GOVERNMENT OF WESTERN AUSTRALIA

Environmental Protection Authority

EPA REFERRAL FORM PROPONENT

Referral of a Proposal by the Proponent to the Environmental Protection Authority under Section 38(1) of the *Environmental Protection Act 1986.*

PURPOSE OF THIS FORM

Section 38(1) of the *Environmental Protection Act 1986* (EP Act) provides that where a development proposal is likely to have a significant effect on the environment, a proponent may refer the proposal to the Environmental Protection Authority (EPA) for a decision on whether or not it requires assessment under the EP Act. This form sets out the information requirements for the referral of a proposal by a proponent.

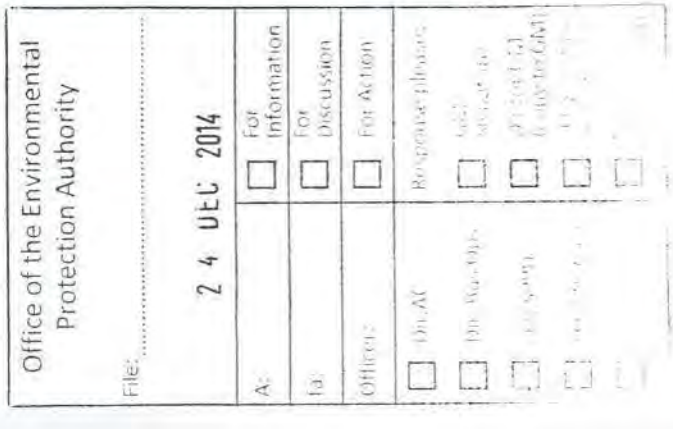
Proponents are encouraged to familiarise themselves with the EPA's *General Guide on Referral of Proposals* [see Environmental Impact Assessment/Referral of Proposals and Schemes] before completing this form.

A referral under section 38(1) of the EP Act by a proponent to the EPA must be made on this form. A request to the EPA for a declaration under section 39B (derived proposal) must be made on this form. This form will be treated as a referral provided all information required by Part A has been included and all information requested by Part B has been provided to the extent that it is pertinent to the proposal being referred. Referral documents are to be submitted in two formats – hard copy and electronic copy. The electronic copy of the referral will be provided for public comment for a period of 7 days, prior to the EPA making its decision on whether or not to assess the proposal.

CHECKLIST

Before you submit this form, please check that you have:

	Yes	No
Completed all the questions in Part A (essential).	X	
Completed all applicable questions in Part B.	X	
Included Attachment 1 – location maps.	X	
Included Attachment 2 – additional document(s) the proponent wishes to provide (if applicable).	X	
Included Attachment 3 – confidential information (if applicable).	NA	
Enclosed an electronic copy of all referral information, including spatial data and contextual mapping but excluding confidential information.	X	



Following a review of the information presented in this form, please consider the following question (a response is optional).

Do you consider the proposal requires formal environmental impact assessment?		
☐ Yes	☒ No	☐ Not sure
If yes, what level of assessment?		
☐ Assessment on Proponent Information	☐ Public Environmental Review	

PROPONENT DECLARATION (to be completed by the proponent)

I, Ilario Spagnolo, *(full name)* declare that I am authorised on behalf of Main Roads Western Australia (being the person responsible for the proposal) to submit this form and further declare that the information contained in this form is true and not misleading.

Signature	Name (print) Ilario Spagnolo
Position Project Director	Company Main Roads WA
Date	17/12/2014

PART A - PROPONENT AND PROPOSAL INFORMATION

(All fields of Part A must be completed for this document to be treated as a referral)

1 PROPONENT AND PROPOSAL INFORMATION

1.1 Proponent

Name	Main Roads Western Australia
Joint Venture parties (if applicable)	Not applicable
Australian Company Number (if applicable)	ABN 50 860 676 021
Postal Address (where the proponent is a corporation or an association of persons, whether incorporated or not, the postal address is that of the principal place of business or of the principal office in the State)	PO Box 6202, East Perth WA 6892
Key proponent contact for the proposal: • name • address • phone • email	Ilario Spagnolo Project Director, Infrastructure Delivery Directorate, Main Roads WA Don Aitken Centre, Waterloo Crescent, East Perth WA 6004 (08) 9323 4120 Ilario.spagnolo@mainroads.wa.gov.au
Consultant for the proposal (if applicable): • name • address • phone • email	Ben Davis PO Box 462 Wembley WA 6913 (08) 6272 0000 ben.davis@bmtoceanica.com.au

1.2 Proposal

Title	Replacement of the Old Mandurah Traffic Bridge
Description	Main Roads Western Australia (MRWA) and the City of Mandurah (CoM) propose to demolish and replace the Old Mandurah Traffic Bridge (The Bridge), which spans the Mandurah Channel at the northern end of the Peel Harvey Estuarine System (PHES). The Bridge is situated south of Mandjar Bay, which is a small embayment that is heavily used for recreation. The Bridge forms the northern extent of the Peel-Yalgorup Ramsar Wetland area, which covers the entire PHES. The Bridge has reached the end of its functional life, and modelling indicates that there will be a future need for a four-lane Bridge to cater for increased commuter traffic volumes, as well as an expanded

	public transport system. The proposed new Bridge is likely to be of a concrete construction, located north of the existing Bridge. The CoM has undertaken extensive review of the Bridge design, with public and stakeholder input. It is anticipated that the construction of the new Bridge will require moderate seabed disturbance in the form of pile driving for the foundations, but will not involve dredging or disposal of sediment.
Extent (area) of proposed ground disturbance.	The total area affected by the project is 7 ha, of which 0.2 ha is native vegetation.
Timeframe in which the activity or development is proposed to occur (including start and finish dates where applicable).	July 2015 – October 2017
Details of any staging of the proposal.	It is proposed that the new traffic bridge will be constructed prior to the old traffic bridge being demolished, to maintain public access across the Mandurah Channel for as long as possible.
Is the proposal a strategic proposal?	No
Is the proponent requesting a declaration that the proposal is a derived proposal? If so, provide the following information on the strategic assessment within which the referred proposal was identified: • title of the strategic assessment; and • Ministerial Statement number.	No
Please indicate whether, and in what way, the proposal is related to other proposals in the region.	N/A
Does the proponent own the land on which the proposal is to be established? If not, what other arrangements have been established to access the land?	No. Class A, Class C, unallocated crown land is being rededicated to road reserve, A 50m2 area of private land is being acquired and dedicated to road reserve.
What is the current land use on the property, and the extent (area in hectares) of the property?	Class A Reserve 27581 (1,903m2), Class C Reserve 27622 (691m2) & unallocated crown land used (64m2) for public recreation (parkland, playgrounds and a skate park), Lot 350 Pinjarra Road (50m2) used for commercial purposes

1.3 Location

Name of the Shire in which the proposal is located.	City of Mandurah
For urban areas: • street address; • lot number; • suburb; and • nearest road intersection.	Pinjarra Road Mandurah Nearest Intersection: Mandurah Tce and Pinjarra Road
For remote localities: • nearest town; and • distance and direction from that town to the proposal site.	N/A
Electronic copy of spatial data - GIS or CAD, geo-referenced and conforming to the following parameters: • GIS: polygons representing all activities and named; • CAD: simple closed polygons representing all activities and named; • datum: GDA94; • projection: Geographic (latitude/longitude) or Map Grid of Australia (MGA); • format: Arcview shapefile, Arcinfo coverages, Microstation or AutoCAD.	Enclosed?: Yes

1.4 Confidential Information

Does the proponent wish to request the EPA to allow any part of the referral information to be treated as confidential?	No
If yes, is confidential information attached as a separate document in hard copy?	N/A

1.5 Government Approvals

Is rezoning of any land required before the proposal can be implemented? If yes, please provide details.	Yes Class A Reserve 27581 (1,903m^2), Class C Reserve 27622 (691m^2) & unallocated crown land used (64m^2) Lot 350 Pinjarra Road (50m^2) will all be re-zoned to road reserve
Is approval required from any Commonwealth or State Government agency or Local Authority for any part of the proposal? If yes, please complete the table below.	Yes Approval from Decision Making Authorities (DMA) may be required depending on the outcome of the EPA's assessment of the Project, see Section 3 of the EIA referral document (BMT Oceanica 2014) for more information

Agency/Authority	Approval required	Application lodged Yes / No	Agency/Local Authority contact(s) for proposal
Commonwealth Department of Environment	Y	Yes – see Appendix A of referral document (BMT Oceanica 2014)	TBA

PART B - ENVIRONMENTAL IMPACTS AND PROPOSED MANAGEMENT

2. ENVIRONMENTAL IMPACTS

Describe the impacts of the proposal on the following elements of the environment, by answering the questions contained in Sections 2.1-2.11:

2.1 flora and vegetation;

2.2 fauna;

2.3 rivers, creeks, wetlands and estuaries;

2.4 significant areas and/ or land features;

2.5 coastal zone areas;

2.6 marine areas and biota;

2.7 water supply and drainage catchments;

2.8 pollution;

2.9 greenhouse gas emissions;

2.10 contamination; and

2.11 social surroundings.

These features should be shown on the site plan, where appropriate.

For all information, please indicate:

(a) the source of the information; and

(b) the currency of the information.

2.1 Flora and Vegetation

2.1.1 Do you propose to clear any native flora and vegetation as a part of this proposal?

[A proposal to clear native vegetation may require a clearing permit under Part V of the EP Act (Environmental Protection (Clearing of Native Vegetation) Regulations 2004)]. Please contact the Department of Environment and Conservation (DEC) for more information.

(please tick) ✓ Yes **If yes**, complete the rest of this section.

☐ No **If no**, go to the next section

2.1.2 How much vegetation are you proposing to clear (in hectares)?

~0.2 ha

2.1.3 Have you submitted an application to clear native vegetation to the DEC (unless you are exempt from such a requirement)?

☐ Yes ✓ No **If yes**, on what date and to which office was the application submitted of the DEC?

If the Project is not assessed the Main Roads WA State-wide Clearing Permit CPS 818 will be used to clear 0.2 ha of native vegetation.

2.1.4 Are you aware of any recent flora surveys carried out over the area to be disturbed by this proposal?

✓ Yes ☐ No

If yes, please attach a copy of any related survey reports and provide the date and name of persons / companies involved in the survey(s).

If no, please do not arrange to have any biological surveys conducted prior to consulting with the DEC.

A copy of a recent terrestrial flora survey commissioned by the City of Mandurah is attached as Appendix E of the EIA document (BMT Oceanica 2014).

2.1.5 Has a search of DEC records for known occurrences of rare or priority flora or threatened ecological communities been conducted for the site?

✓ Yes ☐ No

If you are proposing to clear native vegetation for any part of your proposal, a search of DEC records of known occurrences of rare or priority flora and threatened ecological communities will be required. Please contact DEC for more information.

A search of the Department of Parks and Wildlife (DPaW) NatureMap database was undertaken and a search of DPaW GIS datasets for rare or priority flora and threatened ecological communities was also undertaken. A copy of the DPaW NatureMap Species Report is included as Appendix C of the EIA Referral Document (BMT Oceanica 2014) and search results of the GIS datasets can be seen in Figure 6 (Attachment 1).

The following flora species were identified in the DPaW NatureMap Database report:

Flora

- King spider-orchid (*Caledinia huegelii*)
- Matted centrolepis (*Centrolepis caespitosa*)
- Dwarf bee-orchid (*Diuris micrantha*)
- Purdie's donkey-orchid (*Diuris purdiei*)
- Glossy-leafed hammer–orchid (*Drakaea elastica*)
- Dwarf hammer-orchid (*Drakaea micrantha*)
- Hook-leaf isopogon (*Isopogon unicantus*)
- Beaked lepidosperma (*Lepidosperma rostratum*)
- Wabling Hill mallee (*Eucalyptus argutifolia*).

2.1.6 Are there any known occurrences of rare or priority flora or threatened ecological communities on the site?

☐ Yes ✓ No **If yes**, please indicate which species or communities are involved and provide copies of any correspondence with DEC regarding these matters.

A recent terrestrial flora survey (Appendix E of BMT Oceanica (2014)) did not find any threatened ecological communities or endangered flora within the Bridge footprint.

2.1.7 If located within the Perth Metropolitan Region, is the proposed development within or adjacent to a listed Bush Forever Site? (You will need to contact the Bush Forever Office, at the Department for Planning and Infrastructure)

☐ Yes ✓ No **If yes**, please indicate which Bush Forever Site is affected (site number and name of site where appropriate).

2.1.8 What is the condition of the vegetation at the site?

According to the Keighery (1994) scale, the onsite vegetation is classified as being degraded to completely degraded (CoM 2014; Appendix E of BMT Oceanica (2014))

2.2 Fauna

2.2.1 Do you expect that any fauna or fauna habitat will be impacted by the proposal?

(please tick) ✓ Yes **If yes**, complete the rest of this section.

☐ No **If no**, go to the next section.

2.2.2 Describe the nature and extent of the expected impact.

The largest impact to estuarine and marine fauna is likely to be the effect of noise from piling operations. Other sources of noise include the use of heavy machinery, construction and demolition equipment, power tools and earth-moving equipment.

The small terrestrial footprint of the Project and the highly modified nature of the terrestrial environment mean that terrestrial fauna are unlikely to be affected by the proposed works. The localised nature of the Project will mean that mobile fauna (such as birds) will be able to avoid the Project with little to no impact.

Further information on the impact to terrestrial, marine and estuarine fauna can be found in Sections 5.3.2 and 5.3.4 of the EIA document (BMT Oceanica 2014).

2.2.3 Are you aware of any recent fauna surveys carried out over the area to be disturbed by this proposal?

☐ Yes ✓ No **If yes**, please attach a copy of any related survey reports and provide the date and name of persons / companies involved in the survey(s).

If no, please do not arrange to have any biological surveys conducted prior to consulting with the DEC.

2.2.4 Has a search of DEC records for known occurrences of Specially Protected (threatened) fauna been conducted for the site?

✓ Yes ☐ No (please tick)

A copy of the DPaW NatureMap Species Report is included as Appendix C of BMT Oceanica (2014). 22 terrestrial species of fauna were identified.

The following species were identified in the DPaW NatureMap search report:

Mammals

- Chuditch, western quoll (*Dasyurus geoffroii*)
- Western ringtail possum (*Pseudocheirus occidentalis*)
- Quokka (*Setonix brachyurus*)
- Southern brush-tailed phascogale (*Phascogale tapoatafa subsp. tapoatafa*)
- Western brush wallaby (*Macropus irma*)
- Quenda (*Isoodon obesulus subsp. fusciventer*)

Invertebrates

- Shield-backed trapdoor spider/black rugose trapdoor spider (*Idiosoma nigrum*)
- Graceful sun moth (*Synemon gratiosa*)

Birds

- Australian lesser noddy (*Anous tenuirostris melanops*)
- Australasian bittern (*Botaurus poiciloptilus*)
- Forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*)
- Baudin's black cockatoo (*Calyptorhynchus baudinii*)
- Carnaby's black cockatoo (*Calyptorhynchus latirostris*)
- Malleefowl (*Leipoa ocellata*)
- Australian painted snipe (*Rostratula australis*)
- Amsterdam albatross (*Diomedea exulans amsterdamensis*)

- Tristan albatross (*Diomedea exulans exulans*)
- Wandering albatross (*Diomedea exulans (sensu lato)*)
- Fairy tern (Australian) (*Sternula nereis nereis*)
- Greater sand plover (Mongolian) (*Charadrius leschenaultii subsp. leschenaultii*)
- Common greenshank (*Tringa nebularia*)
- Southern giant petrel (*Macronectes giganteus*).

For further information please refer to Sections 4.2.4 and 4.3.7of the attached EIA document (BMT Oceanica 2014).

2.2.5 Are there any known occurrences of Specially Protected (threatened) fauna on the site?

Yes ✓ No **If yes**, please indicate which species or communities are involved and provide copies of any correspondence with DEC regarding these matters.

For further information please refer to Sections 4.2.4 and 4.3.7of the attached EIA document (BMT Oceanica 2014).

2.3 Rivers, Creeks, Wetlands and Estuaries

2.3.1 Will the development occur within 200 metres of a river, creek, wetland or estuary?

(please tick) ✓ Yes **If yes**, complete the rest of this section.

☐ No **If no**, go to the next section.

The Project will span the Mandurah Channel, part of the Peel-Harvey Estuary system.

2.3.2 Will the development result in the clearing of vegetation within the 200 metre zone?

✓ Yes ☐ No **If yes**, please describe the extent of the expected impact.

0.2 ha of native vegetation will be required to be cleared for the bridge footings and road reserve. See section 5.3.3 of BMT Oceanica (2014)

2.3.3 Will the development result in the filling or excavation of a river, creek, wetland or estuary?

☐ Yes ✓ No **If yes**, please describe the extent of the expected impact.

2.3.4 Will the development result in the impoundment of a river, creek, wetland or estuary?

☐ Yes ✓No **If yes**, please describe the extent of the expected impact.

2.3.5 Will the development result in draining to a river, creek, wetland or estuary?

☐ Yes ✓ No **If yes**, please describe the extent of the expected impact.

2.3.6 Are you aware if the proposal will impact on a river, creek, wetland or estuary (or its buffer) within one of the following categories? (please tick)

Conservation Category Wetland	✓ Yes	☐ No	☐ Unsure
Environmental Protection (South West Agricultural Zone Wetlands) Policy 1998	☐ Yes	✓ No	☐ Unsure
Perth's Bush Forever site	☐ Yes	✓No	☐ Unsure
Environmental Protection (Swan & Canning Rivers) Policy 1998	☐ Yes	✓No	☐ Unsure
The management area as defined in s4(1) of the *Swan River Trust Act 1988*	☐ Yes	✓No	☐ Unsure
Which is subject to an international agreement, because of the importance of the wetland for waterbirds and waterbird habitats (e.g. Ramsar, JAMBA, CAMBA) The Peel-Yalgorup Ramsar wetland occurs adjacent to the Project. Refer to Section 5.3.5 of BMT Oceanica (2014)	✓ Yes	☐ No	☐ Unsure

2.4 Significant Areas and/ or Land Features

2.4.1 Is the proposed development located within or adjacent to an existing or proposed National Park or Nature Reserve?

✓ Yes ☐ No **If yes**, please provide details.

The Project is located adjacent to the Peel-Yalgorup Ramsar wetland system. See Section 4.3.1 of the attached EIA document (BMT Oceanica 2014) for more information.

2.4.2 Are you aware of any Environmentally Sensitive Areas (as declared by the Minister under section 51B of the EP Act) that will be impacted by the proposed development?

✓ Yes ☐No **If yes**, please provide details.

The Project falls within 50 m of the boundary of the Peel-Yalgorup Ramsar Wetland system. See Section 4.3.1 of the attached EIA document (BMT Oceanica 2014) for more information.

2.4.3 Are you aware of any significant natural land features (e.g. caves, ranges etc) that will be impacted by the proposed development?

☐ Yes ✓No **If yes**, please provide details.

2.5 Coastal Zone Areas (Coastal Dunes and Beaches)

2.5.1 Will the development occur within 300metres of a coastal area?

(please tick) ☐ Yes **If yes**, complete the rest of this section.

✓ No **If no**, go to the next section.

2.5.2 What is the expected setback of the development from the high tide level and from the primary dune?

2.5.3 Will the development impact on coastal areas with significant landforms including beach ridge plain, cuspate headland, coastal dunes or karst?

☐ Yes ☐ No **If yes**, please describe the extent of the expected impact.

2.5.4 Is the development likely to impact on mangroves?

☐ Yes ☐ No **If yes**, please describe the extent of the expected impact.

2.6 Marine Areas and Biota

2.6.1 Is the development likely to impact on an area of sensitive benthic communities, such as seagrasses, coral reefs or mangroves?

☐ Yes ✓No **If yes**, please describe the extent of the expected impact.

2.6.2 Is the development likely to impact on marine conservation reserves or areas recommended for reservation (as described in *A Representative Marine Reserve System for Western Australia*, CALM, 1994)?

☐ Yes ✓No **If yes**, please describe the extent of the expected impact.

2.6.3 Is the development likely to impact on marine areas used extensively for recreation or for commercial fishing activities?

☐ Yes ✓No **If yes**, please describe the extent of the expected impact, and provide any written advice from relevant agencies (e.g. Fisheries WA).

2.7 Water Supply and Drainage Catchments

2.7.1 Are you in a proclaimed or proposed groundwater or surface water protection area?

(You may need to contact the Department of Water (DoW) for more information on the requirements for your location, including the requirement for licences for water abstraction. Also, refer to the DoW website)

✓Yes No **If yes**, please describe what category of area.

The Project location falls within the South West Coast Groundwater Area. Groundwater resources are protected under the *Rights in Water and Irrigation Act 1914.* A 5C licence to take water will be applied for in consultation with the Department of Water.

2.7.2 Are you in an existing or proposed Underground Water Supply and Pollution Control area?

(You may need to contact the DoW for more information on the requirements for your location, including the requirement for licences for water abstraction. Also, refer to the DoW website)

☐ Yes ✓ No **If yes**, please describe what category of area.

2.7.3 Are you in a Public Drinking Water Supply Area (PDWSA)?

(You may need to contact the DoW for more information or refer to the DoW website. A proposal to clear vegetation within a PDWSA requires approval from DoW.)

☐ Yes ✓No **If yes**, please describe what category of area.

2.7.4 Is there sufficient water available for the proposal?

(Please consult with the DoW as to whether approvals are required to source water as you propose. Where necessary, please provide a letter of intent from the DoW)

✓ Yes ☐ No (please tick)

2.7.5 Will the proposal require drainage of the land?

☐ Yes ✓No **If yes**, how is the site to be drained and will the drainage be connected to an existing Local Authority or Water Corporation drainage system? Please provide details.

2.7.6 Is there a water requirement for the construction and/ or operation of this proposal?

(please tick) ✓ Yes **If yes**, complete the rest of this section.

☐No **If no**, go to the next section.

2.7.7 What is the water requirement for the construction and operation of this proposal, in kilolitres per year?

A maximum of 3750kL/annum will be abstracted from the Leederville Aquifer.

2.7.8 What is the proposed source of water for the proposal? (e.g. dam, bore, surface water etc.)

Water for the Proposal will be abstracted from the Western Foreshore Leederville Aquifer Bore, under the City of Mandurah water license GWL 158528(8).

2.8 Pollution

2.8.1 Is there likely to be any discharge of pollutants from this development, such as noise, vibration, gaseous emissions, dust, liquid effluent, solid waste or other pollutants?

(please tick) ✓Yes **If yes**, complete the rest of this section.

☐ No **If no**, go to the next section.

Noise is likely to be generated from construction and demolition activities

2.8.2 Is the proposal a prescribed premise, under the Environmental Protection Regulations 1987?

(Refer to the EPA's *General Guide for Referral of Proposals to the EPA under section 38(1) of the EP Act 1986* for more information)

☐ Yes ✓No **If yes**, please describe what category of prescribed premise.

2.8.3 Will the proposal result in gaseous emissions to air?

☐ Yes ✓ No **If yes**, please briefly describe.

2.8.4 Have you done any modelling or analysis to demonstrate that air quality standards will be met, including consideration of cumulative impacts from other emission sources?

☐ Yes ✓No **If yes**, please briefly describe.

2.8.5 Will the proposal result in liquid effluent discharge?

☐ Yes ✓No **If yes**, please briefly describe the nature, concentrations and receiving environment.

2.8.6 If there is likely to be discharges to a watercourse or marine environment, has any analysis been done to demonstrate that the State Water Quality Management Strategy or other appropriate standards will be able to be met?

☐ Yes ✓No **If yes**, please describe.

2.8.7 Will the proposal produce or result in solid wastes?

☐ Yes ✓No **If yes**, please briefly describe the nature, concentrations and disposal location/ method.

2.8.8 Will the proposal result in significant off-site noise emissions?

☐ Yes ✓No **If yes**, please briefly describe.

The major source of noise impacts is expected to be piling on marine mammals. Noise is not expected to present a significant environmental impact, as works will only be conducted between 0700–1900 Monday-Saturday, and not on Public holidays, in accordance with Regulation 13 (2) of the Environmental Protection (Noise) Regulations 1997

2.8.9 Will the development be subject to the Environmental Protection (Noise) Regulations 1997?

☐ Yes ✓No **If yes**, has any analysis been carried out to demonstrate that the proposal will comply with the Regulations?

Please attach the analysis.

Works will be carried out between 0700-1900 hours, Monday to Saturday and not on Public holidays, in accordance with Regulation 13 (2). See section 5.1.2 and Appendix G of the EIA document (BMT Oceanica 2014) for more information.

2.8.10 Does the proposal have the potential to generate off-site, air quality impacts, dust, odour or another pollutant that may affect the amenity of residents and other "sensitive premises" such as schools and hospitals (proposals in this category may include intensive agriculture, aquaculture, marinas, mines and quarries etc.)?

☐ Yes ✓ No **If yes**, please describe and provide the distance to residences and other "sensitive premises".

2.8.11 If the proposal has a residential component or involves "sensitive premises", is it located near a land use that may discharge a pollutant?

☐ Yes ✓ No ☐ Not Applicable

If yes, please describe and provide the distance to the potential pollution source

2.9 Greenhouse Gas Emissions

2.9.1 Is this proposal likely to result in substantial greenhouse gas emissions (greater than 100 000 tonnes per annum of carbon dioxide equivalent emissions)?

☐ Yes ✓No **If yes**, please provide an estimate of the annual gross emissions in absolute and in carbon dioxide equivalent figures.

2.9.2 Further, if yes, please describe proposed measures to minimise emissions, and any sink enhancement actions proposed to offset emissions.

2.10 Contamination

2.10.1 Has the property on which the proposal is to be located been used in the past for activities which may have caused soil or groundwater contamination?

☐ Yes ✓ No ☐ Unsure **If yes**, please describe.

2.10.2 Has any assessment been done for soil or groundwater contamination on the site?

✓ Yes ☐ No **If yes**, please describe.

Sediments of the Mandurah Channel were sampled and tested for contaminants against ANZECC/ARMCANZ (2000) ISQG-Low guidelines. No samples returned results above guideline trigger levels. See Section 4.3.4 of the BMT Oceanica (2014) for more information

2.10.3 Has the site been registered as a contaminated site under the *Contaminated Sites Act 2003*? (on finalisation of the CS Regulations and proclamation of the CS Act)

☐ Yes ✓No **If yes**, please describe.

2.11 Social Surroundings

2.11.1 Is the proposal on a property which contains or is near a site of Aboriginal ethnographic or archaeological significance that may be disturbed?

☐ Yes ✓No ☐ Unsure **If yes**, please describe.

An Aboriginal heritage impact report commissioned by the City of Mandurah (Yates 2014) found no sites of Aboriginal heritage significance occur within the Proposal area. See Section 4.4 of BMT Oceanica (2014) for more information.

2.11.2 Is the proposal on a property which contains or is near a site of high public interest (e.g. a major recreation area or natural scenic feature)?

✓ Yes ☐ No **If yes**, please describe.

The Mandurah Traffic Bridge sits within the Mandurah town CBD, and next to Hall Park, the Mandurah Foreshore and Mandjar Bay. A search of the Heritage Council inHerit Heritage Site Database shows four European heritage sites immediately adjacent to the study site that could be impacted by ground works for the Bridge footings:

- Tuckey's Store (heritage place no. 24392)
- Eureka Shops/Cottage (heritage place no. 3066)
- Brighton Hotel (heritage place no. 4186)
- Scott's Garage (heritage place no. 17178).

The Mandurah Traffic Bridge itself is currently listed on the City of Mandurah's Municipal Heritage Register and has been assessed by the State Heritage Office (SHO) as not meeting the threshold for being on the State Heritage register.

See Section 4.4.2 of BMT Oceanica (2014) for more information

2.11.3 Will the proposal result in or require substantial transport of goods, which may affect the amenity of the local area?

☐ Yes ✓ No **If yes**, please describe.

3. PROPOSED MANAGEMENT

3.1 Principles of Environmental Protection

3.1.1 Have you considered how your project gives attention to the following Principles, as set out in section 4A of the EP Act? (For information on the Principles of Environmental Protection, please see EPA Position Statement No. 7, available on the EPA website)

1. The precautionary principle.	✓ Yes	☐ No
2. The principle of intergenerational equity.	✓ Yes	☐ No
3. The principle of the conservation of biological diversity and ecological integrity.	✓ Yes	☐ No
4. Principles relating to improved valuation, pricing and incentive mechanisms.	✓ Yes	☐ No
5. The principle of waste minimisation.	✓ Yes	☐ No

3.1.2 Is the proposal consistent with the EPA's Environmental Protection Bulletins/Position Statements and Environmental Assessment Guidelines/Guidance Statements (available on the EPA website)?

✓ Yes ☐ No

3.2 Consultation

3.2.1 Has public consultation taken place (such as with other government agencies, community groups or neighbours), or is it intended that consultation shall take place?

✓Yes ☐ No **If yes**, please list those consulted and attach comments or summarise response on a separate sheet.

The community has been engaged extensively in the first two phases of the redevelopment of the Mandurah Traffic Bridge. Public feedback has been positive, with the majority of respondents understanding that the current bridge is in a poor state of repair, either needing extensive refurbishment or to be replaced. However, there is a very strong feeling that the current bridge is iconic and there are many memories attached to it. There was only one comment raised in regard to the environment.

In addition to community consultation, the CoM and MRWA have been in discussions with the following decision making authorities:

- Department of Water (DoW).
- Department of Transport (DoT).
- Department of Planning (DoP).
- Department of Lands (DoL).
- Office of the Government Architect.
- Water Corporation.

- Western Power.
- Atco Gas.
- National Broadband Network.
- Telstra Corporation

In-principle support has been gained from the DoT and DoW, with the DoP confirming that planning approval is not required. The DoL is working with MRWA to rededicate the land required for the project to road reserve. Further information is contained within Section 7 of the EIA Referral (BMT Oceanica 2014).

379400 379600 379800

6399600

N

50 25 0 50

Scale in metres

Western Foreshore

Eastern Foreshore

Old Mandurah Traffic Bridge

Mandurah Channel

6399400

Projection : UTM50 - Datum : GDA94
Produced by BMT Oceanica
Production : 07 Oct 2014, BD, AT, AT
Imagery : ESRI as at 24 Sep 2014
Project Ref : 1028 02_004_01mbridgeA5

Positional accuracy should be considered as approximate. Not for navigation.

Legend

Bridge Design Footprint

379400 379600 379800

Figure 1

Project Area and Design Footprint

370000
380000
6400000
6390000
6380000
N
2 1 0 2
Scale in kilometres
Comet Bay
MANDURAH
Mandurah Traffic Bridge
Mandurah Channel
Goegrup Lake
Black Lake
Serpentine River
Creery Wetlands
Boundary Island
Murray-Serpentine Channel
Murray River
Yunderup
Yunderup Approach Channel
Boodalan Island
INDIAN
OCEAN
Falcon
Dawesville Channel
Novara Boat Ramp Channel
Sticks Channel
Point Grey Channel
PEEL INLET
Dawesville Boat Ramp Channel
Dawesville
Carrabungup Nature Reserve
Parkridge Boat Ramp Channel
Harvey
Estuary
Herron Point
Clifton
Harvey River

Legend

- Peel-Yalgorup Ramsar Wetland
- Peel Inlet Waterways Conservation Act Management Area

Projection : UTM50 - Datum : GDA94

Produced by BMT Oceanica
Production : 07 Oct 2014, BD, AT, AT
Project Ref : 1028 02_004_01peelinletA4

Positional accuracy should be considered as approximate. Not for navigation.

