

BUNBURY PORT AUTHORITY



DESIGN BRIEF

REALIGNMENT OF PRESTON RIVER



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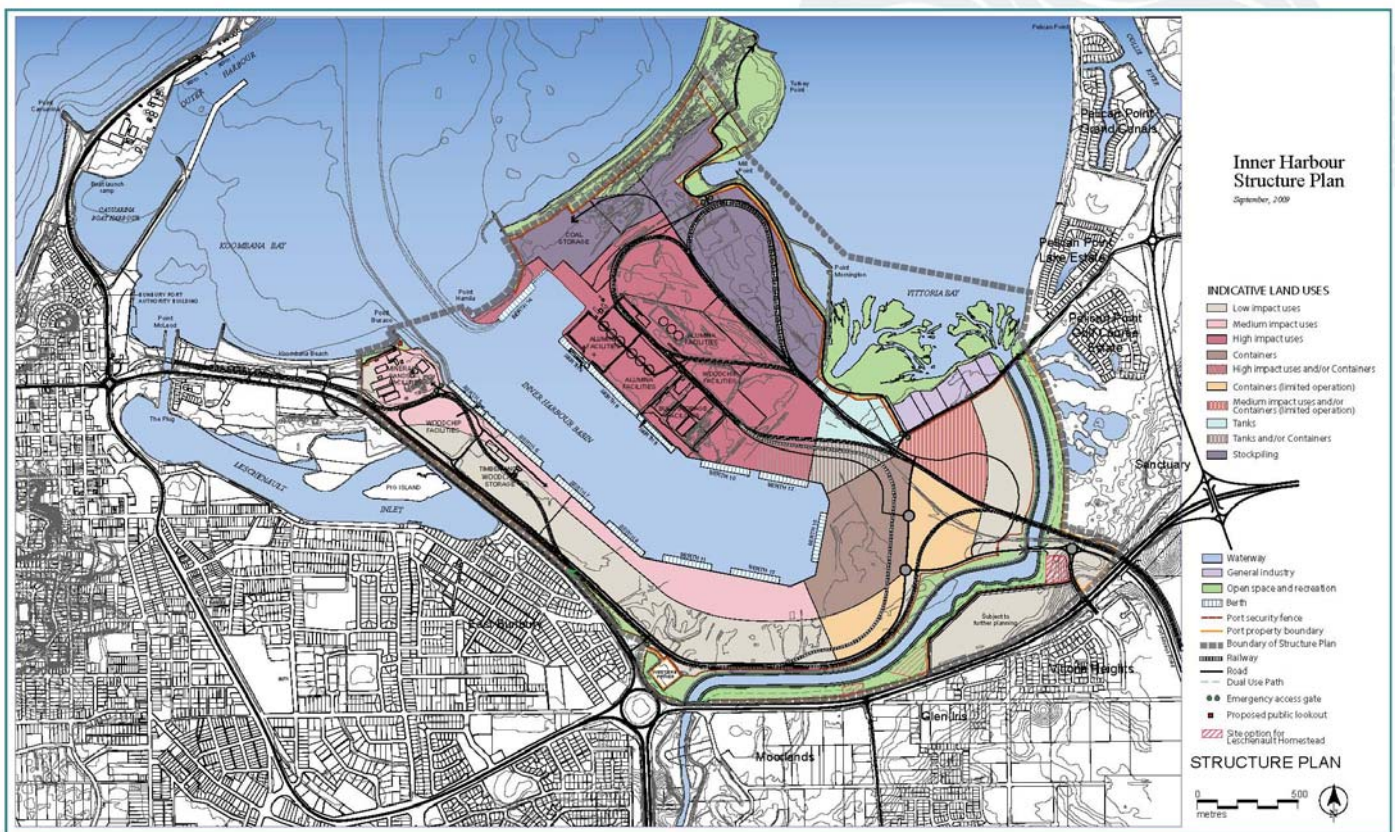
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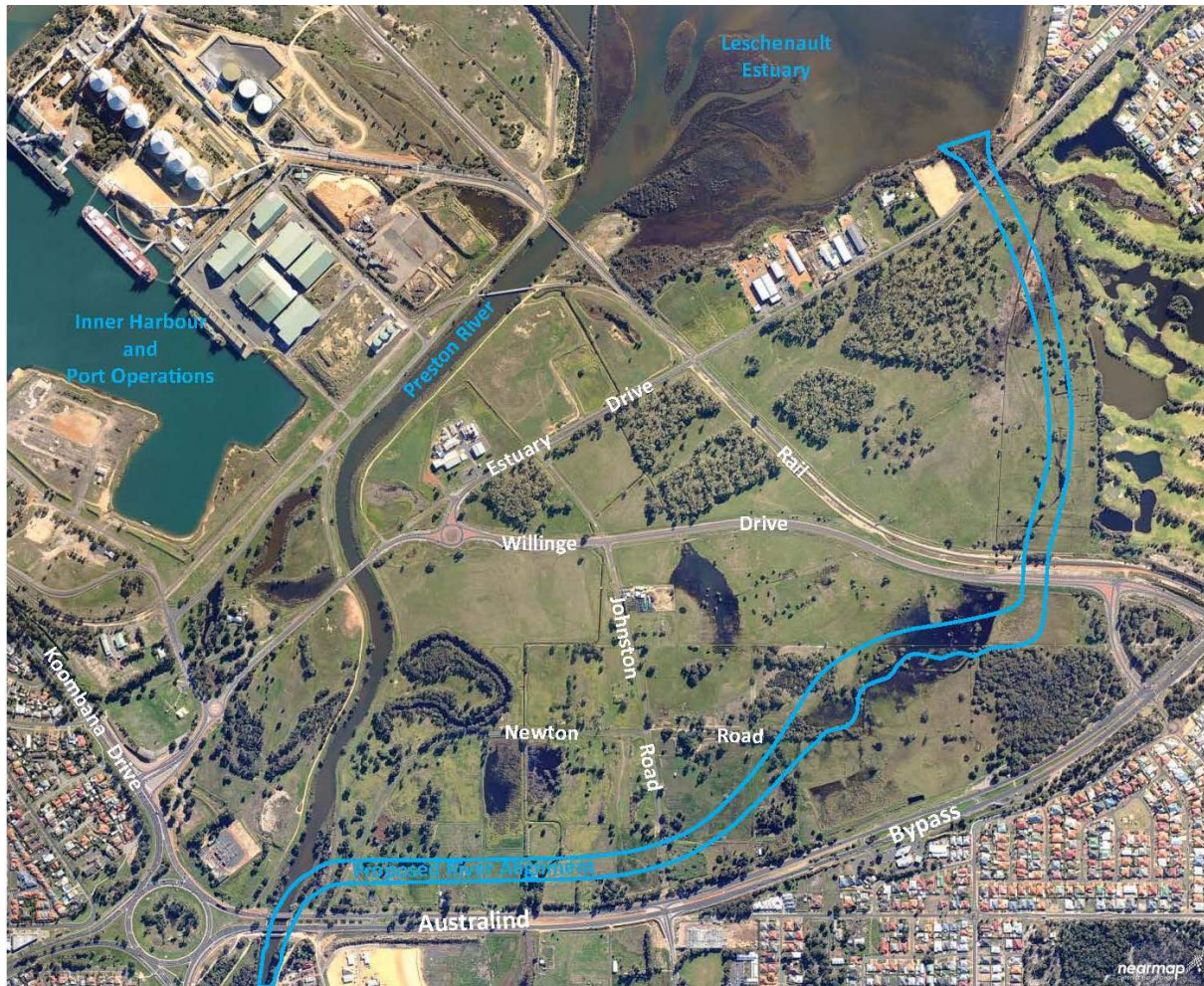
1. INTRODUCTION

1.1. Background

In 2007, the Bunbury Port Authority (BPA) released its draft *Bunbury Port Inner Harbour Structure Plan* (BPA 2007) that laid out the nature and scope of future, expanded Port operations. The Plan was approved by the BPA Board in September 2009. It is a policy document to guide decision making within the Inner harbour and conforms to the strategic planning requirements under the *Port Authorities Act 1999*. The approved Plan document is found on the BPA website under publications. Figure 1 shows the approved Structure Plan map of the inner harbour



One of the significant future expansion works outlined in the approved Structure Plan is the realignment of the lower Preston River to accommodate the expanded Inner Harbour and Port Operations Area. This realignment will be the third realignment that has occurred for the river. The realignment of the 2 km reach of the Preston River, between the Australind Bypass traffic bridge and the Leschenault Estuary, will result in a new river mouth being created approximately 650 m to the east of the present mouth (Figure 2).



The new channel will intersect Estuary Drive, Johnston Road and Newton Road, as well as the rail line that runs to the port and the recently constructed Port Access Road. Bridges will be required where the channel intersects Estuary Drive, the rail line and the new Port Access Road.

After the new channel is satisfactorily stabilised and opened to the estuary for connection to the upstream river, the existing channel will be backfilled to ground level between the new channel and the existing rail bridges. All bridges will need to be removed and the road and rail tracks reinstated prior to use

1.2. Objectives

The design for the river re-alignment needs to achieve the following objectives:

- To best meet the requirements of all statutory stakeholders and ultimate asset owners
- To provide relevant information for completion of the Strategic Public Environmental Review (SPER) where it addresses the realignment.
- To develop a budget estimate to +/- 15%.
- Landscaping and earthworks designs.
- Designs of all road and rail bridges.
- Identify all impacted land titles and easements. These will be used for any land purchases and acquisitions.



