DRAFT REPORT

Water Corporation

East Rockingham Waste Water Treatment Plant – *Preliminary Project Environmental Management Plan*

March 2009

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Reference: 0083144

For and on behalf of Environmental Resources Management Australia Pty Ltd	
Approved by: Signed:	Toby Whincup
Position: Date:	Partner 26th March 2009

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1 INTRODUCTION

1.1 BACKGROUND

The Water Corporation plans to construct a new municipal wastewater treatment plant (WWTP) in East Rockingham, Western Australia (WA). Located approximately 35 km south of Perth in the City of Rockingham, the East Rockingham Wastewater Treatment Plant (ERWWTP) will occupy a total footprint of 30.7 Hectares (ha)[1]. The treated wastewater (TWW) will be discharged to the ocean via the outlet pipeline to the Sepia Depression Ocean Outlet (SDOO), 4.2km offshore. The proposed ERWWTP layout and pipeline route are illustrated in *Figure 1*, *Appendix A*.

In December 2008, Environmental Resources Management Australia Pty Ltd (ERM) prepared an *Initial Environmental Review* for the Water Corporation providing preliminary advice on the environmental and hydrogeological context of the site and an overview of potential environmental requirements for the construction of the ERWWTP.

The following potential environmental risks identified include:

1) soil compaction, erosion and sediment release to land, surface water and groundwater;
2) modification to surface water flows (drainage);
3) modification to groundwater from dewatering impacts (flow and quality);
4) impacts to Threatened Ecological Communities (TECs) from dewatering;
5) modification to aquifer recharge upon completion of dewatering;
6) impacts to significant flora and fauna habitat during construction and dewatering;
7) incursion of disease, weeds, vermin or destructive influences to the site;
8) disturbance of cultural and/or historic heritage sites;
9) dust;
10) odour;
11) noise; and,
12) disturbance to landowners and third parties (ie hours of operation, site access).

[1] Footprint includes outlet (discharge) pipeline to the SDOO

Further to this preliminary environmental work, ERM was commissioned by the Water Corporation to prepare this preliminary Project Environmental Management Plan (PEMP). This document will provide the framework for the Contractor's specific Construction Environmental Management Plan (CEMP) for works associated with development of the ERWWTP Project.

1.2 OBJECTIVES & GOALS

The objectives of this preliminary PEMP are to:

1) provide a framework to the WWTP and pipeline construction Contractor(s) for development of their own company specific CEMP;

2) ensure that all project aspects are conducted in a manner that minimises impacts to the physical, biological, cultural and social environment;

3) provide a mechanism to evaluate potential environmental impacts at the planning stage, to ensure such impacts are minimised or avoided during the construction phase; and,

4) ensure that all Water Corporation employees and Contractors are aware of their environmental responsibilities, have the training to fulfil such responsibilities, and are proactive in their approach to environmental management.

The Contractor must submit their CEMP to the Water Corporation prior to commencement of the work and in sufficient time to allow the Water Corporation to evaluate the suitability of the proposed strategy. The Water Corporation will then review the CEMP and address any concerns with the Contractor.

The CEMP is to be flexible and responsive to situations encountered as work proceeds. The Contractor will have the ability to adjust the CEMP based on site conditions. Any reasons or circumstances necessitating changes made to the CEMP must be documented in writing.

It is critical that all parties are in agreement on the procedures and devices to be used for the protection of the environment prior to commencement of the work.

The goal of the CEMP is to prevent, or minimise, environmental impacts and where possible, to enhance the environmental values of the air, land and water affected by the Project. The development and implementation of the CEMP will:

1) ensure environmental considerations are part of decision making processes;

2) ensure compliance with the requirements of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Environmental Protection Act 1986* (EP Act) referrals and any requirements set as a result of the Environmental Impact Assessment (EIA) process; and,

3) demonstrate to the stakeholders and public that there is an environmental commitment by all parties involved, both in writing and in action.

1.3 LIMITATIONS

This PEMP has been designed to provide *minimum* environmental management requirements to assure regulators that a certain environmental standard will be achieved.

This PEMP has not been prepared to cover broader Occupational Health and Safety (OH&S) issues that should be covered in detail in a specific OH&S plan (as appropriate).

ERM has prepared this PEMP in a manner consistent with the normal level of care and expertise exercised by members of the environmental assessment profession. No warranties, expressed or implied, are made.

ERM is not engaged in environmental assessment and reporting for the purpose of advertising sales promoting, or endorsement of any client interests, including raising investment capital, recommending investment decisions, or other publicity purposes. The client acknowledges that this report is for the exclusive use of the client, its representatives and advisors and any investors, lenders, underwriters and financiers who agree to execute a reliance letter, and the client agrees that ERM's report or correspondences will not be, except as set forth herein, used or reproduced in full or in parts for such promotional purposes, and may not be used or relied upon in any prospectus or offering circular.

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2 IMPLEMENTATION OF THE PEMP

2.1 IMPLEMENTATION

This section outlines a practical system that:

1) assigns environmental responsibilities to key project personnel;

2) develops general and job-specific environmental training and induction programs;

3) provides a clear communication structure and procedures for the transfer of project related information to both internal personnel and external stakeholders; and,

4) details environmental management procedures.

2.2 BASIS FOR MANAGEMENT

This PEMP is based on guidance taken from and with reference to the applicable Acts, Regulations, Codes of Practice, Standards and Guidelines summarised below (*noting that this list represents key references only*):

1) The Australian Pipeline Industry Association Inc. – Code of Environmental Practice;

2) City of Rockingham;

3) Commonwealth Department of Environment, Water, Heritage and the Arts (DEWHA);

4) WA Department of Environment and Conservation (DEC);

5) WA Department of Health (DoH);

6) WA Department of Indigenous Affairs (DIA);

7) WA Department of Planning and Infrastructure (DPI);

8) WA Environmental Protection Authority Service Unit; and,

9) WA Department of Water (DoW).

This PEMP has been tailored to reflect the level of risk associated with the works proposed for known site conditions and the nature of proposed works.

2.3 *ORGANISATION AND RESPONSIBILITIES*

The Water Corporation is responsible for environmental management of the ERWWTP and associated pipeline construction. However, all personnel and Contractors are accountable for the protocols outlined in this document through conditions of employment or contracts. Each individual is responsible for ensuring that their work complies with the stated procedures. Specific environmental responsibilities shall be assigned to particular positions.

2.4 *ROLES & RESPONSIBILITIES*

There are two basic roles that will be referred to throughout this PEMP document, Superintendent and Site Supervisor. It is the holders of these positions that will be responsible for completion of the project; the roles of which are defined as follows:

- Superintendent – Water Corporation representative on site and the Contractor's main point of contact with the Water Corporation; and,
- Site Supervisor – employed by the Contractor and directly responsible for performance of work under contract, including adherence to this PEMP and approved subsidiary CEMP.

2.5 *ENVIRONMENTAL RESPONSIBILITIES*

The contractor's CEMP shall include a list of proposed lead personnel with appropriate documentary accreditation, and detail their respective roles and responsibilities in regards to implementation of the CEMP. A person may function on different roles if acceptable to the Superintendent.

2.6 *TRAINING AND INDUCTION*

Construction personnel, regardless of company position or work duties, shall attend Health, Safety and Environment (HS&E) induction and training programs prior to commencing work. Qualified staff will conduct inductions to ensure that all personnel are aware of environmental responsibilities and have obtained a basis to fulfil such responsibilities.

2.6.1 General Induction

HS&E inductions shall be conducted prior to construction, and will cover environmental management issues, including:

1) personnel roles and responsibilities;

2) identification and management of sensitive areas (eg areas of TEC);

3) erosion and sediment control;

4) Aboriginal and European heritage management;

5) flora and fauna protection;

6) weed and disease control;

7) traffic and access;

8) bushfire prevention and response;

9) water quality protection;

10) groundwater management;

11) waste management;

12) odour Management;

13) protecting the amenity of landholders and local residents;

14) storage and handling of fuels, oils and chemicals;

15) spill prevention and response; and,

16) incident /non conformance reporting procedures.

The Superintendent shall approve the induction program prior to implementation.

2.6.2 Job Hazard Analysis

In addition to basic environmental inductions, all personnel will attend 'job specific environmental instruction', in the form of a Job Hazard Analysis (JHA). *Table 2.1* outlines job specific environmental instructions tailored to specific tasks and work crews, and will normally be conducted in the field as part of the JHA. Job specific environmental instruction talks will be supported by the distribution of handbooks, procedures and presentation notes.

Table 2.1 Job Specific Induction Content

Aspect	Induction Subject
Clear and Grade	• Topsoil management and general soil erosion protocol; • Dust management; • Noise management; • Visual amenity; • Sedimentation (erosion and drainage control) - land and water; • Native flora and fauna management; • Native fauna habitat management; • TEC management; • Public amenity, infrastructure and land use management; • Water quality control (surface water and groundwater); • Surface water management; • Groundwater management; • Right-of-Way restrictions; • Aboriginal & European heritage management; • Weed wash down protocol; • Bushfire prevention/fire awareness; • Spill response, refuelling and waste disposal; and, • Site specific area management
WWTP Construction	• Topsoil and spoil management; • General soil erosion protocol; • Dust management; • Noise management; • Visual amenity; • Sedimentation (erosion and drainage control) - land and water; • Native flora and fauna management; • Native fauna habitat management; • TEC management; • Public amenity and third party infrastructure management; • Water quality control (surface water and groundwater); • Right-of-Way restrictions; • Aboriginal & European heritage management; • Spill response, refuelling and waste disposal; • Site specific area management; • Groundwater management; • Surface water management; • Dewatering management; and, • Discharge water monitoring and management
WWTP Equipment Delivery	• Vehicle access; • Right-of-Way restrictions; • Site specific area management; • Aboriginal & European heritage management; • Weed wash down protocol; • Third party infrastructure management; and, • Native flora, fauna and TEC management associated with potential laydown areas; and, • Spill response and waste disposal
Pipeline Trenching	• Topsoil and spoil management; • General soil erosion protocol; • Dust management; • Noise management; • Visual amenity; • Sedimentation (Erosion and drainage control) - land and water;

Aspect	Induction Subject
	• Native flora, fauna and TEC management; • Public amenity and third party infrastructure management; • Water quality control (surface and groundwater); • Right-of-Way restrictions; • Aboriginal & European heritage management; • Spill response, refuelling and waste disposal; • Site specific area management; • Trench plug placement; • Groundwater management; • Trench dewatering monitoring and management; and, • Trench specifications
Pipeline and Associated Materials Delivery	• Vehicle access; • Right-of-Way restrictions; • Site specific area management; • Weed wash down protocol; • Aboriginal & European heritage management; • Third party infrastructure management; • Native flora, fauna and TEC management associated with potential laydown areas; and, • Spill response and waste disposal
Welding	• String length; • Fauna management; • Bushfire prevention/fire awareness; • Site specific area management; • Waste management; and, • Noise management.
Lower and Lay	• Noise management; • Fauna Management; • Right-of-Way restrictions; • Surface water management; • Groundwater management; • Third party infrastructure management; and, • Padding management.
Backfill	• Topsoil and spoil management; • General soil erosion protocol; • Dust management; • Noise management; • Surface water management; • Groundwater management; • Sedimentation (Erosion and drainage control) - land and water; • Flora, fauna and TEC management; • Weed wash down protocol; • Water quality control (surface and groundwater); • Right-of-Way restrictions; • Site specific area management; and, • Spill response, refuelling and waste disposal.

