DRAFT Future Port Expansion – Reclamation Environmental Management Plan

October 2023

PORT of BRISBANE
Here for the future

Revision History

Revision No.	Prepared By	Description	Date
1	W. Young	Draft	
2	W. Young	Draft	
3	W. Young	Final	June 2002
4	W. Young	Final	July 2004
5	W. Young	Final	December 2004
6	W. Young	Final	April 2005
7	W. Young	Final	May 2005
8	R. Hovey	Final	July 2009
9	R. Hovey	Final	March 2010
10	R. Attard	Final	October 2011
11	M. Linde	Final	Feb 2013
12	M. Linde	Final	Dec 2013
13	N. Perry	Final	March 2015
14	M. Linde	Final	May 2016
15	J. Rudd	Final	April 2017
16	M. Linde	Final	March 2020
17	M. Linde	Final	Oct 2023

DECLARATION OF ACCURACY

I declare that:

1. To the best of my knowledge, all the information contained in, or accompanying this Management Plan[1] (*use correct title of signed document*) is complete, current and correct.

2. I am duly authorised to sign this declaration on behalf of the approval holder.

3. I am aware that:

   a. Section 490 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) makes it an offence for an approval holder to provide information in response to an approval condition where the person is reckless as to whether the information is false or misleading.

   b. Section 491 of the EPBC Act makes it an offence for a person to provide information or documents to specified persons who are known by the person to be performing a duty or carrying out a function under the EPBC Act or the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth) where the person knows the information or document is false or misleading.

   c. The above offences are punishable on conviction by imprisonment, a fine or both.

Signed

_____

Full name (please print)

_____

Organisation (please print)

Date ____/___/____

[1] Future Port Expansion – Reclamation Environmental Management Plan, October 2023

PORT of BRISBANE
Here for the future

FOREWORD

This document provides the Environmental Management Plan (EMP) for the Future Port Expansion (FPE) precinct at the Port of Brisbane. The EMP specifically addresses those impacts associated with the **reclamation phase** of the project, that is, the infilling of internal reclamation paddocks.

Construction and infilling activities are conditionally approved under the *Environmental Protection and Biodiversity Conservation Act 1999* until 31 December 2029. It should be noted that the FPE infilling project are expected to extend at least over some 30+ years. If infilling extends beyond 31 December 2029 a request to extend the period of approval will be submitted in 2028. As the area develops, reclamation pond layout and management of tailwaters is continually modified in response to reclamation technologies, environmental management and monitoring.

The impacts associated with the initial construction of the outer bund wall were addressed through the Future Port Expansion – Bund Construction Environmental Management Plan (Port of Brisbane Corporation, June 2002).

Both the Future Port Expansion – Bund Construction Environmental Management Plan dated June 2002 and the draft version of this EMP, Future Port Expansion – Reclamation Environmental Management Plan, dated June 2002 were submitted to the Department of Environment and Resource Management, which reviewed and endorsed the plans in a letter dated 15 July 2002. Both plans addressed the requirements of the Section 86 sanction and Section 91 authority issued under the *Harbours Act 1955*.

In order to ensure best practice environmental management strategies are adopted, this EMP will be reviewed on an annual basis or as significant changes develop within the FPE precinct. This EMP forms part of the Port of Brisbane Pty Ltd's Environmental Management System (EMS), which is certified and externally audited to ISO14001 standard for Environmental Management Systems.

1 Contents

1. Introduction

The Port of Brisbane Pty Ltd (PBPL) manages an intermodal port facility at the Port of Brisbane located at the mouth of the Brisbane River. The Port of Brisbane was formerly managed by the Port of Brisbane Corporation until December 2010. PBPL is now responsible for the management of the Port and administering this EMP.

In 2002 the existing port facility was extended under the FPE project. Approximately 4.5km of outer bund wall was constructed over two years (completed in August 2004) to enclose an area of 230 ha of subtidal land to the immediate north (Figure 1). During 2004 the development of internal bund walls was undertaken to divide this area up into smaller 'reclamation ponds' (Figure 2)

These ponds were developed for the placement of dredge material and subsequent management of tailwaters from the PBPL's capital works (i.e. berth pockets) and maintenance dredging (i.e. shipping channel through Brisbane River and Moreton Bay). In 2008, a further series of internal bunds were constructed forming three new ponds (Figure 4). The transition of the FPE precinct from the completion of the outer bund wall in 2004 to the most recent aerial in 2014 in shown in Figure 1 to 6.

Dredge material collected by our trailer suction hopper dredge (TSHD) *Brisbane* or other contracted dredges are discharged via a floating pipeline into the reclamation ponds. To allow the dredge material to pump, seawater is added to produce a slurry mixture of 80-90% water. Tailwaters from the initial material placement are discharged into subsequent ponds, which act as detention basins to slow water velocities and allow sediment fall out. The percentage of sediment within the tailwaters decreases through the sequential ponds. The final tailwaters are filtered through the outer rock wall.

The FPE is located adjacent to a number of environmental values, such as the Moreton Bay Marine Park, internationally recognised Ramsar wetlands, extensive seagrass meadows and mangrove communities (

Figure 8). Further, the area is utilised by a wide variety of marine and marine dependent fauna (e.g. shorebirds), including a number of species protected under international conventions to which Australia is a co-signatory (such as the Bonn Convention, Japan-Australian Migratory Bird Agreement (JAMBA) and China-Australian Migratory Bird Agreement (CAMBA).

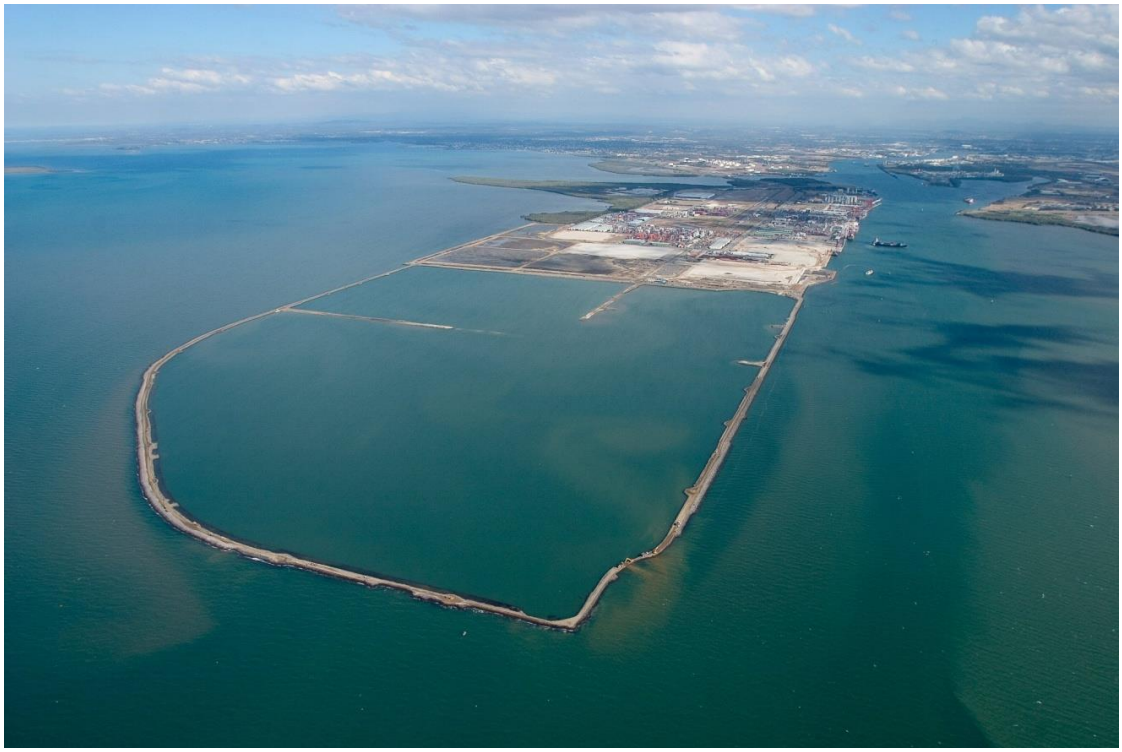

Figure 1 Future Port Expansion with closure of Outer Bund wall dated August 2004. Note partially completed inner bunds.

Figure 2 Future Port Expansion with internal bund walls dated 18 August 2005

Figure 3 Future Port Expansion dated March 2007. Note the completion of internal bund walls dividing central and bayside ponds.

Figure 4 Future Port Expansion oblique aerial dated June 2008. Note the completion of inner bund walls for ponds R3, C3 and B3.

Figure 5 Future Port Expansion oblique aerial dated July 2009. Note filling commenced of Riverside R3 ponds from CSD amity

Figure 6 Future Port Expansions oblique aerial updated July 2014. Note the completion of inner bund wall for paddock B4

Figure 7: Future Port Expansion oblique aerial updated May 2023. Note the completion of paddock C3.

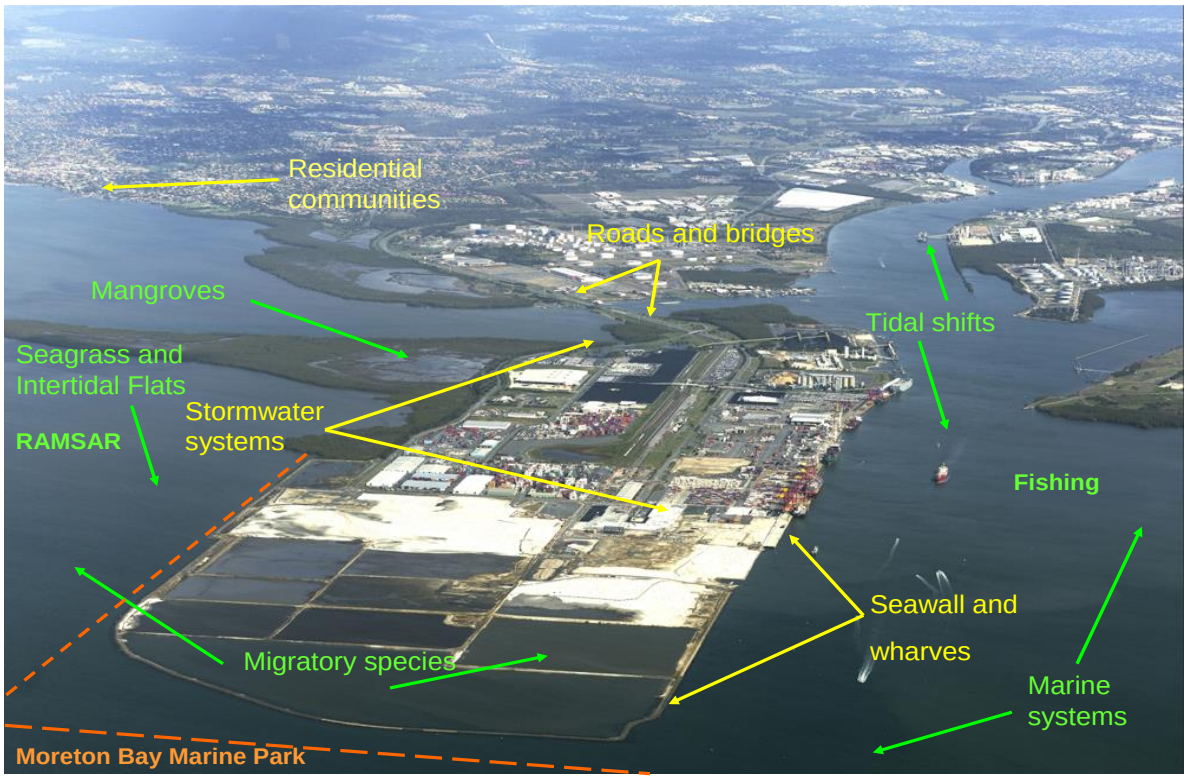

Figure 8 Port of Brisbane with adjacent areas of environmental significance

The successful environmental management of the FPE precinct is paramount in ensuring the overall success of the project and ensuring the minimal regional environmental impact predicted by the Impact Assessment Statement (WBM 2000).

