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10 Water resources

10.1 Chapter content

The Project impact assessment for water resources was provided in Chapter 10 of the Project EIS.

This chapter provides additional information to address a submission received during the statutory public display period of the Project EIS. The key issue raised from the Project EIS submission process, relevant to the water resources assessment, is summarised Table 10.1.

 Table 10.1
 Summary of submission issue received in relation to the Project EIS water resources assessment chapter

Submitter ID number (refer Appendix A)	Summary of submission issue raised	Project EIS section (public notification version)	AEIS section containing information to address submission comments	Complete replacement section for Project EIS	Supplements the Project EIS information
12.04	Potential impacts and risk assessment rating tables in each draft EIS chapter should be amended to include effective mitigation measures to assist with their interpretation	Section 10.7	Section 10.2	1	

10.2 Risk assessment

10.2.1 Methodology

This section replaces the Project EIS Section 10.7 (risk assessment).

To assess and appropriately manage the potential impact on groundwater as a result of Project activities, a risk assessment process has been implemented (herein referred to as 'risk assessment'). The risk assessment methodology adopted is based on principles outlined in the:

- AS/NZS ISO 31000:2009 Risk management Principles and guidelines
- HB 203:2012 Handbook: Managing environment-related risk
- The risk assessment identifies and assesses the risks to groundwater impacts for both the establishment and operational management of the Western Basin and WBE reclamation areas.

The purpose of this risk assessment is to identify potential impacts to environmental values/receptors, prioritise environmental management actions and mitigation measures, and to inform the Project decision making process.

The risk management framework incorporates the Australian/New Zealand Standard for Risk Management (AS/NZS 4360:2004) and contains quantitative scales to define the **likelihood** of the potential impact occurrence and the **consequence** of the potential impact should it occur.

An overview of the interaction between Project activities (drivers/stressors), sensitive values/receptors and the risk impact assessment process is provided in Figure 10.1.



Figure 10.1Risk assessment framework

Criteria used to rank the **likelihood** and **consequence** of potential impacts are provided in Table 10.2 and Table 10.3, respectively.

Table 10.2	Environmental (ecosystem), public perception and financial consequence category
	definitions (adapted from GBRMPA 2009)

Description	Definition/quantification ¹									
	Environmental*	Public perception	Financial							
Negligible (Insignificant)	No impact or, if impact is present, then not to an extent that would draw concern from a reasonable person	No media attention	Financial losses up to \$500,000							
	No impact on the overall condition of the ecosystem									
Low (Minor)	Impact is present but not to the extent that it would impair the overall condition of the ecosystem, sensitive population or community in the long term	Individual complaints	Financial loss from \$500,001 to \$5 million							
Moderate	Impact is present at either a local or wider level Recovery periods of 5 to 10 years likely	Negative regional media attention and region group campaign	Financial loss from \$6 million to \$50 million							
High (Major)	Impact is significant at either a local or wider level or to a sensitive population or community Recovery periods of 11 to 20 years are likely	Negative national media attention and national campaign	Financial loss from \$51 million to \$100 million							
Very high (Catastrophic)	Impact is clearly affecting the nature of the ecosystem over a wide area or impact is catastrophic and possibly irreversible over a small area or to a sensitive population or community	Negative and extensive national media attention and national campaigns	Financial loss in excess of \$100 million							
	Recovery periods of greater than 21 years likely or condition of an affected part of the ecosystem irretrievably compromised									

Table notes:

1 Quantification of impacts should use the impact with the greatest magnitude in order to determine the consequence category

* For Matters of National Environmental Significance (MNES) protected under the provisions of the EPBC Act the Matters of National Environmental Significance – Significant Impact Guidelines 1.1 – Environmental Protection and Biodiversity Conservation Act 1999 (DoE 2013) are to be used to determine the consequence category

Table 10.3	Likelihood category definitions (adapted from GBRM	PA 2009)

Description	Frequency	Probability
Rare	Expected to occur once or more over a timeframe greater than 101 years	0-5% chance of occurring
Unlikely	Expected to occur once or more in the period of 11 to 100 years	6-30% chance of occurring
Possible	Expected to occur once or more in the period of 1 to 10 years	31-70% chance of occurring
Likely	Expected to occur once or many times in a year (e.g. 1 to 250 days per year)	71-95% chance of occurring
Almost certain	Expected to occur more or less continuously throughout a year (e.g. more than 250 days per year)	96-100% chance of occurring

Once the likelihood and the consequence has been defined, determination of the HRG of the potential hazard will be determined through the use of a five by five matrix (refer Table 10.4).

