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31 March 2014

Dr Paul Vogel
Chairman,
Environmental Protection Authority
Locked Bag 33 Cloisters Square
PERTH WA 6850

Office of the Environmental Protection Authority
File:
01 APR 2014
WATER CORPORATION
For Information ☐
For Discussion ☐
For Action ☐
Response required: ☐
GM Signature ☐
Dir for GM (copy to GM) ☐
Dr Sup (copy to GM) ☐
Mgr Direct (copy to GM) ☐
A: ☐
fa: ☐
Officer: ☐
Dir.AC ☐
Dir. Bus Ops ☐
Dir. SPPD ☐
Dir. Strat Sup ☐

Dear Dr Vogel,

RE: ONSLOW WATER INFRASTRUCTURE UPGRADE PROJECT (OWIUP) REFERRAL UNDER S38 OF THE *ENVIRONMENTAL PROTECTION ACT 1986*

The Water Corporation is pleased to submit the Environmental Protection Authority's (EPA) Referral Form and supporting documentation in relation to the Water Corporation's proposed Onslow Water Infrastructure Upgrade Project (OWIUP).

Please note this letter forms a companion document to and therefore should be read in conjunction with the EPA Referral Form and supporting documentation.

Background

In September 2011 Chevron Australia Propriety Limited (CAPL) and the Department of State Development (DSD) executed an agreement (Ashburton North State Development Agreement (Wheatstone Project) (SDA)) that required CAPL, amongst other things, to develop and execute a project that increased potable water supply to Onslow by 2 ML/day. This project is referred to as the Onslow Water Infrastructure Upgrade Project (OWIUP). After completion of the works the assets will be handed-over to the Water Corporation for ongoing ownership and operation.

The Proposal

- A desalination plant and associated infrastructure capable of producing 2ML/d of potable water located on Lot 556 approximately 18km from Onslow.
    - The desalination plant will include deep groundwater bores, pre-treatment filtration system, high pressure membrane systems, a post-treatment system, storage tanks, power supply infrastructure, civil works, facilities for operating employees (e.g. office and car parking) and other associated infrastructure. Raw water will be sourced from the Birdrong Aquifer by securing rights to an existing bore (MDW4) that was constructed by and is currently licensed to BHPB and drilling a secondary stand-by bore on Lot 556 or, drilling two new bores on Lot 556 if the existing bore is not fit for use on the project.
- A site access road from the Wheatstone Access Road (PR-1) (Lot 519) to the desalination plant site on Lot 556 through Lot 557.
- A Residual Saline Stream (RSS) pipeline and associated infrastructure. The RSS pipeline will be reticulated from the desalination plant on Lot 556 to Quick Mud Creek (QMC), an ephemeral drainage channel located west of Lot 556, via Lot 557 and Lot 561.
    - The RSS is a chemically concentrated osmotic waste stream from the desalination plant and will be removed through a disposal pipeline and head works into Quick Mud Creek (QMC). RSS chemical composition in a worst-case, scenario compares favourably with the water quality of the receiving surface water environment. The RSS discharge outlet will incorporate an energy dissipating structure, such as rock riprap or similar, to protect against

creek bed scouring during RSS disposal. The disposal point into QMC will be located in Lot 561 north of the Wheatstone Access Road (PR-1) culverting over QMC.

- An ~16km underground potable water transfer pipeline reticulated from the desalination plant on Lot 556 to the boundary of Lot 185 via Lot 557, Lot 558 and the existing and proposed Main Roads Western Australia (MRWA) Onslow / Mt Stuart road reserve.

Regulatory Control:
The OWIUP is a prescribed premises under Part V of the EP Act which may be subject to the requirements of a works approval and subsequent licence conditions regulating its operation.

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
The EPBC Act allows for Federal Government Assessment of a project's impact on matters of National Environmental Significance (NES). The intent of the Act, is to assign protection levels to flora and fauna species (Critically Endangered, Endangered, Vulnerable or Conservation Dependent), or unique ecological communities (Critically Endangered, Endangered or Vulnerable). This project has determined the likelihood of impacting NES through the implementation of the proposal. The results of this impact assessment are listed in Section **Error! Reference source not found.**. A separate referral for the assessment of impacts to NES under this Act will be submitted. However, it is not expected that this project will require formal assessment by Department of the Environment.

Terrestrial Ecology:
There is no Rare Flora or Threatened Ecological Communities that will be impacted by the implementation of the Project. One species listed as Priority Flora (Flora of Conservation Significance) is known to occur within the project area.

Approximately 100 ha of the 317 ha of land within the project area will be directly cleared to construct the project including temporary works such as access roads and lay down areas required to support construction. None of the vegetation units identified in the project area qualify as Threatened or Priority Ecological communities as listed by the DER.

Only a small number of Priority or conservation significant fauna species may potentially occur in the project area and the amount of clearing and disturbance to their potential available habitat in the region is very small. As such, the project will not impact the conservation status of any species.

Estuarine Ecology:
The initial environmental impact assessment concluded that contaminants in the RSS disposed into the creek will not result in adverse impacts to the QMC environment and surrounds. This is confirmed by analysis of RSS chemistry when compared to the baseline QMC surface water and sub soil chemistry.

Social Impacts
Thalanyji are the Native Title holders of the lands that contain the project area and are recognised as a key stakeholder in the implementation of the project. Heritage surveys will be conducted over the entirety of the project area to identify areas of cultural significance (if any).

Conclusion
The Water Corporation believes that the proposal can be managed under Part V of the EP Act; as such, the Water Corporation believes the proposal does not require formal assessment under Part IV of the *Environmental Protection Act 1986*.

If you have any queries regarding this proposal, please do not hesitate to contact Paul Rogoysky on 9420 3860 or at paul.rogoysky@watercorporation.com.au.

Yours sincerely

Paul Rogoysky
A/MANAGER EIA AND APPROVALS
ENVIRONMENT AND ABORIGINAL AFFAIRS BRANCH

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).		X
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, Paul Rogoysky, *(full name)* declare that I am authorised on behalf of Water Corporation (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 P Rogoysky	Name (print) Paul Rogoysky
Position A/Manager EIA & Approvals	Company Water Corporation
Date 31/3/2014	

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	Water Corporation
Joint Venture parties (if applicable)	N/A
Australian Company Number (if applicable)	
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 100 Leederville WA 6902
Key proponent contact for the proposal: • name • address • phone • email	Paul Rogoysky 629 Newcastle Street Leederville WA 6007 9420 3860 paul.rogoysky@watercorporation.com.au
Consultant for the proposal (if applicable): • name • address • phone • email	N/A

1.2 Proposal

Title	Onslow Water Infrastructure Upgrade Project (OWIUP)
Description	In September 2011 Chevron Australia Propriety Limited (CAPL) and the Department of State Development (DSD) executed an agreement (Ashburton North State Development Agreement (Wheatstone Project) (SDA)) that required CAPL, amongst other things, to develop and execute a project that increased potable water supply to Onslow by 2 ML/day. This project is referred to as the Onslow Water Infrastructure Upgrade Project (OWIUP). After completion of the works the assets will be handed-over to the Water Corporation for ongoing ownership and operation. With reference to Figure 1 (Section 1.2) of this document), the OWIUP project will consists of:

	♦ A desalination plant and associated infrastructure capable of producing 2ML/d of potable water located on Lot 556 approximately 18km from Onslow. - The desalination plant will include deep groundwater bores, pre-treatment filtration system, high pressure membrane systems, a post-treatment system, storage tanks, power supply infrastructure, civil works, facilities for operating employees (e.g. office and car parking) and other associated infrastructure. Raw water will be sourced from the Birdrong Aquifer by securing rights to an existing bore (MDW4) that was constructed by and is currently licensed to BHPB and drilling a secondary stand-by bore on Lot 556 or, drilling two new bores on Lot 556 if the existing bore is not fit for use on the project. ♦ A site access road from the Wheatstone Access Road (PR-1) (Lot 519) to the desalination plant site on Lot 556 through Lot 557. ♦ A Residual Saline Stream (RSS) pipeline and associated infrastructure. The RSS pipeline will be reticulated from the desalination plant on Lot 556 to Quick Mud Creek (QMC), an ephemeral drainage channel west of Lot 556, via Lot 557 and Lot 561. - The RSS is a chemically concentrated osmotic waste stream from the desalination plant and will be removed through a disposal pipeline and head works into Quick Mud Creek (QMC). The chemical composition of the RSS in a worst-case scenario compares favourably with the water quality of the receiving

	surface water environment. The RSS discharge outlet will incorporate an energy dissipating structure, such as rock riprap or similar, to protect against creek bed scouring during RSS disposal. The disposal point into QMC will be located in Lot 561 north of the Wheatstone Access Road (PR-1) culverting over QMC. ♦ An ~16km underground potable water transfer pipeline from Lot 556 to the boundary of Lot 185 via Lot 557, Lot 558 and the existing and proposed Main Roads Western Australia (MRWA) Onslow Road road reserve. The Water Corporation, as end owner and operator of the facilities, is the proponent for the project and most regulatory approvals (environmental or otherwise). CAPL and its subcontractors will fund, design, procure, construct and commission all elements of the OWIUP prior to hand-over of the assets to the Water Corporation.
Extent (area) of proposed ground disturbance.	The OWIUP Project Area is 321 ha which includes Lot 556, Lot 557, Lot 558, a portion of Lot 561, a portion of Lot 519 and the potable water pipeline corridor to the boundary of Lot 185. The project area does not include the RSS discharge plume. Anticipated construction footprint for the OWIUP is less than 100 ha, however additional ground disturbance may be required within the Project Area following finalisation of detailed design.
Timeframe in which the activity or development is proposed to occur (including start and finish dates where applicable).	Construction is expected to begin in March 2015. The operational phase is proposed to commence in April 2016.
Details of any staging of the proposal.	N/A
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.	The Water Corporation understands that a power station will also be constructed on Lot 555 (north of and bordering Lot 556) as part of the Onslow Power Infrastructure Upgrade Project (OPIUP) which will be operated by Horizon Power. The power station will supply power to Onslow and the operating Desalination Plant and the Desalination Plant will provide water to Onslow and the Power Station. The requirement for the OPIUP is not dependent upon the development of the OWUIP, and as such, Horizon Power will submit a separate Environmental Referral for the OPIUP.
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. <u>Desalination Plant & associated infrastructure on Lot 556.</u> Landgate recently subdivided Lot 524 into three smaller Lots: 555, 556, and 557. Lot 556 is currently Unallocated Crown Land and the Department of State Development (DSD) has commenced a process to secure Lot 556 for the Desalination Plant and associated infrastructure. This process involves a Notice of Intention to Take land (NOITT) and subsequent taking order with Lot 556 to be vested to the Water Corporation. <u>Site access road to the Desalination Plant</u> A site access road will be constructed to the desalination plant site on Lot 556 via:

	- Wheatstone Access Road (PR-1); Lot 519 (currently a Pastoral Lease to Forrest and Forrest with other interest holders. Lot 519 will be vested to MRWA in the future).; and - Lot 557 (Unallocated Crown Land proposed to be vested to LandCorp.) Arrangements will be made with Main Road Western Australia (MRWA), other interest holders and LandCorp. to establish access to the land required for the site access road. <u>Potable Water Transfer Pipeline</u> The potable water transfer pipeline will be reticulated from Lot 556 to the boundary of Lot 185 via: • Lot 557 (Unallocated Crown Land proposed to be vested to LandCorp.) and Lot 558 (Lot currently vested to LandCorp.); • Existing section of Main Roads Western Australia (MRWA) Onslow / Mt Stuart Rd road reserve; and • Proposed new sections of MRWA Onslow / Mt Stuart Rd road reserve. The DSD has commenced the process to widen, where required, the existing MRWA Onslow / Mt Stuart Rd road reserve to accommodate the potable water transfer pipeline. Arrangements will be made with LandCorp. to facilitate the reticulation of the potable water pipeline through Lot 557 and Lot 558. <u>RSS Pipeline and associated infrastructure</u> The RSS pipeline will be reticulated from the desalination plant on Lot 556 to Quick Mud Creek (QMC) via Lot 557 (Unallocated Crown Land proposed to be vested to LandCorp.)

	and a portion of Lot 561(Lot currently vested to LandCorp.). Arrangements will be made with LandCorp. to facilitate the reticulation of the RSS pipeline through Lot 557 and Lot 561.
What is the current land use on the property, and the extent (area in hectares) of the property?	Lot 555 is 14.7 ha, Lot 556 is 15.4 ha, Lot 557 is 4.8 ha. . BHPB have a S91 over a portion of Lot 555, Lot 556 and Lot 557 in order to access an existing bore (MDW4) into the Birdrong Aquifer and associated facilities (access road, pipeline, pumping station, storage pond). The Access Road will be located entirely within a section of Lot 519 (2.3 ha), Lot 556 and Lot 557. The potable water transfer pipeline will be located entirely within Lot 557, Lot 558 (1.2 ha) and the existing or proposed MRWA Onslow / Mt Stuart Rd road Reserve. The land is vacant apart from part of Onslow Salt's Mining Lease and salt ponds which traverse part of the proposed new sections of road reserve. Onslow Salt has agreed to the proposed road widening. The RSS pipeline will be located entirely within Lot 557 and a section of Lot 561 (4.0 ha).

Figure 1: OWIUP Project Area

1.3 Location

Name of the Shire in which the proposal is located.	Shire of Ashburton
For urban areas: • street address; • lot number; • suburb; and • nearest road intersection.	N/A
For remote localities: • nearest town; and • distance and direction from that town to the proposal site.	The nearest town is Onslow which is located ~18 km north east of Lot 556.
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.	No. The OWIUP will utilise Lot 556. Lot 556 is a 'Rural' zone defined by the Shire of Ashburton Town Planning Scheme No.7 (TPS7). The facility to be constructed on Lot 556 is consistent with the TPS7 definition of 'Infrastructure', which is listed as a 'D' use in the Zoning Table. This means the Local Government (the Shire of Ashburton) must grant planning approval. The potable water transfer pipeline will be located entirely within Lot 557, Lot 558 and the existing or proposed MRWA Onslow / Mt Stuart Rd road Reserve

		and will not require rezoning. The access road will be located entirely within Lot 519, Lot 556 and Lot 557 and will not require rezoning. The RSS pipeline will be located entirely within Lot 557 and a portion of Lot 561 and will not require rezoning.	
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. The approvals required for the project include environmental, land tenure and other regulatory approvals, such as planning approvals, works approvals, permits and licences. A list of likely approvals is provided below.	
Agency/Authority	**Approval required**	**Application lodged Yes / No**	**Agency/Local Authority contact(s) for proposal**
Department of Environment Regulation	Geotechnical Native Vegetation Clearing Permit	Yes	DER Native Vegetation Conservation Branch Phone: 9219 8744
Department of Environment Regulation	Construction Native Vegetation Clearing Permit	No	DER Native Vegetation Conservation Branch Phone: 9219 8744
Department of Environment Regulation	Works Approval	No	DER Industry Licensing System Email: ils@dec.wa.gov.au
Department of Commerce	Registration of the Design of Items of Plant	No	Energy Licensing Phone: 9422 5200 Email: energylicensing@commerce.wa.gov.au
Department of Health	Poisons Permit	No	DOH Phone: 9222 6883 Email: poisons@health.wa.gov.au.
Department of Indigenous Affairs	Section 18	No	Registrar of Aboriginal Sites Email: registrar@dia.wa.gov.au Phone: 1300 651 077
Department of Planning (DoP)	Management Order / Freehold Title to the Water Corporation	No	DoP Phone: 6551 9000
Department of Regional Development and Lands	Section 91 for investigative works	Yes	State Land Services Manager Murray.Raven@lands.rdl.wa.gov.au
Department of	26D Licence	No	A/Program Manager - Licensing, Pilbara

Water			Region Kevin Hopkinson Phone: 9841 0127 Email: Kevin.hopkinson@water.wa.gov.au
Department of Water	5C Licence to take water	Yes but deferred	A/Program Manager - Licensing, Pilbara Region Kevin Hopkinson Phone: 9841 0127 Email: Kevin.hopkinson@water.wa.gov.au
Department of Water	Section 17, Beds and Banks Permit	No	A/Program Manager - Licensing, Pilbara Region Kevin Hopkinson Phone: 9841 0127 Email: Kevin.hopkinson@water.wa.gov.au
Department of Sustainability, Environment, Water, Population and Communities	Cwth Referral to DSEWPaC	No	Phone: +61 2 6274 1111 Email: ciu@environment.gov.au
Shire of Ashburton	Permit to Use Ablutions	No	Principal Town Planner lee.ridel@ashburton.wa.gov.au
Shire of Ashburton	Planning Approval	No	Principal Town Planner lee.ridel@ashburton.wa.gov.au

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)	X 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)?