- Consultation with MRWA and PTA and acknowledgement within the design with respect to the future transport corridor adjacent to the Australind Bypass.
 - Development of a staging and implementation plan.
 - To ensure that flood protection during the construction phase is maintained.
 - To provide a riverine environment particularly on the Eastern side of the realigned river, that recognises the cultural heritage of aboriginal people and provides access to areas along the diverted river so that cultural pursuits such as fishing can be practiced.
 - To determine a suitable site adjacent to the diverted river for the potential relocation of the Leschenault Homestead and its outbuildings.
 - To maximise the available area of port land to the north and west of the river realignment without compromising the ability of the river to convey a 1:500 year ARI flood event without a breach of the levee banks.
 - To ensure that the diverted river channel can convey a 1:500 year ARI flood event without a breach of the levee banks.
 - To ensure that the realignment of the Preston River does not adversely impact the Leschenault Estuary.
 - To meet, as a minimum the Department of Water (DoW) guiding principles i.e. *“to ensure the proposed development on flood prone areas is acceptable with regard to major river flooding as follows:*
 - ‘(1) Proposed development has adequate flood protection from a 100 year ARI flood (superseded by BPA’s preferred requirement for a 500 year ARI flood) and impacts caused by a **Probable Maximum Precipitation (PMP)** event*
 - (2) Proposed development does not detrimentally impact on the flooding regime of the general area.*
- These guiding principles have significant importance to the project, particularly (2) above, as the proposed works are located at the mouth of the Preston River and they should not detrimentally impact on the flooding regime of the general area. This is particularly important in the possible scenario of the existing Preston River levee bank system failing upstream of the Australind Bypass. The proposed works need to conform with the DoW’s floodplain development strategy for the Preston River floodplain. Further information on this strategy is available from DoW. Also, the issue of potential saltwater intrusion into the superficial groundwater aquifers with a new river channel being constructed also needs to be examined. For more information and further discussion on this matter please contact DoW.*
- Complete a scope of works, a full set of specifications and design drawings response schedules (selection criteria), pricing schedules etc. to be able to tender and construct all anticipated works.

1.3. Previous Studies

A number of previous studies have been undertaken and the majority are listed below and these studies are available to the design Consultant. The SPER team has reviewed these reports and determined the additional environmental investigations required for both the SPER and Preston River re-alignment.

Inner Harbour Structure Plan (TME, 2009)

Bennelongia Environmental Consultants (May 2008) An Assessment of Waterbird Values for the Realignment of Preston River – Leschenault Estuary 2008



Bennelongia Environmental Consultants (December 2008) Report on the Shorebird and Waterbird Values of the Bunbury Inner Harbour

Bennett Environmental Consulting Pty Ltd (2007) Flora and Vegetation Port Expansion – Preston River

Brad Goode and Associates (July 2008) An Aboriginal Heritage Survey of the Bunbury Inner Harbour Redevelopment, Western Australia

Greg Harewood (April 2008) Fauna Assessment Level 1 Bunbury Inner Harbour Proposed Redevelopment

Harley Survey (December 2007) - data sets

KinHill Pty Ltd ((1999) Bunbury Port Development Investigation – Executive Summary

Leschenault Homestead Planning Committee Final report 2007

Parsons Brinkerhoff (August 2008) Acid Sulphate Soil Investigation – Bunbury Port Authority Preston River Channel Realignment

Parsons Brinkerhoff (August 2008) Geotechnical Investigation Report – Bunbury Port Authority Proposed Preston Channel Realignment

Pertola Pty Ltd (January 2008) Bunbury Port Authority Preston River Realignment Calculation Notes

Quartermaine (2005) Report on Preliminary Archaeological Investigation of Aboriginal Sites – Bunbury Port Development

Russel R (November 2007) Predicted Impact of the Diversion of the Preston River on the Delta in the Leschenault (Estuary prepared for Strategen South West Office)

Semeniuk V & C Research Group (2005) Draft Letter Report on the Preston River Modification

SKM (November 2004) Bunbury Flood Management Strategy – prepared for City of Bunbury

SKM (November 2006) Bunbury Inner Harbour Structure Plan – Environmental Appraisal

SKM (September 2007) Bunbury Harbour Extension – Hydraulic Modelling of the Preston River Realignment Final Report

Strategen (July 2009) Preston River Realignment Environmental Scoping Document

SWA366-A1 (EMAIL)

SWA536-AC April Quarterly 2013 (email)

360 Environmental (April 2008) Bunbury Inner Harbour Redevelopment Conservation Category Wetlands

360 Environmental (November 2010 – May 2013) Baseline Characterisation of Preston River Water and Sediment Quality – Quarterly Results Reports

360 Environmental (February 2013) Annual Water and Sediment Quality Report

360 Environmental (May 2013) Preston River Water and Sediment Quality Monitoring – Quarterly Results Report

Thompson McRoberts Edgeloe (TME - September 2009) Bunbury Port Inner Harbour Structure Plan Final

Urban Design Centre –Reclaiming the Preston River- Presentation to Board 2008

Urban Design Centre of Western Australia (UDC – December 2006) Urban Design Structure



2. SCOPE OF WORK

The scope of Consultancy Services to this project shall comprise thorough consultation with relevant stakeholders, all investigations, studies, design, verification and documentation works as required to complete the specified works. The scope shall include all other necessary consultancy works such as Traffic Engineering, Structural Engineering, Electrical Engineering, Acoustics Engineering/Consultancy, Accredited Road Safety Auditor etc. as required. The scope of works includes but is not limited to:

- 1) Project management and liaison; and thorough consultation with relevant stakeholders to determine constraints and requirements to incorporate into the design. (Stakeholders include (DoW), Main Roads Western Australia (MRWA), Public Transport Authority (PTA), Department of Planning (DOP), Western Power (WP), Westnet, Service Authorities, Department of Environmental Regulation (DER, formerly DEC), Department of Aboriginal Affairs (DAA)-through BPA's Representative, City of Bunbury (CoB), Harvey and Dardanup Shires, Department of State Development (DSD), LandCorp, SPER team (for Environmental approvals and conditions, consultation and engagement with Aboriginal Heritage Consultant), Community, and heritage groups, Department of Transport (DOT), Alcoa, Worsley, BPA etc.)
- 2) Regular project team meetings held with the SPER team and BPA.
- 3) Attendance and input at pre-determined public consultations
- 4) Landscaping design, including park facilities, cycle planning and pedestrian management, light vehicle access and parking and lighting;
- 5) Survey, including pre-calculation plans for river, rail and port land requirements;
- 6) Geotechnical investigation, including bridge foundations;
- 7) The Consultant shall design all of the works in accordance with all relevant and applicable standards, guidelines and regulations;
- 8) Traffic management study for road and rail movement alterations for temporary and permanent traffic solutions, noting that public access will be required to the Naval Cadets buildings, Mill Point, Turkey Point, the Cut, and the adjacent beaches and boat ramps and that rail access to the west will be realigned. In addition access corridors through the Port and within the Port need to be defined;
- 9) All bridge designs, including the following:
 - a. Detailed design of Railway Bridge including railway level control and tie ins;
 - b. Detail design of Port Access Road (Willinge Drive) Bridge;
 - c. Detail design of Estuary Drive Bridge;
 - d. Reference design for Australind Bypass Bridge; and
 - e. Removal of the three bridges over the existing Preston River, once backfilled.
- 10) Design of all road works within project boundary/site including drainage design and lighting. This needs to be defined during the consultation stage. This should also include concept design of the ultimate road layout;
- 11) Design of all rail works (temporary and permanent realignment due to having to construct a new rail bridge and realigned rail access corridor to the SW) including signalling and communications;
- 12) Provision for future rail and road access corridor along Australind Bypass;
- 13) Design of all upgrades and flood management control at the existing Australind Bypass;
- 14) Hydrogeology and preliminary groundwater management design for port development with removal of the existing river;



- 15) Drainage strategy and management plan for the proposed port expansion and revised river location;
- 16) Completion of river channel design for realignment of Preston River (including hydrology, siltation and geomorphology, water quality and acid sulphate soil assessment),
- 17) Specification for Backfilling of existing river after realignment, excluding the existing river delta.
- 18) Design and specification of Services relocation
- 19) Engineering design basis report;
- 20) Safety in Design Report;
- 21) Procurement, staging and implementation report;
- 22) Budget estimate to +/- 15%;
- 23) Preparation of a full set of specifications and design drawings to be able to tender and construct all anticipated works (IFC) (i.e. 100% design and documentation at Issued for Tender (IFT) and Issued for Construction (IFC) status including Scope of Works, response schedules (selection criteria), pricing schedules, etc);

All engineering and design work shall be completed and certified by Chartered Professional Engineers of Engineers Australia with appropriate experience and expertise in the class of work being undertaken.

Consultant shall obtain constructability advice from relevant construction contractor specialists, (e.g., methodology options including bulk earthworks and management of acid sulphate soils, bridge foundations, etc.) and use as appropriate in the design.

