfall will infiltrate directly into the soil and groundwater. Rainfall falling on the road surface (within the wetland areas) will be piped to infiltration and bioretention basins in order to intercept, capture and/or treat the road runoff prior to it being infiltrated into the water table.

The area of road to be constructed within the Bibra Lake and Horse Paddock Swamp surface water catchment area is approximately 1.4% of the total catchment area of 730ha. All of the rain landing on the road area will be infiltrated to groundwater, minus some loss for evaporation. The impact on the wetlands water regime due to capturing and detaining rainfall events at discrete locations rather than at source is considered to be negligible, and was therefore not discussed.

Submission 3.2-3: The mounding of groundwater under the retention basins does not mimic the natural water flows in this area. Localised mounding along the shore of a wetland has the potential to change wetland water regime and hydrologic processes permanently. Table 6.3-1 states that there will be 'minor localised alteration to ephemeral surface water flows' but no discussion is presented on the potential impacts on wetlands as a result of this. Wetlands here depend on local ephemeral surface water flows as well as groundwater flows. Confirm that stormwater infiltration and bioretention basins are located outside of the wetland buffers as per the Decision Process for Storm Water Management in WA (2009). Discuss how the local groundwater mounding from the infiltration basins on the periphery of the wetlands will affect the wetland water regime. Discuss whether there will be changes in local groundwater flows due to preferential flows or increased flow rates. Explain how these will be managed to ensure no change to the wetland water regimes and water quality.

Submission 2.3-2: Bioretention basins, infiltration basins and directing stormwater away from wetlands are not management and mitigation measures for alteration in groundwater distribution in response to altered water availability. An additional impact of vegetation removal is the change in hydrological processes and potential impacts on wetland water regime and quality. Modelling of local groundwater systems should include the predicted changes in groundwater levels due to altered water availability and the predicted changes in local groundwater flows due to the construction of bioretention and infiltration basins. These impacts should in turn be used to predict potential/coupled impacts on the wetland water regimes and wetland function. Justification should be provided to show that the location of the bioretention basins is suitable and appropriate to limit the impacts on nearby wetlands due to alterations in the groundwater flows and quality.

There may be minor localised alterations to ephemeral surface water flows, as the road embankment may act as a barrier. It is not expected that this will cause a significant impact on the hydrological regime of the wetlands for a number of reasons:

- It is rare that surface water will exist within the road footprint;
- Culverts will be installed to allow surface water to flow under the road; and
- A bridge over part of Roe Swamp allows surface water to flow freely through the road alignment, maintaining existing surface water flows.

Infiltration and bioretention basins will be located outside of wetlands and wetland buffers, as indicated in the WMS (Appendix E) and Buffer Study (Appendix B). The location of drainage basins is the same as shown in Appendix H of the PER.

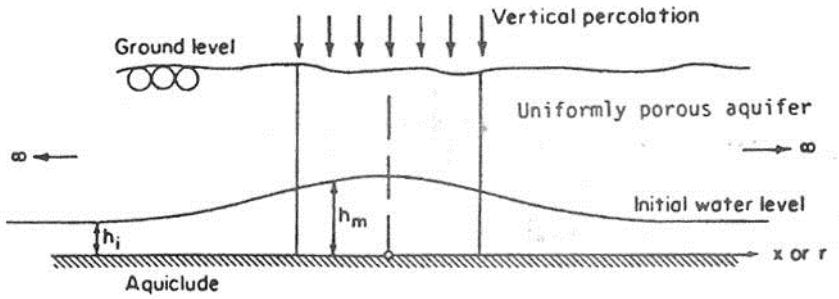
Whilst there will be some groundwater mounding beneath infiltration basins, they will not impact upon wetland water quality or quantity provided they are located in an appropriate location. Modelling of the effects of groundwater mounding has shown that the impacts of mounding are limited spatially and are temporary, lasting only a few days or weeks. Typically following a 5 year ARI event for a 25m radius basin, mounding will result in an increase in groundwater level of 0.2m at 50m from the basin.

A brief summary of the modelling methodology and results is included below:

Modelling Methodology and Inputs

Methodology

Analytical solutions have been adopted from Walton (1997) and *AQTESOLV for Windows software Ver.4.5*, both of which are based on earlier work by Hantush (1967), for estimating the rise and decay of water table mounds beneath areas of vertically uniform recharge (Figure 3).



when $t \geq \frac{r^2 S_y}{2P_h \overline{m}}$ and $r \leq R_m$

$$h_m = \left\{ \frac{W_m R_m^2}{2P_h} \left[W(u_o) - \left(\frac{r}{R_m}\right)^2 \exp(-u_o) + \frac{1}{u_o}(1-e^{-u_o}) \right] + h_i^2 \right\}^{\frac{1}{2}}$$

when $t \geq \frac{r^2 S_y}{2P_h \overline{m}}$ and $r \geq R_m$

$$h_m = \left\{ \frac{W_m R_m^2}{2P_h} \left[W(u) + 0.5\, u_o \exp(-u) \right] + h_i^2 \right\}^{\frac{1}{2}}$$

where

$$u_o = \frac{R_m^2 S_y}{4P_h \overline{m} t} \quad \text{(dimensionless)}$$

$$u = \frac{r^2 S_y}{4P_h \overline{m} t} \quad \text{(dimensionless)}$$

Figure 3: Growth and decay of groundwater mounds in response to uniform percolation (Walton 1997)

Where h_m is the head beneath the mound [length];

h_i is the static head prior to recharge (i.e., initial saturated thickness of aquifer) [length];

~~m~~ = $0.5*(h_i + h_m)$

P_h is the (saturated) hydraulic conductivity of the aquifer [length/time];

r is radial distance from the centre of the recharge area [length];

R_m is the radius of the circular recharge area [length];

Sy is the specific yield of the aquifer [dimensionless];

t is time;

t_1 is time used in successive approximation; and

W is the recharge rate [length/time].

The application of this analytical solution is underpinned by various assumptions that include:

- The aquifer is homogeneous, isotropic and effectively present over a very wide area;
- The solution is not applicable for settings where the mounding 'reaches' the ground surface; and
- Recharge to the watertable is assumed to occur 'instantly' at the water table such that the solution does not consider the complexities of flow through the unsaturated zone and associated time lag effects.

Inputs

Based on the conceptual drainage designs, site investigations and regional groundwater studies, the following inputs and assumptions have been adopted for the estimation of mounding:

- Hydraulic conductivity range of 8 – 30m/day; lower values considered representative of the Bassendean Sands whilst the higher values are adopted for the Tamala Limestone;
- Specific yield range of 0.1 – 0.3;
- Individual basin areas of 2,000 – 15,000m^2; equivalent to circle radii of approximately 25 to 70 m;
- Typical design water heights in basins of 1.0m for 1 in 5 year, 1.2m for 1 in 20 year and 1.6m for 1 in 100 year critical events; and
- Infiltration rates assumed to be 10% of hydraulic conductivity. This parameter is a key transient variable and depends on the unsaturated hydraulic conductivity of the subsurface, the nature of the basin floor and the depth to the water table amongst other things. The adopted value also considers the 'water balance' of the drainage basins; for the lower permeability substrate of 8m/day, 1.6m of water in the drainage basin equates to a period of 2 days for the stored water to reach the water table at the adopted infiltration rate. For a substrate permeability of 30m/day and a water height of 1.2m, this corresponds to full infiltration in less than12 hours. The adopted infiltration rates are thus likely to represent a conservative (or maximum) estimate of the volume of water that reaches the water table and consequently a conservatively high level of mounding.

Model Results

The estimates of peak groundwater levels from mounding beneath basins (as 'cross-sections' from the centre of the basin) are provided in Figure 4 for the Bassendean Sands and in Figure 5 for the Tamala Limestone.

It is important to note that the analytical estimates of mounding provided here are semi-quantitative, conservative and based on conceptual basin designs and typical aquifer properties. The results plotted in Figure 4 and Figure 5 show (as expected) that peak groundwater levels occur beneath the centre of the recharge source (basin), however, the predicted groundwater levels beyond the perimeter of the basin are more important to consider in the context of potential impacts.

Maximum groundwater rises of about 2–3m near the perimeter of basins are expected in response to larger rainfall events (greater stored volumes within basins). For smaller, more frequent rainfall events, groundwater level rises near basin perimeters is likely to be less than 1.0m. Given the relatively high hydraulic conductivity and specific yield of both the Tamala Limestone and Bassendean Sands, any mounding will be limited in magnitude and extent away from the basins. Small groundwater level increases between 0.05-1m are expected 100m from basin perimeters, depending on the size of the basin and the rainfall event.

The analytical solution used is not applicable in situations where very shallow depths to groundwater are present and/or the predicted mounding is large enough to 'intercept' the ground surface. The former case is most applicable to the project area, as some of the conceptual basin locations indicate that the depth to (seasonal) maximum groundwater levels is less than 1.0m. In these locations or situations, the shallow depths to groundwater provide a constraint to the mounding height that can develop, such that changes to existing and surrounding groundwater are likely to be significantly lower than those shown. The time for all stored basin water to infiltrate and dissipate in areas where the basin floor is very close to the watertable is likely to increase.

The mounding estimates are conservatively high in the sense that 100% of the stored water from a design rainfall runoff event is assumed to reach the water table as recharge. In reality, some basins will lose significant amounts of water through evaporation.

Discussion

The results show that the magnitude of mounding expected in areas surrounding the conceptual basin locations is expected to be limited, with a maximum groundwater level increase of 1m at 100m from the basin perimeter. These rises are also relatively short-lived in response to individual rainfall runoff events; the decay of mounds is quite rapid. Groundwater levels would be expected to return to pre-mounding levels within a few days or weeks. In areas where the floor of the infiltration basin is very close (<1.0 m) to the water table, mounding heights will be limited, and the loss of stored water to evaporation is likely to be greater.

In broad terms, significant changes to groundwater levels or fluxes are not expected in the project area due to the relatively high specific yields and hydraulic conductivities of the aquifers beneath. To limit the potential for adverse impacts on the water table and or wetland areas in a localised sense, several factors should be considered when further designing basins:

- Ensure basins are constructed at least 50–100m from wetland boundaries (depending on basin size);
- If infiltration capacity is to be optimised, locate basins away from any areas containing lower permeability / finer grained surficial deposits associated with wetlands; and
- In relative terms, utilise more basins at smaller sizes in comparison to fewer basins of larger size to limit the potential for increased localised mounding in any sensitive areas.

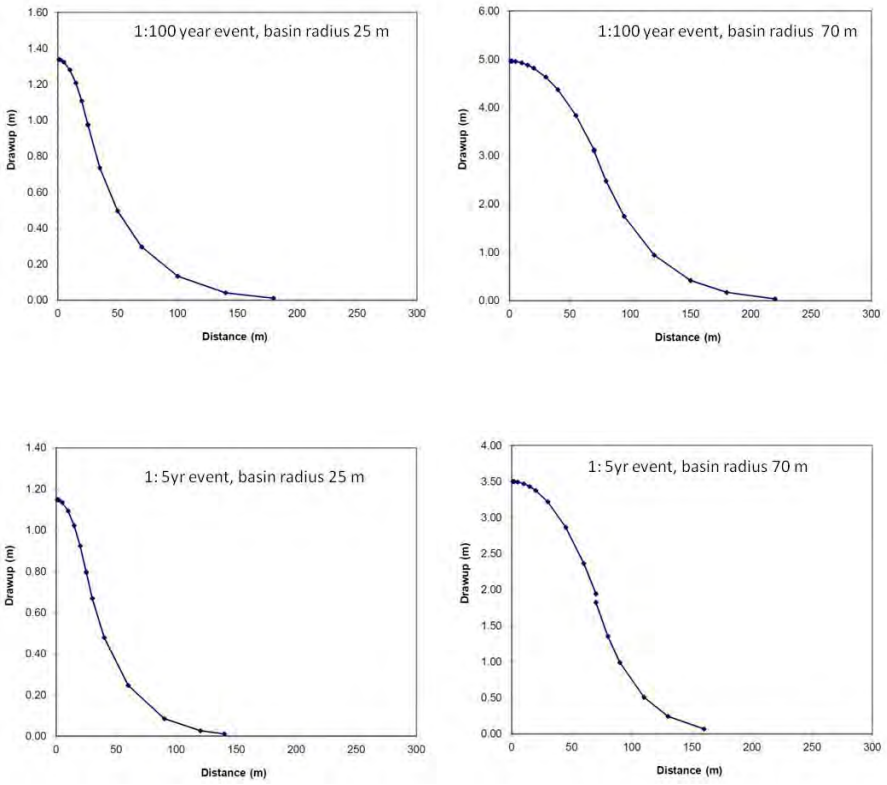


Figure 4: Mounding estimates beneath infiltration basins – Bassendean Sands

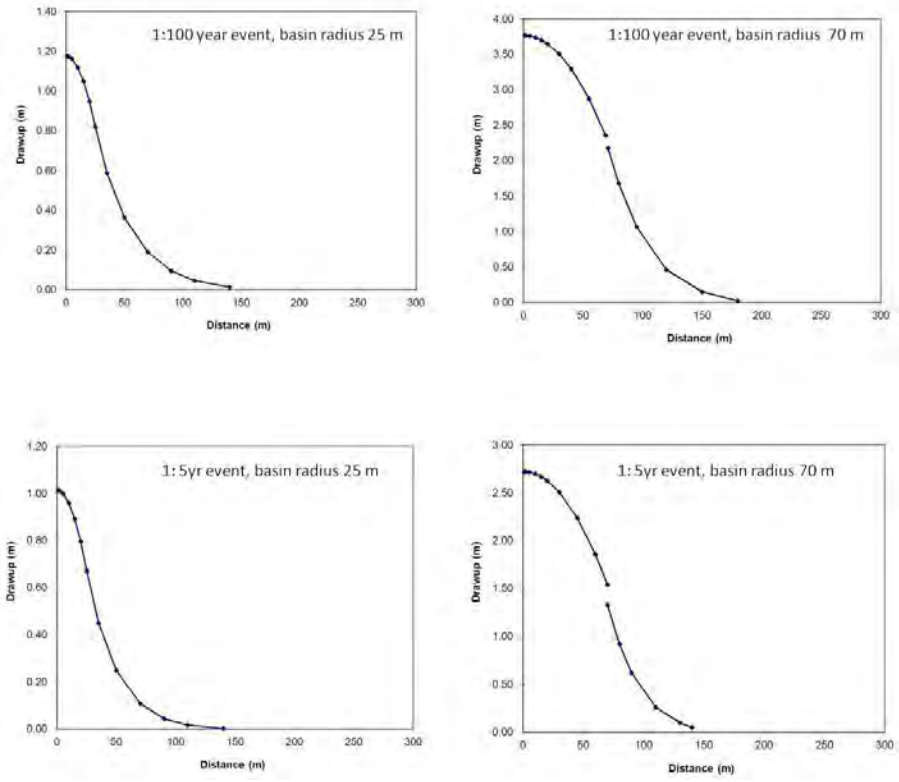


Figure 5: Mounding estimates beneath infiltration basins – Tamala Limestone

Submission 3.2-4: The MIKE-SHE model shows reasonably good calibration against the water levels in the wetlands and the groundwater bores except for the most recent years - 2009 and 2010 - where it is concluded that the model is not capturing system functions in the driest years. This means that the model is not simulating current conditions well and cannot be used to accurately predict how the system will respond to the proposal which will be constructed in current/recent conditions. Modelling showed that in the wet Simulation, there are surface water connections between Bibra Lake, North Lake and Frog Swamp and that these also occur during the extreme events. The model fails to inform on the issues and potential changes to the wetlands as a result of construction of the development, nor does the modelling illustrate how the retention basins will affect local groundwater flow. The results from the MIKE-SHE modelling should be used to inform how the system will be altered by the construction of the development, including redirecting of rainfall away from the wetlands, reduction in surface water connection between wetlands under extreme events and the impact on local groundwater from the installation of bioretention and infiltration basins.

The MIKE-SHE surface and groundwater model was developed to gain an understanding of the existing situation (Appendix G of the PER) and it is not intended to be used for predictive modelling of the impacts of various elements of the road design. Section 11 of Appendix G of the PER outlines suggested measures to develop this model into a predictive tool for use in the future design process. The scope of this model was to develop an understanding of existing water movement patterns and provide information to support both the concept design and environmental impact assessment but not to predict or quantify impacts. The locations and sizes of basins are conceptual and therefore indicative of a feasible design solution only. Final locations and sizes of basins will be determined in the final design in accordance with the WMC (Appendix E).

Model calibration occurred in 2009 using all available data, with the 2010 data used to validate the model as it became available. The 'dry' period mentioned in the submission occurred during 2009-2010. It is to be expected that the model did not validate well as the 2010 data set was fairly unique.

Rainfall will not be directed away from wetlands. Other than rain falling directly on the road surface, all rainfall will follow the existing flow paths. Generally this means the rainfall will infiltrate directly into the soil. Only in very high rainfall events will any form of overland flow occur. Rainfall falling on the road surface (within the wetland areas) will be piped to infiltration and bioretention basins in order to intercept, capture and/or treat the road runoff prior to it being infiltrated into the water table.

The road embankment may act as a barrier to surface water connections between wetlands in the project area. However this is not expected to be a significant impact on the hydrological regime of the wetlands for a number of reasons:

- It is rare that Bibra Lake and Horse Paddock Swamp will be connected by surface water;
- Culverts will be installed to allow surface water to flow under the road; and
- A bridge over part of Roe Swamp allows surface water to flow freely through the road alignment, maintaining existing surface water flows.

Whilst there will be some groundwater mounding beneath infiltration basins, it will not impact upon wetland water quality or quantity provided the basins are located in an appropriate location. Modelling of the effects of groundwater mounding has shown that the impacts of mounding are temporary, lasting only a few days or weeks, and are limited spatially. Typically following a five year ARI event for a 25m radius basin, mounding will result in an increase in groundwater level of 0.2m at 50m from the basin (see Submission 3.2-3)

Design and management of the project's drainage is discussed further in the WMS (Appendix E).

Submission 3.2-5: With regards to Appendix H (Drainage Report):

- Further discussion with the Department of Water regarding an appropriate drainage design for the highway extension will need to be undertaken.
- Design should utilise 'at source' infiltration wherever possible. Ideally up to the first 15mm of rainfall should be infiltrated as close to source as possible.
- The Department aims to achieve at least 2% biofiltration as an appropriate water quality treatment measure. The conceptual design should demonstrate that this area of biofiltration can be achieved for each drainage sub-catchment throughout the project area.
- Consider opportunities to accommodate detention storage volumes generated by infrequent large rainfall events, i.e. the design road protection 20 year ARI event, into the surrounding environment without the need for extensive landform modifications and deep excavations.
- Overflows to wetlands should be considered where the environmental water requirements will allow, provided initial treatment has occurred within the biofiltration areas. Opportunities to provide additional water to wetlands should be further explored. Linkages between the water requirements and the opportunities presented through the proposed drainage systems should be discussed and detailed.
- Further commitments to produce an appropriate Water Management Plan, which will specifically address both the construction phase and the operational phase of the highway extension, its potential impacts and management proposals for both ground and surface water must be included within this document. Discussion of groundwater requirements for construction needs such as dust suppression and dewatering, bore locations and other construction infrastructure requirements must also be detailed within this management plan.

Submission 3.2-7: Consideration should be given to relocating or redesigning the drainage management strategies. It is not acceptable that native vegetation is to be cleared for basins, especially if there are suitable cleared areas in close proximity. Confirmation is sought whether all drainage will be piped and discharged into controlled treatment areas.

In consultation with DoW following the submission of the PER, a commitment was made to scale back the draft concept drainage design report (Appendix H of the PER) to a format similar to a district stormwater management plan. The Water Management Strategy (Appendix E) of this report fulfils this requirement and supplements Appendix H of the PER.

"At source" infiltration will be utilised where possible, except through the wetland area. Kerbing, pits and pipes will only be used in sensitive areas. All other road drainage will be directed to infiltration basins to allow infiltration as close as possible to source. Infiltration basins will be located in cleared areas wherever possible. Infiltration Basins will include a bio-retention component sized at 2% of the directly connected impervious area.

Due to the linear nature of many catchments within the project area, MUSIC modelling demonstrated that a bioretention area of between 1 and 2% will be needed to achieve desired pollutant reduction loads. An area of 2% will be achieved within the areas identified for infiltration basins.

The opportunity to provide overland flows to provide additional water to wetlands and the design of larger infiltration basins will be developed further in the final design.

Submission 3.2-6: Measures need to be in place to address hydrocarbon and contaminant loads in bio retention basins. These basins should be linear and located within current cleared Hope Road alignment rather than vegetated areas.

As per the WMS (Appendix E) the management of the bioretention basins following construction will remain the responsibility of Main Roads. This includes management of debris, sediment and plant health in the bioretention basins. The final design and location of all basins will be determined during the final road design.

Submission 3.2-7: Consideration should be given to relocating or redesigning the drainage management strategies. It is not acceptable that native vegetation is to be cleared for basins, especially if there are suitable cleared areas in close proximity. Confirmation is sought whether all drainage will be piped and discharged into controlled treatment areas.

See Submission 3.2-5.

Groundwater Use and Modelling

Submission 3.3-1: The discussion of existing groundwater use does not include current licensed abstraction; only WIN sites which will not reflect current usages. Current licensed abstraction should be obtained from wrl@waterwa.gov.au in order to quantify abstraction in the local area by identifying the major groundwater users. The proposal is located primarily in the Cockburn Groundwater Area, Kogalup sub-area and reference and discussion of the Cockburn Groundwater Area Water Management Plan (DoW 2007) should be included.

Allocation and licensed abstraction information is included in the Water Management Strategy and has been used to assess suitable locations for abstraction (Appendix E).

Submission 3.3-2: The PER discusses potential changes to local groundwater levels due to drawdown associated with dewatering but fails to identify the potential impacts from the abstraction of groundwater for dust suppression and other construction purposes. The use of groundwater for construction purposes including dust suppression and other construction needs should be discussed; including approximate volumes required and source options. Modelling should be used to determine drawdown associated with abstraction for dust suppression and construction.

See Submission 2.2-9.

Submission 3.3-3: The extent of any perching of groundwater in the area has not been established. Use modelling to determine potential levels of drawdown associated with any dewatering activities and outline intended management of any potential impacts.

No dewatering will be conducted during the construction of the project.

Submission 3.3-4: With regards to Appendix G: (refer also to DoW submission)

- Include the abstraction in the data analysis. Abstraction data is available from the Department of Water.
- Either include abstraction in the conceptualisation, or justify the exclusion of this flux (i.e. if it is a very small flux compared to the other fluxes).
- Average annual fluxes should be included in the conceptual model — most of this data has been collected or calculated (apart from EVT, horizontal flow, and abstraction), so the task is not too onerous.
- Change the conceptualisation so the lower-permeability sediments are an extension of the lacustrine sediments.
- Overall calibration stats to be provided as per the MDBC guidelines (RMSE, mean absolute residual error, mean residual error, the scaled RMSE, and a scatter-plot of all observed versus modelled values). Calibration should not include any 2010 data as this should be used for validation.
- The validation statistics should also be reported in the same way as the calibration stats, and should include all 2010 bore data.
- The spatial plots of the validation should have the predicted contours on the same map as the validation plots.
- The calibration bores should be clearly marked spatially.

As presented within Appendix G of the PER, data analysis was undertaken during the development of the PER. Pumping and irrigation was modelled in the early stages of model development; however, no discernible impact was identified and the additional layer of model complexity was removed to reduce run times. Conceptualisation was undertaken in the preliminary stages of project development. It would not be appropriate to alter the conceptualisation in this report, as this reflects the existing model build. The flux variables have been identified but average annual fluxes were not estimated during this early conceptualisation. Management measures to be implemented during potential abstraction activities are presented in the WMS (Appendix E).

The calibration statistics, required by the Murray-Darling Basin Commission guidelines were omitted to simplify the report for the general public. It was felt that the calibration statistics would add a layer of complexity to the report that would make it difficult for the public to understand. Calibration does not include 2010 data. Calibration bore ID's are shown in Table 5-4 and Table 5-6 of Appendix G of the PER.

In the context of creating a readily accessible document, extensive validation information was also not presented. Given the poor validation in the area of interest, for the 'extreme' year used, there would be little additional benefit in providing additional validation information and statistics, extrapolated, outside the proposed road footprint.

Any future modelling will include full reports on calibration statistics and validation information.

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3.4. Water Quality

Submission 4.0-1: Shading has not come through in the document to show where there are exceedances of the ANZECC guideline levels for water quality.

Noted, this was an editorial error in Tables 6.4.1 and 6.4.2 of the PER. However as the ANZECC guideline level is included and the results obtained are shown, it is considered that the tables can be interpreted without the shading.

Submission 4.0-2: Washdown and maintenance areas should be in contained areas away from the wetland boundaries and their buffers.

Washdown and maintenance areas will be located outside wetland buffer areas. See Table 6.4-4 of the PER and the WMS (Appendix E).

Submission 4.0-3: Little specification is given to the mechanics and function of the infiltration basins including infiltration rates, capacity to filter contaminants and triggers and actions to manage the system. Specify how effectively the infiltration process will remove contaminants and pollutants from stormwater. Specify the lifespan of this treatment process, the maintenance actions required to ensure system efficiency, monitoring program and triggers (for water quantity and quality) to indicate the lifespan of the system and the management actions for stormwater treatment beyond this timeframe, or in the event that the system is not as effective as predicted. Provide management actions to be applied in the event that the installation of these infiltration and bioretention basins deleteriously impacts on the wetlands. Specify the flora species that will be planted in these basins. Confirm that they will be appropriate to the local hydrology and native to the area.

Submission 4.0-4: Provide a contingency plan in the event that a spill occurs which may adversely affect the wetlands. Further detail should be provided on the management strategies implemented to manage contaminants entering the wetlands systems.

Submission 4.0-5: Despite proposed drains, oil, diesel particulates and heavy metals would build up over decades affecting every species using the wetland. A single fuel truck accident would pollute groundwater and devastate the wetlands.

The infiltration process removes contaminants from road runoff by settling particulates out of the road runoff. The majority of road based contaminants are bound to fine particulates (Section 6.4.3.1 of the PER). The fate of those particulates determines to the fate of the majority of road runoff pollutants. When road runoff is directed into an infiltration basin, the particulates settle out of suspension and remain in the basin, whilst the water infiltrates into the groundwater. The majority of road runoff pollutants are therefore captured within the basin.

Hydrocarbons in the wetland areas will be captured in gross pollutant traps and oil/hydrocarbon separators prior to entering the large bio-retention basin on Hope Road. These will be maintained in accordance with the manufacturer's instructions. Through the wetlands, all road runoff will be captured by kerbs and piped to infiltration/bioretention basins. Prior to the runoff entering the infiltration basin, it will pass through a gross pollutant trap and/or an oil/hydrocarbon separator.

In less sensitive environments, most rainfall will be infiltrated at source, with only larger rainfall events being directed to infiltration basins. These basins will also have a bio-retention component. For further detail see Section 6.4 of the PER.

Infiltration rates are stated in the PER Section 6.4.4.3.2.

The lifespan of a well-maintained bioretention system is conservatively estimated at 20 years. Construction, maintenance and monitoring regimes for specific bioretention areas will be created during the detailed design phase once practical considerations are taken into account and final configurations are confirmed.

Flora species to be planted in the bioretention basins will be locally native occurring species. *Baumea juncea* and *Kunzea ericifolia*, both of which are found within the project area, are potential species to be used within the bioretention basins. The final species list will be determined at final design in consultation with DEC and DoW and may include local wetland species such as: *Astartea fascicularis*, *Adenanthos cygnorum*, *Banksia littoralis*, *Kunzea glabrescens*, *Daviesia physodes* and *Hovea pungens*.

Water quality monitoring will occur post-construction to ensure that the bioretention system is achieving the water quality targets stated in the PER Section 6.4.4.3.2 and in Table 15 of the WMS for TSS, TP and TN.

As stated in Table 6.4-4 of the PER, a detailed Emergency Response Plan will be prepared for construction and operation.

Submission 4.0-6: Water quality data shows that the pH of North Lake is decreasing. Further drying may result in acidification.

This project will not contribute to further drying of North Lake, nor have an impact on the water levels of North Lake.

3.5. Acid Sulfate Soils

Submission 5.0-1: Subsurface investigations have indicated that acid sulfate soils occur along the proposed route of the road extension, and that shallow groundwater in the area has already undergone partial acidification and contains elevated concentrations of metals. Existing groundwater quality problems in close proximity to Bibra and North lakes could be further exacerbated by poorly managed dewatering for the installation of concrete footings or other infrastructure associated with the construction of the road. It is therefore recommended that the proponent is required to prepare a dewatering management plan to indicate how subsurface infrastructure will be installed without causing further degradation of groundwater quality. It is recommended that the proponent commits to either avoid or minimise any dewatering undertaken for the construction of subsurface infrastructure, to prevent further soil acidification and degradation of groundwater quality.

Section 6.3.2.2 of the PER incorrectly states that "during construction it may be necessary to undertake temporary groundwater dewatering". Main Roads will not conduct any dewatering operations during construction.

Submission 5.0-2: There is a possible need to remove wetland sediments etc. at the northern end of Bibra Lake before construction. Disturbance of ASS to the east of North Lake could have flow on effects to the lake's ecosystem and contribute to the process of acidification. Estimate how much material will be removed and detail the AASS/PASS mitigation that will be used.

Submission 5.0-4: The proposal should be rejected due to the high risk of ASS on the surrounding ecosystem. Disturbance of these soils could lead to acidification of the groundwater and lakes, resulting in loss of biodiversity.

Procedures for management of wetland sediments and other potential ASS will be presented in the ASS Management Plan (ASSMP), which will be prepared prior to construction (see Commitment 2.2 in Table 9.1-1 of the PER). These procedures will be developed with due consideration of the ASS investigation results (see Commitment 2.1). The ASSMP will be developed following more detailed ground investigations in accordance with the DEC guidelines for ASS.

Submission 5.0-3: Permission should be sought from the DIA to conduct testing of the ASS risk.

Consent to disturb an Aboriginal site is being sought under Section 18 of the *Aboriginal Heritage Act 1972*.

Submission 5.0-4: The proposal should be rejected due to the high risk of ASS on the surrounding ecosystem. Disturbance of these soils could lead to acidification of the groundwater and lakes, resulting in loss of biodiversity.

See Submission 5.0-2.

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3.6. Flora and Vegetation

General

Submission 6.1-1: The loss of vegetation communities BahS and CcAf is not supported, as they are below the 30% threshold of pre-European extent. MRWA should confirm whether this whole community will be cleared within the proposal area.

Generally, EPA's objective for vegetation is to protect at least 30% of pre-European extent of vegetation types in unconstrained areas and 10% in constrained areas of urban development on the Swan Coastal Plain (EPA 2000 and EPA 2006). The project area falls within the constrained definition and therefore, the 10% retention target applies to the project.

Within the project area, the vegetation communities BahS and CcAf are located within the Bassendean complex—Central and South. This vegetation complex has 24% of its pre-European extent remaining, which is above the minimum 10% protection target (Table 6.6-3 of the PER).

Submission 6.1-2: The project construction will require the removal of up to 79.3ha of remnant vegetation. The proposal should be rejected due to the loss of remnant native vegetation and habitat plants for endangered species.

Submission 6.1-3: The proposal cannot be approved based on the EPA's broad principles for the protection of native vegetation and flora.

Submission 6.1-6: The area has one of the richest, floristically diverse plant assemblages within the metro area. The communities around each of the water bodies differ.

Submission 6.1-9: The 434 plant species known to inhabit the project area may be impacted by this proposal.

The EPA objective in relation to flora and vegetation is:

To maintain the abundance, diversity, geographic distribution and productivity of flora at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.

At a species level, the project will not have a significant impact on any flora species such that it significantly impacts the abundance, diversity, geographic distribution or productivity of the species. No 'Threatened Flora' listed under the *Wildlife Conservation Act 1950* (WC Act) or protected under the EPBC Act were recorded within the project area (Section 6.6.2 of the PER). Six species of priority flora were recorded within the project footprint, but the impact on these species will not be significant.

At an ecosystem level, the project will not have a significant impact on an ecological community such that it significantly impacts the abundance, diversity geographic distribution or productivity of the ecosystem. No threatened ecological communities or priority ecological communities were recorded within or near the project area (Section 5.8.4.2.1 and 6.6.1 of the PER). Whilst two vegetation communities within the project footprint are below the EPA's objective of retaining at least 30% of the pre-European extent of vegetation communities, the project will result in the loss of less than 0.3% of the current extent of these vegetation communities.

Impacts on native vegetation have been avoided, minimised and reduced wherever possible. The clearing footprint of the project has been reduced through the reduction of the road cross-section and avoidance of better quality vegetation. The 79.3ha of native vegetation that is proposed to be cleared once all avoidance and minimisation methods have been employed, will be mitigated through rehabilitation of areas disturbed during construction, but not part of the final road or associated infrastructure and the implementation of the Offset Strategy (Appendix F).

The broad EPA principle for the protection of native vegetation and flora has been met. The abundance, diversity, geographic distribution or productivity of flora species or ecosystems will be not be significantly impacted therefore maintaining the abundance, diversity, geographic distribution and productivity of flora at species and ecosystem levels.

Submission 6.1-4: The impact of reduced rainfall on the vegetation covered by the bridge is not explored.

Submission 6.1-13: Shading from the bridge structure will kill less shade tolerant plants. This will enable weed invasions and degradation of the vegetation.

Submission 2.3-6: There are potential impacts to 'vegetation in very good condition or that has been determined to support flora of conservation significance or of other importance' during construction of the bridge over Roe Swamp, even through top-down method. Specify how these impacts will be managed or mitigated.

It is acknowledged that there will be an impact on vegetation due to the bridge construction, but it is argued that the impact will be less than actual clearing. The assessed impacts of reduced rainfall and shading on vegetation under the proposed bridges are discussed in Section 6.6.3.1 of the PER.

Submission 6.1-5: The urban heat island effect will further impact on the loss of vegetation, as the hard dark surfaces will reduce the solar radiation absorption.

An urban heat island is an urban area that is significantly warmer than its surrounding non-urban areas. Roads can increase the heat island effect as they have a different thermal bulk properties (including heat capacity and thermal conductivity) and surface radiative properties (albedo and emissivity) than surrounding vegetated areas. Urban infrastructure also lacks the evapotranspiration properties of vegetation, which also has a cooling effect.

A road surface may increase the ambient air temperature by between 5-8°C (Delgado *et al.* 2007). The effect of this temperature increase on the majority of surrounding vegetation is expected to be limited; as negligible temperature increases (<1°C) are expected beyond 10m of the road perimeter. In a study on the effect of roads on temperature gradient in vegetated areas, significant temperature changes persisted for only 3m from the road edge into the vegetated roadside (Delgado *et al.* 2007).

Significant changes to project area temperatures or diurnal temperature flux that could cause changes to vegetation health are not expected due to the relatively limited range of these effects.

Submission 6.1-6: The area has one of the richest, floristically diverse plant assemblages within the metro area. The communities around each of the water bodies differ.

See Submission 6.1-2.

Submission 6.1-7: The proposal will impact on endangered species. The Beeliar wetlands contain four priority listed plant species plus rare forms of *Dampiera linearis* and *Pattersonia occidentalis*.

Six priority flora species were recorded within the project area (Section 6.6.2 of the PER). The rare forms of *Dampiera linearis* and *Patersonia occidentalis* were not recorded within the project area during project surveys. The Western Australian Herbarium and DEC's Florabase, do not list any rare forms of these species. A number of sub-species of *Patersonia occidentalis* are listed on Florabase, although none of them are listed as priority or threatened.

Submission 6.1-8: There is no such thing as 'temporary clearing'. The 33 ha to be restored will have reduced diversity.

The WWF-Australia submission states:

WWF wishes to point out that there is no such thing as 'temporary' clearing, and presumes the proponent means clearing followed by later restoration ... revegetated areas generally have reduced diversity and functionality when compared to original vegetation.

It is acknowledged that there is no such thing as "temporary clearing". This has been amended and the total clearing area of remnant vegetation (79.3ha) has been included in the Key Characteristics Table (**Error! Reference source not found.**).

The rehabilitation of disturbed areas is mitigation to rectify and reduce the loss of native vegetation over time, however it is acknowledged that the roadside revegetation will be less diverse than remnant vegetation.

Submission 6.1-9: The 434 plant species known to inhabit the project area may be impacted by this proposal.

See Submission 6.1-2.

Submission 6.1-10. 61% of original native vegetation on the Swan Coastal Plain has already been cleared since European settlement. From 2001-2009 clearing of native vegetation has occurred at the rate of 850 ha per year.

These statistics are not disputed.

Submission 6.1-11: Many of the existing degraded sites have the potential to be revegetated by the community organisations into the future.

The Cockburn Wetlands Education Centre submission states:

The PER does not consider the potential for many of the degraded sites, particularly the dampland zones, to be revegetated by the active community organisations into the future. ... Many of the degraded areas are used to devalue the reserve. These include the recreational area on the eastern side of Bibra Drive and the dampland zones of Roe Swamp and Horse Paddock Swamp. These areas have not been revegetated because they are currently found in the Road Reserve and are not managed or supported for revegetation

As the "existing degraded sites" referred to in the Cockburn Wetlands Education Centre submission are currently zoned as road reserve they are not currently available to be revegetated by community organisations or anyone else.

There are opportunities for the involvement of community organisations in the revegetation and restoration of Horse Paddock Swamp as proposed in Offset proposal 2 of the Offset Strategy (Appendix I).

Submission 6.1-12: The relocation of Murdoch Drain will severely impact on the quality of vegetation. The drain has natural vegetated features.

See Submission 2.3-3.

Submission 6.1-13: Shading from the bridge structure will kill less shade tolerant plants. This will enable weed invasions and degradation of the vegetation.

See Submission 6.1-4.

Submission 6.1-14: It is not acceptable that there will be a 75% loss of the population of *Dampiera triloba*. This species is uncommon on the Swan Coastal Plain.

See Submission 6.2-6.

Flora and vegetation survey

Submission 6.2-1: Statements in Section 1.5.2 of the AECOM report are made about threatened ecological communities (TECs) being listed in Western Australia through a determination by Species and Communities Branch. This is not correct. Communities are only deemed to be formally listed as TECs once they have been endorsed by the WA. Minister for Environment following recommendations made by the TEC Scientific Committee. The AECOM report also states that definitions and categories for TECs are defined in the reference English and Blyth 1997. The, definitions have been amended since that 1997 reference and are provided on the DEC website at: http://www.dec.wa.gov.au/contentiview/849/2017/. The correct information pertaining to TECs should be acknowledged.

Appendix K of the PER should read as follows: "Vegetation communities in Western Australia are described as TECs if they have been endorsed by the Western Australian Minister for Environment following recommendations made by the TEC Scientific Committee. There are currently four categories for TECs; Presumed Totally Destroyed (PD), Critically Endangered (CR), Endangered (EN) or Vulnerable (VU). For definitions of TEC categories and criteria refer to DEC (2010). DEC maintains a database of state listed TECs which is available for online searches via the DEC website (www.dec.wa.gov.au)."

Submission 6.2-2: Flora surveys were stated as being undertaken in spring 2009 and 2010 (section 5.8.2). *Drakaea elastica* is listed as Endangered under the EPBC Act and as Critically Endangered in WA, and was determined as likely to occur in the area. While this species flowers between September and November, the best time to look for the species is in July and August when the distinctive glossy leaves are conspicuous (Brown et. a/. 1998). According to Appendix K, the specific timing of the flora surveys was 10 September to 24 November 2009, April 2010,9-15 November 2010 and January 2011, and for priority flora, 17 September and 4, 5, 12 and 25 October 2010. None of these survey times correspond with the optimal time for surveying for *D. elastica*. Elsewhere in the methods section, reference is made to the specific survey requirement for this species, and that an initial survey was undertaken for this species in 'late July to early August 2009'. Unlike other surveys undertaken, the specific dates of this survey were not reported. Similarly, at page 43 of Appendix K, reference is made to 'no *Drakaea elastica* were recorded during spring 2009 or 2010', implying that this was the time when these surveys were undertaken. Confirmation should be sought whether targeted surveys were undertaken for the declared rare flora *Drakaea elastica*, and when, to ensure that the surveys were undertaken at the appropriate time of the year.

Submission 000-01-01: DSEWPaC acknowledges that the surveys for the Glossy-leaved Hammer-orchid may not have been undertaken at the optimum time for detecting the species, particularly considering the low rainfall experienced in south-west WA in the last few years. Additional surveys may be required prior to any construction being undertaken and if found, mitigation measures will be required to protect any extant plants located within the development footprint (see p.18 of summary).

The targeted survey for this species was carried out under the guidance of Dr Andrew Batty who completed a PhD study into native terrestrial orchids in Western Australia and is considered one of the state's orchid specialists. Dr Batty and other senior members of the survey team have conducted numerous targeted surveys for hammer orchids and other native orchid species and are very familiar with the appearance and habitat of the species.

A review of project records, including field planners and field photographic records show that the targeted investigations for *Drakaea elastica* were undertaken on the 12, 14, 18, 19, 25 and 26 August 2009. The methodology in Appendix K of the PER should have stated the dates of this targeted survey.

The habitat considered suitable for *Drakaea elastica* was limited in the project area. These locations were extensively searched for the presence of the distinctive glossy green leaf of *Drakaea elastica*. No leaves were located. Much of the suitable habitat was overgrown and had a dense layer of organic matter which is not considered optimal for *Drakaea* species. Therefore it was considered unlikely for *Drakaea elastica* to be present within the project area and it is considered that the timing of the targeted surveys was appropriate.

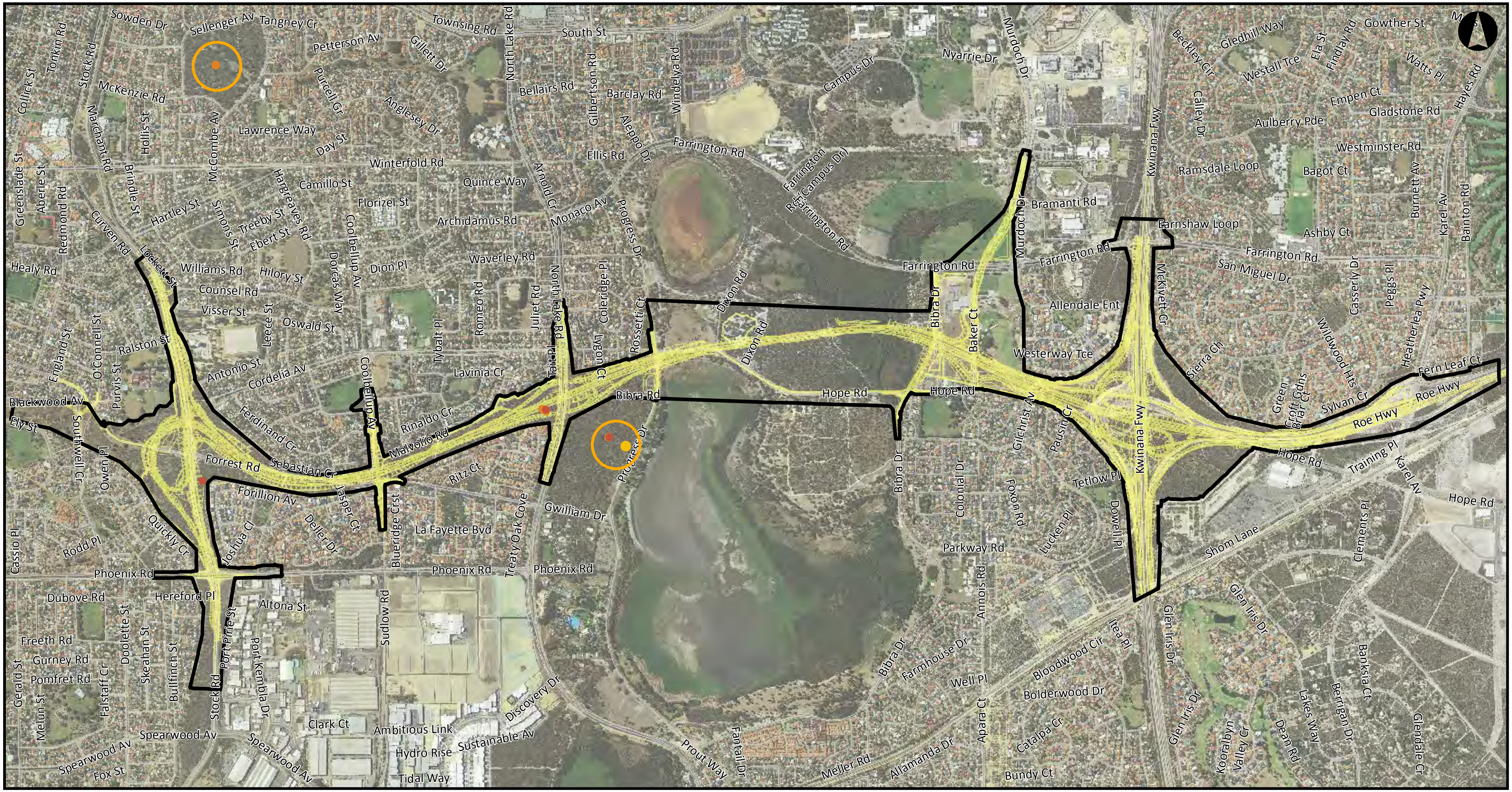
Submission 6.2-3: The flora survey report refers to a number of species of taxonomic uncertainty. Three *Lepidosperma* species and a species of the *Caesia micrantha* complex are identified as requiring further taxonomic work, and determination of their conservation status. The *Lepidosperma* species are noted as being investigated by Russell Barrett, and are referred to in the PER. The additional *Caesia 'micrantha'* is not referred to in the PER, nor referred to in Appendix K as flora requiring further study. This species is noted as occurring in two communities (CcXpMrS and EmXpS), both of which will be significantly impacted by the project footprint. The location of these species of taxonomic uncertainty has not been presented in the PER. Information should be provided on the extent and likely impact of the footprint on the potentially novel *Lepidosperma* and *Caesia* species should be presented for 6.6.2 and assessment. Further taxonomic work is required for the *Caesia* species.

Caesia micrantha sens lat appears to be an undescribed taxon in the group currently known as *Caesia micrantha* – it is a complex variant. Dr Russell Barrett has stated that the taxonomy of *Caesia micrantha* sens lat has yet to be resolved. A targeted survey of the project area and surrounding bushland was conducted in November 2012 to locate *Caesia micrantha* sens lat.

The targeted search within the project area involved revisiting the two previous collection sites of *Caesia micrantha* sens lat. and a single location for *Tetraria* sp. Chandala. To gain a better understanding of the local significance of the *Caesia micrantha* sens. lat. two local reserves, Samson Reserve and Bibra Lake Reserve, were surveyed to determine the local occurrence of these two species thereby quantifying the potential impacts of the proposed project on the long-term survival of the species. The two Reserves were traversed until several patches of *Caesia micrantha* sens. lat. had been recorded using a handheld GPS (±5m accuracy). *Caesia micrantha* sens. lat. was recovered at the two known locations in the project area. Outside the Project Area this species was recorded within 5 minutes of commencing the survey at both Samson Reserve (one population, five individuals) and Bibra Lake Reserve (one population, 10 individuals).

