Appendix H
Provisional EMPs

Moorebank Intermodal Company

Moorebank Intermodal Terminal Project

Light Spill Provisional Environmental Management Framework

2 July 2014

PARSONS BRINCKERHOFF

Document information

Client: Moorebank Intermodal Company
Title: Moorebank Intermodal Terminal Project
Subtitle: Light Spill Provisional Environmental Management Framework
Document No: 2103829B PR_7134-RevC
Date: 2 July 2014

Rev	Date	Details
A	29/04/2013	Final for issue
B	15/08/2013	Updated to address SEWPaC review comments
C	02/07/2014	

Author, Reviewer and Approver details

Prepared by:	Emma Lichkus	Date: 02/07/2014	Signature: 
Reviewed by:	Paul Greenhalgh	Date: 02/07/2014	Signature: 
Approved by:	Paul Greenhalgh	Date: 02/07/2014	Signature: 

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Parsons Brinckerhoff Australia Pty Limited

ABN 80 078 004 798

Level 27 Ernst & Young Centre
680 George Street, Sydney NSW 2000
GPO Box 5394
Sydney NSW 2001
Australia
Tel: +61 2 9272 5100
Fax: +61 2 9272 5101
Email: sydney@pb.com.au
www.pbworld.com

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A GRI Rating: Sustainability Report 2011

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1. Environmental Management framework

The Moorebank IMT Project would be developed by the private sector under the direction of the Moorebank Intermodal Company (MIC) Limited, a Government Business Enterprise. The future developer and operator for the Project has not yet been selected. As such, a proposed overall environmental management framework has been outlined as part of the Environmental Impact Statement (EIS) (refer to Chapter 28 - *Environmental management framework*), which would guide the development of a future detailed framework.

Figure 1.1 outlines the overall environmental management framework for the Project. The environmental management framework would include an overarching Environmental Management System (EMS) that complies with AS/NZS ISO 14001:2004. It is anticipated that MIC and the developer and operator for the Project would have established environmental management systems covering their respective business objectives, policies, activities and associated environmental aspects and impacts.

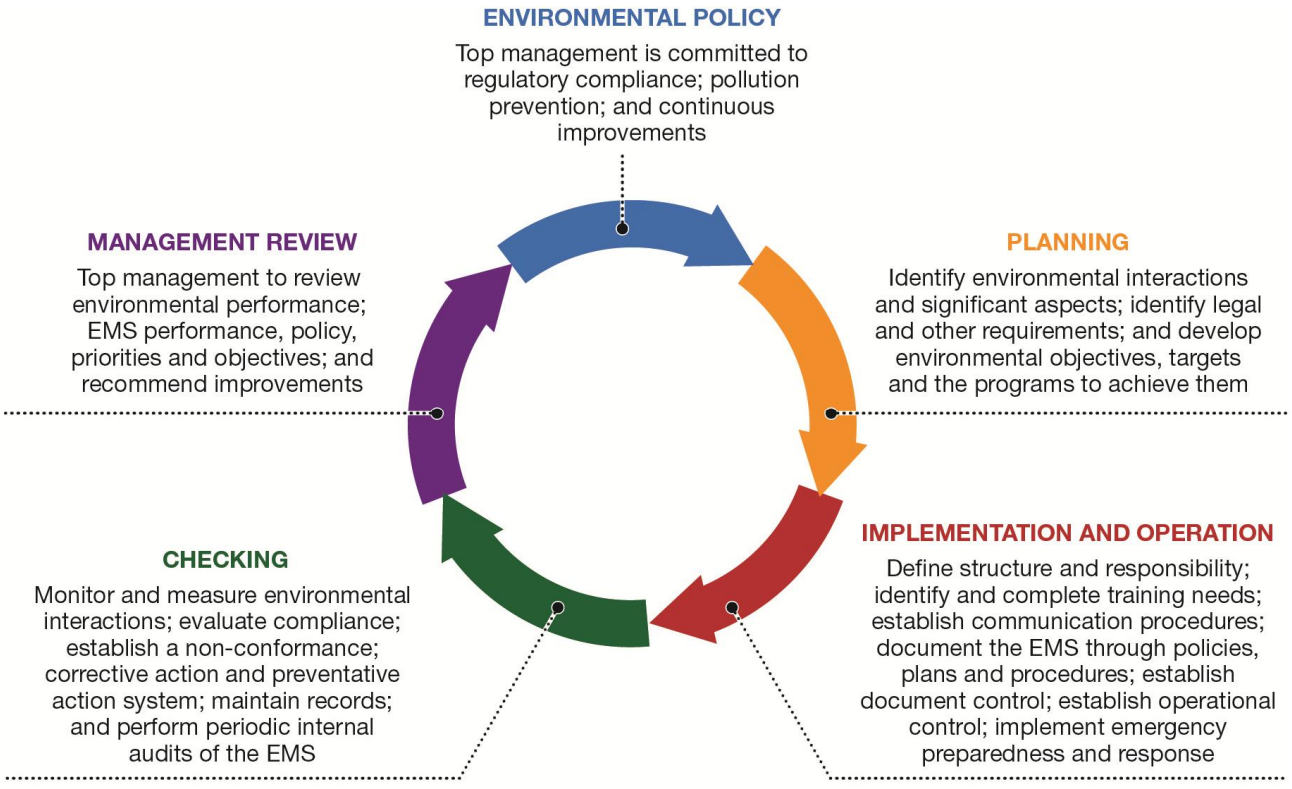

Figure 1.1 Overall environmental management framework for the Project

Approval of the Project is being sought for:

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It is anticipated that the developer and operator for the Project would be required to develop a number of project specific management plans to address design activities, construction activities and operational activities, for example:

- Design Management Plan (DMP) (incorporating environment design criteria).
- Construction Environmental Management Plan(s) (CEMP).
- Operational Environmental Management Plan(s) (OEMP).

This document outlines the Provisional Environmental Management Framework (PEMF) which will guide the development of the above management plans.

The project specific detail to be addressed by each of the above listed management plans would be dictated by the requirements of the following key project documentation:

- The Project's EIS (including this PEMF);
- Project Approval issued under the EPBC Act;
- Stage 1 and Stage 2 SSD approvals issued under the NSW EP&A Act;
- Contractual requirements established between MIC and the developer and operator for the Project; and

Other permits and/or licences required during the course of the project.

1.1 Provisional Environmental Management Frameworks

As part of the Project's EIS, a series of PEMF has been prepared. The purpose of the PEMF is to provide a high level overview as to how the environmental impacts during design, construction and operational phases of the Project will be minimised.

The PEMF combined with the Project approvals, contractual arrangements and other permits and/or licences required during the course of the Project provide guidance with respect to the development of Project specific management plans, such as, DMP, CEMP(s) and OEMP(s).

2. The Project site and study area

The Project site is located within the Liverpool Local Government Area (LGA and includes land occupied by the School of Military Engineering (SME), and a number of minor Defence support units. The Project site is bordered by the Georges River on the western side and Moorebank Avenue and the Defence National Storage and Distribution Centre (DNSDC) on the eastern side. The north and south of the Project site are bordered by key transport corridors, respectively the M5 Motorway and the East Hills Rail Line.

The Project site is located within an urban setting. Suburbs in the immediate vicinity of the Project site include Casula, Glenfield, Moorebank, and Wattle Grove.

Residents in Casula that live immediately west of the Main South Rail Line mostly overlook the Project site (i.e. these residences are elevated above the Project site). At night time, the appearance of the existing Project site environment is relatively dark from viewpoints in Casula.

Moorebank Avenue is currently flanked on both sides by Defence facilities. The military areas vary from very dark lighting environments to quite bright lighting environments. Moorebank Avenue is lit by a combination of high pressure sodium lights and florescent lights.

Glenfield and Wattle Grove are both residential areas with dark lighting environments. The appearance of the existing Project site environment is relatively dark from viewpoints in Glenfield (cul-de-sac at end of Goodenough Street) and Wattle Grove (cul-de-sac at end of Corryton Circuit).

3. Purpose and scope

The purpose of this PEMF is to provide a high level overview as to how light spill impacts will be minimised during design, construction and operational phases of the Project.

This PEMF combined with the Project approvals, contractual arrangements and other permits and/or approvals required during the course of Project provides guidance with respect to the development of Project specific management plans, such as, DMP, CEMP(s) and OEMP(s). It is anticipated that the developer and operator for the Project would be required to develop these plans.

As part of the approval process for the Project, it is necessary to show that the Proponent has taken, and will take, all practical steps to properly manage the light spill risks associated with the Project. This is achieved by the following:

- Identification of activities that may lead to light spill impacts.
- Establishment of objectives, targets and indicators for the management of such potential impacts.
- Establishment of management approaches as well as monitoring, reporting, auditing and review regimes.

4. Activities that may lead to light spill impacts

The construction and operation of the Project will have light spill impacts. This section provides an overview of the impacts detailed in Section 22.5 (in Chapter 22 – *Visual and urban design*) of the EIS.

A range of management and mitigation measures have been identified to minimise these impacts (refer to sections 5 and 6 in this PEMF). The effectiveness of these management and mitigation measures will be assessed/confirmed through further analysis during detailed design.

4.1 Construction impacts

The majority of the construction works for the Project would occur during standard daytime construction hours when no construction lighting would be required. However, as noted in Chapter 8 – *Project development phasing and construction* of the EIS, some out-of-hours construction work is likely to be required for certain activities, including works to existing utilities, oversize deliveries and works requiring track possessions for the tie-in to the SSFL. Lighting required to enable these works would have the potential for light spill impacts during construction due to the presence of fixed lighting within the facility and movement of vehicles during night works. However, construction lighting would be contained within the area of actual works and designed to avoid light spill to surrounding areas as much as possible. In addition, potentially affected residents and relevant authorities would be notified in advance of works intended to be performed outside standard hours.

Light pollution from the Project construction works may have an effect on animals within remaining vegetated areas, which could lead to behavioural changes in foraging, reproduction and communication. The proposed vegetation restoration within the conservation area and landscape planting in the interior of the site is, however, likely to mitigate light spill impacts on fauna through the screening effects of increased vegetation cover. Subsequently no significant effects on fauna are expected during construction of the Project.

4.2 Operation impacts

In accordance with the proposed lighting design, the majority of the open container storage and circulation areas for the Moorebank IMT would be lit from equally spaced 30 m high masts. The lighting masts would normally support two to six 10,000 Watt (W) high pressure sodium luminaries mounted on a head frame. The design of the luminaires would be a full cut-off type to limit site glare and light spill towards residences. Luminaire lights do not have a direct upward light component, but instead direct the light specifically to the task with minimal direct light spill to the surrounding area.

Other areas, such as internal roads, gate areas, vehicle parking, movement and maintenance areas would use 20 m poles with luminaires. The lighting along Moorebank Avenue is proposed to be mounted at 15 m heights, with general surveillance lighting to be provided on 10.5 m poles.

As discussed above in section 4.1, light pollution may have an effect on animals. However, with the landscape planting and revegetation within the conservation area in place, significant light pollution impacts are not expected.

No lighting is proposed for the rail link to the SSFL, other than train signals. However, trains would use headlights at night. Trucks arriving and departing the Project site on Moorebank Avenue would also use headlights, and on-site forklifts and rail mounted gantries would have working lights and flashing amber safety lighting.

5. Objectives, targets and indicators

The objectives, targets and indicators for the management of light spill impacts are shown in Table 5.1. The management controls implemented help achieve these objectives/targets described in the following section.

Table 5.1 Objectives, targets and indicators for the management of light spill impacts

Objectives	Targets	Indicators
During the detailed design phase, ensure that the proposed light spill control measures (as detailed in the EIS) have been incorporated into the Project's design.	Zero incidents whereby control measures detailed in the EIS have not been complied with during detailed design.	Design compliance report(s) document compliance status with respect to control measures specified in EIS.
During detailed design, ensure all external lighting complies with the relevant aspects of Australian Standard AS4282 (INT) 1997 – Control of Obtrusive Effects of Outdoor Lighting.	Zero incidents whereby relevant requirements of AS4282 have not been complied with during detailed design.	Design compliance report(s) document compliance status with respect to relevant requirements of AS4282.
During construction ensure that any temporary (fixed and portable) lighting used to facilitate construction activities is positioned so as to avoid light spill towards sensitive receivers.	Zero complaints during construction regarding light spill from temporary lighting used during construction.	Number of complaints regarding light spill during the construction phase(s) of the Project.
During operations undertake a review/audit of external lighting to confirm that light spill impacts have been minimised and that lighting has been installed as per the detailed design requirements and objectives.	Zero incidents whereby external lighting has not been installed as per the requirements of the detailed design.	Results of review/audit of external lighting.

6. Management approach

As discussed in section 1 of this PEMF, it is anticipated that the private sector developer would be required to develop a number of project specific management plans to address design activities, construction activities and operational activities. This includes a DMP (incorporating environment design criteria); a CEMP; and an OEMP.

The light spill component of the above listed project specific management plans would align with the high level requirements as detailed in this PEMF as well as the project specific requirements.

The following sections provide a summary of the management control measures to be implemented during design, construction and operation in order to mitigate the risks associated with potential light spill impacts.

6.1 Management controls

6.1.1 Management controls – detailed design phase

During the detailed design phase, works would be undertaken to meet the objectives as detailed in section 5 of this PEMF. The following controls measures were identified as part of the EIS and would be implemented during the detailed design phase of the Project:

- Design lighting to minimise impacts on surrounding existing and future residents and the proposed conservation zone as much as possible.
- Consider use of shields on luminaire lighting to minimise brightness effects.
- Select asymmetric light distribution-type floodlights as part of the proposed lighting design (which means the light is directed specifically to the task with minimal direct light spill to the surrounding area).
- Consider low-reflection pavement surfaces to reduce brightness.
- Minimise the quantity of light and energy consumption in parts of the Project site that are not active, whilst retaining safe operation.

6.1.2 Management controls – construction phase

During the construction phase(s), works would be undertaken to meet the objectives as detailed in section 5 of this PEMF. The primary control measure identified as part of the EIS that would be implemented during the construction phase(s) of the Project is that lighting required during construction of the Project would be designed and located to minimise the effects of light spill on surrounding sensitive receivers, including residential areas and the proposed conservation area.

6.1.3 Management controls – operational phase

The following mitigation measures are proposed during the operational phases of the Project:

- For the northern rail access option, in consultation with train operators, consider the practice of avoiding the use of high beam lights on northbound and southbound trains leaving the IMT site until they are on the SSFL, to minimise transitory light spill impacts on residences in Casula.
- For the central rail access option, in consultation with train operators, consider the practice of avoiding the use of high beam lights on northbound trains leaving the IMT site until they are on the SSFL, to minimise transitory light spill impacts on residences in Casula.

6.1.4 Monitoring

Within each of the Project specific management plans, the private sector developer would need to detail what monitoring would be undertaken to ensure compliance with the following:

- The Project's EIS, with respect to the commitments made as well as the management and mitigation measures proposed.
- Project approvals issued under the Commonwealth EPBC Act and NSW EP&A Act.
- Contractual requirements established between MIC and the developer and operator for the Project.
- Other permits and/or licences required during the course of the Project.
- Objectives, targets and indicators as presented in this PEMF.
-

6.1.4.1 Baseline monitoring

During the detailed design phase of the Project, baseline measurements would be undertaken. The measurements at very small illuminance values require both an accurate illuminance meter and attention to detail. The illuminance meter needs to be accurate to two (2) decimal places and certified by a NATA registered laboratory for this range of values within the previous 12 months. Given that instruments vary, it is recommended that baseline measurements are established with the same meter that will be used and maintained throughout the Project's duration.

Light spill would be monitored in accordance with AS4282-1997 *Control of the obtrusive effects of outdoor lighting* (Table 2.1).

6.1.4.2 Light spill monitoring

The following light spill monitoring requirements would apply to the operation phase of the Project (and not the construction phase):

- Light spill would be monitored in accordance with AS4282-1997 *Control of the obtrusive effects of outdoor lighting* (Table 2.1). Compliance with AS4282-1997 would be determined after the commissioning of the permanent lighting at the site.
- Measurement of illuminance at the locations identified in the Light Spill Impact Assessment (Volume 2, Part F) would be undertaken, especially at locations deemed to be sensitive receivers (e.g. L1 to L5 inclusive, L6, L10, L15 and L7 to L20 inclusive).
- The parameters to be measured are vertical illuminance (directly towards the Moorebank IMT site from the required location) and horizontal illuminance.
- A bubble level is recommended to be fitted to the illuminance meter for the purpose of measurements on the horizontal.
- Illuminance measurements in the vertical would be measured at the reference point and aimed directly towards the Moorebank IMT site.
- Photographs would be taken from reference locations towards the Moorebank IMT site so as to be used as a reference and a record of change. Photographs would be taken using a high quality digital SLR camera and the same camera would be used for each monitoring event.
- Where light spill monitoring results exceed the AS4282 requirements or an assigned Project specific criteria, the source of the exceedance is to be investigated and identified and reasonable/feasible corrective actions identified and implemented to address the exceedance.

