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GROUNDWATER SUPPLY DEVELOPMENT PLAN

Prepared for: International Minerals Ltd

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GROUNDWATER SUPPLY DEVELOPMENT PLAN

BALMORAL SOUTH IRON ORE PROJECT

Document Status

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	Name	Position	Signature	Date
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EXECUTIVE SUMMARY

International Minerals Ltd require a water supply of approximately 14GL/annum for mineral processing and mining activities associated with the proposed Balmoral South project at Cape Preston, Western Australia. The preferred water supply option is a water supply borefield located adjacent to the Fortescue River within the Ashburton Coastal Plain.

A comprehensive understanding of the hydrogeology of the proposed borefield area has been developed from numerous hydrogeological assessments completed. Previous investigations completed suggest that a sustainable yield of up to 10GL/annum of fresh water may be obtainable form the Fortescue River alluvium aquifer. This estimate of sustainable abstraction may be considered to be conservative as it does not allow for potential enhanced recharge which may occur under stressed aquifer conditions, which would exist if the borefield were operational.

Additional investigation is currently on-going including a detailed field investigation and groundwater modelling to confirm the sustainable yield of the Fortescue River aquifers (both the shallow alluvium and the Yarraloola Conglomerate).

It is anticipated that once the sustainable yield of the aquifers is established (and can be adequately substantiated) that an application will be submitted, under Section 5C of the Rights in Water & Irrigation Act 1914, to abstract water from the Fortescue River aquifers in order to meet all or part of the Balmoral South project requirements. A detailed hydrogeological report will accompany the application, which will include an assessment of environmental impacts and the management of these impacts, and will be submitted for approval by the Department of Water (DoW) with input from the Department of Environment & Conservation (DEC).

It is currently planned to make up any shortfall in water supply (between Project demand and sustainable borefield/aquifer yield) by seawater desalination. However, prior to the development of a fallback seawater desalination system, other sources of water supply and water supply augmentation would be assessed (including wet season surface water harvesting and enhanced aquifer recharge).

TABLE OF CONTENTS

TABLES

FIGURES

AFTER PAGE

SECTION 1 - INTRODUCTION

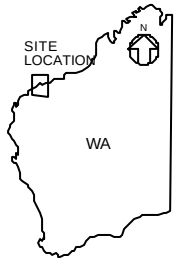
International Minerals Ltd (IM) plans to produce 12 million tones per annum (Mtpa) of iron ore concentrate, pellet and Hot Briquetted Iron products from the Balmoral South project at Cape Preston, Western Australia. The proposed mine site is located approximately 80km to the west of Karratha, as illustrated in Figure 1. The project will mine and process magnetite ore from the Balmoral South Mineral Resource which is located on mining leases held by Mineralogy Pty Ltd. IM has entered into an agreement with Mineralogy for the rights to mine 1 billion tonnes of ore over a 24-year period.

The project water demand for mineral processing and mining is estimated to be approximately 14GL/annum for the life of the project. IM are planning to install a water supply borefield adjacent to the Fortescue River as the primary water supply option to meet part or all of the project water demands.

Hydrogeological assessment of the Fortescue River aquifers has been undertaken through a number of previous investigations. A detailed review of these previous investigations has been undertaken. In addition, a detailed field investigation programme has been initiated (including the drilling and test pumping of bores) and groundwater modelling is proposed with the aim of assessing the sustainable abstraction of the aquifers in this area, taking into account maintenance of environmental flows.

This report outlines the work completed to date on the Fortescue River aquifers and details the ongoing field investigation. The ultimate objective of this work is to evaluate the sustainable abstraction from the Fortescue River aquifers. It is anticipated that once the sustainable yield of the aquifers is established (and can be adequately substantiated) that an application will be submitted, under Section 5C of the Rights in Water & Irrigation Act 1914, to abstract water from the Fortescue River aquifers. A detailed hydrogeological report will accompany the application, which will include an assessment of environmental impacts and the management of these impacts, and will be submitted for approval by the Department of Water (DoW) with input from the Department of Environment & Conservation (DEC).

The preferred water supply option is the development of a borefield to be installed in the Fortescue River alluvial aquifers adjacent to the Project, supplemented by mine dewatering discharge. It is currently planned to make up any shortfall in supply (between Project demand and sustainable borefield/aquifer yield) by seawater desalination which is discussed within the referral document for the overall project (Maunsell, 2007). However, prior to the development of a fallback seawater desalination system, other sources of water supply and water supply augmentation (wet season surface water harvesting, enhanced aquifer recharge etc) will also be assessed.



LEGEND

Proposed Pit Outline

Project Area

0 10 20
kilometers

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Figure 1
Project Location
Balmoral South Iron Ore Project

Author: GMS	Date: 19 April 2007
Drawn By: GMS	Revised:
Job No.: 773	Report No.: 010a
GDA94 Zone50	Scale:1:500,000

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The area has been subjected to three previous field investigation programmes:

- **Bradberry Associates (1965).** This field investigation programme concentrated on confirming the existence and extent of the shallow alluvial aquifer and comprised the drilling of 15 exploration bores and aquifer testing of 6 test bores.
- **Geological Survey of Western Australia (GSWA) (1975-1979).** This field investigation programme included salinity mapping and seismic surveys to determine aquifer thickness (Davidson, 1975 and Nowak, 1979).
- **GSWA (1983-1985).** The GSWA investigation concentrated on the shallow alluvial aquifer but a number of bores were also extended to investigate potential deeper aquifer units. The investigation included seismic surveys, drilling of 41 exploration bores at 34 sites and aquifer testing of 3 test bore sites (Kevi, 1984; Commander, 1989, 1993).