The environmental management of the outer bund construction process was managed under a comprehensive EMP, namely the Future Port Expansion – Bund Construction Environmental Management Plan (PBC 2002). This EMP was approved by Department of Environment and Resource Management (DERM) as part of the approval for the project (Section 86 of the Harbours Act 1955).

The current document addresses the environmental management issues associated with the infilling process.

2. Proposed Works

The principal focus of this EMP is the infilling of the FPE precinct and tailwater management subsequent to bund wall and internal pond development. This project will develop approximately 230ha of land to be future developed as quay line and Port associated industries.

The first stage of these works involved pumping dredge material into Riverside ponds (R1, R2 and R3), Central ponds (C1, C2, C3 and C4) and Bayside ponds (B1, B2, B3 and B4) (Figure 9)

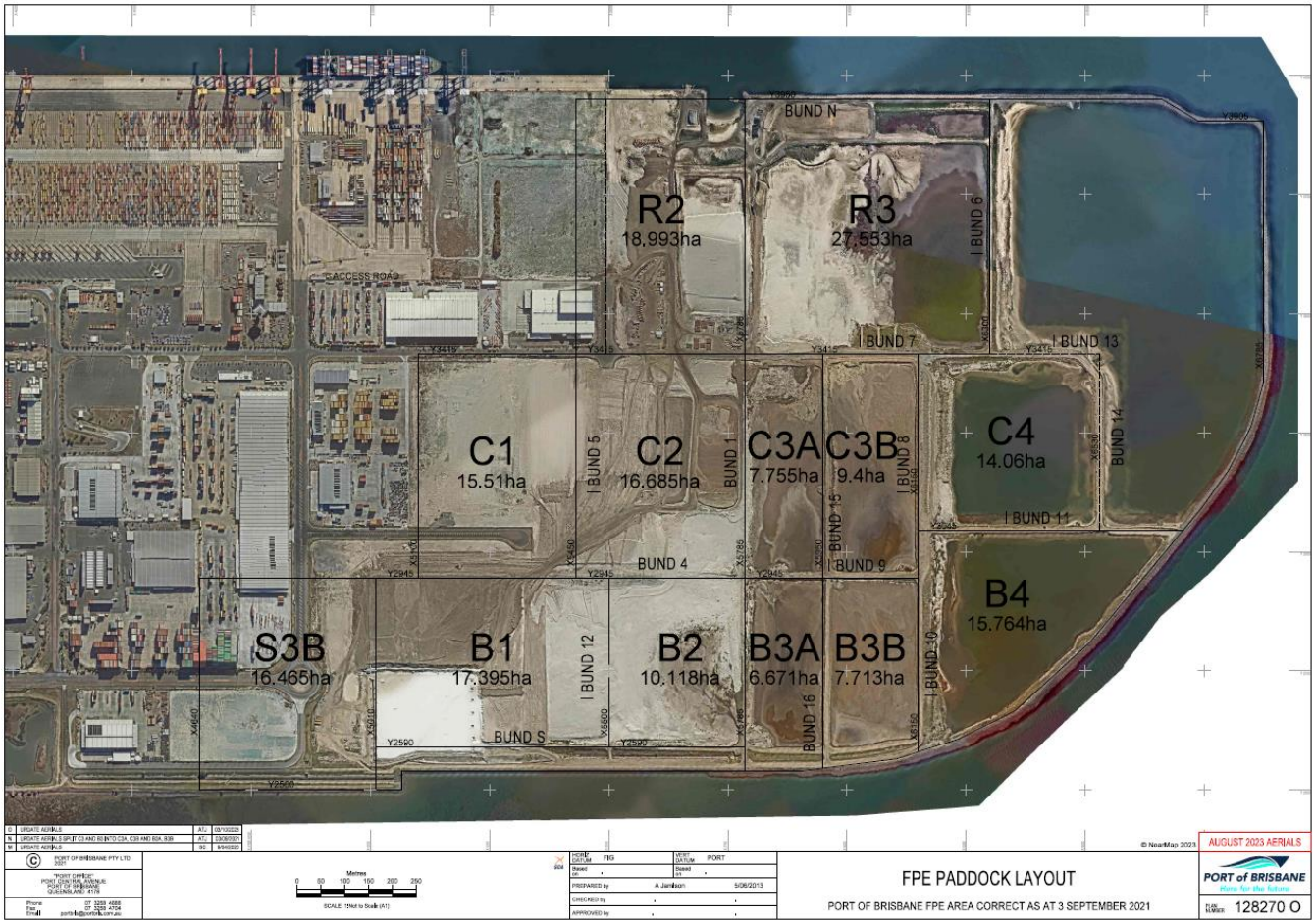

Figure 9: Pond names.

The final tailwaters will continue to be discharged into the outer FPE pond (the remaining section of the FPE). The infilling works (reclamation) have current approval under Section 91 of the Harbours Act 1955, granted 30 August 2002 (Approval number BNE6693) (see Appendix A).

It is anticipated that the FPE precinct will be filled by 2050 and the area will be settled for development by 2055. This EMP considers the current strategy (the 'Base Case') for infilling the FPE precinct, using material sourced from maintenance and capital dredging. Alternative strategies to the Base Case will reduce or extend these timeframes for land availability and are discussed in the Material Disposal Strategies (PBC 2010).

2.1 Infill Material

Estimates to date (based on the current strategy) are that the infilling of the FPE precinct will require up to approximately 30 million cubic metres of material. The majority of material used for the infilling of the reclamation area will be sourced from maintenance dredging of the navigation channels within the Brisbane River and Moreton Bay estimated at approximately 7 million cubic metres. Additionally, a significant volume (approximately 6 million cubic metres) of in-situ material will be generated by capital dredging associated with the development of wharves and associated berths along the FPE quay line.

The initial layers of the reclamation ponds will be filled with fine silts and clays (predominately from the Brisbane River to the Outer Bar Cutting), whilst upper portions will be capped with sands, predominantly gained from dredging of northern Moreton Bay Channels. The sand capping of the area will likely require 15 million cubic metres of sand. Total settlement of the reclamation is estimated to be to 3 metres on average.

2.2 Construction Method

The current construction method is to sequentially develop a series of smaller "ponds" within the reclamation area by constructing internal bund walls. The FPE precinct will accommodate the PBPL's anticipated dredging requirements as infill for up to at least the next 15 – 20 years with the future allocation of a permanent dredge placement area being considered.

The size of each of the current ponds is approximately 20ha and natural bed level ranges from 0m LAT to –1m LAT. The size and configuration of successive ponds and spoil placement methodologies may change in response to changes in dredging technologies, reclamation research or sediment rehandling requirements, while pond depths will increase as natural bed levels subside to -3.5m LAT to the north of the FPE precinct.

Sediment is predominately delivered from a dredge to the reclamation ponds via a floating pipeline. The pumped slurry comprises approximately 80-90% water and is pumped or placed directly into the ponds, with the discharge point of the pipe being moved within the pond to provide a uniform fill consistency. A smaller quantity of dredged material may also be delivered to the site by truck.

This material would be delivered from barged material unloaded within the Port as a result of dredging operations by the grab dredger. Several ponds are developed at any one stage, with waters from the initial receiving pond flowing into each sequential pond, which then act as detention basins. The percentage of sediment within the waters decreases through each pond. The final tailwaters are then discharged to the Outer FPE area (Figure 9).

Walls within the developed ponds (R1, R2, R3, C1, C2, C3, C4, B1, B2, B3 and B4) have been sealed and backed with sand to limit the permeability (Figure 10). As such, all waters pumped to the pond through the dredging process must be stored or discharged to the next pond. Although the outer bund wall is sealed adjacent to paddocks R1, R2, R3, B1, B2, B3 and B4, the wall surrounding the Outer FPE Pond has not yet been sealed. This unsealed section has a degree of permeability and tidal exchange with Moreton Bay (Figure 11).