During construction, low height mobile towers would be used and they would be positioned to direct light away from sensitive residential areas such as Casula and Liverpool. During construction, any light spill monitoring would be in response to complaints. Where light spill monitoring results exceed the AS4282 requirements or an assigned Project specific criteria, the source of the exceedance is to be investigated and identified and reasonable/feasible corrective actions identified and implemented to address the exceedance.

6.2 Management response to incidents and non-compliances

Within each of the Project specific management plans, the private sector developer would need to detail how incidents and non-compliances will be managed. It is envisaged that in doing so the private sector developer will draw upon its corporate Environmental Management System and address the specific requirements of the Project approvals.

Incidents may include (but are not limited to) the following:

- Project and workforce personnel have not attended Project environmental inductions.
- Failure to meet identified objectives and targets.
- Complaints regarding light spill.
- Near misses.
- Non-compliances.

Incidents including non-compliances would trigger internal (and external as required) notifications, reporting, investigation, close out and associated corrective and preventative actions to ensure compliance as well as continual improvement.

6.3 Reporting, auditing and review

Within each of the Project specific management plans, the private sector developer would need to detail what reporting, auditing and review processes would be implemented to ensure compliance with the following:

- The Project's EIS, with respect to the commitments made as well as the management and mitigation measures proposed;
- Project approvals issued under the EPBC Act and EP&A Act;
- Contractual requirements established between MIC and the developer and operator for the Project;
- Other permits and/or licences required during the course of the Project;
- Objectives, targets and indicators as presented in this PEMF; and
- The Project specific management plans themselves (e.g. DMP, CEMP(s) and OEMP) and their associated monitoring programs.

6.3.1 Independent environmental audit

Throughout the life of the Project (construction and operational phases) the proponent would commission an independent environmental audit of the Project on an annual basis. The audit would:

- be conducted by a suitably qualified, experienced and independent team of experts and where necessary the team would be endorsed by the relevant government agencies (e.g. Commonwealth and State);
- be led by a suitably qualified auditor and include experts in and field as directed by the relevant government agencies (e.g. Commonwealth and State);
- be conducted in accordance with the guidance provided in ISO 19011:2002 (or as updated) – *Guidelines for Quality and/or Environmental Management Systems Auditing;*
- include consultation with relevant government agencies;
- assess the environmental performance of the Project and assess whether it is complying with the requirements of the Project approvals and any relevant licences and permits (including any assessment, plan or program required under these approvals);
- review the adequacy of strategies, plans or programs required under the abovementioned Project related approvals, permits and licences;
- recommend measures and actions to improve the environmental performance of the Project, and/or any strategy, plan or program required under the Project approvals, permits and licences; and
- be included in the relevant annual environmental management report (AEMR).

The proponent would make copies of each independent environment audit available for public inspection on request and if requested be submitted to the Commonwealth and State based agencies.

6.3.2 Pre-construction compliance report

Four (4) weeks prior to the commencement of construction activities, the proponent would prepare a Pre-Construction Compliance Report. The Pre-Construction Compliance Report would:

- detail how the relevant conditions of approval (i.e. Commonwealth and State approval conditions) required to be addressed prior to construction was complied with;
- include the date when each relevant condition of approval was complied with, including dates of submission and any required report and/or approval dates; and
- detail any approvals or licences required to be issued by government departments or agencies before construction commences.

6.3.3 Pre-operation compliance report

Four (4) weeks prior to the commencement of operations, the proponent would prepare a Pre-Operation Compliance Report. The Pre-Operation Compliance Report would:

- detail how the relevant conditions of approval (i.e. Commonwealth and State approval conditions) required to be addressed before operations commence were complied with;
- include the date when each relevant condition of approval was complied with, including dates of submission of any required reports and/or approval dates; and
- detail any approvals or licences issued by government departments for the Project's operation.

6.3.4 Annual environmental management review

Throughout the life of the Project (construction and operational phases) the proponent would prepare an AEMR. The AEMR would review the performance of the Project against the CEMP and OEMP. The AEMR would include, but not necessarily be limited to:

- details of compliance with the various conditions of approval (i.e. Commonwealth and State approval conditions);
- copy of the complaints register for the preceding 12 months (exclusive of personal details), and details of how these complaints were addressed and resolved;
- identification of any circumstances in which the environmental impacts and performance of the Project during the year have not been generally consistent with the environmental impacts and performance predicted in the relevant Project documentation (e.g. EIS, Project approval conditions as well as any licences and permits), with details of additional mitigation measures applied to the Project to address recurrence of these circumstances;
- results of all environmental monitoring required by the conditions of approval (i.e. Commonwealth and State approval conditions) as well as relevant licences and permits, including interpretation and discussion by a suitably qualified person;
- a list of all occasions in the preceding 12 month period when environmental goals/objectives/impact assessment criteria for the Project have not been achieved, indicating the reason for failure to meet the criteria and the action taken to prevent recurrence of that type of failure; and
- copies of the relevant independent environmental audit report, pre-construction compliance report and pre-operation compliance report.

6.3.5 Community consultation and liaison

a Community Engagement Plan (CEP) will be prepared and implemented by the developer and operator for the Project. This will outline the consultation and notification processes during the pre-construction, construction and operation phases. The CEP would be prepared to ensure that:

- the community and stakeholders have a high level of awareness of all processes and activities associated with the Project;
- accurate and accessible information is made available; and
- a timely response is given to issues and concerns raised by stakeholders and the community.

6.4 Supporting documentation

This PEMF is one of a suite of frameworks which form part of the Project's EIS. The purpose of the PEMF are to provide a high level overview as to how the environmental impacts during design, construction and operational phases of the Project will be minimised. Other PEMF prepared as part of the Project's EIS include:

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- Noise and vibration;
- Traffic, transport and access;

- Air quality;
- Biodiversity;
- Hazards and risks;
- European heritage;
- Water quality and stormwater management;
- Soils and contamination; and
- Air quality.

7. Applicable legislation, standards and guidelines

The legislative instruments, standards and guidelines specifically related to the management of potential light spill impacts include the following:

- EPBC Act;
- EP&A Act;
- Australian Standard AS4282 (INT) 1997 – Control of Obtrusive Effects of Outdoor Lighting; and
- ISO 19011:2002 (or as updated) – Guidelines for Quality and/or Environmental Management Systems Auditing.

Moorebank Intermodal Company

Moorebank Intermodal Terminal Project

Soils and Contamination Provisional Environmental Management Framework

2 July 2014

PARSONS BRINCKERHOFF

Document information

Client: Moorebank Intermodal Company

Title: Moorebank Intermodal Terminal Project

Subtitle: Soils and Contamination Provisional Environmental Management Framework

Document No: 2103829B PR_7135

Date: 2 July 2014

Rev	Date	Details
A	29/04/2013	Final for issue
B	15/08/2013	Updated to address SEWPaC review comments
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Author, Reviewer and Approver details

Prepared by:	Emma Lichkus	Date: 02/07/2014	Signature: 
Reviewed by:	Paul Greenhalgh	Date: 02/07/2014	Signature: 
Approved by:	Paul Greenhalgh	Date: 02/07/2014	Signature: 

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Level 27 Ernst & Young Centre
680 George Street, Sydney NSW 2000
GPO Box 5394
Sydney NSW 2001
Australia
Tel: +61 2 9272 5100
Fax: +61 2 9272 5101
Email: sydney@pb.com.au
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Certified to ISO 9001, ISO 14001, AS/NZS 4801
A GRI Rating: Sustainability Report 2011

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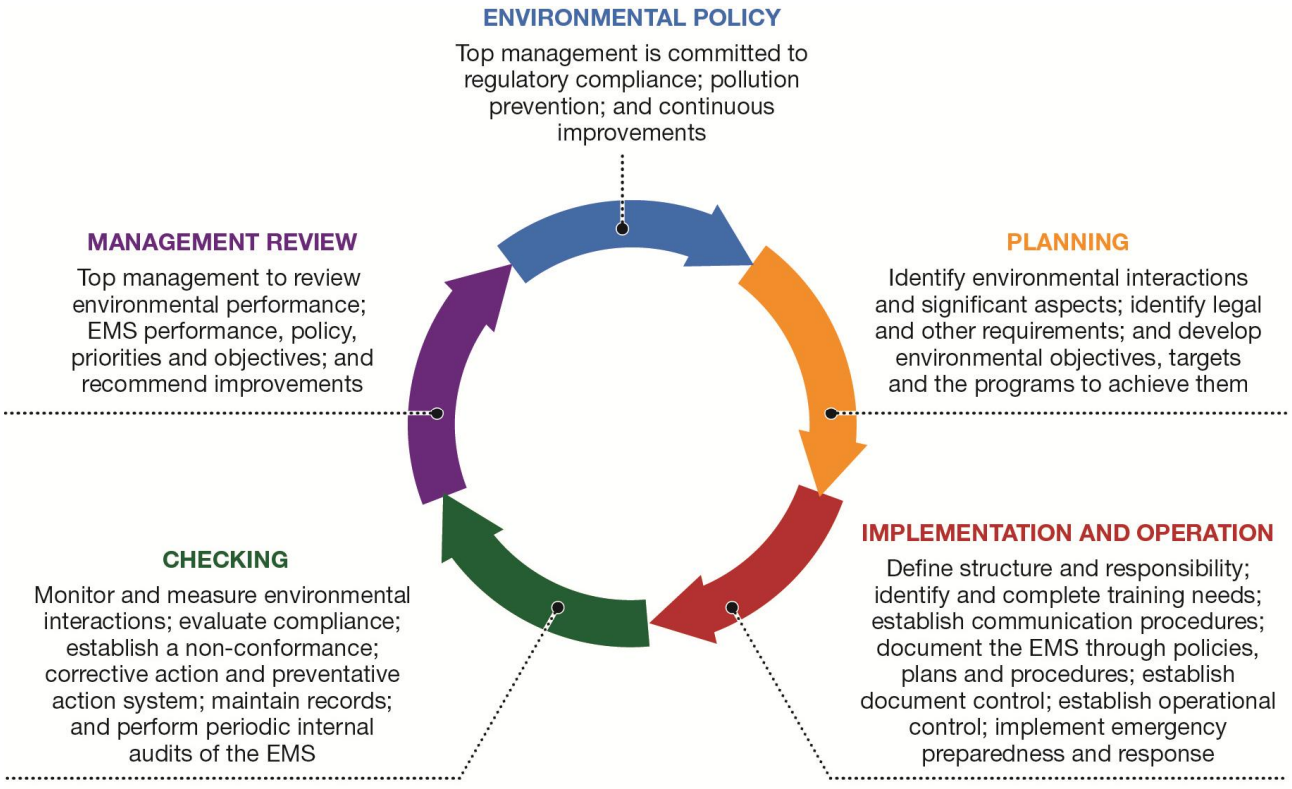

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2. The Project site and study area

The Moorebank IMT Project is proposed to be situated on land located approximately 30 kilometres (km) south-west of the Sydney Central Business District (CBD) and 4 km south of the Liverpool CBD in the Liverpool Local Government Area (LGA) (refer Figure 2.1).

The Project site comprises:

- the main IMT site (which is the land to the east of the Georges River, is currently occupied by Defence; and
- the rail connection (including the Georges River) from the main IMT site to the SSFL, including the three rail access options (northern, central and southern) as proposed within the Project concept.

Phase 1 and Phase 2 Environmental Site Assessments (ESA) have been prepared for the main IMT site and these are included in Technical Paper 5 - *Environmental Site Assessment (Phase 2)* in Volume 4 of this EIS. In addition, Phase 1 ESAs have been prepared for each of the three rail access options and these are appended to the Phase 2 ESA (refer Appendix C – E in Technical Paper 5 - *Environmental Site Assessment (Phase 2)* in Volume 4).

2.1 Main IMT site

The Project is located in an urban setting, comprising mainly residential, industrial and commercial land uses. The vegetation on the Project site has largely been cleared and replaced with roads, buildings, playing fields and exotic grasslands.

The surface geology of the Project site comprises Quaternary and Tertiary alluvium consisting of silt, sand and gravels from Quaternary fluvial deposition. The Penrith 1:100,000 Series Geological Sheet 9030 indicates dark grey to black Ashfield Shale of the Wianamatta Group, which is typically black to dark grey shales and laminates from the Triassic period. This is underlain by Triassic Hawkesbury Sandstone in the north-western area of the Project site, comprising mainly medium to very coarse grained quartz sandstone. The Ashfield Shale strata dips towards the north-west.

The soil landscape consists of Quaternary and Tertiary terraces of the Nepean River and the Georges River. The soils comprise poorly structured orange to red clay loams, clays and sands with the potential for the presence of ironstone nodules. Soils are saturated at depths of between 7 m and 15 m below ground level.

Fill was used during site establishment and construction works throughout the history of development on the main IMT site; however, the volumes of fill on-site are not significant. Fill depths generally range between 0.5 and 1 m below ground level, with maximum depths of over 3.2 m below ground level at certain locations, including at the site of the former sewage treatment plant. Fill material on-site includes sands, gravels and clays, as well as building demolition materials such as concrete, bricks, metals and plastic. Asbestos cement fragments have also been detected in surface soils on the main IMT site.

Potential existing sources of contamination on the IMT site include:

- buried wastes and waste stockpiles from on-site demolition activities over time;
- leaks from the storage/use of hazardous chemicals as well as fuels and waste oils in areas like the bridging yard and engineering workshops;

- building waste containing hazardous materials such as asbestos within above ground structures;
- residual contamination from long-term use of the site as a military training facility for activities like munitions training, bomb disposal and small arms firing ranges;
- ongoing site operations including the use of heavy earthmoving plant and equipment; and
- residual contamination from the detonation of explosives used in military training operations.

Potential off-site sources of contamination include the following:

- ABB site (to the north-west): An online search of the NSW Office of Environment and Heritage (OEH) contaminated land record database returned eight notice records (three former and five current) for the ABB site, which indicate that chemical wastes such as polychlorinated biphenyl (PCB) are present on the site. Based on the relatively high hydraulic conductivity of alluvial sands beneath the site, and the inferred groundwater flow direction, there is the potential for contaminated groundwater to migrate from the ABB site onto the IMT site.
- DNSDC (to the east): Contamination impacts have been identified in groundwater sampled from monitoring wells on the western boundary of the DNSDC site. Chemical wastes include total recoverable hydrocarbons (TRHs), benzene, toluene, ethylbenzene and xylene (BTEX) compounds and elevated dissolved heavy metals (including cadmium, copper, zinc, nickel and lead) (HLA Envirosciences, 2003).
- Moorebank Business Park (north of the DNSDC site): The business park comprises commercial premises including showrooms and warehousing. However, due to the recent redevelopment of the site, this area is unlikely to present a potential offsite source of contamination.
- Glenfield Landfill (to the south-west): This is an active landfill and waste transfer facility, which has the potential to cause environmental impacts associated with the flow of potentially contaminated groundwater within and beneath the waste fill towards the Georges River.

2.2 Rail access options

2.2.1 Northern rail access option

From the historical land use records reviewed as part of the Phase 1 ESA, it appears the land was used as farmland from the 1930s to 1950s, prior to being converted to a golf course in the mid-1990s. More recently a cycleway and footpath have been constructed in a north-south direction on the eastern part of the land. In addition, a road (Powerhouse Road) has been constructed along the western boundary of the northern rail access option site, providing access to the Casula Powerhouse. The land is now used as public open space.

The now decommissioned Casula Powerhouse was built in 1953 and fuelled by oil and coal. The Powerhouse was decommissioned in 1976 and remained disused until 1994, when it was redeveloped as a multi-arts facility.

Based on the review of available information, there is limited potential for contamination to exist. However, there is the potential for buried waste and tipped waste (potentially including ACM, imported fill, and potential aerial deposition of contaminates from the roadway and former Casula Powerhouse).

In addition, due to the previous use of the site as a public golf course, there may be the potential for contaminants associated with the application of fertilisers and pesticides.

2.2.2 Central rail access option

The land has been heavily vegetated since the 1970s. Before then it appears to have been used as farmland.

The Phase 1 ESA concludes that there is limited potential for onsite contamination sources to exist with the exception of uncontrolled fill that may have been deposited on the site. However, the Glenfield Landfill located immediately south of the site and hydraulically up gradient has the potential to cause contamination that may migrate beneath the site via groundwater.

2.2.3 Southern rail access option

Excavation, quarrying and filling have been the dominant activities on the site since the 1970s. Prior to this the site appears to have been open farmland, with the eastern boundary comprising overgrown shrubs and trees. Development of the site appears to have commenced around 1965, with the majority of the site disturbed and access roads constructed. Historical records show that the site has remained generally unchanged since the 1970s and today the site used for landfill purposes, with excavation and quarrying activities well established.