All design with the exception of landscaping shall be independently verified by an organisation separate from the Consultant. post note 14Aug 2014- this should have been amended to include landscaping refer to post tender discussions item 56 -KW

The BPA has separately appointed, GHD, as the lead environmental Consultant responsible for the preparation of and referral of the Strategic Public Environmental Review (SPER) for the expansion of the Inner Harbour. The re-alignment of the Preston River is a project associated with this expansion plan and therefore it is a requirement that all environmental investigations associated with the re-alignment of the Preston River is aligned with work undertaken as part of the SPER.

The Consultant will be required to consult with the SPER project management team, particularly during the early phases of this tender being awarded. The SPER team will be responsible for the consultation with the EPA and OEPA.

The Consultant will be required to consult with the SPER team to:

- Plan environmental studies for the re-alignment of the Preston River;
- Ensure integration the findings of the Preston River re-alignment environmental studies with the environmental work undertaken as part of the SPER;
- Engage with the Aboriginal Heritage Consultant;
- Ensure co-ordination of all community and stakeholder consultation;
- Provide required environmental reports and management plans that are relevant to the SPER.



2.1. Risk Management

The Consultant will be required to provide monthly risk reports to the BPA based on a risk assessment undertaken by the Consultant and endorsed by the BPA. This monthly report is expected to be tabled at the monthly BPA Board meeting where it may be discussed.

The BPA has high level risk assessment for the SPER and implementation of the IHSP. This will be made available to the successful Consultant for their information and use in preparing their risk assessment.

2.2. Project Management and Liaison

The appointed Consultant will be required to liaise and communicate with the BPA project manager. The costs for the following are included in the Consultant fee:

- Preparation of a detailed Project Execution Plan (PEP) to be submitted for approval by BPA. The PEP shall detail the Consultant's scope of work, execution strategy, quality systems, cost control, communications plan, risk mitigation and HSE strategy;
- Fortnightly meetings with the BPA project manager and SPER Consultant and, if required, occasional meetings in Perth. The Consultant shall be responsible for preparing and submitting minutes of these meetings within 3 working days of their being held identifying critical issues and action items, with nominated responsible parties and timelines for completion. The Risk Register will be reviewed at each meeting;
- Completion of two Value Engineering workshops, one at the 15% and the other at 50% design stage of the works to investigate opportunities to improve the design. The Consultant shall facilitate the workshops detailing, in reports, the outcomes and required actions by who and when. Draft reports shall be submitted to the BPA for review and comment prior to finalisation. A briefing paper for participants shall be provided a minimum of seven (7) days prior to the workshops detailing objectives, scope of the workshop and background drawings and information after review of a draft by the BPA project manager;
- Kick off meeting with the BPA and SPER project manager to confirm objectives of the study, deliverables, liaison protocols and interim submission requirements for input into the SPER and other studies being completed by the BPA;
- Completion of a minimum of Two (2) presentations to the BPA Board on the status of the design and outcomes from the studies.
- Submission of an OH & S plan for site activities. No works shall occur on site, other than inspections in company with BPA representatives, until this has been prepared and submitted to the satisfaction of the BPA. The Consultant shall be responsible for management of all sub consultants and contractors for the works. The OH & S management plan shall identify and comply with the requirements of all owners of assets impacted by the proposed project (e.g. Brookfield Rail, Western Power, Water Corp etc.)

The Consultant shall submit a monthly report to the BPA project manager which, as a minimum, shall include the following:

- An assessment of progress of the various work components;
- Critical issues;
- Scope changes being sought;
- Program status;



- Liaison and outcomes of communications with other BPA contractors and consultants.
- Resource budget and programme for outstanding works up to completion
- Fees claimed and approved to date and
- Variations approved

The Consultant shall also allow for the following in it's fee:

- Three community consultation workshops in Bunbury (organised by BPA) with a minimum of three participants from the Consultant's team and the preparation of presentation material regarding the scope of works and its execution and expected outcomes and preparation of minutes of the workshops.

2.2.1. Program and Project Communication/Engagement Plan and Progress Reports

The Consultant will be required to prepare a detailed program for the works and a Project Stakeholder Communication and Engagement Plan upon appointment and submit to the Project Manager for review and agreement. The Program shall be in Microsoft Project or approved equivalent project management software. The program shall highlight dates for workshops, key milestones for packages and completion dates. It will also include key timelines for interfacing with the BPA SPER team and key stakeholders.

The Consultant shall:

- report progress against program in the monthly, or as required report issued to the BPA
- provide status update reports, copies of minutes and other documentation associated with the Project
- provide a copy of the Project Communication and Engagement Plan and activities completed
- at the completion of the Project, provide a summary report on outcomes, environmental and/or social impacts and solutions associated with the Project
- provide to the BPA, progress reports on a quarterly basis (as at 30 September, 31 December, 31 March and 30 June), or as determined from time to time by the BPA, until the completion of the Project,
- provide an annual report on the Project based on a financial year ending 30 June
- provide a report (the Acquittal) at the completion of the Project or the conclusion of the Agreement (whichever occurs first),

The information listed below, is indicative of the minimum reporting information requested by the BPA and may be properly varied from time to time by the BPA:

- Project outputs/outcomes (Key Performance Indicators).
- Milestones/achievements target for the reporting period.
- Milestones/actual achievements for the reporting period.
- Explanation of variances between target and actual achievements, including impediments encountered, action taken to overcome these and potential future impediments if any.
- Summary of progress payments to date compared with planned payments and overall lump sum fee



2.2.2. Stakeholder Approvals and Liaison

The consultation programme for the Preston River realignment will be planned with the SPER team to enable consistency in reporting and minimise the risk of consultation burnout or misaligned messages.

The Consultant shall ensure the Main Stakeholders are fully engaged in establishing the Scope document and the Consultant will be required to liaise with relevant stakeholders and asset owners to determine constraints and requirements to incorporate into the design and to obtain any information for any related works which may be deemed to be included as part of the Consultants scope of work.

The Consultant shall establish regular meetings with the Main Stakeholders (not less than three (3) times per year) to report on Project Milestones and progress

The Consultant shall provide a minimum of 48 hours' notice to the BPA Project Manager for any meetings with third parties to allow the opportunity to attend.

A communication log and copies of all correspondence and approvals and conditions requirements shall be provided at the end of the study as part of the Engineering Design Report. Any critical issues that are raised shall be brought to the attention of the BPA as soon as the Consultant is aware of them.

The Consultant will be required to engage with the BPA's appointed Aboriginal Heritage Consultant. The Consultant will be required to liaise with the SPER Project Manager regarding all Aboriginal Heritage Consultation. The Tenderer is required to include the costs for liaising with the BPA's Aboriginal Heritage consultant in its Tender.

2.3. Basis of Design Report

Upon engagement the Consultant shall prepare a Basis of Design for the works that shall be submitted for approval by BPA prior to 15% design milestone.. The Basis of Design shall include but not be limited to the following for the design elements:

- Functional requirements;
- The design objectives the design shall meet;
- Proposed design standards that it shall comply with;
- Design loadings and performance criteria to be used in the design;
- Design life and tolerances the design shall cater for;
- Design input references that will be used;
- Serviceability limits that the element will cater for;
- Identified stakeholders and asset owners responsible for approvals;
- Any other relevant information;

The Basis of Design shall be updated by revision as design progresses and finalised during the 100% design phase.

The Basis of Design Report shall be submitted to the BPA Project Manager for review within four weeks of engagement.



2.4. Landscaping

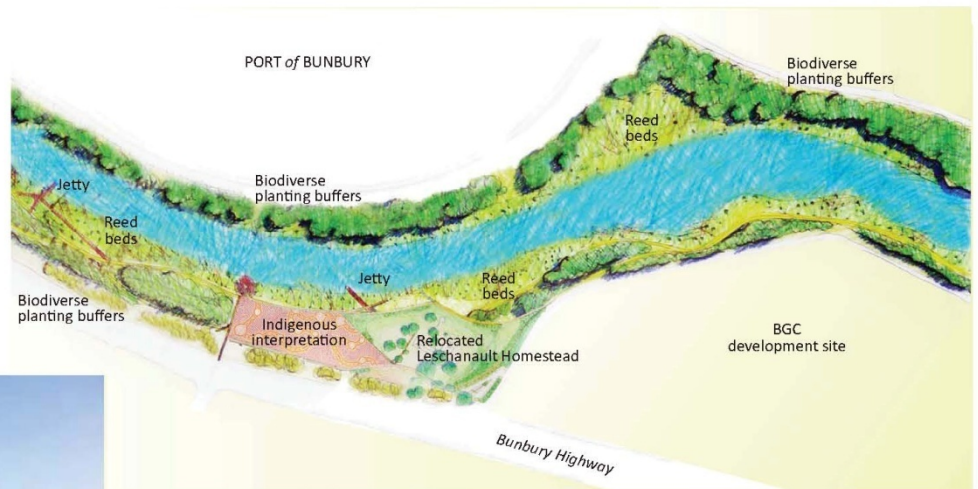
The landscaping design and documentation shall be developed to the 100% stage of design to enable tendering of this part of the works in conjunction with the earthworks for river channel realignment, bridge, rail and road works.

A draft Conceptual Landscaping methodology has been prepared (refer images at Figure 3), which divides the proposed realignment into separate reaches (zones) and describes the alignment, design objectives and constraints, and the landscaping values of each. Broadly, the immediate Port Operations side to the west of the new alignment will be managed for conservation and screening, based on the restricted access to that area, while the eastern levee to the Port boundary will be managed for public access and recreation. These broad strategies are described further below.