Within the 321 ha project area (Figure) it is anticipated that an area of less than 100 ha will actually be cleared for construction activities. Modelling of RSS discharge plumes indicates that an additional 60 ha of bare creek bed may be intermittently inundated by the proposal however, this inundation will not impact any vegetation or flora.

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

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

On 17 October 2013, Chevron received from the Department of Environment Regulation (DER) a Native Vegetation Clearing Permit (NVCP). The permit authorises Chevron to clear 30 hectares of vegetation in order to conduct geotechnical, contaminated land and other site investigations.

If the OWIUP is not assessed under Part IV of the *EP Act* as expected, CAPL will apply for an NVCP to cover construction activities. The application will be finalised on completion of detailed design and will be a subset of the Project Area identified in this document.

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

X 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.

Over seven flora and vegetation surveys have been conducted over the last five years in the OWIUP Project Area locality. The results of these surveys, along with recent database searches, have been summarised in the attached supporting documentation and Biota Environmental Services (Biota) report; refer also to Figure 2. The Biota report encompasses a Survey Area of 1,669 ha, whereas the Project Area expects to disturb less than 100 ha of the 321 ha Project Area (excluding potential RSS plume).

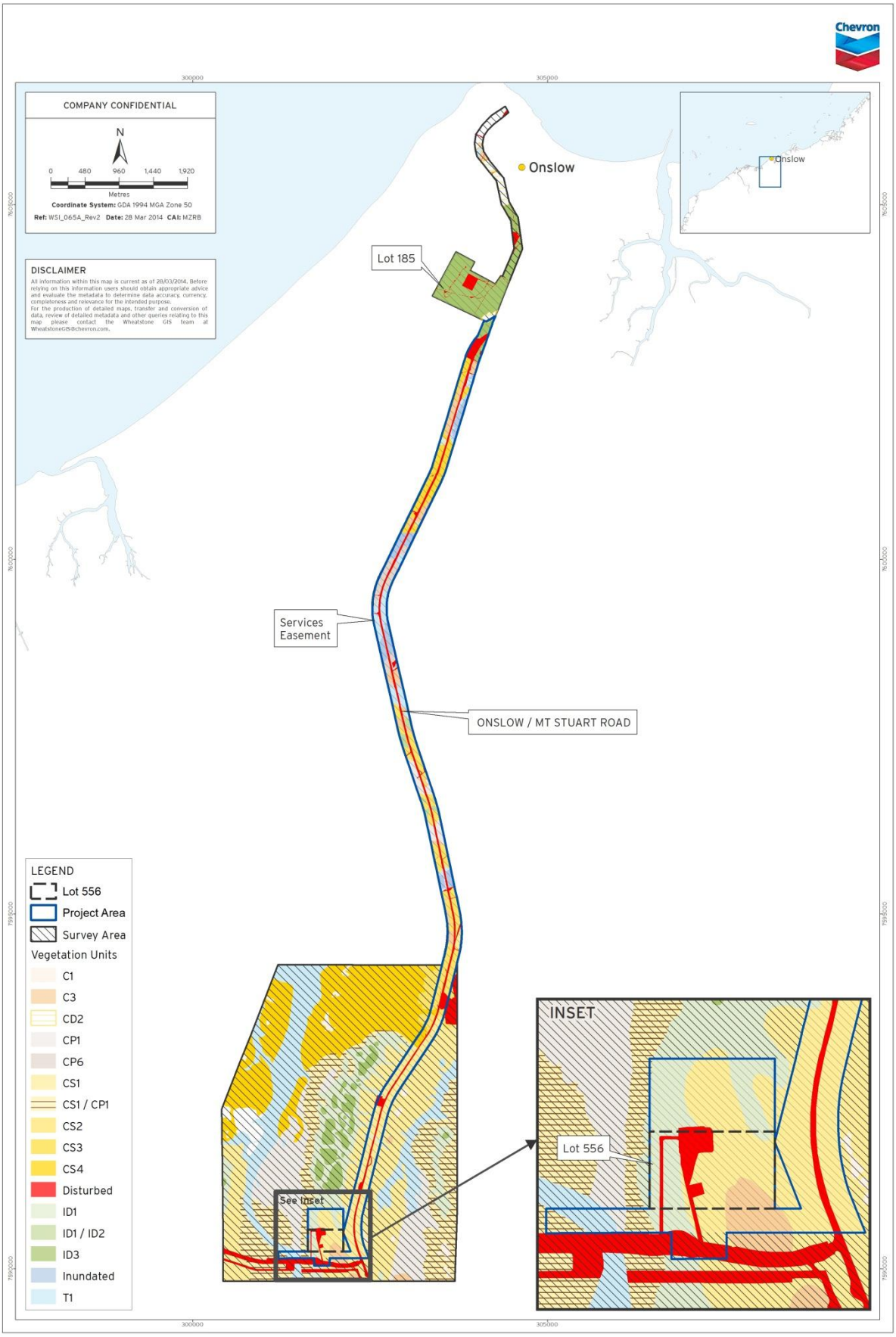

Figure 2: Baseline Flora and Vegetation Survey Area

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?

X 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.

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

X Yes ☐ No

If yes, please indicate which species or communities are involved and provide copies of any correspondence with DEC regarding these matters.

The DEC Rare Flora database search was conducted as part of the attached Biota 2013 report. No Threatened Flora listed under the *Environment Protection Act 1986* was recorded in the Project Area, or the wider Survey Area.

One species listed as Priority Flora (*Triumfetta echinata* [Priority 3]) is known to occur within the Project Area (Lot 556). This species has been recorded on a ridge of red sand dunes within the Project Area, typical of the known habitat for the species (Biota 2013). This habitat (ID1 and ID2) is not restricted to Lot 556 and is common and widespread in the locality (Table 1). The species has also been recorded from numerous locations outside of the Project Area (Chevron 2010).

Table 1: Expected impact of OWIUP on Conservation Significant vegetation units.

Vegetation Unit Code	Description	Amount in Project Area	Amount in Survey Area	Additional unit mapped by other surveys	Percentage of known extent to be cleared
ID1	*Grevillea stenobotrya* tall open shrubland over *Crotalaria cunninghamii, Trichodesma zeylanicum* var. *Grandiflorum* open shrubland over *Triodia epactia* open hummock grassland	15.36 ha plus 4.86 ha in mosaic with unit ID2	136.25 ha, plus 4.91 ha in mosaic with unit ID2	140.29 ha	7.18%

Vegetation Unit Code	Description	Amount in Project Area	Amount in Survey Area	Additional unit mapped by other surveys	Percentage of known extent to be cleared
ID2	*Grevillea stenobotrya* tall open shrubland over *Crotalaria cunninghamii, Hibiscus brachychlaenus* open shrubland over *Triodia schinzii, (T. epactia)* open hummock grassland	4.86 ha, occurs only in mosaic with unit ID2	4.91 ha, occurs only in mosaic with ID1.	197.20 ha	2.41%

There were no occurrences of Threatened or Priority Ecological Communities within 35km of the Project Area. The nearest ecological community of conservation significance is the Priority 1 Peedamulla (Cane River) Swamp Community located 50km away.

The bed of Quick Mud Creek is devoid of vegetation, so there will be no impact to any ecological communities or flora associated with the discharge of RSS associated with this proposal.

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 X 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?

The Project Area is characteristic of the Carnarvon bioregion, comprised mainly of sparse *Acacia* shrubs over dense *Triodia* grasslands (Biota 2013). The Project Area has a long history of pastoralism and associated weed proliferation. Approximately 14% of the Project Area has been mapped as disturbed (Biota 2013), including the majority of the services easement, which is subject to frequent disturbance due to its close proximity to Onslow Road.

The condition of vegetation recorded in flora survey quadrats within the Survey Area was assessed using a modified vegetation condition scale adapted from the BushForever guidelines (Biota 2013). Vegetation condition derived from the flora surveys determined that the vegetation ranged from Completely Degraded to Very Good on the vegetation condition scale, generally depending on the level of weed proliferation. Sites assessed as Completely Degraded have vegetation structure that is almost completely without native species. Sites assessed as Very Good have vegetation structures largely intact with only occasional weed species. The majority of the vegetation units within the Project Area all contain the aggressive environmental weed *Cenchrus ciliaris* from occasional records

through to significant proportions of the grassland strata. None of the vegetation units within the Project Area were assessed as Excellent (pristine).

2.2 Fauna

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

(please tick)	X 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 greatest impact to fauna as a result of implementing this proposal will be due to vegetation clearing. Whilst vegetation clearing (less than 100 ha) will remove some fauna habitat, significant habitat containing vegetation units consistent with that which will be disturbed, exists outside of the Project Area (see Table 1).

Impacts associated with the RSS disposal activities are also not expected to impact upon any fauna. The natural highly saline water quality evident in Quick Mud Creek (QMC) has historically excluded the use of this habitat by fauna. Although the RSS discharged into QMC is less than that naturally occurring, the high salinity levels are still expected to deter fauna from utilising this habitat (see Section 2.8.6).

Temporary disturbances include noise, light and increased human presence. These impacts are expected to be minor at a population scale. Disturbance to fauna from construction activities will be of a short-term nature and are not expected to impact the populations of any fauna.

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

X 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.

Over nine terrestrial fauna surveys have been conducted over the last five years in the OWIUP Project Area locality. These works include surveys focussing on terrestrial vertebrate fauna, invertebrate fauna (including claypan fauna and short-range endemic species) and migratory birds. The results of these fauna surveys, along with recent database searches, have been summarised in the attached supporting documentation and Biota 2013 report.

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

X Yes No (please tick)

There are no known occurrences of specially protected fauna likely to be restricted to the Project Area (Biota 2013).

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

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

There are no known occurrences of any fauna of conservation significance from within the Project Area. Fauna species of conservation significance that are known to occur in one or more of the habitats present within the Survey Area include the Little Northern Freetail Bat *Mormopterus loriae cobourgensis*, Australian Bustard *Ardeotis australis*, Short-tailed Mouse *Leggadina lakedownensis*, *Lerista planiventralis*, Bush Stone Curlew *Burhinus grallarius*, Eastern Curlew *Numenius madagascariensis* and the Peregrine Falcon *Falco peregrines* (Biota 2013).

None of these species are likely to be affected by the proposed development, due to their highly mobile nature and the small proportion of suitable habitat cleared relative to their wider distribution within the region (Biota 2013).

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) X Yes **If yes**, complete the rest of this section.

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

The Project is expected to discharge the RSS into the nearby Quick Mud Creek (QMC). When the OWIUP is operating at its maximum capacity of 2ML/day (potable water), a total volume of 0.857 ML/day of RSS is expected to be discharged into QMC.

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

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

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

☐ Yes X 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 X 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 X 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	X No	☐ Unsure
Environmental Protection (South West Agricultural Zone Wetlands) Policy 1998	☐ Yes	X No	☐ Unsure
Perth's Bush Forever site	☐ Yes	X No	☐ Unsure
Environmental Protection (Swan & Canning Rivers) Policy 1998	☐ Yes	X No	☐ Unsure
The management area as defined in s4(1) of the *Swan River Trust Act 1988*	☐ Yes	X 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)	☐ Yes	X No	☐ Unsure

The closest Ramsar wetland to any of the proposed development areas is the Millstream Pools Proposed Ramsar addition, over 225 km north east of the Desalination Plant survey area.

The closest wetland of importance as listed by a DEC database search from any area of development is 'Exmouth Gulf East' over 25km southwest from Ashburton North.

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 X No **If yes**, please provide details.

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 X No **If yes**, please provide details.

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 X 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.

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

2.5.4 Is the development likely to impact on mangroves?

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

The highest modelled concentrations of RSS constituents, including NORMs and nitrogen (in the form of ammonium) will be remobilised from the QMC headwaters and supra-tidal flats and deposited into the Hooley Creek Tidal Estuary, during a consecutive 1 + 1 year ARI events (see Appendix K and L). It is reasonable to assume that such an event may occur once in 12 months, in a worst-case scenario.

Appendix K of the referral supporting document determined the environmental risk of RSS constituents to Benthic Primary Producing Habitat (BPPH), including mangrove stands. In the case of NORMs, the risk profile was determined to be low due to the periodic nature of the discharge and the short time required to return to baseline concentrations. In addition, the impact of re-mobilised NORMs on mangroves in the Hooley Creek Estuary is likely to be negligible. A conservative exposure standard applicable to humans was adopted for modelling. In all modelled scenarios, exposure of ecological receptors to radiological sources entering the Hooley Creek Estuary was less than the ARPANSA (2011) guidelines of 1 millisievert per year.

Appendix L of the Referral Supporting Document assigned a low risk to nitrogen inputs entering into Hooley Creek Estuary in the worst case remobilisation scenario. The risk assessment put nitrogen levels entering Hooley Creek Estuary within the context of total nitrogen inputs to the system resulting from break out flows from the Ashburton River and long term anthropogenic inputs. It is reasonable to assume that BPPH including mangroves in the Hooley Creek Estuary is able to tolerate wide variations in nitrogen concentrations as BPPH is known to assimilate and redistribute available nitrogen loads. Relevant literature identified in the risk assessment has also indicated that the algal mats surrounding the Hooley Creek Estuary may export up to 55 tonnes of nitrogen into the near-shore environment, further highlighting the natural resilience of the Estuary to nutrient input.

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

As a result of the OWIUP desalination process, the RSS water will be discharged into QMC, resulting in mixing with the poor natural water quality. High rainfall often results in the ephemeral QMC flowing out into the marine environment. The large amount of rainfall required to allow flow to the marine environment is expected to significantly dilute the QMC water quality, resulting in no impacts to any sensitive benthic communities.

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

Commercial fishing activity in the Onslow area is currently limited, due to construction activities in the area. It is likely that existing licenses may be renewed in future, however it has been determined that the risk of impacts to marine species and communities as a result of RSS discharge is low. See Appendix K and L of the Referral Supporting Document for further details.

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

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 X 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 X 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)

X Yes ☐ No (please tick)

Desktop modelling of the Birdrong aquifer indicates that the source can sustainably provide water for this project. The OWIUP agreed to a testing regime with the Department of Water to further assess the sustainability of the Birdrong aquifer. The aquifer testing program was conducted in January 2014. The results of the testing and resultant hydrogeological report will be provided to the DoW Q2 2014, to assist in bore configuration and licencing (5C) dialogue.

2.7.5 Will the proposal require drainage of the land?

☐ Yes X 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) X Yes **If yes**, complete the rest of this section.

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

Water will be required during the construction and commissioning of the desalination plant, including the hydro testing of the potable water pipeline, other pipelines, tanks and for dust suppression.

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

The Construction water volume is estimated to be around 160 ML spread over 14 months. The operations water use is estimated to be approximately 2 ML per year and will be sourced from the proposed Desalination plant.

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

Birdrong Aquifer. An existing bore (MDW4) on Lot 556 into the Birdrong Aquifer, currently in the possession of and licensed to BHPB, may be acquired and used as the primary water source. Under this scenario, a standby well will also be drilled within Lot 556. An alternative to this option is to drill two new wells within Lot 556 which is being considered by the project team.

Approval to use this water source will be obtained via a Section 5C Licence to Take Water and Section 26D Licenses to Construct or Alter an Artesian Well from the DoW.

Construction water will be obtained from a sustainable source that is yet to be determined.

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) X Yes **If yes**, complete the rest of this section.