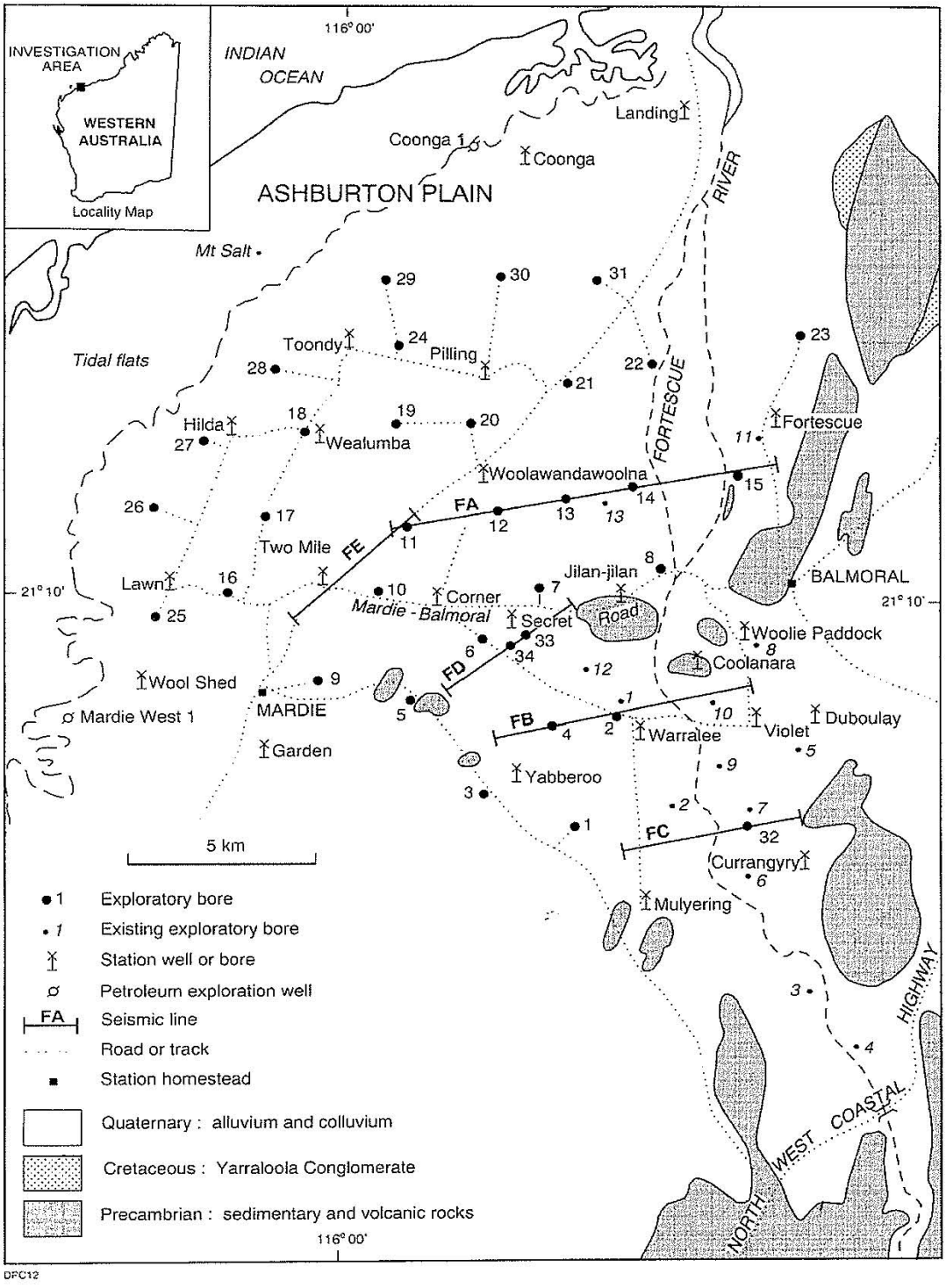
The GSWA (1983-1985) investigation programme was the most comprehensive study to date and included detailed lithological and geophysical logging, groundwater level monitoring, water quality sampling and analysis, salinity profiling and aquifer testing. The investigation area, bore locations and seismic line orientations are shown in Figure 2 and summary bore data is provided in Table 2.1.

Analysis and interpretation of the results of this investigation has enabled delineation of the alluvial aquifer, definition of aquifer characteristics, estimations of recharge/discharge and further identifies groundwater development potential (Commander, 1993).

