

Assessment

Increase in Groundwater Abstraction and Injection – Supporting Environmental Document

Cloudbreak



Rev 2: October 2014
CB-AS-EN-0047



Fortescue
The New Force in Iron Ore

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Increase in Groundwater Abstraction and Injection – Supporting Environmental Document				CB-AS-EN-0047
Revision Number	REV 2		25/09/2014	
Status	IFU - ISSUED FOR USE			
Author	Fiona Rowland	 Signature	23/09/2014	
Checked	FMG SQ-01643	 Signature	25/09/2014	
Approved	Sean McGunnigle	 Signature	25/09/2014	
Confidentiality	FORTESCUE STAFF & CONTRACTORS	Publish on Extranet	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

Revision History (to be completed for each version retained by Document Control)

Author	Checker	Approver	Rev No.	Status	Issued Date
Arne De Vos	Fiona Rowland	Sean McGunnigle	0	IFU	4/04/2014
Fiona Rowland		Sean McGunnigle	1	IFU	01/08/2014

EXECUTIVE SUMMARY

Overview

The Proponent, Fortescue Metals Group Ltd (Fortescue) is currently developing the Pilbara Iron Ore and Infrastructure Project (the Project), which involves a series of iron ore mines in the Pilbara region of Western Australia, and rail and port infrastructure for export of iron ore through Port Hedland. Cloudbreak, which forms a component of the Project, is located in the Pilbara region of Western Australia approximately 120 km north of Newman. The mine site is located approximately 2.5 km from the Fortescue Marsh at the closest point.

As a result of an increased understanding of the hydrogeology at Cloudbreak and subsequent refining of the groundwater model; and the opportunity to blend ore at the mine, Fortescue proposes to increase the volume of groundwater abstraction and injection limits at Cloudbreak to 150 gigalitres per annum (GL/a) (hereafter referred to as ‘the Proposal’).

This document is a supporting information document and has been prepared as part of the referral of the Proposal under the Western Australian *Environmental Protection Act 1986* (EP Act).

The purpose of the document is to present an environmental impact assessment of the Proposal.

Western Australian *Environmental Protection Act 1986* (EP Act)

Section 38 of the EP Act allows for significant proposals (i.e. proposals that may have a significant effect on the environment) to be referred to the Western Australian Environmental Protection Authority (EPA). The information provided as part of the referral should be sufficient for the EPA to decide whether the proposal should be assessed, and the level of assessment that should be applied (EPA, 2012). Fortescue anticipates that this Proposal meets the above criteria and that the Proposal can be assessed at the level of “Assessment on Proponent Information Category A” (API).

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

Under the EPBC Act, any action which is likely to have a significant impact on Matters of National Environmental Significance (MNES) is required to be referred to the DoE for assessment as to whether the action constitutes a “controlled action”. Fortescue has notified the DoE of the increase in groundwater injection and abstraction to 150 GL/a by submitting *Notification of Proposed Changes to the Cloudbreak Water Management Controlled Action EPBC 2010/5696* (refer to letter CB-EN-0146.04 dated 27 September 2013). These changes were outside of the scope of the approval granted under EPBC 2010/5696 and the impact

assessment undertaken outlined no significant impacts to MNES, and as such no referral is required.

Identification of Key Environmental Factors

The identification of Key Environmental Factors for this Proposal has been undertaken in accordance with Environmental Assessment Guideline 9 and on the basis of the extensive studies, surveys and environmental assessments undertaken to date in reference to Cloudbreak.

The following have been identified as Key Environmental Factors for this Proposal:

- Hydrogeological Processes – Groundwater
- Flora and Vegetation
- Terrestrial Fauna
- Conservation and Natural Heritage Areas

Other relevant environmental factors that may be affected by the Proposal, but where the environmental objectives will clearly be met, include heritage, inland water environmental quality, surface water, subterranean fauna, landforms and terrestrial environmental quality.

Assessment of Impacts

The environmental impact assessment of the potential impacts to key environmental factors concluded:

Hydrogeological Processes – Groundwater

- While some increase in the scale of groundwater drawdown and mounding will occur as a result of the Proposal, it is not expected that this will result in any significant impacts to existing or potential users or to ecosystem maintenance.
- Numerical modelling (Fortescue 2013a) has shown that maximum drawdown and mounding at monitoring bores may be up to 1.8 m, with consideration for climatic and parameter sensitivity. Although a 1.8 m change is predicted by modelling, the adaptive groundwater management scheme, including the redistribution of water, will ensure that groundwater levels within and at the fringe of the Marsh do not change by more than 1 m, as required by Condition 7 of Ministerial Statement (MS) 962.
- It is expected that the EPA Management Objective for Hydrogeological Processes – Groundwater will be achieved.

Flora and Vegetation

- The EPA Report 1429 concluded that a total of 763 ha of Samphire may be affected by drawdown for two or more consecutive years outside of the Mine Area; of which 14 ha predicted to be impacted during operations and 749 ha predicted to be impacted post closure. A total of 3 ha would be removed via direct clearing.
- Based on the revised trigger levels and updated hydrogeological model, there are no predicted indirect impacts to Samphire as a result of drawdown for two or more consecutive years outside of the Mine Area, during operations. However there are 16 ha of predicted indirect impacts to Samphire as a result of drawdown outside of the Mine Area in 2025 (first year of post closure), 29 ha in 2026 and 0 ha in 2029.
- This reduction in indirect impacts for the Proposal compared to the impacts described in the EPA Report 1429 is due to the change in the trigger value for impacts to Samphire. The impacts to Samphire in the EPA Report 1429 were based on Samphire being impacted by 2m of drawdown, whereas the impacts to Samphire in the Proposal are based on Samphire being impacted by 3 m groundwater drawdown (Modelling Analysis of the Impact of Mine Dewatering on Soil Water Availability to the Samphire Vegetation on the Fringe of Fortescue Marsh, Fortescue 2013c).
- No vegetation communities are expected to be impacted to an extent where they are reduced to below 30% of their pre-clearing extent.
- No impacts to DRF are predicted.
- It is expected that the EPA Management Objective for Vegetation and Flora will be achieved.

Terrestrial Fauna

- No additional direct impact (clearing) beyond that approved in MS 899 and EPBC 2010/5696 is proposed.
- The predicted areas of direct and indirect impact are located in the Mulga and other Acacia Woodland habitat (6036 ha) followed by the Spinifex Covered Hills and Ranges (985 ha).
- A total of 91% of all expected indirect impact is within the Mulga and other Acacia Woodland habitat (341.5 ha).
- While it is predicted there may be some degradation in the health of the Mulga and other Acacia Woodland habitat, the impact is expected to be minimal and localised.
- The percent of expected indirect impact to all habitat types are significantly lower than presented in the EPA Report 1429.
- It is expected that the EPA Management Objective for Terrestrial Fauna will be achieved.

Conservation and Natural Heritage Areas

- No additional impacts to Fortescue Marsh are expected to occur as a result of the Proposal.
- It is expected that the EPA's Objective for Conservation and Natural Heritage area will be achieved.

Matters of National Environmental Significance

- Based on the predicted impacts to threatened fauna species and the relevant significance criteria it is considered that it is unlikely that the proposed action will have a significant impact on a critically endangered or endangered ecological community.
- Six species listed in the EPBC Act may be present in the Proposal area including Night Parrot, Northern Quoll, Greater Bilby, Orange Leaf-nosed Bat, Pilbara Olive Python.
- There are no changes to the predicted impacts to MNES which have already been approved in the existing controlled action (EPBC 2010/5696).

TABLE OF CONTENTS

EXECUTIVE SUMMARY	3
1. INTRODUCTION	11
1.1 Overview	11
1.2 Existing Relevant Approvals.....	11
1.3 Purpose and Scope of this Document	12
2. PROPOSAL OVERVIEW	13
2.1 Key Proposal Characteristics	13
2.2 The Proponent.....	14
2.3 Related Proposals.....	14
2.4 Overview of Relevant Activities.....	15
3. ENVIRONMENTAL ASSESSMENT AND MANAGEMENT APPROACH.....	17
3.1 Western Australian <i>Environmental Protection Act</i> 1986.....	17
3.2 Commonwealth <i>Environment Protection and Biodiversity Conservation Act</i> 1999	17
3.3 Principles of Environmental Protection.....	18
3.4 Principle of Environmental Impact Assessment.....	20
4. STAKEHOLDER CONSULTATION	22
5. SUPPORTING STUDIES	24
6. ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT	25
6.1 Identification of Key and Relevant Factors	25
6.2 Identification of Environmental Management Objectives	25
6.3 Impact Assessment	25
6.4 Impact Mitigation Hierarchy	26
7. MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE.....	39
7.1 Legislative Background.....	39
7.2 Impact Assessment – Matters of National Environmental Significance.....	39

List of Tables

Table 1:	Key Characteristics of Approved Development and Proposed Changes	13
Table 2:	Water Abstraction and Injection Limits	14
Table 3:	Department of Water Management Hierarchy and Application at Cloudbreak	15
Table 4:	Proposal Comparison with API Category A Criteria	17
Table 5:	Principles of Environmental Protection	18
Table 6:	Principles of Environmental Impact Assessment	20
Table 7:	Summary of Stakeholder Consultation undertaken for this Proposal to Date	22
Table 8:	Summary of Supporting Studies	24
Table 9:	Impact Assessment - Key Environmental Factors	27
Table 10:	Impact Assessment - Relevant Environmental Factors	36
Table 11:	Impact Assessment – Matters of National Environmental Significance	41

List of Plates

Plate 1:	Impact Mitigation Hierarchy	26
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LIST OF FIGURES

Figure 1:	Location of Cloudbreak.....
Figure 2:	Indicative Injection Areas.....
Figure 3:	Conceptual Hydrogeological Model.....
Figure 4:	Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – 2014
Figure 5:	Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – 2015
Figure 6:	Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – 2016
Figure 7:	Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – 2017
Figure 8:	Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – 2018
Figure 9:	Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – 2019
Figure 10:	Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – 2020
Figure 11:	Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts - 2021
Figure 12:	Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – 2022
Figure 13:	Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts - 2023
Figure 14:	Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts - 2024
Figure 15:	Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – Post Closure 2025.....
Figure 16:	Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – Post Closure 2026.....
Figure 17:	Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – Post Closure 2029.....
Figure 18:	Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – Post Closure 2034.....
Figure 19:	Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – Post Closure 2044.....
Figure 20:	Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – Post Closure 2054.....
Figure 21:	Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – Post Closure 2064.....
Figure 22:	Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – Post Closure 2074.....
Figure 23:	Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – Post Closure 2084.....
Figure 24:	Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – Post Closure 2104.....

Figure 25: Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – Post Closure 2124

Figure 26: Indirect Impacts to Mulga for Two or More Consecutive Years and Outside of the Mine Area

Figure 27: Indirect Impacts to Samphire for Two or More Consecutive Years and Outside of the Mine Area

Figure 28: Areas Subject to Mounding for Two or More Consecutive Years – Comparison with the MS 899 Approval and the Proposal for Increased Abstraction/Injection to 150GL/a.....

Figure 29: Areas Subject to Drawdown for Two or More Consecutive Years – Comparison with the MS 899 Approval and the Proposal for Increased Abstraction/Injection to 150GL/a

Figure 30: Surface Water Features

Figure 31: Vegetation Mapping.....

Figure 32: Indirect Impacts to Fauna Habitat.....

Figure 33: Impacts to Stygofauna.....

LIST OF APPENDICES

Appendix 1: Peer Review - Hydrogeological Assessment

Appendix 2: Hydrogeological Assessment

Appendix 3: Cloudbreak Groundwater Operating Strategy

Appendix 4: Vegetation Types in the Cloudbreak Area

Appendix 5: Priority Flora Recorded in the Proposal Area

Appendix 6: Summary of Potential Presence of Conservation Significant Species

1. INTRODUCTION

1.1 Overview

The Proponent, Fortescue Metals Group Ltd (Fortescue) is currently developing the Pilbara Iron Ore and Infrastructure Project (the Project), which involves a series of iron ore mines in the Pilbara region of Western Australia, and rail and port infrastructure for export of iron ore through Port Hedland.

Cloudbreak, which forms a component of the Project, is located in the Pilbara region of Western Australia approximately 120 km north of Newman. The site is within the Mulga Downs and Hillside pastoral leases. The mine site is located approximately 2.5 km from the Fortescue Marsh at the closest point (Figure 1).

Cloudbreak commenced production in 2008 and includes mining of open pits, ore processing, access roads, an accommodation village, airport and the transport of a maximum of 50 Million tonnes per annum (Mtpa) of iron ore to Port Hedland for shipment.

As a result of an increased understanding of the hydrogeology at Cloudbreak and subsequent refining of the groundwater model; and the opportunity to blend ore at the mine, Fortescue proposes to increase the volume of groundwater abstraction and injection limits at Cloudbreak to 150 gegalitres per annum (GL/a) (hereafter referred to as ‘the Proposal’).

1.2 Existing Relevant Approvals

Cloudbreak was originally referred under Part IV of the Western Australian *Environmental Protection Act 1986* (EP Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in 2005. Approval for the mine was granted pursuant to Ministerial Statement (MS) 721 and EPBC 2005/2205.

Subsequent to this approval, additional project components such as a power station and tailings facility have been referred to the Western Australian (WA) Environmental Protection Authority (EPA) and also approved under Part V of the EP Act.

The Cloudbreak Expansion Project was referred under the EPBC Act and Part IV of the EP Act and assessed via the Federal Government/WA Government Bilateral Agreement. The *Cloudbreak Life of Mine Public Environmental Review* (LOM PER) document was submitted to the Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) (now Department of the Environment (DoE)) and the WA EPA to support the assessment. During the EPA assessment there were a number of changes to the Proposal, including the project boundary and the hectares of disturbance. The EPA’s *Report and Recommendations of the Environmental Protection Authority Cloudbreak Life of Mine Project; Report 1429* (EPA Report 1429) outlined these changes and presents the final areas of direct and indirect

disturbance approved for the Project. The Cloudbreak Expansion Project was approved pursuant to EPBC 2010/5696 and MS 899.

Fortescue has obtained approval (20 December 2013) under the Section 45C of the EP Act for the increase in the annual volume of groundwater injection, to integrate groundwater management between Cloudbreak and Christmas Creek mine sites; and to amend the groundwater monitoring locations presented in MS 899. This approval has been granted via the submission of the document *Request to Amend Ministerial Statement 899 under Section 45C of the Environmental Protection Act 1986* (Section 45C) to the EPA. The request to amend the groundwater monitoring locations was granted via the submission of the document *Request to Amend Conditions 7-1 and 7-2 of Ministerial Statement 899 under Section 46 of the Environmental Protection Act 1986*. MS 962 was approved on the 18 March 2014, which presents revised Conditions 7-1 and 7-2 of MS 899.

Fortescue has also notified DSEWPC (now DoE) of the above changes by submitting *Notification of Proposed Changes to the Cloudbreak Water Management Controlled Action EPBC 2010/5696* (refer to letter CB-EN-0146.04 dated 27 September 2013). Given that these changes were within the scope of that which was referred and approved under EPBC 2010/5696, no further approval was required.

1.3 Purpose and Scope of this Document

This document is a supporting information document and has been prepared as part of the referral of the Proposal under the EP Act. In addition this document provides supporting information that the action and predicted impacts are considered not a controlled action.

The purpose of the document is to present an environmental impact assessment of the Proposal.

The scope of Proposal is limited to the increase in abstraction and injection limits as described in Section 2. Any related activities such the potential clearing of land for infrastructure development will be undertaken in accordance and within the limits of existing project approvals.

The scope of the environmental impact assessment presented in this document includes cumulative impacts including potential impacts from the existing Cloudbreak water management scheme and the nearby Christmas Creek water management scheme.

2. PROPOSAL OVERVIEW

2.1 Key Proposal Characteristics

Fortescue proposes to increase the volume of groundwater abstraction and injection at Cloudbreak to 150 GL/a. This is a result of increased understanding of the hydrogeology and subsequent refining of the groundwater model. No other changes to the existing approved project are proposed. There are no changes to the requirement to comply with the 1 m mounding and drawdown limits at the Fortescue Marsh monitoring bores as required by Condition 7-1 of MS 962.

All associated infrastructure required for the implementation of the Proposal are within the scope of the existing approvals and no additional clearing outside of the current approved footprint is required. No access to any new aquifers for injection is required.

The key characteristics of the existing mine and the proposed changes are outlined in Table 1.

Table 1: Key Characteristics of Approved Development and Proposed Changes

Relevant Characteristic	Current Approved (MS 899 and EPBC 2010/5696)	Proposed Changes (cumulative with current approved project)
Main Activities	Iron ore strip mining, dewatering and injection, pit backfilling, ore processing, transport of ore to rail loading facility, ore loading to rail, mine rehabilitation and closure.	No change
Resource	700 Million Ton (MT) Marra Mamba iron ore deposit.	No change
Ore Production	Up to 50 Mtpa wet production down-rail from the Cloudbreak Ore Processing Facility (OPF) consisting of either: <ul style="list-style-type: none"> 100% from Cloudbreak Run of Mine (ROM) ore feed Up to 10 Mtpa from Christmas Creek ROM ore feed. 	No change
Overburden	Approximately 3150 MT.	No change
Tailings	In-pit disposal of up to 70 Million m ³ .	No change
Life of Mine	Approximately 17 years (from commencement in 2008).	No change
Area disturbed	Up to 18 100 ha	No change
Pit depth	Up to 90 m	No change
Dewatering Requirements	Mine dewatering up to 100 GL/yr. Injection of all water that is not used for ore processing or dust suppression (up to 95 GL/yr.)	Mine dewatering up to 150 GL/yr. Injection of excess water up to 150 GL/yr.
Power	40 MW diesel fuelled power station.	No change
Greenhouse gas emissions	Approximately 18kg CO ₂ -e per tonne of ore mined (based on an average production rate of 35 Mtpa).	No change

The abstraction, injection, mounding and drawdown limits for Cloudbreak based on the various approvals are presented in Table 2.

Table 2: Water Abstraction and Injection Limits

Approval	Date	Abstraction Limit (GL/a)	Injection Limit (GL/a)
MS 721	24 April 2006	25 GL/a	n/a
MS 899	5 June 2012	100 GL/a	85 GL/a
Section 45c	20 December 2013	100 GL/a	95 GL/a
This referral		150 GL/a	150 GL/a

2.2 The Proponent

The proponent for the Proposal is Fortescue Metals Group Limited. The contact person for the Proposal is:

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2.3 Related Proposals

Fortescue operates the Christmas Creek mine which is located immediately to the east of Cloudbreak in the Chichester Range. The two mines, collectively termed the Chichester Hub, are linked by heavy and light vehicle access roads as well as a 37 km railway line.

The Section 45C application recently approved on the 20 December 2013 by the EPA relates to integrating groundwater management between Cloudbreak and Christmas Creek mine sites.

The expansion of the adjacent Christmas Creek mine was referred under the EP Act on the 31 October 2013 and under the EPBC Act on the 13 November 2013. This proposed expansion includes the increase in the volume of abstraction and injection of groundwater at the Christmas Creek mine.

Potential cumulative impacts presented by the Christmas Creek mine (including expansion) are accounted for in the groundwater modelling undertaken for this Proposal and have been considered within this document.

2.4 Overview of Relevant Activities

As this Proposal relates solely to the increase of groundwater abstraction and injection quantities, a full description of the Cloudbreak mining operations is not included within this document. A description of the activities relevant to this Proposal is provided below and a detailed description of the mining operations can be found in the Cloudbreak LOM PER.

Groundwater at Cloudbreak lies within the alluvium and mineralised Marra Mamba Formation (MMF), the ore body. Dewatering is therefore required to lower groundwater levels below the base of each pit to enable access to the ore.

The ore body is dewatered ahead of the advancing mine faces using bores, with some sump dewatering in the pit required due to seepage and rainfall. Revised groundwater modelling (based on a greater understanding of the local hydrogeology) indicates that up to 150 GL/a may be required to be abstracted in a wet rainfall scenario (Fortescue, 2013a) (Appendix 2).

Fortescue manages abstracted groundwater in line with the Department of Water (DoW) hierarchy of water management methods (DoW, 2009). The hierarchy of management methods and their application at Cloudbreak is presented in Table 3.

Table 3: Department of Water Management Hierarchy and Application at Cloudbreak

Management Measure (in order of preference)	Application at Cloudbreak
Efficient on-site use – used for fit for purpose activities (such as processing or dust suppression).	Approximately 11 GL/a of abstracted water is reused for purposes such as ore processing and dust suppression, all additional water is returned to the environment through injection. There is currently no opportunity to reuse any of the additional abstracted groundwater that will result from this Proposal.
Transferred to meet other demand, including other proponents in the area and public water supply.	Fortescue will continue to investigate the feasibility of transferring excess water to meet other demands, however no such opportunities have been identified to date.
Injection back in to the aquifer at designated sites.	An aquifer injection scheme has operated at Cloudbreak since 2008. It is proposed that all additional excess water resulting from this Proposal will be reinjected via this aquifer injection scheme.
Controlled release to the environment where the abstracted groundwater release is allowed to flow (through a pipe or overland) into a designated water course or wetland.	Controlled release is only considered as a method of discharge in the event that adequate injection capacity is not available due to system failure or maintenance requirements. If required, controlled release is undertaken in accordance with the <i>Cloudbreak Life of Mine Surface Water Management Plan</i> (CB-PL-EN-0023).

Excess water that cannot be reused on site is reinjected into three available injection areas via a series of bores (Figure 2). A strategic approach to injection is adopted to allow injection into aquifers of similar water quality characteristics. Brackish and saline waters are abstracted and injected to conserve brackish water for future reuse by the mine. Brackish water is considered to have salinity less than 6000 mg/L.

Excess brackish water, from Cloudbreak operations, is currently injected into the Hillside West Injection Area which is located west of the active mining area. The location of brackish water injection will change throughout the life of the mine as the mine pits move and some earlier

mining areas become injection areas. Indicative injection bore locations over the life of the mine are shown in Figure 2.

Excess saline groundwater is injected into the Oakover Formation, at locations between the mining area and the Fortescue Marsh. This location is part of the strategy to reduce the potential impacts from drawdown from mine dewatering near the Fortescue Marsh.

The approach of separating the groundwater based on salinity levels and location of the injection bores is intended to:

- Minimise the drawdown footprint
- Conserve the brackish water resource for future reuse
- Minimise impacts to Fortescue Marsh, Mulga communities and groundwater dependent vegetation and Samphire vegetation.

No change to the surplus water injection method or locations is proposed as part of this Proposal.

Supporting infrastructure relating to groundwater management includes:

- Settlement, transfer and storage ponds
- Pipes used for transporting water to the injection zones
- Storage and processing facilities for use in dust suppression and other uses.

The pipeline corridors are configured in a network that allows water to be transferred around the site according to volume and quality. Any potential changes to the supporting infrastructure will be within the limits of current approvals and are excluded from this Proposal.

3. ENVIRONMENTAL ASSESSMENT AND MANAGEMENT APPROACH

3.1 *Western Australian Environmental Protection Act 1986*

Section 38 of the WA EP Act allows for significant proposals (i.e. proposals that may have a significant effect on the environment) to be referred to the WA EPA. The information provided as part of the referral should be sufficient for the WA EPA to decide whether the proposal should be assessed, and the level of assessment that should be applied (EPA, 2012).

Fortescue anticipates that this Proposal meets the above criteria and that the Proposal can be assessed at the level of “Assessment on Proponent Information Category A” (API). The criteria used to determine that an API Category A level of assessment can be applied are presented in Table 4 (EPA, 2012).

Table 4: Proposal Comparison with API Category A Criteria

API Category A Criteria	Proposal Comparison with Criteria
The proposal raises a limited number of key environmental factors that can be readily managed and for which there is an established condition-setting framework.	The environmental impact assessment identified five key environmental factors (refer to Section 6.1). These key environmental factors have previously been identified in the original Cloudbreak environmental impact assessment and the Cloudbreak LOM PER. Existing measures to manage impacts on these factors are in place as part of the operating mine. The identified key environmental factors are typical of numerous existing iron ore mines in the Pilbara and as such there is an established approach to the setting of conditions.
The proposal is consistent with established environmental policies, guidelines and standards	The Proposal is consistent with established environmental policies, guidelines and standards as detailed in Section 3.
The proponent can demonstrate that it has conducted appropriate and effective stakeholder consultation, in particular with Decision Making Authorities (DMAs).	Extensive consultation with stakeholders including DMAs has been undertaken in reference to the Cloudbreak mine. Consultation undertaken specific to this Proposal is detailed in Section 4.
There is limited or local concern only about the likely effect of the proposal, if implemented, on the environment.	No major concerns have been raised by stakeholders in relation to the Proposal.

3.2 *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*

The Commonwealth EPBC Act provides for the protection of nationally and internationally important flora, fauna, ecological communities and heritage places (collectively referred to as Matters of National Environmental Significance (MNES)). Under the Act, any action which is likely to have a significant impact on MNES is required to be referred to the DoE for assessment as to whether the action constitutes a “controlled action”. Fortescue has notified the DoE of the increase in groundwater injection and abstraction to 150 GL/a by submitting *Notification of Proposed Changes to the Cloudbreak Water Management Controlled Action EPBC 2010/5696* (refer to letter CB-EN-0146.04 dated 27 September 2013). These changes were outside of the

scope of the approval granted under EPBC 2010/5696 and the impact assessment undertaken outlined no significant impacts to MNES.

Potential impacts to MNES are addressed in Section 7 of this report.

3.3 Principles of Environmental Protection

Part 1, Section 4A of the WA EP Act sets out five principles by which protection of the environment is to be achieved in Western Australia. These principles and the manner in which Fortescue has sought to apply them in the design and planned implementation of the Proposal are outlined in Table 5.

Table 5: Principles of Environmental Protection

Principle	Consideration given in Proposal	Corresponding Section
<p>1. Precautionary Principle</p> <p>Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.</p> <p>In the application of the precautionary principle, decisions should be guided by:</p> <ul style="list-style-type: none"> careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and an assessment of the risk-weighted consequences of various options. 	<p>Fortescue recognises the importance of minimising environmental impacts as it is vital in ensuring its longevity, success, growth and positioning in the domestic and global markets. Fortescue aims to gain a level of achievement beyond its legal obligations. This will be achieved by successful management of potential risks.</p> <p>Fortescue maintains an environmental management system (EMS) that addresses all of its activities with a potential to affect the environment. The key elements of the EMS include assessing environmental risk arising from environmental aspects with the intention of identifying issues early in the process to enable planning for avoidance and/or mitigation.</p> <p>Part of this process includes undertaking detailed site investigations of the biological and physical environments. Where these investigations identify significant conservation issues, management measures are incorporated into the project design to avoid, where practicable, and/or minimise any potential impacts.</p> <p>As a result, this Proposal has been designed to minimise potential impacts to the key environmental values of the local flora, vegetation, fauna and Fortescue Marsh.</p>	Section 6
<p>2. Intergenerational Equity</p> <p>The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.</p>	<p>Fortescue's decision making processes incorporate sustainability principles and the implementation of new and better technologies where feasible. Fortescue aims to inspire an ethic and attitude that strives for continuous improvement and ongoing learning.</p> <p>Fortescue encourages employees to engage in positive attitudes and behaviour concerning respect for the environment. It recognises sustainability cannot be achieved without the contribution and action of the entire team.</p>	Addressed in existing management procedures.
<p>3 Conservation of biological diversity and ecological integrity</p> <p>Conservation of biological diversity and ecological integrity should be a fundamental</p>	<p>Conservation of biological diversity and ecological integrity is fundamental to the Fortescue's approach to environmental management and is a major environmental consideration for the Proposal.</p> <p>Biological investigations have been undertaken by Fortescue early in the Cloudbreak planning process to identify values of environmental conservation</p>	Section 6

Principle	Consideration given in Proposal	Corresponding Section
<p>consideration.</p>	<p>significance required to be protected from disturbance. This Proposal has been designed to minimise potential impacts to the key environmental values of the surrounding flora and vegetation and the Fortescue Marsh.</p> <p>Fortescue has previously committed to rehabilitating disturbed environments upon decommissioning, as well as ongoing rehabilitation of vegetation around Cloudbreak. The aim of all rehabilitation is to establish sustainable endemic vegetation units consistent with reconstructed landforms and surrounding vegetation.</p> <p>Fortescue is also undertaking monitoring of groundwater and surface water in the area to determine impacts, as well as funding ongoing studies into the Fortescue Marsh.</p>	
<p>4. Improved valuation, pricing and incentives mechanisms</p> <p>Environmental factors should be included in the valuation of assets and services.</p> <p>The polluter pays principle – those who generate pollution and waste should bear the cost of containment, avoidance or abatement.</p> <p>The users of goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any wastes.</p> <p>Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentives structures, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solutions and responses to environmental problems.</p>	<p>Fortescue acknowledges the need for improved valuation, pricing and incentive mechanisms and endeavours to pursue these principles when and wherever possible. For example:</p> <ul style="list-style-type: none"> • environmental factors have played a major role in determining infrastructure locations • Fortescue has put in place procedures that will ensure that pollution-type impacts are minimised as far as practicable • the cost of rehabilitation and closure requirements has been incorporated into the costs of the product from the commencement of operation. 	<p>Not addressed in this document (addressed under existing management measures as a requirement of MS 707 and MS 899).</p>
<p>5. Waste minimisation</p> <p>All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.</p>	<p>Fortescue’s approach to waste management is to, in order of priority:</p> <ul style="list-style-type: none"> • avoid and reduce at source • reuse and recycle • treat and/or dispose. <p>Fortescue operates an appropriately licensed landfill for the disposal of general domestic solid wastes. Fortescue has a comprehensive recycling program on-site which includes the recycling of aluminium cans, scrap steel, plastic, batteries, light globes, fluorescent tubes, polyethylene pipe, office paper and cardboard.</p>	<p>Waste minimisation is addressed in existing management plans and is not specifically addressed in this document.</p>

3.4 Principle of Environmental Impact Assessment

The Environmental Impact Assessment Administrative Procedures 2012 describe the Principles of EIA for Proponents (EPA, 2012). The principles and how they are addressed within this document are presented in Table 6.

Table 6: Principles of Environmental Impact Assessment

Principle	How addressed in Proposal
1 Consult with all stakeholders, including the EPA, DMAs, other relevant government agencies and the local community as early as possible in the planning of their proposal, during the environmental review and assessment of their proposal, and where necessary during the life of the project.	Section 4 details the stakeholder consultation undertaken in relation to the Proposal. Fortescue will continue to consult with relevant stakeholders and DMAs throughout the assessment process and throughout the life of Cloudbreak.
2 Ensure the public is provided with sufficient information relevant to the EIA of a proposal to be able to make informed comment, prior to the EPA completing the assessment report.	Sections 2 and 6 provide comprehensive information with respect to the Proposal, existing environmental and predicted impacts that may occur as a result of the Proposal implementation.
3 Use best practicable measures and genuine evaluation of options or alternatives in locating, planning and designing their proposal to mitigate detrimental environmental impacts and to facilitate positive environmental outcomes and a continuous improvement approach to environmental management.	Best practicable measures (such as injection and integration of groundwater management between the Cloudbreak and Christmas Creek mines) have been implemented throughout the development of Cloudbreak. The implementation of these measures will continue throughout implementation of the Proposal. These measures are applied to mitigate potential impacts – for example, it is predicted that the Proposal can be implemented within the groundwater drawdown and mounding conditions currently imposed under the approvals, leading to no predicted additional impacts to Fortescue Marsh – a positive environmental outcome. The management measures that will be implemented are described in Section 6.
4 Identify the environmental factors likely to be impacted and the aspects likely to cause impacts in the early stages of planning for their proposal. The onus is on the proponent through the EIA process to demonstrate that the unavoidable impacts will meet the EPA objectives for environmental factors and therefore their proposal is environmentally acceptable.	The key environmental factors and the key aspects of the proposal that may impact these factors were identified during an internal scoping phase and discussed with the EPA on 28 October 2013. Table 9 details how the EPA Management Objectives for the key environmental factors will be achieved.
5 Consider the following, during project planning and discussions with the EPA, regarding the form, content and timing of their environmental review: (a) the activities, investigations (and consequent authorisations) required to undertake the environmental review (b) the efficacy of the investigations to produce sound scientific baseline data about the receiving environment (c) the documentation and reporting of investigations (d) the likely timeframes in which to complete the environmental review and use best endeavours to meet assessment timelines.	A significant number of surveys and studies have been undertaken in and around the Proposal area in support of the Cloudbreak and Christmas Creek mines. These surveys and studies have been undertaken over a number of years and have been scoped to provide an adequate dataset to enable the effective and comprehensive environmental assessment of Cloudbreak and its expansions; as well as the environmental management of the mines operations. The scope and contents of the environmental assessment of the Proposal was discussed with the EPA on 28 October 2013. The results of these discussions have been incorporated into the EP Act referral form and this supporting document. Timeframes for the preparation and submission of the referral were also discussed with the EPA. Fortescue will use best endeavours to meet these target timeframes.

	Principle	How addressed in Proposal
6	Identify in their environmental review, subject to the EPA’s guidance: (a) best practicable measures to avoid, where possible, and otherwise minimise, rectify, reduce, monitor and manage impacts on the environment (b) responsible corporate environmental policies, strategies and management practices, which demonstrate how the proposal can be implemented to meet the EPA’s environmental objectives for environmental factors.	Best practicable measures to avoid and mitigate potential environmental impacts from the Proposal are presented in Section 6. Fortescue is committed to the responsible environmental management of the Cloudbreak operations through the implementation of environmental policies, strategies and management practices. Of particular relevance to this Proposal is the <i>Cloudbreak Groundwater Operating Strategy – Water Management</i> (Fortescue, 2013b). The groundwater operating strategy will be updated as required in the event of changes to the management approach (continual improvement) or changes to the approved abstraction and/or injection limits.

4. STAKEHOLDER CONSULTATION

Stakeholder consultation for the Proposal has been undertaken as part of an extensive ongoing stakeholder engagement program undertaken for Fortescue’s expansion projects. This program started in October 2009 with the objectives of:

- disclosing the Proposal to all interested parties with sufficient detail such that they are able to provide feedback at the project development stage
- establishing relationships with key stakeholders that enable ongoing dialogue throughout implementation and regulation of the Proposal.

Details of the stakeholder engagement undertaken for the Cloudbreak expansion project can be found in the Cloudbreak Life of Mine PER (FMG 2011).

Stakeholder engagement undertaken in reference to this Proposal and how stakeholder comments have been addressed are detailed in Table 7.

Table 7: Summary of Stakeholder Consultation undertaken for this Proposal to Date

Date	Stakeholder	Purpose	Outcome	Fortescue’s Response
28 October 2013	Office of Environmental Protection Authority	To provide an overview of the Proposal and proposed assessment approach under the EP Act.	<ul style="list-style-type: none"> - EPA requests that Guidance Statement 9 be used to identify key environmental factors and that the impact assessment focuses on these factors. - EPA requests that some discussion is provided with respect to non-key factors and the reasons why these factors will not be impacted on by the Proposal. - EPA provided suggestions with respect to the preferred format of the supporting information document and cited suitable examples that could be followed. 	Fortescue has incorporated each recommendation into the referral documentation.
21 November 2013	Department of the Environment	To provide an overview of the Proposal and assess requirement for a formal referral under the EPBC Act.	<ul style="list-style-type: none"> - DoE noted that the scope of the existing controlled action refers to the predicted impacts to MNES and not the volume of abstracted and injected groundwater. - DoE noted that if the predicted impacts to MNES remain in the scope of the existing controlled action, no referral of the Proposal would be required. 	Fortescue has assessed the potential impacts of the Proposal and has concluded that there are no changes to the predicted impacts to MNES from the impact already approved in the existing controlled action.
4 August 2014	Department of the Environment	Confirmation on whether the action is within the scope of the current approval	<ul style="list-style-type: none"> - The action is not within the scope of the current approval EPBC 2010/5696, as such the Minister cannot approve the action. - While the increased abstraction and reinjection of water may not have a significant impact on a MNES, you may wish to refer the increase and reinjection of water for legal certainty. 	No referral is considered necessary as no significant impact to a MNES.

Date	Stakeholder	Purpose	Outcome	Fortescue's Response
15 November 2013	Department of Water	To provide an overview of the Proposal.	DoW informed Fortescue that the tri-annual report remains under review.	No response required.
6 November 2013	WWF	To provide an overview of the Proposal.	WWF will not be commenting on the Proposal.	No response required.

5. SUPPORTING STUDIES

Numerous supporting surveys and studies have been undertaken in support of the environmental assessment and management of Cloudbreak. A summary of the studies relevant to this Proposal are provided in Table 8. All surveys were conducted in accordance with methodology and approaches of EPA Position Statement No.3 (EPA 2002) and EPA Guidance Statement No. 51 (EPA 2004).

Table 8: Summary of Supporting Studies

Report Author and Year	Survey / Study Details
ATA 2006a and 2006b	Level 1 fauna assessment of a trial mine pit site, airstrip, camp and access road.
Bamford 2005a	Level 2 Terrestrial Vertebrate Fauna Survey of Proposal Area (excluding some injection areas).
Bamford 2005b, 2006, 2007a, 2007b, 2009, 2010a and 2011	Annual Night Parrot Surveys.
Bamford 2010b	Level 1 and Level 2 terrestrial fauna survey for the proposed duplication of sections of the Fortescue railway including areas within the Proposal area.
Bennelongia 2011	Desktop subterranean fauna assessment of the Cloudbreak site.
Biota 2004	Mapping of vegetation communities in the Cloudbreak area.
Biota 2005	Level 2 Terrestrial Vertebrate Fauna Survey and Habitat Mapping of the Fortescue Stage B rails corridor and proposed mines at Cloudbreak, Christmas Creek, Mindy Mindy, Mt Lewin and My Nicholas.
Ecologia 2010a	Desktop terrestrial fauna study.
Ecologia 2010b	Desktop short-range endemic (SRE) invertebrate assessment.
Ecologia 2011a	One Phase Level 2 Vertebrate Fauna Assessment of the Cloudbreak tenements and part of the Fortescue Marsh.
Ecologia 2011b	Baseline SRE invertebrate fauna survey of the Proposal area.
ENV 2011	Assessment of flora and vegetation in the Cloudbreak area including consolidation of previous surveys along with additional fieldwork to verify and expand existing mapping.
Fortescue 2013a	Hydrogeological assessment of the proposed increase in groundwater abstraction and injection volumes. This study utilises the conceptual hydrogeological model that has been developed based on field investigations undertaken since 2005, including an extensive drilling and testing program and assessment of hydrological properties conducted during 2008/2009. This assessment takes into account groundwater abstraction and injection associated with the Christmas Creek mine including its proposed expansion.
Mattiske 2005a	Mapping of vegetation communities in the Cloudbreak area.
Mattiske 2005b	Review of the condition of vegetation within Cloudbreak using the Trudgen (1991) vegetation condition scale.
Mattiske 2007	Mapping of vegetation communities near the Fortescue Marsh.

6. ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT

6.1 Identification of Key and Relevant Factors

In preparing this referral document, Fortescue has applied the Environmental Assessment Guideline 9 (EAG9). EAG9 provides guidance for the application of a significance framework in the environmental impact assessment process. This approach allows the environmental assessment's focus to be on Key Environmental Factors which are those factors where the EPA's environmental management objectives may be met, but where there is a (current) lack of confidence, signifying the need for more information or conditions relating to implementation (EPA 2013a).

The identification of Key Environmental Factors for this Proposal has been undertaken on the basis of the extensive studies, surveys and environmental assessments undertaken to date in reference to Cloudbreak.

The following have been identified as Key Environmental Factors for this Proposal:

- Hydrogeological Processes – Groundwater
- Flora and Vegetation
- Terrestrial Fauna
- Conservation and Natural Heritage Areas.

Other relevant environmental factors that may be affected by the Proposal, but where the environmental objectives will clearly be met are presented in Table 10. Objectives include heritage, inland water environmental quality, surface water, subterranean fauna, landforms and terrestrial environmental quality.

6.2 Identification of Environmental Management Objectives

Environmental Assessment Guideline 8 (EAG8) outlines the EPA's Environmental Management Objectives for each environmental factor. The Proponent of any Proposal is then required to demonstrate that these environmental management objectives can be met for each key and relevant factor. If these objectives are likely to be met, then it may be considered that the Proposal is not expected to have a significant impact on the environment (EPA 2013b).

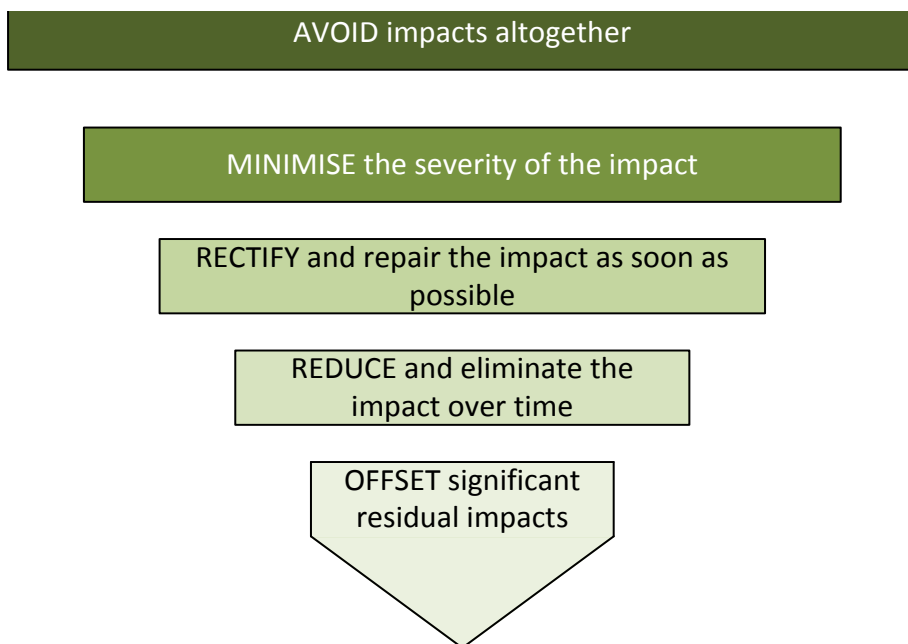
6.3 Impact Assessment

An assessment of the potential impacts on the key and relevant environmental factors is presented in Table 9 and Table 10. Fortescue expects that with the implementation of the proposed management measures, the EPA environmental management objectives will be met for each environmental factor.

6.4 Impact Mitigation Hierarchy

EPA Position Statement 9 *Environmental Offsets* (EPA 2006) states that environmental offsets may only be considered once all other reasonable attempts to mitigate adverse impacts have been exhausted. The hierarchy of impact mitigation (Plate 1) is described in EPA's *Draft Environmental Assessment Guideline – Environmental Offsets* (EPA 2012a). The management and mitigation measures for potential environmental impacts of the Proposal have been designed to take this hierarchy into consideration.

Plate 1: Impact Mitigation Hierarchy



Source EPA 2006

The mitigation measures for each key environmental factor, describing all measures to Avoid, Minimise, Rectify and Reduce, are presented in Table 9.

Fortescue is currently implementing a number offset programs required under existing State and Commonwealth approvals for the Cloudbreak Mine. These are outlined in MS 899 and EPBC 2010/5696. Given that the impacts from the Proposal do not change significantly from the impacts approved under MS 899, no additional offsets are considered required.

