

Pilbara Iron Ore and Infrastructure Project

Stage A
(September 2004)

Response to Public
Submissions on
Public Environmental
Review
April 2005



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**Pilbara Iron Ore and Infrastructure Project:
Stage A Port and North-South Railway**

**Response to Submissions
(and Additional Studies)
April 2005**

by

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**Pilbara Iron Ore and Infrastructure Project:
Stage A Port and North-South Railway**

**Response to Submissions (and additional studies)
EPA Assessment No. 1505**

by

Fortescue Metals Group Limited

1. INTRODUCTION

The public submission period for the Pilbara Iron Ore and Infrastructure Project: Stage A Port and North-South Railway Public Environmental Review (PER) commenced on 20 September 2004 for a period of eight weeks, ending on 15 November 2004. Late submissions were accepted by the EPA until the 3rd December 2004.

Seventeen submissions have been received by the Environmental Protection Authority (EPA). Submissions have been made by State and Local Government; organisations and individuals.

The principal issues raised in the submissions included, biophysical, pollution, social and planning issues. Other issues focused on more technical aspects of the proposal.

Although not all of the issues raised in the submissions are environmental, the proponent is asked to address all issues, comments and questions as they are relevant to the proposal.

2. GENERAL COMMENTS

Four of the submissions received indicated support for the proposal. This support was essentially based on the benefits such a project may bring to the town of Port Hedland. Four of the submissions were neutral but raised a variety of concerns and indicated that further information is needed in order to fully assess the Project's potential impacts. The majority of the submissions focused on biophysical issues arising from the port development and the proposed rail route, including impacts upon marine and terrestrial biota, and the impacts of dust and noise upon residents of Port Hedland and Wedgefield. Social and planning related issues were also raised. The need to consider the cumulative impacts of FMG's proposed railway, the adjacent proposed Hope Downs (HDMS) railway and the existing BHP Billiton Iron Ore (BHPBIO) railway, was also raised. This has been considered further by FMG, as described in Section 3.4.

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3. ADDITIONAL INVESTIGATIONS

3.1 BENTHIC PRIMARY PRODUCING HABITATS

3.1.1 Impact Avoidance

EPA Guidance Statement No.29 on Benthic Primary Producer Habitats (BPPH) (“EPA Guidance 29”) provides a set of principles to be applied to development proposals which may result in the removal of or the damage of marine benthic primary producer communities or the habitats that support them, these principles include:

- avoidance of loss or damage to BPPH;
- design to minimise loss; and
- best practicable design/construction/management to minimise BPPH loss.

To demonstrate Principle 1 of EPA Guidance 29 in more detail FMG has carried out a review of layout alternatives that were evaluated for the Port area to reduce impacts on mangroves. The results of the study on Port Layout Alternatives are included as a report in Appendix 1. In summary the report found that FMG's preferred layout, as presented in the PER, appears to be the best possible compromise between project requirements and other issues and constraints. Minor modifications may be possible during final design, but there appears to be no other feasible location for a rail loop at Port Hedland harbour that would have less impact on mangrove systems.

Since submission of the PER, port design revisions have further reduced the clearing requirements for core mangrove areas. This was achieved by revisiting the design of the port and clearing requirements for infrastructure, in conjunction with the vegetation mapping undertaken by Biota Environmental Sciences, to reduce mangrove clearing as shown in Figure 1 (attached). The revised mangrove clearing areas were re-analysed using a Geographical Information System (GIS), with the outcomes shown in Table 1.

Table 1: Mangrove association clearing based on the revised FMG port design.

Description	Classification		Zone of impact (ha)						
	Paling <i>et al.</i>	Biota	1*	2*	3*	4*	5*	6*	Total
Closed canopy <i>Rhizophora stylosa</i>	1	1	0.00	0.00	0.00	0.01	0.11	0.00	0.12
Closed canopy R. <i>stylosa Avicennia marina</i>	2	2	0.64	0.00	1.02	3.52	0.00	0.00	5.18
Closed canopy A. <i>marina</i> (seaward)	3	3	2.39	0.00	0.61	1.97	0.08	0.04	5.09
Closed canopy A. <i>marina</i> (landward)	4	4	0.00	0.00	0.00	0.00	0.04	0.00	0.04
Low open woodland A. <i>marina</i>	4A	5	3.50	0.00	0.00	0.68	0.00	0.18	4.36
Low scattered A. <i>marina</i> , scattered samphires	4B	6	82.47	0.00	0.00	10.17	0.66	1.14	94.44
Low dense <i>Aegiceras corniculatum</i>		7	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Low open <i>Ceriops tagal</i>		8	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Low dense <i>Aegialitis annulata</i>	8	9	0.00	0.00	0.00	0.00	0.01	0.00	0.01
Algal mats			50.12	0.00	0.00	0.00	0.16	0.00	50.28
Bare sand / mud			40.47	11.46	0.12	0.90	0.36	0.13	53.44
Water			0.25	0.00	0.18	0.82	0.00	0.00	1.25
Supratidal land			98.03	6.33	0.01	9.89	0.38	0.00	114.64
Total areas			277.87	17.79	1.94	27.96	1.80	1.49	328.85
Mangrove systems			6.53	0.00	1.63	6.18	0.24	0.22	14.80

- Zones:
- 1: Main land reclamation area (and other infrastructure within this area, including stockyards and the eastern part of the rail loop).
 - 2: Anderson Point reclamation area.
 - 3: Conveyor from the stockpile to the wharf (excluding the Anderson Point basin).
 - 4: Rail loop (excluding parts of the line within the main land reclamation area).
 - 5: Conveyor from car dumper to the edge of the reclamation area.
 - 6: Access road to Anderson Point.

These revisions have reduced mangrove clearing by an additional 7.2 ha and reduced the overall proportional loss of core mangrove within the harbour from 22 ha to 14.8 ha (Figure 2 shows the amended Port layout). This was achieved by adjusting the boundaries of the dredge spoil reclamation area to avoid mangroves and impact bare mudflat or terrestrial areas instead. Cyanobacterial algal mats have not been included in the calculations as mangroves as they do not fall within the assessment framework of EPA Guidance 29 which defines Benthic Primary Producers as:

‘Predominantly marine plants (e.g. seagrasses, mangroves, seaweeds and turf algae) but include invertebrates such as scleractinian corals, which acquire a significant proportion of their energy from symbiotic microalgae that live in coral polyps. These organisms grow attached to the seabed (i.e. subtidal and intertidal), sequester carbon from surrounding seawater or air and convert it to organic compounds through photosynthesis.’ (EPA, 2004).

There is no mention in this definition (or anywhere in the balance of EPA Guidance 29) of cyanobacterial algal mats. The guidance also defines BPPH as having ‘a complex three-dimensional structure’ which is not considered to apply to a thin layer of cyanobacteria on saline, largely-supratidal, mudflats.

FMG’s consultants, Biota Environmental Sciences consider cyanobacterial algal mats are best considered an ecotone and should not be considered BPPH. Consequently, FMG considers they should not be assessed within the framework specified by EPA Guidance 29.

Biota’s reasoning for this is that the part of the Project area covered by Unit 6 (mudflat, patches of samphires with occasional *A. marina*) is essentially terrestrial in nature and only tidally wet less than one day per month (see Figure 1). The marine biota and specialist mangrove fauna components associated with the true mangrove systems do not utilise this unit and more terrestrial species occur in this habitat. This is discussed in greater detail with the use of quantitative data and photographs in response 5.3.12 of this document.

3.1.2 Port Hedland Management Unit (Guideline 1)

In accordance with EPA Guidance 29, the EPA has determined that the management unit to be used for assessment of the Project should be the ‘Port Hedland’ area as indicated in Guidance Statement No. 1. This is shown in Appendix 3 as ‘Port Hedland Industrial Area’ and defines the area used by Biota to estimate percentage cumulative loss of mangroves. FMG has commissioned Biota to undertake a further review of the projected cumulative loss for this management unit. This assessment has included the cumulative loss of closed and open canopy mangrove communities as described below.

To place the evaluation of cumulative mangrove loss in Port Hedland into a regional context an estimate was made of historical and approved mangrove clearing (Table 2) followed by an estimate of the original extent of the mangroves (Table 3), Table 4 presents historical, approved and proposed losses by development.

Estimates of the pre-disturbance area of mangrove extent were derived from digitising mangroves shown on 1:50,000 topographical maps and using geographic information system (GIS) software to calculate areas for each polygon of mangrove cover. Inspection of available aerial photography indicates that mangrove cover limit shown on topographical maps accurately maps the boundary of the denser mangrove cover such as Biota classifications 1-5, and 9 (refer to Figure 1 and Appendix 2) but not the more open assemblages. Without fine scale aerial photography and considerable ground truthing the unit described as scattered *Avicennia marina* may not be accurately mapped. To account

for historical losses, existing estimates of mangal clearing within the management unit were added to the total derived from topographical maps.

Table 2: Historical Mangrove Losses

Management Unit	Area (ha)	Cause of Loss (refer to Table 3 for more detail)
Port Hedland Industrial Area	342	Approved HDMS Project Infilling of East Creek Port Development (BHPBIO) Salt field crystallisers (Cargill Salt) Salt field condensers (Cargill Salt)

With the pre-disturbance estimates an assessment of the percentage of the cumulative loss to date of mangroves can be made (Table 3), along with an evaluation of the effect of the proposed FMG port facilities (Table 5). Appendix 3 shows the revised calculations of all the management units discussed in the PER.

Table 3: Estimates of Pre Disturbance Mangrove Area

Management Unit	Pre-Disturbance Mangrove Area (Ha)	Total BPPH Area already cleared (ha) (Incl. HDMS)	Total Current Mangrove Area (Ha)	Cumulative Loss to Date
Port Hedland Industrial Area	2,676	342	2,334	12.8 %

For the purposes of calculating total pre-disturbance, the clearing associated with unimplemented HDMS port has been ignored

Table 4: Historical, Approved and Proposed Losses by Development

Project	Area (ha)	Proportion of Loss (%)
BHPBIO E Creek	155	43.4
Cargill Salt condensers and crystallisers	98	27.5
HDMS	89	25
FMGL	14.8	4.1
TOTAL	356.8	100

Table 5: Cumulative Mangrove BPPH loss including FMG

Management Unit	New total BPPH area cleared	New Total Cumulative Loss (%)	Area of BPPH remaining (ha)
Port Hedland Industrial Area	356.8	13.3	2,319

The results show that a cumulative loss of 13.3% which exceeds the 10% threshold as identified by EPA Guidance 29. It is understood that the EPA in discussions with PHPA will decide on how an upper limit of cumulative loss in the Port Hedland Management Unit might be determined and applied to future development.

3.2 SEDIMENT SAMPLING PROGRAMME

FMG has commissioned Oceanica to carry out an additional assessment to fully characterise the quality of the sediments of all areas proposed to be dredged in accordance with the National Ocean Disposal Guidelines for Dredged Material (Commonwealth of Australia, 2002). A peer review was conducted by URS on the proposed sampling plan to ensure it was consistent with the guidelines. The peer review and the results of the sampling plan are included as Appendix 4.

Analysis of the initial samples showed that the concentrations of all contaminants (TBT, silver, arsenic, cadmium, chromium, copper, nickel, lead and zinc) with the exception of nickel fell below the National Ocean Disposal Guideline Screening Levels (Commonwealth of Australia, 2002). The analysis of additional samples was subsequently carried out, with a dilute acid extraction of nickel showing that despite high concentrations being present within the Anderson Point (AP) sediments, only very low levels are likely to be 'bioavailable' (i.e. able to be absorbed by organisms), which would be less than screening levels. In the additional analysis Chromium levels within a small number of AP and intertidal (INT) samples were also found to exceed the screening levels, and the screening level for arsenic was exceeded at one site. However, samples analysed included those obtained from greater or equal to 3 m below the sediment surface (considered to be deep, consolidated, uncontaminated sediment layers) and several exhibited nickel and chromium levels above the screening levels, suggesting that high background levels of these elements occur naturally within the area. Further dilute acid extractions of chromium and nickel from the sediments exhibiting elevated levels showed neither of these elements to be bioavailable.

As these studies indicate that the bioavailability of nickel and chromium is acceptably low (compared with the National Ocean Disposal Guideline Screening Levels), the spoil can be classified as non-toxic in terms of these elements (Commonwealth of Australia, 2002). The single exceedence of the arsenic screening level, within a sample obtained from a sediment depth of 3 m, was investigated and the analysis repeated. A dilute acid extraction of arsenic from this sample showed this element to also be relatively non-bioavailable (below screening levels). The National Ocean Disposal Guidelines have developed a decision tree approach for assessing sediment contamination comprising of 4 stages. If contamination is found to be above specified screening levels in phase II then bioavailability testing will be carried out.

It is likely that any contamination previously present within the surface sediments of the mid-basin area (MB) due to shipping activities, was removed during the recent maintenance dredging operation (PHPA, 2004).

3.3 ACID SULPHATE SOIL SAMPLING PROGRAMME

FMG has commissioned Oceanica to carry out an additional assessment to determine the presence of acid sulphate materials in the terrestrial and marine sediments proposed to be excavated/dredged. The sampling was carried out in accordance with the Department of Environment (DoE) guidelines for

“Identification and Investigation of Acid Sulphate Soils and Groundwater” (DoE/WRC, 2003) and the National Strategy for the Management of Coastal Acid Sulphate Soils. A peer review was conducted by URS on the proposed sampling plan to ensure it was consistent with the guidelines. Results of the Acid Sulphate Soil sampling programme and peer review of the sampling plan by URS are included as Appendix 4.

Results of the terrestrial sampling programme identified acid sulphate soils within the proposed stockpile and train unloader areas. The material consists of a grey clay layer readily identifiable visually, which is generally in close association with mangroves.

For projects that disturb more than or equal to 1,000 tonnes of Acid Sulphate Soils (ASS) with ≥ 0.03 % sulphur, a detailed management plan (ASSMP) is required (DoE, 2004). The results suggest that the grey clay material identified within the northern stockpile area, and within the northern Train Unloader area, exceeds both the acidity and weight criteria for the requirement of a detailed ASSMP covering both these areas. FMG will produce an ASSMP prior to the commencement of excavation. Estimation of the volume of the ASS in each area, together with consideration of the natural acid neutralising capacity of the different sediment/soil layers, will be fundamental to the management options selected. Management options are likely to include measures such as avoidance and/or neutralising the material.

ASS were recorded from one site and described at another within the proposed dredging areas during the marine component of the ASS investigation. However, following an examination of the geotechnical core logs, it was found that this material, composed of clayey grey brown sand, was not present within any adjacent cores. In addition, this material was found to form a layer less than 0.5 m thick. Thus, the ASS material is thought to be extremely limited in its horizontal and vertical extents, suggesting that the amount of this material within the areas to be dredged is relatively small. This material is not highly acidic (upon oxidation) and contains, as do the surrounding sediment layers, a high proportion of calcium carbonate, so it is likely that any acid produced following excavation would be rapidly neutralised. To investigate the availability and reactivity of the carbonate within the material to be dredged, two bulked samples from BP5 (samples from 1.4 m, 3.7 m and 6.2 m combined) and BP16 (samples from 1.4 m, 3.0 m and 4.5 m combined) were tested for ANC and pH-buffering properties (acidimetric auto-titration). It was found that sample BP16 contained a high proportion of reactive carbonate minerals and would be effective in the near-neutral buffering of acidity produced from PASS layers. Sample B5 was found to contain little carbonate and to be ineffective as a buffer.

3.4 ADDITIONAL CUMULATIVE IMPACT ASSESSMENTS

The assessment prepared for the Stage A PER did not include the proposed HDMS railway, as it was considered unlikely that this railway would be constructed in addition to the BHPBIO railway and the proposed FMG railway. This is due to the huge capital cost of heavy haul rail construction and FMG’s intention to be an open access provider that will allow other companies to use its rail infrastructure. This will negate the need for a third railway. However the EPA have requested that

FMG considers the cumulative impacts of three railways, because if approval is granted to FMG's Project there will be in effect, approval for three railways to be built.

FMG has since completed further work on cumulative noise, flora, surface hydrology and dust assessments.

3.4.1 Noise

FMG commissioned Lloyd Acoustics to undertake a cumulative noise assessment of all three railways. In summary the predicted L_{Aeq} (8 hour) noise levels from the combined existing BHPBIO and the proposed FMG and HDMS railways are shown to exceed the preliminary draft EPA Guidance for Road and Rail Transportation Noise at a number of locations along the rail alignment. However, all except one station (Abydos Station) are below the transportation noise criteria of L_{Aeq} (8 hour) 55 dB used by the DoE for similar proposals in Port Hedland. Noise levels experienced at Abydos Station as a result of operation of BHPBIO's railway already exceed 55 dB (55.4 dB). The predicted worst increase in noise levels at Abydos Station due to FMG's proposed railway is expected to be 1 dB. For the majority of its length, the alignment of the FMG rail corridor is constrained by the existing BHPBIO rail line, the proposed HDMS alignment, topography and environmental and heritage constraints therefore the opportunity to avoid noise receptors is limited. FMG will manage train operations to reduce train noise to as low as reasonably practical (ALARP principle).

FMG will develop a Noise Management Strategy specific for its rail operations, which lead to compliance with the noise regulations overtime. Specific noise management likely to be implemented include:

- rail design (e.g. turning circles) to minimise wheel noise;
- use of low-noise equipment where practicable;
- management of train operations, such as the reduction of notch speed to reduce locomotive noise near sensitive areas;
- cuttings and or noise barriers; and
- as a last resort, acoustic treatment of affected buildings.

A copy of the Cumulative Noise Impact Assessment is included as Appendix 5.

3.4.2 Flora and Fauna

Biota carried out an assessment of potential cumulative biological impacts associated with the construction of the FMG Stage A proposal and the previously approved HDMS port and rail facilities (Hope Downs Management Services [HDMS], 2002).

The likelihood, frequency and magnitude of general impacts on flora and fauna arising from construction of a railway between Port Hedland and the Weeli Wollie area (see Biota and Trudgen, 2002; Biota, 2004) would generally be expected to increase if both the HDMS and FMG railways are constructed. The most significant issues in this regard are likely to be:

- isolation of fauna habitat and vegetation in strips between the railways (with associated increases in edge effects from fire and other disturbances);
- restriction of fauna population movement and isolation of populations; and
- greater likelihood of weed transport and spread along the general corridor followed by the railways.

It is proposed that a corridor of around 32 m will be disturbed during construction of FMG's railway. This width is the same as the area proposed for disturbance by the HDMS railway which is also 32 m (HDMS, 2002). Clearing will also be required for construction activities such as access tracks, yards, and temporary disturbance areas such as borrow pits, laydown areas, water bores, dams and construction camps. Cut and fill will be required where the proposed rail corridor traverses ridges and valleys and will extend the limit of clearing beyond the immediate vicinity of the rail line. Where practicable, existing areas of disturbance will be used. However, this may not be practicable in all cases and therefore the total estimated area of disturbance includes a contingency factor, although it is expected the area of clearance will be less. HDMS's PER clearing figures do not appear to include provision for construction and temporary infrastructure areas. Other rail railway corridors built in the Pilbara have generally had a construction corridor of around 60 m exclusive of other infrastructure required for construction. An indicative break down of FMG's clearing is provided in the table below.

Table 6: Clearing associated with FMG's proposed Stage A Railway

Approximate Construction Areas (to be rehabilitated after construction)					
Item	Quantity	Length(m)	Width (m)	Area (m ²)	Area (ha)
Sleeper Production Yard		1,200	800	960,000	96
Track Welding Yard		1,000	100	100,000	10
Mainline		345,000	15	5,175,000	517.5
Bridge Construction Laydown areas	15	300	200	900,000	90
Construction laydown area	50	200	100	1,000,000	100
Construction Access Tracks		120,000	10	1,200,000	120
Borrow Pits	25	500	300	3,750,000	375
Construction Camps	3	500	300	450,000	45
				13,535,000	1353.5
TOTAL CLEARING including Contingency					1,600
Approximate Operational Areas (Permanent)					
Item	Quantity	Length (m)	Width (m)	Area (m ²)	Area (ha)
Port Loop		8,000	25	200,000	20
Workshop and Marshalling Yards				1,170,000	117
Per Way Yard		1000	300	300,000	30
Mainline		345,000	20	6,900,000	690
Access Road		363,000	12	4,356,000	435.6
Microwave towers	12	50	50	30,000	3
				12,956,000	1,295.6
TOTAL CLEARING including Contingency					1,500

Therefore if both railways are constructed, two approximately 40 m wide adjacent or nearby construction corridors would be disturbed. On completion of rehabilitation following construction, the area remaining cleared for operations would be much less.

Both proponents have made commitments to a weed hygiene and management programme, with fire management and fire ecology research initiatives also planned.

As mentioned in Appendix 7, the main sheet flow areas for FMG's north-south railway, with dependant downstream vegetation are located along the flanks of the Fortescue Marshes. Through, this area, the FMG rail corridor has been predominately located parallel to the existing BHPBIO and approved HDMS railway routes. Drainage arrangements through these areas through the adjacent embankments will be matched by FMG. Where sheetflow culverts have not been installed under the existing BHPBIO railway, there is no advantage in installing such culverts, unless BHPBIO intends to retrofit culverts. During the detailed design phase FMG will control sheetflow by locating culverts to

match those in the adjacent railway formations. Refer also to 3.4.3 which details surface water management in more detail.

No new types of impacts would be expected to be introduced with the construction of both railways, given the similarity in nature of the two proposals. From the available data, it also appears unlikely that the conservation status of any Threatened flora, restricted vegetation types or Schedule fauna species would be affected at regional or subregional scales if both rail corridors were constructed.

Local population level impacts on flora, fauna and vegetation, including Threatened taxa, are likely to increase as outlined above if both proposals are implemented. It should be noted however, that both FMG and HDMS have made commitments to avoiding direct disturbance on significant populations of flora and fauna as part of project final design. With these locations treated as design constraints, the local population level effects on significant flora and fauna should be minimised. A copy of the Cumulative Biological impact assessment is included as Appendix 6.

3.4.3 Surface Hydrology

FMG has carried out an additional assessment of the cumulative impacts of three railways (BHPBIO, HDMS and FMG) on surface hydrology. The report has been included as Appendix 7.

The FMG North-South railway corridor essentially runs parallel and in close proximity to the existing BHPBIO and approved HDMS railway routes. The existing BHPBIO railway formation already causes some interruptions to the surface water environment, and the approved HDMS railway formation will also potentially cause additional surface water interruptions. To reduce the potential for further surface water impacts, where feasible the FMG rail corridor has generally been located adjacent to the existing BHPBIO and approved HDMS railway formations.

FMG will locate and size drainage structures to minimise any adverse impact on the corresponding existing BHPBIO and proposed HDMS railway bridges and culverts. The final arrangements for the FMG structures will be determined at the project detailed design stage such that any potential adverse impacts to the existing flood levels will be managed to acceptable levels. Engineering methods will be employed to manage potential adverse impacts of the railway corridor on surface hydrology (and Mulga) such as:

- Install culverts at all defined drainage crossings and with capacity to safely pass the 20 year Average Recurrence Interval (ARI) flood.
- Design culverts with limiting upstream water levels to control flow velocities and with riprap or similar scour protection blankets on the inlets and outlets.
- Install culverts with small interceptor embankments, where appropriate, to prevent long drainage pathways developing adjacent and parallel to the railway formation.
- Install small diameter culverts (300 mm where appropriate) at frequent intervals (approximately 50 – 100 m intervals) through sheetflow areas, with provision for larger sized culverts where higher discharges are predicted.

- Where sheetflow dependent grove/intergrove mulga areas are located immediately downstream from the railway, sheetflow culvert locations shall be based on ground and vegetation conditions.
- In sheetflow areas, install the railway access road on the downslope side of the railway formation (to prevent siltation issues resulting from water passing over the road if it were on the upstream side).
- Downstream from the sheetflow culverts, install a shallow dip in the railway access road using cement stabilised road base material and not place graded windrow material in this flow zone.
- Downstream from the sheetflow culverts and railway access road, install riprap pads to slow and disperse culvert runoff to the downstream environment.
- Where sheetflow dependent grove/intergrove mulga areas are located immediately downstream from the railway, install a sheetflow redistribution system to disperse culvert runoff to the downstream environment (see below).
- Monitor the operation of the sheetflow redistribution system and conduct maintenance as required.

The FMG railway formation and drainage structures are not expected to result in any significant increase in impacts to surface hydrology provided the above measures are implemented.

3.4.4 Dust

The EPA has requested further information in relation to the cumulative dust impact assessment carried out for the Project at Port Hedland. FMG was advised to compare modelling with the DoIR cumulative dust assessment currently being undertaken at Port Hedland in collaboration with BHPBIO. Section 5.20 provides aspects of FMG's dust modelling in more detail.

The DoIR study is not expected to be finalised until mid 2005. However initial comparisons with FMG's model show that dust emissions from BHPBIO's operations have been overestimated particularly for particulate matter less than 10 microns (PM₁₀). This overestimation, noted in the PER, primarily occurred as BHPBIO's emission inventory was not made available to FMG for its modelling study. As such, dust emissions used in FMG's assessment for both BHPBIO and HDMS were obtained from public documents. However, an over-estimate of cumulative emissions is not considered a significant issue by FMG, as it will not reduce the rigour of management measures proposed for the Project. A complete comparison between FMG's modelling results and the DoIR study report will be undertaken once the DoIR study has been completed. In the event that the DoIR study indicates a significant variance in the modelling outcomes as a result of new data from BHPBIO or HDMS, FMG will review its modelling and assumptions.

FMG recognises that dust is a significant issue for Port Hedland and FMG has designed its Project to reduce dust impacts as far as practicable.

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4. OFFSET PACKAGES

4.1 MANGROVES

As described in Section 3.1 of this document, disturbance of mangroves from the FMG proposal has been limited to 14.8 ha. This is the lowest disturbance of mangroves resulting from any major operation in Port Hedland as outlined in Table 4 of this document.

FMG has committed to a range of offsets for impacts to Mangroves within the Stage A PER (Section 7.3.4, page 165). Briefly, these included:

- mangrove and littoral vegetation rehabilitation (primary offset);
- funding into further research into the impacts of dust deposition on mangrove condition (secondary offset); and
- development of a mangrove monitoring programme to further current industry knowledge (secondary offset).

4.1.1 Primary Offsets

Mangrove Rehabilitation

The majority of mangrove clearing associated with the proposal is related to the footprint of the rail loop and the conveyor to the load out facilities. To offset mangrove losses FMG proposes to rehabilitate 3 m on either side of the rail loop at the proposed port facility with mangrove species. Rehabilitation will include reinstatement of tidal flows/flushing and replanting of mangroves using seedling stock. A nursery will be set up to provide seedling stock for this rehabilitation. If necessary, additional research will be carried out to determine the most feasible method of propagating and/or transplanting mangrove seedlings. Rehabilitation will commence during construction.

Natural Recolonisation

FMG will also implement best practice engineering designs to promote the natural regrowth of mangroves around siltation ponds and other plant facilities where possible. This will include design of embankments, drainage channels and other areas, to mimic natural mangrove habitats wherever practicable. In order to achieve this, FMG personnel will visit existing developments in the region where natural mangrove regeneration has occurred in previously disturbed areas. Factors which have led to mangrove regrowth will be identified and incorporated into detailed design of the FMG Project. The opinion of mangrove scientists and other experts will also be sought during this design process, so that the final detailed design represents best practice in terms of encouraging natural recolonisation by mangrove species.

4.1.2 Secondary Offsets

Research into Dust Deposition

As part of the offset package FMG and CSIRO have developed a scope of work which uses hyperspectral technology for use as a monitoring and management tool. Use of this type of data will enable FMG to establish comprehensive, objective and accurate environmental baseline data for the Port facilities.

Multiple uses can be achieved from hyperspectral data. The hyperspectral data will be initially used to establish the level of iron oxide dust deposition on the mangroves prior to construction of FMG's Project. The method developed by collaboration between CSIRO and BHPBIO will be used to generate these measurements. This may be extended to iron oxide dust deposition on buildings and infrastructure.

The data will be subsequently used to establish an inventory (types, density and geographic/spatial distribution) of the mangroves surrounding FMG's proposed facility. Establishing the current physiological conditions of the mangroves is crucial to monitor the possible future impact of dust and the facility infrastructure. Hyperspectral technology has previously been used to successfully determine plant physiological condition (including Australian native plants). Research using hyperspectral technology to measure physiological conditions of mangroves will be undertaken to develop techniques to generate accurate and spatially-comprehensive measurements related to mangrove physiology.

The scope of work will commence prior to construction of the Project and will be reviewed for continuation at the end of three years.

Mangrove Monitoring Programme

A mangrove monitoring program will be implemented to assess mangrove condition in areas reliant on hydrological design of the Project for tidal flushing. Condition monitoring transects will be established primarily in the rail loop and in parts of Anderson Point mangal upstream from infrastructure crossing points. Transects will be initially assessed for baseline information prior to construction and thereafter biannually. Data obtained will be used in conjunction with hyperspectral data where appropriate.

In addition, mangrove rehabilitation areas and natural recolonisation efforts will be monitored using fixed photographic points. Photographs will be taken biannually initially to monitor the success of seedlings and as the mangroves mature, frequency will be decreased to annual or biennial photographs.

Dependent on findings, these data will be published in a referred journal to further regional knowledge on the management of impacts on mangroves and techniques for mangrove rehabilitation and recolonisation.

4.2 THREATENED FAUNA SPECIES

FMG committed to considering offsets for threatened fauna in the Stage A PER in Section 7.2.4.2 (page 134). To further elaborate on this commitment the following information is provided.

4.2.1 Primary Offsets

Fauna Habitat Rehabilitation

A rehabilitation plan will be developed for all non-permanent disturbed areas. This will also serve to restore some areas of fauna habitat lost or modified during construction activities and fauna habitat reconstruction measures will be included as part of this plan.

The figures below (from table E1 of the PER, page ix) show the amount of disturbed area that will be rehabilitated for the rail corridor.

Area of railway construction:

- Railway construction corridor: 1,600 ha
- Access track, yards, temporary disturbance 1,500 ha

Area of operating railway:

- Railway corridor: 1,000 ha
- Access track, yards, workshops, maintenance areas: 500 ha

As such there will be 600 ha of disturbed area rehabilitated along the railway construction corridor and 1,000 ha of areas disturbed for other infrastructure. Fauna habitat reconstruction (in particular potential habitat for threatened fauna) will be included in the rehabilitation plan for these areas.

4.2.2 Secondary Offsets

Research Project

A detailed research project at PhD thesis level or equivalent will be funded by FMG for a period of three years. Commencement of the study will occur once construction is complete and will be reviewed at the end of three years, in consultation with CALM, FMG and Academic Advisors.

The Research Project will be developed in consultation with CALM and Academic Advisors through the following collaborative process:

- desktop review of all current research in the Pilbara area, relevant to the potential impacts of FMG's Stage A Project, concerning Mulgara or other threatened species;
- discussions with CALM regarding research that requires further work or possible new areas of research, to better understand and manage the impacts of rail and port infrastructure (similar to infrastructure proposed by FMG in Stage A) on Mulgara or other threatened species;
- consultation with CALM to select an appropriate area of research to be pursued;

- initiate discussions with Academic Advisors and Experts in the field of study selected in order to scope the Research Project further;
- develop a Scoping Document describing the potential methods, timing and deliverables for the Research Project; and
- select a study team or individual to carry out the work, provide adequate resourcing, technical support, academic and/or expert advice and set a start date for the research.

The above process to scope the three year research effort will commence at the outset of project construction and be complete within 18 months (well before construction is complete).

4.3 MULGA VEGETATION COMMUNITIES

For the Stage A Project there is minimal impact to Mulga vegetation. That is, 1.93 km² land systems containing Mulga will be impacted by the proposed construction corridor for the North-South railway. To place this in a regional context, the Chichester footslopes Mulga woodland can be considered as a management unit. That is, the Chichester footslopes contain 1,641 km² of land systems dominated by Mulga. Therefore the disturbance of Mulga resulting from the Stage A Project as a proportion of the total Chichester footslopes is 0.1%.

In order to mitigate this impact as stated in the PER (Section 7.2.3.1, page 131), offsets will be considered in consultation with CALM. Further information on these offsets is provided below.

FMG will also develop an offset package for the Stage B Project and will ensure any offsets for Mulga impacts from the Stage B proposal, are linked with the offsets below, as appropriate.

4.3.1 Primary Offsets

Mulga Vegetation Rehabilitation

As stated above, the area of Mulga vegetation disturbed for the Stage A Project is small compared with overall project disturbance and in a regional context small compared with the total amount of Mulga within the Chichester Ranges footslopes. The 40 m railway construction corridor will be reduced to around 32m and the remainder rehabilitated.

Investigations have been undertaken into rehabilitation methods used in Mulga communities in the Pilbara. This review has highlighted that with appropriate topsoil/overburden handling and seeding it is feasible to undertake Mulga rehabilitation in environments similar to the Project area, in the Pilbara region (*pers. comm.* Mattiske, 2004). Revegetation of Mulga communities disturbed will be included in the rehabilitation plan.

4.3.2 Secondary Offsets

As stated in the PER (Section 7.2.3.1, page 131), offsets may take the form of contribution of funds to relevant taxonomic research of *Acacia aneura* in the Pilbara or some other poorly known taxa such as

Malvaceae or *Tiliaceae*. FMG will strongly support and encourage partnerships with third party users of its infrastructure and other companies in the Pilbara. In addition to the offsets proposed for Stage A the Stage B Project will include a substantial offset package.

A detailed research project at PhD thesis level or equivalent will be funded by FMG for a period of three years. Commencement of the study will occur once construction is complete and will be reviewed at the end of three years, in consultation with CALM, FMG and Academic Advisors. The scope of research to be undertaken will be developed in collaboration with CALM through the following process.