BMT Oceanica

Figure 2
Ramsar Wetland and Peel Inlet Waterway

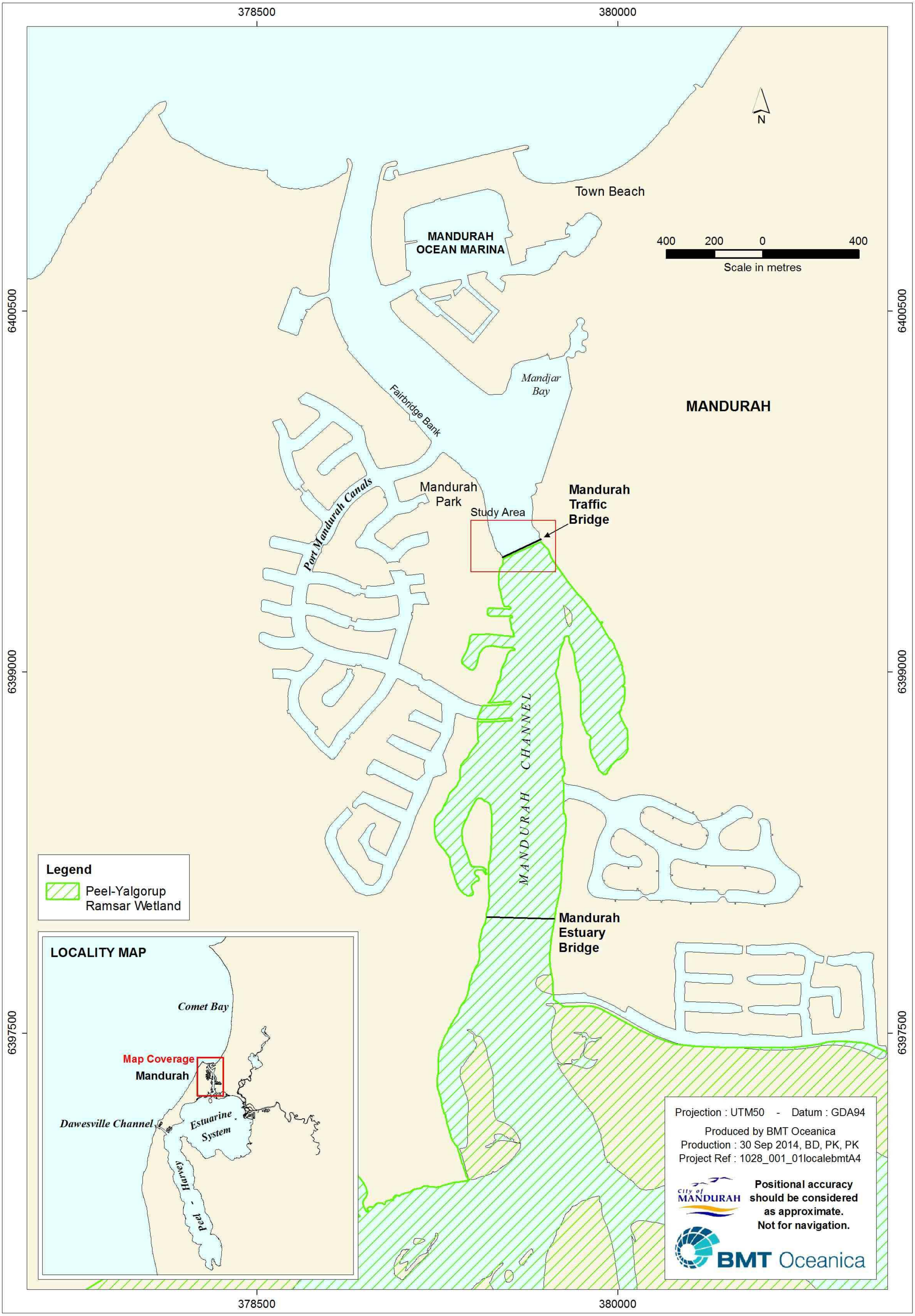
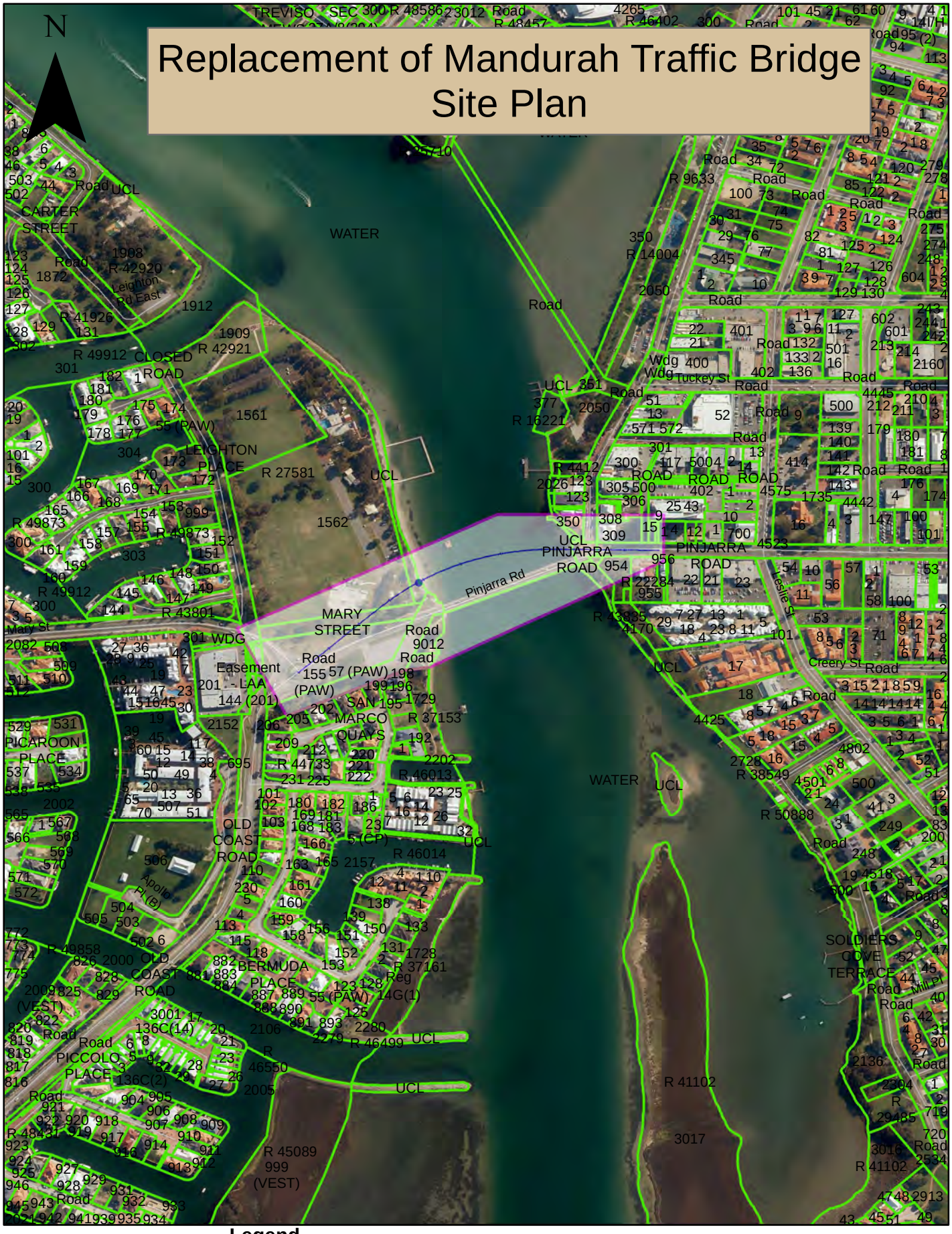
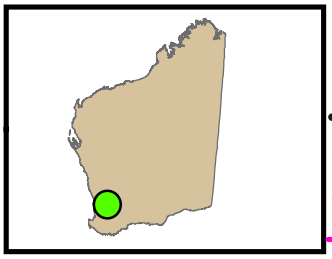


Figure 3
Peel Yalgorup Ramsar Wetland boundary

Figure 4 Locality Plan

Replacement of Mandurah Traffic Bridge Site Plan





Legend

Road Network

Network Type

- State Road
- Local Road
- Miscellaneous Road
- Project Area

Cadastral 2014

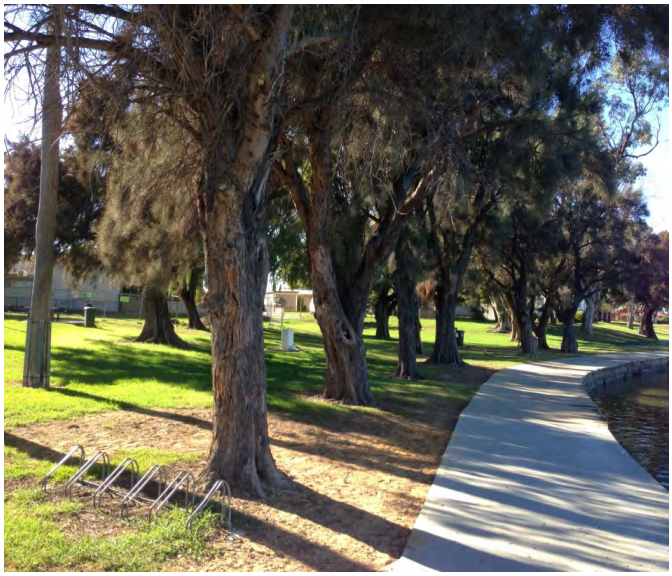
mainroads WESTERN AUSTRALIA

Figure 5 Site Plan

0 0.125 0.25 0.5 Kilometers

Figure 6 Existing Environment

BMT Oceanica



Mandurah Traffic Bridge Replacement Environmental Impact Assessment Referral Document

1028_02_004/1_Rev1
December 2014

Mandurah Traffic Bridge Replacement Environmental Impact Assessment Referral Document

Prepared for

City of Mandurah

Prepared by

BMT Oceanica Pty Ltd

December 2014

Report No. 1028_02_004/1_Rev1

Client: City of Mandurah

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Distribution

Revision	Author	Recipients	Organisation	No. copies & format	Date
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Review

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Quality Assurance

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Quality
ISO 9001
SAI GLOBAL

BMT Oceanica Pty Ltd has prepared this report in accordance with our Health Safety Environment Quality Management System, certified to AS/NZS ISO 9001: 2008.

Status

This report is 'Draft' until approved for final release, as indicated below by inclusion of signatures from: (i) the author and (ii) a Director of BMT Oceanica Pty Ltd or their authorised delegate. A Draft report may be issued for review with intent to generate a 'Final' version, but must not be used for any other purpose.

Approved for final release:

Author
Date: 28/11/2014

Director (or delegate)
Date: 28/11/2014

Cover

Main image: Mandurah Channel, Peel Harvey Estuary and Halls Head (BMT Oceanica Pty Ltd)
Minor images: *Pelecanus conspicillatus*, Mandurah Channel (BMT Oceanica Pty Ltd)
Casuarina sp., Mandurah Channel Foreshore (BMT Oceanica Pty Ltd)

Disclaimer

Contents

List of Figures

List of Tables

List of Appendices

Acronyms

AASS	Actual Acid Sulphate Soils
ANC	Acid Neutralising Capacity
ANZECC/ARMCANZ	Australia and New Zealand Environment and Conservation Council/Agriculture and Resource Management Council of Australia and New Zealand
AQIS	Australian Quarantine and Inspection Service
ASS	Acid Sulphate Soils
BPPH	Benthic Primary Producer Habitat
BWMP	Ballast Water Management Plan
CCW	Conservation Category Wetland
CDEMP	Construction and Demolition Environmental Monitoring Program
DEC	Department of Environment and Conservation (now DPaW)
DER	Department of Environment Regulation
DMA	Decision Making Authority
DPaW	Department of Parks and Wildlife
EAG	Environmental Assessment Guideline
EOI	Expressions of Interest
EP Act	*Environmental Protection Act (1986)*
EPA	Environmental Protection Authority
EPBC Act	*Environmental Protection and Biodiversity Conservation Act (1999)*
FRP	Filtered Reactive Phosphorous
HSE	Health Safety and Environment
IMP	Introduced Marine Pest
ISQG	Interim Sediment Quality Guidelines
LoR	Laboratory Limit of Reporting
MRWA	Main Roads Western Australia
NES	National Environmental Significance
NIMPCG	National Introduced Marine Pest Coordination Group
NVCP	Native Vegetation Clearing Permit
OSCP	Oil Spill Contingency Plan
PASS	Potential Acid Sulphate Soils
pH	The acidity or alkalinity of a solution on a logarithmic scale on which 7 is neutral, lower values are more acidic and higher values more alkaline
PHES	Peel-Harvey Estuary System
WA	Western Australia

1. Introduction

1.1 The proposal

Main Roads Western Australia (MRWA) and the City of Mandurah (CoM) propose to demolish and replace the Old Mandurah Traffic Bridge (The Bridge), which spans the Mandurah Channel at the northern end of the Peel Harvey Estuarine System (PHES). The Bridge is situated south of Mandjar Bay, which is a small embayment that is heavily used for recreation (Figure 1.1). The Bridge forms the northern extent of the Peel-Yalgorup Ramsar Wetland area, which covers the entire PHES.

The Bridge has reached the end of its functional life, and modelling indicates that there will be a future need for a four-lane Bridge to cater for increased commuter traffic volumes, as well as an expanded public transport system. The proposed new Bridge is likely to be of a concrete construction, located north of the existing Bridge (Figure 1.2, Figure 1.3). The CoM has undertaken extensive review of the Bridge design, with public and stakeholder input (see Section 7). It is anticipated that the construction of the new Bridge will require moderate seabed disturbance in the form of pile driving for the foundations, but will not involve dredging or disposal of sediment. The total area of the project is ~7 ha, of which 0.2 ha is native vegetation.

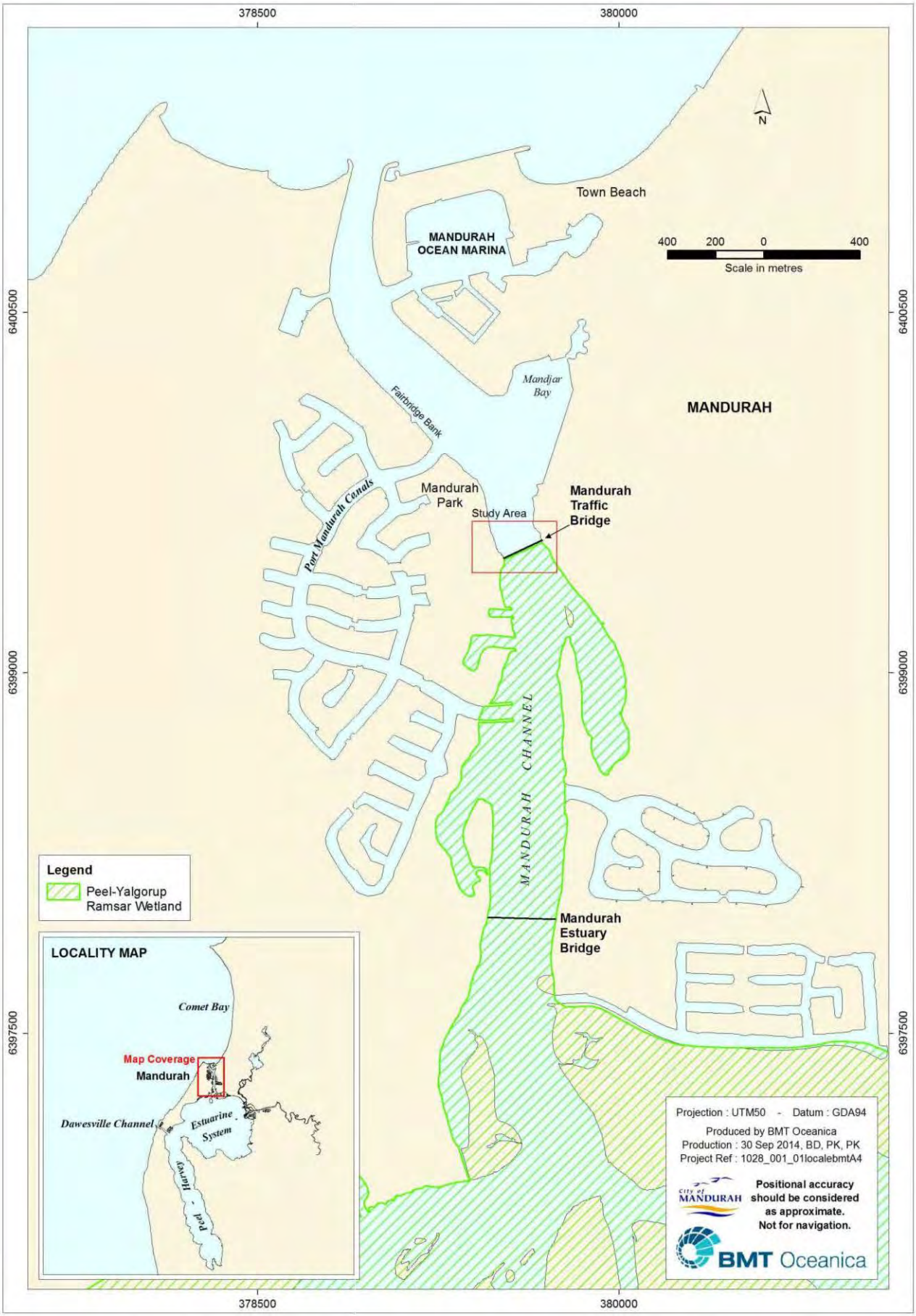
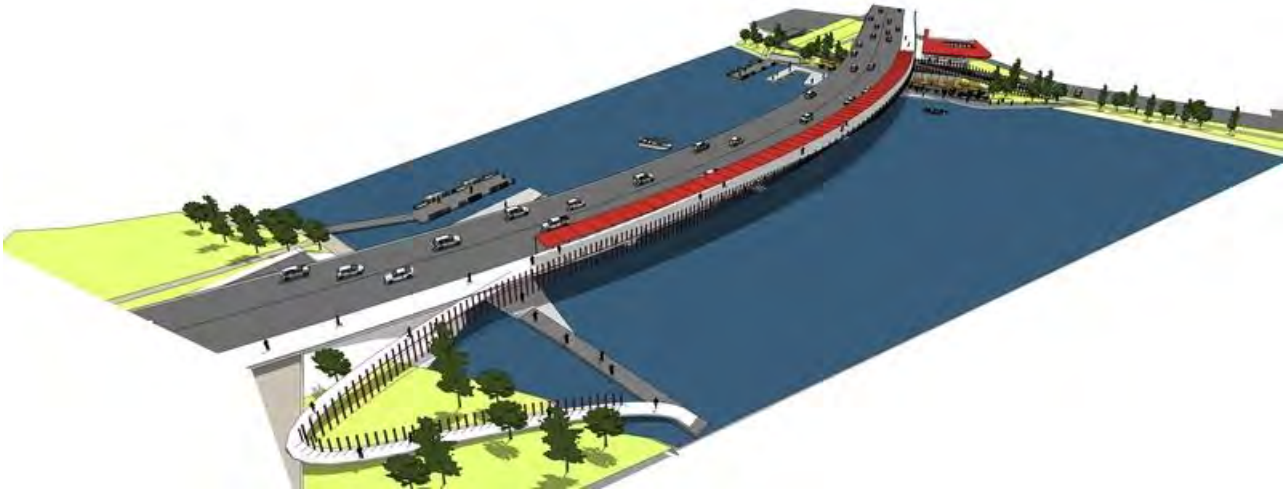


Figure 1.1 Locale map of the Mandurah Channel and proposed development area



Source: City of Mandurah (2013)

Figure 1.2 Proposed concept design for the new Mandurah Traffic Bridge

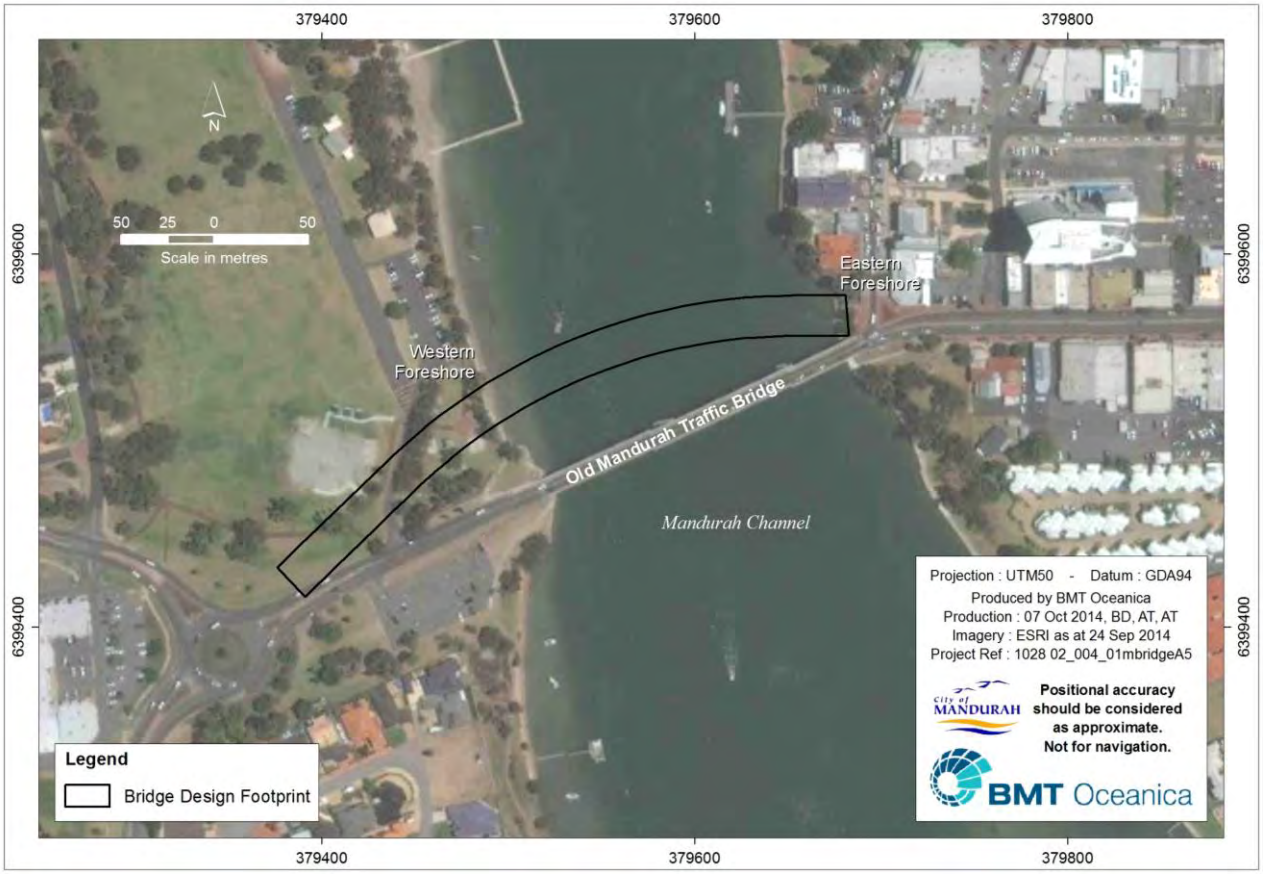


Figure 1.3 Proposed layout of the new Bridge

1.2 Proponent details

The name and legal address of the proponent and key project contacts are given in Table 1.1. While the City of Mandurah own the bridge, Main Roads WA will be delivering the Project, and will be the Proponent for the Project.

Table 1.1 Name and contact details of the project proponent and other key contacts

Role	Name and contact details
Proponent	**Main Roads Western Australia** Don Aitken Centre, Waterloo Crescent East Perth WA 6004
Principal	Ilario Spagnolo, Project Director, Main Roads WA Don Aitken Centre, Waterloo Crescent East Perth WA 6004
Environmental Consultant	Ben Davis Marine Scientist BMT Oceanica Pty Ltd 1/353 Cambridge Street, Wembley, WA, 6014 Tel:: 08 6272 0000 Email: ben.davis@bmtoceanica.com.au

1.3 This document

This document is submitted in accordance with Section 38(1) of the *Environmental Protection Act 1986* (EP Act), whereby the demolition and construction works are referred to the Environmental Protection Authority (EPA) for a decision on whether formal assessment is required (EPA 2012). This document provides a detailed assessment of the overall Project proposal, its potential environmental impacts and the proposed management of these impacts. The completed EPA referral form is attached at the front of this document.

1.4 Project justification

The Old Mandurah Traffic Bridge is at the end of its operational life and is in urgent need of replacement. The CoM, in conjunction with MRWA, has determined that the Bridge's age (constructed in 1953) and condition has resulted in a requirement to retire and replace the Bridge. In particular, the need for replacement is evidenced by the following:

- the poor condition of the existing Bridge, resulting from its age
- the application of a 17 tonne load limit by Main Roads, reducing the load carrying capacity of the Bridge
- the deficiencies from current Bridge design criteria (including design life, load capacity, carriageway width, shared path width, traffic and pedestrian barriers and street lighting).

In November 2012, the Minister for Transport established the Mandurah Bridge Replacement Community Reference Group, to ensure that the community was well represented during the decision making process associated with the replacement of the Bridge. A key outcome of the Community Reference Group was to make a recommendation to the State Government on the preferred option as part of a strategic business case.

The Strategic Business Case, presented to the Minister for Transport in July 2014, included the recommendation of the Minster's Community Reference Group to replace the existing Bridge with a new four lane, two-way Bridge and shared use path.

The preferred option (Figure 1.2, Figure 1.3) addresses the following key elements:

- capacity for current and future traffic demands (four lane, two–way allows for future traffic volume projections, makes provision for efficient public transport options and improves connectivity around the Mandurah City Centre)
- compliance with contemporary Bridge design criteria (including design life, load capacity, geometric design and traffic and pedestrian barriers)
- improved pedestrian and cyclist access (5 m wide shared use path)
- increased clearance for marine vessels (a similar clearance to the Mandurah Canal Bridges is expected to be achieved, i.e. 5.2 m above highest astronomical tide)
- minimal disruption to the community during construction. The proposed northern alignment of the new bridge means that the existing Bridge can continue to operate throughout the majority of construction so that closure to vehicular traffic and associated major disruption will then be limited to the period of connecting the eastern abutment
- the incorporation of other key community feedback issues, including:
  - local landmark structure
  - the provision of fishing platforms
  - maintaining the visual connection to water (to be addressed through the Bridge design, the shared use path and pedestrian connections including boardwalks and other vantage points)
  - the incorporation of social and historical heritage elements including indigenous heritage
  - minimising the potential impacts to the waterways and the surrounding environment, which was a primary concern of the local aboriginal elders (to be addressed through Bridge design and construction methodologies including proposed incremental launching techniques)
  - crime prevention through environmental design[1].

1.5 Key benefits

The key benefits of the demolition and replacement of the Bridge are:

- safer vehicle, pedestrian and cyclist movement through larger paths and roadways
- additional marine vessel clearance within the navigable channel
- improved spectator viewing for major events, including Crabfest and Extreme Action Sports Games within the Mandurah Channel
- the opportunity to incorporate and interpret social and historical heritage, including indigenous heritage, into the Bridge design through interpretive artwork, seating, signage and selective reuse of old Bridge materials
- crime prevention through environmental design
- improved social connectivity in and around the eastern and western foreshores of the Mandurah estuary and the city centre
- promotion of improved public transport outcomes through reduced congestion.

1.6 Schedule

A proposed schedule of works for the demolition and construction of the Bridge is provided in Table 1.2.

[1] *Crime prevention through environmental design (CPTED) is a multi-disciplinary approach to deterring criminal behaviour through environmental design, such as well lit, open spaces. CPTED strategies rely upon the ability to influence offender decisions that precede criminal acts.*

Table 1.2 Proposed schedule of works for the Project

Item	Timing
Advertisement of contractor Expression of Interest (EOI)	October 2014
Short-list of contractor proponents and approval to proceed to EOI	December 2014
Issue of Request for Proposal to selected proponents	December 2014
Assess and recommend preferred proponent	April 2015
Approval of the preferred proponent	May 2015
Award of construction and demolition contract	June 2015
Construction and demolition contract start	July 2015
Construction ground works commence	December 2015
Bridge shut-down period	November 2016
Construction works complete	July 2017
Demolition works commence	July 2017
Demolition works complete	October 2017
Project completion	October 2017

2. Project Description

2.1 Proposed activity

The CoM is looking to replace the existing Mandurah Traffic Bridge as the structure is reaching the end of its functional life. In order to minimise the disruption to bridge access by the public, it is proposed that the new Bridge will be built prior to the demolition of the old Bridge. Proposed construction and demolition methods are outlined below, and will be finalised once the contractor has been chosen to complete the works. The outlined Construction and Demolition Environmental Management Plan (CDEMP; see Section 6, Appendix G) will form part of the contractor procurement documentation. It is understood that there will be no requirement for dredging of the seabed for the Project.

2.2 Construction methods

The new Bridge will consist of a reinforced concrete structure, incrementally launched from the western abutment (Western Foreshore) to the eastern abutment (Eastern Foreshore). The Bridge structure is expected to span ~240 m from abutment to abutment. The structure is expected to be supported on 5 piers with these piers in turn supported on piles expected to be ~20 to 25 m in depth. In addition, it is likely that pile foundations would be required at the abutment on the Eastern Foreshore and may also be required at the abutment on the Western Foreshore (Figure 1.3).

2.3 Demolition methods

The old Bridge will most likely be dismantled incrementally from either the Eastern Foreshore or the Western Foreshore, or both (Figure 1.3). Some of the old Bridge materials are expected to be reused in recognition of the local heritage value, including the likelihood that the sets of piers closest to each abutment will be retained and reused as part of new fishing platforms, or similar. It is expected that existing piles will be removed to a depth marginally below the seabed with the remnant embedded pile sections being left in situ.

3. Regulatory Approvals

3.1 Decision making authorities

The following decision making authorities have been identified for the Project:

- Western Australian Environmental Protection Authority
- Commonwealth Department of Environment
- Western Australian Department of Environment Regulation
- Western Australian Department of Water
- Western Australian Department of Aboriginal Affairs
- Western Australian Department of Transport
- the City of Mandurah
- Main Roads Western Australia

3.2 Applicable and guidance material

3.2.1 Environmental Protection Act 1986

This document has been prepared to satisfy the requirements of an Environmental Referral to the Environmental Protection Authority (EPA) under the provisions of Part IV of the *Environmental Protection Act 1986* (EP Act) and in accordance with the *Administrative Procedures 2012* (EPA 2012). A completed formal Part IV (Section 38) Referral Form is attached at the beginning of this document.

Should the Project not be formally assessed by the EPA under Part IV of the EP Act, native vegetation clearing will be undertaken using the Main Roads WA State-Wide Clearing Permit CPS 818, in accordance with Part V of the EP Act. The clearing permit is required to clear ~0.2 ha of land on both the western and eastern foreshores for the Bridge footings (see Section 5.3.3).

3.2.2 Environmental Protection and Biodiversity Conservation Act 1999

The *Environmental Protection and Biodiversity Conservation* (EPBC) *Act 1999* is the Australian Government's central piece of environmental legislation, which is administered by the Commonwealth Department of Environment (DoE). The EPBC Act provides a legal framework for the protection and management of nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the Act as matters of national environmental significance. The Act applies to seven matters of national environmental significance, which are:

- world heritage sites
- national heritage places
- wetlands of international importance
- nationally threatened species and ecological communities
- migratory species
- commonwealth marine areas
- nuclear actions.

The proposed works (as described in this document) will be referred to the Commonwealth DoE (See Appendix A) because they may potentially have an impact on matters of NES (see Section 5.3).

3.2.3 EPA Environmental Assessment Guideline No. 3: Protection of Benthic Primary Producer Habitats in Western Australia's Marine Environment

The EPA's (2009) Environmental Assessment Guideline No. 3 (EAG3) applies only to seabeds in the intertidal and subtidal zones of WA coastal waters. The Project footprint occurs inland of the WA state coastal waters boundary, therefore EAG3 does not apply and is not triggered for this Project. The potential impacts of the project on BPPHs are considered in Section 5.3.1.

3.2.4 EPA Environmental Assessment Guideline No. 7: Environmental Assessment Guidelines for Marine Dredging Proposals

The EPA's (2011) Environmental Assessment Guideline No. 7 (EAG7) is not triggered for this Project, as no dredging is required for the construction of the new traffic Bridge (see Section 2.2 for construction methods).

3.2.5 Aboriginal Heritage Act 1972

A recent report commissioned by the CoM found that there are no sites of Aboriginal Heritage Significance that occur within the Project footprint (Yates 2014). Therefore, a Notice under Section 18 of the *Aboriginal Heritage Act 1972* will not be required.

3.2.6 Rights in Water and Irrigation Act 1914

As the Project interferes with the beds and banks of the Mandurah Channel it is likely that a Permit to Interfere with Beds and Banks (Form 3P) will be required under Sections 11, 17 and 21A of the *Rights in Water and Irrigation Act 1914*.

3.2.7 Waterways Conservation Act 1976

As the Project occurs within a *Waterways Conservation Act 1976* management area, a license may be required under Section 46 of the Act.

4. Description of the Environment

4.1 Background environmental studies

The sediments within the Project footprint were sampled and characterised in September 2014 (Section 4.3.4). A qualitative benthic habitat survey was also undertaken at the same time to validate the findings of previous surveys (Section 4.3.5). A terrestrial flora and fauna survey was undertaken in September 2014 by the City of Mandurah for the purposes of this EIA (Section 4.2.3 and 4.2.4).

The sediments of the Mandurah Channel have previously been analysed as part of several recent dredging programs. Sampling sites were centred around the Port Mandurah entrance canals (Oceanica 2006a, 2007a, 2009), Fair Bridge Bank (MRA 2004) and the ocean entrance to the channel (Oceanica 2007b, 2013) (Figure 1.1). Dredging studies have also occurred throughout the PHES as part of the Department of Transport's (DoT) maintenance dredging program (DALSE 2002, DALSE & JFA 2002, Oceanica 2007c, 2011a).

A recent environmental impact assessment was undertaken for the replacement of the Mandjar Bay seawall (RPS 2012). An environmental impact assessment was also prepared for the reconstruction of the Stingray Point seawall (Oceanica 2006b). The findings of these reports are included in Section 4.3.

In 2011 the DoT provided guidance for maintenance dredging in the PHES (Oceanica 2011b). The guidance outlines the procedures, techniques and requirements for an effective dredging EIA in the PHES, and is a useful tool for dredging applications and EIA in the PHES.

Many peer-reviewed studies have been conducted within the PHES, detailing the ecology, hydrology, flora and fauna of the wetland. DAL (1998) summarised a five-year study conducted on the PHES to determine the impact of the opening of the Dawesville Channel on the PHES. Key findings included an increase in tidal range within the PHES and associated changes in water chemistry, which resulted in less long-term macroalgal growth and more favourable conditions for estuarine biota. Hale and Butcher (2007) undertook a detailed overview of the ecology of the PHES, and found that the PHES supports an array of species and communities during critical life stages (including large numbers of migratory birds; breeding of waterbirds, fish, crabs and prawns; drought refuge for waterbirds, fish and invertebrates; and waterfowl such as shelducks and musk ducks during moulting). The PHES comprises the most important area for waterbirds in south-western Australia (Hale & Butcher 2007). Recent studies have focused on the population of bottlenose dolphins within the PHES and Mandurah Channel (Raeside 2013), and the hydrodynamics of the Port Mandurah Canals (Ellyard 2006). The findings of these studies are included in Section 4.3.

4.2 Terrestrial environment

4.2.1 Climate

The climate of Mandurah is typically Mediterranean with hot, dry summers and cool, wet winters. During summer, hot, dry easterly winds are common in the morning and are replaced by the south-westerly sea breeze most afternoons. Rainfall is low during summer, although occasional thunderstorms and decaying tropical cyclones can result in heavy rainfall (Hale & Butcher 2007). During winter, cold fronts cross the coast every 4-7 days and can bring heavy rainfall to the region. Passages of storms and cold fronts during winter are frequently interspersed with calm, clear days.

4.2.2 Hydrology

The main freshwater sources to the Mandurah Channel are direct rainfall and rainfall in the PHES catchment, both of which are highly seasonal. Rainfall arrives via surface water flows through rivers and drains, and through groundwater (Hale & Butcher 2007). The three major river systems that flow into the PHES are the Murray River, Serpentine River and Harvey River.

4.2.3 Terrestrial flora

The Commonwealth EPBC Act Protected Matters Search Tool (Appendix B) and Department of Parks and Wildlife (DPaW) NatureMap Database (Appendix C) and Florabase identify the following threatened flora species as potentially occurring in the area:

- king spider-orchid (*Caledinia huegelii*)
- matted centrolepis (*Centrolepis caespitosa*)
- dwarf bee-orchid (*Diuris micrantha*)
- Purdie's donkey-orchid (*Diuris purdiei*)
- glossy-leafed hammer–orchid (*Drakaea elastica*)
- dwarf hammer-orchid (*Drakaea micrantha*)
- hook-leaf isopogon (*Isopogon unicantus*)
- beaked lepidosperma (*Lepidosperma rostratum*)
- Wabling Hill mallee (*Eucalyptus argutifolia*).

The terrestrial footprint of the Project falls within a highly modified urban area. Few native plants exist in the small terrestrial footprint of the Project. The western bridge footing encompasses a park area with a small number of native *Casuarina* sp. trees (Figure 4.1). A terrestrial flora survey commissioned by the CoM in September 2014 (Appendix E) found that the vegetation within the footprint of the Project was degraded to completely degraded from anthropogenic activities. The survey found no remaining significant flora communities at the site, and did not identify any of the threatened species listed above.

Figure 4.1 *Casuarina* sp. trees adjacent to the western footing of the existing Mandurah Traffic Bridge

4.2.4 Terrestrial fauna

General

A search of the EPBC Act Protected Matters Search Tool (Appendix B) and DPaW NatureMap Database (Appendix C) identifies the following threatened and protected fauna species as potentially occurring within the Mandurah region:

- mammals
  - chuditch, western quoll (*Dasyurus geoffroii*)
  - western ringtail possum (*Pseudocheirus occidentalis*)
  - quokka (*Setonix brachyurus*)
  - southern brush-tailed phascogale (*Phascogale tapoatafa* subsp. *tapoatafa*)
  - western brush wallaby (*Macropus irma*)
  - quenda (*Isoodon obesulus* subsp. *fusciventer*)
- invertebrates
  - shield-backed trapdoor spider/black rugose trapdoor spider (*Idiosoma nigrum*)
  - graceful sun moth (*Synemon gratiosa*)
- birds
  - Australian lesser noddy (*Anous tenuirostris melanops*)
  - Australasian bittern (*Botaurus poiciloptilus*)
  - forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*)
  - Baudin's black cockatoo (*Calyptorhynchus baudinii*)
  - Carnaby's black cockatoo (*Calyptorhynchus latirostris*)
  - malleefowl (*Leipoa ocellata*)
  - Australian painted snipe (*Rostratula australis*)
  - Amsterdam albatross (*Diomedea exulans amsterdamensis*)
  - Tristan albatross (*Diomedea exulans exulans*)
  - wandering albatross (*Diomedea exulans (sensu lato)*)
  - fairy tern (Australian) (*Sternula nereis nereis*)
  - greater sand plover (Mongolian) (*Charadrius leschenaultii* subsp. *leschenaultii*)
  - common greenshank (*Tringa nebularia*)
  - southern giant petrel (*Macronectes giganteus*).