The *Caesia micrantha* sens. lat. is a common perennial herbaceous species that occurs within five IBRA regions of Western Australia. The term 'sens. lat' was applied to the specimen collected in the project area because the collected specimen did not contain suitable material to be matched to one of the recognised varieties. At this present time Greg Keighery is working towards resolving the taxonomic uncertainty of this group. However, advice from Dr Russell Barrett suggests that the form found in banksia woodlands on the Swan Coastal Plain will be relatively common. This is supported by recent field investigations in the vicinity of the Project Area. The time taken to recover populations of this species outside the Project Area (less than five minutes) indicates that the species is locally common and likely to be well represented outside the Project Area (Figure 6).

Locations of *Lepidosperma squamatum* sens. lat, *L. pubisquameum* sens. lat and *Caesia micrantha* (complex variant) have been mapped and are presented in Figure 6. Twenty four individuals of *Lepidosperma squamatum* sens. lat, two *Lepidosperma pubisquameum* sens. lat were recorded within the project area during the spring 2009 project survey. *L. squamatum* sens lat was recorded within quadrats R04, RW23, RW12 and RW16, *L. pubisquameum* sens. lat was recorded within quadrats RW07 and RW23 and *C. micrantha* was recorded within quadrats RW09 and RW22. Based on the current clearing footprint and the total number of known individuals in the project area, approximately 4.2% of *Lepidosperma squamatum* sens. lat will be affected by the proposed project. No individuals of *Lepidosperma pubisquameum* sens. lat are anticipated to be directly impacted by the proposed project.



Caesia micrantha sens. lat. Locations by AECOM

South Metro Connect

Figure 6a

0 250 500 750 1,000

Metres

1:27,500 (A4)

Project Area

Road Design

Targeted Survey Outside Project Area

Number of Plants

- 1 / unspecified
- 2 - 5
- 6 - 10
- 11 - 25
- 26 - 50
- 51 - 100
- 101 - 200
- 201 - 500

AECOM does not warrant the accuracy or completeness of information displayed in this map and any person using it does so at their own risk. AECOM shall bear no responsibility or liability for any errors, faults, defects, or omissions in the information.

SouthmetroConnect

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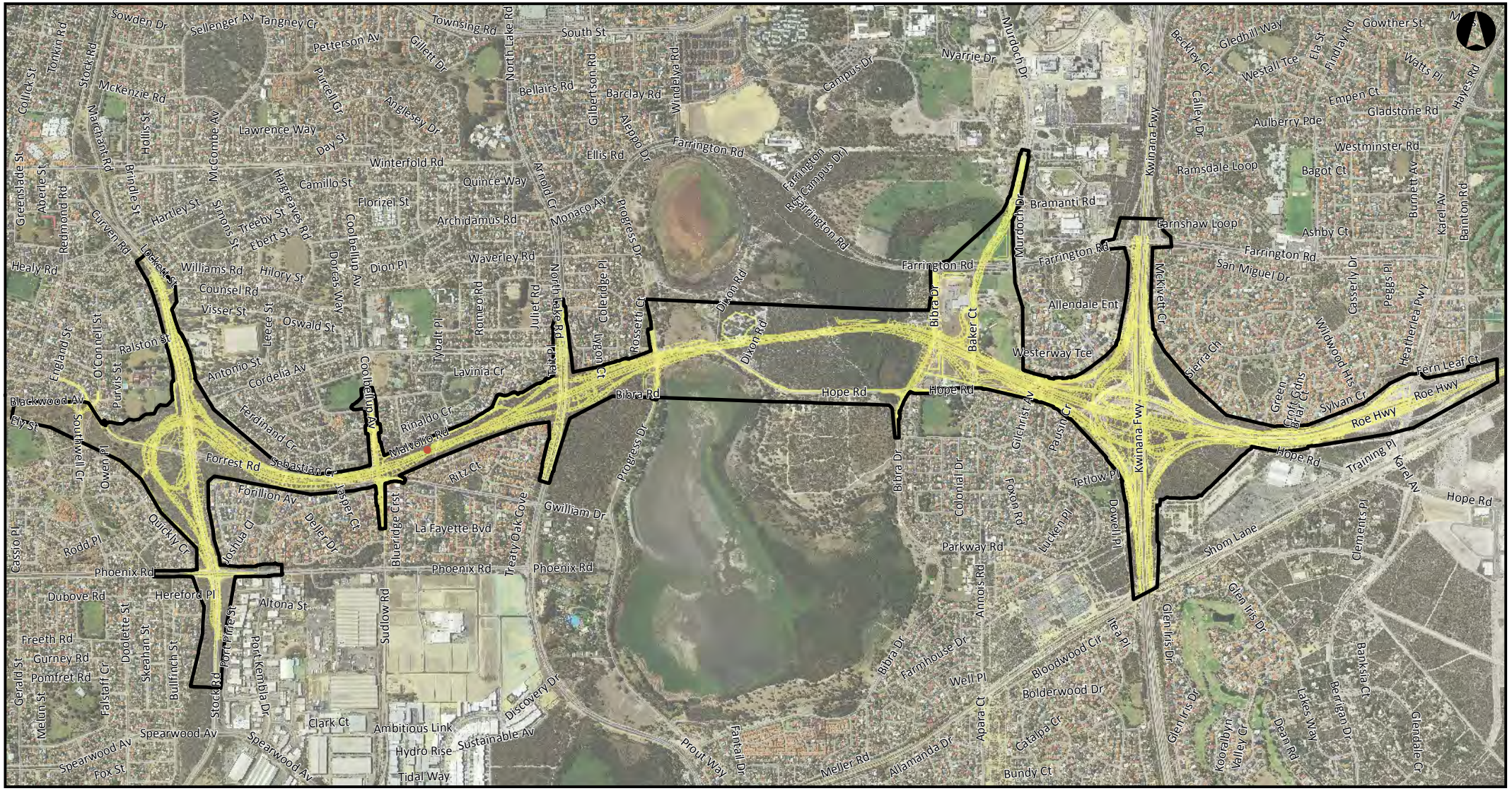


Tetraria sp. Chandala Locations by AECOM

South Metro Connect

Figure 6b

0 250 500 750 1,000

Metres

1:27,500 (A4)

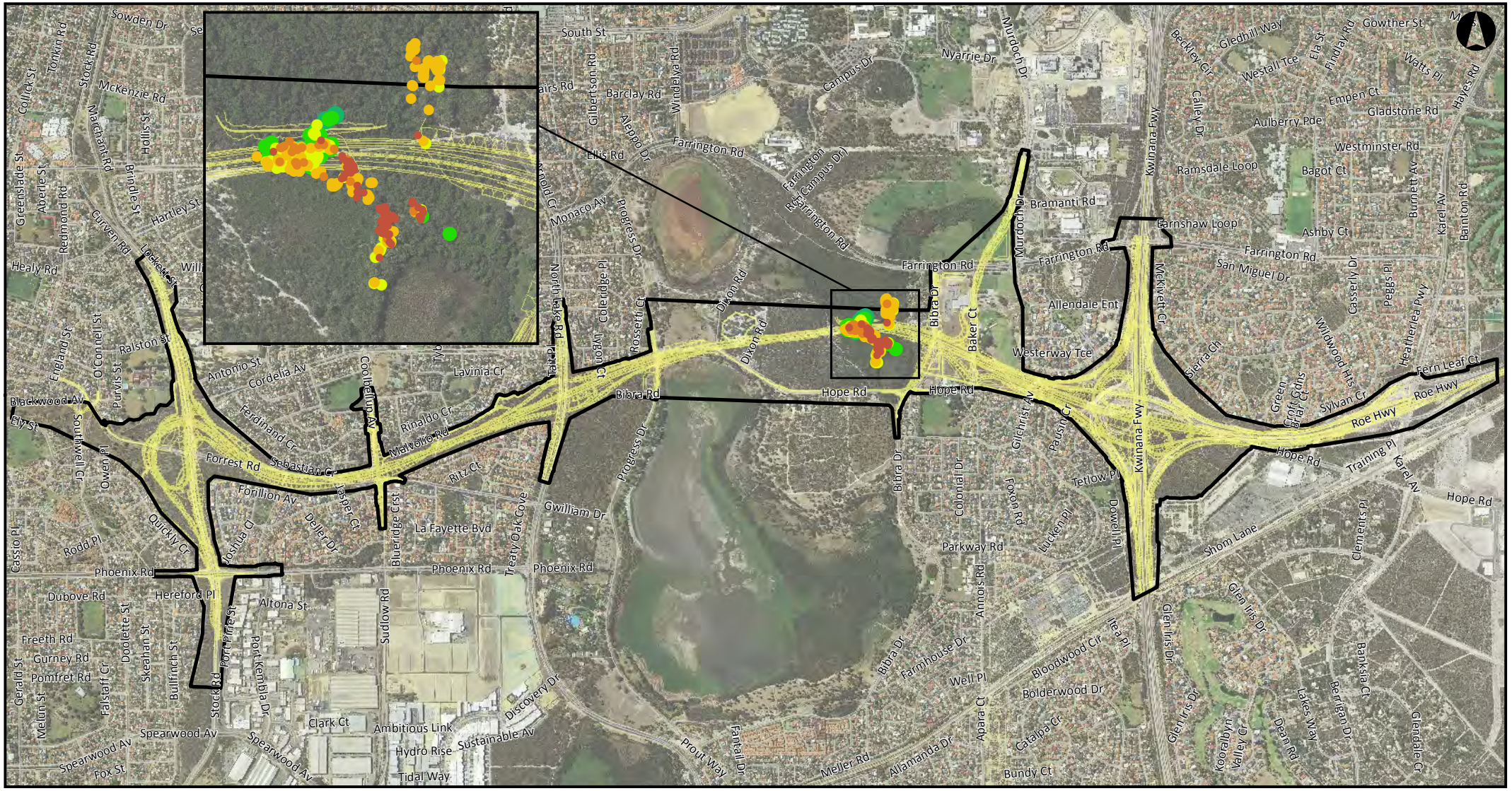
Project Area

Road Design

Number of Plants

- 1 / unspecified
- 2 - 5
- 6 - 10
- 11 - 25
- 26 - 50
- 51 - 100
- 101 - 200
- 201 - 500

SouthmetroConnect



Dampiera triloba
Locations by AECOM

South Metro Connect

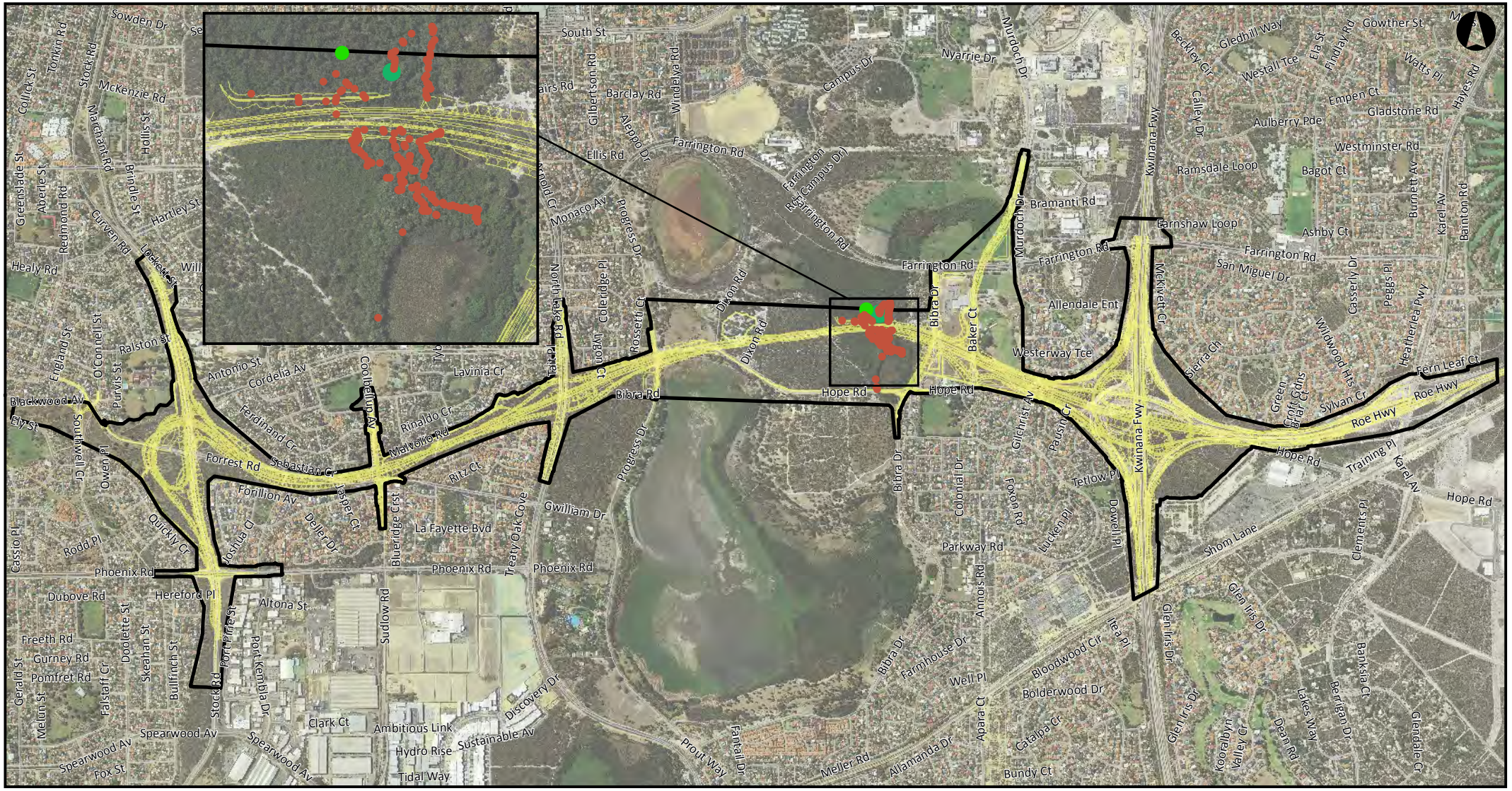
Figure 6c

0 250 500 750 1,000
Metres
1:27,500 (A4)

Project Area
Road Design

Number of Plants
1 / unspecified
2 - 5
6 - 10
11 - 25
26 - 50
51 - 100
101 - 200
201 - 500

SouthmetroConnect



Cyathochaeta teretifolia Locations by AECOM

South Metro Connect

Figure 6d

0 250 500 750 1,000

Metres

1:27,500 (A4)

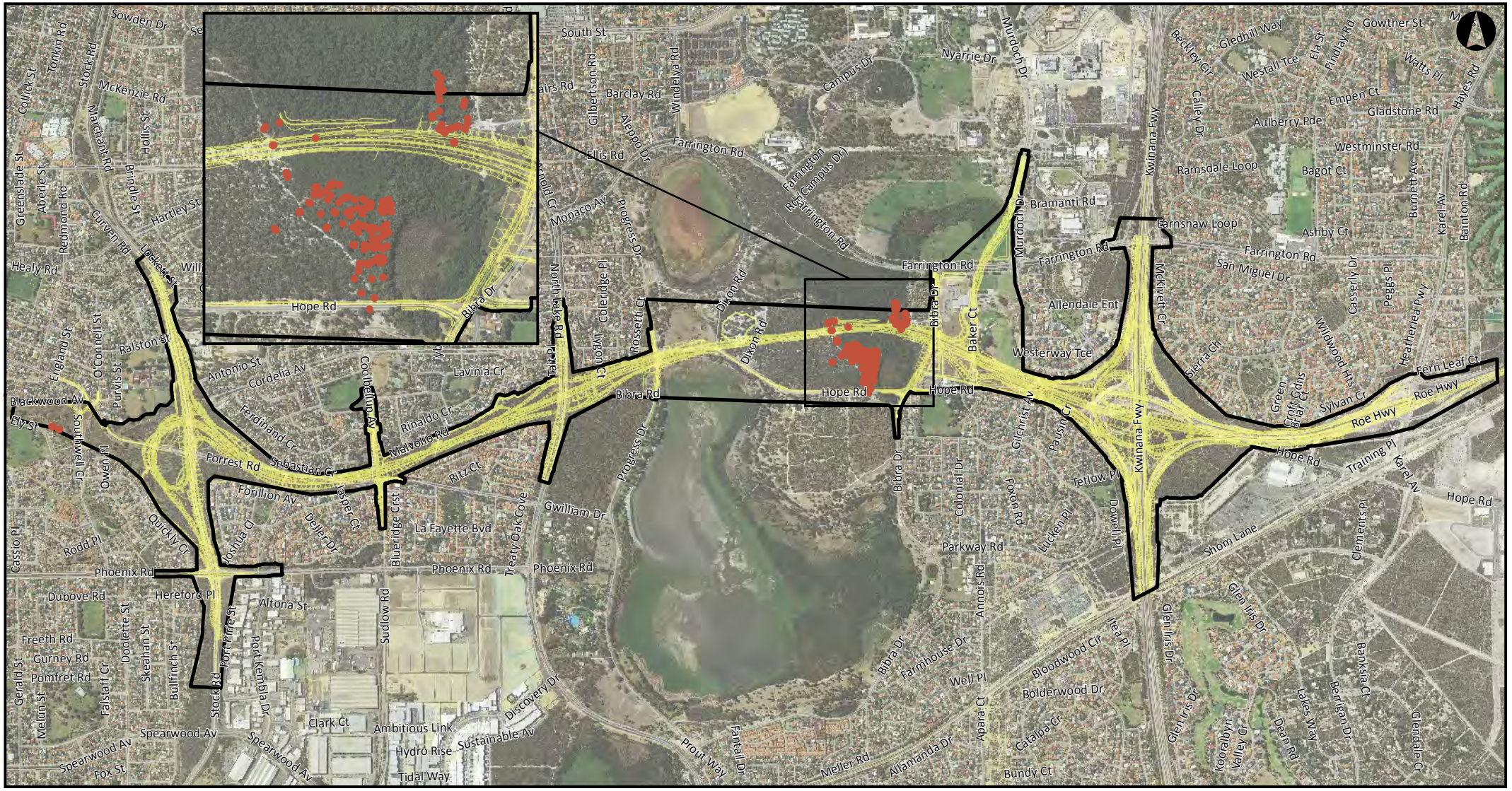
Project Area

Road Design

Number of Plants

- 1 / unspecified
- 2 - 5
- 6 - 10
- 11 - 25
- 26 - 50
- 51 - 100
- 101 - 200
- 201 - 500

SouthmetroConnect



Jacksonia gracillima Locations by AECOM

South Metro Connect

Figure 6e

0 250 500 750 1,000

Metres

1:27,500 (A4)

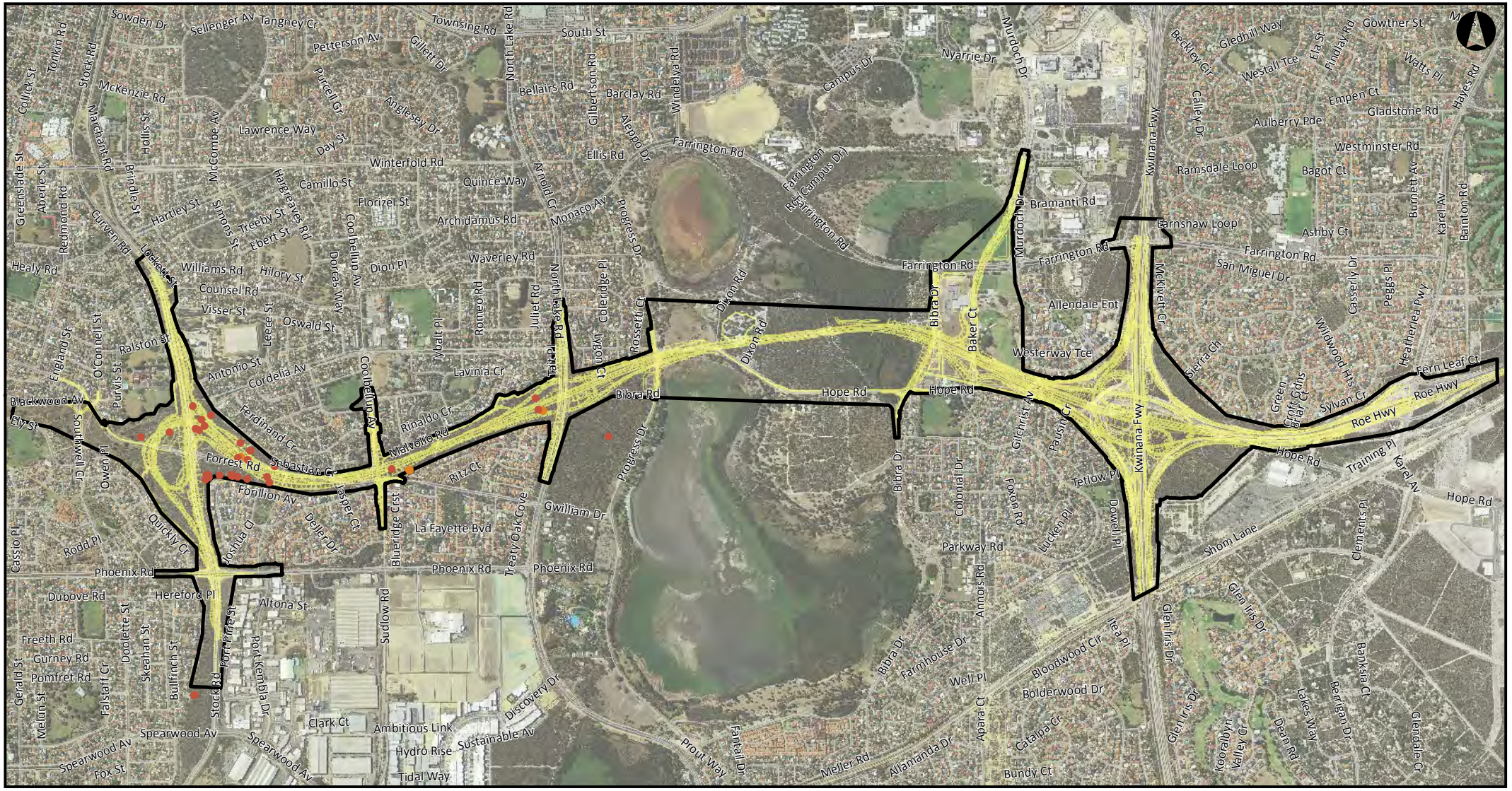
Project Area

Road Design

Number of Plants

- 1 / unspecified
- 2 - 5
- 6 - 10
- 11 - 25
- 26 - 50
- 51 - 100
- 101 - 200
- 201 - 500

SouthmetroConnect



Eryngium pinnatifidum Locations by AECOM

South Metro Connect

Figure 6f

0 250 500 750 1,000

Metres

1:27,500 (A4)

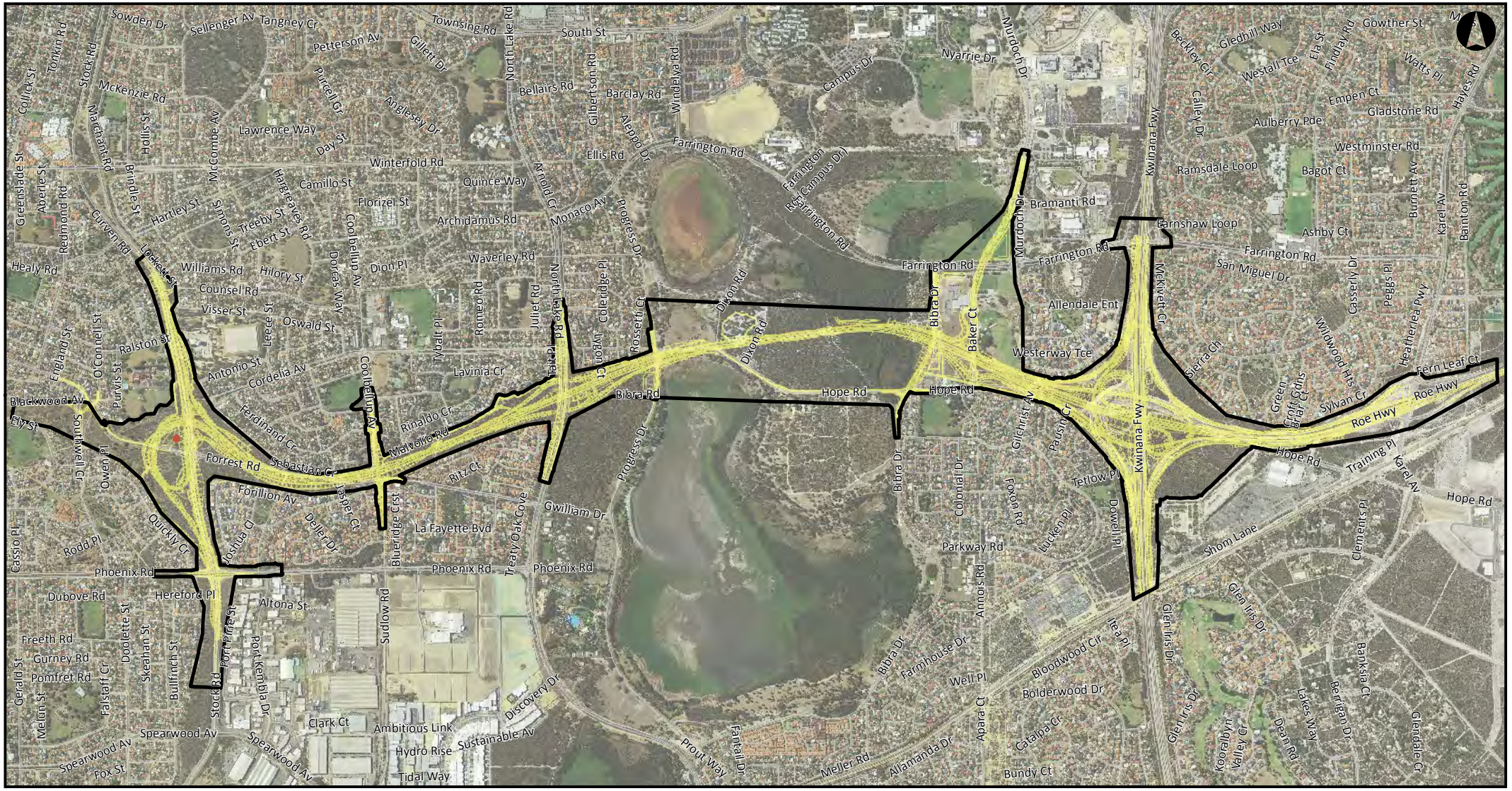
Project Area

Road Design

Number of Plants

- 1 / unspecified
- 2 - 5
- 6 - 10
- 11 - 25
- 26 - 50
- 51 - 100
- 101 - 200
- 201 - 500

SouthmetroConnect



Dodonaea hackettiana Locations by AECOM

South Metro Connect

Figure 6g

0 250 500 750 1,000

Metres

1:27,500 (A4)

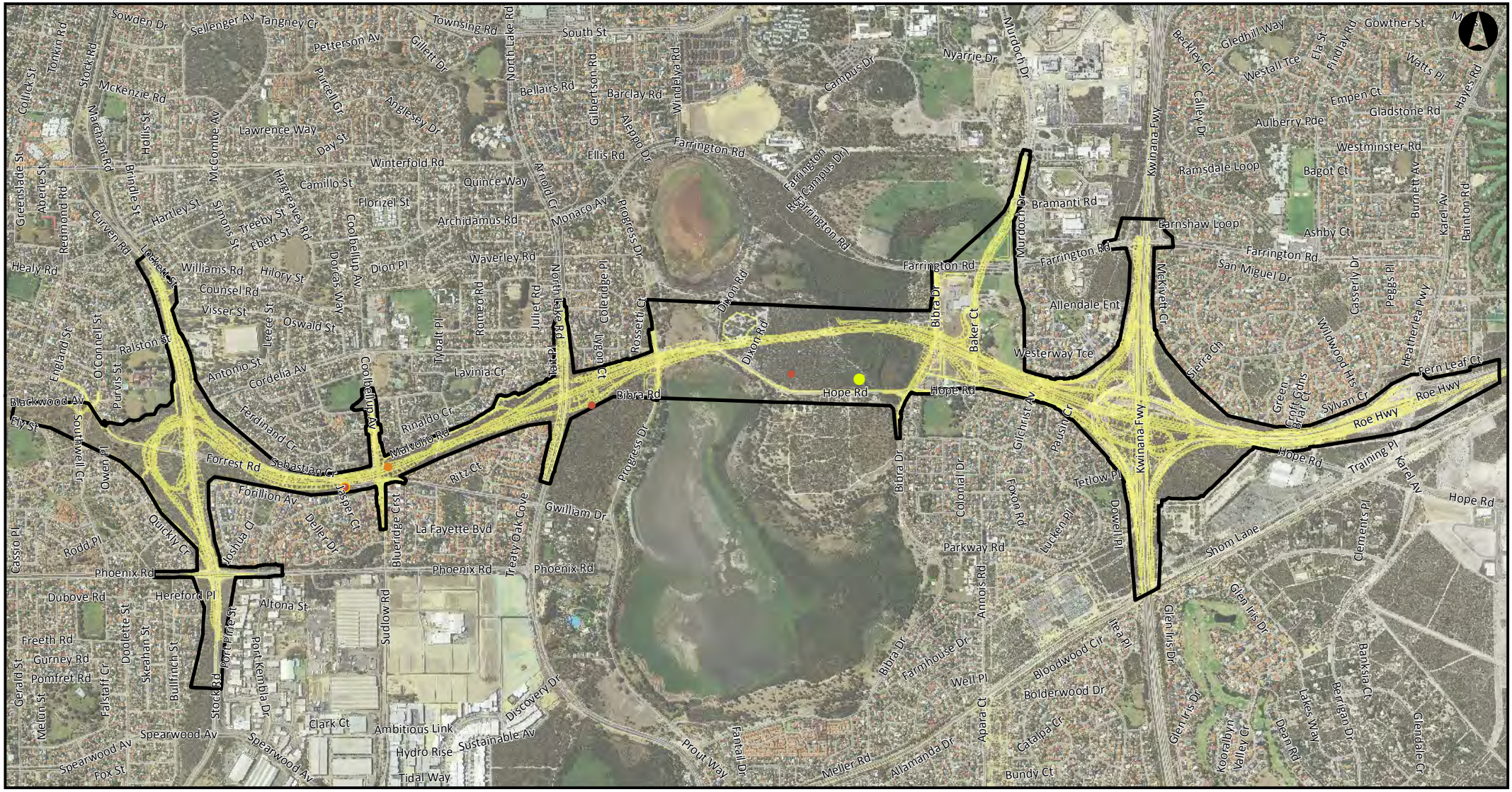
Project Area

Road Design

Number of Plants

- 1 / unspecified
- 2 - 5
- 6 - 10
- 11 - 25
- 26 - 50
- 51 - 100
- 101 - 200
- 201 - 500

SouthmetroConnect



Lepidosperma pubisquameum sens. lat. and _Lepidosperma squamatum_ sens. lat. Locations by AECOM

South Metro Connect

Figure 6h

0 250 500 750 1,000

Metres

1:27,500 (A4)

Project Area

Road Design

Number of Plants

- 1 / unspecified
- 2 - 5
- 6 - 10
- 11 - 25
- 26 - 50
- 51 - 100
- 101 - 200
- 201 - 500

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Submission 6.2-4: Appendix D of Appendix K provides qualitative quadrat data. In this appendix, photos of the different quadrats are provided with a condition rating from Keighery 1994 and the Braun-Blanquet scale. From a review of these photos, the condition ratings provided generally appear to be at least one to two condition scores lower than the photos appear to show. For example, site R01 (Good) could be rated at least Excellent; R02 (Degraded) could be rated Good; and R03 (Degraded to Good) appears to be at least Excellent. This indicates a significant under-estimation of the vegetation condition within the project area, with a far greater proportion potentially being in Very Good to Excellent condition. Advice is required on the methodology of assessing vegetation condition, and an explanation as to why the photographic evidence provided in the report appears to be significantly different to the stated condition rating. If required, the condition mapping should be re-evaluated.

Submission 000-01-02*:* DSEWPaC also echoes the concerns by WA DEC concerning the designation of vegetation condition ratings. The proponent should ensure that these ratings are appropriately assigned as per the relevant DEC guidelines to enable a thorough assessment of the habitat occurring within and in close proximity to the development footprint (see p.18-19 of summary).

A review of vegetation condition was carried out in accordance with advice from DEC in March 2012 and it was determined that the condition of some areas of vegetation were under-rated in the original survey. Vegetation condition ratings were revised in accordance with a condition rating scale (Table 2) adapted from Keighery (1994) and the Braun-Blanquet scale of cover abundance. Subsequently, the revised portions of the condition mapping were field verified on 16 March 2012.

Table 2: Bushland Condition Ratings

Descriptor	Explanation
Pristine	Pristine or nearly so, no obvious signs of disturbance. *0% weed cover*
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. *1 – 5% weed cover*
Very Good	Vegetation structure altered obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing. *5 – 25% weed cover*
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing. *25 – 50% weed cover*
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance of vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing. *50 – 75% weed cover*
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as "parkland cleared" with the flora comprising weed or crop species with isolated native trees or shrubs. *75 – 100% weed cover*

Source: Keighery (1994) and the Braun-Blanquet scale of cover abundance (from Mueller Dombois and Ellenberg 1974)

Vegetation condition is determined in relation to the (perceived) ability of the bushland to maintain itself (Keighery, 1994). This is commonly interpreted based on the ratio of visible introduced species to native species, although other factors should also be considered, such as disturbance (e.g. grazing, erosion), degree of alteration to community, habitat structure and site ecology. Given that effective measures of bushland condition are the amount of change in community structure and the proportion of weeds present, a quantitative measure is considered to add value to interpretations and results.

Vegetation condition within the project area (encompassing the proposed clearing footprint) has been found to range from 'Excellent' to 'Completely Degraded'. The majority of the project area (52.58%) is in 'Degraded to Completely Degraded' condition. Based on the March 2012 revision of the condition mapping, the proportion of varying vegetation condition is presented in Table 3. This table now replaces Table 5.8-6 of the PER. The revised vegetation condition mapping is presented in Figure 7. These figures replace Figures 5.8-5 and 5.8-6 of the PER.

Table 3: Proportion of Varying Vegetation Condition

Condition Rating	Area (ha)	% Total Area Surveyed
Excellent	10.13	4.04
Very Good to Excellent	5.30	2.11
Very Good	14.28	5.69
Good to Very Good	25.26	10.07
Good	36.90	14.71
Degraded to Good	27.10	10.80
Degraded	29.57	11.78
Degraded to Completely Degraded	52.17	20.79
Completely Degraded	50.22	20.01
Total	250.92	100.00

Vegetation Condition Mapping

South Metro Connect

Figure 7.1

0 50 100 150

Metres

1:5,000 (A4)

Coordinate System: GDA 1994 MGA Zone 50

LEGEND

Vegetation Mapping dissolved

- Water
- Completely Degraded
- Degraded - Completely Degraded
- Degraded
- Degraded - Good
- Good
- Good - Very Good
- Very Good
- Very Good - Excellent
- Excellent

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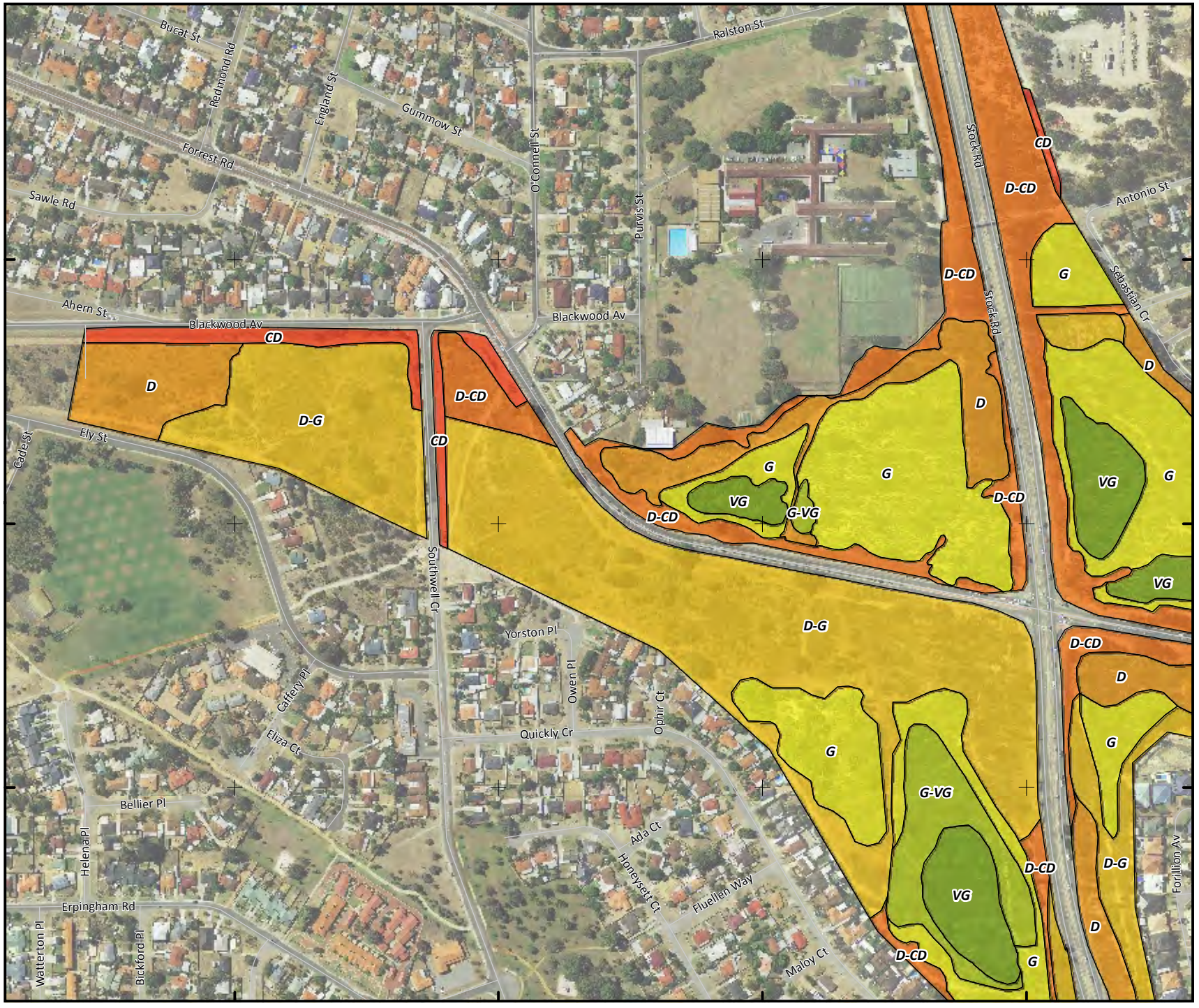

Vegetation Condition Mapping

South Metro Connect

Figure 7.2

0 50 100 150

Metres

1:5,000 (A4)

Coordinate System: GDA 1994 MGA Zone 50

LEGEND

Vegetation Mapping dissolved

- Water
- Completely Degraded
- Degraded - Completely Degraded
- Degraded
- Degraded - Good
- Good
- Good - Very Good
- Very Good
- Very Good - Excellent
- Excellent

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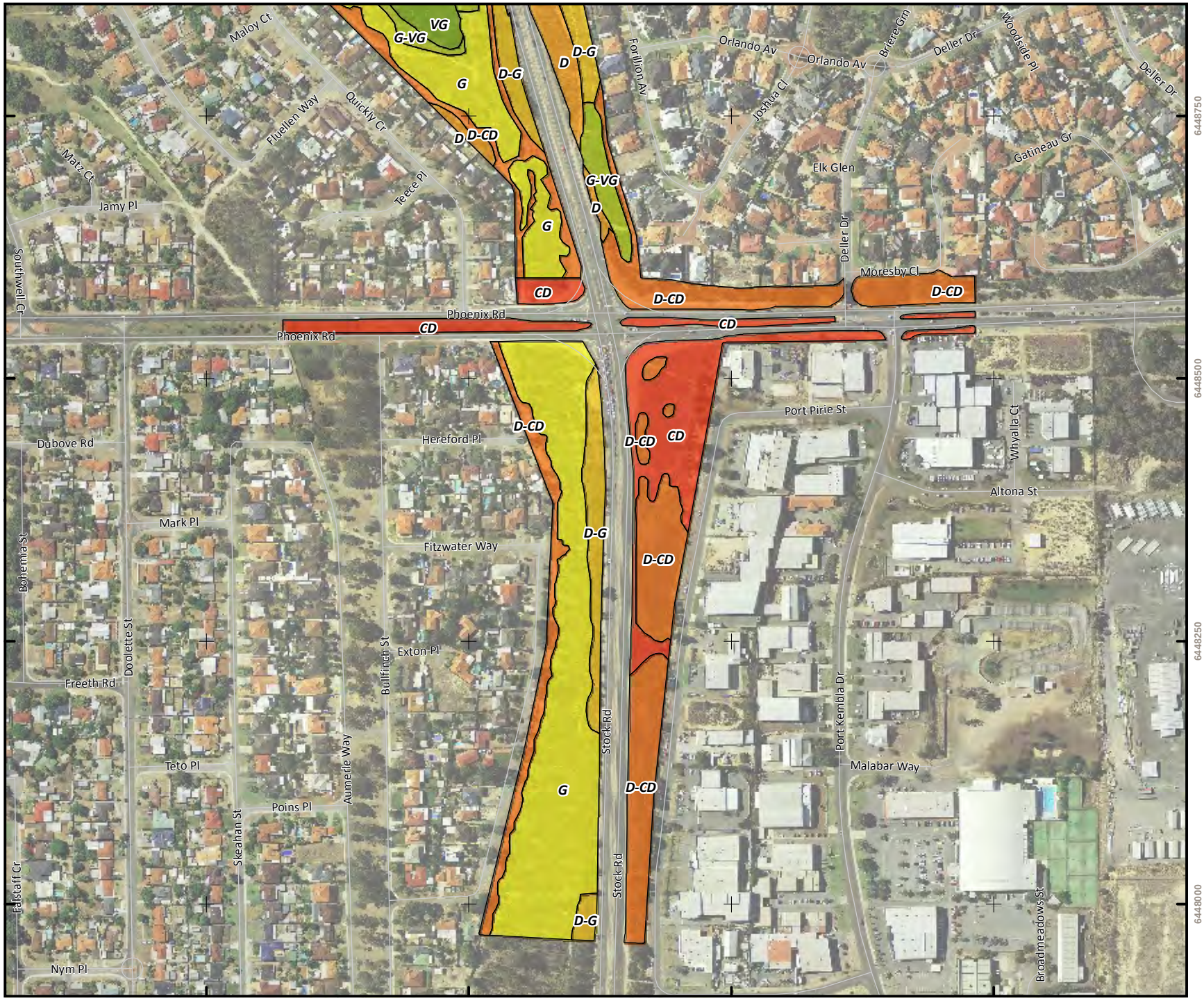

Vegetation Condition Mapping

South Metro Connect

Figure 7.3

0 50 100 150

Metres

1:5,000 (A4)

Coordinate System: GDA 1994 MGA Zone 50

LEGEND

Vegetation Mapping dissolved

- Water
- Completely Degraded
- Degraded - Completely Degraded
- Degraded
- Degraded - Good
- Good
- Good - Very Good
- Very Good
- Very Good - Excellent
- Excellent

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Vegetation Condition Mapping

South Metro Connect

Figure 7.4

0 50 100 150

Metres

1:5,000 (A4)

Coordinate System: GDA 1994 MGA Zone 50

LEGEND

Vegetation Mapping dissolved

- Water
- Completely Degraded
- Degraded - Completely Degraded
- Degraded
- Degraded - Good
- Good
- Good - Very Good
- Very Good
- Very Good - Excellent
- Excellent

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Vegetation Condition Mapping

South Metro Connect

Figure 7.5

0 50 100 150

Metres

1:5,000 (A4)

Coordinate System: GDA 1994 MGA Zone 50

LEGEND

Vegetation Mapping dissolved

- Water
- Completely Degraded
- Degraded - Completely Degraded
- Degraded
- Degraded - Good
- Good
- Good - Very Good
- Very Good
- Very Good - Excellent
- Excellent

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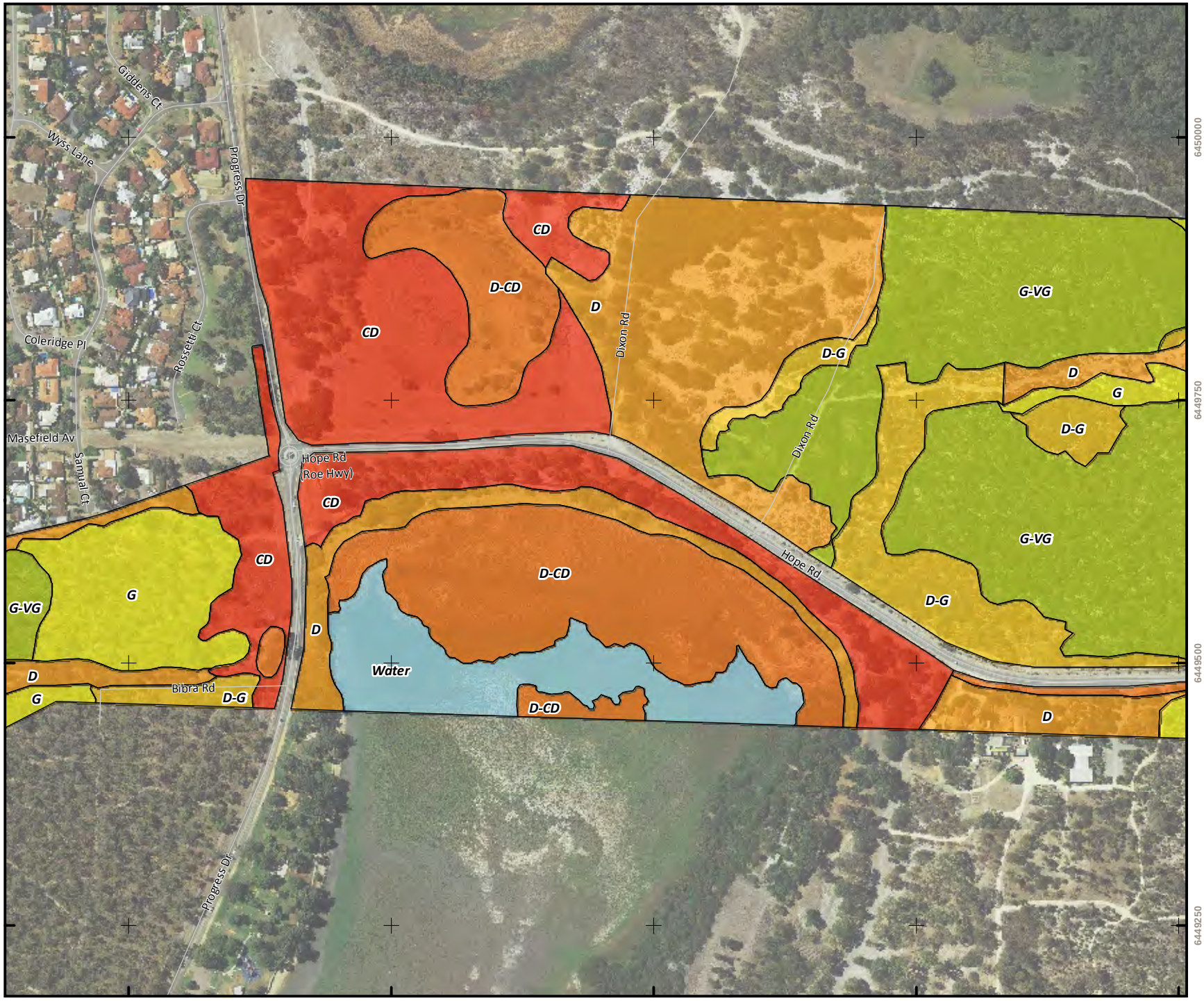