- desktop review of all current research in the Pilbara area, relevant to impacts of FMG's Stage A Project, concerning Mulga (or some other poorly known taxa);
- discussions with CALM regarding research that requires further work or possible new areas of research, to better understand and manage the impacts of rail infrastructure on the species;
- consultation with CALM to select an appropriate area of research to be pursued;
- initiate discussions with Academic Advisors and Experts in the field of study selected in order to scope the Research Project further;
- develop a Scoping Document describing the potential methods, timing and deliverables for the Research Project; and
- select a study team or individual to carry out the work, provide adequate resourcing, technical support, academic and/or expert advice and set a start date for the research.

The above process to scope the three year research effort will commence at the outset of project construction and be complete within 18 months (well before construction is complete).

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RESPONSE TO SUBMISSIONS

The key issues raised in the submissions are summarised in Section 8 and discussed in the sections below.

5. BIOPHYSICAL ENVIRONMENT

5.1 HYDRODYNAMICS (TIDES AND CURRENTS)

5.1.1 Concern over the effects of the acceleration of currents to the south of the Anderson Point area and around the berth pockets. Lack of details of studies or plans to examine the effects of the change of tidal currents and that on marine biodiversity in the mentioned areas (Submissions 10, 11).

A: Detail on the potential impacts of the proposed port development on currents is presented in Appendix J (Marine assessment by DAL Science & Engineering Pty Ltd) and Appendix K (Hydrodynamic modelling by Worley) of the Stage A PER.

The Worley report indicates that the impacts of the proposed developments on both residual and maximum tidal currents within Port Hedland Harbour as a result of the proposed port development will be localised to the area surrounding the dredged pockets and the dredge channel area with minimal impact in the broader creek and mangrove regions. The proposed FMG development leads to a reduction in the residual currents in the berth dredge pocket and in the area surrounding the berth with an increase evident in the area between the berth and Anderson Point. As outlined in Section 7.3.3.4 of the Stage A PER (page 152) the modelling done by Worley specifically indicates:

- impacts on tidal currents will be localised to the berth pockets;
- changes in the tidal range in the berth areas are predicted to be approximately 2 cm, a relatively small change, with little effect on berth operability; and
- based on the small magnitude of the predicted changes in water levels (~1 cm) in the mangrove areas, the inundation of mangroves will not change significantly.

5.1.2 Also concern over the effects of saltation of the surrounding creek areas and also saltation of the mangrove areas. All information tends to centre on tidal flows to the mangroves and lack of consideration of the potential effects of increased saltation and impoundment of water on the mangroves (Submissions 10, 11).

A: Impoundment of water will only occur if flows are restricted beyond current patterns of wetting and drying in the intertidal zone. The modelling completed by Worley for the Stage A PER indicated that the proposed design would not result in any significant restriction or impoundment of water compared to existing regimes. It is unclear what 'saltation' refers to in the context of this submission. If this is in reference to increased soil salinity in mangrove sediments then this is driven by evaporation rates and tidal flushing. As noted in the above comments, the daily reduction of soil

salinity is dependent on maintenance of tidal flushing and this was addressed in the Stage A PER. If 'saltation' refers to siltation, then again, this is not expected to be significantly altered as current tidal flows will largely be maintained. Any areas of potential increased sedimentation on mangroves will be addressed by the mangrove monitoring programme to be implemented by FMG (Section 7.3.4 of the Stage A PER page 165).

5.2 FLORA AND VEGETATION

5.2.1 The environmental impacts [clearing of 3,100 ha for railway within a Project area that supports 122 vegetation types with 21 Priority flora - 16 Priority flora] on the proposed FMG rail corridor are unacceptable. Of the 122 terrestrial vegetation types 22 are considered to be of conservation significance (Submission 5).

A: The flora surveys completed for the railway cover a 2 km corridor which spans for 345 km. The actual width of the railway construction corridor will generally be less than 40 m (depending on final alignment, and cut and fill requirements), which is the minimum distance required for safe construction practices. As outlined in Section 7.2.3.2 of the Stage A PER (page 130) the final alignments of the railway will take into account the location of priority species and vegetation of conservation significance, where practicable. Clearing will be minimised by preferentially using disturbed areas for temporary infrastructure and the use of pre-existing facilities. Vegetation cleared from the rail corridor will be stockpiled for use as a seed stock during rehabilitation.

5.2.2 Several habitats are significant on a local scale and support either apparently restricted suites of flora species or individual species which are, or may be of regional significance (p.xvi) (Submission 5).

A: Refer to response 5.2.1.

5.2.3 It is noted that there is a limited representation of the area in conservation reserves, and that the Project will overlap with areas that would otherwise be the subject of 2015 pastoral lease exclusion. On this basis alone the Project is opposed (Submission 12).

A: All pastoral leases in Western Australia issued under the now repealed *Land Act 1933* expire on 30 June 2015. Portions of numerous pastoral leases in the Pilbara have been nominated by CALM to be released to the conservation estate or to be set aside for conservation management within the pastoral leases under conservation agreements, when the pastoral leases are renewed. Four such pastoral lease exclusion zones have been proposed on pastoral stations in the vicinity of FMG's proposed Project area: Marillana, Roy Hill, Mulga Downs and Hillside. The 2015 exclusion areas have recently been released to FMG by CALM. If the exclusion zones are agreed and approved by the State Minister, a further approval process will be required to be sought for the areas to be included in the conservation estate or conservation agreements are reached with the pastoral lessees. Before approving any such conservation reserve there would be an extensive consultation process which comment would be sought from all stakeholders and would look at the environmental and mineral resource values of the

proposed reserves.

5.2.4 Has the whole length of the proposed rail corridor been the subject of a detailed flora survey? Was the HDMS work, for the part of the proposed rail corridor that the two projects have in common, sufficiently detailed (Submission 12)?

A: The FMG flora survey consisted of sufficient sampling to ensure flora represented along the corridor was adequately assessed. Some areas of the FMG corridor were not surveyed directly (e.g. the deviation east of the BHPBIO rail through the Chichester Range where access was poor), although coverage of the corridor was adequate for preparation of the Impact Assessment Report (Appendix H of the Stage A PER).

FMG has committed to doing rare flora searches in areas that may not have been adequately surveyed. These surveys would be timed to coincide with the end of the summer rains. These surveys would also be used to collect other annual flora that may not have been present at the time the initial surveys were done (essentially July to October).

The HDMS work was sufficiently detailed to prepare the vegetation mapping for that Project and to give a very good indication of the flora that would occur in the area. It was only a single sampling session, however it is understood that the intention of HDMS was always to do further seasonal flora sampling within the corridor.

5.2.5 The PER does not present any information as to the extent to which the final alignment of the line will impact upon priority flora (Submission 13).

A: Refer to response 5.2.1. In Section 7.2.3.2 of the Stage A PER (page 130) FMG has committed to the refinement of the design of the rail alignment taking account of the locations of significant vegetation types and populations of Priority flora, with the objective of avoiding these through final design where practicable. In addition further detailed flora and vegetation surveys will be conducted in areas where adequate survey sampling may not have been conducted as outlined on page 131 of the Stage A PER. The location of borrow pits and other materials sourcing sites are not known in detail at this stage of the Project. Given that all biological surveys are based on representative sampling only, there will always be parts of the Project area which have not been adequately ground-truthed. It is therefore possible that borrow pits may ultimately be located in areas that have not been specifically surveyed. If this is the case, the location of these sites will be subject to targeted survey for any threatened flora species or vegetation types of conservation significance once identified, prior to clearing commencing. The location of materials sourcing sites will be revised as appropriate based on the findings of this work in liaison with the CALM regional office.

A detailed survey of the corridor for priority and rare flora will be conducted prior to construction, and the final alignments of the railway will take into account priority species and vegetation with conservation significance where practicable.

5.2.6 It is positive that FMG has stated that vegetation clearing will be kept to a minimum particularly adjacent to vegetation of higher conservation significance. However, FMG should extend that recommendation to include minimising the clearing of all vegetation types, not just limited to those specific areas identified as having higher conservation significance (Submission 16).

A: All clearing will be minimised wherever possible within safe working requirements. Areas previously cleared will be used preferentially for temporary infrastructure such as construction camps. A clearing permit system will be developed as part of the Environmental Management System. Key points of the clearing permit are listed as follows:

- ensure minimum amount of land required is cleared by delineation of clearing boundaries prior to clearing (Section 7.2.3.2 of the Stage A PER (page 130));
- ground truthing prior to clearing to ensure priority species (flora and fauna) are avoided where practicable. An aboriginal heritage check will also be carried out at this time;
- ensure that topsoil is appropriately stored for future rehabilitation;
- ensure all disturbance is adequately documented; and
- a post clearing inspection is carried out to ensure over clearing has not occurred and procedures have been followed.

5.2.7 Given the conservation significance of the Fortescue Marsh, the presence of rare flora and the friability of the soils, FMG should commit to, and detail how it will limit the clearing envelope to as narrow a corridor as possible across the landform. FMG should also make extensive use of existing BHPBIO access roads and already disturbed areas adjacent to lay down sites in this area to minimise impacts on the Marsh. In addition, this section of the document does not state what measures FMG will implement as a disincentive to contractors for breach of these measures, particularly in relation to vegetation clearing outside of the designated areas (Submission 16).

A. Refer to responses 5.2.5 and 5.2.6. All contractors will be required to comply with the Project's environmental requirements, or risk facing contract penalties. Contracts specify that should contractors cause disturbance of ground beyond the limit of the defined work area, they will be responsible for the rectification and rehabilitation of the area at their cost.

5.2.8 FMG should address the deficiencies (lack of aquatic plants and fewer daisies) identified in the flora survey for this Project. While the timing of the main flora survey six weeks after rainfall was ideal for many species, other species would have been missed at that time as acknowledged by Biota in respect to the daisy (*Asteraceae*) flora. Further, many ephemeral species of *Goodeniaceae*, *Amaranthaceae* and *Brassicaceae* would also have been missed in that survey. As some species within these families are listed as priority flora and are known to occur in the general area (e.g. *Myriocephalus scalpellus*, a P1 taxon is known from only one locality just south on the Fortescue Marsh on the Roy Hill-Munjina Road), further surveys are required. The identification of new flora records for

the State and species found at the limits of their distribution range during the botanical survey also reinforce the need for additional surveys (Appendix H, Section 5.2.2.3) (Submission 16).

A: Refer to response 5.2.4. As stated FMG has committed to additional surveys in borrow pit areas along the rail alignment during detailed design. These surveys will also be used to identify other annual flora that may not have been present at the time of year initial surveys were done (July to October).

5.2.9 The failure of FMG to interrogate the floristic data using PATN (a multivariate exploratory analysis package) analysis is a significant shortcoming for the PER and hinders the environmental impact assessment of this project. Such an analysis would have permitted the identification of botanically significant floristic communities and comparisons (similarities and differences) with the floristic communities present along the FMG and HDMS corridors. Without such an analysis the proponent will not achieve the stated management strategy of avoiding significant vegetation communities as detailed throughout the PER and Draft EMP (Issue 1, Page E7, Appendix E). Subsequently, PATN analysis would facilitate the quantification of the comprehensiveness and adequacy of the previous HDMS assessment, through a comparison of the fidelity of survey sites to floristic community types between sampling sessions. (Submission 16).

A: A PATN floristic analysis has now been run on a dataset comprised of flora species presence-absence data for 2,160 sites (standard 50 m by 50 m floristic survey quadrats, or well-recorded relevés) from 19 projects for Stage A, including:

- 118 sites from the FMG Stage A rail corridor (Biota, 2004) (designated project FMGA in Table 1);
- 219 sites from the survey of the FMG Stage B rail corridor and Mindy Mindy, Christmas Creek, Mt Lewin and Mt Nicholas mine areas (project FMGB);
- 286 sites from the HDMS rail corridor between Port Hedland and Weeli Wolli (Biota and Trudgen, 2002) (project HDRAIL);
- 56 sites from an addition to the HDMS rail corridor through the Chichester Range (Biota 2004a) and an extension to the same rail corridor through the Hamersley Range (Biota 2004b) (project HDRAIL A/D);
- 45 sites from Hamersley Iron's Yandi Expansion area (Biota in prep.) (Project YANEXP);
- 312 sites from the core area surveyed for Robe River Iron Associates' West Angelas mine (Trudgen and Casson, 1998) (project WASA);
- 12 sites from the West Angelas mine access road (Trudgen and Casson, 1998) (Project WAACRD);
- 59 sites from the West Angelas Coondewanna West rail corridor, including extensive Mulga vegetation within the Coondewanna Flats area (Trudgen and Casson, 1998) (Project WACOOWES);
- 84 sites from an alternative rail corridor to the Coondewanna West route, extending from the

West Angelas mine north to near Mt Robinson, then west towards Juna Downs (Trudgen and Casson, 1998) (Project WAMTROB);

- 46 sites from a rail corridor in the Four Corners Bore area, on Hamersley Station (Trudgen and Casson, 1998) (Project WAFCBOR);
- 3 sites from near Eight Mile Well on Hamersley station (Trudgen and Casson, 1998) (Project WAEIMIWE);
- 22 other sites from Hamersley Station (Trudgen and Casson, 1998) (Project WAHAMSTN);
- 26 sites from the Fortescue Slopes study area, along the lower slopes of the Chichester Range (Trudgen and Casson, 1998) (Project WAFORSLO);
- 104 sites from the West Angelas Millstream Rail Segment, extending from the Fortescue Slopes study area along the lower slopes of the Chichester Range parallel to the existing Hamersley Iron rail line, then to Barowanna Hill (Project MILL);
- 296 sites from the West Angelas George River rail corridor, extending along the southern slopes of the Chichester Range to approximately the Table Hill area (Trudgen and Casson, 1998) (Project WAGEORIV);
- 97 sites from the West Angelas Hamersley Parallel rail corridor; parallel to the existing Hamersley Iron rail line, extending northwest through the Chichester Range from near Barowanna Hill (Trudgen and Casson, 1998) (Project WAHAMPAR);
- 144 sites from the West Angelas Mt Herbert rail corridor, extending from the central Chichester Range down the Chichester escarpment to join the George River rail corridor (Trudgen and Casson, 1998) (Project WAMTHER);
- 141 sites from the West Angelas Mt Leal study area, extending from the Fortescue Slopes study area west across the mid-slopes of the Chichester Range to near the Millstream Road intersection with the Wittenoom – Roebourne Road (Trudgen and Casson, 1998) (Project WAMTLEA); and
- 90 sites from the Panorama survey area, south-southeast of Port Hedland (Trudgen *et al.* 2002) (Project PAN).

The analysis thus included sites from an area of approximately 300 km by 300 km, extending from Port Hedland west to the Mt Herbert area, south to West Angelas and east to Mt Nicholas.

Clearly few of the floristic groups at the 100-group level are genuinely widespread through even the relatively small section of the Pilbara sampled by this floristic analysis, with most being restricted to a particular subregion and specific areas and/or habitats within the subregion.

Given the strong regionalisation shown by the FMG Stage B PATN analysis, it is unlikely that the addition of a small number of flora species from a second sampling event would substantially alter the outcomes of the analysis.

Taking into account the results of the PATN analysis (particularly those floristic groups that appear to be restricted to a particular section of a subregion) together with other information for each vegetation type (e.g. areal extent or association with a restricted Land System), vegetation types within the FMG Stage A rail corridor that are considered to be of the highest conservation significance include:

- Ac30 (soak vegetation) – isolated occurrences in drainage areas of the Abydos Plain; restricted floristic group.
- Fx1 – Fx9 (various vegetation units of the Fortescue Marsh and surrounding valley) – occur in floristic groups restricted to this area; support restricted taxa.
- Hd1 (shrublands on sand dunes) – floristic group relatively common in the area, but habitat regionally rare; small, fragile and highly susceptible to overt threatening processes; in good condition in the study area, elsewhere degraded.
- Cx4 (*Astrebla pectinata*, *Aristida latifolia* grassland) and Cc17 (creekline within cracking clay) - unusual cracking clay vegetation types; occurred in two floristic groups restricted to cracking clays of the eastern Chichester Range; limited representation.
- Cx5 (shrublands of cracking clays in the Chichester Range) – occurred in group 100 of the floristic analysis, which is restricted to vegetation of clayey plains along the southern section of the rail corridor; edaphically restricted; variable; support restricted flora.
- Fa1 to Fa7, and Fa9 (Mulga-dominated shrublands to low woodlands of the Fortescue Valley) - occurred in floristic groups restricted to the Fortescue Valley, although locally common within it may support restricted taxa of Mulga and other flora.
- Fc2 (*Acacia stenophylla* open scrub over *Triodia longiceps* and/or tussock grasses) - very unusual combination; floristic group 39 very uncommon in the area.
- Fx1 (*Acacia xiphophylla*, *Cassia sturtii* shrublands with pockets of *Eragrostis xerophila* grassland) and Fx5 (*Frankenia ?setosa* low shrublands) – occurred in floristic group 100, which is restricted to the Fortescue Valley; habitats probably have a restricted areal representation.

Other uncommon vegetation types of high conservation significance include:

- Ar1 and Ar2 (granite rockpile vegetation) - relatively small proportion of the study area; restricted habitats; occurred in a floristic group restricted to the Abydos Plain, but relatively common within it; support restricted taxa.
- Ar3 and Ar4 (*Tripogon loliiformis* grasslands and *Bulbostylis burbridgeae* sedgeland of granite outcrops) - extremely small proportion of the study area; restricted habitats; occurred in a floristic group restricted to the Abydos Plain, but relatively common within it.
- Ar5, Ar6 and Ar7 (vegetation of granite ridges, quartz outcrops and dolerite dykes respectively) - limited representation in the region; occurred in floristic groups restricted to

the Abydos Plain, but not uncommon within it.

- Ac1, Ac4, Ac5 and Ac8 (vegetation of major creeklines of the Abydos Plain) - floristic group restricted to the Abydos Plain, but widespread and not uncommon within it.
- Ah5a (vegetation dominated by *Triodia aff. lanigera* (dwarf form)) - limited representation on the basis of current knowledge; uncommon, possibly rare; occurred in a floristic group restricted to the Abydos Plain, but relatively common within it.
- Ch13 (*Triodia brizoides*, *T. longiceps* hummock grasslands) – occurred in a floristic group restricted to the eastern Chichester Range, but locally common within it.
- Apt1 and Apt2 (hummock grasslands dominated by *Triodia secunda*, a species not particularly common in the area) – occurred in floristic groups restricted to the Abydos Plain, and relatively uncommon within it.
- Apt5 and Apt8 (hummock grasslands dominated by *Triodia angusta*, a species not common in the area) – uncommon; mainly in group 61 of the floristic analysis, which is restricted to the Abydos Plain although not uncommon within it.
- Ac21 (unusual combination of *Acacia ampliceps* over *Triodia secunda*) - probably restricted.
- Ch10 (unusual combination of *Corymbia deserticola* and Mulga over *Triodia lanigera*) - apparently restricted to the southern Chichester Range; may support restricted Mulga taxa.
- Cp1 (sandplain vegetation) – floristic group relatively common on the Abydos Plain, but only limited sandplain habitat in area; uncommon.
- Fh1 (Mulga shrublands over *Triodia brizoides* hummock grasslands) – floristic group relatively widespread but not common in the area; may support restricted Mulga taxa.
- Hp3 and Hp4 (Mulga dominated vegetation types in the Hamersley Range area) - may support restricted Mulga taxa; uncommon.

These are largely similar to the vegetation types of particular conservation significance identified in Biota (2004). The locations and extents of these restricted vegetation types will be used in the detailed design of the final rail alignment. FMG will aim to avoid significant vegetation types where practical.

The results of the PATN analysis are summarised in Appendix 9.

5.2.10 FMG's treatment of land systems (LS), which are the best, and only surrogate for vegetation types across the Pilbara, is inadequate. The statement in the final paragraph 'Therefore construction of the railway will not disturb any restricted Land System units' is false. Three of the land systems associated with the Fortescue Marsh (Marsh, Cowra and Christmas LS) are restricted to the Fortescue Valley and are found nowhere else within the Western Australian rangelands. While the Marsh LS is large, covering 97,840 ha, it is nevertheless a restricted system of national significance. The Cowra and Christmas LS are considerably smaller and very restricted - the former is represented by only six occurrences at the western end of the Fortescue Marsh, totalling an area of 20,330 ha, while the latter is represented by only one occurrence of 23,240 ha. Both are clearly restricted LS's. The impact of the proposed FMG rail corridor will be greatest on the Christmas LS with approximately 5% of the area being affected. This LS is already impacted by the BHPBIO line and access road, and will potentially be further impacted by FMG's Stage B rail alignment and the proliferation of potential FMG mines along the southern foot-slopes of the Chichester Range. All three land systems are not represented on the conservation estate and, as they are a coarse surrogate for vegetation types in the Pilbara, it follows that the vegetation types present are also unreserved (Submission 16).

A: Land systems were not relied on in the PER as they are a coarse surrogate for vegetation types, and FMG has conducted detailed vegetation mapping of the area to assess the impacts of the Project. The percentage of impact on the various land systems mentioned in the submission above has been calculated using GIS and is based on a 40m wide railway corridor. This information is provided below.

The Christmas land system occurs at the western end of the Fortescue Marsh and cannot be avoided if FMG is to align the proposed rail as close as possible to the existing BHPBIO rail line to minimise any further impacts to this land system. FMG's rail will disturb approximately 0.1% of this land system, which is less than the 5% mentioned in the submission above.

The proposed rail will occur on the western edge of the Marsh land system and cannot be avoided if FMG is to align the rail as close as possible to the existing BHPBIO rail line to minimise any further impacts on this land system. The proposed railway would disturb less than 0.01% of this land system.

The Cowra land system fringes the north side of the Fortescue Marsh and parts of the western end of the marsh. FMG's proposed rail will cross part of this land system at the western end of the marsh and will disturb approximately 0.05% of this land system.

FMG recognises the importance of the Fortescue Marsh and associated land systems and will restrict clearing for the rail corridor for the minimum width for safe construction practices. Construction of drainage structures to ensure impacts on surface hydrology are minimised as discussed in Section 5.6. In addition FMG will avoid significant vegetation types (as identified by the PATN analysis – see response 5.2.9) in detailed design where practicable.

5.2.11 Biota states that voucher specimens will be lodged with CALM's Pilbara Regional and State Herbaria, however, this has not yet occurred. Lodging voucher specimens is a condition of Biota's scientific purposes licence and should be a standard operating procedure to facilitate species identification (Submission 16).

A: Biota acknowledges that the specimens have not yet been lodged. Specimens will be collated and submitted to both the Perth Herbarium and the Pilbara Regional Herbarium at Karratha in early 2005.

5.2.12 Section 6.1.5 Land Systems page 49 - Although CALM acknowledges that the rail corridor comprises less than 6% of the mapped extent of the Land System in the Pilbara, this statistic does not recognise that the potential exists for greater impacts than those proposed if threatening processes such as drainage shadows, excessive clearing, weed control and fire are not managed adequately (Submission 16).

There maybe a potential for processes such as drainage shadows, weed infestations and fire as a result of the rail impacting further on the mapped extent of the land system in the Pilbara. It is impossible, however to take into account possible threatening processes such as those mentioned above in the clearing statistics. FMG believes that with appropriate management strategies and best practice engineering design these processes can be minimised or mitigated. Management strategies for these potential impacts are outlined in Sections 7.2.3.1, 7.2.3.2, and 7.2.1 and in the Construction EMP (Appendix E) of the Stage A PER.

5.2.13 The proponent has not included a provision for the development and implementation of a Weed Management Plan for construction and operating life of the railway. A commitment is made to such plan in the Draft EMP, although it is not clear if this plan covers the operating life of the Project or just the construction phase. (Submission 16).

A: FMG has committed to develop and implement a Weed Hygiene and Management Plan and as mentioned in Section 7.2.3.2 of the Stage A PER (page 130) "weed control measures will be implemented to ensure that weed species identified from the FMG rail corridor are not spread as part of the construction and operation of the railway". A Weed Hygiene and Management Plan will be prepared to the satisfaction of CALM prior to construction commencing".

The management plan will include procedures to deal with the prevention of introduction and control of weeds in the Project area. Initial detection of a new weed will be treated as an incident that will be immediately reported and investigated so that suitable corrective actions (control and monitoring) can be effected. The plan will also include procedures for vehicle hygiene to minimise the risk of new weeds being transported into the area.

The Weed Hygiene and Management Plan will cover the construction and operation phases of the Project and will be amended as required throughout the life of the Project.

5.2.14 The location of the ballast and quarry sites is critical for weed management in this area as infested sites are the primary source and vector for dispersal of Ruby Dock (*Acetosa vesicaria*) CALM has knowledge of its presence in the BHPBIO ballast quarry near Shaw Siding in the Chichester Range, and sporadic occurrences south along the rail embankment from Shaw Siding to Hester Siding (Submission 16).

A: FMG agrees with this statement, and every effort to source weed free ballast and rip rap for the Project will be made. FMG's proposed Weed Hygiene and Management Plan will include specific procedures for third parties to provide clean sources of ballast and rip rap and procedures for the prevention of introduction of new weed species and control of existing weed species in the Project area.

FMG is committed to implementing a best practice weed management programme. This will include specific hygiene procedures for all movement of plant/vehicles within Project areas during construction and operations. All attempts will be made to control and manage new outbreaks of weed species such as *Acetosa vesicaria* (Ruby Dock) and *Stylosanthes hamata* (Verano Stylo).

5.2.15 Another weed of significance the proponent must commit to controlling is Verano Stylo (*Stylosanthes hamata*) which Biota detected during the HDMS survey, and which is in a portion of the rail corridor common to both projects. The control of this weed prior to the commencement of construction activities is critical as it proliferates readily in post disturbance environments and is notoriously difficult to control once established (Submission 16).

A: As described in response 5.2.13, FMG's Weed Hygiene and Management Plan will cover all weeds detected within the Project area. The weed *Stylosanthes hamata* will be controlled prior and during construction/operations to prevent its spread. As stated in Appendix H of the Stage A PER (Section 5.3), only one record of *Stylosanthes hamata* was noted within FMG's proposed rail corridor. During selection of the final rail route there may be an opportunity to avoid significant infestations of weeds.

5.2.16 CALM considers it appropriate for FMG to specifically identify Weed and Hygiene Management as a separate and significant key issue under separate headings in all plans in order to emphasis their management. FMG should acknowledge that the Weed Hygiene and Management Plan will deal with both Declared and Environmental weeds, as stated elsewhere in the document (Submission 16).

A: Weed management will be treated by FMG as a key issue, which is why a specific Weed Hygiene and Management Plan will be developed and implemented throughout all stages of the Project. This plan will deal with the control of both Declared and Environmental weeds.

5.3 MANGROVES

5.3.1 Concerns were expressed over the amount of mangrove clearing that is proposed [loss of approximately 9.8% of total mangal in the Port Hedland harbour with the clearing of 109 ha of land', cumulative loss of 28.5% of the total mangal in the harbour area] (Submissions 3, 10, 11) and its impacts upon the tidal creek system which surrounds the harbour (Submission 3).

A: As noted in Section 7.3.4 of the Stage A PER (page154), “The proposed development would result in the clearing of approximately 22 ha of core mangal closed canopy associations (approximately 2% of the current core mangal habitat within Port Hedland Harbour)”. This is the loss of core mangrove cover, core mangrove cover is a more valid comparison as it contains most of the biodiversity, productivity and conservation values associated with mangrove systems. This is the key impact on mangroves associated with the FMG proposal. The remainder represents 89 ha of mudflat with samphires and scattered *Avicennia marina*. As noted on page 154 of the PER, “Most of this clearing (80%), however, impacts on a very low mangrove cover unit at the top end of the tidal range”.

As described under Section 3.1 of this document subsequent port design revisions by FMG has also further reduced the clearing requirements for core mangrove areas. This was achieved by revisiting the design of the port and the clearing requirements for infrastructure as shown in Figure 1 (attached). The revised mangrove clearing areas were re-analysed using a Geographical Information System (GIS), with the outcomes shown in Table 7.

Table 7: Mangrove association clearing based on the revised FMG port design.

Mangrove association	Clearing (ha)
1 - Closed canopy woodland of <i>Rhizophora stylosa</i>	0.12
2 - Closed canopy woodland of <i>R. stylosa</i> and <i>Avicennia marina</i>	5.18
3 - Closed canopy woodland of <i>A. marina</i> (seaward fringe)	5.09
4 - Closed canopy woodland of <i>A. marina</i> (landward margins)	0.04
5 - Low open shrubland of <i>A. marina</i> on saline flats	4.36
9 - Low dense <i>Aegialitis annulata</i>	0.01
Total revised mangrove clearing:	14.80

These revisions have avoided an additional 7.2 ha of mangrove cover and reduced the overall proportional loss of core mangrove within the harbour from 22 ha to 14.8 ha.

It is also worth noting that the long-term study of Paling *et al.* (2003) found that the mangrove areas associated with tidal creeks in the remainder of the harbour were not significantly affected by the historical industrial development that had occurred in some creeks.

5.3.2 Oppose the Project on the basis of the amount (9.6 ha out of a total of 37ha, representing 26% relative loss in Port Hedland Harbour) of closed canopy woodland of *Avicennia marina* that will be affected by the development (Submission 12).

A: As outlined in response 5.3.1 above, the FMG port design has now been revised in an effort to further minimise mangrove clearing. This has resulted in the clearing of the closed canopy of *Avicennia marina* association reducing to 5.09 ha from the 9.6 ha outlined for the design assessed in the PER (14% of the area of this association currently within Port Hedland harbour). It is also worth noting that *A. marina* is the most widespread mangrove species along the Pilbara and Western Australia coasts. Closed canopy *A. marina* associations are also very widespread and well represented in conservation areas outside of Port Hedland harbour.

5.3.3 Concern about the amount of *A. marina* to be cleared and would like to see a preference towards preventing loss of *A. marina* as well as rehabilitating this association (Submissions 10, 11).

Concern that the potential losses cited are only those proposed during construction. Further longer term impacts will cause further mangrove loss (Submission 3).

A: As outlined in response 5.3.2, FMG has revised its port layout such that the loss of *A. marina* has been reduced as far as practicable. Opportunities for rehabilitation will be explored as part of the development and implementation of a Mangrove Rehabilitation Plan (as detailed on page 165 of the Stage A PER). FMG has committed to a range of offsets for mangroves (see Section 4.1), which includes rehabilitation of mangroves. *A. marina* has the widest salinity tolerance of the mangrove species in the harbour and is most likely to be successfully re-established as part of rehabilitation efforts.

In regards to longer-term impacts, the Stage A PER provided an assessment of the potential indirect and ongoing mechanisms affecting mangroves in the harbour. The review of these potential longer-term impacts indicated that further loss of mangroves was unlikely and some colonisation may actually occur (Section 7.3.4 of the Stage A PER (page 155)).

5.3.4 How are particular (mangrove) species impacted by the clearing, and what quality of mangroves will be cleared (Submission 12)?

A: The Stage A PER provided a breakdown of the impacts of the clearing on the various mangrove associations in the harbour (Table 22 of the PER). These are mostly monospecific (or codominant) vegetation units, and therefore also provide an indication of the clearing impacts on the various species. The impacts on mangrove species have been reduced by the revised FMG port layout provided in this response to submissions (Table 7 and Figure 1). In regards to quality, the Stage A PER identified that all mangrove associations in the Project area were generally in good to very good condition (page 95 of the PER), typical of much of the harbour currently not directly affected by industrial development (Paling *et al.*, 2003).

5.3.5 The State Sustainability Strategy 2003 states that “all life has intrinsic value, is interconnected and that biodiversity and ecological integrity are part of the irreplaceable life support systems. This includes protecting aquatic systems and also providing sustainable coastal and marine environments”. The PER and its plan to remove 9.8% of mangroves, is in complete contradiction and totally incompatible with this statement and strategy. The WA Mangrove Assessment Project 1999-2000 conducted by Murdoch University investigated sites such as the Port Hedland Complex – Harbour (including South West Creek, South Creek, South East Creek and Sting Ray Creek). For instance, “The size of the estuary and the extent and diversity of its associated wetlands suggest that its contribution to the local ecology is significant. The site supports substantial areas of wetland that provide habitat for estuarine and offshore fish stocks” (Submission 3).

A: EPA Guidance Statement No’s. 1 and 29 is the primary government policy document for assessment of environmental impacts on mangroves (BPPH). Guidance Statement 1 considers Port Hedland harbour as an area primarily designated for industrial development (recognising that such developments should proceed with the minimum practicable impact on mangrove systems; Section 7.3.4 of the Stage A PER (page 159)). This same Guidance also identifies large areas of the nearby Pilbara coast with mangrove systems of regional conservation significance that should be set aside for conservation. This is the primary context that the above comments on ‘maintaining existing processes or natural systems at the regional or nation scale’ should be considered.

This submission also appears to have confused the work completed by Paling *et al.* (2003), with the Paling and Pedretti (2001) study. Erosion rates were examined by Paling *et al.* (2003), with the outcomes of this long term study indicating that there was no significant difference in erosion rates in creeks in the harbour area compared to those in undisturbed areas.

It is not disputed that the intertidal habitats of Port Hedland contribute to the local ecology. However the implementation of the FMG proposal will still leave over 900 ha of mangroves intact in Port Hedland harbour. This must also be considered in the context of large extent of similar mangrove systems in the immediately vicinity (more than 4,000 ha of mangrove cover within the same regional geomorphic unit (Appendix 3). It is the proponent’s view that this will not compromise the regional ecology of mangrove and coastal systems.

5.3.6 At the port, considerable mangrove assemblage cover is to be lost (109 ha). It is anticipated that in accordance with EPA Guidance number 29, this will require additional impact assessment (Submission 13).

