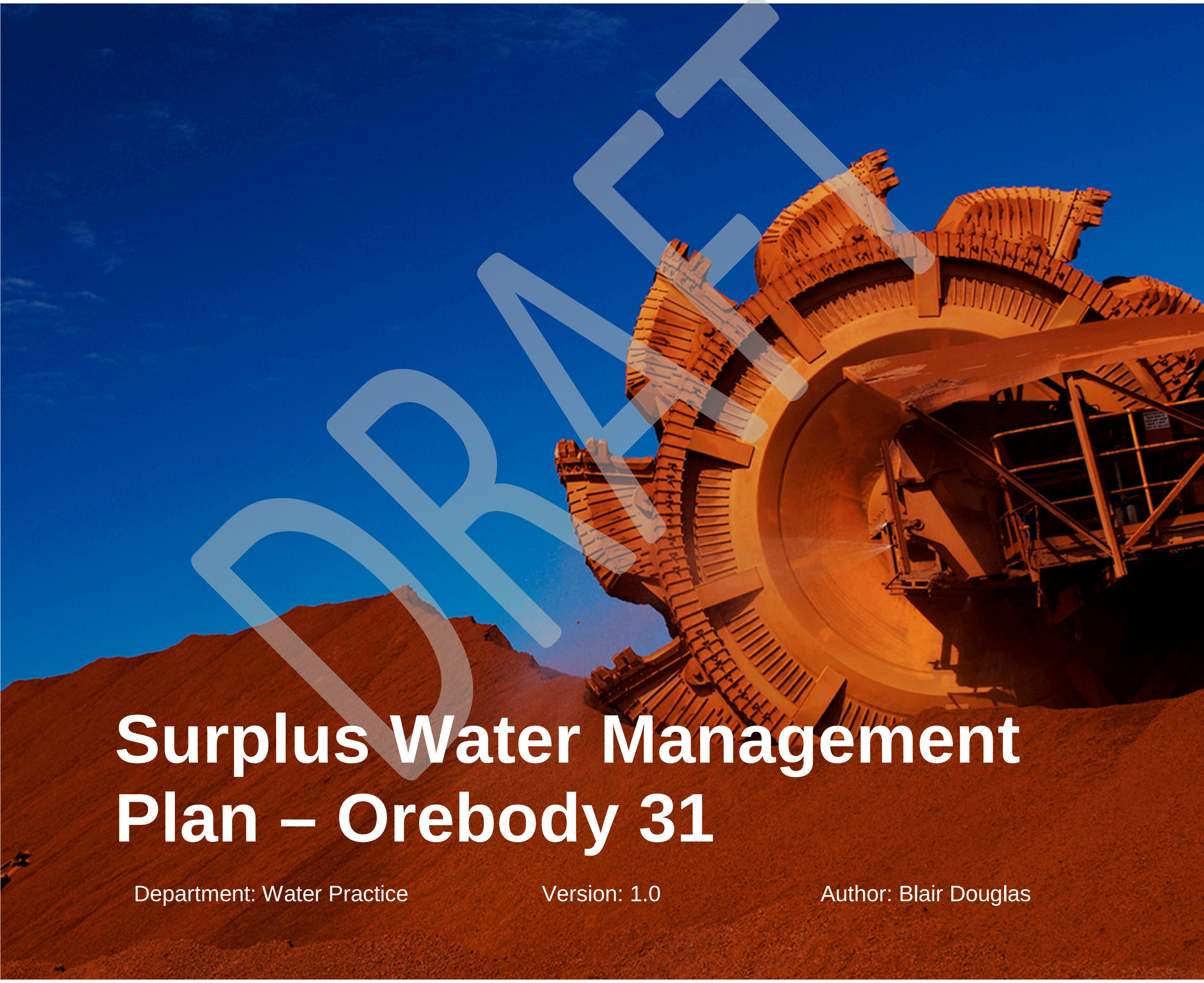
Western Australia Iron Ore



Surplus Water Management Plan – Orebody 31

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Contents

Note to Reader:

This document sets out the BHP Billiton Iron Ore (BHPBIO) Eastern Pilbara Surplus Water Management Plan (EPSWMP) and summarises the technical considerations, assumptions and preferred options to manage surplus water generated from Whaleback, Eastern Ridge operations, OB31, and Jimblebar.

1 Introduction

The Eastern Pilbara surplus water management plan covers three mining hubs (Jimblebar, Eastern Ridge and Whaleback) within the Newman area to address a net water surplus volume and summarise the regional cumulative water management strategic approach. The surplus plan is in recognition of the need for a regional approach which addresses the collective and cumulative management of surface and groundwater as outlined in the Pilbara Water Resource Management Strategy (BHP Billiton 2014). The introduction of the mines which are enabled by the plan will be staged as new mines commence and as existing mines are included over the midterm.

Orebody 31 (OB31) will be the first mine to be included in the surplus plan. The plan includes only industrial water management. Potable and waste water will be managed through Drinking Water Source Protection Plans and the Environmental Management Plan for each hub.