Table 9: Impact Assessment - Key Environmental Factors

Environmental Factor	EPA Management Objective (EPA 2013b)	Existing Environment	Impact Assessment	Management and Mitigation	Predicted Environmental Outcome
Hydrogeological Processes – Groundwater	To maintain the hydrological regimes of groundwater and surface water so that existing and potential uses, including ecosystem maintenance, are protected.	<p>Geology</p> <p>The local geology is dominated by the Fortescue Group and the lower part of the Hamersley Group, the Marra Mamba Formation (MMF). The mineralisation of the Chichester Range is confined to the Nammuldi Member, the lowermost unit of the MMF, overlying the black shales of the Jeerinah Formation at the top of the Fortescue Group. Beneath the Fortescue Valley the MMF is conformably overlain by the Wittenoom Formation of the Hamersley Group.</p> <p>The MMF (and Wittenoom Formation where present beneath the Fortescue Valley) is unconformably overlain by younger Tertiary to Quaternary deposits. The Oakover Formation comprises a sequence of lacustrine carbonate, silcrete and mudstone rocks that have been deposited in the palaeodrainage of the Fortescue Valley. The Fortescue Valley is covered by a thick (up to 50 m) blanket of Tertiary colluvial scree slopes (close to the range) and flood plain alluvial sediments.</p> <p>Conceptual Hydrogeological Model</p> <p>Characterisation of the hydrogeology of Cloudbreak has been based on field investigations undertaken since 2005, including an extensive drilling and testing program and assessment of hydrological properties conducted during 2008/09.</p> <p>The field investigations resulted in development of a conceptual hydrogeological model of the Cloudbreak area intended to represent the understanding of the natural groundwater regime and to enable the potential effects of the Cloudbreak mine on that regime to be assessed (Fortescue 2010).</p> <p>More recent investigations and observations during the mining process have led to a greater understanding of the natural groundwater regime and subsequently a refinement of the hydrogeological model.</p> <p>Figure 3 shows the conceptual hydrogeology of the Cloudbreak Area.</p> <p>Groundwater Recharge</p> <p>Primary mechanisms for groundwater recharge are:</p> <ul style="list-style-type: none"> - Infiltration recharge from direct rainfall and local stream flow on MMF outcrop and Tertiary detritals/alluvium - Infiltration recharge associated with ponding on the Fortescue Marsh - Inflow from aquifers within the Fortescue Group located to the north of the project area. <p>Direct rainfall recharge to the Tertiary detritals/alluvium and MMF aquifers is considered to be low in the Cloudbreak area, reflecting the low rainfall and high evaporation of the region.</p>	<p>Potential Impacts</p> <p>An increase in the abstraction and injection rates may potentially impact groundwater hydrological processes in the following ways:</p> <ul style="list-style-type: none"> - Result in the lowering of the water table at locations (drawdown) and subsequent impacts to environmental factors such as groundwater dependent vegetation and Samphire vegetation. - Result in the raising of the water table at locations (mounding) and subsequent impact to environmental factors such as vegetation that are intolerant to groundwater inundation. - Reduce the duration of surface water on the Fortescue Marsh and the presence of yintas. - Result in loss of water supply to station supply bores in the vicinity of Cloudbreak. <p>Model Predictions</p> <p>A hydrogeological model has been used to predict groundwater levels should the Proposal be implemented. Predicted changes to groundwater depth (drawdown and mounding) for each year of the Proposal are shown in Figure 4 to Figure 14. Predicted changes to groundwater depth (drawdown and mounding) for post closure are shown in Figure 15 to Figure 25. The predicted levels account for the existing approved Project, recently approved changes as part of Fortescue’s Section 45 C application under MS 899; and cumulative impacts from the Christmas Creek mine (including proposed expansion).</p> <p>The Hydrogeological Assessment is provided in Appendix 2. The peer review of the Hydrogeological Assessment is presented in Appendix 1.</p> <p>Impact Assessment</p> <p><i>Drawdown and Mounding</i></p> <p>Abstraction and injection will result in localised changes in groundwater levels as shown in Figures 4 to Figure 14 and post closure changes in groundwater levels are shown in Figure 15 to Figure 25. Extreme changes of up to 50 m will occur within the mine site. Smaller changes (1-5 m) will extend over larger areas.</p> <p>The numerical modelling (Fortescue 2013a) has shown that maximum drawdown and mounding at monitoring bores may be up to 1.8 m, with consideration for climatic and parameter sensitivity. Although a 1.8 m change is predicted by modelling, the adaptive groundwater management scheme including the redistribution of water will ensure that groundwater levels within and at the fringe of the Marsh do not change by more than 1 m, as required by the condition 7 of MS 962.</p> <p>Therefore, while the extent of the changes (both in magnitude and spatially) will increase from that presented in the LOM PER, it is expected that drawdown and mounding at the groundwater monitoring sites can be managed within the limits approved in MS 962.</p> <p><i>Surface Water at Fortescue Marsh and Yintas</i></p> <p>Due to high evaporation rates in the Pilbara region, evaporation is the key process in removing surface water from Fortescue Marsh and yintas. The Fortescue Marsh is adapted to a highly variable rainfall regime in terms of magnitude and frequency and is not inundated on an annual basis. Given the natural variability of the system and the localised short term effect of drawdown on the edge of the marsh, no significant effect on the surface water regime at Fortescue Marsh or yintas is expected as a result of drawdown or mounding associated with the Proposal.</p> <p><i>Station Bores</i></p> <p>Five station bores are present within the Proposal area and may be affected by drawdown (depending on the rainfall scenario). As part of the existing Cloudbreak operations, Fortescue manages these potential impacts in consultation with station managers. Fortescue will continue this process and considers that any potential impacts on station bores are manageable.</p>	<p>Avoid and Minimise</p> <p>The primary option to avoid impacts would be to prevent further mining below the watertable. However, this would mean early closure of the Cloudbreak mine and not accessing the majority of the available ore. This is not a viable option.</p> <p>Options to avoid or minimise impact to groundwater include:</p> <ul style="list-style-type: none"> • minimising the extent of groundwater drawdown and mounding • minimising changes in groundwater salinity. <p>The extent of groundwater drawdown will be minimised by limiting the duration of abstraction to that required for mining. Strategic location of injection will also be used to mitigate against mounding in areas close to the Fortescue Marsh. Changes in groundwater salinity will be minimised by injecting saline groundwater into the deeper aquifers.</p> <p>Rectify and Reduce</p> <p>Department of Water Requirements</p> <p>Fortescue manages abstracted groundwater in line with the Department of Water (DoW) hierarchy of water management methods as described in Table 3.</p> <p>Dewatering of groundwater is subject to a licence issued by the DoW under the RIWI Act that specifies the annual dewatering volume and includes conditions for monitoring. An application to amend the existing license will be submitted to the DoW separate to this referral.</p> <p>As part of the licensing process, an Operating Strategy detailing the monitoring and adaptive management of the dewatering program is required by DoW.</p> <p>Cloudbreak Groundwater Operating Strategy</p> <p>Fortescue will continue to manage groundwater in accordance to the established <i>Cloudbreak Groundwater Operating Strategy</i> (Appendix 3). This operating strategy has been prepared and implemented in accordance with Fortescue’s current water licenses. Upon approval of an increase in abstraction and injection to 150 GL/a, this operating strategy will be updated to reflect the revised volumes.</p> <p>This groundwater operating strategy</p>	<p>Fortescue has successfully managed groundwater abstraction and injection at Cloudbreak to date. All groundwater related conditions specified in MS 899 and 962 have been met.</p> <p>While there are minor increases in groundwater drawdown and mounding as a result of the Proposal, the impacts are of a similar magnitude as the currently approved impacts. The groundwater modelling is based on unmitigated controls and do not include the adaptive management strategy, such as the redistribution of water to ensure compliance with MS 899 and 962.</p> <p>With the adaptive management strategy and existing controls the Proposal is not expected to result in any significant impacts to existing or potential users or to ecosystem maintenance.</p> <p>It is considered that the</p>

Environmental Factor	EPA Management Objective (EPA 2013b)	Existing Environment	Impact Assessment	Management and Mitigation	Predicted Environmental Outcome
		<p>Recharge is enhanced in creeks and areas of stream flow. Areas of outcrop and subcrop with drainage incisions can have direct connection between surface water and underlying permeable lithologies.</p> <p>Groundwater Discharge</p> <p>Based on the evolution of groundwater within the upper Fortescue Valley the groundwater system beneath the Fortescue Marsh is considered a closed system with limited outflow to the west beneath the Goodardarie Hills. Discharge is therefore interpreted to only occur through evaporation and evapotranspiration processes beneath and fringing the Marsh. Discharge would be greatest when water levels are high, following recharge events and lowest after a prolonged dry period when the extinction zone for evaporation or evapotranspiration (from the water table) is reached.</p> <p>Recent Groundwater Trends</p> <p>Monitoring bore data, for all hydrostratigraphic units, display a general groundwater level recession between 2006 and 2010, related to below-average rainfall. The recession between 2006 and 2007 was approximately 1 m and approximately 0.5 to 1 m from 2007 to early 2010, within the Tertiary detrital/alluvium. The recession trend was punctuated by a rainfall event in early 2009 and subsequent groundwater recharge.</p> <p>Since 2010, a number of large rainfall events resulted in variable Tertiary detrital/alluvium water levels across Cloudbreak. Since 2010, Tertiary detrital/alluvium groundwater levels adjacent to the Fortescue Marsh have shown annually fluctuations of up to 2m.</p> <p>Predicted natural groundwater depths for each year of the Proposal are shown in Figure 4 to Figure 14.</p>		<p>outlines the groundwater management scheme with the objective of:</p> <ul style="list-style-type: none"> - Managing excess groundwater - Minimising potential environmental impacts - Conserving groundwater resources. <p>The key component of the scheme is the disposal of abstracted water via injection into nearby aquifers in accordance with the <i>Operational Policy 1.01 Managed Aquifer Recharge in Western Australia</i> (DoW, 2011).</p> <p>Key management measures currently being implemented with respect to the management of groundwater quantities at Cloudbreak include:</p> <ul style="list-style-type: none"> - Progressive dewatering only in active mining areas to minimise groundwater abstraction - Monitor groundwater levels during mining activities and post closure - Apply groundwater level trigger criteria and implement an appropriate management response should trigger levels be exceeded. The primary management response is the modification of the water injection regime. <p>The groundwater operating strategy details the monitoring program, trigger level system and the responses that are initiated when trigger level are exceeded. This includes a monthly 'near marsh' water level assessment to monitor potential changes to groundwater near Fortescue Marsh.</p> <p>No change to the existing monitoring program, trigger levels or management responses is proposed in this Proposal.</p> <p>Cloudbreak and Christmas Creek Integration</p> <p>In addition, the proposed integration of groundwater management between the Cloudbreak and Christmas Creek mines offers significant opportunities to address optimisation of water management at the Chichester operations to meet both operational and environmental objectives via operational planning and review. Note that this integration is the subject of a separate submission as detailed in Section 2.3, although it has been taken into account in the cumulative impact assessment under this Proposal.</p>	<p>Proposal can be implemented with the same condition on drawdown and mounding as contained in MS 962 Condition 7; and that in doing so the EPA Management Objective for Hydrological Processes – Groundwater will be achieved.</p>

Environmental Factor	EPA Management Objective (EPA 2013b)	Existing Environment	Impact Assessment	Management and Mitigation	Predicted Environmental Outcome
<p>Flora and Vegetation</p>	<p>To maintain representation, diversity, viability and ecological function at the species, population and community level.</p>	<p>Vegetation Mapping</p> <p>Cloudbreak is located within the Fortescue Botanical District of the Eremaean Botanical Province (Beard 1975). The vegetation of this province is typically open, and frequently dominated by Spinifex, Wattles and occasionally Eucalypts. Vegetation in the Proposal area comprises a mosaic of low woodland with Mulga in valleys and hummock grasslands, low open tree steppe and Snappy Gum (<i>Eucalyptus leucophloia</i>) over Limestone Spinifex (<i>Triodia wiseana</i>), and Kanji (<i>Acacia pyrifolia</i>) over Soft Spinifex (<i>Triodia pungens</i>) and Limestone Spinifex grasslands.</p> <p>Mapping of the vegetation communities in and around Cloudbreak has been completed by Biota (2004), Matiske (2005a, 2007) and ENV (2011). Thirty-five vegetation communities have been mapped in the Cloudbreak, Christmas Creek and surrounding areas. Of these, 21 have been identified in the Cloudbreak area. Appendix 4 details the vegetation communities within the Cloudbreak area. Figure 31 shows the vegetation mapping of the Cloudbreak area.</p> <p>Vegetation Condition</p> <p>The Proposal area includes the existing approved mine footprint which currently comprises cleared areas that have been developed for the mine pits and associated mine infrastructure. Several existing roads and pipelines associated with the mine also intersect vegetation in the area.</p> <p>The condition of the vegetation in the Proposal area ranges from Good to Excellent in condition as per Trudgen (1991) condition scale with the majority of the vegetation in the fringe of the Samphire Flats, Creek and Drainage line and Ranges, Hills and Hill slope vegetation type categorised as Excellent with the remaining type categories as Good as a result of grazing pressures (ENV 2011).</p> <p>Threatened Ecological Communities</p> <p>No vegetation communities in the Proposal area are representative of any Threatened Ecological Community (TEC) under the Commonwealth EPBC Act or by the DEC (2013).</p> <p>Priority Ecological Communities</p> <p>None of the identified vegetation communities within the Proposal area represent any Priority Ecological Communities (PEC) listed by the DEC (2013).</p> <p>The Proposal is located near the Fortescue Marsh which has recently been classified as a Priority 1 PEC DEC (2009). The Fortescue Marsh PEC is characterised by the presence of endemic and new to science <i>Eremophila</i> and <i>Tecticornia</i> species occurring on the fringe of the Fortescue Marsh (ENV 2011).</p>	<p>Potential Impacts</p> <p>Potential impacts to vegetation and flora as a result of the Proposal include:</p> <ul style="list-style-type: none"> - Impacts to the health of vegetation that is either groundwater dependent, vegetation impacted by groundwater drawdown or intolerant to waterlogging. - Impacts to vegetation via the change in surface water flows - Impacts to vegetation health as a result of the change in groundwater quality. <p>Note that no direct clearing of vegetation beyond that approved in MS 899 is proposed. No changes to the mine's operation that are likely to increase the potential for the introduction of introduced species are proposed.</p> <p>Impact Assessment - Groundwater Drawdown and Mounding</p> <p>Changes to groundwater levels may affect the health of vegetation that is either groundwater dependent, vegetation impacted by groundwater drawdown or intolerant to waterlogging.</p> <p>The groundwater modelling results presented above (Hydrogeological Processes – Groundwater) have been interpreted to identify areas where vegetation health may be impacted by drawdown or mounding.</p> <p>Three trigger levels for impact of mounding/drawdown to vegetation have been applied in this Proposal:</p> <p>Drawdown Trigger Level</p> <p>Any area outside of the approved mine footprint where:</p> <ul style="list-style-type: none"> • Coolibah/Redgum vegetation exists, • the natural groundwater is less than 5 m below the surface, and; • where drawdown of greater than 2 metres is expected to occur. <p>These triggers are used to identify areas where the health of groundwater dependent vegetation (Coolibah/Redgum) may be affected by the Proposal.</p> <p>Any area outside of the approved mine footprint where:</p> <ul style="list-style-type: none"> • Samphire exists, • groundwater is less than 5 m below the surface, and • drawdown of greater than 3 metres is expected to occur. <p>These triggers are used to identify areas of potential impact to Samphire from the Proposal.</p> <p>Mounding Trigger Level</p> <p>Any area outside of the approved mine footprint where:</p> <ul style="list-style-type: none"> • Mulga exists, and • groundwater levels are predicted to rise to within 2 m of the surface where not previously the case. <p>This criterion is used as an impact trigger for water potentially entering the root zone of Mulga, which has a shallow root system and is sensitive to waterlogging.</p> <p>Trigger Levels - Comparison with LOM PER</p> <p>The Cloudbreak LOM PER presented a conservative approach to assessing the potential impacts on vegetation from drawdown. This reflected the application of the precautionary principle which was appropriate due to the lack of understanding of the potential effect drawdown may have on the vegetation types present in the area.</p> <p>The trigger levels presented above have been refined from those used in the LOM PER based on increased understanding of the aquifer, hydrological processes and how vegetation (particularly Samphire) is effected by groundwater drawdown.</p> <p>Simulations as part of a recent study entitled <i>Modelling Analysis of the Impact of Mine Dewatering on Soil Water Availability to the Samphire Vegetation on the Fringe of Fortescue Marsh</i> (Fortescue 2013c) showed that the root water uptake under repeated 3-year dry weather spells is little affected by up to 3 m groundwater drawdowns, and soil water content remains above the Samphire permanent wilting point at all times even under conditions of prolonged drought and with a 3 m groundwater drawdown. The overall findings of the study concluded that groundwater drawdown of up to 3 m would not introduce any significant adverse impacts on the</p>	<p>Avoid and Minimise</p> <p>Alternative locations to avoid or minimise impact are somewhat limited as the location of the mine is dictated by the location and extent of the resource. However, locations of linear infrastructure are flexible to some extent and avoidance of significant flora species or vegetation communities is part of the mine planning process.</p> <p>Options to avoid or minimise impact to flora and vegetation include minimising the extent of groundwater drawdown and mounding. The extent of groundwater drawdown will be minimised by limiting the duration of abstraction to that required for mining. Strategic location of injection will also be used to mitigate against mounding in areas close to the Fortescue Marsh.</p> <p>Rectify and Reduce</p> <p>The predicted indirect impacts to vegetation are based on unmitigated controls and do not include the adaptive management strategy, such as the redistribution of water. The hectares of disturbance are therefore considered overestimations and unlikely to be exceeded.</p> <p>Fortescue approach to the management of indirect impacts to vegetation as a result of abstraction and injection is based on responding to information provided through the implementation of a monitoring program and response plan. If monitoring indicates that unexpected and significant impacts are likely, Fortescue, in consultation with the regulatory agencies, will implement an appropriate contingency action.</p> <p>The <i>Vegetation Health Monitoring and Management Plan</i> prepared under conditions 6-2 and 6-3 of MS 899 details the procedures that are used to assess impacts to vegetation health and condition from changes in groundwater levels (from either drawdown or mounding) outside of the mine envelope (currently with the EPA for approval).</p> <p>Ground Disturbance Permit</p> <p>A procedure of internal review and approval of all proposed vegetation clearing and ground disturbance activities is required prior to the commencement of works (a Ground Disturbance Permit). Under the permitting process areas of vegetation which may comprise high value</p>	<p>An increased understanding of the local hydrogeology as well as potential impacts to important vegetation as a result of drawdown and mounding has been applied to this assessment.</p> <p>The assessment indicates that a lower impact to Samphire vegetation is expected when compared to the estimates presented in the EPA Report 1429.</p> <p>The assessment indicated that a slightly higher impact to water logging intolerant vegetation (Mulga) is expected as a result of the Proposal. Given the large representation of Mulga in the region, this small (4.4%) increase in total impacts is not expected to significantly impact the representation, diversity, viability and ecological function of the Mulga in the region.</p> <p>No vegetation communities</p>

Environmental Factor	EPA Management Objective (EPA 2013b)	Existing Environment	Impact Assessment	Management and Mitigation	Predicted Environmental Outcome
		<p>The Samphire (Tecticornia species.) vegetation communities 12, 13, 22, 25 and 26 (refer to Appendix 4) that are recorded within the Fortescue Marsh are part of the PEC and are also significant due to the presence of varying endemic and new to science species including <i>Eremophila spongiorcarpa</i> (Priority 1).</p> <p>Nationally Important Wetlands</p> <p>The Fortescue Marsh is listed as a 'Nationally Important Wetland' in the Directory of Important Wetlands in Australia (Environment Australia 2001).</p> <p>Surface Water Dependent Mulga</p> <p>Mulga (<i>Acacia aneura</i>) is abundant in the low open woodlands and shrublands on Flats and Broad Plains within the Proposal area. Vegetation communities containing Mulga are a dominant vegetation type of semi-arid and arid Australia and occupy almost 20% of the Australian continent (Johnson and Burrows 1994).</p> <p>Despite this, the Mulga within the Proposal area is considered significant by the DEC as it:</p> <ul style="list-style-type: none"> - is the northern extent of Mulga in Western Australia - is highly morphologically variable - appears to play an important role in water and nutrient capture and is important to ecosystem function - supports a range of Priority flora such as <i>Phyllanthus aridus</i>, <i>Eremophila youngii</i> subsp. <i>lepidota</i>, <i>Goodenia nuda</i> - is highly susceptible to disturbance from fire, grazing and the development of infrastructure. <p>Mulga is considered to be generally shallow-rooted (likely less than 2 m depth) and to utilise water from shallow surface soils (Ecoscape 2009). Currently it is generally accepted that groved Mulga communities have a strong reliance on sheet flow to replenish soil water in the groves (ENV 2011).</p> <p>Groundwater-Dependent Vegetation</p> <p>Open woodlands of <i>Eucalyptus camaldulensis</i> (River Red Gum) and <i>Eucalyptus victrix</i> (Coolibah) occur on the creek lines that occur in the Proposal area. River Red Gum and Coolibah are considered to have a partial dependence on groundwater (partially phreatophytic) to meet their physiological moisture requirements through the use of deep, aggressive root systems (Fisher et al 2004).</p> <p>Both River Red Gum and Coolibah grow in areas subject to highly varying groundwater levels, which may vary by more than 10 m due to rainfall conditions (Ecoscape 2009).</p> <p>Flora</p> <p>A total of 230 taxa from 47 families and 159 genera have been previously recorded during surveys of the</p>	<p>Samphire communities near Fortescue Marsh (Fortescue 2013c). As such a 3 m drawdown has been applied as the trigger level for impacts to Samphire for this Proposal.</p> <p>Two trigger levels for drawdown have been applied to this Proposal to separate potential impacts to Samphire from potential impact to Coolibah / Redgum. While the study discussed above focusses on Samphire, a similar principle can be applied to Coolibah / Redgum. A 2 m drawdown trigger level (in areas where groundwater is less than 5 m from the surface) has been applied as this represents the natural variation of groundwater levels experienced by this vegetation type at Cloudbreak.</p> <p><i>Predicted Impacts</i></p> <p>Figure 4 to Figure 14 show the predicted impact to vegetation health (Coolibah / Red Gum, Samphire and Mulga) for each year of the Proposal in average climatic conditions. Figures 15 to Figure 25 show impacts to vegetation health post closure in average climatic conditions.</p> <p>Samphire – The EPA Report 1429 concluded that a total of 763 ha of Samphire may be affected by drawdown for two or more consecutive years outside of the Mine Area; of which 14 ha predicted to be impacted during operations and 749 ha predicted to be impacted post closure. A total of 3 ha would be removed via direct clearing.</p> <p>Based on the revised trigger levels and updated hydrogeological model (see above), there are no predicted indirect impacts to Samphire as a result of drawdown for two or more consecutive years outside of the Mine Area, during operations. However there are 16 ha of predicted indirect impacts to Samphire as a result of drawdown outside of the Mine Area in 2025 (first year of post closure), 29 ha in 2026 and 0 ha in 2029. To assume a worst-case scenario, it is presumed that all the indirect impacts as a result of drawdown predicted in 2026 persist until 2028. Therefore it is predicted that 29 ha of Samphire will be indirectly impacted to as a result of drawdown for two or more consecutive years outside of the Mine Area during post closure.</p> <p>This reduction in indirect impacts for the Proposal compared to the impacts described in the EPA Report 1429 is due to the change in the trigger value for impacts to Samphire. The impacts to Samphire in the EPA Report 1429 were based on Samphire being impacted by 2m of drawdown, whereas the impacts to Samphire in the Proposal are based on Samphire being impacted by 3 m groundwater drawdown (<i>Modelling Analysis of the Impact of Mine Dewatering on Soil Water Availability to the Samphire Vegetation on the Fringe of Fortescue Marsh</i>, Fortescue 2013c).</p> <p>No additional clearing will occur as a result of the Proposal.</p> <p>Coolibah/Redgum - The EPA Report 1429 concluded that no indirect impacts to Coolibah / Redgum would occur from mounding and drawdown activities, while 126 ha would be directly cleared. This Proposal is not expected to result in any indirect impacts to Coolibah / Red gum and does not require any additional clearing.</p> <p>Mulga - The EPA Report 1429 concluded that a total of 73ha of Mulga would be affected by mounding for two or more consecutive years outside the Mine Area, including post closure. A further 5829 ha would be directly cleared. This Proposal is predicted to increase the area of Mulga that would be affected by mounding for two or more consecutive years outside of the Mine Area, including post closure, to 345ha, which is a 272ha increase from the approved Project. No additional clearing will be required. This corresponds to a 4.4% increase in total (direct and indirect) predicted impacts to Mulga as a result of the Proposal.</p> <p>No mounding is predicted post closure. Therefore, there are no impacts to Mulga for two or more consecutive years outside the Mine Area, post closure.</p> <p>It is not expected that these predicted disturbances will have any significant impact on the representation, diversity, viability and ecological function of these vegetation types at the species, population and community levels.</p> <p>Impacts to vegetation (when combined with existing approval) will not compromise any vegetation association by taking it below the "threshold level" of 30% of its pre-clearing extent.</p> <p>No impacts to threatened flora species or DRF are predicted.</p>	<p>may require ground-truthing surveys to assess its value.</p>	<p>are expected to be impacted to an extent where they are reduced to below 30% of their pre-clearing extent. No impacts to DRF are predicted.</p> <p>As such it is expected that the EPA Management Objective for Vegetation and Flora will be achieved.</p>

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		<p>Cloudbreak area (Biota 2004, Mattiske 2005a and 2007, ENV 2011). The plant families most frequently recorded from the surveys were <i>Fabaceae</i> (82 taxa), <i>Poaceae</i> (68 taxa) and <i>Malvaceae</i> (42 taxa). The most frequently recorded genera were <i>Acacia</i> (44 taxa), <i>Ptilotus</i> (14 taxa) and <i>Senna</i> and <i>Sida</i> (13 taxa).</p> <p>Flora of Conservation Significance</p> <p>No Threatened species pursuant to the EPBC Act have been identified within the Proposal area.</p> <p>No plant taxa gazetted as Declared Rare Fauna (DRF) pursuant to the WC Act have been identified within the Cloudbreak area (Biota 2004, Mattiske 2005a, 2007, ENV 2011).</p> <p>Seven priority flora have been recorded within the Cloudbreak area (Biota 2004, Mattiske 2005a, 2007, ENV 2011). An additional 11 species listed as Priority Flora have not been recorded within the Proposal area, but may occur in the vicinity of the Proposal area. This list is based on the DEC database search (DEC 2010) and recent survey results from the adjoining survey area of Christmas Creek and Fortescue Marsh. Appendix 5 details the priority flora and their conservation significance.</p> <p>Introduced Species</p> <p>Four introduced species were recorded by Mattiske (2007); <i>Aerva jananica</i>, <i>Cenchrus ciliaris</i>, <i>Chloris barbata</i> and <i>Malvastrum americanum</i>, none of which is listed as a Declared Plant.</p>	<table border="1"> <thead> <tr> <th data-bbox="1056 331 1768 432">Vegetation Type</th> <th data-bbox="1768 331 1866 432">Mulga (ha)</th> <th data-bbox="1866 331 1997 432">Samphire (ha)</th> <th data-bbox="1997 331 2154 432">Coolibah / Redgum (ha)</th> </tr> </thead> <tbody> <tr> <td>Predicted area of direct impact – EPA Report 1429 (reference: Table 3 EPA Report 1429)</td> <td>5829</td> <td>3</td> <td>126</td> </tr> <tr> <td>Predicted area of in-direct impact – EPA Report 1429 (mounding and drawdown) (reference Table 21 Response to Public Submissions)</td> <td>73</td> <td>763</td> <td>0</td> </tr> <tr> <td>Predicted area of in-direct impact – EPA Report 1429 (ponding and shadowing) (reference Table 21 Response to Public Submissions)</td> <td>244</td> <td>0</td> <td>3</td> </tr> <tr> <td>Predicted area of in-direct impact – EPA Report 1429 (reference: page 9, Section 3.1 EPA Report 1429)</td> <td>315</td> <td>763</td> <td>3</td> </tr> <tr> <td>Total Predicted Impact (EPA Report 1429)</td> <td>6144</td> <td>766</td> <td>126</td> </tr> <tr> <td>Predicted area of direct impact – this Proposal (reference: Table 3 EPA Report 1429) – no change</td> <td>5829</td> <td>3</td> <td>126</td> </tr> <tr> <td>Predicted area of in-direct impact – this Proposal (mounding and drawdown) (reference: Mulga – Figure 26; Samphire – Figure 27)</td> <td>345</td> <td>29</td> <td>0</td> </tr> <tr> <td>Predicted area of in-direct impact – this Proposal (ponding and shadowing) (reference Table 21 Response to Public Submissions) – no change</td> <td>244</td> <td>0</td> <td>3</td> </tr> <tr> <td>Predicted area of in-direct impact – this Proposal</td> <td>589</td> <td>29</td> <td>3</td> </tr> <tr> <td>Total Predicted Impact (this Proposal)</td> <td>6418</td> <td>32</td> <td>129</td> </tr> <tr> <td>Change in area of indirect impact – this Proposal compared to EPA Report 1429</td> <td>272</td> <td>-734</td> <td>0</td> </tr> <tr> <td>Change in area of total impact – this Proposal compared to EPA Report 1429</td> <td>272</td> <td>-734</td> <td>3</td> </tr> <tr> <td>Revised total impact Cloudbreak Mine</td> <td>6418</td> <td>32</td> <td>129</td> </tr> <tr> <td>Percent change in impact (this Proposal vs EPA Report 1429)</td> <td>4.4%</td> <td>-95.8%</td> <td>2.4%</td> </tr> </tbody> </table> <p>Note: Predicted area of indirect impact (EPA Report 1429) of 315 ha is based on 73 ha of impacts from mounding and drawdown and 244 ha from ponding and shadowing, with 2 ha of overlap.</p> <p>Figure 26 and Figure 27 shows the impacts to Mulga and Samphire for two or more consecutive years, outside of the Mine Area and include post closure impacts. Figure 28 and Figure 29 show the impacts to Mulga and Samphire for two or more consecutive years, outside of the Mine Area and include post closure impacts and provide a comparison between the Proposal for Increased Abstraction/Injection to 150GL/a with the Approval Project (MS 899 and EPA Report 1429).</p> <p>Impact Assessment – Other Factors</p> <p><i>Alternations to Surface Water Flow</i></p> <p>Alterations to surface water flows are addressed above. There is not expected to be any significant change to surface water flows and as such no impact to flora or vegetation is predicted as a result of the Proposal.</p> <p>There are no changes to surface water ponding and shadowing effects as a result of the Proposal. The EPA Report 1429 concluded that 244 ha of indirect impacts to Mulga and 3 ha of indirect impacts to Coolibah/River Red Gum. These indirect impacts have been included in the disturbance calculations, and have not changed from the approved Project.</p>				Vegetation Type	Mulga (ha)	Samphire (ha)	Coolibah / Redgum (ha)	Predicted area of direct impact – EPA Report 1429 (reference: Table 3 EPA Report 1429)	5829	3	126	Predicted area of in-direct impact – EPA Report 1429 (mounding and drawdown) (reference Table 21 Response to Public Submissions)	73	763	0	Predicted area of in-direct impact – EPA Report 1429 (ponding and shadowing) (reference Table 21 Response to Public Submissions)	244	0	3	Predicted area of in-direct impact – EPA Report 1429 (reference: page 9, Section 3.1 EPA Report 1429)	315	763	3	Total Predicted Impact (EPA Report 1429)	6144	766	126	Predicted area of direct impact – this Proposal (reference: Table 3 EPA Report 1429) – no change	5829	3	126	Predicted area of in-direct impact – this Proposal (mounding and drawdown) (reference: Mulga – Figure 26; Samphire – Figure 27)	345	29	0	Predicted area of in-direct impact – this Proposal (ponding and shadowing) (reference Table 21 Response to Public Submissions) – no change	244	0	3	Predicted area of in-direct impact – this Proposal	589	29	3	Total Predicted Impact (this Proposal)	6418	32	129	Change in area of indirect impact – this Proposal compared to EPA Report 1429	272	-734	0	Change in area of total impact – this Proposal compared to EPA Report 1429	272	-734	3	Revised total impact Cloudbreak Mine	6418	32	129	Percent change in impact (this Proposal vs EPA Report 1429)	4.4%	-95.8%	2.4%		
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			<p><i>Change to Water Quality</i></p> <p>Potential changes to ground and surface water quality are address in Table 10. There is not expected to be any impact on vegetation and flora from change in water quality as a result of the Proposal.</p>																																																																															
Terrestrial Fauna	To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.	<p>Ecologia (2010a) undertook a desktop review to consolidate all existing fauna surveys and studies undertaken within the Proposal area. The following description of the fauna habitat and fauna species present in the Proposal area is adapted from Ecologia (2010a) unless otherwise stated.</p> <p>Fauna Habitat</p> <p>Six broad habitat types exist in the Proposal area:</p> <ul style="list-style-type: none"> - Low halophytic shrubland - Hummock grassland on fringe of Fortescue Marsh - Low Mulga, Snakewood and Acacia woodland - Spinifex covered hills and ranges - Creek lines and wells with Acacia shrubland and/or Eucalypt woodland - Rocky escarpments. <p>The halophytic shrubland occurs within the boundary of the Fortescue Marsh, with areas of hummock grassland on the edge of the marsh, moving into low Mulga woodland on alluvial flats, followed by the Spinifex covered hills and ranges. Creek and drainage lines supporting either Acacia shrubland or eucalypt woodland, run north-south into the Fortescue Marsh.</p> <p>Minga Well is a permanent water source and is likely to be important to local animals, especially during the dry season and times of drought. A total of eight species of conservation significance have been observed at Minga Well, including the Night Parrot which was observed drinking at Minga Well during a period of drought (Bamford 2006). Minga Well is over 2.5 km from the closest mine pit and over 3km from the Fortescue Marsh. It is not expected to be impacted on by the Proposal. It should be noted that extensive annual surveys for Night Parrot have not resulted in any further sightings of Night Parrot in the Proposal area.</p> <p>The presence of the Night Parrot at Minga Well has been assessed in the Cloudbreak LOM PER and approved under MS 899 and EPBC2010/5696.</p> <p>Terrestrial Fauna</p> <p>Counts of the number of fauna species that may be present at the site and the numbers that have been recorded are presented below.</p>	<p>Potential Impacts</p> <p>Potential impacts to fauna as a result of the Proposal include:</p> <ul style="list-style-type: none"> - Impacts from the loss of habitat (either direct or indirect loss) - Fauna entrapment - Fauna death or mortality via interaction with site vehicles. <p>Impact Assessment</p> <p>The revised impacts to fauna habitat types are presented in the table below.</p> <table border="1" data-bbox="1071 716 2175 1850"> <thead> <tr> <th>Vegetation Type</th> <th>Low halophytic shrubland (Samphire)</th> <th>Hummock grassland (spinifex)</th> <th>Mulga and other Acacia woodland</th> <th>Spinifex covered hills and ranges</th> <th>Creeklines with shrubland and/or eucalypt open woodland</th> <th>Rocky escarpments</th> </tr> </thead> <tbody> <tr> <td>Predicted area of direct impact – EPA Report 1429</td> <td>1</td> <td>2</td> <td>5,695</td> <td>985</td> <td>683</td> <td>0</td> </tr> <tr> <td>Predicted area of indirect impact – EPA Report 1429</td> <td>763</td> <td>5.5</td> <td>744</td> <td>4.4</td> <td>115.5</td> <td>0</td> </tr> <tr> <td>Total Predicted Impact - EPA Report 1429</td> <td>764</td> <td>7.5</td> <td>6439</td> <td>989.4</td> <td>798.5</td> <td>0</td> </tr> <tr> <td>Predicted area of direct impact – this Proposal</td> <td>1</td> <td>2</td> <td>5695</td> <td>985</td> <td>683</td> <td>0</td> </tr> <tr> <td>Predicted area of indirect impact – this Proposal</td> <td>28.5</td> <td>1.9</td> <td>341.5</td> <td>0</td> <td>2.1</td> <td>0</td> </tr> <tr> <td>Total Predicted Impact - this Proposal</td> <td>29.5</td> <td>3.9</td> <td>6036.5</td> <td>985</td> <td>685.1</td> <td>0</td> </tr> <tr> <td>Change in area of indirect impact – this Proposal compared to EPA Report 1429</td> <td>-734.5</td> <td>-3.7</td> <td>-402.5</td> <td>-4.4</td> <td>-113.4</td> <td>0</td> </tr> <tr> <td>Change in area of total impact – this Proposal compared to EPA Report 1429</td> <td>-734.5</td> <td>-3.7</td> <td>-402.5</td> <td>-4.4</td> <td>-113.4</td> <td>0</td> </tr> <tr> <td>Revised total impact Cloudbreak Mine</td> <td>29.5</td> <td>3.9</td> <td>6036.5</td> <td>985</td> <td>685.1</td> <td>0</td> </tr> <tr> <td>Percent change in impact (this Proposal vs EPA Report 1429)</td> <td>-96%</td> <td>-49%</td> <td>-6.3%</td> <td>-0.4%</td> <td>-14%</td> <td>0%</td> </tr> </tbody> </table> <p>* Note: 5.24 ha of the 341.46 ha of indirect impact in Mulga and other Acacia Woodland habitat are outside and to the west of the Project Area.</p>	Vegetation Type	Low halophytic shrubland (Samphire)	Hummock grassland (spinifex)	Mulga and other Acacia woodland	Spinifex covered hills and ranges	Creeklines with shrubland and/or eucalypt open woodland	Rocky escarpments	Predicted area of direct impact – EPA Report 1429	1	2	5,695	985	683	0	Predicted area of indirect impact – EPA Report 1429	763	5.5	744	4.4	115.5	0	Total Predicted Impact - EPA Report 1429	764	7.5	6439	989.4	798.5	0	Predicted area of direct impact – this Proposal	1	2	5695	985	683	0	Predicted area of indirect impact – this Proposal	28.5	1.9	341.5	0	2.1	0	Total Predicted Impact - this Proposal	29.5	3.9	6036.5	985	685.1	0	Change in area of indirect impact – this Proposal compared to EPA Report 1429	-734.5	-3.7	-402.5	-4.4	-113.4	0	Change in area of total impact – this Proposal compared to EPA Report 1429	-734.5	-3.7	-402.5	-4.4	-113.4	0	Revised total impact Cloudbreak Mine	29.5	3.9	6036.5	985	685.1	0	Percent change in impact (this Proposal vs EPA Report 1429)	-96%	-49%	-6.3%	-0.4%	-14%	0%	<p>Avoid and Minimise</p> <p>Alternative locations to avoid or minimise impact are somewhat limited as the location of the mine is dictated by the location and extent of the resource. However, locations of linear infrastructure are flexible to some extent and avoidance of significant flora species or vegetation communities is part of the mine planning process.</p> <p>Options to avoid or minimise impact to fauna habitat include minimising the extent of groundwater drawdown and mounding of groundwater drawdown will be minimised by limiting the duration of abstraction to that required for mining. Strategic location of injection will also be used to mitigate against mounding in areas close to the Fortescue Marsh.</p> <p>Rectify and Reduce</p> <p>Refer to Vegetation and Flora section of this table for management of drawdown and mounding impacts.</p> <p>Refer to Vegetation and Flora section of this table for management of ground disturbances.</p> <p>The following species specific management plans will continue to be implemented at Cloudbreak:</p> <ul style="list-style-type: none"> - Night Parrot (<i>Pezoporus occidentalis</i>) Management Plan - Bilby (<i>Macrotis lagotis</i>) Management Plan 	<p><i>Night Parrot (Schedule 1)</i></p> <p>The habitat of the Night Parrot consists of Triodia grasslands in stony or sandy environments and of Samphire and chenopod shrublands on floodplains and clay pans, and on the margins of salt lakes, creeks or other sources of water (SEWPAC 2010b). No additional areas of disturbance within the Triodia grasslands have been identified as a result of the Proposal and as such no impacts to this species are expected.</p> <p><i>Northern Quoll (Schedule 1)</i></p> <p>The rocky habitat preferred by the Northern Quoll will not be affected by the Proposal and as such no impacts to this species are expected.</p> <p><i>Greater Bilby (Schedule 1)</i></p> <p>The spinifex dominated vegetation types preferred by the Greater</p>
Vegetation Type	Low halophytic shrubland (Samphire)	Hummock grassland (spinifex)	Mulga and other Acacia woodland	Spinifex covered hills and ranges	Creeklines with shrubland and/or eucalypt open woodland	Rocky escarpments																																																																												
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Change in area of total impact – this Proposal compared to EPA Report 1429	-734.5	-3.7	-402.5	-4.4	-113.4	0																																																																												
Revised total impact Cloudbreak Mine	29.5	3.9	6036.5	985	685.1	0																																																																												
Percent change in impact (this Proposal vs EPA Report 1429)	-96%	-49%	-6.3%	-0.4%	-14%	0%																																																																												

Environmental Factor	EPA Management Objective (EPA 2013b)	Existing Environment			Impact Assessment	Management and Mitigation	Predicted Environmental Outcome																	
		<table border="1"> <thead> <tr> <th>Fauna Group</th> <th>No. Species that may potentially occur in Proposal Area.</th> <th>No. of Species recorded in Proposal Area</th> </tr> </thead> <tbody> <tr> <td>Mammal (native)</td> <td>33</td> <td>21</td> </tr> <tr> <td>Mammal (introduced)</td> <td>9</td> <td>8</td> </tr> <tr> <td>Avifauna</td> <td>165</td> <td>138</td> </tr> <tr> <td>Herpetofauna</td> <td>100</td> <td>35</td> </tr> <tr> <td>Total</td> <td>307</td> <td>202</td> </tr> </tbody> </table>	Fauna Group	No. Species that may potentially occur in Proposal Area.	No. of Species recorded in Proposal Area	Mammal (native)	33	21	Mammal (introduced)	9	8	Avifauna	165	138	Herpetofauna	100	35	Total	307	202		<p>The area of disturbance for the Proposal has been calculated based on 2 or more consecutive years of mounding and drawdown indirect impact outside of the Mine Area, including post closure. The total indirect impacts to flora and vegetation therefore equal the total indirect impacts to habitat, being 345ha for Mulga and 29ha for Samphire (totalling 374ha).</p> <p>The predicted areas of direct and indirect impact are located in the Mulga and other Acacia Woodland habitat (6036 ha) followed by the Spinifex Covered Hills and Ranges (985 ha).</p> <p><i>Loss of Habitat – Clearing</i></p> <p>No additional direct impact (clearing) beyond that approved in MS 899 and EPBC 2010/5696 is proposed. All clearing will be undertaken under existing approvals and in line with existing operational procedures. No additional impacts to fauna as a result of vegetation clearing are expected as a result of the Proposal.</p> <p><i>Loss of Habitat – Indirect</i></p> <p>Using mounding and drawdown for 2 or more consecutive years and outside the Mine Area including post closure, the total indirect impacts from this Proposal equals 374 ha (345ha for Mulga and 29ha for Samphire).</p> <p>A total of 91% of all expected indirect impact is within the Mulga and other Acacia Woodland habitat (341.5 ha).</p> <p>While there is predicted to be some degradation in the health Mulga and other Acacia Woodland habitat, the impact is expected to be minimal and localised. A reduction of 6.3% of Mulga and other Acacia Woodland habitat is expected as a result of the Proposal, compared with the numbers presented in the EPA Report 1429. The disturbance areas in the EPA Report 1429 are based on habitat loss in any one year whereas the area of disturbance for the Proposal has been calculated based on 2 or more consecutive years of mounding and drawdown indirect impact outside of the Mine Area, including post closure.</p> <p>The percent of expected indirect impact to all habitat types are significantly lower than presented in the EPA Report 1429.</p> <p>Figure 32 shows the predicted indirect impacts to the fauna habitat types.</p> <p><i>Habitat fragmentation</i></p> <p>Clearing of vegetation has the potential to result in fragmentation of habitats and lead to the inability of individuals to move between areas of habitat, as well as increase predation events as individuals move across cleared areas. Clearing within the mine footprint has the potential to create a barrier for some species that typically move north-south through this area to access the food, water and habitat resources of the Fortescue Marsh.</p> <p>The percent of expected indirect impact to all habitats are significantly lower than presented in the EPA Report 1429, as such the impacts to habitat fragmentation are significantly lower than originally proposed.</p> <p>There is not expected to be any significant increase in impacts to Fortescue Marsh, yintas or creek lines as a result of the Proposal.</p> <p>Given the lack of predicted impacts and the large regional representation of the key vegetation types, there is not predicted to be any significant impact to terrestrial fauna as a result of indirect impacts to fauna habitat as a result of the Proposal.</p> <p><i>Fauna Entrapment</i></p> <p>The ponds associated with the dewatering and injection infrastructure may attract fauna in times of drought. This could result in fauna becoming trapped and/or drowning within the ponds. There is also potential of fauna entrapment and/or drowning in the trenches associated with pipeline installation.</p> <p>There is not expected to be a significant increase in the number or size of ponds associated with dewatering or the length of trenching required as part of the Proposal. Potential entrapment of fauna can be managed via established procedures. There is not expected to be any significant impact to fauna as a result of entrapment.</p> <p><i>Vehicle Movements during Construction and Operations</i></p> <p>The Proposal is not expected to lead to any increase in the number, type or timing of vehicle movements and as such, is not expected to result in any additional risk of fauna injury or mortality due to vehicle movements.</p> <p>Priority Species</p> <p>Appendix 5 details the priority species that may occur within the Proposal area. As no significant impacts are expected to occur to fauna habitat or important vegetation communities, no significant impacts to any Priority</p>		<p>Bilby will not be affected by the Proposal and as such no impacts to this species are expected.</p> <p><i>Pilbara Leaf-nosed Bat (Schedule 1)</i></p> <p>The species roosts in caves with high humidity and temperature. No roosting habitat will be affected by the Proposal and as such no impact to this species is expected to occur as a result of the Proposal.</p> <p><i>Pilbara Olive Python (Schedule 1)</i></p> <p>The rocky habitat preferred by the Pilbara Olive Python will not be affected by the Proposal and as such no impacts to this species are expected.</p> <p><i>Migratory Birds and other Specially Protected Fauna (Schedule 3 and 4)</i></p> <p>A variety of migratory birds may utilise the Proposal area (Appendix 5), particularly the Fortescue Marsh and creek lines.</p> <p>Changes to the water table level as a result of</p>
Fauna Group	No. Species that may potentially occur in Proposal Area.	No. of Species recorded in Proposal Area																						
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Environmental Factor	EPA Management Objective (EPA 2013b)	Existing Environment	Impact Assessment	Management and Mitigation	Predicted Environmental Outcome
		<p>Introduced Species</p> <p>Previous surveys of the Cloudbreak area recorded seven introduced species, including house mouse (<i>Mus musculus</i>), feral cat (<i>Felis catus</i>), dog/dingo (<i>Canis lupus</i>), European rabbit (<i>Oryctolagus cuniculus</i>), donkey (<i>Equus asinus</i>), horse (<i>Equus caballus</i>), cow (<i>Bos Taurus</i>) and camel (Camelus dromedaries) (camel).</p> <p>Fauna of Conservation Significance</p> <p>A summary of the potential presence of conservation significant species is provided in Appendix 6.</p> <p><i>Threatened Species</i></p> <p>Six fauna species that are listed under Schedule 1¹ under the <i>Wildlife Conservation Act 1950</i> (WC Act) may potentially be present in the Proposal area:</p> <ul style="list-style-type: none"> - Night Parrot (<i>Pezoporus occidentalis</i>) - Northern Quoll (<i>Dasyurus hallucatus</i>) - Greater Bilby (<i>Macrotis lagotis</i>) - Orange Leaf-nosed Bat (<i>Rhinonictoris aurantius</i>) - Pilbara Olive Python (<i>Liasis olivaceus barroni</i>) <p><i>Other Listed Fauna</i></p> <p>Other fauna listed under the WC Act that may potentially be present include:</p> <ul style="list-style-type: none"> - Seven Schedule 3² species - One Schedule 4³ species - Two Priority 1⁴ species - One Priority 2⁵ species - One Priority 3⁶ species - Eight Priority 4⁷ species. <p>Matters of National Environmental Significance</p> <p>Twelve fauna species listed as MNES under the EPBC Act may potentially be present in the Proposal area. Of these two are considered endangered (Night Parrot (<i>Pezoporus occidentalis</i>) and Northern Quoll (<i>Dasyurus hallucatus</i>)). Four species are listed as vulnerable and six are listed as migratory species. A full list of EPBC listed fauna that may be present at the site is included in Appendix 6.</p>	<p>species is expected to occur as a result of the Proposal.</p> <p>Matters of National Environmental Significance</p> <p>Potential impacts to MNES are addressed in Section 7.</p>		<p>the Proposal have the potential to effect vegetation in the vicinity of Fortescue Marsh with subsequent potential indirect impact to migratory birds. However as impacts to these vegetation types are expected to be minimal and they are well represented in the region, no significant impacts to migratory birds are expected as a result of the Proposal.</p> <p>As such, it is expected that the EPA Management Objective for terrestrial fauna will be achieved.</p>

¹ Species that are rare or likely to become extinct.