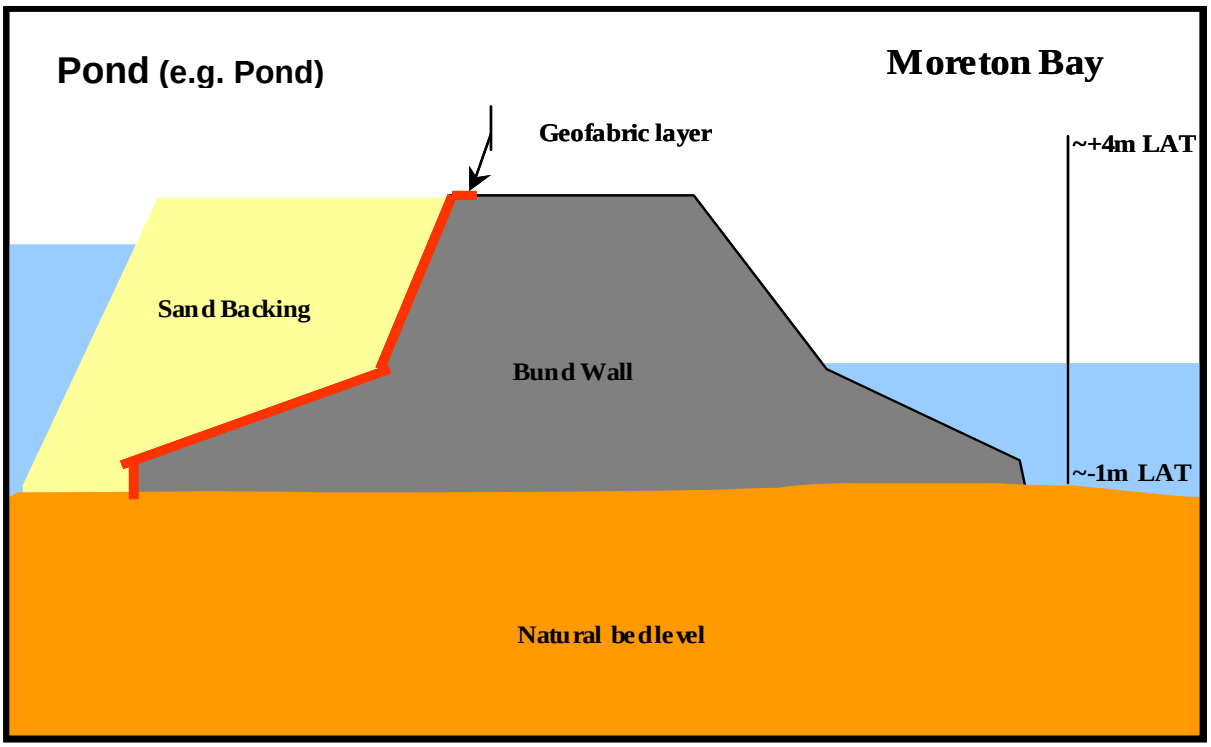

Figure 10 Schematic Cross-Section of Outer Bund Wall – Sealed ponds (R1, R2, R3, B1, B2, B3, B4). Note geofabric layer and sand backing of wall preventing water flows through bunds, but allows filtered seepage

The tidal range within the Outer FPE Pond is approximately half that to the outside Brisbane River and Moreton Bay areas, as the restricted permeability of the wall allows water to be retained. The retention allows the wall to act as a diffuse discharge and maintain water quality within the pond. The wall will be progressively sealed as further inner ponds are developed.

As such, there is no single defined discharge point from the Outer FPE Pond to Moreton Bay.

Subsequent to placement of dredge material the tailwater will be managed by a series of reclamation ponds, which act as detention basins. The number of active detention ponds or the order they are used may vary depending on a number of factors, including the schedule of the dredging campaign, material type, fill requirements and weather conditions. The discharge points to adjoining ponds and the Outer FPE Pond are directed through weir boxes that can be moved as required. These internal ponds are formed by bunds constructed from a mixture of clay and sand material dredged from the future berth areas. These bunds are somewhat impermeable as well, meaning that the surplus water is discharged from pond to pond through a weir box in a controlled manner.

In between dredging campaigns, dredge material placed into the ponds settle and can dry out. However this drying is dependent on several factors such as mud thickness, placement below HAT, drainage including underdrainage, weather etc. Typically the underlying mud will remain moist or waterlogged, whilst the surface dries, shrinks and compacts. Once the mud is placed to the targeted height, it is left to dry for approximately 3 years. To speed the drying process a dewatering machine called a Mudmaster will sometimes be used as required. The Mudmaster moves over the mud via the use of rotating scrolls, which turns the mud and speeds up the drying process. Once the drying process is complete the mud is overlain with 2m of clean sand.

Pre-fabricated vertical drains (wick drains) are then installed across the site to allow the dredged mud and in-situ soft clays in the existing sea bed to consolidate. The treated areas are then subsequently covered with additional layers of sand which acts as a preload to increase the load bearing capacity and consolidation of the underlying material, readying it for development. When the desired geotechnical characteristics are achieved (typically 12-18mths full preloading period), this preload material is removed and transferred to other areas.

Depending on the delivery rate of material from the dredging campaigns and the pond size to final landform, the reclamation and land development process may take 5 to 10 years or longer depending on mud drying times. Trails on defining times and strategies for drying muds are discussed in Dredged Mud Drying Trial Proposal (PBC 2010).

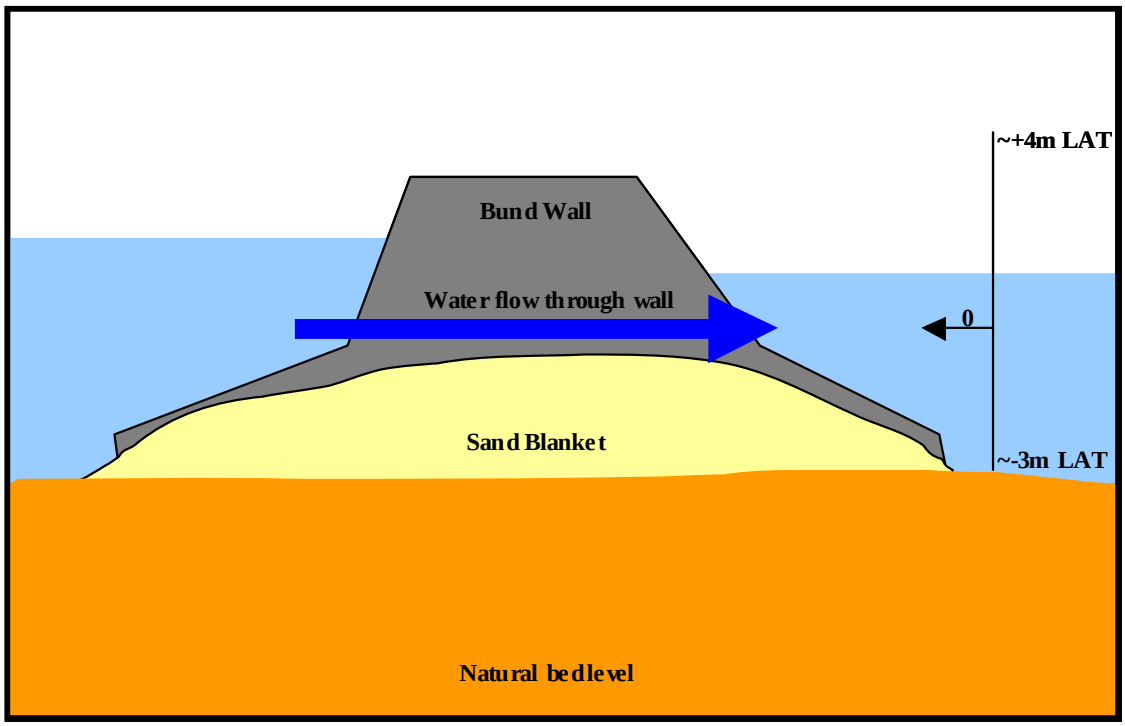

Figure 11 Schematic Cross-Section of Bund Construction – unsealed outer bund wall. Note potential for water flows driven by head differences

3. Proposed Works

The infilling of the entire FPE precinct is currently expected to take 30+ years, subject to the generation of dredge spoil, dredge material storage requirements and demands for port development. This projected timeframe is based on the current infilling works that are driven by the PBPL's maintenance dredging and capital dredging works, which is considered the Base Case. The Base Case and alternative strategies may reduce or extend the expected timeframes and is further discussed in the Material Disposal Strategy (PBC 2010).

Since the completion of the initial outer bund wall in 2004, the internal bund walls have been constructed as required. In 2008 further internal bunds walls were completed to create ponds R3, C3 and B3 and the outer bund wall adjacent to these areas were sealed. In 2012 a new bund wall was constructed to create pond B4 and the outer bund wall adjacent to this area was sealed. In 2019 work commenced on the construction of a new bund wall to create pond C4. C4 will be an internal pond not adjacent to the permeable outer bund wall. In the future it is anticipated that the outer bund wall will continue to be sealed and the Outer FPE Pond will be divided to create additional ponds.

As the FPE precinct is filled, the land available for dredge material placement and rehandling will be reduced. Strategies for the future management of dredge material is being considered, which may include a dedicated drying and rehandling area. Further detail on these strategies is considered in the Material Disposal Strategies (PBC 2010) and the Dredged Mud Drying Trial Proposal (PBC 2010). Over time the strategies for dredge material management and land development are expected to be refined as demands for land development and technologies on managing dredge material become apparent.

4. Purpose of the Environmental Management Plan

This EMP will provide guidance on the environmental management of bund construction, dredge material placement and tailwater management with the FPE precinct. The strategies outlined shall endeavour to minimise environmental harm and encourage best environmental management practices.

This EMP shall:

- Provide a practical document for managing environmental issues associated with the reclamation activities.
- Address all potential environment issues and provide control measures to mitigate the environmental impacts.
- Detail monitoring practices to ensure compliance and performance indicators (or criteria) are met.
- Detail the roles and responsibilities of personnel directly involved in site operation to project management.
- Provide guidance on conducting site inspections and responding to complaints.

To ensure best environmental management practices are adopted, this EMP will be an evolving document to be reviewed as part of the PBPL's EMS either on an annual basis or as changes are made during the course of the project.

5. Environmental Management

The PBPL has an Environmental Management System (EMS) certified to ISO14001. The EMS is a component of the PBPL's integrated management system (IMS), which includes certification to Safety (AS4801) and Quality (ISO9001) standards.

PBPL's EMS was externally certified to ISO14001 in May 2000. The system is audited for re-certification every three (3) years and surveillance audits are conducted annually.

The EMS system involves the identification and monitoring of environmental aspects from our activities and the potential impacts. The impacts are quantified through a risk assessment, where actions are put in place to mitigate the risks. In many instances where controls have been implemented, the actions may be plans or procedures to document and enforce the strategies implemented to manage the environmental impacts.

This EMP provides the overall documentation to guide and identify potential environmental issues within the FPE precinct. To provide further detail on the higher risk of everyday reclamation activities that are practical to site personal, Environmental Operating Procedures (EOPs) and Environmental Monitoring Procedures have been developed. PBPL employs contractors to undertake activities at FPE include material movement and placement. These contractors operate under their own specific Environmental Management Plan and Operating Procedures relevant to the activity they are undertaking.

The Environmental Operating Procedures relevant to reclamation activities include the following:

- Spoil Barge Unloader
- Contaminated Soil and Acid Sulphate Soil Management

The following Environment Monitoring Procedures are relevant to reclamation activities to provide guidance to environment staff on general sediment and water testing of reclamation ponds and to the reclamation staff to conduct regular turbidity monitoring at the reclamation pond discharge points.

- Sediment and Water (Reclamation)
- Tailwaters (Reclamation Ponds)

6. Environmental Aspects

The EMS identifies the potential environmental aspects from the reclamation activities that may impact the environment. This EMP addresses the aspects in greater detail by prescribing the actions, performance indicators, monitoring and correction actions that shall be implemented to mitigate the environmental impacts. Each aspect considered important to the operation is detailed and / or presented in an element table. The structure and components of the element tables are detailed below (Table 1).