OB31 is located approximately 40 kilometres (km) east of Newman Township in the Pilbara region of Western Australia (Figure 1). OB31 is situated to the east of the existing Orebody 17/18 (OB17/18) Mine within Mineral Lease ML244SA, which is subject to the *Iron Ore (Mount Newman) Agreement Act 1964* (Newman Agreement Act). OB31 has not previously been developed and as such is considered a greenfield development.

The project water balance outlined in the (reference approval assessment document) indicates a net water surplus owing to the dewatering requirements being greater than water demands. Dewatering is required to access around 70% of the orebody which is located below the water table.

A number of feasible and practicable surplus water management options have been evaluated and considered in line with Regulatory Guidelines.

This management plan outlines the OB31 surplus water considerations and approach including:

- volumes assumptions (peak and annual average),
- management options, selection process and applications,
- proposed operating model,
- environmental considerations,
- approval steps, and
- monitoring requirements.

This document shall be considered in context with the OB31 Hydrogeological Environmental Impact Assessment (BHP Billiton Iron Ore, 2015) and the Eastern Pilbara Water Resource Management Plan, ((EPWRMP) BHP Billiton Iron Ore, 2015). It will be reviewed annually or as required owing to a change in the technical knowledge, mine scheduling or a new approval.

2 Orebody 31 Water Balance

OB31 is expected to have significant dewatering requirements owing to 70% of the orebody being located below the water table. Dewatering estimates based on 15 Mtpa are illustrated in Figure 1. The predicted daily annual averaged dewatering rate as a range is presented in Figure 1. The range reflects the uncertainty in mine development schedules and dewatering rates plus local water demand.

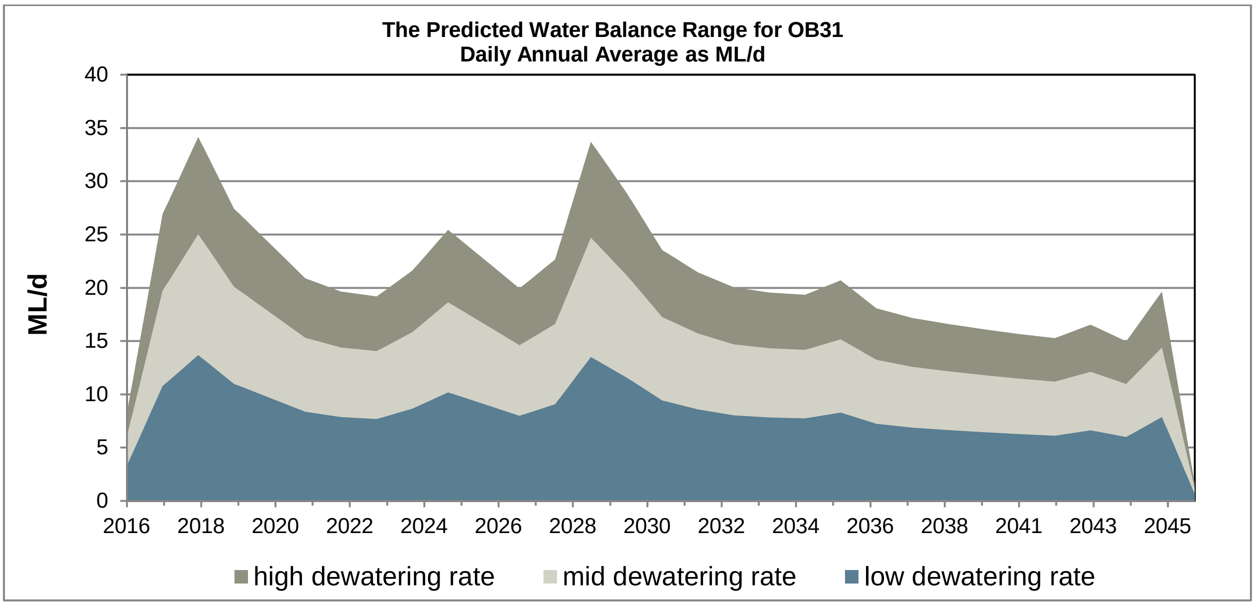

Figure 1 – OB31 predicted water balance range which is predominantly influenced by the dewatering rate. The figure presents a range (low, moderate and high dewatering) to reflect the hydrologeological and mine schedule uncertainty which influences the dewatering rate.

Water abstracted from dewatering activities will be preferentially used as a water supply and will support OB31 mining activities and also the neighbouring orebodies such as OB18. Water demands are anticipated to range between 0.75 and 3.65 GL/a depending upon the production activities and climate. The combined annual daily average water demand is anticipated to be around 2.2 GL/a.

2.1 Annual Dewatering estimate

An OB31 numerical model was used to provide a range in dewatering estimates based on the current 15 Mtpa mine plan. The estimated dewatering volume ranges between maximum rates of between 4.4 GL/a and 12.4 GL/a. Given that the project is seeking approval for a future 30 Mtpa production rate, we estimate an increase of 30% to the 15 Mtpa dewatering rates. Through extrapolation of the model,

Although the 30 Mtpa mining rate was not modelled the radial extent of drawdown from the pit will likely be the same for both mining rates as the ultimate pit depth is the same for both mining rates, the difference between the 30 and 15 Mtpa dewatering rates will be in the rate of drawdown propagation and not the absolute extent of drawdown impact.