² Birds protected under international agreements

³ Other specially protected fauna

⁴ Taxa with few, poorly known populations on threatened lands

⁵ Taxa with few, poorly known populations, some of which occur on conservation lands

⁶ Taxa with several, poorly known populations, some of which occur on conservation lands

⁷ Taxa in need of monitoring

Environmental Factor	EPA Management Objective (EPA 2013b)	Existing Environment	Impact Assessment	Management and Mitigation	Predicted Environmental Outcome
<p>Conservation and Natural Heritage Areas</p>	<p>To protect the environmental values of areas identified as having significant environmental attributes.</p> <p>To maintain the integrity, functions and environmental values (of the Fortescue Marsh).</p>	<p>The Fortescue Marsh has been identified as a 'Nationally Important Wetland' and is listed as an 'indicative place' on the Register of the National Estate due to its importance as a habitat for migratory birds.</p> <p>Previous studies and the protected matter search undertaken on 14 October 2013 identified no wetlands listed under the RAMSAR Convention located in the vicinity of the Proposal area.</p> <p>Fortescue Marsh is the key area of conservation significance in the vicinity of the Proposal and supports a number of significant flora and fauna species.</p> <p>The Fortescue Marsh has been classified as a Priority 1 PEC.</p> <p>The Department of Parks and Wildlife (DPW) is proposing that portions of the Mulga Downs, Hillside, Marillana and Roy Hill stations associated with the Fortescue Marsh be excluded from the renewal of pastoral leases in 2015 and be added to the conservation estate (or managed by conservation agreement).</p>	<p>Potential Impacts</p> <p>Potential impacts to conservation and natural heritage areas as a result of the Proposal include:</p> <ul style="list-style-type: none"> - Impacts to Fortescue Marsh via mounding or drawdown as a result of groundwater abstraction and injection. - Impacts to Fortescue Marsh as a result of contingency surface releases of abstracted groundwater - Impact to Fortescue Marsh as a result of changes in ground or surface water quality. <p>Impact Assessment</p> <p><i>Drawdown and Mounding Impacts on Fortescue Marsh</i></p> <p>MS 962 specifies conditions with respect to acceptable drawdown and mounding (maximum 1 m) on the fringes of Fortescue Marsh. Fortescue monitors compliance with this condition via a series of monitoring bores located on the fringe of the Marsh.</p> <p>The numerical modelling has shown that maximum drawdown and mounding at monitoring bores may be up to 1.8m (Figure 4 to Figure 25), with consideration for climatic and parameter sensitivity. The predicted indirect impacts to vegetation are based on unmitigated controls and do not include the adaptive management strategy, such as the redistribution of water. The adaptive management scheme is believed to be sufficiently robust such the current conditions within MS 962 (1 m variation) are achievable under the increased abstraction scenario.</p> <p>As such, it is expected that the Proposal will comply with the conditions specified in MS 962 and that no additional impacts to Fortescue Marsh will occur as a result of drawdown or mounding associated with the Proposal.</p> <p>As can be seen from Figure 4 to Figure 25, it is not predicted to be any significant impacts to vegetation with Fortescue Marsh as a result of the Proposal, including post closure.</p> <p><i>Surface Water Releases</i></p> <p>As detailed above (Hydrological Processes – Groundwater), there is not proposed to be any change to the contingency surface water release regime that is currently in place for Cloudbreak. As such there is not expected to be any additional impacts to Fortescue Marsh as a result of contingency surface release of water.</p> <p><i>Groundwater and Surface Water Quality</i></p> <p>As detailed in Table 10 (Inland Waters Environmental Quality) there is not expected to be any significant change to ground or surface water quality as a result of the Proposal.</p>	<p>Avoid and Minimise</p> <p>Alternative locations to avoid or minimise impact are somewhat limited as the location of the mine is dictated by the location and extent of the resource.</p> <p>Options to avoid or minimise impact to the Fortescue Marsh include minimising the extent of groundwater drawdown and mounding. The extent of groundwater drawdown will be minimised by limiting the duration of abstraction to that required for mining. Strategic location of injection will also be used to mitigate against mounding in areas close to the Fortescue Marsh.</p> <p>Rectify and Reduce</p> <p>Refer to the Hydrological Processes - Groundwater section of this table for management of drawdown and mounding impacts.</p> <p>Refer to Vegetation and Flora section of this table for management of ground disturbances.</p> <p>Fortescue Marsh Management Plan</p> <p>The <i>Fortescue Marsh Hydrology and Vegetation Monitoring and Management Plan</i> is required to meet Condition 7 of EPBC 2010/5696. This plan outlines existing information available on the Fortescue Marshes and aims to identify assess and minimise potential environmental impacts of the life of mine operations on the Fortescue Marsh.</p>	<p>No additional impacts to Fortescue Marsh are expected to occur as a result of the Proposal. As such it is expected that the EPA's Objective for Conservation and Natural Heritage area will be achieved.</p>

Table 10: Impact Assessment - Relevant Environmental Factors

Environmental Factor	EPA Management Objective (EPA 2013b)	Existing Environment	Impact Assessment	Management and Mitigation	Predicted Environmental Outcome
Heritage	To ensure that historical and cultural associations are not adversely affected.	<p>The Proposal area is located within two areas subject to native title claims (Niyiyaparli and Palyku claimant groups).</p> <p>Approximately 1573 heritage sites are located within the Chichester Project area (Cloudbreak and Christmas Creek), including 567 salvaged sites. These sites comprise artefact, manmade structures, mythological, repository, ceremonial, grinding patch, midden, skeletal material / burial, engraving, historical, scarred tree and quarry sites. Artefact scatters account for over 80% of the identified sites within the Chichester Project area.</p> <p>The Fortescue Marsh has some semi-permanent water pools or “yintas” along the northern shoreline which have been identified as having cultural significance. Two yintas have part of their catchments within the Proposal area being Yinta 1 which receives flow from Gorman Creek and Yinta 2 (Figure 30).</p>	<p>Potential Impacts</p> <p>Potential impacts to heritage include:</p> <ul style="list-style-type: none"> - Physical disturbance of heritage sites - Impacts to heritage sites as a result of alteration to surface water flow. <p>Impact Assessment</p> <p><i>Physical Disturbance</i></p> <p>Physical disturbance of the land surface during the construction of groundwater management infrastructure was considered in the Cloudbreak LOM PER which concluded that with the proposed management and mitigation measures; impacts would be limited to the extent permitted under the <i>Aboriginal Heritage Act 1972</i> Section 19 – consent to disturb.</p> <p>No additional ground disturbance beyond that approved in MS 899 is proposed.</p> <p><i>Alteration of Surface Water Flow</i></p> <p>Surface water discharge of dewatered groundwater may occur as a contingency if injection infrastructure fails. This may result in alterations to surface flows, which has potential to result in erosion of Aboriginal heritage sites and impacts to yinta.</p> <p>Contingency surface water discharge was considered in the Cloudbreak LOM PER which concluded impacts would be limited to the extent permitted under the <i>Aboriginal Heritage Act 1972</i> Section 19 – consent to disturb.</p> <p>The Proposal will not increase the frequency or volume of these contingency releases. Therefore there is not expected to be any significant impact above that presented in the Cloudbreak LOM PER.</p>	<p>Cultural Heritage Management</p> <p>The existing Cultural Heritage Management Plan (CHMP) will continue to be implemented. This plan provides for Aboriginal monitors to oversee construction activities within the relevant native title claims.</p> <p>The existing Aboriginal sites register will continue to be used to provide description, location and condition of heritage sites within Cloudbreak.</p> <p>Management of Surface Water Release</p> <p>Disposal of water via surface will only occur during emergencies and when maintenance is required. All surface discharges will be undertaken in accordance with the <i>Cloudbreak Life of Mine Surface Water Management Plan</i> (CB-PL-EN-0023)</p>	<p>EPA Report 1429 did not consider heritage to be a key environmental factor and is not included in MS899. However MS899 does allow the clearing of up to 13,633 ha of native vegetation.</p> <p>Impacts to heritage are expected to be minimal and with the scope of the approval granted in MS 899.</p> <p>Impacts will be limited to impacts on Aboriginal heritage sites to the extent permitted under the <i>Aboriginal Heritage Act 1972</i> Section 19 – Consent to Disturb.</p> <p>It is expected that the EPA Environmental Management Objective will be achieved.</p>
Inland Waters Environmental Quality	To maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected.	<p>Groundwater Quality</p> <p>Cloudbreak groundwater chemistry data shows groundwater in the resource area is generally brackish and becomes increasingly saline towards the Fortescue Marsh and with depth (Fortescue 2013). Groundwater in the Cloudbreak region ranges from marginally brackish (>500 mg/L Total Dissolved Solids [TDS]) in recharge areas to hypersaline in areas closer to the Fortescue Marsh and in fractured rock zones below the Marra Mamba Formation (>100 000 mg/L TDS) (Fortescue 2010a).</p> <p>Surface Water Quality</p> <p>Surface water runoff to the Fortescue Marsh is typically of low salinity and high turbidity. However during flooding events, salts deposited from previous drying events are redissolved; and the water entering the Marsh becomes moderately saline (Fortescue 2009).</p>	<p>Potential Impacts</p> <p>Potential impacts to Inland Waters Environmental Quality include:</p> <ul style="list-style-type: none"> - Changes to groundwater salinity due to abstraction and injection of groundwater - Impacts to surface water quality through contingency surface release - Acidification of Potential Acid Sulphate Soil due to drawdown in marsh areas. - Potential oxidisation of Potential Acid Sulphate Soils potentially resulting in acid mine drainage. <p>Impact Assessment</p> <p><i>Changes to Groundwater Salinity due to abstraction and injection of groundwater</i></p> <p>Abstraction of groundwater result in depletion of the brackish water resource and migration of saline water from aquifers beneath the Fortescue Marsh and deeper aquifer zones beneath the pits to the dewatering area.</p> <p>Impacts to groundwater salinity due to saline injection are expected to be minimal as the receiving aquifer is saline and confined.</p> <p>Impacts to groundwater salinity due to brackish injection are expected to be minimal; the injected water is abstracted from the same aquifer and has similar water quality.</p> <p><i>Surface Water Quality</i></p> <p>Contingency surface water discharge was considered in the Cloudbreak LOM PER which concluded impacts could be managed by limiting discharge to up to 35 ML/day of fresh or brackish water for periods of up to 21 days under limited circumstance (Fortescue 2009). No change to this regime is proposed and as such no additional impact to surface water quality is expected.</p> <p><i>Acidification in Marsh Areas</i></p> <p>Acidification of any potential Acid Sulphate Soils (ASS) may occur in marsh areas if drawdown occurs during dry climate periods. The potential for acidification will be</p>	<p>Potential impacts to inland waters environmental quality will be managed via:</p> <ul style="list-style-type: none"> - <i>Cloudbreak Groundwater Operating Strategy</i> - <i>Cloudbreak Life of Mine Surface Water Management Plan</i> (CB-PL-EN-0023) - <i>Acid and/or Metalliferous Drainage Plan</i> required by Condition 12-3 of MS 899. 	<p>It is expected that the EPA’s Management Objective for Inland Waters Environmental Quality will be achieved.</p>

Environmental Factor	EPA Management Objective (EPA 2013b)	Existing Environment	Impact Assessment	Management and Mitigation	Predicted Environmental Outcome
			<p>prevented through the manipulation of the injection regime to maintain water levels. No significant impact to water quality is expected to occur through this process.</p> <p><i>Acid Mine Drainage</i></p> <p>Acid mine drainage is not expected to occur as dewatering will not target the Roy Hill Shale member below the ore body and generally the dewatering cone of depression will not extend into the Roy Hill Shale.</p>		
Hydrological Process – Surface Water	To maintain the hydrological regimes of groundwater and surface water so that existing and potential uses, including ecosystem maintenance, are protected.	<p>Figure 30 shows the surface water features of the Proposal area.</p> <p>Surface Water Flow</p> <p>Surface water flow in and around Cloudbreak takes several different forms depending on the characteristics (e.g. slope) of the area. The two most important forms with respect to the local environment are channel flow and sheet flow.</p> <p>Rainfall from the Chichester Range flows through the Proposal area in a southerly direction towards the Fortescue Marsh. Runoff tends to form overland flow paths without defined water courses. Water courses and sheet flow areas frequently support scrub and Mulga woodlands, particularly in the low lying areas.</p> <p>Fortescue Marsh</p> <p>The Fortescue Marsh forms an extensive intermittent wetland (located on the floor of the Fortescue Valley) occupying an area around 100 km long by typically 10 km wide.</p> <p>The Fortescue Marsh has an elevation of around 400 m AHD. To the north, the Chichester Plateau rises to over 500 m AHD, whereas to the south the Hamersley Range rises to over 1,000 m AHD. Following significant rainfall events, runoff from the upper Fortescue River catchment (approximately 31,000 km²) drains to the Fortescue Marsh. For the smaller runoff events, isolated pools form on the Marshes at the main drainage inlets, whereas for the larger events the whole marsh area may flood.</p> <p>On the southern and northern flanks of the Fortescue Valley, numerous creeks discharge to the Fortescue Marsh. Rainfall runoff from the valley sides initially drains down gradient as overland flow before concentrating in defined flow channels. In this process, surface detention, vegetation, infiltration and other mechanisms absorb water from the runoff stream. In steep areas, the runoff processes are rapid with relatively low losses, and defined drainage channels are typically in close proximity. In the lower slope areas, the runoff processes are slow with relatively higher losses and greater distances between defined drainage channels.</p> <p>Yinta</p> <p>The Fortescue Marsh and some semi-permanent water pools or “yintas” along the northern shoreline have been identified as having cultural significance. The yintas are located at low points in the marsh topography and are thought to be associated with seasonal surface water flows. Each of the yintas is associated with large catchments draining the Chichester Ranges. There are two yintas that have part of their catchments within the Proposal area, Yinta 1, which receives flow from Gorman Creek, and Yinta 2 (Figure 30).</p>	<p>Potential Impacts</p> <p>Potential impacts to surface water hydrological processes as a result of the Proposal include:</p> <ul style="list-style-type: none"> - Changes to flow regimes including ponding or sheetflow shadowing through the physical presence of infrastructure - Alterations to surface flows through water courses and into Fortescue Marsh and yintas from the contingency surface release of abstracted groundwater - Surface water expressing due to mounding. <p>Impact Assessment</p> <p><i>Physical Presence of Infrastructure</i></p> <p>The physical presence of infrastructure such as pipelines may cause disruptions to channel and sheet flow surface water regimes through the diversion, ponding or capture of surface flows.</p> <p>No additional infrastructure beyond that presented in the Cloudbreak LOM PER (and approved under MS 899) is proposed in this Proposal. All pipelines associated with groundwater abstraction and injection are either buried; or raised at channel crossings and at regular intervals in sheet flow areas.</p> <p>As such, no significant impacts to surface water flows are expected to occur as a result of this Proposal.</p> <p>There are no changes to surface water ponding and shadowing effects as a result of the Proposal. The EPA Report 1429 concluded that 244 ha of indirect impacts to Mulga and 3 ha of indirect impacts to Coolibah/River Red Gum. These indirect impacts have been included in the disturbance calculations, but have not changed from the approved Project.</p> <p><i>Surface Water Discharge – Water Quantity</i></p> <p>Surface water discharge of dewatered groundwater may occur as a contingency if injection infrastructure fails. This may result in alterations to surface flows through courses and into Fortescue Marsh and yintas. If uncontrolled, this process could lead to the creation of new flow paths and erosion.</p> <p>Contingency surface water discharge was considered in the Cloudbreak LOM PER which concluded impacts could be managed by limiting discharge to up to 35 ML/day of fresh or brackish water for periods of up to 21 days under limited circumstance (Fortescue 2009).</p> <p>No change to these discharge limits is proposed in the Proposal and therefore there is not expected to be any significant impact above that presented in the Cloudbreak LOM PER.</p> <p><i>Surface Water Expression</i></p> <p>If the quantity of water being injected into an aquifer is greater than the capacity of the aquifer, the ground will become water logged and new surface waters may be created.</p> <p>By comparing predicted natural groundwater levels and predicted mounding caused by injection potential ground water expression can be identified. As can be seen in Figure 4 to Figure 25, no surface water expression is expected as a result of the Proposal, including post closure.</p>	<p>Impacts to Surface Water are managed in accordance with:</p> <ul style="list-style-type: none"> • <i>Cloudbreak Life of Mine Surface Water Management Plan</i> (CB-PL-EN-0023) • <i>Cloudbreak Life of Mine Surface Water Monitoring Plan</i> (CB-PL-EN-0024) 	<p>With the application of the <i>Cloudbreak Life of Mine Surface Water Management Plan</i> (CB-PL-EN-0023) and the <i>Cloudbreak Life of Mine Surface Water Monitoring Plan</i> (CB-PL-EN-0024) it is not expected that any direct or indirect impacts will occur as a result of change to surface water regimes as a result of the Proposal.</p> <p>As such it is expected that the EPA’s management objective for hydrological processes – surface water will be achieved.</p>

Environmental Factor	EPA Management Objective (EPA 2013b)	Existing Environment	Impact Assessment	Management and Mitigation	Predicted Environmental Outcome
Subterranean Fauna	To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.	<p>Stygofauna</p> <p>Stygofauna are any fauna that live in groundwater systems or aquifers. Results from sampling indicate a moderately rich stygofauna community of 21 species belonging to eight higher order taxonomic groups occurring in the Proposal area. Only two species appear to be restricted to the vicinity of the Proposal area; the copepods <i>Parapseudoleptomesochra sp.</i> and <i>Goniocyclops sp.</i> (Bennelongia 2011).</p> <p>Troglofauna</p> <p>There has been no sampling of troglofauna in the vicinity of the Proposal area. However, two species, the isopods <i>Philosciidae sp.</i> and <i>Troglarmadillo sp.</i>, have been collected just south the maximum mine disturbance area as by-catch during stygofauna sampling. The occurrence of troglofauna elsewhere in the Chichester Range, the collection of some troglofauna around the Proposal area while stygofauna sampling, and the presence of prospective lithologies at Cloudbreak Mine suggest that a modest troglofauna community is likely to be present within the Proposal area (Bennelongia 2011).</p>	<p>Potential Impacts</p> <p>Potential impacts to subterranean fauna include:</p> <ul style="list-style-type: none"> - Impact resulting from drawdown of the water table - Impacts resulting from the injection of saline water. <p>Impact Assessment</p> <p><i>Drawdown and Mounding</i></p> <p>Stygofauna may be affected by groundwater abstraction and groundwater injection. If drawdown occurs through the full thickness of the aquifer, any stygofauna species restricted to the drawdown area will be affected. The two stygofauna species <i>Parapseudoleptomesochra sp.</i> and <i>Goniocyclops sp.</i> are located outside of the Mine Area and <i>Goniocyclops sp.</i> is also located outside of the Project Area. As can be seen from Figure 4 to Figure 25, the areas where <i>Parapseudoleptomesochra sp.</i> and <i>Goniocyclops sp.</i> are found will not experience drawdown greater than one metre.</p> <p>The two stygofauna species <i>Parapseudoleptomesochra sp.</i> and <i>Goniocyclops sp.</i> are not located in areas of mounding or drawdown for two or more consecutive years outside of the Mine Area, including post closure (Figure 33). The Proposal is therefore unlikely to cause significant impact through groundwater drawdown or mounding.</p> <p><i>Abstraction and Injection of Groundwater</i></p> <p>As discussed above (inland waters environmental quality) there is not expected to be any significant impact to groundwater salinity in shallow water table aquifers fringing the Fortescue Marsh as a result of the Proposal.</p>	Potential impacts to subterranean fauna will be managed via the <i>Cloudbreak Groundwater Operating Strategy</i> .	It is expected that the EPA's Management Objective for Subterranean Fauna will be achieved.
Landforms	To maintain the variety, integrity, ecological functions and environmental values of landforms and soils.	Please refer to the Cloudbreak LOM PER for details on the existing landforms and soils in the Project area. This Proposal is highly unlikely to have any adverse effect on landforms or soils in the area and as such, this factor is not considered further in the document.			
Terrestrial Environmental Quality	To maintain the quality of land and soils so that the environment values, both ecological and social, are protected.	Please refer to the Cloudbreak LOM PER for details the quality of land and soils in the Project area. This Proposal is highly unlikely to have any adverse effect on the quality of land or soils in the area and as such, this factor is not considered further in the document.			

7. MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

7.1 Legislative Background

Matters of National Environmental Significant (MNES), including nationally and internationally important flora, fauna, ecological communities and heritage places are afforded protection under the Commonwealth EPBC Act. Under this Act, any action which is likely to have a significant impact on a MNES is required to be referred to the DoE for assessment as to whether the action constitutes a “controlled action”. If the action is deemed a “controlled action” implementation will consequently be subject to an approval from the Federal Minister for the Environment.

These changes were outside of the scope of the approval granted under EPBC 2010/5696 and the impact assessment undertaken outlined no significant impacts to a MNES.

MNES include:

- Listed threatened species and ecological communities
- Listed migratory species
- RAMSAR Wetlands on International Importance
- The Commonwealth marine environment
- World heritage properties
- National heritage places
- Nuclear actions
- Great Barrier Reef Marine Park
- A water resource, in relation to coal seam gas development and large coal mining development.

7.2 Impact Assessment – Matters of National Environmental Significance

An assessment of the predicted impacts on MNES is presented in Table 11. This assessment is made against the significance criteria as outlined in the *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* (DoE, 2013).

The summary of MNES presented in Table 11 is based on previous and ongoing flora and fauna surveys (refer to Section 0), previous database and literature searches undertaken as part of the various environmental impact assessments undertaken for the Cloudbreak and Christmas Creek mines, an updated Protected Matters Search undertaken on 14 October 2013 and findings from a recent study (Woolley 2005) confirming that the Brush-tailed Mulgara (*Dasyercus blythi*) and Crest-tailed Mulgara (*Dasyercus cristicauda*) are two distinct species

and the Crest-tailed Mulgara (*Dasycerus cristicauda*) no longer known to be distributed near the Proposal Area.

A desktop study undertaken by Ecologia (2010a) summarises all the survey data and information available within the vicinity of Fortescue's projects in the Chichester area. This includes the results of numerous Level 1 and Level 2 surveys within 50km of Cloudbreak. Unless indicated otherwise, the descriptions of the likelihood of species occurring are adapted from Ecologia (2010a).

Based on the impact assessment presented in Table 11, it is considered unlikely that the action will result in any significant impacts to MNES or result in any changes to the level of impact to MNES approved in the existing controlled action (EPBC 2010/5696). These changes were outside of the scope of the approval granted under EPBC 2010/5696 and the impact assessment undertaken outlined no significant impacts to MNES, and as such Fortescue is not referring this action to the DoE.

Table 11: Impact Assessment – Matters of National Environmental Significance

Matter of National Environmental Significance	Significance Criteria	Existing Environment	Impact Assessment	Management and Mitigation	Significance of Impact
Listed Threatened Species and Ecological Communities	<p>An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:</p> <ul style="list-style-type: none"> - reduce the extent of an ecological community - fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines - adversely affect habitat critical to the survival of an ecological community - modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns - cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting - cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: <ul style="list-style-type: none"> o assisting invasive species, that are harmful to the listed ecological community, to become established o causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community o interfere with the recovery of an ecological community. 	<p>No endangered ecological communities are present in or adjacent to the Proposal area.</p> <p>Six threatened fauna species listed under the EPBC Act may be present in the Proposal area:</p> <p>Night Parrot (<i>Pezoporus occidentalis</i>) – Endangered</p> <p>Recorded from Minga Well (>2.5 km from nearest mine pit) and possible, but not previously recorded in the Samphire and Spinifex country of the Fortescue Marsh. Extensive surveys undertaken since the initial recording of the Night Parrot in 2005 have failed to identify any further Night Parrots in the Proposal area.</p> <p>Northern Quoll (<i>Dasyurus hallucatus</i>) – Endangered</p> <p>Previously recorded near the Proposal area in 1980. There is only a limited area of rocky breakaways that may provide a small amount of suitable habitat.</p> <p>Greater Bilby (<i>Macrotis lagotis</i>) – Vulnerable</p> <p>Records of active burrows within the Proposal area (Bamford 2005a). Areas of suitable habitat present along the Fortescue Marsh and in Mulga Woodland.</p> <p>Orange Leaf-nosed Bat (<i>Rhinonictis aurantius</i>) – Vulnerable</p> <p>Recorded at Thieves Well. No suitable roosting habitat but may forage within the Proposal area.</p> <p>Pilbara Olive Python (<i>Liasis olivaceus barroni</i>) – Vulnerable</p> <p>May be present within the rocky areas in the north of the Proposal area.</p> <p>A recent study (Woolley 2005) has accepted that the Brush-tailed Mulgara (<i>Dasyercus blythi</i>) and Crest-tailed Mulgara (<i>Dasyercus cristicauda</i>) are two distinct species and the Crest-tailed Mulgara (<i>Dasyercus cristicauda</i>) no longer known to be distributed near the Proposal Area. The Brush-tailed Mulgara (<i>Dasyercus blythi</i>) is known to occur near the Project Area, however this species is not listed under the EPBC Act.</p>	<p>Potential Impacts</p> <p>Potential impacts to threatened fauna from the action include:</p> <ul style="list-style-type: none"> - Impacts from the loss of habitat (either direct or indirect loss) - Fauna entrapment - Fauna death or mortality via interaction with site vehicles. <p>Impact Assessment</p> <p><i>Loss of Habitat – Clearing</i></p> <p>All clearing will be undertaken under existing approvals and in line with existing operational procedures. No additional impacts to threatened fauna as a result of vegetation clearing are expected as a result of the action.</p> <p><i>Loss of Habitat – Indirect</i></p> <p>The predicted areas of direct and indirect impact are located in the Mulga and other Acacia Woodland habitat (6036.5 ha) followed by the Spinifex Covered Hills and Ranges (985 ha).</p> <p>A total of 91% of all expected indirect impact is within the Mulga and other Acacia Woodland habitat (341.5 ha).</p> <p>A reduction of 6.3% of Mulga and other Acacia Woodland habitat is expected as a result of the Proposal, compared with the numbers presented in the EPA Report 1429. The disturbance areas in the EPA Report 1429 are based on habitat loss in any one year whereas the area of disturbance for the Proposal has been calculated based on 2 or more consecutive years of mounding and drawdown indirect impact outside of the Mine Area, including post closure. The percent of expected indirect impact to all habitat types are significantly lower than presented in the EPA Report 1429.</p> <p>There is not expected to be any significant increase in impacts to Fortescue Marsh, yintas or creeklines as a result of the action.</p> <p>Given the lack of predicted impacts and the large regional representation of the key vegetation types, there is not predicted to be any significant impact to threatened fauna as a result of indirect impacts to fauna habitat as a result of the action.</p> <p><i>Fauna Entrapment</i></p> <p>The ponds associated with the dewatering and injection infrastructure may attract fauna in times of drought. This could result in fauna becoming trapped and/or drowning within the ponds. There is also potential of fauna entrapment and/or drowning in the trenches associated with pipeline installation.</p> <p>There is not expected to be a significant increase in the number or size of ponds associated with dewatering or the length of trenching required as part of the action. Potential entrapment of fauna can be managed via established procedures. There is not expected to be any significant impact to fauna as a result of entrapment.</p> <p><i>Vehicle Movements during Construction and Operations</i></p> <p>The action is not expected to lead to any increase in the number, type or timing of vehicle movements and as such, is not expected to result in any additional risk of fauna injury or mortality due to vehicle movements.</p> <p>Impact Assessment – Threatened Species</p> <p><i>Night Parrot – Endangered</i></p> <p>The only confirmed sighting of Night Parrot was at Minga Well (Mulga habitat) although the habitat of the Night Parrot is thought to, but not confirmed to consist of <i>Triodia</i> grasslands in stony or sandy environments and of Samphire and chenopod shrublands on floodplains and clay pans, and on the margins of salt</p>	<p>The predicted indirect impacts to vegetation are based on unmitigated controls and do not include the adaptive management strategy, such as the redistribution of water. The hectares of disturbance are therefore considered overestimations and unlikely to be exceeded.</p> <p>Fortescue approach to the management of indirect impacts to vegetation as a result of abstraction and injection is based on responding to information provided through the implementation of a monitoring program and response plan. If monitoring indicates that unexpected and significant impacts are likely, Fortescue, in consultation with the regulatory agencies, will implement an appropriate contingency action.</p> <p>The <i>Fortescue Marsh Hydrology and Vegetation Monitoring and Management Plan</i> is required to meet Condition 7 of EPBC 2010/5696. This plan outlines monitoring and management requirements for the Fortescue Marsh with the aim to protect suitable habitat for MNES.</p> <p>Ground Disturbance Permit</p> <p>A procedure of internal review and approval of all proposed vegetation clearing and ground disturbance activities is required prior to the commencement of works (a Ground Disturbance Permit). Under the permitting process areas of vegetation which may comprise high value may require ground-truthing surveys to assess its value.</p> <p>Species Specific Management Plans</p> <p>The following species specific management plans will continue to be implemented at Cloudbreak:</p> <ul style="list-style-type: none"> - Night Parrot (<i>Pezoporus occidentalis</i>) Management Plan - Bilby (<i>Macrotis lagotis</i>) Management Plan 	<p>Based on the predicted impacts to threatened fauna species and the relevant significance criteria it is considered that it is unlikely that the proposed action will have a significant impact on a critically endangered or endangered ecological community.</p>

Matter of National Environmental Significance	Significance Criteria	Existing Environment	Impact Assessment	Management and Mitigation	Significance of Impact
			<p>lakes, creeks or other sources of water (DSEWPC 2010a).</p> <p>It should also be noted that extensive Night Parrot surveys undertaken annually have failed to identify any Night Parrots in the Proposal area since mining commenced.</p> <p>The habitat of the Night Parrot consists of Triodia grasslands in stony or sandy environments and of Samphire and chenopod shrublands on floodplains and clay pans, and on the margins of salt lakes, creeks or other sources of water (SEWPAC 2010b). The Proposal predicts a reduction of 734.5 ha of Low halophytic shrubland (Samphire) and 3.7 ha of Hummock Grassland (spinifex) compared to the disturbance approved EPBC 2010/5696.</p> <p>Due to the lack of recent confirmed Nigh Parrot sightings, the nomadic nature and the large home ranges of the Night Parrot; and the extensive areas of similar habitat surrounding the Proposal area, no impacts to the Night Parrot are expected to occur as a result of this action.</p> <p><i>Northern Quoll - Endangered</i></p> <p>The rocky habitat preferred by the Northern Quoll will not be affected by the action and as such no impacts to this species are expected.</p> <p><i>Greater Bilby - Vulnerable</i></p> <p>The spinifex dominated vegetation types preferred by the Greater Bilby will not be affected by the action and as such no impacts to this species are expected.</p> <p><i>Orange Leaf-nosed Bat – Vulnerable</i></p> <p>No roosting habitat will be affected by the action and as such no impact to this species is expected to occur as a result of the action.</p> <p><i>Pilbara Olive Python – Vulnerable</i></p> <p>The rocky habitat preferred by the Pilbara Olive Python will not be affected by the action and as such no impacts to this species are expected.</p> <p>Refer to Table 9, Terrestrial Fauna for impact areas.</p>		
Listed Migratory Species	<p>An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:</p> <ul style="list-style-type: none"> - substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species - result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species. 	<p>Eight Listed Migratory Species may potentially be present in the area:</p> <p>Fork-tailed Swift (<i>Apus pacificus</i>)</p> <p>Will occasionally overfly Proposal area, but will not utilise it directly.</p> <p>White-bellied Sea-eagle (<i>Haliaeetus leucogaster</i>)</p> <p>Recorded at Fortescue Marsh. Uncommon in area, although suitable habitat present along the marsh where water present. Unlikely to be suitable habitat within the Proposal area.</p> <p>Rainbow bee-eater (<i>Merops ornatus</i>)</p> <p>Recorded within Proposal area. Suitable habitat for hunting and breeding.</p> <p>Great Egret (<i>Ardea alba</i>)</p> <p>Suitable hunting habitat when surface water present in Fortescue Marsh and some potential habitat along creek lines within Proposal area.</p> <p>Cattle Egret (<i>Ardea ibis</i>)</p> <p>Occasionally occur in terrestrial wetlands. Has not been recorded in the Proposal area.</p>	<p>Please refer to the assessment of potential impacts from loss of habitat, fauna entrapment and vehicle movements above. There are no additional potential impacts to migratory species than presented for threatened species above.</p> <p>Migratory species primarily utilise terrestrial wetlands (such as Fortescue Marsh) or water course / creek and drainage lines. There is not expected to be any significant impacts to these features or important vegetation that may subsequently impacts on migratory species.</p>	Please refer to management and mitigation described for threatened fauna species above.	Based on the predicted impacts and the relevant significance criteria it is considered that it is unlikely that the proposed action will have a significant impact on a migratory species.

Matter of National Environmental Significance	Significance Criteria	Existing Environment	Impact Assessment	Management and Mitigation	Significance of Impact
		<p>Wood Sandpiper (<i>Tringa glareola</i>) Recorded at Fortescue Marsh. Suitable habitat present in marsh especially after rain. Some potential habitat along creek lines within the Proposal area.</p> <p>Common Greenshank (<i>Tringa nebularia</i>) Recorded at Fortescue Marsh. Suitable habitat present in marsh especially after rain. Some potential habitat along creek lines within the Proposal area.</p> <p>Red-necked Stint (<i>Calidris ruficollis</i>) Few records, but suitable habitat present in marsh especially after rain. Some potential habitat along creek lines within the Proposal area.</p>			
RAMSAR Wetlands of International Importance	Previous studies and the protected matter search undertaken on 14 October 2013 identified no wetlands listed under the RAMSAR Convention located in the vicinity of the Proposal area. While Fortescue Marsh has been identified as national important wetland and a potential future Ramsar wetland, there is currently no formal nomination at this stage (DEC 2009). As such this MNES is not considered further in this report.				
The Commonwealth marine environment	The proposed action is not in the vicinity of the Commonwealth Marine Environment and as such this MNES is not considered further in this report.				
World heritage properties	Previous studies and the protected matter search undertaken on 14 October 2013 identified no World Heritage properties in the vicinity of the Proposal area. As such this MNES is not considered further in this report.				
National heritage places	Previous studies and the protected matter search undertaken on 14 October 2013 identified no National Heritage Places in the vicinity of the Proposal area. As such this MNES is not considered further in this report.				
Nuclear actions	The proposed action is not a Nuclear Action and as such this MNES is not considered further in this report.				
Great Barrier Reef Marine Park	The proposed action is not in the vicinity of the Great Barrier Reef Marine park and as such this MNES is not considered further in this report.				
A water resource, in relation to coal seam gas development and large coal mining development	The proposed action is not in relation to a coal seam gas development or large coal mining development and as such this MNES is not considered further in this report.				

REFERENCES

ATA Environmental (ATA) 2006a, Fauna Assessment Extension to the Cloud Break Mining Pit, August 2006.

ATA Environmental (ATA) 2006b, Fauna Assessment Cloudbreak Airstrip, Camp and Access Road, September 2006.

Bamford Consulting Ecologists (Bamford) 2005a, Fauna survey of proposed Iron Ore Mine, Cloud Break, Prepared for Fortescue Metals Group Ltd, June 2005.

Bamford Consulting Ecologists (Bamford) 2005b, Survey for the Night Parrot *Pezoporus occidentalis* in the Cloud Break Project Area, May 2005, Fortescue Metals Group, Prepared for Fortescue Metals Group, Perth.

Bamford Consulting Ecologists (Bamford) 2006, Survey for the Night Parrot *Pezoporus occidentalis* in the Cloud Break Project Area, March 2006, Fortescue Metals Group, Prepared for Fortescue Metals Group, June 2006.

Bamford Consulting Ecologists (Bamford) 2007a, Night Parrot survey November-December 2006 at FMG's Cloudbreak site, Prepared for Fortescue Metals Group, Perth.

Bamford Consulting Ecologists (Bamford) 2007b, Survey of the Night Parrot *Pezoporus occidentalis* in the Cloud Break Project Area, November 2007, Fortescue Metals Group. Prepared for Fortescue Metals Group, Perth.

Bamford Consulting Ecologists (Bamford) 2009, Report on September 2008 search for the Night Parrot, A Fortescue Metals Group Project, Prepared for Fortescue Metals Group, January 2009.

Bamford Consulting Ecologists (Bamford) 2010a, Report on September 2009 search for the Night Parrot, A Fortescue Metals Group Project, Prepared for Fortescue Metals Group, July 2010.

Bamford Consulting Ecologists (Bamford) 2010b, Fortescue Metals Group Targeted Fauna Assessment of the Railway Duplication, Prepared for Fortescue Metals Group, Perth.

Bamford Consulting Ecologists (Bamford) 2011, Report on 2010 search for the Night Parrot, A Fortescue Metals Group Project, Prepared for Fortescue Metals Group, January 2011.

Beard J.S. 1975, Pilbara Explanatory Notes and Map Sheet 5, 1:1,000,000 series. Vegetation Survey of Western Australia, University of Western Australia Press, Nedlands, Western Australia.

Bennelongia Environmental Consultants (Bennelongia) 2011, Cloudbreak Project Expansion Subterranean Fauna Assessment, Prepared for Fortescue Metals Group by Bennelongia Pty Ltd, March 2011.

Biota Environmental Sciences (Biota) 2004, Fortescue Metals Group Stage B Rail Corridor, Christmas Creek, Mt Lewin, Mt Nicholas and Mindy Mindy Mine Areas: Vegetation and Flora Survey, Prepared for Fortescue Metals Group Ltd, December 2004.

Biota Environmental Sciences (Biota) 2005, Fauna habitats and fauna assemblages of proposed the FMG Stage B rail corridor and Mindy Mindy, Christmas Creek, Mt Lewin and Mt Nicholas mine areas, Prepared for Fortescue Metals Group, Perth, January 2005.

Department of Environment and Conservation (DEC) 2009, Resource Condition Report for Significant Western Australian Wetland: Fortescue Marsh, Department of Environment and Conservation. Perth, Australia.

Department of Environment and Conservation (DEC) 2010, Threatened and Priority Ecological Community Database Search, Department of Environment and Conservation, Perth, Western Australia.

Department of Environment and Conservation (DEC) 2013, Threatened and Priority Ecological Community Database Search, Department of Environment and Conservation, Perth, Western Australia.

Department of Sustainability, Environment, Water, Population and Communities (SEWPAC) 2010A, Directory of Important Wetlands in Australia - Information sheet Fortescue Marshes – WA066 [Online], Available from: <<http://www.environment.gov.au/cgi-bin/wetlands/report.pl>> [13 October 2010].

Department of Sustainability, Environment, Water, Population and Communities (SEWPAC) 2010A, *Pezoporus occidentalis* – Night Parrot [Online], Available from: www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=59350 [22 June 2010]

Department of Water (DoW) 2009, Pilbara water in mining guidelines: Looking after our water needs, Water Resource Allocation Planning Series. Perth, Western Australia: Government of Western Australia.