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

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)

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

Given that the maximum capacity of the desalination plant is expected to be 2 ML/day, it is assumed that the Project will be assessed as a prescribed premise under Category 85B – Water desalinisation plant: Producing more than 0.5 Gigalitres per year.

2.8.3 Will the proposal result in gaseous emissions to air?

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

Minor volumes of atmospheric emissions will be generated during the construction of the desalinisation plant and associated infrastructure. Emission sources include vehicles and generators. No odour is expected to be generated from the construction and operation of the OWIUP.

Gas will be released from the aquifer during normal production at the water treatment plant. When the facility is operating at maximum capacity, around 130 tonnes of methane per year will be released to atmosphere. The gaseous emission from the aquifer is around 80% methane, and the remainder is nitrogen, oxygen and carbon dioxide.

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 X No **If yes**, please briefly describe.

Emissions are minor and will meet statutory air quality standards.

2.8.5 Will the proposal result in liquid effluent discharge?

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

The operation of the desalination plant will result in a RSS waste stream. The RSS will be discharged to QMC via a discharge outfall. When the OWIUP is operating at its maximum capacity of 2ML/day (potable water), a total volume of 0.857 ML/day of RSS is expected to be discharged into QMC.

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?

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

RSS discharge will be to QMC. The baseline receiving environment of QMC consists of an ephemeral creek bed and a series of intermittent pools, recharged by groundwater. The baseline dry season salinity of these pools ranges from 230,000 to 277,000 mg/L TDS. Evapo-concentration of these pools can result in salinity values up to 380,000 mg/L TDS after periods of drought. Salinity and values for other parameters such as calcium, potassium and magnesium are all higher in the receiving environment of QMC than in the expected RSS discharge stream.

These high salinity levels and the high turbidity that can result from rain events and associated stream flow result in a QMC baseline receiving environment that frequently exceeds ANZECC/ARMCANZ 2000 guidelines. Given that the natural QMC environment exceeds the thresholds in these guidelines, the guidelines become less relevant to the water quality associated with the discharged RSS. Regardless, the quality of the RSS water is not expected to have any impact upon the receiving environment.

A comparison of baseline QMC water quality (during dry season) with RSS water quality is provided in Section 4.3.2 of the OWIUP Referral Supporting Documentation.

2.8.7 Will the proposal produce or result in solid wastes?

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

The construction and operation of the OWIUP is expected to result in the production of solid waste. Solid waste will be managed through a waste management plan. The project will generate a variety of waste materials including domestic waste, general construction waste and some operational waste streams that arise from treatment of raw Birdrong aquifer water. A maximum of 24kg/day of iron hydroxide, manganese oxide and inert material removed by the multimedia filters will be dried in drying beds within Lot 556. These solids will be periodically removed. All waste will be disposed of to an appropriately licensed facility (likely Class 3).

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

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

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

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

Please attach the analysis.

The Environmental Protection (Noise) Regulations will apply to the development; however there are no significant noise receptors in the vicinity of the Desalination Plant on Lot 556.

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

It is not expected that emissions or pollutants from the construction or operation of the OWIUP will affect the amenity of residents in Onslow. The desalination plant site is located 18 km from the centre of the town of Onslow and there are no residential receptors in the vicinity of the desalination plant itself.

There are no other expected significant emissions or pollutants from the Services Easement that would impact Onslow residents or 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 X 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 X 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 X No ☐ Unsure **If yes**, please describe.

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

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

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 X 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 X Unsure **If yes**, please describe.

To be confirmed post completion of the heritage surveys of the project area. If heritage monitors identify items or sites of cultural significance that cannot be avoided, a Section 18 licence to disturb an Aboriginal site under the Aboriginal Heritage Act will be applied for.

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 X No **If yes**, please describe.

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

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

X 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?

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

Consultation has been conducted by the Water Corporation and is included in Section 5 of the OWIUP Referral Supporting Document. No major issues necessitating the abandonment of the proposal have been identified.

Onslow Water Infrastructure Upgrade Project (OWIUP)

Environmental Referral Supporting Document

31 March 2014

watercorporation.com.au

WATER CORPORATION

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ACRONYMS, ABBREVIATIONS AND TERMINOLOGY

AH Act	*Aboriginal Heritage Act 1972*
ARI	Average Recurrence Interval
BHPB	Broken Hill Proprietary Limited (BHP) Billiton Proprietary Limited
Bq	Becquerel
CAPEX	Capital Expenditure
CAPL	Chevron Australia Proprietary Limited
DAA	Department of Aboriginal Affairs
DER	Department of Environment Regulation
DOTE	Department of the Environment
DoW	Department of Water
DPaW	Department of Parks and Wildlife
DSD	Department of State Development
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Authority
EP Act	*Environmental Protection Act 1986* (WA)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
FEED	Front End Engineering and Design
g/L	grams per litre
GL	Gigalitre (billion litres)
ha	Hectare(s)
HCE	Hooley Creek Estuary
Human Receptor	For the purpose of the study it is a person standing outdoors at all times, receiving a worst-case dose of radiation through inhalation of airborne dust
IAEA	International Atomic Energy Agency
ICRP	International Commission for Radiation Protection
L	Litre
LNG	Liquefied Natural Gas
kg	Kilogram
KL	Kilolitre (thousand litres)
km	Kilometre
m	Metre
mg/L	Milligrams per Litre
ML	Megalitre (million litres)

ML/d	Megalitre per day
NEPM	National Environmental Protection Measure
NORM	Naturally Occurring Radioactive Material
NOx	Nitrous Oxide
NVCP	Native Vegetation Clearing Permit
O^3	Ozone
OPEX	Operational Expenditure
PASS	Potential Acid Sulfate Soils
QMC	Quick Mud Creek
OWIUP	Onslow Water Infrastructure Upgrade Project
RSS	Residual Saline Stream
RWI Act	*Rights in Water and Irrigation Act 1914*
SDA	State Development Agreement
Source Term	Describes the modelled amount of an RSS constituent
Sv	Sievert
SWA	Stop Work Authority
TDS	Total Dissolved Solids
VOC	Volatile Organic Compound
WA	Western Australia
WC Act	*Wildlife Conservation Act 1950*

1.0 INTRODUCTION

1.1 Proposal Overview and Location

In September 2011 Chevron Australia Propriety Limited (CAPL) and the Department of State Development (DSD) executed an agreement (Ashburton North State Development Agreement (Wheatstone Project) (SDA)) that required CAPL, amongst other things, to develop and execute a project that increased potable water supply to Onslow by 2 ML/day. This project is referred to as the Onslow Water Infrastructure Upgrade Project (OWIUP). After completion of the works the assets will be handed-over to the Water Corporation for ongoing ownership and operation.

With reference to Figure 1.1, the OWIUP project will consists of:

- A desalination plant and associated infrastructure capable of producing 2ML/d of potable water located on Lot 556 approximately 18km from Onslow.
    - The desalination plant will include deep groundwater bores, pre-treatment filtration system, high pressure membrane systems, a post-treatment system, storage tanks, power supply infrastructure, civil works, facilities for operating employees (e.g. office and car parking) and other associated infrastructure. Raw water will be sourced from the Birdrong Aquifer by securing rights to an existing bore (MDW4) that was constructed by and is currently licensed to BHPB and drilling a secondary stand-by bore on Lot 556 or, drilling two new bores on Lot 556 if the existing bore is not fit for use on the project.
- A site access road from the Wheatstone Access Road (PR-1) (Lot 519) to the desalination plant site on Lot 556 through Lot 557.
- A Residual Saline Stream (RSS) pipeline and associated infrastructure. The RSS pipeline will be reticulated from the desalination plant on Lot 556 to Quick Mud Creek (QMC), an ephemeral drainage channel located west of Lot 556, via Lot 557 and Lot 561.
    - The RSS is a chemically concentrated osmotic waste stream from the desalination plant and will be removed through a disposal pipeline and head works into Quick Mud Creek (QMC). RSS chemical composition in a worst-case, scenario compares favourably with the water quality of the receiving surface water environment, as indicated in Section 4.3.2.1. The RSS discharge outlet will incorporate an energy dissipating structure, such as rock riprap or similar, to protect against creek bed scouring during RSS disposal. The disposal point into QMC will be located in Lot 561 north of the Wheatstone Access Road (PR-1) culverting over QMC.
- An ~16km underground potable water transfer pipeline reticulated from the desalination plant on Lot 556 to the boundary of Lot 185 via Lot 557, Lot 558 and the existing and proposed Main Roads Western Australia (MRWA) Onslow / Mt Stuart road reserve.

Note that Landgate recently subdivided Lot 524 into three smaller Lots: 555, 556, and 557. Repots referenced in this document may refer to Lot 524 as the location of the desalination plant.

1.2 Proponent

The Water Corporation, as end owner and operator of the facilities, is the proponent for the project and most regulatory approvals (environmental or otherwise).

CAPL and its subcontractors will fund, design, procure, construct and commission all elements of the OWIUP prior to hand-over of the assets to the Water Corporation.

This document has been prepared by CAPL for, and on behalf of, the Water Corporation.

1.3 Purpose of Document

This document provides supporting information for the environmental referral of the OWIUP for assessment by the Environmental Protection Authority (EPA) under Section 38(1) of the *Environmental Protection Act 1986* (EP Act). This document, and the attached EPA referral form, has addressed the environmental impacts that may occur as a result of the implementation of this proposal.

An application for a Works Approval under Part V of the *EP Act* will be submitted by the Water Corporation to the Department of Environmental Regulation (DER) following approval advice from the EPA and further development of the design. A License application may also be submitted to DER, subject to DER advice.

The Water Corporation considers that the potential environmental impacts of the proposal can be sufficiently managed under Part V of the *EP Act*, whereby:

- Emissions and discharges can be managed accordingly under a Works Approval and License
- Impact to vegetation and flora can be managed accordingly under a Clearing Permit

Figure 1.1: OWIUP Project Area

2.0 REGULATORY FRAMEWORK AND ENVIRONMENTAL APPROVALS

The key legislation that applies to this referral supporting document includes, but is not limited to:

- *Environmental Protection Act 1986* (EP Act)
- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC act)
- *Rights in Water and Irrigation Act 1914* (RWI Act)
- *Wildlife Conservation Act 1950* (WC Act)
- *Aboriginal Heritage Act 1972* (AH Act).

An environmental approval strategy has been developed and is displayed in Table 2.1.

Table 2.1: Proposed Environmental Approval Strategy

Agency/Authority	Approval Required	Application Lodged
Department of Environment Regulation (DER)	1. Native Vegetation Clearing Permit (NVCP) for Geotechnical Investigation 2. NVCP for construction of the OWIUP, if proposal is not assessed under Part IV below 3. Works Approval under Part V of the *EP Act 1986*	1. Yes. NVCP granted for Geotechnical investigation. 2. Construction NVCP dependent on outcome of the Part IV referral 3. No. Application to be lodged pending outcome of Part IV referral
Environmental Protection Agency (EPA)	Approval under Part IV of the *EP Act 1986*	Yes. Contained within this document package
Department of the Environment (DOTE)	Referral under the EPBC Act	No. To be lodged concurrently with EP Act referral
Department of Water (DoW)	Bore Construction (26D) and Abstraction (5C) permits under the *RWI Act 1914*	Yes but deferred. Water Corporation and CAPL will resume discussions with the DoW post receipt of the aquifer / well performance testing data and bedding-down of proposed bore configuration on Lot 556 (refer also to Section 3.2)
Department of Aboriginal Affairs (DAA)	Application under s18 of the *AH Act 1972* for potential disturbance to Aboriginal heritage sites	No. Subject to findings from baseline heritage survey.

2.1 Approval Under the *Environmental Protection Act 1986*

The EP Act 1986 is the primary legislative tool for the assessment of potential environmental impacts in Western Australia. This Project is being referred to the EPA under Section 38(1) of the *EP Act*. To satisfy the conditions of Part V of the EP Act and to allow for preliminary geotechnical investigations, an NVCP has been applied for and granted on 17 October 2013 by the DER.

2.2 Approval Under the *Rights in Water and Irrigation Act 1914*.

The DoW manages water resources in Western Australia under the RWI Act. Implementation of the project involves two phases that will require licensing from the DoW; disturbance to the bed and banks of QMC (Section 11) and the taking of groundwater from the Birdrong Aquifer for potable water supply and possibly dust suppression (Section 5c/26d). The impact of these activities is discussed further in Section 4.0.

The construction water source for the project has not yet been finalised at the time of writing. RWI Act licenses will be obtained following the finalisation of the design scope and construction water source.

2.3 Approval Under the *Aboriginal Heritage Act 1972*

As the construction and pre-commissioning lead for the project, CAPL has a Native Title Agreement and Aboriginal Heritage Agreement with the Thalanyji that mandates heritage surveys to identify areas of ethnographic significance prior to development. If heritage monitors identify items or sites of cultural significance that cannot be avoided, a Section 18 licence to disturb an Aboriginal site under the AH Act will be applied for.

2.4 Assessment Under the *Environment Protection and Biodiversity Conservation Act 1999*

The EPBC Act allows for Federal Government Assessment of a project's impact on matters of National Environmental Significance (NES). The intent of the Act, is to assign protection levels to flora and fauna species (Critically Endangered, Endangered, Vulnerable or Conservation Dependent), or unique ecological communities (Critically Endangered, Endangered or Vulnerable). This project has determined the likelihood of impacting NES through the implementation of the proposal. The results of this impact assessment are listed in Section 4.0. A separate referral for the assessment of impacts to NES under this Act will be submitted. However, it is not expected that this project will require formal assessment by Department of the Environment.

3.0 ALTERNATIVES TO PROPOSAL

The key alternatives that were evaluated for the OWIUP were the water source and the residuals disposal methods. A summary of the options assessed and selected alternative are presented below. Appendix A to Appendix E provides further detail on the options that were investigated.

3.1 Source Water

A range of source water alternatives were investigated for the OWIUP. This section provides a summary of each source that was assessed and reasons sources were deemed not suitable. The section concludes with a description of the selected water source for the OWIUP and its advantages.

3.1.1 Seawater Desalination

Sourcing seawater from the ocean near Onslow and Ashburton North was assessed against a number of project value drivers. Seawater desalination is a well-established process and data on seawater quality existed from other developments in the region, which enabled desktop analysis of the option. A number of significant constraints to undertaking seawater desalination were identified and are summarised below.

- The nearshore environment around Onslow and Ashburton North is shallow, which leads to poor water quality and likely fouling of the intake and outfall due to high turbidity. Long intakes (>5 km offshore) and outfalls (>2 km offshore) would be required to reach depths needed for water quality and mixing.
- During cyclonic conditions there are significant issues with stabilisation of the intake and outfall structures. Protection from damaging waves and seabed scouring requires robust fixing of the intake and outfall, which introduces marine constructability issues and operational risks.
- Environmental impacts during construction.
- Environmental impacts of continual discharge to the marine environment.

These key factors led to seawater desalination not being considered a viable option. Refer to Appendix A for further details.

3.1.1.1 Coastal Sediments (Beach Wells)

Beach wells that source water from coastal sediments were investigated as an alternative to sourcing water from the nearshore environment. No marine works are required for beach well installation. The main concerns that limited the viability of beach wells are:

- Significant schedule impacts associated with investigating, testing and proving the water source. The reliability and sustainability of beach wells was questionable and largely untested.
- Poor water quality in the sediments, for example, salinity above the level of seawater.
- Environmental concerns with locating wells in a coastal environment that is subject to cyclonic change.
- Significant Operational Expenditure (OPEX) associated with accessing and treating water from the wells.

3.1.1.2 Beadon Creek

Another alternative to sourcing water from the nearshore marine environment was an intake in Beadon Creek. Whilst there was a significant reduction in marine works, considerable environmental (entrainment of marine fauna in intake, mangrove stands), land access and water quality issues meant that this alternative was not pursued.