2.2 Surplus water volumes

Surplus water management for OB31 has two aspects. The first is ongoing discharge to Ophthalmia Dam, where the effect on the Ethel Gorge TEC must be understood. The second is short-term contingency discharge to Jimblebar Creek, where the effect on riparian vegetation is considered.

The response in water level and salinity on the Ethel Gorge receptor were tested through modelling up to the expected maximum discharge rates. Considering the cumulative discharge of existing operations, approved operations, and the OB31 proposal, the maximum expected was 24 GL/a. Further modelling was done to understand the carrying capacity of the dam before the seasonality of water levels may be changed. Rates up to 43.8 GL/a were tested in this analysis.

Intermittent creek discharge is sought in order to enable borefield operation during emergency events (ie pipeline damage) or during major storm events when stormwater management may be required. A 3 month discharge duration at the estimated 30 Mtpa mining rate is considered to be between 1.4 GL/a and 4.0 GL/a.

2.3 Actions to Increase Certainty in relation to Water Balance

Figures presented in the document are currently derived from initial predictive models, supported by limited field pump testing. BHP Billiton Iron Ore will be undertaking the following activities in order to increase the certainty around the likely dewatering volumes required to operate OB31 in dry mining conditions, as per Table 1.

Table 1 – Activities for Water Balance refinement

Activity	Scope / Aspects	Timing	Output
Hydrodynamic Trial	Dewatering volumes Discharge to creek (wetting front)	Quarter 3 CY 2015 to Quarter 1 CY 2016	Revised dewatering estimate. Management measures relating to creek discharge options.
Operational Dewatering – Year 1	Dewatering volumes	Quarter 2 CY 2016	Inputs to Annual Aquifer Review and Annual Environment Report. Revised forecasting of dewatering requirements for next calendar year.
Operational Dewatering – each operataional year	Dewatering volumes	Annual basis	Inputs to Annual Aquifer Review and Annual Environment Report. Revised forecasting of dewatering requirements for next calendar year.

2.3.1 Hydrodynamic Trial

Additional field work is required to more fully understand the groundwater conditions and dewatering volume requirements associated with the yearly mine plan for operation. A hydrodynamic trial, involving dewatering pumping, is about to commence.

BHP Billiton Iron Ore has submitted a 5C Licence amendment application, including a Groundwater Operating Strategy, under the RIWI Act, for approval to commence this hydrodynamic trial. The DER advised that approval to install infrastructure to undertake the hydrodynamic trial and the subsequent operation of the trial will not be required under Part V of the EP Act. This advice applies to a maximum surplus water discharge to Jimblebar Creek of 2.5 GL/a. The DER has advised that following commissioning of the OB31 mine, a Works Approval and application for an Operating Licence will then be required to be submitted to permit the temporary trial infrastructure to become permanent.

For the operation of the trial and to evaluate the feasibility of creek discharge and determine the potential wetting front, the pumped water will be released to a tributary of Jimblebar Creek for a period of up to 18 months.

Baseline riparian vegetation and hydrological condition surveys have been undertaken for the area of Jimblebar Creek where the proposed discharge will be undertaken. During this trial, changes to the baseline conditions and potential impacts to the riparian vegetation and surrounding land use will be evaluated to determine whether creek discharge is feasible in the longer term

3 Eastern Pilbara Predicted Water Balance

Water balance modelling shows that the collective water balance for the Eastern Pilbara operations will present a net surplus over the next 15 years. With the additional water originating from OB31, the total surplus is estimated to range between 3 and 18 GL/a. The Eastern Pilbara water balance (surplus volumes) is presented in Figure 2. The volume is approximated and the surplus is anticipated to vary monthly and annually due to mine plan changes, short term dewatering efforts and seasonal water demand fluctuations.

The surplus volume reflects operations which extend over a distance of 45 km, including from Whaleback (OB29), Eastern Ridge (OB23, OB25 and OB24), OB31 and Jimblebar operations.