Department of Water (DoW), 2011, Operational Policy 1.01 – Managed aquifer recharge in Western Australia, 2011, DoW, Perth, Western Australia.

Ecologia 2010a, Cloudbreak Terrestrial Vertebrate Fauna Desktop Assessment, Prepared for Fortescue Metals Group, September 2010.

Ecologia 2010b, Cloudbreak Short-Range Endemic Desktop Assessment, Prepared for Fortescue Metals Group, October 2010.

Ecologia 2011a, Cloudbreak Level 2 Terrestrial Vertebrate Fauna Assessment, Prepared for Fortescue Metals Group, February 2011.

Ecologia 2011b, Cloudbreak Short-Range Endemic Invertebrate Survey, Prepared for Fortescue Metals Group, February 2011.

Ecoscape 2009, Flora and Vegetation Impact Assessment for Dewatering at Fortescue Cloudbreak Mine, Unpublished report prepared for Fortescue Metals Group, June 2009.

ENV Australia (ENV) 2011, Cloudbreak Flora and Vegetation Assessment, Prepared for Fortescue Metals Group Ltd, February 2011.

Environment Australia 2001, A Directory of Important Wetlands in Australia, Third Edition, Environment Australia, Canberra, Australian Capital Territory.

Environmental Protection Authority (EPA) 2002, Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection, EPA, Perth, Western Australia.

Environmental Protection Authority (EPA) 2004, Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia, Guidance Statement No 51, EPA, Perth, Western Australia.

Environmental Protection Authority (EPA) 2010, Marandoo Mine Phase 2, Hamersley Iron Pty Ltd, Report and Recommendations of the Environmental Protection Authority, Report 1355, EPA, Perth, Western Australia, April 2010.

Environmental Protection Authority (EPA) 2012, Environmental Impact Assessment Administrative Procedures 2012, EPA, Perth, Western Australia.

Environmental Protection Authority (EPA) 2006, EPA Position Statement 9 *Environmental Offsets*, EPA, Perth, Western Australia.

Environmental Protection Authority (EPA) 2012a, *Draft Environmental Assessment Guideline – Environmental Offsets*, EPA, Perth, Western Australia.

Environmental Protection Authority (EPA) 2013a, Environmental Assessment Guideline for Application of a significance framework in the environmental impact assessment process – focussing on Key Environmental Factors, 2013, EPA, Perth, Western Australia.

Environmental Protection Authority (EPA) 2013b, Environmental Assessment Guideline for Environmental factors and objectives, 2013, EPA, Perth, Western Australia.

Fisher A., Hunt L., James C., Landsberg J., Phelps D., Smyth, A. and Watson, I. 2004, 'Review of Total Grazing Pressure Management and Issues in Biodiversity Conservation in Rangelands' in A resource to aid NRM planning, Desert Knowledge CRC Project Report No. 3 (August 2004);

Desert Knowledge CRC and Tropical Savannas Management CRC, Alice Springs.

Fortescue Metals Group (Fortescue) 2010, Hydrogeological Assessment for Cloudbreak Water Management Scheme, Document No. CB-RP-HY-0019, Perth, Western Australia.

Fortescue Metals Group (Fortescue) 2011, Cloudbreak Life of Mine Public Environmental Review, April 2011.

Fortescue Metals Group (Fortescue) 2013a, Hydrogeological Assessment for the Cloudbreak Water Management Scheme. November 2013 Ref. CB-RP_HY-0019

Fortescue Metals Group (Fortescue) 2013b, Cloudbreak Groundwater Operating Strategy – Water Management, Unpublished Report, Ref. CB-PH-HY-0009, June 2013.

Fortescue Metals Group (Fortescue) 2013c, Modelling Analysis of the Impact of Mine Dewatering on Soil Water Availability to the Samphire Vegetation on the Fringe of Fortescue Marsh, unpublished report prepared for Fortescue Metals Group, Perth, Western Australia 2013.

Fortescue Metals Group (Fortescue) 2013, Cloudbreak Life of Mine Surface Water Management Plan (CB-PL-EN-0023). Fortescue Metals Group, Perth

Fortescue Metals Group (Fortescue) Cloudbreak Life of Mine Surface Water Monitoring Plan (CB-PL-EN-0024). Fortescue Metals Group, Perth

Johnson R. and Burrows W. 1994, 'Acacia open forests, woodlands and shrublands' pp. 257-290 in Groves, RH (Ed), Australian Vegetation 2nd ed. Cambridge University Press, Cambridge.

Mattiske Consulting Pty Ltd (Mattiske) 2005a, Flora and Vegetation on the Cloudbreak and White Knight Leases, Prepared for Fortescue Metals Group Ltd, June 2005.

Mattiske Consulting Pty Ltd (Mattiske) 2005b, Review of Vegetation Condition on the Cloudbreak Lease Area, Prepared for Fortescue Metals Group Ltd, June 2005.

Mattiske Consulting Pty Ltd (Mattiske) 2007, Flora and vegetation near Fortescue Marshes, unpublished report for Fortescue Metals Group, June 2007.

Trudgen M.E. 1991, 'Vegetation Condition Scale' in National Trust (WA) 1993, Urban Bushland Policy. National Trust of Australia (WA), Wildflower Society of Western Australia (Inc.) and the Tree Society (Inc.), Perth, Western Australia.

Woolley, P 2005. The species of *Dasyercus* Peters, 1875 (Marsupialia: Dasyuridae). *Memoirs of Museum Victoria*. 62(2):213-221.

Worley Parsons 2011, Cloudbreak Life of Mine Expansion Surface Water Investigation and Impact Assessment, Unpublished Report for Fortescue Metals Group, March 2011, Perth, Western Australia.

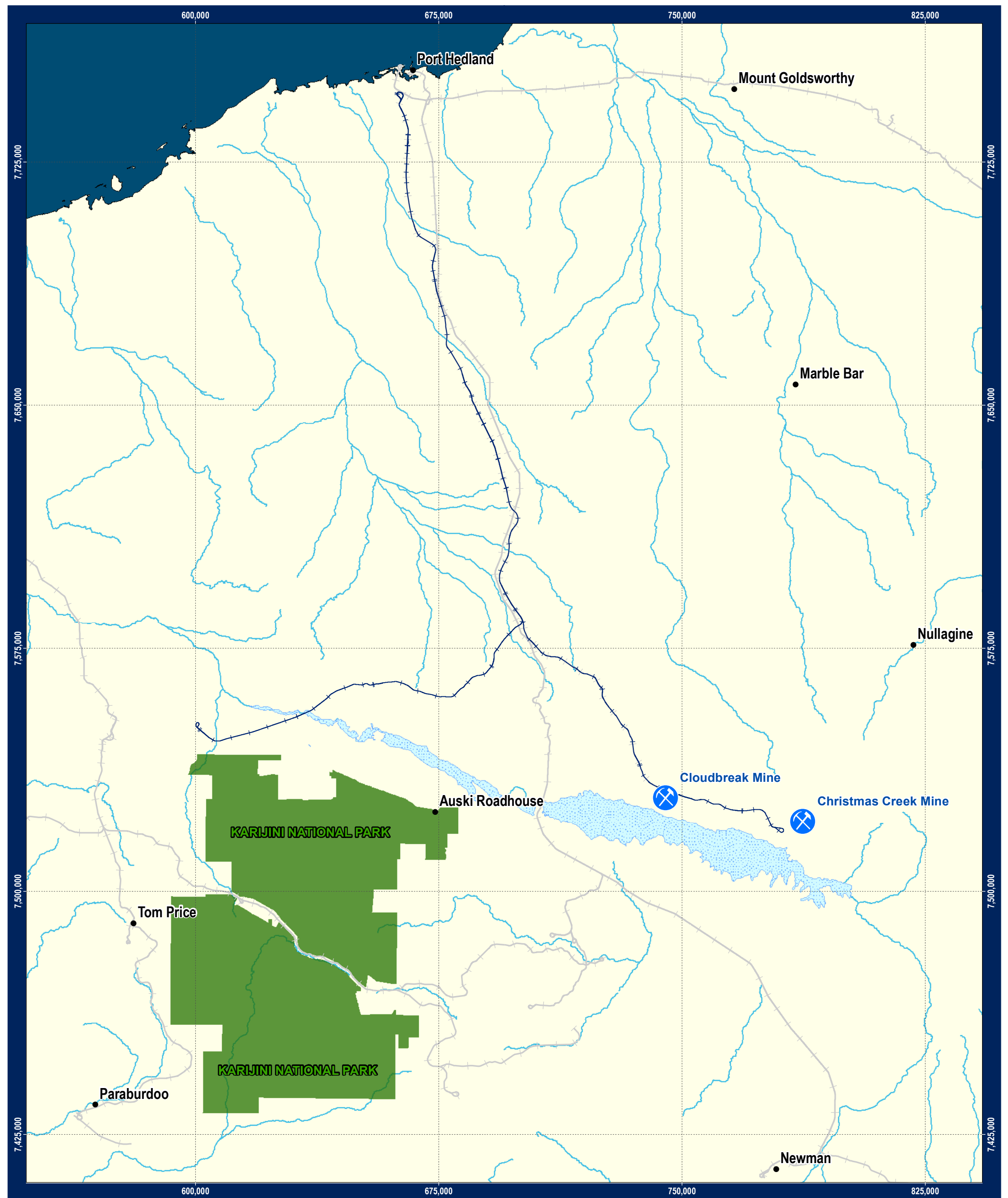
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Figure 1: Location of Cloudbreak

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- Towns
- ⊗ FMG Mines
- Rail
- Drainage
- Reserves
- ▨ Fortescue Marsh

Data Source(s):
 Marsh Data sourced from Enviro Australia (2001)
 Directory of important Wetlands in Australia

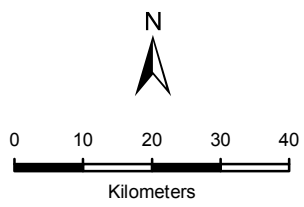


Figure 1
 Location of Cloudbreak

Requested By: Fiona Rowland	Date: 29/11/2013
Drawn By: C Whyte	Size: A3P
Revised By: admoore	Revision: 0
Approved By:	Confidentiality: 1
Scale: 1:1,100,000	
Coordinate System: GDA 1994 MGA Zone 50	
Document Name: CB_MP_EN_0279.001	

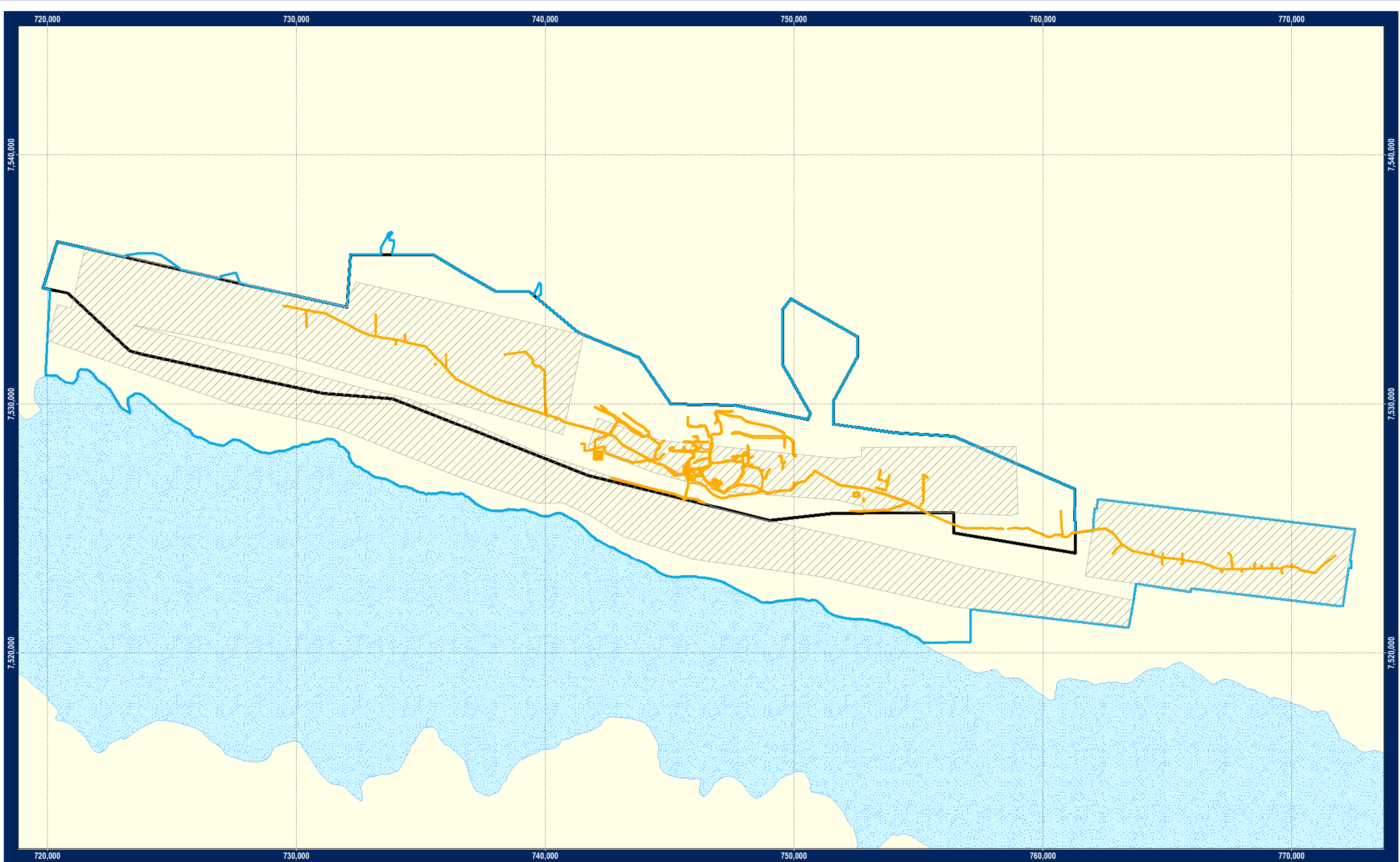
FMG accepts no liability and gives no representation or warranty, express or implied, as to the information provided including its accuracy, completeness, merchantability or fitness for purpose.







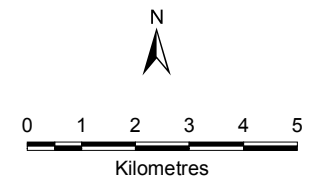
Figure 2: Indicative Injection Areas

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-  Indicative Infrastructure
-  Maximum Mine Disturbance (MS899 - CB Mine Area)
-  Previous Proposal Area (MS899 - CB Project Area)
-  Injection Areas




Requested By: Fiona Rowland
 Drawn By: C Whyte
 Revised By: admooore
 Approved By:
 Scale: 1:140,000
 Coordinate System: GDA 1994 MGA Zone 50
 Document Name: CB_MP_EN_0279.002

Date: 12/12/2013
 Size: A3L
 Revision: 0
 Confidentiality: 1

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Figure 2
Indicative Injection Areas



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The New Force in Iron Ore

Figure 3: Conceptual Hydrogeological Model

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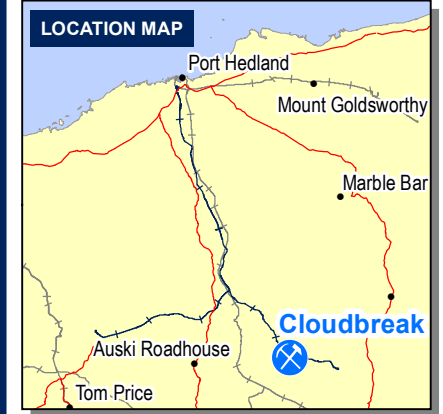
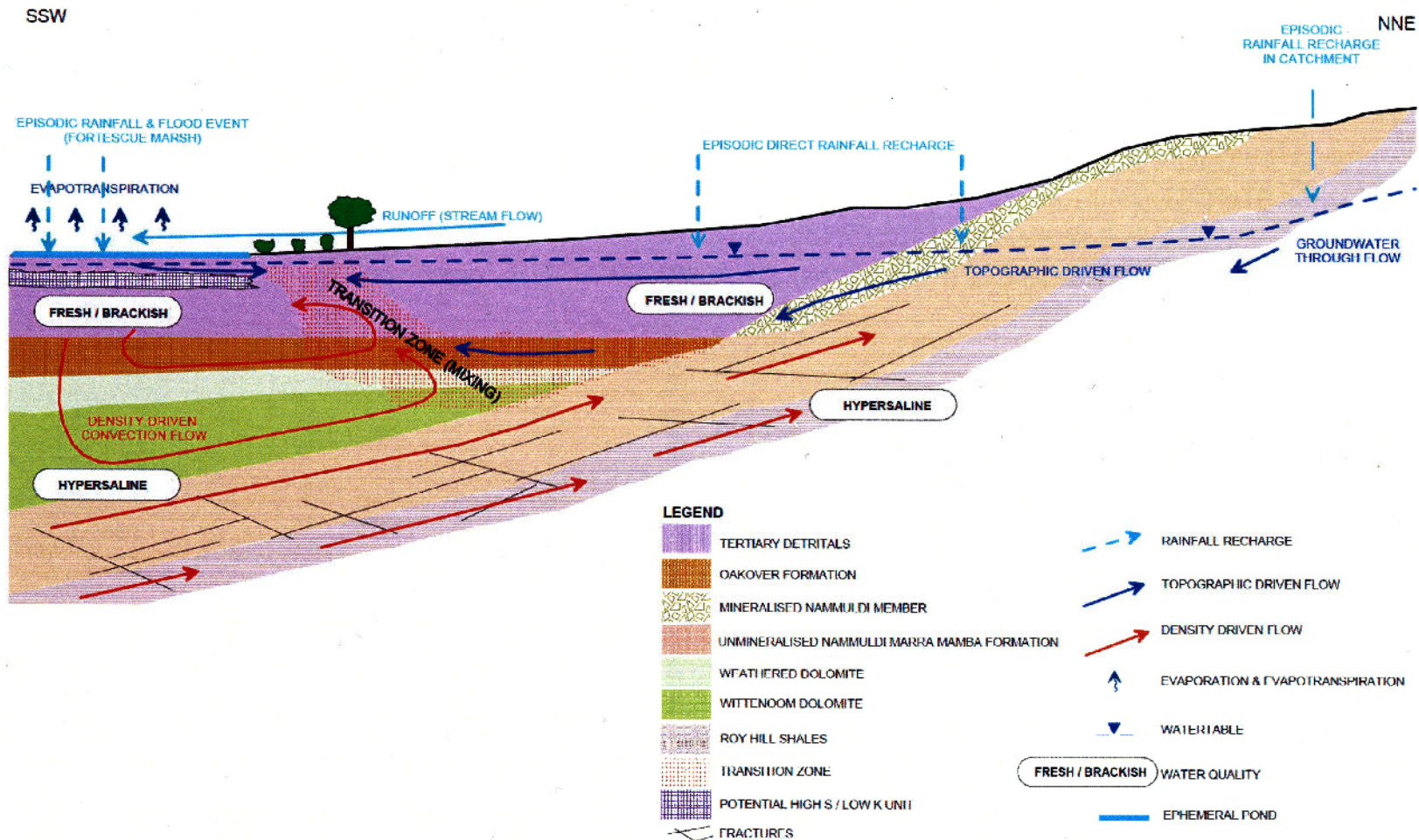


FIGURE 3
 Conceptual Hydrogeology Of
 The Cloudbreak Area

Requested By: A. De Vos	Date: 29/11/2013
Drawn By: PM	Size: A4L
Revised By: admoore	Revision: 0
Approved By:	Confidentiality: 1
Scale: N/A	
Coordinate System: N/A	
Document Name: CB_MP_EN_0279.003	

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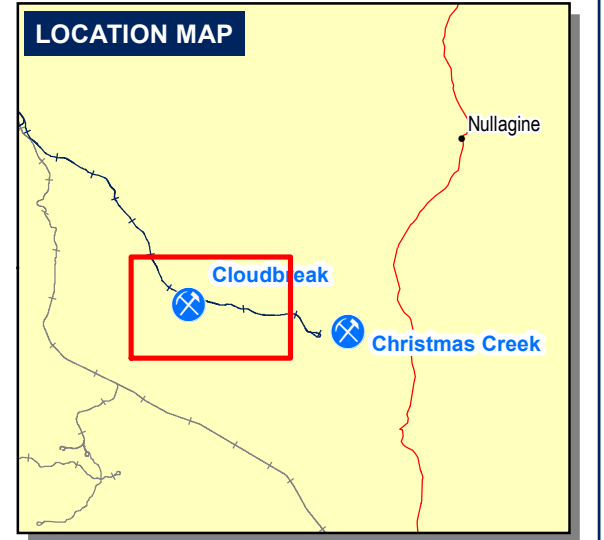
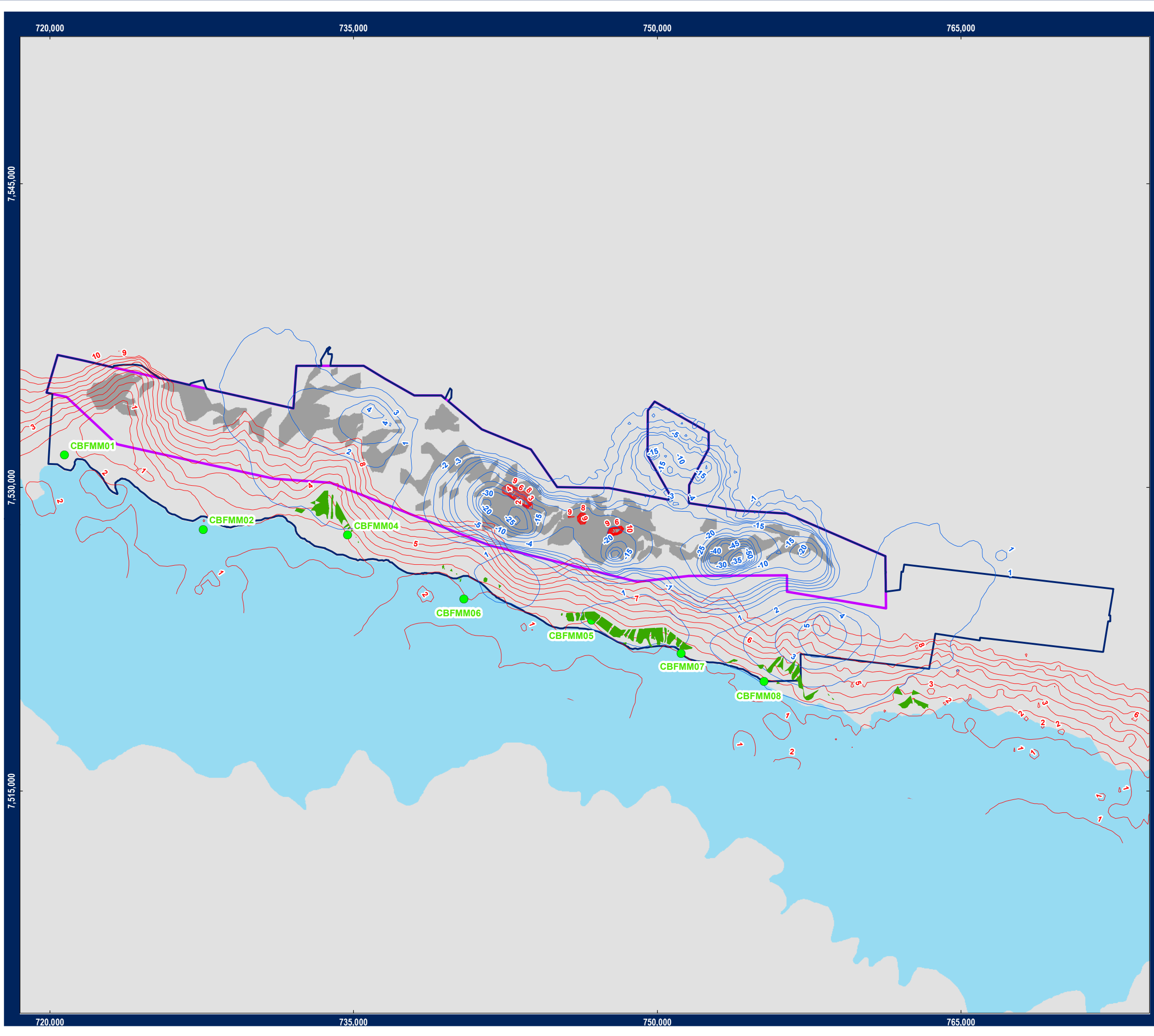
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Figure 4: Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – 2014

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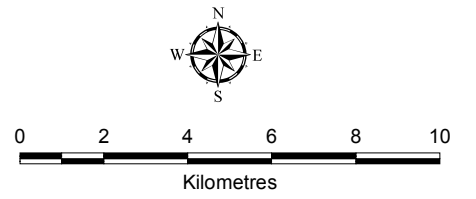




LEGEND

- MS 899 bores
- Change in watertable due to mining
- Depth to watertable (Natural) baseline_mbgf
- CB Mine Area - MS899
- CB Project Area - MS899
- Fortescue Marsh boundary
- Impacts to Mulga - Mounding within 2m of the ground surface where the natural groundwater was below 2mbgl.

Data Source(s):
 Marsh data sourced from Enviro Australia,(2001).
 Directory of Important Wetlands in Australia
 Observation wells,mine plan data sourced from FMG (2013)



2014

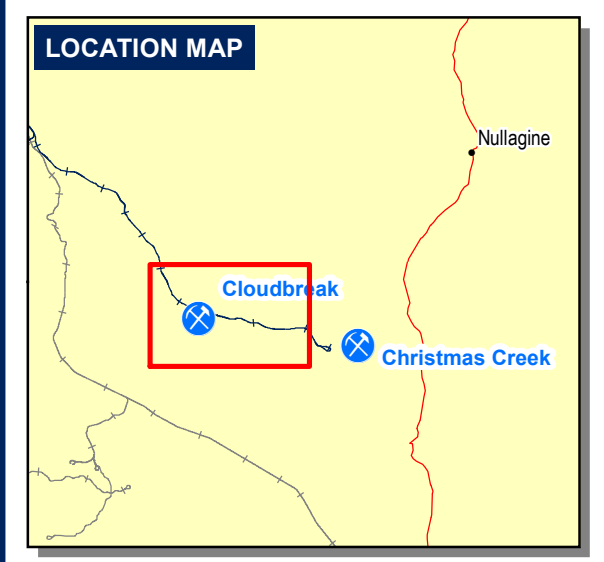
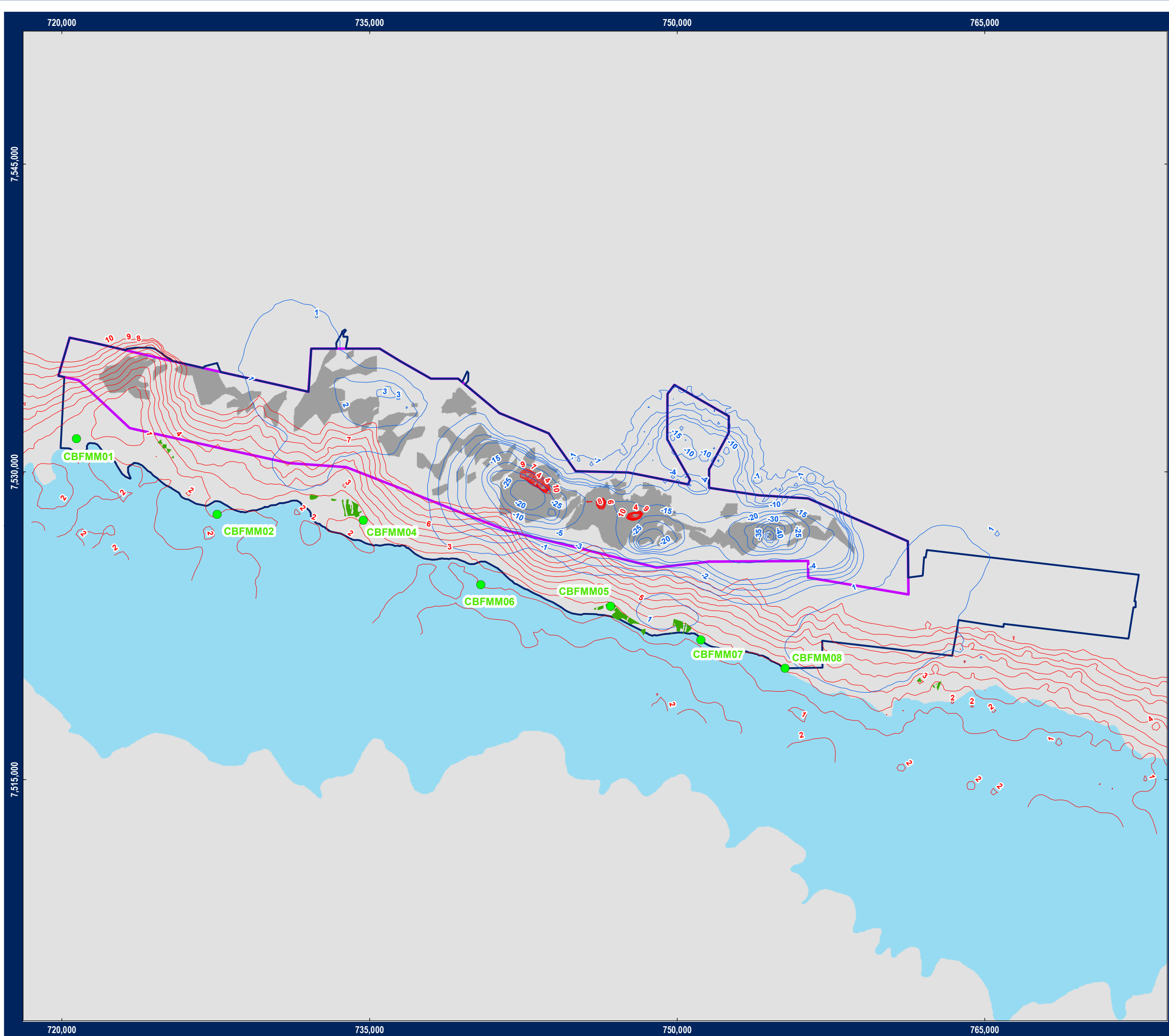
Requested By: Fiona Rowland	Date: 16/09/2014
Drawn By: A.Moore	Size: A3L
Revised By: admooore	Revision: 1
Approved By:	Confidentiality: 1
Scale: 1:180,000	
Coordinate System: GDA 1994 MGA Zone 50	
Document Name: CB_MP_HY_0073.001_r1_2014	

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Figure 5: Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – 2015

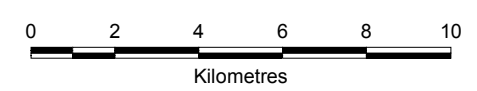
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- LEGEND**
- MS 899 bores
 - Change in watertable due to mining
 - Depth to watertable (Natural) baseline_mbgf
 - CB Mine Area - MS899
 - CB Project Area - MS899
 - Mine Plan
 - Fortescue Marsh boundary
 - Impacts to Mulga – Mounding within 2m of the ground surface where the natural groundwater was below 2mbgl.

Data Source(s):
 Marsh data sourced from Enviro Australia,(2001).
 Directory of Important Wetlands in Australia
 Observation wells,mine plan data sourced from FMG (2013)



2015

Requested By: Fiona Rowland	Date: 16/09/2014
Drawn By: A.Moore	Size: A3L
Revised By: admooore	Revision: 1
Approved By:	Confidentiality: 1
Scale: 1:180,000	
Coordinate System: GDA 1994 MGA Zone 50	
Document Name: CB_MP_HY_0073.002_r1_2015	

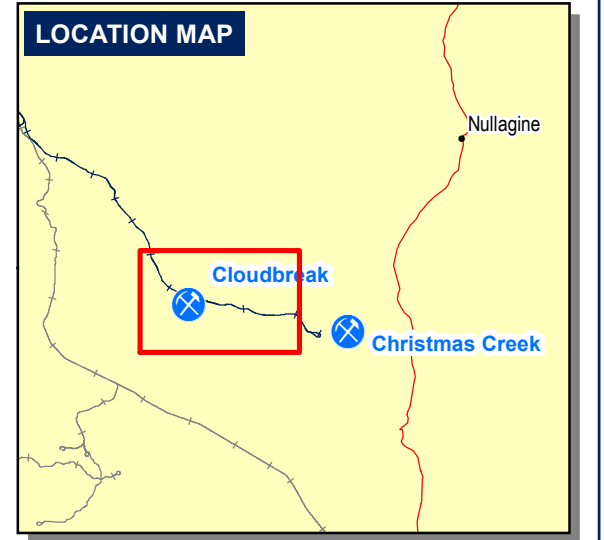
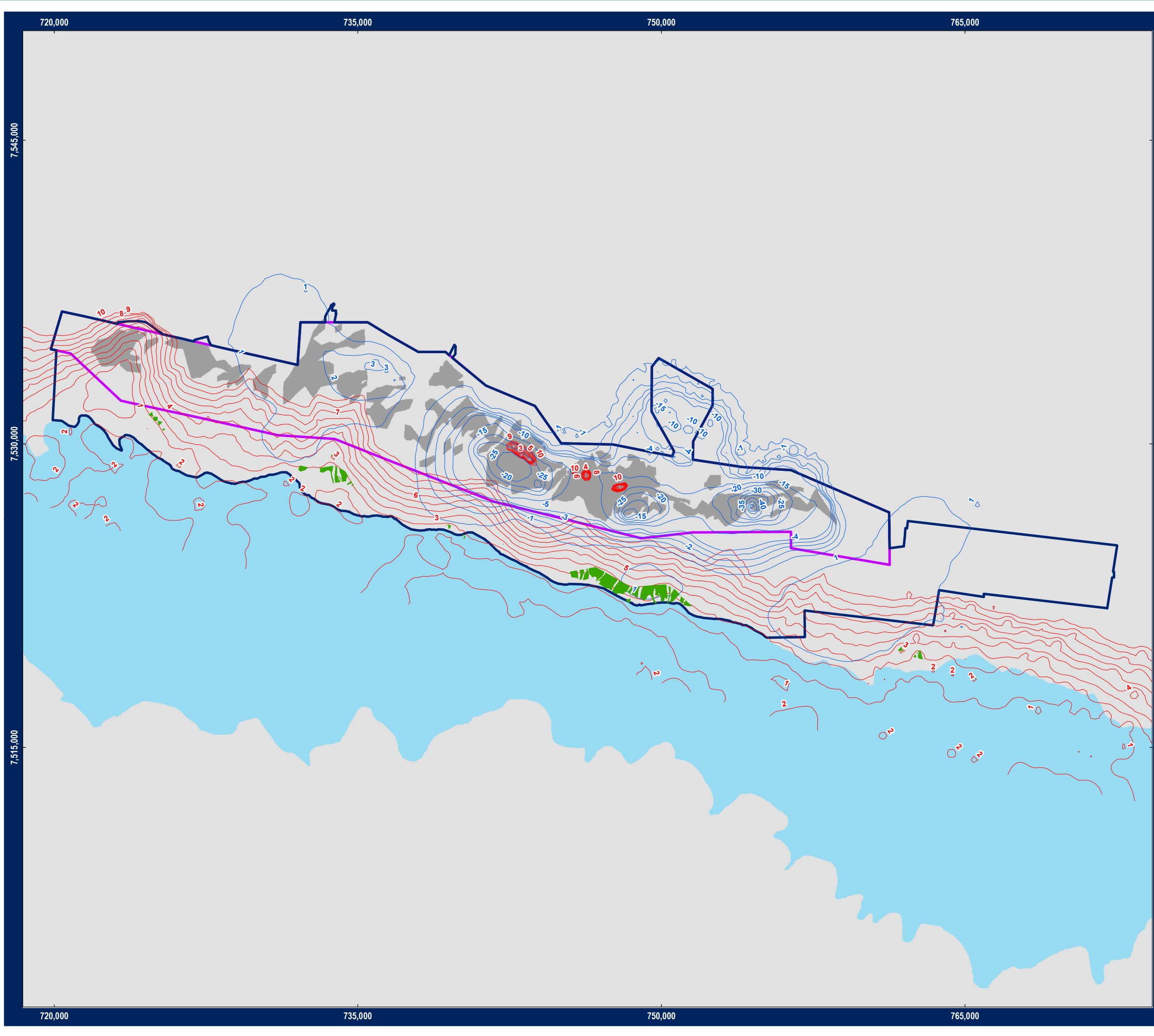
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Figure 6: Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – 2016

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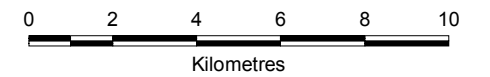




LEGEND

- MS 899 bores
- Change in watertable due to mining.
- Depth to watertable (Natural) baseline_mbgf
- CB Mine Area - MS899
- CB Project Area - MS899
- Mine Plan
- Fortescue Marsh boundary
- Impacts to Mulga – Mounding within 2m of the ground surface where the natural groundwater was below 2mbgl.

Data Source(s):
 Marsh data sourced from Enviro Australia,(2001).
 Directory of Important Wetlands in Australia
 Observation wells,mine plan data sourced from FMG (2013)



2016

Requested By: Fiona Rowland	Date: 16/09/2014
Drawn By: A.Moore	Size: A3L
Revised By: admoore	Revision: 1
Approved By:	Confidentiality: 1
Scale: 1:180,000	
Coordinate System: GDA 1994 MGA Zone 50	
Document Name: CB_MP_HY_0073.003_r1_2016	

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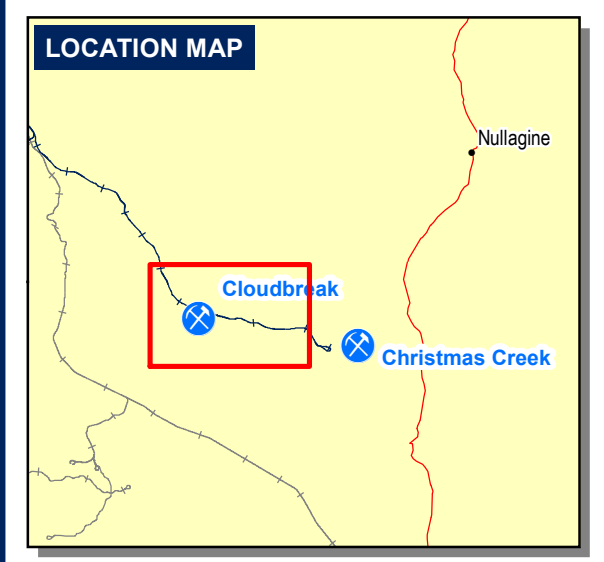
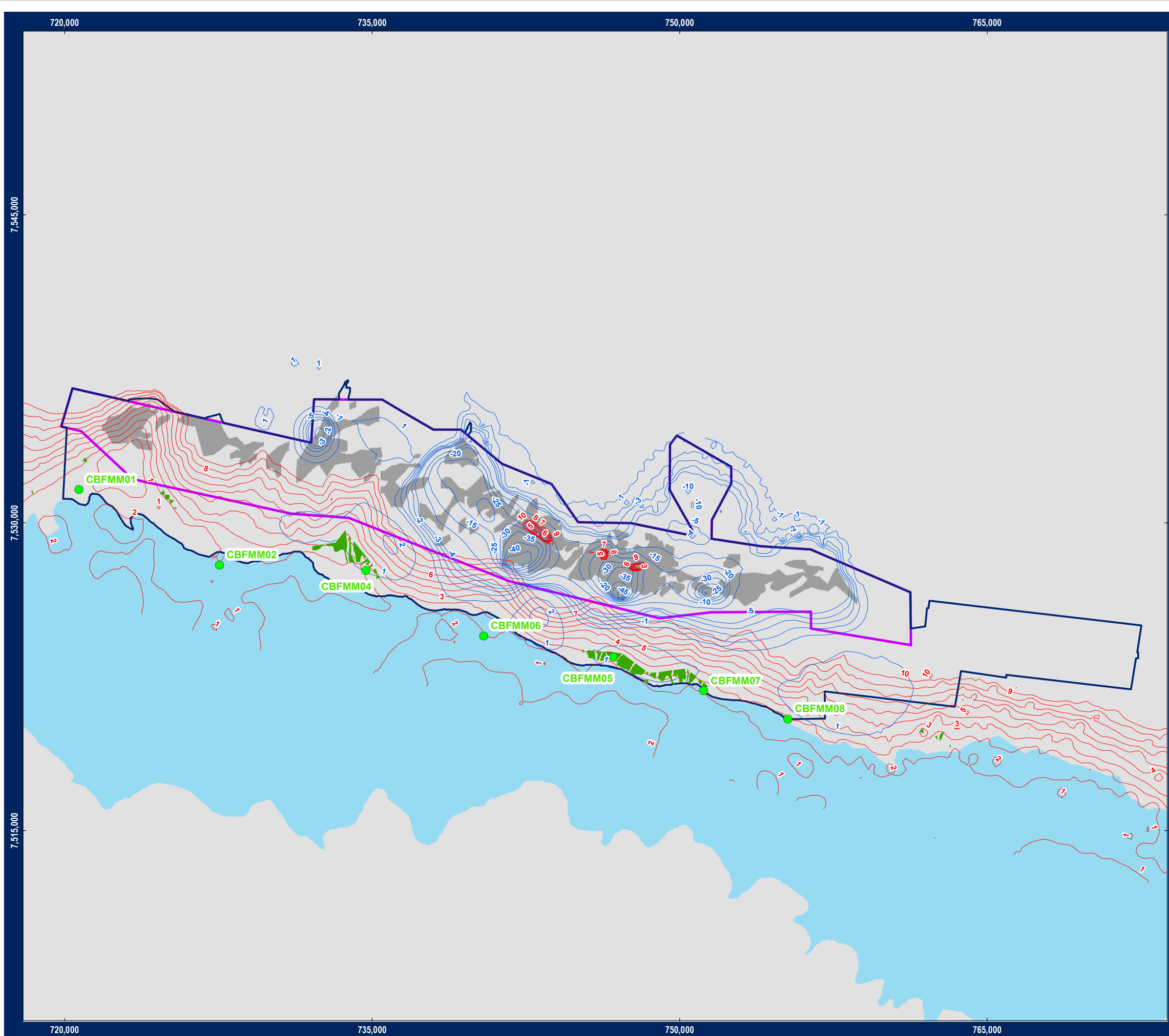


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Figure 7: Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – 2017

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- LEGEND**
- MS 899 bores
 - Change in watertable due to mining.
 - Depth to watertable (Natural) baseline_mbgf
 - ▭ CB Mine Area - MS899
 - ▭ CB Project Area - MS899
 - Mine Plan
 - Fortescue Marsh boundary
 - Impacts to Mulga – Mounding within 2m of the ground surface where the natural groundwater was below 2mbgl.