2.7 *PROJECT COMMUNICATION*

Effective project communication is essential for the transfer of information between the Water Corporation, construction personnel, specialist staff, incidental contractors, landholders and key stakeholders and agencies. Project communication can be categorised into internal and external communication protocols.

2.7.1 *Internal Communication*

The Contractor's CEMP shall outline the internal communication protocol in regards to implementation of the CEMP, and include a construction contact directory with contact details of key project personnel. Correspondence and project documents shall be in accordance with Water Corporation's document control procedures (refer to *Section 4.6*).

2.7.2 *External Communication*

Communication with external stakeholders will be in accordance with the Construction Work Specifications.

2.7.3 *Projects Complaint Register*

A project complaints procedure and register will be developed to record, action and monitor complaints received by external stakeholders in accordance with the Construction Work Specifications.

2.8 *ENVIRONMENTAL CONTROL RECORDS*

Appropriate records relating to the implementation of the CEMP shall be maintained. These will need to include, but may not be limited to:

Data to be recorded

1) daily environmental stockpile reports (including details relating to origin, fate and treatment of excavated material);
2) environmental incidents;
3) complaints;
4) surface water management;
5) dewatering management;
6) discharged water management;
7) groundwater monitoring during dewatering and recharge; and,
8) weather conditions;

Mechanisms for recording information

1) environmental monitoring forms including:
    - surface water monitoring;
    - discharge water monitoring;
    - groundwater gauging; and,
    - groundwater sampling.
2) environmental incident report forms;
3) corrective action forms; and,
4) complaints register.

2.9 *CONTINGENCY MANAGEMENT*

This preliminary PEMP is based on current knowledge of conditions at the site. In the instance that construction activities result in disturbance to soils, flora and fauna, water resources (ie surface water and groundwater), cultural heritage and/or neighbouring landowners, (outside the approved area of disturbance or environmental approved parameters), construction activities should cease and the Superintendent advised so that a specific contingency management plan may be prepared.

The Superintendent will be advised of any changes in site activity or site conditions, and modification of the CEMP may be necessary.

3 ENVIRONMENTAL SETTING

3.1 ENVIRONMENTAL MANAGEMENT STRATEGIES

In order to provide clear mitigation measures and management guidelines for the construction of the ERWWTP project, each environmental issue outlined in the following sections presents sequential construction aspect management guidelines.

Appendix B presents the environmental management strategies provided in this section, in the form of a 'construction process register', for crew use during construction. It must be noted that *Appendix B* does not replace the requirements to comply with the management strategies outlined in following sections, and is to be used as a tool only.

3.2 SOILS

3.2.1 Erosion

Construction activities increase the risk of erosion through clearing protective features such as surface crusts, stone layers and vegetation. Soil management objectives aim to reduce the occurrence and extent of soil erosion and to prevent adverse impacts on water quality by reducing potential sediment runoff.

In addition, the general quality of soil may be adversely affected during or following construction. Chemical and physical properties of soil within the project footprint will be monitored in the implementation of this PEMP. The environmental management strategies described in *Table 3.1* aim to reduce the occurrence and extent of soil erosion and degradation.

3.2.2 Acid Sulfate Soils (ASS)

According to field testing undertaken in June 2008 and the ASS risk map published by the Western Australian Planning Commission (WAPC) Planning Bulletin 64 (updated 2007), the WWTP site and pipeline corridor are located within an area of 'no known risk' of ASS occurring within 3 m of the surface. Therefore, no treatment of Potential Acid Sulfate Soils (PASS) is likely to be required at the Site.

Soil sample monitoring will be undertaken for the duration of ground disturbance works and dewatering. Should field indicators of PASS be encountered, construction activities should cease and the Superintendent advised so that a specific contingency management plan may be prepared, such as an Acid Sulfate Soils Management Plan (ASSMP).

Table 3.1 ***Environmental Management Strategies to Reduce Soil Erosion and Degradation***

Aspect	Management Strategies
Planning	• Required work areas and access tracks shall be identified prior to commencement of clear and grade. • Clearing boundaries shall be specified on all drawings and in the field to define the extent of authorised clearing. • TEC's and significant habitat trees such as Tuarts will be mapped in detail to ensure that clearing of this vegetation is avoided where possible. • The construction of the outlet pipeline shall be no more than 20 m wide, including areas of environmental sensitivity, unless specifically authorised by the Superintendent and within the approved clearing permit. • Design of erosion and sediment control measures shall consider site conditions such as soil type, slope, vegetation cover and proximity to sensitive environments such as TEC's and wetlands. • Construction shall be planned to restrict the time period between clear and grade and construction or restoration (in the case of trenching) to reduce the potential for erosion of exposed soils. • Construction activities shall be scheduled for low rainfall periods, where practical. • Soil contaminant preventative measures shall be in accordance with WA State requirements. • Refer to *Section 3.3* for the protection of water resources.
Clear and Grade (WWTP footprint and pipeline outlet)	• Ground disturbance and vegetation clearing shall be restricted to the construction footprint which includes the WWTP site and the pipeline outlet, designated work areas and access tracks. • Topsoil shall be stripped to the next soil horizon (ie sub-soil) or to a depth specified as per detailed WWTP design. • Stripped topsoil shall be stockpiled on the non-working side of the footprint unless specified by the Superintendent. • Remaining soil shall be appropriately disposed of. • Following initial clearing, cut-off drains shall be installed immediately to reduce erosion. • Erosion cut-off drains shall be constructed by an angled grader blade and spaced at intervals as directed by the Superintendent. • Cut-off drain discharge shall be directed off the construction footprint onto stable soils. Erosion control devises such as sediment fences shall be installed as necessary at the base of each drain to prevent scouring and further sedimentation. • Excessive loss of from wind shall be prevented by the application of water to the construction footprint and topsoil stockpiles and / or the application of hydro-seed to stockpiles for stabilisation.
Dewatering (discharged water)	• A dewatering and recharge strategy shall be developed that is in line with the Department of Water's guidance for construction sites • During dewatering activities, discharged water shall be directed off the construction footprint onto stable soils. • Appropriate management measures as outlined with the Water Management Plan shall be adopted to minimise surface run-off, isolate surface run-off from construction areas and monitor and disposal of surface water.
WWTP Construction	• Construction shall be planned to minimise the time period between clear and grade and construction to reduce the potential for erosion of exposed soils. • Construction activities shall be scheduled for low rainfall periods, where practical.

Aspect	Management Strategies
Trenching (pipeline outlet)	• Appropriate management measures shall be adopted when trenching in potential problem areas such as below the water table or within TEC. • Trench spoil shall be stockpiled separately from topsoil. • Trench breakers shall be installed on long slopes and in dispersive soils.
Backfill	• The period of time between trenching and backfilling shall be minimised to prevent erosion of exposed soils as well as trench collapse and to minimise risk and inconvenience to fauna and third parties associated with the open trench. • Erosion along the backfilled trench shall be prevented by appropriate means such as trench blocks and compaction of backfilled soils. • Erosion controls, such as cut off drains, shall be adequately maintained during backfilling operations. • Where practicable, backfill material shall be replaced in order of excavation. Where acidic subsoils are encountered, they shall not be backfilled in such a manner that they come into contact with the pipeline. • Where practical padding material shall be reclaimed from trench spoil. • Topsoil shall not be used as backfill or padding. • Subsoil displaced by the pipe, and not utilised as backfill, may be stockpiled in locations approved by regulatory authorities for use during maintenance activities. • Erosion and sediment control structures shall be routinely inspected and maintained to ensure they remain effective in drainage lines. • Where erosion does occur, the area shall be stabilised as soon as practicable.
Rehabilitation	• After backfilling, topsoil shall be returned to areas from which it was removed, and contoured to be consistent with surrounding land. • Cut-off drains, contour banks, geotextile application, sediment fencing, mulch or vegetation shall be installed in erosion prone areas to reduce erosion and sedimentation of easement, drainage lines and other exposed areas. • Where sedimentation of a drainage line occurs, the Water Corporation shall remove sediment soils and place in a stable/original position. Drainage lines shall not remain contaminated by sedimentation. • Cut-off drain discharge shall be directed off the construction footprint (away from backfilled trench) onto stable soils. Erosion control devises such as sediment fences shall be installed as necessary at the base of each drain to prevent scouring and further sedimentation.

3.3 WATER RESOURCES

This section details general guidelines for the protection of water resources located within or in close proximity to the WWTP site and pipeline route. These water resources include:

1) Wetlands (sumplands);

2) Groundwater;

3) Dishcarge water.

The objective of water resource management is to:

1) minimise impacts to sumplands and riparian flora and fauna, including associated TEC Floristic Community Type (FCT) 19 (Sedgelands in Holocene Dune Swales);

2) minimise sedimentation or hazardous materials contamination of surface water, groundwater and discharge water; and,

3) minimise modification of natural flow patterns of surface water and groundwater and water table levels.

Further details with regards to managing the water resources on site will be provided in the WMP.