Environmental aspects of the reclamation activities, including the element tables, are detailed in section 12.0 of this EMP.

Table 1

Structure and Components of Element Tables

Item	Content
Element	Aspect that requires management.
Objective	What is intended to be achieved.
Actions	Tasks that will be undertaken to ensure Objective is met.
Performance Indicators	Qualitative or quantitative measurement to gauge objective.
Monitoring	Details of measurement of performance indicators.
Reporting	Nature, timing and responsibility for reporting results.
Corrective Action	Action to be taken if monitoring indicates objective is not being met.
Term	Active term of management plan.
Responsibility	Delegation/nomination of responsibilities for overseeing management plan operation.

7. Environmental Legislation

Environmental legislation relevant to site operations at the Port of Brisbane is included in the PBPL's 'Register of Legislation' and the process of identifying and monitoring this legislation is detailed in the IMS Standard Legislative Requirements. The main legislation applicable to these works is the *Environmental Protection Act 1994* (EP Act). Key elements of this legislation are provided below:

The objective of the EP Act is to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends consistent with "ecologically sustainable development".

The protection of Queensland's environment is to be achieved by an integrated management program that is consistent with ecologically sustainable development.

The program is cyclical and involves the following phases –

- establishing the state of the environment and defining environmental objectives
- developing effective environmental strategies
- implementing environmental strategies and integrating them into efficient resource management
- ensuring accountability of environmental strategies

The PBPL has a responsibility of 'general environmental duty' under section 319 of the Act to minimise environmental harm (serious or material) or environmental nuisance as a result of our activities. This EMP has been prepared to address works to be undertaken by the Port of Brisbane and will be enacted by the PBPL's staff as the working document.

This plan's compliance with Condition 1 of EPBC Act approval is set out in the following table.

Condition requirement	Where addressed in plan
The approval holder must prepare and submit for approval by the Minister prior to commencement of the action, a plan for managing the impacts of construction of the bund wall and reclamation works on listed migratory species,	The construction phase impacts of the construction of the bund wall on listed migratory species were managed via the Future Port Expansion – Bund Construction Environmental Management Plan. Construction (complete and the plan is no longer active). Reclamation work impacts on listed migratory species is detailed section 12.10.
and the impacts of turbidity plumes associated with construction on the ecological character of the Ramsar wetland.	The construction phase turbidity impacts were managed via the Future Port Expansion – Bund Construction Environmental Management Plan (complete and the plan is no longer active).
The plan must provide for construction to be phased so that disturbance of sites used by listed migratory species is minimised during the periods of September-October and March-April.	The construction phase migratory bird impacts were managed via the Future Port Expansion – Bund Construction Environmental Management Plan (complete and the plan is no longer active).
The plan must also include a programme of monitoring, and actions that will be taken if turbidity is greater by a factor of three or more than predicted in hydrological modelling in section 8.4.2 of the Draft Queensland Impact Assessment Study, and if impacts identified in the plan result from turbidity.	The construction phase turbidity impacts were managed via the Future Port Expansion – Bund Construction Environmental Management Plan (complete and the plan is no longer active).

8. Roles and Responsibilities

The following table provides an outline of the roles and responsibilities of key employees associated with the FPE precinct activities at the Port of Brisbane. This also provides an outline of the Chain of Command and links between parties involved in the project.

Table 2 Roles and Responsibilities of key staff for Future Port Expansion Precinct

Position	Responsibility	Reporting to
Reclamation Inspector	Day to day management of reclamation activities	Senior Project Manager Land Development
Senior Project Manager Land Development	Ensure appropriate management of resources of site	Head of Land Development
Head of Land Development	Management of the site including contractor management	General Manager Infrastructure
Environment Advisor	Responding to environmental issues and monitoring EMP implementation	Manager Environment
Manager Environment	Responding to environmental issues and monitoring EMP implementation	Head of Sustainability
General Manager Infrastructure	Ensure engineering aspects of the site are met	Chief Executive Officer

9. Site Assessments

The site inspector conducts daily site inspections during operations. During these inspections, pertinent observations are recorded in work diaries and followed up as required.

Other personnel will undertake inspections as required and during monitoring periods.

Any issues identified during site inspections shall be reported to the Head of Land Development.

10. Complaints Register

Any complaints received by the PBPL, either directly or through a third party such as a government department, will be recorded and addressed as per the PBPL's protocols (refer to IMS Standard for External Communications Standard).

Complaints may be received by email, fax, letter or telephone. All complaints will be responded to within 24 hours of receipt. That is the complainant will be contacted to ascertain the details of the complaint such as:

- Complainants name, contact number and address (if appropriate)
- Details of the event
- Who was involved?
- When did the event occur? (e.g. date and times of day, single or repeated event)
- Where did the event occur? (e.g. description of the areas affected and possible sources)
- What impacts did it have? (e.g. has there been any environmental impacts or affected any persons?)
- What result or outcome is the complainant seeking?

The Manager Engineering and Port Development will be immediately informed of any complaints. For complaints relating to the environment (e.g. noise, dust, light, odours, dredging, pollution), a copy will be forwarded to the Manager Environment and Sustainability.

Personnel may be assigned to the complaint to investigate and undertake any follow up actions required. Once it is believed sufficient information is gained and all possible actions have been undertaken by the PBPL the complainant will be contacted to notify them of the situation and / or resolve the issue (either by the officer or manager).

Any details of the complaint and follow up action will be recorded in the PBPL's (electronic) Complaint Form. Written copies and any correspondence will be filed in the PBPL's complaint file.

11. Emergency Preparedness

The FPE precinct is part of the Port of Brisbane's Emergency Preparedness and Response Manual, which contains site specific details for reclamation. This manual details the roles and responsibilities and actions to be followed during uncontrolled releases or other emergency situations.

If a spill/hazard results in a major environmental event (a significant release of contaminants to air, land or water), please refer to the Critical Incident Plan reporting process.

For the management, clean up and disposal of minor spills refer to section 12.14.

12. Key Aspects and Element Table

Each environmental aspects of the proposed earthworks activities are detailed in this section. Depending on the complexity and control measures to be implemented, elements tables have been developed for some of the environmental aspects.

12.1 Dredging Management

The FPE precinct is implicitly linked to dredging works and these have potential environmental impacts through a range of issues including turbidity, noise and waste management. The TSHD Brisbane will be the primary dredge equipment providing dredge spoil to the FPE precinct. To identify and manage environmental aspects of the PBPL's dredging activities, a Long Term Maintenance Dredging Management Plan (LMDMP) has been prepared that outlines the various controls. The purpose of the LMDMP is to ensure:

- safe navigation for ongoing operation of the Port of Brisbane through the long-term viability and proactive management of maintenance dredging and maintenance dredge material placement;
- the environmental values and sensitive receptors immediately adjacent to the Port of Brisbane and appropriately identified and effectively managed;
- that the sources of sedimentation within critical port infrastructure are well understood, documented and managed as effectively as practicable;
- the ongoing long-term environmental management of maintenance dredging and maintenance dredge material placement is undertaken in an effective and sustainable manner; and,
- open and transparent communication and effective dialogue with all relevant stakeholders.

The Environmental Management Plans (EMPs) developed for each of the PBPL's dredge equipment addresses the field based practices required to meet the overall objectives of the LMDMP. These EMPs are specific to the dredger operations within the PBPL's area of responsibility (Brisbane Port Limits and Port Areas). In developing the EMPs, consideration is given to the environmental aspects and impacts as defined under the PBPL's EMS to ensure all impacting processes are addressed through clearly defined performance indicators.

The linkages between the LMDMP, EMPs and Aspects and Impacts are presented below.

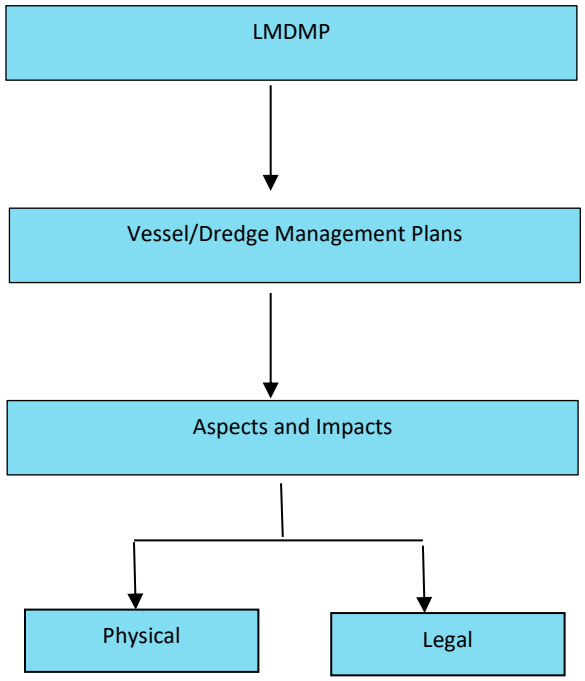

Figure 12 Linkages between LMDMP and dredge plant EMPs

12.2 Land Management (Contaminated land)

The Port of Brisbane (Lot 83 on SP108337) is listed as contaminated land under the Environmental Management Register (EMR) for the notifiable activities such as landfilling. In this instance landfilling activities refers to the placement of dredge material used to reclaim the Port of Brisbane lands given the potential for this sediment to be contaminated. Typically, dredge material is considered contaminated when it does not meet the National Assessment Guidelines for Dredging 2009 (Department of Environment, Water, Heritage and the Arts).

The EMR listing means soil would require approval by DES to be moved off the island. In this instance soil movements such as the movement of sand for preloading are moved only within the island on the same Lot and Plan.

The FPE precinct forms part of the same Lot and Plan as the Port of Brisbane (Lot 83 on SP108337) and also includes three other lots - Lot 93 on SP143710, Lot 94 on SP205694 and Lot 95 on SP205694. These subsequent lots are not listed on the EMR as they are not classified as land while infilling operations are being conducted below HAT. Currently these lots are perpetual lease and would not be transferred to freehold until they are filled to a specified level to become land and native title is extinguished. It is anticipated that when these lots become land they will then be listed on the EMR for landfilling activities.

12.3 Acid Sulphate Soils

The bulk of the material placed in the reclamation ponds is generated through maintenance dredging. This material is recently eroded from the catchments and collects in channel and berth areas. Testing undertaken by the PBPL has indicated that this material has limited Acid Sulfate Soil (ASS) potential. However, capital or development dredging material has some potential.

To manage the uniquely natured reclaimed materials, the PBPL has developed an ASS management plan, which addresses the intent of the SPP2/02 and is supported by the Queensland Acid Sulfate Soils Investigation Team (QASSIT) of DERM. This plan contains practical procedures that can also be used as guidance during site works.