Data Source(s):
 Marsh data sourced from Enviro Australia, (2001).
 Directory of Important Wetlands in Australia
 Observation wells, mine plan data sourced from FMG (2013)

2017

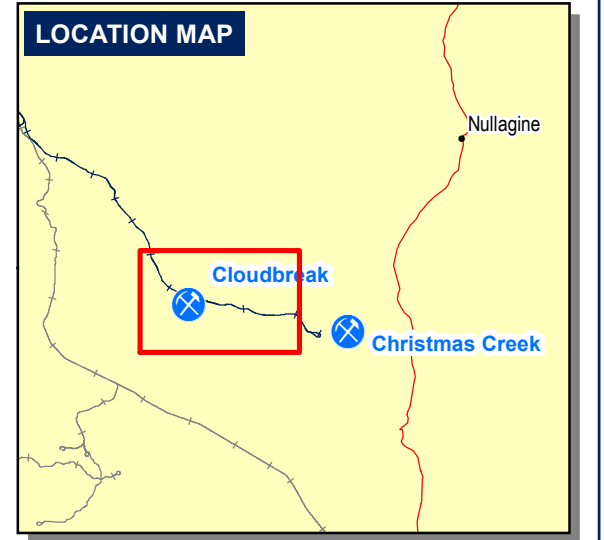
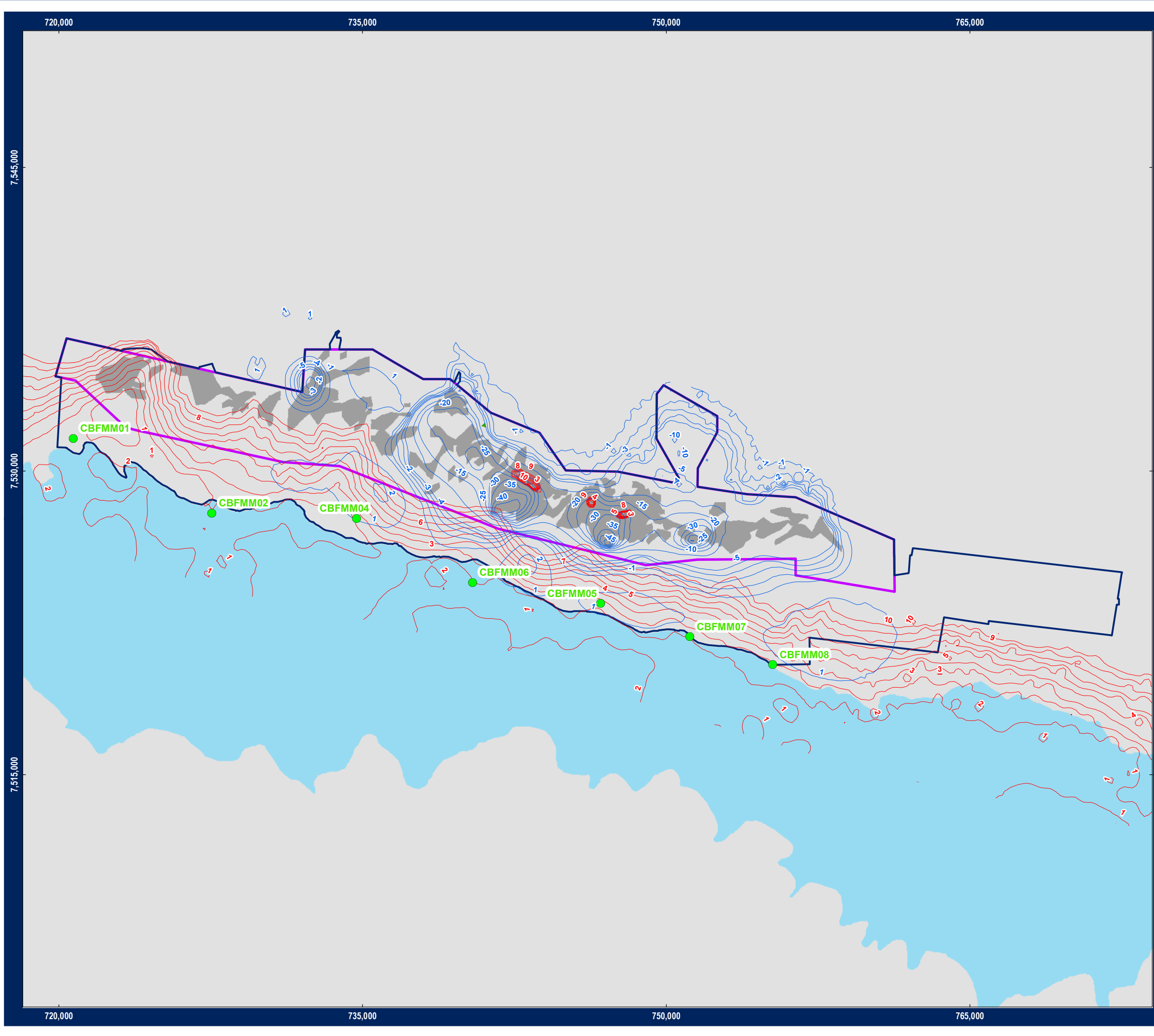
Requested By: Fiona Rowland	Date: 16/09/2014
Drawn By: A.Moore	Size: A3L
Revised By: admooore	Revision: 1
Approved By:	Confidentiality: 1
Scale: 1:180,000	
Coordinate System: GDA 1994 MGA Zone 50	
Document Name: CB_MP_HY_0073.004_r1_2017	

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Figure 8: Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – 2018

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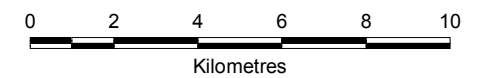




LEGEND

- MS 899 bores
- Change in watertable due to mining
- Depth to watertable (Natural) baseline_mbgf
- CB Mine Area - MS899
- CB Project Area - MS899
- Mine Plan
- Fortescue Marsh boundary

Data Source(s):
 Marsh data sourced from Enviro Australia,(2001).
 Directory of Important Wetlands in Australia
 Observation wells,mine plan data sourced from FMG (2013)



2018

Requested By: Fiona Rowland	Date: 16/09/2014
Drawn By: A.Moore	Size: A3L
Revised By: admooore	Revision: 1
Approved By:	Confidentiality: 1
Scale: 1:180,000	
Coordinate System: GDA 1994 MGA Zone 50	
Document Name: CB_MP_HY_0073.005_r1_2018	

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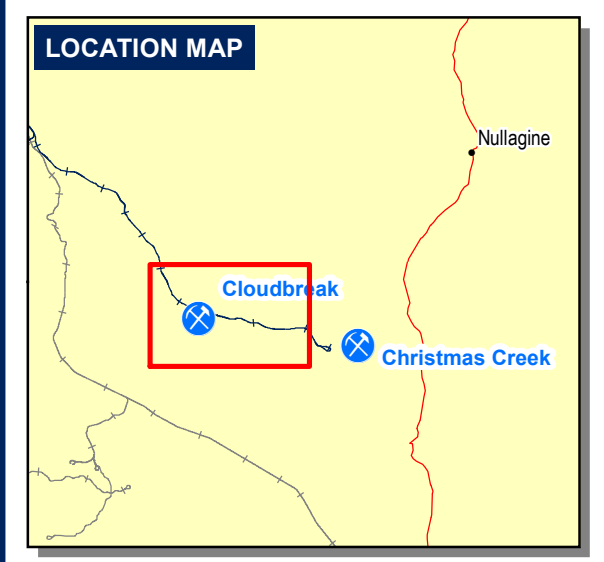
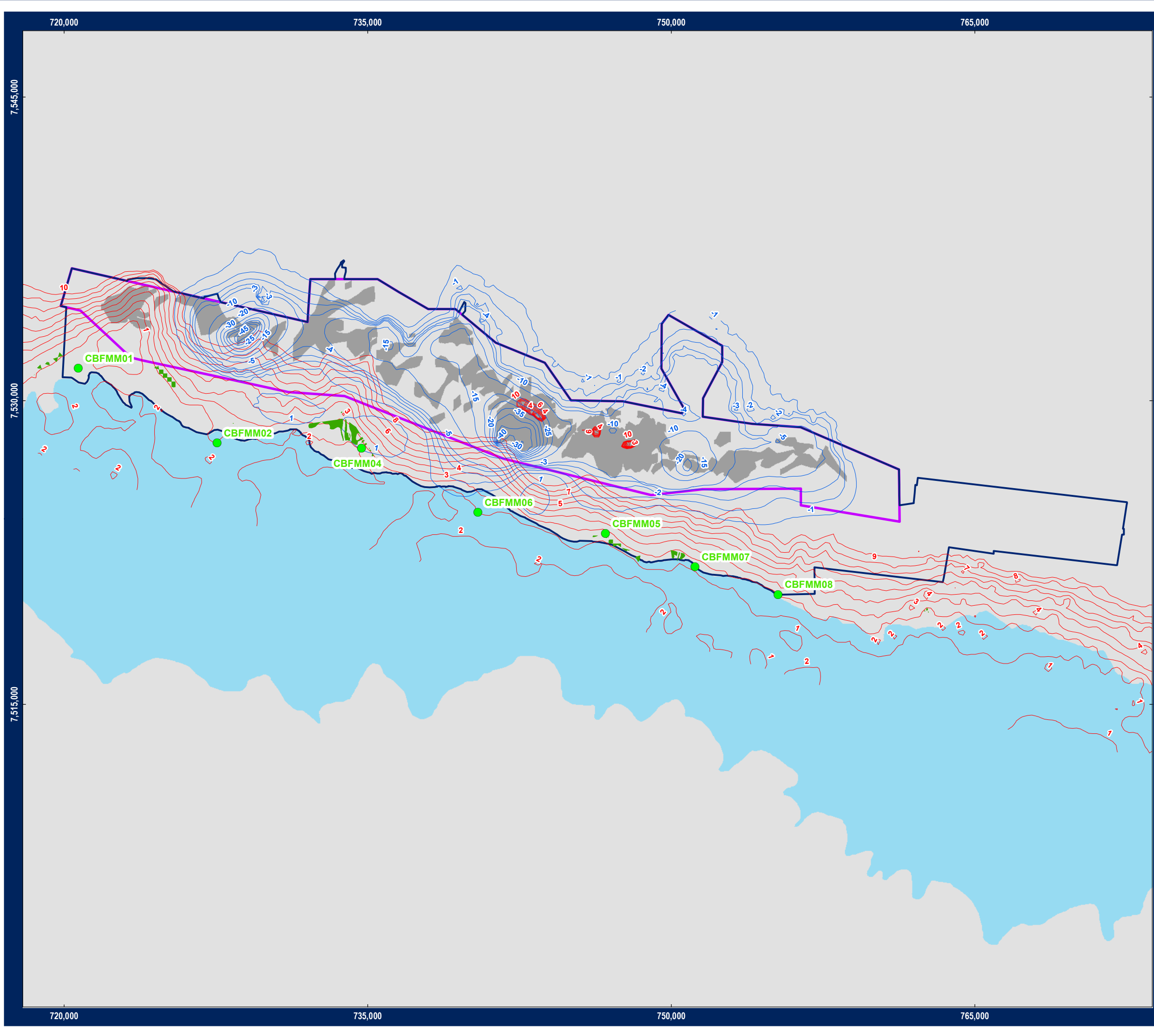


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Figure 9: Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – 2019

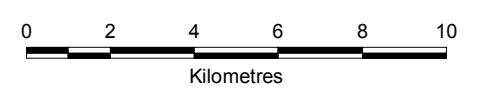
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- LEGEND**
- MS 899 bores
 - Change in watertable due to mining.
 - Depth to watertable (Natural) baseline_mbgf
 - CB Mine Area - MS899
 - CB Project Area - MS899
 - Mine Plan
 - Fortescue Marsh boundary
 - Impacts to Mulga – Mounding within 2m of the ground surface where the natural groundwater was below 2mbgl.

Data Source(s):
 Marsh data sourced from Enviro Australia, (2001).
 Directory of Important Wetlands in Australia
 Observation wells, mine plan data sourced from FMG (2013)



2019

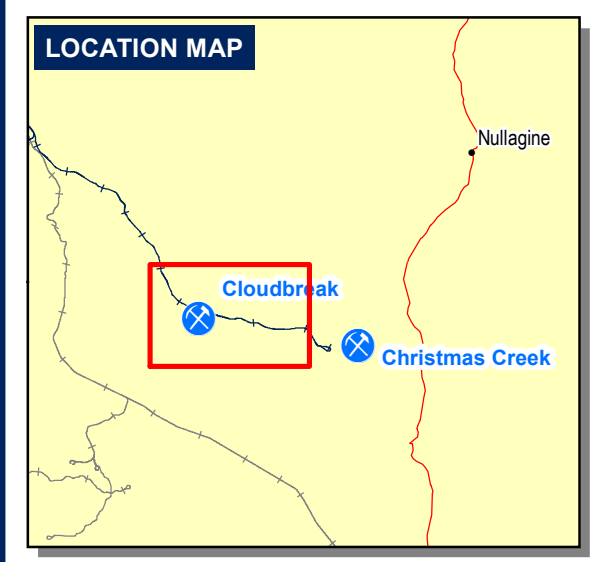
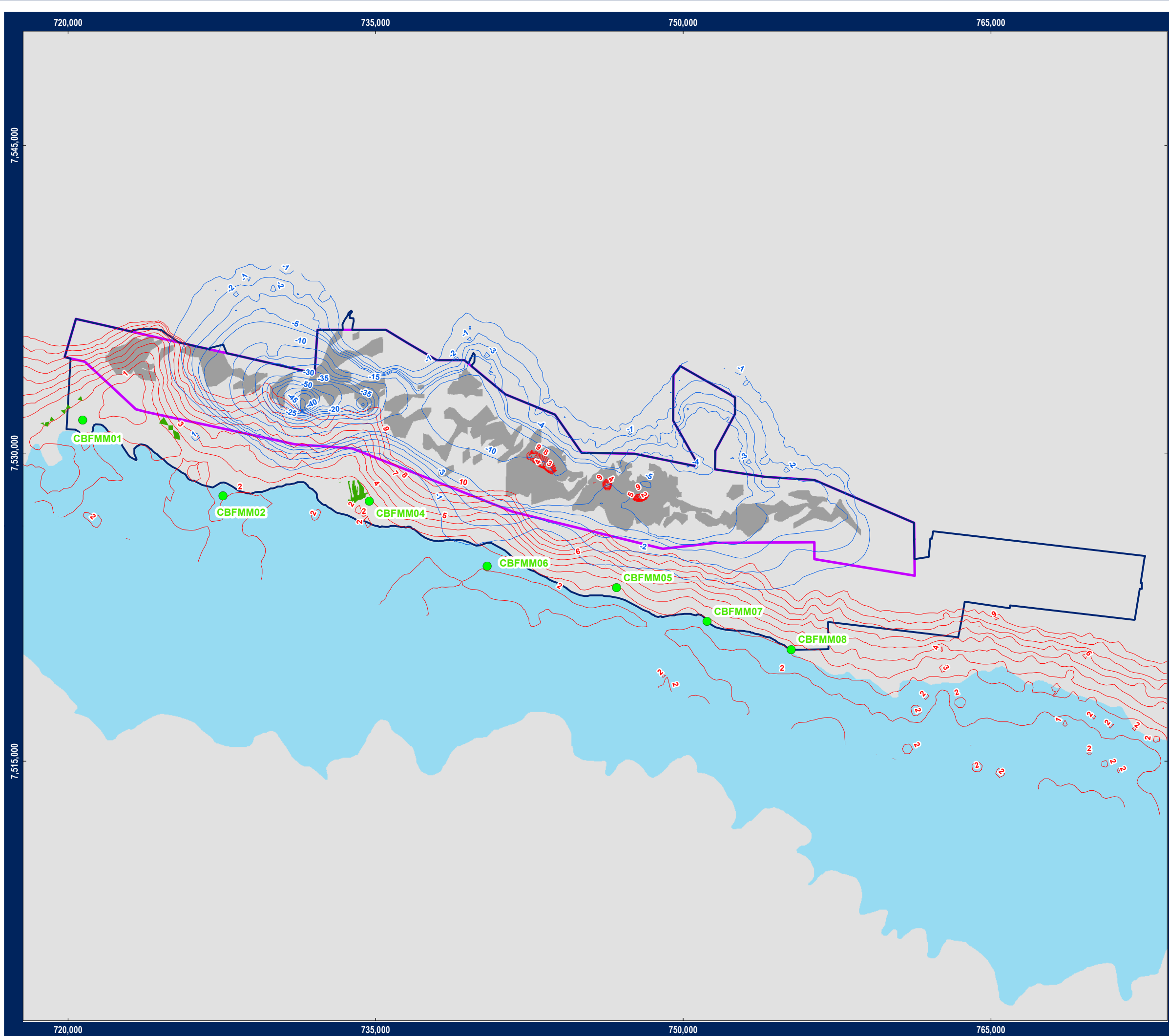
Requested By: Fiona Rowland	Date: 17/09/2014
Drawn By: A.Moore	Size: A3L
Revised By: admooore	Revision: 1
Approved By:	Confidentiality: 1
Scale: 1:180,000	
Coordinate System: GDA 1994 MGA Zone 50	
Document Name: CB_MP_HY_0073.006_r1_2019	

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Figure 10: Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – 2020

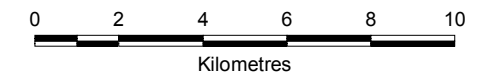
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- LEGEND**
- MS 899 bores
 - Change in watertable due to mining.
 - Depth to watertable (Natural) baseline_mbgf
 - ▭ CB Mine Area - MS899
 - ▭ CB Project Area - MS899
 - ▭ Mine Plan
 - ▭ Fortescue Marsh boundary
 - Impacts to Mulga – Mounding within 2m of the ground surface where the natural groundwater was below 2mbgl.

Data Source(s):
 Marsh data sourced from Enviro Australia,(2001).
 Directory of Important Wetlands in Australia
 Observation wells,mine plan data sourced from FMG (2013)



2020

Requested By: Fiona Rowland	Date: 17/09/2014
Drawn By: A.Moore	Size: A3L
Revised By: admooore	Revision: 1
Approved By:	Confidentiality: 1
Scale: 1:180,000	
Coordinate System: GDA 1994 MGA Zone 50	
Document Name: CB_MP_HY_0073.007_r1_2020	

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7,545,000

7,530,000

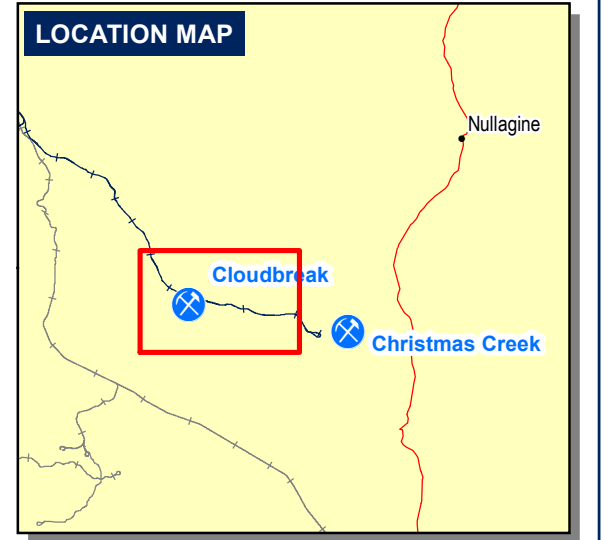
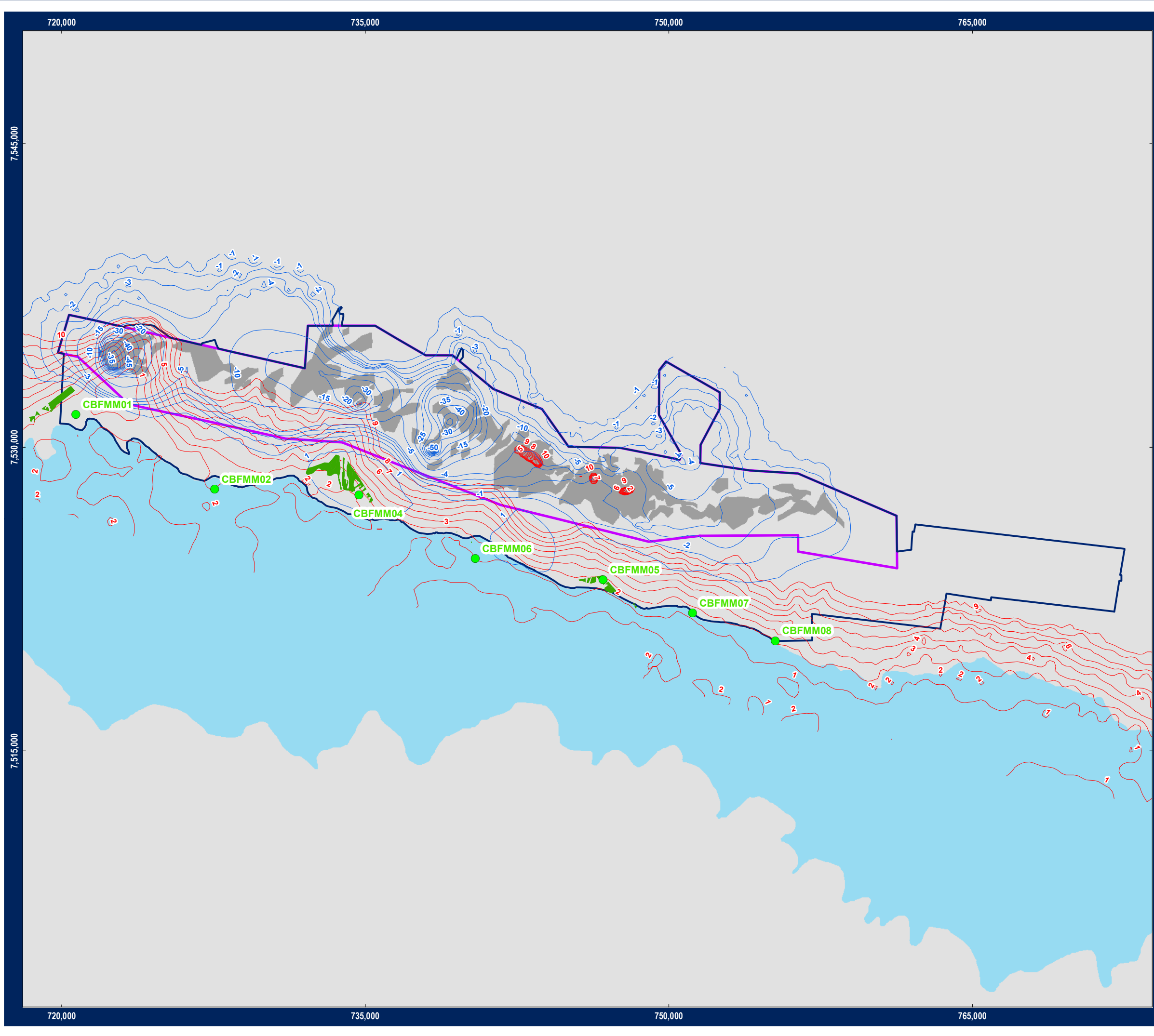
7,515,000

720,000 735,000 750,000 765,000

Figure 11: Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts - 2021

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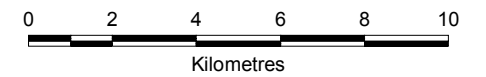




LEGEND

- MS 899 bores
- Change in watertable due to mining.
- Depth to watertable (Natural) baseline_mbgf
- CB Mine Area - MS899
- CB Project Area - MS899
- Mine Plan
- Fortescue Marsh boundary
- Impacts to Mulga – Mounding within 2m of the ground surface where the natural groundwater was below 2mbgl.

Data Source(s):
 Marsh data sourced from Enviro Australia,(2001).
 Directory of Important Wetlands in Australia
 Observation wells,mine plan data sourced from FMG (2013)



2021

Requested By: Fiona Rowland	Date: 17/09/2014
Drawn By: A.Moore	Size: A3L
Revised By: admoore	Revision: 1
Approved By:	Confidentiality: 1
Scale: 1:180,000	
Coordinate System: GDA 1994 MGA Zone 50	
Document Name: CB_MP_HY_0073.008_r1_2021	

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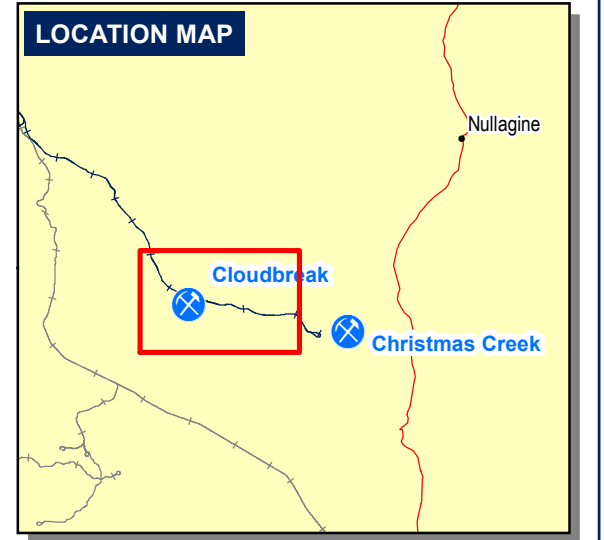
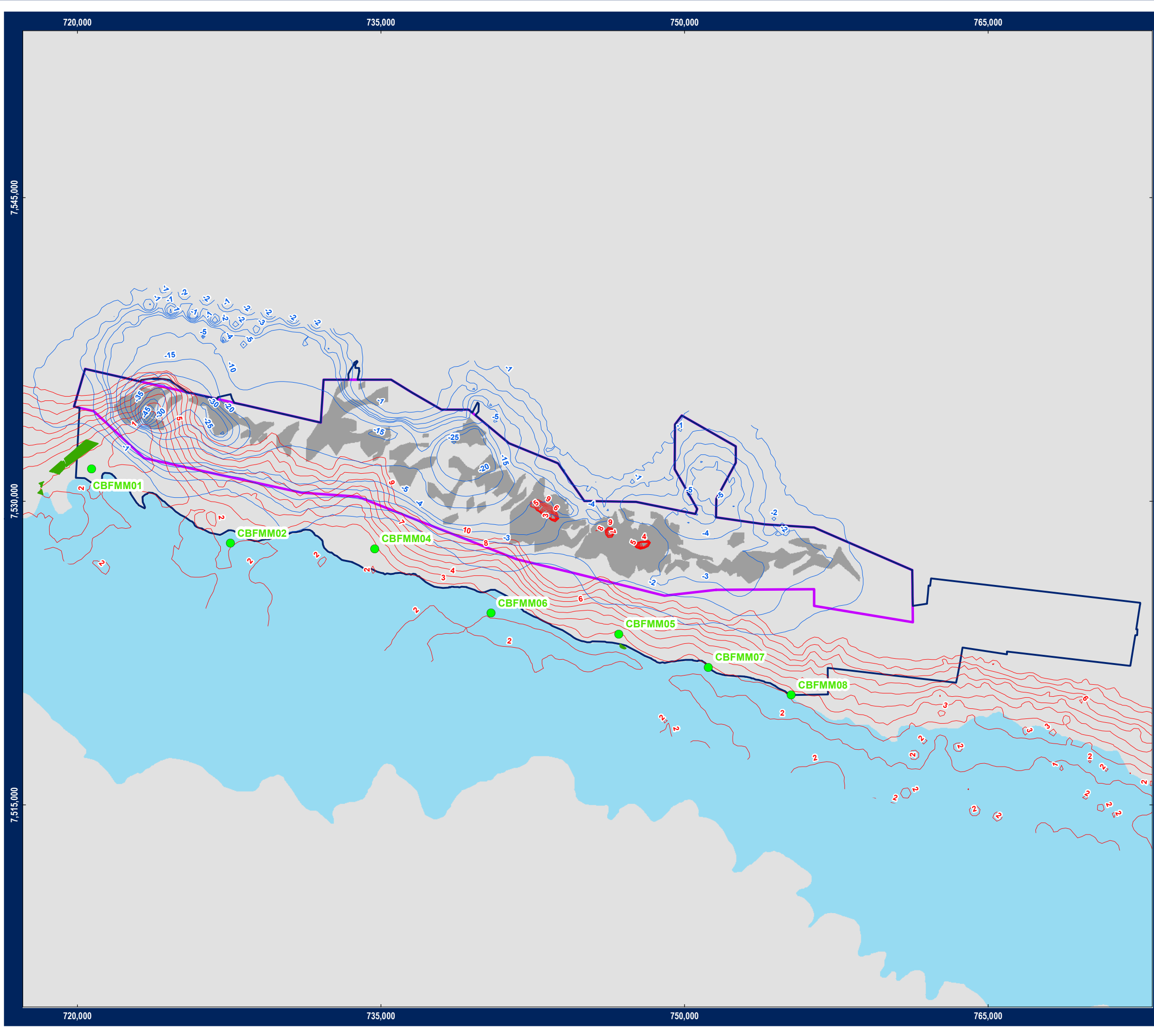


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Figure 12: Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – 2022

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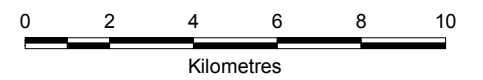




LEGEND

- MS 899 bores
- Change in watertable due to mining.
- Depth to watertable (Natural) baseline_mbgf
- CB Mine Area - MS899
- CB Project Area - MS899
- Mine Plan
- Fortescue Marsh boundary
- Impacts to Mulga – Mounding within 2m of the ground surface where the natural groundwater was below 2mbgl.

Data Source(s):
 Marsh data sourced from Enviro Australia, (2001).
 Directory of Important Wetlands in Australia
 Observation wells, mine plan data sourced from FMG (2013)



2022

Requested By: Fiona Rowland	Date: 17/09/2014
Drawn By: A.Moore	Size: A3L
Revised By: admooore	Revision: 1
Approved By:	Confidentiality: 1
Scale: 1:180,000	
Coordinate System: GDA 1994 MGA Zone 50	
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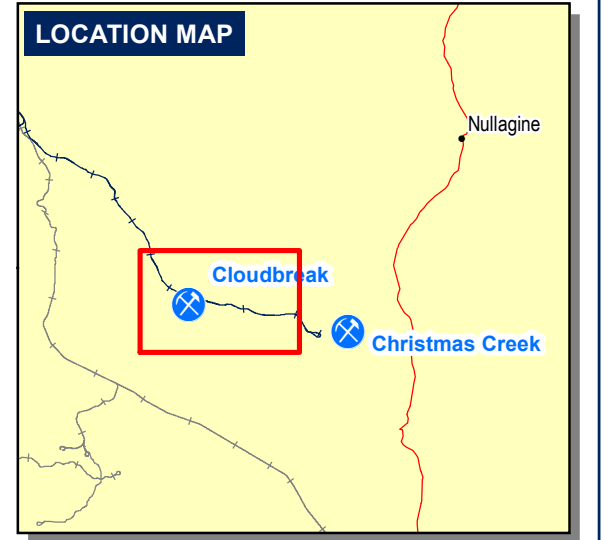
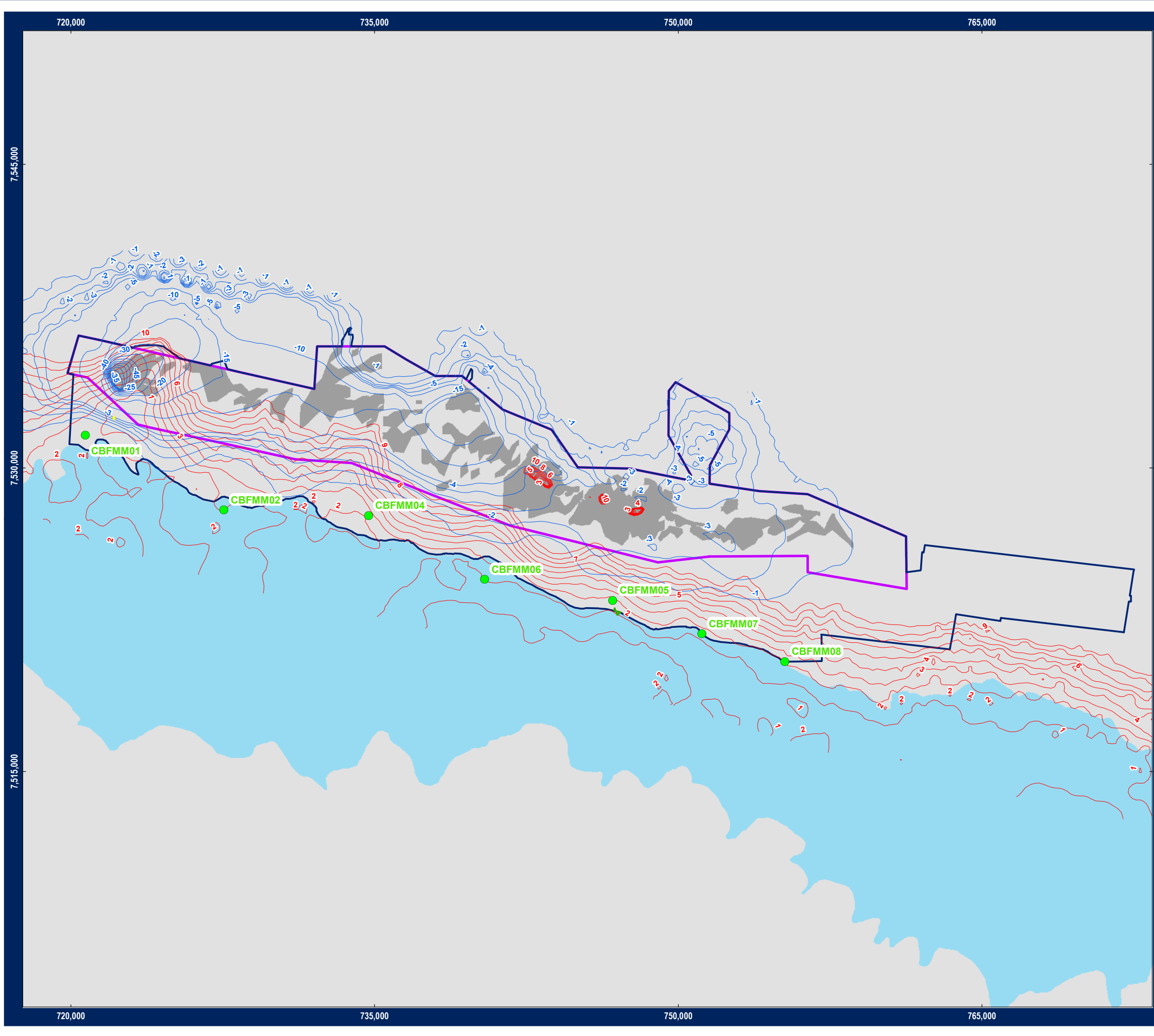


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Figure 13: Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts - 2023

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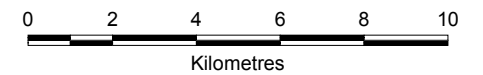




LEGEND

- MS 899 bores
- Change in watertable due to mining.
- Depth to watertable (Natural) baseline_mbgf
- CB Mine Area - MS899
- CB Project Area - MS899
- Mine Plan
- Fortescue Marsh boundary
- Impacts to Samphire – Drawdown greater than 3m in areas where the natural groundwater was 0-5 mbgl.
- Impacts to Mulga – Mounding within 2m of the ground surface where the natural groundwater was below 2mbgl.

Data Source(s):
 Marsh data sourced from Enviro Australia,(2001).
 Directory of Important Wetlands in Australia
 Observation wells,mine plan data sourced from FMG (2013)



2023

Requested By: Fiona Rowland	Date: 17/09/2014
Drawn By: A.Moore	Size: A3L
Revised By: admooore	Revision: 1
Approved By:	Confidentiality: 1
Scale: 1:180,000	
Coordinate System: GDA 1994 MGA Zone 50	
Document Name: CB_MP_HY_0073.010_r1_2023	

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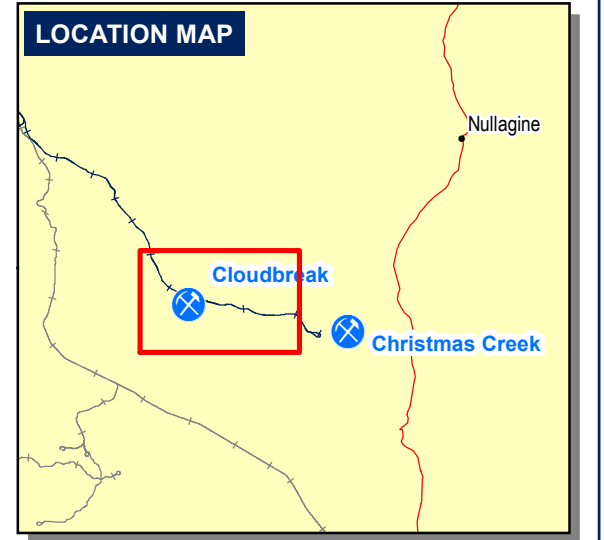
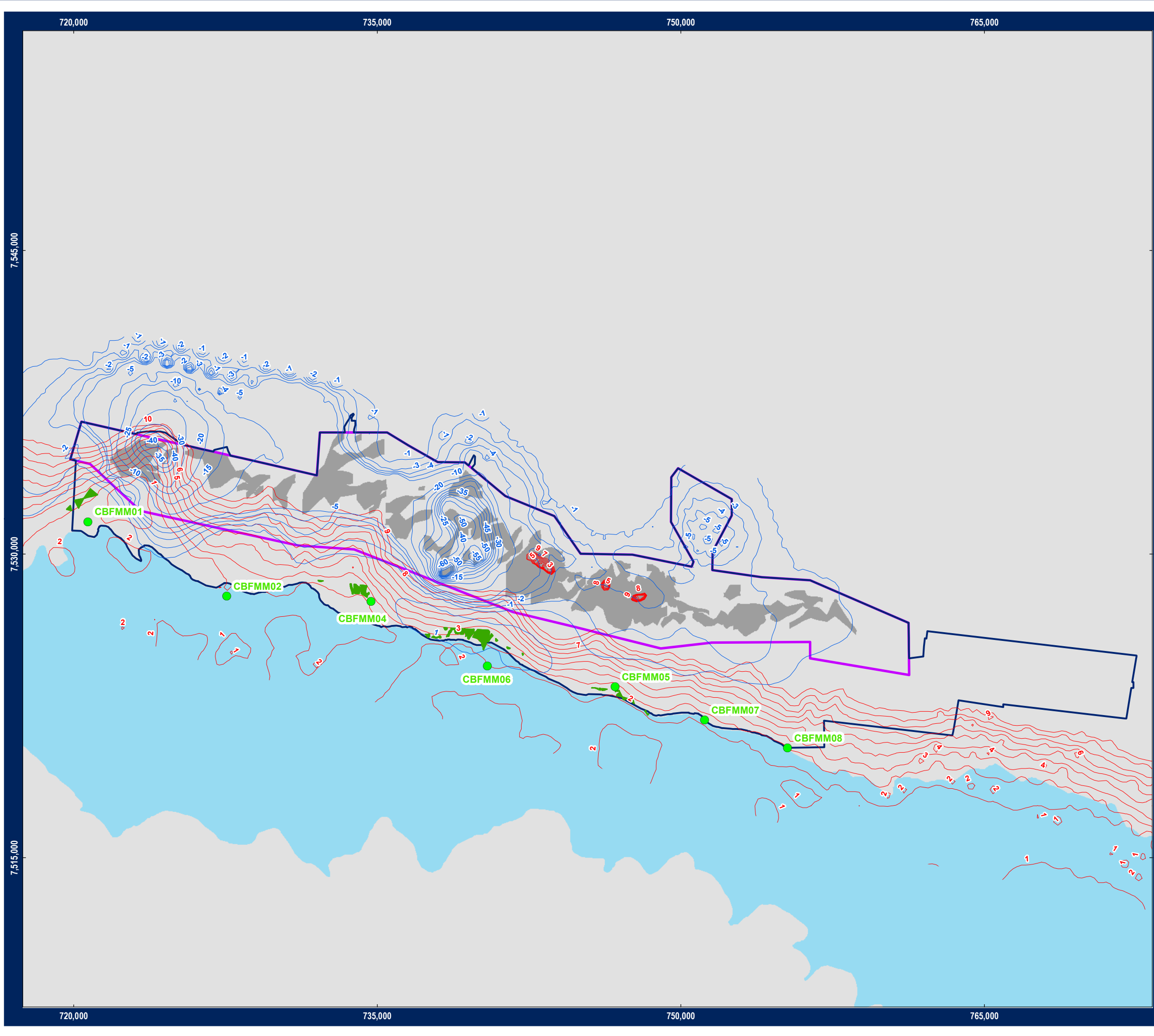


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Figure 14: Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts - 2024

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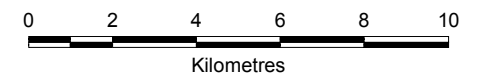




LEGEND

- MS 899 bores
- Change in watertable due to mining.
- Depth to watertable (Natural) baseline_mbgf
- CB Mine Area - MS899
- CB Project Area - MS899
- Mine Plan
- Fortescue Marsh boundary
- Impacts to Mulga – Mounding within 2m of the ground surface where the natural groundwater was below 2mbgl.

Data Source(s):
 Marsh data sourced from Enviro Australia, (2001).
 Directory of Important Wetlands in Australia
 Observation wells, mine plan data sourced from FMG (2013)



2024

Requested By: Fiona Rowland	Date: 17/09/2014
Drawn By: A.Moore	Size: A3L
Revised By: admooore	Revision: 1
Approved By:	Confidentiality: 1
Scale: 1:180,000	
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Document Name: CB_MP_HY_0073.011_r1_2024	

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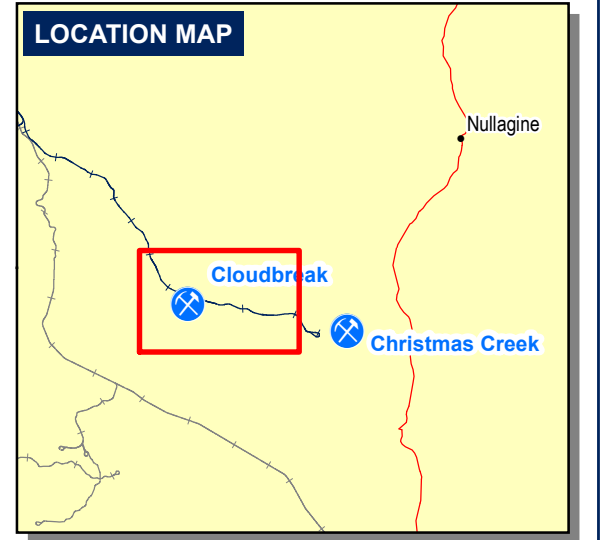
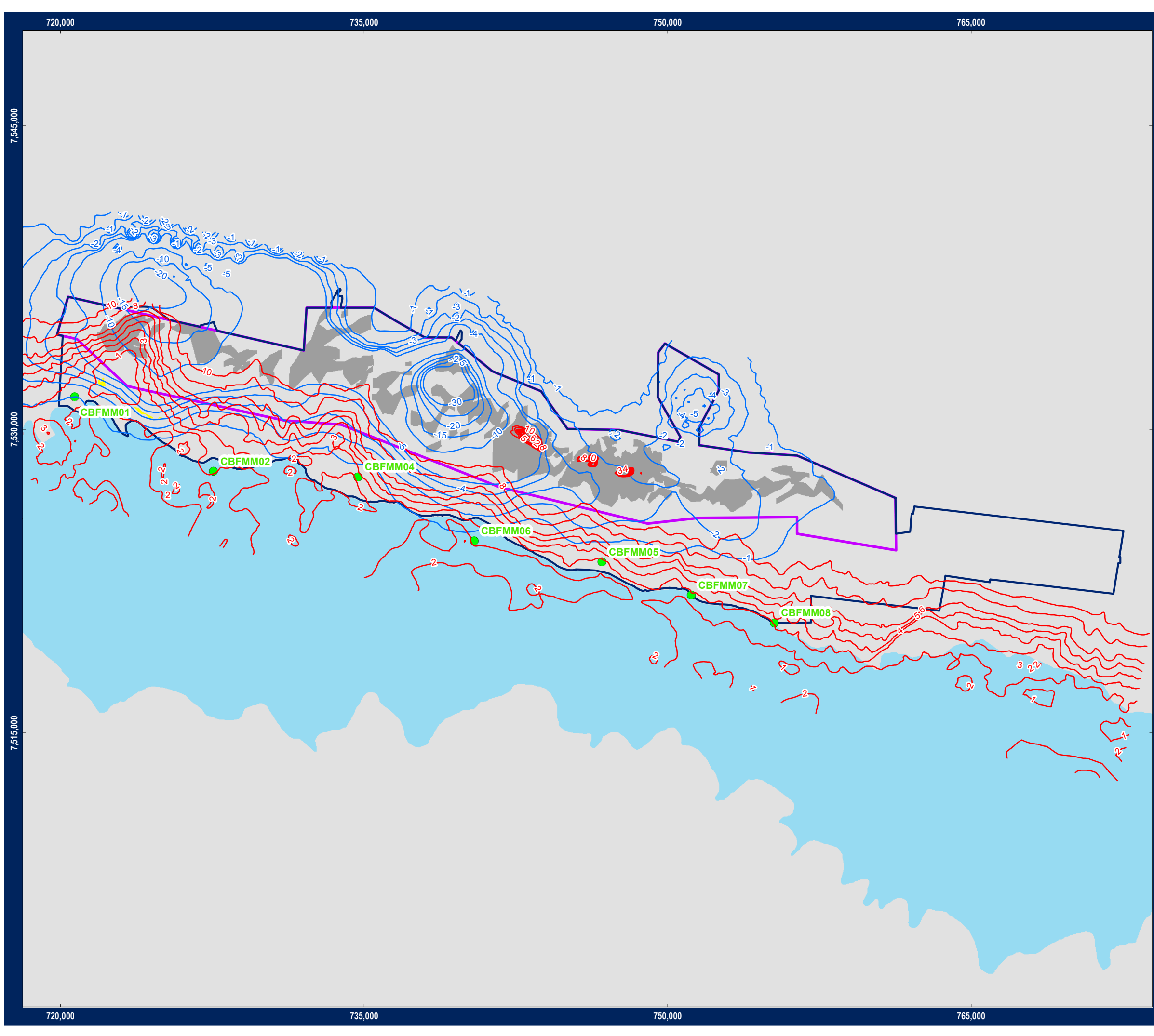


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Figure 15: Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – Post Closure 2025

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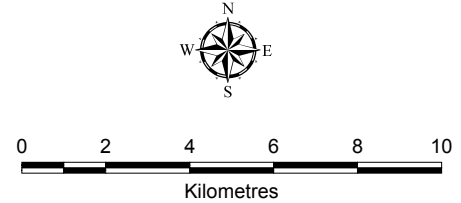




LEGEND

- MS 899 bores
- Depth to watertable (Natural) baseline_mbgf
- Change in watertable due to mining.
- CB Mine Area - MS899
- CB Project Area - MS899
- Fortescue Marsh boundary
- Impacts to Samphire – Drawdown greater than 3m in areas where the natural groundwater was 0-5 mbgl.
- Impacts to Mulga – Mounding within 2m of the ground surface where the natural groundwater was below 2mbgl.