Table 2.1
Summary of GSWA (1983-1985) Bore Data

Bore ID	Date Drilled	TOC Elevation (mAHD)	Total Depth (m)	Slotted Interval (m)	Static WL (m)	Salinity (mg/L TDS)	Airlift Yield (m^3/d)
FCP1A	6/7/83	28.473	18.0	7 – 11	7.60	998	-
FCP2A	26/7/83	27.199	75.5	43.8 – 70.8	7.96	454	120
FCP2B	22/7/83	27.760	21.0	6 – 21	8.46	480	40
FCP3A	7/7/83	25.217	20.0	6 – 16	7.37	1337	15
FCP4A	12/7/83	24.342	25.5	6 – 21	6.97	537	20
FCP4P	20/6/85	-	20.0	13.9 – 20	-	473	288
FCP5A	11/7/83	19.410	25.5	6 – 18	8.46	1715	very low
FCP6A	5/7/83	21.240	25.0	0 – 16.4	9.13	403	-
FCP7A	18/8/83	21.757	32.0	3.2 – 9.2	-	-	very low
FCP7B	30/8/83	21.583	14.5	5 – 11	8.57	-	very low
FCP8A	17/8/83	24.887	26.0	4.7 – 21.7	9.67	505	70
FCP9A	26/7/83	15.855	33.0	6 – 13	9.51	819	-
FCP10A	3/8/83	15.115	26.0	10 – 23	7.18	480	-
FCP11A	4/8/83	14.558	32.0	6 – 23	6.91	691	-
FCP11P	5/6/85	-	22.0	13 – 22	-	678	178
FCP12A	18/8/83	17.748	25.0	6 – 27	8.46	409	100
FCP13A	19/8/83	19.334	20.3	7 – 18	8.23	486	80

FCP14A	12/9/83	19.605	74.0	50.5 – 73.5	8.06	480	120
FCP14B	22/8/83	20.221	30.0	5 – 19	7.03	390	120
FCP15A	2/8/83	19.971	20.0	5.5 – 13.5	9.13	460	-
FCP16A	29/8/83	-	19.5	not cased	-	-	-
FCP16B	29/8/83	11.894	14.5	2.4 – 10.4	8.75	710	15
FCP17A	24/8/83	9.985	26.0	5 – 13 18 – 21	7.15	793	100
FCP18A	25/8/83	8.997	25.5	4 – 17 21 – 23	6.15	742	85
FCP19A	5/8/83	12.488	29.5	4.5 – 22	7.58	633	85
FCP20A	8/8/83	14.737	29.0	4.7 – 22.7	8.52	640	125
FCP21A	11/8/83	14.301	28.0	5 – 17	8.05	806	100
FCP22A	10/8/83	16.288	29.5	5 – 13	9.22	601	40
FCP23A	27/7/83	14.826	17.5	6 – 12	7.07	2278	very low
FCP24A	26/8/83	9.423	21.3	4 – 14 18 – 20	6.49	832	30
FCP25A	3/8/84	6.437	20.5	5 – 20	4.77	7040	108
FCP26A	2/8/84	7.205	20.5	2.5 – 20	6.37	47040	69
FCP27B	31/7/84	6.429	20.5	5 – 13	5.75	16064	-
FCP28A	30/7/84	6.853	23.5	4 – 17	5.58	10560	14
FCP29A	26/7/84	7.514	30.0	5 – 10 14 – 20	6.06	17024	15
FCP30A	20/7/84	9.723	29.5	5 – 21	6.83	1158	216
FCP31A	16/7/84	11.978	29.5	6 – 19	8.07	774	28
FCP32A	28/6/85	32.864	53.0	41.5 – 51.5	8.25	492	9
FCP32B	4/7/85	32.864	18.5	3.4 – 12.4	8.38	345	17
FCP33A	6/6/85	22.429	44.5	11 – 21	8.97	550	86
FCP34A	12/6/85	21.627	44.7	13.8 – 20	7.97	441	103



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GSWA Bore and Seismic Line Locations
Figure 2

3.1 GEOLOGY

The geology of the general project area is illustrated in Figure 3 and 4. The eastern part of the area is characterised by two series of north-northeasterly trending ridges of outcropping Lower Proterozoic aged rocks of the Mount Bruce Supergroup, which are part of the Hamersley Basin. These rocks dip steeply to the west-northwest and become generally younger from east to west, although there are numerous minor faults in the area that have resulted in some repeats of stratigraphic horizons. There is also one major fault parallel to the regional strike, and located between the two series of ridges, that has resulted in the absence of several major stratigraphic units.

The eastern and highest series of ridges are formed by the Kylena and Maddina Volcanics which comprise basalts and tuffs. The western series of ridges are made up of Banded Iron Formation (BIF), cherts, shales and breccias of the Brockman Iron Formation (and to a lesser extent the underlying Mount MaCrae Shale-Mount Sylvia Formation). Three main orebodies have been identified; the Central, Northern and Southern Blocks. These are high-grade magnetites that have developed within the Joffre Member of the Brockman Iron Formation. A thin veneer of Quaternary alluvial, colluvial and residual soils overlies the basement rocks in low lying areas, with some creek bed alluvium along drainage courses.