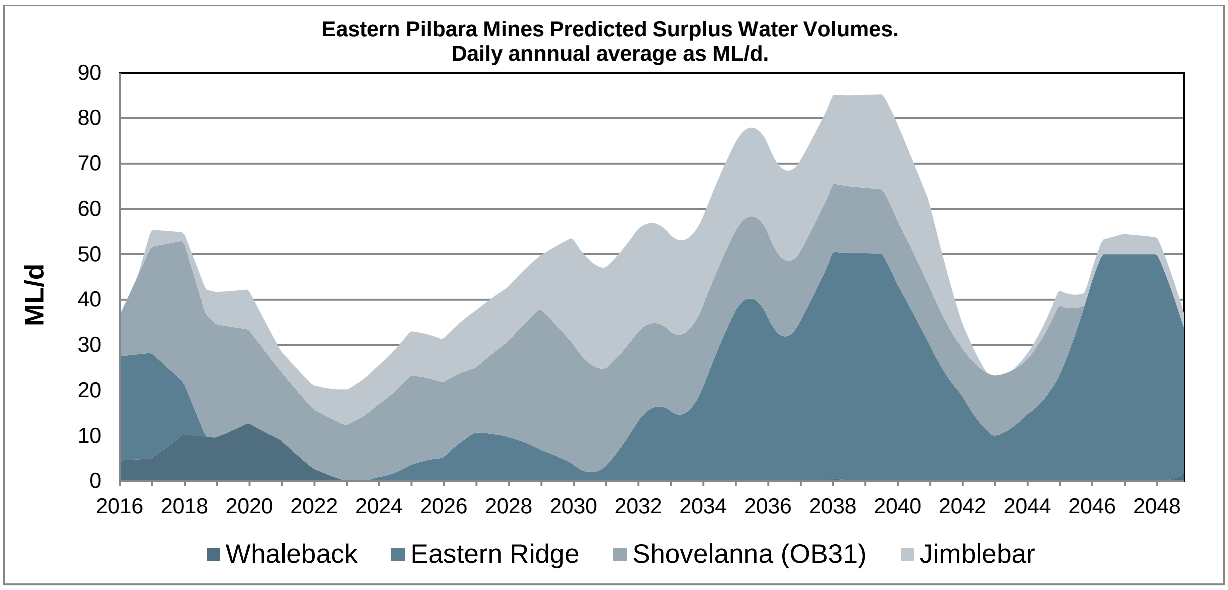

Figure 2: Eastern Pilbara predicted water balance range.

4 Managing Orebody 31 suplus water – Basis of assumptions

The daily peak surplus and average annual volumes have been considered for the purpose of design capacity and approval requirements.

As a minimum, the surplus option for OB31 shall have the capacity to manage an additional volume of up to 12.8 GL/a, under a mining rate of 15 Mtpa, and potentially higher. This rate reflects the peak daily surplus volume during potentially expected high rainfall period when dewatering rates are increased and water demand requirements are reduced and short term changes to the mine plan which result in periods of increased dewatering. Peak volumes are likely to be persistent for a period of days to weeks and will coincide with reduced or not functional production activities.

Daily minimum surplus volumes are assumed to be zero for short periods depending upon operational dewatering activities and demand variations during these periods.

5 Water resource sustainability considerations

BHP Billiton Iron Ore Pty Ltd management of surplus water shall be in accordance with Department of Water (DoW) policy 2.09 Use of Mine Dewatering Surplus which is also followed and referenced by the EPA and Department of Environment Regulation when reviewing proposals. The DoW policy stipulates that Mine dewatering volumes must first be used for:

- Mitigation of environmental impacts
- Fit-for-purpose onsite activities (e.g. processing, dust suppression and mine camp use).

Any dewatering volumes that remain after these requirements have been met constitute mine dewatering surplus with options for management as follows:

1. Transfer water to meet operational demands.
2. Reinjection back into an aquifer.
3. Controlled release to the environment.

For the purposes of aligning surplus water management options with DoW policy, options have been categorised in the subsequent section based on the primary management objective as either:

1. Transfer surplus water to a demand area, for mine production, dust suppression, potable supply or community or 3rd party activities.
2. Aquifer return, includes reinjection or infiltration.
3. Release, includes evaporation and surface water discharge.

The approach is in line with the BHP Billiton sustainability charter and considers prioritization of transferring surplus water to delivery points and infiltrating water to the aquifer to minimize any potential impacts to receiving receptors and offset the area of pumping influence.

6 WAIO's approach to surplus water management

6.1 Existing surplus water management

BHP Billiton Iron Ore has managed surplus water for more than 20 years in the Newman and Yandi mining areas and more recently at MAC and Jimblebar through managed aquifer recharge (MAR), infiltration, intra-mine transfer and creek discharge. Existing surplus water management volumes and practices are summarised in Table 1.

Table 2 – WAIO surplus water management summary (FY13)

Catchment	Site	Surplus Water Volume (GL/a)	Surplus Water Volume (ML/d)	Management Method
Central	Mining	1.6	4.4	MAR
Eastern	Jimblebar	0.5	1.4	MAR, Creek Discharge
Eastern	OB23, 25	7.5	20.6	Ophthalmia Dam, Return to Environment
Northern	Yandi	8.6	23.6	Marillana Creek via two licenced discharge points
TOTAL		18.2	50	

Operational trials have been specifically established to evaluate sustainable water resource alternatives such as managed aquifer recharge and controlled creek discharge. Preliminary trial results indicate that MAR is a feasible alternative to offset drawdown impacts and return fresh water resources to the aquifer, but is limited by aquifer capacity and the requirements for substantial infrastructure within the Ophthalmia Range region.

Creek discharge has also shown to be as sustainable alternative at Yandi but is limited by the capacity and the progressive downstream migration of a wetting front and potential impacts to riparian vegetation.

Around 40 years of monitoring data from the Ophthalmia Dam infiltration system which includes the Dam, recharge ponds and infiltration ponds, shows the system has a large capacity to accommodate and infiltrate surplus water largely owing to the extent of the alluvial aquifer which underlies the Upper Fortescue River. This system has been effective in mitigating the potential impacts to the Ethel Gorge Stygofauna Community and the sustainability of the Newman town water supply borefield (BHP Billiton Iron Ore (2015) OB31 Hydrogeological Impact Assessment).