Data Source(s):
 Marsh data sourced from Enviro Australia, (2001).
 Directory of Important Wetlands in Australia
 Observation wells, mine plan data sourced from FMG (2013)



Post Closure 2025

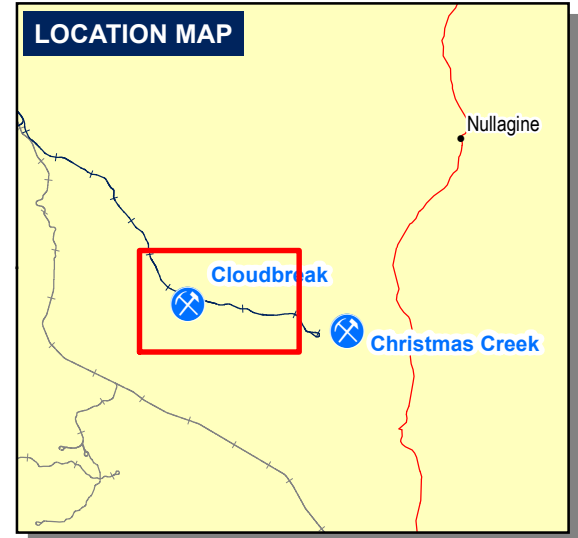
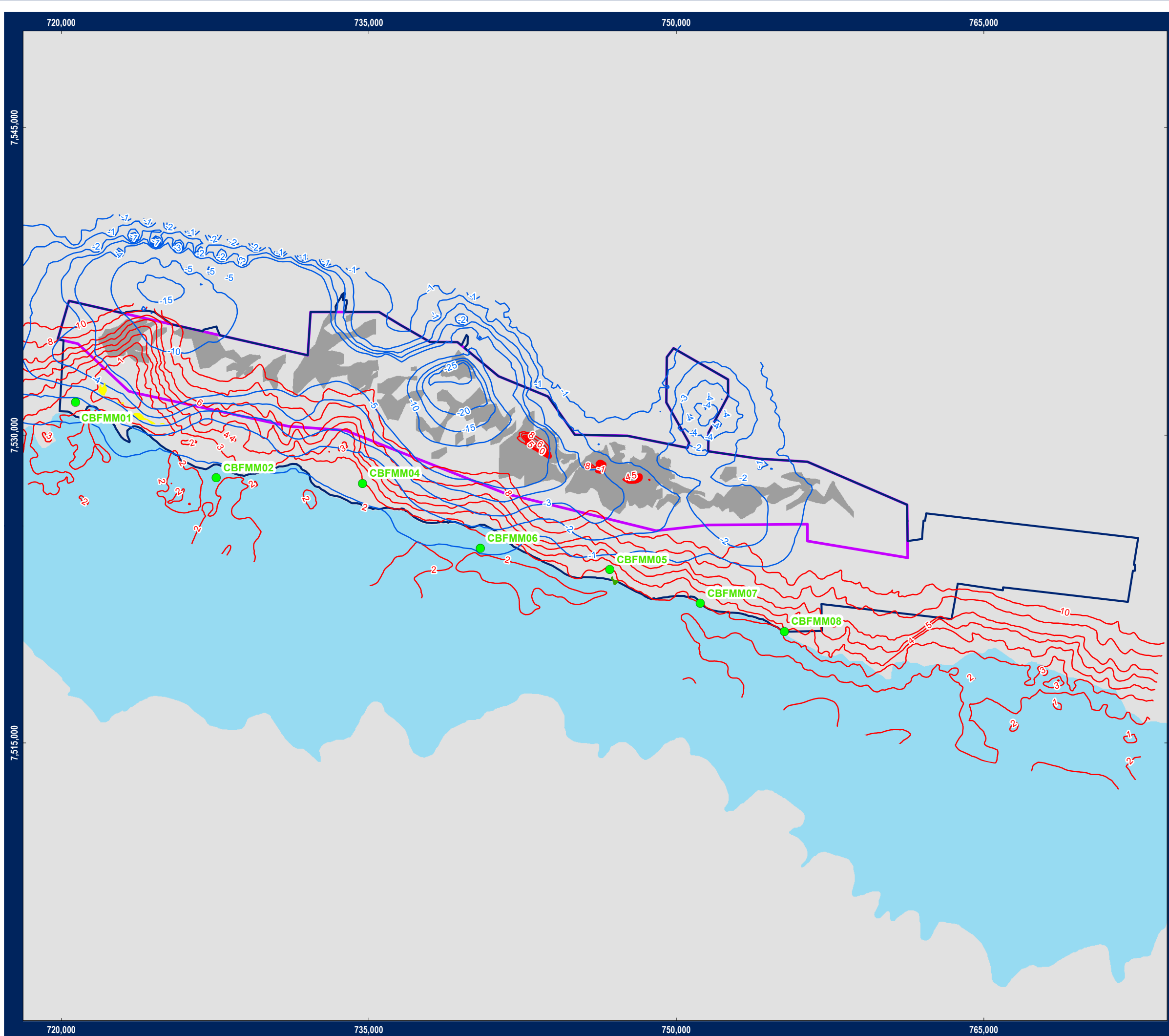
Requested By: Fiona Rowland	Date: 22/09/2014
Drawn By: A.Moore	Size: A3L
Revised By: pmastalir	Revision: 0
Approved By: Chris Whyte	Confidentiality: 1
Scale: 1:180,000	
Coordinate System: GDA 1994 MGA Zone 50	
Document Name: CB_MP_HY_0073.026_r0_2025	

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Figure 16: Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – Post Closure 2026

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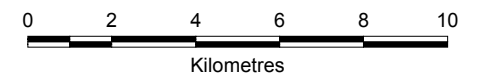




LEGEND

- MS 899 bores
- Depth to watertable (Natural) baseline_mbgf
- Change in watertable due to mining.
- CB Mine Area - MS899
- CB Project Area - MS899
- Fortescue Marsh boundary
- Impacts to Samphire – Drawdown greater than 3m in areas where the natural groundwater was 0-5 mbgl.
- Impacts to Mulga – Mounding within 2m of the ground surface where the natural groundwater was below 2mbgl.

Data Source(s):
 Marsh data sourced from Enviro Australia, (2001).
 Directory of Important Wetlands in Australia
 Observation wells, mine plan data sourced from FMG (2013)



Post Closure 2026

Requested By: Fiona Rowland	Date: 22/09/2014
Drawn By: A.Moore	Size: A3L
Revised By: pmastalir	Revision: 0
Approved By: Chris Whyte	Confidentiality: 1
Scale: 1:180,000	
Coordinate System: GDA 1994 MGA Zone 50	
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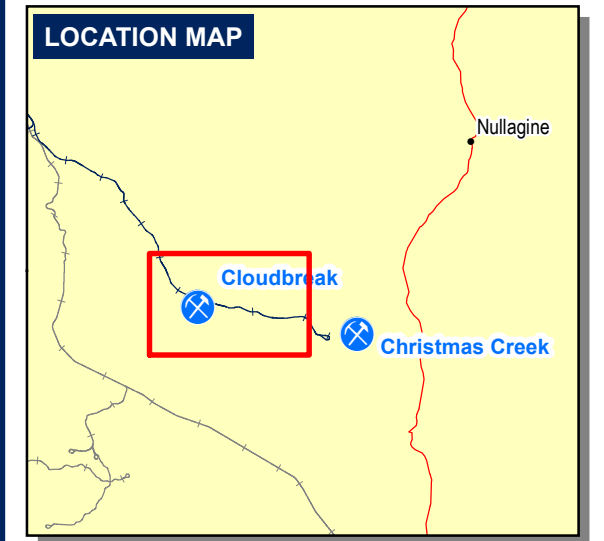
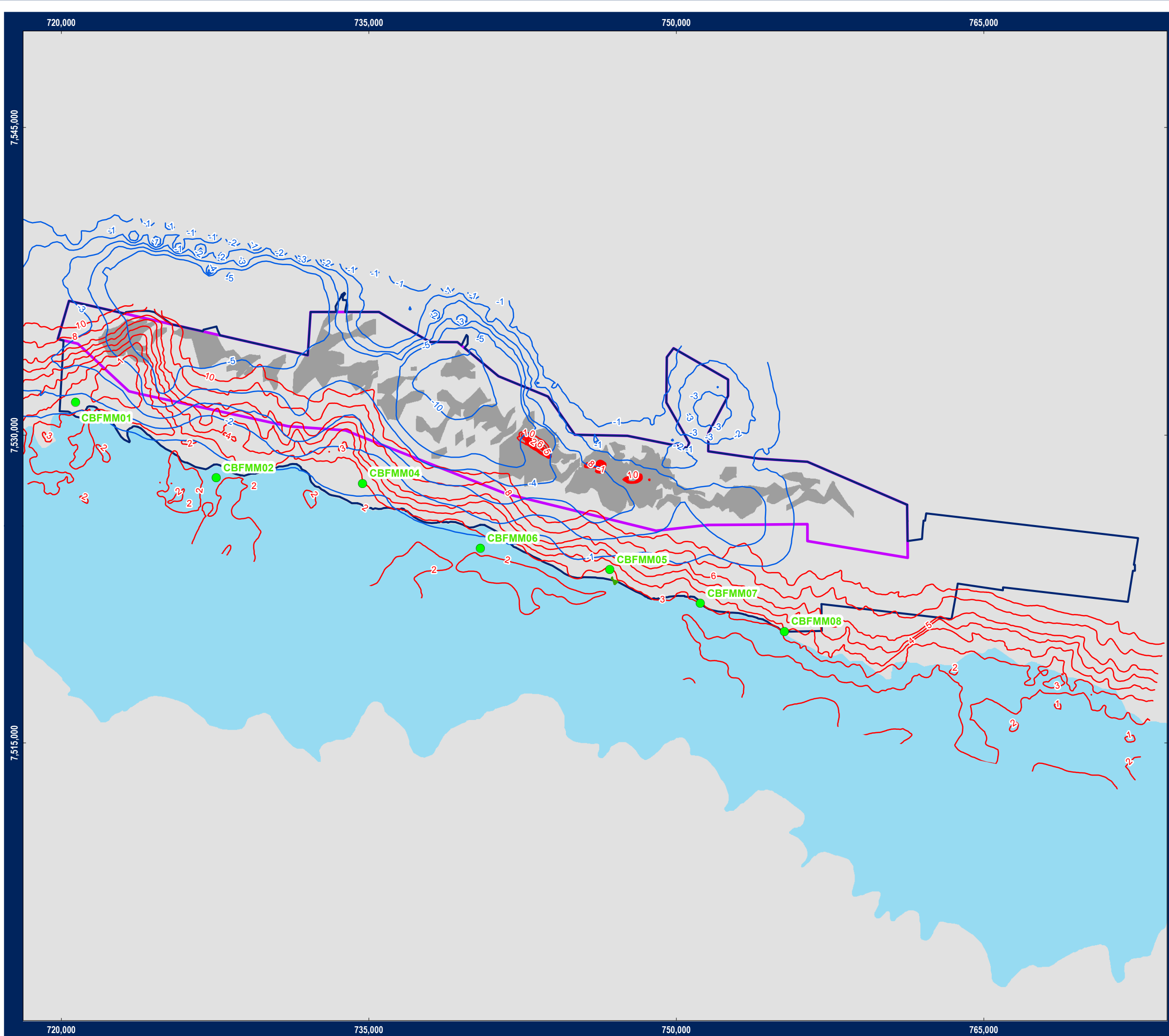


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Figure 17: Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – Post Closure 2029

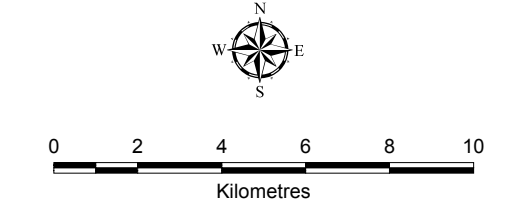
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- LEGEND**
- MS 899 bores
 - Depth to watertable (Natural) baseline_mbgf
 - Change in watertable due to mining.
 - ▭ CB Mine Area - MS899
 - ▭ CB Project Area - MS899
 - ▭ Fortescue Marsh boundary
- Impacts to Samphire – Drawdown greater than 3m in areas where the natural groundwater was 0-5 mbgl.**
- Impacts to Mulga – Mounding within 2m of the ground surface where the natural groundwater was below 2mbgl.**

Data Source(s):
 Marsh data sourced from Enviro Australia, (2001).
 Directory of Important Wetlands in Australia
 Observation wells, mine plan data sourced from FMG (2013)



Post Closure 2029

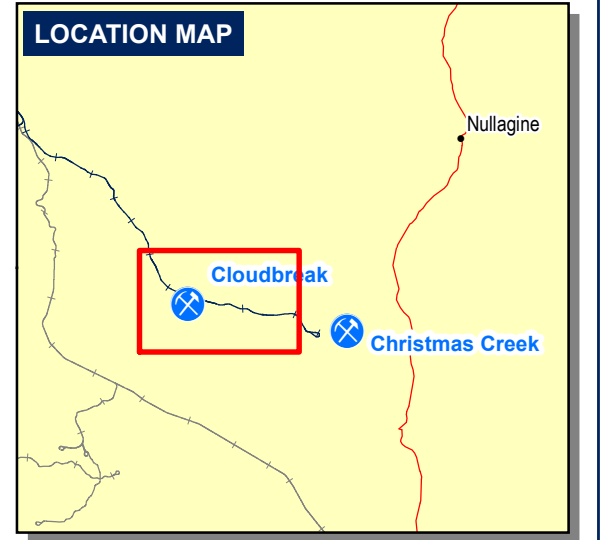
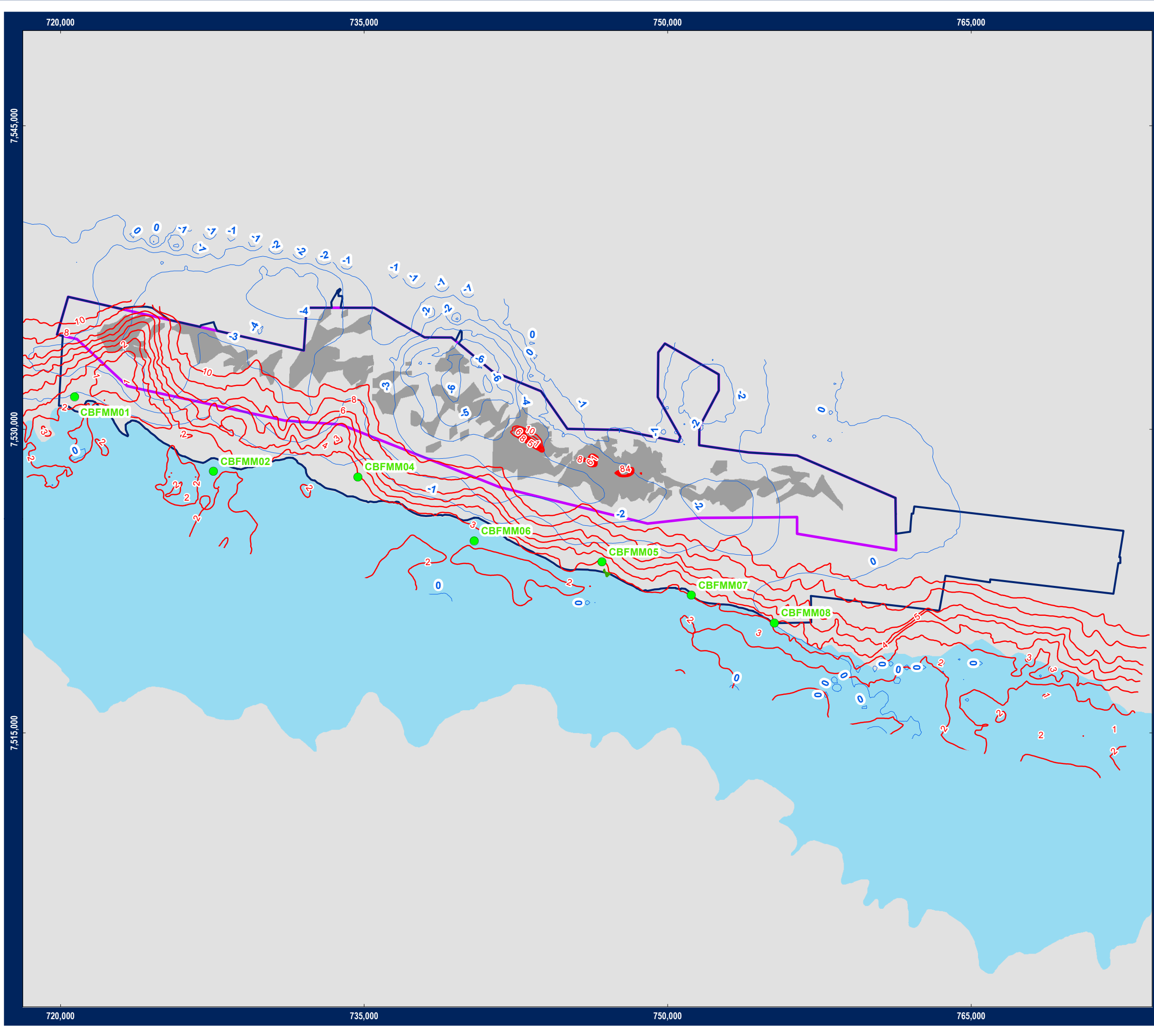
Requested By: Fiona Rowland	Date: 22/09/2014
Drawn By: A.Moore	Size: A3L
Revised By: pmastalir	Revision: 0
Approved By: Chris Whyte	Confidentiality: 1
Scale: 1:180,000	
Coordinate System: GDA 1994 MGA Zone 50	
Document Name: CB_MP_HY_0073.024_r0_2029	

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Figure 18: Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – Post Closure 2034

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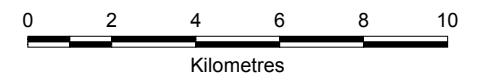




LEGEND

- MS 899 bores
- Change in watertable due to mining.
- Depth to watertable (Natural) baseline_mbgf
- CB Mine Area - MS899
- CB Project Area - MS899
- Fortescue Marsh boundary
- Impacts to Samphire – Drawdown greater than 3m in areas where the natural groundwater was 0-5 mbgf.
- Impacts to Mulga – Mounding within 2m of the ground surface where the natural groundwater was below 2mbgf.

Data Source(s):
 Marsh data sourced from Enviro Australia, (2001).
 Directory of Important Wetlands in Australia
 Observation wells, mine plan data sourced from FMG (2013)



Post Closure 2034

Requested By: Fiona Rowland	Date: 23/09/2014
Drawn By: A.Moore	Size: A3L
Revised By: pmastalir	Revision: 0
Approved By: Chris Whyte	Confidentiality: 1
Scale: 1:180,000	
Coordinate System: GDA 1994 MGA Zone 50	
Document Name: CB_MP_HY_0073.023_r0_2034	

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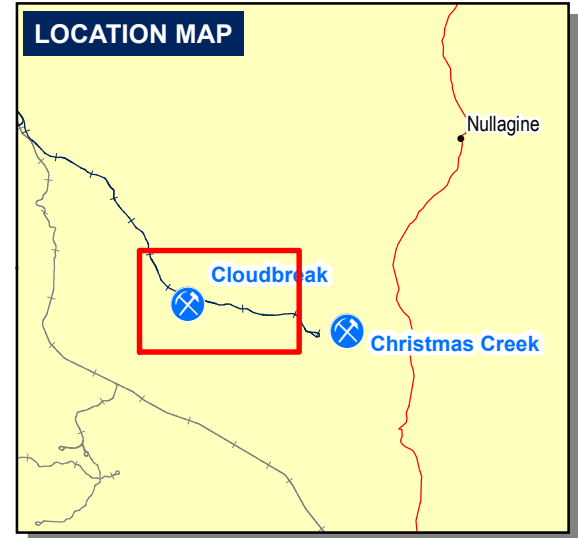
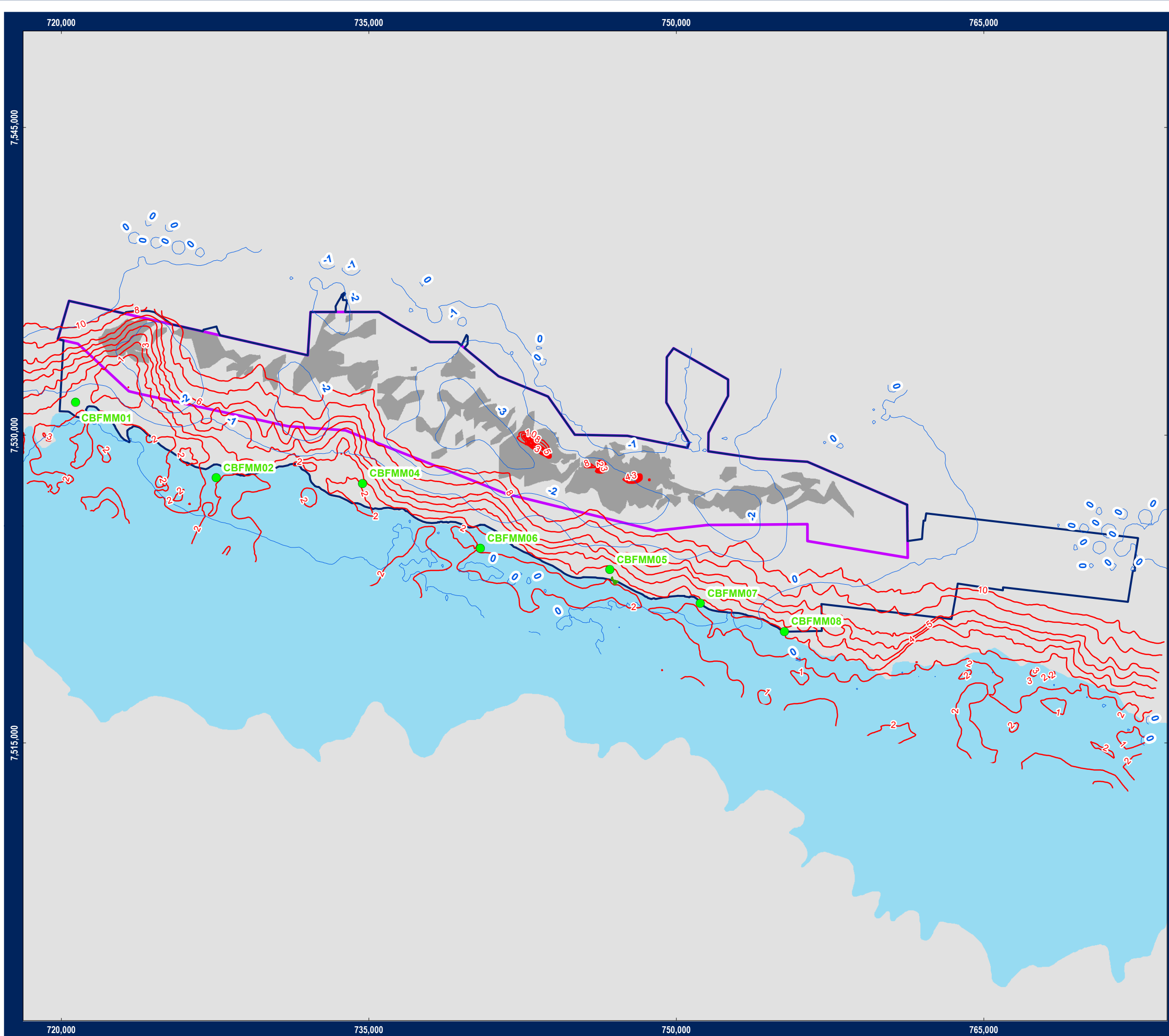


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Figure 19: Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – Post Closure 2044

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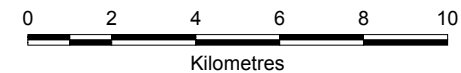




LEGEND

- MS 899 bores
- Change in watertable due to mining.
- Depth to watertable (Natural) baseline_mbgf
- CB Mine Area - MS899
- CB Project Area - MS899
- Fortescue Marsh boundary
- Impacts to Samphire – Drawdown greater than 3m in areas where the natural groundwater was 0-5 mbgl.
- Impacts to Mulga – Mounding within 2m of the ground surface where the natural groundwater was below 2mbgl.

Data Source(s):
 Marsh data sourced from Enviro Australia, (2001).
 Directory of Important Wetlands in Australia
 Observation wells, mine plan data sourced from FMG (2013)



Post Closure 2044

Requested By: Fiona Rowland	Date: 23/09/2014
Drawn By: A.Moore	Size: A3L
Revised By: pmastalir	Revision: 0
Approved By: Chris Whyte	Confidentiality: 1
Scale: 1:180,000	
Coordinate System: GDA 1994 MGA Zone 50	
Document Name: CB_MP_HY_0073.022_r0_2044	

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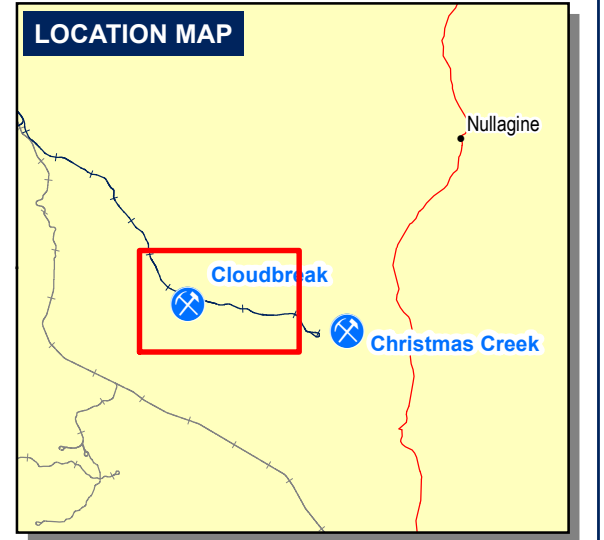
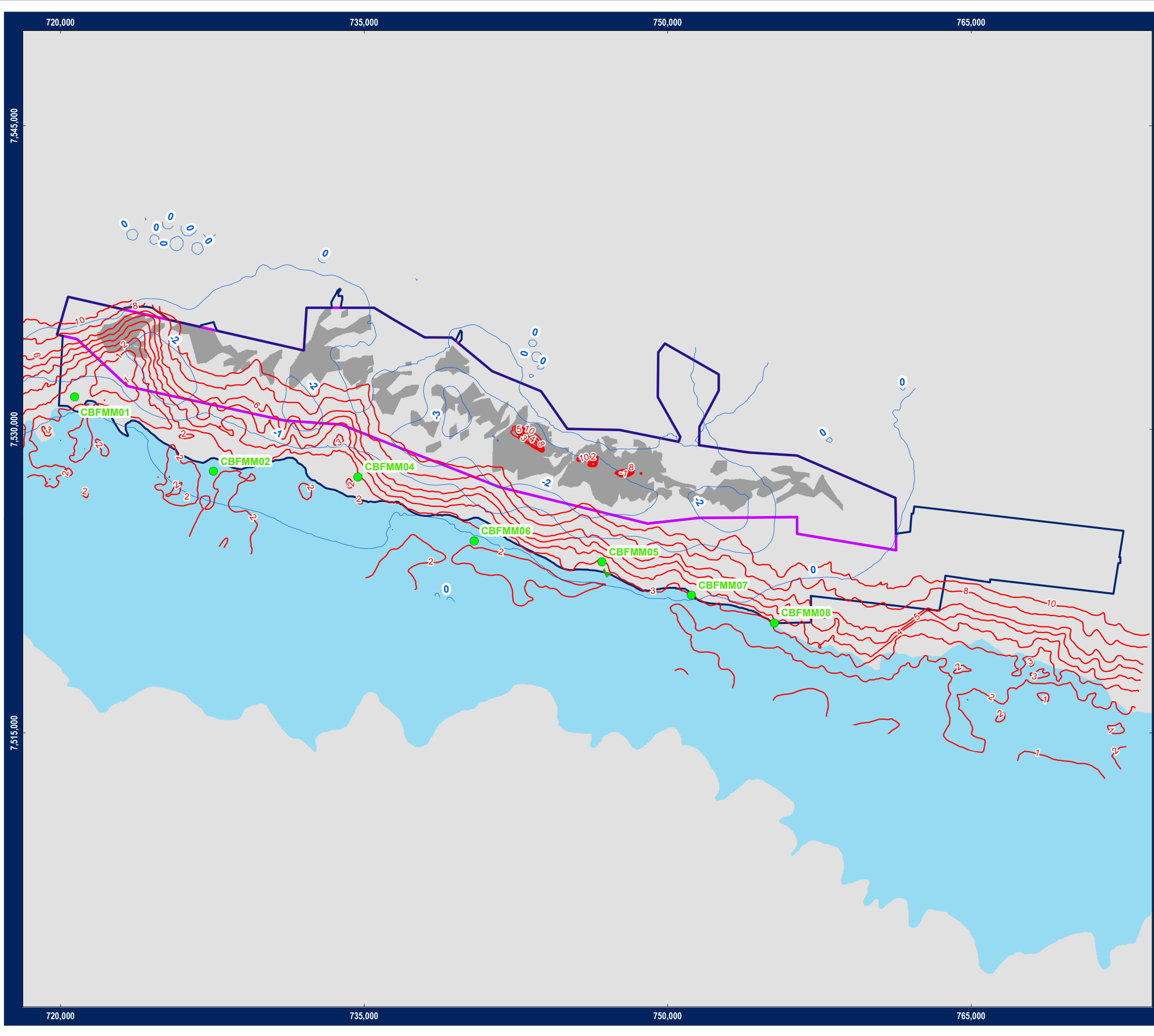


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Figure 20: Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – Post Closure 2054

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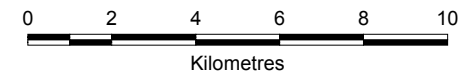




LEGEND

- MS 899 bores
- Change in watertable due to mining.
- Depth to watertable (Natural) baseline_mbgf
- CB Mine Area - MS899
- CB Project Area - MS899
- Fortescue Marsh boundary
- Impacts to Samphire – Drawdown greater than 3m in areas where the natural groundwater was 0-5 mbgl.
- Impacts to Mulga – Mounding within 2m of the ground surface where the natural groundwater was below 2mbgl.

Data Source(s):
 Marsh data sourced from Enviro Australia, (2001).
 Directory of Important Wetlands in Australia
 Observation wells, mine plan data sourced from FMG (2013)



Post Closure 2054

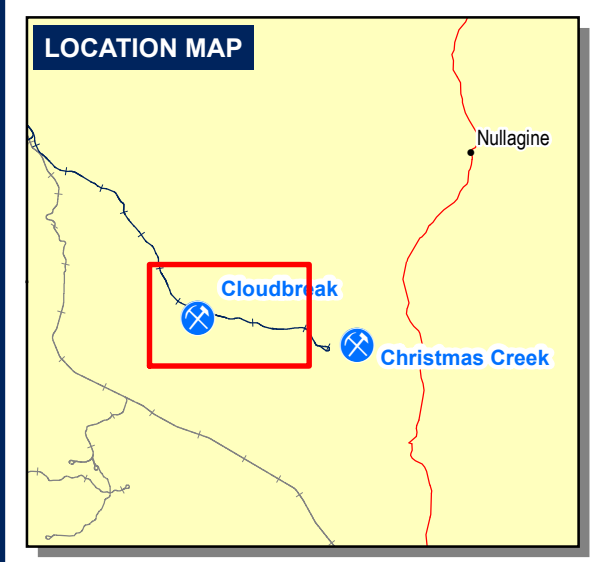
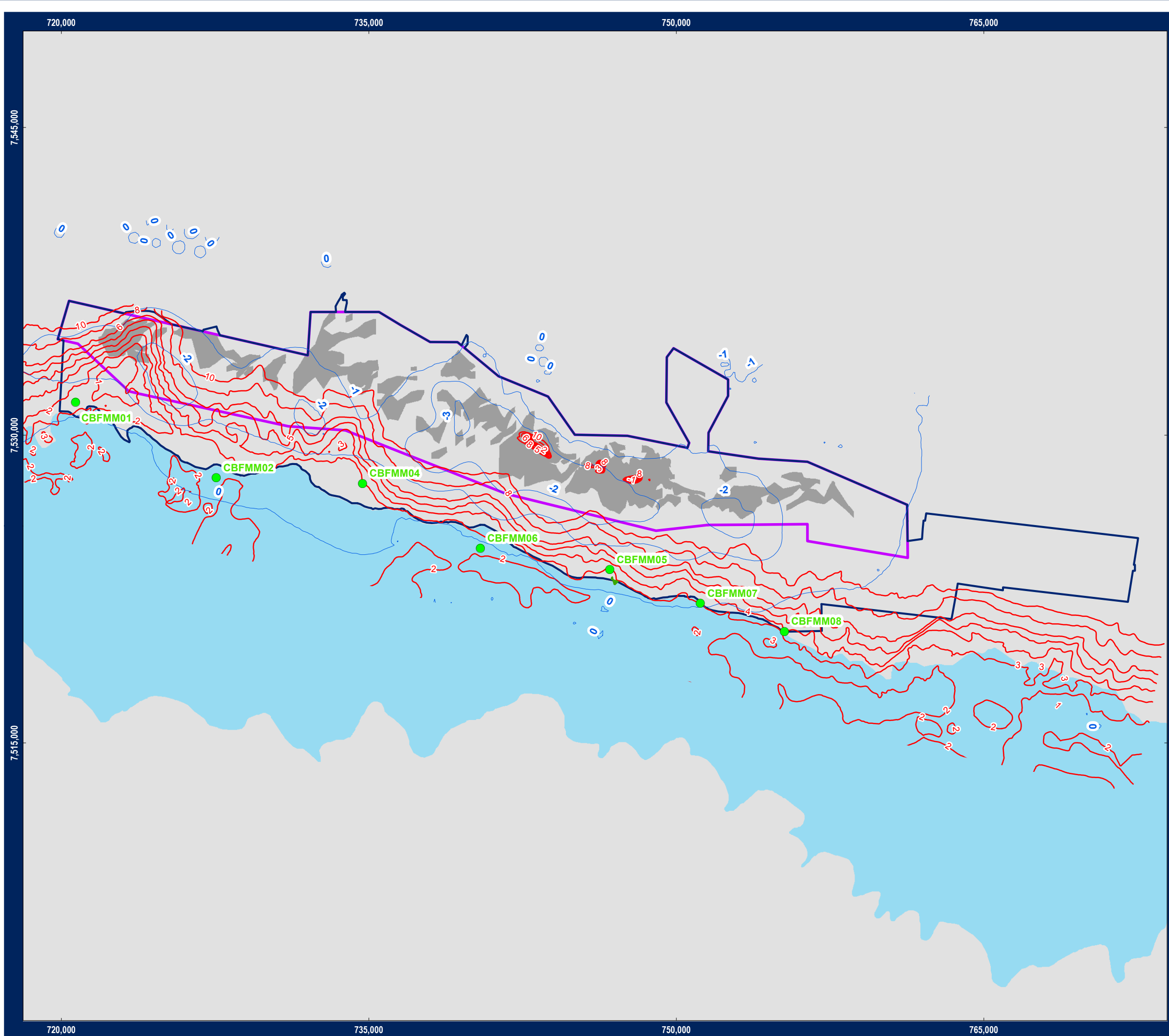
Requested By: Fiona Rowland	Date: 23/09/2014
Drawn By: A.Moore	Size: A3L
Revised By: pmastalir	Revision: 0
Approved By: Chris Whyte	Confidentiality: 1
Scale: 1:180,000	
Coordinate System: GDA 1994 MGA Zone 50	
Document Name: CB_MP_HY_0073.021_r0_2054	

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Figure 21: Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – Post Closure 2064

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- LEGEND**
- MS 899 bores
 - Change in watertable due to mining.
 - Depth to watertable (Natural) baseline_mbgf
 - ▭ CB Mine Area - MS899
 - ▭ CB Project Area - MS899
 - ▭ Fortescue Marsh boundary
- Impacts to Samphire – Drawdown greater than 3m in areas where the natural groundwater was 0-5 mbgl.**
- Impacts to Mulga – Mounding within 2m of the ground surface where the natural groundwater was below 2mbgl.**

Data Source(s):
 Marsh data sourced from Enviro Australia, (2001).
 Directory of Important Wetlands in Australia
 Observation wells, mine plan data sourced from FMG (2013)

Post Closure 2064

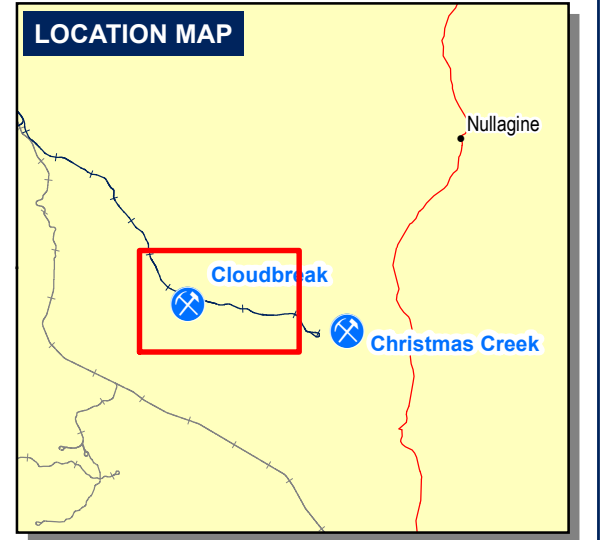
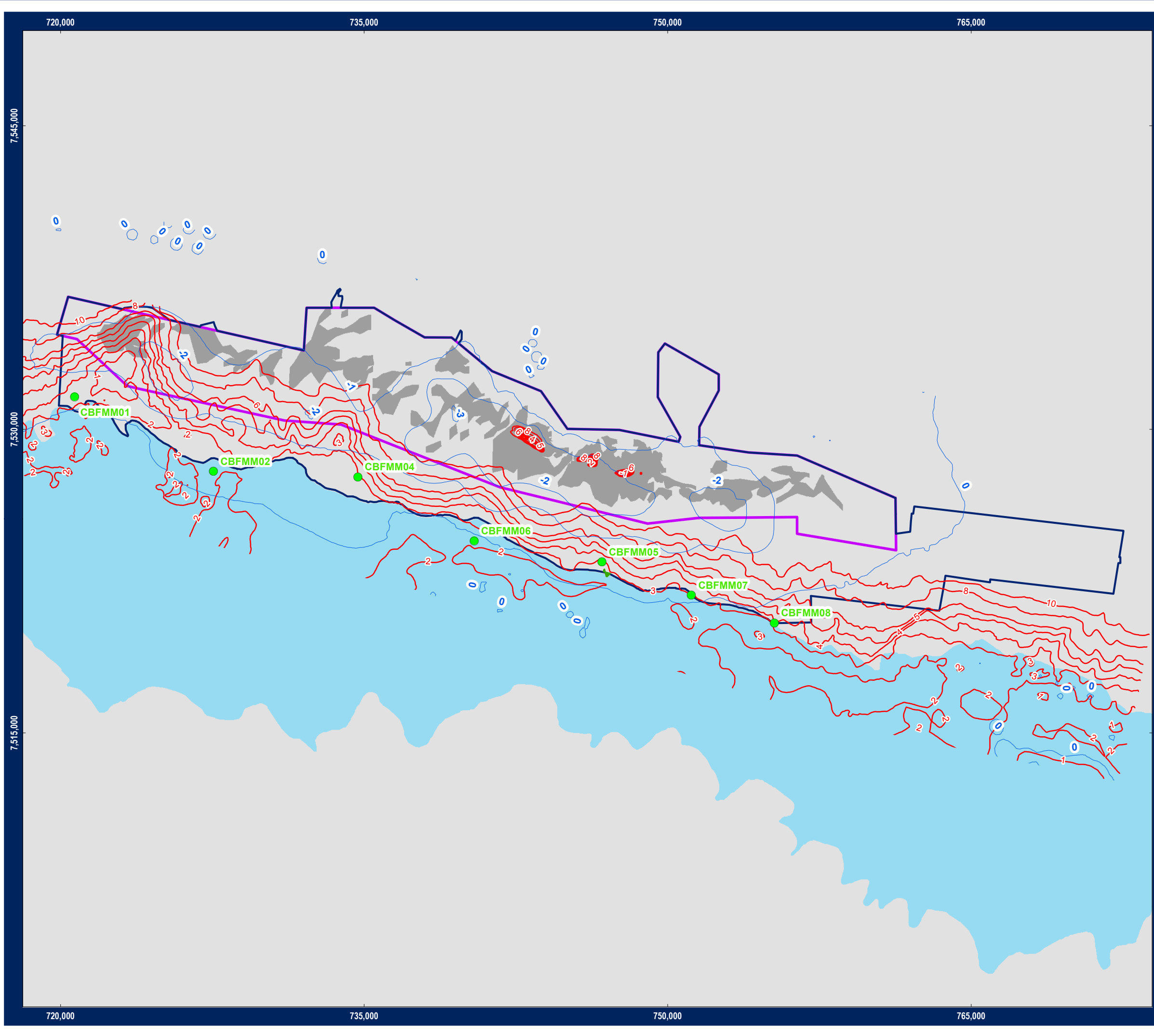
Requested By: Fiona Rowland	Date: 23/09/2014
Drawn By: A.Moore	Size: A3L
Revised By: pmastalir	Revision: 0
Approved By: Chris Whyte	Confidentiality: 1
Scale: 1:180,000	
Coordinate System: GDA 1994 MGA Zone 50	
Document Name: CB_MP_HY_0073.020_r0_2064	