A: The impact assessment that is required for the loss of mangroves has already been completed in the PER in accordance with the requirements of Guidance 29. An updated analysis based on FMG’s revised port layout and final BPPH management units has been provided with these responses (Section 3.1.2). This represents the full extent of impact assessment that is required for this proposal in respect of BPPH impacts.

5.3.7 The management of impacts on mangroves has major implications for industrial development in Port Hedland and in nearby industrial areas. DoIR seeks urgent clarification of the EPA's position on this issue and considers that the EPA's decision should acknowledge the continuing and potentially expanding use of the Port Hedland area for industrial development (Submission 17).

A: FMG agrees with this statement.

5.3.8 Concerns over the amount of bund wall which will be directly abutting the surrounding mangrove habitat and the effect the change in flooding regime would have over these affected mangrove areas. Would like to see efforts to decrease the amount of bund wall that directly abuts the surrounding mangrove habitat. Would like to see measures put in place at bund wall/mangrove interface to maintain the tidal flushing and prevent inundation (Submissions 10, 11).

A: FMG has revised its port design since that published in the PER. One aspect that was changed substantially was the configuration of the bund walls on both the main spoil basin and the Anderson Point spoil bars. FMG has restricted the bund wall to the landward side of the core mangal areas, and therefore the bund wall will not interfere with tidal flushing regimes. However, FMG intends to monitor the mangroves on the seaward side of the bund wall and implement remedial measures should the altered hydrodynamics (e.g. due to seepage from the bunded spoil reclamation area) result in adverse impacts on adjacent mangroves. See Section 7.3.2.2 of the Stage A PER (page 145).

Tidal flushing of the mangroves in South West Creek will be maintained through large culverts for the rail loop and load out conveyor. These drainage structures have been designed based on the hydrodynamic modelling to ensure adequate tidal flushing occurs. See Section 7.3.4 (pages 153-160) of the Stage A PER.

5.3.9 Concerned about the effects of dust deposition on the mangroves that will be remaining in the immediate vicinity [of the port]. Further research (a three year commitment to further study has been given p 165) and management measures need to be implemented to ensure that the potential for dust to coat the mangroves in the immediate area is minimised (particularly by third party users) (Submission 10,11).

A: Studies undertaken in Port Hedland have demonstrated that iron ore dust does not appear to cause any significant damage to mangrove leaf structures, although may result in loss of mangrove condition. Whilst FMG acknowledges the potential for cumulative dust impacts (dust modelling included existing impacts from BHPBIO and proposed impacts from HDMS' operations), FMG intends to implement best practice dust management measures for its operations.

FMG will fund further research into the impacts of dust deposition on mangroves for at least three years and the prospect of ongoing research will be reviewed at the end of the three years. Section 4.1 of this response to submissions details proposed offsets for mangroves including the research to be conducted. FMG is proposing to use hyperspectral technology to monitor dust deposition on

mangroves and also to assess mangrove health.

5.3.10 Strongly support the development of a mangrove monitoring programme to assess mangrove condition in areas reliant on the hydrological design of the Project for tidal flushing and would like to see the scope widened to include not only development and implementation but also longer term operation of the port facilities (Submissions 10, 11).

A: The mangrove monitoring programme will include assessment of mangrove condition in areas reliant on the hydrological design of the Project and will extend throughout the life of the Project and for a period of time post-closure if the facility is ever decommissioned.

Mangrove monitoring will be co-ordinated with HDMS where appropriate (should the HDMS facility also be constructed). Findings of the mangrove monitoring programme will be published in FMG's Annual Environmental Report which would be publicly available.

FMG has also developed a scope of work in collaboration with CSIRO to assess dust deposition and mangrove health using hyperspectral data. Use of hyperspectral data as a management and monitoring tool is detailed in Section 4.1.2.

5.3.11 FMG commits to implementing an offset package relating to mangal in the locality (p.xiv), however this is not discussed in the PER as to what the offset will be and is yet to be negotiated. Further detail is requested (Submissions 5, 10, 11). Would the proponent consider buying mangrove areas from the port authority and putting conservation covenants on them (Submission 12)?

A: Refer to Section 4.1 for further information on mangrove offsets.

5.3.12 Mudflats and patches of samphires with occasional *A. marina* is habitat that supports mangroves and is influenced by tidal inundation. Accordingly, it is considered to be Benthic Primary Producing Habitat (BPPH). Open mangrove habitat and closed mangrove habitat should be considered separately and the cumulative losses of each calculated separately (acknowledging that assumptions will need to be made to assess historical losses). It is also noted that a calculation of cumulative mangrove habitat loss (open and closed associations combined) has only been undertaken for the smallest management unit (Submission 15).

A: The term 'benthic' is defined as 'of or relating to, or happening on, the bottom under a body of water'. The Proponent therefore understands that the Benthic Primary Producer Habitat (BPPH) (and Guidance Statement No. 29) only applies to 'areas on the bottom under a body of water'. In most ecological applications the terms 'benthic' and 'benthos' are used in relation to truly marine, submerged communities such as seagrass, coral reefs and macroalgal beds. This is not consistent with the area being referred to in the above submission (Unit 6 of the revised mapping shown in Figure 1), which is a largely terrestrial environment that is infrequently covered by very shallow water on the highest tides each month. A photo of this habitat type in the study area is provided to illustrate this in

Plate 1 below (note that this was taken on a spring tide).



Plate 1: Mapping Unit 6 (Mudflat, patches of samphires with occasional *A. marina*) in the proposed FMG stockpile area

The above submission also makes reference to this habitat being ‘influenced by tidal inundation’ as the basis for considering it BPPH but provides no context in terms of the extent and frequency of inundation. Quantitative data collected in nearby Pilbara mangrove systems at the Maitland River delta area provide a useful tool to examine this contention (Halpern Glick Maunsell, 1999). A differential GPS was used to collect vertical elevation limits data for mangroves (lower and upper vertical range) and the lower limit of samphire occurrence. The findings of this work are shown in Figures 4 and 5 attached.

Figure 4 shows the lower and upper elevation limits of the mangrove zone and the lower limit of the samphire zone (the lower limit of Unit 6). These values were then applied to a submergence curve generated from a validated hydrodynamic model of the area (Figure 5). This curve provides a measure of the proportion of the time that a given elevation is underwater over a monthly tidal cycle. Imposing the range of lower limit of the samphire zone on this indicates the lower limit of unit 6 is inundated about 3% of an average monthly cycle. This equates to less than one day per month, suggesting that the term ‘benthic’ is not appropriate for this position in the landscape.

It is recognised that the mudflat areas have ecological attributes and function, particularly in relation to the presence of cyanobacterial algal mats which provide nitrogen inputs to local ecosystems (as outlined in Section 6.3.4.2 of the Stage A PER (page 94)). However, FMG considers that these do not fall within the assessment framework of EPA Guidance 29 which defines Benthic Primary Producers as:

‘Predominantly marine plants (e.g. seagrasses, mangroves, seaweeds and turf algae) but include invertebrates such as *scleractinian* corals, which acquire a significant proportion of their energy from symbiotic microalgae that live in coral polyps. These organisms grow attached to the seabed (i.e. subtidal and intertidal), sequester carbon from surrounding seawater or air and convert it to organic compounds through photosynthesis.’ (EPA, 2004).

There is no mention in this definition (or anywhere in the balance of EPA Guidance 29) of cyanobacterial algal mats. The guidance also defines BPPH as having ‘a complex three-dimensional structure’, a description which does not apply to thin cyanobacterial algal mats on saline, largely-supratidal, mud.

The marine biota and specialist mangrove fauna components associated with the true mangrove systems do not utilise this unit and more terrestrial species occur in this habitat. Unit 6 is therefore considered to be an ecotone and FMG does not agree that it should be considered BPPH to be assessed within the framework specified by EPA Guidance 29.

In regards to open and closed canopy mangrove units, the assessment completed does include open units. Unit 5 is described as: ‘Low open shrubland of *A. marina* on saline flats’ (refer to Table 22 of the PER). This unit was included in the area calculated for loss of mangrove BPPH completed for the PER and in the revised BPPH calculations based on FMG’s revised port layout (see Appendix 3). Whilst detailed vegetation mapping of open and closed mangrove units is available over the area designated ‘Inner Harbour’ in Appendix 3, significant ground truthing outside the Project area would be required to calculate cumulative loss for each type of mangrove association for the larger ‘Port Hedland Industrial Area’ Management Unit and hence calculations of cumulative loss have been completed from topographical mapping (refer to Section 3.1.2).

The mapping of mangrove cover from the wider topographical mapping provides a high degree of correspondence to the extent of mangrove units 1-5 (see Figures in Appendix 2). The BPPH calculations for the larger management units do, therefore, provide an indicative analysis of the wider scale cumulative loss (as required by EPA Guidance 29). This analysis included both closed and open canopy mangrove units (as noted in Section 7.3.4 of the Stage A PER (page 167) and Appendix 3), and has been updated based on the revised port layout (see Appendix 1). The final cumulative loss for mangrove units properly considered as BPPH within the ‘Port Hedland Industrial Area’ Management Unit is 13.3 %. This includes open and closed canopy mangrove units (units 1-5) but not the mudflat unit (unit 6) (see Appendix 3).

5.3.13 The PER does not consider that given these open canopy mangrove habitats cover large areas, their overall contribution to local marine ecosystems may be significant. (Submission 15)

A: The primary contribution to local marine ecosystems that these areas provide arises from cyanobacterial algal mats. Port Hedland harbour currently contains approximately 207 ha of algal mats (Paling *et al.*, 2003). The FMG proposal will result in the removal of 49.2 ha of algal mats (23.7% of the local extent). This will leave 157.8 ha of algal mat within the balance of the inner

harbour area. Data from Paling and McComb (1994) indicate that this 157.8 ha of mat will continue to contribute up to 10,730 kg of nitrogen per annum to the local marine environment.

5.3.14 If EPA Guidance Statement No. 29 is to be used then DoIR considers that the management unit should cover the whole geomorphic unit as depicted on Figure 14 to ensure that any cumulative effect resulting from the proposal is assessed on its effect on the mangal environment quality in the whole of the unit. DoIR would not support any option that only partially covers the geomorphic unit and requests that the EPA involves it in any proposal to reduce the management unit's areal extent (Submission 17).

A: FMG supports the view put forward by DoIR in this submission.

5.3.15 EPA Guidance Statement No. 29 provides clear guidance as to the preferred size of a defined management unit for the purpose of calculating cumulative loss of BPPH – normally approximately 50km². It is noted that other researchers (Pedretti and Paling, 2001) have identified a discrete "mangrove complex" which is similar in size (approximately 50 km²) and shape to the "inner harbour" management unit proposed by FMG (Submission 15).

A: EPA Guidance 29 states that the EPA will consider larger management units if well justified (EPA Guidance 29, page 7). The proponent believes that the management unit area (50 km²) defined in Guidance Statement No. 29 is unrealistically small in the context of Port Hedland mangroves assemblages and does not accurately reflect the true ecological boundary of mangroves in the Port Hedland region. Reasons why a management unit great than 50 km² was proposed relate, in part, to the finding of Paling *et al.* (2001) who concluded that the local occurrence of mangrove assemblages within the FMG port facility area was consistent with distribution patterns observed elsewhere in the region in relation to species occurrence in the tidal range, local geomorphology and substrate (PER page 94). The case for larger management units is given comprehensively in Section 7.3.4 the Stage A PER (pages 161 to 168). The final management unit decided by the EPA is discussed in Section 3.1 of this document.

5.3.16 While Guidance Statement No. 29 provides for proponents to put cases to the EPA for larger or smaller management units if well justified, those management units should be justified primarily on ecological and/or geomorphological grounds. The two largest management units do not appear to be supported by technically defensible ecological and/or geomorphological information (Submission 15).

A: FMG believes there are strong grounds why the two larger management units represent distinct ecological and geomorphological units. The case for this is given comprehensively in the Stage A PER pages 161 to 168. This was based, in part, on the work by Paling *et al.* (2001) who concluded that the local occurrence of mangrove assemblages within the FMG port facility area was consistent with distribution patterns observed elsewhere in the region in relation to species occurrence in the tidal range, local geomorphology and substrate (Stage A PER page 94). In addition, Semeniuk (1993) recognised similarities in mangrove species, mangrove structure, tidal regime and substratum type

characteristics of the whole Unit 3 management unit. From a geomorphological perspective Unit 3 is characterised by tidal inlets protected by barrier islands (Stage A PER, page 162). The final management unit decided by the EPA is discussed in Section 3.1 of this document.

5.3.17 The proponent's attention is drawn to Figure 2 of EPA Guidance Statement No 29 which represents the EPA's expectations in regard to level of understanding that should underpin any statements/predictions regarding ecosystem integrity. The PER does not provide adequate information that "demonstrates understanding of the ecological role and value of the BPPH within the local context" (EPA, GS No 29, June 2004) (Submission 15).

A: The EPA's expectations as outlined on Figure 2 of EPA Guideline 29 (EPA, 2004) is for a proponent to provide more detailed information on ecosystem roles as proposed cumulative loss of BPPH increases, with the requirement increasing sharply as the nominal cumulative loss threshold is exceeded. The calculation of cumulative loss is determined by the management unit size that is applied and the PER (and subsequent discussion with the EPA) has provided a number of options for this unit. The final decision on the most appropriate unit, and therefore its size and the percentage cumulative loss, has been decided by the EPA to be the 'Port Hedland' area as indicated in Guidance Statement 1 (EPA, 2001) and shown in Appendix 3 of this document as 'Port Hedland Industrial Area'. On this basis the predicted total cumulative loss on BPPH (mangrove associations 1-5) over this area would be 13.3% which exceeds the nominal cumulative loss threshold of 10%. FMG understands that the EPA is in discussions with PHPA regarding the appropriate upper limit for the Port Hedland Harbour. FMG has undertaken a detailed survey of mangroves within the immediate vicinity of the Project area and proposed mangrove monitoring programmes prior to and during construction and during operations to obtain an understanding of the ecological role and value of the BPPH within the local context. FMG has also refined its Project layout to further reduce impacts on mangrove areas. However, it must be noted that Port Hedland has been nominated in Guidance Statement No. 1 for port development, recognising that such developments should proceed with the minimum practicable impact on mangrove systems.

5.3.18 It appears that FMG has not understood the requirements of EPA Guidance Statement No. 29 in terms of calculating best, most probable and worst case scenarios. Rather than considering a range of possible BPPH loss scenarios resulting from mapping errors or errors associated with predicting peripheral/indirect impacts, FMG has considered one BPPH loss scenario and then calculated percentage loss outcomes by applying management units of different sizes (Submission 15).

A: FMG has revised the layout of the proposed port facility since release of the PER in an effort to further reduce impacts on mangroves. The analysis of mangrove impacts was based on what EPA Guidance 29 would consider to be the 'most probable' scenario. This was derived from field surveys, rectified imagery, validated modelling, GIS based imagery analysis and careful definition of engineering design and construction clearing works areas. The Proponent considers there is little value in producing a 'best case' scenario (as suggested by EPA Guidance 29), by assuming that the clearing requirements will only be limited to the design footprint (i.e. 14.8 ha) when FMG knows that

additional clearing will be needed to accommodate site works. FMG also considers there is little to be gained by assigning an entirely arbitrary upward percentage on the figures arising from an estimation to provide a worse case scenario, as there are no quantitative means to arrive at such a figure for any inaccuracies that may have occurred. It is also possible that positive changes may occur that will reduce the ultimate loss of mangrove cover (e.g. seedling colonisation on bund walls which similarly cannot be quantified for the same reason. Refer also to response 5.3.1 and Appendix 2.

The spatial analysis of mangrove impacts, whilst in an intertidal environment, is analogous to the calculation of loss for terrestrial vegetation associations. With current geo-referenced imagery (which assigns x, y and z coordinates to each pixel), field based ground-truthing and the use of GIS software and realistic construction parameters, the area losses can be accurately predicted. This is not the same scenario as other matters that may have been envisaged in the BPPH when the various loss scenarios were suggested, such as the potential for dredging turbidity to extend far further than estimated. As such FMG felt it appropriate to determine different cases of loss based on various management unit sizes.

5.4 FIRE

5.4.1 FMG has not included a provision for the development of a Fire Management Plan. This is particularly important for areas in the southern part (Fortescue Valley) of the rail corridor where fire sensitive mulga woodlands occur. However, as suggested by Biota, it is also of relevance throughout the whole rail corridor due to the proliferation of fires in the Pilbara over the past decade and the general juvenile status of the vegetation on the Abydos Plain (Submission 16).

A: Sections 4.2.12 and 7.2.3.1 of the PER (pages 27 and 130) state that FMG will prepare and implement a Fire Management Plan. The plan will include work procedures for welding and grinding work, personnel fire procedures, fire response vehicles on site and bushfire contingency plans. The objective of the management measures will be to reduce the risk of unplanned fires and provide contingency measures to minimise any impact in the event that a fire is started. The Fire Management Plan will be updated on a regular basis and will be implemented for the life of the Project.

5.4.2 CALM seeks clarification on what the proponent means by the statement ‘...ensure natural bushfires events’ as an objective under the Bushfire section of the Draft Construction EMP (Submission 16).

A: This is a typographical error and should read “prevent fires caused by FMG’s construction activities and ensure FMG does not increase the frequency of natural bushfire events”. FMG will determine the correct course of action during natural bushfires in consultation with CALM. It is anticipated that intervention will only occur if property, infrastructure, or human life are at risk.

5.5 FORTESCUE MARSH

5.5.1 The Fortescue Marshes are listed as a nationally important wetland. It is a:

- **good example of a wetland type occurring within a biogeographic region in Australia;**
- **wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex;**
- **wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail; and**
- **wetland of outstanding historical and cultural significance.**

It is also listed as an “Indicative Place” on the Register of the National Estate (natural heritage) due to its importance for conservation of waterbirds (Submission 5).

A: FMG acknowledges that the Fortescue Marsh is a nationally important wetland and has high conservation significance. In the Stage A PER, potential impacts to the Fortescue Marsh were assessed by Aquaterra.

For the Stage A Project, the FMG north-south railway crosses through the Fortescue Marsh area upstream from the Goodiadarrie Hills adjacent to the existing BHPBIO railway as described in Section 6.2.1 of the Stage A PER (page 60). Section 7.2.1 (pages 118 – 122) states that at this location slightly elevated terrain locally reduces the width of the Marsh from a typical width of 10 km to less than 500 m. The Marsh bed at this crossing is also higher than the adjacent areas. As the Marsh acts as a flood storage area, receiving runoff from surrounding catchments installation of railway will not reduce the storage volume of the Marsh and will not affect the existing surface water drainage patterns. By locating the railway adjacent to BHPBIO’s existing rail, impacts will be localised by limiting clearing to an area which has already been disturbed. Management of sheetflow to ensure sensitive vegetation (primarily Mulga) is also outlined in Section 7.2.3.2 (pages 129 – 131) of the Stage A PER. The risk of construction and operation of the north-south railway near the Fortescue Marsh is low and FMG commits to implementing and maintaining suitable management measures to ensure the risk to the Fortescue Marsh remains low.

A risk assessment has subsequently been carried out looking at the potential impacts on the marsh as a result of Stage B of the Project and is presented in the Stage B PER.

5.5.2 The risk of impact to the Fortescue Marsh and the biological values that it contains will increase significantly as a consequence of the construction of the proposed railway. These potential impacts include fire management, chemical spills and dust. FMG will need to address the increased risk of impacts specifically relating to the Fortescue Marsh and the biological values that it contains from threats related to the construction and operation of the railway such as fire, chemical spills and dust (Submission 16).

A: As described in response 5.5.1, the Stage A rail crosses the Marsh at its smallest point adjacent to the existing BHPBIO crossing. As such the risks are thought to be low and the impact is localised to

an area which has already been disturbed. Despite this FMG will ensure a construction and operation Environmental Management Plan is implemented to the satisfaction of CALM and DoE. The plan will cover all of the potential impacts as a result of the Stage A railway to the Fortescue Marsh (including fire, chemical spills and dust). These issues have already been considered in the Construction Environmental Management Plan (included as Appendix E of the Stage A PER)

For the Stage B Project which is located along the footslopes of the Chichester ranges, some distance north of the Marsh, a specific risk assessment was conducted and is presented in the Stage B PER.

5.5.3 FMG has not included a management plan for spill and hydrocarbon contamination in the Upper Fortescue River catchment including the Fortescue Marsh. Given the significance of the Fortescue Marsh, the proponent should commit to developing a management plan to address this deficiency. Any contamination or spill that occurs when the Marsh has surface water present will have a detrimental impact on the samphire community, its endemic and rare flora, underground aquifers and potentially significant waterbird populations. This plan should principally address rail accidents/derailments. Although CALM acknowledges there is a low probability that such events will occur, there remains a risk to the Marsh, particularly in the vicinity of the proposed rail crossing. The plan should be similar to plans for Priority 1, 2 and 3 water protection catchments. Pilbara Rail has such a plan in place for the Harding Dam catchment (Submission 16).

A: FMG has committed to “Maintaining or improving the quality of surface water to ensure that existing and potential users, including ecosystem maintenance are protected, consistent with the Australian and New Zealand Water Quality Guidelines (ANZECC, 2000). Monitoring of surface water on a regular basis at the marsh will ensure that water quality is maintained.

As stated in Section 7.3.6 of the PER (page 172), FMG has also committed to the development of a Hydrocarbon Management Plan, which will include spill prevention and clean up procedures, for both construction and operations. The plan will also include a section on rail derailments and accidents involving hydrocarbons. In general, the plan will require all hydrocarbons to be stored, transported and handled in accordance with appropriate legislation and standards including:

- Australian Standard 1940 Storage and Handling of Flammable Goods;
- Australian Code for the Transport of Dangerous Goods by Road and Rail;
- *Traffic Act 1974*; and
- Dangerous Goods (Transport) (Road and Rail) Regulations.

Regular audits will ensure that the plan is adhered to by all personnel (including third parties). Additionally, an Emergency Response Plan will be developed prior to Construction, which will detail procedures to be followed in the event of a Rail Crash/Hydrocarbon spill. This issue has also been included in the Construction EMP (Appendix E of the Stage A PER).

5.5.4 Executive Summary page xvi - This section incorrectly lists the Fortescue Marsh area as a regionally significant wetland. The correct listing for the Fortescue Marsh is as a “Nationally Important Wetland” listed in A Directory of Important Wetlands in Australia in the Australian Wetland Database administered by the Department of Environment and Heritage. The PER needs to be amended accordingly (Submission 16).

A: FMG agrees that the Fortescue Marsh is a Nationally Important Wetland and in Section 6.1.2 of the Stage A PER (page 46), this is stated.

5.6 SURFACE WATER

5.6.1 Concerns were expressed that the cumulative impacts of all three railways (BHPBIO, HDMS and FMG) upon surface water flows need to be considered (Submissions 4, 5, 6, 10, 11, 12, and 13).

A: FMG recognises the potential impacts of three parallel railway lines, and is seeking to reach an agreement with HDMS for sharing of infrastructure (FMG proposes to allow HDMS access to the Stage A infrastructure). However, in the unlikely scenario that an agreement is not reached and two additional railways are constructed, then FMG has aligned their proposed rail line as close as practicable, to both the BHPBIO railway and the proposed HDMS railway. When considering the final alignment of the railway corridor FMG will ensure that it is located to minimise any potential negative effects to surface water drainage with due regard for the impacts already present via the existing railway and the approved HDMS route.

A cumulative impact study of all three railways on surface water flows has been undertaken by FMG and is summarised in Section 3.4.3.

5.6.2 There was concern that alteration of surface water flows as a result of the FMG rail may impact upon the BHPBIO and HDMS railways (Submissions 4, 13).

A: Detailed drainage design for FMG’s railway will consider both the existing BHPBIO railway and the approved HDMS railway and ensure that adverse impacts on surface hydrology from the proposed railway are minimised. FMG will use best practice engineering solutions to design appropriate surface water management structures.

5.6.3 When detailed drainage design is completed could this information be made publicly available (Submission 10, 11, 13)?

A: FMG has completed a study on the cumulative impact of three railways on surface water flows which is summarised in Section 3.4.3. Relevant stakeholders will be consulted in the final detailed drainage design of FMG’s proposed railway.

A review of the rail alignment and flood regimes in both the South West and South Creek catchments

has been completed by Worley (2004). The results of this assessment are included as Appendix 8.

5.6.4 Several submissions raised the concern of the potential impact of the proposed FMG railway and port development on flows in South West Creek and South Creek in the Port Hedland area, and the potential for increased flooding of South Hedland Rural Estate and White Hills areas which are already prone to flooding (Submissions 3, 5, 6, 10, 11). Specific points included:

- **The adequacy of the ARI used to design the drainage structures (Submission 5, 6); and**
- **The appropriateness of using culverts along the proposed railway in the South Hedland and White Hills areas, and the potential for these to be blocked with debris during flood events, resulting in damming of floodwaters (Submission 6).**

A: During studies completed on surface hydrology (Appendix L of the PER), it was found that the rail alignment across the South West Flood plain could potentially cause flooding to South Hedland and Wedgefield. As a result of this FMG has moved its rail alignment further west (refer to Section 7.2.1 (pages 118 – 122) and Figure 4 of the Stage A PER).

A further flood study was undertaken by Worley (2004) with a view to determine the likely contributions of overland flooding to harbour storm surge, whilst taking into account the effects of the existing BHPBIO rail line on floods entering the harbour. The study also included a preliminary assessment of the potential for flooding of the rail yards and any increase in flood risk to the Great Northern Highway (North-West Coastal Highway), Wedgefield and South Hedland.

No evidence was obtained indicating that establishing the rail yards in the flood plain between the North West Coastal Highway and the BHPBIO rail yard would result in increased flood risk to the highway, South Hedland or Wedgefield.

Worley's (2004) review of the flood regime upstream of the Great Northern Highway showed that the rail line will act as a barrier to flood waters flowing towards the South West bridge crossing and therefore peak flood heights would be reduced at the South West Creek during a large flood event. Overall the rail line should therefore reduce the risk of flooding South Hedland and Wedgefield.

Detailed designs for the railway crossings will be to industry standards with bridges to remain above 50 year Average Recurrence Interval (ARI) floods and culverts to remain above 20 year ARI flood. The 1 in 20 year design concept is used to evaluate culvert sizings to allow drainage of a flood event that is likely to occur once every 20 years, and is consistent with design criteria for the North West Coastal Highway by Main Roads. Therefore the culverts will be designed to not be overtopped by a 1:20 year flood event, but will be constructed to withstand many more years of operation with minimal maintenance. A significantly more severe flood event could potentially overtop the railway embankment, however the floodwaters would still drain to the downstream environment.

It is mentioned above that Main Roads Western Australia used a 1 in 20 year design criteria for the

North West Coastal Highway. It is difficult to design infrastructure to take major flood events such as the 1 in 100 year ARI due to the volume of water (resulting in extremely large structures being required, increasing disturbance footprint and visual impact). Therefore, in the majority of cases a major 1 in 100 year flood event is designed to flow overland such as with the North West Coastal Highway and FMG's proposed rail.

5.6.5 Reclamation of land and development of industry on the floodplains at Port Hedland that are prone to storm surge was also raised as a concern. The point was made that any infill of tidal creeks or floodplain areas could result in extensive flooding of the North West Coastal Highway, Wedgefield, South Hedland, airport and the Broome turnoff on the highway during cyclonic or heavy rainfall events (Submission 3). Who has done the port area work to prove that “flow areas available for surface drainage into the creeks essentially remain unaltered” (Submission 12)?

A: Refer to response 8.4.3.

Aquaterra investigated the potential impacts of the proposed port development on the surface hydrology of the site and their report is contained in Appendix L of the Stage A PER. Their assessment considered the changes to flow areas available in the creeks arising from the dredge spoil reclamation area and their effect on surface water flood levels. They concluded that the existing surface water flood levels in these creeks would not be impacted by construction of the dredge spoil reclamation areas.

5.6.6 Could FMG clarify the modelling of the South West Creek catchment response times and the possibility of a storm surge event and a peak in river flood discharge (Submissions 10, 11)?

A: Raised water levels from ocean storm surges can cause flooding in coastal areas. In the Pilbara Region, the largest storm surges result from the combined effect of reduced atmospheric pressure and wave pumping due to tropical cyclones. The maximum rise in ocean water level usually occurs at the point at which the cyclone crosses the coast where wind speeds are at their maximum. The magnitude of the storm surge will be determined by the intensity of the cyclone, the bathymetry at the cyclone's coastal crossing point and the local tide level. Intense, fast moving cyclones, a confining bathymetry and high tidal levels all promote more severe storm surges. Design storm surge levels within the Port Hedland harbour were assessed in the “Greater Port Hedland Storm-Surge Study” (GEMS, 2000). The effects of varying tides and wave set-up were included in the modelling process.

South West Creek has an estimated main stream length of 53 km and an estimated catchment area of 395 km², upstream from the BHPBIO Port Hedland-Shay Gap Railway. Flood modelling of the South West Creek was undertaken for the “Greater Port Hedland Storm-Surge Study” (GEMS, 2000). In this study, the South West Creek catchment discharges and response times were assessed for major rainfall events. The catchment response time is the time lag between the start of the design rainfall event and the time of arrival of the peak runoff discharge at the catchment outlet. Given the size of the South West Creek catchment, a catchment response time of several hours could be expected. For

the peak 50 year and 100 year ARI design floods, the catchment modelling assessed the catchment response times to generally vary between 8 to 12 hours, depending upon the rainfall pattern being modelled.

On South West Creek, due to the 8 to 12 hours catchment response time, the river flood peak discharge generally occurs well after any ocean storm surge peak. The direct combination of the two peak events is unrealistic, though some lesser overlap between the two events may occur. To assess the coincidence of storm surge and rainfall generated flooding in the South West Creek due to cyclones, the “Greater Port Hedland Storm-Surge Study” (GEMS, 2000) employed a probabilistic approach to define return period and associated flood levels. These peak 50 year and 100 year ARI design flood levels will be for used for the project design and have been quoted in the PER.

5.6.7 Have the culverts and other aspects of the proposed port facility’s design factored in greenhouse-induced sea level rises (Submission 12)?

A: During the detailed design process, implications of sea level rise on all Port facilities will be assessed and designs will take this into account.

5.6.8 Have impacts on surface hydrology of the existing BHPBIO railway ever been studied (Submission 12)?

A: FMG is not aware of any studies assessing the impact from the existing BHPBIO railway.

5.6.9 Further detail should be provided on the proposed sheet flow management actions and the redistribution system. This system should not just include culverts as they will not redistribute the flow. Maintenance of the structures should also be addressed (Submission 12, 15, 16).

A: Section 7.2.1 of Stage A PER (page 120) states: “Runoff from rainfall initially drains down gradient as overland flow before concentrating in a defined flow channel. In this process surface detention, vegetation, seepage and other mechanisms absorb water from the runoff stream. In steep areas, the runoff processes are rather rapid with relatively low losses and defined drainage channels are typically in close proximity. Whereas in the lower slope areas, the runoff processes are rather slow with relatively higher losses and a greater distance between defined drainage channels. In some of these lower slope areas, vegetation communities have developed which have become dependent on seepage water provided by the overland flow process. In the lower slope areas the overland flow process has been termed sheetflow.” The “relatively higher losses” refers to the natural runoff process where drainage water volumes from the lower slope areas tend to be lower than volumes draining from the steeper slope areas, due to higher losses arising from surface detention, vegetation, seepage and other mechanisms.

As outlined in the PER, “Sheetflow areas” with dependent downstream vegetation have been identified along the FMG rail corridor. Design of surface water management structures in these areas will take into account whether the BHPBIO railway has already affected these areas. In all sheetflow

areas regular culverting and a redistribution system will be installed to minimise to an acceptable level indirect impacts due to water shadow. The locations and spacings of the culverts and redistribution system will be based on an assessment of ground and vegetation conditions along the railway route with 300 mm diameter culverts typically used (larger where higher discharges predicted) with a minimum spacing of 100 m. FMG is currently testing sheetflow redistribution concept designs. The purpose of these trials is to assess different methods to convert water flow from a point source such as through a culvert to sheet flow. This work will improve on current best practice in the Pilbara. Initial results of these trials have been extremely encouraging and have been made publicly available with the release of FMG's Stage B PER.

In service, operation of the redistribution system will be monitored and modifications made as considered appropriate. The system will also be adequately maintained to ensure its effectiveness over time. Discharges to the redistribution system from a 300 mm diameter sheetflow culvert, would be relatively small (peak around 60 L/s) due to the culvert's limited flow capacity. Hence flow velocities through the redistribution system would be relatively low and non-erosive. Prior to entering the system, runoff from the culvert will be discharged to a silt trap that then overflows to the redistribution system. A small riprap pad will be installed directly in-line with the redistribution system inlet, to restrict any potential for flows to breakout before lateral redistribution. The service track will be situated downslope of the rail to reduce the potential for erosion (the culvert will be discharged across stabilised areas. Routine inspections and maintenance of sheetflow redistribution systems will be carried out, especially after large rainfall events. An inspection and maintenance plan will be developed following construction.

5.6.10 It is recommended that, in the southern portion (Fortescue Valley) of the proposed alignment where extensive mulga woodlands occur, it is appropriate that FMG duplicates the existing surface drainage and engineering structures that have been installed and maintained by BHPBIO (Submission 16).

A: FMG will duplicate where necessary the existing surface drainage and engineering structures that have been maintained by BHPBIO, however it is FMG's intention to significantly improve on these structures and implement best practice engineering design.

5.6.11 FMG should provide more detail regarding the monitoring it proposes to undertake for the early detection of vegetation impacts and, further, stating what remedial actions they will implement to deal with any impacts should they occur (Submission 16).

A: FMG is of the opinion that impact avoidance is the key to management of potential downstream impacts and believe this can be achieved with best practice engineering design. Trials are currently being carried out on a system to redistribute surface water flows to vegetation downstream of the railway.