Vegetation Condition Mapping

South Metro Connect

Figure 7.6

0 50 100 150

Metres

1:5,000 (A4)

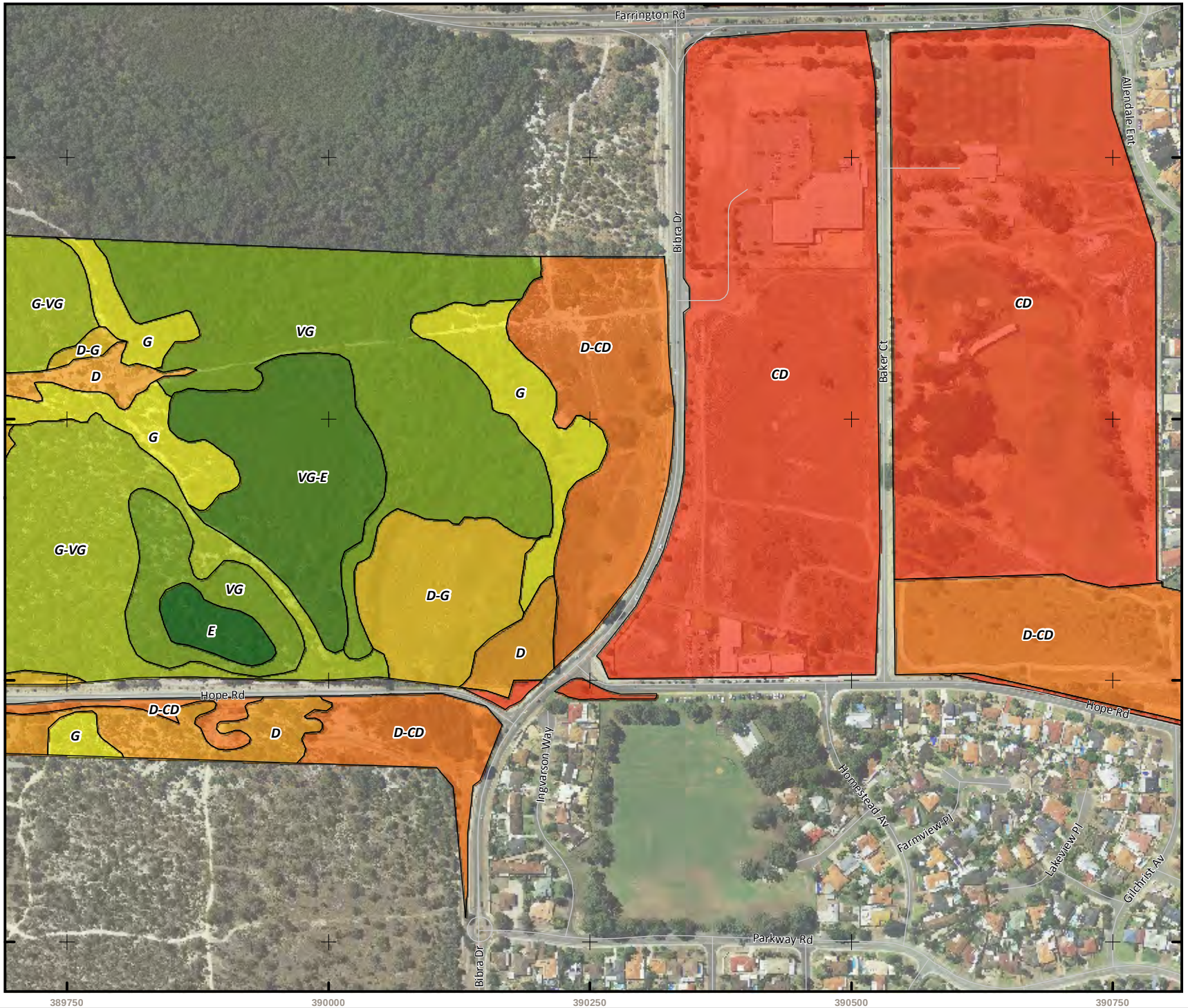
Coordinate System: GDA 1994 MGA Zone 50

LEGEND

Vegetation Mapping dissolved

- Water
- Completely Degraded
- Degraded - Completely Degraded
- Degraded
- Degraded - Good
- Good
- Good - Very Good
- Very Good
- Very Good - Excellent
- Excellent

SouthmetroConnect



Vegetation Condition Mapping

South Metro Connect

Figure 7.7

0 50 100 150

Metres

1:5,000 (A4)

Coordinate System: GDA 1994 MGA Zone 50

LEGEND

Vegetation Mapping dissolved

- Water
- Completely Degraded
- Degraded - Completely Degraded
- Degraded
- Degraded - Good
- Good
- Good - Very Good
- Very Good
- Very Good - Excellent
- Excellent

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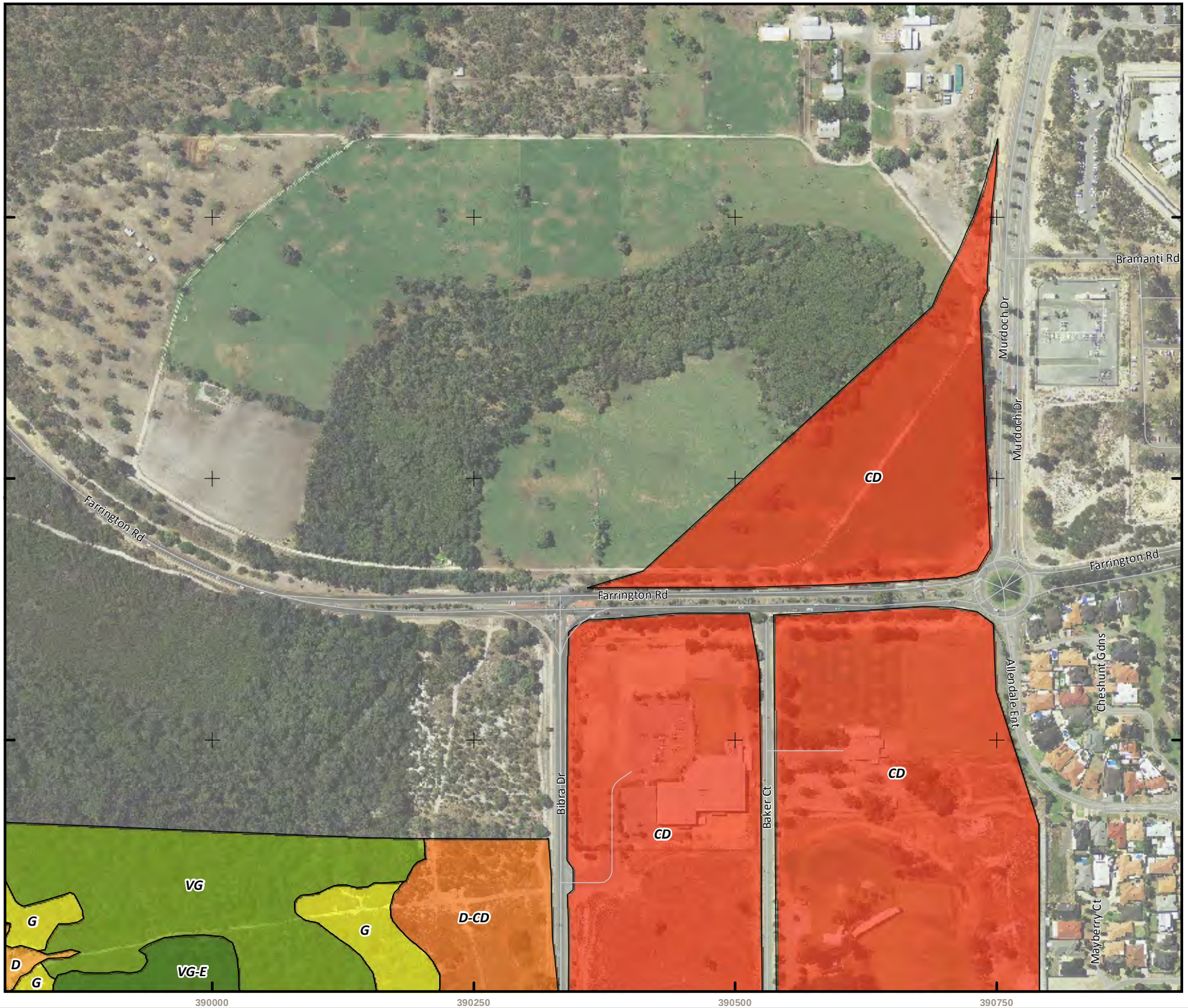

Vegetation Condition Mapping

South Metro Connect

Figure 7.8

0 50 100 150

Metres

1:5,000 (A4)

Coordinate System: GDA 1994 MGA Zone 50

LEGEND

Vegetation Mapping dissolved

- Water
- Completely Degraded
- Degraded - Completely Degraded
- Degraded
- Degraded - Good
- Good
- Good - Very Good
- Very Good
- Very Good - Excellent
- Excellent

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Vegetation Condition Mapping

South Metro Connect

Figure 7.9

0 50 100 150

Metres

1:5,000 (A4)

Coordinate System: GDA 1994 MGA Zone 50

LEGEND

Vegetation Mapping dissolved

- Water
- Completely Degraded
- Degraded - Completely Degraded
- Degraded
- Degraded - Good
- Good
- Good - Very Good
- Very Good
- Very Good - Excellent
- Excellent

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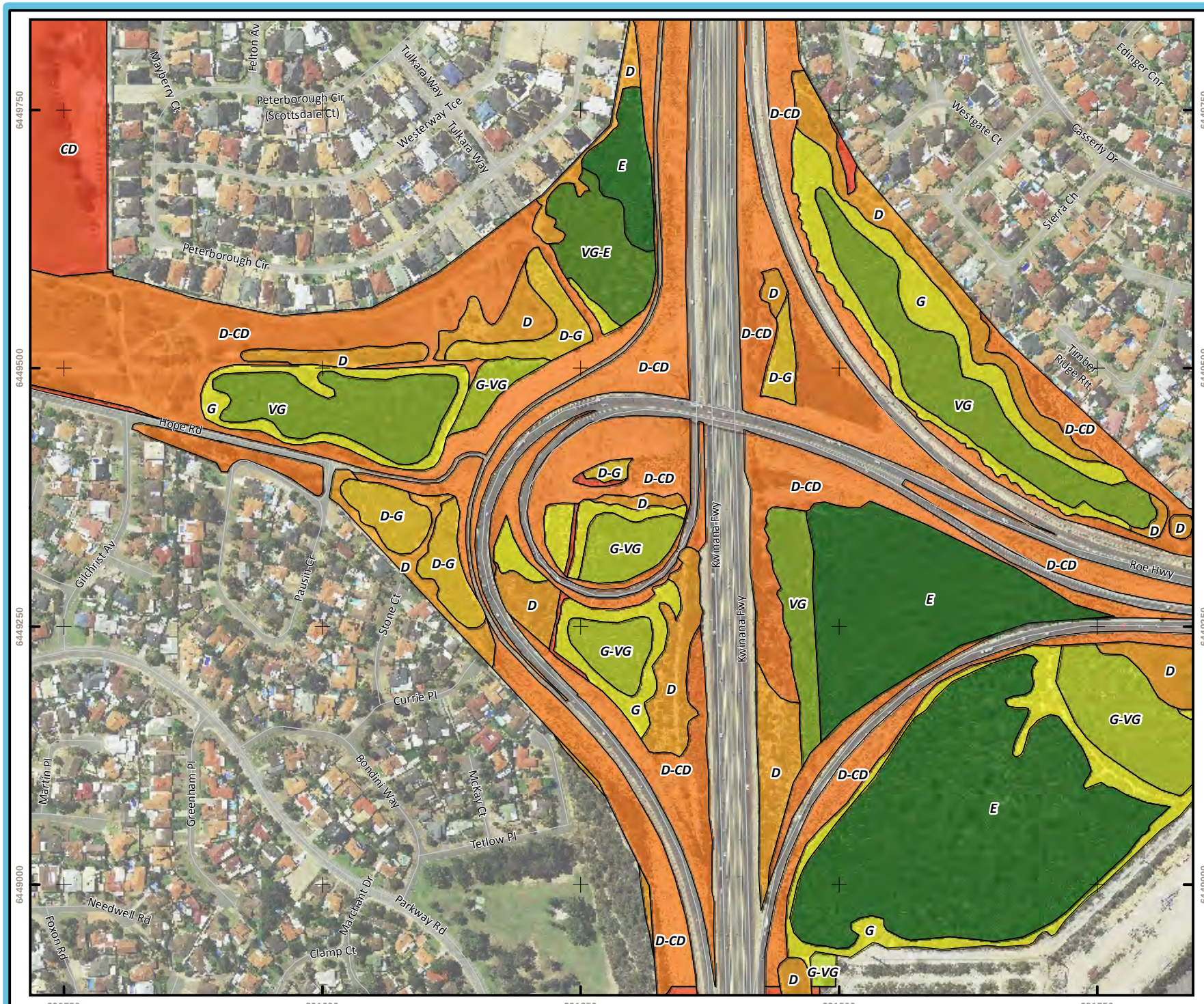


Vegetation Condition Mapping

South Metro Connect

Figure 7.10

0 50 100 150

Metres

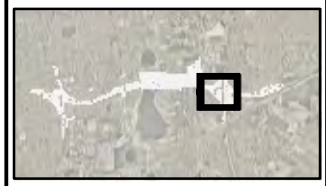
1:5,000 (A4)

Coordinate System: GDA 1994 MGA Zone 50

LEGEND

Vegetation Mapping dissolved

- Water
- Completely Degraded
- Degraded - Completely Degraded
- Degraded
- Degraded - Good
- Good
- Good - Very Good
- Very Good
- Very Good - Excellent
- Excellent



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Vegetation Condition Mapping

South Metro Connect

Figure 7.11

0 50 100 150

Metres

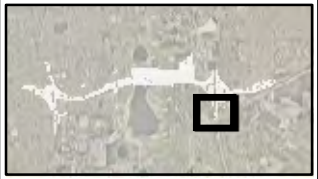
1:5,000 (A4)

Coordinate System: GDA 1994 MGA Zone 50

LEGEND

Vegetation Mapping dissolved

- Water
- Completely Degraded
- Degraded - Completely Degraded
- Degraded
- Degraded - Good
- Good
- Good - Very Good
- Very Good
- Very Good - Excellent
- Excellent



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Vegetation Condition Mapping

South Metro Connect

Figure 7.12

0 50 100 150

Metres

1:5,000 (A4)

Coordinate System: GDA 1994 MGA Zone 50

LEGEND

Vegetation Mapping dissolved

- Water
- Completely Degraded
- Degraded - Completely Degraded
- Degraded
- Degraded - Good
- Good
- Good - Very Good
- Very Good
- Very Good - Excellent
- Excellent

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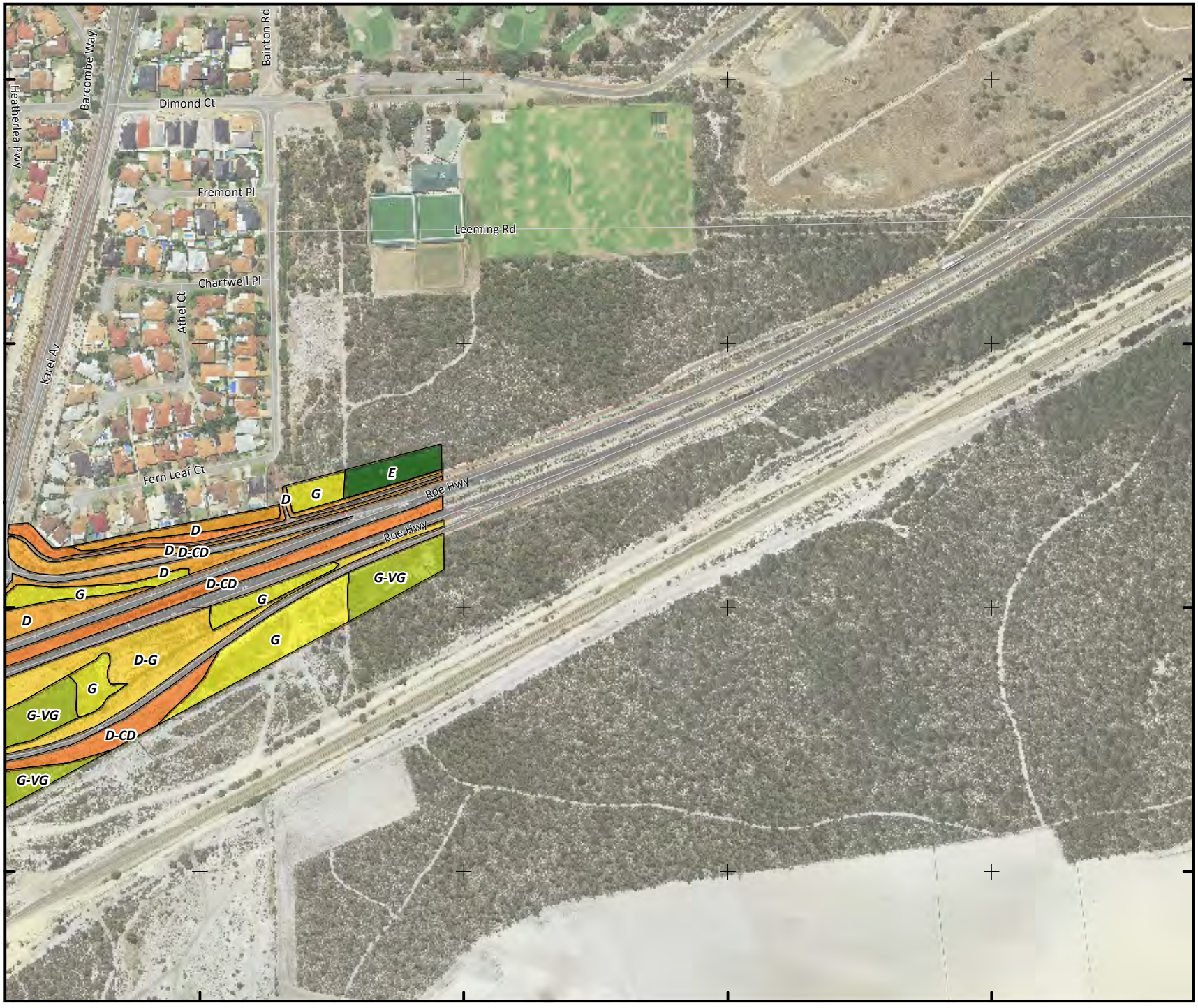

Vegetation Condition Mapping

South Metro Connect

Figure 7.13

0 50 100 150

Metres

1:5,000 (A4)

Coordinate System: GDA 1994 MGA Zone 50

LEGEND

Vegetation Mapping dissolved

- Water
- Completely Degraded
- Degraded - Completely Degraded
- Degraded
- Degraded - Good
- Good
- Good - Very Good
- Very Good
- Very Good - Excellent
- Excellent

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Submission 6.2-5: It appears that the additional areas of vegetation impacted by shading or "Conceptual Effects Model" areas (described in 6.6.3.1) are not included in the statements and summaries of the area (hectares) of impact on vegetation and habitats. The area of impact should include the additional areas of vegetation impacted by shading or "Conceptual Effects Model" areas.

The total area of native vegetation disturbance for the project is 79.3ha. This includes any loss of vegetation from shading by the bridge over a portion of Roe Swamp. As any impact on the hydrological regime from this project will be significantly less than the natural annual variation in the hydrological regime, no loss of vegetation is expected in the "Conceptual Effects Model" areas.

Submission 6.2-6: The priority flora *Dampiera triloba* (P1) is shown to have a significant impact from the project, with 75 per cent of plants found in the footprint area. DEC considers that this level of predicted impact may be overstated due to the lack of species-specific survey work at other sites. Within the project area, while a significant area of the population will be impacted, a significant area of the population will be retained outside the footprint. The overall impact on the species should not be significant to its conservation status provided management measures are in place to ensure offsite impacts are minimised. Management measures will need to be in place to minimise offsite impacts on *Dampiera triloba*.

Submission 6.1-14: It is not acceptable that there will be a 75% loss of the population of *Dampiera triloba*. This species is uncommon on the Swan Coastal Plain.

Submission 6.2-7: A high level of local impact is predicted to *Eryngium pinnatifida* subsp. *palustre* (P3). This taxon is however reasonably widespread, and a proportion of the population has the potential to be retained outside the footprint if appropriate management measures are in place. The overall impact to the conservation status of the taxon can be managed to be relatively insignificant. Management measures will need to be in place to minimise off site impacts on *Eryngium pinnatifida* subsp. *palustre.*

Submission 6.2-8: The priority flora *Tetraria* sp. *Chandala* (P2) is a significant range extension for this rare species (and only the fourth occurrence recorded), and it is noted in Appendix K as being a significant environmental value recorded within the project area. It is noted as being in vegetation type CcXpMrS, and outside the footprint. However, the actual location of this occurrence is not provided in the PER or Appendix K. The location of the occurrence of *Tetraria* sp. *Chandala* in relation to the footprint should be provided, given the degree of disturbance likely to occur to the vegetation type in which it occurs. Protection and management measures will be required if it is located near the footprint.

Priority flora will be managed in accordance with the FVFMP (Appendix F). Prior to construction, populations of priority flora will be surveyed, mapped and marked. Populations and individuals occurring outside of the clearing footprint will be protected from accidental clearing and other impacts. Propagation material will be obtained from populations impacted by the project, and salvage and/or translocation of individuals (including *Tetraria* sp. *Chandala*) will be considered.

Figure 6 shows the known location of all Priority flora and flora of taxonomic uncertainty found during field surveys for Roe Highway Extension.

The location of *Tetraria* sp. *Chandala* (P2) is not shown in the PER or Appendix K of the PER. *Tetraria* sp. *Chandala* is within the clearing footprint of the project (Figure 6). A number of subsequent surveys, including one in November 2012, have failed to locate the individual originally found, or any other examples of this species.

Although *Tetraria* sp. Chandala was not relocated during recent surveys potential impacts to this species are unlikely to be significant in light of the recent taxonomic revision. The proposed conservation status of the proposed new species is described below.

Conservation status: Naturally rare and potentially threatened by habitat degradation and urban expansion in some areas. One of the known populations is found in a Nature Reserve. The habitat of some populations of this species is recognised as a Threatened Ecological Community in Western Australia (Species and Communities

Branch 2009). Probably more widespread than currently known, but restricted to specific habitat and further surveys are required to ascertain its true conservation status. Department of Environment and Conservation (DEC) Conservation Codes for Western Australian Flora Priority Two. (extracted from the unpublished manuscript from Russell L. Barrett, Jeremy J. Bruhl and Karen L. Wilson).

The taxonomy of the *Tetraria* group is currently under revision. It is proposed that *Tetraria* sp. Blackwood River (A.R.Annels 3043) and *Tetraria* sp. Chandala (G.J.Keighery 17055) be combined into a single species to be known as *Netrostylis keigheryana* R.L.Barrett, J.J.Bruhl & K.L.Wilson, sp. nov. (Dr Russell Barrett, *pers comm*).

Submission 6.2-9: The proponent has calculated (and shown in figures 6.6-11 to 6.6-14) a reduction in edge to area ratio, and inferred that this shows improvement in condition and "decreased fragmentation". This is misleading as it reflects the loss of vegetation, including the loss of vegetation that had tracks in it. The loss of poor condition vegetation with tracks doesn't mean an improvement overall. It is still a loss of vegetation, in that it will result in thin strips of vegetation alongside the highway. It should be noted that there is a misleading conclusion on the effect of removal of vegetation on fragmentation and condition.

Submission 000-01-03: DSEWPaC agrees with DEC that losing vegetation that contains degraded or cleared areas does not contribute to 'decreased fragmentation' elsewhere. The impact of edge effects may actually increase upon all vegetation overall if buffers, including fragmented areas, are cleared (see p. 19 of summary).

The edge effect assessment was not intended to imply that the loss of vegetation in degraded condition or worse would have a net positive impact. Rather it was intending to show that the project was impacting lower quality vegetation and retaining better quality vegetation, where possible, and therefore edge effects would have less impact on the remnant vegetation following project construction.

Submission 6.2-10: Some of the methods used in the AECOM report (Appendix K) to determine floristic community types in the project area are consistent and therefore compatible with methods utilised in the original report by Gibson et al. (1994), to describe vegetation present on the southern Swan Coastal Plain. For example, the surveys were conducted in a variety of seasons including spring, and 10 x 10m quadrats were established for the AECOM report. There is no dendrogram provided, so it is assumed that the recommended form of statistical analysis was not used. It appears that a simple determination of the proportional species overlap with each floristic community type (FCT) may have been used. It is also not clear if the full species list for all quadrats for each FCT described in the Gibson et al. (1994) report was used for the actual comparison performed for the AECOM report, or if only the species recorded in the two-way table (Table 12) in the hard copy Gibson et al. (1994) report was used for analysis. It is also not clear if all the species recorded in each vegetation unit in the Roe Highway project area were used for this comparison. If Appendix E (of Appendix K) represents some sort of measure of the similarity between the species recorded in the FCTs in Gibson et al. (1994), and the floristic data for the survey area, then some of the conclusions do not appear to be logical. For example, for the first vegetation unit listed (AfBKgS), a figure of 44 is stated for similarity measure with FCT21 and 46 for FCT23a, yet the determination is FCT21a for this unit. For the unit ErMpH, the stated similarity measure is 30 for FCT28 and for FCT11 it is 18, but the determination is FCT 11. For unit EmKgS, the stated similarity measure is 16 for FCT24 (a Priority 3 ecological community), and that for FCT28 is 15, yet the determination is FCT28. Ten of the FCT determinations out of the total 23 vegetation units listed in Appendix E appear inconsistent with the similarity measures (if this is what the data in the table represent). It may be that habitat, key species and other factors may have been used to determine FCTs present in the survey area, and this critical analysis of data is a logical step and is supported. However, if this is the case, a much clearer explanation of methods utilised in determining the FCTs present is required. The best way to determine the FCTs present at a new survey site on the southern Swan Coastal Plain is to repeat methods as described in the Gibson et al. (1994) report, and to statistically compare floristic data from quadrats rather than amalgamated species lists from identified vegetation units. A guide to recommended methods is available on request from DEC's Species and Communities Branch. Details should be provided on how the floristic community types were evaluated for assessing the conservation significance of vegetation communities in the project area, and confirmation that the evaluation was appropriate. The methodology should follow Gibson et al. (1994).

As presented in Appendix K of the PER, the determination of FCTs for each of the recorded vegetation communities is based on inferences based on a combination of factors:

- Similarity of species (number of species in common);
- Geographical range of Gibson *et al.* (1994) mapped sites;
- FCT specific information documented in Gibson *et al.* (1994); and
- Soils and landforms.

Inferences to FCT were determined by comparing the amalgamated species list for each recorded vegetation type (for quadrat data and opportunistic records) with the species list relevant to the Gibson *et al.* (1994). The analysis was a simple presence/absence comparison. Only intact vegetation communities recorded within the project area were analysed; whilst, the FCTs were inferred. Vegetation communities AfKgS, JfKgE, LlHpS, TBS, R1, R2, R3, R4,T1, P1, P2, P3, P4 and P5 were not included in the analysis as they were degraded; or lacked sufficient native species for comparison.

The greatest number of species in common was not always the inferred FCT assigned to a community. Other characteristics including geographical range of Gibson *et al.* (1994) mapped sites, FCT specific information documented in Gibson *et al.*(1994), soils and landforms were considered to aid clarity in final determinations. For example, for vegetation community AfBKgS, the similarity score between FCT21a and FCT23a was 44 and 46, respectively. Yet the determination for this community was for the lower "scoring" FCT21a. This is due to the fact that habitat and key species were used for the final FCT determination.

Vegetation community AfBKgS is described as Low Open Forest to Open Forest of *Allocasuarina fraseriana, Banksia attenuata, Banksia menziesii* and *Banksia illicifolia* over Tall Shrubland of *Kunzea glabrescens* over a Low Open Shrubland of *Hibbertia hypericoides* over a Sedgeland of *Loxocarya cinerea* and *Dasypogon bromeliifolius* with an Open Exotic Grassland dominated by **Briza maxima* on grey sand. Community type 21a is primarily *Eucalyptus marginata-Banksia attenuata* woodlands, *Eucalyptus marginata – E. calophylla – B. attenuata* woodlands or *B. attenuata* woodlands. This community type has high frequencies of most species in species groups O and Q; and low frequencies of mainly native and weedy annuals from species group A. It also differs from the other two subgroups by presence of the following taxa: *Sowerbaea laxiflora, Drosera pallida, Leucopogon propinquus* and *Isotropis cuneifolia*. Whilst, *Allocasuarina fraseriana* and *Eucalyptus gomphocephala* are sometimes present as dominant or co-dominant. This community was inferred to be 21a rather than 23a due to the presence of species typical of 21a and the closer occurrence of this community to the coast. Similar methodology and conclusions have been applied for the other nine FCTs that show inconsistencies; however, an informed decision was made during the determination.

There are inadequacies with inferring FCTs using this method. The Gibson *et al*. (1994) study under-sampled wetland communities on the Swan Coastal Plain and therefore there may be significant variation between FCTs or new types that have not been adequately defined to date. As the FCTs determined in the PER surveys are an inference of the FCT, no PATN Statistical Analysis of vegetation communities within the project area was conducted.

Submission 6.2-11: 2010 was a relatively dry year. A comprehensive vegetation and flora assessment should larger scale seasonal rainfall into account by surveying in time scales which better reflect immediate and long term rainfall patterns.

A Level 2 flora survey was undertaken in accordance with the EPA's Guidance Statement 51 and the agreed scope in the ESD. Flora surveys were conducted over a number of years and in a number of seasons over that time. Surveys included: spring surveys in 2009 and 2010; targeted surveys for species of conservation significance during optimal seasons and census surveys of permanent quadrats to account for seasonal variability.

Submission 6.2-12: We believe the listing of the King Spider Orchid is incorrect and should be the Grand Spider Orchid as the King Spider Orchid is not typically found in the metro area.

The incorrect reference to the King Spider Orchid is found on page ii of the PER executive summary. This reference should have been made to the Grand Spider Orchid (*Caladenia huegelii*).

Submission 6.2-13: The PER has not adequately described the fungi vales of the subject site or attempted to discuss the likely impact. If the fungi values are unknown or unclear, then the precautionary principle should apply.

Biological surveys and the environmental impact assessment were conducted in accordance with the ESD. Impacts on fungi were not considered significant during the development of the ESD and therefore no further assessment of fungi or fungi values has been conducted.

Management of impact to vegetation and flora

Submission 6.3-1: Funding should be made available to ensure adequate maintenance of bushland within the road reserve is undertaken.

Rehabilitation and weed management will be conducted in areas disturbed by the project. Funding will be made available in order to adhere to commitments made in the Rehabilitation Strategy (Appendix G).

Submission 6.3-2: Rehabilitation and revegetation completion criteria should be negotiated with the City of Cockburn in areas under the City's jurisdiction.

Main Roads will liaise with City of Cockburn with regards to the rehabilitation and revegetation within the City of Cockburn.

Submission 6.3-3: The rehabilitation of cleared land can never replace original remnant vegetation. Offsets for native vegetation is beneficial but does not fully compensate for the loss of 79 ha particularly at a local scale.

See Submission 12.0-4.

Bush Forever

Submission 6.4-1: The proposed extension transects through Bush forever area 244, and 7ha of the site is proposed to be cleared as a result of the construction of Roe Highway. SPP 2.8 sets out the recommendations for proposals affecting a Bush Forever area.

The Department of Planning submission goes on to state (in addition to the summary of submission 6.4-1 above) that the project is in accordance with State Planning Policy 2.8 *Bushland Policy for the Perth Metropolitan Region* (SPP 2.8):

The majority of the proposed Roe Highway alignment within Bush Forever area 244 is within the site implementation category of government lands and public infrastructure (major road/rail). A small portion of the alignment is within the site implementation category Bush Forever reserves, however this is proposed as a mitigation measure for the alignment to coincide with an already existing cleared track. State Strategic Policy considers the proposal is consistent with the overall purpose and intent of an existing major road reserve and planning commitment and can be reasonably justified to wider social and economic considerations (SPP 2.8 section 5.1.2.3 (i) (a)(c)).

Where SPP 2.8, section 5.1.2.3 (i) (a)(c) states:

...

Proposals or decision-making should-

(i) Seek to protect regionally significant bushland as a priority, except where a proposal or decision-

a. Is consistent with the overall purpose and intent of an existing reserve, existing approved uses and/or existing planning or environmental commitments or approvals, in particular, existing reserves for roads (regional or local), railways, pipelines, water or drainage services and any associated emergency maintenance works, with any impacts minimised and managed where practical, in accordance with existing environmental management plan best practice requirements....

b. ...

c. Can be reasonably justified with regard to wider environmental, social and economic considerations (in particular, future road (regional or local) and rail requirements) and all reasonable alternatives have been considered to avoid or minimise and direct loss of regionally significant bushland, and reasonable offset strategies are considered to offset any loss of regionally significant bushland where appropriate and practical...

Submission 6.4-2: The alignment within site 244 transects through a CCW. The vegetation within site 244 (Bassendean Central and South) is underrepresented on the Swan Coastal Plain. The offsets should provide for a net environmental gain. The offset package for clearing of Bush Forever vegetation is not objected to provided:

a. The 7 hectares of Bush Forever vegetation cleared is offset at a 2:1 ratio and is additional to other state and federal offset requirements; and

b. The same vegetation complex of Bassendean central and South and a CCW is acquired as part of the Bush Forever component of the offset package.

The Offset Strategy (Appendix I) sets out the offset proposals for the project. Offsets include Bush Forever and CCW and will be like-for-like where practicable.

Submission 6.4-3: Processes need to be identified to prevent weed incursion and deterioration of surrounding bushland and Bush Forever.

Weed control will be undertaken during construction, rehabilitation and restoration works. Weed control measures are detailed in the FVFMP (Appendix F) and the Rehabilitation Strategy (Appendix G). Commitments to additional weed control outside of the project area are included in the Offset Strategy (Appendix I).

Submission 6.4-4: The proposal will impact portions of vegetation complexes where less than 10% of the complex remains in the Bush Forever study area. The vegetation complexes in the project area are underrepresented in Bush Forever. Any loss or disturbance in these complexes is unacceptable. It is not stated how much vegetation in total will be cleared from site 244.

See Section 6.6.2.1.4 of the PER. The project will result in the clearing of 7ha of Bush Forever Site 244. The Bassendean – Central and South vegetation complex may be under-represented in Bush Forever, but 23.6% of the pre-European extent of the complex remains. The project will reduce the current remaining extent of this vegetation complex by 0.3%.

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3.7. Fauna

General

Submission 7.1-1: Fencing should be erected parallel to road to prevent fauna crossing the carriageway and direct them to the underpasses.

As stated in Section 6.7.4.2 of the PER, permanent fencing will be installed within valuable habitat areas throughout the proposed project. The fencing alignment will be designed to direct fauna to the underpasses where appropriate. The FVFMP (Appendix F) presents the fencing strategy for the proposed project.

Submission 7.1-2: MRWA should confirm whether the following impacts on fauna will be a result of the extension of Roe Highway

- Removal of 64% of GSM habitat at Stock Road.
- Loss of 78 ha of habitat for Carnaby's Black cockatoo.
- Loss of 73 ha of vulnerable Forrest Red Tailed Black Cockatoo habitat
- Loss of 90 ha of potential habitat for the Rainbow Bee Eater.

The proposal will further threaten these species and clearing and disturbance of their habitat should not be approved.

These numbers are reported in the PER and have not changed. It should be noted that the conservation status of GSM has been downgraded in WA from Schedule 1 to Priority 4. At this time it is still listed as Endangered under the EPBC Act.

Impacts on these species have been avoided and minimised to the maximum extent practicable. Unavoidable significant residual impacts will be offset in accordance with the Offset Strategy (Appendix I).

Submission 7.1-3: The overall impact to endangered and vulnerable species across the Swan Coastal Plain needs to be assessed, not just at individual project level.

A regional scale assessment of habitat loss to fauna of conservation significance was conducted for the proposed project. The results are presented in Section 6.7.2.1 of the PER. The regional scale assessment is based on a 15km radius of the project area. To enable a regional scale assessment of black cockatoo habitat loss, DEC provided a GIS dataset of potential habitat for Carnaby's Cockatoo. The dataset covers a 15km radius of the project area. For consistency, the same regional extent has been adopted for other conservation significant species, where possible.

Adopting a regional scale of 15km radius of the project area, rather than the entire Swan Coastal Plain IBRA Region is considered to be a conservative and appropriate approach. Assessing regional habitat loss within the boundaries of the Swan Coastal Plain would considerably dilute the scale of impact of this project. A regional assessment based on the IBRA Region would have likely been much less accurate because of the limited datasets available to extrapolate habitat extent for each species across such a large area.

Submission 7.1-4: The loss of 112ha of existing fauna habitat through clearing of vegetation is an environmental loss ([presented in] the conclusion in Section 3.7 of net environmental gain).

Submission 7.1-10: The proposal should be rejected as it will result in the loss of 112ha of fauna habitat. As well as habitat destruction, the noise, vibration, odour, pollution and light spill will make the area unattractive to fauna.

Measures have been incorporated into the project design to avoid, minimise reduce and rectify environmental impacts within the project area where possible. Management commitments in the FVFMP for flora, vegetation and fauna will further reduce the extent of impacts during construction and operation of the proposed project (Appendix F).

Loss of fauna habitat as identified in the PER, will be mitigated through the implementation of the Rehabilitation Strategy (Appendix G) and residual impacts will be offset through the implementation of the Offset Strategy (Appendix I). The implementation of the Offset Strategy is intended to result in a net environmental gain.

The residual impacts of noise, vibration, odour, pollution and light spill on fauna from the proposed project are not considered to be significant (See sections 6.7.1, 6.7.2 and 6.7.3 of the PER).

Submission 7.1-5: An endless list of state listed threatened fauna species will be impacted.

Submission 7.1-11: Consideration of biodiversity and ecological integrity should encompass the preservation of habitat as integral to the survival of species, particularly endangered species within the wetlands region.

Submission 7.1-13: The area supports a rich diversity of vertebrates which are totally dependent on the wetlands and dry uplands.

Submission 7.1-15: The 120 fauna species known to inhabit the project area may be impacted by this proposal.

Sections 5.9, 6.7 and 11.1.3 of the PER identify the species of conservation significance that occur, or potentially occur, within the project area. The threatened species that will be significantly affected by the project are stated in Sections 6.7.2 and 6.7.3 of the PER. While many impacts have been mitigated by design measures (as described in Section 3 of the PER), further management practices (as described in Section 6.7.4) will minimise impacts for these species, as far as practicable. A summary of the mitigation, management and residual impacts for fauna is presented in Table 6.7-6 of the PER.

The FVFMP (Appendix F) has been developed to in order to consolidate the management and mitigation of impacts to fauna from the project.

Submission 7.1-6: Australia is a signatory to international agreements with Japan, Korea and China to protect migratory birds in danger of extinction. The proposal affects seven migratory birds that rest and breed here. Australia may breech its international treaty obligations due to impacts from the proposal.

Submission 7.1-7: With less than 20% of wetlands left in the Swan Coastal Plain, North lake and Bibra Lake need to be protected and given international statues as it caters for international migratory birds protected under the JAMBA, CAMBA and ROKAMBA international government agreements.

Determining the provision of international status for North Lake and Bibra Lake is beyond the scope of this impact assessment process. International migratory birds listed under JAMBA, CAMBA and ROKAMBA and their associated habitats are protected under the EPBC Act.

While there may be some minor, localised impacts on migratory birds, the project will not cause Australia to breach any international treaty obligations for international agreements on migratory birds. Impacts on migratory birds by the proposed project are unlikely to trigger any significant impact criteria under the EPBC Act.

As presented in Appendix O of the PER, no counts for migratory birds exceed the 1% threshold for defining an ecologically significant population. Therefore, the proposed project is highly unlikely to seriously disrupt the lifecycle of an ecologically significant proportion of the population of a migratory species (Commonwealth of Australia 2009). The project is unlikely to result in the substantial modification of important habitat for migratory species.

As outlined in Section 6.7.2.1 of the PER, migratory species under the EPBC Act (with the exception of the Rainbow Bee-eater, which is not a shorebird) will not be directly affected by habitat loss or habitat fragmentation, as there will be no direct loss of shoreline or lakebed habitats within the project area. Possible minor effects on migratory birds by the proposed project include:

- Road mortalities (Section 6.7.3.1 of the PER);
- Temporary avoidance of areas with predicted noise levels of 55dB and greater (Section 6.7.3.2 of the PER);
- Physiological stress and masking of vocalisations at noise levels greater than 50dB(A) (Section 6.7.3.2 of the PER);
- Artificial night lighting leading to distraction and disorientation of migrating birds, changes to bird foraging and singing times, reduction in size of prey populations, variation in choice of roosting sites, increased physiological stress and changes to the timing of reproductive cycles (Section 6.7.3.5 of the PER); and
- Decline in wetland condition, including erosion and sedimentation and pollutant runoff leading to effects on macro-invertebrate communities and other fauna in the food web (Section 6.2.5.1 of the PER).

Submission 7.1-8: The PER contains one undescribed species of millipede, and to date it is not clear whether more information has been found on this species.

See Submission 7.2-2.

Submission 7.1-9: Roe Swamp is in the path of the planned route, and is a major breeding ground and habitat for several species of fauna listed on WA's endangered fauna list including the Lined Skink and for uncommon timid birds.

The low-lying habitat within Roe Swamp and its buffer provides habitat for a variety of avian, mammal and herpetofauna species. Roe Swamp is currently fragmented by Farrington Road, Hope Road and a power transmission line and access track. The Lined Skink, *Lerista lineata*, was not recorded in the Roe Swamp vicinity during project fauna surveys. This is due to the soil structure not providing suitable habitat for the species in the lower lying swamp. Its habitat appears restricted to the drier upland areas that support woodlands on sandy soils. Further information for *Lerista lineata* recorded in the project area is detailed in Appendix M of the PER.

No reference is made to uncommon timid birds in the PER; however, the full record of species encountered at Roe Swamp can be obtained in Appendix M of the PER.

Impacts on conservation significant fauna and proposed mitigation measures are detailed in Section 6.7.2 and 6.7.3 of the PER; Table 6.7-6 of the PER and also in the FVFMP (Appendix F).

Submission 7.1-10: The proposal should be rejected as it will result in the loss of 112ha of fauna habitat. As well as habitat destruction, the noise, vibration, odour, pollution and light spill will make the area unattractive to fauna.

See Submission 7.1-4.

Submission 7.1-11: Consideration of biodiversity and ecological integrity should encompass the preservation of habitat as integral to the survival of species, particularly endangered species within the wetlands region.

See Submission 7.1.5.

Submission 7.1-12: There is an incomplete assessment of the Troglofauna and their habitat. The prospect for dismissal of the existence of a troglobiotic community within the area needs to be further assessed.

Troglofauna and potential risks on impacting troglofauna were discussed in Section 5.9.3.2 of the PER. The survey of lithology logs to determine the presence of suitable habitat (voids and cavities) was in accordance with the methodology described in the ESD. A detailed field survey was only required if suitable habitat was identified (ESD Section 6.1.3).

Submission 7.1-13: The area supports a rich diversity of vertebrates which are totally dependent on the wetlands and dry uplands.

See Submission 7.1-5.

Submission 7.1-14: Black swans are known to breed on North Lake and Bibra Lake. The cygnets are likely to be predated or killed on the highway should it be constructed.

Black Swans are unlikely to be significantly affected by the proposed project. The FVFMP (Appendix F) has been developed to minimise impacts on fauna from the proposed project. The risk of increased road mortality on Black Swan cygnets will be minimised by installing fauna proof fencing around the project area during construction and operation. The installation of fauna underpasses will facilitate north-south fauna movement between habitats. Several measures are proposed to reduce the risk of fauna predation (Section 6.7.4.7 of the PER).

Submission 7.1-15: The 120 fauna species known to inhabit the project area may be impacted by this proposal.

See Submission 7.1-5.

Submission 7.1-16: There are concerns about the stability of the Quacking Frog population following construction.

Populations of the Quacking Frog (*Crinia georgiana*) are expected to remain stable after construction due to the presence of extensive suitable habitat surrounding the project area and the management of suitable habitat within the project area following construction. This species is highly unlikely to be significantly impacted by the proposed project.

Submission 7.1-17: There are errors in the PER with regards to the GSM population to assert that the population is non-viable. A sustainable population may require greater than 2ha, any non-viability is created by the project.

It is acknowledged that the Graceful sun moth (GSM) population recorded in the project area is not confirmed as non-viable. There is insufficient information available to confirm whether the population is viable or non-viable. DEC has suggested that the persistence of this population, despite surrounding clearing and development, suggests it may survive for some time, if actively managed and left undisturbed (Mitchell and Williams 2012). However DEC has indicated that, based on their knowledge of similar areas, the population is unlikely to persist without active management in the long term (10+ years) (Mitchell and Williams 2012).

Several populations of GSM have persisted in patch sizes of 1 to 5ha in coastal dune habitats. However, DEC has confirmed that this does not apply to *Banksia* woodland habitat; where the number and density of GSM and the food plant is much lower (Mitchell and Williams 2012). The host plant differs between the two habitat types: *Lomandra hermaphrodita* in Banksia woodland and *L. maritima* in coastal dune habitat.

DEC believes it is only relevant to compare the population of the project area with other *Banksia* woodland populations. There is only one record of an extant GSM population in *Banksia* woodland habitat (other than the one within the project area) where the total bushland size supporting the population is less than 10ha, an 8.5ha area at Errina Road, Alexander Heights (Mitchell and Williams 2012).

While the long term viability of the GSM population located in the project area is uncertain (in a scenario that the proposed project does not proceed), it is acknowledged that the population is unlikely to persist if the project does proceed.

Fauna Survey

Submission 7.2-1: A number of bird species were recorded in the areas that rely on larger, intact patches of remnant vegetation. Some populations of these are declining in the Perth region and such species are likely to disappear from the site as a consequence of the clearing and fragmentation of the habitat. These include:

- Chestnut Teal (Anas castanea)
- Musk Duck (Biziura lobata)
- Blue-billed Duck (Oxyura australis)
- Carnaby's Black-Cockatoo (Calyptorhynchus latirostris)
- Shining Bronze-Cuckoo (Chalcites lucidus)
- Sacred Kingfisher (Todirhamphus sanctus)
- Splendid Fairy-Wren (Malurus splendens)
- Varied Sittella (Daphoenositta chrysoptera pileata)
- Grey Shrike-Thrush (Colluricincla harmonica)
- Rufous Whistler (Pachycephala rufiventris)
- Spotted Pardalote (Pardalotus punctatus)
- Striated Pardalote (Pardalotus striatus)
- Grey Fantail (Rhipidura albiscapa)
- Southern Boobook (Ninox novaeseelandiae).