3.1.2 Lower Robe River Aquifer

The Lower Robe River aquifer is a fresh to brackish water source located 80 km east of Onslow. The source is moderately well defined and enjoys a significantly reduced treatment complexity over seawater desalination. A level of investigating, testing and proving of the source would be required prior to guaranteeing sustainability and reliability of the unconfined aquifer. The uncertainty of the short and long term yield of this source, the schedule impacts of the testing program and distance from Onslow deemed this alternative not preferred.

3.1.3 Cane River Aquifer

Similar to the Lower Robe River, the Cane River aquifer is a fresh to brackish water source with only simple water treatment requirements. The unconfined aquifer is located 30–50 km south east of Onslow. The major concern with this source is the sustainability of water availability. Insufficient allocations exist for this source and the probability of securing a 5C Licence from the DoW is considered very low. Investigation into this source was not progressed. This is the current source for Onslow.

3.1.4 Ashburton River Aquifer

The Ashburton River aquifer offers improved water quality over seawater and consequent simplified water treatment requirements. The source is fresh to brackish and may require desalination in some areas. The aquifer extends up to 70–90 km south of Onslow. There are significant constraints associated with this source, including:

- The source is poorly defined and significant investigation, testing and proving is required to determine the sustainable yield
- Poor yields from pump tests conducted by the Waters and Rivers Commission (AECOM 2012)
- It was estimated that upwards of 30 bores may be required to provide sufficient water for the OWIUP
- Significant CAPEX and OPEX due to distance from Onslow and number of bores
- Considerable schedule impact of proving the source, acquiring land access and tenure and gaining environmental approvals

Due to these concerns, the alternative of using the Ashburton River shallow aquifer system was not pursued. Appendix B provides further details on the alternative groundwater supplies that were investigated.

3.2 Selected Water Source for OWIUP – Birdrong Aquifer

The Birdrong aquifer is a deep artesian aquifer within the Carnarvon Artesian Basin. At Lot 556 the aquifer is about 370 m below ground level and has a thickness of around 12 m. Whilst data describing

the Birdrong aquifer in Onslow is limited, BHPB Petroleum drilled a bore on Lot 556 (MDW4) in 2011. The water was used to support construction and as potable water at a construction village. BHPB hold a 5C Licence for extraction from MDW4 for up to 0.9GL/year. Historical data from this operating bore has been acquired and analysed as part of the feasibility investigation. Significant benefits of the Birdrong aquifer were identified, including:

- Reduced salinity compared to seawater and a simplified treatment process to produce potable water
- Decreased residual volumes including reverse osmosis reject and solids
- Schedule benefits compared to seawater, including readily available water quality data and reduced baseline monitoring requirements
- Significant CAPEX and OPEX reduction compared to seawater
- Minimal land access issues

The major work completed to date to validate the Birdrong aquifer as the preferred water source is summarised below:

- Desktop hydrogeological modelling of the Birdrong aquifer at abstraction volumes required to support the OWIUP. No impediments to the aquifer being used as the water source were identified during this preliminary study. Refer to Appendix C.
- Desktop fatal flaw assessment completed based on worst case operating scenarios. Groundwater models were updated following acquisition of data from BHPB's operating bore. No fatal flaws were identified. In all modelled scenarios, the aquifer remained saturated and artesian. Refer to Appendix D.
- A bore siting seismic assessment was completed that identified preferred locations for drilling production and standby bores into the aquifer. Refer to Appendix E.
- The project team proposed a field testing program to validate the aquifer at abstraction volumes expected for the OWIUP. The DoW endorsed the testing program and outlined the steps to be taken to be granted a 5C Licence. Further, with reference to Appendix F the DoW provided a 'letter of intent' that placed the OWIUP as a priority applicant for a 5C Licence. The field testing program has been completed. The results and report will be provided to the DoW Q2 2014, to assist in bore configuration and licencing dialogue.

Whilst access to the Birdrong aquifer is possible from a number of locations, Water Corporation, CAPL and DSD have identified Lot 556 as a strategic preferred location. The OWIUP will utilise two bores on Lot 556 functioning in a duty/standby arrangement. If MDW4 is shown to be suitable for the project, a new bore will be drilled to supplement the existing bore. Alternatively, two new bores will be drilled. A comprehensive groundwater sampling program has been undertaken on MDW4. Four sampling events were completed to assess the quality and consistency of the water in the aquifer. The groundwater is brackish (Total Dissolved Solids (TDS) concentration of about 13 000 mg/L), warm (~45 °C) and contains dissolved metals, minerals and gases. The water quality data is summarised in Appendix G. The water quality data was consistent across the sampling events, which was expected for an artesian aquifer at this depth.

3.3 Water Treatment Process and RSS Chemistry

In order to investigate the environmental impacts of RSS disposal, a conservative RSS chemistry was determined and is detailed in Table 4.2. The chemistry was based on the worst case raw water quality data from the Birdrong aquifer and the proposed treatment process design. After cooling, the groundwater undergoes multimedia filtration prior to reverse osmosis, remineralisation and disinfection. Potassium permanganate and antiscalant are dosed to oxidise iron and manganese and control scale respectively.

Two waste streams are produced in the treatment process; filter backwash solids and RSS from the reverse osmosis. The multimedia filters remove iron hydroxide, manganese oxide and inert solids from the groundwater. When the filters are backwashed the solids are washed from the media and collected in a small thickener. Solids are concentrated in the thickener and sent to a drying bed on Lot 556. Periodically the solids (iron, manganese and inerts) in the drying bed will be removed and sent to an appropriate landfill site.

The RSS primarily consists of reverse osmosis reject and the composition is dictated by the recovery of the reverse osmosis system (70% at 2 ML/d production). The recovery of the RO system has been maximised in order to minimise abstraction from the aquifer and disposal volumes to QMC. The maximum flow rate of the RSS when the plant is operating at full capacity (2 ML/d) will average about 0.86 ML/d. Wet bulb conditions will dictate the RSS temperature which will average 26°C and could reach a maximum of 34°C. Based on expected operating scenarios at the water treatment plant, the average rate of RSS discharge will be 0.65 ML/d.

3.4 Alternate RSS Disposal Pathways

A range of RSS disposal alternatives were investigated for the OWIUP. This section provides a summary of each disposal option that was assessed and reasons disposal options were deemed not suitable. The section concludes with a description of the preferred RSS disposal option for the OWIUP and its advantages.

3.4.1 Nearshore Ocean Outfall

Nearshore ocean outfalls are a widely used method for disposal of desalination plant brine. Similar to the issues described with open ocean intakes in Section 3.1.1, nearshore ocean outfalls in the region are problematic due to the shallow nearshore environment. Long pipelines (>2 km offshore) are required to achieve adequate mixing. The pipelines will have to be fixed robustly in order to remain in place during cyclonic conditions. Finally, Lot 556 is approximately 20 km inland from the coast, which significantly increases the cost of this option. Refer to Appendix A for further technical details.

3.4.2 Re-injection into Birdrong Aquifer

Reinjecting RSS from the water treatment plant into the Birdrong aquifer some distance from Lot 556 was considered. Despite removing requirements for marine works, this option introduced significant uncertainty about potential interference between groundwater and RSS during abstraction. The extent of interference over the life of the project could not be accurately simulated and this option was discounted. The artesian nature of the aquifer also presents technical issues for re-injection due to elevated pressures at depth.

3.4.3 Re-injection of RSS into shallow aquifers

The shallow aquifers surrounding Lot 556 were assessed for their ability to store and transmit the RSS. The shallow aquifers are hypersaline and contain elevated metals and minerals levels. The poor condition of these aquifers suggests that the RSS would not adversely impact the water quality in the aquifers. However, the groundwater level is close to ground level and salt scarring is frequently seen around Lot 556 from groundwater discharge and evaporation. This introduces issues with mounding of the water table and subsequent environmental concerns.

Modelling of the local shallow groundwater environment was undertaken to assess the viability of reinjection. The model had significant uncertainties including: aquifer hydraulics, vertical hydraulic gradients, seasonal and episodic changes in water table elevations, connectivity of the Trealla Limestone and Ashburton River Delta Alluvium and potential yields of injection and abstraction facilities. Accordingly, the modelling was viewed as indicative only.

Modelling suggested that RSS and groundwater would daylight in certain areas where it currently does not, which may have negative impacts on vegetation, flora and fauna. Moreover, the transmissivity of the shallow aquifers is low and clogging and fouling of the injection bores is a significant operational concern. As a result, many injection bores were required to achieve RSS reinjection. Finally, the schedule impact of investigating, testing and proving the reinjection concept, coupled with land access and approvals, was significant and not acceptable for the OWIUP. This alternative was retained as a fall back if the preferred option could not be progressed for any reason.

For further details of the conceptual design of the reinjection alternative, refer to Appendix I.

3.4.4 Evaporation Ponds

Lined evaporation ponds were investigated as an alternative with the benefit of containing the RSS and resulting in no liquid disposal to the environment. However, it was determined that a large amount of land was required to support evaporation of the amount of RSS from the OWIUP. Over time, solids accumulating in the base of the ponds would need to be removed and disposed, which presented a considerable operational concern. This option was determined not to be feasible.

3.4.5 Infiltration Basins

Infiltration basins that allow RSS to infiltrate into the groundwater beneath the basins were assessed as a small footprint alternative to evaporation ponds. Infiltration basins would fit within Lot 556 next to the water treatment plant. As the liquid RSS infiltrates, solids are left behind and accumulate on the bottom of the basin and underlying soil. Over time these solids will require removal and disposal in order to not block infiltration of RSS altogether. Significant operational cost is associated with this option. Similar to re-injection into shallow aquifers, mounding of the water table beneath the infiltration basins may have adverse environmental impacts, such as vegetation death. Modelling suggests that over 1500 ha of good to excellent condition vegetation may be impacted by the increase in the water table depth associated with infiltration basins. Due to these issues, this option for RSS disposal was not pursued.

3.4.6 Solid Disposal

The option of removing and solidifying contaminants from the groundwater at the water treatment plant was investigated. A spadable sludge suitable for disposal at landfill facilities can be produced using certain treatment processes, such as lime softening. One component of solid waste produced is Naturally Occurring Radioactive Materials (NORM), which consists mainly of Radium-226 and Radium-

228. The concentrated activity within the spadable sludge reaches levels above those acceptable for Class IV landfill (250 Bq/kg).

Western Australia has one Class V landfill site at Mount Walton East. This site is considered a disposal option of last resort and it is not available for continuous receipt of waste – essentially a mining operation is mobilised to bury the waste when sufficient quantities of waste are available. This is a very expensive option and was not pursued past initial enquiries with the Department of Finance who manage the facility. This investigation suggested that it is preferable to dilute the NORM in the RSS rather than concentrate in solid form. This constraint also limits the viability of any RSS disposal method that requires solid disposal after a number of years, for example evaporation ponds (Section 3.4.4). Refer to Appendix J for further details of the solid disposal alternative.

3.5 RSS Disposal for OWIUP – Quick Mud Creek

The selected RSS disposal option is into Quick Mud Creek (QMC). The key advantages this alternative include (URS 2012a, 2012b, 2013b, 2014):

- RSS flow entirely contained within QMC flow channel
- Least potential impacts to native vegetation and fauna
- Avoids impacts to conservation significant flora
- QMC is regularly flushed by flood waters, which limits the accumulation of RSS constituents
- QMC baseline environment is naturally high in salinity, metals and nutrients concentrations
- Modelling of RSS disposal into QMC concluded that the risk to the environment or stakeholders (receptors) is low (refer also to Appendix K and Appendix L)
- QMC located immediately adjacent to Lot 556

This option is discussed further in Section 4.3.

3.6 Disposal of Solid Waste from Filter Backwash

As described in Section 3.3, iron hydroxide, manganese oxide and inert material removed by the multimedia filters will be dried in drying beds within Lot 556. It is expected that a maximum of 24kg of solids will be produced per day. These solids will be removed from the drying bed periodically and transported to a suitable (likely Class 3) landfill site.

4.0 ENVIRONMENTAL IMPACT ASSESSMENT

4.1 Soils and Landforms

4.1.1 Baseline Environment

The project area lies within the Western Region soil landscape unit, which covers just under half of the total area of WA (Chevron 2010). This unit is further divided into provinces, with the project area contained entirely within the Exmouth Province. Soils in the Exmouth Province are comprised mainly of:

- Sand plains and dunes dominated by deep red sands and deep sandy duplexes
- Red/brown cracking clays, hard cracking clays and deep red sandy duplexes on the alluvial plains and floodplains, along with some red loamy earths
- Tidal soils on the coastal flats
- Coastal dunes of calcareous sands and deep red sands
- Calcareous shallow loams, red loamy earths and stony soils on the Cape Range and other limestone hills
- Red deep sands on the undulating sandy plains to the south.

Areas of Potential Acid Sulfate Soils (PASS) have been identified in the nearby Ashburton North locality as part of site investigations conducted for the Wheatstone Project (Chevron 2010). Soil profiles indicative of PASS material are considered to be of marine/organic origin and are generally located within landform units associated with intertidal flats, tidal creeks and supratidal salt flats (Chevron 2010). Investigations to date indicate a high probability the construction footprint of the project will intersect areas of PASS particularly during the construction the potable water transfer pipeline.

4.1.2 Impact Assessment

There are no specific landforms that are limited in extent to the project area. Soils in the project area are free draining and the risk of erosion occurring following development of the site is Low. The greatest risk to baseline soils and landform condition is the exposure and subsequent oxidation of PASS during the construction phase of the Project. Soils will be sampled and mapped for PASS during the geotechnical investigation. The high water table, lack of historical disturbance and high acid-neutralising characteristics of the regional soil profiles (Chevron 2010) will reduce the probability of intersecting areas of Actual Acid Sulfate Soils (AASS).

4.1.3 Proposed Management Measures

If exposed, identified areas of PASS will be treated in accordance with Treatment and Management of Soils and Water in Acid Sulfate Soil Landscapes (DER 2011). A specific Environmental Management Plan (EMP) will address the management of PASS and identify a number of targets to enforce compliance with legislative and site specific triggers. Management measures detailed in the EMP will include the development of a PASS risk map showing horizontal and vertical extent of PASS in soil profile and avoidance strategies for high risk areas.

4.1.4 Predicted Environmental Outcome

With the implementation of the management measures outlined in Section 4.1.3, the residual risk to Soils and Landforms from the construction and operation of the project is considered low.

4.2 Groundwater

4.2.1 Baseline Groundwater Environment

Shallow groundwater in the vicinity of the project area is typically hyper saline, with Total Dissolved Solids (TDS) of between 60,000 and 170,000 mg/L (URS 2013b). This groundwater usually ranges between surface level and two metres beneath the surface (Chevron 2010).

In the deeper formations there are several confined aquifers, including the Windalia Radiolarite, Mungaroo Formation and the Birdrong Sandstone (project source water). The Birdrong Aquifer is a major regional groundwater resource for industrial quality water. The Birdrong Sandstone is predominately glauconitic sandstone with minor siltstone and conglomerate, and typically yields for production bores range from 500–4500 kL/day across the Carnarvon Basin (Chevron 2010).

4.2.2 Impact on Groundwater

4.2.2.1 Birdrong Aquifer

With reference to Section 3.2, modelling was conducted by Golder (2012) to assess the sustainability of the Birdrong aquifer under a variety of abstraction scenarios. In all modelled cases, the Birdrong Aquifer remained fully saturated and was not dewatered. No hydraulic connection exists between the Birdrong and shallow aquifers (Golder 2012). No other users of the Birdrong Aquifer have been identified in northern part of the Carnarvon Artesian Basin as such there will be no impacts on other existing users under the abstractions scenarios modelled (Golder 2012).

4.2.2.2 Underlying Aquifers

The environmental heads created by the salinity gradient in the underlying aquifers indicate an upward vertical flow (URS 2013b). In these conditions, it is expected that the RSS would have limited interaction with the water table and minerals would not propagate into the local water table.

4.2.3 Proposed Management Measures

The ongoing sustainability of the Birdrong Aquifer will be assessed in accordance with requirements of the Section 5C Licence issued by the DoW. As there are no known hydraulic connection exists between the Birdrong and shallow aquifers no additional management measures are required.