Photographic monitoring and vegetation transects will be set up at various places along the railway to monitor potential vegetation impacts. Results of this monitoring will be included in the Annual Environmental Report. Remedial actions are yet to be determined but will be developed as a result of

previous studies, research and development and consultation with relevant stakeholders such as CALM.

5.6.12 Who has done the modelling to show that surface water drainage along the 345 km length of the proposed railway will not be adversely affected? Was the HDMS work, for the part of the proposed rail corridor that the two projects have in common, sufficiently detailed (Submission 12)?

A: Aquaterra completed the assessment for surface water impacts along the proposed railway as discussed in Section 7.2.1 of the Stage A PER (pages 118 – 122). FMG has prepared conceptual designs for the surface water drainage structures along the railway corridor adopting standard engineering design procedures as used for other railway developments in the Pilbara Region. The final arrangements for the FMG drainage structures will be determined at the Project detailed design stage such that any potential adverse impacts to the existing flood levels and existing bridges will be managed to acceptable levels. Engineering methods to be employed to manage potential adverse impacts include the provision of guide banks, hydraulic streamline flow areas and riprap or similar scour protection blankets.

Detailed design of drainage structures for the approved HDMS railway corridor has not been provided to FMG. However, from an assessment of the FMG railway route alignment relative to the HDMS and BHPBIO railway routes, FMG is confident that any potential adverse impacts to the existing flood levels and existing bridges will be managed to acceptable levels.

5.6.13 Concern about the argument that the railway formation “will not effect the existing surface water drainage patterns” (within the Fortescue Marsh). On what basis has this conclusion been formed? It is understood that the issue is east-west (and occasionally west-east) flows in the marshes, not their total storage capacity (Submission 12).

A: The surface hydrology study carried out by Aquaterra (Appendix L of the Stage A PER) concluded that the Fortescue Marshes act as an extremely large receiving basin for surface water runoff from the Upper Fortescue River catchment. The downstream end of the marshes is blocked by the Goodiadarrie Hills effectively preventing runoff from the Upper Fortescue River draining to the Lower Fortescue River. Flood storage levels in the marshes are dependent on the catchment water runoff volumes, not on the discharge of floodwater to the Lower Fortescue River. The existing BHPBIO and proposed FMG (and HDMS) railway are located in a slightly elevated area near the downstream end of the marshes, just upstream from the Goodiadarrie Hills. At this location, drainage through the railway zone would predominantly be as a result of differences in water storage levels between the upstream and downstream marsh areas, rather than due to large-scale floodwater drainage. Resulting flows through the railway culverts would be relatively low volume and slow moving. Peak flood levels in the Marshes, such as those reported in the early 1970's, would not be altered by the presence of the railways. A significantly more extreme flood event could potentially cause the storage level in the marshes to pond over the railway.

5.6.14 CALM notes that surface water management and flooding has been identified as an important issue, which is appropriate given the potential impacts on mulga communities from both the Stage A and Stage B proposals. Given the potential impacts on mulga communities from both the Stage A and Stage B proposals, CALM considers that issues relating to mulga and surface drainage should have been addressed as a specific issue under its own headings within the document (Submission 16).

A: As discussed in response 5.6.9, FMG agrees that surface drainage is an important issue for Mulga and FMG is confident that sheet flow can be redistributed with proper engineering designs to minimise downstream impacts from the railway. As outlined in Section 4.3 of this document the area of Mulga vegetation impacted by the Stage A Project is small relative to the overall Chichester Footslopes Mulga woodland. FMG has taken note of this comment for the Stage B PER and has discussed issues relating to mulga and surface drainage separately in the Stage B PER. FMG will implement a surface water plan will include measures to ensure that:

- sheetflow redistribution system levels are maintained;
- redistribution systems and culverts are maintained in operational order and free from blockage; and
- the redistribution systems are effective for the life of the Project.

5.7 STORM SURGE

5.7.1 No allowance appears to have been made in the technical planning to date for the provision of rock armour to face the proposed formations at Anderson Point as protection from storm surge scouring and storm water runoff (Submission 6).

A: FMG will be rock armouring the embankments at Point Anderson where necessary to protect the development from scouring as a result of storm surges. This is standard engineering practices for developments of this type and therefore was not discussed in the Stage A PER.

5.7.2 The design height of 0.5 m above predicted storm surge level for structures is just fanciful. The culverts and formation do block the storm surge events from penetrating inland. This results in a higher storm surge level in the port area, threatening the Town and Wedgefield, the airport etc. The proposed structures at Anderson Point will have the same effect. If the laboratory modelling the design being presented here is based on this error, the impact of a storm surge on these areas can be greater than predicted (Submission 6).

A: As discussed in response 6.3.2 and included as Appendix 1, modelling the potential impact of the Project on oceanic storm surges was undertaken by Worley (2004) by comparing the results of simulations of existing and developed conditions. The study showed that the proposed Project developments at Anderson Point are highly unlikely to result in any significant increases in harbour storm surge. The only potential impacts in this regard are small localised increases in storm surge

heights at the southern end of the rail offload loop where the Project crosses over the Port Hedland – Shay Gap (BHPBIO) railway line and enters the harbour. These slight increases in storm surges are negligible and therefore insignificant, as they are unlikely to result in any impacts to the BHPBIO or to FMG’s rail embankments or any other infrastructure in the area.

The study also confirmed that floods along the South and South West creeks are unlikely to result in any significant contribution to harbour storm surge, mainly due to the difference in timing between the storm surge and flood peaks entering the harbour.

5.8 WATER SUPPLY

5.8.1 Concerns relating to water usage and water efficiency in Port Hedland (Submissions 8, 10, 11, 15).

There is insufficient capacity within the existing system to supply Fortescue Metals Group’s port operations with its 2 Giga-litre per annum requirement. The limited supply of water available results in significant impacts from water extraction to supply Port Hedland. Any further demand for water needs to be minimal and it must be ensured that this water is used as efficiently as possible (Submission 15).

It would be preferred if Fortescue Metals Group investigate the use of non potable water first and using potable water as a last resort for dust suppression (Submissions 8, 10, 11). The department does commend the proponent on their proposed use of non-water based dust suppression measures such as bag houses and skirting/enclosure of transfer points and wind shield covers on conveyers (Submission 15).

A: Water supply for FMG proposed port development will be provided by the Water Corporation. FMG, in collaboration with the Water Corporation will investigate non-potable water sources for dust suppression such as the use of grey water, brackish water and waste water and use these sources in preference where possible. FMG will continue to consult with relevant stakeholders and government representatives on this issue (see Section 7.3.2.1 of the PER (page 144-146)). FMG will implement water conservation measures, such as minimising water use for dust suppression (by enclosing/covering equipment where possible sealing roads and high traffic area and management of stockpiles) and will continue to investigate suitable dust suppression alternatives. Opportunities for harvesting of surface water from the Port site are also being investigated to further reduce the use of potable water at the site. As shown in Appendix D of the Stage A PER, the Water Corporation has indicated it will be able to supply FMG’s water requirement. FMG understands that the Water Corporation is in discussions with DoE regarding general water supply in Port Hedland and how it can be best managed.

5.8.2 If FMG decides to provide its own water supply, it is seen that this will constitute a significant project change and may require reassessment (Submission 15).

A: In the unlikely event that FMG decides to develop supply its own water supply, all appropriate approvals will be gained including reassessment if it is required.

5.8.3 Further information is required regarding minimisation of water usage, automated systems (e.g. moisture measurements, high pressure low volume spray nozzles) and systems to be put in place to track water usage throughout the site (Submission 15).

A: FMG intends to minimise water usage throughout their operations, monitoring water usage, recycling of water, water harvesting and using efficient spray systems where possible. These aspects and others will be incorporated into the design of FMG's facilities during the detailed design phase. It is in FMG's best interest to minimise water usage as considerable cost will be incurred through purchasing water. The details of water efficiency management will form part of FMG's construction EMP.

5.8.4 Water supply for the railroad - FMG is proposing to install a number of production bores along its rail route for fill material conditioning and dust suppression during construction. Previous rail constructions in the Pilbara have shown negligible impact to the water resource due to the limited duration (one to two months) and localised drawdowns; however, it is possible that the environment or water supplies of other users may be locally impacted. These three factors (impact to water resources, environment and other users) are all considered during the groundwater licensing process and are assessed on a site by site basis to determine the best environmental outcome. In addition to demonstrating no adverse impacts, the proponent will be required to demonstrate that the groundwater resource is available. In summary, it is considered that the water supply for the rail construction will have no long-term impact on the groundwater resource, and that localised environmental impacts will be reviewed during the groundwater licensing process (Submission 15).

A: FMG agrees that it is unlikely that there will be any medium or long-term impacts resulting from abstraction from the railway construction bores. The modelling results indicate that drawdowns from each bore are unlikely to extend laterally for more than 250 m. Groundwater levels are expected to recover within 4 to 5 weeks after the cessation of pumping. FMG understands the groundwater licensing process and the requirement to demonstrate groundwater availability.

5.8.5 Section 7.2.2 and Appendix M – there is no hydrogeological information/data provided in the PER that relates to the availability of water required for the construction of the rail. Can FMG please clarify the source of water and how much will be required for construction (Submission 15).

A: As stated in Section 7.2.2.1 of the Stage A PER (pages 123 – 124) water requirement for construction of the rail has been estimated be a maximum of 1 ML/day for 9 months. Use will depend

on ground and metrological conditions at the time. It is expected that each bore will produce 1,000 m³/day for 1 month with 10 work fronts operating at the same time (i.e. 10 bores operating at any one time). This is based on work undertaken for similar projects for Robe River and BHPBIO. FMG will target existing bores and their associated aquifers for the proposed water supply.

5.8.6 FMG states that short-term abstraction for railway construction is going to have little impact on groundwater dependent ecosystems. There is no information provided to quantify the potential for impacts on the Fortescue Marsh area from short-term abstraction (Submission 16).

A: The study by Aquaterra (Appendix M of the Stage A PER) has predicted drawdowns in excess of 2 m are predicted to be confined to within 250 m of each temporary production bore and groundwater levels are expected to recover to 2 m of the original level within 4 - 5 weeks after cessation of pumping. Available data suggests that the Fortescue Marsh is a surface water feature, and the surface water which forms within it does not represent groundwater discharge. It is therefore unlikely that abstraction from the railway construction bores will impact upon the marsh. However FMG will not use or locate any production bore within 400 m of the Fortescue Marsh DEH boundary.

5.8.7 Section 7.2.2.1 Water Supply page 123-125 also states that there is anecdotal evidence that such short-term abstractions will have little impact on stygofauna. It is not appropriate to make such statements without having evidence that abstraction will not have any significant long-term impacts on the stygofauna in that area (Submission 16)

A: It is unlikely that there are significant numbers of stygofauna in the aquifers along the proposed railway. In the event that stygofauna populations are present in some locations, studies elsewhere in the Pilbara have shown that these populations can tolerate short to medium term fluctuations in groundwater levels. Typically, it is expected that short-term perturbation as described above would have a local population level impact on stygofauna (if present), but would be unlikely to have a significant effect at the taxon or conservation status level (i.e. unlikely to lead to extinction of any species) (*pers comm.* Biota).

5.8.8 FMG states that where practicable it will avoid existing bores known to be vulnerable to short-term abstraction. These bores should be completely avoided if there are known and unacceptable impacts (Submission 16).

A: FMG will avoid bores if they are known to be vulnerable to short-term abstraction or there will be unacceptable impacts from using these bores.

5.9 TERRESTRIAL FAUNA

5.9.1 Has the Project considered the incidental impacts of construction camps, such as increased feral cat presence, which can lead to significant impacts on local native fauna (Submission 12)?

A: FMG has considered the impacts of temporary facilities such as construction camps and has prepared a Construction Phase Environmental Management Plan (presented as Appendix E of the Stage A PER). The EMP will form the basis for impact avoidance, minimisation and, if necessary, management and monitoring for all parts of the Project including construction camps. Feral animal control within and adjacent to the Project area will form part of both Construction and Operation EMP's and be coordinated with the pastoral land holders and Agricultural Protection Board.

5.9.2 Concerns over restrictions to fauna movement due to the effects of the three railway lines – BHPBIO, HDMS and FMG railway. Would like to see wherever possible that the distance between the three lines is as minimal as possible to ensure that the effects of isolated habitat is minimised. Also would like to see investigations into mechanisms that may facilitate faunal movement through the respective railway corridors (Submissions 10, 11).

A: FMG recognises the potential impacts of three parallel railway lines, and is seeking to reach an agreement with HDMS for sharing of infrastructure (FMG proposes to allow HDMS access to the Stage A infrastructure). However, in the unlikely scenario that an agreement is not reached and two additional railways are constructed, then FMG has aligned their proposed rail line as close as practicable, within existing engineering, environmental, cultural and land use constraints, to both the BHPBIO railway, and the proposed HDMS railway (see Section 2.3.1 of the Stage A PER (pages 9-10) for an explanation of where FMG has had to deviate from a parallel corridor).

The key mechanisms to allow faunal movement across the FMG railway will be culverts and level crossings. Where possible, these will be aligned with existing culverts and level crossings in the adjacent BHPBIO railway and the HDMS corridor to facilitate faunal movement through the railway corridors.

5.9.3 Section 7.2.4.2 Restriction of fauna movement page 134 - As stated previously the issue of habitat isolation between the two railway corridors is of great concern to CALM. FMG states that the remnant strip of habitat between the two lines may impact on some fauna with relatively small home ranges. FMG should provide a more detailed justification for the current rail alignments, as CALM is of the view that FMG is yet to sufficiently rationalise the separation distances between the rail corridors in the area (Submission 16).

A: Refer to response 5.9.2.

5.9.4 The proponent has committed to conducting targeted flora/vegetation surveys in areas where borrow pits are proposed, but where no previous biological survey has been undertaken. No similar commitment is made with regard to fauna surveying. (Submission 16).

A: As stated in Section 7.2.4.2 of the Stage A PER (page 135), FMG will conduct additional fauna surveys of tracks and other rail infrastructure (including borrow pits) that have not been adequately surveyed to date. Locations of infrastructure will be modified if necessary to avoid significant fauna populations and habitats in consultation with CALM.

Prior to any clearing an internal clearing permit will need to be applied for. As part of procedures a site inspection will be carried out which to identify the presence of the following:

- rare or priority flora species;
- vegetation of conservation significance;
- priority or schedule fauna species habitats; or
- sites or implements of Aboriginal significance.

5.9.5 Figure 10 shows Mulgara records from the vicinity of the proposed FMG rail corridor (data source: HDMS, 2002) and indicates a number of records of Mulgara in the area. FMG has not resurveyed the alignment since this survey (Submission 16).

A: The intent of Figure 10 was to illustrate the fact that Mulgara inhabit the area and hence would likely to be found within the FMG rail corridor. During fauna studies for the FMG rail corridor 18 trapping grids were established, with a total of 1,000 night time pit traps. When taking into account other fauna work completed for other assessments (i.e. HDMS) within FMG's rail corridor, a total of 74 fauna trapping grids have been carried out.

The methodology used and results of the fauna survey carried out for the Project are attached as Appendix I in the Stage A PER.

5.9.6 Section 7.2.4.2 Direct Loss of Individual Fauna page 134 - it is important that FMG recognises that appropriate identification and vouchering should occur for all fauna that may perish as a result of construction of the rail corridor. FMG should forward all monitoring reports to the appropriate authorities, including CALM, to indicate whether there have been deaths of any significant species during construction of the rail corridor. This should include the appropriate identification and vouchering of these species (Submission 16).

A: All fauna deaths resulting from the construction and operation of the Project will be recorded and results will be presented in the Annual Environmental Report. If any priority or scheduled fauna are identified, CALM will be informed, and where appropriate photographs will be taken of dead fauna to assist with identification. Vouchering of specimens may not be possible in all cases, however all attempts will be made to correctly identify species. FMG will develop a procedure which details the

process to be used for identification of deceased fauna in consultation with CALM. Environmental awareness training will also have a component dedicated to fauna, and educational material provided will assist personnel to identify fauna species.

5.9.7 In relation to fauna management, FMG will need to amend proponent environmental commitments (pg 195) to show that if significant fauna are located within the rail corridor area, they will need to prepare fauna management plans for specific species, such as the Mulgara (Submission 16).

A: Should significant fauna be identified within the Project area, FMG will prepare and implement a specific management plan for each species to ensure the potential impacts of the Project are minimised. This process will form part of the construction and operation EMP's for the Project.

5.9.8 Where a report is so heavily dependent on previous reports, as this one is, it is important that the report provides a summary of the methods and the quality of the data that are being used. This information is not provided and should have been (Submission 2).

A: The fauna survey completed for the FMG Stage A proposal drew on earlier work completed in the locality, but was also a comprehensive survey effort in its own right and not 'heavily dependent' on previous reports as stated above. It is valid to refer to other unpublished work in the public domain when this is the relevant data set available for comparison. The HDMS rail corridor fauna survey reports are all matters of public record and available for anyone to review in the Department of Environment library in Perth. Refer to Section 2 of Appendix I of the PER which details survey methods used for the study.

5.9.9 In the Survey Methods section (2.3) it indicates that the 18 trapping grids were located in 'defined' areas. Table 3.1 suggests that the habitat in some of these 'defined' areas might have been the same. Thompson *et al.* (2003) provide clear evidence that different, but even closely situated habitats, are likely to contain different small vertebrate assemblages. It is not reasonable to extrapolate from terrestrial fauna survey data collected in one habitat type to other habitat types in the area. Therefore the assessment of the potential impact on terrestrial vertebrate fauna of the development should have been undertaken in each to the habitat types.

The trapping protocol information presented in the methods section is inadequate. What types of pit-traps were used, were drift fences used and what was the placement and spacing of the traps? Different pit-trap types have a propensity to catch a different component of the terrestrial vertebrate assemblage, so trap-type information is essential in the methods section (Submission 2).

A: Table 3.1 of Appendix I shows that some of the habitats sampled (at the vegetation association and substrate level) sampled by the trapping grids were the same. The proponent agrees that 'different, but even closely situated habitats, are likely to contain different species assemblages'. However, the fauna survey report did not make any attempt to extrapolate results from sites situated in one habitat

type to another as suggested above (except by giving due consideration to any differential survey effort between habitat types).

5.9.10 It appears as if funnel traps were not used as part of this survey and as a consequence it is very likely a proportion of the terrestrial vertebrate faunal assemblage (e.g. medium and large snakes and pythons) will be under represented or absent from the data. The pit-trapping effort (20-70 pit-trap nights in each site) in each of these habitat types is likely to catch less than 50% of the available species in these habitats, and in many cases much less than 50% (Thompson *et al.* 2003). With this level of survey effort the consultant is unlikely to have anywhere near enough data to make reasonable comments or draw defensible conclusions about the small terrestrial vertebrate fauna diversity in any of these habitats. The survey is therefore not a ‘comprehensive’ survey as required by EPA as outlined in Guidelines Terrestrial fauna surveys for environmental impact assessment in Western Australia (2003) and Position Statement No. 3 Terrestrial Biological Surveys as an Element of Biodiversity Protection (2002), and the discussion and comments on potential impacts and management strategies are based on inadequate data (Submission 2).

A: The dataset utilised in Thompson *et al.* (2003), is not based on sampling work in the same region as the current survey and is therefore considered of limited value for direct comparison. Fauna surveys for impact assessment typically draw on previously completed work and existing databases, whilst meeting the guidelines set out by EPA for the field survey components of assessments. The primary reference dataset used for this Project was the HDMS survey work, which combined with the FMG fauna survey, represents one of the most extensive sampling datasets compiled for a fauna environmental impact assessment in the Pilbara region. The survey was conducted in accordance with the EPA Guidelines for Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia.

5.9.11 It is necessary that averaged species accumulation curves are presented for each of the surveyed habitat types. These data indicate to the reader the extent to which each habitat type has been adequately surveyed and what proportion of species in the assemblage have been caught. Species accumulation curves also provide useful information about the structure of the assemblage, particularly the possible presence and number of rare (or difficult to trap) species (Thompson and Withers, 2003). If species accumulation curves were provided in this instance it would have been evident that the survey effort was inadequate to indicate species richness in each of the habitat types (Submission 2).

A: Species accumulation curves are a useful measure of sampling adequacy, but they are only one measure of the adequacy of a fauna survey. There are many other non-systematic sampling methods available that do not lend themselves to such evaluation, but significantly affect the adequacy of surveys in documenting the fauna of a given study area.

Other measures of survey adequacy that provide for a fuller consideration of the extent to which the survey documented the fauna of the area, were provided in the Fauna report (Appendix I of the Stage

A PER). This primarily consisted of consideration of the fauna assemblage documented by the current survey compared against the findings of the earlier seasonal HDMS surveys. As previously noted, the HDMS surveys comprised a total of 44 systematic trapping grids in the same locality and habitat array as the FMG survey. This comparison therefore provides a sound guide as to the fauna assemblage that may be expected along this corridor. As noted in the report, the FMG rail corridor survey, whilst recording 181 vertebrate taxa (64 species of herpetofauna, 22 mammal species, 11 bat species and 84 bird species), only added six new species to the total documented for the overall rail corridor (1 herpetofauna and 5 avifauna). These figures suggest that the survey area has in fact been well sampled for vertebrate fauna.

5.9.12 A comment that there is a second phase of surveying proposed which will possibly catch additional species suggests that the fauna consultants acknowledge that their survey effort is insufficient to adequately understand the small vertebrate assemblages in each habitat type. If additional survey effort is required to adequately understand the terrestrial fauna assemblages, then it should have been undertaken prior to the preparation and public release of the PER documents (Submission 2).

A: It is acknowledged that additional species may be collected by additional survey effort – this is fundamental to basic survey design. It is unlikely that additional records however, would have substantially changed the outcomes of the work for the purposes of the *Environmental Protection Act 1986* impact assessment process. As outlined in response 5.9.4 FMG has committed to further surveys for borrow pits/access tracks that may not have been adequately ground truthed in the initial survey, however this is not an acknowledgement that the initial survey was inadequate.

5.9.13 The consultant claims that the survey was ‘conducted at a suitable time over an eight-day period after a period of sustained rainfall in the area’. Data are not presented on the local weather conditions during the survey. However, no evidence or argument is advanced to support this case (Submission 2).

A: Figure 2.1 on page 16 of the Fauna report (Appendix I of the PER) provides rainfall for the months leading up to and including the survey period. The fauna survey was carried out between the 20th March and 7th April 2004. This was approximately 6 weeks after sustained and heavy rainfall in February. Additional rain fell on the Southern portion of the corridor during the later part of the survey as a result of Cyclone Fay. This rainfall did not impact on the survey and significantly improved the collection of frog fauna.

5.9.14 Surveying in autumn (20 March to 7 April) only is clearly inadequate if the consultant wishes to represent their survey effort as ‘comprehensive’. There are data in the literature to indicate catch rates and sampling representation of an assemblage vary appreciable among spring, summer and autumn, in arid and semi-arid areas of Australia. The submitter offers to share with the authors a substantial dataset for the Goldfields that clearly indicates that a single season survey is unlikely to enable the consultants to adequately represent the small vertebrate fauna in the area. EPA (2004) Guidance Statement No. 56 clearly indicates that for projects of this scale, surveys in multiple

seasons are required (Submission 2).

A: It is noted that the dataset referred to by the submitter is from not only a different bioregion but a different Craton (the Yilgarn). Whilst interesting as a comparison, this is of limited value in an applied sense to specify appropriate seasonal sampling regimes for the central and northern Pilbara region.

Notwithstanding this observation, it is accepted (and well recognised) that a single seasonal survey phase will not adequately document the entire vertebrate assemblage of any given area. This is why the FMG fauna report drew on the earlier long-term, seasonal sampling carried out along in the same area for the HDMS Project. This is clearly explained in the report. As noted in response 5.9.11, the FMG work added few additional species to the existing known fauna assemblage. FMG has also committed to additional fauna surveys in areas which have not been adequately surveyed.

5.9.15 Section 4.3: What is the point of providing pages of annotated lists of species caught or likely to be caught in the area other than to indicate that an inadequate number of individuals were caught during the surveys for most species to adequately report diversity (i.e. species richness and relative abundance) in each of the habitat types (Submission 2).

A: Annotated lists are a standard format for documenting species recorded during an inventory survey (e.g. the WA Museum Abydos-Woodstock survey). The annotated lists prepared by the consultant do not include species "...likely to be caught..." within the Project area, but only those species actually recorded in the Project area (in this case it includes previous work undertaken in the HDMS study area which overlaps or abuts the FMG study area).

The Proponent's understanding is that commonly used measures of diversity (e.g. Shannon-Weiner Index) place emphasis on both species richness and equitability (i.e. how numbers of individuals are spread across the species). For example diversity can be calculated from 10 species all represented by just one individual just as readily as from 10 species all represented by 100 individuals.

5.9.16 The useful and important components of these annotated lists should have been presented in tables and arranged by habitat type in a format that would enable readers to digest the information in an EIA context (Submission 2).

A: It is acknowledged that the data could have reasonably been summarised in a table for each habitat type. However, the intent of the Fauna report is not solely to focus on a particular group of fauna and their habitat requirements. Furthermore habitat classification is, to some extent, subjective and based on the observer's experience across the array of potentially occurring habitats. The value of habitat classification is its ability to resolve uncommon, rare or restricted habitat types. Many habitat classifications grossly simplify species distribution and occurrence. Therefore Biota, has defaulted to utilising the vegetation classifications developed by their botanists which utilise floristics and are a more robust dataset for classification than the vertebrate fauna dataset (see Appendix H of the PER for the Flora and Vegetation report). Biota's botanists and zoologists work closely to resolve classification of uncommon vegetation types and then establish whether they are likely to support rare

fauna.

Therefore whilst Biota has not presented a fauna species by habitat matrix for the 300 km rail corridor FMG believes that uncommon habitat types have been adequately identified.

5.9.17 Section 5.2: Inadequate sampling and a lack of focus in sampling for some important species (e.g. *Liasis olivaceus*, *Aspidites ramsayi*) has resulted in an inability to adequately indicate the likelihood of government ‘listed’ species being impacted on by this development (Submission 2).

A: The Stage A report utilises data collected from 660 funnel trap nights, 5,270 pit-trap nights and 3,195 Elliott trap nights spanning a period of 29 months in a broad corridor encompassing both the proposed HDMS rail and FMG north-west rail (Table 2.2 of Biota, 2004c). Similarly Biota sampled 98 sites for avifauna for a total of 329 censuses spanning 190.08 hrs. In addition, Biota sampled over 30 locations for bats. Collections of invertebrates have been made from pitfall traps and hand collections (particularly of potential Short Range Endemic taxa) that have been identified (typically to family level, though species level where possible) have been undertaken and lodged with the WA Museum. In addition to these systematic approaches, ‘head-torching’ along creeklines (for Olive Pythons and other species) and at fauna sites in general, road spotting along the length of the corridor (for all snake species and other nocturnal species such as Bilby, Spectacled Hair-wallaby and Bush Stone-curlew) and targeted microhabitat searches were undertaken. During these surveys 13 State listed species (see Table 8 below) were recorded.

Table 8: Species of conservation significance recorded from or likely to occur within the FMG rail corridor.

Species	State Conservation Classification	Federal Conservation Classification
Mulgara: <i>Dasyercus cristicauda</i>	Schedule 1	Vulnerable
Bilby: <i>Macrotis lagotis</i>	Schedule 1	Vulnerable
Pilbara Olive Python: <i>Liasis olivaceus barroni</i> ¹	Schedule 1	Vulnerable
Woma: <i>Aspidites ramsayi</i> ²	Schedule 4	-
Peregrine Falcon: <i>Falco peregrinus</i>	Schedule 4	-
<i>Ramphotyphlops ganei</i>	Priority 1	-
Grey Falcon: <i>Falco hypoleucos</i>	Priority 4	-
Bush Stone-Curlew: <i>Burhinus grallarius</i>	Priority 4	-
Australian Bustard: <i>Ardeotis australis</i>	Priority 4	-
Star Finch: <i>Neochmia ruficauda subclarescens</i>	Priority 4	-
Short-tailed Mouse: <i>Leggadina lakedownensis</i>	Priority 4	-
Western Pebble-Mound Mouse: <i>Pseudomys chapmani</i>	Priority 4	-
Ghost Bat: <i>Macroderma gigas</i>	Priority 4	-

Note 1: It is understood that the inclusion of the Olive Python as a Schedule 1 taxon was to afford it additional protection from illicit collecting for the herpetofauna trade, although this species is not considered Threatened.

Note 2: The Woma population in the south-west of Western Australia is the one considered to be under threat (Cogger *et al.* 1993), not the northern and inland population. However, the CALM Schedule listing does not currently distinguish between these two populations.

Additional survey effort focused on the Mulgara and Bilby and involved a targeted search across an area encompassed by the proposed rail alignments between the Chichester Range and Port Hedland and surrounding areas to the Great Northern Highway in the west and Marble Bar Rd to the east. The survey yielded approximately 1,000 data points corresponding to Mulgara evidence across 29 sites. Two additional Bilby diggings were also recorded.

In addition to the listed taxa, the following uncommon/rarely encountered taxa were also noted:

- *Ctenotus rubicundis*;
- *Egernia pilbarensis*;
- *Demansia rufescens*; and
- *Vermicella snelli*.

Snakes can be a poorly represented component of a fauna survey, however 77 specimens of elapid snakes were recorded across 13 species (contrary to the claims made in Submission 2). In the FMG survey alone a total of 16 individuals of three species of python were recorded, whilst the combined surveys recorded five species and 32 specimens. Several new taxa for the eastern Pilbara including *Ctenotus affin. robustus* (a potentially new species) and *Ctenotus affin. uber johnstonei* (a potentially new species) were also recorded. Additional information will be made available from the proposed seasonal survey.

FMG believes that the above demonstrates that Biota has undertaken an appropriate level of sampling to document fauna expected to occur along the alignment with an appropriate level of focus on rare, threatened and restricted taxa. The report is consistent with the EPA's Guidance Statement No.56 - Terrestrial fauna Surveys for Environmental Impact Assessment in Western Australia (2003) and Position Statement No.3 Terrestrial Biological Surveys as an Element of Biodiversity Protection (2002).

5.9.18 For most of the species discussed, a search of FaunaBase and plotting these data to vegetation / soils maps would have provided the same level of information as the consultants report here (Submission 2).

A: Higgs (in prep) has related the distribution of Western Australian *Ctenotus spp* (as sourced from FaunaBase) with major thematic maps (including soils and vegetation) available for Western Australia. The overwhelming finding from this analysis was that the scale of mapping for these themes is inadequate for providing useful information on the habitat preferences for *Ctenotus spp*. For all species recorded, the study provides an annotated discussion on the habitat units in which species were recorded relating these back to Biota's vegetation maps, thereby providing a finer scale resolution.

FaunaBase is a specimen-based collection. To achieve the same level of habitat resolution (if there were thematic maps available at the required resolution), would require a very large number of individuals to be vouchered. However, refer to Submission 5.9.22 regarding vouchering large

numbers of specimens.

5.9.19 Site specific field survey data should have been used to ‘ground truth’ and verify information generated from such an analysis. For example, search for ‘hot spots’ in species diversity and undertake species-specific searches using appropriate strategies. There is little evidence in the report to indicate that this is what has occurred (Submission 2).

A: The ability of an analysis of this kind to adequately document hotspots is based on previous survey effort that has gone into the database and the resolution of the thematic maps. None of the thematic mapping for the Pilbara is of adequate resolution to determine habitat types. In many cases the areas that have been surveyed were either poorly surveyed prior to FMG’s surveys, or poorly collected (and therefore not documented in the FaunaBase database). Zoologists at Biota are experienced in the Pilbara and have a good understanding of diversity across the eastern Pilbara and use this knowledge combined with an evaluation of habitat complexity and uniqueness, to determine the most appropriate location for samplings sites.

5.9.20 Section 5.3: EPA Position Statement No. 3 (pp.12) requires that the data from terrestrial fauna surveys be used to assess:

- biodiversity value at the genetic, species, and ecosystem levels, and
- ecological functional value at the ecosystem level.

The submitter considers that this has not been adequately done by the consultant. The authors have used habitats elsewhere defined, which may or may not have meaning in this context, and have not adequately characterised faunal assemblages in the Project area. There is no evidence to indicate that the consultant has used their terrestrial fauna data to examine the extent to which it concurs with the habitat classification that they used or whether the various faunal assemblages are adequately covered by the habitat types listed (this is easily done with the available statistical packages). There is no comparison among terrestrial fauna assemblages in any of these habitats, nor with other arid or semi-arid areas, nor are they placed into a regional context, which is obviously necessary in order to make a judgement about the significance or otherwise of the terrestrial fauna in the area as required by the EPA (2002) (Submission 2).

A: FMG considers that Biota has adequately characterised faunal assemblages in the area. The FMG survey undertaken for FMG (Stage A), and the two previous surveys undertaken for HDMS, examined all the major faunal habitats in the Pilbara based on current knowledge (which is acknowledged to be limited).

Terrestrial fauna data have not been used to examine the extent to which they concur with habitat classifications. Biota is aware of this problem and has attempted the analysis suggested above with data from this Project and previous projects. The problem is that the classification is largely based on low frequency captures of uncommon species, so sites from similar habitats do not group together. This means that sites recorded different uncommon species that may, or may not, be characteristic of

that habitat. This sampling effect is a well documented ecological phenomenon of field sampling exercises. Therefore, the analysis of the data suggested is not considered suitable to check for concurrence with the habitat classification.

However, even with full species lists for each site, individual sites with similar vegetation structure and floristics are likely to vary in their species assemblages due to landscape position, nutrient levels in the soil, soil structure, connectivity to similar habitats, size of the habitat patch, stochastic effects and an almost infinite array of other variables. Sites similar in their vegetation would therefore not always group together and it would also be almost impossible to achieve full species lists for each site within the time constraints of the assessment process.