All surplus water options are capacity limited and in some cases (such as Ophthalmia Dam and Ethel Gorge) potentially limited due to water quality, such as salinity.

6.2 Surplus water management principles

BHPBIO is committed to addressing the surplus water challenges in the Pilbara and achieving sustainable regional water management.

Our demonstrated success and understanding of Pilbara water management, gained through more than 40 years of experience, plus the advances in hydrology and water management techniques developed around the world, enable us to plan for and deliver robust and comprehensive solutions for our operations. We apply this knowledge to address the water-related resource challenges we face now and into the future and to ensure that to the extent practicable we use the water resource responsibly.

BHP Billiton takes a proactive approach to reduce the risk to the business posed by water, both in our day-to-day operations and in the communities we work with. To maintain our licence to operate, we must continue to achieve positive water management outcomes and demonstrate our commitment to the effective and sustainable management of water.

Surplus water management within the BHP Billiton Pilbara mining operations follow the following principles:

Sustainability and Stewardship Driver

- Transfer surplus water to an alternative demand point where practicable and feasible;
- Avoid and minimize impacts to key receptors, communities, Heritage values and 3rd parties and apply various techniques to minimize or offset any impacts;
- Consider the long term sustainability of the water resources.

Operational Drivers

- Minimise operational complexity and introduce standardization;
- Limit fixed limit 3rd party delivery commitments;
- Maintain capital and operating costs to a reasonable and practicable minimum;
- Identify and obtain approval for contingent options to manage uncertainty and risks with the primary surplus water approach.

A number of feasible and costs effective measures, which are consistent with Regulatory expectations have been assessed and selected to manage the surplus dewatering volumes for OB31. These options provide innovative, flexible and practical control of our operational water issues on a regional and local scale and in-turn mitigates significant environmental impacts.

Although the return of surplus water to the aquifer is preferred in order to offset impacts and minimise the water footprint, discharge to creek and other beneficial use options are considered appropriate where receptor risks are managed (environment and 3rd party) and the overall long term water balance impacts are unlikely to be significant and can recover within the midterm.

The preferred long term surplus management option for OB31 will depend upon the water balance (peaks and troughs), sustainable capacity, the need to maintain an environment, other user demands in the vicinity, costs, and access to land, impacts to creek ecology and the practicality of large scale, low yielding aquifer injection.

7 Surplus management approval approach

BHP Billiton Iron Ore's current environmental approvals to discharge surplus water for the Eastern Pilbara operations are summarised in Table 2.

Table 3 – Eastern Pilbara operations – Surplus water environmental approvals

Site	Ministerial Statement	Volume, Destination & Condition/s	Licence to Operate (DER)	Volume, Destination & Condition/s
Orebody 18	439	N/A – to be addressed under Part V approvals, if required.	L8044/1987/2	N/A – no offsite discharge required
Jimblebar Hub	857	Construction of a 45 mega litre per day pipeline within existing disturbance corridors to convey excess dewatering discharge to the Ophthalmia Dam. Conditions relating to monitoring prior to and during discharge of surplus water of the Ethel Gorge TEC. Water management plan required for operations.	L5415/1988/8	Limited discharge to local creeks, with a buffer from Innawally Pool. Water quality parameters and monitoring (including flow rate) requirements included. Managed Aquifer Recharge Scheme is operational.

Eastern Ridge – Orebody 25	712	Licenced discharge volume of 38 megalitres per day	L6942/1997/12	Allows for discharge of surplus water to Ophthalmia Dam (no volume stated). Water quality parameters and monitoring requirements included. Cumulative flow readings and monthly discharge volumes required.
Eastern Ridge – Orebody 24	834	N/A – no below water table mining approved		
Eastern Ridge – Orebody 23	478	Water abstraction of maximum 38,000KL per annum. Commitments relating to water monitoring and implementation of an EMP.		
Whaleback Hub – Orebodies 29/30/35	963	The discharge any excess dewatering from Orebodies 29/30/35 into Ophthalmia Dam, up to 8 GL/a.	L4503/1975/14	Allows for contingency discharge of surplus water from OB29 hydrodynamic trail to Ophthalmia Dam (6.8 ML/day). Water quality parameters and monitoring requirements included.

BHP Billiton Iron Ore is moving towards a catchment management approach to surplus water management. This approach will be embedded through BHP Billiton Iron Ore's new and existing environmental approvals process.

Regulatory approval of the various surplus water requirements will be sought on an ongoing basis, in accordance with business planning and operational demand.

8 Proposed surplus water management approach

The proposed approach to managing surplus water from OB31 will follow a staged and iterative approach which builds optionality as uncertainty and option limitations are better understood. The surplus plan will, to the extent possible and practicable, consider the regional and strategic objectives of water resource management and sustainability and follow the guidance from the state Regulators on surplus water management.