As the management scope of this document is larger than the reclamation area and specific to ASS management, it will be the principal management tool. No additional management is proposed under this EMP and readers are referred to the Port of Brisbane Acid Sulfate Soil Management Plan 2012.

12.4 Erosion and Sediment Control

Erosion and sediment runoff are influenced by many factors including climate, topography, soil types, vegetative cover and land disturbance activities. Erosion and sediment runoff are two separate processes with different control measures.

Erosion relates to the weathering process influenced by water, wind and land disturbance. The extent of erosion depends on rainfall intensity, soil type and erodibility, steepness of slope, vegetative cover and the control measures in place to minimise disturbed areas.

The transport and deposition of the disturbed soil particles is the sediment runoff or sedimentation. The extent of sedimentation depends on the velocity of the transport medium, the rate of erosion to suspend sediments in the medium and the extent to which sediments settle out as the velocity of the water decreases. The deposition of these sediments can result in blocking drainage systems and contaminate stormwater, creeks, rivers, lakes and oceans.

Appropriate control measures are to be determined and established before works commence to minimise erosion on site and prevent eroded sediments leaving site. The control measures will also be illustrated on a site plan and are to be monitored for their effectiveness. The control measures will be modified and improved as necessary to maintain effectiveness.

Element	Erosion and Sediment Controls
Objective/Target	To minimise the loss of sediment during vegetation clearing, soil movements and construction activities.

Actions	• The controls implemented to reduce erosion and sedimentation depends on the soil type, susceptibility to erosion, slope of site and soil compaction. During works the following controls will be considered and implemented as required:
	• Control vehicle access – a dedicated entrance and/or exit point is established via Curlew Street to prevent tracking of sediment onto roadways where it can run into stormwater systems. Internal movements of vehicles on-site will be confined to dedicated haulage routes and any existing vegetated areas protected from vehicle tracking. Road sweeping, rock rubble pads and vibration grids will be considered if there are ongoing tracking issues.
	• Minimise windblown sediments – Given the reclaimed nature of the area, most areas are highly disturbed. To minimise the exposure of sediments to wind and erosion, disturbed areas will be minimised, preserving any established vegetation. Wind barriers may also be placed to protect sensitive areas.
	• Sediment transport reduction off-site – to prevent or minimise the quantity of sediment loss from exposed soils and batters, control measures will be implemented such as:
	  ○ perimeter control measures (e.g. sediment fences)
	  ○ consolidation by track rolling and other contouring techniques
	  ○ establishing vegetation or stabilisation through grass seeding, hydroseeding, hydromulching, compost blankets, geofabric or hessian fabrics
	• It should be noted that the application of techniques such as hydromulching or compost blankets perform better on compacted soils, where the underlying ground is stable to minimise slippage and reduce runoff. Bare soils are better left uncompacted to create a similar effect to contouring to reduce water velocities and increase rainfall infiltration.
	• Permanent landscaping and stormwater design features – implementation of rehabilitation with grass species, landscaping, or stormwater features will be considered at the earlier stages of construction to minimise land disturbance. Within reclamation this may not be undertaken until the development stage where it would be the responsibility of contractors.
	• Divert stormwater from disturbed areas – to prevent the entrainment of sediment in stormwater, waters will be diverted before entering the site. At the top of batters or at the point of ingress of stormwater the following control measures will be considered:
	  ○ diversion banks or drains
	  ○ perimeter banks
	  ○ vegetative buffers
	• Protect vegetation buffers – retain any existing vegetation on-site or adjacent to site to slow runoff and filter contaminants.
	• Protect existing stormwater systems – provide control measures such as filter socks, silt fences and geofabric to prevent ingress of sediment-laden stormwater into stormwater drains and swales.

Element	Erosion and Sediment Controls
	• Stabilise banks, batters and slopes – to reduce the potential for erosion the site levels and batter slopes (e.g. stockpiles or perimeter bunds) will be reduced to decrease velocity and increase infiltration of water. Exposed banks or slopes will be stabilised with a range of control measures including vegetation, compost blankets, hydromulching, geotextile or rock rubble. This may also include any check dams and contours that are established. • Provide stockpile protection, including preload - stockpiles will be maintained at a manageable size in relation to the nature of the material. These measures may include track rolling and silt fences for small stockpiles. For larger stockpiles, stormwater on the top of the stockpile will be contained within perimeter banks (use of earthen bunds or compost berms), a stabilised outfall with geofabric will be constructed, the batters stabilised with hydromulch, hydro seeding, compost blankets and stormwater flow controlled at toe of batter with controls such as silt fences or compost berms. • Prior to works commencing on any paddock a plan will be drafted to illustrate erosion and sediment control measures such as sediment fences, diversion drains, entry/exit points, haulage roads, contour lines with direction of drainage flow.
Performance Indicators	Measures will be implemented to control erosion and sediment loss from site. Minimal sediment will be lost from site.
Monitoring	Daily visual inspections will be made during site works or subsequent to heavy rainfall periods to check: • Signs of erosion e.g. sheet erosion, rill erosion, gully erosion particularly to bund walls and haulage roads • Effectiveness of erosion controls devices e.g. vegetation cover, track rolling techniques, mulching, etc • Signs of sediment loss particularly to off-site areas. This includes any impacts on adjacent stormwater systems. • Effectiveness of sediment control devices such as silt fences, diversion drains, etc. This includes the position and effectiveness to trap and divert sediments.
Reporting	Any works required or repairs identified during daily inspections or otherwise will be reported to the Reclamation Inspector or Construction Manager.
Corrective Action	The existing sediment and control measures will be reviewed by the Construction Manager or Reclamation Inspector. Control measures will be reinstated where necessary and recommendations for additional control measures will be implemented as instructed by the Reclamation Inspector or Construction Manager.
Term	During all operations.
Responsibility	Reclamation Inspector or Construction Manager

12.5 Water Management

A proportion of the sediments placed within the reclamation ponds are likely to have at least one parameter exceeding the National Assessment Guidelines for Dredging 2009 (Department of Environment, Water, Heritage and the Arts), deeming them “contaminated” sediments. The discharge of tailwaters associated with these sediments has the potential to carry contaminants, either in solution or as suspended sediments, to adjacent areas.

The criteria used to assess the contamination status of the water samples destined for final discharge will be theMoreton Bay Environmental Values and Water Quality Objectives prepared by the State of Queensland (Department of Environment and Resource Management 2010). Whilst sediment will be assessed against the National Assessment Guidelines for Dredging, this will only to be to generate baseline conditions, as these guidelines are not relevant to the placement of the material within the reclamation ponds.

The environment team usually conducts water and sediment sampling post placement of dredge sediment from the maintenance dredging campaign. Sample collection and monitoring will be carried out in accordance with Environmental Monitoring Procedure Mon-005: Sediment and Water (Reclamation).

PBPL conducts pre- and post-placement sediment sampling within the existing reclamation area. This includes analysis of water sampling for both filtered and non-filtered metals, providing an indication of the quality of discharge waters where sediments are retained.

The results of this analysis indicate that generally the analytes were at or below detection limit. Where analytes are above detection, such as aluminium, the results of the filtered samples are orders of magnitude less than the total (or unfiltered) samples. The retention of sediments within the reclamation area retains approximately 95% of metals within the site. As such, the principal control for limiting the transport of contaminates to adjacent waters will be the retention of sediments, and hence turbidity control (see section 12.6).

Element	Water Management (general contaminant suite)
Objective/Target	To ensure no sediment-laden waters are released from site and this is no deterioration in water quality of adjacent watercourses.
Actions	• Ensure sediment and erosion controls are in place during site operations including protection and minimise disturbance of vegetation. Refer to section 12.4. • Any spills to be contained and cleaned up to ensure to no run-off of contaminants. Refer to section 12.15.
Performance Indicators	• Any discharge of water from site to be tested prior to release in accordance with the Moreton Bay Environmental Values and Water Quality Objectives • Sediment will be compared with National Assessment Guidelines for Dredging and the PBPL's Acid Sulfate Soil management plan where required.
Monitoring	• Sampling and analysis of sediments and water from within the reclamation ponds will be taken post dredging maintenance campaign. • The method for sampling will be in accordance with Environmental Monitoring Procedure Mon-005: Sediment and Water (Reclamation).
Reporting	• Water quality results will be reviewed and followed up by environment team. • Reporting of exceptions to Environment Manager and Construction Manager.
Corrective Action	• Environment personnel to investigate reason for exception and take appropriate action. • Investigate the source of the contaminant and the levels reported from adjacent sampling sites. Additional sampling may be undertaken to further define this source. Corrective action where required may include re-routing discharge pathway from contaminated area or material removal for system
Term	During all operations.
Responsibility	Site inspections and operations by Reclamation Inspector and water and sediment testing by environment team.

12.6 Turbidity Management

The discharge of tailwaters from the reclamation process has the potential to transport suspended sediments from the reclamation ponds to adjacent areas, including sensitive receptors such as seagrass beds and Ramsar International Wetland sites.

A real time water quality monitoring buoy has been installed in the outer FPE pond near the final discharge point. The environment team will conduct annual turbidity and water testing or as required to verify pond conditions. Monitoring will be carried out in accordance with Environmental Monitoring Procedure: Tailwaters (Reclamation Ponds).

Waters adjacent to the FPE precinct will not be affected by reclamation activities. The turbidity of tailwaters entering the outer FPE pond will be closely monitored using a real time water quality monitoring buoy, where the bund walls are not sealed. Turbidity at this point of discharge is not to exceed:

- 10 NTU above background where background levels are <25NTU; or
- 25% above background where background levels are >25NTU

Using monitoring methods at weir box locations (without monitoring background), an impact of no greater than 10 NTU is allowed. To achieve this performance, a criteria at the final weir box into the outer FPE pond is calculated based on plume degradation curves (Table 3). In 2012 B4 was constructed, requiring a NTU reading at the final weir box of 17 NTU. In 2020 C4 is planned to be completed, lengthening the distance across the outer FPE, increasing the criteria at this location to 54 NTU. Please see 13 which shows the weir box locations.

Figure 13: Future Port Expansion pond layout

To enhance monitoring a real time continuous water quality monitoring buoy (Xylem, exo3) has been installed in the outer FPE to supplement existing manual methods. An automatic alarm sends text messages if NTU reaches 10 NTU. Manual method procedures will be maintained in the event the buoy requires unscheduled maintenance during the discharge of tailwaters.

Table 3 Expected discharges from Weir Box if absolute 10NTU at boundary outer FPE bund wall (based on previous plume degradation calculations described below). (Table constructed in Excel Crews Ref A936935).