It is a widely known fact that even after 10,000 trap nights, species lists are rarely complete due to the rarity of some species and the fact that others are never or almost never caught in traps. It is not clear how many trap nights would be required to achieve this in the Pilbara and there is likely to be no 'true' value, as the number of animals trapped will depend on climatic and meteorological conditions as well as stochastic effects. Indeed, the submitter in one of his papers (*Austral Ecology* 28: 361-383) states that "Trapping effort to catch a nominated percentage of the total predicted species in homogeneous and heterogeneous habitats varied among sites" and that "It was not possible to provide a general indication of the effort required to predict species richness for a site, or to capture a nominated proportion of species at a site, because species accumulation curves are heavily influenced by the characteristics of particular sites" Therefore, it is considered impossible to predict how many trap nights would be required to get a 'full' species list.

5.9.21 Section 6.1: If you do not understand the terrestrial faunal assemblages (e.g. as a minimum species richness and relative abundance) for each of the habitat types, then how is it possible to adequately comment which, if any, of them are significant in the EPA's context and what impacts the proposed disturbance might have on these assemblages in a regional context. The consultants do not present sufficient information about the terrestrial fauna assemblages in any of the habitat types to give this reader any confidence in their assessment of the impact and how this impact might be managed (Submission 2).

A: The Proponent does not believe that it is necessary to obtain complete species lists for each site and the relative abundance of species (which is not feasible as discussed above in response 5.9.20) in order to assess the significance of each habitat type. It is well recognised that different habitats will be important to different groups. For example, among reptiles, sites with extensive *Triodia* will support a much greater species richness and abundance of reptiles than sites that lack this genus. In addition, mulga sites will have a high proportion of species not found in other habitats and creeks invaded with *Cenchrus spp.* will have a depauperate fauna with mostly generalist species.

Similarly, creeklines will have a high number of bird species with many unique avifauna, mulga will have a relatively high number of species many of which are unique, and *Triodia* hilltops will show a depauperate fauna with only a few species favouring that habitat. The results from the Biota surveys confirm this pattern, even within the limits of short-term studies.

Therefore, zoologists at Biota use their field experience and current theories in the literature to supplement the species lists from each habitat and to assess impacts of any proposed disturbance. Biota believes that this holistic approach makes good use of available data and is the most prudent way to assess any potential impacts, which FMG believes has been done adequately in the study (PER, Appendix 1).

5.9.22 One would have to query why such a large number of specimens for a number of species (e.g. 35 *P. hermannsburgensis*, 33 *D. stenodactylus*, 68 *L. bipes*, etc) were vouchered with the Western Australian Museum, particularly in the context that this exercise is about protecting and conserving fauna. It is noted that ethics approval was obtained from the WAM and CALM AECs for this Project. Is this number of vouchered specimens in accordance with the recently released Australian code of practice for the care and use of animals for scientific purposes (2004) (see page 43)? (Submission 2).

A: As a Research Associate of the Museum of Western Australia, one of Biota's Directors and Zoologist endeavours to keep abreast of some of the vertebrate taxonomic anomalies in this State and is in regular contact with Museum staff as to what species should be vouchered and how many of each may be required. A brief review of Aplin and Smith (2001) provides an insight into the level of taxonomic uncertainty that still surrounds many herpetofauna in Western Australia. One such anomaly is *Diplodactylus stenodactylus* a species complex that may represent up to six different taxa in the Pilbara alone. Two photographs presented below show two morphotypes recognised during the HDMS Surveys (Biota, 2002). Both these specimens are included in the tally of vouchered *D. stenodactylus* referred to above.

The collecting effort in respect of *Diplodactylus stenodactylus* is summarised below:

- 8 specimens in 2001 from 7 localities spaced over a linear distance of 330 km;
- 14 specimens in 2003 from 9 sites spaced over a linear distance of over 100 km; and
- 11 specimens in 2004 from 8 sites spaced over a linear distance of over 100 km.



Plate 2: *Diplodactylus stenodactylus* (source: Greg Harold).



Plate 3 *Diplodactylus stenodactylus* (source: Greg Harold)

It is noted that *Lerista bipes* may also represent a species complex with one taxon collected from the Boodarrie site near Port Hedland (by Mr John Dell and Mr Greg Harold) showing meristic differences and another form occurring on the southern side of the Chichester Range being larger and darker than the main form of the Abydos Plain. The linear nature of the proposed rail enabled the collection of specimens along a 330 km transect that intersected the known distribution of all three morphotypes, to establish whether the variation may be clinal in nature, and if not, establish the extent of the distribution of each morphotype. As with *D. stenodactylus* the collections spanned 29 months and 330 km of linear distance. Again this was reported in Biota (2002).

Pseudomys hermannsburgensis collected in the Pilbara may also represent a species complex with possibly two taxa occurring in the Pilbara. One form has been tentatively labelled *Pseudomys* sp. “Hamersley” and appears to inhabit the rocky substrates whilst *P. hermannsburgensis* appears to prefer sandier substrates”.

The Consultant operates under Animal Ethics Committee approval issued by CALM to the WA Museum. The Australian code of practice (as it relates to vouchering; is stated below).

“5.8 VOUCHER SPECIMENS

5.8.1 Optimal use of voucher specimens requires that they become part of a publicly accessible reference collection. Therefore:

- (i) if it is anticipated that voucher specimens may be taken, the need to do so must be justified to the AEC;
- (ii) numbers of voucher specimens taken must be the minimum required for identification and/or to establish distribution;
- (iii) consultation with a museum or similar institution must take place before collection to ensure the use of proper preservation and holding techniques, the availability of necessary equipment and the collection of essential data;
- (iv) voucher specimens should be lodged with a museum or similar institution where they are made available for further study; and
- (v) proper documentation of the specimens, including reasons for collection, is essential. Data

should be maintained with the specimens”

5.10 MARINE FAUNA

5.10.1 It is noted that dolphin utilisation of the harbour is considered to be a major concern (Submission 12)? The PER states that the report by PHPA (2003) highlights dolphin usage as a major concern. However, FMG then dismisses this statement in the document as only of minimal importance. FMG should justify the dismissal in the PER of the potential usage by dolphins of the harbour, given that it has been identified by PHPA (2003a) as a major concern (Submission 16).

A: This is a typographical error in the PER. The sentence on page 97 of the PER should read “Some dolphin activity has been recorded in the harbour, but a comprehensive review completed by PHPA (2003) does not highlight dolphin utilisation as a major concern.” As stated in the PER, the potential risks from FMG’s proposed port development on dolphins entering the harbour is not expected to be significantly different from the impacts of current shipping in the harbour. Monitoring of dredging impacts on marine biota will be undertaken as part of the Dredging and Reclamation Environmental Management Plan.

5.10.2 CALM concurs that there is likely to be no breeding habitat affected by the port construction as stated in the document, however FMG has not acknowledged that light can be a major issue for turtles. FMG should acknowledge that light could be a major issue for turtles and address its impacts accordingly. In relation to marine fauna, FMG has committed to install appropriate lighting to minimise overspill and provide shielding if necessary (Table 35 Proponent’s environmental management commitments page 195). However, the proponent needs to include a monitoring programme that will identify if these lighting options have been effective in minimising any impacts on marine fauna, and if not what remedial action will be undertaken. It is appropriate that FMG endeavours to minimise the impact of lighting as stated, however, FMG has yet to provide sufficient detail on the lighting design and light management measures proposed (Submission 16) .

A: FMG recognises the importance of limiting the effects of light sources on nesting and hatchling turtles (refer to Section 7.3.5.1 of the Stage A PER (page 171)). FMG will install frequency controlled lighting to avoid affecting hatchling and juvenile turtle orientation. Light overspill from the port facility will also be minimised by shielding and ensuring light is directed to where it is required at the port facility. Detailed design of the proposed port facilities has not been undertaken at this time. FMG will consult relevant stakeholders (e.g. CALM) in regard to this matter. FMG will ensure that lighting design minimises the potential impacts on marine fauna and will have a monitoring programme in place to assess the effectiveness of these measures and identify if remedial measures are required.

5.10.3 Section 7.3.4 Impacts on mangrove fauna page 156 – FMG identifies the removal of mangrove habitat as a possible threat to population levels of local fauna within the harbour area, particularly when looked at in conjunction with the proposed HDMS port. For the purposes of a PER assessment, CALM considers it appropriate for FMG to supply information that quantifies the potential risk to, and species impacted in mangrove areas rather than dismissing this as a low risk activity (Submission 16).

A: Potential impacts on mangrove dependent fauna arising from this proposal are primarily related to habitat reduction. Surveys and field work in the locality suggest that mangrove-dependent terrestrial fauna, primarily mangrove birds and bats, occur throughout the closed canopy mangrove cover. The potential impact at the population level is therefore likely to be proportional to the loss of this true mangrove habitat that will arise from the proposed port compared to that remaining locally. The revised FMG port design will result in the clearance of 14.8 ha of mangrove cover, leaving over 900 ha of habitat for mangrove dependent fauna. This suggests that whilst the Project will result in a reduction of available habitat locally for mangrove specialist fauna, this will represent approximately 1% of the current extent of these habitats in the harbour.

An account of the mangrove dependent vertebrates involved is provided in Section 6.3.4.3 of the Stage PER (pages 95-96). Wider reviews of similar habitat (e.g. Johnstone, 1990) suggest that, whilst these species are effectively restricted to mangal habitat, they occur relatively widely along the Pilbara coast. As noted in other responses, the coast in the immediate vicinity of Port Hedland harbour contains over 4,000 ha of mangrove habitat, with many areas on the wider Pilbara coast identified for conservation purposes.

5.11 STYGOFAUNA

5.11.1 Who has sampled for stygofauna at the proposed port and the whole 345 km length of the proposed railway? Why do the proponents only propose to monitor groundwater drawdown – why can't actual species diversity and abundance be measured as well (Submission 12)?

A: No sampling for stygofauna at the proposed port and for the length of the railway has been undertaken by FMG at this stage. Given the fine-grained nature of the alluvial aquifer underlying the rail route, there are unlikely to be extensive colonies of stygofauna. They may, however, locally inhabit gravels along creek lines. As described in Section 7.2.2.1 of the Stage A PER (pages 123 – 125). Bores used for construction of the rail line will only be used for a short period of time. Small localised drawn-downs (250 m) and a quick recovery (4 to 5 weeks) of aquifers are predicted. Studies elsewhere in the Pilbara have shown that stygofauna populations can tolerate significant short-medium term fluctuations in groundwater levels. Typically, it is expected that short-term perturbation as described above would probably have a local population level impact on stygofauna (if present), but would be unlikely to have a significant effect at the taxon or conservation status level (i.e. lead to extinction of any species). Therefore any stygofauna in gravels along creeklines are unlikely to be affected by short term abstraction for railway construction.

FMG has also committed to development and implementation of a stygofauna sampling and management plan if drawdowns are greater than predicted. Where possible bores near creeklines will be avoided.

5.11.2 As the State's fauna conservation agency, CALM should be listed as an advisory agency under commitments relevant to the development of a Stygofauna Management Plan. This management plan should be prepared by the proponent, in consultation with and agreed to by CALM, prior to reaching the point of significant groundwater drawdowns in water supply bores (Submission 16).

A: While drawdowns are not expected to have an impact, FMG has committed to the development of a contingency Stygofauna Management Plan (in consultation with CALM) to be implemented in the event drawdowns exceed predictions.

5.12 REHABILITATION

5.12.1 Why isn't the monitoring of final rehabilitation considered to be a stage in this process (Submission 12)?

A: Section 7.3.10 of the Stage A PER (pages 190 – 191) details Decommissioning and Rehabilitation of the port facilities. Monitoring of rehabilitation after construction will be undertaken to assess effectiveness and to identify areas which will require further remedial works. Development of rehabilitation completion criteria is currently underway and will be included in the Rehabilitation and Revegetation Management Plan. Completion criteria will be developed in conjunction with regulatory authorities for approval and sign off.

5.12.2 How can the community be certain that decommissioning and rehabilitation operations are appropriately funded (Submission 12)?

A: The Stage A rail and port facilities will have an indefinite operating life dependant on continued exploration and use by third party users. However, FMG will make financial provisions during the life of the operation to cover the costs of closure and decommissioning. This will ensure that sufficient funds are set aside to cover these costs when revenue is no longer being generated.

FMG Senior Management will review the closure provision on an annual basis to ensure provisions are correct. Provisions will be provided monthly through an automatic accounting entry. Any performance bonds are separate from the Company monthly closure provisions and, therefore, do not contribute to the total closure provision.

FMG will develop an asset register and this and the closure provision will be audited on an annual basis by external finance audit consultants.

5.12.3 Item 13 Appendix E page E12 - The draft EMP makes continual reference to visual inspection as the tool for monitoring vegetation health and rehabilitation success. This method of monitoring is not sufficiently rigorous to assess and document changes in biodiversity with any degree of confidence. FMG will need to commit to a more rigorous monitoring methodology including, but not limited to, fixed photo points and a quadrat-based monitoring regime that includes attributes such as vegetation cover and species presence/abundance (Submission 16).

A: The use of visual inspection to assess rehabilitation will include fixed photographic points. Depending on the extent and location of the rehabilitation, quadrat-based monitoring including species presences and absence, and vegetation cover will also be undertaken. This will form part of the Rehabilitation and Revegetation Management Plan to be developed by FMG.

5.12.4 A number of queries were raised regarding the Rehabilitation Plan. Specifically these related to:

- **Could FMG elaborate on timeframes for ongoing monitoring of success criteria and weed control, including a commitment for such in the Rehabilitation Plan;**
- **Including a commitment in the Rehabilitation Plan to undertake remedial work if an area does not achieve the stated criteria; and**
- **CALM should be listed as a key agency for the development of completion criteria (Submission 16).**

A: FMG has developed a draft Rehabilitation and Revegetation Management Plan. Within this plan FMG has committed to develop completion criteria in consultation with all relevant stakeholders, which include CALM. The completion criteria will be reviewed every two years, in consultation with relevant stakeholders.

Commitments relating to monitoring of rehabilitated areas and remedial action if standards are not achieved are also included within the Plan. At this stage FMG has not indicated the timeframes for ongoing monitoring as this will be finalised during consultation with stakeholders regarding completion criteria. However, it is anticipated that photographic monitoring will be undertaken at defined points annually.

If an area requires remedial action, FMG will undertake, as required, repair to eroded areas, weed control and seeding or planting of areas where propagation of native vegetation from the seed bank within the topsoil has not been sufficient successful. FMG will develop appropriate native seed collection and storage procedures as part of the Rehabilitation and Revegetation Management Plan.

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6. POLLUTION

6.1 AIR - DUST

6.1.1 Dust generated from iron ore handling operations at Port Hedland is a significant cumulative impact of industrial development at Port Hedland and is of major concern to the residents of Port Hedland (Submissions 3, 8, 10, 11, 15, and 17). With the addition of FMG and possibly HDMS, the iron ore dust levels will obviously increase in Port Hedland (Submission 3)

A: Predictive modelling with the addition of the proposed FMG operations indicates that there will be small increases in the maximum 24-hour and annual cumulative dust concentrations for TSP, PM₁₀ and PM_{2.5} in the study area with existing operations still the predominant contributor to ambient dust concentrations in Port Hedland. The addition of the FMG and possibly HDMS will result in small increases in the ambient dust concentrations if there are no changes to the existing operations. However, BHPBIO has committed to reducing dust impacts with the BHP Billiton (2002) Dust Management Plan predicting a reduction in future emissions from BHPBIO operations due to improvement in dust control.

FMG has committed to implement a wide range of control measures (Section 7.3.9 of the Stage A PER (pages 188)) to reduce dust emission from its proposed operations including;

- A dust extraction system for the car dumping facility will be installed, which will include an induced draught at the dumping point and wet scrubbing;
- Conveyor transfer points will be totally enclosed, with water sprays jets at each loading point to wet the surface of the ore;
- Allowance has been made if necessary for future installation of insertable dry, reverse pulse gas filters at the transfer points in the unlikely event that the use of water sprays proves to be inadequate for dust control;
- Dust emitted from the belt conveyors will be controlled through proper maintenance of belt scrapers to dislodge material sticking to the belt;
- The conveyors from the car dumper to the screening building and out to the shiploader will be covered;
- Stackers will be automated to minimise the drop heights to stockpiles and the stacker booms will be fitted with spray heads to minimise the emissions of dust;
- The fines stockpiles will be protected from prevailing winds by the coarse stockpiles where practicable and the stockpile area will be fitted out with a fixed water cannon based spray system to reduce the likelihood of dust from wind erosion; and
- The feasibility of planting a vegetation shelter belt along the western side of the stockpiles will be investigated. Such a shelter belt, if feasible, would reduce the wind speed and therefore reduce wind erosion from the stockpiles and surrounding area.

6.1.2 The forecast expansion of iron ore operations at the port is likely to heighten concerns (Submission 17) as with additional development and usage by FMG, and possibly HDMS and third party users, the iron ore dust levels will increase in Port Hedland and Wedgefield (Submissions 3, 10, 11, 15).

A: FMG is committed to working with the community to manage its potential dust impacts on local communities. FMG's Project will be designed with a number of engineering solutions to reduce dust emissions. FMG will develop and implement a comprehensive dust management plan that will include ambient monitoring programmes and continuous improvement programmes to further reduce dust emissions where practicable. The dust management plan will include a real-time dust monitoring network that is proposed to be installed at sensitive receptors to evaluate dust contributions from FMG operations and to enable measurement of dust mitigation measures.

FMG is prepared to coordinate its dust monitoring and management activities with existing and future port users.

6.1.3 The [modelled] 6 per cent increase in the 24 hour average concentrations of PM₁₀ and an approximate 10 per cent increase in the annual concentrations of PM_{2.5} are particularly significant in the context in which the community has clearly stated its desire to see overall levels of dust in the community reduced (Submission 8).

A: The predicted increases of 6% and 10% are based on the highest predicted ground level concentrations likely to occur during worst case meteorological conditions. In addition, FMG has proposed a comprehensive dust management plan to further reduce off site impacts.

In addition, as BHPBIO's operations are currently the largest contributors to ambient dust concentrations in Port Hedland, the implementation of its proposed mitigation measures should result in an overall reduction in the ambient dust levels in the community.

6.1.4 Of concern is the further encroachment of dust into the residential areas of Spinifex Hill and Cooke Point as a result of Fortescue Metals Group's port operations. Figure 17 of the report clearly shows that the 100 µg/m³ total suspended particulate concentration contour is pushed west to encompass a significant part of Spinifex Hill including prime recreation areas. Similarly, the 50 µg/m³ total suspended particulate concentration contour is pushed west and encompasses a greater area of Cooke Point including the Port Hedland Primary School. Given community desires for dust levels to be lowered particularly in residential areas these issues will need to be more fully addressed in direct consultation with the community (Submission 8).

A: The cumulative impacts presented on Figure 17 of the PER includes the expanded BHPBIO and the proposed HDMS and FMG's operations. While the figure shows that there is a predicted modest increase in the TSP concentrations at Spinifex Hill and Cooke Point, it does not show that these increases are a result of FMG's proposal. FMG believes that BHPBIO's operations are a significant contributor to the elevated particulate concentrations and understands that the proposed improvements

to BHPBIO's operations will result in significant reductions in the particulate concentrations experienced at Port Hedland. Further, as a result of the relatively high moisture content of its ore, FMG believes that the modelling results are very conservative and that the actual particulate concentrations experienced will be less than those predicted by the modelling.

FMG is also proposing to manage its dust issues through the development and implementation of a dust management plan which includes an ambient monitoring network and believes that these measures will help reduce the overall ambient dust levels arising from its operations, by aiding in the identification and mitigation of major dust emission sources associated with its activities.

FMG intends to establish a free-call number where the community can contact its operations in the event that high dust emissions occur for any particular reason. FMG will also continue to liaise with the community about all aspects of its Project including dust.

6.1.5 The 45 Mtpa level results in a predicted 10% increase in dust levels for the Town and Wedgefield. This is on an already high existing level which exceeds government health conditions. What happens if future expansion cannot be accommodated at Anderson Point? The Project will then suffer in the future from poor planning decisions made now. Development which meets the needs of the present without compromising the ability of future generations to meet their own needs has not been observed with this Plan (Submission 6).

A: The predicted 10% increase in the annual average concentration of particulate matter of 2.5 µm (PM_{2.5}) at the northwestern edge of Wedgefield is based on the upper estimate of emissions for FMG and HDMS. Applying the anticipated emissions estimates for FMG and HDMS, FMG's Project is predicted to contribute to the dust levels experienced in Wedgefield as follows:

- between 2.3% and 4.9% increase in the maximum 24-hour average concentrations of TSP, PM₁₀ and PM_{2.5}; and
- approximately 5.8% increase in the annual average concentration of PM_{2.5} (refer to page 184 of the Stage A PER).

FMG is currently seeking environmental approval for transport of 45 Mtpa ore (see Table 1 of the Stage A PER). Any proposal to expand the development above 45 Mtpa by FMG or a third party would require separate environmental assessment and approvals, with specific environmental conditions set for any expansion. The potential that future expansion cannot be accommodated at Anderson Point, represents a commercial risk for FMG and other potential proponents.

6.1.6 Concern over presence of asbestos in ore to be mined and would like to see results of testing of ore samples publicly available so that assurance can be passed on in terms of presence of asbestos in the ores coming to the port (Submissions 10,11).

A: Although the Hamersley range geological sequence is noted for occurrence of asbestiform (or asbestos) minerals there has been no identification of such minerals in all of the FMG active

exploration projects to date.

Crocidolite (or riebeckite) is the most common asbestiform mineral recognised in the Hamersley region. These are fibrous members of the amphibole group, which are common rock forming minerals in igneous or metamorphic terrains. It is postulated that there is no recognised asbestiform minerals within the FMG Project areas as there has been unsuitable geological conditions for the formation of crocidolite or riebeckite (unsuitable rock geochemistry or metamorphic conditions). In conjunction with the potential non-occurrence of asbestiform minerals, the processes of iron enrichment can act to replace these minerals with iron, therefore destroying their fibrous nature. As FMG is targeting the iron-enriched areas, the possibility of intersecting these minerals is again reduced. The occurrence of asbestiform minerals within the Project areas is therefore considered to be very low. This is supported by current drilling statistics.

FMG will test for the presence of asbestiform minerals as a matter of course. The results will be available to interested parties.

6.1.7 The proposed commitment for dust states that FMG will meet the NEPM. How will this be achieved when the background in Port Hedland already exceeds the NEPM (Submission 15)?

A: The proposed commitment for dust states that FMG will meet the NEPM for FMG in isolation, not considering cumulative impacts. Further, the location of the proposed FMG facilities minimises the magnitude of cumulative impacts with the existing operations.

6.1.8 BHPBIO has voiced concerns that their PM_{2.5} and PM₁₀ monitoring results may be affected by over sampling and as such the measurements are reading too high. While it is yet to be finally demonstrated what is causing the measurement problems the proponent has used the observations at "Town" and "Hospital" sites to scale up the emissions estimate for the BHPBIO operations for Finucane Island and Parker Point and therefore it is possible that BHPBIO's emissions are overstated. (Submission 15).

A: Based on the preliminary information currently available from the DoIR cumulative impact study, FMG understands that the BHPBIO particulate emissions may have been overstated within its PER for the finer fractions (i.e. PM_{2.5} and PM₁₀). As such, it is likely that the modelling results presented within the Stage A PER are an overestimation of the potential PM_{2.5} and PM₁₀ impacts that may arise from the existing and proposed operations. FMG used the best publicly available information at the time of preparation of the PER and had to make a number of assumptions as it was unable to obtain emissions information directly from BHPBIO for its operations.

The scaling up of the BHPBIO emissions estimates based on the monitoring data was undertaken based on the TSP monitoring data which FMG understands does not suffer from the same "over-sampling". The Stage A PER (page 183) noted that the modelling results for PM_{2.5} and PM₁₀ should be viewed more in a relative sense showing areas where the highest concentrations are predicted to occur.

6.1.9 The proponent has identified that dust from current operations at Port Hedland has exceeded the 24-hour and annual average Total Suspended Particulates licence limit, as well as the PM₁₀ and PM_{2.5} Standards specified by the NEPC, over a defined period of analysis. Notwithstanding the logical implication that further development will elevate dust levels the proponent simply concludes that a Dust Management Plan will be prepared prior to construction. Without further detailed information it is not possible to be satisfied that dust issues at the port will be managed in an environmentally acceptable manner (Submission 9).

A: The DoE has advised that the BHPBIO licence actually presents performance objectives rather than enforceable ambient standards. Similarly, it should be noted that the NEPC has not proposed an ambient standard for PM_{2.5}; but rather an Advisory Reporting Standard.

The air dispersion modelling completed for the Stage A PER predicted that FMG's contribution to ambient dust concentrations would be relatively small and that BHPBIO's operations were the major industrial contributor to elevated dust concentrations at Port Hedland. BHPBIO as part of its dust management plan predicts that future emissions from their operations will significantly decrease due to improvements in dust control and as such, it is anticipated that there will be an overall decrease in the ambient particulate concentrations experienced in the study area once these improvements are implemented.

The dust management plan proposed by FMG not only includes engineering solutions but also includes a real-time dust monitoring programme that will be used to evaluate dust impacts and future mitigation measures. This is described in detail under Section 7.3.9 of the Stage A PER (pages 187 – 189).

6.1.10 There is a need to consider acceptable dust levels in the interim and long term (5 to 10 years), specifically for the region, which may be higher than the NEPM standards/limits (Submission 17).

A: There is a need to consider acceptable dust levels in the interim and long term, which falls in the jurisdiction of the DoE and DoH. FMG is however committed to minimising dust emissions from its proposed operations to minimise off-site impacts.

6.1.11 There is a need to establish a comprehensive and coordinated dust monitoring system for the region with contributions from industry, together with agreed, correct and representative dust collection techniques and methodology for use by industry. The “Pilbara Air Quality Study” provides a catalyst for the iron ore industry to work together and with the community to agree on realistic and acceptable dust impact levels and a long term dust management plan to progressively reduce dust impact on local communities (Submission 17).

A: FMG has proposed to install a dust monitoring network to assess potential localised off site dust impacts from FMG operations. However, FMG is happy to cooperate with other companies and the DoE and contribute (if applicable) to a comprehensive and coordinated dust monitoring system.

6.1.12 DoIR is supportive of a co-operative approach involving government, the PHPA, port users and other industry within Port Hedland to address the issue of cumulative industry impacts on the community and the environment, in particular the dust problem (Submission 17).

A: FMG supports a cooperative approach to address the issue of cumulative industry impacts on the community and the environment, in particular the dust problem.

6.1.13 Need to ensure that all third party users of the infrastructure are compliant with the strategy/imposed measures so as to minimise dust emissions as far as practically possible across all parties using the port infrastructure (Submissions 10, 11).

A: All third-party users of FMG's infrastructure will be required to comply with the environmental management commitments for the Project including management of dust emissions. FMG supports a cooperative approach to dust management at the port of Port Hedland.

6.1.14 Issue of third party users of the railway and port and whether their usage/dust would be below the assigned level. Need an avenue that will enable third party users to be assessed in terms of dust from their operations. Do not want a situation where because the railway is approved to 100 Mtpa that they are using the approved railway, so that there is no avenue for appeal on their operations in regards to dust (Submissions 10, 11).

A: FMG is seeking approval for export of 45 Mtpa of ore. Any proposal to significantly expand the development above 45 Mtpa by FMG or a third party would require separate environmental impact assessment and approvals, with specific environmental conditions set (e.g. for dust) for any expansion.

6.1.15 Prevailing winds cannot be controlled and given the flat nature of the landscape surrounding the town, the stockpiling of iron ore within the town area could result in key health issues in the future (Submission 3).

A: There are a number of mitigation/control measures (e.g. sprays, screens etc.) that are proposed to control dust emission from stockpiles to minimise off site dust impacts. In addition, the high ore moisture content and the position of the stockpiles are such that the impacts of any emissions will be minimised on both the Port Hedland and Wedgefield localities.

6.1.16 It is of concern that the NEPM standard of 50 µg/m³ is already exceeded approximately one day in three in Port Hedland and there are plans to construct another major source of particulate emissions in the vicinity of Port Hedland. It is agreed however that the greater distance of the FMG proposal to the Port Hedland Townsite and the location of the proposal in relation to the prevailing winds mean that the FMG contribution to dust levels in the townsite is minor in comparison to the contributions from BHPBIO's operations (Submission 15).

A: Agreed, the contribution of dust from FMG's operations due to the relative distance from the townsite and the location in relation to the prevailing winds will be minor in comparison with existing dust sources. However, as mentioned earlier, BHPBIO is also proposing to implement additional particulate emission control programmes and these are expected to result in a net reduction in the ambient particulate levels in Port Hedland.

6.1.17 It has been noted that total emissions from FMG is similar to BHPBIO's Finucane Island operations but impacts appear to be much lower. This is most likely due to the configuration of the FMG ore stockpiles which are much longer and have a very different orientation relative to the prevailing winds than those at Finucane Island (Submission 15).

A: According to the estimates as summarised in Table 8 (Appendix L) of the Stage A PER, FMG's estimates of emissions were slightly higher than from the current Finucane Island operations. It is agreed that the impacts on surrounding populated areas are lower due to the location and orientation of the stockyards to the prevailing winds and the much larger separation distances between the facilities and the populated areas.

6.1.18 FMG will have the same problem other producers have when selling lumps product. This material breaks down readily, creating fines. This is called dilution. To overcome the problem of high dilution levels, or too many fines in the lumps, they will require a rescreening plant in the process line immediately before the lumps go on to the ship. This is to be located at Anderson Point. This plant should be a wash plant, not a copy of the open table vibrating screens used elsewhere. The washplant would provide total control over dust, as opposed to a giant dry-blower which creates dust (Submission 6).

A: The FMG process is different in that it is proposed to beneficiate the majority of the ore at all minesites except Mindy Mindy. Therefore the moisture content of FMG's ore will be higher than other producers (around 8%). The moisture content of the ore is one of the most critical elements in minimising dust emissions. The moisture content of the ore will be checked upon delivery at the port and maintained via an integrated ore moisture monitoring and management system for the ore from the time it leaves the minesite until it is shipped from port.

FMG will be screening lumps and fines at Anderson Point. However unlike other producers in the Pilbara, FMG is proposing to screen before stockpiling and not before shipping. If required, FMG will cover or enclose the screens and include dust extraction with a baghouse to reduce dust to acceptable levels.

6.1.19 Dust modelling predicts an increase in the dust levels experienced in Port Hedland and at Wedgefield (Submissions 10, 11). It is of concern that the dust study FMG has modelled and based its conclusions on predicted dust levels of only 45 Mtpa, whereas they seem not have considered the capacity of the railway (100 Mtpa) and allowance of third party users (to achieve the 100 Mtpa) (Submissions 6, 10, 11, 15). The responsible approach surely is to model the expectations of the 100 Mtpa plan. This would provide a better long term planning tool, establishing progressive population exposure levels (Submission 6).

A: FMG is seeking environmental approval for transport of 45 Mtpa ore (see Table 1 of the Stage A PER). Once approval is received, any proposal to expand the development above 45 Mtpa by FMG or a third party would require separate environmental assessment and approvals, with specific environmental conditions set for any expansion. FMG has no current plans for expansion to 100 Mtpa.

6.1.20 Some emissions estimates and modifications are not referenced or otherwise justified. These are based on the experience of the modeller and may be reasonable approximations but are still arbitrary and a source of uncertainty. For example:

- **Relative weighting of 1.1 and 2.2 factors for Finucane Island and Nelson Point.**
- **Choice of emissions factors for screening and rescreening being 25% of NPI low moisture value.**
- **Scaling of vehicle emissions depending on plant age.**
- **Scaling of daytime and night time estimates.**
- **Estimates of 2 g/s for loading DRI briquettes.**
- **Use of exponent of 0.8 in the USEPA batch drop emissions equation (Submission 15).**

A: Estimates were developed based on personnel with experience in dust modelling from reports that were not in the public domain. Examples are the split between daytime and night time emission estimates which are due to activity levels of vehicles etc. Values such as the emission for the DRI briquetting plant are more uncertain as FMG does not have access to BHPBIO data and there is no data on similar operations available. The emissions would be specific to the type of briquette and the amount of handling and breaking off of small particulate and the type of ship loader. The relative weighting of the Finucane and Nelson Point emissions by adjustment factors was based on comparison of the model predictions to observations where it was found that the adjustment factors for the operational emissions were necessary to provide estimates that matched the observations. It is argued that these factors were necessary, as the level of control of dust emissions for existing operations is much less than was assumed using the NPI default emission estimates (particularly for Finucane Island). The adjustments are also not surprising given the approximate nature of the NPI default emission estimates.

6.1.21 In the section on ambient dust standards (Table 18 page 101) there is mention of DoE enforced ambient standards for TSP and PM₁₀ which have been set in BHPBIO licences. This is incorrect. BHPBIO do not have a regulatory limit set on their dust emissions. The licences for BHPBIO have performance targets which are outlined in the non-regulatory preamble of their licence (Submission 15).

A: FMG accepts that the ambient criteria are performance targets rather than enforceable ambient standards in the current version of the BHPBIO licence.

6.1.22 Page 16 of the report: NPI default emissions for “high” moisture content ores is used. The report states that this is considered conservative as the “high”/”low” grouping doesn’t reflect the true variation that can occur in iron ore dust emissions. Given that the high moisture content ore is the low emissions option, it is not at all clear that it is conservative. Further evidence is needed to demonstrate why the “high” moisture content emissions rate is conservative (Submission 15).