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Figure 22: Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – Post Closure 2074

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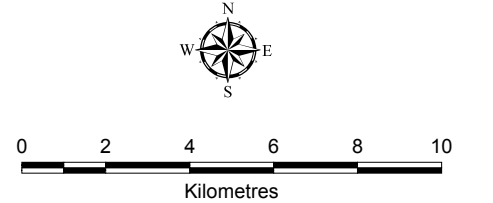




LEGEND

- MS 899 bores
 - Change in watertable due to mining.
 - Depth to watertable (Natural) baseline_mbgf
 - CB Mine Area - MS899
 - CB Project Area - MS899
 - Fortescue Marsh boundary
- Impacts to Samphire – Drawdown greater than 3m in areas where the natural groundwater was 0-5 mbgl.**
-
- Impacts to Mulga – Mounding within 2m of the ground surface where the natural groundwater was below 2mbgl.**
-

Data Source(s):
 Marsh data sourced from Enviro Australia, (2001).
 Directory of Important Wetlands in Australia
 Observation wells, mine plan data sourced from FMG (2013)



Post Closure 2074

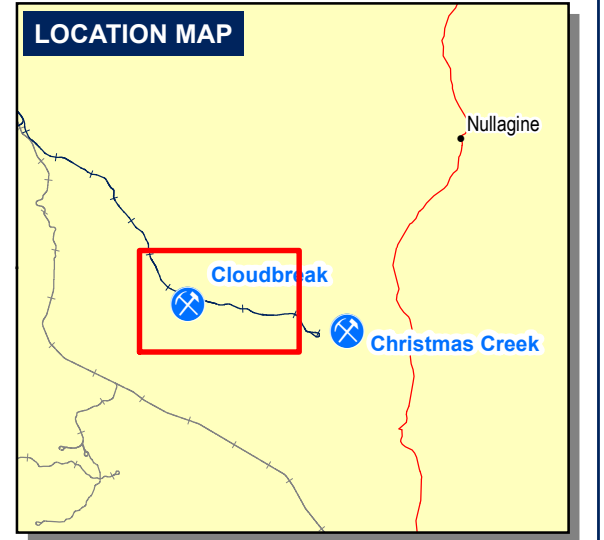
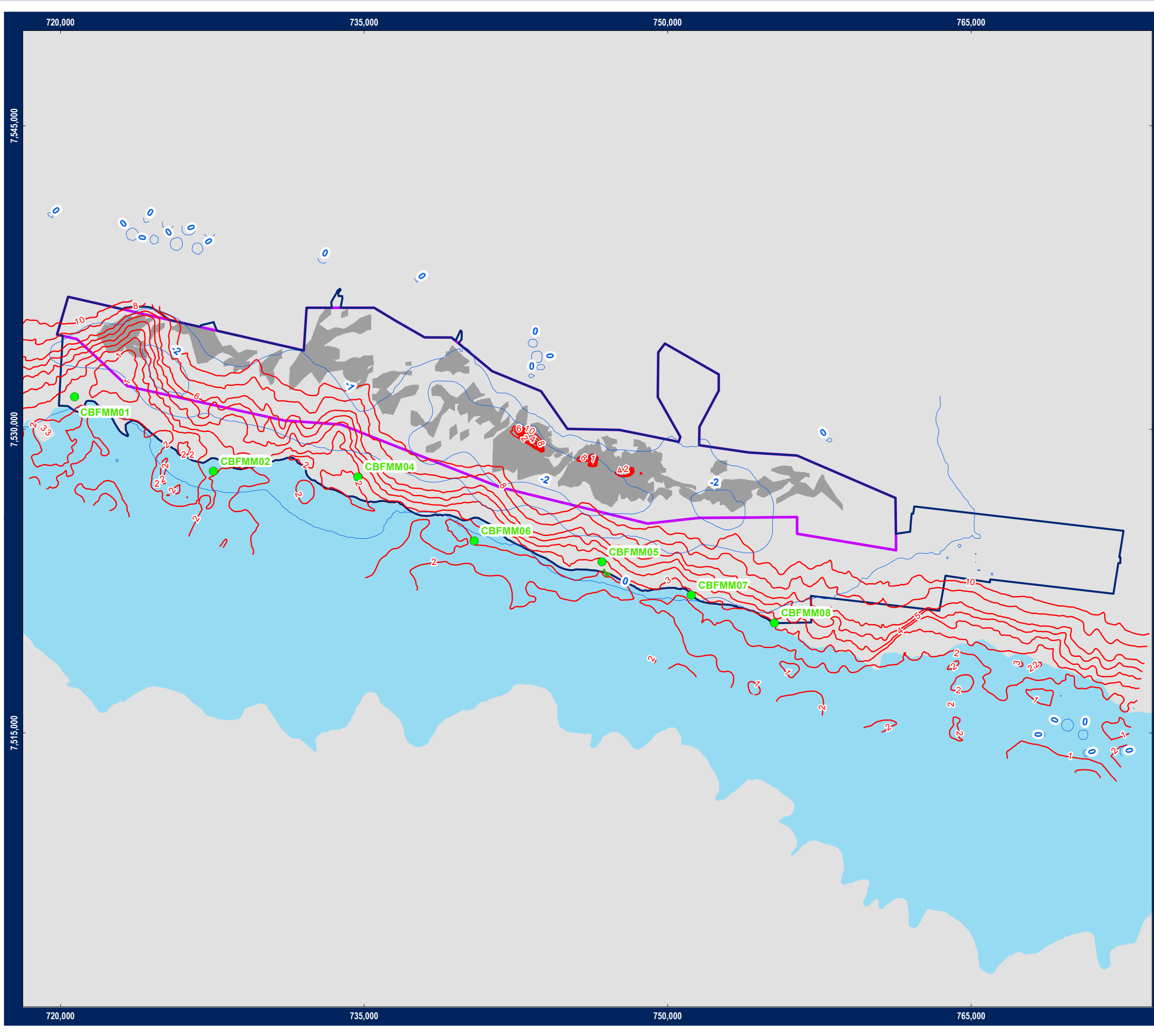
Requested By: Fiona Rowland	Date: 23/09/2014
Drawn By: A.Moore	Size: A3L
Revised By: pmastalir	Revision: 0
Approved By: Chris Whyte	Confidentiality: 1
Scale: 1:180,000	
Coordinate System: GDA 1994 MGA Zone 50	
Document Name: CB_MP_HY_0073.019_r0_2074	

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Figure 23: Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – Post Closure 2084

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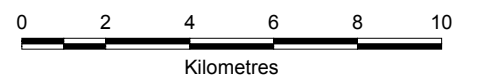




LEGEND

- MS 899 bores
 - Change in watertable due to mining.
 - Depth to watertable (Natural) baseline_mbgf
 - CB Mine Area - MS899
 - CB Project Area - MS899
 - Fortescue Marsh boundary
- Impacts to Samphire – Drawdown greater than 3m in areas where the natural groundwater was 0-5 mbgl.**
-
- Impacts to Mulga – Mounding within 2m of the ground surface where the natural groundwater was below 2mbgl.**
-

Data Source(s):
 Marsh data sourced from Enviro Australia, (2001).
 Directory of Important Wetlands in Australia
 Observation wells, mine plan data sourced from FMG (2013)



Post Closure 2084

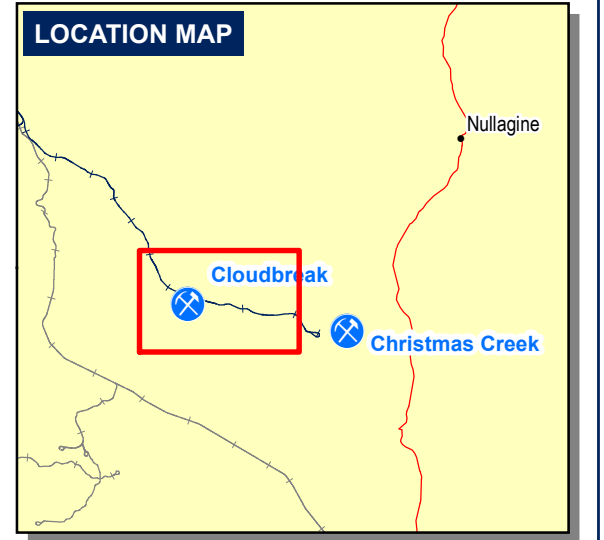
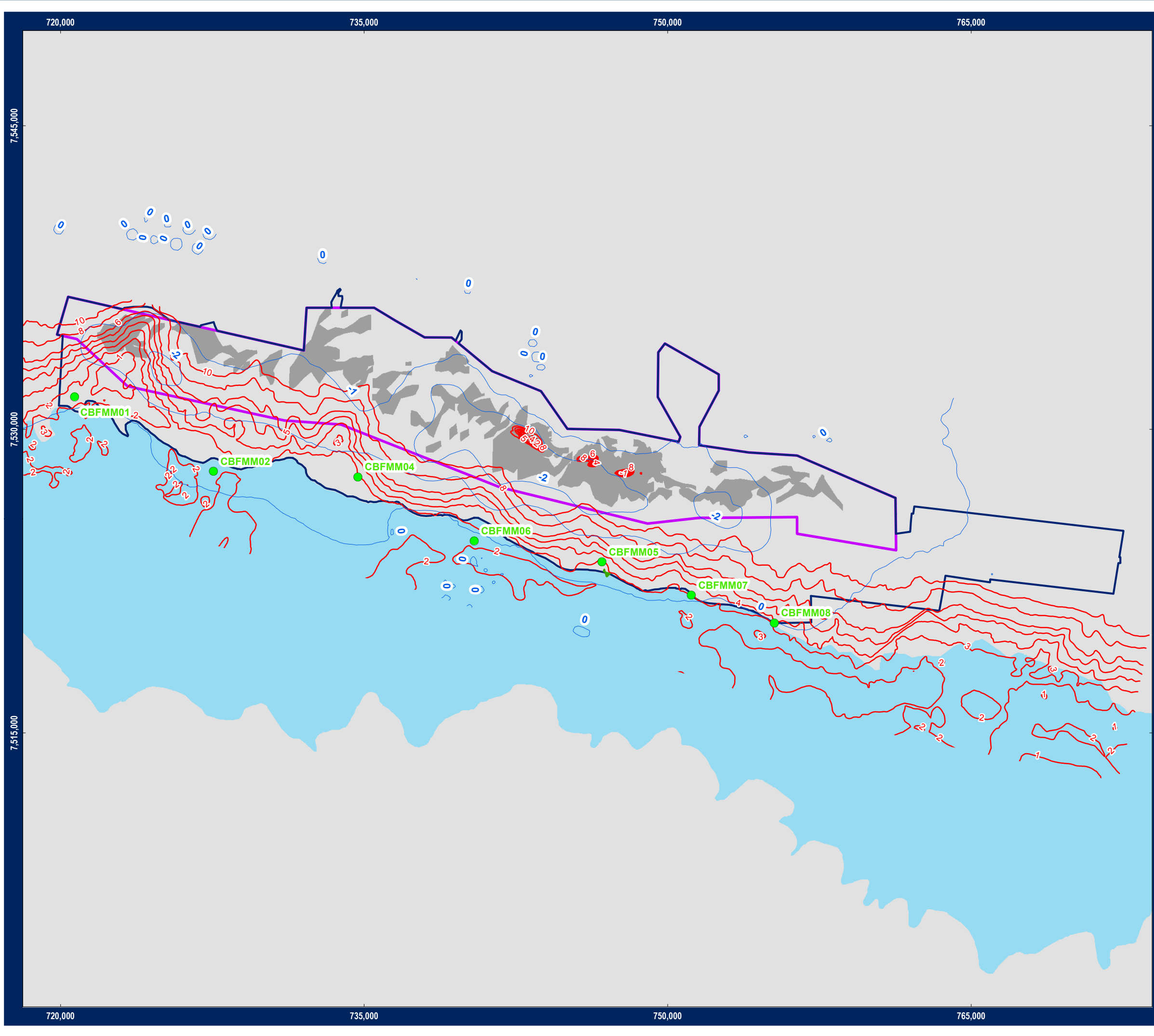
Requested By: Fiona Rowland	Date: 23/09/2014
Drawn By: A.Moore	Size: A3L
Revised By: pmastalir	Revision: 0
Approved By: Chris Whyte	Confidentiality: 1
Scale: 1:180,000	
Coordinate System: GDA 1994 MGA Zone 50	
Document Name: CB_MP_HY_0073.018_r0_2084	

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Figure 24: Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – Post Closure 2104

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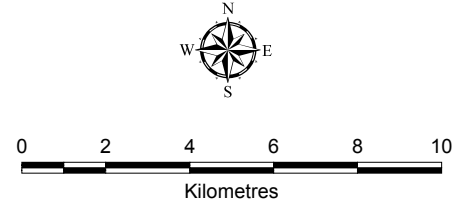




LEGEND

- MS 899 bores
 - Change in watertable due to mining.
 - Depth to watertable (Natural) baseline_mbgf
 - CB Mine Area - MS899
 - CB Project Area - MS899
 - Fortescue Marsh boundary
- Impacts to Samphire – Drawdown greater than 3m in areas where the natural groundwater was 0-5 mbgl.**
-
- Impacts to Mulga – Mounding within 2m of the ground surface where the natural groundwater was below 2mbgl.**
-

Data Source(s):
 Marsh data sourced from Enviro Australia, (2001).
 Directory of Important Wetlands in Australia
 Observation wells, mine plan data sourced from FMG (2013)



Post Closure 2104

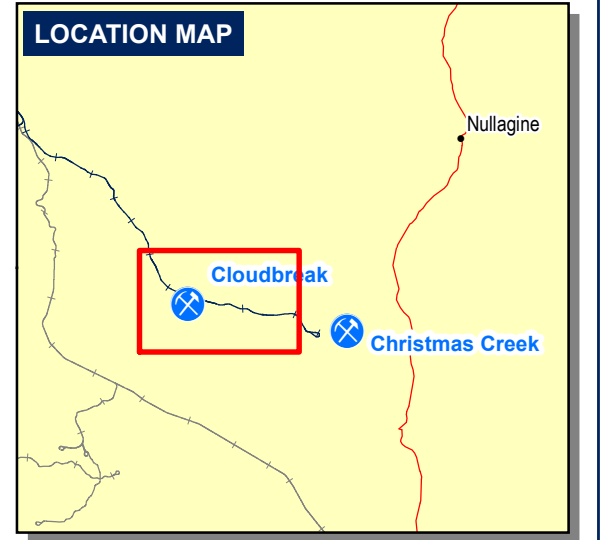
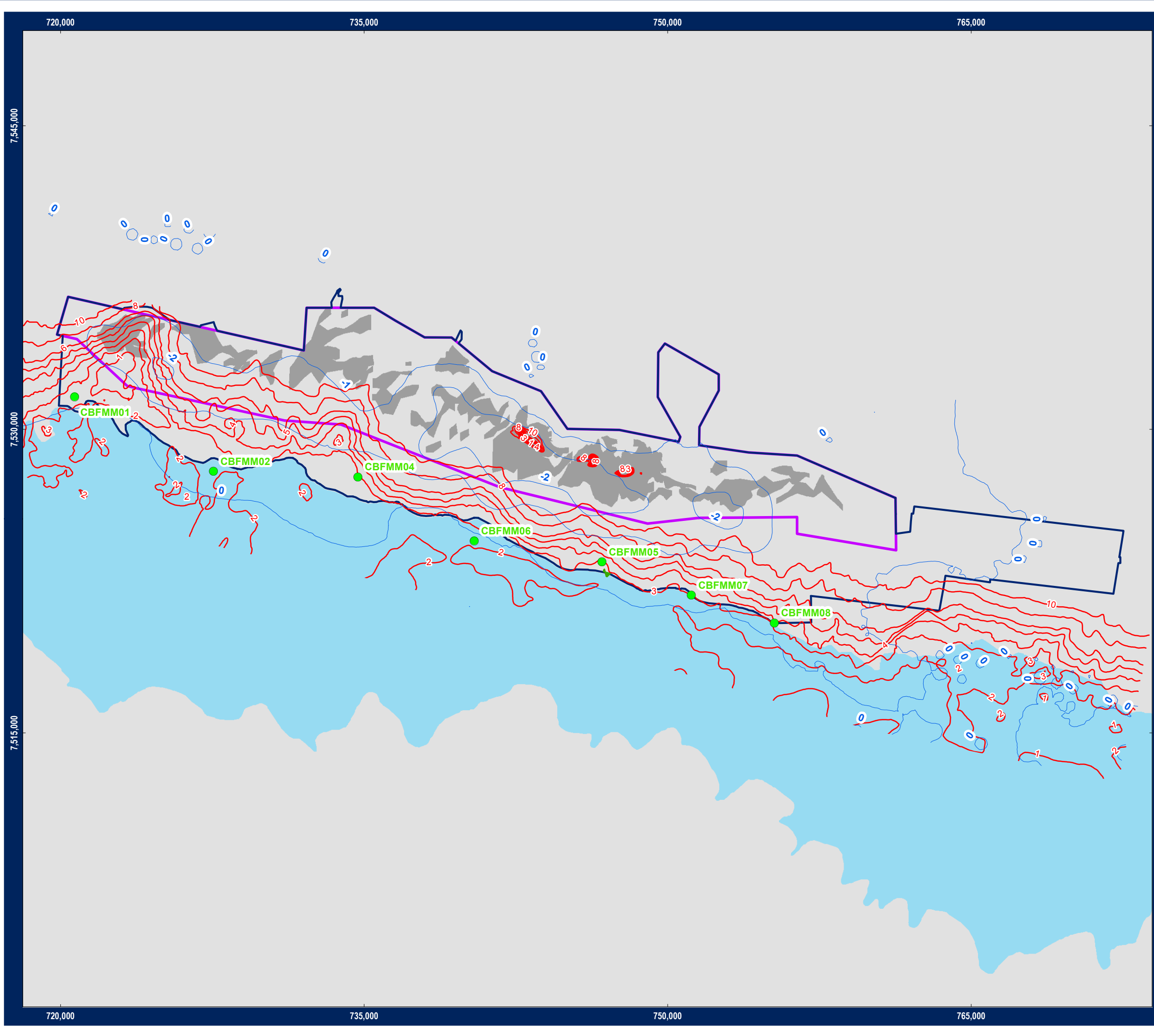
Requested By: Fiona Rowland	Date: 23/09/2014
Drawn By: A.Moore	Size: A3L
Revised By: pmastalir	Revision: 0
Approved By: Chris Whyte	Confidentiality: 1
Scale: 1:180,000	
Coordinate System: GDA 1994 MGA Zone 50	
Document Name: CB_MP_HY_0073.017_r0_2104	

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Figure 25: Predicted Natural Groundwater Levels, Mounding and Drawdown Levels and Vegetation Health Impacts – Post Closure 2124

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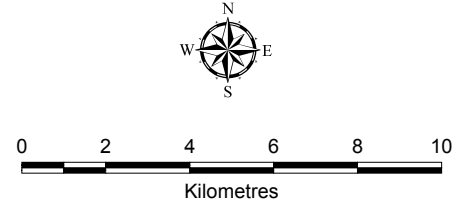




LEGEND

- MS 899 bores
- Change in watertable due to mining.
- Depth to watertable (Natural) baseline_mbgf
- CB Mine Area - MS899
- CB Project Area - MS899
- Fortescue Marsh boundary
- Impacts to Samphire – Drawdown greater than 3m in areas where the natural groundwater was 0-5 mbgf.
- Impacts to Mulga – Mounding within 2m of the ground surface where the natural groundwater was below 2mbgf.

Data Source(s):
 Marsh data sourced from Enviro Australia, (2001).
 Directory of Important Wetlands in Australia
 Observation wells, mine plan data sourced from FMG (2013)



Post Closure 2124

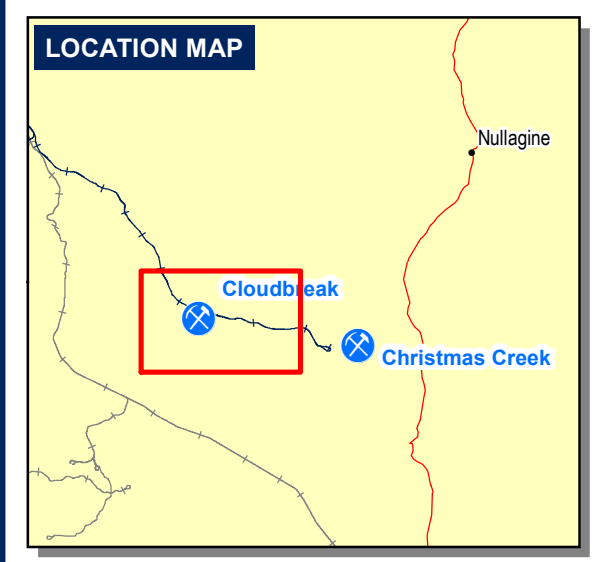
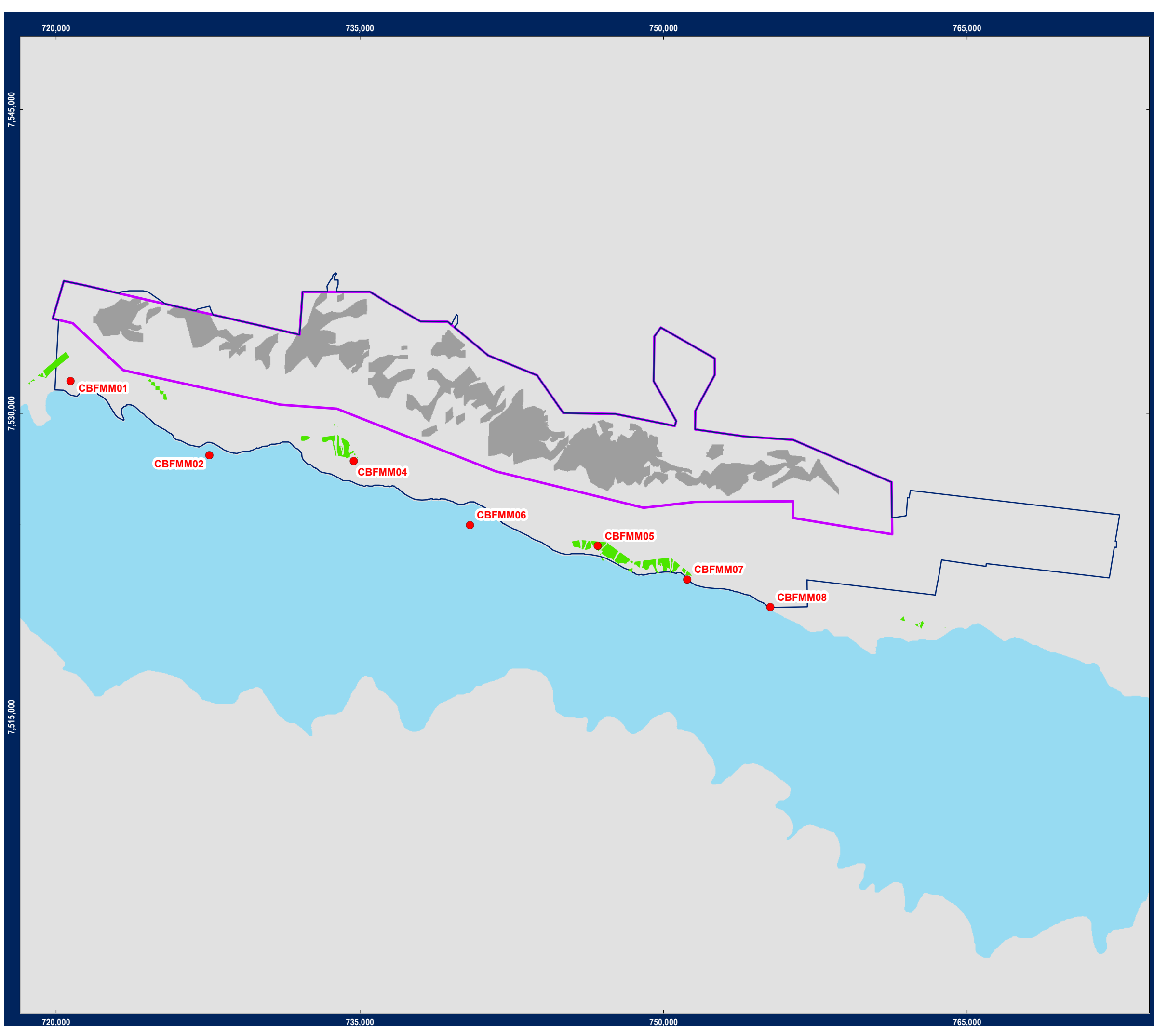
Requested By: Fiona Rowland	Date: 23/09/2014
Drawn By: A.Moore	Size: A3L
Revised By: pmastalir	Revision: 0
Approved By: Chris Whyte	Confidentiality: 1
Scale: 1:180,000	
Coordinate System: GDA 1994 MGA Zone 50	
Document Name: CB_MP_HY_0073.016_r0_2124	

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Figure 26: Indirect Impacts to Mulga for Two or More Consecutive Years and Outside of the Mine Area

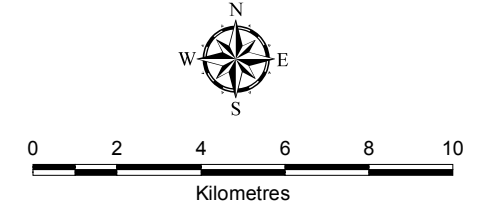
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- LEGEND**
- MS 899 Bores
 - Impacts to Mulga - Mounding within 2m of the ground surface where the natural groundwater was below 2 mbgl, for two or more consecutive years
 - ▭ CB Mine Area - MS899
 - ▭ CB Project Area - MS899
 - Mine Plan
 - Fortescue Marsh boundary

Data Source(s):
 Marsh data sourced from Enviro Australia,(2001).
 Directory of Important Wetlands in Australia
 Mine plan data sourced from FMG (2013)



**Indirect Impacts to Mulga for Two or More Consecutive Years and outside of the Mine Area
 Cloudbreak**

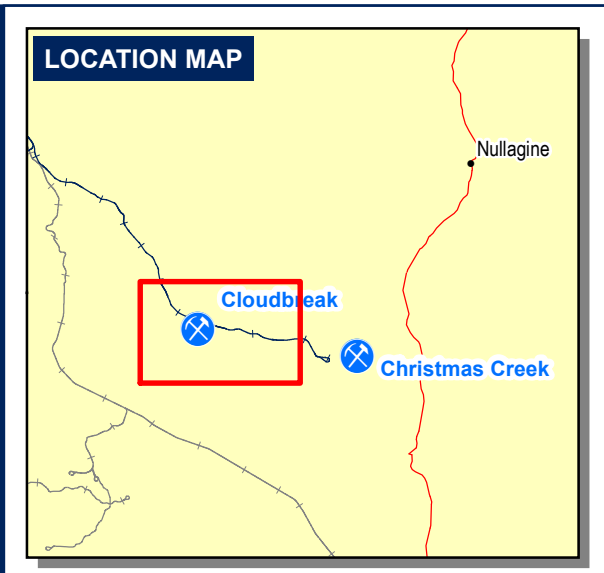
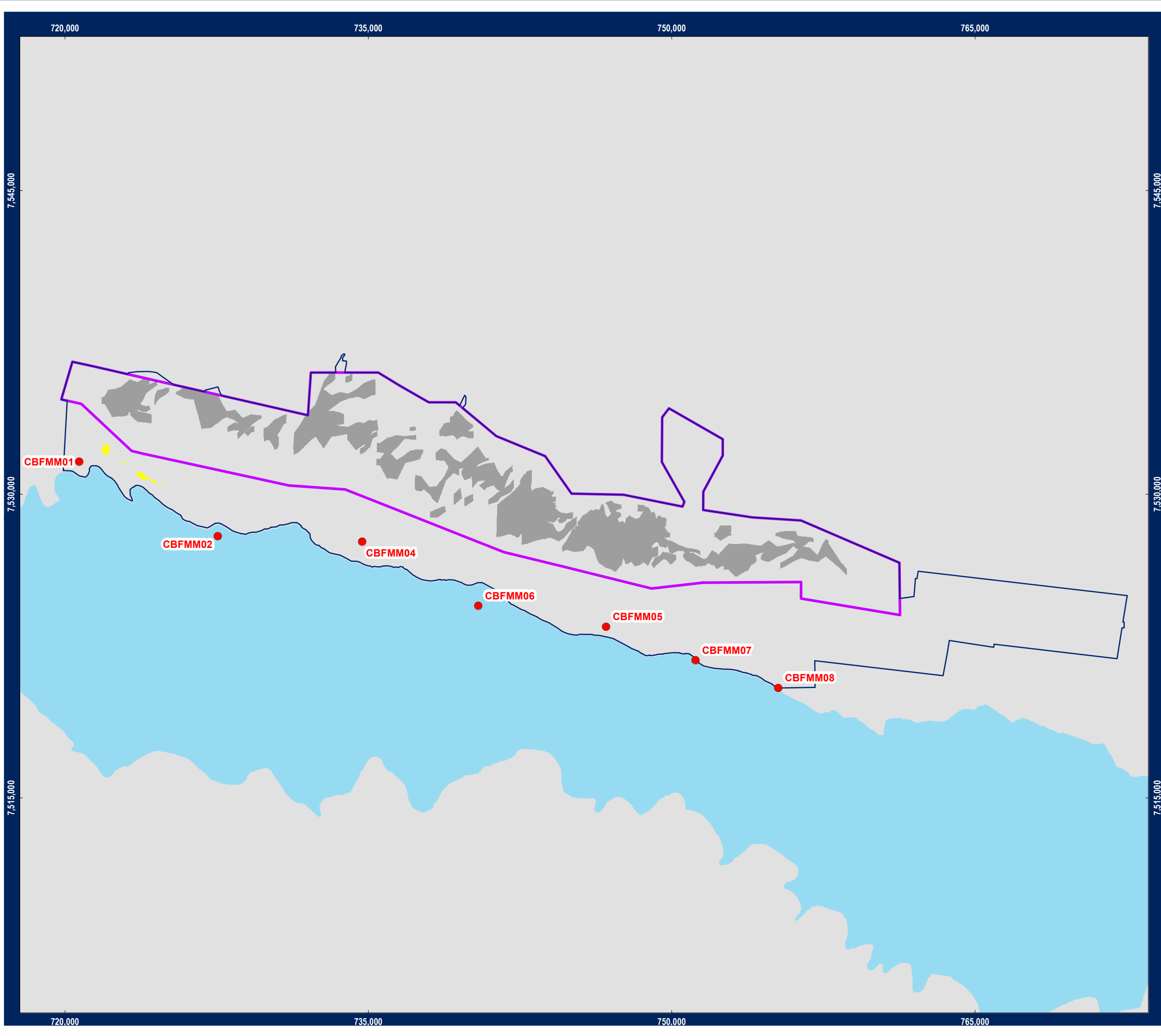
Requested By: Fiona Rowland	Date: 15/09/2014
Drawn By: A.Moore	Size: A3L
Revised By: admoore	Revision: 1
Approved By: B. Ralebala	Confidentiality: 1
Scale: 1:180,000	
Coordinate System: GDA 1994 MGA Zone 50	
Document Name: CB_MP_HY_0073.001_r2_Consec	

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Figure 27: Indirect Impacts to Samphire for Two or More Consecutive Years and Outside of the Mine Area

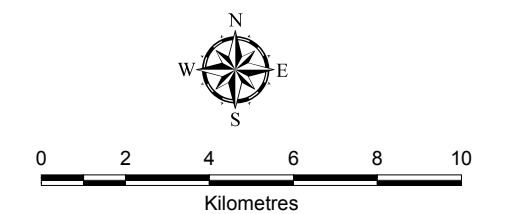
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- LEGEND**
- MS 899 Bores
 - Impacts to Samphire – Drawdown greater than 3m in areas where the natural groundwater was 0-5mbgl.
 - ▭ CB Mine Area - MS899
 - ▭ CB Project Area - MS899
 - Mine Plan
 - ▭ Fortescue Marsh boundary

Data Source(s):
 Marsh data sourced from Enviro Australia, (2001).
 Directory of Important Wetlands in Australia
 Mine plan data sourced from FMG (2013)



Indirect Impacts to Samphire for Two or More Consecutive Years and Outside of the Mine Area/a
 Cloudbreak

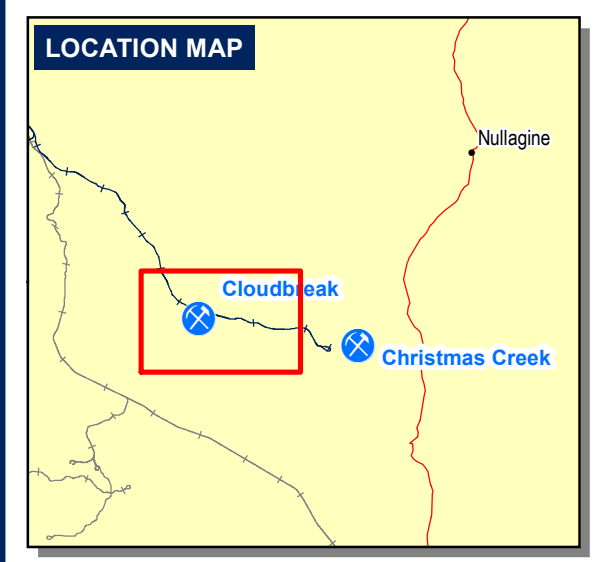
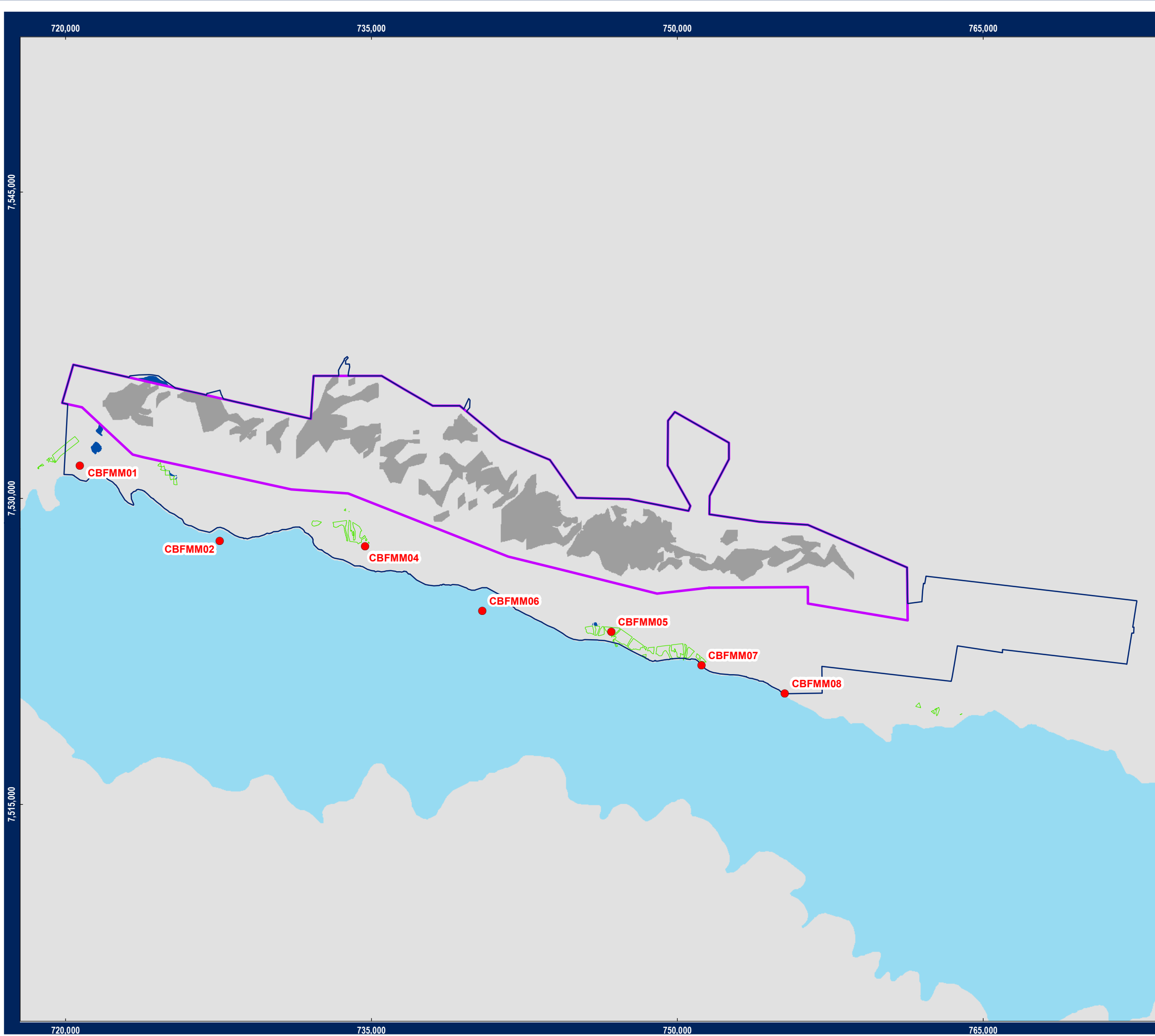
Requested By: Fiona Rowland	Date: 23/09/2014
Drawn By: A.Moore	Size: A3L
Revised By: pmastalir	Revision: 1
Approved By: B. Ralebala	Confidentiality: 1
Scale: 1:180,000	
Coordinate System: GDA 1994 MGA Zone 50	
Document Name: CB_MP_HY_0073.015_r1_Consec_Drawdown	

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Figure 28: Areas Subject to Mounding for Two or More Consecutive Years – Comparison with the MS 899 Approval and the Proposal for Increased Abstraction/Injection to 150GL/a

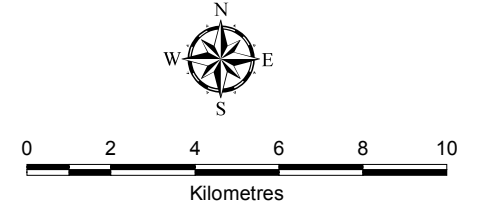
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- LEGEND**
- MS 899 Bores
 - Proposal to 150GL/a - Impacts to Mulga - Mounding within 2m of the ground surface where the natural groundwater was below 2 mbgl, for two or more consecutive years
 - Current Approval - Areas subject to mounding for two or more consecutive years
 - CB Mine Area - MS899
 - CB Project Area - MS899
 - Mine Plan
 - Fortescue Marsh boundary

Data Source(s):
 Marsh data sourced from Enviro Australia, (2001).
 Directory of Important Wetlands in Australia
 Mine plan data sourced from FMG (2013)



Areas subject to mounding for two or more consecutive years – Comparison with the MS 899 approval and the Proposal for Increased Abstraction/Injection to 150GL/a Cloudbreak

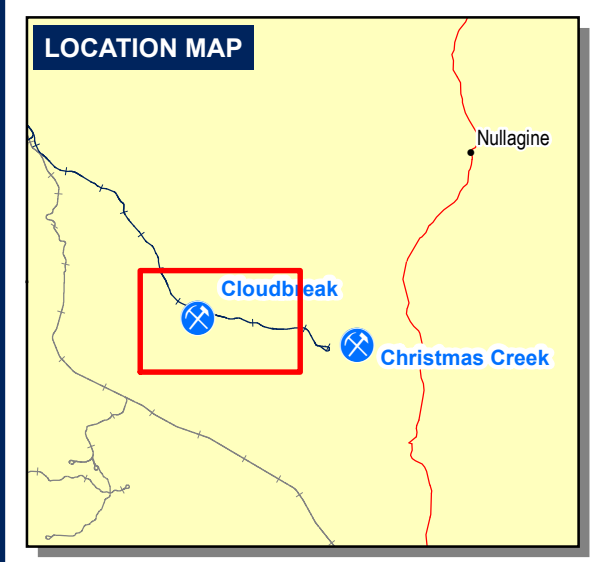
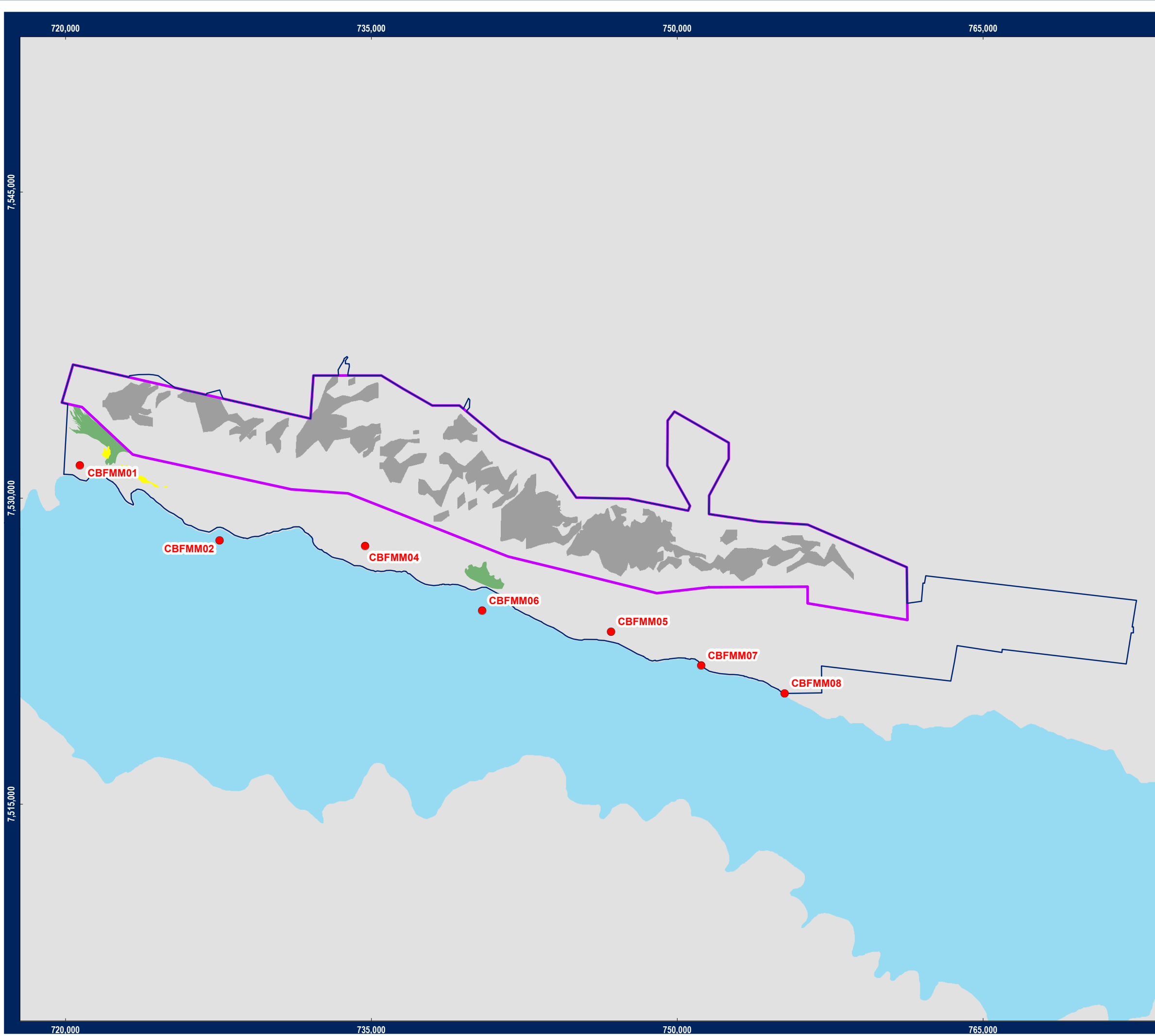
Requested By: Fiona Rowland	Date: 18/09/2014
Drawn By: A.Moore	Size: A3L
Revised By: admoore	Revision: 0
Approved By: B. Ralebala	Confidentiality: 1
Scale: 1:180,000	
Coordinate System: GDA 1994 MGA Zone 50	
Document Name: CB_MP_HY_0073.014_r0	