Given the small terrestrial footprint of the Project and the developed nature of the site, it is unlikely that any of the listed fauna occur in the proposal area. A full list of the species identified by the EPBC Act 1999 Protected Matters Search Tool is given in Appendix B and the DPaW NatureMap species report is given in Appendix C.

Water birds

The PHES is an internationally significant habitat for waterbirds, as recognised by its listing as a Wetland of International Importance under the Ramsar Convention (Government of Western Australia 1990, see Section 4.3). The majority of waterbirds found in the PHES (that may also occur in the Mandurah Channel) have been grouped into the following broad categories (EPA 1988):

- migratory waders (sandpipers, plovers, stilts)
- resident waders (banded stilts, red-capped plovers)
- long-legged waders (herons, egrets)
- fish-eating birds (pelicans, cormorants, terns)
- waterfowl (ducks, swans).

The Mandurah Channel, between the Mandurah Traffic Bridge and Mandurah Estuary Bridge (south of the Project) is recognised as a bird watching area, primarily for darters, cormorants, yellow-billed spoonbills and black-winged stilts (Birds Australia 2009). Birds are usually observed feeding in the marshes and islands of the inlet area. Mandurah Ocean Marina (Figure 1.1) and Dolphin Pool (north of the Project) are also a known bird watching areas for caspian, crested and fairy terns (Birds Australia 2009). Boundary Island, at the southern entrance to the Mandurah Channel, is a major breeding site for pelicans and fairy terns (Hale & Butcher 2007, Birds Australia 2009), and the adjacent Creery Wetlands are regularly used by over 20 000 waterbirds every year (Figure 4.2; Bamford & Bamford 2004).

4.3 Estuarine environment

4.3.1 Wetlands

The existing Mandurah Traffic Bridge forms the northern boundary of the Peel-Yalgorup Ramsar Wetland System (Government of Western Australia 1990; Figure 4.2). Ramsar wetlands are protected under the EPBC Act as a matter of National Environmental Significance (NES). A search of the DPaW Wetland Mapping tool also indicates that the site is within a conservation category wetland (CCW). CCW's are considered to be the highest priority wetland for conservation purposes under state policy, and any activity that may lead to further loss or degradation will be considered inappropriate (DPaW 2014). The Mandurah Bridge is also situated within the Peel Inlet Management Area defined under the *Waterways Conservation Act 1976* (Figure 4.2).

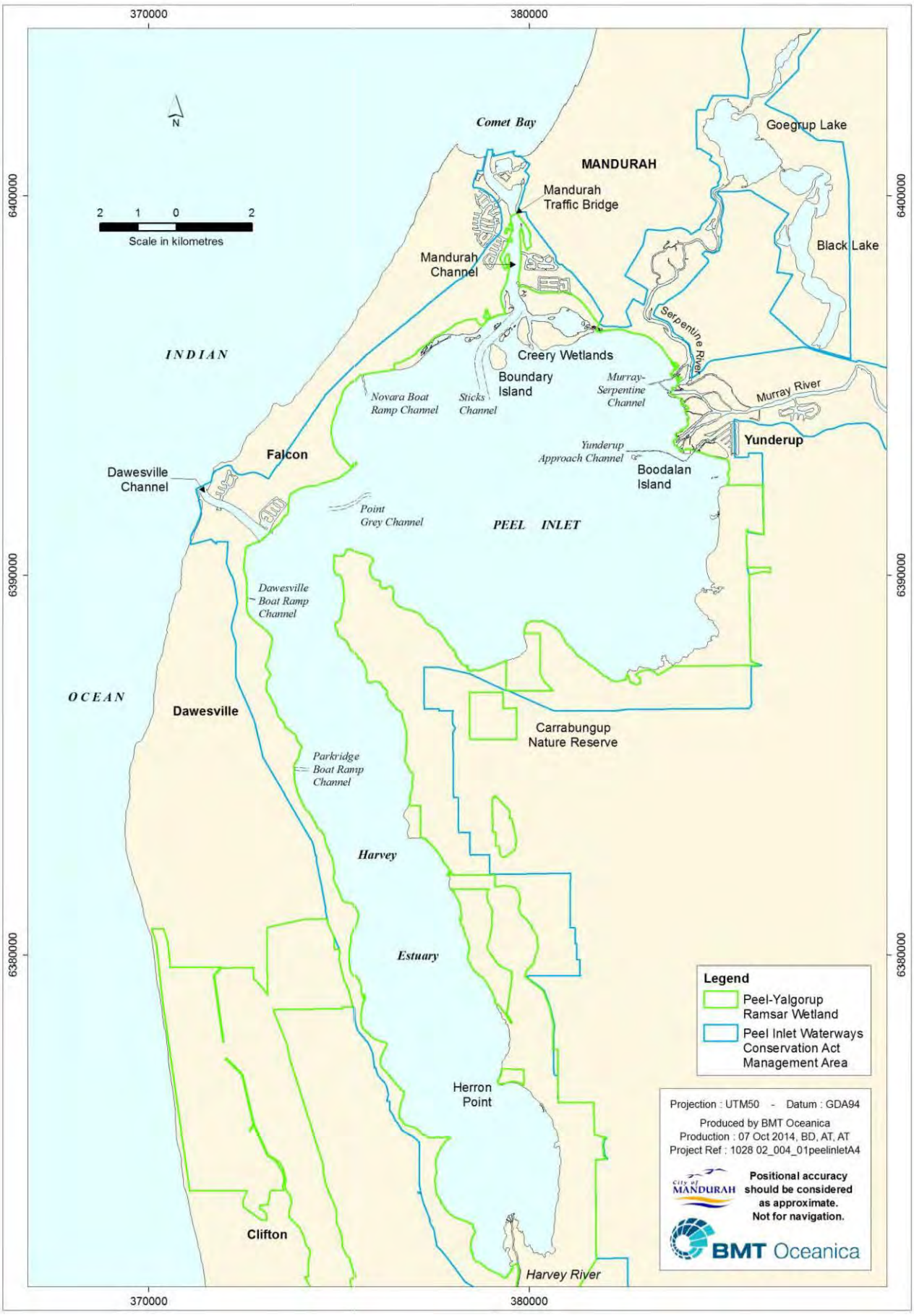


Figure 4.2 Extent of the Peel-Yalgorup Ramsar Wetland System and Peel Inlet Management Area

4.3.2 Hydrodynamics

The Mandurah Channel has experienced a number of anthropogenic modifications (DALSE & JFA 2002; MRA 2004; Oceanica 2006a), which include:

- construction of the Mandjar Bay and Stingray Point seawalls
- training of the Mandurah Channel entrance in 1967–68 and extensions in 1970 and 1988
- construction of the main seawall east of the Mandurah Channel entrance in 1975–77
- significant dredging of FairBridge Bank in 1977–78 (128 000 m^3), 1986 (230 000 m^3) and 1987 (152 000 m^3)
- annual sand bypassing at the Mandurah Channel entrance since 1985 (annual volumes have ranged from 44 000 m^3 to 168 000 m^3)
- construction of Port Mandurah and its entrance channels in 1989–90 and 1996
- alteration of flows due to the construction of Dawesville Channel in 1994
- construction of Mandurah Ocean Marina northern harbour in 2001 and ongoing development of the southern harbour.

These modifications have altered the hydrodynamics in the Mandurah Channel. Installation of the Dawesville Channel in 1994 increased the tidal range in the Mandurah Channel. Tides in the Mandurah Channel are typically diurnal, with a neap tidal range of 0.29 m and spring tide range of 0.74 m (Oceanica 2007a). These tides produce tidal current flows, exchanging significant volumes of water during a tidal cycle. Average flow through the Mandurah Channel has been observed to range between 0.46 and 0.59 m/s on the flood tide, and 0.40 and 0.54 m/s on the ebb tide. The daily tidal exchange occurring through the Mandurah Channel has been estimated at 6.6 x 10^6 m^3 (Oceanica 2007a).

4.3.3 Water quality

The estuarine water exiting via the Mandurah Channel is relatively turbid and has elevated levels of nutrients from catchment inputs compared with marine waters (Oceanica 2007a). However, the Mandurah Channel is tidally flushed and the water quality generally improves northwards as the influence of low-nutrient marine water from tidal flushing increases (Oceanica 2007a).

4.3.4 Sediment quality

The sediments of the Mandurah Channel have been previously characterised for dredging operations (Oceanica 2007a, 2009) and shown to consist of very fine to medium marine carbonate sands, with deeper, decomposing wrack layers. Nutrient levels are generally within the range expected for marine sediments.

The Mandurah Channel is zoned under the Western Australian Planning Commission Planning Bulletin No. 64 (WAPC 2007) as “high risk of actual acid sulphate soils (AASS) and potential acid sulfate soils (PASS) <3 m from the surface" although previous sampling has shown a high level of neutralising capacity within the estuarine waters (Oceanica 2007a). Sediments generally have a high pH, indicating the presence of PASS. However, studies have indicated that there is sufficient neutralising capacity in the sediments and seawater to counteract any acidity (Oceanica 2007a).

Sediment heavy metal concentrations have been consistently below the relevant ANZECC/ARMCANZ (2000) ISQG–Low trigger values (where available) (Oceanica 2007a, 2009), so there is likely to be negligible risk of toxicity due to metal release from the sediments under acidic conditions (Oceanica 2007a).

To verify the results of these previous studies, surface sediments were sampled at five sites within the Project footprint in September 2014 (Figure 4.3, Table 4.1). All sampling sites were distributed randomly within the target area using ArcGIS 10 software.

Figure 4.3 Sediment and video survey sampling sites

Table 4.1 Sediment and drop video sampling site coordinates

Site	Sampling Type	Coordinates (UTM 50S GD94)	
		Easting	Northing
MC 1	Sediment, drop video	379519.8	6399536
MC 2	Sediment, drop video	379545.4	6399545
MC 3	Sediment, drop video	379555.7	6399557
MC 4	Sediment, drop video	379612.4	6399569
MC 5	Sediment, drop video	379643.4	6399567
Video transect end point	Video start point	379656.9	6399568
Video transect end point	Video end point	379546.2	6399529

Methods

At each site a sediment sample was collected using a Van Veen grab. The sample was transferred from the grab, into a collection bucket, where it was described, homogenised and transferred into sample containers for laboratory analysis. Sediment samples consisted of the top 2 cm of sediments. The sediment samples were transported to the laboratories on the same day of sampling, in eskies with ice to keep the samples cool.

Sample analytes were chosen based on previous sampling and identified contaminants of concern (Oceanica 2007a, 2009). The following laboratory analyses were conducted on each sample:

- particle size analysis – using sedigraph for sizes from 4 to 2 000 µm and wet sieving for sediment >2000 µm
- total organic and inorganic carbon
- nutrients (total Kjeldahl nitrogen and total phosphorus) – Kjeldahl digest (sulfuric acid)
- elutriate nutrients (ammonium, nitrate/nitrite, filterable reactive phosphorus [FRP]) – volume ratio 1:4 sediment/seawater
- total metals (aluminium, arsenic, cadmium, chromium, copper, iron, mercury, nickel, silver, selenium and zinc) – digest with 3:1 hydrochloric/nitric acid (aqua regia)
- acid sulphate soils (ASS) analysis (following removal of material coarser than 2 mm) using chromium reducible sulfur suite method, described in Appendix D and DEC (2013).

Results and discussion

The sediments sampled were mostly medium–fine grained sandy material, with little organic material. Particle size distribution results revealed that the samples were predominantly sand (80–94%), with some silt (0.8–13%), clay (0.4–3.7%) and gravel (1.5–10.6%) (Table 4.2, Figure 4.4). Settling times were very short (<2.5 minutes for 90% of particles) across all sites, except for site MC 3, which had a settling time for 90% of particles of 9 minutes, most likely due to its higher silt content (Table 4.2). Particle size distribution laboratory reports are provided in Appendix F.

Table 4.2 Particle size distribution data for sediment sites MC 1–MC 5

Fraction name	Max size (µm)	Min size (µm)	MC 1 %	MC 2 %	MC 3 %	MC 4 %	MC 5 %
Gravel	10000	2000	1.5	2.4	1.7	2.6	10.6
Very coarse sand	2000	1000	4.1	3.9	0.3	8.7	6.3
Coarse sand	1000	500	24.1	21.9	0.5	42.6	16.1
Medium sand	500	212	45.2	21.3	5.1	32.3	22.8
Fine sand	212	106	19.0	40.9	68.9	12.2	32.6
Very fine sand	106	63	1.6	2.1	6.8	0.5	2.7
Total sand	**2000**	**63**	**94.0**	**90.1**	**81.5**	**96.3**	**80.5**
Coarse silt	63	31	2.2	3.2	8.0	0.4	3.6
Medium silt	31	16	0.6	1.1	1.9	0.1	1.1
Fine silt	16	8	0.5	0.8	1.6	0.1	0.9
Very fine silt	8	4	0.4	0.6	1.5	0.1	0.9
Total silt	**63**	**4**	**3.6**	**5.7**	**13.0**	**0.8**	**6.5**
Total clay	**4**	**0**	**0.9**	**1.8**	**3.7**	**0.4**	**2.3**

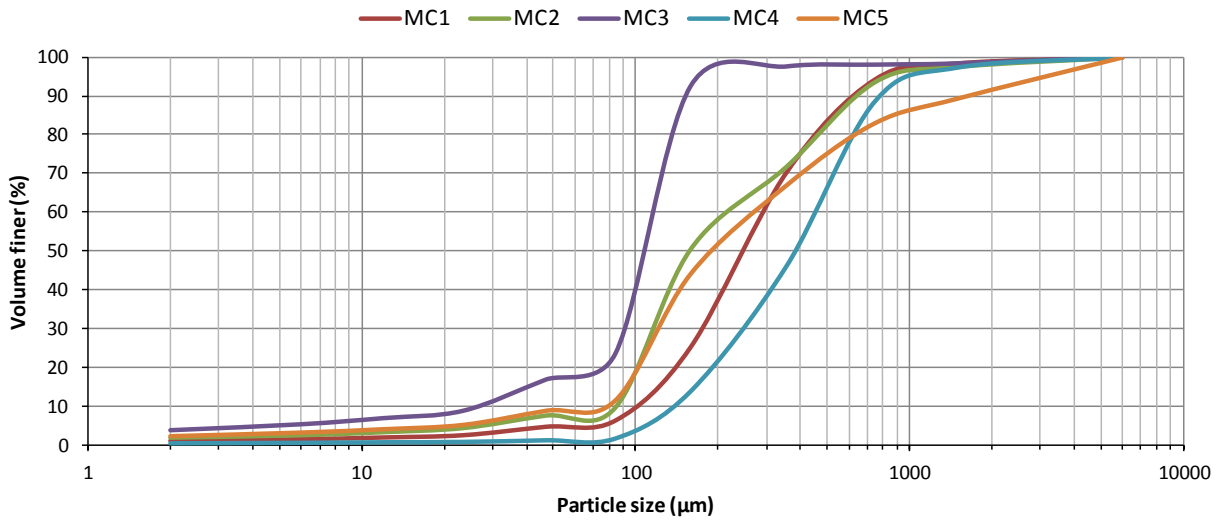


Figure 4.4 Particle size distributions for sediment sites MC 1–MC 5

Table 4.3 Settling velocities and times for 90% of particles at sediment sites MC 1–MC 5

	MC 1	MC 2	MC 3	MC 4	MC 5
Minimum settling velocity of 90% of particles (mm/s)	20.28	14.29	1.81	39.98	6.84
Time for 90% of particles to settle over 1 minute	0.82	1.17	9.00	0.42	2.44

Sediment chemical and metal analysis results were all either below the laboratory limit of reporting (LoR) or below the ANZECC/ARMCANZ (2000) ISQG-Low trigger level (Table 4.4). No ISQG trigger values exist for nutrients in sediments, however Total Kjeldahl Nitrogen (TKN) and Total Phosphorous (TP) values were within the range found in previous sediment surveys of the Mandurah Channel (Oceanica 2007a) and within the Perth coastal waters area (Rosich et al. 1994). Total recoverable hydrocarbon, Benzene, toluene, ethylbenzene, and xylenes (BTEX) and tributlin (TBT) results were all below the LoR (Table 4.4).

Quality assurance and quality control (QAQC) results for laboratory analysis indicated that the duplicate and spike recovery results were within acceptable limits. A full laboratory report is presented in Appendix F.

The sulphur values (%S (S_{CR})) of sites MC 1, MC 2, MC 3, and MC 5 exceeded the values of the Queensland Action Criteria (0.03%) (QEPA 2001) – note there are no values yet established for Western Australia (Table 4.5). The chromium suite method confirmed that MC 1, MC 2, MC 3, and MC 5 samples were PASS. However, the acid neutralising capacity (ANC) of the sediments in negative net acidity indicated that the potential acidity will be effectively buffered by alkaline components within the sediment. This excess neutralising capacity includes the recommended safety factor (fineness factor 1.5) when calculating neutralising requirements (Ahern et al. 2004).

In addition, monitoring of previous dredging projects within the PHES and Mandurah Channel indicated that during dredging the water column did not become acidic, even when sediments with a much higher sulfur content were present (Oceanica 2007a, MOM 2006). Therefore, it is expected that the water column pH during the construction and demolition works should remain above 7.

A full laboratory report is presented in Appendix F.

Table 4.4 Analyte concentrations and ISQG trigger values (where relevant) for sediment sites MC1–MC5

Analyte (unit)		LoR	ISQG-Low	ISQG-High	MC 1	MC 2	MC 3	MC 4	MC 5
Total metals	Arsenic (mg/kg)	0.5	n/a	n/a	8.2	4.1	4.9	3.6	6.3
	Cadmium (mg/kg)	0.4	1.5	10	<0.4	<0.4	<0.4	<0.4	<0.4
	Chromium (mg/kg)	0.5	80	370	6.7	7.1	9	3.8	7.4
	Copper (mg/kg)	0.5	65	270	7.3	3.4	1.9	0.8	3.4
	Lead (mg/kg)	0.5	50	220	2	1.8	2.3	1.6	4.8
	Mercury (mg/kg)	0.1	0.15	1	<0.1	<0.1	<0.1	<0.1	<0.1
	Nickel (mg/kg)	1	21	52	0.7	1.1	1.4	0.7	1.3
	Zinc (mg/kg)	1	200	410	2.2	3.2	4.8	2.7	6.7
Total Nutrients	Total Kjeldahl Nitrogen (mg/kg)	50	n/a	n/a	190	600	1400	100	470
	Total Phosphorous (mg/kg)	1	n/a	n/a	150	220	360	120	200
Elutriate Nutrients	Ammonium (mg/L)	1	n/a	n/a	0.68	1.5	7.6	0.24	1.3
	Nitrate/Nitrite (mg/L)	0.01	n/a	n/a	0.06	<0.01	<0.01	0.17	0.04
	Filtered Reactable Phosphorous (mg/L)	0.005	n/a	n/a	0.019	<0.005	<0.005	0.052	<0.005
Total Inorganic Carbon (mg/kg)		0.01	n/a	n/a	1000	3200	740	5200	3300
Total Organic Carbon (mg/kg)		0.01	n/a	n/a	51000	63600	82600	19300	47400
Poly-Aromatic Hydrocarbons (mg/kg)		0.1	n/a	n/a	<0.10	<0.10	<0.10	<0.10	<0.10
Total BTEX (mg/kg)		2.5	n/a	n/a	<2.5	<2.5	<2.5	<2.5	<2.5
Tribultyn (µg/kg)		0.5	n/a	n/a	<0.5	<0.5	<0.5	<0.5	<0.5
Total Recoverable Hydrocarbons (mg/kg)	TRH C6-C10	25	n/a	n/a	<25	<25	<25	<25	<25
	TRH C6-C10 less BTEX (F1)	25	n/a	n/a	<25	<25	<25	<25	<25
	TRH >C10-C16	50	n/a	n/a	<50	<50	<50	<50	<50
	TRH >C10-C16 less Nap(F2)	50	n/a	n/a	<50	<50	<50	<50	<50
	TRH >C16-C34	100	n/a	n/a	<100	<100	<100	<100	<100
	TRH >C34-C40	100	n/a	n/a	<100	<100	<100	<100	<100

Note:

1. n/a: No ANZECC/ARMCANZ (2000) trigger levels exist for this analyte.

Table 4.5 Acid sulphate soils results for sediment sampled at sediment sites MC1–MC5

Site[1]	%S (S_{CR})	Acid Neutralising Capacity (% $CaCO_3$)	Titratable Actual Acidity (mol H^+/t)	Net Acidity (mol H^+/t)
Action criteria	0.03	–	–	–
MC1	**0.04**	39	<1	-5170
MC2	**0.07**	35	<1	-4618
MC3	**0.15**	37	<1	-4835
MC4	0.02	n/a	<1	12
MC5	**0.08**	37	<1	-4879

Notes:

1. Values in bold exceed Queensland Action Criteria for disturbance of >1 000 tonnes of soils (DoE 2004, after QEPA 2001)
2. – no action criteria exist for this analyte

4.3.5 Benthic habitat

A drop-video benthic habitat survey was conducted in September 2014, to validate the benthic habitats described in Oceanica (2007a) and RPS (2012).

Methods

A high-definition video camera was deployed from a vessel, and towed ~0.5 m above the seafloor while recording footage at 5 sites within the Project footprint, and along one cross-channel transects (Figure 4.3, Table 4.1). Video footage was analysed by a qualified marine scientist to qualitatively describe the major benthic habitat types within the footprint of the Project.

Results and discussion

Habitats surveyed consisted of predominantly medium-coarse grained sand, with the western side of the channel having a fine covering layer of turfing algae and microphytobenthos (unicellular and eukaryotic algae and cyanobacteria [Beardall & Light 1994]) over some patches (Table 4.6).

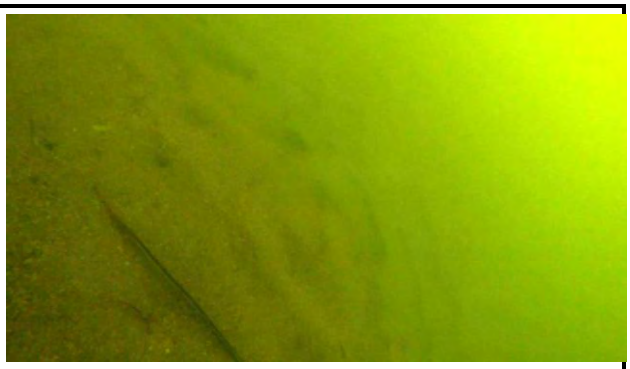
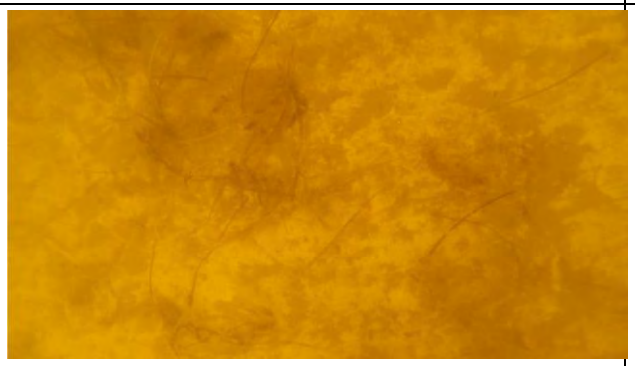
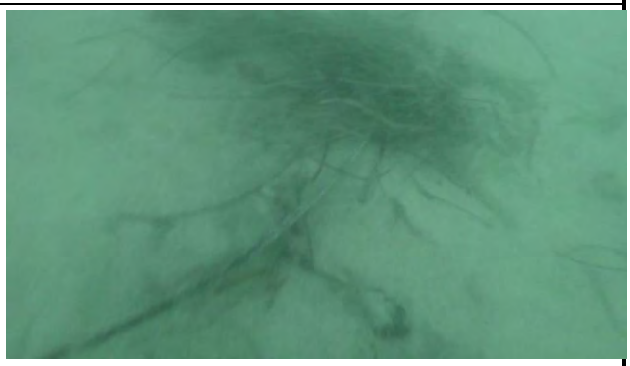
There were some areas of sparse seagrasses *Zostera* spp. and *Ruppia* spp., with large amounts of seagrass and algae wrack[2] also present (Table 4.6). Patches of *Zostera* spp. have been previously identified in Oceanica (2007a) in the vicinity of the Port Mandurah Entrance Channel, north of the Project site. *Ruppia* spp. are typically ephemeral[3], and are only present in the area for a short period of time (Waycott et al. 2014). Video footage from the eastern foreshore showed areas of large limestone rocks covered in turfing algae. Macroalgae and seagrass have also been previously identified in Mandjar Bay, just north of the Project footprint (RPS 2012).

Opportunistic species, such as the filamentous green algae *Chaetomorpha* spp., *Enteromorpha* spp., and *Cladophora* spp., commonly proliferate in this region due to the nutrient-enriched water, particularly during late-summer and autumn (Oceanica 2007a). Live algae and some wrack were identified during the September 2014 survey, however only in small amounts (<1 m^2 patches) (Table 4.6).

[2] *Detached, dead or decaying marine plants, typically seagrasses or seaweeds.*

[3] *Plants that have a short lifecycle, which generally does not persist in a habitat for an extended period.*

Table 4.6 Major benthic habitats indentified during the September 2014 benthic habitat survey

 Sand with turfing algae and microphytobenthos	 Bare sand
 Sand with seagrass and algal wrack	 Sparse seagrass *Ruppia* spp*. and Zostera* spp.
 Rock with turfing algae and sponge	 Seagrass and macroalgae wrack over sand

4.3.6 Geomorphology

The PHES forms part of the Holocene sediment body of the Swan Coastal Plain. The estuary sediments are predominantly silty-sandy, with high organic content. There are four sources of sediments into the estuary:

- Pleistocene soils eroded by wave action
- sand, silt, clay and organic matter transported via river flow
- marine sands from tidal currents
- organic matter which originates within the estuary.

Although organic matter is a natural component of the sediments in the estuary, large areas of surficial sediments have been found to contain high organic content, giving them a black, gel-like texture (these sediments are known as monosulfidic black ooze). Organic matter in estuarine sediments results from biological activity in the estuary and inputs from catchments. The rate of accumulation of organic matter is generally higher in eutrophic (i.e. nutrient-enriched) systems and where a large proportion of the catchment has been cleared and developed, such as the PHES.

4.3.7 Significant marine fauna

A number of commercially important fish and crustaceans use the upper part of the Mandurah Channel for part of their life cycles (Hale & Butcher 2007), including:

- yellow eye mullet (*Aldrichetta forsteri*)
- sea mullet (*Mugil cephalus*)
- cobbler (*Cnidoglanis macrocephalus*)
- blue manna crab (*Portunus pelagicus)*
- king prawn (*Melicertus sp*.).

The DPaW NatureMap Database search identified pouched lamprey (*Geotria australia*) as occurring in the study site, although this species is typically found in rivers south of Margaret River (Morgan et al. 1998).

No threatened or endangered marine mammals were identified from the EPBC Act Protected Matters Search Tool (Appendix B). However, Australian sea lions have several known rookeries among the offshore islands of Perth, with six islands documented as haul-out sites for males: Penguin, Seal, Carnac, Dyer and Little Islands and Burns Rock (Orsini et al. 2006). Penguin Island is the closest to the Mandurah Channel (~25 km north). Male Australian sea lions are known to forage 60–180 km away from their rookeries (Hamer et al. 2011). Therefore, while there are no rookeries or haul-out sites within the Mandurah Channel, it is likely that Australian sea lions may be infrequently sighted.

Among other marine mammal species, bottlenose dolphins (including both *Tursiops aduncus* and *T. truncatus*) are likely to occur in the Mandurah Channel (Appendix B). These dolphins are primarily found between the continental shelf and the coastline (<200 m water depth) in reef, sandy and seagrass habitats (DSEWPaC 2012). In the PHES, a resident population of 80–100 bottlenose dolphins are regularly sighted with known/identified individual dolphins (Zeppel 2007) and identified by the DPaW NatureMap Database (Appendix C). These dolphins regularly use the Mandurah Channel for feeding, socialisation and transit between the ocean and PHES (Raeside 2013). Studies showed that at least 46 dolphins often use the Mandurah Channel, with sightings more common in the channel compared to Mandjar Bay or Port Mandurah Canal Estate (Raeside 2013). As such, dolphin watching tourism has been one of the primary visitor attractions in Mandurah since 1999 (Zeppel 2007). Currently, there are at least two licensed operators that provide daily dolphin tours (CoM 2014). Therefore, as bottlenose dolphins are known to occur throughout the marine areas of Perth, including the PHES, it is likely that bottlenose dolphins may be encountered in the Mandurah Channel.

A search of the EPBC Act Protected Matters Search Tool and DPaW NatureMap Database found the following turtle species as potentially occurring in the area, although it is unlikely that turtles would venture into the Mandurah Channel:

- loggerhead turtle (*Caretta caretta*)
- green turtle (*Chelonia mydas*)
- leatherback turtle (*Dermochelys coriacea*)
- flatback turtle (*Natator depressus*).

4.4 Social environment

4.4.1 Heritage

A recent report commissioned by the CoM found that no sites of Aboriginal Heritage significance occur within the Project footprint (Yates 2014,).

A search of the Heritage Council *inHerit* Heritage Site Database shows four European heritage sites immediately adjacent to the study site that could be impacted by groundworks for the Bridge footings:

- Tuckey's Store (heritage place no. 24392)
- Eureka Shops/Cottage (heritage place no. 3066)
- Brighton Hotel (heritage place no. 4186)
- Scott's Garage (heritage place no. 17178).

4.4.2 Recreation

Mandurah Channel forms one of two access points between the ocean and PHES and is heavily used by recreational craft to transit between these water bodies. Numerous canals, small vessel jetties, the Mandurah Ocean Marina and several public boat ramps are located within the estuary and are frequently accessed and utilised by recreational vessels.

The area on the eastern side of the Bridge marks the southern limit of the Mandurah central business district and cafes and restaurants extend northwards to Mandjar Bay (Figure 1.1). A large public area, Hall Park, is immediately adjacent to the western end of the Bridge and includes public swimming areas and footpaths. The area underneath the Bridge is often used by recreational anglers for line fishing.

5. Environmental Impact Assessment and Significance

5.1 Sources of environmental impacts

5.1.1 Operational activities and disturbance to BPPH

Piling operations have been selected to have minimal impact on the Benthic Primary Producer Habitats (BPPH) of the Mandurah Channel. The construction and demolition methods that will be employed (Section 2.2 and 2.3) will not require dredging of the seabed, so there is not expected to be any direct removal of BPPH through dredging.

BPPH may be affected through the grounding of works vessels on the banks of the channel during operation, or from vessel anchoring or mooring. Additionally, there may be increased shading from the mooring of barges and works vessels in the Channel.

5.1.2 Construction/ and demolition noise, lighting and protected marine fauna

The largest contributor to noise is expected to be piling operations during construction. The use of heavy machinery, lifting equipment and demolition tools will likely generate further noise, both under and above water, during construction and demolition works.

Works will only be conducted between 0700–1900, Monday-Saturday, and not on public holidays, in accordance with Regulation 13 (2) of the *Environmental Protection (Noise) Regulations 1997*. As such, excessive lighting will not be required to illuminate the work site. Safety lighting may be employed to ensure safe transit of the Bridges for the public, or for security purposes. Daytime lighting may be required, however is not likely to have a significant environmental impact.

A Protect Matter Search Tool search returned a number of protected marine and terrestrial flora and fauna (Appendix B). However, the location of the Project, within the urban area of Mandurah, means that the likelihood of interactions with these fauna and flora are greatly reduced. The most significant risk of impact occurs with marine mammals, in particular the bottlenose dolphin (see Section 4.3.7).

5.1.3 Vessel activity and introduced marine pests

There is some risk of turbid plumes being generated from both piling operations and the operation of work vessels in the Mandurah Channel, most likely in the immediate vicinity of piling and vessel operations. However, the Mandurah Channel already experiences a high level of boat traffic throughout the year, and therefore a temporary increase during the Project is not likely to have a significant environmental impact.

The introduction of Introduced Marine Pests (IMP) into the Mandurah Channel from work vessels represents an environmental risk, particularly if these pests proliferate into the adjacent PHES. IMPs can be transferred through the introduction of ballast water or biofouling on vessels and works platforms.

5.1.4 Construction and demolition land clearing

The construction of the new Bridge will require clearing of some native vegetation on the foreshore (see Section 2.2). The area of vegetation to be cleared (~0.2 ha) is primarily parkland or developed public spaces (see Section 4.2.3).

Demolition of the old Bridge will likely require a 'lay down' area for the temporary storage of Bridge components prior to being transported off site. This area is to be located in existing road reserves (to be decommissioned with the construction of the new Bridge) so that no clearing of native vegetation will be required.

5.1.5 Construction and demolition activities and hydrocarbon/waste emissions

During the construction and deconstruction activities there is the potential for the release of hydrocarbons, hazardous substances and waste materials into the environment. These substances could come from one or more potential sources:

- work vessels/barges in the Mandurah channel
- work vehicles on the Mandurah Channel foreshores or Bridges
- work machinery
- construction and demolition materials.

Public access to the foreshore area will also be limited during the construction and demolition works.

5.2 Environmental factors

Environmental factors refer to parts of the environment that may be impacted by an aspect of a proposal (EPA 2013a). The environmental factors identified for the Project are listed in Table 5.1.

Table 5.1 Environmental factors identified for the Project

Theme	Environmental factor[1]
Sea	Benthic primary producer habitats (BPPH)
	Marine and estuarine fauna
Land	Terrestrial flora
	Terrestrial fauna
Water	Inland waters (wetlands) environmental quality
People	Public amenity

Note:
1. From EPA (2013a)

5.3 Potential environmental impacts

5.3.1 Benthic primary producer habitats

It is considered unlikely that there will be major impacts on BPPH due to construction of a new traffic Bridge, given that the only known flora occurring in the Mandurah Channel are opportunistic macroalgae and small amounts of seagrass, predominantly in Mandjar Bay. A video survey of the benthic habitats within the project footprint found no major BPPH (see Section 4.3.5) Further, turbidity levels during construction and operation are unlikely to be extensive or of long duration.

The sediments and habitats of the Mandurah Channel have been previously characterised for dredging operations (Oceanica 2007a, 2009). Piling and Bridge removal operations are likely to only affect the surface sediments through disturbance. Studies have indicated that there is sufficient neutralising capacity in the sediments and seawater to counteract any acidity (Oceanica 2007a, Section 4.3.4). Previous surveys in the area have suggested that there is little risk of contamination from heavy metals or nutrients. Sediment analysis conducted in September 2014 found that analytes were either < LoR or < ISQG-Low trigger level (ANZECC/ARMCANZ 2000), and had a high acid neutralising capacity. Therefore, it is not expected that there will be a significant environmental impact from the release of sediments from construction and demolition operations.

5.3.2 Marine and estuarine fauna

The largest impact to estuarine and marine fauna is likely to be the effect of noise from piling operations. Other sources of noise include the use of heavy machinery, construction and demolition equipment, power tools and earth-moving equipment.

Although influenced by location, water depth, and equipment, pile driving generates underwater noise that increases with pipe diameter and blow energy (Erbe 2009), thereby resulting in potential disturbance to marine fauna. Intense underwater sounds in close proximity to marine fauna may cause temporary or permanent hearing damage or death (Southall et al. 2007). The underwater noises generated by piling operations will likely impact on marine fauna, particularly bottlenose dolphins (Section 4.3.7). If a dolphin swims close to the pile driving hammer, the received underwater sound levels have the potential to directly damage their auditory system, including eardrum rupture and other gross pathological injuries with gas cavities and surrounding soft tissues (Bailey et al. 2010). In addition, intensive sound pressure waves may injure or kill fish by rupturing swim bladders and/or causing internal haemorrhaging (Popper & Hastings 2009).