4.2.4 Predicted Environmental Outcome

As discussed in Section 3.2 and 4.2.2 modelling of various abstraction scenarios has shown that the aquifer remains fully saturated. The suitability and sustainability of the Birdrong Aquifer as the water source will be further assessed by the DoW as part of the assessment of Section 5C and 29D applications.

Disposal of RSS into QMC has been assessed to not negatively impact the composition or water quality in underlying aquifers.

4.3 Surface Water

4.3.1 Baseline Surface Water Environment

Surface water in the Ashburton North locality is subject to several hydrological processes: local rainfall, run-off from upstream catchments and tidal inundation (Chevron 2010). Tidal inundation is not a factor

in the hydrological systems relevant to the project area, with the possible exception of a large storm surge event associated with a tropical cyclone. The nearest occurrence of surface water is QMC. QMC is an ephemeral drainage channel with variable water quality that runs south-north adjacent to Lot 556. It is a natural groundwater discharge area and during drought conditions QMC is characterised by an orange salty crust and white hyper-saline, gypsum-lined ephemeral pools. The water quality in these pools ranges from brackish after periods of stream in-flow, to hyper-saline and clear after periods of drought (380,000 mg/L) and associated evapo-concentration of expressed groundwater.

Episodic precipitation events can cause significant stream flow, with rates up to 10 m^3/sec used in the hydrodynamic modelling (URS 2013b). There are commonly long periods of no flow and short, episodic events of very high flow (URS 2013b). These high flow events will discharge onto the supratidal mudflats and enter the Hooley Creek Estuary (HCE). The predictive modelling indicates that a stream flow rate of about 2 m^3/s over a 24-hour period enables discharge from QMC onto the supratidal flats. Stream flow events below this threshold may enable discontinuous discharge for shorter periods. Stream flow rates of at least about 5 m^3/s over 24 hours enable discharge from QMC to be transmitted to the tidal estuary and sea (URS 2013b). The probability of this occurring for a given rainfall event is displayed in Table 4.1. Flood events in the Ashburton River that contribute to flows in QMC and discharge to HCE have a similar frequency to the sub-regional QMC catchment (URS 2013b). Based on the predicted stream flow frequencies, QMC is expected to discharge to HCE every one to two years.

Table 4.1: Quick Mud Creek Stream Flow Discharge Event Frequency

Quick Mud Creek Catchment	24-Hour Duration Design Storm			
	1-Year ARI*	2-Year ARI	3-Year ARI	5-Year ARI
Local (20 km^2)	No Discharge	Discharge to Supra-tidal Flats	Discharge to Supra-tidal Flats	Discharge to Hooley Creek
Sub-regional (214 km^2)	Discharge to Hooley Creek	Discharge to Hooley Creek	Discharge to Hooley Creek	Discharge to Hooley Creek

Source: (URS 2013b) **ARI= Average Recurrance Interval*

Stream flow from QMC would coalesce with concurrent flows from the supratidal saline flats and Hooley Creek before entering the tidal reaches of West Hooley Creek, East Hooley Creek and Middle Creek. The HCE consists of the drainage lines referred as Hooley Creek East, Hooley Creek West, Middle Creek and Four Mile Creek. The HCE is typical of a tropical estuarine system in the Western Pilbara, with shallow bathymetry and strong tidal movements. Although the HCE is identified as a discrete catchment, it has low relief and during regional flood events it is hydraulically connected to the Ashburton River and adjoining sub-catchments (URS 2013b) provided as Appendix K.

Unlike QMC, which has relatively few ecological receptors, the HCE has fringing areas of algal mats, mangroves and other Benthic Primary Producer Habitat (BPPH). In-flow from QMC, supratidal flats and likely the Ashburton River, combined with the tidal movement in the HCE, will flush diluted RSS out to sea.

4.3.2 Impact Assessment

4.3.2.1 Disposal of RSS

When the desalination plant is operating, the RSS will be transferred via a pipeline into QMC immediately downstream of the bridge over the Wheatstone Access Road. An energy dissipating structure, such as rock riprap or similar, will be constructed to protect against creek bed scouring during RSS disposal. Modelling has indicated that the RSS footprint in Quick Mud Creek is expected to extend a maximum of 4.6 km from the release point in low evaporation conditions and at the maximum discharge rate of 857 kL/day. The water balance and salt balance is predominantly influenced by losses due to evaporation. In the absence of episodic stream flow events RSS constituents accumulate in the creek. During flood conditions, accumulated RSS constituents are dispersed, diluted and transported downstream and ultimately reach the ocean via the HCE.

The initial environmental impact assessment concluded that contaminants in the RSS disposed into the creek will not result in adverse impacts to the QMC environment and surrounds. This is confirmed by analysis of RSS chemistry when compared to the baseline QMC surface water and sub soil chemistry, as displayed in Table 4.2. Additional engineering revisions may identify efficiencies to the process. This may result in increases to constituent concentrations and decreases in volumes leading to decreases in mass flow to QMC thus decreased impacts.

Table 4.2: RSS / QMC Comparison Table

Parameter[1]	RSS Chemistry		Baseline Quick Mud Creek		Hooley Creek Estuary (URS 2011)/Supra-tidal Flats (URS 2014)		Near-shore Marine (MScience 2009)	
	Concentration		Concentration		Concentration		Concentration	
	Units	Value	Units	Value	Units	Value	Units	Value
pH		7.78		8.15	8.27			
Temperature	°C	25 - 36			°C	30.9		
Dissolved Oxygen	mg/L	5 - 8			mg/L	7.6		
Total Suspended Solids	mg/L	12.7	mg/L	77000	570			
Dissolved Organic Carbon	mg/L	3.3	mg/L	13	13			
Organic -N	mg/L	3.3	mg/Kg	30				
Total Phosphorus	mg/L	0.02	mg/Kg	2	mg/L	0.02	mg/L	0.0163
Radium 226	Bq/L	13.7	Bq/Kg	0.30[3]				
Radium 228	Bq/L	22.7	Bq/Kg	0.452[3]				
Thorium 228	Bq/L	2	Bq/Kg	<MDL[3]				
Total Ammonium	mg/L	29.5	mg/L	9.09				
Sodium	mg/L	15,429	mg/L	101000	mg/L	92300		
Potassium	mg/L	484	mg/L	6500	mg/L	2160		
Calcium	mg/L	962	mg/L	1940	mg/L	2520		

Parameter[1]	RSS Chemistry		Baseline Quick Mud Creek		Hooley Creek Estuary (URS 2011)/Supra-tidal Flats (URS 2014)		Near-shore Marine (MScience 2009)	
	Concentration		Concentration		Concentration		Concentration	
	Units	Value	Units	Value	Units	Value	Units	Value
Magnesium	mg/L	653	mg/L	29200	mg/L	5940		
Barium	mg/L	8.7	mg/Kg	<10				
Strontium	mg/L	28.3	mg/Kg	80				
Iron	mg/L	0	mg/L	0.05	mg/L	0.007	mg/L	0.026
Manganese	mg/L	0	mg/Kg	17	mg/L	0.028		
Chloride	mg/L	26,652	mg/L	187000	mg/L	184000		
Bromide	mg/L	89.6	mg/Kg	100				
Iodide	mg/L	5	mg/Kg	<5				
Sulphate	mg/L	17.3	mg/L	21100	mg/L	11200		
Bicarbonate	mg/L	1940	mg/L	361				
Fluoride	mg/L	3.3	mg/Kg	<1				
Boron	mg/L	16.2	mg/Kg	50				
Silica	mg/L	78.9	mg/Kg	173				
Total Dissolved Solids	mg/L	46,418	mg/L	380000	mg/L	176000		
Copper	mg/L	0.09	mg/L	0.475	mg/L	0.269	mg/L	0.01
Lead	mg/L	0.003	mg/Kg	0.16	mg/L	0.04	mg/L	0.05
Nickel	mg/L	0.057	mg/L	0.431	mg/L	0.214	mg/L	0.0035
Sulphur	mg/L	0.4	mg/L	8830	mg/L	1300		
Zinc	mg/L	0.117	mg/L	0.619	mg/L	0.687	mg/L	0.0015
Aluminium	mg/L	0.017	mg/Kg	100			mg/L	0.02
Citric Acid[2]	mg/L	114						
Sodium Lauryl Sulphate[2]	mg/L	2.85						

[1]RSS disposal at 857 kL/day when plant is operating at full production

[2]Cleaning chemical. Discharge concentration indicated is limited to 24hrs every 3 months i.e. one clean every 3 months.

[3]Solid soil sample

The environmental risk assessment assumed a reasonable worst-case scenario of two years salt accumulation on QMC with subsequent transport under low-flow conditions. The risk assessment also assumed a discharge rate of 857kL/day; not the likely discharge rate of <651kL/day. It was determined during the assessments that the lowest dilution of the accumulated salt occurred during consecutive 1 + 1-year ARI stream flow events. During these events, the stream flow in QMC is low compared to the contribution from the supratidal flats. The concentrations of RSS constituents entering HCE were

predicted using the accumulated salt diluted by the QMC stream flow plus contributions from the supratidal flats and HCE system.

Initial feasibility modelling (URS 2012b) suggested that potential accumulation of NORM in the QMC setting was worthy of further investigation. Flushing of the creek and geomorphological factors that affect accumulation were considered in greater detail in subsequent modelling that focused specifically on NORM accumulation (URS 2013b).

Current Australian regulations and guidelines with respect to NORM management are derived from the ICRP and IAEA. The Australian regulations are primarily designed for the protection of human health. The ICRP has set the effective dose limit for the general public at 1 mSv/year and activity level of 1 Bq/g. ARPANSA has accepted this dose limit for Australian regulations. In general, the standards in place for the protection of people are believed to offer protection to and limit radiological risk to other species (URS 2013b).

In Western Australia, the Radiological Council is the primary regulator and assists the Minister of Health to protect public health and maintain safe practises in the presence of radiation. For the general public, the Radiological Council prescribe an average effective dose of 1 mSv/year in any period of five years and no more than 5 mSv in any one year period.

When a litre of the RSS evaporates, it leaves behind approximately 46.4 grams of salt that contains approximately 0.83 Bq/g of (combined Ra-226,Ra-228 and Th-228) radioactivity. The accumulated salt and minerals would be dispersed by stream flow events on Quick Mud Creek. As described above this is expected to occur every one to two years. The RSS salt accumulation in Quick Mud Creek was modelled to occur over a maximum period of about two years during drought. Minerals and NORMs from the RSS remain associated with the salt layer in the QMC low flow channel. The environmental heads created by the salinity gradient in the underlying aquifers show an upwards vertical flow. In these conditions, the RSS would have limited interaction with the water table; therefore NORMs would not propagate into the local water table. As the salt layer builds up, any NORMs that are covered by approximately one meter of salt no longer contribute to radiation doses as the particles cannot penetrate the salt (URS 2013b). In a stream flow event these NORMs can be released and will contribute to overall dose.

External radiation, dust inhalation and ingestion of NORM were identified as potential exposure pathways. The effective dose to a Human Receptor on the edge of a surface water RSS pool on QMC would be no more than 0.525 mSV/year (URS 2013b), well below the effective dose limit. While this pathway represents the largest potential source of radiation, it also represents the least likely potential exposure pathway, as QMC is a remote area not generally accessed by the public. Radiation doses experienced by ecological receptors or the general public will be below those received in QMC due to dispersion and dilution of NORM material.

The risk assessment also quantified the radiation exposure for human receptors at the Onslow Salt Crystalliser ponds and potential contamination of the produced salt. The dust inhalation dose was estimated at a maximum of 6.99e-7mSV/year. Little potential for contamination of produced salt was identified due to: prevailing winds are away from the crystalliser ponds; assumptions that the majority of airborne NORMs would remain airborne and not settle on the ponds; and salt harvesting occurring over a limited time cycle, which limits potentials for progressive NORM accumulation (URS 2013b).

Ingestion of NORM through potential bio-accumulation in aquatic fauna was also assessed. In a flood scenario that results in QMC discharge to HCE, worst-case NORM concentrations in the stream flow have been modelled. During consecutive 1 +1-year ARI stream flow events following two years of no flow in QMC, approximately 1.2GL of water with an activity of 19.5Bq/L is predicted to enter HCE. Periods of between 4 and 18 days are expected before dilution of the Source Term to 1Bq/L (URS 2013b). A hydrodynamic model of the estuary was used to estimate potential doses to aquatic life and subsequently humans through ingestion.

Doses of between 0.036 and 0.29mSv/year were modelled for a number of different mixing ratios of stream flow and seawater in HCE. These scenarios were considered to address worst-case aspects (URS 2013b). Similarly, after NORM bioaccumulation in fish and consumption, the modelled doses were between 0.15 and 0.38mSv/year, well below the 1mSv/year guideline. Moreover, modelling assumed all fish consumption occurred in the HCE; however, construction of the Wheatstone LNG Project has resulted in the closure of land based access to areas of potential RSS accumulation within the HCE. Access is still possible by boat during high tides; however the HCE has never been a high value recreational fishery as displayed in Figure 4.1 (Chevron 2010). Therefore it is extremely unlikely that a person may receive the modelled dose of radiation from consuming fish caught in the HCE. This scenario is also unlikely as elevated NORM signatures will only be present in the system for under a month following significant rainfall.

Further details are available in Appendix K.

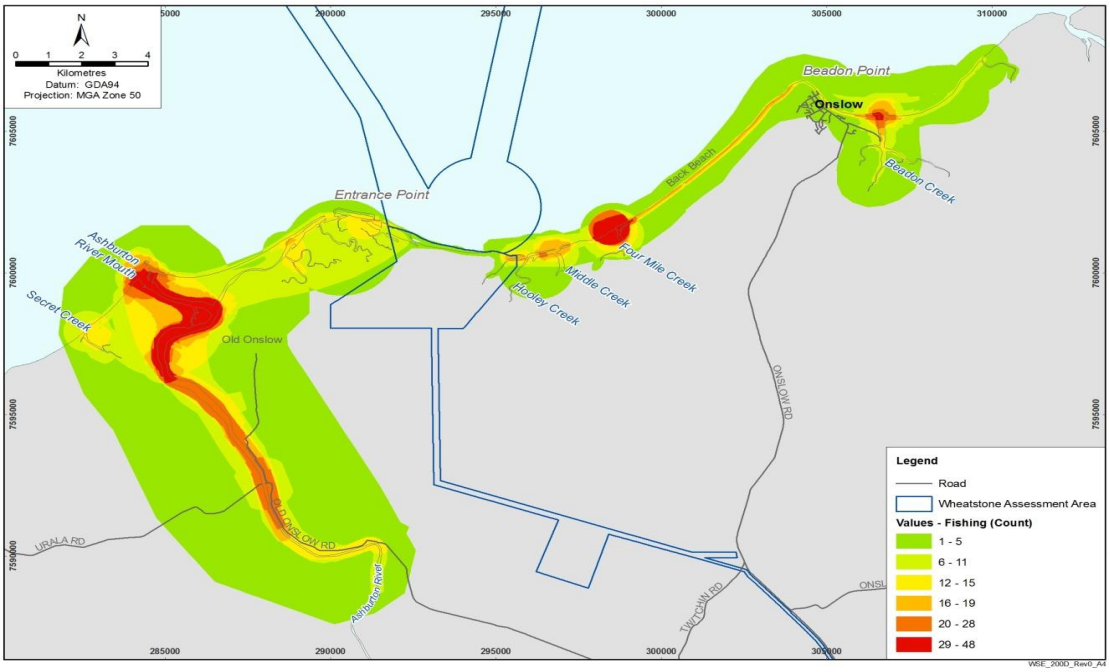

Figure 4.1: Value of recreational fishing areas for the Onslow Community

Analysis of the potential impacts of NORMs on ecological receptors was based on limiting the dose rate to less than 1 millisievert per year and\or activity to 1 Bq/g. In general terms, these standards for the protection of people are believed to offer protection to and limit radiological risk to other species and are appropriate for use given the lack of species specific data in Australia (URS 2013b).