A: Justification for use of the “high” moisture default was provided in Section 7.3.9 of Stage PER (page 184). This justification included the good agreement with the modelled BHPBIO ores through Nelson Point when using the default “high” moisture content ore. The BHPBIO ore in 2002/2003 (the year of model validation) was only somewhat controlled as to the moisture content of the ores that were shipped. This is unlike the FMG and HDMS proposals where moisture control at the mines will be implemented to ensure that the ores are at the optimum moisture level for material handling and dust control. This moisture content can be selected such that dust emissions are in fact up to a factor of 1,000 less than those originating from a dry ore. This is a much greater reduction than the typical factor of 5 to 10 difference between the default ”low” and ”high” moisture provided in the NPI EET. Therefore, as the iron shipped by BHPBIO operations in 2002/2003 is reasonably representative of the NPI “high” moisture defaults and that FMG and HDMS will have better moisture control, actual FMG and HDMS emissions should be less than the “High” moisture default values, perhaps at 50% of this as used in the FMG assessment.

6.1.23 Table 9 page 27 shows maximum PM_{2.5} is higher than maximum PM₁₀ for the Town monitoring site. By definition this is not possible and must be the result of some error or discontinuities in measurement record in one of the monitors. Comparisons of these results against the modelling cannot sensibly be made (Submission 15).

A The calculated observed PM_{2.5} concentrations (based on actual observed concentration minus a background concentration) for the maximum and 99 percentile concentrations were higher than the PM₁₀ concentrations and this was noted in the PER. The PER indicates that this means that either the peak observed PM₁₀ (without background concentrations) were underestimated or the PM_{2.5} (without background) overstated due to problems determining the actual background concentrations. This issue may be the result of potential problems identified by BHPBIO relating to monitoring particulate sizes. As such, only a brief comparison of the modelled and observed PM₁₀ and PM_{2.5} were made within the PER.

6.1.24 On page 22, a value of 7.5 m/s is used for the threshold value for wind erosion. This value is based on tests but it should be noted that this value is also dependent on ore moisture content and size distribution and subject to variability (Submission 15).

A: The value of 7.5 m/s is based on values for the Hamersley iron stockpile area which consists of a range of different iron ores on the surface of the stockpiles including marra mamba ores. As such, it is considered to be reasonably representative of the iron ores at Port Hedland. The wind speed threshold value is essentially for dry ore, as the surfaces of the stockpiles (top few mm) dries reasonably rapidly, without subsequent addition of water. Therefore, the threshold is considered reasonably accurate and applicable for dry ore surfaces before application of dust control by water cannon.

6.1.25 A better estimation of particle size distributions would improve the confidence in the modelling. BHPBIO should have this data available from their investigations into over sampling of particulate matter monitors (Submission 15).

A: Better particle size data would definitely improve the accuracy of the estimates, in particular for estimating the PM_{2.5} contribution. FMG understands that BHPBIO currently do have these data but were not prepared to supply these to FMG at the time the FMG study was being conducted.

6.1.26 The model (Appendix L) is designed to predict the impact on dust concentrations resulting from a 45 Mtpa iron ore facility, whereas the final design throughput is for 100 Mtpa. This has large implications for licensing i.e. this PER will be used to justify any works that will result in a 100 Mtpa facility. Furthermore, modelling assumes various scenarios that are inconsistent with current practices and may not eventuate in the future. For example the model assumes a 25% reduction in vehicular dust emission at BHPBIO sites due to moving crushing and screening activities to the minesites. This has not occurred yet and has not even passed through the BHPBIO internal approval system (Submission 15).

A: While the rail is capable of transport of 100 Mtpa, FMG is only seeking approval for 45 Mtpa. Any proposal to significantly expand the development above 45 Mtpa by FMG or a third party would require separate environmental assessment and approvals, with specific environmental conditions set (e.g. for dust) for any expansion (see response 6.1.19).

For BHPBIO operations, the model did not assume any reduction in BHPBIO dust emissions, but that the dust emissions would remain constant. This as stated would over-predict the dust impacts given BHPBIO plans and commitment to reduce their dust levels.

6.1.27 Section 6.3.1.4 assumes that only 80 Mt of wet ore is shipped through both Finucane Island and Nelson Point. The current amount shipped through Nelson Point is 80 Mt and Finucane Island is 55 Mt. This adds to a total of 135 Mt of wet ore shipped. This is a large discrepancy in the modelling. BHPBIO plans to increase their throughput to 145 Mt. Furthermore the model does not take into account the double handling of ore

from Nelson Point to Finucane Island/DRI plant through the transfer tunnel. These factors may result in an under estimation of total dust concentrations as outlined in table 9, p. 27 Appendix F. This is of concern as TSP is perhaps the largest community issue in the area (Submission 15).

A: The dust model was developed and calibrated for BHPBIO emissions based on the throughputs and resultant dust emissions for the 2002/2003 year as described on page 19 of Appendix F of the Stage A PER. For future dust throughputs it was conservatively assumed that the BHPBIO dust emissions would remain constant. This is conservative in that BHPBIO have committed to a number of developments to reduce dust emissions and predict that dust emissions and levels from their operations will decrease substantially. As such the model is based on the 2002/2003 operations and included the “double” handling, has been validated as far as practicable and should overestimate BHPBIO emissions for the future noting the planned and committed changes by BHPBIO).

6.1.28 As BHPBIO recognises that dust is a primary issue for its Port Hedland operations, it commissioned a consultant to review the dust modelling information included in FMG’s PER. It is the consultant’s opinion that there are a number of shortcomings in the modelling that render its reliability doubtful. This is particularly so in relation to assumptions made about the effectiveness of dust suppression measures (Submission 13).

A: Unfortunately, BHPBIO has not provided its consultant’s report or outlined the reported shortcomings associated with FMG’s modelling. FMG had its dust modelling report independently peer reviewed and this review, presented within the Stage A PER, did not identify any significant shortcomings. FMG also understands that the particulate modelling being conducted for the current DoIR cumulative dust study has not resulted in significantly different outcomes with the exception that FMG may have over predicted the PM₁₀ concentrations primarily as a result of the assumed emissions characteristics for BHPBIO’s operations (see Section 3.4.4 of this document).

The dust suppression measures assumed in the dispersion modelling report are based on standard defaults presented in the current NPI Manual. These default controls are drawn from control factors documented in the USEPA (1998) and Buonicore and Davis (1992, table 3, p794). The use of these standard values gave results that for the Nelson Point operations that were in reasonable agreement with the TSP observations provided by BHPBIO. FMG believes that the use of well designed control/mitigation systems will provide a higher level of control than that stipulated in the NPI manual and as such the expectation is that the dust suppression measure effectiveness has been understated in the dispersion modelling report.

6.1.29 The modelling assumes a reasonable level of efficiency of dust control strategies but it is not clear to what extent failures of controls (such as breakdowns in water cannons) have been factored into the modelling (Submission 15).

A: The control factors assumed of 50% control for water cannon are considered to be typical controls achieved by water cannon systems of 10 to 20 years ago. Higher control efficiencies should easily be achieved with a properly designed automated system with a good maintenance programme. As such

the 50% control is considered to under-predict current dust control efficiencies.

FMG will operate a maintenance system to minimise the frequency of occurrence of failures of the dust control system. FMG will also ensure that failures are promptly identified and repaired. The modelling assessment considered that the normal breakdowns of cannons etc, are factored into the 50% control used.

6.1.30 Given the uncertainty in the modelling results, priority needs to be given by the proponent to a comprehensive ambient air quality monitoring programme and validation of source emissions estimates. This should be one of the requirements of a dust management programme which should also be developed. This is consistent with previous advice regarding Hamersley Iron's port upgrade in Dampier, which states:

The Department's overall assessment of the modelling is that the modelling results are uncertain to the extent that the results should not be heavily relied on in its decision making. It considers that HI's commitment to an upgraded monitoring programme and a programme of continuous dust management and improvements, with ambient monitoring providing the main measure of success, to be more important. As a part of this HI should keep day by day records of particulate events eg (bushfire smoke) to allow meaningful historical analysis (Submission 15).

A: Agreed. FMG believes that the Dust Management Plan, which includes real time monitoring and management response, is critical to the successful management of its particulate emissions. FMG completed the air dispersion modelling presented within the Stage A PER to demonstrate that the impacts of its emissions, if appropriately managed, are likely to be to very low.

6.1.31 The Cumulative Impacts assessment currently being undertaken by the DoIR regarding the impacts associated with the continued growth at the Port Hedland Port, includes impacts associated with dust. If, upon release of the DoIR study, FMG's current modelling results are viewed to be incorrect, it is requested that the Submitter view FMG's revised modelling results (Submission 3).

A: In completing its modelling, FMG had to make a number of broad assumptions regarding the throughput and emission characteristics of BHPBIO's operations. FMG understands that the preliminary results from the DoIR study are not significantly different to those produced by FMG with the exception that the FMG modelling appears to have over-predicted the PM₁₀ concentrations due to differences between the assumed and actual emission characteristics.

FMG's air quality assessment has undergone a third party external peer review that concluded that the inputs used and the assumptions made are consistent with current "best practice". In the event that the published final DoIR study indicates significant variance in the modelling outcomes as a result of new data or dust emission methodologies from BHPBIO or HDMS, FMG will review its modelling and assumptions. As indicated in the report, dust emission methodologies used in the assessment for both BHPBIO and HDMS were obtained from public documents as specific emissions data were not made

available by the respective companies.

6.2 AIR – GREENHOUSE GAS

6.2.1 Though FMG should be commended for a comparatively lower kgCO₂e/t for ore shipped, it would however be good to see a commitment to best practice in ensuring that throughout greenhouse gas emissions are minimised. This may include but not be limited to: all equipment using low sulphur diesel, looking at bio-diesel usage opportunities and also looking at opportunities associated with the train/locomotive technology used (preference towards technology that encourages energy/fuel efficiency) (Submissions 10, 11).

A: FMG will commit to minimising greenhouse gas emissions. This will primarily be achieved by looking to maximise the overall energy efficiency of the Project including type of locomotive used and their operational regimes as described in Section 7.13 of the Stage A PER (pages 108 – 110).

6.3 DREDGING

6.3.1 Concerns were raised about dredging aspects of the proposed Port Development (Submissions 10, 11, 14, 15), including the amount of dredging to take place at the port facility (Submissions 10, 11, 15); and that increased turbidity resulting from dredging operations will adversely impact upon marine biota such as coral reefs, dolphins, mangroves and sea turtles (Submissions 10, 11, 14).

A: The extent of dredging proposed is required to be able to berth and turn fully laden vessels using FMG's proposed port facilities, whilst allowing for sufficient under keel clearance. The depth of dredging is particularly important for operations to be taken safely at low tide. The shipping channel into Port Hedland ranges from 14.2 m to 16.2 m and the existing BHPBIO loading facilities (Nelson Point and Finucane Island) are 19 m. FMG is proposing to develop the berthing pockets to between 14.6 m and 19.5 m (with the greatest depth next to the loading facility). The greater depth at the loading facility is used to allow the vessel to enter on a favourable tide and be berthed and loaded at all phases of the tide, even when the tide is low. The vessel then departs the berth when full and when the tidal conditions are favourable (sufficient depth within the shipping channel). Undertaking loading in such a manner reduces the need to dredge the shipping channel to 19 m. This method of loading is commonly adopted at bulk carrier ports.

Refer to Section 7.3.3.1 of the Stage A PER (page 147) which states, during construction; dredging and reclamation will occur for up to 12 months and will result in elevated turbidity levels at the southern portion of the harbour for this time. Much of the region in question has previously been dredged by PHPA for the swinging basin and will continue to be dredged for maintenance purposes.

As mentioned in Section 7.3.5.1 of the Stage A PER (page 169), Port Hedland harbour is a macro-tidal

creek system that is naturally turbid and therefore it is not expected that any increases in turbidity resulting from the proposed dredging will impact turtles or the occasional dolphin that may enter the Harbour. Mangroves already exist in the range of turbidity expected to result from the Project and would not be effected by increases in turbidity due to dredging.

Subtidal communities that exist in the harbour are tolerant of turbid conditions and no light sensitive communities (e.g. seagrass beds or coral reefs) are present within the harbour. However, coral reef communities occur outside of the harbour and there is a risk that a 12 month dredging campaign may result in higher turbidity water leaving the harbour. If this occurs for a sufficiently extended period of time, then this may result in impacts on the coral reef communities outside of the harbour. However to manage this impact as stated in the PER, FMG will model the likely extent of turbidity from the harbour during dredging (above natural levels) following detailed geotechnical investigation of the sediments to be dredged. This modelling will also predict the extent of any potential plume, which will be checked against known areas of sensitive habitats. If there is a risk that habitats sensitive to turbidity (e.g. coral reefs outside of the harbour) will be adversely affected by the dredging programme, a monitoring programme with suitable 'trigger' criteria for action, will be developed in consultation with the DoE.

6.3.2 At present there is insufficient analysis of marine sediments to determine whether there are acid sulphate soils. If there are, fill material will have to be sourced from elsewhere. Details on alternative sources of fill and the impacts of using such sources have not been provided (Submission 13).

A: Sampling of marine sediments for acid sulphate soils has been undertaken since release of the PER. Refer to Section 3.3 of this document for a summary of these results. In one location on the intertidal area of Anderson Point, levels of sulphur (0.08%) were slightly above the DoE action criteria of 0.03%. This indicates the presence of a low potential for acid generation at this site. However, due to the high acid neutralising capacity of the surrounding sediments, dredged sediments are unlikely to result in sufficient acid generation to require alternative sources of fill to be used. To investigate the availability and reactivity of the carbonate within the material to be dredged, two bulked samples from BP5 (samples from 1.4 m, 3.7 m and 6.2 m combined) and BP16 (samples from 1.4 m, 3.0 m and 4.5 m combined) were tested for ANC and pH-buffering properties (acidimetric auto-titration). It was found that sample BP16 contained a high proportion of reactive carbonate minerals and would be effective in the near-neutral buffering of acidity produced from PASS layers. Sample B5 was found to contain little carbonate and to be ineffective as a buffer. Despite the low risk FMG will develop an Acid Sulphate Soils Management Plan.

Fill will not be required to be sourced from elsewhere for the main area of operations. Any additional fill required for minor uses (construction laydown areas) will be purchased from an existing supplier and any environmental requirements will be met by suppliers.

6.3.3 Although it is considered that the use of dredge spoil to reclaim land is an efficient method if the Project is to go forward (Submission 15), several issues are associated with this activity. Concerns were raised over the suitability of dredged spoil for reclamation because the Harbour is contaminated with metals and tributyl tin (TBT), sediments may also be contaminated; and that construction of the dredge spoil reclamation area has the potential to affect groundwater regimes - particularly at the freshwater/seawater interface (Submissions 10,11).

A: FMG has assessed the contamination levels against the National Ocean Disposal Guidelines for Dredged Material. The criteria within this standard are Screening Level (requires further consideration/assessment) and Maximum Levels (not recommended for disposal at sea). Contaminates addressed by these guidelines relate to the placement of material at sea, where animals can live among and consume the sediment. Consequently, criteria are much stricter than those for placement on land. Results of the sampling programme are described in Section 3.2 and are presented in Appendix 4.

As stated in Section 7.3.2.2 of the Stage A PER (page 145), the proposed port developments may present some potential changes to local groundwater regimes. These primarily relate to the potential for hypersaline groundwater seepage, water-logging or acidic drainage associated with the construction of the dredge spoil basin and bund walls. There is a relatively small percentage of the bund wall which abuts mangrove habitat. In a study of similar phenomena associated with saltfield bund walls, Gordon *et al.* (1995) found that water-logging and other groundwater related changes were typically limited to mangroves less than 50 m from the bunds. In the case of the FMG port, the mangrove areas near the dredge spoil bunds are generally in an area where they would receive regular tidal flushing.

There will be dewatering of the port site during construction of the rail dumper. Some dewatering may also be required during maintenance operations. The extent of dewatering required will be determined during the geotechnical investigations required for detailed design of the Project.

6.3.4 It is anticipated that efforts to vegetate dredge spoil will be unsuccessful due to high salinity levels (Submission 15).

A: Nearly all of the 300 ha required for management of dredged spoil is in tidal areas already influenced by seawater. FMG has not determined the precise mix of species that will be used for rehabilitation of unused reclamation areas, however they will include species already growing on higher ground, influenced by spring tides and wind-blown salt. FMG will carry out vegetation trials to determine the best species to use during revegetation.

6.3.5 The footprint area for reclamation is three times that required for operating facilities and the basis for the planning appears to be for a 100 Mt or larger facility as opposed to the 45 Mtpa facility as outlined in table E1page viii (Submission 15).

A: The reason for requiring 300 ha during reclamation is explained in detail in a report by Townley & Associates Pty Ltd (2004) on port layout options (refer to Appendix 1). Dredging of 3.3 million m³ of spoil typically requires management of many times that volume of material, because of the entrainment of seawater during dredging. This is the primary reason for needing to disturb/reclaim approximately 300 ha of land. The 300 ha will be needed to ensure dredged spoil settles and drains within the construction period.

To explain and support this need, FMG asked Baggerman Associates Pty Ltd, marine and dredging consultants, to explain the proposed dredging and filling operations, in the context of their experience. Baggerman Associates have been working at Port Hedland since 1968. Their letter is included as an attachment to Appendix 1. They argue that an area larger than 300 ha could be utilised if it were available, but that given the 300 ha, "a competent contractor with a well managed site will be able to undertake the works without undue impact on Port Hedland Harbour outside the footprint of the dredging works".

There are currently no plans to expand the 45 Mtpa facility to 100 Mtpa in the near future. However, the area of reclaimed land corresponds reasonably well with areas identified by the Port Hedland Port Authority (PHPA) for future reclamation, and there may be opportunities for other facilities to utilise the unused area reclaimed land. Such facilities could be proposed by FMG but may also be proposed by other users of FMG's port and rail infrastructure.

6.3.6 Detail as to how stormwater runoff from the road that is to be constructed around spoil deposition area is lacking (Submissions 10, 11).

A: As indicated in the Stage A PER, the raised perimeter road around the dredge spoil deposition area would be used to contain local stormwater runoff within the spoil deposition area, including runoff from the road itself. During construction this runoff would be captured using the dredge spoil decantation ponds and then overflow via Humeceptors (oil and sediment interceptors) into the Harbour. During operations, this water will be collected from drainage collection ponds and used for dust control on the ore stockpiles.

6.3.7 Preference should be given to materials that are unable to be used for structural fill being appropriately disposed of offshore, in accordance with the appropriate approvals/permits rather than deposited on land (Submissions 10,11).

A: Dredge material unsuitable for structural fill will be appropriately disposed of on-shore where fill is required, but where the reclaimed area is not proposed for structural foundations. This would result in less of an environmental impact than removing fill from another location for use at the site. However, if no suitable area is available for disposal of non-structural fill on-shore, then dredge material will be disposed off-shore. Should off-shore disposal be required, FMG will undertake detailed environmental, geotechnical and planning investigations and obtain appropriate permitting prior to commencing dredging. A geotechnical drilling programme is currently under way to confirm earlier findings that the dredge material will be suitable for use as fill material.

6.3.8 If proposed reclamation settling ponds are higher than current land level then it would not be an option to rehabilitate pre-existing habitats which are influenced by tides (Submission 15).

A: It is acknowledged that reclamation areas that were tidal prior to construction may not be able to be rehabilitated to their former condition if they are no longer subject to tidal influences. It is proposed to reclaim 100 ha of the reclaimed land to 6.5 mAHD, an elevation higher than the existing levels, which will be rehabilitated with species typical of adjacent naturally elevated areas. Much of the additional 200 ha will remain at a lower elevation, and may be suitable for recolonisation by species typical of pre-existing habitats. As outlined in Section 4.1 of this document, FMG will conduct detailed design of the reclamation area to encourage natural re-generation of mangroves, wherever practicable. Species selection and detailed planning of revegetation activities will be undertaken during review of the draft Construction Phase EMP (refer to response 8.5.2) in consultation with the key DMAs.

6.3.9 Concern over sediment plumes affecting coral reefs during dredging operations was raised. Would like to see data logging of pre-turbidity levels and spot measurements of turbidity at all dredging sites and the implementation of management measures in the event that turbidity levels observations indicate that turbid plumes may be impacting on the sites. Taking daily aerial photographs to determine the level of turbidity generated from dredging and dredge disposal activities (Submissions 10, 11).

A: The turbidity levels in the harbour are currently high due to natural and man-made processes. It is not expected that a sediment plume from FMG's dredging operations will extend outside the harbour. Plume modelling will be conducted to test this expectation. As outlined in Section 7.3.5.1 of the Stage A PER (page 171) the likely extent of turbidity from the harbour during dredging (above natural levels) will be modelled following detailed geotechnical investigation of the dredge sediment. Whilst FMG will use aerial photography as a tool in the management of construction and operational impacts of its Project, it is not practicable to use such technology for monitoring on a daily basis.

Standard sedimentation controls during dredging operations will be implemented. Should unacceptable impacts as a result of increased turbidity be noted during dredging operations, immediate measures will be put in place to prevent or minimise any further impacts. These measures may include silt curtains, or changes to dredging methods or equipment. Any exceedence of Works Approval or Licence requirements will be reported to the DoE.

6.3.10 Would like to see dredging only between May – August to avoid turtle laying/hatching and use of turtle deflection devices during dredging (Submissions 10, 11)

A: Due to the timeframe for construction of the Project, it is not feasible to cease all dredging operations for 8 months of the year. However, FMG will seek to minimise impacts on turtles which may use the harbour. Particular care will be taken between the months of October and April.

FMG will utilise a cutter suction dredge during the Port development project. This form of dredging

is often used in capital programs where the material to be dredged is consolidated. A cutter head is used to loosen the material and a suction line will deliver the material to the onshore reclamation area.

The risk that this form of dredging presents to turtles has been assessed as very low for the following reasons:

- relatively slow movement of the dredge (moves along a face);
- noise generated by the cutter head discouraging fauna from the local area;
- lack of food and habitat within the area (dredging into bed material); and
- localised turbidity generated at the dredge head.

FMG has been in contact with the US Army Corps of Engineers (USACE). The USACE maintains (including dredging) more than 19,200 km of inland waterways, 300 commercial harbours and more than 600 smaller harbours. Based on the USACE historical records (24 years of dredging), they have found there is minimal risk of cutterhead dredging to sea turtles. In fact the USACE gives preference to cutterhead dredging over hopper dredges whenever possible for the purpose of protecting sea turtles.

Based on this method of dredging utilising a rotating cutter head there are currently no turtle deflectors that are able to be fitted. However, a number of procedures can be implemented to further reduce the risk to turtles. This includes ensuring that dredging only occurs within the approved area and when the dredge ladder is being lowered from the surface only operate the dredge pumps on low power. In addition procedures will be developed for dealing with injured marine fauna. Any mortalities of turtles and other fauna will be reported to the DoE and CALM and reported in the Annual Environmental Report.

Based on the low risk cutter suction dredging presents to sea turtles and the unavailability of deflection devices for this type of dredging, FMG believes turtle deflectors are not appropriate or viable for this Project. However, procedures will be implemented to ensure the risk to sea turtles is minimised.

6.3.11 Would like to see the development of an environmental management plan including the following management measures: (1) Hydrocarbon Management (2) Waste Management (3) Ballast Water and Marine Pest Management (4) Marine Vertebrate Management (5) Vessel Movement Management to ensure that the dredging and dredge material disposal operations have minimal impact on the environment (Submissions 10, 11).

A: FMG will have in place a Construction Environmental Management Plan during dredging and dredged spoil disposal which will include, but not be limited to:

- Dredging and Reclamation Plan;
- Hydrocarbon Management / Oil Spill Contingency Plan;
- Sediment and Water Quality Plan;
- Marine Monitoring Programme (including marine vertebrate monitoring and marine pest

- monitoring);
- Mangrove Management Plan; and
 - Waste Management.

As outlined in Section 7.3.5.1 of the Stage A PER (page 171), ships using the FMG port facility will be required to comply with the Australian Quarantine Inspection Services (AQIS) requirements in relation to ballast water control. FMG will work with PHPA on this issue to ensure that protocols are consistent between operators in Port Hedland. As controller of the berth, FMG will prevent hull cleaning and scraping at the proposed berth, implement the above Marine Monitoring Programme which will include monitoring for marine pest species, and will not accept vessels found to be in contravention of AQIS requirements.

Vessel movements will be managed in conjunction with the Port Hedland Port Authority. Refer to Appendix E of the PER for the Draft Construction Environmental Management Plan. An Operations Environmental Management Plan will also be developed covering these issues and presented to the DoE.

6.3.12 There are too many aspects of the port design that will be finalised once environmental approval is given. The area will be impacted to such a great extent that environmental approval should not be given. To approve this proposal and then allow changes afterwards will further compromise the environment. If approved, FMG will be in a position to argue that all “minor modifications” are necessary to make the port work. The overall impacts of these are likely to be considerable and be environmentally unacceptable, particularly the impact on the mangroves. The company has already said they would want additional stockpile areas in the future (Submission 5).

A: In designing and assessing the potential environmental impacts of the Project, FMG has maintained a conservative approach, so that actual impacts will be no greater (and in some cases less) than the impacts predicted. As part of binding conditions to be set by the Minister for the Environment, FMG will be obliged to seek reassessment if the Project or impacts of the Project are likely to differ significantly from that proposed. FMG has no current plans for additional stockpile areas.

6.3.13 Does the proponent agree that they should be subject to binding Ministerial conditions about dredging, which require them to stop immediately if monitoring reveals a problem? It would be unacceptable to have “another Geraldton” (Submission 12).

A: As outlined in Section 7.3.3.3 of the PER (page 150) FMG has committed to the development of a Dredging and Reclamation Management Plan that details the dredging and reclamation work, the procedures to be put in place to manage the impacts during dredging and reclamation, and contingencies to be implemented in the event of an unacceptable level of impact. This commitment will be included within the Ministerial Conditions for the Project to which FMG will be bound.

6.3.14 Has any modelling been undertaken within the proposed dredge area to determine siltation? The build up of sediment will have a large impact upon dredging frequency. Is it FMG's intention to utilise the PHPA study to determine anticipated dredging frequency, and to prepare an appropriate dredge management plan (Submission 15)?

A: FMG has not at this time carried out any modelling to determine siltation. Geotechnical consultants have been employed by FMG to further characterise the sediments to be dredged and this work is ongoing. It is the intention of FMG to utilise work carried out by PHPA and other companies to determine the anticipated maintenance dredging frequency. Given the history of siltation in Port Hedland, maintenance dredging will probably be required at approximately 3 to 4 yearly intervals. PHPA will incorporate the FMG area into their current maintenance dredging programme.

6.3.15 Phrases such as "FMG will re-use a small portion of these settling ponds during operation" and "the majority of the settling pond area will be rehabilitated" are qualitative, adding little in terms of quantifying proposed port's ultimate impacts (Submission 15).

A: Refer to response 6.3.5 which explains the need for 300 ha to dispose of dredge material, the area of reclaimed land corresponds reasonably well with areas defined by PHPA for future reclamation and port use. FMG proposes to use 100 ha of the 300 ha of reclaimed land for the screening plant and for stockpiles and associated infrastructure. The additional 200 ha will be actively managed. Upon completion of the dredging, deposition areas will be drained and levelled. The finished surface will be seeded to reduce the potential for surface erosion from rainfall and dust generation. The perimeter bund will also contain internal stormwater runoff, which will be harvested and used for dust control to supplement the 2 GL per annum required for dust suppression.

6.4 HYDROCARBON AND CHEMICALS

6.4.1 Need to ensure that all third party users of the infrastructure are compliant with the hydrocarbon management measures so as to minimise hydrocarbon spill potential as far as practically possible across all parties using the rail and port infrastructure. Need to ensure that all third party users are educated and trained to ensure that they are able to implement hydrocarbon management and emergency response procedures and work with the PHPA as required (Submissions 10, 11).

A: Third Parties users of the infrastructure will be required to obtain separate environmental approvals where additional or increased impacts result from their use of the FMG facilities, they will also be required to comply with the Projects existing environmental requirements.

6.4.2 No details are provided as to the facility that will be required to handle 45 million litres per annum of diesel fuel , its location, the manner in which fuel is to be transported to the storage site or safeguards to be implemented. It is believed that trucking of diesel fuel would have significant environmental and social impacts, due to the increased movement of dangerous goods along local roads (Submission 13).

A: Diesel fuel will only be stored at the marshalling yards and it is anticipated that the facility will provide sufficient storage for 5 days. Movement from supplier bulk storage facilities will be by road train. All movement of diesel fuel will comply with all applicable legislation including;

- Australian Code for the Transport of Dangerous Goods – Road and Rail;
- Dangerous Goods (Transport) (Road and Rail) Regulations 1999;
- *Traffic Act 1974*;
- Australian Standard (AS 1940-1993) the storage and handling of Flammable and Combustible Liquid.

A Hydrocarbon Management Plan will be developed prior to construction (to be made publicly available) and will provide specific procedures on spill prevention and clean up procedures. New storage facilities will be constructed at the marshalling yards and operated in accordance with Australian Standard (AS 1940-1993) the storage and handling of Flammable and Combustible Liquids.

FMG believes that with application of management measures and adherence to all applicable legislation, dangerous goods can be transported with minimal impact to the environment or to social values.

6.5 NOISE AND VIBRATION

6.5.1 The social setting does not identify the residents in Wedgefield. Has the noise modelling taken this into account (Submission 15)?

A: Wedgefield residents have been considered in all impact assessments including noise modelling.

6.5.2 Concerns were expressed about modelling outcomes as the cited predicted rail noise levels in Table 21 (p 137) only cater for the 45 Mtpa and the cumulative noise of BHPBIO and FMG, and modelling seemed not to consider the capacity of the railway (100 Mtpa) and allowance of third party users (to achieve the 100 Mtpa), or the expected noise from HDMS proposed operations.

Currently existing noise levels are above the assigned noise levels at Port Hedland and this means that any additional noise sources are required to be 5 dB(A) below the assigned noise levels, Also the proposal currently does not comply with preliminary draft EPA Guidance for Road and Rail Transportation Noise at White Hills rural residential development and two remote farming stations. As the HDMS railway is already approved by the EPA, it should be taken into account when considering noise from existing operations (Submissions 10,11).

A: Noise modelling of FMG's proposed port facility was undertaken on the assumption that the HDMS port facility would be operational, and therefore represents the noise impact of BHPBIO's, HDMS and FMG's operations. FMG in the first instance will implement management measures leading to compliance with the Noise Regulations. Noise minimisation measures at the port will include partial enclosure of the loadout and ship conveyors at the port, use of (state of the art) low noise equipment and railway designs to minimise rail wheel noise. All attempts will be made to reduce noise levels, so compliance with the noise regulations is achieved over time. Assuming a reduction of 7 dB(A) can be achieved through these measures, then FMG would comply with the Noise Regulations.

Noise modelling of FMG's proposed railway was undertaken on the assumption that only two railways would be operational (BHPBIO and FMG) since FMG is seeking to reach an agreement with HDMS for sharing of the railway. However, in the unlikely event that two additional railways are constructed, FMG has completed a cumulative noise assessment which has been included in Section 3.4.1 of this document.

To address the issue of locomotive noise, FMG will manage train operations to reduce noise to as low as reasonably practicable (ALARP). Where it is not possible for FMG to achieve the criteria prescribed by the preliminary draft EPA Guidance for Road and Rail Transportation Noise, FMG will ensure that train noise is below the night-time transportation noise criterion of $L_{Aeq(8 \text{ hour})}$ 55 dB, which has been used for similar projects in Western Australia including the HDMS Project.

Specific noise management measures that will be investigated to minimise disturbances to residences along the rail route will include the following;

- rail design (e.g. turning circles) to minimise wheel noise;
- use of low-noise equipment;
- management of train operations, such as reduction of notch speed to reduce locomotive noise near residences;
- cuttings and or noise barriers; and
- as a last resort, acoustic treatment of buildings.

FMG is seeking environmental approval for transport of 45 Mtpa ore (see Table 1 of the PER). Once approval is received, any proposal to expand the development (e.g. to 100 Mtpa) by FMG or a third party would require separate environmental assessment and approvals, with specific environmental conditions set for any expansion.

6.5.3 Concerns were expressed over the noise levels in Port Hedland (particularly given existing noise levels). The proponent has identified that its port facilities would exceed the lower assigned noise levels during the night at some locations in Port Hedland due to existing noise sources (Submissions 9, 10, 11).

A: By itself, the FMG port facility would comply with Noise Regulations. However as existing noise levels do not comply with the noise regulations, any additional sources of noise are required to be 5 dB(A) below the assigned noise levels. Refer also to response 6.5.2.

6.5.4 In order to address this FMG simply advises that it will investigate noise mitigation measures as far as is reasonably practicable. In conclusion [FMG] assumes that noise levels will either be reduced to comply with regulations or that approval will be sought to vary the assigned noise levels. Such a conclusion does not suggest that noise issues at the port will be managed in an environmentally acceptable manner (Submission 9).

A: FMG will implement management measures leading to compliance with the Noise Regulations. Noise minimisation measures will include partial enclosure of the loadout and ship conveyors at the port, state of the art low noise equipment will be used and notch speed restrictions near homesteads for the rail. All attempts will be made to reduce noise levels to an acceptable standard.

FMG has committed to the development of a Noise Management Strategy for the rail and port facility which will be developed prior to construction and will include:

- minimisation of noise emissions from operations;
- minimisation of disturbances to residents from rail operations;
- identification of noise reduction strategies aimed at achieving compliance with the noise regulations over time;
- a monitoring programme to confirm modelled and actual emissions and assess compliance; and
- a Complaints process.

6.5.5 FMG is preparing a noise management strategy specific for its rail operations and adopt management measures to minimise noise impacts – what about the third party users of the railway facilities? Need to ensure that all third party users of the infrastructure are compliant with the strategy/imposed measures so as to minimise disturbance to residences and reduce noise emissions as far as practically possible across all rail operations using the infrastructure. Also need an avenue that will enable third party users to be assessed in terms of noise from their operations. Do not want a situation where because the railway is approved to 100 Mtpa that they are using the approved railway, so that there is no avenue for appeal on their operations in regards to noise (Submissions 10,11).