3.3.1 Sumplands

The Wetland of the Swan Coastal Plain (Hill et al. 1996) and the current DEC Geomorphic Wetlands Swan Coastal Plain dataset (2009) both identify seven wetlands officially mapped within an area of the site (see *Figure 2, Appendix A*). All seven wetlands are located southeast of the site, with the closest being approximately 200 m to the south. All seven wetlands are mapped as sumplands (*A basin type of wetland that has water above-ground for some part of the year*) with a management category of '*Conservation (*Hill et a. 1996)'. '*Conservation*' category wetlands support a high level of ecological attributes and functions and are a priority for protection and conservation (WRC, 2001). These wetlands are not located within the site, nor are they protected by the *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992*.

Other potential wetlands have been identified as existing within the vicinity of the site but have not been officially assigned a management category, or are identified in the DEC Wetland database. *Table 3.2* outlines the environmental management strategies that will help avoid, reduce and mitigate any potential impacts to wetlands.

3.3.2 Water Resources

The quality of discharge water, surface water and groundwater, may be adversely affected during construction or following construction of the WWTP and pipeline outlet. Chemical and physical properties of water resources within the WWTP footprint and along the pipeline outlet route will be monitored in the implementation of this PEMP and the WMP. *Table 3.2* outlines the environmental management strategies that will reduce potential impacts to water resources.

Table 3.2 ***Environmental Management Strategies for Reducing Impacts to Water Resources***

Aspect	Management Strategies
Planning	• Strategies to prevent soil erosion and sedimentation shall be in place prior to the commencement of construction (refer to *Section 3.2*). • Prior to the commencement of construction, detailed procedures for chemical storage and handling, waste management and spill response shall be in place (refer to *Sections 4.2, 4.3 and 4.4*). • Construction activities shall be scheduled for low rainfall periods, where practical. • Construction shall be planned to restrict the time period between clear and grade and construction or restoration (in the case of trenching) to reduce sedimentation of water resources on site. • Water supplies for dust suppression purposes shall be identified and appropriate approvals obtained prior to construction commencing if water is to be withdrawn from surface water bodies. • The workforce induction program shall inform site personnel of the required procedures for the protection of water quality as outlined with the WMP. • Construction shall be undertaken in accordance with the WMP.
Clear and Grade	• Laydown areas shall be located at least 50 m from drainage lines. • Soil stockpiles shall be located so as not to impede surface drainage, where possible.
Dewatering	• Site management practices shall be undertaken on site that will maintain water quality during dewatering. • A spill response strategy shall be developed to avoid recharge water quality being potentially compromised. • A water quality and elevation monitoring program in accordance with the construction dewatering guidelines shall be developed to monitor any potential impacts. • Appropriate management measures as outlined within the WMP shall be adopted to minimise impacts to groundwater, recharge water quality and surface water.
WWTP Construction	• Graded material and spoil shall not be stockpiled where it has the potential to contribute to sedimentation of surface water. Berms, sediment fences, mulch or hydro-seed shall be used to contain stockpiles if necessary.
Trenching of pipeline outlet	• Stockpiled spoil shall be stored so as not to impede surface drainage. • Trench spoil shall not be stockpiled where it has the potential to contribute to sedimentation of surface water. Berms, sediment fences, mulch or hydro-seed shall be used to contain stockpiles if necessary. • Erosion controls, such as cut off drains, shall be adequately maintained during trenching operations. Drains and berms shall be inspected regularly and repaired as necessary. • Trench discharge watering shall be directed onto stable vegetated areas. • Trench discharge water will not be released directly into watercourses or allowed to infiltrate within 50 m of a surface water course.
Backfill	• The backfilled trench shall be compacted to reduce subsidence. The final landform shall be consistent with the surrounding environment, with a slight camber installed over the trench. There shall be breaks in the camber to match natural drainage lines.

Aspect	Management Strategies
Discharge Water	• Where discharge waters do not meet the water guidelines for discharge alternative disposal methods shall be considered. • Chemical free discharge water may be disposed of to surrounding land, subject to the agreement of the relevant landowner. • Discharge water shall not be allowed to infiltrate within 50 m of a surface water body.
General	• All surface water, discharged water, groundwater and dewatering shall be undertaken and managed in accordance with the WMP. • All wastes shall be managed in accordance with *Section 4.2*. • All fuel, oil and chemicals shall be stored and handled in accordance with *Section 4.3*. • Response to spills shall be conducted in accordance with *Section 4.4*. • Water used for dust stabilisation shall be of sufficient quality so as not to cause surface or ground water contamination. • Any water treated with chemicals, or contaminated in any way, shall not be discharged on-site unless tested to be of suitable quality[2].

3.4 AIR QUALITY AND DUST CONTROL

Dust emissions may occur during construction, with the greatest risk being from earthworks and vehicle movement. Dust is a potential nuisance to surrounding third parties/landowners and may have effects on the surrounding flora and fauna.

Air emissions are also produced by all equipment during construction. Air quality guidelines aim to prevent and reduce the effects of exhaust, dust and venting emissions on the natural environment and landholders. *Table 3.3* outlines the environmental management strategies that will reduce impacts to air quality, as well as prevention and suppression measures which aim to maintain dust emission levels within acceptable limits.

Table 3.3 Environmental Management Strategies for Reducing Impacts to Air Quality

Aspect	Management Strategies
Planning	• Equipment and vehicles shall be fitted with adequate pollution control equipment as specified by the manufacturer. • All vehicles and equipment shall be maintained to a standard that prevents excessive emissions release. • Construction shall be planned to restrict the time period between clear and grade and construction or restoration (in the case of trenching) to reduce the potential for dust to be generated. • The workforce induction program shall inform site personnel of the required procedures for the protection of air quality.

[2] Treated water should be sent to a registered and accredited water testing facility and shown to meet the State water quality guidelines.

Aspect	Management Strategies
Clear and Grade	• Dust generation from soil stockpiles shall be minimised by limiting exposure time, covering with vegetation (mulch or hydro-seed) or applying water when applicable. • Dust generated from construction access (ie roads, tracks, etc.) shall be minimised by applying water. • In excessively windy conditions, dust producing activities shall be suspended by the Superintendent if suppression measures prove ineffective. • Water shall be applied, where necessary, on exposed soils to prevent the generation of dust.
WWTP Construction	• Dust generation from spoil stockpiles shall be minimised by limiting exposure time, covering with vegetation (mulch or hydro-seed) or applying water where applicable. • Dust generated from construction access (ie roads, tracks, etc.) shall be minimised by applying water. • In excessively windy conditions, dust producing activities shall be suspended by the Superintendent if suppression measures prove ineffective.
Trenching	• Dust generation from spoil stockpiles shall be minimised by limiting exposure time, covering with vegetation (mulch or hydro-seed) or applying water when applicable. • In excessively windy conditions, dust producing activities shall be suspended by the Superintendent if suppression measures prove ineffective.
Backfill	• During backfill activities, erosion control measures such as compaction or application of water will be implemented as backfilling progresses to ensure minimal dust is generated. • In excessively windy conditions, dust producing activities shall be suspended by the Superintendent if suppression measures prove ineffective.
Rehabilitation	• In excessively windy conditions, dust producing activities (ie ripping to alleviate soil compaction) shall be suspended by the Superintendent if suppression measures prove ineffective.
General	• Project vehicles shall travel at appropriate speeds to reduce the amount of dust generated within the construction area. • Access roads, tracks and the WWTP footprint will have dust control measures (ie application of water) implemented as often as necessary to ensure dust generation is kept to a minimum. • Road surfaces, where and if required, shall be constructed of appropriate materials in order to minimise dust emissions, particularly if frequently trafficked and adjacent to residences or businesses.

3.5 FLORA

Environmental management strategies that will minimise the impact on native flora, fauna habitat, and protect species listed under the EPBC Act are presented in *Table 3.4*.

3.5.1 Vegetation (including TEC's)

The proposed WWTP site and associated outlet pipeline will be designed and located to avoid areas of native vegetation where possible, particularly those areas of high conservation value including the TEC FCT19 (Sedgelands in Holocene Dune Swales). During construction, clearing of native vegetation will be minimised as far as practicable.

Flora surveys conducted on the site have indicated the following (Bennett Environmental Consulting, 2008 & 2009):

1) No Declared Rare Flora (DRF) or Priority Flora was recorded within the WWTP site or the outlet pipeline corridor.

2) Three vegetation units were identified. These were:

    - Woodland of *Eucalyptus gomphocephala* over mixed shrubs in sand;
    - Low Woodland A of *Eucalyptus gomphocephala* and *Melaleuca rhaphiophylla* over Scrub of *Acacia saligna, Banksia littoralis* and *Melaleuca huegelii subsp. huegelii* over weeds. Within this vegetation unit there were occasional pockets of lower lying areas where the vegetation was a Low Woodland A of *Melaleuca rhaphiophylla* over Open Tall Sedges dominated by *Gahnia trifida*; and,
    - Dense Thicket of *Xanthorrhoea preissii* over weeds.

3) The TEC FCT19 (Sedgelands in Holocene Dune Swales) was potentially identified in the south western corner of the site (see *Figure 3, Appendix A*). However some of this unit identified in the September 2008 survey had been burnt during the period before the January 2009 survey.

The vegetation condition at the site and along the outlet pipeline corridor is mainly good to degraded open woodlands with some areas on the western side of the site in very good condition and large areas on the eastern side in degraded condition (see *Figure 4, Appendix A*).

3.5.2 Weed Control

Weed species generally thrive in disturbed areas. This is compounded by the longevity of seed viability that remains dormant until the soil is disturbed. In addition, construction of linear pipelines has the potential risk of spreading weeds significant distances along the easement as construction progresses. Weeds may also be brought in on existing equipment (particularly earthmoving equipment).

Weeds recorded during the flora surveys (Bennett Environmental Consulting, 2008 & 2009) that are rated by CALM (1999) as high (prioritised for control) are: *Bromus diandrus*, *Ehrharta calycina*, *Euphorbia terracina*, *Lagurus ovatus*, *Lupinus cosentinii*, *Pelargonium capitatum* and *Romulea rosea*. These weeds are common across the site and should be targeted for removal where possible.