The impacts of habitat fragmentation should be minimised by maintaining patches of remnant vegetation in contiguous areas that are as large, intact and connected as possible. Buffer zones should be created by planting trees and shrubs around existing remnant vegetation to make these patches larger and where possible, connect them to other existing patches of remnant vegetation.

Impacts on fauna, including the above listed bird species, will be managed in accordance with the management measures described in Section 6.7.4 of the PER and in the FVFMP (Appendix F). Patches of remnant vegetation left following project construction will be as large, intact and connected as possible. The Rehabilitation Strategy (Appendix G) will seek to enhance the habitat value of any remnant vegetation through the rehabilitation of disturbed areas.

Submission 7.2-2: An unidentified sucking millipede *Siphontidae* sp. was found during the SRE study, and was noted in the PER (page 231) as requiring particular attention. This record was found at SRE survey site 3, which is at the north-east corner of the Stock Road and Forrest Road intersection. This site will be largely destroyed under the project footprint. A management strategy is required to either determine the occurrence of the new sucking millipede *Siphontidae* sp outside the footprint, or to protect its occurrence within the footprint area.

Submission 7.1-8: The PER contains one undescribed species of millipede, and to date it is not clear whether more information has been found on this species.

Submission 000-02-05: The distribution of the unidentified millipede (Siphonotidae sp.) is not discussed. An analysis of habitats where specimens have been recorded would provide some insight into the importance of the project area. This should be done independent of determining its taxonomic status. The statement that "the extent of habitat loss cannot be calculated at this time, and the scale of impact by the proposed project has yet to be determined" identifies an unknown risk which needs to be addressed.

It is highly unlikely the unidentified sucking millipede Siphonotidae sp. recorded in the project area (Section 5.9.3.1and Appendix P of the PER,) is confined only to the project footprint; however, as the habitat where the single specimen was collected will be removed, further investigations were conducted for this species.

The specimen collected was a female and therefore identification based on morphological features and comparison with other siphonotid specimens from the Swan Coastal Plain was not possible. Because the specimen was collected in a propylene glycol/formalin pitfall trap, it is unlikely that it will yield DNA that is usable for molecular analysis. In addition, tissue suitable for DNA analyses is not available from any population of Siphonotidae millipedes from the Swan Coastal Plain for comparison.

There are few sites in the Perth Metropolitan Area where sucking millipedes have been collected. Specimens previously collected at Woodman Point (approximately 6km south-west of the project area) were recently assessed by Australia's leading Siphonotidae specialist and represent a common species from south-west Western Australia, Rhinotus michaelseni (Attems 1911). It is perceivable that the Roe Highway sucking millipede is conspecific with those from Woodman Point in which case it would not be an SRE. Other specimens from near the Perth Metropolitan Area cannot be taxonomically assessed, as they are immature females (Black 2012).

From April to June 2012 Phoenix Environmental Sciences, on behalf of SMC, conducted four targeted surveys for the sucking millipede previously collected in the project area (Appendix H). The surveys were aimed at collecting mature males of the siphonotid to allow morphological identification, in particular against the species known from Woodman Point.

Searches were conducted in and around the site of the original record (Table 4). Survey timing was planned to coincide with the time when the previous specimen was collected (May 2011), allowing for seasonal variation (April to June period) and appropriate weather conditions (surveys were conducted after high rainfall events). Survey methods comprised litter sieving and direct searches under logs and rocks.

Table 4: Survey parameters and results for targeted Siphonotidae survey for the Roe Highway Extension Project

Date	Survey staff	Survey site	Survey results
24 April 2012	V. Framenau/C. O'Neill	SRE site 3	Portuguese Millipede (*Ommatoiulus moreletii*)
10 May 2012	K. Penwarden/L. Mason	SRE site 3 and surrounding bushland	Portuguese Millipede (O. moreletii); Podykipus collinus, Karri Millipede (Antichiropus variabilis); Antichiropus sp. indet.
18 May 2012	K. Penwarden/L. Mason	SRE site 3 and surrounding bushland	Portuguese Millipede (*O. moreletii*); Iulomorphidae sp.; Karri Millipede (*Antichiropus variabilis*); *Antichiropus* 'UBS2'; *Antichiropus* sp. indet.
8 June 2012	P. Langlands/ K. Penwarden	SRE site 3 and surrounding bushland	Portuguese Millipede (*O. moreletii*); Iulomorphidae sp.

Although the surveys were conducted by experienced invertebrate zoologists, they did not recover any Siphonotidae. Many other millipedes including large numbers of the introduced Portuguese Millipede (*Ommatoiulus moreletii*) were found (Table 4). All millipede species collected during the targeted surveys were previously recorded at site SRE 3 during the baseline surveys (Appendix P of the PER).

A risk-based assessment has been conducted as recommended in EPA Guidance Statement 20: *Sampling of short-range endemic invertebrate fauna for environmental impact assessment in Western Australia* (EPA 2009) (Appendix H). The assessment was conducted taking into consideration the habitat in which the siphonotid was initially recorded and the extent of this habitat in and around the Perth Metropolitan Area. It is recognised that it is difficult to infer species-specific habitat preferences based on a single record; however, this extrapolation provides the basis for a risk-based approach as proposed by the EPA (2009).

The siphonotid millipede was found in Karrakatta – Central and South vegetation complex characterised predominantly by open forest of *Eucalyptus gomphocephala – Eucalyptus marginata – Corymbia calophylla* and woodland of *Eucalyptus marginata* and *Banksia* species. About 18% (6,275ha) of the original extent of this vegetation complex currently remains (Appendix K of the PER).

Only 0.8% (55.33ha) of current extent of the Karrakatta vegetation complex will be impacted by the proposed project providing considerable refugial areas for invertebrate fauna in the Perth Metropolitan Area that is unaffected. Almost 2,000ha of bushland in the Karrakatta vegetation complex is under protection.

A further factor for consideration is the possible effect of Portuguese Millipedes on the siphonotid from the project area. Portuguese Millipedes are present in high numbers in the remnant vegetation of the project area. It was the predominant millipede species recorded in the targeted surveys and the baseline surveys (Appendix P of the PER). It is currently unknown when the invasion of these millipedes in the area began, but it is perceivable that the Portuguese Millipedes have largely displaced, or are in the process of displacing, some of the native fauna.

Whilst a displacement of native millipedes by Portuguese Millipedes has not been demonstrated (population-level studies on millipedes are rare world-wide and have not been conducted in Australia) (e.g. Griffin and Bull 1995), displacement of native fauna by other invasive invertebrates is very common (Lach and Thomas 2009; McLeod 2004; Odendaal *et al*. 2008). If the siphonotid species recorded in the project area has been locally displaced by Portuguese Millipedes, further surveys are unlikely to recover the species.

In conclusion, a risk-based approach based on perceived habitat preferences suggests that the potential impact on the siphonotid millipede species represented by the female recorded at site 3 is low. The impact is considered to be low, as only 0.8% of the vegetation complex from which it was originally reported (Karrakatta – Central and South) is affected by the proposed project. In addition, it remains possible that it represents the common *R. michaelseni*. Further efforts to collect the species from the project area might be hampered by a possible replacement of the species by the Portuguese Millipede which is present in very high densities in the project area.

Submission 7.2-3: Barrett G. 2010 is not the pers. comm. for the statement in Section 5.9.4.1.3 on page 242 of the PER: 'It has also been suggested that a roost site needs to be within 10 to 12km of a foraging area. However, this estimation applies for foraging in Kwongan heath, where birds would have to travel further from surrounding areas to reach these particular foraging habitats (Barrett G 2010; Kirkby 2010).

The citation for this statement is revised to (Kirkby 2010). A complete reference for Kirkby 2010 is presented correctly in the Bibliography list (Section 12 of the PER).

Submission 7.2-4: DEC is currently reviewing the conservation status of the Graceful sun moth (GSM), and the species is less threatened than was previously thought. DEC will also be updating its advice on how to respond to proposals that impact on GSM as a result of this review. The review will be completed within the coming weeks. This will influence DEC's response to the proponent's proposal for mitigation and offsets for GSM

The GSM is no longer listed as Schedule 1: 'fauna that is rare or likely to become extinct' under the WC Act. It was delisted in the WA Government Gazette on 6 November 2012. It is currently listed as Priority 4 'Rare, near threatened and other taxa in need of monitoring'.

Submission 7.2-5: Notwithstanding the review of the conservation status of the GSM, the loss of this local population of GSM is likely to be significant, as it was not possible to find any other GSM populations within the local or near regional area. There are only a few extant populations of GSM known in the southern Perth metropolitan area that are not threatened by development proposals, or in a large enough or protected area of habitat to give confidence of being resilient to local extinction. The impact on GSM on a local/regional scale will be significant and DEC considers that a local GSM population will likely be lost.

The GSM population affected by the proposed project is currently fragmented by existing roads and is under pressure from habitat fragmentation and associated decline in habitat condition. The DEC has acknowledged that without active management it is unclear whether the GSM population will persist in the long term (10+ years) (Mitchell and Williams 2012).

Despite uncertainty regarding the long-term population viability, it is acknowledged that the population recorded in the project area is considered a significant population. Its removal will have a significant impact on the known regional distribution of GSM.

As described in the Offset Strategy (Appendix I), Offset Proposal 4 provides for funding ($250,000) towards improved management of nearby populations and conservation research for the species to offset the loss of this population.

Submission 7.2-6: Table 6.7-6 states 'Loss of confirmed non-viable Graceful sun moth populations' but should state, 'Loss of confirmed Graceful sun moth populations'. The population of Graceful sun moth is not confirmed as non-viable.

Noted. The term 'non-viable' should be removed from this statement in Table 6.7-6 of the PER.

Submission 7.2-7: *Throscodectes xiphos* has only ever been recorded from the Jandakot area and therefore needs to be better considered, with more information provided on the efforts made to locate the species or its habitat.

Throscodectes xiphos (Rentz 1985) was collected on 29 April 1981 in *Banksia* woodland located at Cutler Road, Jandakot and is apparently only known from the single male specimen. The collection locality is situated in Bassendean complex; and is located approximately 4km from the project area. Based on a review of aerial photography and previous development reports of the Cutler Road area, this area contains habitat similar to the eastern half of the project area, which is also located on the Bassendean complex.

Consultation with the Western Australian Museum in February 2012 (Houston 2012), confirmed that no additional collections of *T. xiphos* have been submitted since its original description. It is impossible to ascertain definite habitat preferences for this species based on holotype alone. While the eastern portion of project area, containing *Eucalyptus-Banksia* woodland, appears similar to the habitat where the species was recorded; microhabitat qualities may be different to what is needed to sustain populations of the species.

Despite extensive systematic and targeted invertebrate surveys undertaken in the project area, *T. xiphos* was not recorded. During the surveys, eight specimens of native crickets in the Gryllidae (near *Bobilla*) and Acrididae (*Cedarinia* sp., *Heteropternis obscurella*) families were collected—none of these being of conservation significance. As outlined in Appendix P of the PER, surveys conducted in the project area for this species include:

- Pit trapping over seven survey rounds conducted every month from February 2010 to September 2010 (excluding June 2010) totalling 3,900 trap nights, during the short-range endemic invertebrate surveys;
- Targeted pitfall trapping over two additional survey rounds (spring 2010 and autumn 2010), totalling 3,000 trap nights;
- Deployment of bait stations utilising chemical free insect attractant at seven targeted sites over late spring to early summer 2009, totalling 420 trap nights;
- Collection of leaf litter samples (38 samples) during summer 2009, autumn 2010, winter 2010 and spring 2010;
- Active foraging undertaken during summer 2009, autumn 2010 and spring 2010 and comprising 75 minutes at each of the seven targeted invertebrate sites during the first two sampling events (summer 2009 and autumn 2010) and 12.5 hours of searching a total area of 2.5 ha during spring 2010. In addition, an hour of intensive targeted sampling at seven sites was undertaken in the preferred spring sampling period in 2010.
- Night searches (active foraging and listening for cricket calls) at six fixed light trapping stations in autumn 2010 and spring 2010, with a total of 2160 minutes of foraging and listening conducted at the trapping sites, and a total of 36 light trapping hours over the six stations.

While it cannot be ruled out that *T. xiphos*, may be present, it was not recorded from the project area, despite extensive efforts to locate it.

Submission 7.2-8: Southern brown bandicoot is stated incorrectly as Priority 3 in Section 5.1.2.3, and correctly as Priority 5 in Section 5.9.1.3 onwards. A high incidence of activity is reported for this species in the project area between North Lake Road and Stock Road, further supporting the importance of this area as fauna habitat and a corridor. It is unlikely that Southern brown bandicoot will persist in this road reserve once the road construction has occurred. There will thus be the loss of what appears to be a large and active population of this species. No mention is made that the 2010 surveys were conducted in the second driest winter, and one of the driest years, on record. Taking these conditions into account it can be reasonably assumed that the achieved low capture rate (particularly of females with pouch young and of juveniles) is actually indicative of a much larger, and significant, population. A research and management strategy (which includes a feasibility study into translocation) should be developed and implemented for Southern brown bandicoot.

As presented in Section 6.7.4.2 of the PER, a trapping and translocation program for fauna occurring in the construction zone will be implemented following the installation of construction fencing. The proposed strategy for the translocation program is outlined in the FVFMP (Appendix F). It gives explicit consideration to translocating Southern Brown Bandicoots. A detailed trapping and translocation plan will be developed and implemented in consultation with DEC prior to clearing activities.

Submission 7.2-9: *Egernia luctuosa* is frequently observed throughout the Bibra Lake foreshore and was not recorded in the PER.

As presented in Appendix M of the PER, *Lissolepis luctuosa* (formerly *Egernia luctuosa*) (Gardner *et al.* 2008) was identified as potentially occurring in the project area during the preliminary desktop review. There is a high likelihood of occurrence within suitable habitat of the project area. However, it was not recorded during the vertebrate fauna surveys. *L. luctuosa* was not specifically discussed in the PER because it is not listed as a species of conservation significance.

Submission 7.2-10: Photographic evidence of the Carpet Python exists, and it occurs within the subject area.

Submission 9.0-13: The Carpet Python, which exists in the area (despite the PER not listing it) is of significance to the Aboriginal people. Impacts to this species especially would be detrimental.

It is acknowledged that the photographic evidence submitted shows a south-west Carpet Python (*Morelia spilota imbricata*). As presented within Appendix M of the PER, the Carpet Python was not identified as potentially occurring in the project area during preliminary desktop review. Additionally, it was not recorded during the vertebrate fauna surveys.

Records of the Carpet Python are sparse on the Swan Coastal Plain and it is likely the species has declined in this region due to pressure from urban development (Bush *et al*. 2010; Storr *et al*. 2002). The closest Naturemap records of the species to the project area are 11km north-west (Mosman Park), and 17km east (Kelmscott). It is currently listed as Schedule 4 under the WC Act. It is not clear from the photographic record whether the specimen is naturally occurring or a captive specimen that has escaped. Suitable habitat does exist within the project area; however as this species tends to be a habitat generalist, it is highly unlikely that it will be significantly impacted.

Carnaby's Cockatoo

Submission 7.3-1: Carnaby's cockatoo is shown to have extensive habitat in the form of foraging habitat and potentially breeding and roosting sites within the overall development area. These areas are potentially high value vegetation for the species, which is reflected in the incidence of reported foraging behaviour. DEC considers there is apparent under-evaluation of vegetation condition and importance within the project area, especially between North Lake Road and Stock Road. The known roost site for Carnaby's cockatoo at Manning Park, some 2 km to the west of the western end of the development footprint, has not been brought forward from Appendix M to the main text, thus understating the significance of the site as a roost/forage area in that text. Figure 5-2 in Appendix M would suggest that the food value of the whole site is significant and that a major element of connectivity involving this site will be lost if the development proceeds as currently planned. The significance of the site to Carnaby's, and the forest red-tailed black cockatoos should be further evaluated.

Submission 7.3-2: The proponent states on page 242 that "a roost site needs to be within 10 to 12 km of a foraging area. However, this estimation applies for foraging in Kwongan heath, where birds would have to travel further from surrounding areas to reach these particular foraging habitats". Data obtained from the Great Cocky Count 2011 analysis indicate that potential foraging habitat within 6 km of Carnaby's cockatoo night roost sites is likely to be most important in sustaining that roost site. It would therefore be prudent to analyse roost site/foraging values to a lesser distance than the 12 km and the 6 km distance would be appropriate in this regard. Seventy-eight hectares of Carnaby's cockatoo foraging habitat will be affected by the proposed development (page xv), representing approximately 6 per cent of all potential foraging habitat within 6 km of the centre of the development area. For particular Carnaby's cockatoo night roost sites (e.g. DEC2 with around 200 roosting birds in 2011), 78 ha represents over 10 per cent of the potential feeding habitat within 6 km. Figure 5.9-5a (page 246) portrays the high level of use of the remnant vegetation in the development area as a source of food for Carnaby's cockatoo and therefore indicates its importance for the species. A likely consequence of the clearing of this 78 ha is that the Carnaby's cockatoo roosts within 6 km to the north-west of the development site will become significantly less viable. An evaluation of foraging areas within a 6 km radius of known Carnaby's, and forest red-tailed black cockatoo roost sites be undertaken to better determine the significance of this area to these cockatoo species.

Submission 7.3-4: Four known forest red-tailed black cockatoo roost sites, located between 150 m and 1.5 km from the project area, were recorded in November 2010. One roost was observed to be in use in November 2010 and another was observed being used intermittently from March to November 2010. Little is known about the forest red-tailed black cockatoo in regard to roosting and foraging patterns. In the absence of other information, it is reasonable to assume that the 6 km threshold from night roost sites, within which all potential foraging habitat is important, may also apply for forest red-tailed black cockatoos. The significance of night roost sites, as important habitat for Carnaby's cockatoos, can be considered to similarly apply to red-tailed black cockatoos. Red-tailed black cockatoo night roost sites should be considered to be of similar importance to Carnaby's cockatoo night roost sites.

Submission 000-01-05: DSEWPaC agrees with the comments on Carnaby's Black Cockatoo, particularly the issue of maintaining roost sites within 6km of foraging areas. Additionally, the loss of suitable hollows for the Forest Red-tailed Black Cockatoo is a concern, in particular, as these birds are known to breed within the Perth metropolitan area. Continuing loss of black cockatoo habitat within the Perth metropolitan area is an issue for DSEWPaC (see p.26-7 of summary).

Black cockatoo foraging habitat was recorded during detailed field surveys of the project area (Appendix M of the PER) and vegetation unit mapping (Appendix K of the PER). Vegetation condition was not taken into account in assessing foraging habitat extent. The extent of foraging habitat within the project area is shown in Figure 5.9-5 of the PER and the extent of foraging habitat loss within the project area is shown in Figure 6.7-1 of the PER.

As presented in Section 6.7.2.1.1 of the PER, the project impacts on foraging habitat may reduce the value of the known black cockatoo roost sites located within 2km to 5km of the project area. To better understand the scale of impact for each roosting site, a more detailed spatial analysis was undertaken. This analysis took into account recent data from the 2011 Great Cocky Count, which indicates that foraging habitat within 6km of a roost site is most critical to sustaining the roost. This data was not available at the time of preparing the PER.

The extent of potential foraging habitat and extent of loss of foraging habitat from the proposed project was analysed for each of the 12 known Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo roost sites located within a 6km radius of the project area. Potential foraging habitat for both species was mapped based on DEC's dataset of potential foraging habitat for Carnaby's Cockatoo '*CBC areas requiring further investigation*'. This dataset was also used to map Forest Red-tailed Black Cockatoo foraging habitat, with DEC endorsement (Barrett 2012).

Results of the analysis are presented in Table 5 and Figure 8 and Figure 9. The percentage loss of foraging habitat will be greater than 10% for only one of the known roost sites (10.4% loss for '5 CBC'). Percentage loss for a further nine roost sites will be between 5 and 10%. There may be some reduction in viability of these nine roosts.

Table 5: Foraging Habitat Extent and Loss within 6km Radius of Known Black Cockatoo Roost Sites

Roost Site ID[1]	Total area (ha) foraging habitat within 6km radius of roost site	Total area of foraging habitat within 6km radius that intersects project footprint	Percentage loss of foraging habitat
1 CBC	2928	52	1.8
2 CBC	1001	78	7.8
3 CBC	825	67	8.1
4 CBC	883	78	8.9
5 CBC	750	78	10.4
6 CBC	852	78	9.2
7 CBC	1111	78	7.0
8 CBC	2868	57	2.0
Combined area all CBC roost site buffers	3607	78	2.2
1 RT	1125	73	6.5
2 RT	1241	73	5.9
3 RT	1191	73	6.1

Roost Site ID[1]	Total area (ha) foraging habitat within 6km radius of roost site	Total area of foraging habitat within 6km radius that intersects project footprint	Percentage loss of foraging habitat
4 RT	1185	73	6.2
Combined area all RT roost site buffers	1606	73	4.6

CBC = Carnaby's Cockatoo roost

RT = Forest Red-tailed Black Cockatoo roost

[1]Arbitrary site code applied for ease of interpretation

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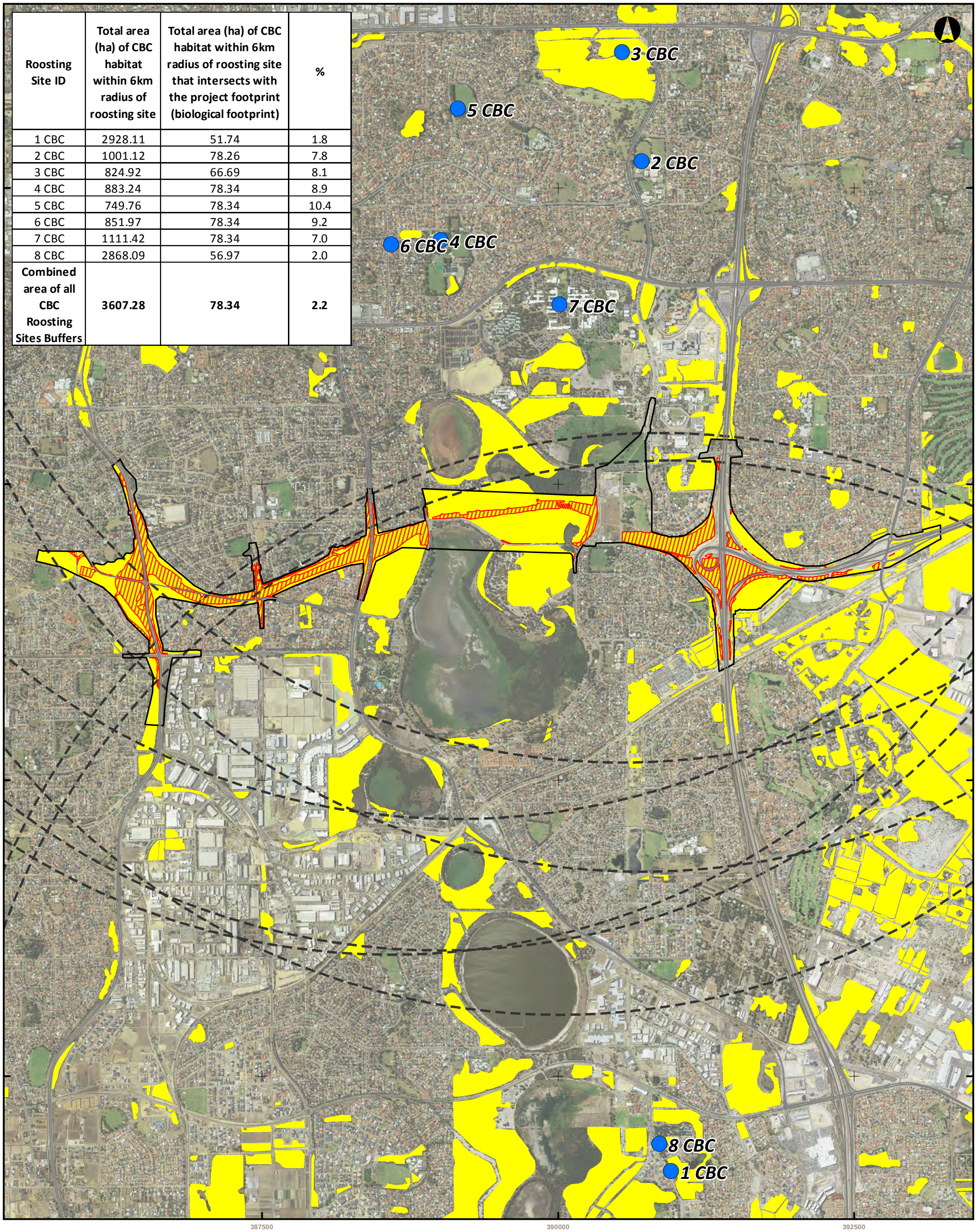
Roosting Site ID	Total area (ha) of CBC habitat within 6km radius of roosting site	Total area (ha) of CBC habitat within 6km radius of roosting site that intersects with the project footprint (biological footprint)	%
1 CBC	2928.11	51.74	1.8
2 CBC	1001.12	78.26	7.8
3 CBC	824.92	66.69	8.1
4 CBC	883.24	78.34	8.9
5 CBC	749.76	78.34	10.4
6 CBC	851.97	78.34	9.2
7 CBC	1111.42	78.34	7.0
8 CBC	2868.09	56.97	2.0
Combined area of all CBC Roosting Sites Buffers	**3607.28**	**78.34**	**2.2**



Carnaby's Black Cockatoo Foraging Habitat within 6km of Known Roost Sites

South Metro Connect

Figure 8

Coordinate System: GDA 1994 MGA Zone 50

0 0.5 1 1.5

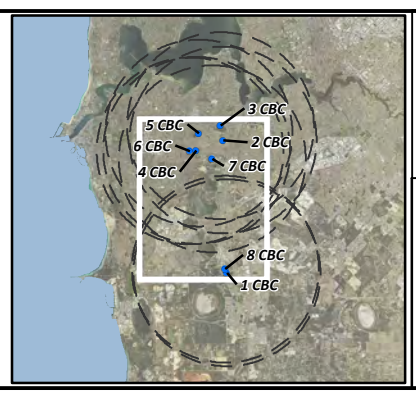
Kilometres

1:30,000 (A3)

Datum: GDA94 Projection: MGA z50

LEGEND

- Project Area
- Known Carnaby's Roost Sites
- Known Roost Sites 6km Buffer
- CBC Regional Habitat (combined with SMC CBC Mapping)
- CBC Regional Habitat within Project Footprint (biological footprint)



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Roosting Site ID	Total area (ha) of RT habitat within 6km radius of roosting site	Total area (ha) of RT habitat within 6km radius of roosting site that intersects with the project footprint (biological footprint)	%
1 RT	1124.62	73.22	6.5
2 RT	1240.72	73.22	5.9
3 RT	1191.39	73.22	6.1
4 RT	1185.30	73.22	6.2
Combined area of all RT Roosting Sites Buffers	**1606.18**	**73.22**	**4.6**

4 RT
3 RT
2 RT
1 RT

6452500
6450000
6447500
6445000
387500
390000
392500

Forest Red-tailed Black Cockatoo Foraging Habitat within 6km of Known Roost Sites

South Metro Connect

Figure 9

Coordinate System: GDA 1994 MGA Zone 50

0 0.5 1 1.5

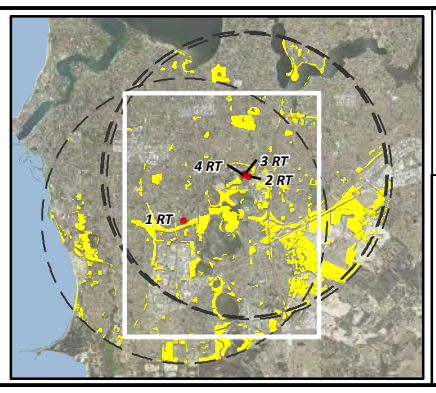
Kilometres

1:30,000 (A3)

Datum: GDA94 Projection: MGA z50

LEGEND

- Project Area
- Known Red-tail's Roost Sites
- Known Roost Sites 6km Buffer
- RT Regional Habitat (combined with SMC RT Mapping)
- RT Regional Habitat within Project Footprint (biological footprint)



SouthmetroConnect

Submission 7.3-2: The proponent states on page 242 that "a roost site needs to be within 10 to 12 km of a foraging area. However, this estimation applies for foraging in Kwongan heath, where birds would have to travel further from surrounding areas to reach these particular foraging habitats". Data obtained from the Great Cocky Count 2011 analysis indicate that potential foraging habitat within 6 km of Carnaby's cockatoo night roost sites is likely to be most important in sustaining that roost site. It would therefore be prudent to analyse roost site/foraging values to a lesser distance than the 12 km and the 6 km distance would be appropriate in this regard. Seventy-eight hectares of Carnaby's cockatoo foraging habitat will be affected by the proposed development (page xv), representing approximately 6 per cent of all potential foraging habitat within 6 km of the centre of the development area. For particular Carnaby's cockatoo night roost sites (e.g. DEC2 with around 200 roosting birds in 2011), 78 ha represents over 10 per cent of the potential feeding habitat within 6 km. Figure 5.9-5a (page 246) portrays the high level of use of the remnant vegetation in the development area as a source of food for Carnaby's cockatoo and therefore indicates its importance for the species. A likely consequence of the clearing of this 78 ha is that the Carnaby's cockatoo roosts within 6 km to the north-west of the development site will become significantly less viable. An evaluation of foraging areas within a 6 km radius of known Carnaby's, and forest red-tailed black cockatoo roost sites be undertaken to better determine the significance of this area to these cockatoo species.

See Submission 7.3-1.

Submission 7.3-3: Targeted searches were undertaken in habitats with the potential to support fauna species of conservation significance known from the region and these searches occurred in spring 2009 and autumn 2010 at all survey sites, and opportunistically in habitats that were specific to the target species, using standard methodologies (Appendix M, Table 3-5). 'Significant habitats' for black cockatoos were also targeted (Section 5.4). Additional surveys were conducted from June to December 2010 to assess potential nest hollows for evidence of nesting Carnaby's and forest red-tailed black cockatoos. The total time spent conducting targeted searches totalled approximately 60 person hours. Notwithstanding this, it is not clear how much survey effort was made to identify possible breeding trees, particularly for forest red-tailed black cockatoos (as opposed to surveys for other fauna). There are a significant number of suitable breeding trees (Fig 5.9 4ab) which, if visited twice a month for six months, would constitute a significant survey effort. Additional survey effort is required to determine breeding activity for Carnaby's and forest red-tailed black cockatoos. These additional survey field observations should include the 'Hollow knocking' method recommended by DEC and Murdoch University researchers, which has successfully been used to survey potential breeding trees in Yanchep National Park. The technique involves knocking on large, hollow-bearing trees, every few weeks, from June to December. Breeding birds will show themselves if a hollow is occupied.

The hollow knocking method was employed during targeted surveys for evidence of breeding activity by black cockatoos, following consultation with the WA Museum. Targeted breeding surveys were undertaken every month from June 2010 to December 2010 (excluding July). July was avoided because it is outside the breeding period for Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo.

During project surveys, zoologists knocked at the base of each significant tree (mapped during earlier surveys) and watched to see if breeding birds exited hollows. The trees were also observed from mid-afternoon to dusk to see if birds returned to the existing hollows. Field dates for targeted breeding surveys in 2010 included: 21-25 June; 11-16 August; 21-23 September; 25-29 October; 15-19 November; 23 November; and 8-10 December. Total field person hours were documented at 276; equating to approximately 46 person hours per month. Surveys focussed mainly on 30 of the 71 significant trees recorded in the project area (see Section 5.9.4.1.3 of the PER), as that subset of trees were determined to have current hollows most suitable for nesting.

The hollow-knocking methodology was not described in Appendix M of the PER, as it is not common knowledge in the public arena. There was a concern that describing the technique may increase the risk of poaching of black cockatoo chicks throughout the state.

Submission 7.3-4: Four known forest red-tailed black cockatoo roost sites, located between 150 m and 1.5 km from the project area, were recorded in November 2010. One roost was observed to be in use in November 2010 and another was observed being used intermittently from March to November 2010. Little is known about the forest red-tailed black cockatoo in regard to roosting and foraging patterns. In the absence of other information, it is reasonable to assume that the 6 km threshold from night roost sites, within which all potential foraging habitat is important, may also apply for forest red-tailed black cockatoos. The significance of night roost sites, as important habitat for Carnaby's cockatoos, can be considered to similarly apply to red-tailed black cockatoos. Red-tailed black cockatoo night roost sites should be considered to be of similar importance to Carnaby's cockatoo night roost sites.

See Submission 7.3-1.

Submission 7.3-5: Text in table 6.7-3 (and table 8.1-2, page 642) claims there to be 9,133 ha of cockatoo feeding habitat within a 15 km radius. This information is not substantiated in the PER or appendices. There are no maps and no description of how this was calculated and it is therefore unknown what proportion of this area is wetland vegetation and other non-foraging habitat. A reference and/or map is required to demonstrate the claim (page 500) that 9,133 ha of cockatoo feeding habitat is found within a 15 km radius of the project site, in order to confirm this statement against DEC data.

The estimate of potential foraging habitat for black cockatoos within the 15km radius of the project area was derived from the DEC dataset of potential foraging habitat for Carnaby's Cockatoo 'CBC areas requiring further investigation'. No such dataset exists for Forest Red-tailed Black Cockatoo and therefore the Carnaby's dataset was used as a proxy. Figure 10 shows the extent of potential black cockatoo foraging habitat within the 15km radius.

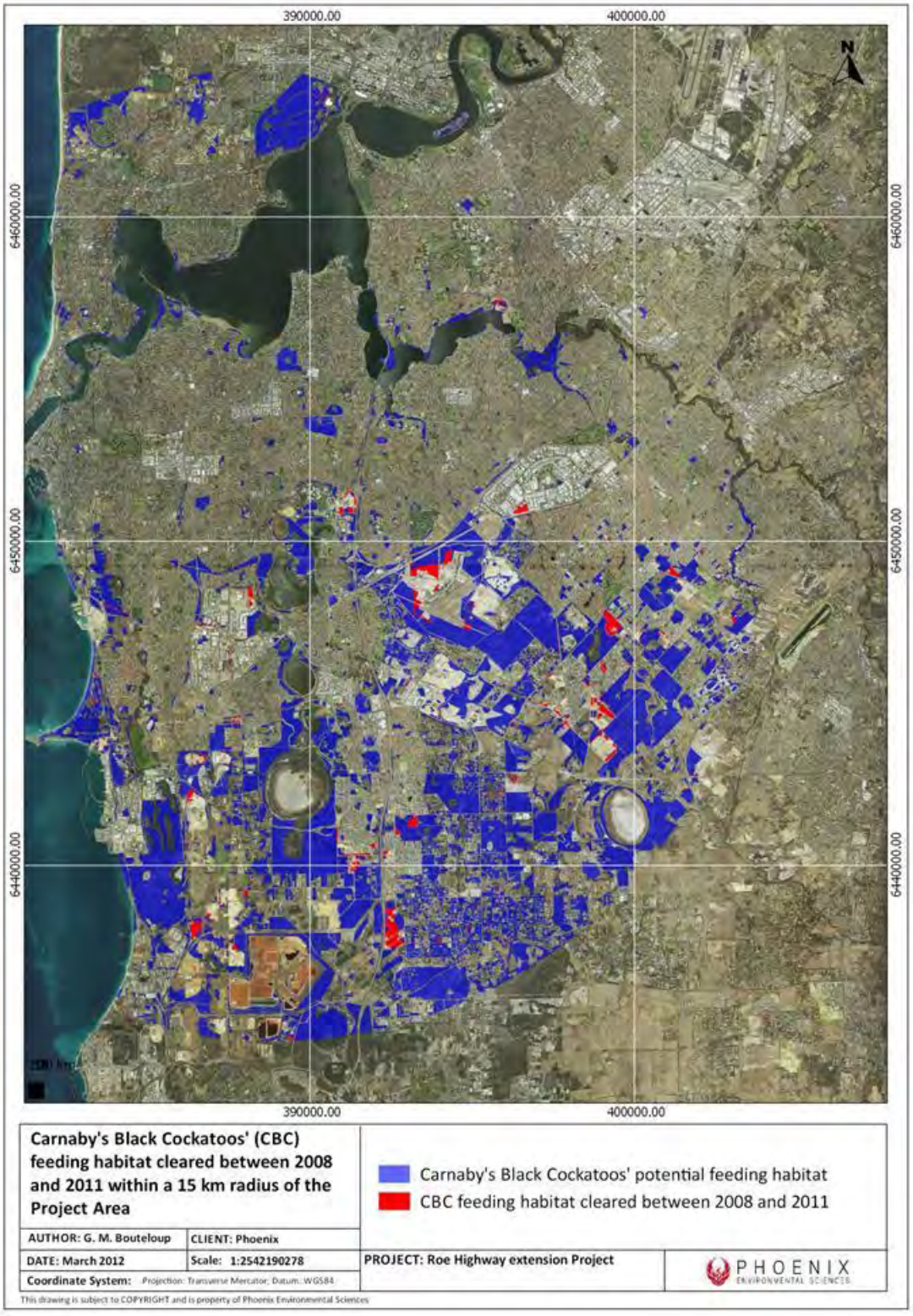


Figure 10: Potential Black Cockatoo Foraging Habitat within 15km radius of Project Area. Sources: DEC's dataset '*CBC areas requiring further investigation*' and Appendix M of the PER.

Submission 7.3-6: Rehabilitation along roadsides with plant species suitable for Carnaby's cockatoo is likely to result in the attraction of this species to that area, and possible vehicle strikes due to the increased volume and speed of traffic. There is a commitment in table 7.1 (page 616) to installation of visual barriers to encourage migratory birds to fly over the height of traffic, but this is not carried over to the section (9) on environmental commitments (nor is it a proven method for mitigating bird collisions with vehicles). DEC would prefer to see specific strategies in place to avoid attracting Carnaby's cockatoos to the road edge where they are at high risk of being struck by vehicles. Greater detail is required on how revegetation of the roadsides will be undertaken in a manner that does not jeopardise conservation for Carnaby's cockatoo through increased rates of bird strike.

The Rehabilitation Strategy (Appendix G) presents a framework for rehabilitation and revegetation activities for the proposed project. The strategy provides a guideline to revegetate roadsides, batters, redundant roads and Horse Paddock Swamp. It also includes criteria based on minimising risks associated with vehicle strike on black cockatoos. To reduce these risks, a buffer of three metres will be applied to the revegetation of roadsides so that plant species that are a source of food or nesting for Carnaby's and Forrest Red-tail black cockatoos will be planted outside this buffer. This will discourage the birds from feeding or nesting close to the proposed project; and will minimise vehicle bird strike.

Submission 7.3-7: The PER does not address the cumulative impacts of the loss of substantial environmental habitat for the Carnaby's cockatoo over the last 2 years.

A GIS analysis of cumulative habitat loss for Carnaby's Cockatoo within a 15km radius was undertaken in March 2012. Aerial photography from late 2008 and late 2011 was compared to identify potential feeding habitat that has been cleared during this period. Only direct habitat destruction (land clearing) was considered in the analysis. Habitat degradation (poor vegetation condition, change in vegetation structure, etc.) cannot be assessed accurately enough from aerial photography.

The comparison between 2008 and 2011 was based on aerial photography taken in different conditions at different times of the year. Light, vegetation condition, the shade of the trees, etc., can potentially lead to a visual misinterpretation of the photos.

Figure 11 shows the results of the analysis. The analysis determined that 8599ha of potential habitat occurs within the region. Of this, 271ha was cleared between late 2008 and late 2011, equating to 3.15%.

The proposed project will result in the loss of 78ha of Carnaby's Cockatoo foraging habitat. Clearing of this habitat will increase cumulative regional habitat loss to 349ha, or 4.06%.

The estimate of potential foraging habitat used here (8599ha) varies slightly from the estimate in the PER (9133ha in Table 6.7-3 of the PER). The reason for the variation is not known, but may be due to different analysts conducting the two assessments.

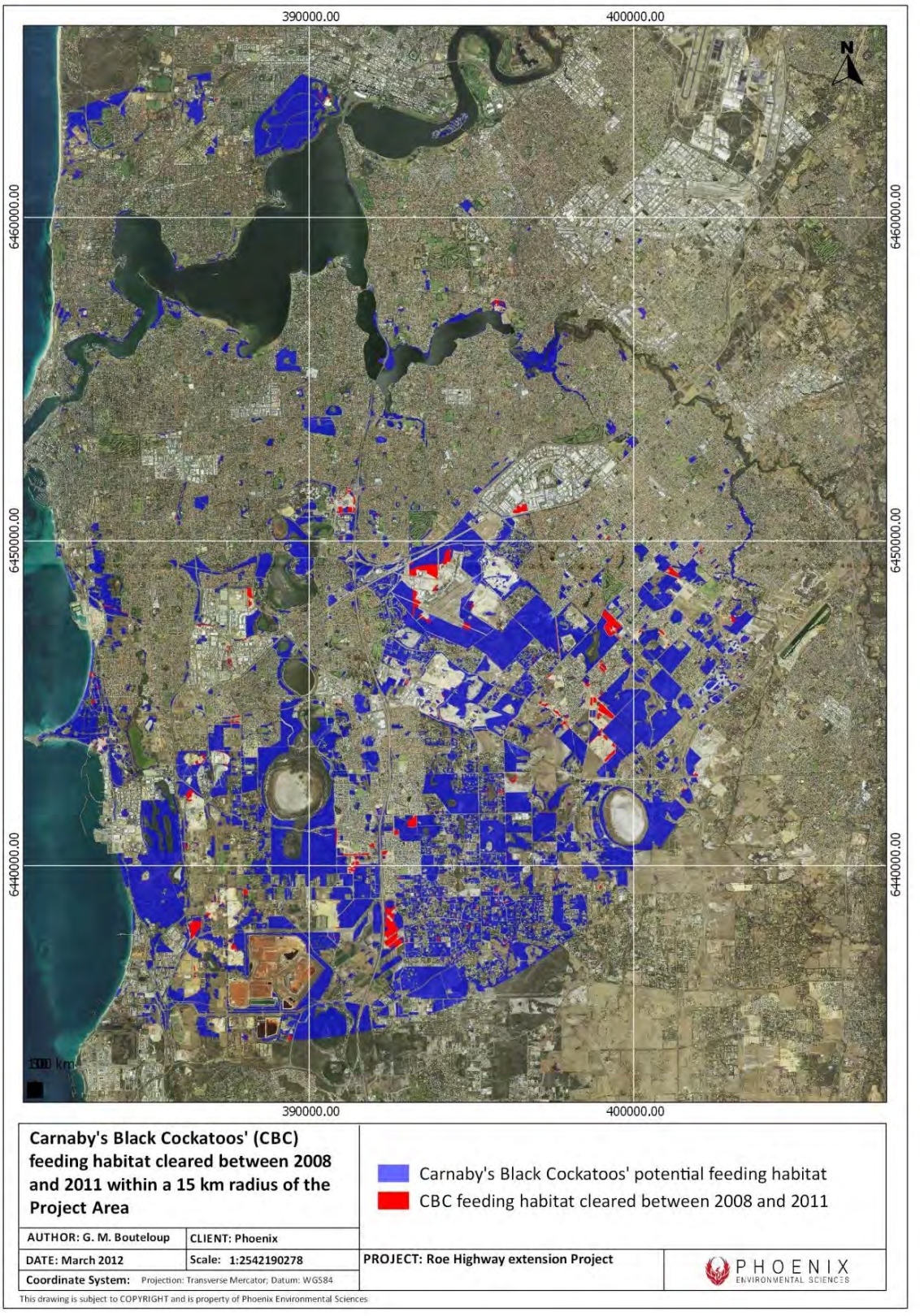


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Figure 11: Potential Carnaby's Cockatoo Foraging Habitat Cleared Between 2008 and 2011

Source: Regional habitat derived from DEC dataset 'CBC areas requiring further investigation'

Submission 7.3-8: The Carnaby's black cockatoo inhabits the proposal area and feeds on the banksia, marri and jarrah trees. North Lake reserve is now the major feeding area for the local cockatoos.

Submission 7.3-9: The clearing of 78ha of foraging habitat and 249 potential nest trees is not compliant with the DEC's Carnaby's Black Cockatoo Recovery Plan.

It is acknowledged that Carnaby's Cockatoo inhabits the project area and feeds on the seeds of Banksia, Marri and Jarrah. The 78ha of foraging habitat and 249 potential nesting trees potentially impacted by this project is considered to be critical habitat in accordance with the Carnaby's Black Cockatoo Recovery Plan (Cale 2003).

Carnaby's Cockatoo and impacts on its habitat are described and assessed in Sections 5.9.4.1.1, 6.7.2.1.1 and 8.1.1.2 of the PER.

3.8. Ecological Linkages

Submission 8.0-1: The analysis of linkages ignores Carnaby's cockatoo, Forest red-tailed black cockatoo and Peregrine falcon as they are deemed to be not dependent on these linkages. This is questioned as Carnaby's cockatoo would be using the corridor as habitat and would benefit from the linkage. The analysis for Southern brown bandicoot is mainly about the use of the project area for transition through and out of the area. It does not consider the value of the linkage within the project area, which is a significant length of linkage and has potential for maintaining the local population. This would also apply to other species, such as GSM and Lined Skink. The value of the east-west linkage along the road route should be recognised for a number of local fauna. Management strategies should be considered for the maintenance of this linkage.

Submission 8.0-2: Ecological linkages are only addressed for the north-south movement between the major lake and vegetation areas. No consideration is given to the east-west linkage between North Lake Road and Stock Road (as the value of this linkage has been discounted) other than a general commitment to rehabilitate disturbed roadside areas in Table 7.1, page 616, which is not carried forward into Table 9.1-1 on environmental commitments, but is picked up through the general reference to vegetation restoration in section 9.2. This commitment is supported. Greater detail should be provided on the nature of vegetation establishment on the roadsides, and explaining how this is intended to maintain fauna habitat and ecological linkages.

Submission 8.0-3: Of six ecological linkages in the area, three will be affected and fragmented. The PER details a number of species that depend on ecological linkages for their survival. These include the Southern Brown Bandicoot and a number of birds and reptile species.

Submission 8.0-4: Many species will not be able to cross the highway, or will be too timid to pass under bridges or through fauna underpasses which leave them vulnerable to predators.

Submission 8.0-5: There were no investigations into design features for underpasses for different species of fauna. There is also no literature provided regarding the use and success of underpasses.

Submission 8.0-6: Ecological Link 3 is already stressed and suffering and the future protection of remaining habitat throughout this link is not protected.

Submission 000-01-06: DSEWPaC considers it important to maintain movement corridors, i.e. linkages, for black cockatoos that follow these corridors from feeding site to feeding site. Losing vegetated corridors could lead to the birds increasingly avoiding areas they previously occurred in, a particular concern within the Perth metropolitan area with its ongoing habitat loss.

Ecological Linkages are described in Section 5.9 of the PER and impacts upon those linkages are outlined in Section 6.8 of the PER. Use and value of fauna habitat (including areas within linkage boundaries) is addressed in detail in Section 5.9 of the PER. Section 5.10 of the PER focussed primarily on the value of fauna linkages as corridors for movement between habitat patches.

Medium to large sized birds including Carnaby's Cockatoo, Forest Red-tailed Black Cockatoo and Peregrine falcon have been excluded from the analysis of impacts on linkages as they are able to move between habitat patches, without being significantly impeded by barriers such as roads. It is recognised however that although Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo are not reliant on these linkages for movement between habitat patches, the linkages themselves represent important foraging habitat for these species. Section 6.7.2.1 of the PER, 'Habitat Loss and Fragmentation' addresses this issue.