Indirectly, underwater noise may interfere with the communication systems of fish and dolphins, masking important biological cues necessary for normal biological and/or ecological functioning or causing behavioural disturbance (Richardson et al. 1995, NRC 2005, Southall et al. 2007, Popper & Hastings 2009). These impacts may affect critical behaviours and functions, such as feeding, migration, breeding and response to predators, all of which may ultimately affect an individual animal's survival (NRC 2005). Depending on the duration and intensity of underwater noise, an animal may avoid the source of the disturbance completely, thus causing temporary or long-term avoidance of an area that may be important for feeding, reproduction or sheltering. The long-term negative impact would alter the animal's use and ecology of that marine environment. In general, the degree to which an individual animal is exposed to underwater noise is dependent upon the source sound pressure level and frequency as well as the species, size and condition of the fish (e.g. small fish are more prone to injury by intense sound waves than are larger fish of the same species; Popper & Hastings 2009).

The potential negative acoustic impacts from pile driving on dolphins have been documented for different species worldwide (Nedwell et al. 2003, David 2006, Erbe 2009, Brandt et al. 2011, Lucke et al. 2011). In shallow water, the underwater sound levels generated by pile driving was predicted to fatally kill a marine mammal within 20 m, while suffering moderately severe injury (e.g. eardrum rupture) at 70 m (Nedwell et al. 2003). In the North Sea, harbor porpoise acoustic activity within 2.6 km stopped completely up to one hour following commencement of pile driving for an offshore wind farm, with porpoise abundance levels reduced throughout the entire, five-month construction period (Brandt et al. 2011). In Queensland, Australia, none of the resident bottlenose dolphins were sighted during construction of a highway Bridge (Erbe 2009). The underwater sound levels were measured at sound exposure level of 183 dB *re* 1μPa^{2}s at 14 m from the source, which is just under the injury criteria of 198 dB *re* 1μPa^{2}s proposed for bottlenose dolphins (Southall et al. 2007). However, dolphin whistles and fish chorusing were recorded while pile driving occurred in the Fremantle inner harbour in Western Australia, which regularly experiences a high level of anthropogenic sound from vessel traffic, dredging operations, and trains passing over Bridges (Salgado Kent et al. 2012).

5.3.3 Terrestrial flora

The highly degraded nature of the terrestrial flora within the Project footprint means that there is unlikely to be any major environmental impact from the removal of this vegetation. Clearing of ~0.2 ha of this highly degraded native vegetation will be required to allow for the construction of

the bridge footings and road reserve. The removal of this vegetation is unlikely to have any major impact on the surrounding environment.

5.3.4 Terrestrial fauna

The small terrestrial footprint of the Project (Figure 1.2) and the highly modified nature of the terrestrial environment mean that the fauna identified in Section 4.2.3 are unlikely to be affected by the proposed works. The localised nature of the Project will mean that mobile fauna (such as birds) will be able to avoid the Project with little to no impact.

Small estuarine islands ~2 km south of the Project are a popular resting and breeding place for birds (see Section 4.2.4). The construction of the Mariners Cove canal estate near to the Creery Wetlands (Figure 4.2) showed no long-term influence on bird species, however, a short term drop in bird numbers was noted while the entrance canal earth works were undertaken (Bamford & Bamford 2004). There is the potential for noise and lighting from the works to have an effect on these birds, however, the distance between these islands and the Project area means that there is unlikely to be a negative effect on the birds as a result of the Bridge works.

5.3.5 Inland waters (wetlands) environmental quality

As noted in Section 4.3.1, the existing Mandurah Traffic Bridge forms the northern boundary of the Peel-Yalgorup Ramsar Wetland System (Figure 4.2). A search of the DPaW Wetland Mapping tool also indicates that the site is within a conservation category wetland (CCW, DPaW 2014). Although the impact to the wetland area is expected to be minimal, there is the potential for IMPs to enter the wetlands via vessels involved in the Project, potentially negatively affecting the biodiversity of the wetland area. In addition, hydrocarbons, hazardous substances, or waste from the Project may have a negative impact on the wetlands.

Piling operations and the removal of the existing Mandurah Traffic Bridge are likely to result in an increase in turbidity levels above ambient conditions during the periods of the marine-based construction works. As there will be no dredging operations, turbid plumes are likely to be localised to the immediate vicinity of the Project footprint for a limited time during ground disturbing works. It is possible that there may be a sulfurous smell associated with some of the dislodged sediment as have been detected in previous dredging campaigns in the Port Mandurah Canals (Oceanica 2007a). However sulfurous smells were not recorded in a recent sediment quality investigation (Section 4.3.4).

It is anticipated that any turbidity or smell generated by the ground disturbance works will be an aesthetic concern rather than environmental, due to the short duration of the works and absence of light-dependent benthic habitat in the vicinity. This assumption is supported by monitoring undertaken during previous short dredging campaigns where turbidity levels return to ambient levels rapidly after the completion of works (CoM 2006, 2007, Oceanica 2007c).

The release of hydrocarbons, hazardous substances or waste from vessels and machinery could adversely affect water quality. The release of hydrocarbons or hazardous substances is considered unlikely, however controls shall be implemented in the CDEMP (see Appendix G) to ensure that any release is properly managed and monitored.

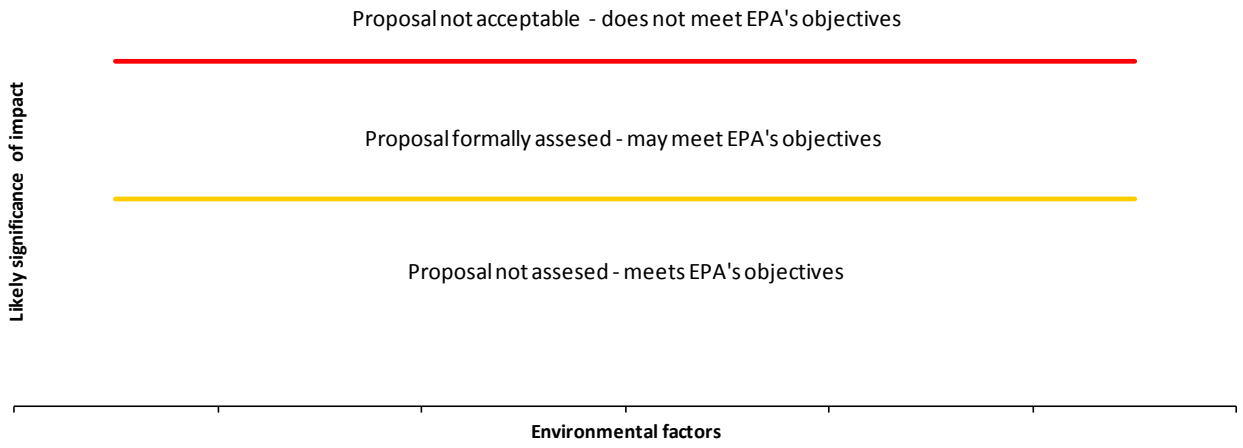
5.3.6 Public amenity

As noted in Section 4.4.2, the foreshore area and platforms beneath the existing Bridge are heavily used for recreational activities. The construction and demolition works will limit the availability of this area to the public, including where access to the foreshore area is completely restricted.

In addition, road works required for the Project will restrict vehicle access through the area, and potentially cause delays in crossing the channel. There will be a period of time (~3 months) where all vehicle traffic will be required to cross on the Mandurah Estuary Bridge, south of the Project.

5.4 Environmental factor impact significance assessment and management

An assessment has been undertaken in the context of the *Environmental Assessment Guideline for Application of a Significance Framework in the Environmental Impact Assessment Process* (EPA 2013b) to determine the potential significance of any environmental impact on the environmental factors associated with the demolition and construction works. A framework for determining the significance of any environmental impact and management is outlined in Figure 5.1, where environmental factors underneath the yellow line are not significantly impacted, and do not require management, and factors between the yellow and red lines require management to reduce the significance of the Project's impact. Factors above the red line have unacceptable impact significance.



Adapted from EPA (2013b)

Figure 5.1 Framework for decisions on whether to assess the proposal

If no environmental management is undertaken then there it is considered that there will be a significant environmental impact on the five environmental factors identified in Section 5.2 (Figure 5.2) As such, if no environmental management is undertaken then the significance of the environmental impacts of the Project on the environmental factors is considered sufficient to trigger a formal assessment by the EPA (Figure 5.2).

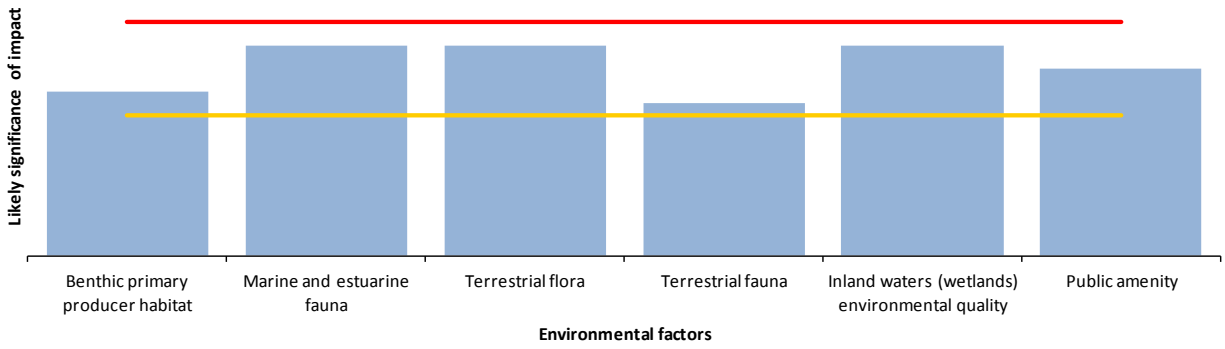


Figure 5.2 Perceived environmental factor impact significance without management

To reduce the significance of the impact to terrestrial flora, wetlands and water quality, and BPPH, regulatory licensing will be required from the decision making authorities identified in Section 3.1. The proposed licensing controls for each environmental factor are listed in Table 5.2.

Table 5.2 Regulator licensing applicable to the Project

Environmental factor	License name	Legislation	Regulatory authority
Terrestrial flora	Main Roads WA State-Wide CLeating Permti CPS818	Part V of the *Environmental Protection Act 1986*	Department of Environment Regulation
Inland waters (wetlands) environmental quality	Permit to Interfere with Beds and Banks (Form 3P)	Sections 11, 17 and 21A of the *Rights in Water and Irrigation Act 1914*	Department of Water
Benthic primary producer habitat Inland waters (wetlands) environmental quality	Section 46 License	*Waterways Conservation Act 1976*	Department of Parks and Wildlife

By obtaining the licences and permits outlined in Table 5.2, the significance of the environmental impact of the Project can be reduced. Issuing of the licenses and permits by the regulatory authorities indicates that the significance of the Project's environmental impact on the environmental factors has been assessed, and is considered to be acceptable (subject to any conditions that may be placed on the licence or permit). By obtaining the permits and licences outlined in Table 5.2, the significance of the Project's environmental impacts on terrestrial flora, and BPPH can be reduced to meet the EPA's objectives (Figure 5.3). The significance of the Project's environmental impacts, however, may not meet the EPA's objectives for each environmental factor (Table 5.1), so further management is required.

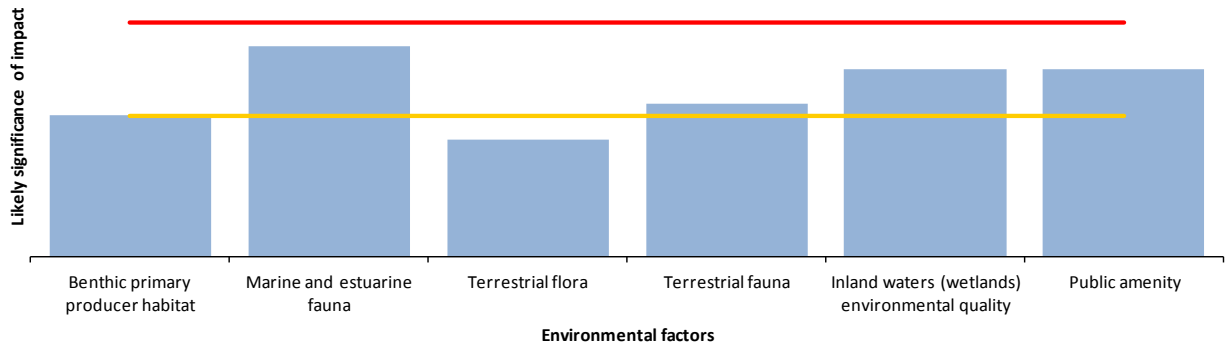


Figure 5.3 Perceived environmental factor impact significance with regulator licensing

To manage the impacts of the Project on all of the environmental factors, primarily wetlands and water quality, BPPH, estuarine and marine fauna, and public amenity, a series of environmental objectives (Table 5.3) and commitments (Table 5.4) have been developed for the project. These objectives and commitments have been developed to specifically reduce the significance of the Project's impact to meet the EPA's environmental objectives (EPA 2013b). These objectives and commitments will be implemented through the use of a CDEMP.

An outline of the CDEMP is presented in Appendix G, however, the CDEMP will be updated to a final version by the contractor awarded the construction and demolition activities, to meet the requirements of this EIA. The CDEMP will be approved by the Proponent (CoM) prior to any construction or demolition works commencing.

By implementing the management and monitoring requirements outlined in the CDEMP, the Project environmental objectives (Table 5.3) and commitments (Table 5.4) will be met, reducing the significance of the Project's impact to meet the EPA's objectives, for all environmental factors (Figure 5.4).

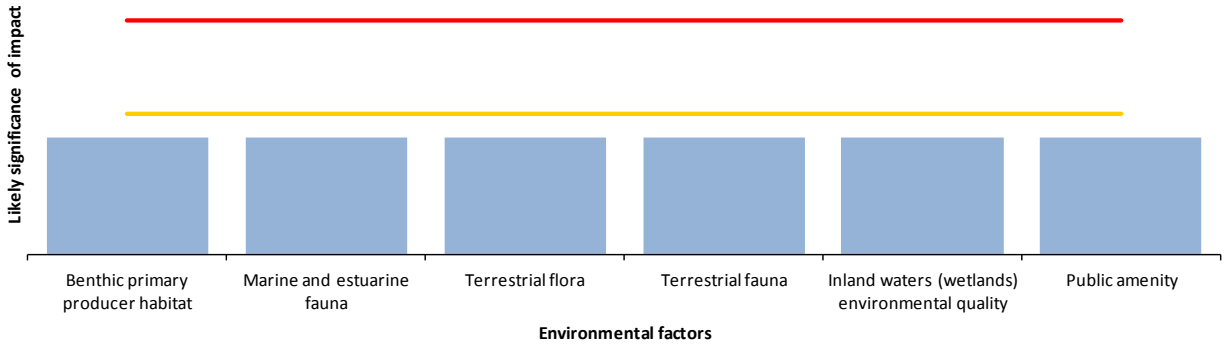


Figure 5.4 Perceived environmental factor impact significance with regulator licensing and CDEMP management controls

5.5 Environmental objectives and commitments

The EPA (2013a) lists an objective for each environmental factor that, if met, will indicate that the proposal is not expected to have a significant impact on the environment. The environmental objectives, performance objectives, standards/guidelines/policies and measurement criteria for the Project are summarised in Table 5.3.

An Environmental Commitments Register to manage the potential environmental impacts associated with the overall Project is listed in Table 5.4. The environmental commitments are largely derived from the management actions as defined in Section 5.4. All commitments listed in the register are measurable and/or auditable. The responsibility for each commitment is ultimately assigned to the CoM's Project Manager, but Project Managers from the contractors also have designated responsibility for various key commitments, as per Table 5.3.

Table 5.3 Environmental objectives, standards and measurement criteria

Environmental Factor	EPA Environmental Objectives[1]	Performance Objectives[2]	Standards[3]	Measurement Criteria[4]
Inland waters (wetlands) environmental quality	To maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected.	Introduced Marine Pest Species (IMP): Ensure marine pest species are not introduced into Mandurah Channel or the Peel Harvey Estuary as a result of the Project.	• Construction and Demolition Environmental Management Plan (CDEMP), including procedures for preventing introduction of marine pest species via ballast water and/or hull biofouling, in accordance with Australian Quarantine and Inspection Service (AQIS) and National Introduced Marine Pest Coordination Group (NIMPCG) guidelines.	• System in place to ensure all Project vessels entering Mandurah Channel adhere to CoM's CDEMP, including logging of environmental incidents involving IMP incursions (and near misses).

Marine fauna	To maintain the diversity, geographic distribution and viability of fauna at the species and population levels.	Ensure the risk of harm to susceptible marine fauna from Project piling and demolition noise emissions is acceptably low.	• CDEMP, detailing procedures for the management of piling and demolition works and resultant underwater noise, including:
			  • definition and maintenance of susceptible marine fauna exclusion zone (based on appropriate modelling);
			  • pile driver soft start-up procedures (to help facilitate avoidance by susceptible marine fauna).
				• Implementation and maintenance of marine fauna exclusion zone of 200 m during piling and demolition operations by on-deck surveillance and/or dedicated boat search prior to the commencement of driving each pile. System in place to record boat/deck searches and presence and location of susceptible marine fauna.
				• Piling to be undertaken during daylight hours only, to enable surveillance of exclusion zone.
				• Adherence to CDEMP soft start-up procedures.

Benthic primary producer habitat	To maintain the structure, function, diversity, distribution and viability of benthic communities and habitats at local and regional scales.	Ensure no loss of BPPH outside of the new traffic Bridge piling footprint.	Design controls to:
			• Ensure no dredging is required, to minimise direct footprint losses of BPPH to piling areas only
			• Construction and Demolition Environmental Management Plan (CDEMP), detailing procedures for:
			  • Barge anchor and pile placement, so as not to disturb BPPH
			  • Preventing accidental loss of equipment and materials, so as not to disturb BPPH.
				• System in place for logging of environmental incidents involving loss of BPPH, including spatial estimate of loss.

Inland waters (wetlands) environmental quality	To maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected.	Hazardous Substances and Waste: Ensure potential contaminants associated with the Project, e.g. fuels, hydraulic oils, lubricants, wastes (putrescibles and hydrocarbon-based), are not released to the environment.	• Construction and Demolition Environmental Management Plan (CDEMP), detailing procedures for:
			  • fuel storage as per AS1940 requirements
			  • waste storage and disposal
			  • refuelling procedures
			  • equipment inspection and servicing
			  • spill response (including oil spill response).
				• System in place to ensure records of incidents and regular inspections of equipment and storage/bunding integrity.
				• System in place to immediately deal with a hydrocarbon/contaminant spill.
				• Oil spill kit located nearby fuel storage, refuelling and servicing areas.

Terrestrial flora	To maintain representation, diversity, viability and ecological function at the species, population and community level.	No impact on native vegetation outside of the Project footprint.	Native Vegetation Clearing Permit CPS 818 under the *EP Act 1986* and associated conditions.	• System in place to ensure the Native Vegetation Clearing permit conditions are adhered to.

Terrestrial fauna	To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.	No impact to native birds utilising the Peel Harvey Estuary.	• CDEMP detailing procedures for the management of impacts to birds, including:
			  • reduced (safety and security) lighting at night.
			  • soft-start or ramp up during piling operations.
				• System in place to ensure CDEMP is followed.
				• Adherence to CDEMP soft-start up procedures.

Public amenity	To ensure that impacts to amenity are reduced as low as reasonably practicable.	Public access to the foreshore area is restricted as little as possible during the works.
		
		Vehicle access across the Mandurah Channel is restricted as little as possible.
			• CDEMP to clearly outline construction and demolition methods that:
			  • reduce the impact of the works on public access to the foreshore area.
			  • limit closure of the bridges to vehicles to as short a time as possible.
				• System in place to ensure CDEMP is followed.
				• Adherence to CDEMP construction and demolition methods and timeframes.

Notes:
1. EPA (2013a)
2. 'Performance Objectives' relates to the overall environmental goal (consistent with environmental policy) that an organisation sets itself to achieve
3. 'Standards' include; company standards, regulatory requirements, and recognised Australian and International standards
4. 'Measurement criteria' are measurable/auditable outcomes that ensure that the company's environmental performance objectives meet and/or surpass the standards

Table 5.4 Environmental commitments register

#	Key Environmental Commitment
1	No dredging of the seafloor will occur in the Mandurah Channel.
2	Vessels and barges shall not moor or land directly to the foreshore banks outside of the area of foreshore that is to be modified for the purpose of constructing the new Bridge.
3	Vessel and barges shall not be allowed to run aground on the seafloor during operations except when mooring to the foreshore that is to be modified for the purpose of constructing the new Bridge.
4	No works shall occur between 1900 and 0700 or on Sunday.
5	Minimal lighting only will be used overnight for security and safety purposes.
6	Night-time light levels should not exceed the ambient light level at the existing Mandurah Traffic Bridge.
7	AQIS Guidelines for ballast water exchange (when required) will be complied with at all times, as documented in the CDEMP.
8	Barges and works vessels will be clean of biofouling before arrival at the Mandurah Channel.
9	A 200 m exclusion zone will be maintained through dedicated on-deck surveillance or boat search for susceptible marine fauna prior to commencement and during pile driving each pile and during demolition.
10	Pile driving shall commence with soft/'fairy taps' to warn proximal marine fauna.
11	Waste shall be disposed of and stored in secured, lidded bins for appropriate onshore disposal.
12	A post-construction and demolition seabed visual survey shall be conducted to ensure no waste remains in the Mandurah Channel.
13	Lifting equipment shall be certified and crane operation shall be to Department of Commerce WorkSafe requirements to ensure safe operation and no loss of equipment/materials (refer to CDEMP).
14	Mechanical/hydraulic equipment and oil/fuel/lubricant storage areas will be regularly inspected (refer to CDEMP).
15	Any on-deck or on-shore spills and leaks of hydrocarbons or other contaminants (including during fuel transfer) shall be recovered promptly with spill-kits.
16	Fuels and lubricants, including waste-oil, shall be stored in accordance with Dangerous Goods requirements, including storage in bunded drums for licensed on-shore disposal.
17	Fuel pumps, tanks and storage areas will be regularly inspected.
18	Marine equipment and boats shall be operated by qualified personnel. Mooring lighting will be utilized on barges and moorings.
19	Supplier contracts shall require adherence to national/international legislative requirements for oil spill prevention (as per the CDEMP).
20	The boundary of the Native Vegetation Clearing Permit area will be clearly marked.
21	No clearing of native vegetation will occur outside of the permitted area.
22	Public access to the foreshore area around the bridges to be restricted as little as possible.
23	Vehicle access across the bridges to be restricted for no longer than 3 months during the works.

6. Implementation Strategy

6.1 Systems, management and review

Management systems, practices and procedures will be described in detail in the CDEMP (refer Appendix G). Workplace inspections and audits shall include a daily site inspection by a supervisor to control any hazards to an acceptable level and a detailed inspection of all current work areas conducted every month. In addition, Health, Safety and Environment (HSE) audits will be carried out at regular intervals, as documented in the CDEMP.

6.2 Contingencies

All employees have a responsibility to report incidents and accidents to the Site Supervisor as soon as practicable after the incident occurs. All incident reporting and investigation procedures, including emergency response procedures, are documented in detail in the CDEMP (refer Appendix G). For reporting purposes, environmental incident reports will be rolled up into the CoM existing Health, Safety and Environment (HSE) system.

6.3 Records

The CoM documentation and environmental records will be maintained and controlled in order to:

- leave an auditable trail for regulatory authorities
- demonstrate compliance with environmental legislation and works approval documentation
- record policies
- record and communicate employee roles and responsibilities
- record standards, procedures and work instructions
- document the results of any environmental monitoring, audits and reviews.

The CoM documents are either controlled[4] or uncontrolled[5], with controlled documents generated by the CoM registered with a formal document number, revision date and signed off by the responsible person.

6.4 Management responsibilities

The Senior Project Manager at the CoM has the overarching responsibility for management of the Project. The roles and responsibilities for all personnel (including contract personnel) working on the Project are obligated to demonstrate a duty of care to ensure that their actions and work practices do not have a detrimental effect on the environment.

The CDEMP (Appendix G) shall detail the specific responsibilities of Contractor personnel in relation to environmental management for the following positions during the construction phases of the Project:

- Managing Director
- Operations Manager
- Contracts Manager
- HSE Manager/Coordinator
- Project Manager
- Supervisors
- Employees and Subcontractors.

[4] *Controlled documents must be the same at any point and cannot be changed without authorisation.*

[5] *Uncontrolled documents refer to completed records, annual reports, monitoring results etc.*

6.5 Competence, training and awareness

In accordance with their roles and responsibilities, all personnel working on the Project shall be trained in the management of environmental risks and impacts.

As documented in the CDEMP outline (Appendix G), the Project Manager is responsible for ensuring adequate training is provided for personnel involved in the Project. All training completed shall be documented in the Induction/Training Register on site and copies of competencies shall be filed. Records will also be maintained in a central register at Head Office and copies of certificates, competencies and licences will be made available. Training shall include environmental training and competency and site inductions.

6.6 Communication

Communication and consultation on environmental issues is to be established and maintained with all parties involved in the Project. The CDEMP outline (Appendix G) details the means of communication in relation to environmental management, including the following means:

- kick-off meetings for contractors, clients and sub-contractors
- daily pre-start meetings
- toolbox meetings
- leadership visits
- statistical reporting.

All personnel are to have access to the information resulting from these processes.

7. Stakeholder Consultation

The community has been engaged extensively in the first two phases of the redevelopment of the Mandurah Traffic Bridge. Public feedback has been positive, with the majority of respondents understanding that the current bridge is in a poor state of repair, either needing extensive refurbishment or to be replaced. However, there is a very strong feeling that the current bridge is iconic and there are many memories attached to it. There was only one comment raised in regard to the environment. A full community consultation report is contained in Appendix H.

In addition to community consultation, the City of Mandurah and Main Roads WA have been in discussions with other decision making authorities (DMA), and have gained in-in -principle support for the project. Table 7.1 outlines DMA consultation undertaken, including key outcomes.

Table 7.1 DMA consultation details and outcomes.

Organisation/individual consulted	Contact	Initial contact date	Topics discussed	Outcomes
Department of Transport	Mark Briant	May 2014	Navigational channel/spans	Agreed dimensions and preferred location of navigational spans
Department of Water	Bob Pond	May 2014	Approval requirements	Agreement in principle received (Appendix H)
Department of Planning	Cameron Bulstrode	June 2014	Approval requirements	Letter received that no Development Approval is required from DoP
Department of Lands	Kylie Binks	June 2014	Land tenure requirements	Land tenure processes for the rededication of land to road reserve in progress
Office of the Government Architect	Melinda Payne	August 2014	Architectural objectives for the new bridge	OGA contributing to tender documentation and participating in tender evaluation
Water Corporation	Sylvain Cabanel	October 2013	Service relocation requirements	Design of relocation in progress
Western Power	Arash Faroughi	October 2013	Service relocation requirements	Design of relocation in progress
Atco Gas	Jim Richardson	October 2013	Service relocation requirements	Design of relocation in progress
NBN	Serkan Aktas	November 2014	Service relocation requirements	Design of relocation in progress
Telstra	Richard Prokojes	October 2013	Service relocation requirements	Design of relocation in progress

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Appendix A

DoE Referral Form

Australian Government
Department of the Environment

Referral of proposed action

What is a referral?

The *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) provides for the protection of the environment, especially matters of national environmental significance (NES). Under the EPBC Act, a person must not take an action that has, will have, or is likely to have a significant impact on any of the matters of NES without approval from the Australian Government Environment Minister or the Minister's delegate. (Further references to 'the Minister' in this form include references to the Minister's delegate.) To obtain approval from the Environment Minister, a proposed action should be referred. The purpose of a referral is to obtain a decision on whether your proposed action will need formal assessment and approval under the EPBC Act.

Your referral will be the principal basis for the Minister's decision as to whether approval is necessary and, if so, the type of assessment that will be undertaken. These decisions are made within 20 business days, provided sufficient information is provided in the referral.

Who can make a referral?

Referrals may be made by or on behalf of a person proposing to take an action, the Commonwealth or a Commonwealth agency, a state or territory government, or agency, provided that the relevant government or agency has administrative responsibilities relating to the action.

When do I need to make a referral?

A referral must be made for actions that are likely to have a significant impact on the following matters protected by Part 3 of the EPBC Act:

- World Heritage properties (sections 12 and 15A)
- National Heritage places (sections 15B and 15C)
- Wetlands of international importance (sections 16 and 17B)
- Listed threatened species and communities (sections 18 and 18A)
- Listed migratory species (sections 20 and 20A)
- Protection of the environment from nuclear actions (sections 21 and 22A)
- Commonwealth marine environment (sections 23 and 24A)
- Great Barrier Reef Marine Park (sections 24B and 24C)
- A water resource, in relation to coal seam gas development and large coal mining development (sections 24D and 24E)
- The environment, if the action involves Commonwealth land (sections 26 and 27A), including:
    - actions that are likely to have a significant impact on the environment of Commonwealth land (even if taken outside Commonwealth land);
    - actions taken on Commonwealth land that may have a significant impact on the environment generally;
- The environment, if the action is taken by the Commonwealth (section 28)
- Commonwealth Heritage places outside the Australian jurisdiction (sections 27B and 27C)

You may still make a referral if you believe your action is not going to have a significant impact, or if you are unsure. This will provide a greater level of certainty that Commonwealth assessment requirements have been met.

To help you decide whether or not your proposed action requires approval (and therefore, if you should make a referral), the following guidance is available from the Department's website:

- the Policy Statement titled Significant Impact Guidelines 1.1 – Matters of National Environmental Significance. Additional sectoral guidelines are also available.

- the Policy Statement titled Significant Impact Guidelines 1.2 - Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies.
- the Policy Statement titled Significant Impact Guidelines: Coal seam gas and large coal mining developments—Impacts on water resources.
- the interactive map tool (enter a location to obtain a report on what matters of NES may occur in that location).

Can I refer part of a larger action?

In certain circumstances, **the Minister may not accept a referral for an action that is a component of a larger action and may request the person proposing to take the action to refer the larger action for consideration under the EPBC Act (Section 74A, EPBC Act).** If you wish to make a referral for a staged or component referral, read 'Fact Sheet 6 Staged Developments/Split Referrals' and contact the Referrals Gateway (1800 803 772).

Do I need a permit?

Some activities may also require a permit under other sections of the EPBC Act or another law of the Commonwealth. Information is available on the Department's web site.

Is your action in the Great Barrier Reef Marine Park?

If your action is in the Great Barrier Reef Marine Park it may require permission under the *Great Barrier Reef Marine Park Act 1975* (GBRMP Act). If a permission is required, referral of the action under the EPBC Act is deemed to be an application under the GBRMP Act (see section 37AB, GBRMP Act). This referral will be forwarded to the Great Barrier Reef Marine Park Authority (the Authority) for the Authority to commence its permit processes as required under the Great Barrier Reef Marine Park Regulations 1983. If a permission is not required under the GBRMP Act, no approval under the EPBC Act is required (see section 43, EPBC Act). The Authority can provide advice on relevant permission requirements applying to activities in the Marine Park.

The Authority is responsible for assessing applications for permissions under the GBRMP Act, GBRMP Regulations and Zoning Plan. Where assessment and approval is also required under the EPBC Act, a single integrated assessment for the purposes of both Acts will apply in most cases. Further information on environmental approval requirements applying to actions in the Great Barrier Reef Marine Park is available from http://www.gbrmpa.gov.au/ or by contacting GBRMPA's Environmental Assessment and Management Section on (07) 4750 0700.

The Authority may require a permit application assessment fee to be paid in relation to the assessment of applications for permissions required under the GBRMP Act, even if the permission is made as a referral under the EPBC Act. Further information on this is available from the Authority:

Great Barrier Reef Marine Park Authority

2-68 Flinders Street PO Box 1379
Townsville QLD 4810
AUSTRALIA

Phone: + 61 7 4750 0700
Fax: + 61 7 4772 6093

www.gbrmpa.gov.au

What information do I need to provide?

Completing all parts of this form will ensure that you submit the required information and will also assist the Department to process your referral efficiently. If a section of the referral document is not applicable to your proposal enter N/A.

You can complete your referral by entering your information into this Word file.

Instructions

Instructions are provided in blue text throughout the form.

Attachments/supporting information

The referral form should contain sufficient information to provide an adequate basis for a decision on the likely impacts of the proposed action. You should also provide supporting documentation, such as environmental reports or surveys, as attachments.

Coloured maps, figures or photographs to help explain the project and its location should also be submitted with your referral. Aerial photographs, in particular, can provide a useful perspective and context. Figures should be good quality as they may be scanned and viewed electronically as black and white documents. Maps should be of a scale that clearly shows the location of the proposed action and any environmental aspects of interest.

Please ensure any attachments are below three megabytes (3mb) as they will be published on the Department's website for public comment. To minimise file size, enclose maps and figures as separate files if necessary. If unsure, contact the Referrals Gateway (email address below) for advice. Attachments larger than three megabytes (3mb) may delay processing of your referral.

Note: the Minister may decide not to publish information that the Minister is satisfied is commercial-in-confidence.

How do I pay for my referral?

From 1 October 2014 the Australian Government commenced cost recovery arrangements for environmental assessments and some strategic assessments under the EPBC Act. If an action is referred on or after 1 October 2014, then cost recovery will apply to both the referral and any assessment activities undertaken. Further information regarding cost recovery can be found on the Department's website.

Payment of the referral fee can be made using one of the following methods:

- **EFT Payments can be made to:**

  BSB: 092-009
  Bank Account No. 115859
  Amount: $7352
  Account Name: Department of the Environment.
  Bank: Reserve Bank of Australia
  Bank Address: 20-22 London Circuit Canberra ACT 2601
  Description: The reference number provided (see note below)

- **Cheque** - Payable to "Department of the Environment". Include the reference number provided (see note below), and if posted, address:

  The Referrals Gateway
  Environment Assessment Branch
  Department of the Environment
  GPO Box 787
  Canberra ACT 2601

- **Credit Card**

  Please contact the Collector of Public Money (CPM) directly (call (02) 6274 2930 or 6274 20260 and provide the reference number (see note below).

Note: in order to receive a reference number, submit your referral and the Referrals Gateway will email you the reference number.

How do I submit a referral?

Referrals may be submitted by mail or email.

Mail to:

Referrals Gateway
Environment Assessment Branch
Department of Environment
GPO Box 787
CANBERRA ACT 2601

- If submitting via mail, electronic copies of documentation (on CD/DVD or by email) are required.

Email to: epbc.referrals@environment.gov.au

- Clearly mark the email as a 'Referral under the EPBC Act'.
- Attach the referral as a Microsoft Word file and, if possible, a PDF file.
- **Follow up with a mailed hardcopy including copies of any attachments or supporting reports.**

What happens next?

Following receipt of a valid referral (containing all required information) you will be advised of the next steps in the process, and the referral and attachments will be published on the Department's web site for public comment.

The Department will write to you within 20 business days to advise you of the outcome of your referral and whether or not formal assessment and approval under the EPBC Act is required. There are a number of possible decisions regarding your referral:

The proposed action is NOT LIKELY to have a significant impact and does NOT NEED approval

No further consideration is required under the environmental assessment provisions of the EPBC Act and the action can proceed (subject to any other Commonwealth, state or local government requirements).