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Figure 29: Areas Subject to Drawdown for Two or More Consecutive Years – Comparison with the MS 899 Approval and the Proposal for Increased Abstraction/Injection to 150GL/a

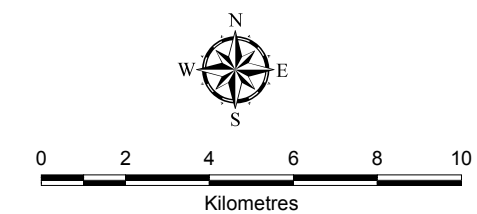
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- LEGEND**
- MS 899 Bores
 - Impacts to Samphire – Drawdown greater than 3m in areas where the natural groundwater was 0-5mbgl.
 - Current Approval - Areas subject to mounding for two or more consecutive years
 - ▭ CB Mine Area - MS899
 - ▭ CB Project Area - MS899
 - Mine Plan
 - ▭ Fortescue Marsh boundary

Data Source(s):
 Marsh data sourced from Enviro Australia,(2001).
 Directory of Important Wetlands in Australia
 Mine plan data sourced from FMG (2013)



Areas subject to drawdown for two or more consecutive years – Comparison with the MS 899 approval and the Proposal for Increased Abstraction/Injection to 150GL/a Cloudbreak

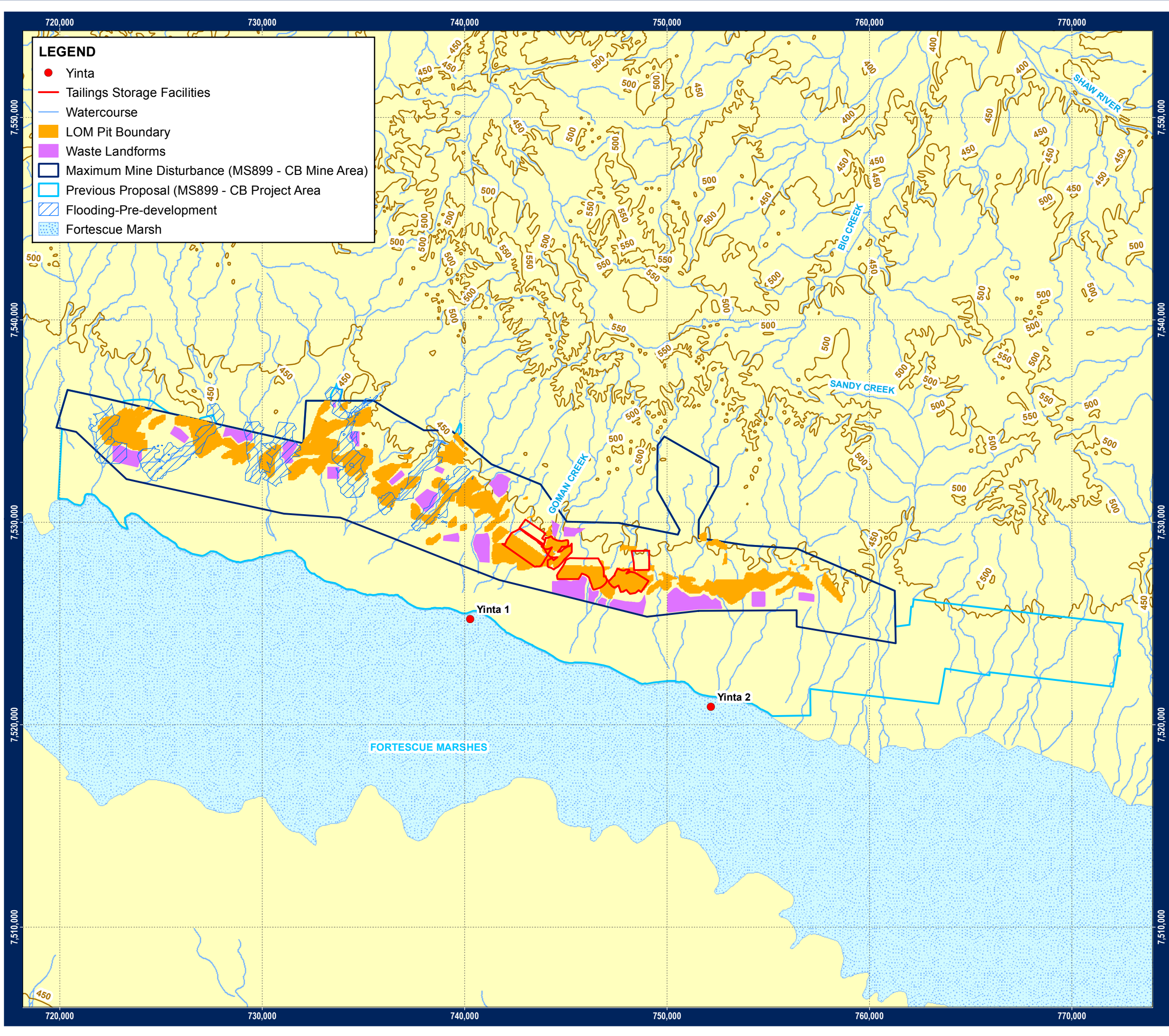
Requested By: Fiona Rowland	Date: 22/09/2014
Drawn By: A.Moore	Size: A3L
Revised By: pmastalir	Revision: 0
Approved By: B. Ralebala	Confidentiality: 1
Scale: 1:180,000	
Coordinate System: GDA 1994 MGA Zone 50	
Document Name: CB_MP_HY_0073.015_r1_Consec_Drawdown	

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Figure 30: Surface Water Features

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LEGEND

- Yinta
- Tailings Storage Facilities
- Watercourse
- LOM Pit Boundary
- Waste Landforms
- Maximum Mine Disturbance (MS899 - CB Mine Area)
- Previous Proposal (MS899 - CB Project Area)
- ▨ Flooding-Pre-development
- ▤ Fortescue Marsh

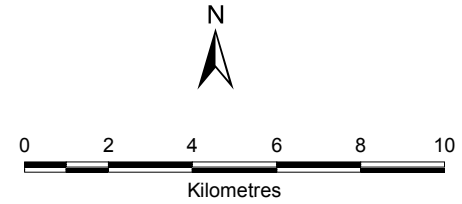
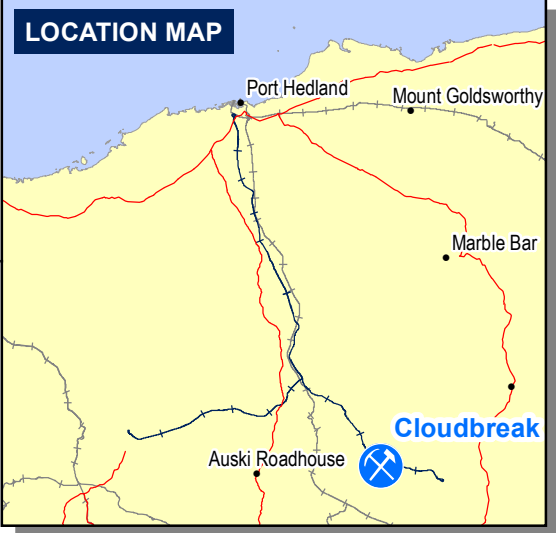


Figure 16
Surface Water Features

Requested By: F Rowland	Date: 29/11/2013
Drawn By: R Maconachie	Size: A3L
Revised By: admoore	Revision: 0
Approved By:	Confidentiality: 1
Scale: 1:180,000	
Coordinate System: GDA 1994 MGA Zone 50	
Document Name: CB_MP_EN_0279.004	

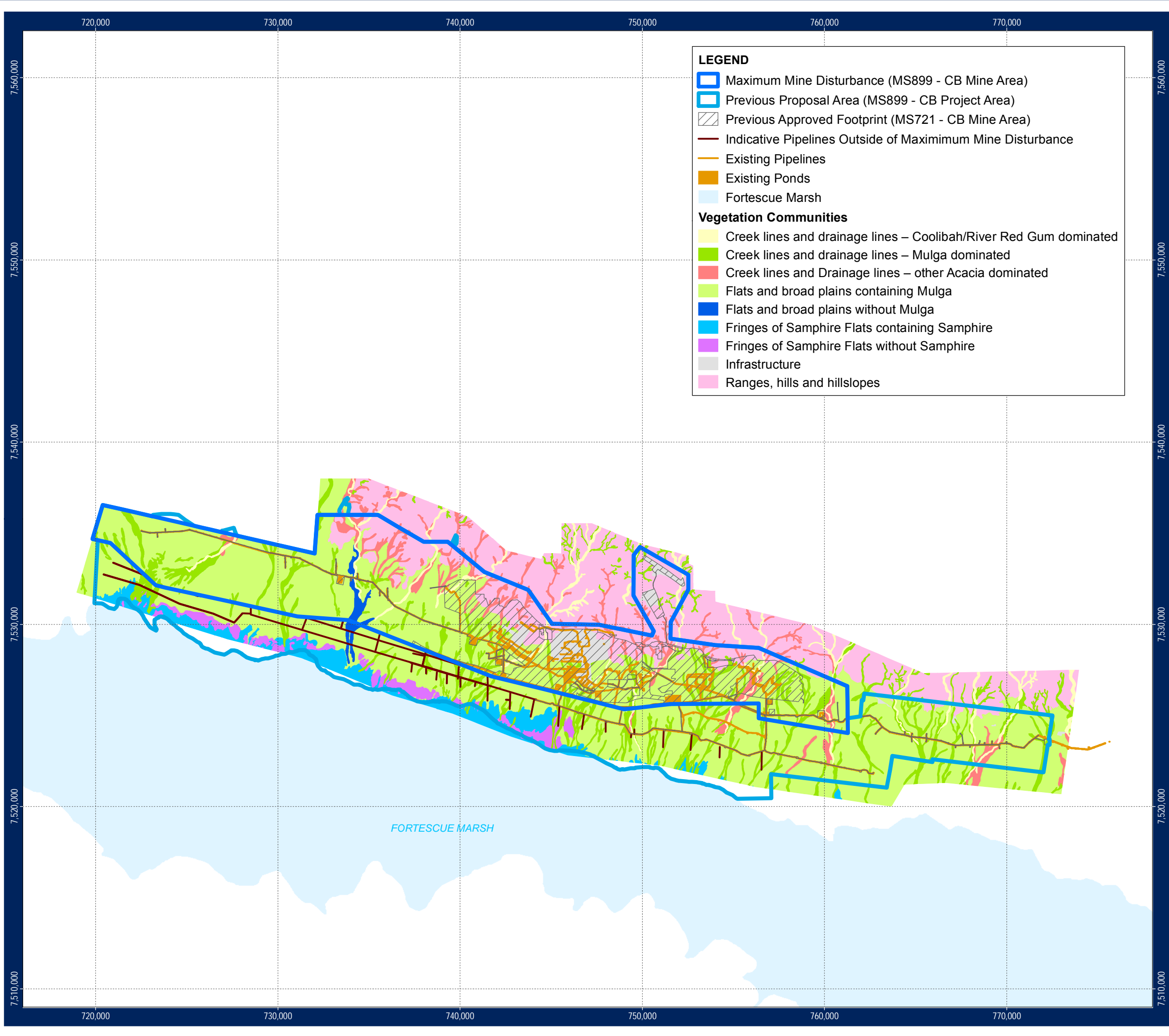
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Figure 31: Vegetation Mapping



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LEGEND

- Maximum Mine Disturbance (MS899 - CB Mine Area)
- Previous Proposal Area (MS899 - CB Project Area)
- Previous Approved Footprint (MS721 - CB Mine Area)
- Indicative Pipelines Outside of Maximum Mine Disturbance
- Existing Pipelines
- Existing Ponds
- Fortescue Marsh

Vegetation Communities

- Creek lines and drainage lines – Coolibah/River Red Gum dominated
- Creek lines and drainage lines – Mulga dominated
- Creek lines and Drainage lines – other Acacia dominated
- Flats and broad plains containing Mulga
- Flats and broad plains without Mulga
- Fringes of Samphire Flats containing Samphire
- Fringes of Samphire Flats without Samphire
- Infrastructure
- Ranges, hills and hillslopes

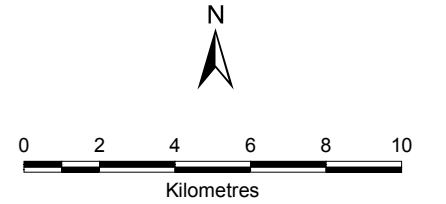
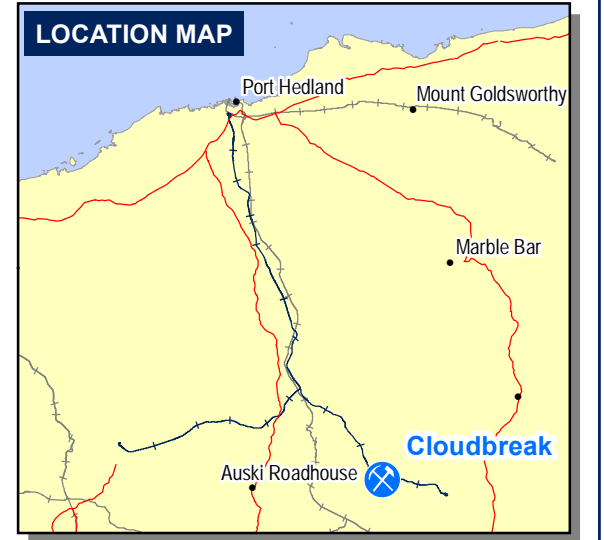


FIGURE 17
Broad Vegetation Mapping

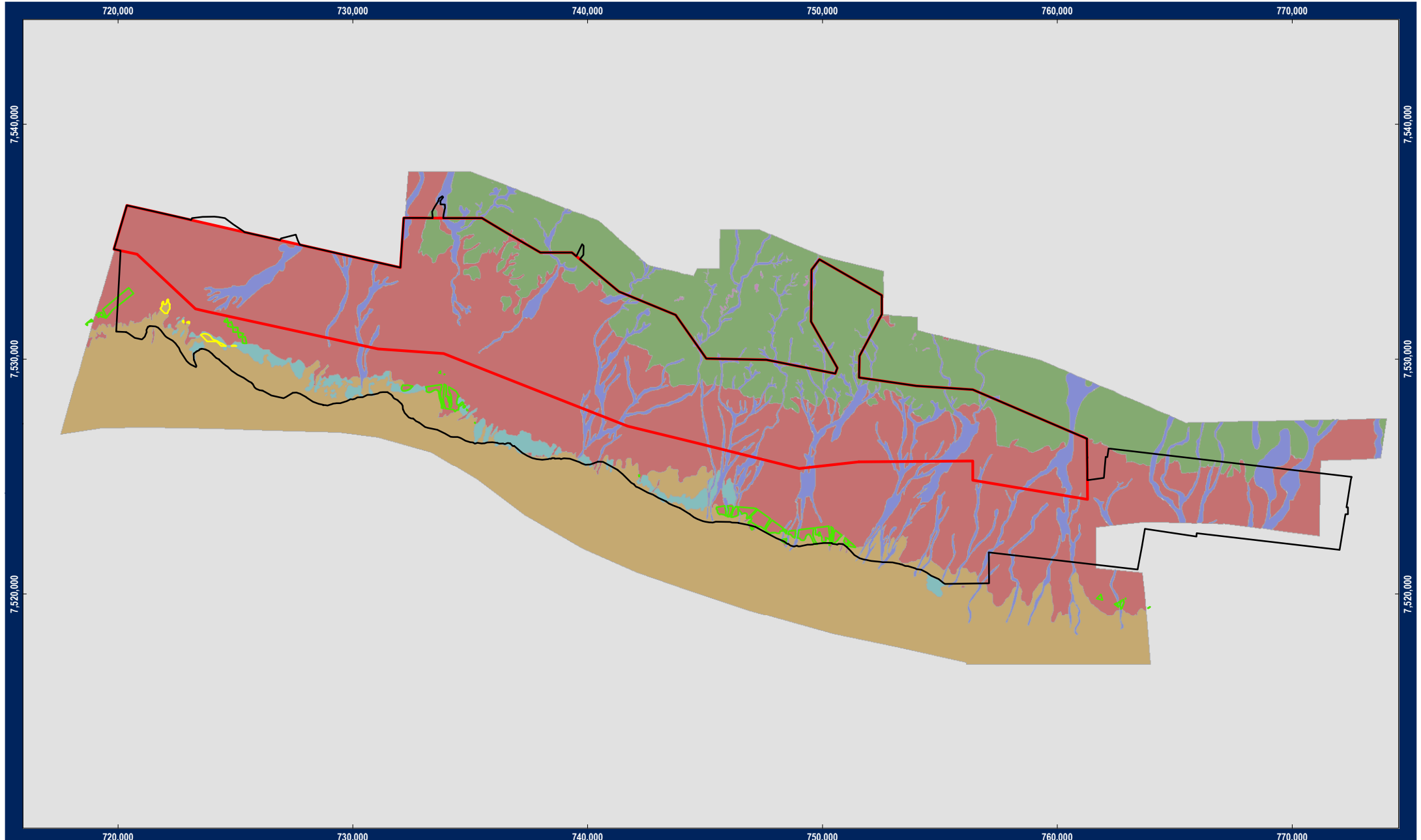
Requested By: A. De Vos	Date: 29/11/2013
Drawn By: PM	Size: A3L
Revised By: admoore	Revision: 0
Approved By:	Confidentiality: 1
Scale: 1:200,000	
Coordinate System: GDA 1994 MGA Zone 50	
Document Name: CB_MP_EN_0279.005	

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Figure 32: Indirect Impacts to Fauna Habitat

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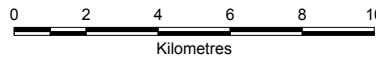


Legend

- CB Mine Area - MS899
- CB Project Area - MS899
- Impacts to Mulga
- Impacts to Samphire

Fauna Mapping

- Drainage Line/River/Creek (Minor / Major)
- Hills/Ranges/Plateaux
- Hummock grassland
- Rocky Escarpments (Ridges/Mesa/Ciffs/Outcrops/Breakaways)
- Samphire/Marsh
- Woodland (Open/Closed)



Requested By: Fiona Rowland
 Drawn By: A.Moore
 Revised By: pmastalir
 Approved By: P.Mastalir
 Scale: 1:210,000
 Coordinate System: GDA 1994 MGA Zone 50
 Document Name: CB_MP_EN_0283.003_r2

Date: 23/09/2014
 Size: A4L
 Revision: 2
 Confidentiality: 1

Indirect Impacts to Fauna Habitat



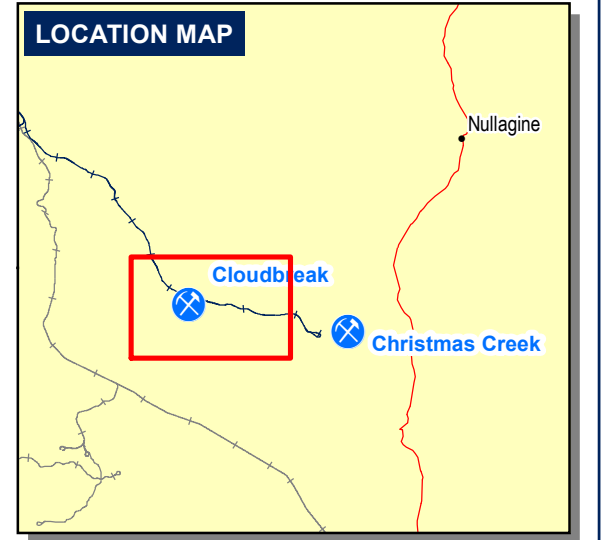
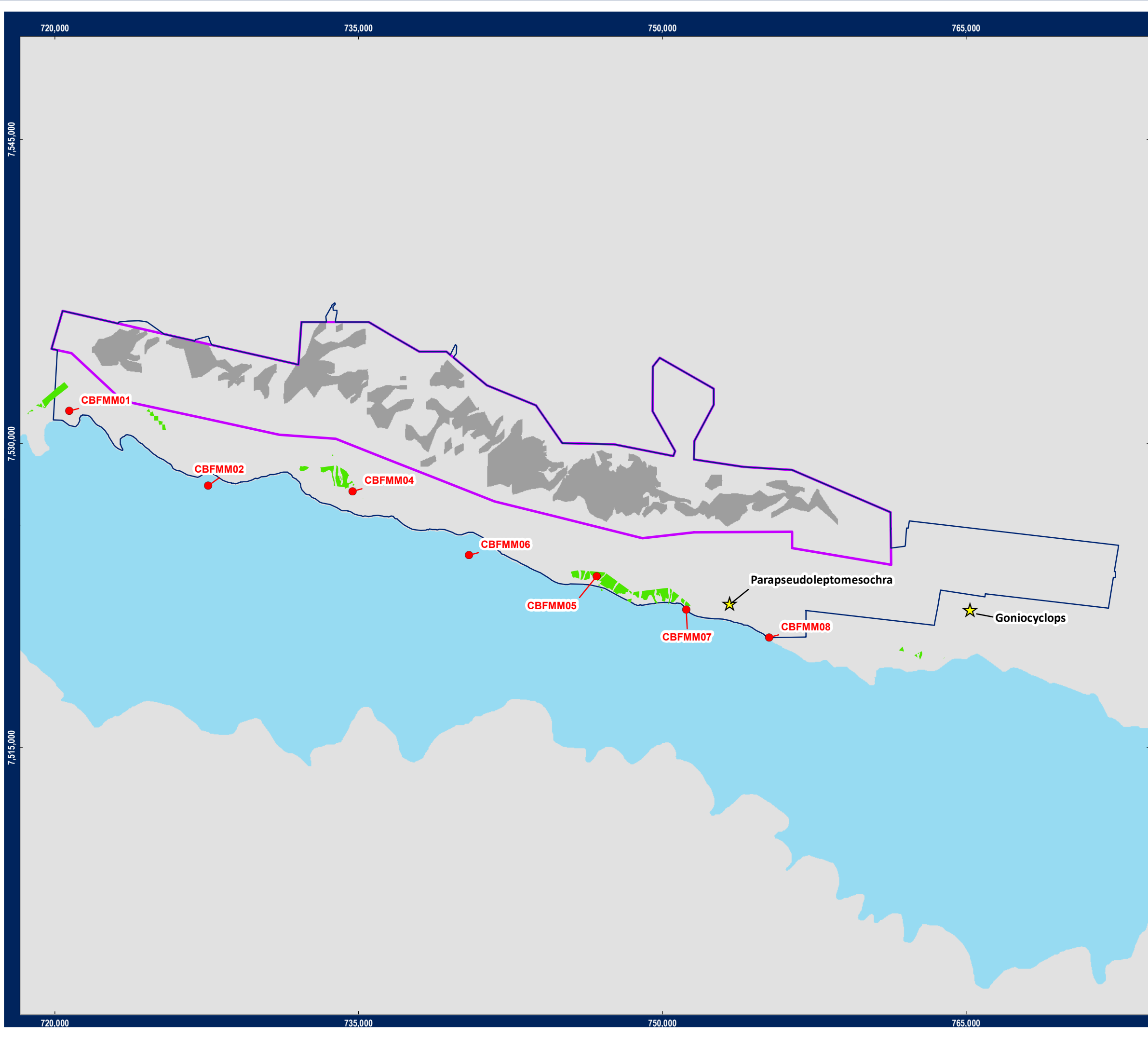
Fortescue Metals Group Ltd
 The New Force in Iron Ore

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Figure 33: Impacts to Stygofauna

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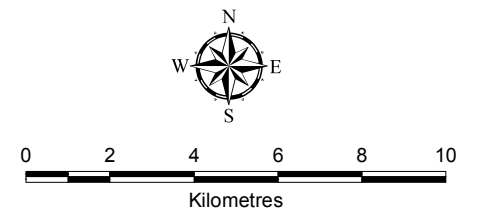




LEGEND

- ★ Impacts to Stygofauna
- MS 899 Bores
- Impacts to Mulga - Mounding within 2m of the ground surface where the natural groundwater was below 2 mbgl, for two or more consecutive years
- ▭ CB Mine Area - MS899
- ▭ CB Project Area - MS899
- Mine Plan
- ▭ Fortescue Marsh boundary

Data Source(s):
 Marsh data sourced from Enviro Australia,(2001).
 Directory of Important Wetlands in Australia
 Mine plan data sourced from FMG (2013)



**Impacts to Stygofauna
Cloudbreak**

Requested By: Fiona Rowland	Date: 18/09/2014
Drawn By: A.Moore	Size: A3L
Revised By: admoore	Revision: 0
Approved By: B. Ralebala	Confidentiality: 1
Scale: 1:180,000	
Coordinate System: GDA 1994 MGA Zone 50	
Document Name: CB_MP_HY_0073.013_r0	

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Appendix 1: Peer Review - Hydrogeological Assessment



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Appendix 2: Hydrogeological Assessment



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Appendix 3: Cloudbreak Groundwater Operating Strategy

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Appendix 4: Vegetation Types in the Cloudbreak Area



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Vegetation Type	Description	Local Conservation Significance Description
	Creek line and Drainage lines – Coolibah and River Red Gum Dominated	
1	Open Woodland of <i>Eucalyptus victrix</i> , <i>E. camaldulensis</i> with pockets of <i>Acacia coriacea</i> subsp. <i>pendens</i> over <i>Grevillea wickhamii</i> subsp. <i>aprica</i> , <i>Petalostylis labicheoides</i> and <i>A. tumida</i> over <i>Triodia longiceps</i> , <i>Chrysopogon fallax</i> , <i>Themeda triandra</i> and <i>Aristida</i> species.	Groundwater Dependent Ecosystem Priority 3 & 4 Flora Species
	Creek line and drainage lines – Mulga dominated	
2	Low Woodland to Low Open Forest of <i>Acacia aneura</i> var. <i>aneura</i> , <i>A. citrinoviridis</i> , <i>A. pruinocarpa</i> over <i>A. tetragonophylla</i> and <i>Psyrax latifolia</i> over <i>Chrysopogon fallax</i> , <i>Stemodia viscosa</i> , <i>Blumea tenella</i> , <i>Themeda triandra</i> and species of <i>Triodia</i> and <i>Aristida</i> .	Priority 1, 3 & 4 Flora Species
	Creek line and drainage lines – other Acacia dominated	
8	Closed Scrub to Tall Shrubland of <i>Acacia pruinocarpa</i> , <i>A. tumida</i> , <i>A. ancistrocarpa</i> , <i>A. maitlandii</i> , <i>A. kempeana</i> , <i>A. tetragonophylla</i> with occasional <i>Eucalyptus gamophylla</i> and <i>Corymbia deserticola</i> over <i>Triodia epactia</i> , <i>Themeda triandra</i> and <i>Aristida</i> species.	Samphire Priority 3 & 4 Flora Species
9	Closed Scrub to Shrubland of <i>Acacia ancistrocarpa</i> , <i>A. maitlandii</i> , <i>A. kempeana</i> , <i>A. monticola</i> with occasional <i>Eucalyptus gamophylla</i> and <i>Corymbia deserticola</i> over <i>Senna</i> species, <i>Triodia basedowii</i> and <i>Aristida</i> species.	Samphire Priority 3 & 4 Flora Species
	Flats and broad plains containing Mulga	
3	Low Woodland to Low Open Forest of <i>Acacia aneura</i> var. <i>aneura</i> , <i>A. pruinocarpa</i> , <i>A. tetragonophylla</i> , <i>A. tenuissima</i> , <i>Grevillea wickhamii</i> subsp. <i>aprica</i> , <i>Psyrax latifolia</i> over <i>Dodonaea petiolaris</i> and species of <i>Triodia</i> and <i>Aristida</i> .	Surface Water Dependent Mulga Samphire Priority 3 & 4 Flora Species
4	Low Open Woodland of <i>Acacia aneura</i> var. <i>aneura</i> , <i>A. pruinocarpa</i> , <i>A. xiphophylla</i> , <i>A. victoriae</i> over <i>A. tetragonophylla</i> , <i>Psyrax latifolia</i> and <i>P. suaveolens</i> over <i>Ptilotus obovatus</i> and mixed species of <i>Maireana</i> and <i>Sclerolaena</i> .	Surface Water Dependent Mulga Samphire Priority 3 Flora Species
10	Low Open Woodland of <i>Acacia xiphophylla</i> , <i>A. victoriae</i> , <i>A. aneura</i> var. <i>aneura</i> over <i>A. tetragonophylla</i> , <i>Ptilotus obovatus</i> , <i>Senna</i> species and mixed species of <i>Maireana</i> and <i>Sclerolaena</i> .	Surface Water Dependent Mulga Priority 4 Flora Species
	Flats and broad plains without Mulga	
15	Low Open Woodland of <i>Acacia xiphophylla</i> , <i>Acacia cictoriae</i> , <i>Acacia aneura</i> var. <i>aneura</i> over <i>Acacia tetragonophylla</i> , <i>Ptilotus obovatus</i> , <i>Senna</i> species and species of <i>Maireana</i> and <i>Sclerolaena</i> .	
	Ranges, Hills and Hillslopes	
7	Hummock Grassland of <i>Triodia basedowii</i> with emergent patches of <i>Eucalyptus gamophylla</i> , <i>E. Leucophylloia</i> , <i>Corymbia deserticola</i> over <i>Acacia ancistrocarpa</i> , <i>A. sclerosperma</i> subsp. <i>Sclerosperma</i> , <i>A. kempeana</i> , <i>A. arida</i> , <i>Grevillea berryana</i> , <i>G. wickhamii</i> subsp. <i>Aprica</i> , <i>Calytrix carinta</i> over <i>Goodenia stobbsiana</i> and mixed <i>Poaceae</i> species.	
16	Hummock Grassland of <i>Triodia basedowii</i> with pockets of <i>T. epactia</i> and <i>T. lanigera</i> with emergent patches of <i>Eucalyptus leucophylloia</i> , <i>Corymbia deserticola</i> over <i>Acacia ancistrocarpa</i> , <i>A. hilliana</i> , <i>A. acradenia</i> , <i>A. pyrifolia</i> , <i>Hakea lorea</i> subsp. <i>lorea</i> over <i>Goodenia stobbsiana</i> and mixed <i>Senna</i> species.	

Vegetation Type	Description	Local Conservation Significance Description
17	Hummock Grassland of <i>Triodia basedowii</i> with pockets of <i>T. epactia</i> and <i>T. lanigera</i> with emergent patches of <i>Eucalyptus leucophloia</i> , <i>Corymbia deserticola</i> over <i>Acacia ancistrocarpa</i> , <i>A. pyrifolia</i> , <i>Hakea lorea</i> subsp. <i>lorea</i> over <i>Goodenia stobbsiana</i> and mixed <i>Senna</i> and <i>Ptilotus</i> species.	Samphire Priority 3 & 4 Flora Species
18	Hummock Grassland of <i>Triodia angusta</i> with emergent patches of <i>Eucalyptus leucophloia</i> over <i>Acacia ancistrocarpa</i> , <i>a. pyrifolia</i> , <i>Hakea lorea</i> subsp. <i>lorea</i> over <i>Goodenia stobbsiana</i> and mixed <i>Senna</i> and <i>Ptilotus</i> species.	
Fringes of Samphire Flats Containing Samphire		
12	Low Halophytic Shrubland of <i>Tecticornia auriculata</i> , <i>T. indica</i> subsp. <i>leiostachya</i> with associated <i>Maireana</i> species and <i>Atriplex flabelliformis</i> with <i>Muehlenbeckia florulenta</i> with patches of <i>Acacia victoriae</i> and <i>A. sclerosperma</i> subsp. <i>sclerosperma</i> .	Samphire
13	Low Halophytic Shrubland of <i>Tecticornia auriculata</i> , <i>T. indica</i> subsp. <i>leiostachya</i> , <i>T. halocnemoides</i> subsp. <i>tenuis</i> with patches of <i>Frankenia</i> species.	Samphire
22	Low Shrubland of <i>Tecticornia indica</i> subsp. <i>bindens</i> and <i>Nicotiana occidentalis</i> over grasses with occasional stands of <i>Sesbania cannabina</i> and <i>Cullen cinereum</i> .	Samphire Priority 1 & 4 Flora Species
25	Low Shrubland of <i>Tecticornia auriculata</i> , <i>T. indica</i> subsp. <i>bidens</i> and <i>Frankenia ambita</i> over <i>Eragrostis dielsii</i> .	Samphire
26	Low Shrubland of <i>Muellerolimon salicorniaceum</i> and <i>Tecticornia indica</i> subsp. <i>bidens</i> .	Samphire Priority 1 & 4 Flora Species
Fringes of Samphire flats without Samphire		
11	Hummock Grassland of <i>Triodia angusta</i> with patches of <i>Acacia victoriae</i> , <i>A. anerura</i> var. <i>aneura</i> , <i>A. Xiphophylla</i> over <i>Atriplex codonocarpa</i> , <i>Eremophila cuneifolia</i> and mixed <i>Chenopodiaceae</i> species.	
14	Hummock Grassland of <i>Triodia angusta</i> with patches of <i>Acacia victoriae</i> over <i>Atriplex codonocarpa</i> and mixed <i>Chenopodiaceae</i> and <i>Poaceae</i> species.	
20	Scrub of <i>Acacia sericophylla</i> over <i>Muellerolimon salicorniaceum</i> , <i>Nicotiana occidentalis</i> and <i>Mimulus gracilllis</i> .	
27	Low Shrubland of <i>Maireana caronos</i> , <i>Attriplex codonocarpa</i> and <i>Sclerolaena cuneata</i> over <i>Eragrostis dielsii</i> and <i>Trianthema turgidifolia</i> .	

Appendix 5: Priority Flora Recorded in the Proposal Area



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Taxa	Conservation Status	Vegetation Communities Recorded	Notes
<i>Eremophila spongiorcarpa</i>	Priority 1	2, 22, 26	A compact, succulent leaved shrub, to 1 m with white flowers in May and September. Known to occur on weakly saline alluvial plains on the margins of marshes. Known from 16 records from the Western Australian Herbarium (WAH) (2010) and has been recorded in five locations within or adjacent to the Proposal area.
<i>Gymnanthera cunninghamii</i>	Priority 3	17	An erect shrub to 2 m with cream to yellow flowers. Known from 15 records from WAH (2010). Species has been recorded once in the Proposal area.
<i>Phyllanthus aridus</i>	Priority 3	1, 2, 3, 4, 8, 9, 17	An erect, much branched shrub to 0.25 m with cream to green flowers. Known from 23 records from the WAH (2010). Species has been recorded throughout the Proposal area (60 records) in a range of vegetation communities.
<i>Rostellularia adscendens</i> var. <i>latifolia</i>	Priority 3	4	A prostrate shrub to 0.3 m with blue, purple and violet flowers from April to May. Known from 12 records from the WAH (2010). On the basis of these records it appears that species is relatively widespread locally in a range of habitats from alluvial fringes of creek lines to rocky hillslopes (Mattiske 2005a). Species has been recorded once in Proposal area.
<i>Thermodes sp.</i> Hamersley Station (M.E. Trudgen 11431)	Priority 3	9	A perennial grass restricted to the Pilbara Bioregion, and is found in red clay in clay pans or on grass plains. May form tussocks or take on an herbaceous habit between 90 and 180 cm in height (Mattiske 2005a). Known from 13 records from the WAH (2010).
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	Priority 4	10, 22, 26	A dense spreading shrub to 3 m with purple, red and pink flowers from January to March and June to September. Known from 25 records from the WAH (2010) from the Pilbara, Gascoyne and Carnarvon Bioregions. Herbarium records appear to indicate the species is associated with a range of habitats including well drained stony sandy loam, semi-saline floodplains, mudflats and clayflats. Has been recorded in two locations in Mulga woodland on the flats and plains, and on the fringes of the Fortescue Marsh.
<i>Goodenia nuda</i>	Priority 4	1, 2, 3, 4, 8, 9, 10, 17	An erect to ascending herb to 0.5 m with yellow flowers. Known from 42 records from the WAH (2010). Species has been recorded throughout the Proposal area and its surrounds (66 records in survey area) in a range of vegetation communities including hummock grassland, creek and drainage lines, flats and plains.

An additional 11 species listed as Priority Flora have not been recorded within the Proposal area, but may occur in the vicinity of the Proposal area. This list is based on the DEC database search (DEC 2010) and recent survey results from the adjoining survey area of Christmas Creek and Fortescue Marsh:

- *Eremophila pilosa* (Priority 1) (Biota 2004b)

- *Helichrysum oligochaetum* (Priority 1) (Biota 2004b)
- *Myriocephalus scalpellus* (Priority 1) (Biota 2004b)
- *Peplidium* sp. Fortescue Marsh (S. van Leeuwen 4865)(Priority 1) (DEC 2010c)
- *Nicotiana heterantha* (Priority 1) (Mattiske 2007)
- *Tecticornia* sp. Christmas Creek (K.A. Shepherd & T. Colmer et al. KS 1063) (Priority1) (ENV 2011)
- *Tecticornia* sp. Fortescue Marsh (K.A. Shepherd et al. KS 1055) (Priority 1) (ENV 2011)
- *Stylidium weeliwollii* (Priority 2) (DEC 2010c)
- *Atriplex flabelliformis* (Priority 3) (ENV 2011)
- *Rhagodia* sp. Hamersley (M. Trudgen 17794) (Priority 3) (ENV 2011)
- *Tecticornia* sp. Roy Hill (H. Pringle 62) (Priority 3) (ENV 2011).

Appendix 6: Summary of Potential Presence of Conservation Significant Species



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Species	EPBC ACT	EP Act	Habitat	Likely Presence in Proposal Area
<i>Pezoporus occidentalis</i> (Night Parrot)	EN	S1	Hummock grassland on the fringe of the Fortescue Marsh Triodia hummock grassland or chenopod shrublands. Thick unburnt vegetation most suitable.	Recorded from Minga Well and likely to occur in the Samphire and Spinifex country of the Fortescue Marsh.
<i>Dasyurus hallucatus</i> (Northern Quoll)	EN	S1	Rocky escarpments. Creek lines and wells with Acacia shrubland and/or Eucalypt woodland.	Previously recorded near Proposal area in 1980 (NatureMap). Limited areas of rocky breakaways that may provide a small amount of suitable habitat.
<i>Macrotis lagotis</i> (Greater Bilby)	VU	S1	Hummock grassland Low Mulga, Snakewood and Acacia woodland	Records to recent active burrows within the Proposal area (Barnford 2005a). Areas of suitable habitat present along the Fortescue Marsh and in Mulga Woodland.
<i>Rhinonicteris aurantius</i> (Orange Leaf-nosed Bat)	VU	S1	Rocky escarpments. Roosts in caves with high humidity and temperature.	Recorded at Thieves Well. No suitable roosting habitat but may forage within the Proposal area.
<i>Liasis olivaceus barroni</i> (Pilbara Olive Python)	VU	S1	Rocky escarpments. Gorges and escarpments, area of permanent water.	May be present within the rocky areas in the north of the Proposal area.
<i>Apus pacificus</i> (Fork-tailed Swift)	Mig	S3	Almost entirely aerial, particularly associated with storm fronts.	Will occasionally overfly Proposal area, but will not utilise it directly.
<i>Haliaeetus leucogaster</i> (White-bellied Sea-eagle)	Mig	S3	Coastal and near coastal water bodies.	Recorded at Fortescue Marsh. Uncommon in area, although suitable habitat present along the marsh where water present. Unlikely to be suitable habitat within the Proposal area.
<i>Merops ornatus</i> (Rainbow bee-eater)	Mig	S3	Open country, most vegetation types, dunes, banks.	Recorded within Proposal area. Suitable habitat for hunting and breeding.
<i>Ardea alba</i> (Great Egret)	Mig	S3	Floodwaters, rives, shallows of wetlands, intertidal mud-flats.	Suitable hunting habitat when surface water present in Fortescue Marsh and some potential habitat along creek lines within Proposal area.
<i>Tringa glareola</i> (Wood Sandpiper)	Mig	S3	Freshwater swamps, river pools, claypans, salt lakes.	Recorded at Fortescue Marsh. Suitable habitat present in marsh especially after rain. Some potential habitat along creek lines within the Proposal area.
<i>Tringa nebularia</i>	Mig	S3	Coastal and inland lakes.	Recorded at Fortescue Marsh.

Species	EPBC ACT	EP Act	Habitat	Likely Presence in Proposal Area
(Common Greenshank)				Suitable habitat present in marsh especially after rain. Some potential habitat along creek lines within the Proposal area.
<i>Calidris ruficollis</i> (Red-necked Stint)	Mig	S3	Coastal and inland shorelines.	Few records, but suitable habitat present in Marsh especially after rain. Some potential habitat along creek lines within the Proposal area
<i>Falco peregrinus</i> (Peregrine Falcon)		S4	Coastal cliffs, riverine gorges and wooded watercourses	Recorded hunting within Proposal area. Suitable hunting habitat along rivers and gorges. Some potential breeding habitat in rocky areas.
<i>Ramphotyphlops ganei</i> (Blind Snake)		Priority 1	Unknown, but possible associated with moist gorges and gullies.	Species rarely recorded but suitable habitat present in gullies throughout area of Spinifex hillslopes within the northern areas of the Proposal area.
<i>Ctenotus nigrilineatus</i>		Priority 1	Spinifex at the base of granite outcrops	May occur as suitable habitat exists in the Proposal area.
<i>Ctenotus uber johnstonei</i>		Priority 2	Small outcrops on sandy and stony plains	Likely to occur around small outcrops on sand and stony plains in the Proposal area.
<i>Falco hypoleucos</i> (Grey Falcon)		Priority 4	Lightly wooded coastal and riverine plains.	Recorded near Proposal area at Sandy Creek. Wide- ranging species. Some suitable habitat for hunting and breeding along creek lines in the Proposal area.
<i>Ardeotis australis</i> (Australian Bustard)		Priority 4	Open grasslands, chenopod flats and low heath.	Recorded within Proposal area and surrounds. Suitable habitat present throughout Mulga woodland.
<i>Burhinus grallarius</i> (Bush Stone-curlew)		Priority 4	Lightly wooded country next to day time shelter of thickets or long grass.	Recorded within Proposal area and surrounds. Suitable habitat present along creek lines through Mulga woodland.
<i>Neochmia ruficauda subclarescens</i> (Star Finch)		Priority 4	Vegetation around watercourses, particularly thick reed beds	Recorded at Minga Well. No other suitable habitat present within the Proposal area.
<i>Sminthopsis longicaudata</i> (Long tailed Dunnart)		Priority 3	Rocky escarpments.	May occur in suitable habitat such as rock hill-slopes within and around the Proposal area. However. Very few records within 100km of the Proposal area.
<i>Pseudomys chapmani</i> (Western Pebble-mound Mouse)		Priority 4	Spurs and rocky hills with many small pebbles vegetation by Spinifex.	Numerous active mounds recorded within the Proposal area. Large amount of suitable habitat along Spinifex hill slopes within and surrounding the Proposal area.

Species	EPBC ACT	EP Act	Habitat	Likely Presence in Proposal Area
<i>Leggadina lakedownensis</i> (Northern Short-tailed Mouse)		Priority 4	Spinifex and tussock grassland on cracking clays. Also <i>Acacia</i> shrubland, Samphire, woodlands and stony ranges.	Likely to occur within the Proposal area. Recorded at Christmas Creek in tussock grassland on cracking clay and in other habitats. Similar habitats are present in the Proposal area.
<i>Dasyercus blythi</i> (Brush-tailed Mulgara)		Priority 4	Sandy areas with moderately dense spinifex with 'runways' between clumps	May occur within the Proposal area. Potential burrows previously observed in the Proposal area but no evidence of individuals. Small amount of suitable habitat within the Proposal area.
<i>Macroderma gigas</i> (Ghost Bat)		Priority 4	Caves, rockpiles and abandoned mines	Record of individual foraging along edge of Fortescue Marsh. No suitable roosting habitat within the Proposal area.