Species that have been included in the analysis are those which are reliant on contiguous linkages. This information is based on a recent broadscale study (Davis *et al.,* 2008) which identified key species groups that are particularly dependent on linkages. These groups include:

- Large bodied reptiles, such as goannas, snakes, bobtails and possibly dragons
- Vagrant bird species such as fairy wrens
- Mammal species, including the common Brushtail possum, Quenda and Western Grey Kangaroo.

The movement of fauna species from east to west has been considered and it is proposed that fauna underpasses will be utilised to facilitate movement at regular intervals along the alignment. The precise locations and design of fauna underpasses will be determined during detailed design. The movement of fauna species, such as Quenda, will be considered during final design. Ground habitat features such as fallen logs, will be used in rehabilitation to provide fauna habitat. Additional aspects such as the use of a bridge to cross Roe Swamp, the removal of traffic on Hope Road and the restoration of Horse Paddock Swamp will all assist to maintain fauna linkages in the local area.

Additional management measures related to the management of ecological linkages are included in the FVFMP (Appendix F) and the Rehabilitation Strategy (Appendix G).

3.9. Aboriginal Heritage

Submission 9.0-1: The proponent has conducted consultative heritage surveys and examined the register of Aboriginal sites. The proponent has also taken into account the impacts on Aboriginal culture and designed elements to mitigate these impacts. It is clear that the design will destroy one or more Aboriginal sites. The proposal will require the consent of the Minister for Aboriginal Affairs under s18 of the *Aboriginal Heritage Act 1972*.

Main Roads acknowledges that consent of the Minister for Aboriginal Affairs, under Section 18 of the *Aboriginal Heritage Act 1972* (AH Act), is required for the project. An application under Section 18 of the AH Act was submitted in late 2012, following consultation with relevant Aboriginal groups. Consultation will continue through the final design and construction phases of the project.

Submission 9.0-2: In terms of Aboriginal Heritage there are no doubt the changes proposed to the biophysical environment will adversely affect historical and cultural associations within the area.

As presented in Section 6.9 of the PER, there are some impacts on the biological and physical environment but these are not expected to significantly affect cultural and historical associations within the project area. Impacts on hydrology, native vegetation and ecological linkages will be avoided or minimised through innovative design methodologies, features that minimise the construction footprint (e.g. retaining walls), and incorporating bridges and underpasses into the design to maintain fauna linkages.

Submission 9.0-3: This land is subject to the combined Swan River and Swan Coastal Plain Native Title claim. Written notification needs to be given to representative Aboriginal bodies, registered native title bodies and to all native title claimants before public works can proceed. This would provide the Aboriginal groups to formally voice their opposition.

Section 5.16.4 of the PER states that the project area is covered by the unregistered Single Noongar Area 1 (WC 03/6) Native Title Claim Group. This claim has not been accepted by the Native Title Tribunal for registration. The project area falls within Native Title Claim WAD242/11 (Federal Court Number) or WC11/9 (Native Title Tribunal Number) - Whadjuk People, represented by the South West Aboriginal Land and Sea Council (SWALSC). This native title claim application is registered, but has not been determined. This registration has occurred since the release of the PER in June 2011.

Main Roads will adhere to the requirements of the *Native Title Act 1993.* Where Native Title has not been extinguished, these requirements include the written notification of the proposed project to representative Aboriginal bodies, registered native title bodies and native title claimants before construction commences.

Aboriginal groups have had, and will continue to have, the opportunity to voice their concerns and opinions regarding the proposed project through a number of forums. Groups have been involved in community and stakeholder engagement activities related to the PER process. Consultation with relevant groups and individuals has occurred and is ongoing for the Section 18 process under the AH Act.

Submission 9.0-4: The Beeliar wetlands are one of the most significant places to the Noongar people. The wetlands are considered to have been semi-permanent settlement grounds. It was also a traditional place of birth, and burial grounds area close to the wetlands. The wetlands also provided a good source of food throughout the year.

Submission 9.0-5: Waugal, Firestick and Spirit Children Dreaming stories are integral to this site. The proposal will desecrate this heritage. The hydrology of the Lake system will be affected and even jeopardise the waterway that contains the Waugal spirit.

Submission 9.0-6: The Metropolitan Commission of Elders have highlighted their concerns and wishes for the area to the then Minister for Planning in 2002.

Important relationships between Noongar culture and the ecology of the project area are presented in Section 5.16 of the PER. Rivers, pools and wetlands are described as central to sustaining Noongar culture and society. Historically, these wet areas provided essential food, served as ceremony sites, and offered linkages for trade and travel through the surrounding landscape. Impacts on mythology will be addressed through the Section 18 process.

Concerns were raised by the Metropolitan Commission of Elders in a letter (dated 18 November 2002) to the Hon Alannah McTiernan MLA (the then Minister for Planning and Infrastructure), the EPA and Main Roads in relation to proposed traffic calming on Farrington Road. The letter also highlighted concerns over the proposed extension of Roe Highway through the area.

Some impacts on the biological and physical environment will result in minor adverse effects on cultural and historical associations within the project area. Impacts on hydrology, native vegetation and ecological linkages have been avoided or minimised to the fullest extent possible through innovative design methodologies, features that minimise the construction footprint (e.g. retaining walls and no median), and incorporating bridges and underpasses into the design.

Extensive community and stakeholder consultation has been conducted in order to identify the current interests and concerns of people and organisations potentially affected by the proposed project, including Aboriginal groups. Consultation with Aboriginal groups was conducted prior to the submission of the PER and is continuing in order to obtain consent to disturb an Aboriginal site under Section 18 of the AH Act. Consultation will continue through the final design and construction phases of the project.

Submission 9.0-7: The Aboriginal Heritage report in the PER did not contain quotes from custodians of the area or other Noongar representatives. Living custodians should be prioritised in the consultation process. The correct people have not been consulted.

The reporting of impacts on Aboriginal heritage differs between assessment under the EP Act and assessment under Section 18 of the AH Act. As per the EPA's Guidance Statement 41, the PER addresses impacts on the physical and biological environment affecting Aboriginal historical and cultural associations within the project area. Under the Section 18 process, there is more emphasis on the cultural significance of the place and whether the place is considered a site under the AH Act. As a result of these differences, the PER reporting of Aboriginal heritage has been confined to statements associated with how impacts on the biological and physical environment affect Aboriginal heritage.

Living custodians were consulted in developing the PER (see Section 5.16.2). Further consultation with Aboriginal groups has been conducted as part of the Section 18 process under the AH Act. The full heritage reports have been submitted to the Department of Indigenous Affairs (DIA) and the Aboriginal Cultural Material Committee (ACMC) as part of the Section 18 process. These reports are included in Appendix O of this document for the information of the EPA. Appendix O is not to be published for public review.

Submission 9.0-8: All communications with representative families show they all oppose the proposal. Customary laws prevent custodians revealing to non-essential people (not of right heritage, clan or skin groups) some of the knowledge.

Main Roads acknowledges that certain cultural information cannot be revealed to non-essential people. Various consultation elements will remain confidential, and will only be presented to the ACMC for assessment under the Section 18 of the Act. Consultation with Aboriginal groups to date has shown that not all oppose the project outright.

Submission 9.0-9: Few Aboriginal heritage sites are left intact. The highest survival rates are in wetlands, and assume a greater significance representing past Aboriginal activity. The extension could not be completed without irreparable damage to this sacred site.

An application under Section 18 of the AH Act is being sought for permission to disturb Aboriginal sites within the project area. Appropriate mitigation and management will be developed during this process, in accordance with the provisions of the AH Act, which will involve further consultation with DIA and Aboriginal groups.

In accordance with EPA Guidance Statement 41, the impacts on the biophysical environment have been considered. The impacts upon the biophysical environment will not significantly affect the cultural and historical associations.

Submission 9.0-10: There would be a case under the Commonwealth *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* to apply for the Commonwealth Minister for Aboriginal Affairs for a declaration prohibiting activities that impact on Aboriginal sites.

Protection of places of significance to Indigenous Australians is provided through the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (ATSIHP Act). The ATSIHP Act offers protection for significant places or objects through ministerial decision.

Aboriginal people who believe that a place or object is threatened and believe that state government processes offer inadequate protection can apply under the ATSHIP Act to protect the place or object.

Submission 9.0-11: There is no option to reject the extension outright and therefore no way to represent Noongar concerns.

See Submission 1.4-2.

Submission 9.0-12: The proposal would impact on the ability of Noongar people to practice culture, to speak and to be. It is not supported that there is a 'lack' of cultural practice in the area.

As stated in Section 6.9.4 of the PER, there are low levels of traditional and/or historical cultural practice (i.e. hunting, fishing and camping) currently conducted within the project area, relative to historical levels prior to non-indigenous land use and urban development.

Submission 9.0-13: The Carpet Python, which exists in the area (despite the PER not listing it) is of significance to the Aboriginal people. Impacts to this species especially would be detrimental.

See Submission 7.2-10.

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3.10. Noise

Submission 10.0-1: The peer review which was undertaken for the noise modelling report should be reviewed as assessed before the final recommendations on this proposal are made. If necessary the proponent should be required to revisit their commitments on noise mitigation measures based on the outcomes of the peer review report.

Submission 10.0-5: The noise assessment should make conservative assumptions as detailed studies cannot be completed until the detailed design phase.

Following a meeting with DEC Noise Branch and OEPA on 31 May 2012, the noise assessment presented in Appendix U of the PER and summarised in Section 6.10 of the PER has been amended. A Noise Management Plan (NMP), showing revised noise modelling and locations and heights of noise barriers, is included at Appendix J.

A further noise assessment will be conducted prior to construction, following the completion of detailed road design, to verify the noise assessment in the NMP.

Submission 10.0-2: The proposal needs to demonstrate compliance with the *Environmental Protection (Noise) Regulations 1997*, specifically the requirement of Regulation 13, WAPC's SPP5.4 Road and Rail Transport Noise and Freight Considerations in Land Use Planning and the City of Cockburn's Local Laws 2000 Division 4 Sand Drift and Dust Management.

Submission 10.0-3: Prior to construction, the proponent should provide a Noise Management Plan to the City of Cockburn's Health Services detailing compliance with the above regulation and policy.

Submission 10.0-8: There is a strong concern regarding the impact of construction noise, and vehicle noise following construction on the surrounding community, especially the students in the surrounding schools.

The project will comply with Regulation 13 of the *Environmental Protection (Noise) Regulations 1997* for construction noise by submitting a detailed noise management plan to DEC and the City of Cockburn for approval prior to the commencement of construction. The noise management plan will comply with Regulation 13(6) of the noise regulations.

Following a meeting with DEC Noise Branch and OEPA on 31 May 2012, the noise assessment presented in Appendix U of the PER and summarised in Section 6.10 of the PER has been amended. A Noise Management Plan, showing revised noise modelling and locations and heights of noise barriers, is included at Appendix J.

A dust management plan will be developed prior to construction as part of the Construction Environmental Management Plan. The dust management plan will take into account DEC guidelines for dust management and will be provided to the City of Cockburn for comment prior to the commencement of construction.

Submission 10.0-4: There is no evidence that fauna will adapt to the noise levels (Section 6.7.3.2).

Submission 10.0-7: Noise pollution may affect communication and breeding behaviours of nocturnal animals. Behavioural effects from noise might decrease chances of survival and reproduction.

Submission 10.0-9: The 'Lombard Effect' may change the calls of birds and frogs in the region due to traffic noise.

Potential impacts of noise on birds have been addressed in Section 6.7.3.2 and Appendix T of the PER.

Submission 10.0-5: The noise assessment should make conservative assumptions as detailed studies cannot be completed until the detailed design phase.

See Submission 10.0-1.

Submission 10.0-6: There are several limitations to the acoustic assessment report:

1) Effects on wildlife are not considered.

2) Critical working areas that require low vibration can include home hobbyists.

3) Only 5 consecutive days of data were used for any station.

4) The model uses the assumption that; traffic will be evenly shared between lanes, the road is the only reflecting or hard ground and that the rest is soft, all fences and walls will remain in place and be kept in good repair

5) Traffic volumes used were not up to date.

6) The likelihood of upper floors on houses becoming more prevalent is ignored.

7) The no build scenario used should include noise mitigation.

8) The Blue Gum Montessori School was not taken into consideration, nor the upper floors of Hamilton Hill Senior High School.

9) An alternative area of similar recreational value will be complicated by the new highway to cross.

A response for each of the numbered points in Submissions 10.0-6 has been provided below with a corresponding number.

1) The impact of noise on birds has been addressed in Section 6.7.3.2, and Appendix T of the PER.
2) Vibration criteria are presented in Section 2.2 of Appendix U of the PER. Specifically, Table 4 outlines multiplying factors for various places, including critical working areas as identified in Annex A of the Australian Standard (AS) 2670.2-1990.
3) Monitoring of noise for the proposed project was conducted in accordance with Main Roads' guidelines that also meet SPP 5.4 requirements.
4) The model used the assumption that traffic will be evenly shared between lanes, the road is the only reflecting or hard ground and the other surfaces are comparatively softer and that all fences and walls will remain in place and kept in good repair.
5) Existing traffic volumes are based on the most recent traffic counts available at the time of assessment.
6) Only ground floors of noise sensitive receivers have been assessed in accordance with SPP 5.4.
7) It is not considered practical or feasible to assess noise mitigation on a no-build scenario.
8) The Blue Gum Montessori School was assessed as a noise sensitive receiver, and is shown on relevant noise contour maps. Ground floors of noise sensitive receivers are assessed in accordance with SPP 5.4. The upper floors of Hamilton Senior High School were assessed by way of example in Section 4.4.3 of Appendix U of the PER.
9) While not subject to noise criteria, parks and recreational areas have been considered in Sections 6.4 and 6.5 of Appendix U of the PER.

Submission 10.0-8: There is a strong concern regarding the impact of construction noise, and vehicle noise following construction on the surrounding community, especially the students in the surrounding schools.

See Submission 10.0-2.

Submission 10.0-10: Noise barriers will also have a significant impact on visual amenity.

The visual impacts of noise barriers are addressed in Section 6.12.6 of the PER and in appendices X1 and X2 of the PER.

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3.11. Environmental Commitments

Submission 11.0-1: There is no audit process to ensure that the objectives are achieved. The proponent should include monitoring (of water quality and quantity, vegetation condition), reporting and contingency action plans to ensure that the objective of maintaining existing wetland ecological functions and environmental values is achieved. The proponent should commit to maintain or improve the predevelopment wetland water regime for conservation category and resource enhancement wetlands. Any boardwalk to be constructed should be sited outside of the Bibra Lake wetland and its buffer.

A commitment to audit all project environmental commitments is stated in Table 9.1-1 of the PER. Commitments to the monitoring of environmental outcomes for water quality, quantity and vegetation are given in Section 9.2 of the PER. A Principle Shared Path (PSP) is proposed along the north bank of Bibra Lake, immediately to the south of Roe Highway. This "boardwalk" connects pedestrians and cyclists to the PSP from Progress Drive.

Submission 11.0-2: DEC supports the proponent's commitment to maintain connectivity for pedestrians and regional park visitors between either side of the proposed alignment. The proposed project will have greatest impact on recreation along paths and trails between Bibra Lake and Horse Paddock Swamp/North Lake. DEC supports the proposed north-south and east-west connections by new recreation shared paths that are consistent with the intent of the Beeliar Regional Park and Bibra Lake management plans. Should the project be approved, DEC requests that it be involved in the design and approvals process to ensure achievement of this commitment is to DEC's satisfaction. Should recreation underpasses be designed as part of the highway and within Beeliar Regional Park, DEC advises they should also cater for fire and emergency vehicles. The proponent is requested to liaise with DEC and FESA to ensure adequate height and width specifications of underpasses for emergency vehicles.

Main Roads commits to liaising with DEC and FESA regarding the design of underpasses as part of the highway and within Beeliar Regional Park, to ensure adequate the underpasses are of adequate height and width to cater for fire and emergency vehicles.

Submission 11.0-3: An explanation is needed regarding why the closeout report will be submitted three years after construction when the Auditing Compliance Reporting in 9.2.1.1 is committed to for five years.

Upon commencement of construction, Main Roads will prepare and submit an Annual Compliance Report (ACR) for the duration of construction activities and for five years following practical completion. Specific monitoring requirements are outlined for each individual commitment within Section 9.2 of the PER.

In relation to the Hope Road Bioretention Basin, Main Roads will monitor the groundwater quality for up to three years following completion of construction as discussed in Section 9.2.2.3 of the PER.

Main Roads will submit a closeout report for this commitment as part of its third ACR (not the *final ACR* as stated in Section 9.2.2.4 [Reporting Requirements] of the PER), to be submitted three years following completion of construction. As stated in the Section 9.2.1.1, the Final ACR is scheduled to be submitted five years following completion of construction.

Submission 11.0-4: Contingency actions should be specified to provide assurance that any impacts on conservation category wetlands can be managed and appropriately mitigated.

The project environmental management commitments are listed in Table 9.1-1 of the PER. Possible actions to ensure that these commitments are met are also described within this table. The WMS (Appendix C) provides further detail on management actions for CCW.

Submission 11.0-5: It is understood that Hope Road will be converted to a cul-de-sac with an adjacent Principal Shared Path (PSP). The proponent should commit to achieving a high quality landscape along Hope Road, with revegetation.

All redundant sections of Hope Road will be rehabilitated in accordance with the Rehabilitation Strategy (Appendix G).

Submission 11.0-6: DEC is concerned about the increase in light levels compared to the current situation at night through the regional park. DEC is supportive of innovative lighting solutions to minimise light pollution. While it is acknowledged that lighting along the PSP is required for Crime Prevention Through Environmental Design reasons, DEC is seeking a commitment from the proponent to use best management practice to minimise light spill from the elevated section of the road.

See Submission 13.1-3.

Submission 11.0-7: Agencies that are to assume responsibility for areas of bushland should be given a financial allocation to enable ongoing maintenance for a minimum of five years.

A full description of all direct and indirect offsets is provided in the Offset Strategy (Appendix I).

Submission 11.0-8: Monitoring (and subsequent remediation action) of rehabilitation of cleared areas should be undertaken for a minimum of 7 years, ideally 10.

Monitoring of rehabilitation will be undertaken in accordance with the Rehabilitation Strategy (Appendix G). Monitoring is proposed for five years post-construction.

Submission 11.0-9: A Disease and Pathogen Management Plan needs to be developed to prevent the introduction or spread of diseases or pathogens, specifically Dieback. Phytophthora dieback risks are not identified or mitigated. The PER does not address how the effect of the inevitable spread of dieback will be managed. It will not be possible to address these impacts.

Dieback management is addressed in Section 6.6.4.9 of the PER and a dieback assessment was conducted (see Appendix L of the PER). The PER details the commitment to implement appropriate site hygiene and management measures. The FVFMP (Appendix F) addresses on-site hygiene, dieback assessment and the movement of soil on site. Site hygiene management is aimed to prevent the introduction and/or spread of diseases, pathogens and/or weeds, in particular dieback (*Phytophthora cinnamomi*).

Submission 11.0-10: Dust and noise should be continued to be monitored for years after construction, and management measures implemented.

Dust will be managed in accordance with a Dust Management Plan (DMP) that details dust minimisation, management and monitoring measures to be implemented by the construction contractor and subcontractors. Following the completion of construction and dust generating activities, there will not be a requirement for further dust monitoring. Management measures are described Section 6.13.4 of the PER.

As discussed in Section 9.2.8.3 of the PER and the NMP (Appendix J), post construction compliance noise monitoring will be conducted following the opening of the project. Results of compliance noise monitoring will be included within the subsequent Annual Compliance Report as detailed in Section 9.2.8.4 of the PER.

Submission 11.0-11: Revegetated plants should be watered for the first two summers until established.

Watering of revegetation will be conducted as required. Ideally the revegetation will not be watered to allow it to acclimatise fully to the local conditions.

3.12. Offsets

Submission 12.0-1: Offset 2 refers to the provision of $100,000 to DEC's Environmental Community Grants Scheme (ECG) to support community actions to conserve wetlands. The ECG should be recognised as being the Minister for Environment's grant scheme, administered by DEC. The $100,000 in Offset 2 should be made available to DEC for allocation to community projects for rehabilitation and restoration work within wetlands of Beeliar Regional Park.

The Environmental Community Grants Scheme (ECG) is recognised as the Minister for Environment's, as administered by DEC. The provision of $100,000 to the ECG has been withdrawn from the Offset Strategy following consultation with the OEPA. The OEPA did not consider that funding the ECG constituted an environmental offset under the *WA Environmental Offsets Policy* (September 2011).

Submission 12.0-2: While accepted as a direct offset, the proposed purchase and transfer of 468 ha of land to the State to offset the impacts on Carnaby's and forest red-tailed black cockatoos may not, in itself, provide sufficient offset for the losses predicted for these species.

The assessment of high quality and poor quality vegetation requires review based on the apparent inconsistencies in the photographic evidence in figures 8.01 to 8.12 in Appendix K, which delineate apparently reasonable condition vegetation in the category degraded or completely degraded. Also the apparent assumption in the PER that Carnaby's cockatoo foraging habitat and nesting habitat will co-occur may not be valid for all areas. In selecting the area of land for acquisition, some adjustment to the area sought may be necessary to accommodate this factor.

It would be preferable if the offset acquisition commitment could be restated as at least 468 ha of Carnaby's cockatoo foraging habitat, inclusive of, or in addition to, 25 ha of nesting habitat, plus additional areas of suitable wetland and/or other features. Further, the minimum offset area for the loss of 9.7 ha of conservation category wetlands (including buffers) should be clearly identified in the offset commitments to enable accounting against the offset area acquired. It is noted that on page 704 (section 10.2.1.3), reference is made to the acquisition of 'up to' 468 ha. This should be amended to 'at least' 468 ha as this is the minimum area of Carnaby's cockatoo foraging habitat to be acquired, and additional areas may need to be acquired to achieve the additional offset requirements should these not be found in a single area of acquisition, or if additional restoration works are required. It is acknowledged that 468 ha of land is proposed to be acquired as an offset to the clearing of Carnaby's cockatoo foraging and nesting habitat (page 526, section 6.7.5.3). In implementing this proposal, a focus should be to establish whether suitable habitat or restoration sites are available within 6 km of the development site, and if available, options to incorporate these within the overall offsets should be investigated, including the possibility of reducing the more remote offset area.

Submission 12.0-5: Offset areas should be in close proximity to the environmental loss wherever practical or within the Cockburn area.

Submission 12.0-8: With regards to Offset 1, in addition to the 470 ha purchase of intact vegetation, an additional area (at least equal to the area to be cleared) that is currently degraded should also be purchased and rehabilitated to support foraging habitat for Carnaby's and Forest Red-tailed Black cockatoos.

Submission 12.0-16: There is substantially more information required to be assessed and open for public comment in respect to Offset 1 before it can be considered and permitted. In order to offset the removal of 249 cockatoo nesting trees at a 10:1 ratio, the offset area will have to have actual trees identified, found suitable and quantified.

The assessment of Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo foraging habitat was independent of the vegetation condition mapping. Although the vegetation condition mapping has been revised (see Submission 6.2-4), this will have no bearing on the assessment of cockatoo foraging habitat affected by the project, as there was no attempt made in the PER to rate the value of the impacted habitat on the basis of vegetation quality. This is illustrated in a comparison of Figures 5.8-5 and 6.7-1 of the PER. Areas where vegetation condition was mapped as "Degraded" or "Completely Degraded" were included as Carnaby's foraging habitat. The assessment of Carnaby's foraging habitat is independent of the vegetation condition mapping.

The release of the EPBC Act *Environmental Offsets Policy* (October 2012) and the associated *Offsets Assessment Guide* has resulted in amendments to the offset package proposed in the PER. An Offset Strategy has been developed to address the offsetting of significant residual environmental impacts (Appendix I). The 468ha described in the PER was developed following consultation with DSEWPaC in 2010/2011, where DSEWPaC indicated that they would require a 6:1 ratio for any offset of impacts to Carnaby's Cockatoo. This 6:1 ratio is no longer applicable, and any proposed offset land parcel would need to be assessed in accordance with the new policy. Therefore the Offset Strategy does not specify a specific amount of land to be acquired – the size of the offset will be determined using the *Offset Assessment Guide*.

The quantity of CCW and CCW buffer affected by the proposed project has been recalculated in the Buffer Study (Appendix B). Offsets for CCW and buffers are included in Offset Proposals 1, 2, 3 and 4. It is not possible to fully calculate the amount of CCW to be included in Offset Proposal 1 at this stage, until an offset land parcel is purchased. The CCW offset is presented in the Offset Strategy (Appendix I).

Potential offset sites were evaluated closer to the project area; however, none were deemed suitable for mitigation of all the project impacts. This was due to a lack of suitably sized properties as well as landholders and decision making authorities not responding to SMC's enquiries prior to PER submission. Rehabilitation of several small properties located closer to the project area is not deemed practical at this stage, especially when a single suitable property is potentially available to fulfil a large part of direct offset requirements. While offsets will ideally be in the immediate local vicinity of the area being impacted, sometimes a better environmental outcome will be achieved at a regional rather than local scale (EPA 2008). Offset Proposals 2, 3 and 4 will all be in close proximity to the project area and within the City of Cockburn.

Submission 12.0-3: It is suggested that, in order to ensure long-term conservation outcomes, when the offset land is acquired by the State, funding should be made available for basic works to establish reserve infrastructure (e.g. fencing, signs, and access) and for initial management.

A full description of all direct and indirect offsets is provided in the Offset Strategy (Appendix I).

Submission 12.0-4: The environmental offset package proposed will not result in a net environmental benefit.

Submission 12.0-11: The offsets proposed in the PER are insulting and inadequate. Offsets do nothing for the species that will be destroyed. The offsets cannot compensate for the biodiversity loss as they will be too distant or take too long to reach maturity.

Submission 6.3-3: The rehabilitation of cleared land can never replace original remnant vegetation. Offsets for native vegetation is beneficial but does not fully compensate for the loss of 79 ha particularly at a local scale.

Measures have been incorporated into the project design to avoid, minimise and mitigate the extent of impacts on environmental factors and values. In addition, environmental management commitments will further limit the extent of impacts during construction and operation of the proposed project. The remaining residual impacts will be offset by the proposals described in the Offset Strategy (Appendix I).

In the Offset Strategy (as Offset Proposal 1), there is a commitment to acquire remnant native vegetation and habitat. This offset proposal will offset project impacts on cockatoo foraging, roosting and nesting habitat. Additionally, the offset proposal will serve to mitigate other residual project impacts, as specified below.

The Offset Strategy has been developed in consultation with stakeholders and is in accordance with State and Commonwealth offset policies. Main Roads has been in discussion with DEC regarding the funding of the purchase of a particular property for Offset Proposal 1, recommended to Main Roads by DEC.

Offsets are considered to be an acceptable form of mitigation to achieve a net environmental gain once all other forms of mitigation are exhausted and a residual environmental impact remains. Whilst offsets should ideally be located in close proximity to the environmental impact, there needs to be some flexibility in determining offset sites. Sometimes a better environmental outcome will be achieved by obtaining an offset at a regional rather than a local scale (EPA 2006).

The collective result of avoidance and management of project impacts on environmental values; as well as provision of the proposed direct and indirect offsets for the residual impacts will result in a net environmental gain.

Submission 12.0-5: Offset areas should be in close proximity to the environmental loss wherever practical or within the Cockburn area.

See Submission 12.0-2.

Submission 12.0-6: Offset proposal 2 should be reassessed to confirm that it achieves a 2:1 offset ratio.

Submission 12.0-23: Horse Paddock Swamp (Offset 2) is already intended to be revegetated by the community pending the outcome of proposal. The provision of $100 000 is not enough. This would only rehabilitate 0.7 ha. It does not equate to 2:1 ratio in real terms.

The combination of Offset Proposals 2, 3 and 4 will provide a greater than 2:1 offset ratio for CCW. The project will impact 5.4ha of CCW and 2.0ha of CCW buffer (total of 7.4ha). Offset Proposal 3 includes approximately 8.3ha of CCW that will be protected and incorporated into Beeliar Regional Park. Total direct offsets for CCWs that are presented as Offset Proposals 2, 3 and 5 consist of the following:

- Inclusion of 8.3ha of CCW into secure tenure as part of Beeliar Regional Park through the transfer of redundant road reserve (Offset Proposal 3);
- Rehabilitation of 8.4ha of CCW, CCW buffer and upland areas around Horse Paddock Swamp (Offset Proposal 2);
- Management and rehabilitation of 5ha of CCW and CCW buffer around North Lake (Offset Proposal 2);
- Funding ($300,000) for the management of *Typha orientalis* at Thomsons Lake, a CCW (Offset Proposal 4).

Overall, the Offset Strategy provides a package in excess of the 2:1 ratio proposed for impacts on CCW.

Submission 12.0-7: Offsets should not be developed to fund the management of Ramsar sites. For existing RAMSAR listed sites, weed control and other management actions should already be funded from State and Federal Governments.

Offset Proposal 4 (Appendix I) was recommended by DEC during consultation for the offset package presented in the PER. Implementation of the Thomsons Lake's Management Plan, specifically *Typha* control, is a discrete project, outside of the scope of DEC's usual work.

Submission 12.0-8: With regards to Offset 1, in addition to the 470ha purchase of intact vegetation, an additional area (at least equal to the area to be cleared) that is currently degraded should also be purchased and rehabilitated to support foraging habitat for Carnaby's and Forest Red-tailed Black cockatoos.

See Submission12.0-2.

Submission 12.0-9: The wetland areas contained within the City of Melville which form a part of the eastern wetland chain of the Beeliar Regional Park should also be rehabilitated.

The City of Melville's submission states: "In the event that no suitable land to purchase can be found in the region, the City requests that wetland areas contained in the City of Melville, and which form part of the Eastern Wetland Chain of the Beeliar Regional Park be rehabilitated..."

It is acknowledged that there are wetlands and bushland within the City of Melville that could benefit from rehabilitation works. This may be considered as a potential offset proposal, if the property acquisition presented in Offset Proposal 1 does not eventuate.

Submission 12.0-10: Regarding Offset 4 for GSM, it would be better practice to establish management techniques prior to clearing of vegetation so that existing populations can be better managed once construction commences. This is also relevant to Offset 5.

Submission 12.0-25: For Offset 4, it seems pointless to provide research into a species when it is proposed to destroy an entire population (GSM). Translocation of the GSM is also highly problematic.

Offset 4, as described in the above submissions and the PER, has been removed from the current Offset Strategy for two reasons. The first reason is the de-listing of GSM as a Schedule 1 species under the WC Act. The proposed management plans and translocation were intended to support DEC's management of the species, in order to assist DEC in determining the conservation status of the species. The second reason is that DSEWPaC considers that Offset 4 as proposed in the PER does not meet the requirements for a direct offset under the EPBC Act *Environmental Offsets Policy* (October 2012). DSEWPaC are currently assessing whether to remove the GSM as a threatened species under the EPBC Act. If an offset is required for GSM, it will be in the form of land acquisition of suitable habitat, under Offset Proposal 1 of the Offset Strategy (Appendix I).

Submission 12.0-11: The offsets proposed in the PER are insulting and inadequate. Offsets do nothing for the species that will be destroyed. The offsets cannot compensate for the biodiversity loss as they will be too distant or take too long to reach maturity.

See Submission12.0-4.

Submission 12.0-12: There is significant uncertainty whether the offsets will eventuate. Offset land must be purchased and reserved before the project is approved. The proponent should be required to monitor the offset against performance objectives and implement contingencies if they are not met.

The Offset Strategy (Appendix I) will be implemented following environmental approval of the project.

Submission 12.0-13: Offset land has not been assessed and there is no likelihood that it will result in its environmental objectives.

Any offset land will be assessed prior to its acceptance as an offset in accordance with the Offset Strategy (Appendix I) and State and Commonwealth offset policies.

Submission 12.0-14: The offsets are mitigation measures, not accepted offset matters and do not represent net environmental gain. Some of the proposed offsets are assessments matters which should already have been completed.

The Offset Strategy (Appendix I) proposes a collection of offsite direct offsets or contributing/indirect offsets as defined in EPA Position Statement No 9 (EPA 2006). The property acquisition and transfer into the conservation estate (Offset Proposal 1); the rehabilitation of Horse Paddock Swamp and North Lake (Offset Proposal 2) and the transfer of redundant road reserve into Beeliar Regional Park (Offset Proposal 3) constitute direct offsets. They involve offsite activities selected to counterbalance residual impacts to supplement proposed on-site environmental mitigation and management activities. Offset Proposals 4 and land management under Offset Proposal 1 are contributing or indirect offsets. Together with the direct offsets listed above, the total offset package for this project is expected to provide a regional net environmental benefit.

Submission 12.0-15: Without offsets, the proposal would be unacceptable, and government policies provide that offsets are not intended to make proposals with unacceptable impacts become acceptable.

Even without offsets, the project would not be "unacceptable". Using environmental offsets to obtain a net environmental benefit for a proposal is an established practice in Western Australia (EPA 2006). For the proposed project, the environmental offsets are part of Main Roads' commitment of a net environmental benefit. EPA (2006) recognises that within a growing population and economy, it is difficult to avoid environmental impacts; and for unavoidable environmental impacts, offsets are the "last line of defence" for the environment.

Submission 12.0-16: There is substantially more information required to be assessed and open for public comment in respect to Offset 1 before it can be considered and permitted. In order to offset the removal of 249 cockatoo nesting trees at a 10:1 ratio, the offset area will have to have actual trees identified, found suitable and quantified.

See Submission12.0-2.

Submission 12.0-17: No offset has been offered to local residents for the loss of recreational amenity in the area. The proposed revegetation of Hope Road Swamp is pointless as it is too close to the highway and will have limited habitat value. There needs to be substantially more offsets offered in the vicinity of the project area. The offsets need to be better balanced to provide benefits within the region and focus on remediation of existing conservation areas and improving environmental linkages through biodiversity corridors.

Residual project impacts on recreational amenity are not considered significant and therefore do not trigger the need for an offset under State or Commonwealth policy. Every effort has been made to avoid, minimise and reduce impacts on residential amenity.

The rehabilitation and revegetation of a portion of Hope Road and Horse Paddock Swamp is part of a strategy to mitigate for project impacts. The rehabilitation of Hope Road in combination with proposed bridges and fauna underpasses on the main alignment will maintain a north-south ecological linkage. The rehabilitation of Horse Paddock Swamp will enhance its presently degraded condition. The proposed enhancement of this wetland and associated buffer will improve flora and fauna habitat, as well as other wetland values, such as filtration of nutrients and improvement of water quality.

Whilst it is preferable that offsets are located in close proximity to the project, the EPA's Guidance Statement No 19 and Position Statement No 9 acknowledge that this cannot always be achieved (EPA 2006, EPA 2008). In this case, a better regional environmental outcome can be achieved by the acquisition and protection of a large tract of land located within the Swan Coastal Plain. A suitable land parcel, or a combination of land parcels, of this size has not been identified closer to the project area.

Submission 12.0-18: MRWA has a poor history with regards to revegetation on previous projects.

Main Roads' has demonstrated continuous improvement in rehabilitation success over recent projects. Landscaping and revegetation for some high profile projects, such as Tonkin Highway Extension (Mills Road East to Thomas Road) and Roe Highway Stage 7 did not turn out as intended in all areas. Main Roads continues to work toward achieving the desired revegetation outcomes for these projects. Main Roads has gained invaluable knowledge from these and other past projects regarding revegetation. Lessons learned have been successfully applied to recent major road projects, including: Mitchell Freeway Extension (Hodges Drive to Burns Beach Road) and the New Perth to Bunbury Highway (now known as Kwinana Freeway and Forrest Highway). Lessons learned and implemented on these projects consist of:

- Planned and effective site preparation;
- Detailed planning of quantities and species of plants;
- Auditing programs to ensure that the revegetation has been conducted in accordance with the revegetation plans;
- Planning and implementing appropriate revegetation schemes; and
- Adequate budgeting for revegetation and management of revegetation.

In addition to the management and monitoring objectives of the Rehabilitation Strategy, lessons learned from other revegetation efforts will be applied to revegetation works as part of this proposed project.

Submission 12.0-19: Restoration areas in the offsets were selected based on ease of revegetation in the dampland areas.

Restoration areas presented in the Offset Strategy (Appendix I) were chosen to provide the greatest environmental gain. The restoration of Horse Paddock Swamp will return a number of wetland attributes and functions to this CCW that are not currently present. Currently Horse Paddock Swamp is almost entirely devoid of native vegetation and therefore has limited biological values for flora or fauna.

The submission implies that the restoration of dampland areas will be easier than upland areas. Generally, one of the most significant challenges for restoration efforts is weed control. Whilst access to water will encourage plant growth, it also encourages weed growth. Horse Paddock Swamp is infested with a number of dominant weeds that grow well due to the availability of water in the dampland. If weeds are not successfully controlled, then the restoration effort will likely be a failure. Weed control in wetland areas has a number of concerns, as many herbicides can be dangerous to fauna, especially aquatic species. Additionally, herbicides can be transported by water and wind to non-target flora species. Weed control applied during revegetation efforts is problematic and must be managed well.

In summary, the restoration areas selected for Offset Proposal 2 have not been selected for "ease of revegetation", but rather to maximise the environmental gain from restoration efforts. In practice, restoration of a wetland area will be more difficult than in upland areas, as weed control is more difficult within a wetland.

Submission 12.0-20: A funding package to support the offsets should be achieved by increasing the remediation funding to a minimum of $5 million to be spent within the region.

Submission 12.0-27: In general, the funding to be provided for the offsets does not provide enough funds to allow conservation in real terms in the long term, especially with regards to revegetation and management of conservation areas.

The Offset Strategy (Appendix I) includes funding in excess of $5 million for the land acquisition to offset for impacts on Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo habitat. The original submission from the South West Group, states:

A funding package to support the Offsets Strategy should be achieved by increasing the remediation funding to a minimum of $5 million to be spent entirely within the region. This allocation would include funding to purchase land in the Southern Metropolitan Region for direct offsets suitable for black cockatoo habitat (Offset Package 1)

Offset Proposal 1 is the acquisition and conservation of land to offset project impacts on black cockatoos. In combination with the other offset proposals, it will exceed the $5 million target. Preferably it will be in the southern metropolitan area, provided a suitable land package can be found.

Submission 12.0-21: Offsets from Roe 7 should not be claimed for this proposal. The offsets from Roe 7 have not been finished.

Roe Highway Stage 7 offsets have not been claimed for this project. Reference to Roe 7 offsets has been made to highlight efforts taken to avoid them.

Submission 12.0-22: The Offset 1 area is potentially Lowlands in Mundijong. This area already has a level of protection and should not be a priority for use as an offset.

The location of the potential offset property in Offset Proposal 1 is confidential until the purchase is complete. However the acquisition and transfer of Lowlands to the conservation estate would significantly improve the level of protection for this property.

Submission 12.0-23: Horse Paddock Swamp (Offset 2) is already intended to be revegetated by the community pending the outcome of proposal. The provision of $100 000 is not enough. This would only rehabilitate 0.7 ha. It does not equate to 2:1 ratio in real terms.

See Submission 12.0-6.

Submission 12.0-24: Offset 3 cannot be considered an offset, as it offers no additional habitat at all.

The transfer of land containing native vegetation outside of the conservation estate and under threat into the conservation estate may be considered a direct offset because of the security of tenure, management and purpose (EPA 2006). Currently, the land proposed to be transferred to Beeliar Regional Park as part of Offset Proposal 3 is not in secure conservation tenure and is zoned as MRS road reserve. Therefore, it is potentially under threat from future development. Placing this section of redundant road reserve into conservation estate will ensure ongoing management and protection of:

- 14ha of Bush Forever Site 244
- 8.3ha of CCW
- 11.5ha of Black Cockatoo habitat
- 14.5ha of native remnant vegetation

Submission 12.0-25: For Offset 4, it seems pointless to provide research into a species when it is proposed to destroy an entire population (GSM). Translocation of the GSM is also highly problematic.

See Submission 12.0-10.

Submission 12.0-26: Typha removal should be gradual and controlled. Replacement with native species should be carried out.

A *Typha* Control Program will be developed in consultation with DEC to ensure desired environmental outcomes are achieved. See Offset Proposal 4 in the Offset Strategy (Appendix I).

Submission 12.0-27: In general, the funding to be provided for the offsets does not provide enough funds to allow conservation in real terms in the long term, especially with regards to revegetation and management of conservation areas.

See Submission 12.0-20.

3.13. Other

General (Heritage, Light spill and uncategorised concerns)

Submission 13.1-1: The two Norfolk pine trees on the corner of Progress Drive and Hope Road should be retained (heritage value).

The two Norfolk Island Pine trees on the corner of Progress Drive and Hope Road will be cleared during construction. The site is listed on the City of Cockburn's Municipal Inventory as a site of heritage value and prior to their clearing, an appropriate record will be taken.

Submission 13.1-2: North Lake and Bibra Lake have been interim listed on the National Estate of the Australian Heritage Commission because of the environmental and heritage significance.

The Register of the National Estate was closed in 2007 and is no longer a statutory list. All references to the Register of the National Estate were removed from the EPBC Act on 19 February 2012.

Submission 13.1-3: The proposal should limit the impacts of light spill on surrounding bushland areas.

Submission 13.1-4: Of the potential impacts of artificial night lights, only two are addressed in detail.

Submission 11.0-6: DEC is concerned about the increase in light levels compared to the current situation at night through the regional park. DEC is supportive of innovative lighting solutions to minimise light pollution. While it is acknowledged that lighting along the PSP is required for Crime Prevention Through Environmental Design reasons, DEC is seeking a commitment from the proponent to use best management practice to minimise light spill from the elevated section of the road.

The PER addresses impacts of highway lighting on fauna (Section 6.7.3.5 of the PER). A commitment is given in Section 6.7.4.8 of the PER to consider innovative lighting solutions through the wetland areas in lieu of normal practice and standards to reduce the impact of light spill on fauna. This commitment is followed through into the FVFMP (Appendix F). Whilst Main Roads' lighting standards can be challenged, road safety standards can't be compromised. Innovations to reduce the impact of light spill on fauna will not be made where they may compromise road safety.

Submission 13.1-5: With regards to critical assets, every category listed in the EPA's Position Statement 9 is represented in the project area. These deserve the full protection of the EPA. This project cannot be approved as outlined in EPA Guidance Statement 33 Section A2.3, as it has significant adverse impacts on critical assets.

The project will have significant impacts on a CCW and EPP wetlands, which are described as 'critical assets'. As stated in EPA Position Statement No 9, the EPA has a presumption that no significant impacts are acceptable against 'critical assets' (EPA 2006). However EPA Position Statement No 9 also states:

"In some instances, significant adverse impacts to 'critical assets' may be approved by State Government Ministers to provide an essential community service (such as electricity, water, gas and transport infrastructure), public benefit, or to allow a strategic social or economic development to occur."

Whilst there is a presumption by the EPA against approving proposals with significant impacts on 'critical assets', there are circumstances when a proposal that impacts 'critical assets' can be approved. However, the proponent must demonstrate that on site mitigation has been conducted to the maximum extent possible and a suitable offset package has been provided. For the proposed project, it has been demonstrated (in the PER and this report) that on site impacts have been mitigated to the maximum extent possible and a suitable offset package has been provided for significant residual impacts.

EPA Guidance Statement 33, Section A2.3, provides guidance to developers on the implementation of EPA Position Statement No 9 regarding 'critical assets' and the presumption against approving proposals with impacts on 'critical assets' (EPA, 2008).

Submission 13.1-6: The area between North Lake Road and Kwinana Freeway has a high vulnerability to contamination. This and other sites with pre-existing contamination will need further investigation.

A Preliminary Site Investigation (PSI) was undertaken of the project area as part of the PER investigations (see Appendix E of the PER). During the PSI, several areas were identified that require further investigation. The area between North Lake Road and the Kwinana Freeway is considered the area of highest risk for contamination.

As stated in Table 9.1-1 of the PER, a Detailed Site Investigation (DSI) will be undertaken in areas where excavation is proposed to occur during construction. The DSI will be conducted prior to commencement of excavations. Outcomes of this investigation will be used to develop appropriate management procedures for ASS and contaminated land in accordance with DEC guidelines (as per Commitments 2.1, 2.2, 3.1 and 3.2 of Table 9.1-1 of the PER).

Submission 13.1-7: One serious potential impact which was not addressed in the PER is the impact on public safety. The proposal means more traffic accidents, injuries and deaths.

Parts of Leach Highway and South Street currently have crash rates in excess of Metropolitan averages for both the "all vehicles" and "trucks only" categories, while existing sections of Roe Highway have crash rates well below Metropolitan average (Table 6). This is primarily due to the free flow of traffic related to highway/freeway travel compared to local roads where traffic is stop-start and mixed use. With the Roe Highway Extension expected to draw a significant amount of traffic away from local roads by 2021 (particularly heavy vehicles), the project is expected to reduce crash rates on local roads.

Safety aspects related to likely high levels of congestion in the surrounding road network if no action is taken are a key consideration of the proposed project. A Crash History Investigation for the Roe Highway Extension was undertaken by Main Roads and SMC in January 2011 to examine crash rates on the surrounding network for the five year period between 2005 and 2009. The crash rates were calculated as crashes over the five year period per 100 million vehicle kilometres travelled (VKT). It found that, on average, for the study period the road crash rates on Leach Highway and South Street were well above the 'metro network' average. Meanwhile, for Roe Highway crash rates were significantly below the 'metro network' average. Table 6 below outlines the findings of the investigation.

Table 6: Crash Rates on the road network around Roe Highway Extension (Road Crash History Investigation, South Metro Connect Project, January 2011, unpublished)

Road Section	Total Crash Rate (per 100 million VKT)	Trucks Crash Rate (per 100 million VKT)
Roe Hwy Stage 5	20.07	45.81
Roe Hwy Stage 6	26.77	64.50
Roe Hwy Stage 7	26.77	52.28
Leach Hwy (Karel Ave – Kwinana Fwy)*	69.55	130.81
Leach Hwy (Kwinana Fwy – Stock Rd)*	204.44	250.36
Leach Hwy (Stock Rd – Carrington St)*	83.11	140.15

Road Section	Total Crash Rate (per 100 million VKT)	Trucks Crash Rate (per 100 million VKT)
South St (Karel Ave – Kwinana Fwy)*	364.06	230.55
South St (Kwinana Fwy – Stock Rd)*	105.19	130.67
South St (Stock Rd – Carrington St)*	138.55	268.95
Metro Network Average	159.13	131.33

* Excluding Major Intersections.

Note: For Leach Hwy and South St it is more appropriate to use crash rates derived using number of crashes "Excluding the major intersections" rather than "Including the major intersections". The major intersections are mainly located at the end of the sections in which case vehicle travel is not involved yet the number of crashes is very high. Inclusion of crashes at these intersections would introduce the bias towards exceptionally high crash rate for the section under observation. The metro state road network average Crash Rate is estimated using the metropolitan State road network MVKT estimate.

The results also illustrate a much higher incidence of crashes involving trucks. This is as a result of the growing use of Leach Highway and South Street as freight routes during this period. The contrast in the crash rates for Roe Highway relative to Leach Highway and South Street (Table 6) is primarily due to the free flow of traffic related to highway/freeway travel compared to mixed use link and intersecting local roads where traffic is stop-start.