Distance to Unlined Bund Wall (m)	Discharge at Weir Box Turbidity Value (NTU)	Comments
600	90.0	Discharge before paddocks R3, C3, B3
550	83.3	
500	76.7	
450	70.0	
445	69.3	
400	63.3	
350	56.7	
330	54.0	C4 Weir Box
300	50.0	
250	43.3	
200	36.7	
150	30.0	
100	23.3	
54.33	17.2	B4 Weir Box
50	16.7	
0	10.0	At bund wall

Table 4 The turbidity measurements (in NTUs) to be compared against for weir boxes R3 and B3 and the subsequent levels of response and actions to be taken (extract from Environmental Monitoring Procedure Mon:006 Tailwater (Reclamation Ponds).

Location	Turbidity (NTU)		
B4 Weir	< 17 NTU	17-30 NTU	>30 NTU
C4 Weir	< 54 NTU	54-69 NTU	>69 NTU
Xylem	< 10 NTU	10 – 23 NTU	> 23 NTU
	↓ Action Levels ↓		
	Continue Discharge	Take Action	Stop Discharge
	Continue discharge and maintain monitoring (manually - every 6 hours, Xylem – real time).	Compare to background criteria. If exceeds criteria, change pond set up (e.g. slow down flow speed, board up weir box, change flow directions, discharge paddocks). Monitor again in 2 hours.	Compare to background criteria. If exceeds, stop discharge to outer FPE. Change pond set up (e.g. slow down flow speed, board up weir box, change flow directions, discharge paddocks). Monitor weather conditions (e.g. tides, wind, and currents). When conditions suitable allow discharge and monitor within 1 hour of recommenced discharge. If turbidity still high contact environment staff.

Further details on turbidity measurements, establishing plume paths and degradation curves is described below.

Element	Water Management (Turbidity)
Objective/Target	To ensure that the turbidity of waters adjacent to the FPE precinct are not adversely affected by reclamation activities.
Actions	The following will be implemented to minimise turbidity of tailwaters generated from placement of dredge material prior to discharge to outer FPE pond: • From point of dredge material placement, tailwaters will be directed through a minimum of three (3) ponds prior to discharge to our FPE pond. • If less than three ponds are utilised, then management must ensure that appropriate management measures are in place to achieve turbidity performance indicators.Weir boxes will be placed in ponds to provide maximum distance for sediment fall out. Weir boxes will have the capacity to be boarded up when necessary to slow flow velocities. • Daily inspections of weir boxes and potential turbidity plumes will be conducted. Turbidity monitoring while dredge material placement activities is occurring will be conducted in real time with an exceedance alarm or approximately every 6 hours during using manual procedures • Ensure continuous monitoring equipment is calibrated and maintained in the weeks preceding tailwater discharge
Performance Indicators	No plumes of turbid waters exceeding acceptable criteria to be generated outside the external bund wall. Turbidity at the point of discharge is not to exceed: • 10 NTU above background where background levels are <25NTU; or • 25% above background where background levels are >25NTU Discharge from final weir box to the Outer FPE will be <17 NTU at B4 or <54 NYU at C4 (see Table 5) where manual monitoring methods are used. **Impact Site** – The impact site is defined as a point of discharge from site. **Background** – Background is defined as an average of measurements of turbidity representative of local ambient conditions, recognising factors such as sediment type, exposure, water depth and current direction at the impact site. In partnership with Healthy Land and Water, a continuous real-time water quality monitoring buoy has been installed to monitor surface and sub-surface background water quality in Moreton Bay near the Mud Island disposal ground. The surface monitoring results will provide a suitable measure of background and will be used when available. Manual sampling provides a back-up process when continuous monitoring is unavailable. To be representative of the impact site without the influence of the earthworks activities, a minimum of three background sites will be assessed within 400m directly up-current of the site. The Environmental Representative undertaking the monitoring will determine measurement locations within this 400m zone. These sites will be varied based on conditions, but will generally be located in areas representative of the depth range within the zone (i.e. deepest, mid depth and shallow site will be selected). Where possible measurements are to be taken approximately top, mid and bottom depth within the water column where appropriate. Spot measurements are an average of a minimum of 20 measurements taken over at least a 1 min period. In partnership with Healthy Land and Water, a continuous real-time water quality monitoring buoy has been installed to monitor surface and sub-surface background water quality in Moreton Bay

Element	Water Management (Turbidity)
	near the Mud Island disposal ground. The surface monitoring results will provide a suitable measure of background and will be used when available. Manual sampling provides a back-up process when continuous monitoring is unavailable.
Monitoring	During releases of discharge waters into the Outer FPE Pond, turbidity will be monitored continuously in real time (using a Xylem buoy, checked daily during tailwater discharge) with an exceedance alarm that will alert environmental personnel if NTU exceeds 10. If NTU exceeds 10 then background monitoring in the Bay will be checked and a site inspection of the outer FPE will occur. If water quality in the FPE is less than background + 10 and there are no visible signs of impacts at the point of discharge (i.e. outside the FPE outer bund) then discharge will continue with increased monitoring frequency (twice daily data and site inspections). Typically, high background readings will be due to regional natural weather events (e.g. wind) and the cause easily determined. When background data is viewed, the potential for high readings caused by sensor fouling or localised human induced impacts near the buoy will be considered (e.g. such as a nearby passing vessel or sediment disposal) and excluded as a possible cause. If continuous monitoring is unavailable, manual monitoring will occur on a regular basis (6 hourly or significant changes in release and/or weather conditions) as dictated by changes in pond conditions, discharge volume or dredge cycles. Samples will be taken from the discharge point flowing into the Outer FPE pond. Sampling will be performed in accordance with Environmental Monitoring Procedure Mon: 006 Tailwater (Reclamation Ponds).
Reporting	Water quality results will be reviewed and followed up by environment team. Reporting of exceptions to Construction Manager, Environment Manager and Reclamation Inspector.
Corrective Action	Discharge will cease where discharge waters exceed criteria. Investigations will be undertaken to determine the cause of the elevated levels and corrective actions put in place. This will involve the hierarchy of controls as follows: 1. Increase pond depth (weir box control) to reduce wind induced resuspension; 2. Increase tailwater retention time; 3. Delay discharge until conditions improve (e.g. wind drops); 4. Implement control devices or change discharge path via additional ponds; 5. Cease discharge. The implementation of these strategies will include consideration of: • Weather conditions (e.g. wind increasing, direction shifting); • Works location and daily work plan (time remaining on current activity); and • Likely effectiveness of above controls given site conditions.
Term	During all operations.
Responsibility	Site inspections and operations by Reclamation Inspector and water and sediment testing by environment team.

A Word on Turbidity
(extract from Environmental Monitoring Procedure Tailwater (Reclamation Ponds)).

Turbidity testing will be the primary indicator to determine the water quality of discharging tailwaters.

Turbidity refers to the clarity or cloudiness of water, which is caused by suspended particles. Turbidity can be measured by the amount of total suspended solids (TSS) or the scatter of light by the particles (NTU).

Total suspended solids (TSS) - The greater the amount of total suspended solids (TSS) in the tailwaters, the cloudier it will appear and the higher the measured turbidity. The suspended solids will be sourced from algae or dead organic matter, however more typically in these tailwaters it will be suspended silts and clays. Total suspended solids (TSS) are measured by pouring a known volume (typically 1L) of water through a pre-weighed filter and weighing the dried filter. The difference determines the weight of the particulates and is expressed in mg/L. This technique is usually carried out in the laboratory and takes time to receive results.

NTU (Nephelometric Turbidity Units) – Turbidity measured in NTU can be determined by a turbidity meter, secchi tube or secchi disk. This measures the amount of light absorbed or scattered by particles depending on their shape, colour and size. For this procedure a turbidity meter and secchi tube is used to determine turbidity in NTU.

There is no set correlation between turbidity and TSS. A correlation will be determined depending on each location.

The principal environmental variable likely to be impacted by the discharge from the reclamation works is likely to be the concentration of total suspended sediments (TSS) within the discharge waters. The determination of TSS is by a laboratory analysis and takes the order of 24hrs to return a result, and as such is not an effective measure for a reactive monitoring program.

The PBPL will use NTU to measure the turbidity of discharge waters as:

- this is an instantaneous measurement;
- can be made in the field and in-situ;
- multiple measurements can be rapidly made to determine the average if required, rather than a single grab sample; and
- is consistent and repeatable measure requiring limited operator skill.

This approach was used very successfully during the bund construction phase of the monitoring works.

In 2009 the PBPL purchased new secchi tubes that provide absolute turbidity readings in NTU. The previous secchi tubes gave readings in secchi depth (cm) and required a conversion to a NTU reading. At the time, a reproducible correlation was determined between secchi depth (cm) and NTU to make this conversion. Should this old secchi tube be used, this historical information can be retrieved in the Reclamation EMP (May 2005) and the Environmental Monitoring Procedure Mon: 006 Tailwater (Reclamation Ponds) version 3 dated 17 March 2007 (an extract of these are provided in Appendix B).

The criteria used for the bund construction EMP were 10NTU above background when background was less than 25NTU. This was assessed as highly conservative criteria during the bund construction works. Qualitative surveys of seagrasses within 10m of the construction front (rather than 100m downstream where the criteria were actually assessed) found no impacts.

As the bund construction EMP does not propose background measurements, an absolute 10NTU at the boundary conditions was established as benchmark criteria.

This criteria was developed to look at the maximum allowable plume at the boundary of the site where waters would enter Moreton Bay. However, as the Outer FPE pond provides a diffuse discharge, no single nominated point could be defined. In this regard, the discharge from the final weir box into the Outer FPE pond is used.

Two critical factors were considered in the development of turbidity criteria at the weir box:

- Plume path – considers the path where the plume travels across the outer FPE pond and enters Moreton Bay through the outer (unsealed) FPE bund wall. This plume path travelled considers time and distance.
- Plume degradation – considers the degradation in turbidity of these plumes over the plume path travelled. This allows to back calculate a maximum allowable turbidity level at the weir box which would achieve the absolute 10NTU at the boundary of the site.

Plume Path

The internal pond walls are impervious, and no tidal exchange via these sections is recorded or expected (Figure 11). This is supported by the track of tidal heights presented Figure 14. It can be seen that as the walls were sealed, the trace of tidal heights was dampened, and finally removed with variations in water heights totally controlled by dredge discharge and weir box changes.