The realigned Preston River eastern levee will be the main pedestrian and bike commuter route between Bunbury and Australind. It will also need to consider access for river recreational vehicles, minor boating access and jetty/mooring facilities within the river.

The revised Preston River route will be the main pedestrian and bike commuter route between Bunbury and Australind. It will also need to consider river recreational vehicles, minor boating access and mooring facilities and related access and parking space for light vehicles.





Source: UDC, 2008

2.4.1. Objectives

The main outcome from the landscaping brief is to provide a set of design drawings and specifications for the ultimate landscaping works for the realigned river. This shall include identification of relevant statutory and asset owner approvals.

The objectives of the landscaping scope will include:

- a) Public safety;
- b) Site access for maintenance and emergency vehicles along the river;
- c) Local Plant species selection (low maintenance varieties) and locations for planting;
- d) Design of pedestrian and bike access. This will be the main pedestrian and bike access between Bunbury and Australind. It will need to cater for both recreational cyclists/ pedestrian and higher speed cycling commuters in a safe manner;
- e) Irrigation design for initial establishment and long term operation. This shall include approvals for sources of water and associated infrastructure that will be required;
- f) Hard landscaping/recreational areas;
- g) Management of weeds and introduced species;
- h) Protection and supplementation of the existing biodiversity;
- i) Fire prevention;
- j) Integration of the passive biological and soil amelioration zones for improvement of the water quality arising from the engineering design;



- k) Integration of the scour protection and flood management objectives from the Engineering design;
- l) Mooring facilities and recreational boat needs;
- m) Breach failure mechanism in case the channel does overtop;
- n) Public parking and access requirements;
- o) Operations and maintenance. The Consultant shall document and provide a budget estimate for all ongoing operations and maintenance.
- p) Recommendation of future management strategy by CoB (ownership to be confirmed)
- q) Signage strategy.

Each section of the river Public Open Space (POS) site has specific management issues and will require strategies which are summarised below.

2.4.2. Port Operations (west) levee

The Port Operations area, which will include the storage and handling of hazardous materials, will eventually be filled to a minimum height of 3.6m AHD to match the elevation of existing berths. This sets the height of the Port Operations levee as the area will be filled over time. This will be about 0.5 m higher than the levee at the new channel mouth (i.e. the purpose of the levee along this reach is 'retention') and about 1.5 m lower than the levee height near the Australind Bypass traffic bridge (i.e. the purpose of the levee along this reach is 'protection'). In either case, the levee at low tide will represent a 3 to 5 m high structure, which is expected to be quite significant from the viewpoint of users of the eastern bank and surrounding residential and public spaces.

In consideration of these and other points, the Port Operations levee bank and river side overall should ideally:

- be designed and constructed to offer the maximum protection to the Port Operations area and the materials contained therein;
- maximise opportunities for the screening of visual and other port-related impacts;
- maximise opportunities for the establishment and maintenance of important ecological values and functions within the river, on the basis that the Port Operations bank will not be accessible to the public;
- include treatments to minimise its visual impact on the users/residents of the eastern bank;
- include biological and soil treatment zones;
- be low maintenance;
- discourage public access to Port Operations from the river;
- provide access for maintenance;
- give due recognition to the on-going commercial cost of its footprint on Port Operations land

The Port Operations side of the realignment consists of several distinct reaches.



2.4.3. Public access (east) levee and bank

The levee bank on the southern and eastern side of the realigned river will be publicly accessible as Regional Open Space (ROS) in the Greater Bunbury Regional Scheme, to compensate for loss of ROS surrounding the existing alignment. The levee will provide a (non-vehicular) connection between the Perth Bunbury Highway (Glen Iris) and Estuary Drive (Pelican Point). It is reasonable to assume that the broad community will have a range of expectations regarding the design elements of the eastern levee, as it would for any public area.

- **Existing use of current river foreshore**

The public open space along the current channel has minimal aesthetic value and only a few, quite specific, recreational values, namely fishing, walking and dog exercise. The water in the river is essentially not used by the public. The public open space does not connect to any public pathways or points of particular interest and its nature does not encourage use by the public.

- **Opportunities with the new alignment**

The new alignment will bring the Preston River much closer to the public eye, particularly for motor vehicles travelling along the Perth-Bunbury Highway, which is the major entry to Bunbury, and users of the Sanctuary Golf Club and Resort. These two new 'audiences' will both necessitate and appreciate an outlook that adds value to their experience of the area, including Bunbury as a whole.

In regards to environmental aspects, an important objective of the realignment project is to increase the ecological values and functions of the river and surrounds compared to the existing situation. While the design of both levee banks will be important in this regard, the eastern levee has the greatest potential for developing a variety of environments of benefit to the public.

In consideration of the above and in addition to its flood protection role, the public access levee bank should ideally:

- have a risk to public safety that is As Low As Reasonably Practicable;
- be designed and constructed in a manner that satisfies the broad expectations of the community for a publicly accessible, managed natural like areas;
- be a stable landform that is resistant to erosion and promotes environmental and social interaction with the waterway;
- include a range of environments that are self-maintaining as far as possible;
- connect to local pathways to provide good public access to and from the levee;

The design concepts for the specific reaches of the public access levee bank are also described in the Inner Harbour Structure Plan.

2.4.4. Deliverables

The Landscaping brief will be required to provide information for the community consultation team. The deliverables will include the following:

- Provision of 3 x A0 colour prints and electronic files of the layout and development plan to assist community consultation presentations. This shall be provided at the 30% and 85% review and final design submission;
- Delivery of a review design at the 30% and 85% design stage;



- Delivery of designs and technical specification for tender;
- Identify and unless advised otherwise by the BPA, provide all statutory and stakeholders approvals and conditions;

2.5. Survey

One of the key objectives is to deliver a final pre-calculation plan to define final reserve and title boundaries for the study which will be used to define Land Tenure and purchase. To achieve this adequate engineering design will need to be completed to define all batters, levees and rail and road corridor requirements for the river realignment and final asset locations.

The DoW have indicated that aerial survey to 0.15 m contours has been completed and when asked can supply information for modelling and design (to be confirmed by the Consultant). Detailed site survey will be required to confirm road and rail tie in grades and locations.

The Consultant will be required to provide all survey that has been used as a basis of the design in the engineering design report in electronic format. For relevant sites, surveys shall be completed to industry standard specifications.

2.6. Traffic Management

This brief defines the scope of the Consultant's traffic management services required for the Preston River Realignment.

The Consultant will be responsible for the concept design and detailed design of the Site. It will also be responsible for preparing the necessary reports for submission to local and state government authorities, where this is required for approvals and relates to the traffic discipline.

With consideration to the objectives outlined above, the following sections include but are not limited to the Consultant's scope of services as they relate to traffic management.

2.6.1. Objectives

The objectives of the Consultant's traffic engineer shall include but not be limited to:

- a) Assist the Consultant's design team in preparing the concept and detailed designs to facilitate safe and efficient vehicular, pedestrian, and cyclist movements both within the site and at the access/egress points of the site.
- b) Undertake a detailed design stage Road Safety Audit and work with the Consultant's design team to ensure resulting recommendations are included in the Consultant's final design.
- c) Prepare a Transport Assessment, particularly for changes in bulk transport movements in and out of the port for current and future requirements.
- d) Prepare a Parking Management Plan.
- e) Identify a Construction Traffic Management risks and issues register that needs to be implemented during the construction period of the works.
- f) Liaise with and obtain approvals from the CoB and MRWA for changes to the road network and/or intersections proposed as part of the works.



2.6.2. Design input

The Consultant's traffic engineer shall provide advice to the Consultant's design team in finalising the design and development of the Site. The Consultant will be required to investigate each issue and identify a suitable solution for inclusion in the design.

The following items are required to be addressed:

- Calculate the required number of car bays for the Site and agree this figure with the City of Bunbury. Review the Masterplan and identify if the required number of car bays have been provided. If a shortfall exists, detail level of shortfall and provide recommendations on where the additional car bays could be located.
- With consideration to the different users of the site and their parking requirements, review the location of parking facilities within the site as shown on the existing Masterplan for the river realignment. Provide comment on the suitability of these locations and recommendations for improvement.
- Identify a suitable location(s) for bicycle parking facilities. Recommend the number and type of parking facilities to be provided, with consideration to the needs of different users of the site.
- On the Masterplan, identify locations suitable for overflow parking that may be required for occasional 'peak' events.
- Identify suitable speed control measures and where these should be located within the site.
- Recommend a signage strategy for both directional and regulatory signage. This shall be in the form of indicative signage locations marked on a plan with a description of the sign's content.
- In conjunction with the Consultant's landscape architect, identify on the site plan a suitable network of shared paths and footpaths to cater for pedestrian and cyclist movements, and how these will connect to the path network external to the site.
- Identify suitable crossing points for pedestrians (both across roadways, bridges and across car parking areas) and recommend crossing treatments.
- If sufficient data is not available from other sources (.e.g., BPA, CoB, DoT & DoP), undertake traffic count data collection. If it is required, payment for the traffic count data collection will be made under the relevant Provisional Sum.