A: Should third party users use FMG's proposed infrastructure, they will be required to comply with FMG's existing environmental approvals. Any proposal to significantly expand the development above 45 Mtpa by FMG or a third party would require separate environmental assessment and approvals, with specific environmental conditions set for any expansion.

6.5.6 Would like to see as much as practicable partial enclosure of the load out and ship loader conveyors, which are the major items influencing the noise levels in Port Hedland. Also worried about the cumulative noise impacts of BHPBIO, HDMS, FMG and third party users of the facilities (Submissions 10, 11).

A: The loadout conveyor and ship loader conveyor will be covered (partially) to minimise noise and dust emissions. Refer also to response 6.5.4. Cumulative noise impacts are discussed in Section 3.4.1 of this document.

6.6 WASTE

6.6.1 During the operation stage of the Project there has been little attention afforded to waste generation and management and particular emphasis on recycling. Would like to see that attention and emphasis to waste minimisation/recycling is actively encouraged throughout and that waste generated will be properly disposed of at a licensed premise (Submissions 10, 11).

A: Stage A of the Project is expected to produce low volumes of general waste. However, waste management will be based on the principles of:

1. Avoid/Reduce;
2. Re-use;
3. Recycle;
4. Dispose of appropriately (e.g. to licensed facility).

FMG has addressed waste management in its construction EMP (see Appendix E of the PER) and will also address this issue in its operational EMS (see Section 7.1.2 of the Stage A PER (pages 107 – 108)).

7. SOCIAL IMPACTS

7.1 ABORIGINAL HERITAGE AND CONSULTATION

7.1.1 Objection to the statement (FMG Stage A PER Section 6.1.8) that “FMG has signed Protocols with all of the above native title claim groups (with the exception of the Kariyarra Yingibarndi with whom negotiations are in progress (and their representative body the Pilbara Native Title Service)”. The Pilbara Native Title Service does not represent the Nyiyaparli Claim group. All Aboriginal heritage survey and assessment work commissioned by FMG for its Project and undertaken through PNTS has not been undertaken with either the understanding, endorsement or approved involvement of the Nyiyaparli Native Title claimants for WC99/04 (Submission 1).

A: All Aboriginal heritage survey and assessment work commissioned by FMG is in accordance with a formal heritage protocol signed by every registered Nyiyaparli Native Title Applicant for WC99/04. The second party to these protocols is FMG solely.

7.1.2 Aboriginal cultural and heritage surveys should be conducted to enable the delineation and protection of Aboriginal heritage sites within the Project area (Submissions 9, 13).

A: Aboriginal cultural and heritage surveys are ongoing in consultation with all relevant stakeholders. To-date FMG has completed well in excess of 200 survey days on site with Aboriginal traditional owners with more than 900 "man days" worked.

To date, all sites of significance recorded in surveys have been avoided in the design of the Project. By way of example FMG and the Aboriginal community, together with the PNTS, jointly developed a process of managing a major ethnographic site close to Roy Hill Station. This took 9 months of consultation that culminated in a meeting on site over a two day period, with 40 senior Aboriginal elders and lore men from the Pilbara and the desert regions to the east, followed by detailed Aboriginal heritage surveys and a commitment from FMG not to disturb the final area defined as the "Mankarlyirrkurra" mythological site. FMG understands that such a process has never been undertaken in the Pilbara before.

FMG has developed an extremely good working relationship with all Aboriginal parties impacted by its proposed Project, the wider Pilbara Aboriginal Community and the Pilbara Native Title Service (PNTS) which is the legal representative body for the Aboriginal parties (except the Nyiyaparli Claim group which has signed a heritage protocol with FMG directly). FMG's Project is being conducted in accordance with the *Aboriginal Heritage Act 1972* and the *Native Title Act 1993*.

7.1.3 Whilst the PER advises that the proponent is committed to avoiding the disturbance of sites in the final design of the Project its advice to us would seem to indicate the contrary. Rather the proponent has indicated that it may seek approval under section 18 of the *Aboriginal Heritage Act 1972* to disturb all sites within and possibly beyond the Project area whether they will be impacted upon or not (Submission 9).

A: FMG has committed to minimising, as far as practicable, any disturbance to any Aboriginal Heritage sites. This process has been agreed within heritage protocols. It is acknowledged that it may not be possible to avoid disturbing all sites. Any section 18 application or applications under the *Aboriginal Heritage Act 1972*, if required, will be preceded by consultation with the traditional owners.

7.2 ACCOMMODATION

7.2.1 A number of concerns were raised regarding the housing of the construction and operational workforce (including private sub-contractors). Specifically the concerns included:

- **FMG has committed to a Housing Plan. Will this be completed prior to Project approval (Submission 8)?**
- **The figure of 14% housing vacancy that was used appears too high (Submissions 3, 8, 10, 11).**
- **During other Projects, businesses and residents in Wedgefield have found short stay caravan parks spring up in neighbours' yards. As Wedgefield is not serviced by deep sewage, this alone causes significant health issues (Submission 3).**
- **Long term residents may be dislocated due to inflated rental prices (Submission 3, 8, 10, 11).**

A: FMG has been working with State and Local Governments and a local Real Estate agent regarding their housing needs and options within the local community. The vacancy rate of 14% quoted in the Stage A PER was from the 2001 census data. Since this time it is believed that the vacancy rates have significantly decreased and a more likely vacancy rate has been discussed during the consultation with stakeholders. The information that has been obtained during the consultation with the relevant stakeholders will be included in FMG's Housing Plan.

FMG has advised they will not be purchasing properties within the local community and will encourage their employees to purchase or rent. FMG is aware that the current vacant housing stock that is available is in a state of neglect or disrepair and unsuitable for rental purposes however, discussions have indicated that there are a number of investors interested in purchasing and refurbishing properties within the local community. An indication of housing types and numbers anticipated for FMG's requirements has been given to the State Government Authority who is responsible for land release in Port Hedland.

FMG is also presently evaluating offers from various sources to house construction workforce in existing and new accommodation. Consultation with existing Caravan Parks and short term transient camps have been positive and a number of these businesses have indicated that they have sufficient land available with appropriate services which would be able to meet the needs of FMG construction workforce. Discussions are continuing with these businesses. FMG does not anticipate that the

construction workforce will result in housing concerns previously experienced in Port Hedland and particularly the scenario described for Wedgefield.

Discussions with the Town of Port Hedland have identified that construction accommodation shortages has been a problem in the past and a repeat of these issues is not acceptable.

7.2.2 Since 1990 the population of Western Australia has increased by 17%, but during the same time the population of the Pilbara has reduced by 13% (Pilbara Regional Profile: Prepared by Consultancy North, 2003). This is the real impact of the mining industry. It is certainly high profile, and they do pay some pretty impressive royalties to the state, but their priority is not on community or state development, and this plan demonstrates that (Submission 6).

A: FMG's Project will have both State and National Benefits as advised in Section 2.2 of the Stage A PER (page 8). Construction of a multi-user port and railway to the proposed FMG mines is necessary for the operation of the Pilbara Iron Ore and Infrastructure Project. The development of the port and North-South railway to FMG's iron ore resources will provide a number of significant benefits including;

- Sufficient capacity to meet the transport requirements of all of FMG's proposed developments in the area (45 Mtpa);
- Rail and port capacity will also be available for other operations in the area, such as the proposed HDMS Iron Ore Project and any other third parties, further to expansion;
- Creation of significant direct and indirect employment opportunities through materials purchase, construction and operation. Stage A of the Project will directly employ around 1,500 people during the peak construction stage and around 225 people onsite for operating the port and rail;
- The construction phase of the North-South railway and port facilities and mine infrastructure will require an expenditure of approximately A\$1.85 billion, which represents a significant contribution to the State's economy;
- Workforce for construction and operation of the port and North-South railway will be prioritised from the towns of Port Hedland and Newman and the Pilbara region;
- FMG's operational workforce will not be fly-in-fly-out (FIFO) and will be housed in the regional townships of Port Hedland and Newman; and
- Regional community capacity building through local employment opportunities, including meaningful vocational training and employment for local indigenous people.

The company acknowledges the need for community and social benefits and subsequently requested a section of their State Agreement Act include community development such as:

- training and guaranteed employment for indigenous and non-indigenous persons living in the Pilbara region;
- regional development and local procurement of goods and services;

- contribution to community services and facilities;
- a regionally based workforce; and
- consultation with relevant local government with respect to the community and social benefits.

These issues will be documented in a Community Development Plan as required by the State Agreement Act

7.3 COMMUNITY SERVICES

7.3.1 Clearly, despite the wealth created in the area, the State Government does not consider the importance of maintaining and improving the services to this community. There appears, generally, to be a lack of understanding by Government of the significant issues faced by the community of Port Hedland. This includes areas such as education, childcare, police and community services. (Submission 3) calls for FMG to lobby government in these areas while (Submission 10 and 11) state they should be considered. Furthermore any Projects undertaken by FMG to assist the community must be sustainable and not further burden the low rate base of this town (Submission 3).

A: Discussions with Local Government, the Pilbara Development Commission and involvement in community groups and forums held in the local community have made FMG aware of these and other issues in the community. Further discussions with Local Government will continue and where appropriate, FMG will support the community in seeking better community services.

FMG is aware of the importance of ensuring that any community Projects in which it becomes involved, are sustainable so that on completion of FMG's Project, these projects can continue for the benefit of the local community, where required. As stated in response 7.2.2, FMG will develop a community development Plan which will consider these issues and how FMG might best contribute to improvements.

7.3.2 The Town of Port Hedland as one of the relevant local government authorities, is not listed as a Decision Making Authority, although the report lists the *Town Planning and Development Act 1928* as being relevant to the Project. Council is a relevant authority under the Act (Submission 10).

A: FMG agrees with this statement and will continue to consult with the Town of Port Hedland as one of the key decision making authorities.

7.3.3 The Wedgefield Association is disappointed that the community and the environment as a whole are being totally disregarded by the Port Authority and the State of Western Australia in their drive to increase tonnage and State income from resource industries by allowing the establishment of these industries within the town boundaries and around our waterways to the detriment and destruction of our natural environment and the possible future health consequences that may arise. In addition there is concern regarding the impact of the potential increase in usage of the FMG infrastructure from 45 Mtpa to 100 Mtpa (Submission 3).

A: As part of the Public Environmental Review process FMG has undertaken extensive environmental studies into the environment surrounding the Project. As a result FMG has a thorough understanding of the existing environment and potential impact from the Project. FMG, as detailed in Section 7 of the PER, has developed management actions to minimise the environmental risks associated with the Project.

FMG is seeking environmental approval for transport of 45 Mtpa ore (see Table 1 of the PER). Once approval is received, any proposal to expand the development above 45 Mtpa by FMG or a third party would require separate environmental assessment and approvals, with specific environmental conditions set for any expansion, including consideration of impacts on the local community.

7.4 RECREATIONAL ACTIVITIES

7.4.1 There is concern that recreational areas around the Port are going to decrease due to the construction of the Project. The local population, both indigenous and non-indigenous, use the tidal mud flats as fishing, crabbing and general recreational areas. In addition, the ability by small recreational vessels to use the harbour is certainly under threat (Submission 3). FMG stated that they will consult with the community to develop appropriate management measures or suitable alternative recreational sites – would like further details on this commitment (Submissions 10, 11).

A: FMG is aware of the importance of the recreational pursuits within the harbour for the local community. Discussions have been held with Kariyarra people regarding their needs for cultural and heritage purposes. Section 4.3.12 of the Stage A PER (page 33) states that during construction and operation the port facility, access to the general public will be restricted in the Anderson Point and the South West Creek areas. FMG is currently in the process of consulting with the wider community to develop appropriate management measures or suitable alternative recreational sites. When identifying potential recreational areas, regard will have to be had to security requirements, public safety and port operations. Further details will be made available to interested parties as this consultation progresses.

7.5 SMALL BUSINESS SECTOR

7.5.1 The Commission notes that Fortescue Metals Group claims that because much of its construction workforce will be from outside the region there will be little expenditure within the town of Port Hedland. This is not necessarily the experience of the Commission. Construction workforces often have high disposable incomes and are willing to spend in the local community. In cases the level of expenditure can be sufficient to distort the decisions of the small business sector to the extent that they have little capacity to cope when the construction phase ends. This sometimes results in the closure of small businesses. As a result the Commission would like to see some commitment by Fortescue Metals Group to supporting mechanisms such as the Port Hedland Business Enterprise Centre that provide small business advice and planning (Submission 8).

A: Unsuccessful investment decisions made by local businesses based on unreal expectations, was one of the key risks identified in the Socio-Economic Assessment of the Project (see Appendix O of the Stage A PER). Whilst FMG cannot control expenditure by the construction workforce or investment decisions made by local businesses, FMG will use local suppliers and businesses during construction and operation of the Project, and will be seeking to establish long-term partnerships with local business throughout the life of the Project, where commercially practicable.

FMG will consult with the Port Hedland Business Enterprise Centre and the Pilbara Development Commission further in regards to this matter.

7.5.2 Whilst Fortescue Metals Group maintains it has developed a range of policies and commitments to support small business, it has failed to recognise that the cost of housing for employees is a significant cost component in the operation of small businesses in the Pilbara. Higher rental prices reduce the capacity of small business to attract and retain staff and/or force operating costs up to the extent the business is no longer financially competitive or viable (Submission 8).

A: The issue of high rental prices is of concern to FMG as potential employees will also be affected by rental increases. FMG will not be providing houses to its employees, but will encourage its employees to purchase accommodation in the community or rent.

FMG is working with state and local authorities to ensure adequate land and housing is made available in Port Hedland and Newman to ensure housing stocks are not limited and contributing to increase in rental prices.

8. OTHER ISSUES

8.1 CUMULATIVE IMPACTS

8.1.1 Concerns expressed that the cumulative impact of the duplication/triplication (BHPBIO, HDMS and FMG) of the rail infrastructure has not been addressed (Submissions 3, 4, 6, 7, 9, 10, 11, 12, 14, 16). If the cumulative impacts are studied could these be made publicly available and published in a refereed journal (Submissions 10, 11)?

A: FMG recognises the potential impacts of three parallel railway lines and has completed cumulative impact studies on Noise, Dust, Surface Hydrology and Flora and Fauna. A summary of these studies is presented in Section 3.4 of this document.

It is not FMG's intention to put the findings in a referred journal although the assessments will be available publicly. The FMG rail and port infrastructure will be available to third party access at commercially competitive rates and time slots. Therefore, there is an opportunity for HDMS to utilise the FMG Infrastructure. However, this will be a commercial decision made by HDMS.

8.1.2 Particularly concerned about the cumulative impact of loss of habitat at a population level when the proposal is considered in combination with the construction of the already approved HDMS port facilities. Would like to see a commitment to further study and investigate this potential impact and the development of a combined management response with HDMS to minimise any negative effects on mangrove fauna that will be affected by the combined proposals. Though it is accepted that it potentially represents a low risk of change to the conservation status of any of the fauna species, it still would be accepted that within that immediate vicinity it would have a significant effect and is worthy of further research/study (Submissions 10, 11).

A: A report conducted by Biota and Trudgen (2002) concluded that the fauna within the Project area are widely distributed throughout the harbour. It is therefore expected that the impacts on these fauna are unlikely to be significant. However, FMG acknowledges that there will be some cumulative impact of loss of fauna habitat at a population level when the proposal is considered in combination with the proposed HDMS port facilities. As shown in Table 4, Section 3.1 of this document, FMG's contribution to cumulative loss of mangroves is the least of any major project or company in Port Hedland.

FMG will make efforts to work with HDMS to minimise cumulative impacts on mangrove fauna. FMG will ensure that impacts to mangrove fauna habitats are minimised by limiting clearing, wherever possible. FMG has committed to the implementation of a Mangrove Monitoring Programme which will assess mangrove condition in areas reliant on the hydrological design of the Project. FMG has also committed to funding further research into the impacts of dust deposition on mangrove condition, extending studies already completed in the harbour. Monitoring of mangrove fauna will be carried out if it is determined to be a successful indicator of rehabilitation success. A cumulative impact assessment on flora and fauna of the proposed Project in combination with the

HDMS Project has been carried out and is presented in Section 3.4.2 and Appendix 6.

8.1.3 Concern was raised regarding the 2 km wide corridor for the railway (Submission 7).

A: The railway will be located within the 2 km wide corridor which has been surveyed for environmental and heritage constraints. However the actual width of the construction corridor for the railway will only be approximately 40 m wide. The FMG railway has been located close to the BHPBIO and the HDMS railways to limit environmental and social impacts to areas adjacent to already disturbed areas. Combined with engineering surveys, this will allow the most appropriate alignment for the rail to be selected within this 2 km wide corridor. .

8.1.4 What type of site inspections and/or audits will be conducted during the construction of the railway? Is the EPA likely to be involved in these inspections/audits (Submission 3)?

A: As part of the Environmental Management System FMG will develop an audit schedule in compliance with ISO14001. All contractors and sub contractors working on FMG's facilities will be subject to audits. Audits will assess compliance with all licence and ministerial conditions, and all applicable legislation and commitments and FMG Standards. DoE, CALM and DoIR will be notified of the results of each audit through Annual Environmental Reports. Frequent site inspections will also be carried out by FMG personnel to ensure best practice environmental management within the Project areas and an internal reporting structure will be established.

Periodic compliance audits and reporting to DoE is expected to be a Ministerial condition applied to the Project. Inspections and auditing by the DoE personnel is also anticipated under Part V of the *Environmental Protection Act*.

8.1.5 Concern was expressed that the project will limit the potential for future growth in the port and add to the existing pollution problem. Is there an opportunity for a more integrated and co-operative approach within the mining industry (Submission 6)?

A: PHPA have developed a DRAFT Ultimate Development Plan addressing port development for all users. The FMG development has integrated its layout into this plan as shown in Figure 5 of the Stage A PER. An integral part of FMG's proposal is a policy of "open access" which will allow third party access to FMG's facilities, allowing the infrastructure to be fully utilised and encouraging a co-operative approach in the mining industry.

FMG believes that with sound environmental management, no significant pollution problems will result from the development of the Port facilities. A series of management plans will be developed, implemented and audited to address potential impacts. Other parties using FMG facilities will also be required to comply with FMG management plans.

8.2 IMPACT OF STAGE B PER ON THE STAGE A PER.

8.2.1 Several comments were made regarding the assessment of the Project in two stages and that for the Project to be adequately assessed, Stages A and B should be available for public comment concurrently (Submissions 9, 13, 16).

A: Whilst the Minister of Environment encouraged the two projects to be assessed concurrently where possible, she also recognised that there may be practical constraints in doing so. The Minister did not stipulate that the public comment periods for both projects must overlap.

Whilst the public comment period for the two projects does not overlap, both projects are undergoing various stages of the Environmental Impact Assessment process concurrently.

Although the two Stages are closely linked, their environmental impacts and geographical separation of the two projects are sufficiently distinct for them to be assessed in two stages (as supported by the Ministers approval for the Project to be separated into Stage A and B).

In order to ensure that the interrelationships between the two projects are clearly articulated and well understood, FMG has written a dedicated section on this topic in both the Stage A and Stage B PER's. This will ensure that during the public comment period for each PER, there is an opportunity for stakeholders to comment on the interrelationships between the projects, as has been demonstrated throughout this document.

8.3 DETAILED INFORMATION

8.3.1 Commitment 4 should be amended to reflect what plans will be incorporated in the EMP (Submission 15).

A: The Draft Construction EMP (see Appendix E of the Stage A PER) identifies management plans and management strategies to ensure the Project's environmental commitments and objectives are met. A similar EMP will be developed during operations.

FMG has also committed to the development of an Environmental Management System (EMS) prior to construction. The EMS (based on ISO14001) is a risk approach to environmental management. Management plans and procedures will be developed for any area of the Project which has been identified as having a moderate to high risk.

8.3.2 In many respects the PER does not provide the level of information necessary to make an informed assessment of the Project. Consequently external parties (and FMG itself) are unable to fully understand the range and extent of the Project, or to make an adequate assessment of the potential impacts of the FMG proposals (Submissions 4, 13).

A: As part of the approval process FMG has undertaken extensive environmental studies covering a wide range of issues. In addition FMG has investigated and incorporated where appropriate, information from studies undertaken in the area by third parties (provided this information was made publicly available). These studies have given FMG a comprehensive understanding of the existing environment and potential impacts within the Project area. In areas where additional information is required, FMG has committed to undertake further surveys prior to the commencement of construction. One such example is flora and vegetation surveys of borrow pits.

Prior to approving the PER to be released for public comment, the EPA Service Unit undertook a comprehensive review of the draft PER, to ensure it had adequate information available for agencies and other stakeholders to understand and make an assessment of the Project. The review, involved a wide range of branches and individuals within the Department of Environment (representing the various environmental specialty areas covered within the PER). In addition extra information subsequently requested by the DoE has been included in Sections 3 and 4 of this document. FMG considers that the PER combined with this document provides sufficient information for the EPA assessment.

8.3.3 A number of studies that are relevant to and should have been included in the PER are either ongoing or have yet to be undertaken. For example, marine sediments to be dredged at the port have not been tested for the potential to form acid sulphate soils.

In addition a significant number of the documents referred to in the PER are either incomplete or are yet to be prepared. These include:

- **Construction Environmental Management Plan (Appendix E) – draft**
- **Sustainability Strategy – to be prepared**
- **Environmental Management System – to be prepared**
- **Weed Hygiene and Management Plan – to be prepared**
- **Fire Management Plan – to be prepared**
- **Topsoil Management and Rehabilitation Plan – to be prepared**
- **Stygofauna Management Plan – to be prepared**
- **Construction Dust Management Plan – to be prepared**
- **Dust Management Plan – to be prepared**
- **Mangrove Monitoring and Rehabilitation Plan – to be prepared**
- **Dredging and Reclamation Management Plan – to be prepared**
- **Acid Sulphate Soil Management Plan – to be prepared**
- **Construction Noise Management Plan – to be prepared**
- **Noise Management Plan – to be prepared**
- **Cultural Heritage Management Plan – to be prepared (Submission 9).**

Geotechnical studies relating to the proposed rail corridor appear to either have not been undertaken to date or not provided in the PER. This is despite such an investigation being referred to in Section 6.7.2 of the Scoping Document in Appendix A (Submission 9).

A: It is common practice during the EIA Process that the proponent makes a series of commitments such as the plans indicated above, which must be completed in consultation with nominated advisory agencies, within specified timeframes. Proponent commitments will be included in Ministerial Conditions issued by the Minister for Environment. FMG is legally obliged to complete all commitments prior to the timeframes nominated. Each and every Environmental Management Plan listed in the Project commitments will have to be completed to the satisfaction of the DoE Audit Branch, in most cases before construction can commence.

The results of further studies requested of FMG by the EPA are included in Section 3 of this report. This includes the following studies:

- Benthic Primary Producing Habitats – Application of EPA Guidance Statement No. 29;
- Sediment Sampling Program;
- Acid Sulphate Soils Sampling Program; and
- Additional Cumulative Impact Assessments (Noise, Flora and Fauna, and Hydrology).

A preliminary geotechnical study was carried for the Project and was included as Appendix N of the Stage A PER. Further geotechnical investigations are currently underway, to further characterise sediments which will form foundations for the Port Facilities.

8.4 PROJECT DEVELOPMENT

8.4.1 The port should be shared with the HDMS Project and in fact on a sustainability argument the HDMS Project and the FMG one should be staged to extend the iron ore industry into the second half of the century. The impact on the environment will be too great putting two rail loops, unloaders and stockpiles in the Southwest Creek Anderson Point area. There is the impact on the vegetation, increased turbidity and issues of water flow and drainage in an area subject to cyclonic conditions (Submission 5).

A: A fundamental component of FMG's State Agreement Act is that FMG's rail and port facilities will be made available to other parties, with a policy of "open access". HDMS' proposed facilities are not large enough to support FMG's needs. FMG's proposed infrastructure is more likely to provide an opportunity for HDMS to use FMG's infrastructure than vice versa. All the studies commissioned by FMG on water management, turbidity, vegetation and marine impacts conclude that impacts will be manageable.

8.4.2 A dedicated shiploader for the conveying of all high impact product from the port should be constructed in the form of an outer harbour/offshore facility from Finucane Island north east to the existing shipping channel. This structure could be used by all producers; BHPBIO, FMG, and HDMS. Access to the shiploader could be via a services corridor parallel to and west of the existing HBI conveyor and Goldsworthy railway. The west end of Finucane Island could handle product surge requirements and transfer stations onto

the shiploader.

Costs should be shared by the stakeholders, working together for the common good, to develop a strategy for dust control which will help stimulate regional growth. A clean and healthy port is crucial to the long term sustainability of the region (Submission 6).

A: BHPBIO have exclusive control over Finucane Island export facilities. The two wharves at that location are currently fully utilised and there is not sufficient area at Finucane Island to accommodate the rail unloading facilities, stockpiling and shipping berths for BHPBIO, HDMS and FMG. HDMS have a lease on Harriet Point to construct 2 berths to accommodate their proposed 25 Mtpa, future expansion which would mean that these facilities would also be fully utilised, and the timing for the construction of the HDMS's facilities is not known at present.

FMG will have a lease over Anderson Point area and will be constructing one berth and a parking berth to be able to ship out 45 Mtpa, FMG has no plans to expand in the near future, however it is likely that expansions will be undertaken at some stage. FMG has had discussions with PHPA about sharing HDMS facilities at Harriet Point. It was concluded that sharing would be impracticable for both parties.

However, FMG supports a collaborative approach to management of dust and other issues that would benefit the town of Port Hedland.

8.4.3 Concern about the lack of details on any of the maps and plans on the proposed access causeway that is to support the load out conveyor and roadway from the stockyard to the Anderson Point ship loading facilities. Further details on this aspect of the Project would be beneficial to ensure that there is no negative impact on the tidal flushing of the mangrove areas and local drainage, in particular South West Creek and South Creek within the port development area. (Submissions 10, 11).

A: The causeway to support the load out conveyor and access road will be located in the area designated by the PHPA Planning Study as a transport corridor. As part of the Stage A PER, Aquaterra carried out a detailed hydrology study which investigated impacts on local drainage including South and Southwest Creek. As outlined in Section 7.3.1 of the Stage A PER (page 141 – 142), whilst the dredge spoil reclamation will block some minor mudflat channels, these channels are not considered significant and the flow areas available for surface water drainage in South West Creek and South Creek will essentially remain unaltered. That is the majority of water flow in flood events escapes to the harbour through South Creek and adjacent low lying mudflat areas (to the east of the dredge spoil area) as well as to the west of the Port Hedland – Shay Gap railway (through the bypass channel excavated by BHPBIO and adjacent sheetflow areas). As such, the existing surface water flood levels in these creeks will not be impacted by construction of the dredge spoil areas.

A proposed access causeway supporting the loadout conveyor and a roadway will be constructed from the stockyard area to the Anderson Point shiploading facilities. Culverts will be provided through the embankment to enable tidal flushing of the mangrove areas and local drainage. The construction of

this causeway will not have an impact on the existing flood levels in South West Creek or South Creek and will not impact on drainage from the port development area, as the majority of surface water escapes to the harbour over the low lying mudflat areas to the east of the dredge spoil area, and within/adjacent to South Creek. The portion of the conveyor into the harbour itself will be constructed on trestles which will not impede surface water flows.

In addition FMG has completed both a flood and storm surge study and investigated the impact of the Project on these aspects. In summary, the report findings showed that there would be no adverse effects on drainage within the port development area, South West Creek and South Creek, and no adverse impacts on tidal flushing of mangrove areas within the port development area.

8.4.4 The option of containing the stockpiles in sheds was examined, looking at the situation in Geraldton and Esperance. However with the sheer quantities being stored for this proposal, the footprint of the area would be significantly increased. This would have a substantial effect on the surrounding mangroves (effecting tidal flows and increased inundation) and would mean that a greater area would have to be cleared. Also this option would potentially compromise the usage of the facilities by third parties, which is a desired outcome for the facilities by the proponent. On the basis of increased footprint, potential detrimental effect on the mangroves, compromise in its usage by third parties and feasibility containing the iron ore in sheds is not an option for this particular site (Submissions 10, 11).

A: FMG agrees with this statement.

8.4.5 Would like clarification of the role of the primary screen house in the stockyard area and further explanation of the role of this component of the facility, in light of the commitment that all crushing and screening will be taking place at the mine site. Would like to gain an understanding of any potential for noise and dust generation from this facility (Submissions 10, 11).

A: Initial crushing and screening will occur at the mines, however the product in the rail car as delivered to the Port will be combined lump and fines and therefore the screenhouse at the Port is to separate lumps and fines. No crushing is required at the Port.

As stated in Section 7.3.8 of the Stage A PER (page 178), noise generated from the proposed FMG facilities at Port Hedland (including screen house, load out facilities and conveyors) under worst case meteorological conditions are predicted to:

- comply with noise regulations during day time;
- comply with the regulations during the evenings and Sundays/Public Holidays between 0700 to 1900 and;
- exceed the regulations by 4 dB during the night time period.

FMG will implement management measures leading to compliance with the Noise Regulations.

Noise minimisation measures will include partial enclosure of the loadout and ship conveyors at the port, state of the art low noise equipment will be used and notch speed restrictions near homesteads for the rail. All attempts will be made to reduce noise levels to an acceptable standard. . If it were found that overtime even with noise mitigation measures in place, compliance with the noise regulations is not possible, an exemption under regulation 17 would need to be sought.

Dust levels as a result of screening activities are expected to be low due to the high moisture content of the ore. Regardless of this FMG will undertake investigations to further reduce dust emissions and if required, will cover or enclose the screens and include dust extraction with a baghouse to reduce dust to acceptable levels.

8.4.6 Page 153 - the PER fails to adequately demonstrate how the principle of impact avoidance has been fully addressed. While FMG has described how some impacts of the proposal submitted for assessment by the EPA have been minimised, it has not provided environmental justification for the need to fill 200 ha of the environment more than appears necessary for operational purposes. Most discussion in Section 2.3.2 focuses on locational constraints, particularly for the proposed rail loop. Little attention is given to any alternative designs for the proposed reclamation which may have been considered up-front to avoid the need to impact areas (Submission 15).

A: A number of alternative port layouts were considered during initial port design as described in Section 2.3.2 of the Stage A PER (pages 11 and 12). This has been presented in further detail and the issue of impact avoidance is addressed in a report on port layout options by Townley & Associates Pty Ltd (2004) (Appendix 1). The report presents and compares alternative layouts considered by FMG, prior to submission of the PER, and outlines measures taken to reduce impacts on mangroves.

In order to decide between options a hierarchy of control was used – avoid, minimise, mitigate and manage. FMG took into account land access issues (including relationships with BHPBIO's rail line, the proposed Hope Downs rail line and plans of the Port Hedland Port Authority), engineering issues (including the design of rail lines and conveyors), requirements for dredging and filling, geotechnical issues, the distribution of mangrove systems, impacts to the environment as a whole and proximity to Wedgefield (issues of noise and dust).

The preferred option includes reclaimed land with a footprint designed to minimise potential impacts on the environment. Some impact is unavoidable, because of the need to manage dredge spoil effectively.

Dredging of 3.3 million m³ typically requires management of many times that volume of material, because of the entrainment of seawater during dredging. This is the primary reason for needing to disturb/reclaim approximately 300 ha of land. The 300 ha will be needed to ensure that dredge spoil settles and drains within the construction period.

To explain and support this need, FMG asked Baggerman Associates Pty Ltd, marine and dredging consultants, to explain the proposed dredging and filling operations, in the context of their experience.

Baggerman Associates have been working at Port Hedland since 1968. Their letter is included as Appendix 1. They argue that an area larger than 300 ha could be utilised if it were available, but that given the 300 ha, "a competent contractor with a well managed site will be able to undertake the works without undue impact on Port Hedland Harbour outside the footprint of the dredging works".

Upon completion of the dredging, the deposition areas will be drained and levelled. The finished surface will be seeded to reduce the potential for surface erosion from rainfall and dust generation. The perimeter bund will also contain internal stormwater runoff, which will be harvested and used for dust control. Excess surface runoff water will be treated via an oil separator and a sediment interceptor basin, prior to discharging to the environment.

8.4.7 It is understood that the iron content of the areas to be mined is considerably lower than is generally accepted to be iron "ore" quality and the question of whether the enterprise is economically viable was raised (Submission 14).

A: The iron content of FMG mines is of similar quality to ore currently beneficiated by BHPBIO and Rio Tinto. FMG is currently undertaking a bankable feasibility study which will be completed at the end of April 2005. Commencement of construction is dependant on a satisfactory feasibility study, however all indicators to date show that FMG's proposal is both economic and technically feasible. .

8.4.8 It is noted amongst other matters, that FMG has not yet completed a bankable feasibility study to determine whether this Project is economically or technically feasible (Submission 4).

A: FMG is currently undertaking a bankable feasibility study which will be completed at the end of April 2005. Commencement of construction is dependant on a satisfactory feasibility study, however all indicators to date show that FMG's proposal is both economic and technically feasible.

8.4.9 Believe that the cheapest option has been selected, ignoring the long term requirements of the Project, and also the environmental impact on a sensitive area that is already under enormous strain (Submission 6).

A: FMG has indicated that the rail and port infrastructure will be made available to third party access and such infrastructure will have an indefinite life. Therefore, during the design phase FMG has ensured that the projected life has been incorporated into the decision making process for the infrastructure. Section 2.3 of the Stage A PER (pages 8 and 9) describe how various alternatives were considered to minimise environmental impact, meet the long term needs of the Project and balance other constraints. In addition a report by Townley & Associates Pty Ltd, further detailing the evaluation of alternatives considered for the port area is attached as Appendix 1.

