

Memo

To: Fiona Bell
From: Paul Davies
Date: 24/03/2005
Subject: Mesa A / Warramboos Development

Company: Pilbara Iron
Job No: 568/B5
Doc No: 039a

Fiona,

1. SURFACE HYDROLOGY

The proposed development area is located in the Pilbara region of Western Australia, just over 100km south west of Karratha, west of Pannawonica and on the western edge of the Hamersley Ranges. A regional plan of the area is presented on Figure 1.

The development area covers Mesa A, Warramboos and the transport corridor between Mesa A and Mesa J, as shown on Figure 2. This area is located predominately in the Robe River drainage catchment, a major river system in the region. The Robe River Catchment drains generally from east to west through the high relief areas of the Hamersley Ranges onto the more gently sloping areas in the coastal plain, before discharging into the ocean. There are many tributaries that discharge into the Robe River from within the proposed development area.

The regional area of the development experiences an arid climate, with very low rainfall, high evaporation and high daytime temperatures. There are numerous rainfall stations in the vicinity of the development area including three Bureau of Meteorology sites within 20km of Warramboos and Mesa A Pits. The average annual rainfall is 300 to 350mm, with a mean annual runoff less than 10mm (Water & Rivers Commission Mapping). Average monthly rainfall varies from almost zero in September/October to a peak of 100mm in February, which includes the influence of the occasional intense rainfall event when more than 100mm can fall within a 24-hour period (usually from cyclonic activity). Daily maximum and minimum temperatures range from 25 to 40 Degrees Celsius in Summer to 12 to 28 Degrees Celsius in Winter.

As for most parts of the Pilbara, the normal condition for creeks is dry. Runoff is ephemeral, occurring only after significant and intense rainfall events. There is one streamflow gauging station on Robe River at Yarraloola (Station Number 707 002). This gauging station is adjacent to the North West Coastal Highway and is within the development area. The station has a catchment area of 7250km², and flow data has been recorded since January 1972. The next closest streamflow gauging station is on the Fortescue River, outside of the development area.

Besides the Robe River, other significant waterways in the development area are the Warramboos, Mungarathoona and Jimmawurrada Creeks. These creeks are discussed below. Most other waterways in the development area are tributaries of the Robe River.

Warramboos Creek with a catchment area of roughly 1000km², has its headwaters about 30km south of the development area, and discharges into the poorly defined scrubland in the coastal plain. It is likely that during large floods, the downstream Warramboos Creek in the coastal plain becomes part of the Robe River Floodplain. Warramboos Pit is located in the Warramboos drainage catchment. All other proposed mine infrastructure is located in the Robe River drainage catchment.

Mungarathoona Creek with a catchment area of roughly 1500km², has its headwaters in the Hamersley Ranges, about 50km to the south of the catchment outlet. The outlet of this creek discharges into Robe River, near the Dampier to Goldfields gas pipeline. Just over 10km south (upstream) from its outlet, Mungarathoona Creek changes its name to Red Hill Creek.

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Jimmawurrada Creek with a catchment area of roughly 1300km², has its headwaters in the Hamersley Ranges about 60km south east of the catchment outlet. The outlet of this creek discharges into Robe River near Mesa J. Just over 10km south (upstream) from its outlet, Jimmawurrada Creek changes its name to Bungaroo Creek.

2. POTENTIAL HYDROLOGICAL IMPACTS OF THE WORKS

The impact of the proposed development on the environment should be minor in hydrological terms with the main impact being the disturbance of natural vegetation in the development footprint. Potential impacts relating to surface water runoff are outlined below:

- Soil erosion due to increases in flow velocities
- Minor changes to flow volumes
- Contamination from sediments and chemicals

These potential impacts are discussed below.

2.1 Soil Erosion

Surface water runoff in the transport corridor that previously occurred as sheet runoff, will be concentrated by the proposed railway/haul road embankment, prior to being discharged through a bridge opening or culverts towards the Robe River. Similarly, sheet flow that previously flowed through the pit and mine infrastructure areas will also be concentrated prior to being diverted and discharged downstream.