Considering the historical and ongoing use of the land as a waste disposal facility, there is a high potential for contamination to exist on land within the southern rail access option. This includes contaminated fill, soils, groundwater, leachate and generation of landfill gases.

3. Purpose and scope

The purpose of this PEMF is to provide a high level overview as to how soil and contamination impacts will be minimised during design, construction and operational phases of the Project.

This PEMF combined with the Project approvals, contractual arrangements and other permits and/or approvals required during the course of Project provides guidance with respect to the development of Project specific management plans, such as, DMP, CEMP(s) and OEMP(s). It is anticipated that the developer and operator would be required to develop these plans.

As part of the approval process for the Project, it is necessary to show that the Proponent has taken, and will take, all practical steps to properly manage the soil and contamination risks associated with the Project. This is achieved by the following:

- Identification of activities that may lead to soil and contamination impacts.
- Establishment of objectives, targets and indicators for the management of soil and contamination impacts.
- Establishment of management approaches as well as monitoring, reporting, auditing and review regimes.

4. Activities that may lead to contamination and soil impacts

Activities undertaken during both the Project's construction stages and its operation have the potential to result in contamination being generated and existing sources of contamination being liberated and released into the surrounding environment.

4.1 Main IMT site

4.1.1 Contamination activities during construction

Potential construction activities that may result in contamination or opportunities for contamination include:

- Earthworks and ground penetration;
- Removal of USTs and AST;
- Stockpiling;
- Vegetation clearing; and
- Storage and usage of fuels.

Given the size and scale of the Project, it is anticipated that construction activities such as earthworks and ground penetration would take place across the majority of the main IMT site to varying degrees, including in areas containing existing undiscovered or unremediated contamination.

4.1.2 Contamination activities during operation

Potential activities undertaken during the Project's full operation that may result in contamination or opportunities for contamination include:

- storage and usage of fuels;
- maintenance of underground utilities; and
- minor earthworks.

4.1.3 Contamination pathways

The construction and operational activities above pose a potential contamination risk if uncontrolled and allowed to develop into contamination impacts. Throughout the Project construction and operation it is anticipated that the primary transport pathways for contaminants and sediment within the Project site would include:

- leaching and migration of contaminants vertically into underlying groundwater systems;
- surface water flows to the Georges River and Anzac Creek;
- lateral migration of contaminated water through preferential pathways such as drainage lines or geological features;

- soil to human exposure routes (i.e. direct contact with soils (dermal contact, ingestion and inhalation));
- groundwater to human exposure routes (i.e. direct contact with surface water or groundwater via pumping to other areas of the site or abstraction of potentially impacted groundwater from the identified registered bores);
- soil to dust to human exposure routes (dermal contact, ingestion and inhalation due to dust migration); and
- vapour migration from soil or groundwater.

4.1.4 Contamination and soil impacts

As a result of existing contamination within the Project site, proposed Project activities and contamination pathways, a number of potential contamination impacts have been recognised. The most significant potential contamination impacts are discussed below:

- Contamination of soils: Soils may be contaminated by fuels, oils and other chemical substances stored and used during the construction and operation of the Project. In addition, hazardous materials such as asbestos and buried contaminated material or fill may be present within the main IMT site, and could cause further contamination to soils when disturbed or relocated.
- ASS: Existing ASSs have the potential to be liberated into the surrounding soil and water environments. In addition, potentially acidic soils may oxidise and develop into ASSs through ground disturbance and/or changes in water levels.
- Erosion and sedimentation: Across the main IMT site, erosion may occur in surrounding cleared vegetation, stockpiled materials, drainage lines, and earthworks. As a result, there is the potential for sedimentation of water bodies and the surrounding Georges River and Anzac Creek.
- Groundwater contamination: The local groundwater environment within the main IMT site may be contaminated through Project related activities. Seepage of contaminated runoff, leakages from fuel and oil storage tanks, and acidification of soils all have the potential to affect the local groundwater environment.

4.2 Rail access options

The Phase 1 ESAs prepared for the three rail access options identify the potential for contamination on the land affected by each of the three proposed rail alignments. Based on the findings in the Phase 1 ESAs the following exposure pathways have been identified:

- *Northern rail access option:* There is limited potential for contamination to exist; however, if contamination were to exist in the subsurface, the key exposure pathways would likely be:
  - via direct contact with soils, surface water or groundwater (dermal contact, ingestion and inhalation) by construction/utility workers, site users and future land users;
  - through the migration of airborne dust to on-site and offsite receptors; and
  - uptake via dermal contact, ingestion and inhalation.
- *Central rail access option:* There is limited potential for onsite contamination sources to exist. As with the northern rail access option, if contamination were to exist in the subsurface, the key exposure pathways would likely be: via direct contact with soils, surface water or groundwater (dermal contact, ingestion and inhalation) by construction/utility workers during site redevelopment; through the migration of airborne dust to offsite receptors; and uptake via dermal contact, ingestion and inhalation.

- *Southern rail access option:* There is a high potential for contamination to exist under this option including contaminated fill, soils, groundwater, leachate and generation of landfill gases. The key exposure pathways would likely be via direct contact with soils, surface water, groundwater, leachate and landfill gases (via dermal contact, ingestion and inhalation) by construction/utility workers, site users and potentially future land users.

5. Objectives, targets and indicators

The objectives, targets and indicators for the management of soil and contamination impacts are shown in Table 5.1. The management controls implemented help achieve these objectives/targets described in the following section.

Table 5.1 Objectives, targets and indicators for the management of soil and contamination impacts

Objectives	Targets	Indicators
During the detailed design phase, ensure that the proposed contamination and soil control measures (for detailed design) are implemented and/or incorporated into the design.	Detailed design phase control measures have been implemented and/or incorporated into the design.	Instances whereby nominated control measures have not been implemented and/or incorporated into the design.
During the detailed design phase, ensure that the proposed contamination and soil control measures (for pre-construction, construction and operation) have been incorporated into the design.	Detailed design incorporates the control measures for construction and operation as identified in the EIS and this PEMF.	Instances whereby nominated control measures have not been incorporated into the detailed design.
During the pre-construction and construction phases of the Project, ensure that the proposed contamination and soil controls are implemented.	Proposed contamination and soil control measures have been implemented during the pre-construction and construction phases.	Instances whereby nominated control measures have not been implemented during the pre-construction and construction phases.
The implementation of a remediation program applicable to each stage of development in accordance with the Moorebank Intermodal Terminal Remediation Action Plan.	Remediation works (where required) have planned and implemented in accordance with the Moorebank Intermodal Terminal Remediation Action Plan.	Instances whereby remediation works (where required) have not been planned and implemented in accordance with the Moorebank Intermodal Terminal Remediation Action Plan.
Establish and maintain awareness of the importance of ensuring impacts associated with contamination and disturbance of soil associated with the Project are minimised.	All Project and workforce personnel to complete an environmental induction, which will include information on the importance of minimising soil and contamination impacts.	Number and percentage of Project and workforce personnel that have attended required environmental induction prior to commencing work on the Project site.
During construction and operational phases, all contaminated material including soil/spoil and hazardous materials (e.g. asbestos containing material) are handled, stored, transported and disposed of in a lawful manner.	Zero environmental and safety incidents associated with the handling, storage, transportation and disposal of contaminated materials including soil/spoil and hazardous materials.	Project environmental and safety incident statistics during construction and operational phases.

6. Management approach

As discussed in section 1, it is anticipated that the private sector developer would be required to develop a number of project specific management plans to address design activities, construction activities and operational activities. This includes a DMP (incorporating environment design criteria); a CEMP; and an OEMP.

The soil and contamination component of the above listed project specific management plans would align with the high level requirements as detailed in this PEMF as well as the project specific requirements.

The following sections provide a summary of the management control measures to be implemented during design, construction and operation in order to mitigate the risks associated with potential soil and contamination impacts.

6.1 Management controls – detailed design

During the detailed design phase, works would be undertaken to meet the objectives as detailed in section 5 of this PEMF.

The following controls measures were identified as part of the EIS and would be implemented during the detailed design phase of the Project:

- Further investigations for the rail access options are as follows:
  - Northern rail access option: it is recommended that an intrusive soils and groundwater investigation be undertaken to gather data on soil and groundwater quality so that management and/or remediation options can be evaluated.
  - Central rail access option: it is recommended that a comprehensive site walkover be completed to verify fill mounds and/or depressions. If evidence of contamination is observed then targeted intrusive soil and groundwater investigations may be required.
  - Southern rail access option: it is recommended that a targeted intrusive investigation be undertaken to gather data on soils and groundwater quality so that management and/or remediation options can be evaluated.
- Before or during remediation works, further investigation works would be undertaken to address identified knowledge gaps. These further investigations include:
  - Further testing of soils to confirm the presence of ASSs. If ASS are detected a management plan should be developed in accordance with the ASSMAC Assessment Guidelines (1998), with active on-going management through the construction phases and offsite disposal would need to be in accordance with the NSW *Waste Classification Guidelines Part 4: Acid Sulfate Soils* (2009).
  - Further testing of surface water quality to gather data to inform management of dewatering/discharges anticipated to be required, Further groundwater monitoring would be undertaken on the main IMT site and would be used to inform the remedial approach for groundwater, if contamination is detected.
  - Further testing of residual sediments to gather data to information the management of sediments likely to be disturbed/dewatered during construction.
  - Further testing of groundwater beneath the north-western area of the IMT site (adjacent to the ABB) to inform any additional control, management or remediation measures required.

- Ground penetrating radar (GPR) or similar techniques would be carried out to locate and document all existing and underground tank infrastructure across the Project site.
- A management tracking system for excavated materials would be developed to ensure the proper management of the material movements at the Project site, particularly during excavation works.

6.2 Management controls – Early Works and construction phases

During the Early Works and construction phases of the Project, works would be undertaken to meet the objectives as detailed in section 5 of this PEMF.

Early Works:

- Before construction, a remediation program would be implemented in accordance with the Moorebank Intermodal Terminal Preliminary Remediation Action Plan (RAP). The program will have been formally reviewed and approved by the Site Auditor review under Part 4 of the NSW *Contaminated Land Management Act 1997* (CLM Act).
- A CEMP would be prepared by the contractor for all excavation and remediation works and would include requirements for decontamination facilities at the Project site.
- An Unexploded Ordnance (UXO) management plan would be developed for the Project site. This plan would detail a framework for addressing the discovery of UXO, explosive ordnance (EO) or explosive ordnance waste (EOW) to ensure a safe environment for all Project staff, visitors and contractors.

Early works and construction

- Contaminated soil/fill material present will be ‘chased out’ during the excavation works based on visual, olfactory and preliminary field test results.
- Excavated soil would be temporarily stockpiled, sampled and analysed for waste classification processes. Following receipt of waste classification results, the material would be transported to a licensed off-site waste disposal facility as soon as practicable to minimise dust and odour issue through storage of materials on-site.
- Stockpiled soils would be stored on a sealed surface and the stockpiled areas would be securely bunded using silt fencing to prevent silt laden surface water from entering or leaving the stockpiles or the Project site.
- All excavation works would be undertaken by licensed contractors, experienced in remediation projects and the handling of contaminated soils.
- All asbestos removal, transport and disposal must be performed in accordance with the *Work Health and Safety Regulation 2011* (WH&S Regulation).
- The removal works would be conducted in accordance with the *National Occupational Health and Safety Commission Code of Practice for the Safe Removal of Asbestos*, 2nd Edition [NOHSC 2002 (2005)] (NOHSC 2005a).
- An appropriate asbestos removal licence issued by WorkCover would be required for the removal of asbestos impacted soil.
- Environmental management and WH&S procedures would be put in place for the asbestos removal during excavation to protect workers, surrounding residents and the environment.
- Temporary stockpiles of asbestos containing material (ACM) soils would be covered to minimise dust and potential asbestos release.

- An asbestos removal clearance certification would be prepared by an occupational hygienist at the completion of the removal work. This would follow the systematic removal of asbestos containing materials and any affected soils from the Project site and validation of these areas (through visual inspection and laboratory analysis of selected soil samples).
- Asbestos fibre air monitoring would be undertaken during the removal of the asbestos materials and in conjunction with the visual clearance inspection. The monitoring would be conducted in accordance with the *National Occupational Health and Safety Commission Guidance Note on the Membrane Filter Method For the Estimating Airborne Asbestos Fibre*, 2nd Edition [NOHSC 3003 (2005)] (NOHSC 2005b).
- All stockpiles would be maintained in an orderly and safe condition. Batters would be formed with sloped angles that are appropriate to prevent collapse or sliding of the stockpiled materials.
- Stockpiles would be placed at approved locations and would be strategically located to mitigate environmental impacts while facilitating material handling requirements. Contaminated or potentially contaminated materials would only be stockpiled in unremediated areas of the Project site or at locations that did not pose any risk of environmental impairment of the stockpile area or surrounding areas (e.g. hardstand areas).
- Stockpiles would only be constructed in areas of the Project site that had been prepared in accordance with the requirements of the Project Preliminary RAP in Appendix F of Technical Paper 5 – *Environmental Site Assessment* (Phase 2), Volume 4. All such preparatory works would be undertaken prior to the placement of material in the stockpile. Stockpiles must be located on sealed surfaces such as sealed concrete, asphalt, high density polyethylene or a mixture of these, to appropriately mitigate potential cross contamination of underlying soil.
- The stockpiles of contaminated material would be covered with a waterproof membrane (such as polyethylene sheeting) to prevent increased moisture from rainwater infiltration and to reduce wind-blown dust or odour emission.
- Before the reuse of any material on-site, it would be validated so that the lateral and vertical extent of the contamination is defined.
- Where required, contaminated materials and wastes generated from the Project remediation and construction works would be taken to suitable licensed offsite disposal facilities.

6.3 Management controls – operational phase

There are no specific management controls proposed for the operational phase of the Project.

6.4 Monitoring

Within each of the Project specific management plans, the private sector developer would need to detail what monitoring would be undertaken to ensure compliance with the following:

- The Project's EIS, with respect to the commitments made as well as the management and mitigation measures proposed;
- Project approvals issued under the EPBC Act and EP&A Act;
- Contractual requirements established between MIC and the developer and operator for the Project;
- Other permits and/or licences required during the course of the Project; and
- Objectives, targets and indicators as presented in this PEMF.

6.5 Management response to incidents and non-compliances

Within each of the Project specific management plans, the private sector developer would need to detail how incidents and non-compliances will be managed. It is envisaged that in doing so the private sector developer will draw upon its corporate Environmental Management System and address the specific requirements of the Project approvals.

Incidents may include (but are not limited to) the following:

- Project and workforce personnel have not attended Project environmental inductions.
- Failure to meet identified objectives and targets.
- Contaminated soilspoil and hazardous materials have not been appropriately managed (i.e. classification, handling, storage, transport, and disposal).
- Near misses.
- Non-compliances.

Incidents including non-compliances and near misses would trigger internal (and external as required) notifications, reporting, investigation, close out and associated corrective and preventative actions to ensure compliance as well as continual improvement.

6.6 Reporting, auditing and review

Within each of the Project specific management plans, the private sector developer would need to detail what reporting, auditing and review processes would be implemented to ensure compliance with the following:

- The Project's EIS, with respect to the commitments made as well as the management and mitigation measures proposed;
- Project approvals issued under the EPBC Act and EP&A Act;
- Contractual requirements established between MIC and the developer and operator for the Project;
- Other permits and/or licences required during the course of the Project;
- Objectives, targets and indicators as presented in this PEMF; and
- The Project specific management plans themselves (e.g. DMP, CEMP(s) and OEMP) and their associated monitoring programs.

6.6.1 Independent environmental audit

Throughout the life of the Project (construction and operational phases) the proponent would commission an independent environmental audit of the Project on an annual basis. The audit would:

- be conducted by a suitably qualified, experienced and independent team of experts and where necessary the team would be endorsed by the relevant government agencies (e.g. Commonwealth and State);
- be led by a suitably qualified auditor and include experts in and field as directed by the relevant government agencies (e.g. Commonwealth and State);
- be conducted in accordance with the guidance provided in ISO 19011:2002 (or as updated) – *Guidelines for Quality and/or Environmental Management Systems Auditing;*

- include consultation with relevant government agencies;
- assess the environmental performance of the Project and assess whether it is complying with the requirements of the Project approvals and any relevant licences and permits (including any assessment, plan or program required under these approvals);
- review the adequacy of strategies, plans or programs required under the abovementioned Project related approvals, permits and licences; and
- recommend measures and actions to improve the environmental performance of the Project, and/or any strategy, plan or program required under the Project approval, permits and licences.

The independent environmental audit would be included in the relevant annual environmental management report (AEMR).

The proponent would make copies of each independent environment audit available for public inspection on request and if requested be submitted to the Commonwealth and State based agencies.