Table 3.4 Environmental Management Strategies for Reducing Impacts to Flora

Aspect	Management Strategies
Planning	• An inventory of noxious weeds occurring along the pipeline easement shall be completed (see Bennett Environmental Consulting, 2008 & 2009) and appropriate weed control measures shall be developed based on regulatory pest plant control guidelines, regional weed control programs and assessment of weed risk. • Clearing boundaries shall be specified on all drawings and in the field to define the extent of authorised clearing. • Clearing of native vegetation shall be minimised by using existing access tracks wherever possible and by sensitive route selection of pipelines. • Required work areas and access tracks shall be identified prior to commencement of construction. • Trees to be preserved or trimmed on the right-of-way shall be flagged prior to clear and grade. • A qualified ecologist shall examine any known or potential hollow bearing trees to be removed within remnant areas being in fair to good condition. • The workforce induction program shall inform site personnel of the required procedures for the protection of vegetation.

Clear and Grade	• Native vegetation shall only be cleared in accordance with the Clearing Permit. The clearing boundary shall be marked on all construction drawings and indicated on site by flagging. Any variation from the drawing must first be approved by the Superintendent.
	• Clearing of native vegetation shall not commence until the clearing boundary has been flagged on site and approved by the Superintendent.
	• Disturbance to `no go' areas shall be avoided.
	• Vegetation shall be trimmed rather than cleared wherever practicable.
	• Large shrubs and trees shall be cut into smaller sections and stockpiled along the easement.
	• Vegetation shall be stockpiled so as to avoid damage to adjacent live vegetation.
	• Should a threatened species be identified during construction the following shall be adopted in order of priority:
	  • fine scale relocation of the pipeline route;
	  • reduction of width of the cleared easement;
	  • fencing or marking of areas containing populations; and
	  • seed collection and replanting in re-spread soil.
	• All earthmoving equipment shall be washed down, inspected and certified clean prior to entering the project area.
	• Vehicles to be used on the right-of-way shall be cleaned before entering the easement as per specific requirements outlined below.
	• Where practicable, the access of vehicles and personnel to areas of known noxious weed infestation shall be restricted and where access is needed, rewashing shall be undertaken.
	• Appropriate records shall be kept regarding vehicle wash down.

Aspect	Management Strategies
Temporary Worksites	• Lay down areas, if necessary, shall be located only in previously disturbed areas devoid of trees and shrubs, and be adjacent to existing access tracks. • Trees and tall shrubs shall not be cleared, trimmed or disturbed. All other vegetation shall be rolled or driven over. • The boundaries of worksites shall be pegged to contain the extent of development.
Backfill	• All imported construction material (eg soil or padding) shall be free from weeds and guaranteed from the supplier.
Rehabilitation	• Weed eradication measures such as spraying with non-residual herbicide or mechanical removal shall be undertaken in areas of significant noxious weed infestation. Consultation with the relevant landholders and regulatory authorities shall be undertaken to ensure sensitive areas, water resources, flora and fauna and neighbouring landowners are not affected. • The construction right-of-way shall be allowed to revegetate through natural vegetation regeneration processes or by re-seeding as requested by the landowner. • Native vegetation shall be progressively and evenly re-spread over the construction right-of-way in the immediate vicinity from where it was removed. • Revegetation of the outlet pipeline corridor will aim to be of a standard to support the pre-existing land use. • Revegetation strategies for degraded/cleared areas should aim to include the use of local seed stock such as cockatoo food plants (e.g. *Euclayptus*, *Banksia*, *Hakea* etc.) • Disturbed areas shall be progressively rehabilitated to as soon as practicable to prevent weed establishment. • Topsoil and vegetation material shall be respread in the immediate vicinity of the area of origin to limit the potential spread of weeds.

3.6 FAUNA

Fauna species of conservation significance and other native fauna are known use remnants of good quality vegetation surrounding the site and outlet pipeline route and as such efforts to minimise disturbance to these areas is needed.

Potential impacts resulting from construction can include loss of habitat for native species and disturbance and mortality to native species. *Table 3.5* outlines the environmental management strategies for reducing impacts to fauna during construction activities.

3.6.1 Fauna Species of Conservation Significance

A review of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Threatened Fauna list, *Western Australian Wildlife Conservation Act 1950* (WAWC Act) Threatened Fauna list, DEC's Threatened Fauna Database and Priority List and scientific publications identified 24 specially protected, priority or migratory fauna species as potentially occurring in the general study area (excluding species such as seabirds and marine mammals) (Harewood 2008 & 2009).

From Fauna studies undertaken at the site (Harewood 2008 & 2009), 12 of those identified species have no potential, under normal circumstances, to utilise the site for any purpose due to lack of suitable habitat or known local extinction.

The vertebrate fauna species of conservation significance (listed on state or federal threatened species lists or DEC priority species) that were positively identified as utilising the study area for some purpose during the Level 1 and Level 2 surveys were (Harewood 2008 & 2009):

- *Merops ornatus* Rainbow Bee-eater – Migratory[3]
  Common seasonal visitor to the southwest. Small flock of five birds observed foraging in study area during Level 2 survey. May use some earthen banks in the general area for tunnel construction/breeding. This was not observed during the level 2 survey.

- *Falco peregrinus* Peregrine Falcon - S4[4]
  Observed in woodland area just north of western pipeline corridor. Study site may form part of larger home range. No potential or existing nest sites observed.

- *Isoodon obesulus fusciventer* Quenda – P5[5]
  Captured several times during Level 2 survey. Widespread within study area in apparently low numbers.

Species of conservation significance that can be considered to possibly utilise the study area for some purpose at times but whose current status on site is difficult to determine (i.e. some may actually be locally extinct, habitat on site maybe marginal, they maybe infrequent/seasonal visitors or rare vagrants) are:

- *Lerista lineata* Perth Lined Lerista – P4[6]
  Known from some nearby regional parks. Can persist in disturbed areas.

- *Neelaps calonotos* Black-striped Snake – P3[7]
  Habitat maybe marginal. Listed as a potential species but possibly locally extinct.

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[3] Migratory (EPBC Act Threatened Fauna Categories)

[4] Schedule 4 (WAWC Act Threatened Fauna Categories) - Fauna that is otherwise in need of special protection

[5] Priority 5 (Western Australian DEC Priority Fauna Categories) - Taxa in need of monitoring (conservation dependent)

[6] Priority 4 (Western Australian DEC Priority Fauna Categories) - Taxa in need of monitoring

[7] Priority 3 (Western Australian DEC Priority Fauna Categories) - Taxa with several, poorly known populations, some on conservation lands

- *Ardea alba* Great Egret – Migratory
  May infrequently visit pasture areas during wetter months of year. Would not breed on site.

- *Ardea ibis* Cattle Egret – Migratory
  May infrequently visit pasture areas during wetter months of year. Would not breed on site.

- *Apus pacificus* Fork-tailed Swift – Migratory
  Rare seasonal visitor. May forage in area but very unlikely to roost.

- *Haliaeetus leucogaster* White-bellied Sea-Eagle – Migratory
  May fly over the site occasionally due to the sites proximity to ocean and lakes. Known to nest in coastal forest (recent record from Baldivis). No existing or potential nest sites were observed.

- *Calyptorhynchus latirostris* Carnaby`s Cockatoo – S1[8]
  Sighted flying across the general area during the Level 2 survey period but not over the site. Potentially a visitor to forage or roost but habitat appears marginal which is supported by the fact that no recent or historical evidence of foraging or roosting was found. Known to have bred in nearby Baldivis. No potential nest hollows were observed on site.

- *Calyptorhynchus baudinii* Baudin`s Cockatoo - S1
  Potentially a very infrequent visitor to forage/roost but habitat appears marginal supported by the fact that no recent or historical evidence of foraging or roosting was found. Rarely recorded in general area. No potential nest hollows were observed.

- *Calyptorhynchus banksii naso* Forest Red-tailed Black Cockatoo – S1
  Potentially a rare visitor while travelling to areas outside the study area that contain marri and sheoak (rare/absent in study area). Frequencies of observations in other parts of the Perth metropolitan area are increasing. No potential nest hollows were observed.

[8] Schedule 1 (WAWC Act Threatened Fauna Categories) - Fauna which is rare or likely to become extinct

Table 3.5 Environmental Management Strategies for Reducing Impacts to Fauna

Aspect	Management Strategies
Planning	• Construction shall be planned to restrict the time period between clear and grade and restoration • Construction activities shall be planned to minimise the period of time pits and trenches are left open, particularly in fauna habitat areas. • Construction activities shall be planned to restrict activity during known fauna breeding periods (eg bird species in wooded areas). • The workforce induction program shall inform site personnel of the required procedures for the protection of fauna and be made aware that native fauna is protected. • Discussions with DEC should be undertaken prior to clearing to establish a management plan for the Quendas that may potentially be displaced as a result of the proposed development. This may involve the trapping and relocation/translocation of individuals just prior to clearing or implementation of clearing protocols that allow animals to move to adjacent bushland areas unharmed. • During clearing operations, fauna (e.g. Quendas) may be encountered. It is recommended that an experienced fauna spotter/handler be employed during vegetation removal to relocate individuals to suitable nearby habitat if observed. This should involve searching vegetation prior to clearing where possible.
Clear and Grade	• Disturbance to native fauna habitat shall be minimised by adopting vegetation management procedures detailed in *Section 3.5*. • A qualified ecologist will examine any known or potential hollow bearing trees (fauna habitat) to be removed within remnant areas, as identified being in fair to good condition. • Soil stockpiles shall be located so as not to impede the movement of wildlife across the construction area.
Trenching	• Trench plugs, with slopes no greater than 50%, shall be used to facilitate movement of native fauna across the right-of-way. • Plugs shall also be positioned to coincide with areas of thicker native vegetation and designated fauna and vehicle crossings. • Where the trench is to be left open for more than 48 hours, native fauna shall be provided with methods of escape from the trench. These could include branches, hessian sacks or ramped gangplanks. • Maximum period of open trench in fair to good habitat areas shall be 5 days. • Surveillance of the open trench in sensitive areas and the removal of fauna from the trench shall be undertaken by appropriately trained personnel.
Pipe Stringing	• Pipe shall be strung, allowing gaps for wildlife access across the right-of-way. Gaps shall coincide with trench plug locations. • Welded pipe strings shall be capped when unattended, to prevent ingress by wildlife and other foreign material.
Backfill	• The trench shall be inspected and appropriate actions taken, immediately prior to backfill. • Where practicable, backfilling shall be kept to within 5 km of pipe laying to minimise fauna entrapment. • Fauna monitoring records shall be provided to relevant regulatory personnel for information following completion of construction.