This will result in a localised increase in flow velocities as the floodwaters are concentrated in constructed diversion channels, or alongside flood bunds or raised pads. Provided these flow diversions are designed to ensure flow velocities are low or adequate rock armouring is provided, the potential impact on soil erosion from the development can be managed.

2.2 Changes in Flow Volumes

Flow diversions often result in a loss of flow downstream in the natural channel, as the diversion works potentially re-direct the water into an alternative waterway or into a storage area such as an open pit.

The Mesa A Pit which is located in the Robe River Catchment, intersects only one creek with an upstream catchment of around 22km². The creek flows past the eastern edge of the pit footprint, so it should be relatively easy to divert around the pit and back into the same creek downstream. Hence, the impact on flow volumes should not be significant.

The Warrambo Pit is located in the Warrambo Creek Catchment, with the pit having an upstream catchment of around 10km². A number of creeks are intersected by the pit footprint so will require diverting, possibly into other downstream catchments. This impact may or may not be significant depending upon the catchment areas and flow volumes involved, and the vegetation present.

The transport corridor intersects numerous tributaries of the Robe River, the main one being Mungarathoona Creek. As this is a significant waterway, a bridge is proposed at this location to allow an uninterrupted railway or haul road (depending which one is constructed). Other smaller tributaries that cross the transport corridor will require culverts. Hence, there should be no change in the downstream flow volumes for each creek crossing.

2.3 Contamination

The proposed waste dumps have the potential to discharge sediment laden water to the environment. In addition, the proposed workshop has the potential to discharge various chemicals such as hydrocarbons. Water management measures will be required to mitigate the potential impacts on downstream runoff water quality.

If you require any further information, please do not hesitate to contact our office.