6.6.2 Pre-construction compliance report

Four (4) weeks prior to the commencement of construction activities, the proponent would prepare a Pre-Construction Compliance Report. The Pre-Construction Compliance Report would:

- detail how the relevant conditions of approval (i.e. Commonwealth and State approval conditions) required to be addressed prior to construction have been complied with;
- include the date when each relevant condition of approval was complied with, including dates of submission and any required report and/or approval dates; and
- detail any approvals of licences required to be issued by government departments or agencies before construction commences.

6.6.3 Pre-operation compliance report

Four (4) weeks prior to the commencement of operations, the proponent would prepare a Pre-Operation Compliance Report. The Pre-Operation Compliance Report would:

- detail how the relevant conditions of approval (i.e. Commonwealth and State approval conditions) required to be addressed before operations commence have been complied with;
- include the date when each relevant condition of approval was complied with, including dates of submission of any required reports and/or approval dates; and
- details any approvals or licences issued by government departments for the Project's operation.

6.6.4 Annual environmental management review

Throughout the life of the Project (construction and operational phases) the proponent would prepare an AERM). The AEMR would review the performance of the Project against the CEMP and OEMP. The AEMR would include, but not necessarily be limited to:

- details of compliance with the various conditions of approval (i.e. Commonwealth and State approval conditions);
- a copy of the complaints register for the preceding 12 months (exclusive of personal details), and details of how these complaints were addressed and resolved;

- identification of any circumstances in which the environmental impacts and performance of the Project during the year have not been generally consistent with the environmental impacts and performance predicted in the relevant Project documentation (e.g. EIS, Project approval conditions as well as any licences and permits), with details of additional mitigation measures applied to the Project to address recurrence of these circumstances;
- results of all environmental monitoring required by the conditions of approval (i.e. Commonwealth and State approval conditions) as well as relevant licences and permits, including interpretation and discussion by a suitably qualified person;
- a list of all occasions in the preceding 12 month period when environmental goals/objectives/impact assessment criteria for the Project have not been achieved, indicating the reason for failure to meet the criteria and the action taken to prevent recurrence of that type of failure; and
- copies of the relevant independent environmental audit report, pre-construction compliance report and pre-operation compliance report.

6.7 Community consultation and liaison

A Community Engagement Plan (CEP) will be prepared and implemented by the developer and operator for the Project. This will outline the consultation and notification processes during the pre-construction, construction and operation phases. The CEP would be prepared to ensure that:

- the community and stakeholders have a high level of awareness of all processes and activities associated with the Project;
- accurate and accessible information is made available; and
- a timely response is given to issues and concerns raised by stakeholders and the community.

6.8 Supporting documentation

This PEMF is one of a suite of plans which form part of the Project's EIS. The purpose of the PEMFs is to provide a high level overview as to how the environmental impacts during design, construction and operational phases of the Project will be minimised. Other PEMF prepared as part of the Project's EIS include:

- Noise and vibration;
- Light spill;
- Traffic and transport;
- Biodiversity;
- Hazards and risk;
- Water quality;
- Aboriginal heritage;
- European heritage; and
- Air quality.

7. Applicable legislation, standards and guidelines

The legislative instruments, standards and guidelines specifically related to the management of potential soil and contamination impacts include the following:

- EPBC Act;
- EP&A Act;
- ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*;
- Australian Standard AS4482.1 (2005) *Guide to the investigation and sampling of sites with potentially contaminated soil* – Part 1: Non-volatile and semi-volatile compounds;
- NSW EPA (2000a) *Guidelines for Consultants Reporting on Contaminated Sites*;
- NSW DECC (2006) *Guidelines for the NSW Site Auditor Scheme* (2nd Edition);
- NSW DECC (2007b) *Guidelines for the Assessment and Management of Groundwater Contamination*;
- DUAP (1998) SEPP 55 – Managing Land Contamination;
- National Environment Protection Council (NEPC) 2013, *National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No.1)* (NEPM);
- NSW EPA (1995) *Sampling Design Guidelines*;
- NSW EPA (1994) *Guidelines for Assessing Service Station Sites;* and
- ISO 19011:2002 (or as updated) – Guidelines for Quality and/or Environmental Management Systems Auditing.

Moorebank Intermodal Company

Moorebank Intermodal Terminal Project

Water Quality, Stormwater and Flooding Provisional Environmental Management Framework

2 July 2014

PARSONS BRINCKERHOFF

Document information

Client: Moorebank Intermodal Company

Title: Moorebank Intermodal Terminal Project

Subtitle: Water Quality, Stormwater and Flooding Provisional Environmental Management Framework

Document No: 2103829B PR_7136

Date: 2 July 2014

Rev	Date	Details
A	29/04/2013	Final for issue
B	15/08/2013	Updated to address SEWPaC review comments
C	02/07/2014	Updated for adequacy

Author, Reviewer and Approver details

Prepared by:	Emma Lichkus	Date: 02/07/2014	Signature: 
Reviewed by:	Paul Greenhalgh	Date: 02/07/2014	Signature: 
Approved by:	Paul Greenhalgh	Date: 02/07/2014	Signature: 

Distribution

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Parsons Brinckerhoff Australia Pty Limited

ABN 80 078 004 798

Level 27 Ernst & Young Centre
680 George Street, Sydney NSW 2000
GPO Box 5394
Sydney NSW 2001
Australia
Tel: +61 2 9272 5100
Fax: +61 2 9272 5101
Email: sydney@pb.com.au
www.pbworld.com

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A GRI Rating: Sustainability Report 2011

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1. Environmental Management framework

The Moorebank IMT Project would be developed by the private sector under the direction of the Moorebank Intermodal Company (MIC), a Government Business Enterprise. The future developer and operator for the Project has not yet been selected. As such, a proposed overall environmental management framework has been outlined as part of the EIS (refer to Chapter 28 – *Environmental management framework*), which would guide the development of a future detailed framework.

Figure 1.1 outlines the overall environmental management framework for the Project. The environmental management framework would include an overarching Environmental Management System (EMS) that complies with AS/NZS ISO 14001:2004. It is anticipated that MIC and the developer and operator for the Project would have established environmental management systems covering their respective business objectives, policies, activities and associated environmental aspects and impacts.

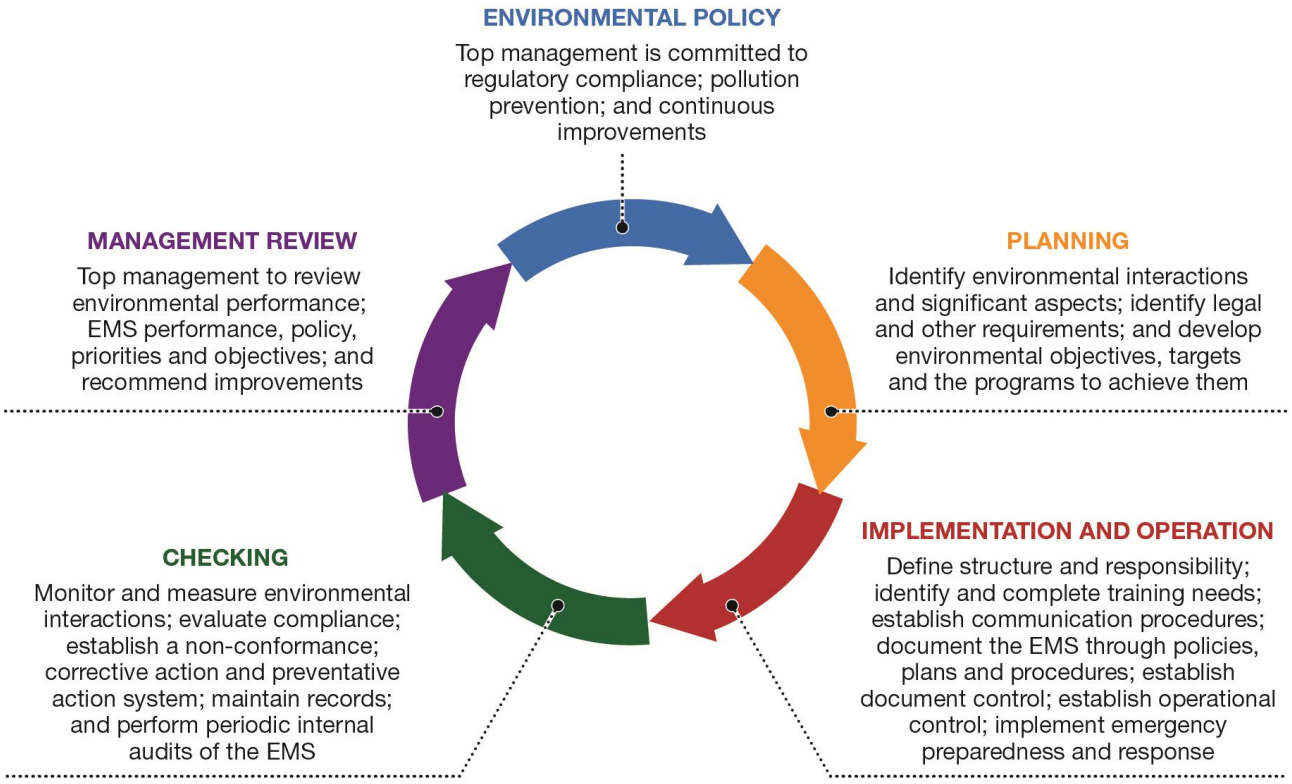


Figure 1.1 Overall environmental management framework for the Project

Approval of the Project is being sought for:

- construction and operation of the Project from the Commonwealth Department for the Environment (DoE) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- Stage 1 development consent as State significant development (SSD) from the NSW Department of Planning & Environment (NSW DP&E) under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) for the concept proposal described in the EIS (including final approval for Early Works).

Subject to approval of the Stage 1 SSD, the Project will be subject to further development approval under the EP&A Act (Stage 2 SSD development approvals).

It is anticipated that the developer and operator for the Project would be required to develop a number of project specific management plans to address design activities, construction activities and operational activities, for example:

- Design Management Plan (DMP) (incorporating environment design criteria).
- Construction Environmental Management Plan(s) (CEMP).
- Operational Environmental Management Plan(s) (OEMP).

This document outlines the Provisional Environmental Management Framework (PEMF) which will guide the development of the above management plans.

The project specific detail to be addressed by each of the above listed management plans would be dictated by the requirements of the following key project documentation:

- The Project's EIS (including this PEMF);
- Project Approval issued under the EPBC Act;
- Stage 1 and Stage 2 SSD approvals issued under the NSW EP&A Act;
- Contractual requirements established between MIC and the developer and operator for the Project; and
- Other permits and/or licences required during the course of the project.

1.1 Provisional Environmental Management Frameworks

As part of the Project's EIS, a series of PEMFs have been prepared. The purpose of the PEMFs is to provide a high level overview as to how the environmental impacts during design, construction and operational phases of the Project will be minimised.

The PEMFs combined with the Project approvals, contractual arrangements and other permits and/or licences required during the course of the Project provide guidance with respect to the development of Project specific management plans, such as, DMP, CEMP(s) and OEMP(s).

2. The Project site and study area

2.1 Hydrology and water quality

The Project site is located within the Georges River Catchment, with the majority of the site draining into the Georges River, which forms the western boundary of the Project site. The Georges River extends approximately 60 km south-west of Sydney, with the Project site located in the upper section of what is referred to as the mid-Georges River.

The catchment area upstream of the Project site is largely undeveloped; however, downstream the catchment is becoming increasingly developed, extending out to the river mouth at Botany Bay. The section of river adjacent to the Project site is not subject to tidal influences because the Liverpool Weir, which is located approximately 2 km downstream and to the north of the Project site, governs minimum water levels. A small portion of the south-eastern part of the Project site drains to Anzac Creek, which is a temporary tributary of the Georges River and flows in a north-westerly direction through the south of the Project site.

The area, including sections of the Project site, has historically been subject to flooding from the Georges River. The Liverpool City Council (LCC) flood risk map in (included in Appendix A of this PEMF), illustrates that the Project site is most at risk of flooding from the Georges River in the lower terrace area of the eastern floodplain of the river.

Stormwater on the existing Project site is generally conveyed to the Georges River via pits, pipes and open channels, which flow in a north-west direction. Only one of the existing stormwater pipe networks discharges elsewhere, into Anzac Creek. In 2010, inspections of the two open channels located on the Project site revealed both channels are in poor condition, with the presence of thick vegetation and significant erosion.

Based on the local topography, a number of land areas surrounding the Project site partially drain into the Project site through open channels, box culverts, natural drainage lines and overland flows during differing rainfall events. These land areas include:

- Defence National Storage and Distribution Centre (DNSDC) site, east of the Project site;
- M5 Motorway, north of the Project site;
- Moorebank Business Park, north-east of the Project site; and
- ABB site, north of the Project site.

There are several small to medium sized water bodies adjacent to and within the Project site that provide either a stormwater treatment function or are used for on-site activities. These water bodies include:

- Georges River
- Amiens wetland
- Anzac Creek water bodies
- Defence Land ponds.

Surface water within the Project site and surrounding local catchment predominantly drains to one of these water bodies, before discharging to the Georges River. The Amiens wetland and Defence land ponds provide a limited stormwater treatment function through the retention of some nutrients, sediment and other pollutants. However, discharge of stormwater from the Project site to the Georges River and Anzac Creek is currently largely unmanaged.

In January 2011, Parsons Brinckerhoff conducted a Phase 2 environmental site assessment (ESA) to assess the nature and likely extent of contamination at the main IMT site, based on the areas of potential environmental concern (refer to Chapter 15 – *Contamination and soils*). The Phase 2 ESA has since been updated in accordance with the *National Environmental Protection (Assessment of Site Contamination) Amendment Measure 2013* (No. 1) (NEPM), released in 2013. The following field parameters were collected at various surface water sampling locations scattered across the main IMT site using a water quality meter:

- pH ranged between 6.47 to 9.37, indicating a wide range of values from slightly acidic to alkaline conditions;
- electrical conductivity ranged from 65.4 to 528 micro Siemens per centimetre (µs/cm), indicating fresh water; and
- dissolved oxygen ranged between 4.02 to 8.44, indicating that surface waters are well oxygenated.

The majority of samples returned results below the levels required to undertake laboratory assessment. However, concentrations of copper, nickel and zinc were above the default trigger values provided in the ANZECC guidelines for these metals (refer Table 16.3 in Chapter 16 – *Hydrology, groundwater and water quality* of the EIS). Based on the findings of the ESA, the soil and groundwater contamination identified at the Project site is considered unlikely to contribute significantly to the water quality within the Georges River through surface and/or groundwater migration.

2.2 Groundwater

Three main groundwater systems occur within the Project site and surrounds:

- Quaternary and Tertiary alluvium in the area contains a shallow, unconfined aquifer that is likely to be hydraulically connected to the Georges River.
- Ashfield Shale in the area generally behaves as a deeper regional aquitard, storing and transmitting groundwater slowly between aquifers. The thickness of this low-permeability shale varies across the Project site from 3 to 10 metres (m) (HLA-Envirosciences 2003).
- The Hawkesbury Sandstone aquifer in the area is unlikely to influence groundwater flow characteristics of the Project site and surrounds, as the Ashfield Shale aquitard acts as a barrier for groundwater flow between the overlying alluvial aquifer and the underlying sandstone aquifer.

Alluvial soils are generally quite vulnerable to transmitting contamination within urban environments. Previous hydraulic testing indicates that hydraulic conductivity ranges between 3.4×10^{-3} and 1.1×10^{-1} metres per day (m/day) for alluvial aquifers and 1.1×10^{-2} m/day and 8.2×10^{-2} m/day for the Ashfield Shale aquitard in the Sydney Basin (HLA-Envirosciences 2003).

Information from current licensed bores registered with NSW Office of Water (NOW) in the area surrounding the Project site. These results show that salinity in the alluvium is generally low, but is generally higher in the Ashfield Shale (brackish). Groundwater within the shales typically exceeds 3,000 milligrams per litre (mg/L) total dissolved solids (TDS), while in the Hawkesbury Sandstone, water quality is typically below 500 mg/L TDS (SCA, 2007). The measured salinities for the Hawkesbury Sandstone are also high, and are likely to be influenced by the overlying Ashfield Shale.

Previous groundwater investigations for the study area indicate that groundwater pH in the alluvial deposits ranges between 4.3 and 8.0 (HLA Envirosciences 2003), while electrical conductivity (EC) ranges between 31 micro Siemens per cm (µS/cm) and 24,500 µS/cm. Groundwater investigations conducted by GHD in 2004 indicate that groundwater pH within the Project site is acidic, ranging between 4.76 and 5.83.

Water quality measurements from monitoring wells installed in the Ashfield Shale and the Hawkesbury Sandstone indicated both fresh and salty water quality (up to18,500 µS/cm). The higher salinity in the sandstone is probably due to leakage of saline groundwater from the overlying shales (HLA-Envirosciences, 2003).