Aspect	Management Strategies
General	• Vermin shall be discouraged by the implementation of sound waste management practices in accordance with *Section 4.2*. • Pets shall be prohibited from all sites. • Fauna shall not be harassed, hunted or eggs or nests destroyed. • Fauna shall not be fed and direct contact with fauna shall be avoided. • Native fauna injured during clearing or construction should be taken to a designated veterinary clinic or a DEC nominated wildlife carer.

3.7 NOISE

Construction activities will cause localised and temporary increases in noise levels. The environmental management objective regarding noise is to ensure that landowners and local residents experience no unacceptable noise impacts.

All construction and work activities associated with the ERWWTP development shall be undertaken in accordance with the:

1) *Environmental Protection (Noise) Regulations 1997* (EP Noise Regulations);

2) EPA Draft Guidance Statement No.8 – Environmental Noise 2007 (Guidance Statement No.8);

3) Australian Standard (AS) AS 2436—1981 - Guide to noise control on construction, maintenance and demolition sites; and,

4) *National Occupational Health and Safety Commission (NOHSC) Occupational Noise National Standard [NOHSC:1007(2000)]* and *National Code of Practice [NOHSC:2009(2000)].*

Noise mitigation guidelines aim to provide basic precautions designed to limit disturbance to wildlife and nearby businesses, landowners and residents. *Table 3.6* outlines the environmental management strategies to reduce the impact to landowners and local residents from noise generated on site.

Table 3.6 Environmental Management Strategies for Reducing Noise

Aspect	Management Strategies
Planning	• All construction equipment shall be equipped with appropriate mufflers or other noise attenuating devices and shall be maintained in good working order. • Landholders and residents shall be given adequate prior notification of particularly noisy activities and shall be scheduled for periods which are less likely to result in a noise nuisance. • Appropriate strategies for dealing with noise complaints shall be implemented and complaints will be investigated and remedial action taken as required.

Aspect	Management Strategies
General	• Construction activities shall comply with all relevant regulatory requirements and guidelines pertaining to noise control including EP Noise Regulations, EPA Guidance Statement No.8, AS 2436-1981, NOHSC:1007(2000), NOHSC:2009(2000), and AS 2885.3-2001. • Where construction is adjacent to residences, noisy construction activities shall be undertaken within standard construction hours, except where unavoidable for practical reasons or agreement is obtained from affected residents. Affected residents shall be advised when unavoidable out-of-hours work, resulting in noise nuisance, will occur. • Noise attenuation screens shall be provided where appropriate. • Noise generating, stationary equipment such as generators, pumps and air compressors shall be positioned at appropriate distances from residents and wildlife watering points.

3.8 LAND USE AND INFRASTRUCTURE

Industry and heritage listed property exists surrounding the WWTP site and along the proposed outlet pipeline route. The integrity of building and underground foundations (especially for heritage listed sites) is potentially sensitive to construction activities. Underground services such as utilities to service communities and industry may also be affected by construction activities. Other land uses such as traffic thoroughfares and other infrastructure (ie fences) may be affected by construction activities in the short term.

When construction is completed there will be no continuing impact on infrastructure such as roads and fencing. The implementation of mitigation measures will minimise damage and disruption to heritage listed buildings, third party infrastructure and land use practices (*Table 3.7)*.

Table 3.7 ***Environmental Management Strategies for Reducing Impacts to Land Use and Infrastructure***

Aspect	Management Strategies
Planning	• Prior to commencement of construction activities, all affected stakeholders shall be contacted and informed of proposed activities, schedule and potential impacts to infrastructure. • Clearing boundaries shall be specified on all drawings and in the field to define the extent of authorised clearing. • Required work areas, access tracks and turnaround bays shall be identified prior to commencement of clear and grade. • All sites shall be included in all planning documents, alignment sheets and maps. • Areas in close proximity to heritage listed places are to be avoided where possible. • Stakeholders shall be consulted regarding access to and use of water for construction purposes. • Appropriate compensation shall be negotiated regarding potential losses incurred as a direct result of WWTP and/or pipeline construction and operation. • The Water Corporation will consult with relevant utility authorities for identification of existing overhead and buried cables, lines, pipes, water mains or other potentially affected infrastructure. • WWTP lead items and pipe transport routes and storage areas shall be planned to minimise disruption to stakeholders. • Delivery of WWTP equipment and pipe shall be planned to minimise the need for stockpiling of equipment. • Construction at or near major roads shall be in accordance with relevant regulatory requirements and guidelines. • Construction will aim to complete road crossings within 24 hours to reduce traffic and residential disturbance.
Clear and Grade	• Disturbance to 'no go' areas shall be avoided. • Where practicable, stakeholders shall be notified of construction schedule.
Plant, Equipment and Pipe Transport	• Pipe sections shall be strung immediately on delivery where possible. • Should delays occur between delivery and stringing/construction, plant, equipment and/or pipe shall be stockpiled within an approved area designated by the Superintendent.
Traffic Movement	• Vehicles shall only be parked on the right-of-way or approved access roads. • Where practical, movement of construction equipment shall be undertaken during daylight hours to avoid disturbance to wildlife and residents. • Appropriate road warning/hazard signs shall be erected on public roads, and appropriate control systems to direct traffic shall be in place. • Escort vehicles shall be used where appropriate.
General	• Any gates shall be left as found, or as discussed with the stakeholder prior to construction commencement. • Delivery of equipment and/or construction occurring within close proximity to Heritage listed places are to be undertaken in accordance with the *Heritage of Western Australia Act 1990* and the *Heritage of Western Australia Regulations 1991*.

Rehabilitation	• Any stakeholder infrastructure disturbed during construction shall be restored to the stakeholder's satisfaction. • Damaged public utility (overhead and buried cables, lines, pipes, water mains or other affected infrastructure) shall be repaired as soon as possible by the contractor. • Any fences or gates damaged during construction shall be reinstated to a condition equal to or better than the pre-existing condition. • Any tracks on private property damaged by construction shall be reinstated to a condition equal to or better than the pre-existing condition.

3.9 INDIGENOUS CULTURAL HERITAGE

No registered sites of Aboriginal significance have been identified within the proposed WWTP and outlet pipeline route. However, six sites have been identified in the immediate vicinity of the site, approximately 1.1 km northeast and 1.5 km south of the site (*Figure 5, Appendix A*). These areas are protected under a variety of Commonwealth and State legislation and while construction and operation of the WWTP and outlet pipeline is unlikely to disturb these sites, caution must be taken to avoid any impacts.

Initial archaeological and ethnographic surveys indicated that given the numerous burial sites in the Spearwood and Quindalup dune systems of the Swan Coastal Plain, the possibility for skeletal material to be present within the footprint of the WWTP and outlet pipeline can not be discounted.

It is recommended that a disturbance protocol be established prior to construction.

The implementation of mitigation measures as outlined in *Table 3.8* will minimise damage and disruption to these Aboriginal Heritage features.

Table 3.8 ***Environmental Management Strategies for Reducing Impacts to Indigenous Heritage Features***

Aspect	Management Strategies
Planning	• A final archaeological and ethnographic survey of the WWTP site and pipeline corridors shall be completed and heritage sites shall be identified prior to construction. • Where practicable, construction will avoid identified heritage sites. • Where necessary, areas containing cultural heritage sites shall be flagged as 'no go' areas. • Clearing boundaries shall be specified on all drawings and in the field to define the extent of authorised clearing. • Required work areas, access tracks and turnaround bays shall be identified prior to commencement of clear and grade. • All sites shall be included in all planning documents, alignment sheets and maps. • Approval to disturb identified Aboriginal heritage sites shall be obtained under *Section 18* of the *Aboriginal Heritage Act 1972* prior to construction. • A procedure, agreed to by all relevant stakeholders, shall be devised regarding the actions to be taken if any previously unrecorded heritage sites are uncovered during construction activities. • Any proposed changes to the WWTP footprint or associated pipeline corridors shall be surveyed by an archaeologist and Aboriginal community representative prior to clearing.
Clear and Grade	• Disturbance to 'no go' areas shall be avoided. • In the event an Aboriginal Cultural Heritage site or material is discovered within the WWTP and pipeline corridor work areas, all construction activities shall stop, the Superintendent, as soon as reasonably practicable, shall notify all relevant regulatory authorities (ie heritage and wildlife agencies) and relevant community representatives (as determined prior to construction), of the discovery. • A cultural heritage monitor shall be present during initial clear and grade activities. A qualified archaeologist shall be available on an `as-needs' basis to verify artefact findings and potential sites, and to assist with determining management strategies.
Excavation/ Trenching	• If determined as necessary during the clear-and-grade operations, the excavated/trenched areas shall be inspected for cultural heritage material by cultural heritage monitors. • In the event an Aboriginal Cultural Heritage site or material is discovered within the WWTP and pipeline corridor work areas, all construction activities shall stop, the Superintendent, as soon as reasonably practicable, shall notify all relevant regulatory authorities (ie heritage and wildlife agencies) and relevant community representatives (as determined prior to construction), of the discovery. • A qualified archaeologist shall be available on an 'as-needs' basis to verify artefact findings and potential sites.

3.10 EUROPEAN CULTURAL HERITAGE

Significant European Heritage features are protected under a variety of Commonwealth and State legislation. A search of the Heritage Council of Western Australia's *State Register of Heritage Places* and the Australian Heritage Database was undertaken to identify any heritage listed sites within or in close proximity to the site.

Chesterfield Inn (fmr) (Place No: 02325) and Chesterfield Inn Stables (fmr) (Place No: 02326) are within 200 m and care must be taken when developing the site to not disturb these sites (*Figure 6, Appendix A*).

The implementation of mitigation measures will minimise damage to heritage listed buildings and features, see *Table 3.8* above.

3.11 PUBLIC AMENITY

Implementation of mitigation measures presented in *Table 3.9* will minimise damage and disruption to public amenity.