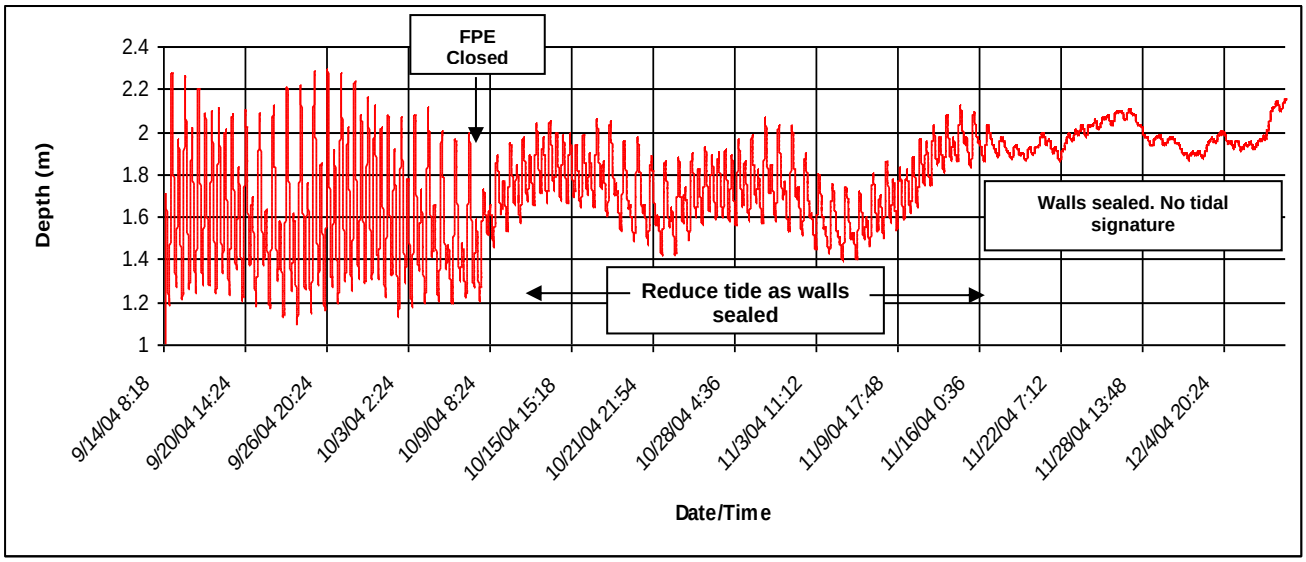

Figure 14 Plot of Water Level with Pond B1 during construction. Note full tidal signature until the outer FPE walls were closed, a period of reduced tidal amplitude as wall sealing was undertaken, and no tidal signature from early November as wall sealing completed. Minor fluctuations due to dredger input

As such, the only way that a plume could escape the FPE precinct to adjacent areas is through the Outer FPE Pond wall. This wall has some 30-40m cross sectional length of rock rubble for water to percolate through before access to the waters outside the FPE precinct. Water velocities through the wall would be very small, with numerous voids to act as micro-detention voids. In essence, the bund wall is likely to have a significant filtering capacity. However, to ensure calculations of turbidity control within this EMP are conservative, this fact is acknowledged but no allowance has been made for this within plume degradation.

As such, any plume generated by the works and discharged from the weir box to the Outer FPE pond, must travel a considerable distance to reach an unprotected portion of the wall. This distance depends on the location of the weir box. Previously this was some 600m and with the construction of ponds B3, C3 and R3 has been reduced to 445m and 125m (Table 3).

Plume Degradation

To gain an understanding of the nature of the plumes generated by the anticipated dredging works, the PBPL has monitored degradation plumes of sediments resulting from dredging works within the FPE precinct. This was undertaken by collecting several samples directly from the end of dredge pipe during placement works (approximately 1L of material) and placing in vessels of seawater of some 50L capacity. These were then thoroughly agitated to simulate mixing due to placement, and the

degradation of the material monitored over an extended period. It should be noted that these trials did not allow dilution of the plume, and hence would represent a conservative estimate of plume degradation. The results are shown in total in Figure 15.

This plot indicates that the degradation of the plumes is variable, depending on the nature of the dredge sediments, but would degrade to background levels within 48hrs. The ponds do not experience any tidal flows that would generate tidal streams to transport plumes as would occur for dredging operations outside the FPE precinct (i.e. Brisbane River). The predominate influence on water movement within the FPE precinct is discharge from the previous pond and wind. Current speeds within the ponds are very low, and would be unlikely to reach a vertically depth averaged speed of greater than 0.001m/sec. To calculate a conservative degradation, a value of 0.01m/sec has been adopted (i.e. 10 times the anticipated maximum).

Minimum travel distance of a plume would be achieved by the use of only one pond. In this scenario, distance to the final weir box from the end of pipe was some 900m prior to construction of ponds B3, C3 and R3. At this time, the distance from the final weir box (which was at the end of pond C2) to the FPE precinct to the closest portion of the bund wall was 600m. In this case, the minimum travel distance was 1.5km. Based on the transport speed above, discharge from end of pipe to outer wall was approximately 42hrs.

This length of time would result in a significant degradation of material released from the final weir box to the Outer FPE pond, as can be seen in Figure 12.6.5. In this regard, the establishment of an absolute discharge criteria at the adopted level provides for a significant level of confidence that plumes at the site boundary (i.e. outside the FPE wall) will be negligible.

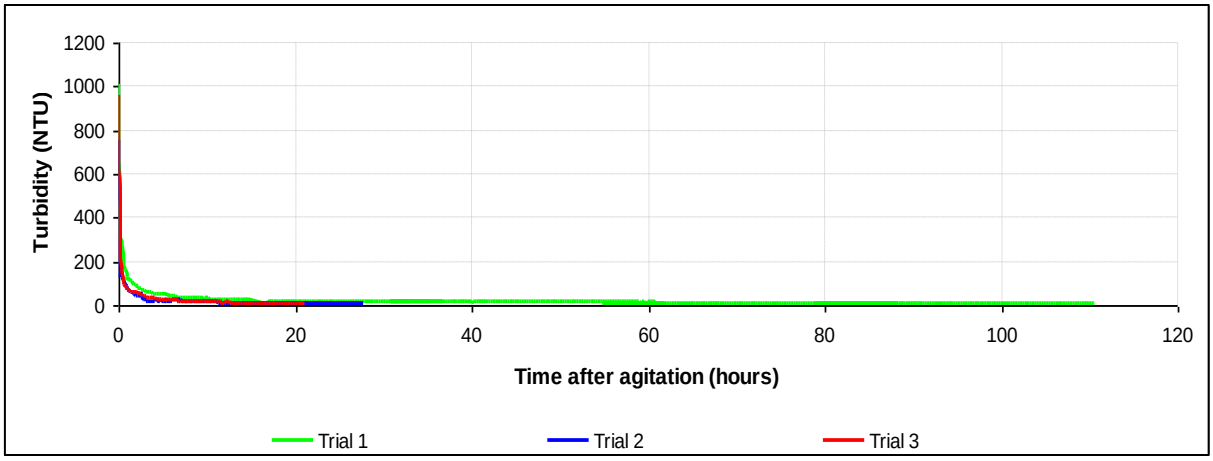

Figure 15 Degradation plots of turbidity generated by dredging discharge. Note initial intense plumes rapidly settle (10% of initial within 1.5hrs) with residual values taking longer to degrade to background values

12.7 Noise

The activities undertaken during the reclamation process (e.g. use of large earth-moving equipment, moving materials about the site) have the potential to generate significant and sustained levels of noise. Additionally, the reclamation process can be undertaken 24 hours per day and seven days per week depending on the project requirements and dredging plant.

The reclamation works is in an area remote from commercial premises (>1km) and very remote from residential areas (>5km). The works are to be undertaken in an industrial workplace, with the noise likely to be generated of a similar nature to the existing noise environment.

As such, the works are unlikely to provide an issue for management in this regard. Hence the principal management response will be investigation of specific noise complaints. If in the term of the project a number of complaints are received, overall project monitoring will be instigated.

Element	Noise Management
Objective/Target	To ensure noise generated by earthworks operations does not impact sensitive areas.
Actions	• To minimise the impact of noise nuisance on sensitive areas the following shall be conducted: • Plant and equipment shall be maintained in accordance with manufactures' specifications. • Plant and equipment maintenance shall only be conducted on weekdays and during business hours. • Earthworks shall be conducted so as to avoid low background noise times. • All noise from activities must not exceed the levels specified in the Environmental Protection Noise Policy 2008. • Should site operations impact sensitive areas and a complaint be received, works shall be investigated and measures implemented to minimise noise where possible or cease works pending further investigation. Contributing environmental factors such as wind direction shall be considered and consideration given to works being shifted or ceased during prevailing winds in direction of sensitive areas.
Performance Indicators	No noise complaints received regarding the earthworks operations.
Monitoring	• The level of noise shall be assessed at the sensitive location to determine the impacts (i.e. nuisance issue), the source and whether further noise monitoring is required. • If required, a qualified acoustic consultant shall be engaged to measure the noise levels, determine the noise source and recommend noise mitigation measures. • Measurement of noise levels shall be guided by the latest edition of the Environmental Protection Agency's Noise Measurement Manual.
Reporting	All complaints shall be recorded in the Complaints Register and reported to the Construction Manager and Reclamation Inspector. Corrective and subsequent investigation shall also be recorded. Any reports submitted by consultants shall be recorded and actions followed up.
Corrective Action	The Construction Manager or Reclamation Inspector shall investigate or coordinate an investigation into the source of the complaint. Should the source derive from site earthworks, operators shall be notified and cease work if necessary. Investigations into the effectiveness of noise reduction equipment, further implementation of noise mitigation measures, environmental conditions (e.g. wind) shall be conducted and subsequent monitoring carried out.
Term	During all operations.
Responsibility	Construction Manager and Reclamation Inspector.

12.8 Dust

The reclamation process will involve developing large areas of exposed sediments. Due to the location and the nature of the process, vegetation is unlikely to establish on these areas in the short term, and wind exposure is likely.

As previously discussed for noise, the construction site is relatively distant from sensitive receptors such as residential places. The activities that generate dust may be exposing sediment at the working face of stockpiles and truck movements on haulage roads. This has effectively been managed to date via traditional techniques such as water trucks and surface treatments. This will also be undertaken during the FPE reclamation works.