Therefore, the Roe Highway Extension to Stock Road will provide not only a more efficient, but also a safer movement of heavy vehicles, without which these vehicles would have to be accommodated elsewhere in the network - most likely along less efficient routes. If Roe Highway Extension is constructed, trucks heading west to Fremantle on the current Roe Highway will continue across Kwinana Freeway, travelling west on the new extension until its end point at Stock Road. From there vehicles will travel north along Stock Road and then turn left at Leach Highway and use Leach Highway / High Street to access Fremantle as is currently the case.

As a result, a significant number of trucks will be removed from the Kwinana Freeway (between Roe Highway and Leach Highway) and Leach Highway (between Kwinana Freeway and Stock Road). Therefore, there is a significant safety benefit in extending the Roe Highway for passenger vehicle users of Leach Highway and South Street.

Submission 13.1-8: A highway through the middle of this reserve would totally change the character of the area forever and the visual and landscape values would be lost.

The existing landscape character of the project area was objectively assessed as part of the visual impact assessment for the PER. See Section 5.14 and 6.12 of the PER and more detailed studies in appendices X1 and X2 of the PER.

Submission 13.1-9: More sustainability issues such as water reduction, extended producer responsibility and waste recycling should be discussed and adopted for construction.

Main Roads recognises the important role it has in the promotion and implementation of sustainability issues associated with the construction and operation of the road network. For more than five years, Main Roads has established and monitored sustainability performance indicators for the construction phases of major projects. These performance indicators have included the benchmarking of water and energy consumption and the identification of ways to reduce consumption during construction. Main Roads' practice of embedding sustainability performance indicators within the construction phase contracts will be continued as the Roe Highway Extension project progresses to construction.

In the planning phase it is not desirable to commit to individual sustainability initiatives as these may preclude the implementation of opportunities which have better environmental, social or economic advantages which become available at the time of construction. Similarly, the specification of waste recycling is dependent on the availability and ability of commercial providers to take the waste materials generated on the project.

Main Roads is a member of the Australian Green Infrastructure Council (AGIC) and has actively promoted the objectives of the scheme in recent construction and alliance contracts. AGIC is an industry association designed to promote the development and construction of infrastructure, including roads. AGIC's Infrastructure Sustainability rating scheme is designed to rate the broader sustainability performance of projects. The Infrastructure Sustainability scheme rewards the minimisation of energy, water, waste and pollution as well as supply chain sustainability performance and eco-labelling.

Submission 13.1-10: There are concerns about the impact of vibration on the surrounding community (both construction and vehicle post construction). As well as mosquito management.

Vibration impacts are addressed in the Section 6.10.4.1 of the PER.

The management of mosquitoes and midges is a local government responsibility. However the proposal is unlikely to result in an increase in standing water.

Submission 13.1-11: The loss of pastureland used by Murdoch University will result in the need to create pastureland elsewhere on the campus. There is also a concern about the impact on noise and vibration on the farm animals.

As stated in Murdoch University's submission, Main Roads and Murdoch University will negotiate these issues independently of the PER process.

Submission 13.1-12: Housing prices will be negatively affected for those in the area.

SMC is not in a position to speculate on the effect of the project on housing prices.

Submission 13.1-13: The highway will cut off public access to Coolbellup public transport, Kardinya Shopping Centre and North Lake English Centre.

Road network connectivity will be maintained during and after construction. Only two existing public transport routes will be directly impacted by the project, one that travels down Forrest Road and another that crosses the project alignment at Bibra Drive (see Section 5.15 of the PER). Only the route travelling along Forrest Road will be affected permanently.

Air Quality

Submission 13.2-1: Since existing traffic congestion to Fremantle Port will not be solved, local air amenity will be worsened in the local area.

Submission 13.2-2: The proposal should be rejected due to its impact on health and wellbeing from air pollution to residents.

Submission 13.3-3: Outdoor recreational activities in Beeliar Regional Park will be affected by the vehicle emissions and reduce options for healthy recreational activities.

Section 6.13.3 of the PER outlines operational phase impacts on ambient air quality based on dispersion modelling for the predicted concentrations of CO, NO_2, PM_{10}, $PM_{2.5}$ and five air toxics. With the exception of annual average $PM_{2.5}$, the pollutants are expected to fall below the National Environment Protection Measure (NEPM) ambient air criteria.

Local air quality is already in excess of the NEPM advisory standard for $PM_{2.5}$ averaged over one year. The NEPM advisory standard for $PM_{2.5}$ of 8 µg/m^3 averaged over one year was exceeded at South Lake and all other air monitoring sites in the State, except one (Quinns Rock 7.8 µg/m^3) in 2010. The predicted concentration of $PM_{2.5}$ at all receptors in the project area from this project, when considered in isolation from the background concentration, was less than 5% of the annual average NEPM in most cases with a peak of 17.5% of the NEPM at one receptor.

Submission 13.2-3: This proposal will not reduce greenhouse gas emissions due to greater transport efficiency. It is well documented that new roads generate more traffic and in turn become congested.

Submission 13.2-5: The PER does not adequately deal with the additional carbon footprint that will result from the proposal.

Submission 13.2-6: The greenhouse impact of this road has not been properly assessed. The road will bring greenhouse pollution to the area via the heavy traffic expected.

In terms of greenhouse gas (GHG) emissions, the project will result in the emission of GHG during both the construction and operational phases of the project (Sections 6.14.2 and 6.14.3 of the PER), but will result in a net reduction in GHG across the road network (Appendix W of the PER). The net reduction is due to the improved traffic flow across the network for passenger and freight transport brought about by the construction of the project. It is estimated the direct and indirect emissions from the project during construction will be about 8,000t CO_2-eq and during operation there will be a net annual reduction in GHG emissions of 62,415t CO_2-eq based on predicted traffic volumes.

The calculation of the expected emissions from this project was conducted in accordance with accepted national and international methodology. In Australia the accepted approach to quantify the impacts and emissions from GHG for vehicle travel is the approach outlined in the AustRoads (2008) 'Guide to Project Evaluation Part 4. Project Evaluation Data' and for non-vehicle emissions in the *National Greenhouse and Energy Reporting Act 2007* (NGER Act). Both these approaches are consistent with ISO14064-2:2006 which addresses quantification of greenhouse gas emissions at the project level. The ISO14064:2006 family of standards is an internationally recognised, voluntary standard for the assessment of GHG emissions and impacts. As the GHG assessment for this project was conducted in accordance with the standard approach, used for quantifying vehicle emissions and the NGER Act for non-vehicle emissions, consistent with ISO14064-2:2006, the greenhouse impact of the project has been adequately assessed.

A local increase in the emissions of GHG is unlikely to have an adverse impact on the local area. The impacts of GHG emissions are felt regionally and globally, through climate change, rather than locally. Impacts on local air quality from increased traffic volumes are addressed in Section 6.13 of the PER.

Overall, SMC has shown through the PER and Appendix W of the PER that the project will result in a net reduction of GHG emissions across the Perth road network. The reduction will be due to improved road design and better traffic flow management, allowing more free flowing traffic and less congestion. The GHG assessment was conducted in accordance with current accepted national and international practice.

Submission 13.2-4: NO_2 exposure levels may affect flora and fauna in the area.

Nitrogen dioxide will not adversely affect flora and fauna in the area. Nitrogen dioxide affects plant growth at much greater concentrations of nitrogen dioxide than found in Perth (DEC, 2012). Impacts on human health will occur before impacts on plant health from high levels of nitrogen dioxide. The NEPM levels for ambient air quality were set to protect human health and well being. The air quality impact assessment has assessed the potential for adverse impacts on surrounding areas of human occupation and levels of nitrogen dioxide are predicted to remain below the NEPM levels. As the NEPM will not be exceeded for nitrogen dioxide, which protects human health, then it is unlikely that nitrogen dioxide will impact upon flora or fauna.

Submission 13.2-5: The PER does not adequately deal with the additional carbon footprint that will result from the proposal.

See Submission 13.2-3.

Submission 13.2-6: The greenhouse impact of this road has not been properly assessed. The road will bring greenhouse pollution to the area via the heavy traffic expected.

See Submission 13.2-3.

Submission 13.2-7: There are concerns about dust generated from earthworks and cement works and the impacts of reduced air quality (construction and post construction traffic) on residents and students in the surrounding schools (especially the Montessori school).

Submission 13.2-8: Prior to construction, the proponent should provide a Dust Management Plan to the City of Cockburn's Health Services for approval. This must comply with the City's Moratorium on Bulk Earthworks.

Submission 13.3-4: There are concerns regarding the impacts to the surrounding schools with regards to impacts from noise, dust, vibration and odour.

The potential impact of dust generated from earthworks and associated reduced air quality are discussed in Section 6.13 of the PER. Discharges to air (in particular, dust) during project construction are primarily a management issue and can be minimised with good management practices. Accordingly, fugitive dust emissions during construction have not been modelled or quantified, but they are expected to be minimal, localised, temporary and manageable. Management measures are described Section 6.13.4 of the PER

Prior to construction, a Dust Management Plan (DMP) will be developed that details dust minimisation, management and monitoring measures to be implemented by the construction contractor and subcontractors. This will aim to minimise dust emissions to as low as reasonably practicable and to the satisfaction of the regulatory authorities. The plan will take into account nearby receptors, including Blue Gum Montessori School.

The DMP will be developed in accordance with current industry practice and DEC guidelines on dust management. A copy of the DMP will be provided to the City of Cockburn for comment.

Recreation, Education and Sense of Place

Submission 13.3-1: The Beeliar wetlands are a popular place for recreational, cultural and educational activities. The proposal will result in a loss of healthy, diverse and productive environmental open space areas and will impact on the quality and amenity of the Beeliar Regional Park for future generations. The educational and experiential opportunities currently present need to be preserved and enhanced.

Submission 13.3-2: The wetlands are an important environmental node for the community within the metro area, and offer extensive social, recreational and educational benefits and tourist attractions.

Submission 13.3-7: It is impossible to calculate the values which will be lost with the proposal.

The importance of the wetlands as an area of recreation and education is acknowledged in Section 5.15 of the PER. There will be no direct impacts on the western shore of Bibra Lake, where most recreational and cultural activities currently occur. A Principal Shared Path (PSP) is incorporated in the preferred concept design. The PSP will provide additional recreation for park users. Walk trails/paths and picnic areas around Bibra Lake, North Lake and Roe Swamp will be retained, providing the existing level of recreational, educational and experiential access and opportunities.

Submission 13.3-2: The wetlands are an important environmental node for the community within the metro area, and offer extensive social, recreational and educational benefits and tourist attractions.

See Submission13.3-1.

Submission 13.3-3: Outdoor recreational activities in Beeliar Regional Park will be affected by the vehicle emissions and reduce options for healthy recreational activities.

See Submission 13.2-1.

Submission 13.3-4: There are concerns regarding the impacts to the surrounding schools with regards to impacts from noise, dust, vibration and odour.

See Submission 13.2-7.

Submission 13.3-5: The Cockburn Wetlands Education Centre is situated along Hope Rd, and will now be situated on the edge of a highway. It provides education to schools, the community, businesses, scouts and church groups. The safety and integrity of this site will be undermined by the construction of the highway.

The Cockburn Wetlands Education Centre is a valued community resource. Following construction, the centre will be located approximately 350m from Roe Highway. Safety at the site is expected to be improved following construction as access to the highway will be restricted by fencing and the flow of traffic along Hope Road will be reduced considerably, due to Hope Road becoming a cul-de-sac.

Submission 13.3-6: The project breaches the principle of intergenerational equity.

See Submission 2.2-15.

Submission 13.3-7: It is impossible to calculate the values which will be lost with the proposal.

See Submission 13.3-1.

Cost implications

Submission 13.4-1: Any analysis of the economic viability or impact of this project on the state's budget or comparison with the current operating budget on MRWA has been omitted from the PER. MRWA cannot afford the project, and the federal government has already confirmed it will not be providing funding.

Submission 13.4-2: On a similar budget, the State Government could build a 43km light rail network linking Fremantle to Cockburn and Murdoch. The money would be far better spent on alternative infrastructure projects to reduce congestion.

Submission 13.4-3: Is the investment of $750 million in building more road infrastructure the best legacy for future generations, particularly in the context of the recognitions of the peak of global oil supplies?

Submission 13.4-4: The road extension is far more expensive when compared to the Perth to Bunbury Highway which was for 70 km worth of road, as opposed to 5.5 km.

The state's budget allocation, Main Roads' operating budget and the overall cost of the project is outside the scope of the PER and the environmental impact assessment process. The State Government has made the decision to proceed with the development of the proposed project and it is Main Roads' responsibility to act upon that decision. The State Government has the responsibility to obtain project funding.

Recent studies by the Department of Transport have indicated that the proposed project could be deferred beyond 2016, however the extension needs to be in place before 2021 to avoid congestion and poor levels of service across the network (AECOM 2011). The result of this congestion would be longer travel times and increased transport costs, in particular for freight.

Whilst the construction cost of the project appears prohibitive, it will ultimately save money within the state's economy through transport cost savings. The project is estimated to cost around $700 million (if constructed by 2018). The transport cost savings in the first 30 years of operation is estimated at $3 billion, excluding private time benefits

Editorial Comments

Submission 13.5-1: Resolution of many figures is so poor it makes them generally illegible. Please provide a version of the report with legible figures (including the text) to the Department of Water (specifically appendices D and G).

The PER document and all appendices (including D and G) are all publically available on the SMC website (http://southmetroconnect.web1.interactiveinvestor.com.au/SMC1101/index.html).

Submission 13.5-2: Resource enhancement category wetland UFI 6509 (and its buffer) is missing from many of the figures. Accurate mapping of all wetlands in the proposal area should be provided.

Noted. It is missing from several figures in the PER. However, it is included in Figure 5.2-2 of the PER, in association with the only section of the PER where it is mentioned. Wetland UFI 6509 is well outside the project area and there will be no impact upon this wetland.

4. Responses to DSEWPaC and OEPA Submissions

4.1. DSEWPaC

Submission 000-01-01: DSEWPaC acknowledges that the surveys for the Glossy-leaved Hammer-orchid may not have been undertaken at the optimum time for detecting the species, particularly considering the low rainfall experienced in south-west WA in the last few years. Additional surveys may be required prior to any construction being undertaken and if found, mitigation measures will be required to protect any extant plants located within the development footprint (see p.18 of summary).

See Submission 6.2-2.

Submission 000-01-02*:* DSEWPaC also echoes the concerns by WA DEC concerning the designation of vegetation condition ratings. The proponent should ensure that these ratings are appropriately assigned as per the relevant DEC guidelines to enable a thorough assessment of the habitat occurring within and in close proximity to the development footprint (see p.18-19 of summary).

See Submission 6.2-4.

Submission 000-01-03: DSEWPaC agrees with DEC that losing vegetation that contains degraded or cleared areas does not contribute to 'decreased fragmentation' elsewhere. The impact of edge effects may actually increase upon all vegetation overall if buffers, including fragmented areas, are cleared (see p. 19 of summary).

See Submission 6.2-9.

Submission 000-01-04: DSEWPaC notes the reference to migratory birds breeding within or in close proximity to the development footprint. Additional information from the proponent to determine if this is so is required, as DSEWPaC is not aware of any breeding by listed migratory or threatened bird species, with the exception of the Rainbow Bee-eater (see p.22 of summary).

No known breeding habitat for EPBC listed migratory birds (other than the Rainbow Bee-eater) occurs within the project area or the study area. Although it is stated that a number of wetland birds breed in and around the project area (Section 6.7.2.1.5 of the PER), none of these species are EPBC listed migratory species. Section 6.7.2.1.4 of the PER, appendices M and O of the PER all state that there are low numbers of EPBC listed migratory waterbirds likely to use the project area and no breeding has been recorded.

Submission 000-01-05: DSEWPaC agrees with the comments on Carnaby's Black Cockatoo, particularly the issue of maintaining roost sites within 6km of foraging areas. Additionally, the loss of suitable hollows for the Forest Red-tailed Black Cockatoo is a concern, in particular, as these birds are known to breed within the Perth metropolitan area. Continuing loss of black cockatoo habitat within the Perth metropolitan area is an issue for DSEWPaC (see p.26-7 of summary).

See Submission 7.3-1.

Submission 000-01-06: DSEWPaC considers it important to maintain movement corridors, i.e. linkages, for black cockatoos that follow these corridors from feeding site to feeding site. Losing vegetated corridors could lead to the birds increasingly avoiding areas they previously occurred in, a particular concern within the Perth metropolitan area with its ongoing habitat loss.

See Submission 8.0-1.

Submission 000-01-07: DSEWPaC supports the comments on environmental commitments, specifically the issue of financial allocations to support ongoing maintenance of revegetation/rehabilitation areas, as well as management measures (i.e. hygiene protocols) to prevent the spread of Phytophthora, as this could compromise habitat for listed species. All commitments to maintain all areas of revegetation, rehabilitation and retention are welcomed (see p. 30-1 of summary).

Additional management commitments are included the FVFMP, Rehabilitation Strategy and Offset Strategy.

Submission 000-01-08: DSEWPaC acknowledges the comments on offsets and agrees that the proposed offsets package requires further work. Any proposed areas of revegetation, rehabilitation and/or habitat acquisition (offset purchase) must represent comparable habitat values for the specific listed species in question, i.e. black cockatoos, Graceful sun moth and migratory birds. Projects should be able to demonstrate that they protect or rehabilitate more habitat than they clear and any proposed offset areas, including those to be revegetated or rehabilitated, must be able to be permanently protected from future clearing. DSEWPaC also supports maintenance funding to be made available to management authorities, e.g. DEC, and recommends costings of proposed funding programs to ensure the outcomes can be achieved, i.e. implemented, in full (see p. 31-4 of summary).

Submission 000-01-09: Please also note that DSEWPaC will look to ensure that any proposed offset property purchases, including associated maintenance costs, are completed and/or locked in prior to any construction, which includes clearing.

Submission 000-01-10: Purchase and transfer to conservation estate (is this the DEC conservation estate?) approximately 470ha (other parts of PER say 468ha) of intact native vegetation, which includes wetlands and has black cockatoo habitat. This represents a 4:1 ratio for foraging habitat, but does not include potential breeding habitat. This proposal will need to identify the specific location of the offset and have DEC confirm that they will manage the site for black cockatoos as part of their conservation estate (permanent protection). In addition, the site should include some potential breeding habitat comparable with that which is being cleared on the project site. If a funding amount for an offset property is proposed to be pooled with other proponents, so as to effect an appropriate purchase on the Swan Coastal Plain, confirmation will be required from both AECOM and DEC that such a purchase can be undertaken within a reasonable period of time, e.g. within 12 months of approval. Please also note that any information provided to the department concerning location and price of a potential offset property will not be disclosed publicly, under commercial-in-confidence.

Submission 000-01-11: Rehabilitate 8.4ha at Horse Paddock Swamp, adjacent to the south side of the project site, as well as undertake weed control and restoration of approximately 5ha of North Lake, to the north of the project site. The proposal includes money to DEC's Environmental Community Grants Scheme ($100,000) for volunteers to undertake ground works to conserve the wetlands at these locations. Confirmation will be required of the mix of habitat to be rehabilitated, i.e. for migratory species and black cockatoos, and of tenure that will permanently protect the rehabilitation work - this is likely to strengthen the package.

Submission 000-01-12: Transfer 9ha of the road reserve back to Beeliar Regional Park, an area adjacent to the project, on both sides. This proposal is aimed at protecting the wetland values of this area. Confirmation of tenure for permanent protection is required and would strengthen the proposal.

Submission 000-01-13: Undertake a package of measures ($250,000) to protect and improve GSM habitat in the region, specifically:

- Undertake additional surveys at potential habitat areas within the region (please confirm that these surveys are to determine presence/absence of GSM within these areas prior to construction and confirm the location of these surveys – this will allow the Minister to see what work specifically is being proposed);

- Actions to improve management of habitat within the region with known populations, such as Fred Samson Park and Wandi Nature Reserve; such as weed control, fencing, translocating habitat to be cleared to sites with poor quality or declining habitat, and translocating adults captured within the project footprint to other sites (recommend incorporating this work into a GSM Management Plan, in consultation with DEC; also, information concerning the tenure of these areas would be useful – it would be a shame to invest in translocation and habitat improvement in an area that may not be permanently protected for the GSM);

- Research investigating the success of translocation of Lomandra and introducing new Lomandra to improve habitat quality, and follow up monitoring to record success of such measures for up to three years, including a GSM Management Plan (as above, and please ensure the plan confirms those areas to which Lomandra will be translocated; again, recommend this be in consultation with DEC and any other GSM experts who may be able to assist).

The offset package presented in Section 10.0 of the PER has been updated into the Offset Strategy (Appendix I). The questions raised by DSEWPaC in the above submissions have been addressed in the Offset Strategy and in Section 3.12 of this document (Submissions 12.0-1 to 12.0-27). Main Roads has committed to ensuring that the proposed offset land package, revegetation and rehabilitation areas will represent comparable environmental values to those impacted by the project.

Note that the offset property will contain at least 468ha of Carnaby's Cockatoo foraging habitat to mitigate the loss of 78ha of Carnaby's Cockatoo habitat identified within the project area. This offset size has been calculated at a ratio of 6:1 (not 4:1) in accordance with advice received from DSEWPaC.

4.2. OEPA

Submission 000-02-01: The EPA's objective for flora, into which vegetation is also considered, is to "maintain the abundance, diversity, geographic distribution and productivity of flora at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge". The Roe Highway Stage 8 proposal will impact flora and vegetation through clearing:

- approximately 38 hectares of intact native vegetation, which includes 7 hectares within Bush Forever site 244, of which 4 hectares is intact native vegetation;

- 7 hectares of Groundwater Dependant Ecosystems;

- populations of 6 Priority Flora species including the taking of 5400 plants of the Priority 1 species *Dampiera triloba*. There appears to be some potential for *Drakaea elastica* (DRF) habitat in the *Kunzea* thickets, although none was found during the flora surveys; and

- the severing of a reasonably large tract of urban bushland that remains in a good or better condition and contributes to the buffering of a Bush Forever site and wetland areas.

Additionally there is a risk of dieback introduction into areas of native vegetation that has been assessed as *Phytophthora* free or uninterpretable. It is noted that 38 hectares of the proposal is to be rehabilitated with native species post construction. Roadside revegetation has been variable in success in other projects and is typically simplistic in structure, weedy and does not replace functional bushland.

Sections 5.8 and 6.6 of the PER address the impacts of the project on native vegetation. Outcome based commitments on flora and vegetation are provided in Section 9.2.5 and 9.2.6 of the PER. Further management measures are incorporated into the FVFMP (Appendix F) and the Rehabilitation Strategy (Appendix G). A dieback assessment was conducted as part of the PER studies and is included in Appendix L of the PER and construction management of dieback hygiene is addressed in the FVFMP.

Submission 000-02-02: It is acknowledged that no TECs or Declared Rare Flora were recorded during the field surveys and that of the priority species recorded within the disturbance footprint, no taxa is likely to have its conservation status adversely impacted by the proposal. Of the mapped vegetation types, no complex will be reduced below the 10% retention threshold for constrained areas. However, vegetation units at a local scale will be impacted by clearing within reasonably large remnants within an urban context being bisected by significant road infrastructure and associated works.

Eighteen communities mapped within the project area during the 2009 and 2010 spring surveys are considered locally significant as they support populations of Priority Flora, regionally significant species and significant flora of the Perth Metropolitan Region (PMR). The vegetation units that have significance are listed in Table 5.8-8 of Section 5.8.4.2 of the PER. Further analysis of vegetation representation on a local level was carried out for this project by assessing the proportionate extent of each recorded community within the surveyed area. Based on this assessment it was considered that ten vegetation communities; AfBKgS, BAhS, BaBmBi, BaNfW, BiSiH, EmBaS, ErMpAfS, ErMpGeS, EtKgS and MpKgS may be considered significant due to limited representation (by area) within the local context. Of these communities eight will be impacted by the project (Table 6.6-2 of PER). It is acknowledged that certain communities will be impacted on a local scale, however, further analysis of the species composition of the intact vegetation communities recorded within the project area against the Gibson *et al.,* (1994) dataset indicates that all of the vegetation communities that will be impacted at a local level have Floristic Community Types (FCTs) documented to be "Well Reserved" and at "Low Risk" of extinction and are therefore well represented elsewhere in the region.

Submission 000-02-03: Impacts on fauna can be divided into two categories, immediate and on-going. Immediate impacts on fauna through clearing of native vegetation will be moderate but temporary. On-going impacts on fauna through habitat fragmentation, disturbance, increased predation, reduced connectivity, mortality by vehicle traffic and other causes will be more significant, harder to quantify and long-term.

Submission 000-02-04: The proposed mitigation measures for fauna impacts will be of some benefit to the species concerned. However they will never compensate fully for the impacts caused by habitat loss and fragmentation.

Impacts on fauna are described in Sections 5.7 and 6.8 of the PER. Outcome based commitments for the management of flora and vegetation impacts are provided in Section 9.2.7 of the PER. Further management actions proposed during construction and operation of the road are described in the FVFMP (Appendix F).

Submission 000-02-05: The distribution of the unidentified millipede (Siphonotidae sp.) is not discussed. An analysis of habitats where specimens have been recorded would provide some insight into the importance of the project area. This should be done independent of determining its taxonomic status. The statement that "the extent of habitat loss cannot be calculated at this time, and the scale of impact by the proposed project has yet to be determined" identifies an unknown risk which needs to be addressed.

See Submission 7.2-2.

Submission 000-02-06: While it may be true (Executive Summary page x) that "project impacts of habitat loss and fragmentation on invertebrates are negligible to minor", this statement is based on studies that focused on only a few target groups. This should be clearly acknowledged and knowledge deficiency should not become surrogate evidence for assuming that impacts will be "negligible to minor".

The statement on page x of the Executive Summary should state: "project impacts of habitat loss and fragmentation on SRE invertebrate species surveyed are negligible to minor."

Submission 000-02-07: The key finding on page 262 that "Fauna habitats of the project area are well represented both locally and regionally" needs to be supported by evidence. It seems to conflict with the statement on page 254 that the Graceful sun moth "have particular habitat requirements that have yet to be understood". Fragmentation of populations are likely to have long-term problems as demonstrated by the statement that "sub-populations either side of Stock Road are unlikely to have interbreeding" (page 254).

Fauna habitat for those species surveyed is well represented locally and regionally. No species surveyed, including those of conservation significance, other than GSM and the unidentified sucking millipede (Siphonotidae sp.), were significantly restricted in their habitat availability within the project area or on a regional scale.

Further discussion on GSM is included in Submission 7.2-4 and 7.2-5. Submission 7.2-2 and 7.1-8 discuss the unidentified sucking millipede.

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5. OEPA Request for Additional Information

On 20 November 2012 the OEPA requested additional information from SMC in order to progress the assessment of the proposal (Appendix B). The OEPA provided a consolidated list of questions and issues that it required SMC to consider in finalising the Response to Submissions document. Those issues and questions are addressed specifically below. Amendments to other sections of the draft document as a result of the OEPA's request for additional information have been listed in Appendix C.

5.1. Groundwater Dependent Ecosystems – Construction Impacts

The Department of Water (DoW) has advised that based on the drawdown estimates presented in the Water Management Strategy (WMS), no abstraction bores should be located within 1.5km of North Lake or Bibra Lake. The 'recommended groundwater abstraction areas' within this distance are not appropriate.

The OEPA requests that you modify the WMS to incorporate the requirement that bores will not be located within 1.5km of the two lakes, as this will potentially be required as a condition on the WMS.

The DoW has also advised that the groundwater levels at groundwater dependent ecosystems, other than north Lake and Bibra Lake, will need to be determined. While groundwater levels were identified in the PER using the *MIKE SHE surface and groundwater modelling,* this model cannot be used to assess the local impacts on wetlands as a result of post-development activities. This includes the infilling of Murdoch Drain, the construction of retaining walls and any local abstraction. The DoW considers that to determine the potential impacts to groundwater dependent ecosystems outside of the 1.5km area around North Lake and Bibra Lake, the groundwater levels at groundwater dependent ecosystems should be provided.

The OEPA requests that you liaise directly with the DoW to confirm which groundwater dependent ecosystems need groundwater levels determined and provide this information to inform the assessment of this factor.

No abstraction bores will be located within a 1.5km buffer around North Lake and Bibra Lake. The WMS has been amended to reflect this (Appendix E).

SMC has liaised directly with DoW regarding groundwater dependent ecosystems (GDEs) (Appendix K). DoW commented that the current modelling information (MIKE SHE) is not suitable to estimate water levels across the site, and groundwater levels needed to be determined for any GDEs where abstraction may have an impact. It was proposed to DoW that monitoring was not appropriate until closer to commencement of construction, as these would be the baseline conditions which the impact would be assessed against. DoW agreed that baseline monitoring should be conducted closer to construction. The WMS has been modified to note that further monitoring is required during the groundwater abstraction licencing process. The proponent will consult the DoW's Regional Hydrogeologist (Peel Region) at that time to determine the extent of monitoring required.

5.2. Drainage

The DoW has suggested the following changes to the WMS:
1. All bioretention areas to be sized at 2% of the constructed, directly connected impervious area to ensure effective water quality treatment of the 1:1 ARI rainfall event

2. All drainage areas to receive stormwater in the 1:1 ARI rainfall event to be bioretention areas to protect the water quality of groundwater and connected wetlands

3. Future Water Management Plan (WMP) to investigate further opportunity for treatment of the 1:1 ARI rainfall close to source and discharge of larger events to wetlands

4. Proponent to consult with the DoW during preparation of the WMP

The OEPA considers that these changes are important for maintaining groundwater quality and quantity for wetlands and will potentially become conditions on the WMS. Please modify the WMS to incorporate these changes.

The WMS has been amended to incorporate these changes (Appendix E).

5.3. Wetlands

OEPA considers that it has sufficient information on the direct impacts on wetlands from the construction of the highway extension. However, there is insufficient information on the likely extent of indirect impacts to wetlands.

Section 6.6.2.4 of the PER contains a conceptual model to show indirect impacts on distal vegetation, and alterations in surface water and groundwater in the wetland zone. Indirect impacts to the wetlands are also discussed in Section 6.2.3.2.

Based on existing information, the OEPA considers that further detail and mapping (including spatial data) should be provided regarding predictions of indirect impacts on Bibra Lake and Roe Swamp. This further detail should include which threatening processes were used to determine the zone of indirect impact.

Appendix D of the PER identified a number of indirect impacts that have the potential to affect wetlands within the project area. Indirect impacts on wetlands potentially include:

- altered hydrology
- edge effects including weed incursion
- shading
- dust

Altered hydrology

Hydrology may be indirectly impacted in a number of ways including:

- raising or lowering of the water table by obstructing the flow of groundwater through compaction
- lowering groundwater levels within the wetland areas through groundwater abstraction

Section 6.6.2.4 of the PER "Altered Surface Hydrology and Groundwater"

The conceptual model of potential groundwater impacts depicted in Section 6.6.2.4 of the PER was developed to show the potential impact of groundwater decline or increase along the alignment of the project in the wetland areas. At the time of its development, the impact of compaction and road construction on groundwater was not fully understood and accordingly, the precautionary principle was applied. The areas depicted in this conceptual model would be potentially impacted by successional change of the species composition within the adjacent GDE.

Following further modelling of the impacts of compaction, and advice from the DoW, the impact on groundwater levels have been determined to be negligible (Appendix K, Appendix L). DoW provided advice to the OEPA in their correspondence of 5 October 2012 to Gerard O'Brien (Attachment 2 of Appendix B) and in an email to SMC dated 11 January 2013 (Appendix K) that: "compaction associated with road construction will reduce the porosity to a depth of 2-3m, but as the flow of groundwater east to west maintains the hydrological function of the lake/wetland system, the impact will be negligible". SMC notes that this statement does not necessarily apply for impacts associated with Bibra Drive, which is positioned at right angles to the general groundwater flow. However, given the small change in porosity and permeability discussed in the next paragraph, the impact of compaction associated with Bibra Drive is also considered to be minimal.

To support this advice, SMC has mapped the areas where compaction from embankment construction may cause a reduction of porosity (Figure 12). Any reduction in soil porosity will be minor. Modelling has shown that for a 9m embankment, changes in porosity are limited to the upper 3m of the subsurface (Table 7), with the maximum reduction in porosity in the order of 3% within the first meter and 1% at 3m depth. It should be noted that the embankment height will only be 5m through Roe Swamp – the 9m embankment occurs between Bibra Lake and Horse Paddock Swamp. The effects of any compaction on groundwater levels or flow will be insignificant for clean sands that have porosities in the range of 30-45% (before compaction). Where finer grained sediments occur, there is the potential for greater compaction. However considering the aquifer is highly permeable and at least 35-40m thick, it is considered that a 1% to 2% reduction in porosity and permeability within the top few metres will not significantly change aquifer flows or levels (Appendix L).

In terms of potential indirect impacts on wetlands from changes to hydrology, the only areas that may be impacted are those areas that have groundwater within 3m of the surface and are underneath the project footprint. Figure 12 shows where wetland areas intersect groundwater levels within 3m of the surface and proposed road embankments. This is the maximum area where compaction may be an issue. Figure 12 also shows where wetland areas intersect groundwater levels within 1m of the surface and proposed road embankments. These are the areas with the greatest potential to impact groundwater flows, as the reduction in porosity is greatest within 1m of the surface.

In light of this modelling and the advice of DoW, the conceptual effects model in Section 6.6.2.4 of the PER is no longer considered valid. The potential extent of impacts by compaction is much reduced from the conceptual effects model depicted in Figure 12, as compared to Figure 6.6-2 of the PER. Advice from DoW and evidence from modelling suggest that any potential impact on groundwater flows or levels from compaction will be negligible due to the high permeability of the aquifer, the thickness of the unconfined aquifer and the existing east to west groundwater flows that maintain the hydrological function of the wetland system.

Table 7 Reduction in porosity for a 9m embankment

Metres below ground level	Reduction in porosity
0 – 1	1.9 – 2.0%
1 – 2	1.3 – 1.9%
2 – 3	0.6 – 1.2%

Appendix D of the PER suggests that up to 90.65ha of GDE will be indirectly impacted by "undetermined hydrological changes". That report was written before much of the modelling and assessment was completed and without reference to DoW expertise. Since then a better understanding of the potential hydrological changes has been developed. As the water table will not be raised or lowered by obstructing the flow of groundwater and the impacts of compaction from embankment construction on the water table will be negligible (PER Section 6.3.2.4, Attachment 2 of Appendix B and Appendix K) and the proposal will not change the existing water regime, there will be no distal hydrological impacts due to road construction.

The WMS has been amended in accordance with the OEPA's request that no groundwater abstraction occurs within 1.5km of Bibra Lake or North Lake. Accordingly, groundwater abstraction will not result in any appreciable decline in groundwater levels in and around Roe Swamp and Bibra Lake. The maximum predicted drawdown at Bibra Lake from a bore operating at maximum capacity 1.5km from Bibra Lake is less than 5cm (see Submission 2.2-9). This potential drawdown is in the "low" category as defined by DoW (see Attachment 2 of Appendix B). GDE species will begin to be affected by changes to the water table of greater than 0.25m.

Edge Effects

The most likely indirect impact from edge effects is weed incursion into intact wetland vegetation. Weed incursion will not be significant in areas of wetland vegetation with a condition rating of "Good" or worse. These areas have been disturbed in the past and already have a high weed burden. It is unlikely that the construction of Roe Highway Extension will significantly increase the weed burden in these disturbed areas.

Where the wetland vegetation is in "Very Good" or "Excellent" condition, there is a risk that road construction will result in the spread of more weeds into these areas. Vegetation in these areas has a lower weed burden than areas with a lower vegetation condition rating and therefore is at a higher risk of weed invasion. Applying the 80m buffer for weed incursion recommended in Appendix D of the PER, 6.1ha of wetland vegetation has the potential to be indirectly impacted by the project from weed incursion (Figure 13).

It should be noted that these areas already contain Declared Plants, in particular Arum Lily (*Zantedeschia aethiopica*), and other significant environmental weeds such as Fig (*Ficus* spp), despite their vegetation condition rating. The most prevalent roadside weeds in Perth – grasses such as African Lovegrass (*Eragrostis curvula*), Veldt grass (*Ehrharta* spp) and Bearded Oats (*Avena* spp) – are unlikely to establish themselves in the wetland environment, as it is too wet and densely vegetated. An Arum Lily Control Plan, proposed as part of Offset Proposal 3, will control the spread of Arum Lily following road construction.

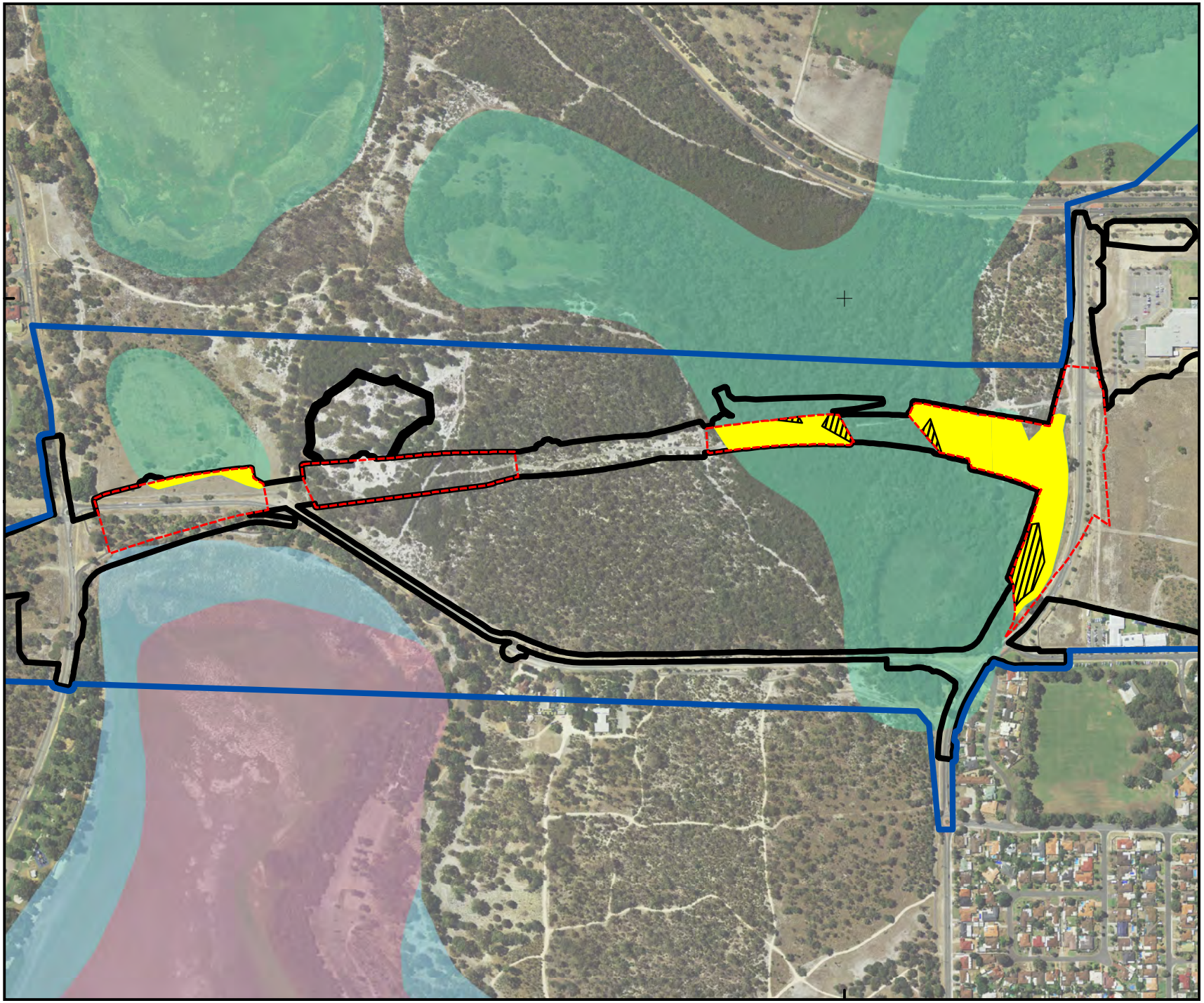
Shading

Shading will impact 0.5ha of wetland vegetation. Most of this will be due to the bridge over Roe Swamp (0.4ha). Shade will impact the southern side of the road formation where there is a retaining wall. Only where wetland vegetation is within 2m of the southern side of a retaining wall will there be any significant impact due to shading. Within 2m, there is a loss of more than 75% of available sunlight (see PER Table 6.6-8). From 2-7m from the retaining wall, only 18.8% of sunlight will be lost due to shading. The impact of shading (other than the Roe Swamp bridge) will be less than 0.1ha and is contained within the proposed construction envelope.

Dust

Dust generated during construction may have an impact on wetland vegetation. Dust on leaf surfaces can block stomata and prevent the uptake of sunlight. Prolonged dusty conditions can cause the death of plants and a change in vegetation structure. However this is unlikely to occur in this instance, as dust generation will be minimised during construction through the implementation of a dust management plan. The duration of the dust generation is also limited to 2-3years during construction. Due to the limited amount of dust likely to be generated following mitigation measures, and the relatively short period of dust generation, it is unlikely that there will be any impact on vegetation from dust.

Appendix D of the PER suggested that groundwater abstraction for dust suppression may have an adverse impact on GDE. However as no groundwater for dust suppression will be abstracted from within 1.5km of North Lake or Bibra Lake in accordance with the Water Management Strategy, there will be no impact to wetland vegetation from groundwater drawdown for dust suppression.



Wetland areas beneath embankments with groundwater less than 3m or less than 1m below the ground surface

Figure 12

0 50 100 150 200 250

Metres

1:7,500 (A4)

Coordinate System: GDA 1994 MGA Zone 50

LEGEND

- Project Area
- Construction Envelope
- Embankment
- Wetland areas beneath embankments with groundwater less than 1m below the ground surface
- Wetland areas beneath embankments with groundwater less than 3m below the ground surface

Geomorphic Wetlands

- Conservation
- Multiple Use
- Resource Enhancement

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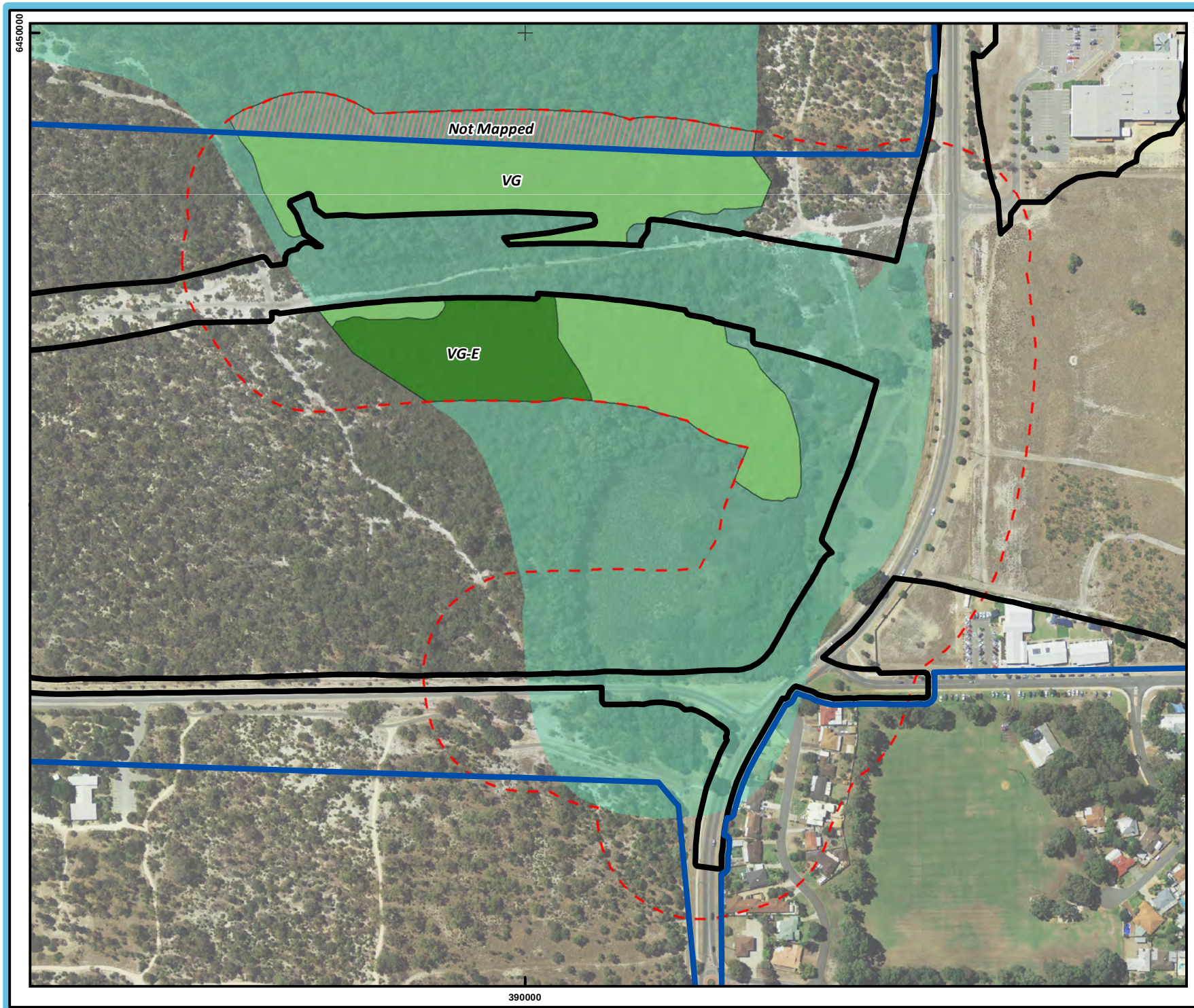

Extent of indirect impact on wetland areas from weed incursion

Figure 13

0 25 50 75 100

Metres

1:4,000 (A4)

Coordinate System: GDA 1994 MGA Zone 50

LEGEND

- Project Area
- Construction Envelope
- 80m buffer of Construction Envelope
- Areas of **Very Good Vegetation** within 80m of the Const. Envelope
- Areas of **Very Good to Excellent Vegetation** within 80m of the Const. Envelope
- Areas of Vegetation **Not Mapped** within 80m of the Const. Envelope
- Conservation Category Wetland

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5.4. Flora and Vegetation

DEC identified that the *Caesia* species of taxonomic uncertainty will require further investigations to determine whether it exists in areas that will not be impacted, and its status. DEC also considers that further investigations should be carried out on the known priority flora taxa in the area to determine their local distribution, which may include monitoring remnant vegetation sites over the long term.

The OEPA needs to have an understanding of the impacts of the highway extension to these species, and considers that the proponent should deal directly with DEC for a resolution regarding these details.

SMC has consulted with DEC regarding impacts on *Caesia micrantha* sens lat and Priority flora found within the project area (Appendix M). The known location of all priority flora and species of taxonomic uncertainty has been mapped and is shown in Figure 6. A summary of DEC's comments and recommendations is provided below in Table 8. Further surveys for Priority flora are proposed in the FVFMP (Appendix F).

Field surveys in November 2012 confirmed the presence of *Caesia micrantha* sens lat both within the project area and also in bushland outside of the project area (see Submission 6.2-3 and Figure 6). Advice from Dr Russell Barrett suggests that the form of *Caesia micrantha* found in banksia woodlands on the Swan Coastal Plain will be relatively common. This advice was supported by the ease of the recent field surveys in finding the species both in the project area and in nearby bushland.