 Table 10.4
 Hazard risk assessment matrix (adapted from GBRMPA 2009)

Likelihood	Consequence rating									
	Negligible (insignificant)	Low (minor)	Moderate	High (major)	Very high (catastrophic)					
Rare	Low	Low	Medium	Medium	Medium					
Unlikely	Low	Low	Medium	Medium	High					
Possible	Low	Medium	High	High	Extreme					
Likely	Medium	Medium	High	High	Extreme					
Almost certain	Medium	Medium	High	Extreme	Extreme					

Table note:

Hazard risk categories identified in Table 10.4 are defined in Table 10.5

Table 10.5Risk definitions and actions associated with hazard risk categories (adapted from
GBRMPA 2009)

Hazard risk category	Hazard Risk Grade (HRG) definition
Low	These risks should be recorded, monitored and controlled. Activities with unmitigated environmental risks that are graded above this level should be avoided.
Medium	Mitigation actions to reduce the likelihood and consequences to be identified and appropriate actions (if possible) to be identified and implemented.
High	If uncontrolled, a risk event at this level may have a significant residual adverse impact on MNES, MSES, GBRWHA and/or social/cultural heritage values. Mitigating actions need to be very reliable and should be approved and monitored in an ongoing manner.
Extreme	Activities with unmitigated risks at this level should be avoided. Nature and scale of the significant residual adverse impact is wide spread across a number of MNES and GBRWHA values.

10.2.2 Summary of risk assessment

The potential groundwater impact risk assessment is summarised in Table 10.6. The implementation of the mitigation measures below, will result in the residual groundwater risks from the Project activities being assessed as low.

10.2.2.1 Construction phase

The following mitigation measures will be implemented to minimise potential groundwater impacts:

- Implementation of an ASS Management Plan (refer Dredging EMP in AEIS Appendix F)
- Provide spill control materials at the Western Basin and WBE reclamation areas and BUF, including spill kits, booms and absorbent materials, to control any event of chemical spill
- Educate relevant site personnel in appropriate chemical handling and response techniques
- Installation of piezometers on the perimeter of the WBE reclamation area once earthworks are completed. Ensure the piezometers are installed in the dredged material and not the bund wall to ensure the accuracy of results.
- Development of a Western Basin and WBE reclamation areas groundwater monitoring program to be implemented once dredging and earthworks have been completed and the Western Basin and WBE reclamation areas are stable. Monitoring to include sites within the coastal strip of land adjacent to the WBE reclamation area to be installed prior to construction commencing. Groundwater monitoring piezometer installation will not be undertaken during the construction of the WBE reclamation area as piezometers are likely to be broken/demolished prior to finalisation of earthworks.

10.2.2.2 Stabilisation and maintenance phase

As part of the stabilisation and maintenance phases of the Western Basin and WBE reclamation areas (post dredging) an ongoing groundwater monitoring program (i.e. groundwater levels and water quality, specifically pH) will be implemented until the risk of PASS contamination is minimised. If potential effects are observed, as part of the operational groundwater monitoring, corrective actions would include:

- Further investigation to qualify, quantity and delineate impacts
- Identify and implement appropriate management and/or remediation measures.

Table 10.6 Potential water resource impacts and risk assessment ratings

Potential impact	Project phase					Preliminary HRG			Post mitigation HRG		
	Reclamation area and BUF establishment	Dredging	Navigational aids	Demobilisation	Maintenance	Likelihood	Consequence	HRG	Likelihood	Consequence	HRG
Degradation of groundwater quality in the combined existing WB and WBE reclamation areas, and potentially in groundwater external to the WBE reclamation area as a result of leaks and spills from the use and storage of oils and hazardous materials	1	5		5	1	Possible	Negligible	Low	Unlikely	Negligible	Low
Contamination of groundwater quality of the combined existing WB and WBE reclamation areas as a result of ASS disturbance	1	1			1	Possible	Low	Medium	Unlikely	Low	Low