- **Stage 1 –** The initial stage will rely on transfer of water to meet operational demands with discharge of excess water to Ophthalmia Dam, supported by Creek discharge during high rainfall and wet seasons whilst managed aquifer recharge to the Ophthalmia Range dolomites and orebodies is evaluated.
- **Stage 2 –** The subsequent phases will depend upon the finding of the technical assessments and may consider a combination of Ophthalmia Dam, Jimblebar Creek discharge and MAR.
- **Stage 3 –** During this stage the enhancement of a strategic direction on a regional scale will be considered. This may include the development of a water infrastructure system which leverages the Ophthalmia Dam pipeline to transfer surplus water across the mining areas and catchment of the Eastern Pilbara to the point of demand and to maximise the sustainability of a water resources.

9 Orebody 31 Surplus discharge approach

The methodology used to evaluate the preferred surplus water management options and combination of options is outlined in Appendix A. A total of 14 options (Figure A-1) were initially considered of which this list was reduced to four feasible alternatives. Further evaluation identified that although some of the options are potentially suitable, the uncertainty in capacity, approval timeframes and costs precluded the options of progressing.

The preferred options to manage OB31 surplus water are outlined in Table 3 in order of preference and priority and summarized below.

1. Transfer water to meet operational demands.
2. Ophthalmia Dam discharge is the proposed primary surplus water management option.
3. Jimblebar Creek will provide a wet weather or short term contingency discharge option but requires further assessment.
4. Managed aquifer recharge into the dolomite formations and orebodies along the Ophthalmia Range is presented as an emerging option currently being evaluated.

A combination of all four options will be progressed through to approval stages as all options introduce some level of operational and environmental limitation or risk. Multiple options will also provide flexibility and risk mitigation should operational challenges or constraints be discovered.

Table 4 – Surplus water management options

Surplus Water Management Options	Description	Capacity	Environmental Monitoring
Option 1 – Transfer water to meet operational demands. **Application –** as needs basis	The existing water pipeline network will be used to transfer water from operations with a water surplus to those with a water deficit.	As per operational requirements	Not applicable
Option 2 – Discharge to Ophthalmia Dam and surrounding infiltration ponds MAR system. **Application -** up to 14.6 GL/year.	A pipeline will be constructed from OB31 to Ophthalmia Dam. The capacity will allow for future increases in flow and allow for a reversal of flow to provide long term regional integrated mine water management solution to exist.	Current water balance modelling and analysis indicates that the Dam and surrounding infiltration ponds and basins have the capacity to manage up to 40 ML/d of dewatering water for at least 5 years, and potentially 15 years	As per the EPWRMP
Option 3 – Temporal discharge to Fortescue River from the Dam for 3 months following the wet season. **Application -** up to 7.5 GL/year over a maximum of 3 months (Feb-May).	Stored Ophthalmia Dam water can be released for three months following the wet session (Feb to May) creating greater storage capacity for dewatering water. Discharge will only occur once water levels in the Ethel Gorge aquifer are rising and the Dam maximum capacity is likely to be exceeded during the dry months (May to Oct).	Up to 80 ML/d can be released for a period of 3 months from the end of February to May each year.	1. Discharge volumes 2. Flow rate 3. Water quality monitoring at discharge point (while discharging): Salinity, pH, TDS, TSS. 4. Vegetation health monitoring
Backup option – Controlled discharge to Jimblebar Creek **Application -** Up to 3.5 GL/year for periods of up to 3 months during wet season or when needed through failure or maintenance of Option 2.	During periods when surplus water cannot be discharged to Ophthalmia Dam (for example during rainfall events, maintenance or emergency situations), water would be discharged to Jimblebar Creek.	To be confirmed by the hydrodynamic trial.	1. Discharge volumes 2. Flow rate 3. Water quality monitoring at discharge point (while discharging): Salinity, pH, TDS, TSS, Total Petroleum Hydrocarbons (TPH) 4. Downstream water quality Salinity, pH, TDS, TSS, TPH, major ions and metals 5. Vegetation health monitoring
Alternative under evaluation - Controlled discharge to Jimblebar Creek **Application -** up to 11 GL/year	Once water demands at other operations are met, surplus water would be discharged to Jimblebar Creek.	To be confirmed by the hydrodynamic trial.	1. Discharge volumes 2. Flow rate 3. Water quality at discharge point (while discharging): Salinity, pH, TDS, TSS, TPH 4. Downstream water quality Salinity, pH, TDS, TSS, TPH, major ions and metals 5. Vegetation health monitoring
Alternative under evaluation - Return to the Ophthalmia Range dolomite aquifer via MAR **Application -** capacity to be defined during later studies (3.7 GL/year potential)	Once water demands at other operations are met, surplus water would be re-injected to the Ophthalmia Range dolomite aquifer, via a network of up to 15 re-injection bores, to provide a sustainable supporting alternative to manage peak surplus periods or when other options are under maintenance.	To be confirmed during MAR trial. Capacity likely to be less than total discharge requirements but suitable for augmenting other discharge options.	1. Discharge volumes 2. Flow rate 3. Water level 4. Water quality: Salinity, pH, TDS, TSS, TPH, major ions and metals

Other surplus water management options and strategic alternatives which are being explored further within the regional context of the Eastern Pilbara mining precinct include the transfer of water to other operations or demand points (including 3rd parties) and discharge to the large creek systems of Carramulla Creek and Fortescue River as outlined below in Table 3.