Review the site layout and identify conflict points for and between different user groups (motorised vehicles, cyclists, pedestrians) and design suitable treatments at these points.

Undertake capacity analysis of the main intersections within the site for the peak period(s) of the Site. These intersections are envisaged to be the entrance point into the main recreation centre car park and the intersection located along the existing entrance road into the site. The Level of Service as defined in AUSTRROADS should generally be D or better. Where this is not occurring, provide the Consultant's design team with recommended improvements that would increase the Level of Service.

2.6.3. Road Safety Audit (RSA)

The Consultant is responsible for organising an independent road safety audit to be undertaken at the detailed design stage.

The road safety audit will be undertaken for the following elements of the design:

- Proposed Site internal roadways and intersections including rail crossings



- Proposed Site vehicle parking areas
- Proposed Site crossovers
- Roadways and intersections external to the site (if design changes are proposed as part of the Site works)
- Footpaths cycle ways and dual use pathways

The road safety audit will be undertaken at the detailed design stage (ie after completion of detailed design) but prior to preparation of construction documents.

The Consultant's design team will provide to the Consultant's traffic engineer detailed drawings and report which cover not only the general road layout but also intersection details, signing, line marking, drainage, lighting, fencing, landscaping, roadside objects, barriers etc.

The road safety audit will be a formal examination of the project, in which an independent, qualified team appointed by the Consultant, reports on the project's crash potential and safety performance. The outcome of the audit will be a Road Safety Audit Report that identifies any road safety deficiencies and makes recommendations to remove or reduce the deficiencies. The Consultant shall be responsible for incorporating the recommendations and conclusions of the RSA into the final design.

It is expected the following issues will be considered within the audit (list is indicative and is not exhaustive):

- Standards used for design and any departures from these standards
- Signing, line marking, and landscape plans, and how these affect traffic movements
- Swept paths of large vehicles – can vehicles turn safely?
- Visibility at conflict points
- How the detailed elements interact with each other
- Details of connections to existing roadways (both internal and external), especially consistency of design elements
- Speeds within the site and speed control measures
- Parking provision and potential for overflow onto roadways
- Footpath locations near traffic and pedestrian crossing facilities

The Consultant shall provide a RSA report for the completed final design.

2.6.4. Transport Assessment

The Consultant shall prepare a Transport Assessment for the Site. The intent of the transport assessment shall be to clearly demonstrate that the development:

- Provides safe and efficient access and egress for all modes
- Is well integrated with surrounding land uses
- Will not adversely impact on the surrounding land uses
- Will not adversely impact on the surrounding transport networks and the users of those networks
- Is consistent with the transportation aspects of the town / structure planning for the area



The Transport Assessment should be in accordance with the Western Australian Planning Commission's *Transport Assessment Guidelines for Developments* (2006). This will require the Consultant to include the following information:

- Development proposal
- Existing situation
- Changes to surrounding transport networks
- Integration with surrounding area including within the Port lands
- Assessment years and time periods for assessment
- Development generation and distribution
- Parking
- Committed and future developments and other transport proposals
- Design traffic flows
- Analysis of development accesses
- Impact on surrounding roads
- Impact on intersections
- Impact on neighbouring areas
- Traffic noise and vibration
- Road safety
- Public transport access
- Pedestrian access and amenity
- Cyclist access and amenity
- Analysis of cyclist / pedestrian networks

The assessment should be in a form suitable for submission to local and state government authorities.

2.6.5. Parking Management Plan

The Consultant shall prepare a Parking Management Plan for the proposed river realignment recreational and maintenance requirements.

The Plan should outline in detail how parking for the development will be managed and identify practical strategies to minimise parking conflicts between different users. It should include:

- An outline of the land uses and the responsible party(s) for the day to day management of the parking;
- The number of parking spaces;
- The availability of public transport, pedestrian facilities, and cyclist facilities serving the Site;
- Strategies that will be employed to manage parking on site.

The plan should be in a form suitable for submission to local and state government authorities.



2.6.6. Deliverables

The Consultant's traffic engineer's deliverables include but are not limited to:

Table 1 Traffic Consultant Deliverables

Item	Deliverable	Format
Design input	Advice to Consultant's design team on traffic related issues	Verbal and/or written advice, with supporting sketches if required
Road safety audit	Road Safety Audit Report – Draft Road Safety Audit Report – Final	MRWA / Council
Transport assessment	Transport Assessment Report – Draft Transport Assessment Report – Final	MRWA / Council
Parking management plan	MRWA / Council	MRWA / Council

Where a draft and final report are required, the Consultant shall agree with the BPA Project Manager:

- The stakeholders who are required to review the draft report
- The timeframe for review of the draft report

Comments on the draft report are to be resolved prior to issue of the final RSA report.

2.7. Bridge Works

There are six bridges that will be affected by and one bridge potentially affected by the proposed river realignment. These are –

- Two existing rail bridges over the existing Preston River to be taken out of service;
- One existing road bridge over the existing Preston River (Estuary Drive) to be taken out of service;
- Two new road bridges over the re-aligned Preston River to be constructed (Estuary Drive and Willinge Drive);
- One new rail bridge over the re-aligned Preston River to be constructed; and
- One existing road bridge over the existing Preston River (Australind bypass) to be retained but potentially impacted by the proposed Preston River re-alignment.

The functional requirements of the four bridges required to be in service after the proposed Preston River re-alignment are noted in Table 2. Preference is to design the Preston channel so that no upgrade to Australind Bypass bridge is required. However, if this is not possible then upgrade to facilitate flood flows may be required.

The Consultant shall prepare a reference design for approval for the four bridges and full IFC designs for Estuary Drive, Port Road Access (Willinge Drive) and Rail bridges. The Consultant's reference and IFC designs will also be used to define the minimum river clearance requirements, boating capabilities and land requirements for the bridges and road/railway alignments.



Table 2 Bridge Functional Requirements

	Australind Bypass	Estuary Drive	Rail Bridge	Port Road Access (Willinge Drive)
Design Life	MRWA Standard (100 Years)	MRWA Standard (100 Years)	100 Years	MRWA Standard (100 Years)
Proposed Works	Preference is to design channel so that no upgrade to this bridge is required. However, if this is not possible then Upgrade to facilitate flood flows	New	New	New
Facility for Future Duplication	To be confirmed with MRWA for flood modelling purposes only.	No	Yes	Yes
Pedestrian/ cycle access at river	No – existing	Required	Required	Required
Pedestrian/ Cycle Access at Deck	N/a – existing	Yes – one side	To Westnet rail maintenance requirements	Yes – one side
Deck Traffic Requirements	N/a existing	Two lanes – alternate access for heavy movements to port	Single Track	Two lanes – main access for port including heavy platform vehicles
Recreational boat movements	N/a existing	Required – single small boat movement	Required – single small boat movement	Required – single small boat movement

Notes: MRWA= Main Roads of Western Australia

The BPA is a working port. Disruption to freight movements for tie-ins shall be limited to a maximum of 24 hours, and must be allowed for in the design. A key objective for all bridges will be to maximise the clearance height for recreational boats.

For the rail bridge, this will need to take into account that:

- The clearance height will be limited by the rail tie in levels and vertical grades;
- Minimising the distance between the top of rail and bridge soffit or provision of a slot.

The Consultant will be required to prepare a reference design that is suitable for preparing a budget estimate and approvals with relevant authorities prior to commencing full detail design of bridges. It is noted the designs will need to cater for the saline environment and potentially acid sulphate soils. Design standards shall be to the requirements of the asset owner. Where these are not available the Main Roads Standards shall apply.

The bridge design works include but are not limited to:

- a) Detailed horizontal and vertical design for rail and road surfaces. This shall be completed in MX or 12 D terrain modelling software;
- b) Geotechnical investigation and design for bridge abutments and piers;
- c) Definition of the minimum river vertical and horizontal clearances for floodway performance;



- d) Engineering design of the substructure and superstructure to achieve scour protection, recreational boat clearance, and cater for geotechnical conditions.
- e) Piped drainage design (on the superstructure for a 1:10 Year storm event of 5 minutes duration and a 1:100 year storm event flow path to accommodate major storm events).
- f) Street lighting to comply with AS1158 and WP standards;
- g) Facility for the provision of existing and future services and communication requirements;
- h) Shared path and footpath network designs. The pedestrian and cycle facilities shall be designed to integrate with the existing networks abutting the works.
- i) Bridge design shall include provision of pedestrians and cyclist access to pass under each of the three new bridges at the eastern abutments.
- j) Layouts and proposed ties ins for future bridge duplications shall be shown on the plans;
- k) Liaison with all Service Utility Providers in relation to existing service locations and relocations/adjustments, and future service locations as applicable to this project including quotations from service utility providers for any required relocation/adjustment works.
- l) Identify future proposed services that may impact the ultimate design.
- m) Completion of a durability analysis. This will assess and recommend corrosion protection design for the site conditions to allow completion of the budget estimate;
- n) Approvals from relevant stakeholders and asset owners;
- o) Operations and maintenance. The Consultant shall document and provide a budget estimate for all ongoing operations and maintenance.
- p) Detailed design and preparation of tender drawings and specifications (at AFC status) for the new bridges, including demolition of existing bridges.
- q) Preparation of detailed Bill of Quantities and a detailed cost estimate verified by an experienced Quantity Surveyor.