The proposed action is NOT LIKELY to have a significant impact IF undertaken in a particular manner

The action can proceed if undertaken in a particular manner (subject to any other Commonwealth, state or local government requirements). The particular manner in which you must carry out the action will be identified as part of the final decision. You must report your compliance with the particular manner to the Department.

The proposed action is LIKELY to have a significant impact and does NEED approval

If the action is likely to have a significant impact a decision will be made that it is a *controlled action*. The particular matters upon which the action may have a significant impact (such as World Heritage values or threatened species) are known as the *controlling provisions*.

The controlled action is subject to a public assessment process before a final decision can be made about whether to approve it. The assessment approach will usually be decided at the same time as the controlled action decision. (Further information about the levels of assessment and basis for deciding the approach are available on the Department's web site.)

The proposed action would have UNACCEPTABLE impacts and CANNOT proceed

The Minister may decide, on the basis of the information in the referral, that a referred action would have clearly unacceptable impacts on a protected matter and cannot proceed.

Compliance audits

If a decision is made to approve a project, the Department may audit it at any time to ensure that it is completed in accordance with the approval decision or the information provided in the referral. If the project changes, such that the likelihood of significant impacts could vary, you should write to the Department to advise of the changes. If your project is in the Great Barrier Reef Marine Park and a decision is made to approve it, the Authority may also audit it. (See "*Is your action in the Great Barrier Reef Marine Park,"* p.2, for more details).

For more information

- call the Department of the Environment Community Information Unit on 1800 803 772 or
- visit the web site http://www.environment.gov.au/topics/about-us/legislation/environment-protection-and-biodiversity-conservation-act-1999

All the information you need to make a referral, including documents referenced in this form, can be accessed from the above web site.

Referral of proposed action

Project title:

1 Summary of proposed action

1.1 **Short description**

Main Roads Western Australia (MRWA) and the City of Mandurah (CoM) proposes to demolish and replace the Old Mandurah Traffic Bridge (The Bridge), which spans the Mandurah Channel at the northern end of the Peel Harvey Estuarine System (PHES). The Bridge spans the Mandurah Channel, Pinjarra Road, Mandurah and is situated south of Mandjar Bay, which is a small embayment that is heavily used for recreation. The Bridge forms the northern extent of the Peel-Yalgorup Ramsar Wetland area, which covers the entire PHES. The total area of the project is 7 ha of which 0.2 ha is currently native vegetation. See Sections 1 and 2 of the EIA Referral (BMT Oceanica 2014) document for more information.

1.2 **Latitude and longitude**

location point	Latitude			Longitude		
	degrees	minutes	seconds	degrees	minutes	seconds
1	115°	43'	3.73"	32°	32'	3.53"
2	115°	43'	11.40"	32°	32'	3.53"
3	115°	43'	11.40"	32°	32'	5.66"
4	115°	43'	0.58"	32°	32'	10.56"
5	115°	42'	59.51"	32°	32'	10.66"
6	115°	42'	54.02"	32°	32'	12.75"
7	115°	42'	51.75"	32°	32'	8.75"

Also attach the associated GIS-compliant file that delineates the proposed referral area. If the area is less than 5 hectares, please provide the location as a point layer. If greater than 5 hectares, please provide a polygon layer. If the proposed action is linear (eg. a road or pipeline) please provide a polyline layer (refer to GIS data supply guidelines at Attachment A).

Do not use AMG coordinates.

1.3 **Locality and property description**

The project will take place on unallocated crown land. Approximately 50m2 of private land will be acquired to complete the project. The Bridge spans the Mandurah Channel, Pinjarra Road, Mandurah, and is adjacent to the Mandurah CBD.

1.4 **Size of the development footprint or work area (hectares)**

7 ha, of which ~0.2 ha is native vegetation.

1.5 **Street address of the site**

Pinjarra Road
Mandurah Channel
Mandurah, Western Australia 6210

1.6 **Lot description**

Class A Reserve 27581, Class C Reserve 27622

1.7 **Local Government Area and Council contact (if known)**

City of Mandurah, Mathew Hall
Manager Projects, Works & Services
Phone: +61 (8) 9550 3857
Address: 3 Peel St, Mandurah WA 6210
e-mail: Matthew.Hall@mandurah.wa.gov.au .

1.8	**Time frame** July 2015-October 2017. See Section 1.6 of the attached EIA Referral (BMT Oceanica 2014) document for more information		
1.9	**Alternatives to proposed action** Were any feasible alternatives to taking the proposed action (including not taking the action) considered but are not proposed?		No
		X	Yes, you must also complete section 2.2
1.10	**Alternative time frames etc** Does the proposed action include alternative time frames, locations or activities?	X	No
			Yes, you must also complete Section 2.3. For each alternative, location, time frame, or activity identified, you must also complete details in Sections 1.2-1.9, 2.4-2.7 and 3.3 (where relevant).
1.11	**State assessment** Is the action subject to a state or territory environmental impact assessment?		No
		X	Yes, you must also complete Section 2.5
1.12	**Component of larger action** Is the proposed action a component of a larger action?	X	No
			Yes, you must also complete Section 2.7
1.13	**Related actions/proposals** Is the proposed action related to other actions or proposals in the region (if known)?	X	No
			Yes, provide details:
1.14	**Australian Government funding** Has the person proposing to take the action received any Australian Government grant funding to undertake this project?	X	No
			Yes, provide details:
1.15	**Great Barrier Reef Marine Park** Is the proposed action inside the Great Barrier Reef Marine Park?	X	No
			Yes, you must also complete Section 3.1 (h), 3.2 (e)

2 Detailed description of proposed action

2.1 Description of proposed action

The City of Mandurah (CoM) and Main Roads WA (MRWA) are looking to replace the existing Mandurah Traffic Bridge as the structure is reaching the end of its functional life. In order to minimise the disruption to bridge access by the public, it is proposed that the new Bridge will be built prior to the demolition of the old Bridge. Proposed construction and demolition methods are outlined in the EIA Referral (BMT Oceanica 2014) and will be finalised once the contractor has been chosen to complete the works. The outlined Construction and Demolition Environmental Management Plan (CDEMP; see Section 6 of the EIA Referral (BMT Oceanica 2014)) will form part of the contractor procurement documentation. It is understood that there will be no requirement for dredging of the seabed for the Project.

See Sections 1 and 2 of the attached EIA Referral (BMT Oceanica 2014) for more information.

2.2 Alternatives to taking the proposed action

Several alternative options were considered, including taking no action, maintaining the current Bridge, and replacing the current Bridge. The CoM, in conjunction with MRWA, has determined that the Bridge's age (constructed in 1953) and condition has resulted in a requirement to retire and replace the Bridge. In particular, the need for replacement is evidenced by the following:

- the poor condition of the existing Bridge, resulting from its age
- the application of a 17 tonne load limit by Main Roads, reducing the load carrying capacity of the Bridge
- the deficiencies from current Bridge design criteria (including design life, load capacity, carriageway width, shared path width, traffic and pedestrian barriers and street lighting).

See Section 1.4 of the attached EIA for more information.

2.3 Alternative locations, time frames or activities that form part of the referred action

n/a

2.4 Context, planning framework and state/local government requirements

The Old Mandurah Traffic Bridge is at the end of its operational life and is in urgent need of replacement. The CoM, in conjunction with Main Roads Western Australia (Main Roads), has determined that the Bridge's age (constructed in 1953) and condition has resulted in the management mode classification of 'manage to failure' being activated.

In November 2012, the Minister for Transport established the Mandurah Bridge Replacement Community Reference Group, to ensure that the community was well represented during the decision making process associated with the replacement of the Bridge. A key outcome of the Community Reference Group was to make a recommendation to the State Government on the preferred option as part of a strategic business case.

Approval is required from several West Australian Government agencies. See Section 3.1 of the attached EIA document for more information.

2.5 Environmental impact assessments under Commonwealth, state or territory legislation

The project has also been referred to the Western Australia Environmental Protection Authority for assessment under the *Environmental Protection Act 1984.* See Section 3 of the attached EIA Referral (BMT Oceanica 2014) for more information on state assessments and approvals.

2.6 Public consultation (including with Indigenous stakeholders)

The community has been engaged extensively in the first two phases of the redevelopment of the Mandurah Traffic Bridge. Public feedback has been positive, with the majority of respondents understanding that the current bridge is in a poor state of repair, either needing extensive refurbishment or to be replaced. However, there is a very strong feeling that the current bridge is iconic and there are many memories attached to it. There was only one comment raised in regard to the environment.

In addition to community consultation, the City of Mandurah and Main Roads WA have been in discussions with the following decision making authorities:

- Department of Water (DoW).
- Department of Transport (DoT).
- Department of Planning (DoP).
- Department of Lands (DoL).
- Office of the Government Architect.
- Water Corporation.

- Western Power.
- Atco Gas.
- National Broadband Network.
- Telstra Corporation

In-principle support has been gained from the DoT and DoW, with the DoP confirming that planning approval is not required. The DoL is working with MRWA to rededicate the land required for the project to road reserve. Further information is contained within Section 7 of the EIA Referral (BMT Oceanica 2014).

2.7 A staged development or component of a larger project

n/a

3 Description of environment & likely impacts

3.1 Matters of national environmental significance

3.1 (a) World Heritage Properties

Description
N/A

Nature and extent of likely impact

The nearest World Heritage Property to the proposal is Shark Bay, which will not be impacted by the proposal

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3.1 (b) National Heritage Places

Description
N/A

Nature and extent of likely impact

The nearest National Heritage Place to the Proposal is the Fremantle Prison, which will not be impacted by the Proposal

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3.1 (c) Wetlands of International Importance (declared Ramsar wetlands)

Description

The existing Mandurah Traffic Bridge forms the northern boundary of the Peel-Yalgorup Ramsar Wetland System.

Nature and extent of likely impact

Although the impact to the wetland area is expected to be minimal, there is the potential for Introduced Marine Pests (IMPs) to enter the wetlands via vessels involved in the Project, potentially negatively affecting the biodiversity of the wetland area. In addition, hydrocarbons, hazardous substances, or waste from the Project may have a negative impact on the wetlands. Piling operations and the removal of the existing Mandurah Traffic Bridge are likely to result in an increase in turbidity levels above ambient conditions during the periods of the marine-based construction works. As there will be no dredging operations, turbid plumes are likely to be localised to the immediate vicinity of the Project footprint for a limited time during ground disturbing works. Any impact on the wetlands is expected to be short-lived, and localised to the section of Wetlands within the Mandurah Channel.

See Section 5.3.5 of the attached EIA Referral (BMT Oceanica 2014) for more information.

3.1 (d) Listed threatened species and ecological communities

Description

The following species were identified in a Protected Matters Search Tool and DPaW Nature Map Database report:

- mammals
  - chuditch, western quoll (*Dasyurus geoffroii*)
  - western ringtail possum (*Pseudocheirus occidentalis*)
  - quokka (*Setonix brachyurus*)
  - southern brush-tailed phascogale (*Phascogale tapoatafa* subsp. *tapoatafa*)
  - western brush wallaby (*Macropus irma*)
  - quenda (*Isoodon obesulus* subsp. *fusciventer*)
- invertebrates
  - shield-backed trapdoor spider/black rugose trapdoor spider (*Idiosoma nigrum*)
  - graceful sun moth (*Synemon gratiosa*)
- birds
  - Australian lesser noddy (*Anous tenuirostris melanops*)
  - Australasian bittern (*Botaurus poiciloptilus*)
  - forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*)
  - Baudin's black cockatoo (*Calyptorhynchus baudinii*)
  - Carnaby's black cockatoo (*Calyptorhynchus latirostris*)
  - malleefowl (*Leipoa ocellata*)
  - Australian painted snipe (*Rostratula australis*)
  - Amsterdam albatross (*Diomedea exulans amsterdamensis*)
  - Tristan albatross (*Diomedea exulans exulans*)
  - wandering albatross (*Diomedea exulans (sensu lato)*)
  - fairy tern (Australian) (*Sternula nereis nereis*)
  - greater sand plover (Mongolian) (*Charadrius leschenaultii* subsp. *leschenaultii*)
  - common greenshank (*Tringa nebularia*)
  - southern giant petrel (*Macronectes giganteus*).
- flora
  - king spider-orchid (*Caledinia huegelii*)
  - matted centrolepis (*Centrolepis caespitosa*)
  - dwarf bee-orchid (*Diuris micrantha*)
  - Purdie's donkey-orchid (*Diuris purdiei*)
  - glossy-leafed hammer–orchid (*Drakaea elastica*)
  - dwarf hammer-orchid (*Drakaea micrantha*)
  - hook-leaf isopogon (*Isopogon unicantus*)
  - beaked lepidosperma (*Lepidosperma rostratum*)
  - Wabling Hill mallee (*Eucalyptus argutifolia*).

The DPaW NatureMap Database search identified pouched lamprey (*Geotria australia*) as occurring in the study site, although this species is typically found in rivers south of Margaret River (Morgan et al. 1998).

No threatened or endangered marine mammals were identified from the EPBC Act Protected Matters Search Tool. However, Australian sea lions have several known rookeries among the offshore islands of Perth, with six islands documented as haul-out sites for males: Penguin, Seal, Carnac, Dyer and Little Islands and Burns Rock (Orsini et al. 2006). Penguin Island is the closest to the Mandurah Channel (~25 km north). Male Australian sea lions are known to forage 60–180 km away from their rookeries (Hamer et al. 2011). Therefore, while there are no rookeries or haul-out sites within the Mandurah Channel, it is likely that Australian sea lions may be infrequently sighted.

Sections 4.2 and 4.3.4 of the attached EIA Referral (BMT Oceanica 2014) outline the listed threatened species.

Nature and extent of likely impact

The highly degraded nature of the terrestrial flora within the Project footprint means that there is unlikely to be any major environmental impact from the removal of this vegetation. Clearing of ~0.2 ha of this highly degraded native vegetation will be required to allow for the construction of the bridge footings and road reserve. The removal of this vegetation is unlikely to have any major impact on the surrounding environment.

The small terrestrial footprint of the Project and the highly modified nature of the terrestrial environment mean that the fauna

identified above are unlikely to be affected by the proposed works. The localised nature of the Project will mean that mobile fauna (such as birds) will be able to avoid the Project with little to no impact.

The largest impact to estuarine and marine fauna is likely to be the effect of noise from piling operations. Other sources of noise include the use of heavy machinery, construction and demolition equipment, power tools and earth-moving equipment.

See Section 5.3 of the attached EIA Referral (BMT Oceanica 2014) for more information.

3.1 (e) Listed migratory species

Description

37 listed migratory species were identified by the EPBC Protected Matters Search Tool, the majority of which are bird species associated with wetland areas. These species use the Peel-Yalgorup Ramsar wetland system for roosting, foraging and breeding. The listed migratory species are:

- migratory marine birds
  - fork-tailed swift (*Apus pacificus*)
  - Amsterdam Albatross (*Diomedea amsterdamensis*)
  - Tristan albatross (*Diomedea exulans exulans*)
  - wandering albatross (*Diomedea exulans* (*sensu lato*))
  - flesh-footed shearwater (*Puffinus carneipes*)
  - roseate tern (*Sterna dougallii*)
- mgratory marine species
  - loggerhead turtle (*Caretta caretta*)
  - green turtle (*Chelonia mydas*)
  - leatherback turtle (*Dermochelys coriacea*)
  - mackerel shark (*Lamna nasus*)
  - flatback turtle (*Natator depressus*)
- migratory terrestrial species
  - white-bellied sea-eagle (*Haliaeetus leucogaster*)
  - malleefowl (*Leipoa ocellata*)
  - rainbow bee-eater (*Merops ornatus*)
- migratory wetlands species
  - great egret (*Ardea alba*)
  - cattle egret (*Ardea ibis*)
  - ruddy turnstone (*Arenaria interpres*)
  - sharp-tailed sandpiper (*Calidris acuminate*)
  - sanderling (*Calidris alba*)
  - red knot (*Calidris canutus*)
  - curlew sandpiper (*Calidris ferruginea*)
  - red-necked stint (*Calidris ruficollis*)
  - great knot (*Calidris tenuirostris*)
  - greater sand plover (*Charadrius leschenaultia*)
  - lesser sand plover (*Charadrius mongolus*)
  - grey-tailed tattler (*Heteroscelus brevipes*)
  - broad-billed sandpiper (*Limicola falcinellus*)
  - bar-tailed godwit (*Limosa lapponica*)
  - black-tailed godwit (*Limosa limosa*)
  - eastern curlew (*Numenius madagascariensis*)
  - little curlew (*Numenius minutes*)
  - whimbrel (*Numenius phaeopus*
  - pacific golden plover (*Pluvialis fulva*)
  - painted snipe (*Rostratula benghalensis* (*sensu lato*))
  - wood sandpiper (*Tringa glareola*)
  - common greenshank (*Tringa nebularia*)
  - marsh sandpiper (*Tringa stagnatilis*).

Nature and extent of likely impact

It is considered unlikely that the Project will have an impact on migratory species, as the localised nature of the Project will mean that mobile fauna (such as birds) will be able to avoid the Project with little to no impact. Te listed migratory marine

species typically do not occur in channels and estuaries, and so are unlikely to occur within the Project area.

There is the potential for noise and lighting from the works to have an effect on migratory birds, however, the distance between the Project area and bird habitats means that there is unlikely to be a negative effect on the birds as a result of the Bridge works.

See Section 5.3 of the attached EIA Referral (BMT Oceanica 2014) for more information.

3.1 (f) Commonwealth marine area

(If the action is in the Commonwealth marine area, complete 3.2(c) instead. This section is for actions taken outside the Commonwealth marine area that may have impacts on that area.).

Description

N/A

Nature and extent of likely impact

The Proposal is located outside of the Commonwealth Marine Area, and is unlikely to have an impact.

3.1 (g) Commonwealth land

(If the action is on Commonwealth land, complete 3.2(d) instead. This section is for actions taken outside Commonwealth land that may have impacts on that land.)

Description

N/A

Nature and extent of likely impact

The proposal is located outside of Commonwealth Land, and is unlikely to have a secondary impact on Commonwealth Land.

3.1 (h) The Great Barrier Reef Marine Park

Description
N/A

Nature and extent of likely impact

The Proposal is not within the Great Barrier Reef Marine Park

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3.1 (i) A water resource, in relation to coal seam gas development and large coal mining development

Description

N/A

Nature and extent of likely impact

The Proposal is not a coal seam gas or large coal mining development.

3.2 Nuclear actions, actions taken by the Commonwealth (or Commonwealth agency), actions taken in a Commonwealth marine area, actions taken on Commonwealth land, or actions taken in the Great Barrier Reef Marine Park

3.2 (a)	**Is the proposed action a nuclear action?**	X	No
			Yes (provide details below)
	If yes, nature & extent of likely impact on the whole environment		

3.2 (b)	**Is the proposed action to be taken by the Commonwealth or a Commonwealth agency?**	X	No
			Yes (provide details below)
	If yes, nature & extent of likely impact on the whole environment		

3.2 (c)	**Is the proposed action to be taken in a Commonwealth marine area?**	X	No
			Yes (provide details below)
	If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(f))		

3.2 (d)	**Is the proposed action to be taken on Commonwealth land?**	X	No
			Yes (provide details below)
	If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(g))		

3.2 (e)	**Is the proposed action to be taken in the**	X	No

Great Barrier Reef Marine Park?		Yes (provide details below)

If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(h))

3.3 Other important features of the environment

3.3 (a) Flora and fauna

Flora

The terrestrial footprint of the Project falls within a highly modified urban area. Few native plants exist in the small terrestrial footprint of the Project. The western bridge footing encompasses a park area with a small number of native *Casuarin*a sp. trees. A terrestrial flora survey in September 2014 found no remaining significant flora communities at the site, and did not identify any of the threatened species listed above.

A recent survey of the Mandurah Channel found some areas of sparse seagrasses *Zostera* spp. and *Ruppia* spp., with large amounts of seagrass and algae wrack also present. Ruppia spp. are typically ephemeral , and are only present in the area for a short period of time. Opportunistic species, such as the filamentous green algae *Chaetomorpha* spp., *Enteromorpha* spp., and *Cladophora* spp., commonly proliferate in this region due to the nutrient-enriched water, particularly during late-summer and autumn.

Fauna

The Mandurah Channel, between the Mandurah Traffic Bridge and Mandurah Estuary Bridge (south of the Project) is recognised as a bird watching area, primarily for darters, cormorants, yellow-billed spoonbills and black-winged stilts (BMT Oceanica 2014). Boundary Island, at the southern entrance to the Mandurah Channel, is a major breeding site for pelicans and fairy terns, and the adjacent Creery Wetlands are regularly used by over 20 000 waterbirds every year (BMT Oceanica 2014).

A number of commercially important fish and crustaceans use the upper part of the Mandurah Channel for part of their life cycles, including:

- yellow eye mullet (*Aldrichetta forsteri*)
- sea mullet (*Mugil cephalus*)
- cobbler (*Cnidoglanis macrocephalus*)
- blue manna crab (*Portunus pelagicus)*
- king prawn (*Melicertus sp.*).

Bottlenose dolphins (including both *Tursiops aduncus* and *T. truncatus*) are likely to occur in the Mandurah Channel. These dolphins are primarily found between the continental shelf and the coastline (<200 m water depth) in reef, sandy and seagrass habitats (BMT Oceanica 2014). In the PHES, a resident population of 80–100 bottlenose dolphins are regularly sighted with known/identified individual dolphins and identified by the DPaW NatureMap Database (Appendix C of BMT Oceanica 2014).

See Sections 4.2 and 4.3 of the Attached EIA Referral (BMT Oceanica 2014) for more information.

3.3 (b) Hydrology, including water flows

The main freshwater sources to the Mandurah Channel are direct rainfall and rainfall in the PHES catchment, both of which are highly seasonal. Rainfall arrives via surface water flows through rivers and drains, and through groundwater. The three major river systems that flow into the PHES are the Murray River, Serpentine River and Harvey River.

The Mandurah Channel has experienced a number of anthropogenic modifications. These modifications have altered the hydrodynamics in the Mandurah Channel. Tides in the Mandurah Channel are typically diurnal, with a neap tidal range of 0.29 m and spring tide range of 0.74 m (BMT Oceanica 2014). These tides produce tidal current flows, exchanging significant volumes of water during a tidal cycle. The daily tidal exchange occurring through the Mandurah Channel has been estimated at 6.6 x 106 m^3 (BMT Oceanica 2014).

See Section 4.2.2 and 4.3.2 of the attached EIA Referral (BMT Oceanica 2014) for more information.

3.3 (c) Soil and Vegetation characteristics

A terrestrial flora survey commissioned by the CoM in September 2014 (Appendix E of BMT Oceanica 2014) found that the vegetation within the footprint of the Project was severely impacted and degraded from anthropogenic activities. The survey found no remaining significant flora communities at the site, and did not identify any of the threatened species listed above.

See Sections 4.2.3 of the attached EIA Referral (BMT Oceanica 2014) for more information.

3.3 (d) Outstanding natural features

There are no outstanding natural features within the vicinity of the Project

3.3 (e) Remnant native vegetation

There is a small (0.2 ha) area of remnant native vegetation within he Project footprint. A recent (September 2014) survey found that existing vegetation was degraded to completely degraded from anthropogenic activities. The survey found no remaining significant flora communities at the site, and did not identify any of the threatened species listed above.

See Section 4.2.3 of the attached EIA Referral (BMT Oceanica 2014)

3.3 (f) Gradient (or depth range if action is to be taken in a marine area)

The Mandurah Channel is between 1-5 m deep; see Section 4.3 of the attached EIA Referral (BMT Oceanica 2014) for more information

3.3 (g) Current state of the environment

The current state of the environment within the Project footprint is degraded, and highly modified from anthropogenic activities. There is little to no remnant native vegetation within the site.

See Sections 4.2 and 4.3 of the EIA Referral (BMT Oceanica 2014)

3.3 (h) Commonwealth Heritage Places or other places recognised as having heritage values

A search of the Heritage Council inHerit Heritage Site Database shows four European heritage sites immediately adjacent to the study site that could be impacted by groundworks for the Bridge footings:

- Tuckey's Store (heritage place no. 24392)
- Eureka Shops/Cottage (heritage place no. 3066)
- Brighton Hotel (heritage place no. 4186)
- Scott's Garage (heritage place no. 17178).

See Sections 4.4 of the EIA Referral (BMT Oceanica 2014)

3.3 (i) Indigenous heritage values

A recent report commissioned by the CoM found that no sites of Aboriginal Heritage significance occur within the Project footprint. See Sections 4.4 of the EIA Referral (BMT Oceanica 2014) for more information.

3.3 (j) Other important or unique values of the environment

The Project is adjacent to the Peel-Yalgorup RAMSAR Wetland System, see Section 4.3.1 of the EIA Referral (BMT Oceanica 2014) for more information.

3.3 (k) Tenure of the action area (eg freehold, leasehold)

The current tenure of the land is Class A Reserve, Class C reserve, unallocated crown land, and private land. This land will be re-zoned to road reserve for the Project.

3.3 (l) Existing land/marine uses of area

The current land uses are primarily recreation, with some road reserve and private land used for commercial (350 Pinjarra Road).

3.3 (m) Any proposed land/marine uses of area

The land will be rededicated to road reserve

4 Measures to avoid or reduce impacts

A formal Environmental Impact Assessment (EIA) has been undertaken and is presented in the attached EIA Referral document (BMT Oceanica 2014). Specifically, Section 5 outlines the expected environmental impacts, their significance, and proposed mitigation measures, and is outlined below.

The major sources of environmental impact are expected to be:

- Operation activities and disturbance to benthic primary producer habitat (BPPH).
- Construction and demolition noise and lighting.
- Vessel activity and introduced marine pests.
- Construction and demolition land clearing.
- Construction and demolition activities, . resulting in hydrocarbon/ waste emissions

The following environmental factors are most likely to be impacted by the above sources:

- **Benthic Primary Producer Habitat**
    - It is considered unlikely that there will be major impacts on BPPH due to construction of a new traffic Bridge, given that the only known flora occurring in the Mandurah Channel are opportunistic macroalgae and small amounts of seagrass, predominantly in Mandjar Bay. A video survey of the benthic habitats within the project footprint found no major BPPH (see Section 4.3.5 of BMT Oceanica 2014) Further, turbidity levels during construction and operation are unlikely to be extensive or of long duration.
- **Marine and Estuarine Fauna**
    - The largest impact to estuarine and marine fauna is likely to be the effect of noise from piling operations. Other sources of noise include the use of heavy machinery, construction and demolition equipment, power tools and earth-moving equipment.
- **Terrestrial flora**
    - The highly degraded nature of the terrestrial flora within the Project footprint means that there is unlikely to be any major environmental impact from the removal of this vegetation
- **Terrestrial Fauna**
    - The small terrestrial footprint of the Project and the highly modified nature of the terrestrial environment mean that fauna are unlikely to be affected by the proposed works. The localised nature of the Project will mean that mobile fauna (such as birds) will be able to avoid the Project with little to no impact.
- **Inland waters (wetlands) environmental quality.**
    - Although the impact to the wetland area is expected to be minimal, there is the potential for Introduced Marine Pests to enter the wetlands via vessels involved in the Project, potentially negatively affecting the biodiversity of the wetland area. Piling operations and the removal of the existing Mandurah Traffic Bridge are likely to result in an increase in turbidity levels above ambient conditions during the periods of the marine-based construction works. As there will be no dredging operations, turbid plumes are likely to be localised to the immediate vicinity of the Project footprint for a limited time during ground disturbing works. The release of hydrocarbons, hazardous substances or waste from vessels and machinery could adversely affect water quality. The release of hydrocarbons or hazardous substances is considered unlikely,
- **Public amenity**
    - As noted in Section 4.4.2, the foreshore area and platforms beneath the existing Bridge are heavily used for recreational activities. The construction and demolition works will limit the availability of this area to the public, including where access to the foreshore area is completely restricted.

In order to reduce the significance of the Project's impact on these environmental factors, a series of controls are proposed to be implemented. They are:

- **Project Design**
    - The new Traffic Bridge has been designed to not require dredging during construction, with minimal piling required in the Mandurah Channel. Bridge footings utilise existing cleared areas, without interfering with large areas of native vegetation.
- **Referral of the Project to Regulators**
    - The project will be referred for assessment to the WA Environmental Protection Authority under the *Environmental Protection Act 1986*
    - The Project will be referred for assessment to the Commonwealth Department of Environment under the *Environmental Protection and Biodiversity Conservation Act 1999*
- **Regulator Licensing**
    - The clearing of native vegetation will be undertaken using the Main Roads WA State-Wide Clearing Permit CPS 818 (assuming the project is not assessed by the WA Environmental Protection Authority).
    - A Permit to Interfere With Beds and Banks will be obtained from the Department of Water
    - A Section 46c license will be obtained from the WA Department of Parks and Wildlife
- **Environmental Commitments and Objectives register**

- The EPA (2013a) lists an objective for each environmental factor that, if met, will indicate that the proposal is not expected to have a significant impact on the environment. The environmental objectives, performance objectives, standards/guidelines/policies and measurement criteria for the Project are auditable and will be managed through the development of a Construction and Demolition Environmental Management Plan (CDEMP).

- **Construction and Demolition Environmental Management Plan**
  - Management systems, practices and procedures required to meet the environmental objectives, commitments and permit/license conditions will be described in detail in the CDEMP (refer Appendix G of BMT Oceanica 2014).

5 Conclusion on the likelihood of significant impacts

5.1 Do you THINK your proposed action is a controlled action?

X	No, complete section 5.2
	Yes, complete section 5.3

5.2 Proposed action IS NOT a controlled action.

The proposed impact mitigation measures (Section 5.4 and 5.5 of the EIA Referral (BMT Oceanica 2014) document) and Implementation strategy (Section 6 of the EIA Referral document) are designed to reduce the significance of any environmental impacts to an acceptable level of significance (EPA 2013). The proponent will carry out all work in accordance with the implementation strategy, and ensure that the associated Construction and Demolition Environmental management Plan (CDEMP; Appendix G of the EIA Referral document) are followed and enforced.

5.3 Proposed action IS a controlled action

	Matters likely to be impacted
	World Heritage values (sections 12 and 15A)
	National Heritage places (sections 15B and 15C)
	Wetlands of international importance (sections 16 and 17B)
	Listed threatened species and communities (sections 18 and 18A)
	Listed migratory species (sections 20 and 20A)
	Protection of the environment from nuclear actions (sections 21 and 22A)
	Commonwealth marine environment (sections 23 and 24A)
	Great Barrier Reef Marine Park (sections 24B and 24C)
	A water resource, in relation to coal seam gas development and large coal mining development (sections 24D and 24E)
	Protection of the environment from actions involving Commonwealth land (sections 26 and 27A)
	Protection of the environment from Commonwealth actions (section 28)
	Commonwealth Heritage places overseas (sections 27B and 27C)

6 Environmental record of the responsible party

		Yes	No
6.1	**Does the party taking the action have a satisfactory record of responsible environmental management?** **Provide details** Main Roads Western Australia (MRWA) is the State Government agency responsible for managing the State's road network. This includes all National Highways and State Roads, regulatory road signs, traffic control signals and road markings on the WA road network. Management actions undertaken by MRWA include planning, development, delivery, maintenance and operation of the road network. In fulfilling this role, MRWA is committed to achieving high standards in environmental management. To support the delivery of this commitment, MRWA maintains a corporate Environmental Management System (EMS) that requires compliance with ISO14001. Through the application of this EMS, MRWA will • Minimise risks of environmental non-compliance; • Implement best practice environmental management; and • Provide a consistent, transparent and systematic approach to environmental management. MRWA commits to protecting and enhancing the environmental values of road reserves, minimising the impact on the natural environment of roads and road use, and conserving natural resources and minimising energy consumption and waste. MRWA has successfully developed a number of road projects in the past whilst exhibiting responsible environmental management practices. Some of these include: • The New Perth Bunbury Highway • Great Northern Highway Realignment Port Hedland • Dampier Highway Duplication	X	
6.2	**Has either (a) the party proposing to take the action, or (b) if a permit has been applied for in relation to the action, the person making the application - ever been subject to any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources?** **If yes, provide details**		X
6.3	**If the party taking the action is a corporation, will the action be taken in accordance with the corporation's environmental policy and planning framework?**	X	

If yes, provide details of environmental policy and planning framework

Main Roads operates under an Environment Policy as well as operating under an ISO 14001 accredited Environmental Management System.

Main Roads Environmental Policy Statement (2004) states:

Main Roads manages the State's road network to provide safe and efficient road access that will enhance community lifestyles and support economic prosperity. Main Roads seeks to achieve balanced and sustainable outcomes for the community. Responsible environmental stewardship in developing and maintaining the road network is critical to the success of Main Roads.

Principles

Main Roads is committed to:

- Protecting and enhancing the environmental values of road reserves;
- Minimising the impact on the natural environment of roads and road use; and
- Conserving natural resources and minimising energy consumption and waste.

Objectives

In applying these principles, Main Roads aims to:

- Fully satisfy all environmental legislation, Government Policy and, where specific legislation is lacking, uphold the spirit of the law;
- Implement, maintain and continually improve an effective environmental management system across Main Roads planning, business, project and management processes;
- Apply an approach of "avoid, minimise and mitigate", in order of preference, to the management of environmental impacts associated with road construction projects;
- Develop awareness of environmental management processes, standards and responsibilities among Main Roads' employees and contractor partners;
- Listen and be responsive to community and stakeholder views on environmental issues; and
- Set specific environmental objectives and targets relating to the key environmental aspects of Main Roads' activities, and measure and report progress in achieving these targets.