Radiological exposures were calculated to be well under the 1 millisievert per year threshold in worst case scenarios. Receptors in HCE would, in this worst-case scenario, be typically exposed to radiological activity for a periods of up to one month. Most aquatic fauna are transient within tidal creeks such as the HCE and are unlikely to be consistently exposed to elevated levels of radiological activity. Sedentary fauna, such as molluscs and bi-values could potentially be exposed to these elevated levels, however investigations have indicated a reduced diversity and abundance of this fauna in the HCE due to elevated turbidity levels and strong tidal movements (Chevron 2010) (URS 2014).

A desktop risk assessment of non-NORM constituents in the RSS was conducted by URS. These investigations used the RSS chemistry in Table 4.2 as the basis of the risk assessment. Similar to the accumulation and subsequent release of NORMs during particular flood situations, the worst-case scenario for RSS constituent input into the HCE (the most sensitive receiving environment), was in the event of consecutive 1 + 1 year ARI events following an RSS accumulation period of 1 - 2 years. Following evaluation of all non-NORM constituents in the RSS, only nitrogen (in the form of ammonium NH4) was identified as being a potential environmental factor for receiving environments in the HCE. All other RSS constituents were of concentrations less than that found in QMC baseline water quality. During further work, the risk assessment showed that the dilution, attenuation and adsorption that occurs on accumulated nitrogen when mixing with QMC flows and Ashburton River in-flow, significantly reduces the risk to receiving environments to low (URS 2014).

Further details are available in Appendix L.

4.3.3 Proposed Management Measures

During operation, surface water and groundwater monitoring will be conducted to validate the findings of the environmental impact assessment. A number of water quality and environmental parameters will be monitored in QMC including:

- Surface water flow rates
- Salinity
- Turbidity
- Selected metals (aluminium, barium, copper, lead, nickel, strontium and zinc)
- Nutrients (Nitrogen, Phosphorus and related compounds)
- Naturally Occurring Radioactive Materials (NORM)

A surface water flow gauge, installed to provide baseline data on QMC will provide continuous surface water monitoring. Monthly testing for NORMS at the plant site and at QMC is proposed pending land access. Testing will also occur after rainfall of more than 20mm in 48 hours or until it can be demonstrated that no significant risk to OSPL's operations can be identified. Other constituents in the RSS that may be concentrated in a similar manner to NORMs have also been identified and broadly include trace metals, salts and nutrients, namely nitrogen and phosphorus compounds. The high level risk assessment has determined that most of the constituents are of low to moderate environmental risk, however nitrogen levels in the form of ammonia (NH4+) are likely to be elevated in drought breaking floodwaters (URS 2014a). Monitoring of these elevated constituents is proposed to occur in parallel with the monitoring of NORMs and at the same locations and frequency.

4.3.4 Predicted Environmental Outcome

All environmental impact assessments completed to date have shown that RSS disposal to QMC presents no material impacts to the environment and stakeholders in the vicinity of the project area. The periodic flushing of QMC and the supratidal flats into HCE, and mixing and dilution in seawater within the HCE system, indicates that RSS disposal will not present a measurable environmental impact outside of the project area (see Appendix K and Appendix L).

4.4 Flora and Vegetation

4.4.1 Baseline Environment

Six flora and vegetation and one rare flora survey have been conducted at the Onslow locality, all with survey boundaries intersecting with the project area. This has allowed interpolation of vegetation communities in the project area with a high level certainty.

The project area has a long history of pastoral and industrial use with five per cent of the project area mapped as Disturbed. The condition of the remaining 95% of the project area ranges from Good to Very Good (Biota 2013 – See Condition Scale Appendix 4). Weed infestation of vegetation units by Buffel grass (Cenchrus ciliarus) is a major factor in determining vegetation condition within the project area. A further 1.6% of the project area has been mapped as bare mudflat, which contains no vegetation (Biota 2013).

Interpolation of vegetation units from existing studies has identified 15 distinct vegetation units and 206 flora species occurring in the wider Survey Area over six regionally extensive habitat types (Biota 2013). The project area is a subset of the unrefined Survey Area, as displayed in Figure 4.1.

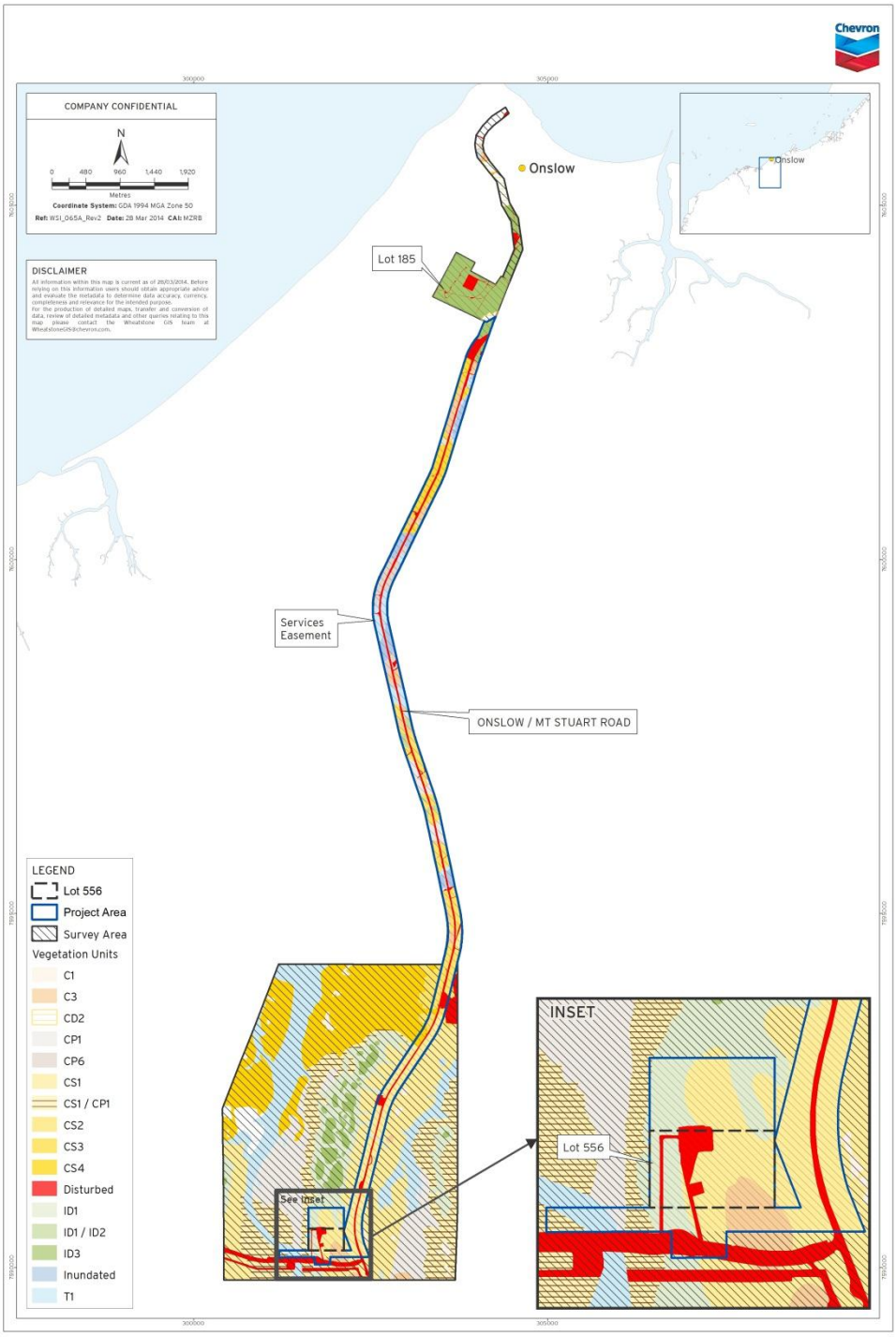

Figure 4.2: Baseline flora and vegetation Survey Area

4.4.2 Impact on Flora and Vegetation

There is no Rare Flora or Threatened Ecological Communities that will be impacted by the implementation of the Project. One species listed as Priority Flora (Flora of Conservation Significance) is known to occur within the project area.

Triumfetta echinata (Priority 3) is known to occur on two ridges of red sand dunes within the project area, typical of the known habitat for the species (Biota 2013). This habitat is not restricted to the project area and is common and widespread in the locality (Biota 2011). The species has also been recorded from numerous locations outside of the project area (Chevron 2010).

Approximately 100 ha of the 317 ha of land within the project area will be directly cleared to construct the project including temporary works such as access roads and lay down areas required to support construction. None of the vegetation units identified in the project area qualify as Threatened or Priority Ecological communities as listed by the DER (see Table 3.4). Two vegetation units (ID1 and C3) in the project area are of elevated conservation significance, as they are known to support Priority and other flora of conservation significance in nearby areas (see Figure 4.2). The refined project area when compared to the wider Survey Area will minimise the footprint on these units. The amount of each vegetation unit cleared relative to the extent identified in regional botanical surveys is displayed below in

Table 3.4: Impact of clearing for the OWIUP on vegetation units in the project area

Vegetation Unit Code	Description	Conservation Significance	Amount in project area (ha)	Amount mapped by all surveys	Percentage to be cleared - Regional Surveys * Assumes 100% of unit within project area will be cleared
T1	*Tecticornia* spp. scattered low shrubs	Low	20.6	1366.11	1.5
CD1	*Acacia coriacea* subsp. *coriacea, Crotalaria cunninghamii* tall shrubland over *Spinifex longifolius,* (**Cenchrus ciliaris*) open tussock grassland	Low	0	4.58	0
CD2	*Acacia coriacea* subsp. *coriacea* tall shrubland over *Crotalaria cunninghamii, Trichodesma zeylanicum* var. *grandiflorum* open shrubland over *Triodia epactia* open	Low	0.48	57.68	0.83

Vegetation Unit Code	Description	Conservation Significance	Amount in project area (ha)	Amount mapped by all surveys	Percentage to be cleared - Regional Surveys * Assumes 100% of unit within project area will be cleared
	hummock grassland with *Cenchrus ciliaris* open tussock grassland				
ID1	*Grevillea stenobotrya* tall open shrubland over *Crotalaria cunninghamii, Trichodesma zeylanicum* var. *grandiflorum* open shrubland over *Triodia epactia* open hummock grassland	High	14.92 ha plus 4.86 ha in mosaic with unit ID2	140.29	19.78
ID2	*Grevillea stenobotrya* tall open shrubland over *Crotalaria cunninghamii, Hibiscus brachychlaenus* open shrubland over *Triodia schinzii, (T. epactia)* open hummock grassland	High	4.86 ha, occurs only in mosaic with unit ID1.	197.20	2.46
ID3	*Acacia stellaticeps* shrubland over *Triodia epactia* hummock grassland	Low	4.46	146.47	3.04
CS1	*Acacia tetragonophylla* scattered shrubs over *Triodia epactia* hummock	Low	78 ha plus 2 ha in mosaic with CP1	912.35 ha plus 171.68 in mosaic with CP1 and 636.21	4.65** Does not include ha in mosaic with other units

Vegetation Unit Code	Description	Conservation Significance	Amount in project area (ha)	Amount mapped by all surveys	Percentage to be cleared - Regional Surveys * Assumes 100% of unit within project area will be cleared
	grassland			ha in mosaic with CS2	
CS2	*Acacia tetragonophylla* scattered shrubs over *Triodia epactia* hummock grassland with **Cenchrus ciliaris* open tussock grassland	Low	46.95	254.61 ha plus 636.21 ha in mosaic with CS1	5.27
CS3	*Acacia tetragonophylla* scattered shrubs over *Scaevola pulchella, Indigofera monophylla* low open shrubland over *Triodia epactia* hummock grassland	Low	26.47	52.18	50.72** Does not include ha in mosaic with other units
CS4	**Prosopis pallida*, *Acacia tetragonophylla, A. synchronicia* scattered tall shrubs over *Triodia epactia* very open hummock grassland and **Cenchrus ciliaris* open tussock grassland	Low	3.20	298.15, plus 24.86 ha in mosaic with CP1 and 181.43 ha in mosaic with CS1	0.63
C1	Bare claypan	Low	0.22	47.78	0.46
C3	*Tecticornia* spp.[2] low shrubland	High	22.91	551.19 plus 56.62 in mosaic with	3.50

Vegetation Unit Code	Description	Conservation Significance	Amount in project area (ha)	Amount mapped by all surveys	Percentage to be cleared - Regional Surveys * Assumes 100% of unit within project area will be cleared
				CP1 and 17.18 in mosaic with C2	
C4	**Prosopis pallida, Atriplex bunburyana* open shrubland over *Triodia epactia* open hummock grassland and **Cenchrus ciliaris* open tussock grassland.	Low	0	7.78	0
CP1	*Sporobolus mitchellii, Eriachne* aff. *benthamii, E. benthamii, Eulalia aurea* tussock grassland	Moderate	10. 63 ha plus 2 ha in mosaic with CS1	714.50	1.77
CP6	*Lawrencia viridigrisea* low open shrubland over *Triodia epactia* open hummock grassland over **Cenchrus ciliaris* open tussock grassland	Low	15.28	25.03 ha ***This unit has only been described by one survey (Validus 2008).	61.05 ***This unit has only been described by one survey (Validus 2008).

4.4.3 Proposed Management Measures

Implementation of the project will utilise previously cleared areas where practicable and implement a Permit to Work system to manage vegetation clearing. Appropriate supervision of machinery operators will also occur at all times.

Management conditions associated with the required NVCP (if applicable) will be adhered to during construction. The current valid NVCP only authorises clearing for geotechnical and other investigative works.

4.4.4 Predicted Environmental Outcome

If the management measures in Section 4.4.3 are implemented, the risk of damage to flora and vegetation communities outside of the project area and associated with construction activities is low. No impact to the conservation status of any vegetation units or flora is anticipated.

4.5 Fauna

4.5.1 Baseline Environment

Extensive sampling and trapping of terrestrial fauna has been conducted in the vicinity of the project area. The desktop analysis conducted by Biota (2013) has collated this information for the purposes of this document.

Six of the seven broad fauna habitats recorded in the Wheatstone LNG study were identified in the project area (Biota 2013). These were:

- Coastal Dune: *Acacia coriacea* tall shrubland over *Spinifex longifolius* open tussock grassland on coastal dune system
- Inland Dune: *Triodia epactia* dominated hummock grassland on inland dune system
- Sand/Loam Plain: *Acacia sp*. scattered shrubs over *Triodia epactia* hummock grassland on sand/loam plain
- Buffel on clay: Buffel Grass tussock grassland on clay plain
- Samphire: Samphire claypan
- Tussock on clay: Tussock grassland on heavy clay plain

The Wheatstone LNG Fauna Study identified 128 vertebrate species, comprising 51 herpetofauna, 60 avifauna and 17 mammals (Chevron 2010). This assemblage is considered representative of the likely species list for the project area given the proximity of the project area to the Wheatstone LNG Fauna Survey boundaries and the identification of six of the seven fauna habitats in the project area (Biota 2013).

The available data indicates a low likelihood of Schedule 1 fauna occurring in the project area. Three Priority fauna species were recorded from the Wheatstone LNG Fauna Survey Area:

- Little Northern Freetail-bat (*Mormopterus loriae cobourgensis*; Priority 1)
- Western Pebble-mound Mouse (*Pseudomys chapmani*; Priority 4)
- Australian Bustard (*Ardeotis australis*; Priority 4)

Migratory species are not discussed further due to the small nature of clearing when compared to their available habitat within the region. Studies have also demonstrated that the locality is not an important habitat for migratory bird species (URS 2009). Conservation significant fauna species recorded within 20 km of the project area are displayed in Table 4.5.