Previous investigations of the Project site (HLA-Envirosciences 2003) identified elevated levels of total petroleum hydrocarbons (TPH), chromium, copper, nickel, zinc and lead concentrations in groundwater sampled across the site.

3. Purpose and scope

The purpose of this PEMF is to provide a high level overview as to how impacts on water quality, stormwater and flooding will be minimised during design, construction and operational phases of the Project.

This PEMF combined with the Project approvals, contractual arrangements and other permits and/or approvals required during the course of Project provides guidance with respect to the development of Project specific management plans, such as, DMP, CEMP(s) and OEMP(s). It is anticipated that the developer and operator for the Project would be required to develop these plans.

As part of the approval process for the Project, it is necessary to show that the Proponent has taken, and will take, all practical steps to properly manage the water quality, stormwater or flooding risks associated with the Project. This is achieved by the following:

- Identification of activities that may lead to impacts on water quality, stormwater and flooding.
- Establishment of objectives, targets and indicators for the management of such potential impacts.
- Establishment of management approaches as well as monitoring, reporting, auditing and review regimes.

A detailed Surface Water Impact Assessment (Volume 5) was undertaken for the Project, in addition a Preliminary Risk Assessment (Volume 3) and Environmental Site Assessment (Volume 4) of the EIS). Chapter 16 – *Hydrology, groundwater and water quality* of the EIS provides a summary of the potential impacts of the Project on water quality or stormwater on, under or near to the Project site.

4. Activities that may lead to water quality, stormwater or flooding impacts

The construction and operation of the Project will have impacts on water quality, stormwater and/or flooding. This section provides an overview of the impacts detailed in Section 16.3 (in Chapter 16 – *Hydrology, groundwater and water quality*) of the EIS.

A range of management and mitigation measures have been identified to minimise these impacts (refer to section 5 and 6 in this PEMF). The effectiveness of these management and mitigation measures will be assessed/confirmed through further analysis during detailed design.

4.1 Construction impacts

Construction activities likely to be associated with the Project include:

- earthworks and vegetation removal;
- dewatering excavations;
- stockpiling of spoil or other materials or substances (including contaminated materials);
- construction of embankments;
- development of the rail link and bridge over the Georges River;
- increase in impervious surfaces as a result of the construction of infrastructure and buildings;
- changes to the landform;
- potential water quality, stormwater and/or flooding impacts that could arise as a result of the above activities may include:
  - increased turbidity of waterways and drainage lines
  - increased nutrient loads to receiving waterways
- changes to groundwater levels and systems;
- changed concentration of stormwater pollutants;
- changes to volume and velocities of surface water drainage;
- sedimentation of creeks and drainage lines;
- mobilisation of sediment on the river bed;
- exposure of potential acid sulfate soils;
- mobilisation of contaminated groundwater, with potential impacts on the Georges River or other groundwater resources;
- contamination of groundwater bodies through interaction and infiltration of contaminated surface run-off caused by accidental spills and sedimentation;
- water table drawdown as a result of dewatering around subsurface infrastructure, potentially altering ground stability and impacting existing groundwater extraction bores;

- mobilisation of acidic groundwater associated with acidic soils;
- an increase in saline groundwater and ground surface salinity as a result of altered groundwater conditions; and
- flooding impacts could also arise due to changes in drainage patterns or flows or the construction of infrastructure with the potential to obstruct river flows.

4.2 Operation impacts

It proposed to manage the potential impacts of the Project on the Georges River and Anzac Creek receiving waterways through a treatment train approach of on-site stormwater best practice management systems. Through the proposed combination of swales, raingardens, catchpit screens and bio-retention, potential stormwater pollutants such as total suspended solids, total phosphorus and total nitrogen would be removed in accordance with regulatory guidelines. A preliminary assessment has shown that stormwater quality from the developed site would be maintained or improved relative to that of the existing situation. Therefore the mitigation measures that address water quality are considered to be highly effective.

Stormwater quantity discharges would also be managed in parallel with stormwater quality through velocity constrictions of swales and raingardens and detention within the piped stormwater network and detention basins. An assessment of the flooding impacts of the Project as outlined in Chapter 16 – *Hydrology, groundwater and water quality,* has determined that as the changes in existing stormwater flows would be managed on-site and discharged solely to Anzac Creek and the Georges River, the main potential impacts on regional flooding are associated with the new rail access connection and Georges River crossing. Modelling indicates that the maximum afflux for a 1% AEP event would occur immediately upstream of the proposed rail bridges for each option and would be limited to:

- 150 mm for the northern rail access connection option;
- 220 mm for the central rail access connection option; and
- 30 mm for the southern rail access connection option.

The central option had the largest predicted impact at the upstream model extent and this predicted impact is of concern as it could result in a change to the flood level at the upstream extent of the model, which could in turn affect flood planning considerations. However modelling shows that none of the three bridge options would increase the flood risk to residences upstream during a 1% AEP event, as these properties are beyond the 1% AEP flood extent.

Notwithstanding this, it is recommended that the impacts of the Project be further minimised through design refinement of the bridge and bridge related infrastructure at a later stages of design. For the central rail crossing, further assessment is required and mitigation measures required to reduce the afflux resulting from this option.

5. Objectives, targets and indicators

The objectives, targets and indicators for the management of water quality, stormwater and flooding impacts are shown in Table 5.1. The management controls implemented help achieve these objectives/targets described in the following section.

Table 5.1 Objectives, targets and indicators for the management of water quality, stormwater and flooding impacts

Objectives	Targets	Indicators
During the detailed design phase, ensure that the proposed control measures (for construction and operation) for water quality, stormwater management and flooding; have been incorporated into the Project's design.	Detailed design incorporates the control measures for construction and operation as identified in the EIS and this PEMF, to ensure water quality remains within acceptable levels as specified in relevant regulations or guidelines (e.g. Commonwealth *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC 2000)). Detailed design incorporates the control measures for construction and operation as identified in the EIS and this PEMF, to ensure that stormwater management occurs in accordance with relevant regulations or guidelines (e.g. NSW *Managing Urban Stormwater: Soils and Construction* (OEH 2008)). Detailed design incorporates the control measures for construction and operation as identified in the EIS and this PEMF, to ensure the Project is developed in accordance with relevant regulations or guidelines (e.g. NSW *Floodplain Development Manual* (DIPNR 2005)). Predictive water quality modelling confirms that construction and operation mitigation/ management measures incorporated into the detailed design will enable regulatory requirements to be achieved.	Instances whereby nominated control measures have not been incorporated into the detailed design. Instances whereby relevant regulatory requirements are anticipated not to be achieved
Establish and maintain awareness of the importance of protecting EVs or WQOs associated with the Project site.	All Project and workforce personnel to complete an environmental induction, which will include information on the importance of minimising impacts on water quality and effectively managing stormwater.	Number and percentage of Project and workforce personnel that have attended required environmental induction prior to commencing work on the Project site.
Avoid the exceedance of water quality goals/criteria during construction or operation.	Zero incidents of water quality goals/criteria being exceeded during construction or operation.	Number of incident reports relating to exceedances of water quality goals/criteria during the construction or operation.
Avoid the exceedance of stormwater management goals/criteria during construction or operation.	Zero incidents of stormwater management goals/criteria being exceeded during construction or operation.	Number of incident reports relating to exceedances of stormwater management goals/criteria during the construction or operation.

Objectives	Targets	Indicators
Construction and operational activities do not adversely affect flood water flows and do not exacerbate flooding.	Zero incidents whereby construction and operational activities adversely affect flood water flows and exacerbate flooding.	Extent of flooding during construction and operations. Determinations whereby construction and/or operations have exacerbated flooding.

6. Management approach

As discussed in section 1 of this PEMF, it is anticipated that the private sector developer would be required to develop a number of project specific management plans to address design activities, construction activities and operational activities. This includes a DMP (incorporating environment design criteria); a CEMP; and an OEMP.

The water quality, stormwater and groundwater component of the above listed project specific management plans would align with the high level requirements as detailed in this PEMF as well as the project specific requirements.

The following sections provide a summary of the management control measures to be implemented during design, construction and operation in order to mitigate the risks associated with potential water quality and stormwater impacts.

6.1 Management controls

6.1.1 Management controls – detailed design phase

During the detailed design phase, works would be undertaken to meet the objectives as detailed in section 5 of this PEMF. The following controls measures were identified as part of the EIS and would be implemented during the detailed design phase of the Project:

- The potential effects of various flood events on construction phase works would be further investigated during detailed design and preparation of the Stage 2 SSD approvals.
- The design of the Georges River bridges would ensure structural stability under an appropriate upper limiting flood event, typically the 1 in 2,000 year AEP event or other event of similar magnitude.
- A detailed scour assessment of the structure would be undertaken and a scour protection scheme for the bridge abutments and piers would be designed to ensure structural stability and avoid erosion of the channel and floodplain bed local to the structure.
- Further design optimisation of the bridge would consider reducing the afflux impacts as far as possible. The bridge piers would be designed to minimise obstruction to flow and associated afflux under potential blockage and/or debris build-up scenarios.
- Further hydraulic modelling would be undertaken to quantify the impact of climate change on afflux caused by the bridge and on hydraulic loading on the bridge structure.
- For the central rail access option bridges, further design of the structures and their alignment and/or consideration of compensatory measures would be undertaken during detailed design to reduce the impact of this option.
- If landfill cells at the Glenfield Landfill are to be affected then site-specific erosion and sediment control measures would be developed and implemented to ensure pollutants do not enter the Georges River.
- A stormwater management plan would be developed in accordance with the detailed design. This includes the requirement to control the rate of stormwater run-off so that it does not exceed the pre-developed rate of run-off.
- The stormwater system would be designed such that flow from low order events (up to and including the 10% AEP event from the main part of the site and up to and including the 2% AEP event for the rail access connection corridor) would be conveyed within the formal drainage systems. Flows from rarer events (up to the 1% AEP event) would be conveyed in controlled overland flow paths.

- The on-site detention system proposed would detain flow and control discharge rates to the Georges River equal to pre-development discharge rates.
- A stormwater treatment system would be implemented, incorporating sedimentation and bio-filtration basins upstream of the stormwater detention basins.
- Use of on-site infiltration would be incorporated into the design through the distribution of swale drains and rain gardens across the Project site.
- A number of other stormwater management opportunities would be considered during development of the detailed design in accordance with Liverpool City Council's Development Control Plan *Part 2.4 Development in Moorebank Defence Lands* and other relevant policies, including:
  - polishing water run-off using dry creek gravel beds with macrophyte plants;
  - using drainage swales to slow down stormwater run-off and increase on-site infiltration;
  - collecting roof rainwater for re-use on-site;
  - installing gross pollutant traps (GPTs) at the outlets of the pipe system before discharge into the sedimentation basins; and
  - incorporating impervious surfaces and vegetated areas into the design to increase sub-surface water flow during rain events and reduce the discharge of stormwater pollutants.
- Concrete structures and other subsurface infrastructure would be constructed from sulfate resistant cement and materials in areas that may potentially interact with local groundwater.
- Groundwater quality would be tested to determine salinity levels and inform potential design measures to ensure the design life of any infrastructure is achieved.
- To prevent the contamination of groundwater during Project construction and operation, suitable water treatment, water retention, water proofing and ground treatments would be investigated and implemented where required.
- Potential impacts on two existing groundwater bores in the vicinity of the proposal would be further investigated during detailed design. Mitigation measures to minimise these impacts would be also developed as required.
- The following groundwater assessments would be carried out:
  - an overall assessment of pre-construction groundwater quality and levels;
  - characterisation of local and regional groundwater flow systems, including the groundwater contours and flow conditions;
  - consideration of potential groundwater supply options, if required;
  - assessment of impacts on groundwater levels and quality during construction and ongoing operation;
  - confirmation of management and mitigation solutions for potential groundwater impacts; and
  - assessment of the potential salinity impacts that may result from the Project.

6.1.2 Management controls – Early Works and construction phase

During the Early Works and construction phases, works would be undertaken to meet the objectives as detailed in section 5 of this PEMF. The following control measures were identified as part of the EIS and would be implemented during the preconstruction and construction phases of the Project:

- Early Works:
  - A soil and water management plan would be developed before work begins in the conversation area. This plan would include erosion and sediment control plans (ESCPs) and procedures to manage and minimise potential environmental impacts associated with developing this area.
  - Site compounds, stockpiling areas and storage areas for sensitive plant, equipment and hazardous materials to be located above an appropriate design flood level, to be determined based on the duration of the construction works.
  - A flood emergency response and evacuation plan would be implemented for the conservation area works, to allow work sites to be safely evacuated and secured in advance of any flooding on the site. This plan would also include recovery actions to be implemented following a flood and to allow the site works to resume as quickly as possible.
- Construction:
  - Locate site compounds, stockpiling areas and storage areas for sensitive plant, equipment and hazardous materials above an appropriate design flood level, to be determined based on the duration of the construction works.
  - Implement a flood emergency response and evacuation plan that allows work sites to be safely evacuated and secured in advance of flooding occurring at the Project site.
  - Where required, water access entitlements, such as groundwater licences, would be obtained for dewatering activities, in accordance with the requirements of the NSW Office of Water's proposed Aquifer Interference Policy.
  - Implement a staged construction process for the building of the Georges River bridges that minimises temporary obstruction of flow in the main channel and floodplain.
  - For the building of the Georges River bridges, design temporary works to resist forces and pressures that could occur during the design flood event adopted for the Project construction.
  - For all site works, provide temporary diversion channels around temporary work obstructions to allow low and normal flows to safely bypass the work areas.
  - The following staging process is proposed to be implemented when constructing surface water drainage infrastructure:
    - Biofiltration and detention basins that form part of the proposed stormwater management strategy would be excavated at the outset of the Project Phase A, with the intention that the excavated basins would be used as temporary construction phase sedimentation basins. Once construction activities during Project Phase A are complete, the, and the Project becomes operational, these temporary construction phase sedimentation basins can be developed into the permanent biofiltration and detention basins.
    - During Project Phase A, all major stormwater pipes and culverts (600 mm diameter and larger) and main channels and outlets would be installed. Minor drainage and upstream systems would then be progressively connected to the major drainage elements during each phase of construction as required.
  - A soil and water management plan would be developed prior to land disturbance that would include erosion and sediment control plans (ESCPs) and procedures to manage and minimise potential environmental impacts associated with construction of the Project.

The ESCP(s) for the Project would be prepared in accordance with Volume 1 of *Managing Urban Stormwater: Soils and Construction* ('the Blue Book') (Landcom 2004), *Managing Urban Stormwater: Soils and Construction* - Installation of Services, Volume 2A (OEH 2008) and *Managing Urban Stormwater: Soils and Construction* - Main Road Construction, Volume 2D (OEH 2008). The ESCP(s) would be established before the start of each construction phase and would be updated as relevant to the changing construction activities.

Strategies proposed as part of the plan include:

- clean run-off from upstream undisturbed areas would be diverted around the Project site to minimise overland flow through the disturbed areas;
- stabilised surfaces would be reinstated as quickly as practicable after construction;
- all stockpiled materials would be stored in bunded areas and away from waterways to avoid sediment-laden run-off entering the waterways;
- sediment would be prevented from moving off-site and sediment-laden water prevented from entering any watercourse, drainage line or drainage inlet;
- erosion and sediment control measures would be regularly inspected (particularly following rainfall events) to monitor their effectiveness and stability;
- erosion and sediment control measures would be left in place until the works are complete or areas are stabilised;
- temporary erosion control and energy dissipation measures would be installed to protect receiving environments from erosion; and
- vehicle movements would be managed during rainfall (or whilst the ground remains sodden) to minimise disturbance to the topsoil.

- Procedures to maintain acceptable water quality and to manage chemicals and hazardous materials (including spill management procedures, use of spill kits and procedures for refuelling and maintaining construction vehicles/equipment) would be implemented during construction.
- Vehicles and machinery would be properly maintained to minimise the risk of fuel/oil leaks.
- Routine inspections of all construction vehicles and equipment would be undertaken for evidence of fuel/oil leaks.
- All fuels, chemicals and hazardous liquids would be stored within an impervious bunded area in accordance with Australian Standards and Environmental Protection Authority guidelines.
- Emergency spill kits would be kept on-site at all times. All staff would be made aware of the location of the spill kits and trained in their use.
- Construction plant, vehicles and equipment would be refuelled off-site, or in designated re-fuelling areas located at least 50 metres from drainage lines or waterways.
- Suitable groundwater monitoring would be established and undertaken prior to construction, during construction and during the operational life of the Project.

6.1.3 Management controls – operational phase

The following control measures were identified as part of the EIS and would be implemented during the operation phase of the Project:

- A stormwater treatment system would be implemented, incorporating sedimentation and bio-filtration basins upstream of the stormwater detention basins.
- Suitable groundwater monitoring would be established and undertaken prior to construction, during construction and during the operational life of the Project.