The western part of the project area lies on part of the Fortescue River floodplain, which is the area of the proposed water supply borefield. The geological sequence within this area comprises a sequence of Precambrian rocks overlain by Cretaceous rocks, inturn overlain by Cretaceous, Tertiary and Quaternary sediments. The lower most unit is the Cretaceous aged Yarraloola Conglomerate, which comprises rounded gravels with minor sands and clays. This unit forms part of the Carnarvon Basin and unconformably overlies units of the Mount Bruce Supergroup that are stratigraphically higher (younger) than the Brockman Iron Formation (Weeli Wolli Formation and possibly others). The Yarraloola Conglomerate is unconformably overlain by the Tertiary aged Trealla Limestone, which comprises clays, marls and crystalline limestone. This is unconformably overlain by the Quaternary aged Fortescue River alluvium, which forms an alluvial fan extending from basement outcrops, that border the coastal plain, to the coast. The alluvium includes gravel bed-load deposits in the present and past riverbeds and overbank deposits of silty clays with some sands and gravels. There are also calcrete deposits within the zone of water table fluctuation and some colluvial deposits on the flanks of the major ridges.

3.2 AQUIFER CHARACTERISTICS

The stratigraphy and hydrogeological properties of the various geological units within the project area are summarised in **Table 3.1.**

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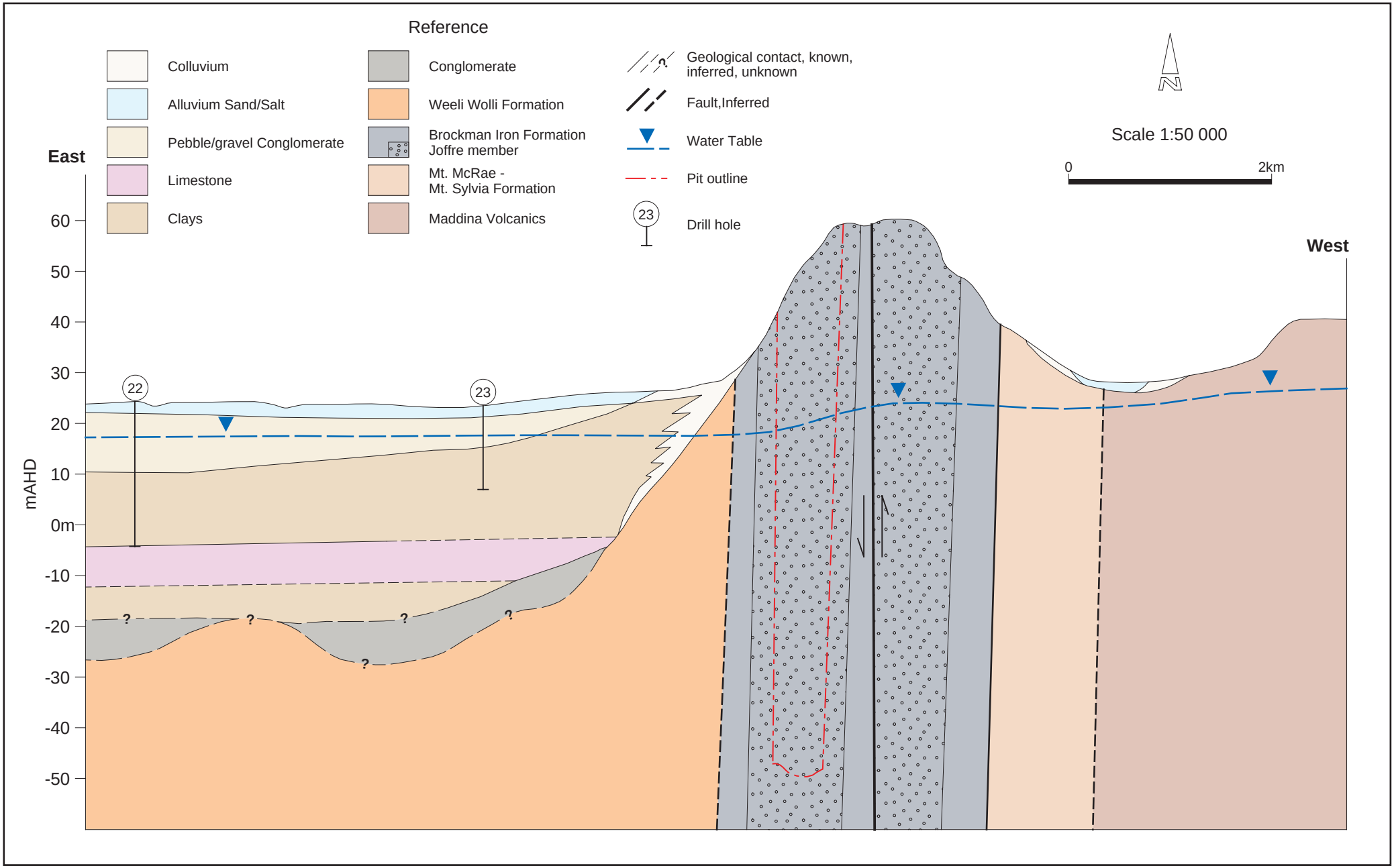