Appendix A Surplus water option analysis methodology

A range of surplus water management options were considered based upon existing industry practices and feasible existing and future alternatives. Options are summarised broadly in Table 4 and categorised to align with DoW terminology.

Table 5 – Surplus water management option evaluation categories

Option	Description	Category
Managed aquifer recharge (MAR)	Reinjection is the controlled return of water to the aquifer by pumping into reinjection bores. Typically involves water storage prior to pumping via a pipeline network to reinjection bores	Aquifer Return
Surface water discharge - permanent or temporal	Discharge of excess water to existing streams adjacent operations	Release/Loss
Irrigation (agriculture and horticulture)	Development of agricultural areas and irrigation infrastructure. A 10ML/day irrigation scheme would require approx. 300ha of irrigation area and potentially 300ha of buffer area. Irrigation limited by climate	Site Use or Transfer
Infiltration	Construction of storage ponds to promote infiltration	Aquifer Return
Evaporation	Construction of storage ponds or dams to promote natural evaporation. Ponds may be lined to reduce infiltration	Release/Loss
Enhanced evaporation, i.e. spray	Construction of infrastructure to promote enhanced evaporation. Can include sprinklers, water cannons and misting units to distribute small droplets and increase exposure to air	Release/Loss
Potable water	Treatment of surplus water via desalination or similar for potable water use. May involve supply for town/camp use, community amenities (i.e. ovals) or promote regional growth (urban, industrial)	Site Use or Transfer
Beneficial env. use - i.e. replenishment	Transfer of surplus water to areas under stress from groundwater abstraction. Could include replenishment of potable water source aquifers (with/without treatment), maintaining flows to groundwater dependent ecosystems	Mitigate
In-pit storage	Use of abandoned pit or lower bench levels in an active pit to store water	Release

In accordance with this Policy directive a regional perspective was initially considered to ensure that catchment scale and water use synergies could be identified. Based on the above criteria a range of potential surplus water management options have been identified as per.

A total of 14 options were initially identified and assessed (Figure 2), all having different surplus water management capacities, infrastructure and approval requirements. These included the following:

- Ophthalmia Dam
- Creek or river discharge at five potential locations
- MAR at two potential locations
- A regional water supply or transfer of water to Port Hedland (outside catchment)
- A potential irrigation area
- Three potential third party supply options
- An in-pit storage option

Key surplus water management evaluation criteria have been established for the analysis and assessment of management strategies or individual options.

Key criteria are aligned to the WAIO Strategy and include:

- Financial
- Environment and Community
- Regulatory and External
- Flexibility
- Delivery
- Operations

The criteria allow a consistent approach to analysis of surplus water management options and identification of critical flaws using a multi-criteria analysis approach. Relevant weightings can be applied to criteria to indicate importance under specific circumstances, or criteria given a zero weighting if of no relevance to the situation.

An initial screening process was completed against the core requirements of delivery time, regulatory and business objectives to short-list options prior to applying a detailed multi-criteria analysis approach.

Table 6 – Surplus water management screening criteria

Option	Ability to meet Project Timeframe	Regulatory Acceptance	Alignment with Business Objectives
1. Ophthalmia Dam	✓	✓✓	✓✓
2. Jimblebar Creek	X	✓	✓
3. MAR - dolomites	X	✓✓	✓
4. Alternative 3rd party Demand	X	✓✓	✓
5. Carramulla / Fortescue Creek	X	✓	✓

The practicable and feasible options which could be implemented within the project timeframes and still meet the Regulatory direction and BHP Billiton business and sustainability objectives was reduced to Ophthalmia Dam and the surrounding infiltration ponds.