- To prevent the contamination of groundwater during Project construction and operation, suitable water treatment, water retention, water proofing and ground treatments would be investigated and implemented where required.

6.1.4 Monitoring

Within each of the Project specific management plans, the private sector developer would need to detail what monitoring would be undertaken to ensure compliance with the following:

- The Project's EIS, with respect to the commitments made as well as the management and mitigation measures proposed;
- Project approvals issued under the EPBC Act and EP&A Act;
- Contractual requirements established between MIC and the preferred developer and operator for the Project;
- Other permits and/or licences required during the course of the Project; and
- Objectives, targets and indicators as presented in this PEMF.

The Project's EIS has identified the following water quality and stormwater management monitoring requirements:

- Erosion and sediment control measures would be regularly inspected (particularly following rainfall events) to monitor their effectiveness and stability.
- Suitable groundwater monitoring would be established and undertaken prior to construction, during construction and during the operational life of the Project.

6.2 Management response to incidents and non-compliances

Within each of the Project specific management plans, the private sector developer would need to detail how incidents and non-compliances will be managed. It is envisaged that in doing so the private sector developer will draw upon its corporate Environmental Management System and address the specific requirements of the Project approvals.

Incidents may include (but are not limited to) the following:

- Relevant water quality, stormwater management or flooding goals/criteria not achieved or regulations not adhered to.
- Project and workforce personnel have not attended Project environmental inductions.
- Failure to meet identified objectives and targets.
- Non-compliances and near misses.
- Incidents, such as non-compliances and near misses, would trigger internal (and external as required) notifications, reporting, investigation, close out and associated corrective and preventative actions to ensure compliance as well as continual improvement.

6.3 Reporting, auditing and review

Within each of the Project specific management plans, the private sector developer would need to detail what reporting, auditing and review processes would be implemented to ensure compliance with the following:

- The Project's EIS, with respect to the commitments made as well as the management and mitigation measures proposed;
- Project approvals issued under the EPBC Act and EP&A Act;
- Contractual requirements established between MIC and the developer and operator for the Project;
- Other permits and/or licences required during the course of the Project;
- Objectives, targets and indicators as presented in this PEMF; and
- The Project specific management plans themselves (e.g. DMP, CEMP(s) and OEMP) and their associated monitoring programs.

6.3.1 Detailed design phase

Design reviews will be undertaken and documented to ensure the environmental design requirements/criteria associated with mitigating potential water quality, storm water management and flooding impacts during construction and operation have been incorporated into the design and complied with.

6.3.2 Construction phase

Any reporting requirements applicable to the construction phase will be in accordance with the Project's CEMP, relevant subordinate management plans and the requirements specified in Project approvals/ conditions of approval, permits and licences as applicable to the Project.

Monthly environmental reports would be prepared during the construction phase of the Project. Regular environmental audits would also be undertaken to assess compliance with the CEMP, relevant subordinate management plans, and the requirements specified in the Project Approval/conditions of approval, permits and licences as applicable to the Project.

An annual environmental performance review and compliance report would be prepared during the construction phase of the Project.

6.3.3 Operational phase

The reporting requirements applicable for the operational phase will be in accordance with the Project's OEMP, relevant subordinate management plans, and the requirements specified in the Project approvals/conditions of approval, permits and licences as applicable to the Project.

Monthly environmental reports would be prepared during the operational phase of the Project. Regular environmental audits would be undertaken to assess compliance with the Operational Environmental Management Plan, relevant subordinate management plans (e.g. the Air Quality Management Plan), and the requirements specified in the Project approvals/conditions of approval, permits and licences as applicable to the Project.

An annual environmental performance review and compliance report would be prepared during the operational phase of the Project.

6.3.4 Independent environmental audit

Throughout the life of the Project (construction and operational phases) the proponent would commission an independent environmental audit of the Project on an annual basis. The audit would:

- be conducted by a suitably qualified, experienced and independent team of experts and where necessary the team would be endorsed by the relevant Commonwealth and State government agencies;
- be led by a suitably qualified auditor and include experts in and field as directed by the relevant Commonwealth and State government agencies;
- be conducted in accordance with the guidance provided in ISO 19011:2002 (or as updated) – *Guidelines for Quality and/or Environmental Management Systems Auditing;*
- include consultation with relevant government agencies;
- assess the environmental performance of the Project and assess whether it is complying with the requirements of the Project approvals and any relevant licences and permits (including any assessment, plan or program required under these approvals);
- review the adequacy of strategies, plans or programs required under the abovementioned Project related approvals, permits and licences;
- recommend measures and actions to improve the environmental performance of the Project, and/or any strategy, plan or program required under the Project approvals, permits and licences; and
- be included in the relevant annual environmental management report (AEMR).

The proponent would make copies of each independent environment audit available for public inspection on request and if requested be submitted to the Commonwealth and State based agencies.

6.3.5 Pre-construction compliance report

Four (4) weeks prior to the commencement of construction activities, the proponent would prepare a Pre-Construction Compliance Report. The Pre-Construction Compliance Report would:

- detail how the relevant conditions of approval (i.e. Commonwealth and State approval conditions) required to be addressed prior to construction have been complied with
- include the date when each relevant condition of approval was complied with, including dates of submission and any required report and/or approval dates
- detail any approvals of licences required to be issued by government departments or agencies before construction commences.

6.3.6 Pre-operation compliance report

Four (4) weeks prior to the commencement of operations, the proponent would prepare a Pre-Operation Compliance Report. The Pre-Operation Compliance Report would:

- detail how the relevant conditions of approval (i.e. Commonwealth and State approval conditions) required to be addressed before operations commence have been complied with;
- include the date when each relevant condition of approval was complied with, including dates of submission of any required reports and/or approval dates; and
- detail any approvals or licences issued by Commonwealth or State government departments for the Project's operation.

6.3.7 Annual environmental management review

Throughout the life of the Project (construction and operational phases) the proponent would prepare an AEMR. The AEMR would review the performance of the Project against the CEMP and OEMP. The AEMR would include, but not necessarily be limited to:

- details of compliance with the various conditions of approval (i.e. Commonwealth and State approval conditions);
- copy of the complaints register for the preceding 12 months (exclusive of personal details), and details of how these complaints were addressed and resolved;
- identification of any circumstances in which the environmental impacts and performance of the Project during the year have not been generally consistent with the environmental impacts and performance predicted in the relevant Project documentation (e.g. environmental impact statement, Project approval conditions as well as any licences and permits), with details of additional mitigation measures applied to the Project to address recurrence of these circumstances;
- results of all environmental monitoring required by the conditions of approval (i.e. Commonwealth and State approval conditions) as well as relevant licences and permits, including interpretation and discussion by a suitably qualified person;
- a list of all occasions in the preceding 12 month period when environmental goals/objectives/impact assessment criteria for the Project have not been achieved, indicating the reason for failure to meet the criteria and the action taken to prevent recurrence of that type of failure; and
- copies of the relevant independent environmental audit report, pre-construction compliance report and pre-operation compliance report.

6.4 Community consultation and liaison

A Community Engagement Plan (CEP) will be prepared and implemented by the developer and operator for the Project. This will outline the consultation and notification processes during the pre-construction, construction and operation phases. The CEP would be prepared to ensure that:

- the community and stakeholders have a high level of awareness of all processes and activities associated with the Project;
- accurate and accessible information is made available; and
- a timely response is given to issues and concerns raised by stakeholders and the community.

6.5 Supporting documentation

This PEMF is one of a suite of frameworks which form part of the Project's EIS. The purpose of the PEMFs are to provide a high level overview as to how the environmental impacts during design, construction and operational phases of the Project will be minimised. Other PEMFs prepared as part of the Project's EIS include:

- Noise and vibration;
- Traffic and transport;
- Light spill;
- Biodiversity;
- Hazards and risk;

- Aboriginal heritage;
- European heritage;
- Soils and contamination; and
- Air quality.

7. Applicable legislation, standards and guidelines

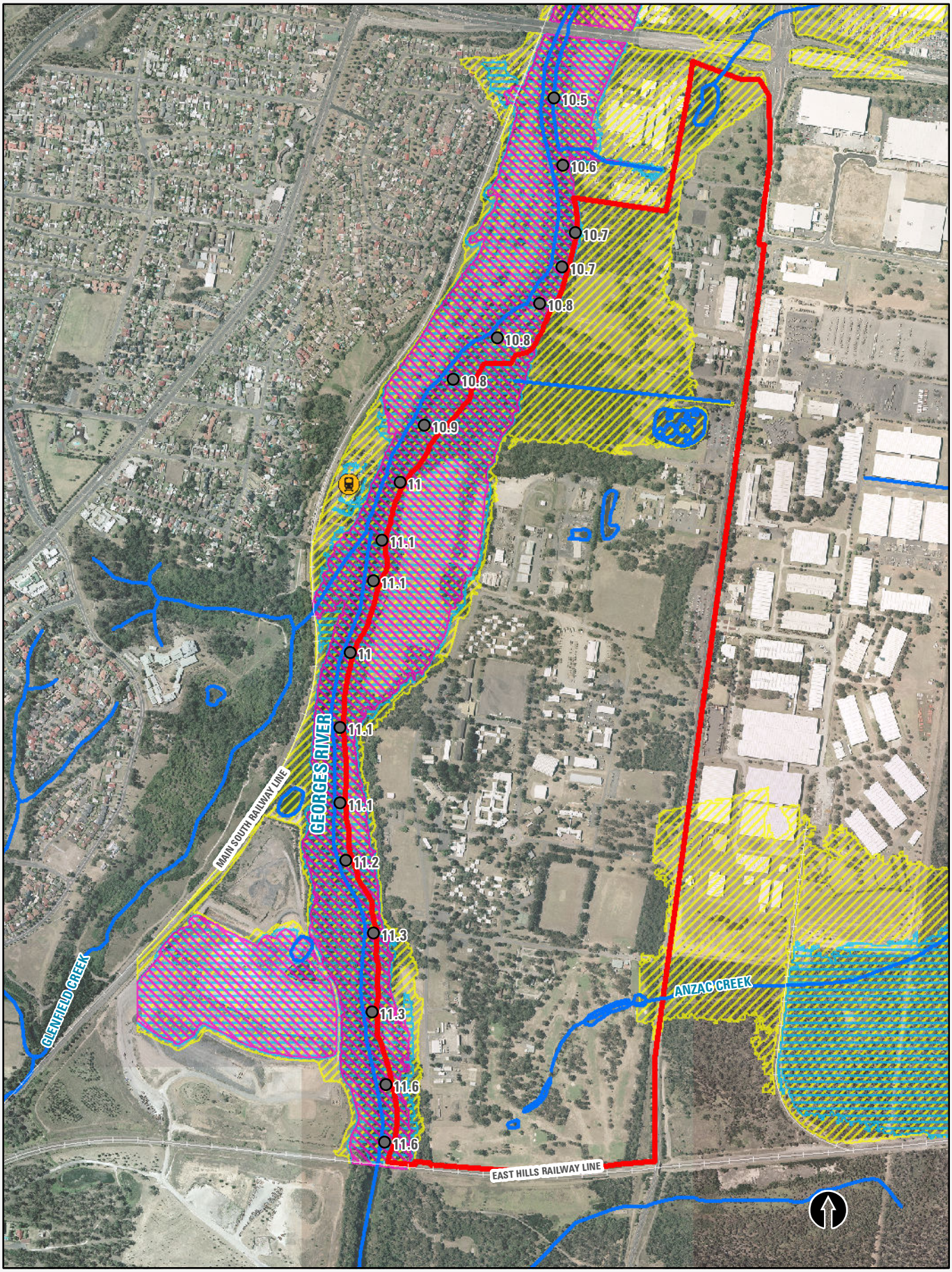
The legislative instruments, standards and guidelines specifically related to the management of potential impacts to water resources include the following:

- EPBC Act;
- Commonwealth *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (Australian and New Zealand Environment and Conservation Council 2000);
- ISO 19011:2002 (or as updated) – Guidelines for Quality and/or Environmental Management Systems Auditing;
- EP&A Act;
- *Using the ANZECC Guidelines and Water Quality Objectives in NSW* (DEC 2006);
- *Floodplain Risk Management Guideline: Practical Consideration of Climate Change* (DECC 2007);
- *Floodplain Development Manual* (DIPNR 2005);
- *Aquifer Interference Policy* (NOW 2012);
- *Managing Urban Stormwater: Soils and Construction – Installation of Services*, Volume *2A* (OEH 2008);
- *Managing Urban Stormwater: Soils and Construction – Main Road Construction*, Volume 2D (OEH 2008);
- LCC Development Control Plan Part 2.4 Development in Moorebank Defence Lands (LCC 2008);
- *Anzac Creek Floodplain Risk Management Study and Plan and Floodplain Development Manual* (BMT WBM Pty Ltd 2008)*;*
- Georges River Floodplain Risk Management Study and Plan (Bewsher 2004);and
- *Managing Urban Stormwater: Soils and Construction*, *Volume* 1 (Landcom 2004).

Appendix A

Liverpool City Council flood risk map

PARSONS BRINCKERHOFF



Moorebank Intermodal Terminal boundary
Drainage
Rail line

Flood risk probability*
Low risk
Medium risk
High risk

100 year water level mAHD (existing conditions)

** Flood risk based on data supplied by Liverpool City Council (January, 2011)*

Existing flood risk probability map

Aerial Source: ©2009 SKM

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Moorebank Intermodal Company

Moorebank Intermodal Terminal Project

Biodiversity Provisional Environmental Management Framework

3 July 2014

PARSONS BRINCKERHOFF

Document information

Client: Moorebank Intermodal Company
Title: Moorebank Intermodal Terminal Project
Subtitle: Biodiversity Provisional Environmental Management Framework
Document No: 2103829B PR_7068-RevC
Date: 3 July

Rev	Date	Details
A	29/04/2013	Final for issue
B	15/08/2013	Updated to address SEWPaC review comments
C	03/07/2014	Updated for adequacy review

Author, Reviewer and Approver details

Prepared by:	Emma Lichkus	Date: 03/07/2014	Signature: 
Reviewed by:	Paul Greenhalgh	Date: 03/07/2014	Signature: 
Approved by:	Paul Greenhalgh	Date: 03/07/2014	Signature: 

Distribution

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Parsons Brinckerhoff Australia Pty Limited

ABN 80 078 004 798

Level 27 Ernst & Young Centre
680 George Street, Sydney NSW 2000
GPO Box 5394
Sydney NSW 2001
Australia
Tel: +61 2 9272 5100
Fax: +61 2 9272 5101
Email: sydney@pb.com.au
www.pbworld.com

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A GRI Rating: Sustainability Report 2011

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1. Environmental management framework

The Moorebank IMT Project would be developed by the private sector under the direction of the Moorebank Intermodal Company (MIC) Limited, a Government Business Enterprise. The future developer and operator for the Project has not yet been selected. As such, a proposed overall environmental management framework has been outlined as part of the Environmental Impact Statement (EIS) (refer to Chapter 28 - *Environmental management framework*), which would guide the development of a future detailed framework.

Figure 1.1 outlines the overall environmental management framework for the Project. The environmental management framework would include an overarching Environmental Management System (EMS) that complies with AS/NZS ISO 14001:2004. It is anticipated that MIC and the developer and operator for the Project would have established environmental management systems covering their respective business objectives, policies, activities and associated environmental aspects and impacts.