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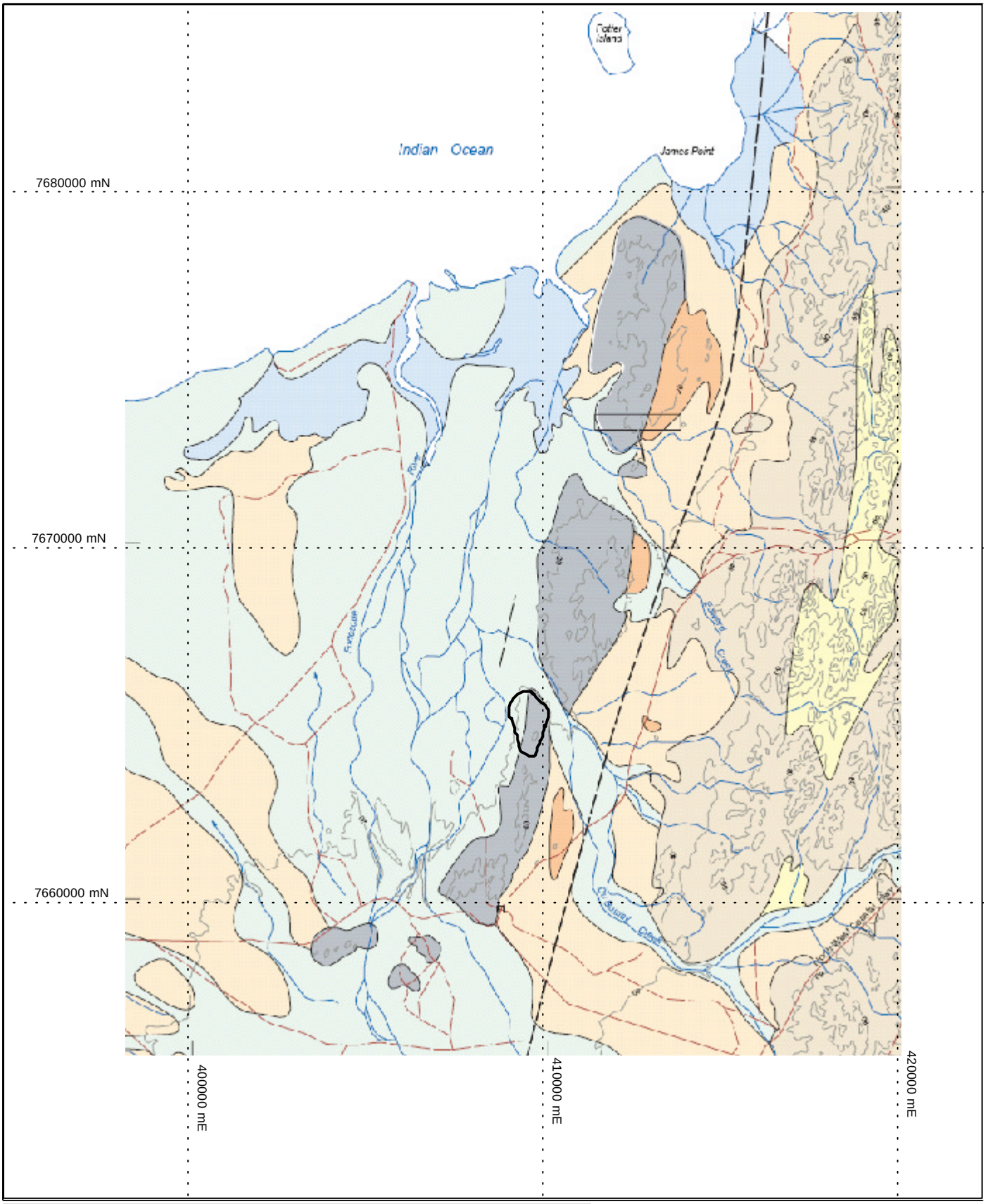
Geological - Hydrological Cross Section

Figure 3



LEGEND

- Tidal Flats-high water areas
- Fortescue River Alluvium
- Residual Clays, Sands and Gravel
- Brockman Iron Formation
- Mt.McRae Shale
- Mt.Sylvia Formation
- Maddina Volcanics
- Kylena Volcanics
- Fault (inferred)
- Major Roads
- Minor Roads
- 40 Elevation (m AHD)
- Drainage
- Proposed Pit Outline

2 0 2 km

SITE LOCATION

WA

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Figure 4
Regional Geology
Balmoral South Iron Ore Project

Author: GMS	Date: 19 April 2007
Drawn By: GMS	Revised:
Job No.:773	Report No.: 010a
GDA94 Zone50	Scale:1:150,000

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Table 3.1
Summary of Stratigraphy & Hydrogeological Properties

Age	Unit	Comments
Quaternary	Fortescue River Alluvium	-Gravels form major aquifer with high permeability. -Aquifer covers extensive area beneath floodplain. -Groundwater is fresh in most of floodplain area. -Groundwater is marginal to brackish on edge of floodplain. -Groundwater is brackish to saline at depth near coast.
	Eluvium-Residual Soils	-Mostly above the water table. -Forms local aquifer where saturated, connected to alluvium.
Tertiary	Trealla Limestone	-Aquitard. -Forms confining layer to Yarraloola Conglomerate. -Forms base of overlying alluvial aquifer.
Cretaceous	Yarraloola Conglomerate	-Confined aquifer with moderate to low permeability. -Forms narrow channel aquifer in old river course. -Intersected in three GSWA bores. -Groundwater is fresh in these bores.
Proterozoic	Weeli Wolli Formation	-Indurated rocks with no primary porosity or permeability. -Some minor fracture induced secondary aquifer properties. -Not aquifers in project area. -Groundwater is marginal to brackish in mine area.