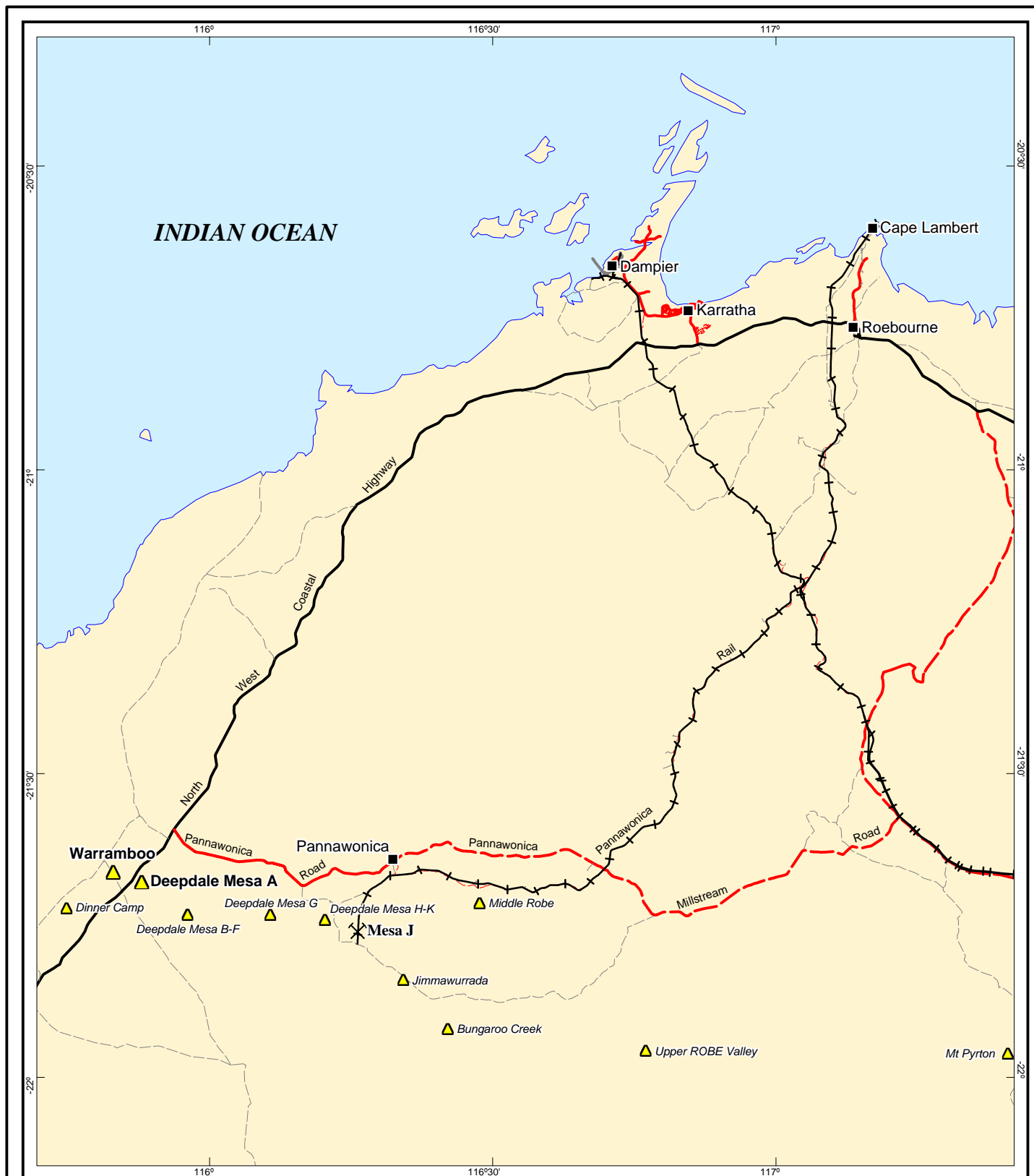
Regards,
Aquaterra

Paul

Paul Davies
Senior Civil/Water Resources Engineer

Vince

Vince Piper
Principal Civil/Water Resources Engineer



- ▲ Major Resource
- ✕ Existing Minesite
- Town

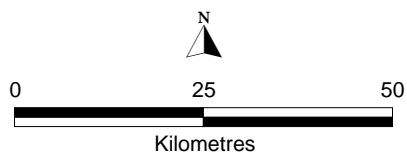
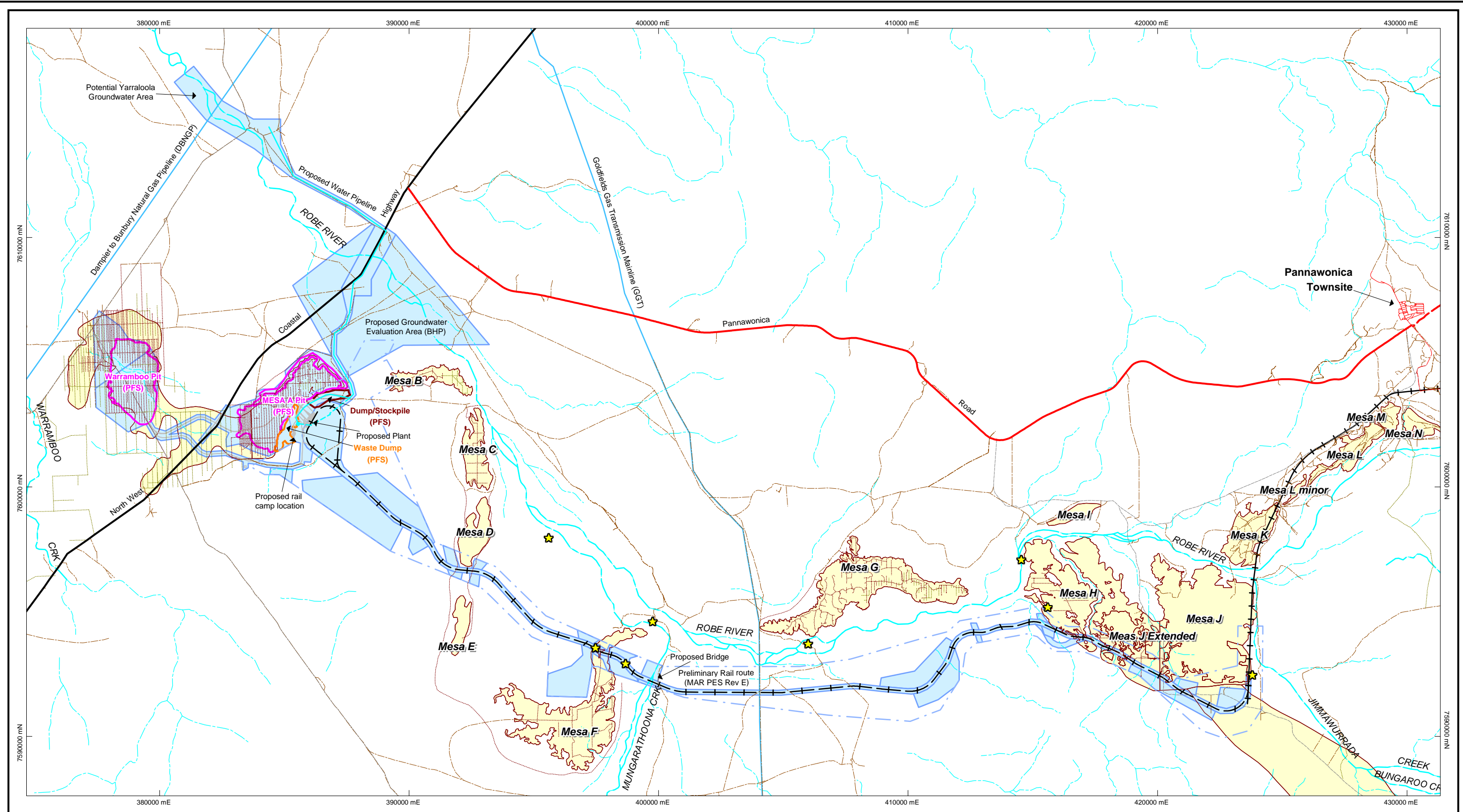
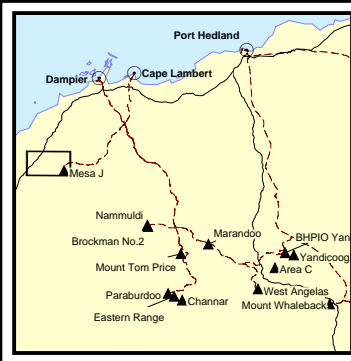


Figure 1
Location of Mesa A/Warrambo

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|-------------------------------|--------------------|
| Author: FB | Date: 10/03/2005 |
| Drawn: CB | Revised: |
| Dwg No.: #109829v1 | Report No.: |
| Projection: MGA Zone 50 GDA94 | Scale: 1:1,000,000 |





— Highway

--- Secondary Road

— Main Road

— Town Road

--- Rail Maintenance Road

— Track

— Gas Pipeline

--- Exploration Track

--- Vehicle Track

--- Proposed Exploration Track

++++ Existing Railway

—+— Proposed Railway

--- Major River/Creek

Resource Outline

Transport Corridor


Proposed Disturbance Areas

★ Water Source

2.5 0 2.5 5

Kilometres

N



Pilbara Iron
A member of the Rio Tinto Group

Figure 2
Transport Corridor between
Mesa A and Mesa J

| | |
|-------------------------------|------------------|
| Author: FB | Date: 10/03/2005 |
| Drawn: CB, Land Assets | Revised: |
| Dwg No.: #109829v1 | Report No.: |
| Projection: MGA Zone 50 GDA94 | Scale: 1:150,000 |