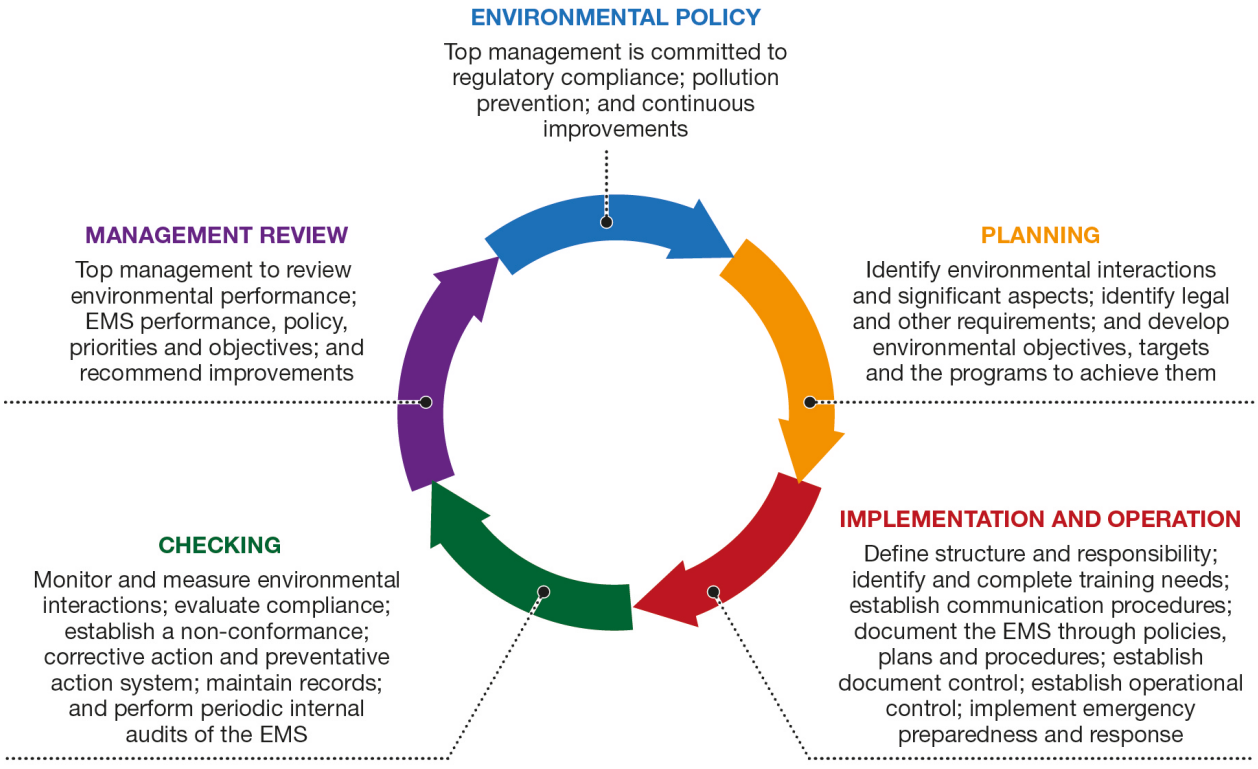

Figure 1.1 Overall environmental management framework for the Project

Approval of the Project is being sought for:

- construction and operation of the Project from the Commonwealth Department for the Environment (DoE) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act); and
- Stage 1 development consent as State significant development (SSD) from the NSW Department of Planning & Environment (NSW DP&E) under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) for the concept proposal described in the EIS (including final approval for Early Works).

Subject to approval of the Stage 1 SSD, the Project will be subject to further development approval under the EP&A Act (Stage 2 SSD development approvals).

It is anticipated that the developer and operator for the Project would be required to develop a number of project specific management plans to address design activities, construction activities and operational activities, for example:

- Design Management Plan (DMP) (incorporating environment design criteria);
- Construction Environmental Management Plan(s) (CEMP); and
- Operational Environmental Management Plan(s) (OEMP).

This document outlines the Provisional Environmental Management Framework (PEMF) which will guide the development of the above management plans.

The project specific detail to be addressed by each of the above listed management plans would be dictated by the requirements of the following key project documentation:

- The Project's EIS (including this PEMF);
- Project Approval issued under the EPBC Act;
- Stage 1 and Stage 2 SSD approvals issued under the NSW EP&A Act;
- Contractual requirements established between MIC and the developer and operator for the Project; and
- Other permits and/or licences required during the course of the project.

1.1 Provisional Environmental Management Framework

As part of the Project's EIS, a series of PEMFs have been prepared. The purpose of the PEMFs is to provide a high level overview as to how the environmental impacts during design, construction and operational phases of the Project will be minimised.

The PEMFs combined with the Project approvals, contractual arrangements and other permits and/or licences required during the course of the project provide guidance with respect to the development of project specific management plans, such as, DMPs, CEMPs and OEMPs.

2. The Project site and study area

The Moorebank IMT Project is proposed to be situated on land located approximately 30 kilometres (km) south-west of the Sydney Central Business District (CBD) and 4 km south of the Liverpool CBD in the Liverpool Local Government Area (LGA) (refer Figure 2.1).

The Project site comprises:

- the main IMT site (which is the land to the east of the Georges River, is currently occupied by Defence; and
- the rail connection (including the Georges River) from the main IMT site to the SSFL, including the three rail access options (northern, central and southern) as proposed within the Project concept.

These are described below.

2.1 Main IMT site

The main IMT site and the surrounding landscape are part of the Cumberland Plain Woodland of western Sydney. The Cumberland Plain Woodland has undergone extensive clearing, grazing and disturbance for agricultural, urban and industrial development, particularly in the 20th century. The vegetation on the Project site has been largely cleared and replaced with roads, buildings, playing fields and exotic grassland. Small stands of introduced and native trees are scattered throughout the Project site.

Four native vegetation communities have been recorded on the main IMT site, as described by Tozer (2003): Castlereagh Swamp Woodland, Castlereagh Scribbly Gum Woodland, Riparian Forest and Alluvial Woodland. The latter two communities are both listed as River-Flat Eucalypt forest under the NSW *Threatened Species Conservation Act 1995* (TSC Act). While all four communities form part of threat-listed ecological communities under the TSC Act, none of these communities correspond with a threat-listed community as listed under the EPBC Act.

Two threat-listed species of plant, *Persoonia nutans* (listed as endangered under the EPBC Act and TSC Act) and *Grevillea parviflora subsp. parviflora* (listed as vulnerable under the EPBC Act and TSC Act), have been recorded on the main IMT site. Six additional threat-listed plant species have a moderate likelihood of occurrence within the main IMT site and the land affected by the three rail access options, based on their preferred habitats and known distribution; however, targeted searches undertaken for this Project have not detected these species.

Faunal surveys detected the Grey-headed Flying-fox (listed as Vulnerable under the EPBC Act and TSC Act) flying over the main IMT site. An earlier fauna study (Lesry 2003) recorded the presence of two threat-listed microbat species in the Project site: the Large-footed Myotis and the Eastern Bent-wing Bat.

Aquatic biodiversity in the lower freshwater reaches of the Georges River is modified as a result of habitat degradation caused by changes in water flow volumes and velocities (including weirs upstream and downstream), increased nutrients and chemical pollutants, and the introduction of exotic species. The native species that exist here generally comprise disturbance tolerant species. Within the IMT site itself, some disturbed aquatic habitat exists, including Anzac Creek, which is identified as Class 3 (Minimal Fish Habitat) in accordance with Fairfull and Witheridge (2003). Onsite detention basins provide some foraging and breeding habitat for native frogs, reptiles and water birds.

Ten migratory species have been predicted to occur within the locality of the IMT site, but were not recorded during the surveys. Based on previous studies, the Regent Honeyeater (listed as Critically Endangered under the EPBC Act) has the potential to occur within the Project site, along with other migratory species of bird, as described in further detail in Chapter 13 – *Biodiversity.*

2.2 Rail access options

The vegetation communities affected by each of the three rail access options consist of open grassy woodland of the shale-derived soils of the Cumberland Plain in the west, and shrubby riparian woodland of the alluvial plains adjoining the Georges River riparian corridor in the east (refer Figure 13.2 in Chapter 13 – *Biodiversity*). There are no Threatened flora species present or with potential habitat within the rail access options.

A summary of the specific ecological characteristics relevant to each of the rail access options is provided in Table 13.2 in Chapter 13 – *Biodiversity*. The main difference between the existing ecological environments of the rail access options is the extent of vegetation, habitat and riparian zone associated with the Georges River.

3. Purpose and scope

The purpose of this PEMF is to provide a high level overview as to how the biodiversity impacts during design, construction and operational phases of the Project will be minimised.

This PEMF combined with the Project approvals, contractual arrangements and other permits and/or approvals required during the course of project provides guidance with respect to the development of project specific management plans, such as, DMP, CEMP and OEMP. It is anticipated that the developer and operator for the Project would be required to develop these plans.

As part of the approval process for the Project, it is necessary to show that the Proponent has taken, and will take, all practical steps to properly manage the biodiversity risks associated with the Project. This is achieved by the following:

- Identification of activities that may lead to biodiversity impacts.
- Establishment of objectives, targets and indicators for the management of biodiversity impacts.
- Establishment of management approaches as well as monitoring, reporting, auditing and review regimes.

A detailed Ecological Impact Assessment was undertaken (Volume3 of the EIS) and Chapter 13 – *Biodiversity* of the EIS provides a summary of the potential impacts of the Project on existing biodiversity within and surrounding the Project site.

4. Activities that may lead to biodiversity impacts

Given the location and nature of the Project and its context with regard to existing road and rail infrastructure, there is limited scope for using alternative locations to entirely avoid impacts on biodiversity. Multi-criteria analyses (MCA) were carried out and considered the reduction of impacts on areas of high ecological value, which resulted in the proposed retention (as a conservation zone) of substantial areas of vegetation along the Georges River. Other areas of vegetation outside the riparian corridor would also be retained.

The vegetation clearing and associated impacts on biodiversity is likely to follow a phased approach (Early Works, Project Phase A, Project Phase B, Project Phase C) as discussed in Chapter 8 – *Project development phasing and construction* of the EIS. The phasing of the Project will affect the timing of the implementation of mitigation measures; however allowing for the establishment of offsets prior to the occurrence of these impacts.

4.1 Potential impacts

The potential environmental impacts associated with construction of the project include the following direct and indirect impacts:

4.1.1 Construction direct impacts

- Vegetation clearing and habitat loss.
- Direct mortality (flora and fauna).
- Disturbance of aquatic habitat.
- Disturbance of groundwater dependent ecosystems.

4.1.2 Construction indirect impacts

- Fragmentation and loss of connectivity.
- Noise impacts on fauna.
- Light impacts on fauna.
- Turbidity impacts.
- Dust pollution.
- Introduction and spread of weeds.
- Increased edge effects.
- Changes to fire regimes.

The potential environmental impacts associated with the operation of the project include the following direct and indirect impacts:

4.1.3 Operational direct impacts

- Direct mortality (fauna).

4.1.4 Operational indirect impacts

- Noise impacts on fauna.
- Light impacts on fauna.
- Dust pollution.
- Changes to fire regimes.

As part of the EIS, impact assessments for threatened species, populations and ecological communities have been conducted and mitigation measures proposed to mitigate impacts. It be noted that based on these assessments and the mitigation measures proposed (including an offsets strategy detailed in Technical Paper 3 - *Ecological Impact Assessment*), no threatened species population or ecological community is likely to be significantly impacted by the Project.

5. Objectives, targets and indicators

The objectives, targets and indicators for the management of biodiversity impacts are shown in Table 5.1. The management controls implemented help achieve these objectives/targets described in the following section.

Table 5.1 Objectives, targets and indicators for the management of biodiversity impacts

Objectives	Targets	Indicators
During the detailed design phase, ensure that the nominated vegetation retention areas are maintained.	No reduction in the area of native vegetation proposed to be retained.	Area of nominated vegetation retention to be cleared as a result of the Project's detailed design.
During the detailed design phase, minimise the extent of vegetation clearance required during construction.	Area of vegetation clearance required following completion of detailed design does not significantly exceed the area identified during the EIS.	Area of vegetation clearance required during construction.
During the detailed design phase, assess opportunities for increase habitat connectivity.	Opportunities for increased habitat connectivity within the Project site have been identified during detailed design.	Opportunities identified during detailed design have been confirmed as part of the project's construction and operational phases.
Establish and maintain awareness of the importance of protecting the biodiversity values associated with the Project site.	All project and workforce personnel to complete an environmental induction, which will include information on the biodiversity values associated with the Project site and their accountabilities and responsibilities associated with minimising biodiversity impacts.	Number and percentage of project and workforce personnel that have attended required environmental induction prior to commencing work on the Project site.
Avoid disturbance to flora and fauna located outside the approved clearing footprint during the construction phase of the project.	Zero incidents of unauthorised disturbance or clearing.	Area impact by disturbance/clearing outside the approved clearing footprint.
Avoid injury or death of fauna resulting from construction activities (including vegetation clearing and drainage of any on-site waterbodies).	Zero incidents of injury or death to fauna resulting from construction activities (including vegetation clearing and drainage of any on-site waterbodies).	Number of incident reports relating to the injury or death of fauna resulting from construction activities (including vegetation clearing and drainage of any on-site waterbodies).
Prevent the spread of weeds within nominated vegetation retention areas including riparian vegetation associated with the Georges River.	Noxious and environmental weeds do not spread within the Project site and their presence within vegetation retention areas including riparian vegetation is reduced.	Presence of noxious and environmental weeds is reduced within the Project site.
Proposed offset strategy and riparian restoration plan are commenced at earliest opportunity to enable the realisation of their associated environmental benefits.	The implementation of the proposed offset strategy and riparian restoration plan at the earliest stage of the project possible	Progress reporting as to the implementation status of offset strategy and riparian restoration plan as well as identifiable environmental improvements
Avoid disturbance to flora and fauna resulting from operational activities.	Zero incidents of unauthorised disturbance of vegetation retention area including riparian vegetation associated with the Georges River	Number of instances relating to unauthorised flora/fauna disturbance during operational activities.
Avoid injury or death of fauna resulting from operational activities.	Zero incidents of injury or death to fauna resulting from operational activities.	Number of incident reports relating to the injury or death of fauna resulting from operational activities.

6. Management approach

As discussed in section 1 of this PEMF, it is anticipated that the private sector developer would be required to develop a number of project specific management plans to address design activities, construction activities and operational activities. This includes a DMP (incorporating environment design criteria); a CEMP; and an OEMP.

The biodiversity component of the above listed project specific management plans would align with the high level requirements as detailed in this PEMF as well as the project specific requirements.

The following sections provide a summary of the management control measures to be implemented during design, construction and operation in order to mitigate the risks associated with potential biodiversity impacts.

6.1 Management controls – detailed design phase

During the detailed design phase, works would be undertaken to meet the objectives as detailed in section 5 of this PEMF.

The following controls measures were identified as part of the EIS and would be implemented during the detailed design phase of the project:

- The design of site fencing and any overhead powerlines would consider the potential for collision by birds and bats and minimise this risk where practicable.
- The potential for translocation of threatened plant species as individuals or as part of a soil translocation process would be considered during the detailed development of the CEMP.
- Consideration would be given to fitting roost boxes to the bridge over the Georges River to provide roost sites for the Large-footed Myotis and other species of microbats (e.g. Eastern Bentwing-bat) which may utilise such structures. Provision of roost boxes under bridges has been identified as priority action for the recovery of the Large-footed Myotis.
- A bridge/viaduct would be used for the railway crossing of the Georges River. This may allow connectivity of terrestrial habitat along the river banks underneath the bridge.
- Options for maintaining habitat connectivity would be investigated at the detailed design phase of the Project, including establishing native vegetation and placing habitat elements such as rock piles and large woody debris under the bridge to provide cover for fauna.
- The detailed design process for the bridge over the Georges River would consider disturbance to aquatic habitat and fish passage conditions. The design would as a minimum adhere to the fish friendly passage guidelines (Fairfull & Witheridge 2003) for waterway crossings.
- Opportunities for planting of detention basins with native aquatic emergent plants and fringing trees would be explored in the detailed design of the Project and, if practicable, implemented so that they would provide similar habitat in the medium term to that lost through the removal of existing basins.
- The Biosecurity division of the Commonwealth Department of Agriculture would be consulted regarding the detailed design of the Project and its operation, to ensure that all legal requirements and appropriate management measures related to biosecurity are implemented to minimise the risk of the introduction of pest species.
- During detailed design, the Project would implement appropriate design and landscape/vegetation management measures to reduce the bushfire risk and threat to biodiversity.

- The detailed design process would consider the potential groundwater impacts to ground-dependent ecosystems and in most cases would be mitigated at the design phase.

6.2 Management controls – Early works and construction phase

During the construction phase(s), works would be undertaken to meet the objectives as detailed in section 5 of this PEMF.

The following control measures were identified as part of the EIS and would be implemented prior to and during the construction phase(s) of the project:

- Following detailed design and prior to construction, detailed flora and fauna mitigation measures would be developed and presented as part of the CEMP. These detailed measures would incorporate the measures listed below.
- Vegetation clearing would be restricted to the construction footprint and sensitive areas would be clearly identified during the construction process as exclusion zones.
- The exclusion zones would be marked on maps, which would be provided to contractors, and would be marked on the ground using high visibility fencing (such as barrier mesh).
- A trained ecologist would accompany clearing crews in order to ensure disturbance is minimised and to assist in relocating any native fauna to adjacent habitat.
- A staged habitat removal process would be developed and would include the identification and marking of all habitat trees in the area.
- Where feasible, clearing of hollow-bearing trees would be undertaken in March–April when most microbats are likely to be active (not in torpor) but are unlikely to be breeding or caring for young, and when threatened hollow-dependent birds in the locality are also unlikely to be breeding.
- Pre-clearing surveys would be conducted 12 to 48 hours before vegetation clearing to search for native wildlife (e.g. reptiles, frogs, Cumberland Land Snail) that can be captured and relocated to the retained riparian vegetation of the Georges River Corridor.
- Vegetation would be cleared from a 10 m radius around habitat trees to encourage animals roosting in hollows to leave the tree. A minimum 48 hour waiting period would allow animals to leave.
- After the waiting period, standing habitat trees would be shaken (where safe and practicable) under the supervision of an ecologist to encourage animals roosting in hollows to leave the trees, which would then be felled, commencing with the most distant trees from secure habitat.
- Felled habitat trees would either be immediately moved to the edge of retained vegetation, or left on the ground for a further 24 hours before being removed from the construction area, at the discretion of the supervising ecologist.
- All contractors would have the contact numbers of wildlife rescue groups and would be instructed to coordinate with these groups in relation to any animal injured or orphaned during clearing.
- Relocation of animals to adjacent retained habitat would be undertaken by an ecologist during the supervision of vegetation removal.
- An ecologist would supervise the drainage of any waterbodies on the Project site and would relocate native fish (e.g. eels), tortoises and frogs to the edge of the Georges River and/or the existing pond at the northern end of the IMT Site.
- Important habitat elements (e.g. large woody debris) would be moved from the construction area to locations within the Project site which would not be cleared during the Project or to stockpiles for later use in vegetation/habitat restoration.