The primary aquifers within the project area are as follows:

- Gravels of the Fortescue River alluvium; and
- Yaraloola Conglomerate (although to a lesser extent).

The Yarraloola Conglomerate infills a narrow, subsurface palaeo-valley incised in the Precambrian bedrock. The palaeo-valley coincides roughly with the present course of the Fortescue River. The Yarraloola Conglomerate consists of rounded gravels derived from basement rock and minor sand and clay beds. The Trealla Limestone, consisting of 20-30m of marl and clay, overlies the Yarraloola Conglomerate. The alluvial deposits of the Fortescue River are up to 30m thick and overly the Trealla Limestone. The alluvium consists of a clay and silt matrix with gravel bed load deposits in the riverbed and the subsurface.

3.3 RECHARGE, WATER LEVELS, DISCHARGE & GROUNDWATER FLOW

Recharge to the shallow alluvial sediments occurs by direct infiltration of streamflow via river beds. The magnitude of recharge is dependent on duration of streamflow and by the available storage of the aquifer in the vicinity of the river. Direct rainfall recharge may also occur locally during intense rainfall events. The alluvial aquifer may also be recharged to some extent by throughflow from flanking basement rock aquifers.

The water table in this area is relatively shallow, generally between 5 and 12m below ground level. The watertable is subject to significant fluctuations especially near river beds as a results recharge by fresh surface flow in the Fortescue River, fluctuations of up to 6m have been recorded in some bores located close to the Fortescue River (Commander, 1993).

The shallow alluvial aquifers discharge by baseflow to the Fortescue River during periods when the water table is above the river bed and above river water levels, and by evapotranspiration. The latter occurs via vegetation on the floodplain and also as direct evaporation from the near shore tidal flats where the fresh groundwater flows up to the surface above a saline water interface.

Groundwater level contours tend to be parallel to the coast with flow in a northwesterly direction, although there is local divergence of groundwater flow away from the main River channels at times of river flow and local convergence of groundwater flow about the River channels in periods of little to no flow. The groundwater throughflow in the main aquifer (gravels) in the alluvium has been estimated (Commander, 1993) at up to 9.2GL/yr (an average of around 25ML/d).

It is important to note that the estimated throughflow of up to 9.2GL/yr may be considered to be a conservative value, as throughflow may increase if enhanced recharge were to occur under stressed aquifer conditions, which would exist if the borefield were operational.

3.4 STORAGE

Previous investigations (Commander, 1993 and Bradberry Associates, 1965) indicate that the alluvium is potentially a major source of fresh water and could support substantial pumping. The total groundwater storage in the alluvial gravel aquifer was estimated as 126GL in November 1985, assuming a specific yield of 0.1. Although groundwater storage depletion was calculated to be of the order of 11GL during a period of minimal streamflow between November 1985 and November 1986 (Commander, 1993).

3.5 AQUIFER PARAMETERS & BORE YIELDS

Test pumping of three bores completed within the alluvium provided transmissivity values ranging from 380 to 1,760m^2/day and hydraulic conductivity values ranging from 63 to 190m/day. The pumping tests suggested that pumping rates up to 800m^3/day were achievable (Commander 1993).

Test pumping of two bores completed within the Yarraloola conglomerate provided transmissivity values of 3 and 65m^2/day and hydraulic conductivity values less than 2m/day. The pumping tests were completed at 120 and 1,063m^3/day suggesting significant fluctuation with regard to pumping rate potential (Commander 1993).

3.6 WATER QUALITY

There are three primary groundwater quality types within the region:

- Fresh groundwater (<1,000mg/L TDS) in the central part of the Fortescue River alluvium. This fresh water forms a “lobe” elongated along the main channels of the Fortescue River as a result of recharge through infiltration of streamflow.
- Marginal to brackish groundwater (1,000 to around 2,000mg/L TDS) in the basement rock aquifers and on the flanks of the Fortescue River alluvium where throughflow from the basement rocks mixes with the fresh water in the alluvium.
- Brackish to saline groundwater (greater than 5,000mg/L TDS) adjacent to the coast, where there is a saline water interface between the fresh groundwater flowing northwards and seawater. This interface

dips to the south (i.e. inland) forming a “salt water wedge” and groundwater salinity would increase with depth in the near coastal and tidal flats areas.

Both the alluvium and Yarraloola Conglomerate store considerable volumes of fresh water, with the available laboratory data suggesting that groundwater quality within the alluvium conforms to the drinking water guidelines (NHMRC, 2004), except in areas at the flanks of the floodplain and in the near coastal zone.