Table 4.5: Conservation significant species recorded from within 20 km of the project area

Species Name	Status	NatureMap	Chevron (2010)	Habitat	Liklihood
Burhinus grallarius	P4	Yes	-	Sparselygrassed,lightly timbered forest or woodland	Medium
Leggadina lakedownensis	P4	Yes	-	Craking clay and surrounding areas	Medium
Lerista planiventralis maryani	P1	Yes	-	Sandy Areas	Medium
Falco peregrinus	S4	Yes	-	Forest, woodlands, wetlands and open country.	Medium
Numenius madagascariensis	P4	Yes	-	Tidal mudflats and. Sandy beaches.	Medium

Subterranean fauna such as trolglofauna and stygofauna and other Short-Range Endemic (SRE) species will not be examined further as investigations conducted for the Wheatstone LNG development have confirmed a lack of potential habitat in the locality.

4.5.2 Terrestrial Fauna Impacts

Only a small number of Priority or conservation significant fauna species may potentially occur in the project area (see 4.5.1) and the amount of clearing and disturbance to their potential available habitat in the region is very small (Biota 2013). As such, the project will not impact the conservation status of any species (Biota 2013).

4.5.3 Proposed Management Measures

Management and inspection measures will be put in place to minimise potential impacts to fauna during site activities including:

- Fauna Rescue Personnel on site prior to clearing taking place.
- Personnel provided with information on the proper response to fauna encounters through the induction process, including the requirement not to interact with fauna and to report immediately to Contractor or Fauna-Rescue Personnel upon an encounter
- Inspection of cleared areas for fauna presence will occur immediately post clearing operations. Fauna will be removed from impacted areas using trained Fauna Rescue Personnel.

4.5.4 Predicted Environmental Outcome

Fauna of conservation significance that may occur in the project area are all highly mobile and not likely to be impacted by either the construction or operation of the project.

4.6 Air Quality

4.6.1 Regional Context

The Pilbara is an arid, pan tropical region with a strong summer-bias of rainfall due to the passage of tropical cyclones and low pressure systems. Winter rainfall is sporadic and low intensity and usually associated with the northern extend of cold fronts affecting the south-west coast of Western Australia. Cyclonic rainfall ranges from sporadic falls of up to 30mm to high intensity events of up to 300mm (Chevron 2010).

Temperature has been recorded at the Onslow Airport since 1940. Maximum temperatures of 49°C have been recorded, with an average daily maximum temperature of 36°C during summer. Baseline air quality values reflect the arid, underpopulated nature of the region. Total Suspended Particulates, as measured by PM10, average 22.9 µg/m3 (Chevron 2010) in the Dampier locality, reflecting the high dust loading in the Pilbara region. Baseline air quality values for NOx, VOCs and O3 are all well below NEPM criteria air quality limits (Chevron 2010).

4.6.2 Particulate Impacts

Air emissions from the construction phase of the project include dust, exhaust from mobile plant and exhaust from static equipment such as power generators. High particulate levels in the form of dust resulting from earthworks or land clearing has the potential to blanket vegetation communities. This may result in lowered rates of photosynthesis and ultimately vegetation death in extreme cases. Dust also has nuisance value and may be detrimental to human health.

Gas is emitted from the existing bore and is vented to atmosphere. Tests have shown that this gas is composed of (in decreasing order) methane, nitrogen, oxygen and carbon dioxide. Volumetric and composition tests conducted during low groundwater flows at the existing bore were used to estimate the approximate emissions of methane at full production (2ML/d potable water). Results indicate that around 130 tonnes of methane per year will be released to atmosphere when the desalination plant is operating at maximum capacity.

4.6.3 Proposed Management Measures

Dust will be managed according to Environmental Management Plans and will utilise best-practice mitigation measures such as water application, compaction and the use of soil binding agents.

4.6.4 Predicted Environmental Outcome

If the management measures in Section 4.6.3 are implemented, there will be a low risk of particulate, or air quality impacts on the environment or human health.

4.7 Noise and Vibration

4.7.1 Baseline Environment

The project area is likely to have similar baseline noise levels as those identified for the Wheatstone Project. The project area is therefore largely free from anthropogenic noise emissions (Chevron 2010).

4.7.2 Impact

Clearing and construction works will involve the use of plant and machinery. The use of plant and machinery at any construction site causes increase in noise and vibration. Lot 556 is remote and has no receptors, which means that noise and vibration from construction is not a concern at this site.

No significant noise is expected during operation of the OWIUP facilities. All noise and vibration expected in operations will be below all relevant regulations.

4.7.3 Proposed Management Measures

Limiting construction working hours, spatial placement of noise emitting machinery and other measures will be considered and implemented if deemed worthwhile. Construction site will comply with the relevant conditions of the Environmental (Noise) Regulations, 1997.

4.7.4 Predicted Environmental Outcome

There will be no detrimental outcome to people or the environment as a result of implementing this Project.

4.8 Conservation Parks and Reserves

4.8.1 Baseline Environment

The closest Ramsar wetland to any of the proposed development areas is the Millstream Pools Proposed Ramsar addition, over 225 km north east of the project area.

The closest wetland of importance as listed by the SEWPaC Protected Matters Search Tool from any part of the project area is ‘Exmouth Gulf East’, over 25 km to the southwest.

There are no occurrences of Threatened or Priority Ecological Communities within 35 km of the project area. The nearest ecological community of conservation significance is the Priority 1 Peedamulla (Cane River) Swamp Community located 50km away.

The former Mt Minnie lease hold will be vested to the Department of Parks and Wildlife (DPaW) as an addition to the existing Cane River Conservation Park in 2015 and is currently under that department’s management. It is located approximately 10 km from the project area.

4.8.2 Impacts

There will be no impact to any National Parks, reserves or other conservation areas as a result of implementing this project.

4.8.3 Management Measures

No management measures are required as there will be no impact to conservation parks or reserves.

4.8.4 Predicted Environmental Outcome

Conservation parks and reserves will remain unaltered as a result of implementing this Project.

4.9 Social

4.9.1 Baseline Environment

The town of Onslow currently supports a population of between 600 and 900 people depending on seasonal fluctuations (Chevron 2010). Onslow’s population is expected to increase to 2,201 by 2017

(Western Australian Planning Commission 2011). Community consultation conducted by CAPL prior to the approval of the Wheatstone LNG project noted the requirement to manage impacts to the unique character of Onslow and its industries, recreational activities and heritage values (Chevron 2010).

4.9.1.1 Visual Amenity

Lot 556 is a remote site with no receptors. The finalised design will however, be optimised for visual impact and appropriateness for the receiving environment.

4.9.1.2 Light

Lot 556 is a remote site with no receptors. Light emissions will be restricted to levels and intensity appropriate for intended function, whilst minimising environmental impact to light sensitive species.

4.9.1.3 Restricted Access to Lot 556

Lot 556 does not have a history of public use. As the source of construction water for the construction of the BHPB's Macedon Project, Lot 556 has been subject to restricted access since 2011. Security measures will be implemented on Lot 556 during construction and operation to restrict public access.

4.9.1.4 Cultural Considerations

The Thalanyji are the Native Title holders of the lands that contain the project area and are recognised as a key stakeholder in the implementation of the project (see section 5.0). Heritage surveys will be conducted over the entirety of the project area to identify areas of cultural significance (if any).

4.9.2 Impact

Visual amenity is not considered an important concern due to the remote nature of the site. No impacts from light associated with the OWIUP are anticipated. A light study will be undertaken to confirm this.

Implementation of the project will not result in additional access restrictions to recreation areas used by the public.

Impacts, if any, to Aboriginal heritage will be determined post completion of the heritage surveys.

4.9.3 Management Measures

Design of the project will consider the environmental setting and visual amenity at all locations. Infrastructure associated with the project will be constructed in a manner that ensures all existing public thoroughfares along the potable water transfer pipeline infrastructure corridor remain open. Security measures will be implemented on Lot 556 during construction and operation however, to restrict public access.

The siting of infrastructure on the project within the project area will be modified as required to minimise / eliminate the impact on areas of cultural significance and to ensure compliance with the Aboriginal Heritage Act 1972. Worker inductions will encourage a high level of participation in heritage awareness and workers will be expected to exercise a 'Stop Work Authority' (SWA), in the event that construction works uncover unexpected heritage artefacts or remains.

4.9.4 Predicted Outcome

If the management measures in section 4.9.3 are implemented, there will be no social impact as a result of the implementation of this Project.

5.0 STAKEHOLDER CONSULTATION

5.1 Consultation

The Water Corporation, in conjunction with Department of State Development and CAPL, undertook consultation with government agencies, landowners, community representatives and other relevant stakeholders.

Face-to-face consultation was considered the most appropriate mechanism to achieve genuine feedback and to build ongoing relationships for the duration of the project's construction and ongoing operations.

Meetings were set up with identified stakeholders. Presentations covered, as a base, the scope of work, the proposed water treatment process, and environmental considerations – in particular the use of Quick Mud Creek to dispose of the RSS.

A summary of engagement and stakeholders' feedback follows in Table 5.1.

5.2 State Government Agencies and Regulators

Briefings were held with representatives from Office of Environmental Protection Authority, Department of Environment Regulation, Department of Water and Department of Health as key regulators for the submission.

Briefings were also held with Main Roads WA to discuss reticulation of the potable water transfer pipeline adjacent Onslow Road.

5.3 Local Government

Briefings were held with Shire of Ashburton CEO, President and Executive Manager Technical Services.

5.4 Traditional Owners

The Thalanyji people are the traditional owners of the land and are currently in negotiations with the Department of State Development around a Notice of Intention to Take (NOITT) for Lot 556. A separate briefing was held with the Thalanyji Board to discuss only environmental concerns.

5.5 Community

Chevron's Community Reference Group was targeted as the best mechanism to engage with key members of the Onslow community. All specific community members identified that had an interest in the project were represented on the group. These representatives are vocal in the local community and well represented the concerns of the broader community.

A presentation was given at CAPL's December 2013 Community Reference Group meeting.

5.6 Onslow Salt

Onslow Salt was briefed on a number of occasions in relation to the proposal. Briefings were held with the CEO, Senior Managers, Environmental specialists and Operational Managers in Perth and in Onslow.

5.7 Minderoo Station

Water Corporation, the Department of State Development and CAPL also met with representatives from Minderoo Station. Minderoo Station holds the pastoral lease in which Quick Mud Creek lies.

Table 5.1: Stakeholder Consultation Matrix

Date	Stakeholder	Questions / Comments / Issues Raised	Outcome	Document Reference
22 October 2013	Shire of Ashburton	Comfortable with the proposal and the planned approach to engagement.	N/A	N/A
		Not aware of any community or environmental sensitivities associated with the planned project or areas of community significance that would be impacted by the project.	N/A	N/A
20 November 2013	Onslow Salt Pty Ltd	What is the chemical composition of the RSS?	A list of chemical constituents present in the worst case RSS discharge have been provided to Onslow Salt and are detailed in this document.	Table 4.2
		Did the modelling of the RSS consider the new crystallisers?	Modelling did consider the construction of the new crystallisers.	Appendix K
		Will the RSS infiltrate into aquifer?	Modelling demonstrates that RSS will have limited interaction with the water table and minerals would not propagate into the local water table.	Section 4.2 Appendix K
		Will Quick Mud Creek flow all the time, or just during flood events?	Outside of flooding events, modelling has indicated that the RSS footprint in Quick Mud Creek is expected to extend a maximum of 4.6 km from the release point in low evaporation conditions and at the maximum discharge rate of 857 kL/day.	Section 4.3.2.1
		Will chemicals be added to the RSS?	No chemicals will be added to the RSS. Chemistry of RSS as per Table 4.2.	Table 4.2

Date	Stakeholder	Questions / Comments / Issues Raised	Outcome	Document Reference
		Onslow Salt has environmental monitoring stations including at the junction of Hooley's and Middle Creek. How will the RSS discharge impact on these monitoring points?	The modelling has shown that there is unlikely to be any detectable impact to water quality in Middle Creek where we understand OSPL's current monitoring program is based. We have committed to continue discussions with Onslow Salt on the location and nature of monitoring.	Section 4.3.3
		Onslow Salt's liability obligations with disposal on their land/lease.	Land issues are complex with several State Agreements and pastoral leases in plant. Discussions are ongoing with stakeholders to determine responsibilities.	
25 November 2013	Minderoo	What is the chemical composition of the RSS?	A list of chemical constituents present in the worst case RSS discharge have been provided to Minderoo and are detailed in this document.	Table 4.2
		Will the desalination plant be able to be expanded?	The location of the plant ha been decided to enable future expansion of the plant.	
27 November 2013	Shire of Ashburton	No concerns raised.	N/A	N/A
27 November 2013	Main Roads WA	Will there be any corrosion of the new road bridge over Quick Mud Creek as a result of the RSS disposal?	RSS will be discharged downstream of the QMC bridge. Thus impacts to QMC bridge are unlikely.	N/A
4 December 2013	Onslow Salt Pty Ltd	What are the heavy metals discharged into the environment as part of the RSS?	A list of chemical constituents present in the worst case RSS discharge have been provided to Onslow Salt and are detailed in this document.	Table 4.2
		Is the modelling report available?	Modelling of RSS discharge will be made available to the public during the EPA referral process.	Appendix K

Date	Stakeholder	Questions / Comments / Issues Raised	Outcome	Document Reference
		Contamination of Onslow Salt lands / waters during extreme flood scenario	Modelling has indicated that minerals and metals occurring (naturally and through RSS discharge) in QMC are highly diluted during extreme flood events. In this scenario, no contamination of Onslow Salt lands / waters have been modelled to occur.	Section 4.3.2.1 Appendix K Appendix L
4 December 2013	CAPL's Onslow Community Reference Group	No environmental concerns raised.	N/A	
		Will the plant have an impact on cost of water?	Under the current pricing structure, the cost of water will not change as a result of the project.	N/A
		Suggested that a story in the local Onslow Times would be appropriate to inform wider community.	This was published in 20 December 2013 edition of the Onslow Times.	N/A
		How wider community would be engaged during life of project?	Agreed to ongoing information during the life of the project.	N/A
		Requested advertisements in their local paper, the Onslow Times, and their local Facebook page when the documentation was submitted to the EPA.	Committed to notify when documentation is submitted to EPA	N/A
6 December 2013	Onslow Salt Pty Ltd	What is the chemical composition of the RSS?	A list of chemical constituents present in the worst case RSS discharge have been provided to Onslow Salt and are detailed in this document.	Table 4.2
		Does Onslow Salt have the right to approve or not approve this project on the basis of the State Agreement?	Onslow Salt is able to provide comment under the State Agreement and through this referral process.	N/A
		What sort of monitoring will be done? Concerns around who would be attributable if cumulative impact of RSS and Onslow Salt's discharge breaches conditions.	The modelling has shown that there is unlikely to be any detectable impact to water quality in Middle Creek where we understand OSPL's current monitoring program is based. We have committed to continue discussions with Onslow Salt on the location and nature of monitoring.	N/A

Date	Stakeholder	Questions / Comments / Issues Raised	Outcome	Document Reference
		Will we develop an MoU? We need to determine a system, procedure, or set of protocols in case something goes wrong.	Water Corporation is committed to working with Onslow Salt to determine the approach as project progresses.	N/A
		Is Onslow Salt required to relinquish part of their mining tenement for OWIUP infrastructure corridor?	DSD advised Onslow Salt that there is no requirement to relinquish part of the Mining tenement for the project.	N/A
11 December 2013	Department of Health	No concerns raised.	N/A	N/A
16 December 2013	Office of Environmental Protection Authority	How will the first (and subsequent) flushes of the Residue Saline Stream affect marine water quality, plus any consequences of this?	Modelling of RSS disposal into QMC concluded that the risk to the environment or stakeholders (receptors) is low.	Section 4.3.2.1 Appendix K Appendix L
		Need to consider longer recurrence intervals of flushing events based on the unpredictability of cyclone rainfall events in the region.	Quick Mud Creek is predicted to discharge to marine water once every one to two years. Modelling has been conducted based on two years of no discharge to marine waters.	Section 4.3 Appendix K Appendix L
		The impact on water quality (surface and groundwater) of the receiving creek, noting that while the receiving water quality is similar to that of the RSS, the RSS discharge will accumulate and concentrate between flushing events.	Modelling of impacts conducted and provided in this environmental referral package.	Section 4.3 Appendix K Appendix L
		Particular attention should be paid to radionuclides, due to public interest.	Significant modelling and research has been undertaken on radionuclides and is included in this environmental referral.	Appendix K