- Winter-flowering trees would be preferentially planted in landscaped areas of the Project site to provide a winter foraging resource for migratory and nomadic nectar-feeding birds and the Grey-headed Flying-fox.
- Erosion and sediment control measures such as silt-fencing and hay bales would be used to minimise sedimentation of streams and resultant impacts on aquatic habitats and water quality.
- The CEMP would include detailed measures for minimising the risk of introducing weeds and pathogens.
- Measures to manage undesirable animal species include:
  - Monitoring of undesirable animal species. Monitor the site for the presence of introduced and undesirable animal species as part of fauna monitoring;
  - Co-operate with government bodies, interest groups and adjacent landowners in regional pest management programs including the NSW Department of Primary Industries, the Office of Environment and Heritage (OEH), and the Invasive Animal Cooperative Research Centre interest groups (e.g. Australasian Pest Bird Network and local landowners);
  - Manage the use of nest boxes by undesirable species by removing the eggs and/or young of introduced animals (e.g. Black Rat and Common Myna) found utilising nest boxes under appropriate permit conditions.;
  - Remove any insect colonies (bees, wasps, termites, ants found in nest boxes); and
  - Modify or move nest boxes to discourage use by undesirable species.
- The Project would also include a long-term program of weed removal and riparian vegetation restoration in the Georges River corridor, which would include monitoring landscaped areas for the presence of noxious and environmental weeds. A preliminary weed management strategy is provided in Appendix E of Technical Paper 3 - Ecological Impact Assessment in Volume 3, setting out the principles for the management of the riparian zone.
- The Biodiversity Offsets Strategy detailed in Appendix F of Technical Paper 3 – Ecological Impact Assessment in Volume 3 would be implemented for the Project.

6.3 Management controls – operational phase

During the operation phase, works would be undertaken to meet the objectives as detailed in section 5 of this PEMF. The following control measures were identified as part of the EIS and would be implemented during the operation phase of the project:

- A riparian restoration plan for the Georges River riparian zone and Casula offset area would be implemented. The objectives of the plan include:
  - restoration and revegetation of the riparian zone of the site to be consistent with, and complementary to, areas of remnant indigenous vegetation within the Georges River Corridor (approximately 16.7 ha of land to be revegetated);
  - long-term eradication and suppression of the most detrimental weed species on the site including vine and woody weeds (approximately 20.0 ha of land to undergo a weed control program);
  - consolidation and widening of the existing vegetation corridor of Georges River where feasible; and
  - improved habitat values for native animals and plants, particularly threatened species.
- The Biodiversity Offsets Strategy detailed in Appendix F of Technical Paper 3 – Ecological Impact Assessment in Volume 3 would be implemented for the Project.
- The management plan for the Georges River riparian corridor (refer to Appendix E of Technical Paper 3 - Ecological Impact Assessment in Volume 3) would be implemented and would include a monitoring program designed to detect operational impacts.

- Measures to manage undesirable animal species include:
  - Monitoring of undesirable animal species. Monitor the site for the presence of introduced and undesirable animal species as part of fauna monitoring;
  - Co-operate with government bodies, interest groups and adjacent landowners in regional pest management programs including the NSW Department of Primary Industries, the OEH, and the Invasive Animal Cooperative Research Centre interest groups (e.g. Australasian Pest Bird Network and local landowners);
  - Manage the use of nest boxes by undesirable species by removing the eggs and/or young of introduced animals (e.g. Black Rat and Common Myna) found utilising nest boxes under appropriate permit conditions;
  - Remove any insect colonies (bees, wasps, termites, ants found in nest boxes); and
  - Modify or move nest boxes to discourage use by undesirable species.
- The Project would also include a long-term program of weed removal and riparian vegetation restoration in the Georges River corridor, which would include monitoring landscaped areas for the presence of noxious and environmental weeds. A preliminary weed management strategy is provided in Appendix E of Technical Paper 3 - Ecological Impact Assessment in Volume 3, setting out the principles for the management of the riparian zone.
- The management of the conservation lands along the Georges River would include management of fire regimes to promote biodiversity conservation.

6.4 Monitoring

It is anticipated that the developer and operator for the Project would be required to develop a number of project specific management plans to address design activities, construction activities and operational activities. These plans would include a DMP, CEMP and an OEMP.

Within each of the project specific management plans, the private sector developer would need to detail what monitoring would be undertaken to ensure compliance with the following:

- The Project's EIS, with respect to the commitments made as well as the management and mitigation measures proposed.
- Project approvals issued under the EPBC Act and EP&A Act.
- Contractual requirements established between MIC and the developer and operator for the Project.
- Other permits and/or licences required during the course of the project.
- Objectives, targets and indicators as presented in this PEMF.

6.4.1 Baseline monitoring

The Project's EIS has identified the following biodiversity monitoring requirements:

- Georges River riparian corridor monitoring – A monitoring program (as part of the management plan for the Georges River riparian corridor) would be designed to detect operational impacts and a procedure for reporting to inform any modification to the operation of the Project site that may be necessary to minimise the identified impacts.
- Weed monitoring – The Project would also include a long-term program of weed removal and riparian vegetation restoration in the Georges River corridor, which would include monitoring of the landscaped areas of the facility for the presence of noxious and environmental weeds.

Baseline monitoring would be undertaken prior to the commencement of construction works and would include the following monitoring requirements.

6.4.1.1 Georges River riparian corridor monitoring

Monitoring of the Georges River riparian corridor would be undertaken in accordance with the Management Plan for Restoration of the Riparian Zone of the Georges River at the Moorebank IMT site, provided in Appendix E of the Ecological Impact Assessment (Volume 3). The Management Plan outlines the management and restoration strategies for this area as well as the detailed planning, monitoring and performance indicators as well as adaptive management measures.

In accordance with the Management Plan, baseline monitoring of the current condition would be needed and would include:

- cover and diversity of weed species
- cover and diversity of native canopy, shrub and groundcover plants
- diversity and abundance of sedentary native bird species
- extent of erosion.

6.4.1.2 Weed monitoring

A preliminary weed management strategy is provided in Appendix E of the Ecological Impact Assessment, (Volume 3) report, which sets out the principles for the management and monitoring of the riparian zone.

Baseline monitoring of location and extent of weed invasion within the Project site and weed species present would be undertaken to allow evaluation of the progress and effectiveness of weed control measures. This would involve general monitoring of terrestrial weeds, focusing on areas that have recently been burnt, riparian zones and areas adjacent to the proposed footprint. This monitoring would be repeated during and following construction in order to assess the introduction levels of weeds.

Annual reports summarising the progress of weed control works would be provided by the organisation engaged to carry out the weed management strategy. These are to include but not be limited to information regarding species targeted, photographic monitoring (before and after treatments), areas treated, herbicide concentrations used, techniques used and time spent on each task.

6.4.2 Monitoring of biodiversity impacts

Table 6.1 outlines the parameters for monitoring impacts to biodiversity, the response triggers and management actions.

Table 6.1 Parameters, objectives, targets and management action responses for biodiversity management

Parameter	Objective	Targets	Response trigger	Management action
Native vegetation extent	During the detailed design phase, ensure that the nominated vegetation retention areas are maintained.	No reduction in the area of native vegetation proposed to be retained.	No clearing beyond the proposed footprint.	Review design, revise impact assessment if necessary.
Environmental protection through induction	Establish and maintain awareness of the importance of protecting the biodiversity values associated with the Project site.	All project and workforce personnel to have completed an environmental induction, which will include information on the biodiversity values associated with the Project site and their accountabilities and responsibilities associated with minimising biodiversity impacts.	Any staff on-site that have not completed the required environmental induction(s).	Staff member to stop work until induction successfully completed.
Disturbance to flora and fauna outside approved footprint	Avoid disturbance to flora and fauna located outside the approved clearing footprint.	Zero incidents of unauthorised disturbance or clearing.	Clearing or disturbance beyond the proposed footprint.	Report incident to environmental site manager. Check that vegetation clearing boundaries and environmental protection zones are adequately delineated. Review environmental inductions issued for construction plans, drawings and work instructions.
Fauna injury or death	Avoid injury or death of fauna (including vegetation clearing and drainage of any on-site waterbodies).	Zero incidents of injury or death to fauna resulting from construction activities (including vegetation clearing and drainage of any on-site waterbodies).	Any injury or death of fauna.	Report incident to environmental site manager. Review mitigation measures and revise if appropriate. Where appropriate, update environmental inductions.
Weeds	Prevent the spread of weeds within nominated vegetation retention areas including riparian vegetation associated with the Georges River.	Noxious and environmental weeds do not spread within the Project Site and their presence within vegetation retention areas including riparian vegetation is reduced.	Weed extent increased. New location of weed invasion identified. New species of weed identified on-site.	Report incident to environmental site manager. Undertake adaptive weed management as outlined in weed management plan.

During the construction and operation phases of the Project, regular inspections would be undertaken to assess whether or not biodiversity impacts are in accordance with that permitted. The inspections would focus on the following key items:

- Are vegetation clearing boundaries and environmental protection zones adequately delineated?
- Have pre-clearing surveys and fauna relocation / rescue operations been implemented?
- Has vegetation been cleared in accordance with best practice or as specified in the relevant Project Approval?
- Has access to environmentally sensitive areas been restricted?
- Have the appropriate number and types of nest boxes been installed?
- Have hollow-bearing limbs, woody debris and bush rocks identified for relocation been moved to fauna translocation sites or other recipient sites?
- Have identified bat roosts been relocated, or have artificial bat roosts been installed in fauna translocation sites or other recipient sites?

6.5 Management response to incidents and non-compliances

As previously noted, it is anticipated that the developer and operator for the Project would be required to develop a number of project specific management plans to address design activities, construction activities and operational activities. These plans would include a DMP, CEMP and an OEMP.

Within each of the project specific management plans, the private sector developer would need to detail how incidents and non-compliances will be managed. It is envisaged that in doing so the private sector developer will draw upon its corporate Environmental Management System and address the specific requirements of the Project Approval.

Incidents may include (but are not limited to) the following:

- Nominated vegetation areas not maintained (all stages of project).
- Project and workforce personnel have not attended project environmental inductions.
- Unauthorised clearing of vegetation (flora).
- Unauthorised disturbance of animals including injury and death.
- Failure to meet identified objectives and targets.
- Near misses.
- Non-compliances.

Incidents including non-compliances and near misses would trigger internal (and external as required) notifications, reporting, investigation, close out and associated corrective and preventative actions to ensure compliance as well as continual improvement.

6.6 Reporting, auditing and review

Within each of the project specific management plans, the private sector developer would need to detail what reporting, auditing and review processes would be implemented to ensure compliance with the following:

- The Project's EIS, with respect to the commitments made as well as the management and mitigation measures proposed.
- Project approvals issued under the EPBC Act and NSW EP&A Act.
- Contractual requirements established between MIC and the developer and operator for the Project.
- Other permits and/or licences required during the course of the project.
- Objectives, targets and indicators as presented in this PEMF.
- The project specific management plans themselves (e.g. DMP, CEMP and OEMP) and their associated monitoring programs.

6.6.1 Independent environmental audit

Throughout the life of the Project (construction and operational phases) the proponent would commission an independent environmental audit of the Project on an annual basis. The audit:

- be conducted by a suitably qualified, experienced and independent team of experts and where necessary the team would be endorsed by the relevant government agencies (e.g. Commonwealth and State);
- be led by a suitably qualified auditor and include experts in and field as directed by the relevant government agencies (e.g. Commonwealth and State);
- be conducted in accordance with the guidance provided in ISO 19011:2002 (or as updated) – *Guidelines for Quality and/or Environmental Management Systems Auditing;*
- include consultation with relevant government agencies;
- assess the environmental performance of the Project and whether it is complying with the requirements of the Project Approval and any relevant licences and permits (including any assessment, plan or program required under these approvals);
- review the adequacy of strategies, plans or programs required under the abovementioned Project related approvals, permits and licences;
- recommend measures and actions to improve the environmental performance of the Project, and/or any strategy, plan or program required under the Project Approval, permits and licences; and
- be included in the relevant annual environmental management report (AEMR).

The proponent would make copies of each independent environment audit available for public inspection on request and if requested be submitted to the Commonwealth and State based agencies.

6.6.2 Pre-construction compliance report

Four (4) weeks prior to the commencement of construction activities, the proponent would prepare a Pre-Construction Compliance Report. The Pre-Construction Compliance Report details:

- how the relevant conditions of approval (i.e. Commonwealth and State approval conditions) required to be addressed prior to construction have been complied with;
- the date when each relevant condition of approval was complied with, including dates of submission and any required report and/or approval dates; and

- any approvals or licences required to be issued by government departments or agencies before construction commences.

6.6.3 Pre-operation compliance report

Four (4) weeks prior to the commencement of operations, the proponent would prepare a Pre-Operation Compliance Report. The Pre-Operation Compliance Report detail:

- how the relevant conditions of approval (i.e. Commonwealth and State approval conditions) required to be addressed before operations commence have been complied with;
- the date when each relevant condition of approval was complied with, including dates of submission of any required reports and/or approval dates; and
- any approvals or licences issued by government departments for the Project's operation.

6.6.4 Annual environmental management review

Throughout the life of the Project (construction and operational phases) the proponent would prepare an AEMR. The AEMR review the performance of the project against the CEMP and OEMP. The AEMR includes, but not necessarily be limited to:

- details of compliance with the various conditions of approval (i.e. Commonwealth and State approval conditions);
- a copy of the complaints register for the preceding 12months (exclusive of personal details), and details of how these complaints were addressed and resolved;
- identification of any circumstances in which the environmental impacts and performance of the Project during the year have not been generally consistent with the environmental impacts and performance predicted in the relevant Project documentation (e.g. environmental impact statement, Project Approval conditions as well as any licences and permits), with details of additional mitigation measures applied to the Project to address recurrence of these circumstances;
- results of all environmental monitoring required by the conditions of approval (i.e. Commonwealth and State approval conditions) as well as relevant licences and permits, including interpretation and discussion by a suitably qualified person;
- a list of all occasions in the preceding 12 month period when environmental goals/objectives/impact assessment criteria for the Project have not been achieved, indicating the reason for failure to meet the criteria and the action taken to prevent recurrence of that type of failure; and
- copies of the relevant independent environmental audit report, pre-construction compliance report and pre-operation compliance report.

6.7 Community consultation and liaison

A Community Engagement Plan (CEP) will be prepared and implemented by the developer and operator for the Project. This will outline the consultation and notification processes during the pre-construction, construction and operation phases. The CEP would be prepared to ensure that:

- the community and stakeholders have a high level of awareness of all processes and activities associated with the Project;
- accurate and accessible information is made available; and
- a timely response is given to issues and concerns raised by stakeholders and the community.

6.8 Supporting documentation

This PEMF is one of a suite of plans which form part of the Project's EIS. The purpose of the PEMF is to provide a high level overview as to how the environmental impacts during design, construction and operational phases of the Project will be minimised. Other PEMFs prepared as part of the Project's EIS include:

- Noise and vibration;
- Traffic;
- Light spill;
- Hazards and risk;
- Water quality;
- Aboriginal heritage;
- European heritage;
- Soils and contamination; and
- Air quality.

7. Applicable legislation, standards and guidelines

The legislative instruments, standards and guidelines specifically related to the management of potential biodiversity impacts include the following:

- EPBC Act;
- EP&A Act;
- TSC Act;
- NSW *Noxious Weeds Act 1993;*
- NSW *National Parks and Wildlife Act 1974;*
- NSW *Pesticides Act 1999;*
- *NSW principles for the use of biodiversity offsets in NSW* (NSW Department of Environment and Climate Change 2008);
- *EPBC Act – Environmental Offsets Strategy* (Department of Sustainability, Environment, Water, Population and Communities 2012);
- ISO 19011:2002 (or as updated) – Guidelines for Quality and/or Environmental Management Systems Auditing;
- The Australian Weeds Strategy; and
- NSW Weeds Strategy.