SECTION 4 - PROPOSED INVESTIGATION

The principal objective of the proposed investigation (which commenced in April 2007) was to confirm the sustainable groundwater resources available within the Fortescue River floodplain sediments. Once the sustainable abstraction was confirmed it was proposed to submit an application for a Groundwater Well Licence (GWL) to abstract groundwater (up to a maximum of 14GL/year) to meet some or all of the project water supply demand.

As a part of earlier investigations (2000 to 2002), Aquaterra met with the (then) Waters and Rivers Commission (WRC) and discussed their requirements for the granting of the appropriate GWL. Key objectives to arise out of this meeting, held on 17th July 2002 were as follows:

1. Enhance hydrogeological understanding of the project area, including the hydraulic interaction between different stratigraphical (aquifer) units.
2. Develop a groundwater model to predict impacts of pumping to a level of confidence to satisfy the DoW that the requested allocation was sustainable. This component of the work would also demonstrate the reliability of water supply for the project.
3. Use the groundwater model to predict the impacts of pumping in terms of water levels drawdowns and interruptions to groundwater and surface flows in the area.
4. Identify and assess the impact of groundwater abstraction on any groundwater dependent ecosystem within the predicted area drawdown.

A detailed investigation programme was developed to meet these objectives and included the following:

- Data Review
- Field Investigation
- Groundwater Modelling
- Analysis & Reporting

The scope of work for each of the components of the proposed investigation is detailed within this section of the report.

4.1 DATA REVIEW

Aquaterra have been working on various aspects of this project since early 2000. We have a comprehensive understanding of all work previously completed in the area both by us and by other parties. During our involvement with the project over the last seven years we have constantly been upgrading our hydrogeological understanding of the project area and reviewing any newly available data in the context of the previous hydrogeological investigations completed. This review is an ongoing process continuing as new data becomes available (egg recent completion of air-lift testing within the vicinity of the ore body).

4.2 FIELD INVESTIGATION

A detailed field investigation was initiated in April 2007. The field investigation includes the drilling of up to twenty exploration holes, along a number of transects, in order to help delineate aquifer geometry and aid in targeting production bore locations. At favourable locations (based on the exploration data) up to six trial

production bores and six dedicated observation bores will be installed to assess hydraulic characteristics of the aquifer units present, hydraulic connection and the performance of the trial pumping bores.

Two of the trial production bores will be extended into the Yarraloola Conglomerate and sealed off from the upper alluvial aquifer. Paired deep and shallow bores will be installed adjacent to the two deep production bores to allow for assessment of leakage from the near surface alluvium and the river to the deeper aquifer. The remaining four trial production bores and observation bores will be constructed into the shallow Fortescue Alluvium.

Test pumping will be conducted on each trial production bore for determination of sustainable bore yields and aquifer characteristics. Two day tests (comprising multi-rate and standard 24 hour constant rate tests) would be conducted in the Fortescue Alluvium bores. Extended (up to seven day) constant rate tests would be conducted on the Yarraloola Conglomerate bores to provide sufficient aquifer stress to assess leakage/recharge from the shallow aquifers.

The field investigation will also provide a series of monitor bores at key locations throughout the Fortescue River floodplain area that will be maintained as permanent observation sites for long-term scheme monitoring of regional drawdown and groundwater quality impacts.

4.3 GROUNDWATER MODELLING

A groundwater flow model (using the industry standard MODFLOW package) will be developed to provide for prediction of aquifer response to pumping. This will include provision for the simulation of recharge from the river under natural and artificially enhanced conditions.

The model will be established and calibrated as follows.

- Steady state calibration to observed long term water levels.
- Long term transient calibration to GSWA water level records of the early 1980's.

The calibrated model will be run to predict aquifer response to various pumping and recharge scenarios (long term average conditions and dry/wet conditions) to determine:

- Sustainable aquifer yield (in terms of preventing saltwater encroachment from the sea, minimising drawdown inputs in areas of groundwater dependent ecosystems and under dry/wet conditions).
- Optimum bore design and borefield layouts to make best, and most cost effective, use of the sustainable yield while minimising water level drawdown impacts.

4.4 ANALYSIS & REPORTING

All the data derived from the field investigation and groundwater modelling will be analysed in order to define the sustainable groundwater resource. Definition of the sustainable yield of the aquifer units will be established in terms of the surface water/groundwater interaction in the area and the interaction with any groundwater dependent ecosystems. A notional borefield design will be developed to optimise the use of the sustainable water supply in terms of impacts of groundwater abstraction and cost effectiveness under various operational conditions.

A Hydrogeological Report will be compiled and submitted for approval, in support of the GWL application, to the DoW with input from DEC. The hydrogeological report will discuss the hydrogeology of the area, predict water level drawdowns, assess environmental impacts and identify the proposed management of these impacts. This report will provide sufficient details to substantiate and satisfy the DoW and DEC that the requested allocation is sustainable and will have no long term detrimental impacts on the groundwater resource or groundwater dependent ecosystems.