6.4	**Has the party taking the action previously referred an action under the EPBC Act, or been responsible for undertaking an action referred under the EPBC Act?**	X	

Provide name of proposal and EPBC reference number (if known)

MRWA has previously referred projects under the EPBC Act, most recently including:

- 2013/7091: Mitchell Freeway Extension
- 2013/7042: Perth Darwin National Highway (Swan Valley Section)
- 2013/6766: Albany Highway Upgrade (248.4-250.8 SLK)
- 2012/6535: South Coast Highway upgrade, Mt Manypeaks
- 2012/6652: Bunbury Outer Ring Road Southern Section
- 2012/6245: Kununurra Heavy Vehicle Route – Stage 1 Western Link
- 2012/6253: Great Northern Highway Upgrade
- 2011/5852: Construction of a 43 km long sealed access road to the Browse LNG precinct
- 2010/5793: Realignment of the Great Northern Highway
- 2010/5768: Stage 2 of the Bunbury Port Access Project
- 2010/5684: Extraction of road building materials
- 2010/5617: South Western Highway Reconstruction (Waterloo Road to Hynes Road)
- 2010/5419: Dampier Highway Duplication Stage 2 and 6
- 2010/5384: Gateway WA – Perth Airport and Freight Access project
- 2009/5031: Roe Highway Extension (Kwinana Freeway to Stock Road)
- 2009/4692: Mandurah Entrance Road
- 2007/3515: Intersection of Bussell Highway and Caves Road
- 2005/213: New Perth to Bunbury Highway
- 2003/972: Roe Highway Stage 7 Extension
- 2002/846: Caves Road Turning Pockets
- 2002/781: Translocation of orchids (Caladenia huegelli) from Roe Highway Reserve
- 2001/470: Tonkin Highway Extension
- 2001/325: South Western Highway – Wokalup to Brunswick Junction – Upgrade
- 2000/83: Useless Loop Road Upgrade
- 2010/5793: Realignment of Great Northern Highway, South of Port Hedland

7 Information sources and attachments

(For the information provided above)

7.1 References

All references are provided in Section 8 of the EIA Referral (BMT Oceanica 2014) document

7.2 Reliability and date of information

All details and data references are contained in the EIA Referral (BMT Oceanica 2014) document

7.3 Attachments

		✓ attached	Title of attachment(s)
You must attach	figures, maps or aerial photographs showing the project locality (section 1)	X	S14-154 NEW BRIDGE AND OMTB AFFECTED AREA MGA94.dwg
	GIS file delineating the boundary of the referral area (section 1)		
	figures, maps or aerial photographs showing the location of the project in respect to any matters of national environmental significance or important features of the environments (section 3)	X	See BMT Oceanica (2014) for relevant maps and figures
If relevant, attach	copies of any state or local government approvals and consent conditions (section 2.5)	NA	
	copies of any completed assessments to meet state or local government approvals and outcomes of public consultations, if available (section 2.6)	X	See attached EIA Referral document (BMT Oceanica 2014)
	copies of any flora and fauna investigations and surveys (section 3)	X	See attached EIA Referral document (BMT Oceanica 2014)
	technical reports relevant to the assessment of impacts on protected matters that support the arguments and conclusions in the referral (section 3 and 4)	X	See attached EIA Referral document (BMT Oceanica 2014).
	report(s) on any public consultations undertaken, including with Indigenous stakeholders (section 3)	X	See attached EIA Referral document (BMT Oceanica 2014)

8 Contacts, signatures and declarations

Project title: Replacement of the Old Mandurah Traffic Bridge

8.1 Person proposing to take action

1. Name and Title:	Ilario Spagnolo, Project Director
2. Organisation	Main Roads Western Australia
3. EPBC Referral Number	
4: ACN / ABN	50 860 676 021
5. Postal address	PO Box 6202, East Perth WA 6892
6. Telephone:	9323 4120
7. Email:	Ilario.spagnolo@mainroads.wa.gov.au
8. Name of designated proponent (if not the same person at item 1 above	
9. ACN/ABN of designated proponent (if not the same person named at item 1 above):	

COMPLETE THIS SECTION ONLY IF YOU QUALIFY FOR EXEMPTION FROM THE FEE(S) THAT WOULD OTHERWISE BE PAYABLE

I qualify for exemption from fees under section 520(4C)(e)(v) of the EPBC Act because I am:

□ an individual; OR

□ a small business entity (within the meaning given by section 328-110 (other than subsection 328-119(4)) of the *Income Tax Assessment Act 1997*).

If you are small business entity you must provide the Date/Income Year that you became a small business entity:

COMPLETE THIS SECTION ONLY IF YOU WOULD LIKE TO APPLY FOR A WAIVER

I would like to apply for a waiver of full or partial fees under Schedule 1, 5.21A of the EPBC Regulations. Under sub regulation 5.21A(5), you must include information about the applicant (if not you) the grounds on which the waiver is sought and the reasons why it should be made:

Declaration

I declare that to the best of my knowledge the information I have given on, or attached to this form is complete, current and correct.
I understand that giving false or misleading information is a serious offence.

I agree to be the proponent for this action.
I declare that I am not taking the action on behalf of or for the benefit of any other person or entity.

Signature Date

8.2 Person preparing the referral information (if different from 8.1)

Individual or organisation who has prepared the information contained in this referral form.

Name	Ben Davis
Title	Marine Scientist
Organisation	BMT Oceanica Pty Ltd
ACN / ABN (if applicable)	89 093 752 811/093 752 811
Postal address	PO Box 462, Wembley WA 6913
Telephone	08 6272 0000
Email	ben.davis@bmtoceanica.com.au
Declaration	I declare that to the best of my knowledge the information I have given on, or attached to this form is complete, current and correct. I understand that giving false or misleading information is a serious offence.

Signature  Date 06/11/2014

REFERRAL CHECKLIST

NOTE: This checklist is to help ensure that all the relevant referral information has been provided. It is not a part of the referral form and does not need to be sent to the Department.

HAVE YOU:

- ❑ Completed all required sections of the referral form?
- ❑ Included accurate coordinates (to allow the location of the proposed action to be mapped)?
- ❑ Provided a map showing the location and approximate boundaries of the project area?
- ❑ Provided a map/plan showing the location of the action in relation to any matters of NES?
- ❑ Provided a digital file (preferably ArcGIS shapefile, refer to guidelines at Attachment A) delineating the boundaries of the referral area?
- ❑ Provided complete contact details and signed the form?
- ❑ Provided copies of any documents referenced in the referral form?
- ❑ Ensured that all attachments are less than three megabytes (3mb)?
- ❑ Sent the referral to the Department (electronic and hard copy preferred)?

Attachment A

Geographic Information System (GIS) data supply guidelines

If the area is less than 5 hectares, provide the location as a point layer. If the area greater than 5 hectares, please provide as a polygon layer. If the proposed action is linear (eg. a road or pipline) please provide a polyline layer.

GIS data needs to be provided to the Department in the following manner:

- Point, Line or Polygon data types: ESRI file geodatabase feature class (preferred) or as an ESRI shapefile (.shp) zipped and attached with appropriate title
- Raster data types: Raw satellite imagery should be supplied in the vendor specific format.
- Projection as GDA94 coordinate system.

Processed products should be provided as follows:

- For data, uncompressed or lossless compressed formats is required - GeoTIFF or Imagine IMG is the first preference, then JPEG2000 lossless and other simple binary+header formats (ERS, ENVI or BIL).
- For natural/false/pseudo colour RGB imagery:
    - If the imagery is already mosaiced and is ready for display then lossy compression is suitable (JPEG2000 lossy/ECW/MrSID). Prefer 10% compression, up to 20% is acceptable.
    - If the imagery requires any sort of processing prior to display (i.e. mosaicing/colour balancing/etc) then an uncompressed or lossless compressed format is required.

Metadata or 'information about data' will be produced for all spatial data and will be compliant with ANZLIC Metadata Profile. (http://www.anzlic.org.au/policies_guidelines#guidelines).

The Department's preferred method is using ANZMet Lite, however the Department's Service Provider may use any compliant system to generate metadata.

All data will be provide under a Creative Commons license (http://creativecommons.org/licenses/by/3.0/au/)

Appendix B

EPBC Act Protected Matters Search Tool Results

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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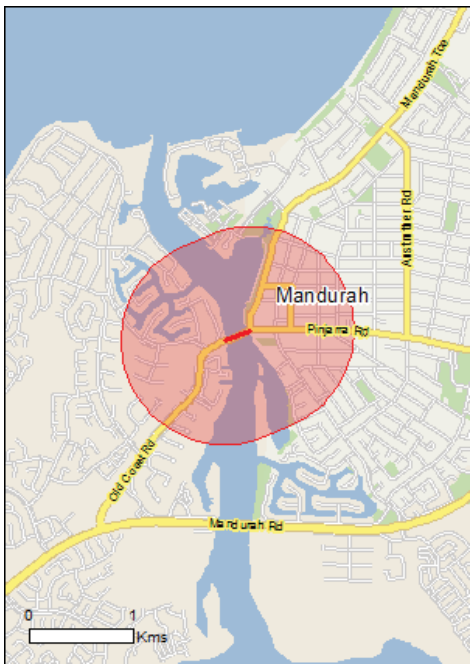

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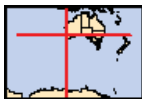

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	2
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	27
Listed Migratory Species:	37

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate.

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	47
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

Place on the RNE:	3
State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	22
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (RAMSAR)	[Resource Information]
Name	Proximity
Becher point wetlands	Upstream from Ramsar
Peel-yalgorup system	Within Ramsar site

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo [67034]	Vulnerable	Species or species habitat may occur within area
Calyptorhynchus baudinii Baudin's Black-Cockatoo, Long-billed Black-Cockatoo [769]	Vulnerable	Species or species habitat likely to occur within area
Calyptorhynchus latirostris Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat likely to occur within area
Diomedea exulans amsterdamensis Amsterdam Albatross [82330]	Endangered	Species or species habitat may occur within area
Diomedea exulans exulans Tristan Albatross [82337]	Endangered	Species or species habitat may occur within area
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Vulnerable	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat known to occur within area
Mammals		
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Pseudocheirus occidentalis Western Ringtail Possum [25911]	Vulnerable	Species or species habitat likely to occur within area
Setonix brachyurus Quokka [229]	Vulnerable	Species or species habitat may occur within area
Other		
Idiosoma nigrum Shield-backed Trapdoor Spider, Black Rugose Trapdoor Spider [66798]	Vulnerable	Species or species habitat likely to occur within area
Plants		
Caladenia huegelii King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat likely to occur within area
Centrolepis caespitosa [6393]	Endangered	Species or species habitat likely to occur within area
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area
Diuris purdiei Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat may occur within area
Drakaea elastica Glossy-leafed Hammer-orchid, Praying Virgin [16753]	Endangered	Species or species habitat likely to occur within area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat may occur within area
Isopogon uncinatus Hook-leaf Isopogon [20871]	Endangered	Species or species habitat may occur within area
Lepidosperma rostratum Beaked Lepidosperma [14152]	Endangered	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur

Name	Status	Type of Presence
		within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Diomedea amsterdamensis		
Amsterdam Albatross [64405]	Endangered*	Species or species habitat may occur within area
Diomedea dabbenena		
Tristan Albatross [66471]	Endangered*	Species or species habitat may occur within area
Diomedea exulans (sensu lato)		
Wandering Albatross [1073]	Vulnerable	Species or species habitat likely to occur within area
Puffinus carneipes		
Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Sterna dougallii		
Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Lamna nasus		
Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Leipoa ocellata		
Malleefowl [934]	Vulnerable	Species or species habitat may occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat known to occur

Name	Threatened	Type of Presence
		within area
Ardea ibis Cattle Egret [59542]		Species or species habitat likely to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]		Roosting known to occur within area
Calidris ferruginea Curlew Sandpiper [856]		Roosting known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]		Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]		Roosting known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Roosting known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Numenius madagascariensis Eastern Curlew [847]		Roosting known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Tringa glareola Wood Sandpiper [829]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Roosting known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat likely to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]		Roosting known to occur within area
Calidris ferruginea Curlew Sandpiper [856]		Roosting known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Roosting known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris subminuta Long-toed Stint [861]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]		Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]		Roosting known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered*	Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Diomedea dabbenena Tristan Albatross [66471]	Endangered*	Species or species habitat may occur within area
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Vulnerable	Species or species habitat likely to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known to occur within area
Himantopus himantopus Black-winged Stilt [870]		Roosting known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Roosting known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew [847]		Roosting known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Roosting known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Roosting known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
Thinornis rubricollis		
Hooded Plover [59510]		Roosting known to occur within area
Tringa glareola		
Wood Sandpiper [829]		Roosting known to occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]		Roosting known to occur within area
Tringa stagnatilis		
Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Tringa totanus		
Common Redshank, Redshank [835]		Roosting known to occur within area
Reptiles		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Extra Information

Places on the RNE [Resource Information]

Note that not all Indigenous sites may be listed.

Name	State	Status
Natural		
Peel - Harvey Estuarine System	WA	Registered
Historic		
Christs Church and Churchyard	WA	Indicative Place
Halls Cottage	WA	Registered

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Anas platyrhynchos		
Mallard [974]		Species or species habitat likely to occur within area
Columba livia		
Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Mammals		
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species

Name	Status	Type of Presence
		habitat may occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area

Coordinates

-32.535617 115.716705,-32.534821 115.718979,-32.534821 115.718979

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia
-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Geoscience Australia
-CSIRO
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Appendix C

DPaW NatureMap Species Report

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 17/09/2014

Current Names Only Yes
Core Datasets Only Yes
Method 'By Rectangle'
Extent 115°42' 54" E, 115°43' 12" E, 32°32' 06" S, 32°31' 56" S

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1.	-14089	*? ?*			
2.	3584	*Acacia truncata*			
3.	24260	*Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)*			
4.	24261	*Acanthiza chrysorrhoa (Yellow-rumped Thornbill)*			
5.	24262	*Acanthiza inornata (Western Thornbill)*			
6.	24560	*Acanthorhynchus superciliosus (Western Spinebill)*			
7.	-15682	*Acentrogobius bifrenatus*			
8.	-16282	*Achoerodus gouldii*			
9.	42368	*Acritoscincus trilineatus (Western Three-lined Skink)*			
10.	-16254	*Afurcagobius suppositus*			
11.	2656	*Amaranthus caudatus (Love Lies Bleeding)*	Y		
12.	-12754	*Aname mainae*			
13.	24332	*Anhinga melanogaster subsp. novaehollandiae (Darter)*			
14.	-17842	*Anoplocapros amygdaloides?*			
15.	-15768	*Anoplocapros lenticularis*			
16.	24561	*Anthochaera carunculata (Red Wattlebird)*			
17.	24562	*Anthochaera lunulata (Western Little Wattlebird)*			
18.	3692	*Aotus procumbens*			
19.	24991	*Aprasia repens (Sand-plain Worm-lizard)*			
20.	24334	*Apus pacificus subsp. pacificus (Fork-tailed Swift)*		IA	
21.	24209	*Arctocephalus tropicalis (Sub-antarctic Fur Seal)*			
22.	7839	*Arctotheca populifolia (Dune Arctotheca)*	Y		
23.	41324	*Ardea modesta (Eastern Great Egret)*		IA	
24.	-17130	*Arripis truttacea*			
25.	-17031	*Aulohalaelurus labiosus*			
26.	-12293	*Austracantha minax*			
27.	-15446	*Batrachomoeus rubricephalus*			
28.	25716	*Cacatua sanguinea (Little Corella)*			
29.	25335	*Caretta caretta (Loggerhead Turtle)*		T	
30.	-15856	*Centroberyx gerrardi*			
31.	24086	*Cercartetus concinnus (Western Pygmy-possum, Mundarda)*			
32.	24372	*Charadrius leschenaultii subsp. leschenaultii (Greater Sand Plover (Mongolian))*		T	
33.	-14173	*Cheilodactylus gibbosus*			
34.	-14152	*Chelidonichthys kumu*			
35.	24431	*Chrysococcyx basalis (Horsfield's Bronze Cuckoo)*			
36.	-14377	*Cirrhimuraena calamus*			
37.	2929	*Clematis pubescens (Common Clematis)*			
38.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
39.	24613	*Colluricincla harmonica subsp. rufiventris (Grey Shrike-thrush)*			
40.	-15777	*Conger wilsoni*			
41.	1885	*Conospermum triplinervium (Tree Smokebush)*			
42.	-16085	*Contusus brevicaudus*			
43.	-17760	*Coris aygula*			
44.	-1832	*Cormocephalus turneri*			
45.	24417	*Corvus coronoides subsp. perplexus (Australian Raven)*			
46.	24422	*Cracticus tibicen subsp. dorsalis (White-backed Magpie)*			
47.	-15403	*Cristiceps aurantiacus*			
48.	-14900	*Cristiceps australis*			
49.	-16186	*Cristiceps sp.*			
50.	25027	*Ctenotus australis*			
51.	-13714	*Cyclosa trilobata*			
52.	-18128	*Cypselurus sp.*			
53.	24606	*Daphoenositta chrysoptera subsp. pileata (Varied Sittella, Black-capped Sitella)*			
54.	-16907	*Dasyatis thetidis*			Y

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
55.	25296	*Demansia psammophis subsp. reticulata (Yellow-faced Whipsnake)*			
56.	-16237	*Echeneis naucrates*			
57.	25251	*Echiopsis curta (Bardick)*			
58.	25250	*Elapognathus coronatus (Crowned Snake)*			
59.	-15053	*Elops hawaiensis*			
60.	24651	*Eopsaltria australis subsp. griseogularis (Western Yellow Robin)*			
61.	-16524	*Epinephelus rivulatus*			
62.	24567	*Epthianura albifrons (White-fronted Chat)*			
63.	-12379	*Eriophora biapicata*			
64.	-18106	*Euleptorhamphus viridis*			
65.	-17552	*Filicampus tigris*			
66.	42314	*Gavicalis virescens (Singing Honeyeater)*			
67.	34030	*Geotria australis (Pouched Lamprey)*		P1	
68.	-18084	*Gerres subfasciatus*			
69.	24271	*Gerygone fusca subsp. fusca (Western Gerygone)*			
70.	24054	*Globicephala macrorhynchus (Short-finned Pilot Whale)*			
71.	-16971	*Gonorynchus greyi*			
72.	-17806	*Gymnapistes marmoratus*			
73.	-14093	*Gymnothorax woodwardi*			
74.	2197	*Hakea prostrata (Harsh Hakea)*			
75.	24295	*Haliastur sphenurus (Whistling Kite)*			
76.	24689	*Halobaena caerulea (Blue Petrel)*			
77.	25119	*Hemiergis quadrilineata*			
78.	24491	*Hirundo neoxena (Welcome Swallow)*			
79.	25366	*Hydrophis elegans (Elegant Seasnake, Bar-bellied Seasnake)*			
80.	43384	*Hydrophis platurus (Yellow-bellied Seasnake)*			
81.	-14292	*Hyperlophus vittatus*			
82.	-15401	*Hyporhamphus melanochir*			
83.	-16083	*Ichthyscopus barbatus*			
84.	24153	*Isoodon obesulus subsp. fusciventer (Quenda, Southern Brown Bandicoot)*		P5	
85.	24367	*Lalage tricolor (White-winged Triller)*			
86.	-1834	*Lampona cylindrata*			
87.	24511	*Larus novaehollandiae subsp. novaehollandiae (Silver Gull)*			
88.	25005	*Lialis burtonis*			
89.	24582	*Lichmera indistincta subsp. indistincta (Brown Honeyeater)*			
90.	25415	*Limnodynastes dorsalis (Western Banjo Frog)*			
91.	-18187	*Lobodon carcinophaga*			
92.	24690	*Macronectes giganteus (Southern Giant Petrel)*		P4	
93.	24133	*Macropus irma (Western Brush Wallaby)*		P4	
94.	85	*Macrozamia riedlei (Zamia, Djiridji)*			
95.	25654	*Malurus splendens (Splendid Fairy-wren)*			
96.	36480	*Malva arborea (Tree Mallow)*	Y		
97.	24838	*Megalurus gramineus subsp. gramineus (Little Grassbird)*			
98.	24587	*Melithreptus chloropsis (Western White-naped Honeyeater)*			
99.	-12393	*Missulena occatoria*			
100.	-14595	*Mola mola*			
101.	-17809	*Mugil cephalus*			
102.	25248	*Neelaps bimaculatus (Black-naped Snake)*			
103.	-1773	*Nicodamus mainae*			
104.	25252	*Notechis scutatus (Tiger Snake)*			
105.	-16054	*Odax cyanomelas*			
106.	8149	*Olearia rudis (Rough Daisybush)*			
107.	-14986	*Ophisurus serpens*			
108.	-15788	*Orectolobus ornatus*			
109.	24623	*Pachycephala pectoralis subsp. fuliginosa (Golden Whistler)*			
110.	-17561	*Paraplagusia bilineata*			
111.	-15647	*Paraplesiops meleagris*			
112.	25253	*Parasuta gouldii*			
113.	24630	*Pardalotus striatus subsp. westraliensis (Striated Pardalote)*			
114.	-16518	*Pegasus volitans*			
115.	4343	*Pelargonium capitatum (Rose Pelargonium)*	Y		
116.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
117.	24660	*Petroica multicolor subsp. campbelli (Scarlet Robin)*			
118.	24664	*Phalacrocorax carbo subsp. novaehollandiae (Great Cormorant)*			
119.	24666	*Phalacrocorax melanoleucos subsp. melanoleucos (Little Pied Cormorant)*			
120.	25699	*Phalacrocorax varius (Pied Cormorant)*			
121.	24099	*Phascogale tapoatafa subsp. tapoatafa (Southern Brush-tailed Phascogale, Wambenger)*		T	
122.	24462	*Phoebetria fusca (Sooty Albatross)*		T	
123.	24596	*Phylidonyris novaehollandiae (New Holland Honeyeater)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
124.	-15644	*Platycephalus speculator*			
125.	24680	*Podiceps cristatus subsp. australis (Great Crested Grebe)*			
126.	24907	*Pogona minor subsp. minor (Dwarf Bearded Dragon)*			
127.	-16267	*Pomatomus saltatrix*			
128.	24771	*Porzana tabuensis (Spotless Crake)*			
129.	25259	*Pseudonaja affinis subsp. affinis (Dugite)*			
130.	25433	*Pseudophryne guentheri (Crawling Toadlet)*			
131.	-17043	*Pseudophycis breviuscula*			
132.	24702	*Pterodroma brevirostris (Kerguelen Petrel)*			
133.	42340	*Ptilotula ornatus (Yellow-plumed Honeyeater)*			
134.	25271	*Ramphotyphlops australis*			
135.	-16563	*Regalecus glesne*			
136.	25613	*Rhipidura fuliginosa (Grey Fantail)*			
137.	24452	*Rhipidura fuliginosa subsp. preissi (Grey Fantail)*			
138.	24454	*Rhipidura leucophrys subsp. leucophrys (Willie Wagtail)*			
139.	-14156	*Salmo gairdneri*			
140.	-14177	*Salmo trutta*			
141.	2593	*Sarcocornia quinqueflora (Beaded Samphire)*			
142.	1018	*Schoenus subfascicularis*			
143.	-17507	*Schuettea woodwardi*			
144.	-14099	*Scobinichthys granulatus*			
145.	-16051	*Sillago maculata*			
146.	-16464	*Sillago schomburgkii*			
147.	25266	*Simoselaps bertholdi (Jan's Banded Snake)*			
148.	30948	*Smicrornis brevirostris (Weebill)*			
149.	-16491	*Squatina australis*			
150.	24529	*Sterna leucoptera (White-winged Black Tern)*		IA	
151.	24530	*Sterna nereis subsp. nereis (Fairy Tern)*		T	
152.	-17509	*Stigmatopora argus*			
153.	-18091	*Strongylura leiura*			
154.	-15677	*Synchiropus papilio*			
155.	33992	*Synemon gratiosa (Graceful Sunmoth)*		P4	
156.	-14437	*Thunnus maccoyii*			
157.	25207	*Tiliqua rugosa subsp. rugosa*			
158.	24309	*Todiramphus sanctus subsp. sanctus (Sacred Kingfisher)*			
159.	-17511	*Trachinocephalus myops*			
160.	-14143	*Trachurus novaezelandiae*			
161.	24808	*Tringa nebularia (Common Greenshank)*		IA	
162.	-16082	*Trygonoptera mucosa*			
163.	-17570	*Trygonorrhina fasciata*			
164.	30954	*Tursiops aduncus (Indo-Pacific Bottlenose Dolphin)*			
165.	24069	*Tursiops truncatus (Bottlenose Dolphin)*			
166.	24983	*Underwoodisaurus milii (Barking Gecko)*			
167.	-15451	*Urocampus carinirostris*			
168.	-12178	*Venator immansueta*			
169.	24856	*Zosterops lateralis subsp. gouldi (Grey-breasted White-eye)*			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

Appendix D

Acid Sulphate Soils Analysis Methods

1. Acid Sulphate Soils Analysis Methods

Sediments were analysed for Acid sulphate soils (ASS) analysis (following removal of material coarser than 2 mm) using chromium reducible sulphur suite method. Chromium reducible sulphur suite enables an accurate measure of the reduced inorganic sulphur compounds present within the sediment via a series of steps, providing a measure of the Potential Acid Sulphate soils (PASS) (Figure 1.1) (Ahern et al. 2004). The first step in the chromium reducible sulphur method is the determination of the reduced inorganic sulphur content (SCR) which provides an estimate of the potential sulphuric acidity of the sediment. Following this, the soil pH in a potassium chloride suspension (pHK_{Cl}) is determined as a means of estimating the actual acidity of the sediment. Depending upon these results (Figure 1.1), it may be necessary to analyse for Titratable Actual Acidity ($TAAK_{Cl}$) to determine the actual acidity and/or analyse for the Net Acid Soluble Sulphur (SNAS) to estimate the retained acidity. The acid neutralising capacity (ANC) of the sediment provides an estimate of the ability of the soil to naturally neutralise any acid produced (for example due the presence of carbonate material). Hence, this method provides a measure of AASS, PASS, and where applicable, the ANC.

The present investigation considers the ANC inherent within the sediments. This acid neutralising is likely to be associated with carbonate materials which may include fine carbonate generated by the accumulation of foraminifera or by the breakdown of calcareous estuarine skeletons. Sand-sized carbonate material can also be contributed by shelly benthos including gastropods and bivalves.

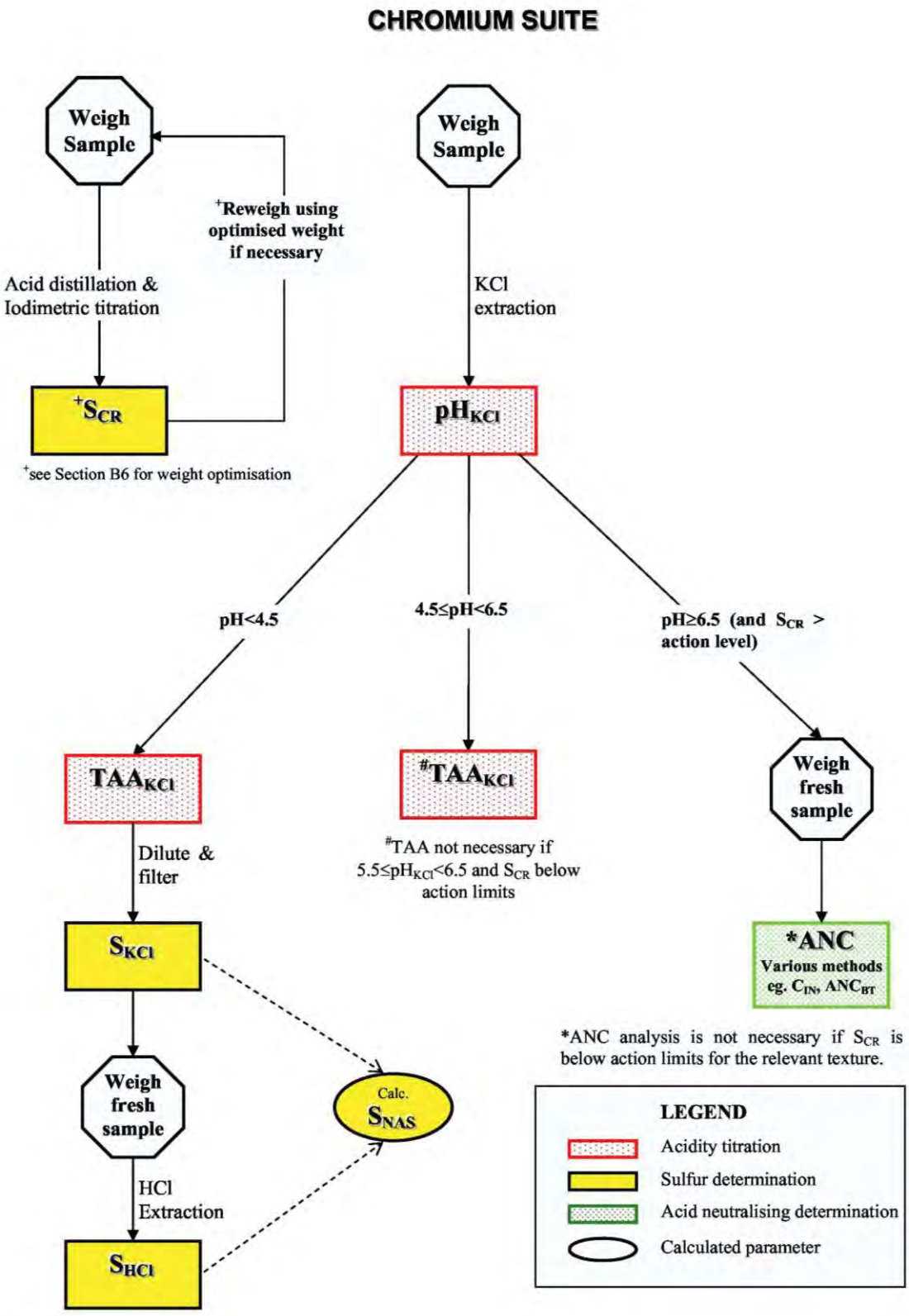
The ANC of the soil layers indicates their ability to neutralise any acid produced. This neutralising capacity can be compared against the potential acidity (in mol H+/tonne) to determine whether effective neutralisation is likely to occur following the oxidation of the soil. This approach is commonly referred to as Acid-Base Accounting (ABA). The general ABA equation is:

$$Net\ \ acidity = Potential\ sulphidic\ acidity + Existing\ acidity - \frac{ANC}{FF}$$

(Ahern et al. 2004),

where potential sulphidic acidity is represented by SCR (converted from %S to mol H+/tonne by multiplying by 623.7); if there is no existing acidity in these sediments, the existing acidity term is neglected (if TAA=0); ANC is represented by ANC_{BT} (converted from %CaCO3 to mol H+/tonne by multiplying by 199.8); and FF (Fineness Factor) = 1.5 (see below).

Often neutralising material present in the field may have low reactivity because of particle size and/or insoluble coatings (e.g. coarse shell). Results determined from finely ground samples in the laboratory could underestimate the net acid risk likely to be experienced in the field. To allow for these inaccuracies, all material coarser than 2 mm was removed prior to the laboratory ASS analysis. In addition, all measurements of the neutralising material (ANC) were divided by a FF during ABA. The minimum FF that should be applied to any ANC is 1.5, however larger factors (e.g. 2, 2.5, or 3) may be applicable for shell or other forms of neutralising inclusions in the soil (Ahern et al. 2004).



Source: Ahern et al. (2004)

Figure 1.1 Chromium suite flow diagram

2. References

Ahern CR, McElnea AE, Sullivan LA (2004) Acid Sulfate Soils Laboratory Methods Guidelines. Queensland Department of Natural Resources Mines and Energy, Indooroopilly, Queensland, June 2004

Appendix E

Mandurah Traffic Bridge Footings Terrestrial Flora Survey

MEMORANDUM

TO:	**Ben Davis** **BMT Oceanica Pty Ltd** **PO Box 462** **Wembley WA 6913**
FROM:	**Mark Langdon Environmental Services - City of Mandurah**
DATE:	**12-9-14**
FILE NO:	**1577090**
SUBJECT:	**Terrestrial Flora Survey**

An informal terrestrial flora survey was conducted 11 September 2014 along the following areas:

- Northwest side of the Bridge (Hall Park)
- Southeast side of the Bridge (Dalrymple Park)
- Northeast side of the Bridge (Eastern Foreshore)

The above areas have been significantly altered to suit a public open space setting. Due to the long history of recreational uses associated with river and foreshore fauna are limited to the avian species outside of the survey area

FLORA

A majority of the flora on these sites have been replaced by introduced or weedy species, however there are a few remnant vegetation communities remaining, they are:

A grove of remnant *Eucalyptus rudis*, *Casuarina sp*. and *Agonis flexuosa* remains on the southeast side of the existing bridge (Dalrymple Park).

The south-west side of the bridge (San Marco Quay) has one remnant *Melaleuca lanceolata* tree and a small sparsely vegetated samphire wetland containing *Sarcoronia* and *Suaeda* species.

The following table lists the flora species identified:

NORTH-WEST SIDE OF BRIDGE (Hall Park)	
Casuarina obesa	

SOUTH-EAST SIDE OF BRIDGE (Dalrymple Park)	
Ficinia nodosa	Knotty club rush

Juncus krausii	Sea rush
Sarcocornia quinqueflora	
Suadia australis	
Melaleuca lanceolata	Black paperbark
Agonis flexuosa	Peppermint tree
Casuarina obesa	Swamp sheoak
*Melaleuca nesophilla**	Pink melaleuca
Eucalyptus rudis	Flooded gum
*Livingstona australis**	Australian cabbage tree palm

NORTH-EAST SIDE OF BRIDGE (Eastern Foreshore)	
*Ulmus parvifolia**	Chinese Elm
*Araucaria heterophylla**	Norfolk Island Pine
*Melaleuca quinquenervia**	Broad Leaved Paperbark
*Phoenix canariensis**	Canary Island Palm
*Ficus macrophylla**	Moreton Bay Fig
*Livingstona australis**	Australian cabbage tree palm

*Introduced species

CONCLUSION

There is no remaining significant flora communities found at the site. According to the Keighery Condition Scale (Keighery 1994), the onsite vegetation condition ranged from degraded to completely degraded.

Degraded
Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management.

Completely Degraded
The structure of the vegetation is no longer intact and the area is completely or almost completely without native species.

Regards,

Dr Mark W Langdon,
Manager, Environmental Services.