Date	Stakeholder	Questions / Comments / Issues Raised	Outcome	Document Reference
		Confirmation that proposed abstraction will not have any significant impacts on any groundwater dependent ecosystems and that it is within sustainable limits.	Modelling indicates no impact on groundwater dependent ecosystems and abstraction is within sustainable limits.	Section 4.2
		The extent to which discharge of RSS will change the hydrology of the receiving creek (area of permanent inundation, change to patterns of inundation, etc.).	No hydrological impact is expected in QMC due to comparatively low volume of RSS disposal.	Section 4.3 Appendix K Appendix L
		Drawing together some of these factors, there should be some analysis of the quantity of solutes and solids that will be discharged into the creek/marine environment (over a flushing cycle) and the capacity of these environments cope with these loads.	Modelling of RSS disposal into QMC concluded that the risk to the environment or stakeholders (receptors) is low.	Section 4.3 Appendix K Appendix L
18 December 2013	Department of Environment Regulation	What is the chemical composition of RSS	A list of chemical constituents present in the worst case RSS discharge has been provided in this environmental referral package.	Section 4.3.2.1
		Why wasn't discharging into Onslow Salt's crystallisers feasible?	Volume of RSS was too small to be viable for Onslow Salt.	N/A
		Acknowledged that it would be further assessed by DER under S.83.	N/A	N/A
19 December 2013	Minderoo	Minderoo have a concern about the source and the chemical concentrations and impact on the environment.	Modelling of RSS disposal into QMC concluded that the risk to the environment or stakeholders (receptors) is low.	Section 4.3 Appendix K Appendix L

Date	Stakeholder	Questions / Comments / Issues Raised	Outcome	Document Reference
		The imbalance of metals and minerals in the natural environment that the RSS disposal will create	A list of chemical constituents present in the worst case RSS discharge has been provided to Minderoo and is in this environmental referral package. Modelling of RSS disposal has been conducted and is provided in this environmental referral package.	Section 4.3 Appendix K Appendix L
		Bio-accumulation of minerals and heavy metals in the environment	Periodic stream flow in QMC will transport accumulated RSS constituents out to sea for rapid dilution. Ecological vectors for bioaccumulation are almost all contained within HCE, rather than QMC or the supra-tidal flats. The large majority of aquatic fauna in HCE are transient and are therefore unlikely to be consistently exposed to RSS constituents during the month long residence times which, in a worst-case scenario, may occur within the HCE. The high turbidity of this environment prohibits colonisation by sedentary fauna such as molluscs and bivalves, limiting the chance of bioaccumulation in the food chain	Section 4.3 Appendix K Appendix L
		Bio-accumulation of minerals and heavy metals in environmental receptors in the disposal path, including the ocean (Eg. Mangroves, fish, turtles, seaweed and other marine life)	Risk assessments have demonstrated that the residence time of constituents in the RSS source terms entering Hooley creek are less than one month of one year. This will limit the amount of time for bio-accumulation to occur. Most of the environmental receptors in Hooley Creek are mobile species, with the high turbidity levels restricting the abundance of sedentary fauna such as bivalves.	Section 4.3 Appendix K Appendix L

Date	Stakeholder	Questions / Comments / Issues Raised	Outcome	Document Reference
		What other water sources were assessed?	During the early phase of the project a number of other sources were investigated for viability. The Birdrong aquifer was deemed to be preferred water source for this project.	Section 3.1
		Why is the disposal to Quick Mud Creek the best environmental solution?	A number of other sources were investigated for viability. Disposal into QMC was deemed to be the preferred disposal method for this project.	Section 3.4
		What is the expected timeframe for submission to the EPA and opportunity to comment?	Committed to notify when documentation is submitted to EPA	N/A
8 January 2014	Department of Water	Was the Ashburton River considered as a source?	Ashburton River was considered and assessed as a water source during the early phase of the project. Birdrong aquifer was deemed to be preferred water source for this project.	Section 3.1.4
		What is the current extraction rate from the Macedon bore?	Water Corporation understands that BHPB currently hold a 5C Licence for extraction from MDW4 for up to 0.9GL/year (~2.5ML/day). Water Corporation is unaware of what percentage of this allocation is currently being used per day.	Section 3.2
		Has modelling been done on expanded draw from Birdrong in case desalination plant needs to be expanded in future?	Whilst the scope of the project is limited to providing 2ML/day of potable water to Onslow, modelling has been undertaken and concluded the Birdrong Aquifer is able to supply an expanded scope.	Appendix D
7 February 2014	Office of Environmental	What is the chemical composition of RSS	A list of chemical constituents present in the worst case RSS discharge is available in this document.	Table 4.2

Date	Stakeholder	Questions / Comments / Issues Raised	Outcome	Document Reference
	Protection Authority	Creation of wetland through standing water in Quick Mud Creek.	Modelling has demonstrated that some attenuation of disposed RSS will occur in pools on QMC. The initial TDS of these pools will be a minimum of 46 418 g/L (see also Table 4.2) without the dilution of floodwaters. The salinity of such a pool is greater than that of seawater and is likely to further concentrate through evaporation to levels that will not support aquatic or riparian ecosystems. Freshwater pools in QMC resulting from rainfall or stream flow have not persisted for long due to evaporation and interaction with hyper-saline groundwater. Disposed RSS will interact with any short-lived fresh water pools and ensure that these pools will not support dependent ecosystems	N/A
		Impact on sawfish in Hooley's Creek	Monitoring conducted on sawfish for the Wheatstone project has demonstrated that the different species are highly transient and occupy a wide variety of habitats from tidal creeks (with elevated salinity) to freshwater streams and rivers, including the Ashburton. Final disposition of RSS into Hooley's Creek is unlikely to significantly change the baseline receiving environment of the creek. Impacts to sawfish from discharges (including RO brine) were assessed in the Wheatstone EIS/ERMP. The risk was rated as Very Low (Chevron 2010).	Appendix K Appendix L
		Requested referral documentation includes objectives and approach to monitoring RSS discharge during operations.	Information included in this document.	Section 4.3.3

Date	Stakeholder	Questions / Comments / Issues Raised	Outcome	Document Reference
11 February 2014	Thalanyji Aboriginal Corporation	Will disposal of 1.5 million litres a day of RSS leave salt and heavy metals and does it pose any environmental risks.	Modelling of RSS disposal into QMC concluded that the risk to the environment or stakeholders (receptors) is low.	Section 4.3 Appendix K Appendix L
		Requested independent review is conducted on behalf of BTAC in order to assess the impact of RSS discharge.	BTAC will be presented with an opportunity to conduct a review of the impact of the RSS discharge and provide a submission as part of the Part IV Referral process.	N/A
		Requested that they be informed when the EPA referral is made public for comment	Committed to notify when documentation is submitted to EPA.	N/A

6.0 EPA SIGNIFICANCE TEST

6.1 Aim and Objective of the Significance Test

The objective of the *EP Act 1986*, is to ensure the protection of the environment, having regard to the precautionary principle, intergenerational equity, conservation of biological diversity, ecological integrity, improved valuation, pricing and incentive mechanisms and waste minimisation (GGWA 2012).

In 2012, The EPA developed new administrative procedures to enhance the principles and practices of EIA, as defined in the Act. One of the key procedures was the implementation of the Significance Test to assist in determining whether the proposal would meet the EPA's objectives for environmental factors and consequently whether or not a referred proposal should be assessed. The OWIUP has been assessed against the Significance Test below.

6.2 Values, Sensitivity and Quality of the Environment Which is Likely to be Impacted

The baseline environment of the OWIUP is broadly represented in the surrounding locality and implementation of this proposal will not adversely affect flora and fauna at a species level (Biota 2013). The project area does intersect with two vegetation units of high conservation significance (refer to Table 3.4), however these units are not critical to the existence of Rare or Priority Flora and exist in much higher proportion outside of the project area.

The project area does contain habitat known to support fauna of conservation significance, however, the broad fauna habitats identified in the project area are extensively represented in the western Pilbara (Biota 2013). QMC will be impacted as a result of implementing this proposal, however it is not a sensitive habitat, in that it contains no ecological receptors and is only sporadically utilised by migratory fauna.

Infrequent weather events may remobilise accumulated RSS salts including NORMs and distribute these into the Hooley Creek Estuary and tidal embayment. This may result in brief periods of concentrations elevated above baseline, but the risk assessment (refer Appendix K) demonstrates it is unlikely to negatively impact the local ecosystem, nor impact local populations of any particular species.

6.3 Extent (Intensity, Duration, Magnitude and Geographic Footprint) of the Likely Impacts

The extent of impacts will be limited to the project area, QMC, the Hooley Creek Estuary and a portion of the wider Tidal Embayment. Areas cleared for infrastructure will be permanently impacted, however areas temporarily cleared will be rehabilitated according to relevant regulatory permit conditions.

Modelling has been completed on worst case RSS volumes and chemistry. Modelling has shown that the Birdrong Aquifer remained fully saturated and was not dewatered. Modelling completed to date has shown that RSS disposal to QMC presents no material impacts to the environment. The consistent flushing of QMC and the supratidal flats into HCE, and mixing and dilution in seawater within the HCE system, indicates that RSS disposal will not present a measurable environmental impact outside of the project area. The overall risk of

detrimental environmental impacts to receiving environments as a result of implementing this proposal is low.

6.4 Consequence of the Likely Impacts (or Change)

Other than areas permanently cleared for infrastructure, there will be no irreversible impacts to local environmental values as a result of implementing this proposal. PASS may be exposed and oxidise during the construction phase however soil sampling and mapping during geotechnical investigations will reduce the risk of exposure. Treatment and management measures will be enacted if PASS is exposed reducing the environmental impact to low.

Modelling completed to date have shown disposal of RSS to QMC results in no material impacts to the environment. The consistent flushing of QMC and the supratidal flats into HCE, and mixing and dilution in seawater with the HCE system indicates that RSS disposal will not present a measurable environmental impact outside of the project area. Measureable impacts to the Birdrong Aquifer are not expected and it is anticipated that the aquifer remains saturated.

It is anticipated that the small amount of clearing that is required for the project will not impact the conservation status of any vegetation units or flora. The one Priority Flora species which is known to occur within the project area is known from populations outside of this area. Only a small number of Priority or conservation significant fauna species may potentially occur in the project area. The small amount of clearing and minor disturbance to potential available habitat in the region is not anticipated to impact the conservation status of any species (Biota 2013).

Dust may be generated from the construction of the project. With the implementation of best practise mitigation measures, such as water application, compaction and the use of soil binding agents, impacts are anticipated to be minor.

Due to the remote location of Lot 556 with no receptors, noise and vibration generated during clearing and construction is not anticipated to have a significant impact. The remote nature of the site also means that visual amenity is not a concern. No impacts from light associated with the OWIUP are anticipated.

The potential impacts are not likely to have a measurable impact on the environment.

6.5 Resilience of the Environment to Cope with the Impacts or Change

The Pilbara region is subject to regular extreme weather events including elevated temperatures, drought, heavy precipitation and the impact of floodwaters. On a local scale, QMC is usually in a drought-like state, broken by periods of moderate to heavy flows. The intertidal zone represents one of the most variable environments on earth, alternatively exposed to high temperatures or submerged under tidal or overland flow.

As a result of these naturally variable conditions, the baseline environment has undergone long periods of adaptation to extreme events and has demonstrated a certain resilience to natural processes. QMC does not contain any known ecological receptors and historically accepts very large streamflows, far in excess of the RSS discharge.

6.6 Cumulative Impact with Other Projects

Other Projects or users operating in the proposed area include:

- Chevron Australia Pty Ltd as proponent of the Wheatstone Project. This Project involves the construction and operation of a multi-train liquefied natural gas and domestic gas plant at Ashburton North;
- Onlsow Salt Pty Ltd who produce salt at a site north east of the project area. This operation also includes handling facilities to transport, process, store and load salt into ships for export; and
- BHP Billiton as operator of the Macedon Gas Development. This domestic gas project is located 15km south west of Onslow.

Emissions from the project are not expected to add to a cumulative impact. .

6.7 Level of Confidence in the Prediction of Impacts and the Success of Proposed Mitigation

Modelling conducted has used conservative estimates including an RSS discharge rate of 857kL/day compared with a likely discharge rate of <651 kL/day and conservative hydrology inputs resulting in worst case RSS constituents (incl. NORMs) source terms in HCE. There is a high level understanding of the baseline environment as a result of extensive studies undertaken for the Wheatstone Project including studies on hydrology, soil and landforms, air quality, fauna, flora and vegetation.

The proponent has a large amount of experience in the implementation, management and operation of desalinisation plants.

6.8 Objects of the Act, Policies, Guidelines, Procedures and Standards Against Which a Proposal can be Assessed

All relevant legislation, polices, guidelines, procedures and standards have been considered in the identification and assessment of potential impacts of this proposal. Relevant legislation has also been considered in pre-FEED documentation, and will continue to inform the detailed design prior to construction.

6.9 Presence of Strategic Planning Policy Framework

This item is not applicable to the proposal.

6.10 Presence of Other Statutory Decision-making Processes Which Regulate the Mitigation of the Potential Effects on the environment to meet the EPA's objectives and principles for EIA

As per the referral form itself, there are a number of key statutory environmental approvals that will be sought in order to implement this proposal. These include:

- Native Vegetation Clearing Permit (NVCP) under Part V of the *EP Act*
- *RWI Act* Section 5C licence to take Groundwater
- *RWI Act* Section 11 Beds and Banks Permit
- AH Act Section 18 Disturbance to Aboriginal heritage sites
- Works Approval Application under Part V of the *EP Act*

6.11 Public Concern About the Likely Effect of the Proposal, if Implemented, on the Environment

Stakeholder consultation conducted to date has identified minor environmenta; concerns from key stakeholders which are addresses in this referral. It is proposed that this consultation will continue during the approvals process until the start of construction. No issues have been raised to date that would necessitate the abandonment of this proposal.

6.12 Conclusion

Modelling conducted for the project has used conservative estimates including a higher RSS discharge rate and worst case constituents source terms. Potential environmental impacts from the project are not anticipated to present a significant environmental impact. The potential environmental impacts of the project can be adequately managed to meet EPA environmental objectives through the described management measures. In considering the significance test, the regulatory controls that can be applied to the project and the implementation of relevant management plans, the Proponent is of the view that the proposal does not require formal environmental impact assessment under Part IV of the EP Act but will be managed under other legislation including the Part V of the EP Act.

7.0 REFERENCES

AECOM 2012, Wheatstone Social Infrastructure Development – New Onslow Water Plant Alternative Water Supply Options – Identification of Sources and Reliability Assessment. (Unpublished Report) October 2012. Appendix B

Biota Environmental Sciences, 2011, Wheatstone Rare Flora Survey. (Unpublished Report) March 2011

Biota Environmental Sciences, 2013, Desktop Review of the Proposed Onslow Micro-Siting Survey Area. (Unpublished Report) April 2013

Chevron Australia Pty Ltd, 2010, Draft Environmental Impact Statement/Environmental Review and Management Programme for the Proposed Wheatstone Project. (EPA Report) July 2010

URS Australia 2009, Survey for Migratory Waterbirds in the Wheatstone LNG Project Area. (Unpublished Report) November 2009

URS Australia 2012a, Onslow Water Infrastructure Upgrade Project Alternative Assessment of Brine Disposal. (Unpublished Report) October 2012

URS Australia 2012b, Onslow Water Infrastructure Upgrade Project. Definition of Impediments to Residual Saline Stream Disposal (Unpublished Report) December 2012. Appendix H

URS Australia 2013a, Wheatstone Groundwater and Surface Water Monitoring 2011 – 2012 Interpretive Report. (Unpublished Report) December 2013

URS Australia 2013b, NORM Risk Assessment in Quick Mud Creek. (Unpublished Report) January 2014. Appendix K

URS Australia 2014, Desktop Risk Assessment on RSS Constituents (excluding NORMs) of the Residual Saline Stream. (Unpublished Report) February 2014. Appendix L