Table 3.9 Environmental Management Strategies for Reducing Impacts to Pubic Amenity

Aspect	Management Strategies
Construction	• Permanent pipeline warning signs shall be erected along the easement in accordance with AS 2885. • Above ground structures shall be screened where necessary through earth shaping and tree planting.

4 GENERAL MANAGEMENT

4.1 ACCESS

Access to the WWTP and outlet pipeline corridor right-of-way will be required on a regular basis during construction. Access to the right-of-way and the working areas will generally be via public roads and existing private tracks and it is likely that only a few new access tracks will be required. *Table 4.1* outlines the environmental management strategies that will reduce impact to surrounding natural areas from impacts related to accessing the site for construction purposes.

Table 4.1 Environmental Management Strategies for Reducing Impacts Due to Site Access

Activity	Management Strategies
Planning	• Required work areas and access tracks shall be identified prior to commencement of clear and grade. • Consultation with landholders and regulatory authorities regarding the utilisation of existing roads or tracks and the selection of new access routes shall be undertaken. • An appropriate Traffic Management Plan shall be developed prior to commencement of construction activities. • The location of the access tracks shall be marked on construction drawings or alignment sheets and pegged in the field. • No native trees or shrubs shall be damaged or cleared to create access tracks where-ever practicable.
Clear and Grade	• Disturbance to `no go' areas shall be avoided.
General	• All vehicles shall remain on designated vehicle tracks and in designated work areas. • Private vehicles shall be prevented from entering the construction right-of-way and any construction areas. • Public access along Chesterfield Rd and other work areas or access tracks shall not be permitted. • All construction activities shall be restricted to the approved access routes. • Vehicle access in sensitive environmental areas shall be restricted as appropriate. Refer to *Section 3.5* (Flora), *3.6* (Fauna), *3.9* (Indigenous heritage) and *3.10* (European Heritage). • Access shall be restricted during wet weather where there is a risk of land degradation. • Access to the right-of-way shall be restricted to essential construction activities. Public roads and existing access tracks shall be used to access the right-of-way where it is feasible and safe to do so. • Any gates along access tracks are to be left as found unless otherwise agreed by landowners.
Rehabilitation	• Public roads and tracks will be used during construction and all vehicles will observe appropriate load limits. • Compacted areas shall be ripped or scarified as part of site rehabilitation. • The pipeline easement shall not be fenced unless it is required for rehabilitation of an area, protection of heritage sites or safety hazard control.

4.2 *WASTE MANAGEMENT*

During construction activities, domestic and industrial wastes such as timber skids, sewage, used lube oils and general refuse will be generated. A high emphasis shall be placed on housekeeping and cleanliness at all sites to promote safety and minimise environmental impact. *Table 4.2* outlines the environmental management strategies to reduce impact to the surrounding natural areas and to third parties/ land owners from wastes generated on site.

Table 4.2 Environmental Management Strategies for Waste Management

Activity	Management Strategies
Planning	• Prior to the commencement of any waste producing activities, specific waste management strategies shall be developed for each waste stream based on the principles of reduce, reuse, recycle and appropriate disposal. These management strategies are to be developed by the Contractor and approved by the Superintendent.
Construction	• Waste containers shall be provided for litter on-site. • Waste containers shall be regularly emptied. • Portable toilets shall be provided on-site. Sewage shall be retained in sealed tanks and removed by a licensed contractor for disposal in an approved facility. • Opportunities for recycling materials shall be investigated by the Contractor and implemented where practicable. • Where practicable, waste shall be stockpiled with similar items for recycling. • Personnel shall place a high emphasis on housekeeping and cleanliness at all worksites. All work areas shall be maintained in a neat and orderly manner. • Welding refuse shall be retrieved for disposal at an approved waste disposal site. • Hydrocarbon wastes, including lube oils and oily sludges, shall be collected for safe transport off-site for reuse, recycling, treatment or disposal at approved locations. • Hazardous wastes, such as solvents, rust proofing agents and primer, shall be managed in accordance with the requirements of relevant legislation and industry standards, in particular, the Australian Dangerous Goods Code. • Hazardous materials and empty containers shall be safely stored at approved sites determined by the Construction Manager prior to off-site disposal at an appropriately licensed facility. • Handling and disposal of `Prescribed wastes' shall comply with the appropriate regulatory requirements in particular regulations regarding waste inventories, tracking systems and permitting etc. • Storage and handling of chemicals shall be conducted in accordance with *Section 4.3*. • Spills of waste materials shall be dealt with in accordance with *Section 4.4*. • On completion of each section of construction all waste material shall be removed from the worksite.

4.3 FUEL, OIL AND CHEMICAL MANAGEMENT

Table 4.3 outlines the environmental management strategies for reducing impacts to surrounding soils, water resources, flora and fauna and neighbouring landowners due to accidental spills or leaks of fuels, oils or chemicals.

Table 4.3 Environmental Management Strategies for Reducing Impacts Due to Spills or Leaks of Fuels, Oils and Chemicals

Activity	Management Strategies
Planning	• Prior to the commencement of construction, storage and handling procedures shall be developed for each specific oil or chemical.
General Construction	• All chemicals stored on site shall be listed on a register and the relevant MSDS's held on site. The storage and handling of fuels and chemicals shall comply with AS 1940:2004 – *The storage and handling of flammable and combustible liquids.*
	• Hazardous materials shall be transported, stored and handled in accordance with the requirements of relevant legislation and industry standards, in particular, the Australian Dangerous Goods Code.
	• The minimum practicable volume of chemicals shall be stored on site.
	• Chemical use should be minimised where practicable.
	• Fuels, lubricants and chemicals shall be stored and, where practicable, handled within containment facilities (eg bunded areas, leak proof trays, impermeable flooring).
	• All storage and handling equipment (including transfer hoses etc.) shall be kept in a well maintained condition.
	• Wherever practicable, all fuels and chemicals shall be stored and handled within the approved compounds and not in the vicinity of natural or built waterways or water storage areas (eg streams, canals, dams, lakes etc.).
	• Where it is necessary to refuel heavy equipment on-site, adequate spill prevention and containment measures (eg drip trays) shall be implemented.
	• Equipment shall not to be refuelled within 50 m of surface water.
	• All vehicles and equipment shall be adequately maintained so as to minimise drips/leaks of oil and fuel.
	• All spills of fuel, oil or chemicals shall be addressed in accordance with *Section 4.4.*
	• Fuels, lubricants and chemicals shall not be stored on the pipeline easements.

4.4 *EMERGENCY PREPAREDNESS AND RESPONSE*

Emergencies consist of incidents that threaten the public, worker safety or the environment. The Contractor will develop an Emergency Response Procedure (ERP) that addresses the likely causes of incidents, including:

1) spills of fuels or chemicals;

2) dust generation;

3) excavation/easement washout (erosion) as a result of high intensity rainfall/flooding;

4) pipeline rupture;

5) fire;

6) potential acid sulphate soils and dewatering;

7) water quality issues (discharge water, surface water, groundwater);

8) clearing of native vegetation; and,

9) trapped or injured fauna.

The procedure will include reporting requirements and emergency contact details of relevant regulatory agencies.

Environmental incidents will be reported to the Superintendent as soon as practicable.

Table 4.4 outlines the environmental management strategies to reduce impacts to the public, construction personnel and the environment.

Table 4.4 Environmental Management Strategies for Emergency Preparedness and Response

Activity	Management Strategies
Planning	• Prior to the commencement of construction, appropriate strategies and equipment shall be in place to deal with a spill of all types of fuel, oil or chemicals to be used on-site. • Spill response procedures shall comply with all relevant regulatory requirements. • A Construction Safety Plan will be developed for the project. • The Contractor shall consult with the Police Services to incorporate Regional Disaster Plans to the Emergency Response Procedure. • The Construction Safety Plan as well as the Operations ERP should incorporate municipal disaster plans. • The Contractor will maintain a contact directory of Local (municipal) and Regional (State) Emergency Management Officers (*Appendix C*). • Workforce training shall be conducted in spill response and recovery procedures and health and safety.

Activity	Management Strategies
Erosion	• Erosion control measures shall be implemented in accordance with *Section 3.2*. • In the event of an erosion emergency, rectification of control measures shall occur with 24 hours of the event.
Fuel or chemical spills	• All fuel, oils and chemicals shall be stored and handled in accordance with *Section 4.3*. • In the event of a spill or leak of fuel, oil or chemicals, the safety of personnel and third parties shall be protected as the first priority. • Spills shall be stopped at the source as soon as practicable. • Spilt material shall be contained to the smallest possible area. • Spilt material shall be recovered as soon as possible using appropriate equipment and clean up methodologies in accordance with relevant legislation and industry standards. • Contaminated soil, or spill recovery materials (such as sawdust, absorbent pads etc.) shall be disposed of to appropriately licensed facilities. • Spill response equipment shall be maintained on-site and replaced as required. • All spills over 20 litres are considered an environmental incident and shall be reported. • All spills near surface water, regardless of quantity, shall be reported. • Emergency response shall be in accordance with the Emergency Response Procedure.
Fire	• Fire prevention measures and construction requirements shall be in accordance with *Section 4.5*. • Emergency response shall be in accordance with the ERP.

4.5 BUSHFIRES

Construction of the WWTP and associated outlet pipeline has the potential to ignite bushfires through the following:

1) pipe/steel cutting;

2) welding and grinding activities;

3) smoking; and,

4) the operation of flammable fuel powered equipment and vehicles.

Table 4.5 outlines the environmental management strategies to reduce the occurrence of bushfires on site.

Table 4.5 Environmental Procedures for Reducing Impacts due to Bushfires

Activity	Management Strategies
Planning	• Prior to construction commencement, a fire management plan, based on a risk assessment, will be required. The plan shall detail bushfire prevention, preparedness, emergency contacts, equipment, response and training, and shall be liked to the project's safety and emergency response procedures. • All fire restrictions, notification requirements and permitting procedures shall be complied with. • Exemption may be sought from the appropriate agencies for welding operations on Total Fire Ban Days.
Smoking	• Smoking on site will be limited to designated smoking areas and be equipped with fire fighting equipment.
Construction	• All vehicles shall be equipped with fire fighting equipment. • All machinery shall be maintained and operated to comply with relevant fire safety standards. • Adequate fire prevention measures shall be implemented. These may include (but not be limited too): - Avoiding high fire danger periods; - Clearing flammable material such as leaf litter from around potential ignition sources; - Parking vehicles away from flammable areas; - Utilising tarpaulins or fire resistant mats around potential ignition points; and, - The provision of standby earthmoving equipment and water tanks in high risk fire areas. • As part of rehabilitation works cleared vegetation shall be respread and wastes shall be removed. • Emergency response shall be in accordance with the ERP.