Previous investigations suggest that the alluvium is a major source of fresh water that receives regular replenishment. These previous investigations suggest that based on natural recharge rates the alluvial aquifer has the potential to sustain and annual abstraction of up to approximately 10GL, with salinity ranging from 400 to 800mg/L (TDS), from bores pumping at rates of up to 800m^3/day. In addition, the previously estimated sustainable abstraction of up to approximately 10GL/yr may be considered to be a conservative value as it does not allow for potential enhanced recharge which may occur under stressed aquifer conditions, which would exist if the borefield were operational. The sustainable yield could also be increased by promoting a greater infiltration rate by using artificial recharge dams or increasing available storage of the aquifer in the vicinity of the river (Commander, 1993).

The most appropriate area for groundwater abstraction from the Fortescue River alluvium and the Yarraloola Conglomerate is adjacent to the present river bed, where rapid recharge can occur during stream flow. Lowering the water table close to the river will create a larger available storage capacity to be recharged when stream flow occurs. The area adjacent to the river bed also has the thickest deposits of saturated alluvium and underlying Yarraloola Conglomerate which should result in relatively high bore yields. However, to sustain the overall demand, any water supply borefield will most likely need to extend to the west of the current Fortescue River to develop groundwater resources within the basal gravels of previous river courses.

In assessing development potential, consideration needs to be given to:

- Water availability.
- Existing water use.
- Potential impacts of abstraction.

5.1 WATER AVAILABILITY

A sustainable abstraction of approximately 10GL/year has been established by the GSWA investigation programme and there is significant groundwater in storage (more than 100GL) to provide additional capacity in years of low streamflow.

It is further noted that recharge to, and groundwater flux/storage within, the alluvial aquifer system may be greater than has been estimated (being largely derived through adoption of a conservative specific yield value of 0.1 when values of up to 0.3 may be expected locally and an average value of 0.2 is conceivable for the area as a whole).

Streamflow records and current recharge estimates indicate that only a minor portion of streamflow infiltrates to provide aquifer recharge and that surface water discharge at the coast may average about 100GL/yr. As a consequence, significant potential exists for:

- direct recovery of surface water; and/or
- augmenting recharge to the groundwater system through:
    - lowering of the watertable close to the river to increase the infiltration capacity of the aquifer; and/or
    - streamflow regulation to extend flow duration and/or increase area available for direct infiltration.

5.2 EXISTING WATER USE

Water use in the area is currently limited to pastoral use with numerous station wells and bores withdrawing supplies from the alluvial aquifer to meet limited stock and domestic requirements. A search of the Water and Rivers Commission (WRC) database for licensed users shows was undertaken in mid-2002 and identified only two licensed groundwater allocations (Table 6.1), one of which was a GWL (exploration) granted to one of the Project companies (Mineralogy). The WRC database would be reviewed and existing licensed water users identified prior to submission of the hydrogeological report supporting the GWL application.

Table 6.1
Licensed Groundwater Allocations (2002)

Licence No.	*Licensee*	Easting	Northing	Allocation (kL)	Aquifer
63146	Epic Energy Pty Ltd	407142	7656051	1000	Fractured Rock
71401	Mineralogy Pty Ltd	412734	7679218	0	Carnarvon (Superficial)

5.3 POTENTIAL IMPACTS OF ABSTRACTION

The proposed water supply development would involve a series of production wells located along the current course of the main Fortescue River channel (intersecting the alluvium and underlying Yarraloola Conglomerate) and elsewhere throughout the broad area of the floodplain.

Whilst groundwater modelling studies will be required to accurately quantify the drawdown resulting from abstraction and any modifications to the groundwater flow regime, the general impacts for both base and peak water supply scenarios will likely be limited to:

- In and around the wellfield area:
  - Lowering of groundwater levels.
  - Yield decline and possible abandonment of some pastoral bores.
  - Local stress on phreatophytic vegetation.
- Near the coast:
  - Reduced groundwater flow to and discharge from the tidal flats at the coast.
  - Slight upward movement and modification of the shape of the saline interface at the coast.
  - Local increases in salinity in coastal bores.
  - Marginal reduction in surface water flow and discharge at the coast.

Development would be accompanied by maintenance of water security on pastoral leases. The potential environmental impacts appear minimal and, as mentioned above, significant opportunity exists with engineering and operation of the development scheme for minimization and/or mitigation as may be deemed appropriate.

5.4 ALTERNATIVE WATER SUPPLY OPTIONS

The preferred water supply option is the development of a borefield to be installed in the Fortescue River alluvial aquifers adjacent to the Project, supplemented by mine dewatering discharge. It is currently planned to make up any shortfall in supply (between Project demand and sustainable borefield/aquifer yield) by seawater desalination which is discussed in the referral document for the overall project (Maunsell, 2007). However, prior to the development of a fallback seawater desalination system, other sources of water supply and water supply augmentation (wet season surface water harvesting, enhanced aquifer recharge etc) will also be assessed.

SECTION 6 - REFERENCES

- Bradberry Associates, 1965. Water Resources of the Lower Fortescue River Area. Unpublished report to Raymond International and Cliffs International.
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