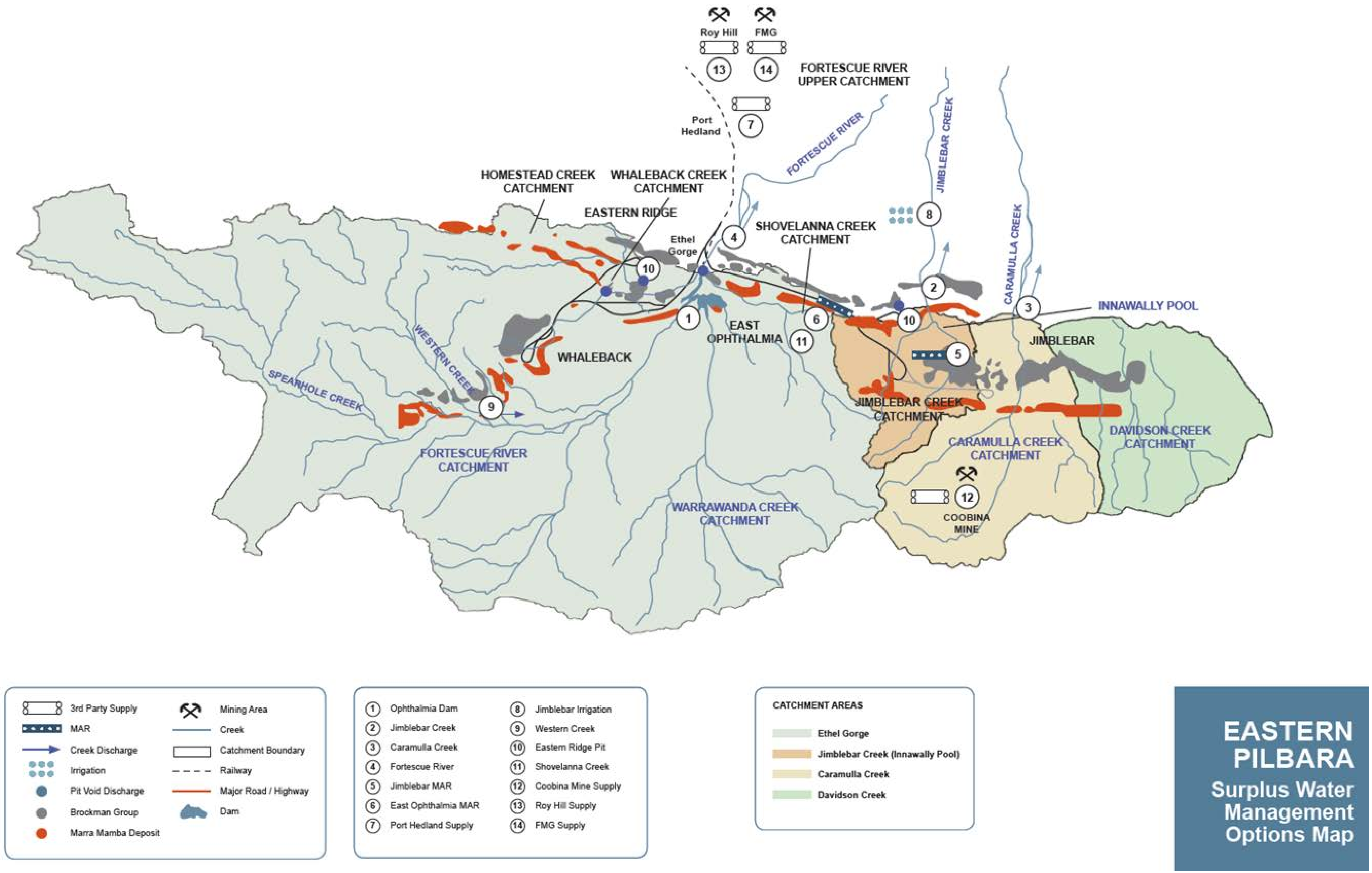

Figure 3 – Surplus water management options assessed in the Eastern Pilbara

Appendix B Receptors of significance

Surplus water management activities outlined above may result in the change to the hydrological conditions resulting in potential impacts to the dependent ecosystems, 3rd parties or areas of cultural significance. Management of the key receptors of Ethel Gorge is detailed in the EPWRMP. Receptors in the area which have been considered as part of the surplus disposal from OB18 hub are:

- Ethel Gorge Sygobiont community – Ecological Receptor
- Innawolly Pool – Cultural and Ecological Receptor
- Jimblebar Creek riparian vegetation – Ecological Receptor
- Ophthalmia Potable Borefield – Community Receptor
- Groundwater in the area of OB31 – Water Resource

Other receptors may be identified through ongoing works to assess discharge options.

The predicted change to the hydrological condition which may result in impact are addressed in the OB31 Hydrological Impact Assessment Report (BHPBilliton, 2015, OB31 Hydrogeological Impact Assessment – Summary Document).

Discharge activity which may result in a change in hydrological conditions and ultimately impacts include falling or rising water levels, increased salinity concentrations and changes to soil moisture. An acceptable potential impact to a receptor (temporal or permanent), the value of the receptor and the ability of the receptor community to adapt to changed hydrological conditions will determine and limit the acceptable disposal methods used. The receptors identified above have different impact pathways which are detailed in the table below:

Table 7– Key water dependent receptors

Receptor	Pathway	Cause
Ethel Gorge Stygobiont community	Increase in salinity above an impact threshold	Evapotranspiration of the surplus water infiltrated (with a slightly higher salinity) into the aquifer resulting in an increased salt load of the groundwater system within Ethel Gorge.
Ophthalmia Borefield	Increase in salinity above an impact threshold and potable water treatment design capability.	
Jimblebar Creek Riparian vegetation	Seasonal or permanent Inundation of root zone causes change in riparian community value and condition.	Water discharged to Creeks (such as Jimblebar Creek) is greater than infiltration rates to the lower aquifer resulting in an inundation or creek sediments and surrounding geology in root zone and a continued propagation of a wetting front
Heritage Agreements	Changes to hydrological conditions and the implementation of water management activities which are in conflict with existing Traditional Owner Group Agreements.	Volumes discharged to creek are above direct infiltration capacity causing unacceptable standing water or impact to culturally significant areas.
Ethel Gorge aquifer	Aquifer discharges to surface resulting in continual surface water flow due to reduction in carrying capacity.	Infiltration via Ophthalmia Dam and the infiltration ponds results in mounding to an extent which generates surface discharge in downstream creeks and low points.