Potential impacts to the five Priority flora species occurring in the project area are unlikely to be significant for four of the species *(Cyathochaeta teretifolia, Jacksonia gracillima, Eryngium pinnatifidum* subsp*. Palustre* and *Dodonaea hackettiana*). However, the potential influence on the long term survival of the population of *Dampiera triloba* dissected by the project footprint is not fully understood. The loss of approximately 75% of the population is considered to be the worst case scenario. Proposed design changes in the area associated with Murdoch Drain will result in a reduced impact to the species.

After further consultation with Dr Ken Atkins (DEC) regarding *Dampiera triloba*, he provided this response in an email dated 30 May 2013:

"…Re the Dampiera triloba, I have reviewed the information available for this species through NatureMap.

According to NatureMap, this species occurs at seven scattered locations across the south west, near Lake Muir, ? near Mt Barker (affinity), east to Esperance, near Cunderdin and three locations in the Perth area. It thus appears to be widespread, and while not known from many locations, does have more occurrences and a greater distribution than previously thought. Its conservation status will be reviewed with a recommendation that it change to Priority 3.

These records are primarily based on Herbarium records that generally do not have quantitative estimates of population size at collection locations. While a definitive statement cannot be made without detailed surveys, it is likely that the species is present in reasonable numbers where it does occur, based on the descriptions of frequency on some Herbarium labels. This is confirmed by the detailed survey work in the Roe Highway alignment.

The loss of a proportion of the population in the Roe Highway alignment will not affect the conservation status of the species given the number of occurrences overall, and the number of records in the Perth area. However, it is recommended that management strategies be put in place to maximize the retention of the species where it occurs, where this is possible.

It is also noted that Dampiera species are known to act as primary colonizers after disturbance (such as gravel pits in the wheatbelt) and hence this species may regenerate in areas where disturbance occurs or where appropriate topsoil management is implemented. Strategies to facilitate regeneration in situ and with local topsoil are also recommended to maximize the opportunity for this species to persist in the area.

I hope this provides greater clarification on the conservation of this species."

Table 8 DEC advice regarding priority flora species and flora species of taxonomic uncertainty

Species	Outcome	SMC Recommendation	DEC Endorsement of recommendation	DEC Comments
Taxonomic				
Caesia micrantha sens. lat.	Although taxonomy is not resolved recent advice and results of additional survey effort suggests project impacts are unlikely to be significant	No further action	Endorsed	Taxonomic investigation, and local conservation status, noted. The taxon appears to be relatively common locally, and while subject to further taxonomic investigation, is not deemed to be of conservation concern at this site.
Tetraria sp. Chandala (G.J. Keighery 17055)	Taxonomy resolved and project impacts to the proposed new species unlikely to be significant	No further action	Not endorsed – further investigation warranted	Taxonomic status noted. Confirmation of local conservation status and impact required. *Tetraria* sp. Chandala is currently listed as Priority 2. *Tetraria* sp. Blackwood is not currently listed as a Priority Flora, but is only known from few non-reserved locations, and hence would meet the criteria. When these two taxa are combined it is likely that the new taxon would meet the criteria, and be listed as Priority 3. Further survey investigation recommended for this taxon in the local and regional area.

Species	Outcome	SMC Recommendation	DEC Endorsement of recommendation	DEC Comments
Priority Species				
Dampiera triloba (P1)	Extent of potential impacts uncertain	Further action may be required in the form management actions and monitoring	Endorsed, plus further regional/ species status investigations warranted	This species occurs at seven scattered locations across the south west, near Lake Muir, ? near Mt Barker (affinity), east to Esperance, near Cunderdin and three locations in the Perth area. It thus appears to be widespread, and while not known from many locations, does have more occurrences and a greater distribution than previously thought. Its conservation status will be reviewed with a recommendation that it change to Priority 3.
Cyathochaeta teretifolia (P3)	Impacts unlikely to be significant	No further action	Endorsed	Impact minimal and viable population will remain.
Jacksonia gracillima (P3)	Impacts unlikely to be significant	No further action	Endorsed	Impact minimal and viable population will remain.
Eryngium pinnatifidum subsp. *Palustre* (P3)	Impacts unlikely to be significant	No further action	Qualified endorsement	The data provided does not appear to match the information provided in the associated map. A high proportion of data points appear to overlay the development footprint resulting in either direct or indirect impacts to a high proportion of the local plants. Overall for the species, however, the impact does not appear significant, but the basis for the local impact data should be provided.
Dodonaea hackettiana (P3)	Impacts unlikely to be significant	No further action	Endorsed	Low local and regional impact.

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5.6. Fauna

DEC has identified that further work is required to determine the identity and distribution of the unidentified sucking millipede, Siphonotidae sp.

The OEPA considers that the Western Australian Museum should be consulted regarding the millipede and whether the species is likely to be restricted in habitat.

SMC contacted the Dr Amber Beavis (Research Scientist, Department of Terrestrial Zoology, WA Museum) on 7 January 2013 regarding the unidentified sucking millipede (Siphonotidae) found within the Roe Highway Extension project area. Dr Beavis provided a response on 9 January 2013 (Appendix N). Her response concluded:

"At present, there is very little known about the taxonomy of the Siphonotidae. It is highly probable that these millipedes are SREs, however, due to the current state of understanding of the group, their official status would be ***Potential SREs****."* (Dr Beavis, *pers comm.*).

Dr Beavis also included a table used by the Western Australian Museum to explain the SRE parameters used by the museum. The table also explains the implications of the sucking millipede being labelled a potential SRE (Table 9).

Table 9Short Range Endemic (SRE) categories (Western Australian Museum)

SRE category	Criteria	Typical representatives
Confirmed	Confirmed or almost certainly SRE; Taxonomy is well known (but not necessarily published) Group is well represented in collections (in particular from the region in question) High levels of endemism exists in documented species of the genus/family Inference is often possible from immature specimens based on locality	*Antichiropus* millipedes (Paradoxosomatidae) *Aops* scorpions (Urodacidae)
Likely	Taxonomically poorly resolved group Unusual morphology related to poor dispersal for that group e.g. troglomorphism Often singletons in surveys Few, if any, regional records	Opiliones in the genus *Dampetrus* Some pseudoscorpions Schizomids Some slaters (Philosciidae) *Karaops* spiders (Selenopidae)
Potential	Taxonomically poorly resolved group (or specimen cannot be identified to species level) Often common in certain microhabitats in SRE surveys (i.e. litter dwellers) Other species within the genus might be widespread	Many mygalomorph spiders Some centipedes (Cryptopidae; Geophilomorpha) Some pseudoscorpions
Unlikely	Cannot be identified to species level and taxonomy uncertain, but experience suggests the distribution is unlikely to be restricted	*Indolpium* pseudoscorpions
Unknown	So little is known that it does not allow for any suggestion of geographic distribution	Acari
Widespread	Taxonomy well understood Common and known from areas larger than 10,000 km^2	the spider *Gaius villosus* (Idiopidae) The millipede *Austrostrophus stictopygus*

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5.7. Aboriginal Heritage

Aboriginal Heritage is likely to be considered as a key environmental factor. Please provide an update regarding any further work and consultation on Aboriginal Heritage to inform the assessment of the factor.

SMC has conducted two rounds of consultation with Aboriginal groups and submitted a Section 18 application under the Aboriginal Heritage Act 1972. Consultation was conducted in August 2010 and again in May 2012. Four reports were produced as part of the Aboriginal Heritage consultation and assessment process. These reports are included in Appendix O and are not to be published. A Section 18 application was submitted in November 2012 to the Department of Indigenous Affairs and is under assessment. A summary of the consultation is provided below.

Summary of 2010 consultation

The following Noongar people and community groups were identified as having heritage interests in the project area:

- Ballaruks Aboriginal Corporation (Bodney family)
- Bibbulmun group (Colbung family and Mr Philip Prosser)
- Independent Aboriginal Environment group (Hume family)
- Whadjuk bloodline descendants (Jacobs family group)
- Swan Valley Noongar Community (previously Combined Metropolitan Area Working group, comprising members of the Bropho, Corunna, Garlett, Warrell and Wilkes families)
- Warrell family women
- Cockburn Aboriginal Advisory Committee (Rev. Sealin Garlett chairman)
- Walley family (Bilya and Naramya organisations)
- Mr Russell Hansen (adjacent site informant, Bennell family)

Several attempts were made by telephone to contact the South West Aboriginal Land and Sea Council (SWALSC) regarding the proposed Roe Highway Extension. Contact was eventually made by Dr Peter Gifford (ethnographer) on 28 July 2010. The council's coordinator Mr Daniel Garlett said the council had decided not to participate in the consultation.

Dr Gifford undertook the process of contacting members of the Noongar groups through phone calls and letters and rostering site inspections.

The late Mr Ken Colbung's Bibbulmun group was represented by Mr Phillip Prosser in company with representatives of the Hume group.

Attempts to contact the Walley family (Bilya Noongar Organisation and Naramya Aboriginal Corporation) were unsuccessful.

Ethnographic surveys were undertaken on 14, 19, 21, 23, 24, 26, 27 and 31 August 2010, and involved 54 members of Noongar families along with representatives of Australian Cultural Heritage Management Pty Ltd (ACHM) SMC.

Dr Peter Gifford met the groups on the shores of Bibra Lake. A bus was available for those groups wishing to drive through all or part of the survey area, and features of the proposed development were explained along the way.

Noongar survey participants were shown the location of previously registered DIA sites on field maps and invited to comment on the proposed impact of the development. They were also asked if there were any other ethnographic sites within the survey area, and whether they wished to add or amend any details in relation to the previously registered DIA sites.

The archaeological survey was undertaken during the same period as the ethnographic consultation, and involved a methodology of walking of 10 metre wide transects over the survey areas. Any previously recorded archaeological site was inspected and the condition of the site recorded. Any archaeological site identified in the project area during the survey was spatially recorded, and photographs of the site were taken along with information about the intra-site components of the site.

Some groups opposed the project under any circumstance. These included: Warrell Women's Group, Jacobs family group, Bibbulmun group, the Independent Aboriginal Environmental group, the Cockburn Aboriginal Advisory Committee and Mr Russell Hansen. Of these groups, the Jacobs family group, the Independent Aboriginal Environmental group and the Bibbulmun group said they would discuss the management of Aboriginal heritage further. The other groups listed here declined to be involved further in the survey.

A number of issues were raised by those groups that were willing to be involved in the discussion of management of Aboriginal heritage. These issues included:

- Being kept informed as plans for the project progressed;
- Having Aboriginal monitors during ground disturbing works;
- Acknowledgement and recognition of Noongar associations with the area;
- Involve Noongar artists in the development of any related public art;
- No separate cycle path;
- Banning of dogs from the project area except on leashes;
- Salvage of native vegetation and revegetation with species native to the area;
- Aboriginal people employed for salvage and revegetation work; and
- Establish an Indigenous Interpretative Centre near the project

The area has significant personal, social, historic, and mythological values for the people consulted. While some of the people welcomed opportunities the project may provide for the clean-up and revegetation of the wetland and the opportunities for Aboriginal involvement in the process, reservations were expressed about impacts on the wetlands and related effects on the local area.

Of the 54 people consulted:

- 26 expressed approval of Main Roads' plans to seek approval under section 18 of the Aboriginal Heritage Act (1972) for registered sites to be disturbed; and
- The remaining 28 others were not in favour.

The 28 Noongar people opposed to the highway extension as proposed by Main Roads included seven who wanted no further part in consultations regarding the highway extension, should the application under section 18 of the AHA succeed.

The other 21 people, while opposed to the granting of permission under section 18 to disturb the sites involved, decided nonetheless that in the event of the application succeeding, that Main Roads be required to keep all relevant Indigenous people informed regularly as the highway extension plans progressed.

A detailed record of the 2010 consultation with the Noongar Aboriginal groups is included in the report at Appendix O.

Summary of 2012 consultation

ACHM made contact with all the indigenous groups involved in the first consultation in March and May 2012. SWALSC metropolitan area working party nominees were invited to take part in this survey, however only two participated, Mr Stan Headland and Ms Marion Collard, and they took part in consultation meetings as members of other Indigenous groups (other than SWALSC). Each group was sent an updated information pack prior to the consultation date, informing them of the current status of the assessment and the Roe Highway Extension project (Appendix O)

The second round of consultation occurred between 21 and 25 May 2012. MRWA project manager and SMC project director Mr Terry Pearce and SMC principal engineer, highways and structures, Mr Etienne Fourie were present on each occasion, and Mr Pearce addressed each group. Noongar representatives were informed on each occasion that their comments and recommendations were welcomed, and these were duly noted.

The results from the consultation meetings were sent to the respective Noongar groups. Each group received a copy of the summary and recommendations from their consultation meeting and were invited to respond with any comments or amendments within a specified period. Several telephone responses were received, and relevant amendments made to the contents of the report.

A total of 45 people participated in seven consultation sessions between 21 and 25 May, 2012, most of whom had taken part in the initial survey in 2010. They included several who had stated in 2010 that they wanted no further part in discussions regarding the highway extension, but who had changed their minds in the interim.

Most remained opposed to the highway extension plans, although members of one group indicated that their position on this had changed. This was as a result of proposed efforts by MRWA to minimise and repair potential and existing environmental and heritage to the 5km road extension area, and in particular to the vicinity of North and Bibra Lakes. Other groups, while still opposing the plans in general, expressed praise for the efforts of MRWA in this respect.

SWALSC was invited to attend the second round of consultation, but declined to do so. However two members of SWALSC arrived unannounced and uninvited to one of the second round consultation meetings on 23 May 2012. They were asked to leave by the Traditional Owners present, and did so.

The consultation recommended that:

- Senior members of all Indigenous groups involved in consultations regarding the proposed extension of Roe Highway, continue to be kept informed by MRWA of further developments in respect of the project as they occur;
- MRWA is to consider the insertion of a series of culverts between the 120m and 70m bridges to the north of Bibra Lake to allow for better fauna access there;
- MRWA discuss with the DIA the problems associated with appropriate and relevant Indigenous monitoring of earthworks on the site of the proposed extension of Roe Highway, should the project go ahead;
- MRWA consider bringing in Aboriginal elders to the proposed Roe Highway extension area to collect, and if necessary, transfer medicinal plants with a view to using these plants in traditional ways;
- The question of Whadjuk intellectual property relating to the proposed Roe Highway extension area be considered by MRWA before any decision is made on whether the work should proceed, and
- In the event of the Roe Highway extension gaining approval, where possible, fill material will be obtained from within the project footprint.

A full report of the 2012 consultation is included in Appendix O.

A Section 18 application was submitted in late 2012. The application is on the agenda for the February 2013 ACMC meeting.

5.8. General

The OEPA requests the following spatial data:

- Project area
- Construction Envelope, including details regarding:
  - All vegetation to be cleared
  - Areas to be rehabilitated
  - Drainage basin locations and area
  - Zone of indirect impacts
- Area to be covered by bridges

This spatial data has been provided to OEPA as part of this submission.

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SouthmetroConnect

Summary of Responses to Submissions

Appendix A

Summary of Responses to Submissions

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GOVERNMENT OF WESTERN AUSTRALIA

Office of the Environmental Protection Authority

Roe Highway Extension

Public Environmental Review
ASSESSMENT NO. 1787

SUMMARY OF PUBLIC SUBMISSIONS

This document forms a summary of public submissions regarding the Public Environmental Review (PER) for the extension of Roe Highway from Kwinana Freeway to Stock Road, proposed by Main Roads Western Australia. This summary was prepared by the Office of the Environmental Protection Authority (OEPA); the proponent should refer to the submissions for context and further detail.

The PER was prepared by Southmetro Connect, and the 12 week public review period for the proposal commenced on Monday 20 June and ended on 12 September 2011.

The principle issues raised in submissions and advice included environmental, social and planning issues. Other issues focussed on questions of fact and technical aspects of the proposal. Although not all of the issues raised in the submissions are environmental, the proponent is asked to address all issues, comments and questions as they are relevant to the proposal.

Approximately 449 submissions were received, of these 29 were from organisations and government agencies and 420 were from members of the public. A further 189 were part of a petition which were counted as one submission.

Table of Contents

1. Proposal

1.1 General Comments

Submitter	Submission and/or issue
• City of Cockburn • City of Melville • Office of Senator Scott Ludlam • Office of Hon Lynn MacLaren MLC • Save Beeliar Wetlands • North Lakes Residents Association • Conservation Council of WA • WWF Australia • Wildflower Society of WA • Urban Bushland Council WA • The Fremantle Society • Murdoch University • Concerned Citizens for Good Governance • Members of the public	1. The proposal will result in additional fragmentation of the wetland environment, loss of endangered and vulnerable species, habitat loss, fauna deaths and weed intrusion into adjoining vegetation resulting in long term degradation. 2. The proposal is a pointless act of environmental vandalism against a sanctuary from which people and fauna obtain peace, enjoyment and refuge. The proposal was drafted in an era when land clearing and extinction of endangered fauna was the norm. The proposal has not changed to reflect today's knowledge and attitudes. The proposal will destroy forever the beauty, tranquility and amenity of the Beeliar Wetlands. Beeliar Wetlands should be retained as a green corridor. 3. The full cost of the Roe Highway extension needs to consider the loss, in monetary terms, of the environment and eco-systems that will be lost as a result of the proposal. There is no evidence in the PER that any sort of valuation of environmental factors has been attempted. 4. The project cannot be approved because the protection of WA's biodiversity is one of the EPA's priority areas of concern. Protection of biodiversity is given the highest environmental priority rating in the WA Sate of the Environment report. The Swan Coastal Plain is one of the most critical areas under pressure in WA and land clearing is one of the greatest threats to biodiversity. MRWA has a role to play in the protection of biodiversity and must recognize that road reserves are some of the only 'green ribbons' of native vegetation remaining. 5. The EPA has previously considered the Roe 8 proposal and concluded that the highway would have a damaging effect on the wetlands and suggested to Government that it find a different transport situation. 6. The proponent's own literature points to the ecological impossibility of mitigating the known and unknown impacts of the highway. 7. The road reservation should be removed from the planning scheme and the area added to Beeliar Regional Park and Bushforever. 8. The project breaches the principle of the conservation of biological diversity and ecological integrity. It also breaches every clearing principle of the EP Act.

Proponent response.

1.2 Proposal Justification

Submitter	Submission and/or issue
• City of Cockburn • City of Fremantle • Office of Senator Scott Ludlam • Office of Hon Lynn MacLaren MLC • Save Beeliar Wetlands • North Lakes Residents Association • Wetlands Conservation Society • Wildflower Society of WA • Friends of Shenton Bushland • The Fremantle Society • Murdoch University • Concerned Citizens for Good Governance • Members of the public	1. The priority and timing of the Roe Highway Extension is not supported by the justification provided in the PER. 2. The no build option should be assessed against the precautionary principle as required by the Environmental Protection Act. 3. The existence of current road and power infrastructure cannot be used as an argument to support the expansion of the infrastructure corridor. 4. The government should continue to develop and support programs to address vehicle dependence in the Perth metro area. This road should not be built and other transport alternatives including more freight on rail and public transport should be considered. Numerous studies have recommended existing rail and rail freight infrastructure be upgraded instead. A tunnel from the harbour for freight rail should also be considered. Measures should be introduced to improve efficiency and impact of traffic, which include improving public transport, promoting cycling and walking, manage travel demand and moderating car use. The proponent has not demonstrated that alternatives to this road have been properly investigated. A study should be undertaken on the comparative cost and efficiency of upgrading the existing double tracked railway for freight, and an improved and enlarged public transport network. 5. Building more roads will not relieve traffic congestion. This road will shift the traffic congestion problems from one place to another. The proposal was designed to connect Fremantle Port with Kewdale, Welshpool and canning Vale industrial areas. The proposal only replicates a small section of Leach Highway and vehicles will have to return to local roads. Existing rail freight infrastructure already connects Fremantle Port with these areas. Existing traffic problems will remain and be exacerbated by the proposal. Leach Hwy will still be the primary access route used to access the port. 6. Population growth causing traffic congestion should not be used to justify the proposal. Considering the population, Perth has an extensive road network. All of the planned urban growth areas are already connected to existing rail and future rail and rapid bus transit. 7. Current rail freight targets aim for 30% of port related traffic to be moved by rail. Also 80% of freight is made by small to medium trucks unrelated to the port. 8. The proposal will not improve access to the Murdoch Activity Centre. South Street provides efficient access, and is also the closest access point to the Fiona Stanley Hospital. 9. The PER shows that the proposal makes no significant difference in daily traffic flows and no reduction in daily heavy vehicles by 2021. Forecasts to changes to congestion do not take into consideration changes to freight infrastructure and public transport. It also does not consider fuel price rise. Traffic flows will only be slightly lower, with congestion worsening in half the areas surveyed. Intersection improvements and congestion management solutions along leach Hwy and South Street would ease congestion. 10. The Liberal government election commitment is the main rationale

	behind this project. The rationale for the proposal is built on engineering models and social values that are now out dated. The previous Labour Government developed a six point plan to address and improve traffic flows without the need for extending the highway. 11. The project is unsustainable. The proponents have not honoured their promise to find a sustainable solution to the transport needs. 12. It is inappropriate to spend $750 million on an extension when the congestion is not predicted to improve but rather get worse.

Proponent response.

1.3 Preferred Option Development

Submitter	Submission and/or issue
• Department of Environment and Conservation • City of Cockburn • City of Melville • Office of Senator Scott Ludlam • Office of Hon Lynn MacLaren MLC • Save Beeliar Wetlands • Wetlands Conservation Society • Urban Bushland Council WA	1. There is inadequate justification for the decision to locate a bridge over only a portion of Roe Swamp, instead of over the entire wetland portion. Section 2.2.5 discusses the decision on the preferred option of a bridge over the entire wetlands section between Bibra Drive and Progress Drive. It does not discuss why the bridge does not extend over the entire Roe Swamp wetland rather than just over a portion of it. Provide justification for the decision to locate a bridge over only a portion of Roe Swamp instead of over the entire wetland portion. 2. The proponent notes that 'the primary purpose of constructing an extension to Roe Highway is to improve vehicle mobility within the region'. The document provides a comparison between the Roe Highway Extension and the 'no build scenario'. It is noted that this is not a comparison between alternate options for resolving congestion and improving vehicle (i.e. passenger and freight) mobility. It is therefore difficult to qualitatively evaluate the relative merits of this proposal even if the assumed benefits are valid. There may be other options - such as mode shifting of heavy vehicle freight to rail, light rail expansion or utilisation of bus rapid transit systems - that would deliver benefits in terms of mobility, reduced emissions and improved air quality. 3. DEC believes that a reasonably thorough landscape and visual impact assessment (Appendices X1 and X2) has been undertaken, however the design options for the bridges over the wetlands are unclear. DEC recognises that bridge design will be finalised later in the process and is willing to provide further advice/assistance when options are being considered. DEC is supportive of the Public Art Scoping Document included as an Appendix in Section 9.0 of the LUDF. Given that the regional park has high landscape value, the need to look further at the design of the bridge sections through the regional park should be emphasised in the Landscape and Urban Design Framework (LUDF) (Appendix X2). 4. The ‘no build option’ is the preferred option from an environmental and social perspective. Improving rail infrastructure for freight, public transport and existing roads will achieve a better outcome. The community was never consulted with regards to the ‘no build’ option. 5. The lack of transparency makes it very difficult to understand how

	different options were considered and how the sustainability details were developed and considered. The process has not followed any identifiable outline that could be considered 'best practice'. 6. The road design is determined by minimising the economic and political costs, rather than ecological and hydrological considerations. 7. The seven options for the alignment were not all considered in the PER. It was recommended that Option 7 would have the least environmental impact.

Proponent response.

1.4 Community Consultation

Submitter	Submission and/or issue
• Department of Environment and Conservation • Office of Senator Scott Ludlam • Office of Hon Lynn MacLaren MLC • Cockburn Wetlands Education Centre • Urban Bushland Council WA • Members of the public	1. It is important that appropriate funding is allocated to the implementation of public interpretation which is linked to the values of Beeliar Regional Park and the Aboriginal heritage of the area. The proponent must continue to involve the community in each aspect of the design process, as specified in the Landscape and Urban Design Framework (LUDF) (Appendix X2). 2. The consultation never included a 'no extension' option. Because of this a number of key stakeholders were excluded and a low number of participants contributed to the design options. 3. The consultation provided no presentation on Aboriginal heritage values, matter of national environmental significance, threatened ecological communities or threatened species. MRWA was dismissive of community concerns. The economic value of the wetlands was not provided. 4. Important major stakeholders have not been consulted as part of the stakeholder engagement, and important information has not been included about their activities and knowledge of the project area. 5. Workshop facilitators modified input by participants and left out key points. The choice of options was not made on environmental grounds, and was insulting o community participants. 6. The Cockburn Wetlands Centre was not pursued vigorously for consultation despite its pivotal role in the functioning of the wetlands.

Proponent response.

2. Wetlands

2.1 Wetland buffer requirements

Submitter	Submission and/or issue
• Department of Environment and Conservation	1. Conservation category and resource enhancement wetlands (REW) require buffers. The role of the buffer is to limit impacts on the wetland. The statement on page 360 *'The area* of *mapped Lakes EPP wetland impacted by the proposed project (approximately 1.0ha)* has *limited*

• Save Beeliar Wetlands • Urban Bushland Council WA • Members of the public	*ecological value* as a *functional wetland'* is not supported, because this area is within the buffer to the REW, and thus the development is impacting on the buffer protection for the REW. It is recommended that all wetlands of conservation significance, including conservation category wetlands and resource enhancement wetlands, be afforded an appropriate buffer distance determined on a site specific basis and taking into account modelling information relating to predicted impacts on the wetlands from the development. 2. Buffers are a key component of wetland conservation regardless of the condition of the vegetation and habitats surrounding the wetlands. A buffer study to assess the threats, risks and potential impacts on the wetlands is provided in Appendix D and ascertained that a hydrological buffer of 200m was necessary to protect the wetlands from the impacts of the development. However, the PER allows for a maximum of 50m buffer around some of the wetlands and also allows for construction inside this buffer and onto wetland boundaries. Justify the reduction of the recommended buffer distances provided in Appendix 0 and illustrate how these reductions will not deleteriously impact on the wetlands. 3. The wetlands and their buffers extend over the whole construction footprint. These buffers are not explained and the 50m is used without reasoning. This buffer should be increased because of the potential heavy vehicle use close to the wetlands.

Proponent response.

2.2 Impacts to wetlands

Submitter	Submission and/or issue
• Department of Environment and Conservation • Department of Water • City of Cockburn • Office of Senator Scott Ludlam • Office of Hon Lynn MacLaren MLC • Save Beeliar Wetlands • North Lakes	1. The statement that there 'is *no anticipated* loss *or reduction in current wetland function'* is not considered to be correct for the direct impact on Horse Paddock Swamp due to infrastructure, as this statement does not consider hydrological and ecological linkage values. It is recommended that the hydrological and ecological linkage values should be factored in when assessing potential loss and reduction in wetland function. 2. These natural wetland systems are already under stress. Increasing the fragmentation and further reducing the connectivity of these systems threatens their viability, especially of the smaller portions of wetland and vegetation. Section 6.2.3.1.2 notes that Roe Swamp has previously been fragmented by Farrington Road, the powerline access track and Hope Road. This is in conflict with the wetland's hydrology description in Section 5.2.2.2.3 which states that Roe Swamp has remained relatively unaltered in terms of its hydrological regime. The proposed project will reduce the connectivity between some of the surface areas and the relatively intact vegetation within the Roe Swamp conservation category wetland. It is not sufficient to assume that a previously robust system can sustain any and all impacts,

Residents Association • Wetlands Conservation Society • WWF Australia • Wildflower Society of WA • Urban Bushland Council WA • WA Naturalists' Club • Beeliar Regional Park Community Advisory Committee • The Fremantle Society • Perth Waldorf School • Friends of Forrestdale • Members of the public	particularly when the extent of disturbance this wetland has already sustained is also unclear. Limits of acceptable change should be set and adhered to for these natural wetland systems. 3. Impacts on the hydrology of Bibra Lake, Horse Paddock Swamp and Roe Swamp due to the proposed construction being located on wetland boundaries and buffers are not considered. The impacts on wetland water regime due to construction in and on wetlands and their buffers should be considered and presented. Development on conservation category wetlands and their buffers is considered highly likely to result in significant ecological detriment to these wetlands. 4. Baseline water quality and/or sediment data are required for Roe Swamp to ensure it is not detrimentally impacted by the proposal. If there was no water in the wetland in 2010, a sediment sample should still have been collected. Baseline data should be collected for Roe Swamp, especially for the portions proposed to contain a bridge. A sediment sample should be collected prior to construction if the rainfall in 2011 has not been sufficient to provide a surface expression in this portion of the wetlands system. 5. Figure 53 illustrates the areas of high risk if hydrological patterns and/or hydrochemical conditions are impacted by the proposed Roe Highway Extension, and shows much of the construction footprint is located within the high risk area. It concludes that *'the combination* of *these maps clearly demonstrates that the placement* of *any road through this area is contrary to the intent* of a *number* of *Commonwealth and Western Australian policies for protection of wetlands, determination of buffers, and protection of regionally significant vegetation.'* Table 12 also lists a variety of impacts on the wetlands that are likely to be localised but intense and to affect groundwater flow and flow paths, flushing and wetland water levels. Examples include: • the conduits under the bridge over Roe Swamp assisting surface water flow but not facilitating groundwater recharge which is the dominant flow for this wetland; • adjustments to Bibra Lake groundwater movement and through flow due to raising height of road with infill; and • impacts on flushing mechanisms; impacts of edging and retaining walls on general water flow through the system; dewatering; drain discharge. The potential impacts and changes to natural predevelopment wetland water regimes should be quantified, including identification of areas likely to have altered water regimes such that the wetland classification may change, including from sumpland to dampland and loss of wetland area to dry land. Describe how these impacts will be managed and mitigated. Explain how environmental water requirements for the wetlands of conservation significance and the groundwater dependent ecosystems will be met in the future, should groundwater levels decline or flow path direction change. These risks to the wetlands, as well as others included in Appendix D should be used to inform the buffer distances to be applied around conservation category and resource enhancement wetlands and EPP lakes.

	7. The low permeability lakebed sediments extend further westwards than depicted in Figure 5.6-1. These are probably a westward extension of wetland silts, muds, diatomaceous sediments (as is the case for many wetlands on SCP), not associated with the Tamala limestone. 8. Some important references that report thickness of Bibra Lake lacustrine sediments are missing (Pickett 1997). 9. No use was made of very recent DoW groundwater and lake water chemistry data, available in the WIN database, particularly in and around North Lake which shows pH in the lake has been as low as 4.4 and -4 at the watertable. 10. The DoW is bound by Ministerial conditions to protect the ecological values of Bibra and North lakes *(Ministerial Statement No. 688).* The Department is bound to criteria water levels, based on ecological water requirements, which are the water regimes necessary to maintain a low level of risk to the ecological values of the lakes. The Roe Highway extension must not affect the Department's ability to meet Ministerial criteria water levels for Bibra and North lakes and all effort must be made to limit the impact on the ecological values of these lakes. Specify how the development may potentially impact the Department's ability to meet Ministerial criteria levels. Specify how the development may potentially impact on the habitat for wading birds and the fringing vegetation at the northern end of Bibra Lake and how potential impacts will be managed or mitigated. Evaluate options for drainage to be used to assist the Department to meet Ministerial criteria water levels at Bibra and North lakes. Ensure any draw down is within the 'low' impact category as per Table 1 (See DoW Submission*).* 11. With regards to Wetland Ecological Investigations, it appears that not all major ions were analysed (or at least not reported) and no ion balances were presented so no assessment can be made on the reliability of the results. Provide full ion balances, and/or QA/QC methods used and their results. 12. The proposal will result in additional fragmentation of the wetland environment, loss of endangered and vulnerable species, habitat loss, fauna deaths and weed intrusion into adjoining vegetation resulting in long term degradation. 13. Limits of acceptable change (LAC) to wetland function should be established in order to measure impacts over time. 14. The Bibra Lake-North Lake wetland system is unique in its conservation values and should not be disturbed or changed. 15. The wetlands need to be seen from a global perspective. Remnant urban wetlands have direct benefits to the surrounding area, treating wastes and pollution from storm water run-off and improving air quality. These wetlands include a diversity of water bodies and vegetation communities. The wetland upland Banksia woodland is currently listed as an Endangered community under the EPBC Act. The North Lake reserve also contains four priority listed plant species. 16. Is the uncertainty of the environmental impacts on the wetlands justifiable in terms of the impacts on the wetlands and the legacy for future generations? 17. The highway will sever the North Lake-Bibra Lake wetlands, cutting wildlife migration routes and disrupting the hydrology of this habitat

	area. 18. 80% of wetlands on the Swan Coastal Plain have already been cleared, degraded or filled since European settlement. 19. Roe Swamp is an integral part of the linked hydrological, geomorphic and ecological systems within the Bassendean Dunes that drains towards North and Bibra Lakes. The proposal will destroy these wetlands. Roe Swamp is the only sumpland in the area which is intact hydrologically and vegetationally. 20. The Beeliar Wetlands are a source of the source of 6 wetland ecosystems in a biodiversity hot-spot with significance of global endemic importance.

Proponent response.

2.3 Management of impacts to wetlands

Submitter	Submission and/or issue
• Department of Environment and Conservation. • Department of Water • Murdoch University	1. The road design includes apertures to aid shallow sub-surface and sheet flow movement when natural flows occur. However, apertures do not mimic natural sheet flow across the landscape; by definition they work to funnel water through in pipeflow. Neither is there discussion on this flow, specifically in relation to frequency of flow, flow rates and volumes, nor is there discussion of potential impacts due to heightened flow rates and volumes such as erosion, stirring of sediments and increases of contaminants flow. The post development flow behaviour of water through these apertures should be included in the modelling of the proposed development, and the potential impacts on the wetland water regimes and water quality should be investigated. Triggers for action and mitigation measures should also be provided to ensure the protection of wetland water quality and quantity. 2. Bioretention basins, infiltration basins and directing stormwater away from wetlands are not management and mitigation measures for alteration in groundwater distribution in response to altered water availability. An additional impact of vegetation removal is the change in hydrological processes and potential impacts on wetland water regime and quality. Modelling of local groundwater systems should include the predicted changes in groundwater levels due to altered water availability and the predicted changes in local groundwater flows due to the construction of bioretention and infiltration basins. These impacts should in tum be used to predict potential/coupled impacts on the wetland water regimes and wetland function. Justification should be provided to show that the location of the bioretention basins is suitable and appropriate to limit the impacts on nearby wetlands due to alterations in the groundwater flows and quality. 3. Specify how modifications to Murdoch Drain are likely to affect water levels at North Lake and propose suitable mitigation measures for any potential impacts. 4. Specify how nutrient inputs from Murdoch drain will affect nutrient levels in Frog Swamp and North Lake and how likely impacts will be

	managed or mitigated. 5. Specify how stormwater discharge into Bibra and North lakes from the development will be managed to limit the impact of runoff contributing to poor water quality. 6. There are potential impacts to 'vegetation in very good condition or that has been determined to support flora of conservation significance or of other importance' during construction of the bridge over Roe Swamp, even through top-down method. Specify how these impacts will be managed or mitigated. 7. The management of stormwater and impacts on the Murdoch University wetlands is unclear. There is no information about the effects on Melaleuca Swamp or veterinary paddocks from construction and operation of the road. 8. The project is not consistent with environmental policies like the Swan Coastal Plain Lakes EPP.

Proponent response.

3. Surface and Groundwater

3.1 Impacts to surface/groundwater

Submitter	Submission and/or issue
• Department of Environment and Conservation • Department of Water • Office of Senator Scott Ludlam • Office of Hon Lynn MacLaren MLC • Conservation Council of WA • Wetlands Conservation Society • WWF Australia • Cockburn Wetlands Education Centre	1. The proponent states on page 384 that 'during construction it may be necessary to undertake temporary groundwater dewatering to facilitate some construction activities. This can lead to a short-term lowering of local groundwater levels and potentially impact water levels in the groundwater dependent ecosystems.', however, information on dewatering and the potential impacts of this activity on groundwater dependent vegetation and wetlands has not been provided in the document. The location, volume, timeframe and timing of dewatering should be provided. Likely potential impacts and stress on wetlands and groundwater dependent ecosystems should also be presented. 2. Modelling should be presented that investigates the local impacts on wetlands as a result of filling and relocating Murdoch Drain. 3. Modelling of subsurface compaction shows the impact is likely to be in the top 1 to 2m. The proponent states on page 385 that 'Most of the change in porosity is expected to occur in the top one to two metres of the soil immediately beneath the embankment. Therefore, the proposed infrastructure is expected to have a minimal, if any, discernible impact on groundwater levels beneath and adjacent to the road formation. Generally, groundwater levels or the water table is at least several metres below for the majority of the alignment. However in this case the groundwater expresses at the surface. Additionally the top 1 to 2m is intrinsically linked to wetland hydrology for surface runoff, infiltration and local groundwater flow. The compaction and loss of porosity should be discussed in terms of its effect on water flow and direction in relation to the wetlands.

• Wildflower Society of WA • Urban Bushland Council WA • Beeliar Regional Park Community Advisory Committee • Murdoch University • Members of the public	4. Much of the knowledge on the relevant hydrological systems is based on data collected over 2010, or one year's worth of site specific hydrological data. Given 2010 was close to the driest year on record, this information provides little insight as to how the wetlands system functions in wet conditions. Hydrological data should continue to be collected and used to inform accuracy of model predictions. 5. The use of hydrogeological terms are somewhat confused, making some discussions difficult to follow. Hydrogeological evidence should be provided which shows that groundwater flow is impeded by limestone lenses. 6. Impacts to Groundwater Dependent Ecosystems should be further investigated. The absence of data to discount impacts on GDEs does not comply with the precautionary principle. In fact, the GDE sub community area to be cleared in three times the impact reported in the PER, at 16%. 7. The proposal should be rejected due to the severe hydrological impacts listed in the PER. Building a highway between lakes will impede groundwater flow and disrupt the hydrology of Roe Swamp and North Lake. 8. Groundwater should not be used for construction and dust suppression.

Proponent response.

3.2 Management of surface/groundwater movement

Submitter	Submission and/or issue
• Department of Environment and Conservation • City of Cockburn • South West Group	1. It should be confirmed whether the two areas where the road vertical profile will not be maintained at greater than 2m above the groundwater table are near or on the wetlands. If so, describe the potential impacts on the wetlands in relation to waterlogging, soil filtration and changes to local groundwater movement. 2. The need to protect the existing wetland system from accidental spills and road pollutants by controlling the discharge point was considered a higher priority than retaining the small rainfall events at source. However the effect of this decision on the water regimes of the wetlands is not discussed in the PER. Discuss the impacts on the wetlands' water regimes of directing rainfall events away from Bibra Lake and Horse Paddock Swamp. 3. The mounding of groundwater under the retention basins does not mimic the natural water flows in this area. Localised mounding along the shore of a wetland has the potential to change wetland water regime and hydrologic processes permanently. Table 6.3-1 states that there will be 'minor localised alteration to ephemeral surface water flows' but no discussion is presented on the potential impacts on wetlands as a result of this. Wetlands here depend on local ephemeral surface water flows as well as groundwater flows. Confirm that al/ stormwater infiltration and bioretention basins are located outside of the wetland buffers as per the *Decision Process for Storm water*

	Management in WA (2009). Discuss how the local groundwater mounding from the infiltration basins on the periphery of the wetlands will affect the wetland water regime. Discuss whether there will be changes in local groundwater flows due to preferential flows or increased flow rates. Explain how these will be managed to ensure no change to the wetland water regimes and water quality. 4. The MIKE-SHE model shows reasonably good calibration against the water levels in the wetlands and the groundwater bores except for the most recent years - 2009 and 2010 - where it is concluded that the model is not capturing system functions in the driest years. This means that the model is not simulating current conditions well and cannot be used to accurately predict how the system will respond to the proposal which will be constructed in current/recent conditions. Modelling showed that in the wet Simulation, there are surface water connections between Bibra Lake, North Lake and Frog Swamp and that these also occur during the extreme events. The model fails to inform on the issues and potential changes to the wetlands as a result of construction of the development, nor does the modelling illustrate how the retention basins will affect local groundwater flow. The results from the MIKE-SHE modelling should be used to inform how the system will be altered by the construction of the development, including redirecting of rainfall away from the wetlands, reduction in surface water connection between wetlands under extreme events and the impact on local groundwater from the installation of bioretention and infiltration basins. 5. With regards to Appendix H (Drainage Report): • Further discussion with the Department of Water regarding an appropriate drainage design for the highway extension will need to be undertaken. • Design should utilise 'at source' infiltration wherever possible. Ideally up to the first 15mm of rainfall should be infiltrated as close to source as possible. • The Department aims to achieve at least 2% biofiltration as an appropriate water quality treatment measure. The conceptual design should demonstrate that this area of biofiltration can be achieved for each drainage sub-catchment throughout the project area. • Consider opportunities to accommodate detention storage volumes generated by infrequent large rainfall events, i.e. the design road protection 20 year ARI event, into the surrounding environment without the need for extensive landform modifications and deep excavations. • Overflows to wetlands should be considered where the environmental water requirements will allow, provided initial treatment has occurred within the biofiltration areas. Opportunities to provide additional water to wetlands should be further explored. Linkages between the water requirements and the opportunities presented through the proposed drainage systems should be discussed and detailed. • Further commitments to produce an appropriate Water Management Plan, which will specifically address both the construction phase and the operational phase of the highway

	extension, its potential impacts and management proposals for both ground and surface water must be included within this document. Discussion of groundwater requirements for construction needs such as dust suppression and dewatering, bore locations and other construction infrastructure requirements must also be detailed within this management plan. 6. Measures need to be in place to address hydrocarbon and contaminant loads in bio retention basins. These basins should be linear and located within current cleared Hope Road alignment rather than vegetated areas. 7. Consideration should be given to relocating or redesigning the drainage management strategies. It is not acceptable that native vegetation is to be cleared for basins, especially if there are suitable cleared areas in close proximity. Confirmation is sought whether all drainage will be piped and discharged into controlled treatment areas.

Proponent response.

3.3 Groundwater Use and Modelling

Submitter	Submission and/or issue
• Department of Water	1. The discussion of existing groundwater use does not include current licensed abstraction; only WIN sites which will not reflect current usages. Current licensed abstraction should be obtained from wrl@waterwa.gov.au in order to quantify abstraction in the local area by identifying the major groundwater users. The proposal is located primarily in the Cockburn Groundwater Area, Kogalup sub-area and reference and discussion of the Cockburn Groundwater Area Water Management Plan (DoW, 2007) should be included. 2. The PER discusses potential changes to local groundwater levels due to drawdown associated with dewatering but fails to identify the potential impacts from the abstraction of groundwater for dust suppression and other construction purposes. The use of groundwater for construction purposes including dust suppression and other construction needs should be discussed; including approximate volumes required and source options. Modelling should be used to determine drawdown associated with abstraction for dust suppression and construction. 3. The extent of any perching of groundwater in the area has not been established. Use modelling to determine potential levels of drawdown associated with any dewatering activities and outline intended management of any potential impacts. 4. With regards to Appendix: (refer also to DoW submission) • Include the abstraction in the data analysis. Abstraction data is available from the Department of Water. • Either include abstraction in the conceptualisation, or justify the exclusion of this flux (i.e. if it is a very small flux compared to the other fluxes). • Average annual fluxes should be included in the conceptual model

	— most of this data has been collected or calculated (apart from EVT, horizontal flow, and abstraction), so the task is not too onerous. • Change the conceptualisation so the lower-permeability sediments are an extension of the lacustrine sediments. • Overall calibration stats to be provided as per the MDBC guidelines (RMSE, mean absolute residual error, mean residual error, the scaled RMSE, and a scatter-plot of all observed versus modelled values). Calibration should not include any 2010 data as this should be used for validation. • The validation statistics should also be reported in the same way as the calibration stats, and should include all 2010 bore data. • The spatial plots of the validation should have the predicted contours on the same map as the validation plots. • The calibration bores should be clearly marked spatially.

Proponent response.

4. Water Quality

Submitter	Submission and/or issue
• Department of Environment and Conservation • City of Melville • Office of Hon Lynn MacLaren MLC • Cockburn Wetlands Education Centre • Members of the public	1. Shading has not come through in the document to show where there are exceedances of the ANZECC guideline levels for water quality. 2. Washdown and maintenance areas should be in contained areas away from the wetland boundaries and their buffers. 3. Little specification is given to the mechanics and function of the infiltration basins including infiltration rates, capacity to filter contaminants and triggers and actions to manage the system. Specify how effectively the infiltration process will remove contaminants and pollutants from stormwater. Specify the lifespan of this treatment process, the maintenance actions required to ensure system efficiency, monitoring program and triggers (for water quantity and quality) to indicate the lifespan of the system and the management actions for stormwater treatment beyond this timeframe, or in the event that the system is not as effective as predicted. Provide management actions to be applied in the event that the installation of these infiltration and bioretention basins deleteriously impacts on the wetlands. Specify the flora species that will be planted in these basins. Confirm that they will be appropriate to the local hydrology and native to the area. 4. Provide a contingency plan in the event that a spill occurs which may adversely affect the wetlands. Further detail should be provided on the management strategies implemented to manage contaminants entering the wetlands systems. 5. Despite proposed drains, oil, diesel particulates and heavy metals would build up over decades affecting every species using the wetland. A single fuel truck accident would pollute groundwater and devastate the wetlands.

	6. Water quality data shows that the pH of North Lake is decreasing. Further drying may result in acidification.

Proponent response.

5. Acid Sulfate Soils

Submitter	Submission and/or issue
• Department of Environment and Conservation • City of Melville • Office of Hon Lynn MacLaren MLC • Wetlands Conservation Society • Urban Bushland Council WA • Beeliar Regional Park Community Advisory Committee • Members of the public	1. Subsurface investigations have indicated that acid sulfate soils occur along the proposed route of the road extension, and that shallow groundwater in the area has already undergone partial acidification and contains elevated concentrations of metals. Existing groundwater quality problems in close proximity to Bibra and North lakes could be further exacerbated by poorly managed dewatering for the installation of concrete footings or other infrastructure associated with the construction of the road. It is therefore recommended that the proponent is required to prepare a dewatering management plan to indicate how subsurface infrastructure will be installed without causing further degradation of groundwater quality. It is recommended that the proponent commits to either avoid or minimise any dewatering undertaken for the construction of subsurface infrastructure, to prevent further soil acidification and degradation of groundwater quality. 2. There is a possible need to remove wetland sediments etc. at the northern end of Bibra Lake before construction. Disturbance of ASS to the east of North Lake could have flow on effects to the lake's ecosystem and contribute to the process of acidification. Estimate how much material will be removed and detail the AASS/PASS mitigation that will be used. 3. Permission should be sought from the DIA to conduct testing of the ASS risk. 4. The proposal should be rejected due to the high risk of ASS on the surrounding ecosystem. Disturbance of these soils could lead to acidification of the groundwater and lakes, resulting in loss of biodiversity.

Proponent response.