Appendix F

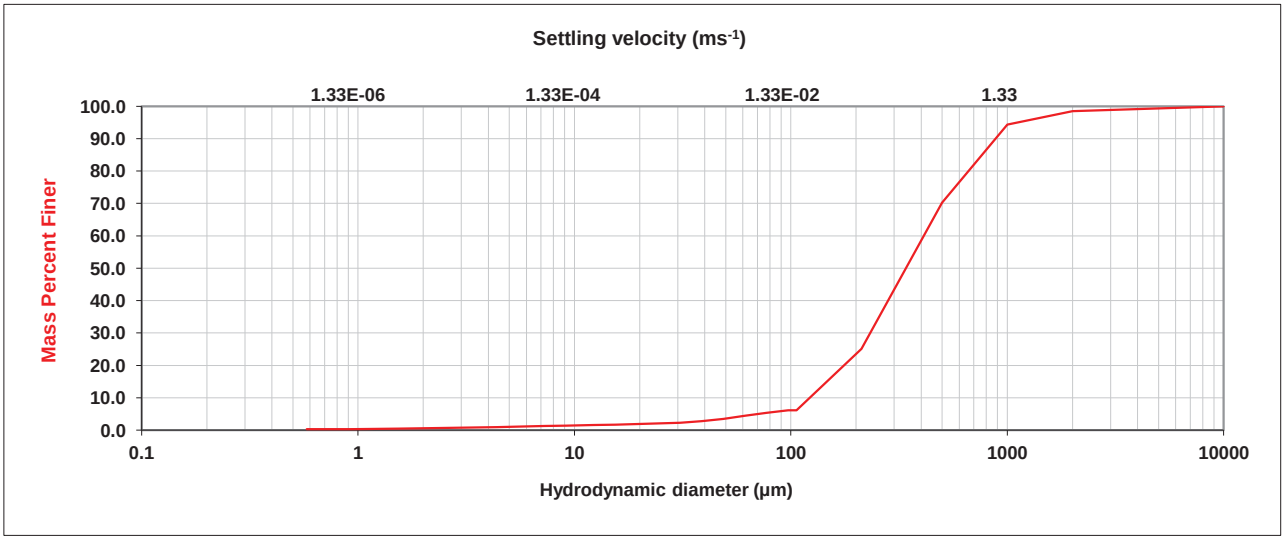
Sediment Analysis Laboratory Report

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client:	BMT Oceanica Pty Ltd
Client ID:	MC 1
Job No:	14_1096
Laboratory ID:	14_1096_01

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7ºC
Dispersant:	Water	**Sonication:**	N/A
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650 g/cm^3 (assumed)		
Liquid density:	0.994 g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.725 cp		



Fraction name	Max size (µm)	Min size (µm)	In %
Gravel	10000	2000	1.5
Very Coarse Sand	2000	1000	4.1
Coarse Sand	1000	500	24.1
Medium Sand	500	212	45.2
Fine Sand	212	106	19.0
Very Fine Sand	106	63	1.6
Total Sand	2000	63	94.0
Coarse Silt	63	31	2.2
Medium Silt	31	16	0.6
Fine Silt	16	8	0.5
Very Fine Silt	8	4	0.4
Total Silt	63	4	3.6
Total Clay	4	0	0.9
Total			96.4

D50 (µm)	370.81
Minimum settling velocity of 50% of particles (mm s^{-1})	171.27
Time for 50% of particles to settle over 1m (hours)	0.002
D10 (µm)	127.60
Minimum settling velocity of 90% of particles (mm s^{-1})	20.281
Time for 90% of particles to settle over 1m (hours)	0.01

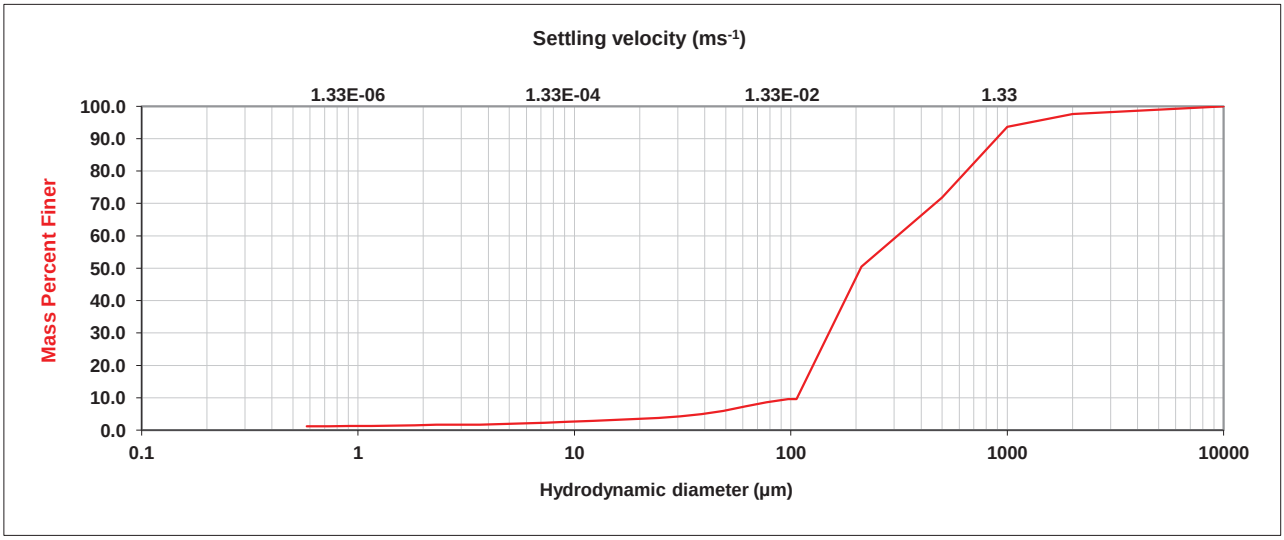
Notes: Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
Please note that the Wentworth scale requested was slightly modified to match standard sieve sizes.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client:	BMT Oceanica Pty Ltd
Client ID:	MC 2
Job No:	14_1096
Laboratory ID:	14_1096_02

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7ºC
Dispersant:	Water	**Sonication:**	N/A
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650 g/cm^3 (assumed)		
Liquid density:	0.994 g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.725 cp		



Fraction name	Max size (µm)	Min size (µm)	In %
Gravel	10000	2000	2.4
Very Coarse Sand	2000	1000	3.9
Coarse Sand	1000	500	21.9
Medium Sand	500	212	21.3
Fine Sand	212	106	40.9
Very Fine Sand	106	63	2.1
Total Sand	2000	63	90.1
Coarse Silt	63	31	3.2
Medium Silt	31	16	1.1
Fine Silt	16	8	0.8
Very Fine Silt	8	4	0.6
Total Silt	63	4	5.7
Total Clay	4	0	1.8
Total			94.3

D50 (µm)	210.87
Minimum settling velocity of 50% of particles (mm s^{-1})	55.39
Time for 50% of particles to settle over 1m (hours)	0.005
D10 (µm)	107.12
Minimum settling velocity of 90% of particles (mm s^{-1})	14.292
Time for 90% of particles to settle over 1m (hours)	0.02

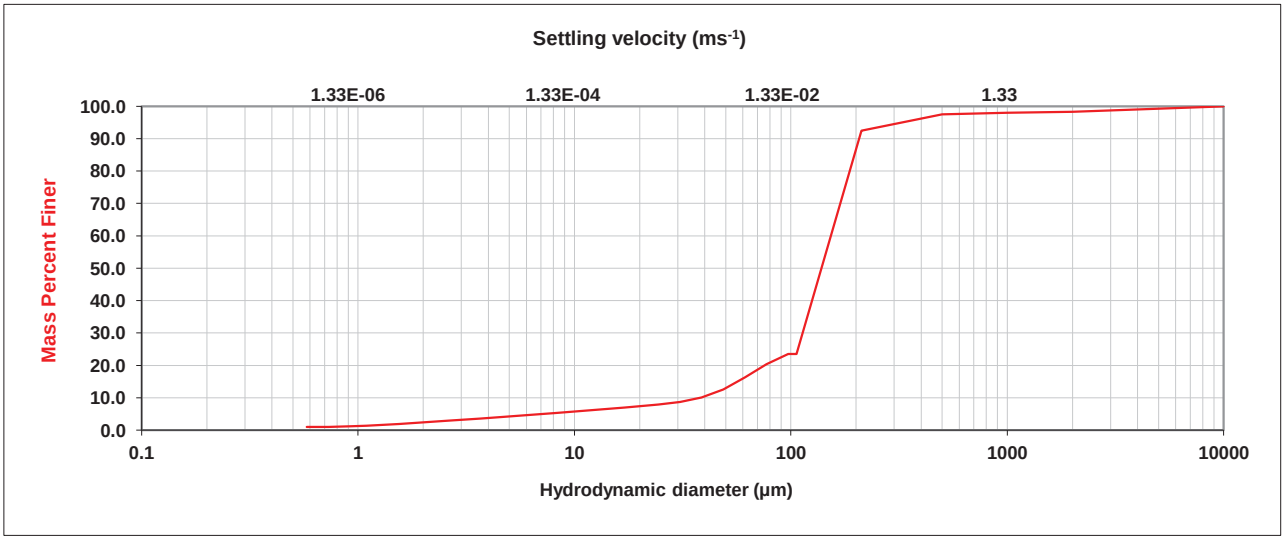
Notes: Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
Please note that the Wentworth scale requested was slightly modified to match standard sieve sizes.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client:	BMT Oceanica Pty Ltd
Client ID:	MC 3
Job No:	14_1096
Laboratory ID:	14_1096_03

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7ºC
Dispersant:	Water	**Sonication:**	N/A
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650 g/cm^3 (assumed)		
Liquid density:	0.994 g/cm^3	**Critical diameter:**	54.33 µm
Liquid viscosity:	0.724 cp		



Fraction name	Max size (µm)	Min size (µm)	In %
Gravel	10000	2000	1.7
Very Coarse Sand	2000	1000	0.3
Coarse Sand	1000	500	0.5
Medium Sand	500	212	5.1
Fine Sand	212	106	68.9
Very Fine Sand	106	63	6.8
Total Sand	2000	63	81.5
Coarse Silt	63	31	8.0
Medium Silt	31	16	1.9
Fine Silt	16	8	1.6
Very Fine Silt	8	4	1.5
Total Silt	63	4	13.0
Total Clay	4	0	3.7
Total			87.0

D50 (µm)	146.74
Minimum settling velocity of 50% of particles (mm s^{-1})	26.85
Time for 50% of particles to settle over 1m (hours)	0.010
D10 (µm)	38.14
Minimum settling velocity of 90% of particles (mm s^{-1})	1.814
Time for 90% of particles to settle over 1m (hours)	0.15

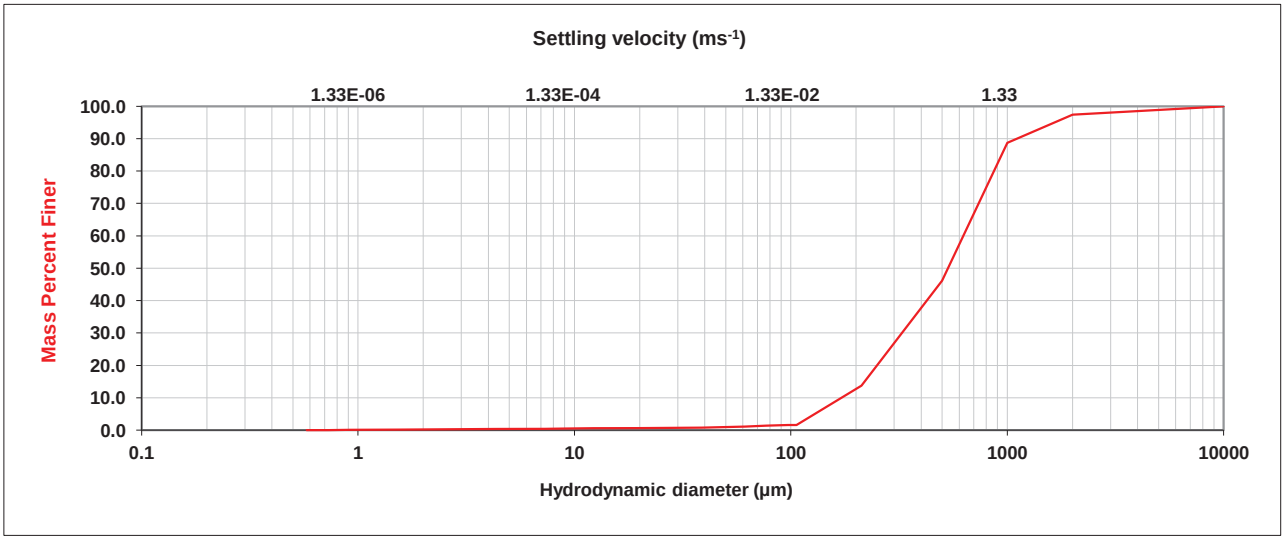
Notes: Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
Please note that the Wentworth scale requested was slightly modified to match standard sieve sizes.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client:	BMT Oceanica Pty Ltd
Client ID:	MC 4
Job No:	14_1096
Laboratory ID:	14_1096_04

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7ºC
Dispersant:	Water	**Sonication:**	N/A
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650 g/cm^3 (assumed)		
Liquid density:	0.994 g/cm^3	**Critical diameter:**	54.35 µm
Liquid viscosity:	0.725 cp		



Fraction name	Max size (µm)	Min size (µm)	In %
Gravel	10000	2000	2.6
Very Coarse Sand	2000	1000	8.7
Coarse Sand	1000	500	42.6
Medium Sand	500	212	32.3
Fine Sand	212	106	12.2
Very Fine Sand	106	63	0.5
Total Sand	2000	63	96.3
Coarse Silt	63	31	0.4
Medium Silt	31	16	0.1
Fine Silt	16	8	0.1
Very Fine Silt	8	4	0.1
Total Silt	63	4	0.8
Total Clay	4	0	0.4
Total			99.2

D50 (µm)	545.74
Minimum settling velocity of 50% of particles (mm s^{-1})	371.00
Time for 50% of particles to settle over 1m (hours)	0.001
D10 (µm)	179.14
Minimum settling velocity of 90% of particles (mm s^{-1})	39.975
Time for 90% of particles to settle over 1m (hours)	0.01

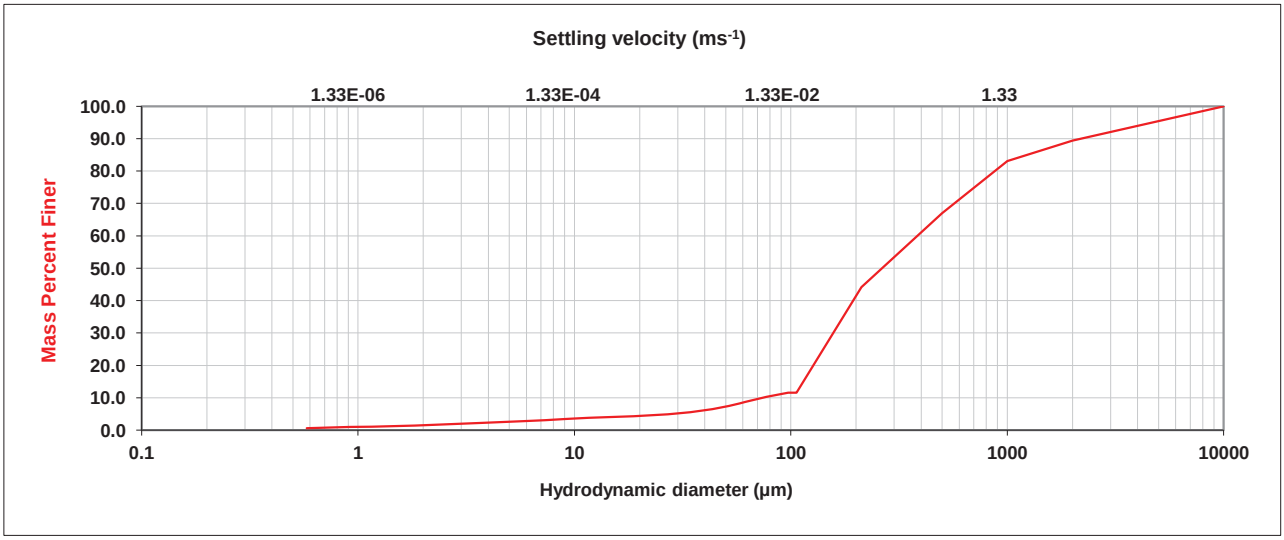
Notes: Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
Please note that the Wentworth scale requested was slightly modified to match standard sieve sizes.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client:	BMT Oceanica Pty Ltd
Client ID:	MC 5
Job No:	14_1096
Laboratory ID:	14_1096_05

Analysis:	X-ray sedimentation by Sedigraph 5100	**Analysis temp.:**	35.7ºC
Dispersant:	Water	**Sonication:**	N/A
Additives:	10 mL sodium hexametaphosphate	**Concentration:**	~5 % w/w

Sample density:	2.650 g/cm^3 (assumed)		
Liquid density:	0.994 g/cm^3	**Critical diameter:**	54.33 µm
Liquid viscosity:	0.724 cp		



Fraction name	Max size (µm)	Min size (µm)	In %
Gravel	10000	2000	10.6
Very Coarse Sand	2000	1000	6.3
Coarse Sand	1000	500	16.1
Medium Sand	500	212	22.8
Fine Sand	212	106	32.6
Very Fine Sand	106	63	2.7
Total Sand	2000	63	80.5
Coarse Silt	63	31	3.6
Medium Silt	31	16	1.1
Fine Silt	16	8	0.9
Very Fine Silt	8	4	0.9
Total Silt	63	4	6.5
Total Clay	4	0	2.3
Total			93.5

D50 (µm)	285.60
Minimum settling velocity of 50% of particles (mm s^{-1})	101.70
Time for 50% of particles to settle over 1m (hours)	0.003
D10 (µm)	74.05
Minimum settling velocity of 90% of particles (mm s^{-1})	6.837
Time for 90% of particles to settle over 1m (hours)	0.04

Notes: Data from 106 µm to 10,000 µm by wet screening , from 0.3µm to 106 µm by Sedimentation.
Please note that the Wentworth scale requested was slightly modified to match standard sieve sizes.
* based on the mean of the size interval and on the the calculations and variables in the 'settling velocity worksheet

REPORT OF ANALYSIS

Report No. RN1038012

Client	: BMT Oceanica Pty Ltd	Job No.	: OCEA26_W/140910_1
	LEVEL 1	Quote No.	: QT-02002
	353 CAMBRIDGE STREET	Order No.	: 1028_02
	WEMBLEY WA 6913	Date Sampled	: 10-SEP-2014
		Date Received	: 10-SEP-2014
Attention	BEN DAVIS	Sampled By	: CLIENT
Project Name	: City of Mandurah OEPA Approval		
Your Client Services Manager	: KOON-BAY HO	Phone	: (08) 9368 8400

Lab Reg No.	Sample Ref	Sample Description
W14/015329/1	MC1	City of Mandurah OEPA Approvals ELUTRIATE 10/09/14
W14/015330/1	MC2	City of Mandurah OEPA Approvals ELUTRIATE 10/09/14
W14/015331/1	MC3	City of Mandurah OEPA Approvals ELUTRIATE 10/09/14
W14/015332/1	MC4	City of Mandurah OEPA Approvals ELUTRIATE 10/09/14

Lab Reg No.		W14/015329/1	W14/015330/1	W14/015331/1	W14/015332/1	
Sample Reference	Units	MC1	MC2	MC3	MC4	Method
Miscellaneous						
Ammonium-N (calculated)	mg/L	0.68	1.5	7.6	0.24	NW_D8
NOx	mg/L	0.06	< 0.01	< 0.01	0.17	NW_B19
Orthophosphate-P	mg/L	0.019	< 0.005	< 0.005	0.052	NW_D9
Ammonia-N	mg/L	0.70	1.5	7.7	0.25	NW_D8
pH	pH_unit	7.6	7.4	7.2	7.7	NW_S11
TCLP						
Volume of Elutriate water	ml	400	400	400	400	NW_SL17
Volume of Elutriate water plus sample	ml	500	500	500	500	NW_SL17
Elutriate water used		W14/015334	W14/015334	W14/015334	W14/015334	NW_SL17

Wei Huang, Analyst
Inorganics - NSW
Accreditation No. 198

25-SEP-2014

REPORT OF ANALYSIS

Report No. RN1038012

Client	: BMT Oceanica Pty Ltd	Job No.	: OCEA26_W/140910_1
	LEVEL 1	Quote No.	: QT-02002
	353 CAMBRIDGE STREET	Order No.	: 1028_02
	WEMBLEY WA 6913	Date Sampled	: 10-SEP-2014
		Date Received	: 10-SEP-2014
Attention	BEN DAVIS	Sampled By	: CLIENT
Project Name	: City of Mandurah OEPA Approval		
Your Client Services Manager	: KOON-BAY HO	Phone	: (08) 9368 8400

Lab Reg No.	Sample Ref	Sample Description
W14/015333/1	MC5	City of Mandurah OEPA Approvals ELUTRIATE 10/09/14
W14/015334	Blank Seawater	City of Mandurah OEPA Approvals SEAWATER 10/09/14

Lab Reg No.		W14/015333/1	W14/015334			
Sample Reference	Units	MC5	Blank Seawat			Method
Miscellaneous						
Ammonium-N (calculated)	mg/L	1.3	0.024			NW_D8
NOx	mg/L	0.04	0.01			NW_B19
Orthophosphate-P	mg/L	< 0.005	< 0.005			NW_D9
Ammonia-N	mg/L	1.3	0.025			NW_D8
pH	pH_unit	7.6	7.9			NW_S11
TCLP						
Volume of Elutriate water	ml	400	Not Tested			NW_SL17
Volume of Elutriate water plus sample	ml	500	Not Tested			NW_SL17
Elutriate water used		W14/015334	Not Tested			NW_SL17

Wei Huang, Analyst
Inorganics - NSW
Accreditation No. 198

25-SEP-2014

Unless notified to the contrary, the above samples will be disposed of one month from the reporting date.

REPORT OF ANALYSIS

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Results relate only to the sample(s) tested.

This Report supersedes reports: RN1037844

REPORT OF ANALYSIS

Report No. RN1038565

Client	: BMT Oceanica Pty Ltd	Job No.	: OCEA26_W/140910
	LEVEL 1	Quote No.	: QT-02002
	353 CAMBRIDGE STREET	Order No.	: 1028_02
	WEMBLEY WA 6913	Date Sampled	: 10-SEP-2014
		Date Received	: 10-SEP-2014
Attention	BEN DAVIS	Sampled By	: CLIENT
Project Name	: City of Mandurah OEPA Approval		
Your Client Services Manager	: KOON-BAY HO	Phone	: (08) 9368 8400

Lab Reg No.	Sample Ref	Sample Description
W14/015329	MC1	City of Mandurah OEPA Approvals SOIL 10/09/14
W14/015330	MC2	City of Mandurah OEPA Approvals SOIL 10/09/14
W14/015331	MC3	City of Mandurah OEPA Approvals SOIL 10/09/14
W14/015332	MC4	City of Mandurah OEPA Approvals SOIL 10/09/14

Lab Reg No.		W14/015329	W14/015330	W14/015331	W14/015332	
Sample Reference	Units	MC1	MC2	MC3	MC4	Method
Organotins						
Monobutyltin as Sn	ng/g	< 0.5	< 0.5	< 0.5	< 0.5	NR_35
Dibutyltin as Sn	ng/g	< 0.5	< 0.5	< 0.5	< 0.5	NR_35
Tributyltin as Sn	ng/g	< 0.5	< 0.5	< 0.5	< 0.5	NR_35
Surrogate: Tripropyltin	%REC	86	75	75	84	NR_35
Dates						
Date extracted		18-SEP-2014	18-SEP-2014	18-SEP-2014	18-SEP-2014	
Date analysed		19-SEP-2014	19-SEP-2014	19-SEP-2014	19-SEP-2014	

Luke Baker, Analyst
Organics - NSW
Accreditation No. 198

30-SEP-2014

Lab Reg No.		W14/015329	W14/015330	W14/015331	W14/015332	
Sample Reference	Units	MC1	MC2	MC3	MC4	Method
Miscellaneous						
Carbon - Total Organic	mg/kg	1000	3200	740	5200	NW_S15
Carbon - Total Inorganic	mg/kg	51000	63600	82600	19300	NW_S15

REPORT OF ANALYSIS

Lab Reg No.		W14/015329	W14/015330	W14/015331	W14/015332	
Sample Reference	Units	MC1	MC2	MC3	MC4	Method

Wei Huang, Analyst
Inorganics - NSW
Accreditation No. 198

30-SEP-2014

Lab Reg No.		W14/015329	W14/015330	W14/015331	W14/015332	
Sample Reference	Units	MC1	MC2	MC3	MC4	Method
Polycyclic Aromatic Hydrocarbons						
Naphthalene	mg/kg	< 0.10	< 0.10	< 0.10	< 0.10	WL206
Acenaphthylene	mg/kg	< 0.10	< 0.10	< 0.10	< 0.10	WL206
Acenaphthene	mg/kg	< 0.10	< 0.10	< 0.10	< 0.10	WL206
Fluorene	mg/kg	< 0.10	< 0.10	< 0.10	< 0.10	WL206
Phenanthrene	mg/kg	< 0.10	< 0.10	< 0.10	< 0.10	WL206
Anthracene	mg/kg	< 0.10	< 0.10	< 0.10	< 0.10	WL206
Fluoranthene	mg/kg	< 0.10	< 0.10	< 0.10	< 0.10	WL206
Pyrene	mg/kg	< 0.10	< 0.10	< 0.10	< 0.10	WL206
Benzo(a)anthracene	mg/kg	< 0.10	< 0.10	< 0.10	< 0.10	WL206
Chrysene	mg/kg	< 0.10	< 0.10	< 0.10	< 0.10	WL206
Benzo(b + k)fluoranthene	mg/kg	< 0.20	< 0.20	< 0.20	< 0.20	WL206
Benzo(a)pyrene	mg/kg	< 0.10	< 0.10	< 0.10	< 0.10	WL206
Indeno(1,2,3,c,d)pyrene	mg/kg	< 0.10	< 0.10	< 0.10	< 0.10	WL206
Dibenzo(a,h)anthracene	mg/kg	< 0.10	< 0.10	< 0.10	< 0.10	WL206
Benzo(g,h,i)perylene	mg/kg	< 0.10	< 0.10	< 0.10	< 0.10	WL206
Total PAH (as above)	mg/kg	< 1.6	< 1.6	< 1.6	< 1.6	WL206
BTEX						
Benzene	mg/kg	< 0.50	< 0.50	< 0.50	< 0.50	WL244
Toluene	mg/kg	< 0.50	< 0.50	< 0.50	< 0.50	WL244
Ethylbenzene	mg/kg	< 0.50	< 0.50	< 0.50	< 0.50	WL244
Xylene	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	WL244
Total BTEX	mg/kg	< 2.5	< 2.5	< 2.5	< 2.5	WL244
Miscellaneous						
Moisture	%	28	35	49	26	WL170
NEPM Total Recoverable Hydrocarbons						
TRH C6-C10	mg/kg	< 25	< 25	< 25	< 25	WL244
TRH C6-C10 less BTEX (F1)	mg/kg	< 25	< 25	< 25	< 25	WL244
TRH >C10-C16	mg/kg	< 50	< 50	< 50	< 50	WL230WL206
TRH >C10-C16 less Nap(F2)	mg/kg	< 50	< 50	< 50	< 50	WL230WL206
TRH >C16-C34	mg/kg	< 100	< 100	< 100	< 100	WL230WL206

REPORT OF ANALYSIS

Lab Reg No.		W14/015329	W14/015330	W14/015331	W14/015332	
Sample Reference	Units	MC1	MC2	MC3	MC4	Method
NEPM Total Recoverable Hydrocarbons						
TRH >C34-C40	mg/kg	< 100	< 100	< 100	< 100	WL230WL206
Dates						
Date extracted		11-SEP-2014	11-SEP-2014	11-SEP-2014	11-SEP-2014	
Date analysed		11-SEP-2014	11-SEP-2014	11-SEP-2014	11-SEP-2014	
Sample condition on receipt		COLD	COLD	COLD	COLD	

Koon-Bay Ho, Section Manager
Organics - WA
Accreditation No. 2474

30-SEP-2014

Lab Reg No.		W14/015329	W14/015330	W14/015331	W14/015332	
Sample Reference	Units	MC1	MC2	MC3	MC4	Method
Inorganics						
ANC bt as CaCO3	%	39	35	37	Not Tested	WL281-19A2
pH kcl		9.8	9.7	9.5	9.9	WL281-23A
Scr	%	0.04	0.07	0.15	0.02	WL281-22B
Total Kjeldahl Nitrogen	mg/kg	190	600	1400	100	WL132
Total Phosphorus	mg/kg	150	220	360	120	WL195
Trace Elements						
Arsenic	mg/kg	8.2	4.1	4.9	3.6	WL273
Cadmium	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4	WL273
Chromium	mg/kg	6.7	7.1	9.0	3.8	WL273
Copper	mg/kg	7.3	3.4	1.9	0.8	WL273
Lead	mg/kg	2.0	1.8	2.3	1.6	WL273
Mercury	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	WL41
Nickel	mg/kg	0.7	1.1	1.4	0.7	WL273
Zinc	mg/kg	2.2	3.2	4.8	2.7	WL273

W14/015329
to W14/015329

Acid sulfate soil analytes were determined on the samples after they were dried and ground in a ring mill (i.e. reported on a dry weight basis).

REPORT OF ANALYSIS

Lab Reg No.		W14/015329	W14/015330	W14/015331	W14/015332	
Sample Reference	Units	MC1	MC2	MC3	MC4	Method

David Lynch, Section Manager
Inorganics - WA
Accreditation No. 2474

30-SEP-2014

REPORT OF ANALYSIS

Client	: BMT Oceanica Pty Ltd	Job No.	: OCEA26_W/140910
	LEVEL 1	Quote No.	: QT-02002
	353 CAMBRIDGE STREET	Order No.	: 1028_02
	WEMBLEY WA 6913	Date Sampled	: 10-SEP-2014
		Date Received	: 10-SEP-2014
Attention	BEN DAVIS	Sampled By	: CLIENT
Project Name	: City of Mandurah OEPA Approval		
Your Client Services Manager	: KOON-BAY HO	Phone	: (08) 9368 8400

Lab Reg No.	Sample Ref	Sample Description
W14/015333	MC5	City of Mandurah OEPA Approvals SOIL 10/09/14

Lab Reg No.		W14/015333				
Sample Reference	Units	MC5				Method
Organotins						
Monobutyltin as Sn	ng/g	< 0.5				NR_35
Dibutyltin as Sn	ng/g	< 0.5				NR_35
Tributyltin as Sn	ng/g	< 0.5				NR_35
Surrogate: Tripropyltin	%REC	85				NR_35
Dates						
Date extracted		18-SEP-2014				
Date analysed		19-SEP-2014				

Luke Baker, Analyst
Organics - NSW
Accreditation No. 198

30-SEP-2014

Lab Reg No.		W14/015333				
Sample Reference	Units	MC5				Method
Miscellaneous						
Carbon - Total Organic	mg/kg	3300				NW_S15
Carbon - Total Inorganic	mg/kg	47400				NW_S15

Wei Huang, Analyst
Inorganics - NSW
Accreditation No. 198

30-SEP-2014

REPORT OF ANALYSIS

Lab Reg No.		W14/015333				
Sample Reference	Units	MC5				Method
Polycyclic Aromatic Hydrocarbons						
Naphthalene	mg/kg	< 0.10				WL206
Acenaphthylene	mg/kg	< 0.10				WL206
Acenaphthene	mg/kg	< 0.10				WL206
Fluorene	mg/kg	< 0.10				WL206
Phenanthrene	mg/kg	< 0.10				WL206
Anthracene	mg/kg	< 0.10				WL206
Fluoranthene	mg/kg	< 0.10				WL206
Pyrene	mg/kg	< 0.10				WL206
Benzo(a)anthracene	mg/kg	< 0.10				WL206
Chrysene	mg/kg	< 0.10				WL206
Benzo(b + k)fluoranthene	mg/kg	< 0.20				WL206
Benzo(a)pyrene	mg/kg	< 0.10				WL206
Indeno(1,2,3,c,d)pyrene	mg/kg	< 0.10				WL206
Dibenzo(a,h)anthracene	mg/kg	< 0.10				WL206
Benzo(g,h,i)perylene	mg/kg	< 0.10				WL206
Total PAH (as above)	mg/kg	< 1.6				WL206
BTEX						
Benzene	mg/kg	< 0.50				WL244
Toluene	mg/kg	< 0.50				WL244
Ethylbenzene	mg/kg	< 0.50				WL244
Xylene	mg/kg	< 1.0				WL244
Total BTEX	mg/kg	< 2.5				WL244
Miscellaneous						
Moisture	%	31				WL170
NEPM Total Recoverable Hydrocarbons						
TRH C6-C10	mg/kg	< 25				WL244
TRH C6-C10 less BTEX (F1)	mg/kg	< 25				WL244
TRH > C10-C16	mg/kg	< 50				WL230WL206
TRH > C10-C16 less Nap(F2)	mg/kg	< 50				WL230WL206
TRH > C16-C34	mg/kg	< 100				WL230WL206
TRH > C34-C40	mg/kg	< 100				WL230WL206
Dates						
Date extracted		11-SEP-2014				
Date analysed		11-SEP-2014				
Sample condition on receipt		COLD				

Koon-Bay Ho, Section Manager
Organics - WA
Accreditation No. 2474

30-SEP-2014

REPORT OF ANALYSIS

Lab Reg No.		W14/015333				
Sample Reference	Units	MC5				Method
Inorganics						
ANC bt as CaCO3	%	37				WL281-19A2
pH kcl		9.7				WL281-23A
Scr	%	0.08				WL281-22B
Total Kjeldahl Nitrogen	mg/kg	470				WL132
Total Phosphorus	mg/kg	200				WL195
Trace Elements						
Arsenic	mg/kg	6.3				WL273
Cadmium	mg/kg	< 0.4				WL273
Chromium	mg/kg	7.4				WL273
Copper	mg/kg	3.4				WL273
Lead	mg/kg	4.8				WL273
Mercury	mg/kg	< 0.1				WL41
Nickel	mg/kg	1.3				WL273
Zinc	mg/kg	6.7				WL273

David Lynch, Section Manager
Inorganics - WA
Accreditation No. 2474

30-SEP-2014

All results (except moisture) are expressed on a dry weight basis. Unless notified to the contrary, the above samples will be disposed of one month from the reporting date.

NATA
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Results relate only to the sample(s) tested.

This Report supersedes reports: RN1036847 RN1037828 RN1037902 RN1038560

Acid Base Accounting for Chromium Suite Analyses

Net Acidity = Potential Sulfidic Acidity + Actual Acidity + Retained Acidity - measured ANC_{bt}/ Fineness Factor

Liming Rate = Net Acidity * Safety Factor * Soil Density

A typical Fineness Factor is 1.5	A typical Safety Factor is 1.5	Normal Soil Bulk Density Range is from 0.7 to 2.0 Peat can be 0.2	Super-fine Agricultural Lime used in calculation

Note (1) : The S_{NAS} results (Retained Acidity) are multiplied by a factor of 0.75 when calculating the Net Acidity (to convert jarositic sulfur to an equivalent pyrite sulfur value)

Note (2) : A factor of 100/ 96 is applied to the Liming Rate (to account for the pure $CaCO_3$ neutralising value of 100 compared to that of agricultural lime of 96)

		ANC_{bt}	Scr	TAA	S_{NAS} (Calc)					Soil	Soil
NMI Lab Number	Client Sample Number	Acid Neutralising Capacity back titration	Potential Sulfidic Acidity	Actual Acidity	Retained Acidity	Net Acidity	Net Acidity	Fineness Factor	Safety Factor	Bulk Density	Liming Rate for Ag Lime
Units		% $CaCO_3$	% S	mol H^+/ t	% S	as % S	as mol H^+/ t			t/ m^3	kg $CaCO_3$/ t
Limit of Reporting		<0.05	<0.01	<1	<0.01						
W14/015329	MC1	39	0.04	<1		-8.29	-5170	1.5	1.5	1.0	-404.3
W14/015330	MC2	35	0.07	<1		-7.41	-4618	1.5	1.5	1.0	-361.2
W14/015330-d	MC2	35	0.08	<1		-7.40	-4612	1.5	1.5	1.0	-360.7
W14/015331	MC3	37	0.15	<1		-7.75	-4835	1.5	1.5	1.0	-378.1
W14/015332	MC4		0.02	<1		0.02	12	1.5	1.5	1.0	1.0
W14/015333	MC5	37	0.08	<1		-7.82	-4879	1.5	1.5	1.0	-381.5

Australian Government
National Measurement Institute

QUALITY ASSURANCE REPORT

BMT OCEANICA CONSULTING

Level 1
353 Cambridge Street
WEMBLEY 6014

Attention: Ben Davis

NMI Job No: OCEA26_W/140910
Sample Matrix: Soil
Sample LRN Range: W14/015329 - 015333

Analyte	LOR	Blank	Units	LRN	Duplicate	Recovery	Acceptability
				W14/015330	D	%	Limits
ANC bt as CaCO3	0.05	N/A	%	35	35	96 %	95 - 105
pH kcl	-	-	-	9.7	9.7	-	-
Scr	0.01	N/A	%	0.07	0.08	95 %	80 - 120
Total Kjeldahl Nitrogen	50	<50	mg/kg	600	600	88 %	80 - 110
Total Phosphorus	1	<1	mg/kg	220	210	95 %	80 - 110
Trace Elements							
Arsenic	0.5	<0.5	mg/kg	4.1	4.1	102 %	75 - 120
Cadmium	0.4	<0.4	mg/kg	<0.4	<0.4	98 %	75 - 120
Chromium	0.5	<0.5	mg/kg	7.1	7.1	92 %	75 - 120
Copper	0.5	<0.5	mg/kg	3.4	3.4	98 %	75 - 120
Lead	0.5	<0.5	mg/kg	1.8	1.9	95 %	75 - 120
Mercury	0.1	<0.1	mg/kg	<0.1	<0.1	103 %	75 - 120
Nickel	0.5	<0.5	mg/kg	1.1	1.1	97 %	75 - 120
Zinc	0.5	<0.5	mg/kg	3.2	3.3	93 %	75 - 120

Signed: **David Lynch**
Section Manager
Inorganics - WA

Date: **30/09/2014**

Appendix G

Construction and Demolition Environmental Management Plan Outline

BMT Oceanica

Mandurah Traffic Bridge Construction and Demolition Environmental Management Plan Outline

1028_02_004/2_Rev0
November 2014

Mandurah Traffic Bridge

Construction and Demolition Environmental Management Plan Outline

Prepared for

City of Mandurah

Prepared by

BMT Oceanica Pty Ltd

November 2014

Report No. 1028_02_004/2_Rev0

Client: City of Mandurah

Document history

Distribution

Revision	Author	Recipients	Organisation	No. copies & format	Date
A	B Davis	K Crawley	BMT Oceanica	1 x docm	26/9/2014
B	B Davis	T Ridgway	BMT Oceanica	1 x docm	6/10/2014
C	B Davis	S Hudson	City of Mandurah	1 x PDF	9/10/2014
D	B Davis	B Hegge	BMT Oceanica	1 x docm	27/11/2014
Rev0	B Davis	S Hudson	City of Mandurah	1 x PDF	28/11/2014

Review

Revision	Reviewer	Intent	Date
A	K Crawley	Technical Review	1/10/2014
B	T Ridgway	Editorial Review	6/10/2014
C	S Hudson	Client Review	9/10/2014
D	B Hegge	Director Review	27/11/2014

Status

This report is 'Draft' until approved for final release, as indicated below by inclusion of signatures from: (i) the author and (ii) a Director of BMT Oceanica Pty Ltd or their authorised delegate. A Draft report may be issued for review with intent to generate a 'Final' version, but must not be used for any other purpose.