4.6 DOCUMENT CONTROL

Control and distribution of this PEMP shall be in accordance with the Water Corporation's document control procedures.

Government Agencies, relevant authorities, members of the project management team and supervisory field staff will be issued with controlled copies of this document. Uncontrolled copies shall be available to other interested parties, for information purposes, at the discretion of the Superintendent.

Specifically, the control and distribution of this PEMP shall consist of the following steps:

1) controlled documents will be uniquely numbered;

2) the Water Corporation's procedure for document control will be applied to all project environmental management documents revised during construction;

3) the Superintendent shall approve the publication and distribution of all project documents;

4) the Superintendent may approve reviews of this document during the construction phase;

5) the Project Management Team will review documents issued for use on the project within three months of project commencement and thereafter as required;

6) any changes to the CEMP must be approved by the Superintendent;

7) all obsolete documents shall be withdrawn from project usage, kept for record purposes and marked `superseded';

8) changes to either the PEMP or CEMP may require additional environmental approvals and/or negotiation with environmental regulatory agencies. This will be coordinated by the Water Corporation's Environment Branch;

9) controlled documents shall only be issued to personnel whose work requires the use of controlled documents - uncontrolled documents may be issued for information purposes only; and,

10) records will be kept by the Water Corporation and the construction company as per procedural requirements.

5 MONITORING, MEASUREMENT AND EVALUATION

Environmental inspection, monitoring and auditing shall be undertaken to assess if construction activities are in compliance with this PEMP.

5.1 ENVIRONMENTAL INSPECTION

A program of systematic environmental inspections shall be conducted during construction of the project. The CEMP shall detail environmental inspection procedures including:

1) monitoring of environmental performance during construction and formally reporting on a weekly basis;

2) construction crew supervisors' notes on environmental issues and including these in their daily reports; and,

3) unscheduled inspections as required.

5.2 ENVIRONMENTAL MONITORING

A program of environmental monitoring shall be undertaken in conjunction with environmental inspections. The Contractor will develop an appropriate monitoring program that is consistent with the contract terms and conditions, site characteristics, work activities and potential environmental risks associated with the work to be performed.

Monitoring requirements may include, but are not limited to, the following:

1) evidence of soil erosion, scouring, compaction and stockpile stabilisation;

2) groundwater quality (*refer to WMP for further detail*);

3) surface water quality(*refer to WMP for further detail*);

4) discharge water quality (*refer to WMP for further detail*);

5) evidence of adverse impacts to flora and fauna; and,

6) effectiveness of erosion and sediment control structures.

Deficiencies identified during monitoring activities must be addressed immediately.

5.3 *ENVIRONMENTAL AUDITING*

Environmental Audits shall be undertaken independently of the monitoring program by suitably qualified environmental auditors. Environmental Audit requirements for the ERWWTP shall include:

1) an Environmental Compliance Audit to be conducted at least twice, the first within twelve months of commissioning, to assess compliance with the CEMP, regulatory requirements and licence conditions;

2) an audit of the cultural heritage management shall be undertaken by an independent professional heritage practitioner at least once during construction; and

3) an Environmental Assessment Audit to be conducted within two years of commissioning to assess actual environmental impacts over time.

The Environmental Compliance Audits shall be conducted in accordance with the Audit Guidelines included in *Appendix D*. The findings of environmental audits shall be submitted to the Water Corporation. Rectification plans shall then be developed and implemented as required.

5.4 *REPORTING*

Reporting of environmental incidents can be through a series of processes, with the selection of the method dependant on the severity of issue. All personnel can notify supervisors of preventative or general environmental observations. Environmental incidents, non-conformance and statutory reporting are considered serious environmental breaches of the CEMP or statutory requirements. Reporting of this nature is to be conducted by the appropriate qualified personnel. The CEMP will detail internal reporting procedures for non-conformance with the CEMP. Reporting of environmental incidents is to be in accordance with Water Corporation policies and procedures.

All records of management procedures and monitoring data implemented during the construction of the WWTP and outlet pipeline will be collated and documented in a closure report assessing the effective implementation of the CEMP and the WMP.

A Water Corporation Incident Report shall be completed for all environmental incidents associated with the project.

The Superintendent will be notified as soon as practicable of all environmental incidents.

5.4.1 Non-compliance Reporting

Identified instances of non-compliance with the CEMP shall be recorded and reported on the appropriate form as directed by the Water Corporation and must be addressed and closed out by the Superintendent.

5.4.2 Statutory Reporting

The Contractor will be responsible for submitting any Environmental Incident Reports to Statutory Authorities in the event of an incident under breach of statute requirements.

5.5 CORRECTIVE AND PREVENTATIVE ACTION

Corrective and Preventive Actions identify system deficiencies and areas of environmental performance improvement. Corrective and Preventive Actions may arise during audits, incident report/investigations, work site inspections or as a result of community complaints. These actions will be documented through a company specific Corrective and Preventative Action Request (CPAR) system.

The CPAR shall be reviewed by the Site Supervisor and approved by the Superintendent. Management shall then undertake the following protocol:

1) assign responsibility for the Corrective and Preventive Action;

2) assign priority of follow-up action and document;

3) identify and nominate appropriate follow-up action to be undertaken;

4) review completed follow-up actions for effectiveness; and,

5) advise all appropriate persons of relevant outcomes and/or changes.

5.5.1 Incident Investigation

A formal investigation shall be carried out for all environmental incidents reported on the Project.

Environmental incident investigations shall be conducted by a competent and experienced person or investigation team appointed by the Water Corporation.

Copies of all environmental investigation reports shall be attached to the original Incident Report and duplicate copies distributed as appropriate.

6 REVIEW

This preliminary PEMP shall be reviewed before the commencement of construction and before the commissioning of the Contractor. The reviews will ensure that:

1) information and environmental management procedures contained remain current;

2) implications of government approvals are incorporated;

3) all opportunities for improvement are identified; and,

4) any changes to legislation, licence and approval conditions are adhered.

Reviews shall take the following forms:

1) the Water Corporation shall consider the above issues on an ongoing basis;

2) a formal review shall be conducted within two months of construction commencing.; and,

3) a further review of the CEMP should be undertaken by the WWTP operator within one year of commissioning.

The construction Contractor has yet to be appointed for the project; however, the successful company shall be contractually committed to responsible environmental management of the ERWWTP Project, in line with the requirements of this preliminary PEMP.

All planning, construction and operation activities will be conducted in accordance with the construction company's HS&E Policy and Statement of Environmental Commitments (*Appendix E – to be inserted once Contractor appointed*), which outlines the company's commitment to sound management of environmental aspects of the Project.

8 REFERENCES

The Australian Pipeline Industry Association Inc., 1998. *Code of Environmental Practice, Section 4: Environmental Management Guidelines*.

Bennett Environmental Consulting Pty Ltd (2008). *Level 1 vegetation and flora survey of proposed waste water treatment plant East Rockingham*. Unpublished report for ERM Consulting

Bennett Environmental Consulting Pty Ltd (2009). *Level 2 vegetation and flora survey of proposed waste water treatment plant East Rockingham*. Unpublished report for ERM Consulting

Department of Conservation and Land Management (1999). *Environmental Weed Strategy for Western Australia*. Department of Conservation and Land Management, Western Australia

Department of Environment and Conservation (2009). *Geomorphic Wetlands Swan Coastal Plain dataset*. See http://www.dec.wa.gov.au/management-and-protection/wetlands/wetlands-data.html

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Greg Harewood (2008). *Fauna Survey (Level 1) East Rockingham WWTP Site & Pipeline Corridors*. Unpublished report for ERM Consulting

Greg Harewood (2009). *Fauna Survey (Level 2) East Rockingham WWTP Site & Pipeline Corridors*. Unpublished report for ERM Consulting

Hill AL, CA Semeniuk, V Semeniuk, and A. Del Marco (1996). *Wetlands of the Swan Coastal Plain Volume 2B*. Department of Environmental Protection, Perth WA.

Water and Rivers Commission (2001). *Water and Rivers Commission Position Statement: Wetlands*.

Appendix A

Figures

Legend

- Site Boundary
- RIZ Boundary
- Site Detail
- Outlet Buffer
- Cadastre

Figure 1

Site Location

Client:	Water Corporation		
Project:	East Rockingham WWTP PEMP		
Drawing No:	0083144p_EPA_GIS001_R1.mxd		
Date:	24/02/2011	Drawing size:	A4
Drawn by:	DN	Reviewed by:	BC
Source:	-		
Scale:	1:25 000 @ A4		

N

0 300 600 900 m

Maps and figures contained within this document may be based on third party data, may not be to scale and is intended for use as a guide only. ERM does not warrant the accuracy of any such maps or figures.