With respect to item (p), Consultant shall provide detail planning of shutdown and scoping of the rail bridge removal. Staged GA's must be provided to add clarity to the scope.

2.8. Rail Design

The Consultant must design an operational railway and associated signals, control systems and communications for the existing railway on existing or new alignment that achieves the safety, environmental, operational and technical requirements of the owner and operator.

The design must be in accordance with the requirements of the Railway Code of Practice and must satisfy the requirements of AS 4292.1 Railway Safety Management – General and Interstate Requirements. For any issues not covered by the Railway Code of Practice, the Consultant's design must be in accordance with the requirements of the RISSB Code of Practice or other relevant standards and codes, including the Office of Rail Safety.

Designs shall be provided for:-

- 1) Any temporary realignment of existing railway line to accommodate construction of new rail bridge and demolition of existing rail bridge.
- 2) Permanent final alignment of railway line.

The Consultant shall agree all technical and rail design parameters with the rail owner and operator.



The design must provide a transition between the existing and new track structures.

The BPA harbour and surrounds is a working port. Disruption to freight movements for tie-ins shall be limited to a maximum of 24 hours and must be allowed for in the design.

The Consultant must undertake risk assessment of the design for the Railway related works in accordance with the requirements of AS 4292. The Consultant must include the risk assessment outcomes in the design documentation. The Consultant's risk assessment must include a risk assessment workshop to which Bunbury Port Authority representative must be invited.

The design works include but are not limited to:

- a) Detailed horizontal and vertical design for rail. This shall be completed in MX or 12 D terrain modelling software;
- b) Detailed design of rail tie-ins.
- c) Detailed rail cross-section plans at maximum 10m intervals, including typical cross sections.
- d) Design of boom gates.
- e) Geotechnical investigation;
- f) Drainage design.
- g) Signalling and communication design;
- h) Approvals from relevant stakeholders and asset owners;
- i) Operations and maintenance. The Consultant shall document and provide a budget estimate for all ongoing operations and maintenance.
- j) Preparation of detailed tender drawings (IFC drawings) and specifications.
- k) Preparation of detailed Bill of Quantities and a detailed cost estimate verified by an experienced Quantity Surveyor.

The signalling and communications design includes the development of 15% design for signalling and communications and the provision of a Performance Specification. The design and Performance Specification shall be suitable for the Consultant's cost estimating purposes. It shall also be suitable for subsequent quotation, detail design, supply and installation by an approved specialist rail signalling and communications supplier as part of the construction contract.

The Consultant must conduct design workshops with BPA, Main Roads, rail owner and rail operator and any other advisers nominated by BPA's representative, firstly at the start of railway design and then at 15% and 85% design stages, and address all comments made.

Drawings for temporary rail alignment (if required) must include foundation details and be supplemented with specifications.

2.9. Road Works Design

The Consultant must design all roadworks required, which shall meet MRWA design requirements and obtain Main Roads sign off of the final design where the road will form part of the Main Roads network.

The design works include but are not limited to:

- a) Detailed horizontal and vertical design for road surfaces. This shall be completed in MX or 12 D terrain modelling software;



- b) Detailed design of all side road and intersections.
- c) Detailed road cross-section plans at maximum 10m intervals, including typical cross sections.
- d) Geotechnical investigation and design for pavement requirements;
- e) Street lighting to comply with AS1158 and WP standards;
- f) Facility for the provision of existing and future services and communication requirements;
- g) Shared path and footpath network designs. The pedestrian and cycle facilities shall be designed to integrate with the existing networks abutting the works.
- h) Locate all existing underground and aerial services including drainage network. Details of existing services are to be shown on the plans and longitudinal/section plans.
- i) Design of relocation or protection of services.
- j) Liaison with all Service Utility Providers in relation to existing service locations and relocations/adjustments, and future service locations as applicable to this project including quotations from service utility providers for any required relocation/adjustment works.
- k) Identify future proposed services that may impact the ultimate design.
- l) Completion of a durability analysis. This will assess and recommend corrosion protection design for the site conditions to allow completion of the budget estimate;
- m) Approvals from relevant stakeholders and asset owners;
- n) Operations and maintenance. The Consultant shall document and provide a budget estimate for all ongoing operations and maintenance.
- o) Preparation of detailed tender drawings (IFC drawings) and specifications.
- p) Preparation of detailed Bill of Quantities and a detailed cost estimate verified by an experienced Quantity Surveyor.

Design includes all new, modifications and improvements necessary to road network including intersections, rail crossings and access roads.

The Consultant must conduct design workshops with BPA, Main Roads, rail owner and rail operator and any other advisers nominated by BPA's representative, firstly at the start of road design and then at 15% and 85% design stages, and address all comments made.

The roadworks design shall include all shared paths and footpaths, pavements, services, road markings, signage, drainage, lighting and other associated works.

2.10. Services Design

The Consultant must locate all existing services and ensure that these services are accommodated in the Consultant's design of the project whether by retention as is, protection, relocation, redesign or replacement. Such accommodation shall meet Service Authority design requirements and achieve Service Authority sign off of the final design.

The services design works include but are not limited to:

- a) Locate all existing underground and aerial services including drainage network. If it is required to provide additional verification of existing buried services by a specialist provider this shall be undertaken under the relevant Provisional Sum. Details of existing services are to be shown on the plans and longitudinal/section plans.



- b) The Consultant must develop necessary scopes to all services works with appropriate GA drawings of services relocations after appropriate consultation and agreement with Service Authorities. This will include budgetary estimates from Service Authorities and design and construct quotations if required. This largely constitutes preliminary or 15% design.
- c) Detailed design of relocation or protection of existing services, and/or design of new or replacement services.
- d) Where the Service Authority requires the design to be carried out by itself or a nominated third party, such design shall be co-ordinated and managed by the Consultant.
- e) The actual service design carried out by the Service Authority and/or its nominated designer (but not the management of the design by the Consultant) shall be paid for under the Provisional Sum provisions of the Contract.
- f) The Consultant shall manage the process, ensure clashes do not occur and ensure bridge structures can accommodate services when required
- g) Liaison with all Service Utility Providers in relation to existing service locations and relocations/adjustments, and future service locations as applicable to this project including quotations from service utility providers for any required relocation/adjustment works.
- h) Identify future proposed services that may impact the ultimate design.

2.11. Hydrogeology

The proposed port development will involve infilling a large area, including the current river alignment. The groundwater table is near or at surface for the surrounding area. Both the current river and proposed river will have infiltration and exfiltration interaction with the groundwater table. The Consultant will be required to prepare a Groundwater Management Plan for the site.

The Consultant will be required to assess the effects on the Hydrogeology of the affected area caused by the development of the proposed port expansion area, existing river and the proposed realigned river.

2.11.1. Objectives

The objectives of the hydrogeology study and development of the Groundwater Management Plan shall include but not be limited to:

- a) Assess and determine local groundwater resources and their characteristics, with particular attention to depth to underlying aquifer(s), groundwater quality, quantity, availability and current use, and any pollution risk industrial development may present to local groundwater. This assessment is to consider published data, local knowledge, and any pertinent characteristics evident from site inspection.
- b) Develop principles, objectives and requirements for total water cycle management as outlined in the draft Water Resources SPP (WAPC, 2004), Liveable Neighbourhoods Edition 3 (WAPC, 2004) and the Stormwater Management Manual for WA.
- c) Identify site constraints and opportunities (such as water dependent ecosystems, remnant vegetation, landscape and landform), identifying the critical management issues.
- d) Identification of previous and proposed land use and likely impacts on the quality of surface runoff and shallow groundwater and how this will be addressed by the proposed system.



- e) Assess potential for short-term mobilisation of nutrients and contaminants resulting from development works as well as long-term impacts on groundwater quality from development.
- f) Where necessary, identify pollutant pathways.
- g) Operations and maintenance. The Consultant shall document and provide a budget estimate for all ongoing operations and maintenance.
- h) Devise a groundwater monitoring program to determine baseline groundwater levels and water quality for the existing river, proposed port development area and new river location. The groundwater monitoring program will be submitted to the BPA for review and comment;
- i) Examine the function and interaction of the existing river and determine what the possible outcomes are once it has been filled in. This needs to be considered in conjunction with the proposed port development and proposed infill that will occur in the area.
- j) Examine the alignment of the proposed river realignment and assess the exfiltration and infiltration groundwater interaction and its impact on upstream and downstream groundwater levels.
- k) Assess the existing and proposed hydro geological profile, including groundwater levels and water quality pre and post development. This shall include preparation of groundwater contour mapping for existing and the ultimate proposed development. Complete a subsoil drainage design for the proposed development and this shall include pipe sizing and grades.
- l) Minimise changes to the hydrological regime to prevent impacts on, and manage and restore, downstream receiving environments, water courses and wetlands, Maintain ground water quality at pre-development levels (median winter conditions) and improve the quality of water leaving the development.
- m) A detailed Groundwater Management Plan report detailing the outcomes of the above.
- n) If the design indicates dewatering will be necessary, the Consultant shall make dewatering estimates using the groundwater model. Dewatering design system design and modelling shall be done under the relevant Provisional Sum item on the basis that dewatering will be limited due to the issues associated with ASS on Site.

2.12. Stormwater Management Plan

This scope defines the Stormwater Management Plan. The Consultant shall prepare a Stormwater Management Plan which considers the drainage requirements for decommissioning of the existing river, proposed port development (as per the Inner Harbour Structure Plan) and new river alignment.