Element	Dust Management
Objective/Target	To minimise the generation of dust and ensure any dust generated does not impact on sensitive receptors.
Actions	• To minimise the dust generation and impact on sensitive areas the following shall be conducted: • Minimise areas of disturbance through staging works to restrict the exposed areas. • When an area of reclamation is to be handed over, schedule removing surcharge and stripping of a site to minimise the time gap before construction begins. • When moving surcharge, consider leaving a strip of capped sand if the site is adjacent to sensitive areas • Rehabilitate areas through establishment of vegetation as soon as site levelling and capping works are complete. • Develop buffers at the perimeter of the site. For example, if appropriate, earthen landscaped mounds or screens will be installed. • Works to be relocated or ceased if winds prevail towards sensitive areas and are causing a dust emission nuisance to those areas. • Dust suppression techniques will be utilised such as applying water (or other products approved by the environment team) to the subject site. • Planting vegetation in strategic locations to reduce wind velocities.
Performance Indicators	No dust complaints received regarding the earthworks operations.
Monitoring	Dust generated shall be monitored either by regular visual inspections or air quality monitoring. If required a qualified air quality consultant shall be engaged to measure the dust levels and recommend dust mitigation measures. Dust levels shall be determined using the Australian Standard AS3580:2006 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM (sub)2.5(/sub) low volume sampler - Gravimetric method; or AS3580:2003 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM(sub)10(/sub) high volume sampler with size-selective inlet - Gravimetric method.
Reporting	All complaints shall be recorded in the Complaints Register and reported to the Construction Manager and Reclamation Inspector. Corrective and subsequent investigation shall also be recorded. Any reports submitted by consultants shall be recorded and actions followed up.
Corrective Action	The Construction Manager or Reclamation Inspector shall investigate or coordinate an investigation into the source of the complaint. Should the source derive from site earthworks, operators shall be notified and cease works if necessary. Dust controls shall be implemented such as watering the site and the effectiveness of these controls and environmental conditions (e.g. wind) shall be monitored.
Term	During all operations.
Responsibility	Construction Manager and Reclamation Inspector

12.9 Flora Management (Seagrass)

The reclamation process is wholly contained within the FPE bund, and an approval is held by the PBPL for disturbance/removal of seagrasses within this site. Monitoring during the bund construction process showed no impacts to seagrass immediately adjacent the site during placement within the following period up to March 2005. This monitoring did show however that the system is highly variable on a seasonal basis, making it a poor monitoring tool for temporal changes.

With the bund wall in place and all activities restricted to internal areas, the only potential impact will be turbid waters from the site. As such, the emphasis on the control of turbid waters within the EMP will be used to address this issue.

No seagrass monitoring is planned under this EMP, however there are seagrass areas monitored as part of the volunteer based Seagrass Watch program and the PBPL's general environmental monitoring. The Seagrass Watch area is located on mudflats to the south of the permanent bird roost. Consultants are engaged every 2-3 years by the PBPL to conduct a broad scale seagrass monitoring with control sites in the Wynnum-Manly area. Monitoring has demonstrated a significant and sustained expansion of seagrass in this area since the construction of the FPE. It has been concluded that the protection afforded to the seagrass by the separation from Brisbane River caused by the FPE has benefited the seagrass bed.

12.10 Fauna Management (Shorebirds)

The site does not contain terrestrial habitat at present, and this will be created as the reclamation process continues. Previous experience has shown that the reclamation ponds are used by shorebirds (especially migratory waders) as a high tide roost. The PBPL seeks to maximise this beneficial use of the site.

The PBPL has a monitoring program for a number of sites on Fisherman Islands, including the reclamation area. This includes a dedicated 12 ha permanent roost area constructed by the PBPL.

To ensure the management of these areas is consistent, the PBPL has developed a stand-alone management plan for Shorebirds. This plan has been previously approved by DERM, Queensland Wader Study Group and Commonwealth Department of Environment, Heritage Water and the Arts.

As the management scope of this document is larger than just the reclamation area, and specific to shorebirds, it will be the principal management tool. No additional management is proposed under this EMP and readers are referred to the Port of Brisbane Shorebird Management Plan.

Element	Protection of Shorebirds
Objective/Target	To ensure the minimal disturbance to shorebird roosting sites.
Actions	• Areas of disturbance to be minimised. • When working adjacent to shorebird roosting sites, ceasing works during high tide will be considered. • All wastes to be removed from site to discourage scavengers and predators to the birds.
Performance Indicators	No capture or injury of shorebird or other fauna.
Monitoring	Shorebirds counts to be conducted on monthly basis. Any capture or harm caused to shorebirds or other fauna to be reported to Environment Manager.
Reporting	Reporting of exceptions to Construction Manager and Reclamation Inspector
Corrective Action	Construction Manager and Reclamation Inspector to investigate reason for exception and take appropriate action, with input from Environment personnel.
Term	During all operations.
Responsibility	Construction Manager and Reclamation Inspector are responsible to maintain visual checks and reports any incidents

12.11 Waste Management

Waste generated during reclamation activities will be managed by existing waste facilities at the reclamation compound. These wastes are collected by licensed waste contractors.

The waste types that will be generated on-site are tabulated below:

Waste types generated	Source of waste generation	Disposal Options
General waste including food scraps	Lunch waste generated by operators	3m^3 general waste bins at Reclamation Compound
Bulk inert general waste e.g. timber, concrete	Clean up operations at reclamation and from dredge plant	12m^3 general waste at Reclamation Compound
Scrap metal materials including ferrous and non-ferrous metals	Illegal waste dumping by public	Bulk metals skip bin at Reclamation Compound
Recycled waste including metals plastics, paper and glass products	Waste generated by operators	2 x 240L recycling bins at Reclamation Compound

Element	Waste Management
Objective/Target	To ensure that wastes are collected, retained and transferred to an appropriate licensed facility without unintentional material loss
Actions	• Waste will be segregated and recycled wherever possible. • Wastes generated will be transferred to waste reception facilities at the Reclamation Compound or Operations Base wherever possible. • Bulk inert wastes such concrete and timbers will be segregated and stockpiled on-site until collection by a licensed waste contractor. • Green waste generated from site clearing will be collected as bulk materials. However where possible clean vegetation (relatively free of weeds) shall be used as temporary cover over exposed areas to prevent erosion.
Performance Indicators	No waste shall be lost to the surrounding environment.
Monitoring	Regular visual checks for waste during daily site inspections.
Reporting	Reporting of material loss to Construction Manager or Reclamation Inspector.
Corrective Action	If practicable, retrieve material that was lost. Review procedure causing material loss and rectify immediately.
Term	During all operations.
Responsibility	Construction Manager or Reclamation Inspector

12.12 Cultural Heritage

Cultural heritage refers to both European and Indigenous heritage issues. The following table describes the general process should items of cultural significant be discovered during reclamation activities.

Element	Cultural Heritage
Objective/Target	To ensure earthworks activities do not disturb or destroy items of cultural significance.
Actions	• Undertake visual inspection prior to commencing site works and report any items of suspected cultural significance. If items are found, retain and report to relevant authorities (DEHP) through Construction Manager. • Works to cease immediately if any items of suspected cultural significance are observed. • Areas of cultural significant are to be marked on-site and avoided during site works, unless instructed by the Construction Manager.
Performance Indicators	No disturbance of items of cultural significance.
Monitoring	Visual inspection of paddocks prior to and during site works.
Reporting	Reporting of material loss to Construction Manager or Reclamation Inspector.
Corrective Action	Construction Manager to investigate reason for exception, contact the relevant authorities (DEHP) and take appropriate action.
Term	During all operations.
Responsibility	Construction Manager is responsible to maintain visual checks and reports any incidents.

12.13 Refuelling

The contractor is responsible for the refuelling of plant and equipment on site. The following table provides a brief overview of the refuelling process.

Element	Refuelling
Objective/Target	To ensure no spillage or fuel loss during refuelling operations
Actions	• Refuelling will be conducted by licensed mini-tankers and the appropriate procedures and processes will be followed and signed off. • The portable diesel tank will only be used in emergency situations and whilst not in use will be stored in a purpose built bund kept free of contaminants. • Spill equipment to be readily available to contain and clean up any spill. Refer to section 12.14.
Performance Indicators	No spills or leaks during fuel transfer.
Monitoring	Visual inspections of fuel-dispensing equipment and surrounding waters (where applicable) during and after fuel transfer.
Reporting	Reporting of spill / or leak to Construction Manager or Reclamation Inspector.
Corrective Action	In the event of a minor spill, it will be cleaned up with spill equipment and in accordance with the PBPL's Emergency Preparedness and Response Manual. In the event of a major spill, call Triple zero (000) then refer to the Critical Incident Plan reporting process. Construction Manager or Reclamation Inspector to investigate source and cause of spill or inappropriate work practices. Operating procedures will be changed if required and the crew will be informed.
Term	During all operations.
Responsibility	The contractor onsite

12.14 Equipment Wash down

Washing of plant and equipment will be conducted in the dedicated washbay at Operations Base in accordance with current water restrictions. The process for washing equipment is referred to in the Operations Base Environmental Operating Procedure OpPOBOB: 001 – Washbay Operation.

Excess dirt on site vehicles may be brushed and hosed down at the Reclamation Compound. No soaps or detergents are to be used at the Reclamation Compound for the washing of vehicles.

12.15 Spill Management

Spills shall be reported as soon as practicable to the Maintenance Supervisor and documented through the Accident and Incident Notification process.

Any minor spills (approximately 20 litres or less) shall be contained and cleaned up using the spill kit. Spill kits shall be located on-site or within a known location in the workshop.

Any spill material that is not draining free oil and is less than 100 kilograms (or 0.1m3) will be disposed of in the general waste bin. Spill material that is freely draining oil and in large volumes must be contained in plastic bags, stored within a bunded area and removed by a licensed waste contractor.

Any contaminated soil that results from a spill shall be contained in an impermeable medium (e.g. plastic bags or containers) and collected by a licensed transporter. Contaminated soils shall not be placed in waste bins.

13. References

ANZECC 2002. *National Ocean Disposal Guidelines for Dredged Material* 2002. Commonwealth of Australia, Canberra.

http://www.environment.gov.au/coasts/pollution/dumping/guidelines/pubs/guidelines.pdf

Commonwealth of Australia 2009. *National Assessment Guidelines for Dredging*. Department of the Environment, Water, Heritage and the Arts, Canberra.

http://www.environment.gov.au/coasts/pollution/dumping/publications/pubs/guidelines09.pdf

Moreton Bay environmental values and water quality objectives Basin No. 144 (part) and adjacent basins 141, 142, 143, 145 and 146, including Moreton Bay, North Stradbroke, South Stradbroke, Moreton and Moreton Bay Islands July 2010

https://apps.des.qld.gov.au/protection-policy-water/PBC 2002. *Future Port Expansion – Bund Construction. Environmental Management Plan.* June 2002. Port of Brisbane Corporation.

PBC 2010. *Material Disposal Strategies.* 2010. Port of Brisbane Corporation.

PBC 2010 *Dredged Mud Drying Trial Proposal.* 2010. Port of Brisbane Corporation.

WBM 2000. *Proposed Port Expansion at Fisherman Islands. Impact Assessment Study* Volume 1 August 2000. WBM, prepared for the Port of Brisbane Corporation.

WBM 2001. *Water Quality Monitoring – Fisherman Islands Expansion.* WBM, prepared for the Port of Brisbane Corporation.

Library 333.9164099431 WBMO 2001

PBC 2007. Reclamation Strategy, Port of Brisbane Corporation January 2007