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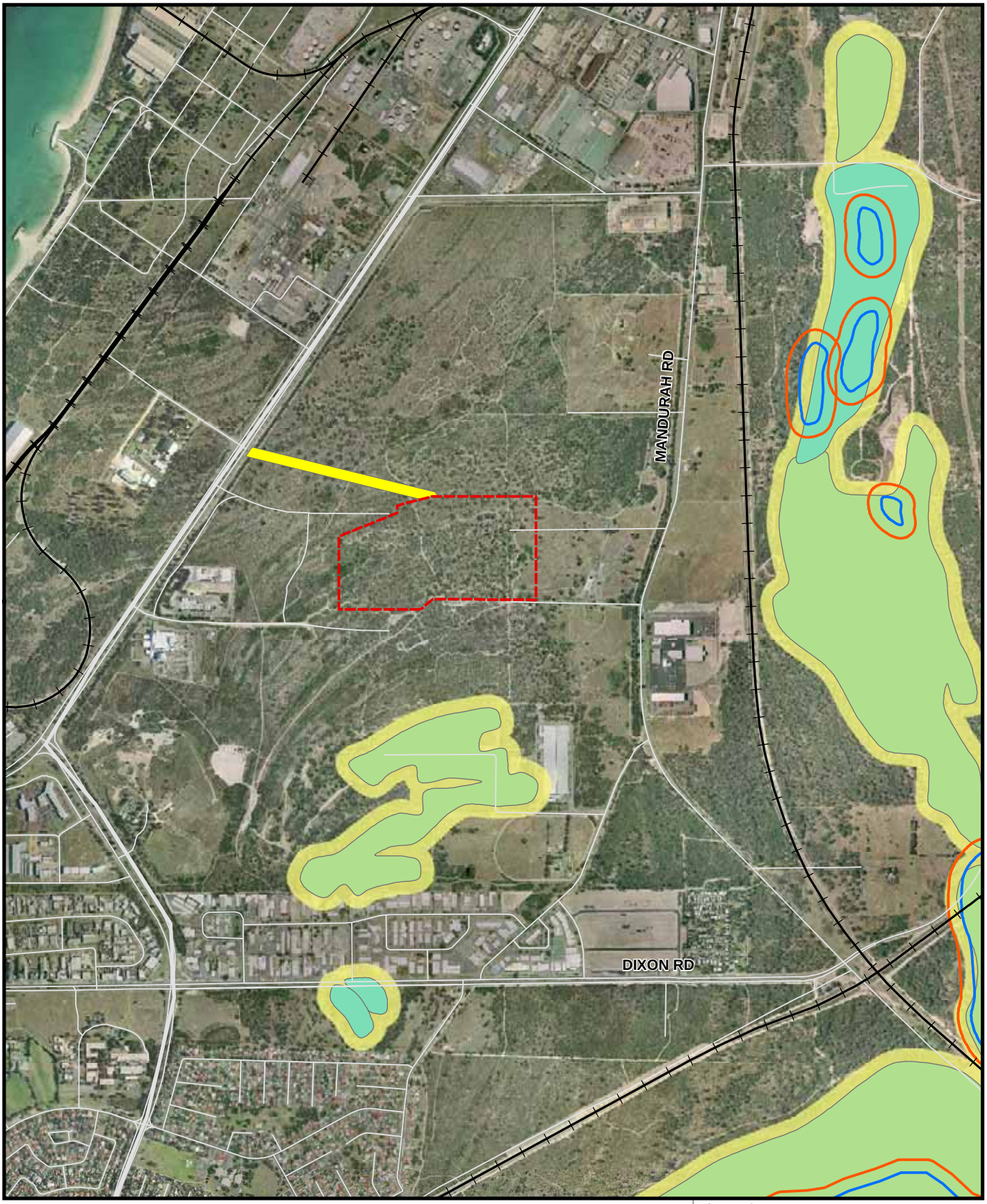

Legend

- Railway
- Main Roads
- Roads
- Site Boundary
- Outlet Corridor
- EPP Lakes
- EPP Lakes 50 Buffer

Geomorphic_Wetlands

- Conservation
- Multiple Use
- Resource Enhancement
- Geomorphic Wetlands 50m Buffer

Client:	Water Corporation	
Project:	East Rockingham WWTP PEMP	
Drawing No: 0083144p_EPA_GIS014_R0.mxd		
Date:	25/02/2011	Drawing size: A4
Drawn by:	DN	Reviewed by: BC
Projection:	GDA 94 MGA Zone 50	
Scale:	Refer to Scale Bar	

N

0 210 420 630m

Figure 2

Wetlands within Proximity to ERWWTP

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Figure **3**

ERWWTP Vegetation Units

Legend

- Site Boundary
- Cadastre

Vegetation Units

- Eg
- Em
- Xp
- Xp (inferred area of TEC 19)
- Threatened Communities Conservation Boundary

Client:	Water Corporation	
Project:	East Rockingham WWTP PEMP	
Drawing No:	0083144p_EPA_GIS008_R0.mxd	
Date:	25/02/2011	Drawing size: A4
Drawn by:	DN	Reviewed by: BC
Source:	-	
Scale:	1:7500 @ A4	

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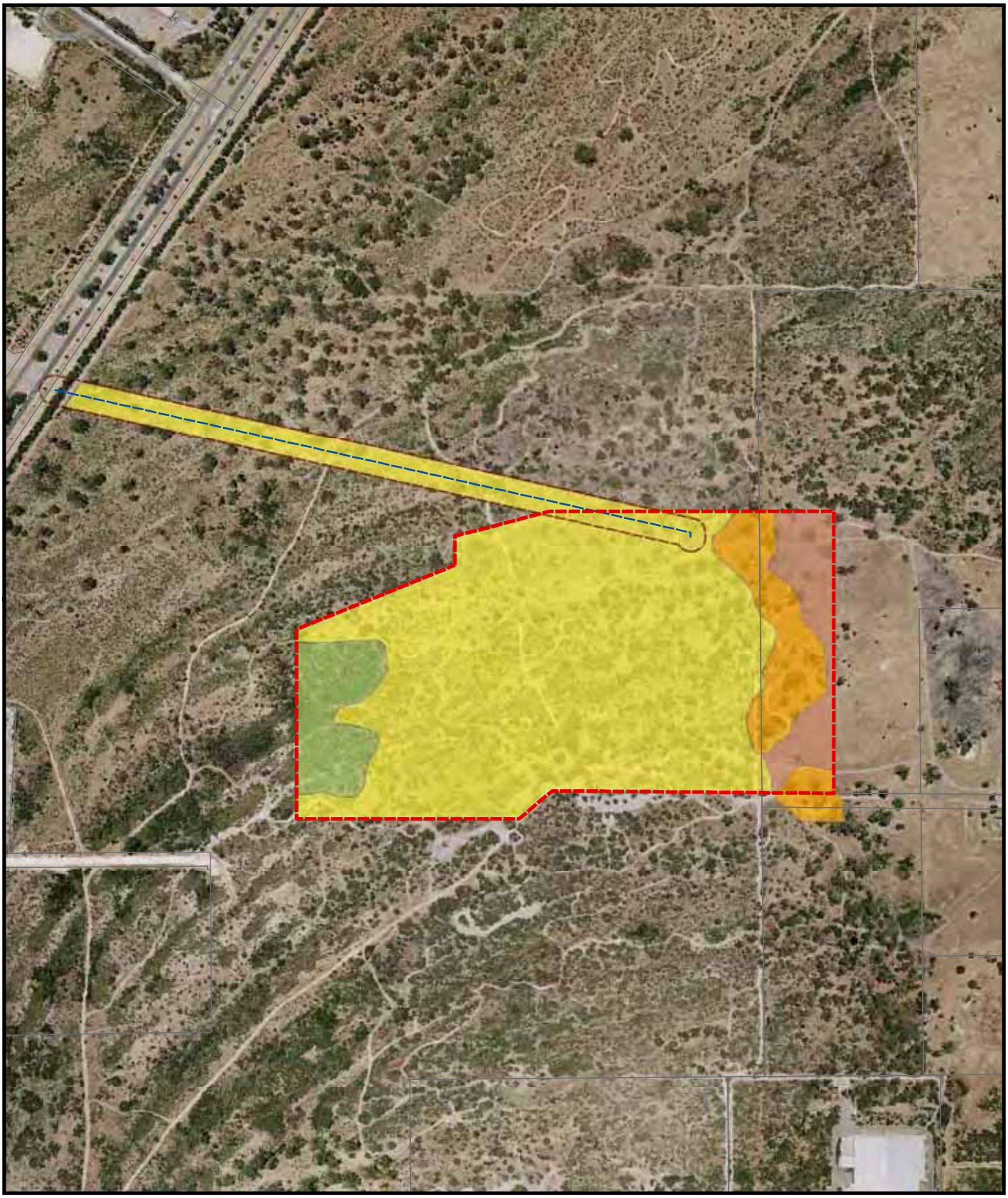

Legend

- Site Boundary
- Cadastral Information
- Hydrography
- Outlet
- Outlet Buffer

Vegetation Condition

- 3/4 - Very Good / Good
- 4 - Good
- 5 - Degraded
- 6 - Completely Degraded

N

0 90 180 270 m

Figure 4

Vegetation Condition

Client:	Water Corporation		
Project:	East Rockingham WWTP PEMP		
Drawing No:	0083144_04_GIS_PEMP	Suffix No:	A0
Date:	25/03/2009	Drawing size:	A4
Drawn by:	DD	Reviewed by:	BC
Source:	Bennett Environmental Consulting Pty Ltd (2009)		
Scale:	1:7500 @ A4		

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Legend

- Site Boundary
- Hydrography
- Outlet
- Outlet Buffer
- Site Detail
- Main Road
- Aboriginal Heritage
- Cadastre

Figure 5

Aboriginal Heritage

Client:	Water Corporation		
Project:	East Rockingham WWTP PEMP		
Drawing No:	0083144_05_GIS_PEMP	Suffix No:	A0
Date:	25/03/2009	Drawing size:	A4
Drawn by:	DD	Reviewed by:	BC
Source:	Department of Indigenous Affairs		
Scale:	1:20 000 @ A4		

N

0 250 500 750m

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Legend

- Site Boundary
- Hydrography
- Main Road
- Cadastral Information
- Heritage Sites
- Outlet
- Outlet Buffer
- Site Detail

Notes:

Hymus House and outbuildings and Bell Cottage could not be located from the information provided by the Heritage Council.

Figure 6

State Register of Heritage Places (East Rockingham)

Client:	Water Corporation		
Project:	East Rockingham WWTP PEMP		
Drawing No:	0083144_06_GIS_PEMP	Suffix No:	A0
Date:	25/03/2009	Drawing size:	A4
Drawn by:	DD	Reviewed by:	BC
Source:	Heritage Council of Western Australia		
Scale:	1:25 000 @ A4		

N

0 250 500 750 m

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Appendix B

Construction Process Register

Appendix not available at draft stage

Appendix C

Local And Regional Emergency Management Officers Contact Directory

Appendix not available at draft stage

Appendix D

Audit Guidelines

Appendix not available at draft stage

Appendix E

Health, Safety and Environment Policy and Statement of Environmental Commitments

Appendix not available at draft stage