6. Flora and Vegetation

6.1 General

Submitter	Submission and/or issue
• City of Cockburn • City of Melville • Office of	1. The loss of vegetation communities BahS and CcAf is not supported, as they are below the 30% threshold of pre-European extent. MRWA should confirm whether this whole community will be cleared within the proposal area. 2. The project construction will require the removal of up to 79.3ha of

Senator Scott Ludlam • Office of Hon Lynn MacLaren MLC • North Lakes Residents Association. • Wetlands Conservation Society • WWF Australia • Wildflower Society of WA • Urban Bushland Council WA • WA Naturalists' Club • Friends of Shenton Bushland • The Fremantle Society • Murdoch University • Friends of Forrestdale • Members of the public	remnant vegetation. The proposal should be rejected due to the loss of remnant native vegetation and habitat plants for endangered species. 3. The proposal cannot be approved based on the EPA's broad principles for the protection of native vegetation and flora. 4. The impact of reduced rainfall on the vegetation covered by the bridge is not explored. 5. The urban heat island effect will further impact on the loss of vegetation, as the hard dark surfaces will reduce the solar radiation absorption. 6. The area has one of the richest, floristically diverse plant assemblages within the metro area. The communities around each of the water bodies differ. 7. The proposal will impact on endangered species. The Beeliar wetlands contain four priority listed plant species plus rare forms of *Damperia linearis* and *Pattersonia occidentalis.* 8. There is no such thing as 'temporary clearing'. The 33 ha to be restored will have reduced diversity. 9. The 434 plant species known to inhabit the project area may be impacted by this proposal. 10. 61% of original native vegetation on the Swan Coastal Plain has already been cleared since European settlement. From 2001-2009 clearing of native vegetation has occurred at the rate of 850 ha per year. 11. Many of the existing degraded sites have the potential to be revegetated by the community organisations into the future. 12. The relocation of Murdoch Drain will severely impact on the quality of vegetation. The drain has natural vegetated features. 13. Shading from the bridge structure will kill less shade tolerant plants. This will enable weed invasions and degradation of the vegetation 14. It is not acceptable that there will be a 75% loss of the population of *Dampiera triloba*. This species is uncommon on the Swan Coastal Plain.

Proponent response.

6.2 Flora and vegetation survey

Submitter	Submission and/or issue
• Department of Environment and Conservation • Save Beeliar Wetlands • Wildflower	1. Statements in Section 1.5.2 of the AECOM report are made about threatened ecological communities (TECs) being listed in Western Australia through a determination by Species and Communities Branch. This is not correct. Communities are only deemed to be formally listed as TECs once they have been endorsed by the WA. Minister for Environment following recommendations made by the TEC Scientific Committee. The AECOM report also states that definitions

Society of WA • WA Naturalists' Club • Perth Waldorf School • Members of the public	and categories for TECs are defined in the reference English and Blyth 1997. The, definitions have been amended since that 1997 reference and are provided on the DEC website at: http://www.dec.wa.gov.au/contentiview/849/2017/. The correct information pertaining to TECs should be acknowledged. 15. Flora surveys were stated as being undertaken in spring 2009 and 2010 (section 5.8.2). *Drakaea elastica* is listed as Endangered under the EPBC Act an as Critically Endangered in WA, and was determined as likely to occur in the area. While this species flowers between September and November, the best time to look for the species is in July and August when the distinctive glossy leaves are conspicuous (Brown et. *a/. 1998).* According to Appendix K, the specific timing of the flora surveys was 10 September to 24 November 2009, April 2010,9-15 November 2010 and January 2011, and for priority flora, 17 September and 4, 5, 12 and 25 October 2010. None of these survey times correspond with the optimal time for surveying for *D. elastica.* Elsewhere in the methods section, reference is made to the specific survey requirement for this species, and that an initial survey was undertaken for this species in *'late July* to *early August 2009',* Unlike other surveys undertaken, the specific dates of this survey were not reported. Similarly, at page 43 of Appendix K, reference is made to *'no Drakaea elastica were recorded during spring 2009 or 2010',* implying that this was the time when these surveys were undertaken. Confirmation should be sought whether targeted surveys were undertaken for the declared rare flora *Drakea elastica,* and when, to ensure that the surveys were undertaken at the appropriate time of the year. 16. The flora survey report refers to a number of species of taxonomic uncertainty. Three *Lepidosperma* species and a species of the *Caesia micrantha* complex are identified as requiring further taxonomic work, and determination of their conservation status. The *Lepidosperma* species are noted as being investigated by Russell Barrett, and are referred to in the PER. The additional *Caesia 'micrantha'* is not referred to in the PER, nor referred to in Appendix K as flora requiring further study. This species is noted as occurring in two communities (CcXpMrS and EmXpS), both of which will be significantly impacted by the project footprint. The location of these species of taxonomic uncertainty has not been presented in the PER. Information should be provided on the extent and likely impact of the footprint on the potentially novel *Lepidosperma* and Caesia species should be presented for 6.6.2 and assessment. Further taxonomic work is required for the *Caesia* species. 17. Appendix D of Appendix K provides qualitative quadrat data. In this appendix, photos of the different quadrats are provided with a condition rating from Keighery 1994 and the Braun-Blanquet scale. From a review of these photos, the condition ratings provided generally appear to be at least one to two condition scores lower than the photos appear to show. For example, site R01 (Good) could be rated at least Excellent; R02 (Degraded) could be rated Good; and R03 (Degraded to Good) appears to be at least Excellent. This indicates a Significant under-estimation of the vegetation condition within the project area,

	with a far greater proportion potentially being in Very Good to Excellent condition. Advice is required on the methodology of assessing vegetation condition, and an explanation as to why the photographic evidence provided in the report appears to be significantly different to the stated condition rating. If required, the condition mapping should be re-evaluated. 18. It appears that the additional areas of vegetation impacted by shading or "Conceptual Effects Model" areas (described in 6.6.3.1) are not included in the statements and summaries of the area (hectares) of impact on vegetation and habitats. The area of impact should include the additional areas of vegetation impacted by shading or "Conceptual Effects Model" areas. 19. The priority flora *Dampiera triloba* (P1) is shown to have a significant impact from the project, with 75 per cent of plants found in the footprint area. DEC considers that this level of predicted impact may be overstated due to the lack of species-specific survey work at other sites. Within the project area, while a significant area of the population will be impacted, a significant area of the population will be retained outside the footprint. The overall impact on the species should not be significant to its conservation status provided management measures are in place to ensure offsite impacts are minimised. Management measures will need to be in place to minimise offsite impacts on *Dampiera triloba.* 20. A high level of local impact is predicted to *Eryngium pinnatifida* subsp. *palustre* (P3). This taxon is however reasonably widespread, and a proportion of the population has the potential to be retained outside the footprint if appropriate management measures are in place. The overall impact to the conservation status of the taxon can be managed to be relatively insignificant. Management measures will need to be in place to minimise off site impacts on *Eryngium pinnatifida* subsp. *palustre.* 21. The priority flora *Tetraria* sp. Chandala (P2) is a significant range extension for this rare species (and only the fourth occurrence recorded), and it is noted in Appendix K as being a significant environmental value recorded within the project area. It is noted as being in vegetation type CcXpMrS, and outside the footprint. However, the actual location of this occurrence is not provided in the PER or Appendix K. The location of the occurrence of *Tetraria* sp. Chandala in relation to the footprint should be provided, given the degree of disturbance likely to occur to the vegetation type in which it occurs. Protection and management measures will be required if it is located near the footprint. 22. The proponent has calculated (and shown in figures 6.6-11 to 6.6-14) a reduction in edge to area ratio, and inferred that this shows improvement in condition and "decreased fragmentation". This is misleading as it reflects the loss of vegetation, including the loss of vegetation that had tracks in it. The loss of poor condition vegetation with tracks doesn't mean an improvement overall. It is still a loss of vegetation, in that it will result in thin strips of vegetation alongside the highway. It should be noted that there is a misleading conclusion on the effect of removal of vegetation on fragmentation and condition. 23. Some of the methods used in the AECOM report (Appendix K) to

	determine floristic community types in the project area are consistent and therefore compatible with methods utilised in the original report by Gibson et al. (1994), to describe vegetation present on the southern Swan Coastal Plain. For example, the surveys were conducted in a variety of seasons including spring, and 10 x 10m quadrats were established for the AECOM report. There is no dendrogram provided, so it is assumed that the recommended form of statistical analysis was not used. It appears that a simple determination of the proportional species overlap with each floristic community type (FCT) may have been used. It is also not clear if the full species list for all quadrats for each FCT described in the Gibson et al. (1994) report was used for the actual comparison performed for the AECOM report, or if only the species recorded in the two-way table (Table 12) in the hard copy Gibson et a/. (1994) report was used for analysis. It is also not clear if all the species recorded in each vegetation unit in the Roe Highway project area were used for this comparison. If Appendix E (of Appendix K) represents some sort of measure of the similarity between the species recorded in the FCTs in Gibson et al. (1994), and the floristic data for the survey area, then some of the conclusions do not appear to be logical. For example, for the first vegetation unit listed (AfBkgS), a figure of 44 is stated for similarity measure with FCT21 and 46 for FCT23a, yet the determination is FCT21a for this unit. For the unit ErMpH, the stated similarity measure is 30 for FCT28 and for FCT11 it is 18, but the determination is FCT 11. For unit EmKgS, the stated similarity measure is 16 for FCT24 (a Priority 3 ecological community), and that for FCT28 is 15, yet the determination is FCT28. Ten of the FCT determinations out of the total 23 vegetation units listed in Appendix E appear inconsistent with the similarity measures (if this is what the data in the table represent). It may be that habitat, key species and other factors may have been used to determine FCTs present in the survey area, and this critical analysis of data is a logical step and is supported. However, if this is the case, a much clearer explanation of methods utilised in determining the FCTs present is required. The best way to determine the FCTs present at a new survey site on the southern Swan Coastal Plain is to repeat methods as described in the Gibson et al. (1994) report, and to statistically compare floristic data from quadrats rather than amalgamated species lists from identified vegetation units. A guide to recommended methods is available on request from DEC's Species and Communities Branch. Details should be provided on how the floristic community types were evaluated for assessing the conservation significance of vegetation communities in the project area, and confirmation that the evaluation was appropriate. The methodology should follow Gibson et al. (1994). 24. 2010 was a relatively dry year. A comprehensive vegetation and flora assessment should larger scale seasonal rainfall into account by surveying in time scales which better reflect immediate and long term rainfall patterns. 25. We believe the listing of the King Spider Orchid is incorrect and should be the Grand Spider Orchid as the King Spider Orchid is not typically found in the metro area. 26. The PER has not adequately described the fungi vales of the subject

	site or attempted to discuss the likely impact. If the fungi values are unknown or unclear, then the precautionary principle should apply.

Proponent response.

6.3 Management of impact to vegetation and flora

Submitter	Submission and/or issue
• City of Cockburn • Office of Senator Scott Ludlam	1. Funding should be made available to ensure adequate maintenance of bushland within the road reserve is undertaken. 2. Rehabilitation and revegetation completion criteria should be negotiated with the City of Cockburn in areas under the City's jurisdiction. 3. The rehabilitation of cleared land can never replace original remnant vegetation. Offsets for native vegetation is beneficial but does not fully compensate for the loss of 79 ha particularly at a local scale.

Proponent response.

6.4 Bush Forever

Submitter	Submission and/or issue
• Department of Planning • City of Cockburn • Office of Senator Scott Ludlam • North Lakes Residents Association • Urban Bushland Council WA • Friends of Forrestdale • Members of the public	1. The proposed extension transects through Bush forever are 244, and 7 ha of the site is proposed to be cleared as a result of the construction of Roe Highway. SPP 2.8 sets out the recommendations for proposals affecting a Bush Forever area. 2. The alignment within site 244 transects through a CCW. The vegetation within site 244 (Bassendean Central and South) is underrepresented on the Swan Coastal Plain. The offsets should provide for a net environmental gain. The offset package for clearing of Bush Forever vegetation is not objected to provided: • The 7 hectares of Bush Forever vegetation cleared is offset at a 2:1 ration and is additional to other state and federal offset requirements; and • The same vegetation complex of Bassendean central and South and a CCW is acquired as part of the Bush Forever component of the offset package. 3. Processes need to be identified to prevent weed incursion and deterioration of surrounding bushland and Bushforever. 4. The proposal will impact portions of vegetation complexes where less than 10% of the complex remains in the Bushforever study area. The vegetation complexes in the project area are underrepresented in Bushforever. Any loss or disturbance in these complexes is unacceptable. It is not stated how much vegetation in total will be cleared from site 244.

Proponent response.

7. Fauna

7.1 General

Submitter	Submission and/or issue
• City of Cockburn • City of Melville • Office of Senator Scott Ludlam • Office of Hon Lynn MacLaren MLC • North Lakes Residents Association • Conservation Council of WA • Wetlands Conservation Society • Wetlands Conservation Society • WWF Australia • Cockburn Wetlands Education Centre • Wildflower Society of WA • Urban Bushland Council WA • WA Naturalists' Club • Beeliar Regional Park Community Advisory	1. Fencing should be erected parallel to road to prevent fauna crossing the carriageway and direct them to the underpasses. 2. MRWA should confirm whether the following impacts on fauna will be a result of the extension of Roe Highway • Removal of 64% of GSM habitat at Stock Road. • Loss of 78 ha of habitat for Carnaby's Black cockatoo. • Loss of 73 ha of vulnerable Forrest Red Tailed Black Cockatoo habitat • Loss of 90 ha of potential habitat for the Rainbow Bee Eater. 3. The proposal will further threaten these species and clearing and disturbance of their habitat should not be approved. 4. The overall impact to endangered and vulnerable species across the Swan Coastal Plain needs to be assessed, not just at individual project level. 5. The loss of 112 ha of existing fauna habitat through clearing of vegetation is an environmental loss (re the conclusion in section 3.7 of net environmental gain). 6. An endless list of state listed threatened fauna species will be impacted. 7. Australia is a signatory to international agreements with Japan, Korea and China to protect migratory birds in danger of extinction. The proposal affects seven migratory birds that rest and breed here. Australia may breech its international treaty obligations due to impacts from the proposal. 8. With less than 20% of wetlands left in the Swan Coastal Plain, North lake and Bibra Lake need to be protected and given international statues as it caters for international migratory birds protected under the JAMBA, CAMBA and ROKAMBA international government agreements. 9. The PER contains one undescribed species of millipede, and to date it is not clear whether more information has been found on this species. 10. Roe Swamp is in the path of the planned route, and is a major breeding ground and habitat for several species of fauna listed on WA's endangered fauna list including the Lined Skink and for uncommon timid birds. 11. The proposal should be rejected as it will result in the loss of 112ha of fauna habitat. As well as habitat destruction, the noise, vibration, odour, pollution and light spill will make the area unattractive to fauna. 12. Consideration of biodiversity and ecological integrity should encompass the preservation of habitat as integral to the survival of species, particularly endangered species within the wetlands region.

Committee • Friends of Shenton Bushland • The Fremantle Society • Members of the public	13. There is an incomplete assessment of the Troglofauna and their habitat. The prospects for dismissal of the existence of a troglobitic community within the area needs to be further assessed. 14. The area supports a rich diversity of vertebrates which are totally dependent on the wetlands and dry uplands. 15. Black swans are known to breed on North Lake and Bibra Lake. The cygnets are likely to be predated or killed on the highway should it be constructed. 16. The 120 fauna species known to inhabit the project area may be impacted by this proposal. 17. There are concerns about the stability of the Quacking Frog population following construction. 18. There are errors in the PER with regards to the GSM population to assert that the population is non-viable. A sustainable population may require greater than 2 ha, any non viability is created by the project.

Proponent response.

7.2 Fauna Survey

Submitter	Submission and/or issue
• Department of Environment and Conservation • Cockburn Wetlands Education Centre • Urban Bushland Council WA • Members of the public	19. A number of bird species were recorded in the areas that rely on larger, intact patches of remnant vegetation. Some populations of these are declining in the Perth region and such species are likely to disappear from the site as a consequence of the clearing and fragmentation of the habitat. These include: • Chestnut Teal (*Anas castanea*) • Musk Duck (*Biziura lobata*) • Blue-billed Duck (*Oxyura australis*) • Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) • Shining Bronze-Cuckoo (*Chalcites lucidus*) • Sacred Kingfisher (*Todirhamphus sanctus*) • Splendid Fairy-Wren (*Malurus splendens*) • Varied Sittella (*Daphoenositta chrysoptera pileata*) • Grey Shrike-Thrush (*Colluricincla harmonica*) • Rufous Whistler (*Pachycephala rufiventris*) • Spotted Pardalote (*Pardalotus punctatus*) • Striated Pardalote (*Pardalotus striatus*) • Grey Fantail (*Rhipidura albiscapa*) • Southern Boobook (*Ninox novaeseelandiae*). The impacts of habitat fragmentation should be minimised by maintaining patches of remnant vegetation in contiguous areas that are as large, intact and connected as possible. Buffer zones should be created by planting trees and shrubs around existing remnant vegetation to make these patches larger and where possible, connect them to other existing patches of remnant vegetation. 20. An unidentified sucking millipede *Siphonidae* sp.was found during the

	SRE study, and was noted in the PER (page 231) as requiring particular attention. This record was found at SRE survey site 3, which is at the north-east corner of the Stock Road and Forrest Road intersection. This site will be largely destroyed under the project footprint. A management strategy is required to either determine the occurrence of the new sucking millipede *Siphonidae* sp outside the footprint, or to protect its occurrence within the footprint area. 21. *Barrett G. 2010* is not the pers. comm. for the statement in Section 5.9.4.1.3 on page 242 of the PER: *'It has also been suggested that* a roost *site needs to be within* 10 *to 12km* of a *foraging area. However, this estimation applies for foraging in Kwongan heath, where birds would have to travel further from surrounding areas to reach these particular foraging habitats (Barrett* G *2010; Kirkby 2010). '* 22. DEC is currently reviewing the conservation status of the Graceful sun-moth (GSM), and the species is less threatened than was previously thought. DEC will also be updating its advice on how to respond to proposals that impact on GSM as a result of this review. The review will be completed within the coming weeks. This will influence DEC's response to the proponent's proposal for mitigation and offsets for GSM 23. Notwithstanding the review of the conservation status of the GSM, the loss of this local population of GSM is likely to be significant, as it was not possible to find any other GSM populations within the local or near regional area. There are only a few extant populations of GSM known in the southern Perth metropolitan area that are not threatened by development proposals, or in a large enough or protected area of habitat to give confidence of being resilient to local extinction. The impact on GSM on a local/regional scale will be significant and DEC considers that a local GSM population will likely be lost. 24. Table 6.7-6 states *'Loss of confirmed non-viable Graceful Sun-moth populations'* but should state, *'Loss of confirmed Graceful Sun-moth populations'*. The population of Graceful Sun-moth is not confirmed as non-viable. 25. *Throscodectes xiphos* has only ever been recorded from the Jandakot area and therefore needs to be better considered, with more information provided on the efforts made to locate the species or its habitat. 26. Southern brown bandicoot is stated incorrectly as Priority 3 in Section 5.1.2.3, and correctly as Priority 5 in Section 5.9.1.3 onwards. A high incidence of activity is reported for this species in the project area between North Lake Road and Stock Road, further supporting the importance of this area as fauna habitat and a corridor. It is unlikely that Southern brown bandicoot will persist in this road reserve once the road construction has occurred. There will thus be the loss of what appears to be a large and active population of this species. No mention is made that the 2010 surveys were conducted in the second driest winter, and one of the driest years, on record. Taking these conditions into account it can be reasonably assumed that the achieved low capture rate (particularly of females with pouch young and of juveniles) is actually indicative of a much larger, and significant, population. A research and management strategy (which includes a

	feasibility study into translocation) should be developed and implemented for Southern brown bandicoot. 27. *Egernia luctuosa* is frequently observed throughout the Bibra Lake foreshore and was not recorded in the PER. 28. Photographic evidence of the Carpet Python exists, and it occurs within the subject area.

Proponent response.

7.3 Carnaby's Cockatoo

Submitter	Submission and/or issue
• Department of Environment and Conservation • City of Cockburn • Office of Senator Scot Ludlam • Office of Hon Lynn MacLaren MLC • Save Beeliar Wetlands • North Lakes Residents Association • Conservation Council of WA • WWF Australia • Wildflower Society of WA • Urban Bushland Council WA • The Fremantle Society • Perth Waldorf School • Murdoch University • Friends of	1. Carnaby's cockatoo is shown to have extensive habitat in the form of foraging habitat and potentially breeding and roosting sites within the overall development area. These areas are potentially high value vegetation for the species, which is reflected in the incidence of reported foraging behaviour. DEC considers there is apparent under-evaluation of vegetation condition and importance within the project area, especially between North Lake Road and Stock Road. The known roost site for Carnaby's cockatoo at Manning Park, some 2 km to the west of the western end of the development footprint, has not been brought forward from Appendix M to the main text, thus understating the significance of the site as a roost/forage area in that text. Figure 5-2 in Appendix M would suggest that the food value of the whole site is significant and that a major element of connectivity involving this site will be lost if the development proceeds as currently planned. The significance of the site to Carnaby's, and the forest red-tailed black cockatoos should be further evaluated. 2. The proponent states on page 242 that "a *roost site needs to be within* 10 *to 12 km of* a *foraging area. However, this estimation applies for foraging in Kwongan heath, where birds would have to travel further from surrounding areas to reach these particular foraging habitats".* Data obtained from the Great Cocky Count 2011 analysis indicate that potential foraging habitat within 6 km of Carnaby's cockatoo night roost sites is likely to be most important in sustaining that roost site. It would therefore be prudent to analyse roost site/foraging values to a lesser distance than the 12 km and the 6 km distance would be appropriate in this regard. Seventy-eight hectares of Carnaby's cockatoo foraging habitat will be affected by the proposed development (page xv), representing approximately 6 per cent of all potential foraging habitat within 6 km of the centre of the development area. For particular Carnaby's cockatoo night roost sites (e.g. DEC2 with around 200 roosting birds in 2011), 78 ha represents over 10 per cent of the potential feeding habitat within 6 km. Figure 5.9-5a (page 246) portrays the high level of use of the remnant vegetation in the development area as a source of food for Carnaby's cockatoo and therefore indicates its importance for the species. A likely consequence of the clearing of this 78 ha is that the Carnaby's cockatoo roosts within 6 km to the north-west of the development site will become significantly

Forrestdale • Members of the public	less viable. An evaluation of foraging areas within a 6 km radius of known Carnaby's, and forest red-tailed black cockatoo roost sites be undertaken to better determine the significance of this area to these cockatoo species. 3. Targeted searches were undertaken in habitats with the potential to support fauna species of conservation significance known from the region and these searches occurred in spring 2009 and autumn 2010 at all survey sites, and opportunistically in habitats that were specific to the target species, using standard methodologies (Appendix M, Table 3-5). 'Significant habitats' for black cockatoos were also targeted (Section 5.4). Additional surveys were conducted from June to December 2010 to assess potential nest hollows for evidence of nesting Carnaby's and forest red-tailed black cockatoos. The total time spent conducting targeted searches totalled approximately 60 person hours. Notwithstanding this, it is not clear how much survey effort was made to identify possible breeding trees, particularly for forest red-tailed black cockatoos (as opposed to surveys for other fauna). There are a significant number of suitable breeding trees (Fig 5.9 4ab) which, if visited twice a month for six months, would constitute a significant survey effort. Additional survey effort is required to determine breeding activity for Carnaby's and forest red-tailed black cockatoos. These additional survey field observations should include the 'Hollow knocking' method recommended by DEC and Murdoch University researchers, which has successfully been used to survey potential breeding trees in Yanchep National Park. The technique involves knocking on large, hollow-bearing trees, every few weeks, from June to December. Breeding birds will show themselves if a hollow is occupied. 4. Four known forest red-tailed black cockatoo roost sites, located between 150 m and 1.5 km from the project area, were recorded in November 2010. One roost was observed to be in use in November 2010 and another was observed being used intermittently from March to November 2010. Little is known about the forest red-tailed black cockatoo in regard to roosting and foraging patterns. In the absence of other information, it is reasonable to assume that the 6 km threshold from night roost sites, within which all potential foraging habitat is important, may also apply for forest red-tailed black cockatoos. The significance of night roost sites, as important habitat for Carnaby's cockatoos, can be considered to similarly apply to red-tailed black cockatoos. Red-tailed black cockatoo night roost sites should be considered to be of similar importance to Carnaby's cockatoo night roost sites. 5. Text in table 6.7-3 (and table 8.1-2, page 642) claims there to be 9,133 ha of cockatoo feeding habitat within a 15 km radius. This information is not substantiated in the PER or appendices. There are no maps and no description of how this was calculated and it is therefore unknown what proportion of this area is wetland vegetation and other non-foraging habitat. A reference and/or map is required to demonstrate the claim (page 500) that 9,133 ha of cockatoo feeding habitat is found within a 15 km radius of the project site, in order to confirm this statement against DEC data. 6. Rehabilitation along roadsides with plant species suitable for Carnaby's

	cockatoo is likely to result in the attraction of this species to that area, and possible vehicle strikes due to the increased volume and speed of traffic. There is a commitment in table 7.1 (page 616) to installation of visual barriers to encourage migratory birds to fly over the height of traffic, but this is not carried over to the section (9) on environmental commitments (nor is it a proven method for mitigating bird collisions with vehicles). DEC would prefer to see specific strategies in place to avoid attracting Carnaby's cockatoos to the road edge where they are at high risk of being struck by vehicles. Greater detail is required on how revegetation of the roadsides will be undertaken in a manner that does not jeopardise conservation for Carnaby's cockatoo through increased rates of bird strike. 7. The PER does not address the cumulative impacts of the loss of substantial environmental habitat for the Carnaby's cockatoo over the last 2 years. 8. The Carnaby's black cockatoo inhabits the proposal area and feeds on the banksia, marri and jarrah trees. North Lake reserve is now the major feeding area for the local cockatoos. 9. The clearing of 78ha of foraging habitat and 249 potential nest trees is not compliant with the DEC's Carnaby's Black Cockatoo Recovery Plan.

Proponent response.

8. Ecological Linkages

Submitter	Submission and/or issue
• Department of Environment and Conservation • Office of Senator Scott Ludlam • Office of Hon Lynn MacLaren MLC • Cockburn Wetlands Education Centre • Wildflower Society of WA • WA Naturalists' Club • Members of	1. The analysis of linkages ignores Carnaby's cockatoo, Forest red-tailed black cockatoo and Peregrine falcon as they are deemed to be not dependent on these linkages. This is questioned as Carnaby's cockatoo would be using the corridor as habitat and would benefit from the linkage. The analysis for Southern brown bandicoot is mainly about the use of the project area for transition through and out of the area. It does not consider the value of the linkage within the project area, which is a significant length of linkage and has potential for maintaining the local population. This would also apply to other species, such as GSM and Lined Skink. The value of the east-west linkage along the road route should be recognised for a number of local fauna. Management strategies should be considered for the maintenance of this linkage. 2. Ecological linkages are only addressed for the north-south movement between the major lake and vegetation areas. No consideration is given to the east-west linkage between North Lake Road and Stock Road (as the value of this linkage has been discounted) other than a general commitment to rehabilitate disturbed roadside areas in Table 7.1, page 616, which is not carried forward into Table 9.1-1 on environmental commitments, but is picked up through the general reference to vegetation restoration in section 9.2. This commitment is supported. Greater detail should be provided on the nature of

the public	vegetation establishment on the roadsides, and explaining how this is intended to maintain fauna habitat and ecological linkages. 3. Of six ecological linkages in the area, three will be affected and fragmented. The PER details a number of species that depend on ecological linkages for their survival. These include the Southern Brown Bandicoot and a number of birds and reptile species. 4. Many species will not be able to cross the highway, or will be too timid to pass under bridges or through fauna underpasses which leave them vulnerable to predators. 5. There were no investigations into design features for underpasses for different species of fauna. There is also no literature provided regarding the use and success of underpasses. 6. Ecological Link 3 is already stressed and suffering and the future protection of remaining habitat throughout this link is not protected.

Proponent response.

9. Aboriginal Heritage

Submitter	Submission and/or issue
• Department of Indigenous Affairs • Office of Senator Scott Ludlam • Office of Hon Lynn MacLaren MLC • Save Beeliar Wetlands • North Lakes Residents Association • Conservation Council of WA • Wetlands Conservation Society • Cockburn Wetlands Education Centre • Wildflower Society of WA • Perth Waldorf	1. The proponent has conducted consultative heritage surveys and examined the register of Aboriginal sites. The proponent has also taken into account the impacts on Aboriginal culture and designed elements to mitigate these impacts. It is clear that the design will destroy one or more Aboriginal sites. The proposal will require the consent of the Minister for Aboriginal Affairs under s18 of the *Aboriginal Heritage Act 1972*. 2. In terms of Aboriginal Heritage there are no doubt the changes proposed to the biophysical environment will adversely affect historical and cultural associations with the area. 3. This land is subject to the combined Swan River and Swan Coastal Plain Native Title claim. Written notification needs to be given to representative Aboriginal bodies, registered native title bodies and to all native title claimants before public works can proceed. This would provide the Aboriginal groups to formally voice their opposition. 4. The Beeliar wetlands are one of the most significant places to the Noongar people. The wetlands are considered to have been semi-permanent settlement grounds. It was also a traditional place of birth, and burial grounds area close to the wetlands. The wetlands also provided a good source of food throughout the year. 5. Waugal, Firestick and Spirit Children Dreaming stores are integral to this site. The proposal will desecrate this heritage. The hydrology of the Lake system will be affected and even jeopardise the waterway that contains the Waugal spirit. 6. The Metropolitan Commission of Elders have highlighted their concerns and wishes for the area to the then Minister for Planning in 2002. 7. The Aboriginal Heritage report in the PER did not contain quotes from custodians of the area or other Noongar representatives. Living

School • Friends of Forrestdale • Members of the public	custodians should be prioritised in the consultation process. The correct people have not been consulted. 8. All communications with representative families show they all oppose the proposal. Customary laws prevent custodians revealing to non essential people (not of right heritage, clan or skin groups) some of the knowledge. 9. Few Aboriginal heritage sites are left intact. The highest survival rates are in wetlands, and assume a greater significance representing past Aboriginal activity. The extension could not be completed without irreparable damage to this sacred site. 10. There would be a case under the Commonwealth *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* to apply for the Commonwealth Minister for Aboriginal Affairs for a declaration prohibiting activities that impact on Aboriginal sites. 11. There is no option to reject the extension outright and therefore no way to represent Noongar concerns. 12. The proposal would impact on the ability of Noongar people to practice culture, to speak and to be. It is not supported that there is a 'lack' of cultural practice in the area. 13. The Carpet Python, which exists in the area (despite the PER not listing it) is of significance to the Aboriginal people. Impacts to this species especially would be detrimental.

Proponent response.

10. Noise

Submitter	Submission and/or issue
• Department of Environment and Conservation • City of Cockburn • Save Beeliar Wetlands • Wildflower Society of WA • Beeliar Regional Park Community Advisory Committee • Friends of Forrestdale • Members of the public	1. The peer review which was undertaken for the noise modelling report should be reviewed as assessed before the final recommendations on this proposal are made. If necessary the proponent should be required to revisit their commitments on noise mitigation measures based on the outcomes of the peer review report. 2. The proposal needs to demonstrate compliance with the *Environmental Protection (Noise) Regulations 1997*, specifically the requirement of Regulation 13, WAPC's SPP5.4 *Road and Rail Transport Noise and Freight Considerations in Land Use Planning* and the City of Cockburn's Local Laws 2000 Division 4 Sand Drift and Dust Management. 3. Prior to construction, the proponent should provide a Noise Management Plan to the City of Cockburn's Health Services detailing compliance with the above regulation and policy. 4. There is no evidence that fauna will adapt to the noise levels (Section 6.7.3.2). 5. The noise assessment should make conservative assumptions as detailed studies cannot be completed until the detailed design phase. 6. There are several limitations to the acoustic assessment report: • Effects on wildlife are not considered.

	• Critical working areas that require low vibration can include home hobbyists. • Only 5 consecutive days of data were used for any station. • The model uses the assumption that; traffic will be evenly shared between lanes, the road is the only reflecting or hard ground and that the rest is soft, all fences and walls will remain in place and be kept in good repair • Traffic volumes used were not up to date. • The likelihood of upper floors on houses becoming more prevalent is ignored. • The no build scenario used should include noise mitigation. • The Blue Gum Montessori School was not taken into consideration, nor the upper floors of Hamilton Hill Senior High School. • An alternative area of similar recreational value will be complicated by the new highway to cross. 7. Noise pollution may affect communication and breeding behaviours of nocturnal animals. Behavioural effects from noise might decrease chances of survival and reproduction. 8. There is a strong concern regarding the impact of construction noise, and vehicle noise following construction on the surrounding community, especially the students in the surrounding schools. 9. The 'Lombard Effect' may change the calls of birds and frogs in the region due to traffic noise. 10. Noise barriers will also have a significant impact on visual amenity.

Proponent response.

11. Environmental Commitments

Submitter	Submission and/or issue
• Department of Environment and Conservation • City of Cockburn • City of Melville • Members of the public	7. There is no audit process to ensure that the objectives are achieved. The proponent should include monitoring (of water quality and quantity, vegetation condition), reporting and contingency action plans to ensure that the objective of maintaining existing wetland ecological functions and environmental values is achieved. The proponent should commit to maintain or improve the predevelopment wetland water regime for conservation category and resource enhancement wetlands. Any boardwalk to be constructed should be sited outside of the Bibra Lake wetland and its buffer. 8. DEC supports the proponent's commitment to maintain connectivity for pedestrians and regional park visitors between either side of the proposed alignment. The proposed project will have greatest impact on recreation along paths and trails between Bibra Lake and Horse Paddock Swamp/North Lake. DEC supports the proposed north-south and east-west connections by new recreation shared paths that are consistent with the intent of the Beeliar Regional Park and Bibra Lake management plans. Should the project be approved, DEC requests that it be involved in the design and approvals process to ensure

	achievement of this commitment is to DEC's satisfaction. Should recreation underpasses be designed as part of the highway and within Beeliar Regional Park, DEC advises they should also cater for fire and emergency vehicles. The proponent is requested to liaise with DEC and FESA to ensure adequate height and width specifications of underpasses for emergency vehicles. 9. An explanation is needed regarding why the closeout report will be submitted three years after construction when the Auditing Compliance Reporting in 9.2.1.1 is committed to for five years. 10. Contingency actions should be specified to provide assurance that any impacts on conservation category wetlands can be managed and appropriately mitigated. 11. It is understood that Hope Road will be converted to a cul-de-sac with an adjacent Principal Shared Path (PSP). The proponent should commit to achieving a high quality landscape along Hope Road, with revegetation. 12. DEC is concerned about the increase in light levels compared to the current situation at night through the regional park. DEC is supportive of innovative lighting solutions to minimise light pollution. While it is acknowledged that lighting along the PSP is required for *Crime Prevention Through Environmental Design* reasons, DEC is seeking a commitment from the proponent to use best management practice to minimise light spill from the elevated section of the road. 13. Agencies that are to assume responsibility for areas of bushland should be given a financial allocation to enable ongoing maintenance for a minimum of five years. 14. Monitoring (and subsequent remediation action) of rehabilitation of cleared areas should be undertaken for a minimum of 7 years, ideally 10. 1. A Disease and Pathogen Management Plan needs to be developed to prevent the introduction or spread of diseases or pathogens, specifically Dieback. Phytophthora dieback risks are not identified or mitigated. The PER does not address how the effect of the inevitable spread of dieback will be managed. It will not be possible to address these impacts. 15. Dust and noise should be continued to be monitored for years after construction, and management measures implemented. 16. Revegetated plants should be watered for the first two summers until established.

Proponent response.

12. Offsets

Submitter	Submission and/or issue
• Department of Environment Conservation. • City of	1. Offset 2 refers to the provision of $100,000 to DEC's Environmental Community Grants Scheme (ECG) to support community actions to conserve wetlands. The ECG should be recognised as being the Minister for Environment's grant scheme, administered by DEC. The $100,000 in Offset 2 should be made available to DEC for allocation to

Cockburn • City of Melville • Office of Senator Scott Ludlam • Save Beeliar Wetlands • Conservation Council of WA • Wetlands Conservation Society • Cockburn Wetlands Education Centre • Wildflower Society of WA • South West Group • WA Naturalists' Club • Beeliar Regional Park Community Advisory Committee • Members of the public	community projects for rehabilitation and restoration work within wetlands of Beeliar Regional Park. 2. While accepted as a direct offset, the proposed purchase and transfer of 468 ha of land to the State to offset the impacts on Carnaby's and forest red-tailed black cockatoos may not, in itself, provide sufficient offset for the losses predicted for these species. The assessment of high quality and poor quality vegetation requires review based on the apparent inconsistencies in the photographic evidence in figures 8.01 to 8.12 in Appendix K, which delineate apparently reasonable condition vegetation in the category degraded or completely degraded. Also the apparent assumption in the PER that Carnaby's cockatoo foraging habitat and nesting habitat will co-occur may not be valid for all areas. In selecting the area of land for acquisition, some adjustment to the area sought may be necessary to accommodate this factor. It would be preferable if the offset acquisition commitment could be restated as at least 468 ha of Carnaby's cockatoo foraging habitat, inclusive of, or in addition to, 25 ha of nesting habitat, plus additional areas of suitable wetland and/or other features. Further, the minimum offset area for the loss of 9.7 ha of conservation category wetlands (including buffers) should be clearly identified in the offset commitments to enable accounting against the offset area acquired. It is noted that on page 704 (section 10.2.1.3), reference is made to the acquisition of 'up to' 468 ha. This should be amended to 'at least' 468 ha as this is the minimum area of Carnaby's cockatoo foraging habitat to be acquired, and additional areas may need to be acquired to achieve the additional offset requirements should these not be found in a single area of acquisition, or if additional restoration works are required. It is acknowledged that 468 ha of land is proposed to be acquired as an offset to the clearing of Carnaby's cockatoo foraging and nesting habitat (page 526, section 6.7.5.3). In implementing this proposal, a focus should be to establish whether suitable habitat or restoration sites are available within 6 km of the development site, and if available, options to incorporate these within the overall offsets should be investigated, including the possibility of reducing the more remote offset area. 3. It is suggested that, in order to ensure long-term conservation outcomes, when the offset land is acquired by the State, funding should be made available for basic works to establish reserve infrastructure (e.g. fencing, signs, access) and for initial management. 4. The environmental offset package proposed will not result in a net environmental benefit. 5. Offset areas should be in close proximity to the environmental loss wherever practical or within the Cockburn area. 6. Offset proposal 2 should be reassessed to confirm that it achieves a 2:1 offset ratio. 7. Offsets should not be developed to fund the management of RAMSAR sites. For existing RAMSAR listed sites, weed control and other management actions should already be funded from State and Federal Governments. 8. With regards to Offset 1, in addition to the 470 ha purchase of intact vegetation, an additional area (at least equal to the area to be cleared)

	that is currently also be purchased and rehabilitated to support foraging habitat for Carnaby's and Forest Red-tailed Black cockatoos. 9. The wetland areas contained within the City of Melville which form a part of the eastern wetland chain of the Beeliar Regional Park should also be rehabilitated. 10. Regarding Offset 4 for GSM, it would be better practice to establish management techniques prior to clearing of vegetation so that existing populations can be better managed once construction commences. This is also relevant to Offset 5. 11. The offsets proposed in the PER are insulting and inadequate. Offsets do nothing for the species that will be destroyed. The offsets cannot compensate for the biodiversity loss as they will be too distant or take too long to reach maturity. 12. There is significant uncertainty whether the offsets will eventuate. Offset land must be purchased and reserved before the project is approved. The proponent should be required to monitor the offset against performance objectives and implement contingencies if they are not met. 13. Offset land has not been assessed and there is no likelihood that it will result in its environmental objectives. 14. The offsets are mitigation measures, not accepted offset matters and do not represent net environmental gain. Some of the proposed offsets are assessments matters which should already have been completed. 15. Without offsets, the proposal would be unacceptable, and government policies provide that offsets are not intended to make proposals with unacceptable impacts become acceptable. 16. There is substantially more information required to be assessed and open for public comment in respect to Offset 1 before it can be considered and permitted. In order to offset the removal of 249 cockatoo nesting trees at a 10:1 ratio, the offset area will have to have actual trees identified, found suitable and quantified. 17. No offset has been offered to local residents for the loss of recreational amenity in the area. The proposed revegetation of Hope Road Swamp is pointless as it is too close to the highway and will have limited habitat value. There needs to be substantially more offsets offered in the vicinity of the project area. The offsets need to be better balanced to provide benefits within the region and focus on remediation of existing conservation areas and improving environmental linkages through biodiversity corridors. 18. MRWA has a poor history with regards to revegetation on previous projects. 19. Restoration areas in the offsets were selected based on ease of revegetation in the dampland areas. 20. A funding package to support the offsets should be achieved by increasing the remediation funding to a minimum of $5 million to be spent within the region. 21. Offsets from Roe 7 should not be claimed for this proposal. The offsets from Roe 7 have not been finished. 22. The Offset 1 area is potentially Lowlands in Mundijong. This area already has a level of protection and should not be a priority for use as

	an offset. 23. Horse Paddock Swamp (Offset 2) is already intended to be revegetated by the community pending the outcome of proposal. The provision of $100 000 is not enough, this would only rehabilitate 0.7 ha. It does not equate to 2:1 ratio in real terms. 24. Offset 3 cannot be considered an offset, as it offers no additional habitat at all. 25. For Offset 4, it seems pointless to provide research into a species when it is proposed to destroy and entire population (GSM). Translocation of the GSM is also highly problematic. 26. Typha removal should be gradual and controlled. Replacement with native species should be carried out. 27. In general, the funding to be provided for the offsets does not provide enough funds to allow conservation in real terms in the long term, especially with regards to revegetation and management of conservation areas.

Proponent response.

13. Other

13.1 General (Heritage, Light spill and uncategorised concerns)

Submitter	Submission and/or issue
• City of Cockburn • Office of Senator Scott Ludlam • Office of Hon Lynn MacLaren MLC • Save Beeliar Wetlands • North Lakes Residents Association • Conservation Council of WA • WWF Australia • Wildflower Society of WA • Beeliar Regional Park Community Advisory Committee	2. The two Norfolk pine trees on the corner of Progress Drive and Hope Road should be retained (heritage value). 3. North Lake and Bibra Lake have been interim listed on the National Estate of the Australian Heritage Commission because of the environmental and heritage significance. 4. The proposal should limit the impacts of light spill on surrounding bushland areas. 5. Of the potential impacts of artificial night lights, only two are addressed in detail. 6. With regards to critical assets, every category listed in the EPA's Position Statement 9 is represented in the project area. These deserve the full protection of the EPA. This project cannot be approved as outlined in EPA Guidance Statement 33 Section A2.3, as it has significant adverse impacts on critical assets. 7. The area between North Lake Road and Kwinana Freeway has a high vulnerability to contamination. This and other sites with pre-existing contamination will need further investigation 8. One serious potential impact which was not addressed in the PER is the impact on public safety. The proposal means more traffic accidents, injuries and deaths. 9. A highway through the middle of this reserve would totally change the character of the area forever and the visual and landscape values would be lost. 10. More sustainability issues such as water reduction, extended producer responsibility and waste recycling should be discussed and adopted for

• Perth Waldorf School • Murdoch University • Members of the public	construction. 11. There are concerns about the impact of vibration on the surrounding community (both construction and vehicle post construction). As well as mosquito management. 12. The loss of pastureland used by Murdoch University will result in the need to create pastureland elsewhere on the campus. There is also a concern about the impact on noise and vibration on the farm animals. 13. Housing prices will be negatively affected for those in the area. 14. The highway will cut off public access to Coolbellup public transport, Kardinya Shopping Centre and North Lake English Centre.

Proponent response.

13.2 Air Quality

Submitter	Submission and/or issue
• Office of Senator Scot Ludlam • Office of Hon Lynn MacLaren MLC • Save Beeliar Wetlands • Conservation Council of WA • Wetlands Conservation Society • Beeliar Regional Park Community Advisory Committee • The Fremantle Society • Members of the public	1. Since existing traffic congestion to Fremantle Port will not be solved, local air amenity will be worsened in the local area. 2. The proposal should be rejected due to its impact on health and wellbeing from air pollution to residents. 3. This proposal will not reduce greenhouse gas emissions due to greater transport efficiency. It is well documented that new roads generate more traffic and in turn become congested 4. NO_2 exposure levels may affect flora and fauna in the area. 5. The PER does not adequately deal with the additional carbon footprint that will result from the proposal. 6. The greenhouse impact of this road has not been properly assessed. The road will bring greenhouse pollution to the area via the heavy traffic expected. 7. There are concerns about dust generated from earthworks and cement works and the impacts of reduced air quality (construction and post construction traffic) on residents and students in the surrounding schools (especially the Montessori school). 8. Prior to construction, the proponent should provide a Dust Management Plan to the City of Cockburn's Health Services for approval. This must comply with the City's Moratorium on Bulk Earthworks.

Proponent response.

13.3 Recreation, Education, Sense of Place

Submitter	Submission and/or issue
• City of Cockburn	1. The Beeliar wetlands are a popular place for recreational, cultural and educational activities. The proposal will result in a loss of healthy,

• Office of Hon Lynn MacLaren MLC • North Lakes Residents Association • Conservation Council of WA • Wetlands Conservation Society • Cockburn Wetlands Education Centre • Beeliar Regional Park Community Advisory Committee • Perth Waldorf School • Murdoch University • Friends of Forrestdale • Members of the public	diverse and productive environmental open space areas and will impact on the quality and amenity of the Beeliar Regional Park for future generations. The educational and experiential opportunities currently present need to be preserved and enhanced. 2. The wetlands are an important environmental node for the community within the metro area, and offer extensive social, recreational and educational benefits and tourist attractions. 3. Outdoor recreational activities in Beeliar Regional Park will be affected by the vehicle emissions and reduce options for healthy recreational activities. 4. There are concerns regarding the impacts to the surrounding schools with regards to impacts from noise, dust, vibration and odour. 5. The Cockburn Wetlands Education Centre is situated along Hope Rd, and will now be situated on the edge of a highway. It provides education to schools, the community, businesses, scouts and church groups. The safety and integrity of this site will be undermined by the construction of the highway. 6. The project breaches the principle of intergenerational equity. 7. It is impossible to calculate the values which will be lost with the proposal.

Proponent response.

13.4 Cost implications

Submitter	Submission and/or issue
• Office of Senator Scott Ludlam • Office of Hon Lynn MacLaren MLC • Save Beeliar Wetlands • Members of the public	1. Any analysis of the economic viability or impact of this project on the state's budget or comparison with the current operating budget on MRWA has been omitted from the PER. MRWA cannot afford the project, and the federal government has already confirmed it will not be providing funding. 2. On a similar budget, the State Government could build a 43km light rail network linking Fremantle to Cockburn and Murdoch. The money would be far better spent on alternative infrastructure projects to reduce congestion. 3. Is the investment of $750 million in building more road infrastructure the best legacy for future generations, particularly in the context of the recognitions of the peak of global oil supplies? 4. The road extension is far more expensive when compared to the Perth to Bunbury Highway which was for 70 km worth of road, as opposed to

	5.5 km.

Proponent response.

13.5 Editorial Comments

Submitter	Submission and/or issue
• Department of Water • Department of Environment and Conservation	1. Resolution of many figures is so poor it makes them generally illegible. Please provide a version of the report with legible figures (including the text) to the Department of Water (specifically Appendices D and G). 2. Resource enhancement category wetland UFI 6509 (and its buffer) is missing from many of the figures. Accurate mapping of all wetlands in the proposal area should be provided.

Proponent response.

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