Approved for final release:

Author
Date: 28/11/2014

Director (or delegate)
Date: 28/11/2014

Cover

Main image: Mandurah Channel (BMT Oceanica Pty Ltd)
Minor images: Underneath the Mandurah traffic bridge (BMT Oceanica Pty Ltd)
Mandurah traffic bridge (BMT Oceanica Pty Ltd)

Disclaimer

Contents

List of Figures

List of Tables

1. Introduction

1.1 The proposal

Main Road WA (MRWA) and the City of Mandurah (CoM) proposes to demolish and replace the old Mandurah Traffic Bridge (The Bridge), which spans the Mandurah Channel. The existing Mandurah Traffic Bridge spans the Mandurah Channel at the northern end of the Peel Harvey Estuarine System (PHES). The Bridge is situated south of Mandjar Bay, which is a small embayment within the Mandurah channel that is heavily used for recreation (Figure 1.1). This traffic bridge forms the northern extent of the Peel-Yalgorup Ramsar Wetland area, which covers the entire PHES.

The proposed new Bridge is likely to be of a concrete construction, located north of the existing Bridge (Figure 1.2, Figure 1.3). The CoM has undertaken extensive review of the Bridge design, with public and stakeholder input. It is anticipated that the construction of the new Bridge will require some seabed disturbance in the form of pile driving for the foundations, but will not involve dredging or disposal of sediment. It is proposed that the new Bridge will be built first, prior to the demolition of the old Bridge. This approach will minimise the time period of no access across either bridge to ~3 months.

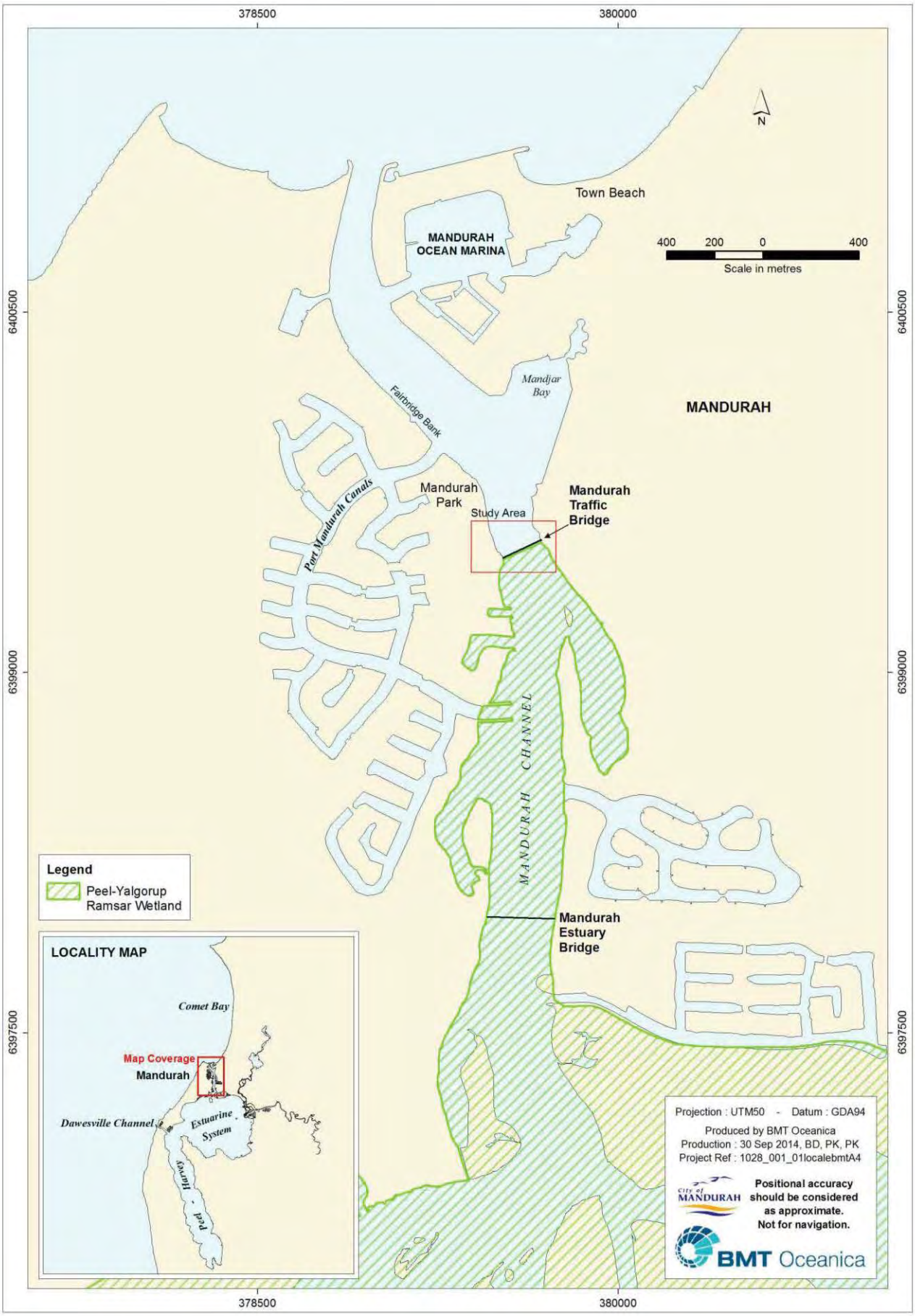

Figure 1.1 Study area

Source: City of Mandurah (2013)

Figure 1.2 Proposed concept design for the new Mandurah Traffic Bridge

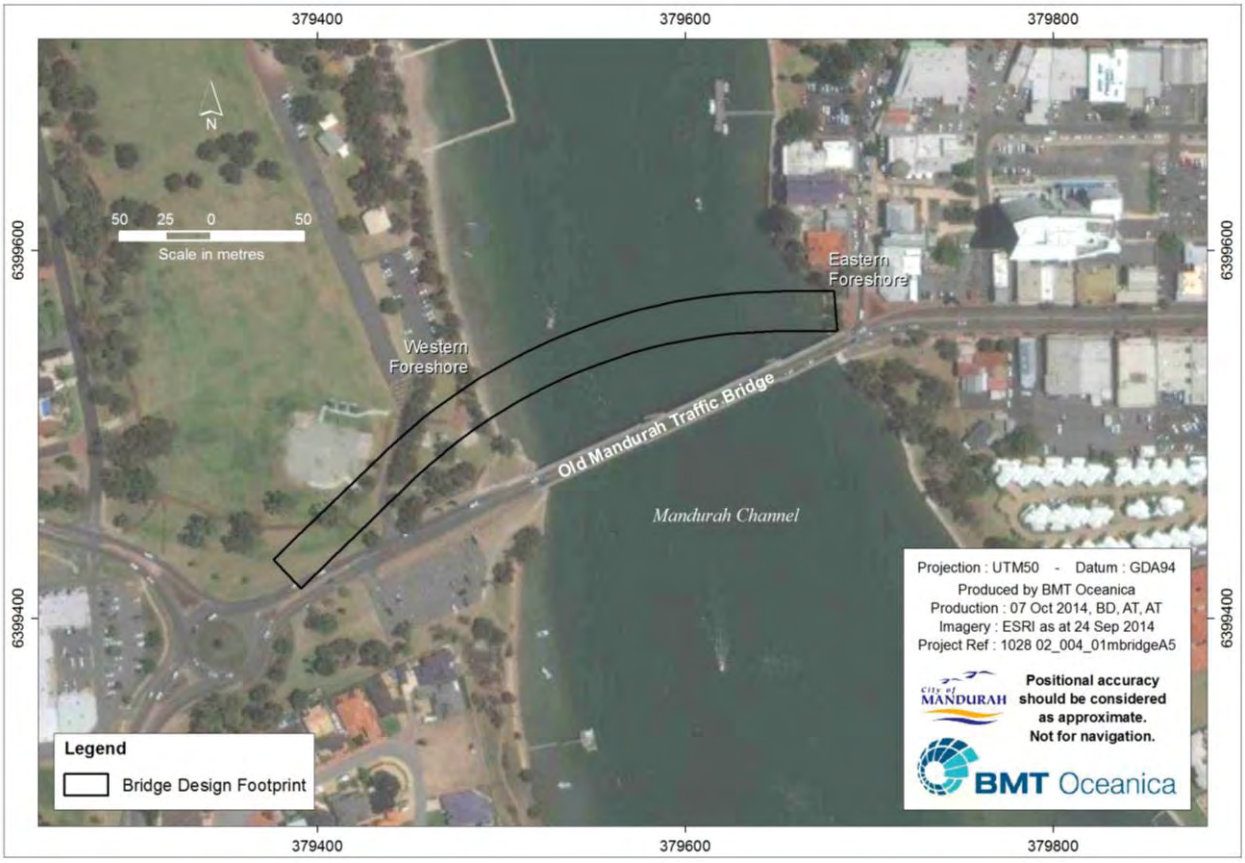

Figure 1.3 Proposed layout of the new Bridge

1.2 Purpose of this document

This Construction and Demolition Environmental Management Plan outline (CDEMP) provides an outline environmental management and monitoring framework for the environmental aspects of the Project to ensure environmental impacts are minimised to as low as reasonably practicable. It is intended that this outline will be used by the Contractor (once awarded by the CoM) to form a final CDEMP to be used for the Project.

The key environmental factors, risks, and management commitments outlined in this CDEMP are documented in the Project Environmental Impact Assessment (EIA) referral document (BMT Oceanica 2014).

1.3 Construction methods

The new Bridge will most likely be a reinforced concrete structure, incrementally launched from the western abutment (Western Foreshore) to the eastern abutment (Eastern Foreshore). The Bridge structure is expected to span ~240 m from abutment to abutment. The structure is expected to be supported on 5 piers with these piers in turn supported on piles expected to be ~20 to 25 m in depth. In addition, it is likely that pile foundations would be required at the abutment on the Eastern Foreshore and may also be required at the abutment on the Western Foreshore. Detailed construction methods will be included as part of the final CDEMP.

1.4 Demolition methods

The old Bridge will most likely be dismantled incrementally from either the Eastern Foreshore or the Western Foreshore, or both. Some of the old Bridge materials are expected to be reused in recognition of the local heritage value, including the likelihood that the sets of piers closest to each abutment will be retained and reused as part of new fishing platforms, or similar. It is expected that existing piles will be removed to a depth marginally below the seabed with the remnant embedded pile sections being left in situ. Detailed demolition methods will be included as part of the final CDEMP.

2. Construction and Demolition Environmental Management Plan Implementation

2.1 Relevant legislation

The following legislation applies to this CDEMP:

- *Environmental Protection Act 1986*
- *Environmental Protection and Biodiversity Conservation Act 1999*
- *Rights in Water and Irrigation Act 1914*
- *Waterways Conservation Act 1976*

In addition, the final CDEMP will need to comply with any permits and licenses issued for the Project, and any conditions placed on the Project by these permits and licenses.

2.2 Roles and responsibilities

The CoM owns the Mandurah traffic bridge; however MRWA will be the Principal proponent for the Project, and as such, will be ultimately responsible for all aspects of the Project. This includes the implementation of the environmental management and monitoring actions identified within this CDEMP that aim to minimise and/or prevent impacts to human and environmental health for the duration of the works.

The Contractor will be responsible for the delivery of the construction and demolition works. The Contractor will have responsibilities to implement environmental management and monitoring actions documented herein and to report to the Principal.

The specific environmental management and monitoring actions to be implemented by both the Principal and Contractor for the duration of this Project are summarised in Section 2.6.

The Principal has engaged BMT Oceanica Pty Ltd (BMT Oceanica) to provide environmental advice for this Project.

The key roles and responsibilities for this Project are provided in Table 2.1.

Table 2.1 Key roles and responsibilities for the Project

Role and organisation	Name and contact details	Responsibilities
Principal	Ilario Spagnolo, Project Director, Main Roads WA Don Aitken Centre, Waterloo Crescent East Perth WA 6004	• overseeing the Project • ensuring the implementation of environmental management and monitoring • reporting to the regulatory authorities.
Contractor	TBA	• completion of the construction and demolition works • environmental management and monitoring actions • reporting to the Principal.

Role and organisation	Name and contact details	Responsibilities
Environmental Consultant –BMT Oceanica	Ben Davis Marine Scientist 1/353 Cambridge Street, Wembley, WA, 6014 Email: ben.davis@bmtoceanica.com.au Phone: (08) 6272 0000	• provision of advice relating to the environmental commitments of the Project • coordination of the environmental monitoring actions • liaison with Regulators, on behalf of the Principal

Notes:
1. TBA = to be awarded/announced

2.3 Training and awareness

All on-site project personnel involved in construction, dredging and other site works associated with the Project shall receive a formal environmental induction prior to commencing the works. The induction will ensure all personnel are aware of their roles and responsibilities and confirm they are competent to complete the works in an environmentally responsible manner. The environmental induction shall outline:

- regulatory requirements
- roles and responsibilities
- environmental values and issues
- environmental management and monitoring commitments
- incident reporting requirements
- emergency response procedures
- remedial actions to be applied across the entire Project.

An induction training register shall be maintained as well as copies of certification relevant to work practices.

2.4 Incident reporting

For the purposes of this CDEMP, environmental incidents are defined as any breaches or non-compliance with environmental objectives and actions prescribed by the management and monitoring commitments in Section 2.6.

All incidents and complaints shall be reported within 24 hours to the Principal (Section 4). An incident and/or complaint record shall be completed by the Principal, including details of the incident or complaint, severity (minor, moderate or major), contributing factors, immediate and further corrective and/or preventative actions, and notifications. Where required, a copy of the incident report shall also be provided to the Office of the Environmental Protection Authority (OEPA) and Department of Environment Regulation (DER). Management measures shall be implemented as soon as practicable.

2.5 Stakeholder and community consultation

Stakeholder and community consultation has been documented in the EIA (BMT Oceanica 2014).

2.6 Environmental objectives and commitments

The EPA (2013) lists an objective for each environmental factor that, if met, will indicate that the proposal is not expected to have a significant impact on the environment. The environmental objectives, performance objectives, standards/guidelines/policies and measurement criteria for the Project are summarised in Table 2.2.

An Environmental Commitments Register to manage the potential environmental impacts associated with the overall Project is listed in Table 2.3. All commitments listed in the register are measurable and/or auditable. The responsibility for each commitment is ultimately assigned to the CoM's Project Manager, but Project Managers from the contractors also have designated responsibility for various key commitments, as per Table 2.3.

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Table 2.2 Environmental objectives, standards and measurement criteria

Environmental Factor	EPA Environmental Objectives[1]	Performance Objectives[2]	Standards[3]	Measurement Criteria[4]
Inland waters (wetlands) environmental quality	To maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected.	Introduced Marine Pest Species (IMP): Ensure marine pest species are not introduced into Mandurah Channel or the Peel Harvey Estuary as a result of the Project.	• Construction and Demolition Environmental Management Plan (CDEMP), including procedures for preventing introduction of marine pest species via ballast water and/or hull biofouling, in accordance with Australian Quarantine and Inspection Service (AQIS) and National Introduced Marine Pest Coordination Group (NIMPCG) guidelines.	• System in place to ensure all Project vessels entering Mandurah Channel adhere to MRWA's CDEMP, including logging of environmental incidents involving IMP incursions (and near misses).

Marine fauna	To maintain the diversity, geographic distribution and viability of fauna at the species and population levels.	Ensure the risk of harm to susceptible marine fauna from Project piling and demolition noise emissions is acceptably low.	• Construction and Demolition Environmental Management Plan (CDEMP), detailing procedures for the management of piling and demolition works and resultant underwater noise, including:
			  • definition and maintenance of susceptible marine fauna exclusion zone (based on appropriate modelling);
			  • pile driver soft start-up procedures (to help facilitate avoidance by susceptible marine fauna).
				• Implementation and maintenance of marine fauna exclusion zone of 200 m during piling and demolition operations by on-deck surveillance and/or dedicated boat search prior to the commencement of driving each pile or the commencement of demolition works. System in place to record boat/deck searches and presence and location of susceptible marine fauna.
				• Piling to be undertaken during daylight hours only, to enable surveillance of exclusion zone.
				• Adherence to CDEMP soft start-up procedures.

Benthic primary producer habitat	To maintain the structure, function, diversity, distribution and viability of benthic communities and habitats at local and regional scales.	Ensure no loss of BPPH outside of the new traffic Bridge piling footprint.	Design controls to:
			• Ensure no dredging is required, to minimise direct footprint losses of BPPH to piling areas only
			• Construction and Demolition Environmental Management Plan (CDEMP), detailing procedures for:
			  • Barge anchor and pile placement, so as not to disturb BPPH;
			  • Preventing accidental loss of equipment and materials, so as not to disturb BPPH.
				• System in place for logging of environmental incidents involving loss of BPPH, including spatial estimate of loss.

Inland waters (wetlands) environmental quality	To maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected.	Hazardous Substances and Waste: Ensure potential contaminants associated with the Project, e.g. fuels, hydraulic oils, lubricants, wastes (putrescibles and hydrocarbon-based), are not released to the environment.	• Construction and Demolition Environmental Management Plan (CDEMP), detailing procedures for:
			  • fuel storage as per AS1940 requirements;
			  • waste storage and disposal;
			  • refuelling procedures;
			  • equipment inspection and servicing;
			  • spill response (including oil spill response).
				• System in place to ensure records of incidents and regular inspections of equipment and storage/bunding integrity.
				• System in place to immediately deal with a hydrocarbon/contaminant spill.
				• Oil spill kit located nearby fuel storage, refuelling and servicing areas.

Terrestrial flora	To maintain representation, diversity, viability and ecological function at the species, population and community level.	No impact on native vegetation outside of the Project footprint	Native Vegetation Clearing Permit under the *EP Act 1986* and associated conditions	• System in place to ensure the Native Vegetation Clearing permit conditions are adhered to.

Terrestrial fauna	To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.	No impact to native birds utilising the Peel Harvey Estuary	• CDEMP detailing procedures for the management of impacts to birds, including
			  • reduced lighting at night.
			  • soft-start or ramp up during piling operations.
				• System in place to ensure CDEMP is followed.
				• Adherence to CDEMP soft-start up procedures.

Public amenity	To ensure that impacts to amenity are reduced as low as reasonably practicable.	Public access to the foreshore area is restricted as little as possible during the works
		
		Vehicle access across the Mandurah Channel is restricted as little as possible
			• CDEMP to clearly outline construction and demolition methods that
			  • reduce the impact of the works on public access to the foreshore area.
			  • limit closure of the bridges to vehicles to as short a time as possible.
				• System in place to ensure CDEMP is followed.
				• Adherence to CDEMP construction and demolition methods and timeframes.

Notes:

1. *EPA (2013)*
2. *'Performance Objectives' relates to the overall environmental goal (consistent with environmental policy) that an organisation sets itself to achieve*
3. *'Standards' include; company standards, regulatory requirements, and recognised Australian and International standards*
4. *'Measurement criteria' are measurable/auditable outcomes that ensure that the company's environmental performance objectives meet and/or surpass the standards*

Table 2.3 Environmental commitments register

#	Key Environmental Commitment
1	No dredging of the seafloor will occur in the Mandurah Channel.
2	Vessels and barges shall not moor or land directly to the foreshore banks outside of the area of foreshore that is to be modified for the purpose of constructing the new Bridge.
3	Vessel and barges shall not be allowed to run aground on the seafloor during operations except when mooring to the foreshore that is to be modified for the purpose of constructing the new Bridge.
4	No works shall occur between 1900 and 0700 or on Sunday.
5	Minimal lighting only will be used overnight for security and safety purposes.
6	Night-time light levels should not exceed the ambient light level at the existing Mandurah Traffic Bridge.
7	AQIS Guidelines for ballast water exchange (when required) will be complied with at all times, as documented in the CDEMP.
8	Barges and works vessels will be clean of biofouling before arrival at the Mandurah Channel.
9	A 200 m exclusion zone will be maintained through dedicated on-deck surveillance for susceptible marine fauna at commencement of pile driving each pile and during demolition.
10	Pile driving shall commence with soft/'fairy taps' to warn proximal marine fauna.
11	Waste shall be disposed of and stored in secured, lidded bins for appropriate onshore disposal.
12	A post-construction and demolition seabed visual survey shall be conducted to ensure no waste remains in the Mandurah Channel.
13	Lifting equipment shall be certified and crane operation shall be to Department of Commerce WorkSafe requirements to ensure safe operation and no loss of equipment / materials (refer to CDEMP).
14	Mechanical/hydraulic equipment and oil/fuel/lubricant storage areas will be regularly inspected (refer to CDEMP).
15	Any on-deck or on-shore spills and leaks of hydrocarbons or other contaminants (including during fuel transfer) shall be recovered promptly with spill-kits.
16	Fuels and lubricants, including waste-oil, shall be stored in accordance with Dangerous Goods requirements, including storage in bunded drums for licensed on-shore disposal.
17	Fuel pumps, tanks and storage areas will be regularly inspected.
18	Marine equipment and boats shall be operated by qualified personnel. Mooring lighting will be utilized on barges and moorings.
19	Supplier contracts shall require adherence to national/international legislative requirements for oil spill prevention.
20	The boundary of the Native Vegetation Clearing Permit area will be clearly marked.
21	No clearing of native vegetation will occur outside of the permitted area.
22	Public access to the foreshore area around the bridges to be restricted as little as possible.
23	Vehicle access across the bridges to be restricted for no longer than 3 months.

3. Environmental Management and Monitoring

It is expected that the Contractor will develop management and monitoring commitments for each environmental objective (Table 2.2), environmental commitment (Table 2.3), and any license or permit conditions, to ensure that these objectives, commitments and conditions are met. The monitoring and management commitments must include the Environmental Standards outlined in Table 2.2). An example piling noise management and monitoring commitments are provided in Table 3.1.

Table 3.1 Piling noise management and monitoring commitments during the Project

Piling noise management and monitoring commitments	
Performance objectives	Ensure the risk of harm to susceptible marine fauna from Project piling noise emissions is acceptably low.
Key performance indicator	No piling while marine mammals are within 200 m of the piling operations. No reports of injured or dead marine mammals from piling noise-related injuries.
Environmental commitment	A 200 m exclusion zone will be maintained through dedicated on-deck surveillance for susceptible marine fauna at commencement of pile driving each pile and during demolition. Pile driving shall commence with soft/'fairy taps' to warn proximal marine fauna.
Timing	During construction.
Monitoring commitments	
• A trained marine mammal observer (MMO) will be present on the piling vessel at all times while piling operations are occurring, and shall not be required to complete any task other than MMO while onboard. • The MMO shall record all marine mammal observations (> 200 m from the piling vessel) and interactions with marine mammals (< 200 m from the piling vessel) and provide a copy of these records to the Principal. • Piling operation shall not occur while a marine mammal is within the 200 m exclusion zone. • A dedicated 10 minute standoff period shall be employed at the start of each piling operation to ensure that no marine mammals are within the exclusion zone. • Soft-start or ramp up procedures shall be used at the start of each pilling operation to deter marine mammals from the area.	
Contingency measures	
Marine mammal within the exclusion zone before piling operations commence: • The piling operations shall not commence until marine mammal has left the exclusion zone. • The piling contractor shall follow all standoff and soft-start/ramp up procedures when commencing piling. **Marine mammal enters the exclusion zone during piling operations:** • Piling will be immediately cease. • Piling shall not re-commence until the marine mammal has left the exclusion zone. • The piling contractor shall follow all standoff and soft-start /ramp up procedures when re-commencing piling. **MMO not onboard during piling operations** • Piling operations shall cease immediately, and may only re-commence once a trained MMO is onboard. • The piling contractor shall notify the Principal of the non-conformance, as per Section 4.2. • The piling contractor shall follow all standoff and soft-start /ramp up procedures when re-commencing piling.	
Responsibilities and reporting commitments	
Principal: • Ensure all marine mammal monitoring is completed, compiled, and the associated reporting is undertaken. • Report results to OEPA and DER as appropriate. **Contractor** • Provide a MMO staff with adequate training, and provide a record of this training to the Principal. • Ensure a trained MMO is onboard the piling vessel at all times piling is undertaken. • Provide copies of all marine mammal observations and interactions to the Principal.	

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4. Review, Reporting, Records and Auditing

4.1 Revision

This CDEMP shall be revised as required to: (i) reflect updates or changes to applicable legislative requirements and/or any future approval or permit conditions; and (ii) incorporate any changes to work requirements, practices and/or procedures. All revisions of the CDEMP are to be reviewed and signed by the Principal and Contractor, and shall be provided to the OEPA and DER, where required.

4.2 Reporting and records

Reporting associated with this CDEMP shall be in accordance with any project approvals and/or conditions, as well as prevailing legislation. Reporting to regulatory authorities shall be directly by the Principal, or by a nominated representative of the Principal.

Reports relating to environmental management and monitoring commitments shall be provided to the Principal by the consultant undertaking the work. The Principal shall be responsible for ensuring all management and monitoring results are provided to regulatory authorities (OEPA and DER) as necessary.

4.3 Auditing

An audit table template should be prepared by the contractor, in accordance with the *Post Assessment Guideline for Preparing an Audit Table* (OEPA 2012), to facilitate assessment of compliance with this CDEMP.

The audit table shall contain each management and monitoring requirement and/or commitment and include the attributes outlined in Table 4.1. An example audit table for the Piling noise management and monitoring commitments (Table 3.1) is provided in Table 4.1.

Table 4.1 Audit table requirements and example for piling noise management and monitoring

	Audit code	Subject	Timing	Requirement/commitment	Evidence	Status	Further information
Definition	The main theme of the implementation condition, procedure or commitment.	The environmental subject/issue	Specific timing and/or location	An exact copy of the wording of the relevant implementation condition, procedure or commitment.	Information or data required to be collected to verify compliance as outlined in this CDEMP and/or any approval condition (e.g. monitoring report, site inspection requirements etc.).	Assessment of compliance against the audit requirements/commitments, to be completed during the audit.	Provision of additional information or comments during the audit.
Example	Piling noise management and monitoring commitments.	Marine Fauna	During piling operations	A 200 m exclusion zone will be maintained through dedicated on-deck surveillance for susceptible marine fauna at commencement of pile driving each pile and during demolition.	MMO observation and interaction reports.	–	–

Note:
1. – indicates a cell that should be completed during the audit

Each of the above attributes can be pre-filled into the Project audit table columns, with the exception of the 'Status' and 'Further information' columns. These will be filled in during the audit to assess compliance.

The appropriate audit terms to indicate compliance (i.e. the 'Status' for each audit requirement/commitment), as adapted from OEPA (2012) and presented in Table 4.2, should be used to indicate conformance with this CDEMP, or compliance with regulatory approval conditions associated with this Project.

Table 4.2 Terms to be used to document the level of compliance (audit status) during audit reporting

Term	Definition
Satisfactory to date	Management action(s) or condition generally appears to be implemented.
Conformance	Management action or commitment has been implemented.
Compliance	Approval condition has been implemented.
Partial conformance	Management action is partially being implemented.
Non-conformance	Management action or commitment has not been implemented.
Non-compliance	Approval condition has not been implemented.
Opportunity for improvement	Evidence presented indicates a requirement has been implemented, but based on auditor experience and knowledge, additional effectiveness might be possible with a modified approach. An opportunity for improvement may potentially improve the system if action is taken.
Completed/Closed	Management action(s) or approval condition has been completed and is no longer required to be implemented.
Not applicable	Audit element was not applicable at the time of the audit.
Unable to assess	Information was not available at the time of the audit to determine conformance/compliance.
Not required	The requirements of the management action(s) or approval condition were not triggered at the time of the audit.

The audit table shall be revised to reflect any changes made to management and monitoring requirements/commitments. The Principal shall review the audit table and requirements/commitments in accordance with its auditing and monitoring procedure.

5. References

BMT Oceanica (2014) Mandurah Traffic Bridge Replacement Environmental Impact Assessment Referral Document. Prepared for City of Mandurah by BMT Oceanica Pty Ltd, Report No 1028_02_004/1 RevB, Perth, Western Australia, October 2014

OEPA (2012) Post Assessment Guideline for Preparing and Audit Table. Prepared by Office of the Environmental Protection Authority, Report No PAG 1, Perth, Western Australia, August 2012

EPA (2013) Environmental Assessment Guideline 8–Environmental Factors and Objectives. Environmental Protection Agency, Perth, Western Australia, June 2013

Appendix H

City of Mandurah Stakeholder Consultation Reports

Community Engagement Report
Old Mandurah Bridge Redevelopment

1. Key Objectives

In the first two phases of this project, the objectives of community consultation were to:

1.1 create awareness of the current state of the Old Mandurah Bridge and the possible requirement to build a new bridge

1.2 provide balanced and objective information to assist in the understanding of the bridge redevelopment requirements and project timing

1.3 provide the community with an opportunity to:

- share memories of the existing bridge
- give feedback on the elements of the bridge design that are most important to them
- view the draft design concept/s and make comment

2. Community engagement

The following three community engagement strategies were used to involve the community:

- inform/educate
- consult
- involve

3. Phased communications plan

The communications strategies utilised to engage the community are listed in Table 1, below.

Table 1 - Communications strategies

Communications strategy	
Letters to ratepayers	Almost 35,000 letters were sent to property owners in the local community, outlining the planned redevelopment
Surveys	
1. Have your say to help us celebrate our history	Seeking community input into the community's preferred bridge design and identify social history
2. Have your say in the preferred design concept	Seeking community feedback into the CRG's preferred design concept – has it captured what is most important to the community?
Value Management and technical workshops	The Value Management and technical workshops consisted of approximately 10 appointed specialists and 20 community representatives, who made an in-depth assessment the project requirements developed through the CRG

Communications strategy (cont'd)	
Displays	Information, updates and design concepts were displayed with surveys and Frequently Asked Questions at: • Mandurah Library and Falcon eLibrary and Community Centre • City's Administration Building • Ac-cent • street-side 2mx1m corflute signs
Print media	• Media briefing session • media releases were sent for the launch of the project and when the preferred design concept was released • Single, double and three page advertisements in the *Mandurah Mail* and *Mandurah Coastal Times*, which included project information, the community surveys and the design concepts • posters were distributed to local schools
Electronic media	• Radio advertisements and community announcements were played on CoastFM and 6MM • the Mayor discussed the project during her fortnightly radio interview on 6MM • CRG Chair, Geoff Totterdell, recorded an interview with CoastFM • through the following websites: o Have Your Say Mandurah (HYS) o City of Mandurah o *Mandurah Mail* o *Mandurah Coastal Times* o CoastFM and 6MM website banner advertisements • through the following Facebook pages: o City of Mandurah o *Mandurah Mail* o *Mandurah Coastal Times* o Coast Live o Challenger TAFE o Murdoch University
Personal communication	• Briefings and presentations to City staff, Executive Leadership Team and Elected Members • emails to local businesses through business database, Peel Chamber of Commerce and Industry • flyers delivered face-to-face to surrounding businesses

4. Results of community feedback

4.1 Have Your Say Mandurah website

The HYS website has been widely used as a source of information for the Old Mandurah Bridge Redevelopment project, in addition to providing access to both community surveys online. An activity overview is provided in Table 2, below.

Table 2: Have Your Say Mandurah website activity overview

Activity overview	#
Site visits	6,190
Page views	13,925
Visitors	3,299
Comments	86
Document downloads	2,907

4.2 Surveys

4.2.1 Survey one - *Have your say to help us celebrate our history*

The results of the feedback from the first community survey are outlined, below.

- 329 respondents
- If a new bridge was built, 50% respondents preferred an historic bridge design, 50% preferred a contemporary/modern design
- The four most important design elements for the community were:
  - visual connection to the water
  - incorporation of social and historical heritage
  - inclusion of public art
  - inclusion of feature lighting
- In terms of the re-use of elements from the Old Mandurah Bridge, 73 percent respondents were keen for seating for be created, and 43 percent would like to see public art created
- The top two most commonly mentioned new features respondents were keen to see were:
  - pedestrian walkways and bike paths
  - fishing platforms

4.2.2 Survey two - *Have your say about the preferred design concept*

The results of the feedback from the second community survey are outlined, below.

- 91 respondents
- 59 percent of survey respondents indicated that the design concept captured what was most important to them
- Responses received from a range of age demographics, lowest represented were 18-34 year olds; the highest age group represented was 65+
- Respondents were slightly skewed to females (56 percent female respondents, 44 percent male respondents)
- The survey results indicated the following are the six most important aspects of the proposed bridge redevelopment to respondents:
  1. Retention of fishing platforms
  2. Increased pedestrian and cycling access
  3. Safety
  4. A visual connection to the water from the bridge
  5. Reduced traffic congestion
  6. Incorporation of social and historical heritage

4.3 Miscellaneous feedback regarding the preferred design concept

Feedback was received from a range of sources, as detailed in Table 3, below.

Table 3 – Feedback methods and # of responses

Feedback method	**# responses**
City of Mandurah Facebook comments	7
HYS website Q&A comments	7
HYS website guestbook comments	14
Mandurah Mail Facebook comments	71
Mandurah Coastal Times Facebook comments	45
Coast Live Facebook comments	56

The two most frequent comments received through all feedback methods indicated that the community would like:

1. a new bridge to maintain a heritage feel with the predominant use of wood, if unable to keep the old bridge (83 comments)
2. to retain the fishing platforms/ walkways under the bridge (41 comments)

Through the Facebook pages of the City of Mandurah, *Mandurah Mail, CoastLive* and *Mandurah Coastal Times,* over 20,000 people will have received the posts regarding the Old Mandurah Bridge Redevelopment design concepts.

5. In summary

The community has been engaged extensively in the first two phases of the redevelopment of the Mandurah Traffic Bridge. Most people engaged understand that the current bridge is in a poor state of repair, either needing extensive refurbishment or to be replaced. However, there is a very strong feeling that the current bridge is iconic and there are many memories attached to it. Therefore, the design and presentation of the new bridge has to be in sympathy.

Whilst there have been some comments about the draft design concept being too modern/ not having enough references to the heritage of the Old Bridge, the vast majority of people who have seen the design concept have not responded to them. Those who have taken the time to look at the information provided appear happy with the design concept and the rationale behind it. There was only one comment raised in regard to the environment.

Community engagement at each stage of the redevelopment process is extremely important, to ensure members of the community feel well informed. Further, that they understand that their feedback has been considered and incorporated into the design and redevelopment of the bridge.

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