All design, documentation, drawings, modelling and specifications shall comply with the DoW Stormwater Management Manual for Western Australia and the Water Corporations Drainage Manual with guidance from the West Australian Planning Commissions Better Urban Water Management Guidelines.

2.12.1. Objectives

The Stormwater Management Plan shall identify the requirements for local drainage that will need to be implemented for the Port Development and River Realignment. This shall include flow paths and levels, peak flow rates and storage requirements. The DoW has indicated discharges to the proposed river realignment do not need to be attenuated to assist with flushing (to be confirmed by the Consultant). Alternative discharge locations will need to be in accordance with the Decision process for stormwater management in WA (DoW 2009). The



Consultant shall also identify appropriate stormwater best management practices to manage water quantity and quality.

The Stormwater Management Plan shall include as a minimum:

- Appropriate water sensitive urban design best management practices to control stormwater quality from the site. The Consultant shall develop appropriate stormwater quality objectives to be met. Stormwater quality modelling shall be completed to demonstrate performance of the proposed treatment measures and indicative concentrations and loads that shall be discharged into the environment. All modelling shall be provided as part of the Stormwater Management Plan Report;
- Mapping of existing natural and constructed drainage systems and floodplains;
- Develop a new hydraulic flood model using 2D modelling software and existing bridge structures into the pre-development model to simulate existing flood conditions.
- If required, carry out as a Provisional Sum item, a feature and control survey at existing bridge structures to supplement the available LiDAR data provided by the DoW. The survey shall also include cross section survey of river channel up to 1 km upstream of the Australind Bypass Bridger to assess backwater effects within that extent (100 m intervals or 10 cross sections).
- The Consultant's hydrological modelling, hydraulic modelling and engineering design of the river realignment shall be completed so that the new channel / river will perform satisfactorily at the present day sea level and also with a rise in sea level of 0.9 m that could occur by 2110. All flood mapping shall be completed with the present day sea level and with a rise of 0.9 m in sea level;
- Hydraulic flood modelling shall be packaged up by the Consultant in "WaterRide" software and provided to BPA along with guidance on how to use the software.
- Identification of drainage network required for the port development, decommissioning of the existing river and proposed river realignment. All stormwater discharge points from the port development area shall be defined and sized. This shall include the proposed river realignment, and discharge arrangements for the Port development on to the estuary. Sizing of the pipe/ channel network and its proposed location shall be provided. All modelling shall be provided as part of the Stormwater Management Plan Report. Modelling and provision of 100 year flow paths and required earthwork levels shall also be included;
- The SPER team shall investigate the risk of the formation of a delta in the Leschenault Estuary near the new river outlet location. The investigation shall examine the sedimentation and erosion issues of the outlet area and the shorelines for at least 1 km on each side of the new outlet. The investigations must be of suitable detail to satisfy, in the minimum, the DoW and the Department of Environment and Conservation that there will not be unacceptable changes to the stability of the area and shorelines. The Consultant's river realignment design team shall work closely with the Consultant's environmental team to assist and report on this aspect;
- Quantification of any easements and land required for the proposed drainage assets;
- Demonstrate potential impacts from the proposed development on any downstream surface water dependent environments and how these impacts are to be minimised or eliminated;
- Identification of any interim or staged drainage requirements between completion of the river realignment and the development of the Inner Harbour Structure Plan; The Stormwater Management Plan shall integrate the outcomes of the hydrogeology study, including subsoil drainage flow rates, infrastructure, treatment and discharge requirements;



- The Stormwater Management Plan shall identify fill levels, final RL's and site gradings for the port development. These shall comply with the DoW and OEPA Environmental Protection guidelines;
- In coordination with the SPER team, obtain relevant stakeholder and statutory approvals ;
- A detailed report documenting the outcomes of the study and investigation;
- The Consultant shall document and provide a budget estimate for all ongoing operations and maintenance.

2.13. River Channel Design

The Consultant shall be responsible for completion of the following components of the River Channel Realignment Design:

- Water Quality improvements;
- Hydrology;
- Hydraulic and Flood Modelling Design;
- Scour protection
- Flood mitigation and protection
- Prevention of sedimentation;
- Geotechnical investigation;
- Hydrodynamic modelling to determine surge levels in the Estuary at the mouth of realigned Preston River;
- Hydrodynamic modelling at the estuary outlet ("the Cut") to the ocean; and
- Design documentation and Specifications, including mass haul and volume calculations;

~~Each of the above are described below.~~

2.13.1. Water Quality

The Water Quality in the current river is considered to be degraded. The Consultant is required to consult with the DoW to determine current requirements regarding the water quality prior to discharge in to the estuary. The objectives of the Water Quality assessment and design will be to assess and complete the following:

- Develop a pre and post water quality monitoring program that is acceptable to measure the existing conditions and post implementation quality of the water. The Water Quality monitoring program shall be assessed and approved by key stakeholders. This shall be submitted with a fee for implementation for approval by the BPA. Implementation of the monitoring program shall be completed as a provisional sum item;
- Guidelines and water quality objectives that will need to be met for treatment improvements and during construction;
- The Consultant shall design passive treatment zones to improve the river water quality in consultation with key stakeholders. The passive water quality treatment zones shall consist of both chemical and biological treatment zones along the river. The design will need to consider seasonal hydraulic and pollutant loading patterns. The design shall also include an estimate of the design life for the proposed treatments and requirements for ongoing operational costs and management required for the proposed treatment zones;



- The Consultant shall prepare a water quality model to quantify and estimate the pollutant loadings and improvements for TN, TP, TSS, and BOD that will occur for an atypical year and typical minor storm events (1:1 year and 1: 3 month);

Proposed deliverables include:

- Water Quality monitoring program and budget for implementation;
- Construction water quality objectives and guidelines that will need to be implemented during construction;
- Incorporation of the Water Quality passive treatment zones in both the landscaping and engineering design;
- Water Quality modelling and improvement estimates for the design; Operations and maintenance. The Consultant shall document and provide a budget estimate for all ongoing operations and maintenance.
- Stakeholder liaison and approvals for the proposed treatment design;

2.13.2. Hydrology

The DoW has advised that flood modelling hydrographs have been completed and available for completion of the study up to a 1:500 year event. Due to the drying climate being observed in the south west leading to decreases in rainfall compared to long term averages it is not proposed they be revised as they are considered adequately conservative for this study.

To comply with recent guidelines the Consultant will need to develop a PMP hydrograph and peak flow rate as a sensitivity check to compare against the 1:500 year event.

The proposed deliverables are as follows:

- Review the existing hydrographs available from the DoW and comment on their suitability. The Consultant shall also review and advise on the status on The Bureau of Meteorology program to update the IFD charts, and changes that may occur for extreme events;
- Summarise and provide the hydrographs in electronic format that are used in the design; and
- Develop a PMP peak flow rate and hydrograph as a sensitivity check for the design.

2.13.3. Hydraulic and Flood Modelling Design

The Consultant shall be required to complete all flood modelling and hydraulic design for the proposed river realignment. Several previous studies have been completed which provide the basis and objectives for the hydraulic performance of the River Realignment. These are noted as follows:

- Bunbury Flood Management Study SKM 2004,
- Bunbury Harbour Extension – Hydraulic Modelling of the Preston River Realignment SKM 2007.

The DoW has advised that a LIDAR survey for the area has now been completed and can be made available for the proposed studies. It is recognised that for large events if the Australind Bypass is breached and adequate inclusion of the river upstream of the Australind bypass for modelling will occur in this study.

The objectives to be achieved for Hydraulic and Flood Modelling include the following:



- Completion of all bridge hydraulic design and defining required horizontal and vertical clearances. This shall include requirements for all proposed future duplications;
- Hydraulic gradelines and cross sections shall be provided;
- Completion of all channel embankment, longitudinal grade and cross section hydraulic design;
- Completion of all scour modelling and sediment transport design. The Consultant shall complete a geomorphology study indicating:
 - An estimate of the seasonal changes and first flush sediment transport that will occur;
 - An assessment of the sediment transport and flow regime impacts that will occur discharging into a tidal estuary, particularly for the flatter grade that will occur over the existing river profile;
 - A review and assessment of the development of the river mouth delta and impacts on minor boating access including at the Leschenault Estuary outlet to the Ocean.
- Completion of all scour protection and armouring design;
- Completion of the delta channel mouth design at river outlet to estuary and estuary outlet to ocean. This shall include an assessment of a suitable size recreational boat to access the river and ability of the mouth delta to scour an adequate channel, or alternatively maintenance requirements to maintain minor boating access.
- Completion of flood mapping for the area for 1:1 year, 1:10 year, 1:50 year, 1:100 year and 1:500 year events;
- Completion of a sensitivity check for a PMP event and review the implications for this size event;
- Hydraulic impacts of discharging into a tidal zone and worst case scenario that should be modelled;
- The design shall consider a breach and controlled failure mechanism and flow path for failure of the levy;
- Completion of a sensitivity analysis for climate change and increase in sea level to 2110 of 0.9 m (as required by EPA and Planning Department) and what impact this may have on the design;
- Liaison with relevant statutory Authorities and approvals for the hydraulic design and flood modelling study.

2.13.4. River Channel Design Documentation and Specifications

The Consultant will be required to complete the channel design and documentation to 100% for the river realignment. The design shall be completed in a terrain model, preferably 12 D or equivalent. All documentation, drawings and specifications shall comply with the Water Corporation's Drainage Manual.

A key component of the earthwork design will be cost effective management of Sulphate Soils. A preliminary Acid Sulphate soil investigation carried out by Parsons Brinkerhoff Geotechnical Investigation July 2008 was completed and shall be used as a basis of design. An Acid Sulphate soil management plan is also part of the scope of works for this brief.

The requirements and objectives of this component of the works include:

- Confirm the suitability and availability of the soils on the site for embankment and levy construction, this shall include requirements for erodability, settlement, infiltration /



exfiltration characteristics and slope stability, including all associated engineering calculations for the differing soil types;

- Once an acceptable design is developed prepare and submit a discussion paper on treatment options and budgets for economically addressing the Acid Sulphate soils that are anticipated to occur along the route. Options to consider may include isolation techniques, lime treatment, chemical treatment, select use of material in specific fill locations, alternative sources of material. This shall consider the extent of Acid Sulphate soils, construction techniques and location of the channel in relation to the water table and potential downstream impacts. The discussion paper shall be approved by relevant stakeholders and result in a formal ASS Management Plan prepared by the Consultant.
- Prepare a disposal management plan for the material excavated from the re-alignment. This management plan will include approximate volume of material, treatment, location of storage of material and proposed use for the material.
- Prepare mass haul diagrams and earthworks quantities for the proposed river realignment. The long sections and earthworks quantities from the terrain model shall include details for differing type of material, including:
 - Rock;
 - Suitable and unsuitable material;
 - Different grades of Acid Soils requiring different levels of treatment. The extent of Acid Sulphate soils at different levels of acidity shall be indicated on a series of long sections for the channel and there proposed treatment options based on the preliminary Acid Sulphate Soil investigation completed by Parsons Brinkerhoff. Long sections shall also include details of the groundwater table.
- The Consultant shall document and provide a budget estimate for all ongoing operations and maintenance.
- Prepare detailed tender/IFC drawings and specifications for the river channel. This shall include:
 - Long sections and cross sections and channel details. Cross sections shall be provided at a maximum of 10 m intervals;
 - Mass haul diagrams, including groundwater details, and hydraulic grade lines;
 - Soil material type mapping and suitability for construction/ fill;
 - Details of all current and future services that are located within the river reserve;
 - Channel embankment and scour protection design;
 - Rehabilitation or interim decommissioning arrangements for the existing channel;
 - Design tie in and temporary diversion arrangements between the existing and new river;
 - Proposed local drainage connection points and treatment;
 - Serviceability access and fencing requirements;
 - Passive water quality treatment zones and requirements;
 - Spoil disposal locations, sizes and requirements, including groundwater management and control;
 - Interim embankment treatments prior to bulk filling of port development area;
 - Cadastral and easement requirements;
 - Controlled spill and breach mechanism for the channel;
 - Boating access requirements and treatments at the delta mouth;



- Acid Sulphate soil treatment and management requirements in particular with regard to the land area required for soil storage and treatment including treatment of water from dewatering activities
- Specifications.

The Consultant's fee includes allowance for the Consultant's river alignment specialist (Mike Harvey) to visit site to enhance his contribution to the design process.

2.14. Geotechnical Reports

The Consultant shall carry out the relevant geotechnical investigations as required for the project's design and/or as specified elsewhere in the document and produce geotechnical reports covering –

- Site engineering geological model;
- Geotechnical design parameters used to inform detailed design requirements;
- Soil and material type mapping and suitability for construction / fill; and
- Geotechnical recommendations for design and construction.

2.15. Detailed Concept Port Development Plan

The Consultant shall prepare, as an amendment and appendix to the existing Structure Plan, a revised Concept Port Development Plan of the whole Port area in consultation with BPA Senior Management and in line with the Port Structure Plan, outlining indicative land uses, road infrastructure and service corridors. The plan should also provide proposed minimum design levels and an overall drainage plan and include approximate land fill volumes based on existing and proposed concept design levels. Output should be in digital pdf and Autocad format.

2.16. Procurement, Staging and Implementation Plan

The Consultant shall prepare a procurement, staging and implementation plan for the proposed river realignment. This plan shall assist the BPA in providing a guideline and framework for implementation of the River Realignment. The proposed river realignment may need to be implemented in stages to allow rehabilitation and development of biological material, prior to decommissioning of the existing river. The Plan will need to consider implementation and commissioning requirements for various asset owners and stakeholders in implementation of the river realignment.

The Consultant will be required to have a workshop with key members of the BPA management team to assess program, commercial and delivery risks upon submission of a draft copy of the Procurement Staging and Implementation Plan.

The Procurement Staging and Implementation Plan shall include the following:

- Procurement strategy. The procurement strategy shall review various implementation and procurement strategies for implementation of the works and provide a recommendation in consultation with BPA management.
- Detailed program for implementation of the river realignment. The program shall include:
 - all statutory approvals;
 - completion of outstanding studies and design;



- Engagement and tender timelines for procurement with consultants and contractors;
 - Construction timelines;
 - Identification of key milestones;
 - Identification of critical shutdown times for existing assets;
 - Critical lead time items;
 - A suitable contingency.
- Identification of critical major project restraints/ risks and mitigation measures to manage these risks;
 - Indicative Monthly Cash flow;
 - Land tenure and title requirements. This shall also include identification of all ultimate asset owners and responsible parties for various assets;
 - The Consultant shall prepare a resourcing and organisation chart in consultation with BPA management. This will include a review of BPA internal resourcing requirements for the project. The resourcing chart shall include relevant consultants that will need to be engaged for a project of this size, including project management, independent verification requirements, stakeholders and statutory authorities, indicative work packages and construction teams based on the implementation strategy.

2.17. Safety in Design

The Consultant shall adopt a safety in design approach in which the design shall be in accordance with the Code of Practice: Safe Design of Buildings and Structures 2008.

The Consultant will be required to facilitate Safety in Design workshops with all statutory stakeholders, asset owners and the Bunbury Port to carry out the risk management process on all asset components of the design. Following these, the Consultant will need to identify who will be responsible for addressing the actions raised as a result of these workshops.

The Consultant shall prepare a Safety in Design Report to indicate the safety and health aspects of the design and to convey:

- Key information concerning the hazards identified during the workshops
- Consultant's assessment of the risks resulting from these identified hazards
- Actions taken to reduce the risks
- Residual risks that have been identified but not resolved

The report shall include a register of the significant hazards, associated risks and control measures.

2.18. Budget Estimate

The Consultant shall prepare a budget estimates to +/- 15% for implementation of the proposed river realignment. The budget estimate shall be completed by a qualified quantity surveyor and shall comply with relevant Commonwealth and State governments' guidelines and requirements for publicly funded projects.

The budget estimates shall include:

- All works associated with the proposed new river alignment, interim staging and realignment requirements, decommissioning requirements for the existing river, and interim arrangements required for the existing river after completion of the realignment and prior to completion of the Bunbury Port Expansion;



- A breakdown of costs for each bridge, rail works, earthworks, drainage, roadworks, utilities, landscaping and finishing's;
- All capital costs, outstanding studies, investigations, consultancy fees and statutory and stakeholder approvals;
- A detailed assessment of contingency costs for the construction (at P50 and P90) and operation phases;
- A full set of priced Bill of Materials or tender break down and schedule of rates for a lump sum type contract and associated documentation;
- All assumptions that have been made in completion of the estimate, including a basis for all rates used or budgets derived;
- A risk assessment identifying critical risks with the budget and any mitigation measures that need to be in place;
- An operations and maintenance budget;
- An anticipated monthly cash flow for implementation of the works;

Budget estimates shall be prepared:

- At 15% design milestone
- At 85% design milestone; and
- On completion of 100% design.

2.19. Engineering Design Report

The Consultant will be required to prepare an Engineering Design Report. The Engineering Design Report shall document the work completed and include at least the following items:

- Engineering design scope
- Variations or alterations of design
- Key performance attributes
- Design standards used and specifications to be complied with
- Basis of Design
- Methodology
- Calculations and outcomes
- Risk assessment detailing specific risks and limitations of design to be managed during construction and operation
- Land tenure requirements
- Options and value engineering considered in design
- Summaries of reports and management plans completed. All reports and management plans completed shall be included in Appendices;
- Procurement Staging and Implementation Plan
- Further studies and investigations outstanding prior to tendering the construction works
- Operation and maintenance.
- Design verification report
- Safety and design report



- Stakeholder review response schedule
- Option and value engineering considered in design
- Status of approvals
- Budget estimate
- Documentation of works completed during the design phase
- Documentation of Liaison and outcomes of communications with other BPA consultants, stakeholders and Statutory Authorities requirements and subsequent implementation into the design

The Consultant shall provide the Engineering Design Report including all working and calibrated design models and all electronic data in electronic and hard format.

This report and all relevant documentation shall be submitted to BPA for review by the Consultant prior to finalisation. Three copies of all final reports shall be provided on the final submission.

All drawings submitted to BPA must be in 3 set A1 hard copy, 3 set A3 hard copy and digital pdf and Autocad format. All reports should be in Hard copy, and digital PDF and Word documents.