Section 7.1.1 of the Stage A PER (pages 105 – 107) outlines the principles of sustainability that have been adopted by the Project. Section 7 continues to detail how sustainability will be incorporated into the various aspects of the Project. Briefly as stated in the PER, FMG has designed the Project to maximise long term benefits to the community and meet the definition of sustainable development as

follows:

“Development which meets the needs of the present without compromising the ability of future generations to meet their own needs.” (World Commission on Environment and Development, 1987).

8.5 ENVIRONMENTAL MANAGEMENT

8.5.1 Appendix E Section 1.5 Environmental Accountabilities page E4 - This table fails to adequately identify how environmental accountability will operate on-site. Given the nature of the Project, there is a need to ensure that there is adequate on-ground environmental management/supervision, particularly during the construction phase (Submission 16).

A: FMG will establish an EMS consistent with the ISO14001 international standard. The implementation component of ISO14001 requires that “roles, responsibility and authorities shall be defined, documented and communicated”. These roles, responsibility and authorities will be clearly identified within EMP’s for both construction and operation. Particular emphasis will be given to the management of activities conducted by contractors.

8.5.2 Although the current Construction Phase EMP broadly covers the majority of environmental issues, the plan will require much finer detail prior to construction being undertaken. CALM, and specifically its Pilbara Region office, should be consulted by FMG during the development of the subsequent more detailed EMP (Submission 16).

A: The Construction Phase EMP presented as an Appendix to the PER is intended to be revised in consultation with key Decision Making Authorities (DMAs) such as CALM, to provide further detail on management of specific issues prior to commencement of construction. As stated in Section 1.7 of Appendix E of the Stage A PER the Construction Phase EMP will be supplemented with the following specific information prior to construction:

- More detailed issue specific management plans;
- Procedures and work instructions where required;
- Training and awareness documentation; and
- Monitoring and Inspection protocols.

8.6 SUSTAINABILITY

8.6.1 There is no comment on the impact on the landscape as a whole and this should be added and considered (Submission 5).

A: Construction of the Stage A Project will disturb approximately 3,100 ha during construction of the railway and 300 ha during construction of the port facility. The extent of the Stage A Project is largely due to the long distances required to transport iron ore from FMG's proposed iron ore mines approximately 350 km inland (which are currently being assessed separately as the 'Stage B Project'), for export through Port Hedland, which is the nearest port.

It is therefore unavoidable that there will be some noticeable impact on the landscape as a whole due to the size of the Project. However, FMG has aligned the proposed railway as close as practicable to the existing BHPBIO railway to minimise the cumulative effects of multiple railways on the landscape, and has proposed to develop its port facility adjacent to existing port developments. Measures outlined in the PER and these Response to Submissions to minimise vegetation clearing, minimise interruption to natural surface water flows where practicable, and control erosion will be implemented to reduce the impact on the landscape as a whole.

Areas not required during operations (approximately 1,800 ha) will be rehabilitated as close as practicable to pre-existing conditions. Successful rehabilitation of non-operational areas will be key to minimising the overall long-term effects on the landscape (see Section 7.2.7.2 and 7.3.10.2 of the Stage A PER (pages 140 – 141 and 190 – 191)).

8.6.2 The biodiversity of the Project area is recognised as an important value – especially through recognition as one of 15 national biodiversity hotspots (Submission 12).

A: FMG recognises the Pilbara as one of 15 national biodiversity hotspots and the importance of minimising the impact of the Project on the biodiversity values of the region.

FMG has conducted flora and fauna surveys to identify threatened flora and fauna species that occur (or could potentially occur) within the Project area, and habitats that are significant for biodiversity (e.g. the Fortescue Marsh). The location of significant fauna, flora or habitats of conservation significance will be considered where practicable in the selection of the final rail alignment, in consultation with CALM, to ensure that the Project does not adversely affect the biodiversity values of the region. FMG will also conduct additional surveys for borrow pits/access tracks in areas not adequately surveyed initially. These surveys will also be used to identify annual species that may have not been present during the initial surveys.

8.6.3 It does not appear that the Project meets any of the core objectives of the National Strategy for Ecologically Sustainable Development (NSED) e.g.

- **enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations (see comments 2.3.3). This Project seems to be all about getting in and shipping out as much ore now rather than working on a staged development with the appropriate amount of infrastructure.**
- **To provide for equity between generations. Future generations will have taken from them environmental and natural heritage assets for the short term gain of the current generation should this proposal proceed in its current form.**
- **To protect biological diversity and maintain essential ecological processes and life support systems. This Project will have detrimental and damaging impacts on the mangrove and marine area of the port as will the cumulative impact of a second and potentially a third railway crossing the Fortescue Marshes. The existing port and railway dates from the 1960's and our knowledge of the environment and expectations for environmental protection has increased greatly since that time. Therefore we should not be allowing the work at the port to proceed with all the detrimental impacts on the mangrove vegetation. The same can be said for the effect a second rail way crossing the Fortescue Marshes will have.**

The PER does not address the guiding principles of NSED. FMG appears to have dismissed as unnecessary any attempt to show how their Project meets NSED core objectives and guiding principles. The EPA should delay assessment of the Project until this is provided and circulated to stakeholders (Submission 5).

A: Whilst mining in itself is not sustainable as it involves extracting minerals and using fuel resource that will one day be depleted, FMG intends to design, construct, operate and decommission the Project in a way which meets the core objectives of the National Strategy for Ecologically Sustainable Development (ESD).

- “Enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations”:
Resource Projects are the main economic and employment generators in the Pilbara region. FMG will maintain a focus on regional capacity building in the Pilbara through offering local employment opportunities; implementing education and training programmes for a local workforce; using local suppliers and establishing partnerships with local businesses where commercially practicable; and offering a competitive open access regime for the use of its port and rail infrastructure to contribute to the long-term economic development and sustainability of the Pilbara region (refer to Section 7.1.6 of the Stage A PER (page 116) for further detail). The Project as a whole will see mining and export of iron ore over a generation. Further exploration may lead to an extension of FMG's known resource and thus an extension of the life of the Project.

- “To provide for equity between generations”:
Whilst it would be preferable that FMG be able to make use of existing infrastructure to avoid the potential environmental impacts of an additional railway and port facility for future generations, to date this has not been possible, and is not expected to occur in the near future. Therefore, FMG will need to construct its own infrastructure for the development of its iron ore resources, which will result in some unavoidable environmental impacts (such as clearing of land for construction of the facilities). However, FMG will make every effort to minimise the potential environmental and social impacts of the Project to ensure future generations are not disadvantaged by construction of the port and railway. This includes such measures as alignment of the proposed rail as close as practicable to BHPBIO’s existing railway and the HDMS proposed railway to minimise cumulative impacts of multiple railways; siting the Project in an area designated for port development and adjacent to existing port development, rather than impacting more pristine areas of coast; clearing only the minimum area required for construction of the Project; and using ‘best practice’ surface water management measures. FMG will make available their proposed railway and port facility for other users, so that resource development can continue in the Pilbara whilst minimising the impacts that additional infrastructure may cause. Future generations will receive social and economic benefits arising from the Project.
- “To protect biological diversity and maintain essential ecological processes and life support systems”:
As discussed above it is proposed to develop the Project in or adjacent to areas of existing disturbance, to protect more pristine undeveloped areas. FMG will ensure that clearing of land for the Project, and subsequent management of construction and operation of the Project will not adversely impact the biological diversity of any area within or adjacent to the Project area, by ensuring that ecological processes are maintained. It is acknowledged that expectations for environmental protection have greatly improved since the 1960s. FMG has undertaken initial surveys of flora, vegetation and fauna along the habitats to avoid areas of ecological significance where practicable. FMG recognises the importance of the Fortescue Marsh and have designed the rail crossing to minimise the impacts on this environment (refer to Section 5.5 of this document). Section 5.12 of this document details the proposed management of the Project’s impacts on the mangroves at Port Hedland.

8.6.4 The Pilbara is too special a region to be further spoiled by more mining and its associated infrastructure as this would adversely affect flora, fauna and landscape qualities (Submission 14).

A: FMG is committed to the principles of Sustainability and Biodiversity Conservation. While mining is not part of the Stage A Project, impacts of mining and how they will be minimised and managed will be addressed in the Stage B PER. As part of the Stage A PER detailed flora and fauna studies were conducted and all efforts were made to minimise impacts on the landscape and flora and fauna in the rail and port design. The north-south rail route has been aligned parallel the existing BHPBIO line to Mt Newman where possible, which localises any impacts to an area that has already been disturbed. FMG will rehabilitate all disturbed areas that are no longer required during operations

to a high standard. FMG believes that its activities can be conducted in a way that minimises impacts on the environment, but adds significant benefit to the community in terms of regional capacity building and contributing to the wealth of the State.

8.6.5 FMG makes the point that the "no project" option would result in loss of opportunity to Australia (page 12 (2.3.3)). The Submitter believes that this proposed development, has the potential to contribute to the destruction of a major state asset, for the sake of corporate profits. Port Hedland could become the equivalent of Fremantle in the north of the state, but not if the port is handed to the mining industry for their exclusive use. If the emergence of other industries in Port Hedland being given a chance of developing is an important consideration in FMG's overall planning philosophy (page 18 final paragraph), they will agree with this (Submission 6).

A: Resource development is one of the main industries in the Pilbara, and the port of Port Hedland is a major port that services industry in this region. Whilst FMG will initially make its port and rail facilities at Port Hedland available to developers of other mineral resource projects in the Pilbara, this does not mean that this precludes other industries from using FMG's infrastructure in the future. FMG intends to support regional capacity building through local business partnerships wherever possible.

8.7 PORT DEVELOPMENT

8.7.1 Concerns that Anderson Point is an unsatisfactory location for port development (Submissions 3, 5, 6) because the stratigraphy comprises of mobile sand, which rests on mangrove mud, suggesting that the terrain is dynamically unstable in the long term (Submission 3) and that a port at Anderson Point would exacerbate the existing pollution problems thereby increasing the constraints on development and regional growth being experienced in the area (Submission 6).

A: Preliminary geotechnical assessments of Anderson Point (Appendix N of Stage A PER) showed that most of the material is likely to be suitable for fill and hence can support Port Facilities at this location. Further geotechnical work is currently underway, with the objective of assessing the soil, rock and groundwater conditions within the significant foundation support zone. Approximately 23 geotechnical holes are currently being drilled as part of this study. The results of this investigation will form the basis for the determination of suitable construction methods to ensure the long term stability of the foundations for FMG's proposed facilities.

FMG considers it is more appropriate to develop a port facility in an area designated for port development and already modified by existing harbour activities, than to disturb a less impacted section of the coast for a new port development. Reasons for the choice of Anderson Point are also outlined in Appendix 1. FMG will co-operate with PHPA and other operators on Port Hedland harbour to collaboratively manage environmental issues such as pollution of the harbour.

8.7.2 All of the matters raised in the dot points on page 12 of the PER indicate that environment has had to be compromised because of the engineering and operational issues. It would be fair to say the port location is unsatisfactory from both an environmental and operational perspective (Submission 5).

A: The dot points listed in Section 2.3.2 of the Stage A PER (page 12) and the associated paragraph present the key environmental, engineering and operational factors that were considered during the design of the proposed Port layout. FMG does not believe that any of these factors can lead to the conclusion that the port location is unsatisfactory from environmental and operational perspectives. FMG has recently completed a study on alternative port layouts and this is summarised in Section 3.1 and included as Appendix 1.

Every decision related to the Project will need to strike a balance between potential environmental impacts, social impacts, economic constraints and engineering constraints. The dot points listed on page 12 of the PER specifically discuss engineering and economic constraints, whilst Section 7.3 of the Stage A PER considers environmental and social constraints of the Port development in more detail. FMG believes it is more appropriate to propose a port development in an area designated for such land use and work within the existing constraints presented by the environment, the nearby town of Port Hedland and adjacent industry, rather than propose a port development in an area which may have fewer overall constraints, but results in impacts on a more pristine environment.

8.7.3 The Submitter refers to the Fortescue Metals Group to the report “Port Hedland Mangrove Description and Assessment July 1994” by V & C Semeniuk Research Group and specifically the implications of any development at Anderson Point -

The report states “the stratigraphy of the Anderson Point area is not inherently conducive to developing a port facility. The system is underlain by mobile sand, which rests on mangrove mud, and has formed specifically as a storm deposit facing the entrance to Port Hedland harbour. The stratigraphic context suggests that the terrain is dynamically unstable in the long term.” It is believed that this report is extremely relevant to the Port Hedland harbour.

This is one of many reports which confirm the view that any Port expansion should be west of the Port. Any development at Anderson Point would not only be an extremely risky capital investment but would also destroy many hectares of mangroves including the surrounding wetlands. It is further believed that all previous studies undertaken, both by private industry and government agencies are being totally ignored by the State Government, at the expense of the surrounding environment (Submission 3).

A: An Initial Geotechnical Study of the area concerned was undertaken by Coffey Geosciences and is included in the Stage A PER, Appendix N. Whilst establishing the existence of sand and mangrove mud this preliminary study indicated it was practical to establish a port facility at this location. On the basis of recommendations of the preliminary study and the lack of any definitive geotechnical information for this area, FMG commissioned Coffey Geosciences to undertake a detailed

geotechnical investigation of this area as part of the definitive feasibility study for the Project. The detailed study involving boreholes, test pits, dynamic cone probing and shear testing will assess the soil, rock and groundwater conditions within the site. This work is currently underway and will form the basis for the determination of suitable construction methods to ensure the long term stability of the foundations for FMG's facilities. The detailed geotechnical study was commissioned specifically to assess the geotechnical characteristics at Anderson Point and is based on significantly more investigations and data than the Semeniuk report on Mangrove Description and Assessment.

FMG is making every attempt to reduce the impact on mangroves and the issue of impact avoidance is addressed in a report on port layout options by Townley & Associates Pty Ltd (2004) (Appendix 1). The port cannot be located at Boodarie Industrial Estate for reasons outlined in response 8.7.4.

8.7.4 It has been suggested that many impacts could be avoided or managed if the stockpiling and processing of ore prior to shipment could take place at or to the west of the Boodarie Industrial Estate (Submissions 3, 6, 10). This would be beneficial because the ground in this area is stable, storm water control would be more manageable and the disruption to mangrove ecosystems in the area of Anderson Point would not be an issue. The effects of dust and noise on Port Hedland and Wedgefield would be reduced (Submission 6).

A: There will be no downstream processing of ore at the Port Facilities, only screening to separate out lump and fines. All crushing and initial screening will take place at the mines, locating the port facilities at Boodarie Industrial Estate would present significant operational impracticability's due to the need for long conveyors in the order of 10 km.

As described by Townley and Associates in Appendix 1 the proposed conveyor is already considered long for ship loading. The difficulty is one of ship loading control. An operator loading and trimming a ship gives an instruction for gaps in loading to occur, i.e. the belt has empty sections equal to the time it takes to move hatches or trimming load to put into a particular hold. If for whatever reason a stoppage occurs, then problems arise; the longer the conveyor the larger the operational and safety issues. There are safety issues associated with longer conveyors, as well as issues involving cost, materials handling, noise and dust. The safety issues are due to the large volume of material on the conveyor at any one time, hence the conveyor can be more difficult to manage during an emergency. A longer conveyor carries more material, has more momentum and is more difficult to stop quickly in an emergency. If the conveyor were any longer, consideration would have to be given to storing the excess material on the conveyor in surge bins on the wharf. These surge bins would be large structures with significant visual impacts.

Locating the facilities on the Boodarie Industrial Estate does not meet zoning requirement for that area. The Boodarie Industrial Estate is currently zoned for downstream petroleum processing, power intensive industry and down stream iron ore processing. Long conveyors from the Boodarie Industrial Estate to the wharf would only add to ambient noise levels at Wedgefield.

8.7.5 By locating west of the Boodarie Industrial Area FMG would be contributing to a structure plan which would benefit all. FMG would avoid the cost of 3 creek crossings on South West Creek, and all the storm surge protection work required to make the Anderson Point site work. The ground west of Boodarie is above the storm surge level (Submission 6).

A: Refer to response 8.7.4.

FMG has completed a flood study overview which summarises studies completed by Worley (October 2004) on storm surge at Anderson Point and on the catchment flood hydrology of the South and South West Creeks and also a combined effect of both of these. This summary and the Worley Reports are included as Appendix 8. The study showed that the proposed FMG Port facilities at Anderson Point are highly unlikely to result in any increases in harbour storm surge. The only potential impacts identified in this study are small, localised increases in storm surge heights at the southern end of the rail offload loop where the rail line crosses over the Port Hedland – Shay Gap railway line and enters the harbour. These slight increases in storm surge are negligible and therefore insignificant as they are unlikely to result in impacts to BHPBIO or FMG rail embankments or any other infrastructure in the area.

The study did note that the western section of the rail loop could potentially constrict and divert flood waters in the South West Creek towards the west, along the long open corridor between the BHPBIO and FMG's rail line. To overcome this problem FMG has proposed to include a number of additional culverts or small bridge structures at South West Creek to mitigate this impact and allow flood waters to enter the harbour along the main creek line and natural flood lines.

The study also found that the floods along South and South West creeks are unlikely to result in any significant contribution to harbour storm surge mainly due to the difference in the timing between storm surge and flood peaks entering the harbour (see responses 5.6.6 and 5.7.2).

8.7.6 The Submitter does not believe that FMG's product is a port dependant industry. Obviously the shiploading side of their operation requires port access, but the stockpiling and processing of their ore prior to shipment could take place well to the west of the Boodarie Industrial Area, effectively minimising the effects of dust and noise on the Town and Wedgefield (Submission 6).

A: Refer to response 8.7.4.

8.7.7 At Hamersley Iron Channar minesite they use conveyors up to 20 km long to feed the ore to the rail head and crusher. At Alcoa in Pinjarra they convey material over similar distances FMG state that it is not commercially viable to transport ore from Boodarie Industrial Area to the shiploader by a conveyor. Why not (Submission 6)?

A: It is commercially viable to have long conveyors for transport of ore at mine sites. It is impractical to use long conveyors for port facilities especially ship loading (see response 8.7.4).

8.7.8 The zone demarked for the railway infrastructure cuts through the currently situated Cattle yards and potentially cuts through a significant proportion of the Boodarie Industrial Estate. It would be preferred that the rail alignment be placed outside of or close to as possible to the western edge of the industrial zone. Also there would be a need for compensation and re-siting of the current cattle yard facilities. There is a need for further details on the exact location and extent of the marshalling yard and maintenance facility, as there is a need to ensure that any associated land requirements includes consideration of the zoning of land north of the Great Northern Highway for industrial development. This land is zoned for future general industrial development and due to a shortage of suitable alternative sites, should be protected as much as possible (Submission 10).

A: FMG has aligned its rail line as close to the west of the Boodarie Industrial Estate as practicable with constraints imposed by the required curvature of rail line, the alignment of HDMS proposed marshalling yard and maintenance facility, and an at grade crossing of BHPBIO railway line. These constraints will need to be taken into account during the detailed design process

FMG has undertaken consultation with the Port Hedland Town Council who is the owner of the current cattle yard facilities and not averse to relocating elsewhere. FMG will continue to investigate alternatives to the resiting of these facilities.

The area is zoned for future general industrial development including supporting industries under which, the marshalling yards and maintenance facilities would be classified. This area is currently covered by the HDMS's State Agreement, and negotiations with HDMS and the State Government will be required to secure access to this area.

The precise location of the marshalling yard and maintenance facility will be determined during final design, in consultation with relevant stakeholders. At this stage it is proposed to locate FMG's marshalling yards on a strip of land through the middle and eastern section of the industrial zone between the North West Coastal Highway and BHPBIO railway line (refer to Figure 3). HDMS will occupy a similar corridor to the west (refer to the HDMS PER).

8.8 TEMPORARY AND PERMANENT FACILITIES

8.8.1 Need to ensure that borrow pits are opened and rehabilitated in a timely manner, in coordination with the progress of the development of the railway. Need to ensure the appropriate rehabilitation of any borrow pits used for the supply of fill material for the rail embankment (Submissions 10, 11).

A: Prior to establishing borrow pits, FMG will undertake a number of actions to minimise the amount of fill required to be sourced from external sources for the Project. Initially FMG will aim to balance the cut and fill requirements within the footprint of the railway. FMG will also aim to utilise local

existing quarries for fill. If such quarries are used, the rehabilitation of the area would be incorporated into the operation of the quarry and would not be the direct responsibility of FMG.

If FMG establishes borrow pits, they will be rehabilitated as soon as practicable. It is likely that the majority of borrow pits will be rehabilitated following the construction phase. A limited number of borrow pits may be required for maintenance of FMG's infrastructure throughout the life of the Project.

FMG has developed a Rehabilitation and Revegetation management plan. Within this management plan the rehabilitation and revegetation of borrow pits are detailed. A draft Borrow Pit Rehabilitation Procedure has been developed and is included as Appendix 10. The following are broad concepts that relate to the rehabilitation of borrow pits:

- As part of the PER process vegetation and flora surveys have been undertaken along the Project area. FMG is therefore aware of the types of vegetation that will be disturbed.
- If borrow pits are located in areas which have not been adequately surveyed, additional surveys will be conducted.
- Vegetation will be cleared and stockpiled to the side of the borrow pit area.
- Topsoil will be stripped and stockpiled. Measures will be implemented to ensure the seed source in the stockpile is maximised. This will include:
 - Topsoil stockpiled at a height less than 2 m;
 - Topsoil stockpiling for less than 2 years.
- The borrow pit will be designed to be self-draining where practicable. The slope of the borrow pit walls will be minimised to reduce the potential for water erosion and will be less than 20°.
- As soon as the borrow pit has been utilised the base of the pit will be deep ripped. The topsoil that was stripped will be placed over the borrow pit. Where practicable the cleared vegetation will be spread across the borrow pit.
- Propagation will rely initially on the seed bank within the topsoil. The borrow pit will be monitored to determine the success of revegetation. If revegetation is shown to be insufficient through existing seed sources direct seeding will be utilised. The seeds used in the programme will be collected from local sources.

8.8.2 No details are given in relation to ancillary and or temporary facilities such as borrow pits and construction camps, which are likely to have significant environmental impacts (Submission 13).

A: A stated in Section 4.2.6 of the PER (page 25), the siting of temporary and ancillary facilities will take into consideration the location of:

- significant flora populations and or vegetation communities;
- significant fauna habitats or threatened flora populations;
- sites of Aboriginal significance;

- proximity to water supplies;
- topographic constraints and potential impacts on the surface hydrology of the site; and
- areas prone to flooding.

FMG will endeavour to preferentially locate all temporary facilities within previously disturbed areas to limit the amount of clearing. Final locations of temporary facilities will be finalised in consultation with CALM.

Impacts associated with temporary facilities will be managed by the Construction Environmental Management Plan.

8.8.3 The location of permanent facilities along the route of the rail line has not been described in the PER. These permanent facilities may include rail maintenance camps, quarries, repeater stations and access roads (Submission 13).

A: FMG is currently going through the detailed design phase for the rail line. During this period the location for the facilities along the rail will be selected. The location of these facilities will consider environmental, cultural and engineering constraints and will be assessed by the DoE and DoIR through the Notice of Intent and Works Approval Process as appropriate.

FMG has developed a Construction Environmental Management Plan. This Management Plan will be finalised prior to the commencement of activities. At this time the location of the permanent facilities will have been finalised. Actions will be detailed within this plan to ensure risks to the environment associated with the permanent rail facilities are minimised. Associated with the Construction Environmental Management Plan will be an auditing function to ensure the plan has been adequately implemented. Refer also to response 8.8.2.

8.8.4 Any quarry sites that FMG require for ballast during railway construction should be assessed as part of this PER as they are integral to the construction aspects of the Project. This is currently not part of the process as the quarry sites have not yet been identified and, as stated, these sites may be managed by a third party who will be responsible for obtaining environmental approvals. This staged approach to the approval process is unsatisfactory in determining the environmental acceptability of this Project as all the information is not presented and addressed in parallel (Submission 16).

A: FMG has committed to ensuring that ballast and quarry sites not provided by a third party will be managed by FMG in consultation with CALM. Biological surveys will be conducted on these facilities to ensure that species and vegetation of conservation significance are avoided. If construction materials such as ballast and rip rap are sourced from a third party, then the approval process will be conducted separately to FMG's Stage A and B proposals. FMG is committed to ensuring that all aspects of its Project are carried out in an environmentally responsible manner.

8.8.5 The proponent statement for borrow pits to be left as free draining structures is insufficient. Previous failed attempts at “free draining” borrow pits in the Pilbara have yielded poor results, as the ripping is not normally deep enough, or saltation has occurred and a hard pan developed on the floor of the pit which has prevented water infiltration. Subsequently ponding has occurred and any vegetation that that has re-established has been killed through water logging, and thus a self-perpetuating vegetation community has rarely been attained. (Submission 16)

A: FMG will adopt best practice environmental management to rehabilitate borrow pits used in the Project. This will include incorporating any previous experience of borrow pit rehabilitation within the Pilbara. The final rehabilitation technique that is adopted will be case specific for each borrow pit. Where practicable FMG will aim to minimise the 'bowl' effect within the borrow pits by preferentially excavating shallower borrow pits while aiming to minimise the footprint area of the pit.

Depth and footprint of borrow pits will be balanced with one another for the best environmental outcome. In addition, wherever practicable, oversized screened material excavated from an embankment prior to culvert construction will be returned to and spread onto the base of the borrow pits after the bases have been ripped. Surface water will be diverted around the pits to minimise the potential for water to pond within the borrow pits.

FMG has developed a draft Borrow Pit Rehabilitation Procedure, which is contained within its Rehabilitation and Revegetation Management Plan. Rehabilitation outlined in this procedure includes tapering borrow pit batters to shallow angles and respreading vegetation into the borrow pits (to reduce batter erosion and promote revegetation). Completion criteria that are developed in consultation with relevant stakeholders and included within the Rehabilitation and Revegetation Management Plan will be applicable to all borrow pit rehabilitation. FMG will monitor the success of rehabilitation of the borrow pits and implement corrective actions if necessary. This draft procedure is attached as Appendix 10.

8.8.6 In instances where there is excess material extracted from the rail corridor, due to it being unsuitable for use in the rail formation, this material should be either disposed of in an exhausted borrow pit or dumped in abandoned BHPBIO borrow pits. Preferably the receiving borrow pit for such material would be the same type of habitat as the original, thereby facilitating rehabilitation and the development of a self sustaining community. Where this is not possible and the material is deposited in a borrow pit of different habitat type material should be buried or covered thereby eliminating problematic rehabilitation (Submission 16).

A: Initially FMG will aim to balance the cut and fill requirements within the footprint of the railway. However, if there is additional material, FMG will use abandoned borrow pits where practicable to dispose of excess material extracted from the rail corridor in the manner mentioned above. Use of BHPBIO borrow pits will depend on whether BHPBIO grants permission for their use. Details of disposal for excess materials will be agreed in consultation with CALM.

8.9 TENURE

8.9.1 Sections 3.1.2 and 3.1.3 detail the key decision making authorities and approvals process in relation to the Project. From the information provided it would appear that there is currently no tenure for the Project but that a number of possible scenarios exist. For example, Section 3.1.3 states that “Parts of the Project may be constructed on tenure granted under the *Mining Act 1978*”. Similarly Section 3.1.4.2 states that “Discussions with Port Hedland Port Authority to date indicate that it intends to offer an option to FMG to develop Anderson Point”. Such statements do not assist in the PER process (Submission 9).

A: FMG has recently finalised a State Agreement Act for the port and rail facilities covered by the Stage A PER, and is still in negotiations for a separate State Agreement Act for the mining operations. Leasing arrangements for the facilities at Anderson Point are currently being negotiated with PHPA. Tenure will be secured by the time FMG is required to submit a Notice of Intent is ready for approval by DoIR.

8.9.2 FMG is pursuing a State Agreement Act, though due to timing they may need to apply for tenure under the Mining Act – uncertainty how this will affect the Town of Port Hedland in terms of its ability to access royalties and the funding of public services (Submission 10).

A: FMG has recently finalised a State Agreement for the port and rail facilities, and is still in negotiations for a separate State Agreement for the mining operations. Consultation with State and Local Governments regarding the content of the State Agreements has been undertaken prior to its approval. FMG’s State Agreement contains a section called Community Development which is dedicated to local content. It includes training and guaranteed employment for indigenous and non-indigenous persons living in the Pilbara region of the state, regional development and local procurement of goods and services, contribution to community services and facilities and a regional based workforce. FMG has not sought an exemption for Local Government Rates as part of the State Agreements.

8.9.3 The PER refers to a proposal for a port and railway, the exact location of which is not known and for which it would appear the proponent currently has no tenure (Submission 9).

A: Refer to response 8.9.1. The location of the port and railway is documented throughout the Stage A PER. During detailed design refinements will be made to minimise environmental impacts.

8.9.4 The railway is located mostly on land zoned “rural” by TPS No. 5 or subject to a proposed interim development order prior to incorporation of the scheme. It would be preferred that the proposed railway corridor be protected by a scheme reservation for “other purposes – infrastructure consistent with existing rail and infrastructure

corridors” (Submission 10).

A: FMG accepts the proposal that the railway corridor should be protected by a scheme reservation for “other purposes – infrastructure consistent with existing rail and infrastructure corridors” and support it being included in the next review of the railway for Port Hedland.

8.9.5 Recent media reports indicate that the WA State Government has finalised a State Agreement Act for the Project. However, no details of such an agreement, the area it covers or any validating tenure are provided in the PER. Accordingly it is difficult to assess the impact of the proposal as it is not known what rights are to be afforded to the proponent and over what areas of land and water (Submission 9).

A: Refer to response 8.9.1. At the time the PER was printed, confirmation of a State Agreement for the Project had not been given. Sections 1.5.2 and 3.1.2 of the Stage A (pages 5 – 15) outlines FMG’s position with regards to the State Agreement at the time of printing.

8.9.6 Section 1.5.2 of the PER identifies the gaining of environmental approvals and appropriate tenure as “constraints to the Project timing”. In our view the proponent should be required to clarify this statement as it suggests it views the gaining of the legal authorities to operate the Project as an impediment (Submission 9).

A: FMG will finalise all Environmental Approvals and gain appropriate tenure prior to construction of the Project commencing. This process however involves extensive consultation with the local community, regulators and other interested parties which takes time and can result in delays in projected Project timings if key stakeholders require an extended period of consultation. For this reason, FMG has commenced the Environmental Approvals Process early in the Project planning stage.

FMG is pursuing two State Agreements, one for the rail and port facilities and one for the mining operations. This process is also a lengthy one. The State Agreement for the port and rail authorities has recently been finalised by the WA State Government and the State Agreement for the mining operations is still in the negotiation process.

8.10 RAIL ALIGNMENT

8.10.1 Within the documentation provided it is outlined that the railway corridor would have a 2 km buffer, though it has yet to be gained from FMG whether this would be an actual buffer or whether it is to allow for finalisation of the actual alignment. There were concerns expressed that if this is were to be an actual buffer this would have negative ramifications on the area around the South Hedland Rural Estate and zoned “Industrial Land” north of the Great Northern Highway (Submission 10).

A: The 2 km rail corridor is not intended strictly as a buffer which restricts adjacent development, rather it is to allow FMG to finalise the alignment once environmental, heritage and engineering constraints have been taken into account. The actual width of the railway during construction would only be approximately 40 m wide along the most suitable alignment within the 2 km surveyed corridor.

8.10.2 FMG previously advised our association that BHPBIO Iron Ore denied access to FMG for use of the current railway line. During a meeting with Coakes Consulting (BHPBIO consultants) and this Association on the 4th November, 2004, a BHPBIO representative who was present, but uninvited, was questioned as to why this access was denied. The representative stated quite clearly that access was offered to FMG by BHPBIO but FMG would not pay the price offered (Submission 3).

A: FMG wish to state, that BHPBIO had never offered FMG access to its rail infrastructure. In addition, there has never been any advice to FMG, written or oral, from BHPBIO concerning possible rates which might be charged to prospective third party users of BHPBIO's rail infrastructure.

8.10.3 HDMS has advised the State Government and several third parties that on request, HDMS' intended railway from the Central Pilbara to Port Hedland harbour would be available to third parties requiring haulage of iron ore, where that requirement does not unduly prejudice or interfere with its own operations. HDMS is prepared to discuss such requirements when the Projects of such parties have progressed to the point that they could enter a binding contract for such haulage. HDMS is not however prepared to consider entering into any arrangements whereby the progress of its own Project becomes contingent on the actions of or arrangements necessary to such a third party (Submission 4).

A: The development of HDMS Railway is not expected to occur within a timeframe which would be compatible with the development of FMG's Pilbara Iron Ore mines. In order to secure finance FMG must gain its own approvals for infrastructure in the event that HDMS facilities are not constructed or access to FMG is denied. Open access is a fundamental part of FMG's State Agreement and FMG is willing at any time to discuss third party access to its rail facilities.

8.10.4 The proposed location of the FMG rail loop in Port Hedland south of HDMS' proposed stockyards overlays FNA 1545. This may compromise HDMS' ability to implement its proposal and meet commitments specified in Ministerial Statement 611. FMG's proposed rail loop will prevent HDMS from using that area for extension of product stockpiles, extraction of fill material and storage of dredged material (Submission 4).

A: FMG is aware of HDMS proposals and commitments in Ministerial Statement 611 in relation to discharging of dredging and protection of mangrove communities. FMG is also aware that borrow pit (A) has been earmarked for dredge spoil management. FMG believes that greater community and environmental benefits could be achieved with a cooperative approach with HDMS to rationalising land use. The approach of sharing limited land resource areas within the Port Hedland precinct is

closely in line with the overall and long term plans of PHPA.

In its letter to HDMS dated 30 August 2004 (see PER Appendix D), FMG committed to compensate HDMS should any additional costs be incurred for the sourcing of suitable borrow material from other locations, (should FMG's construction process be ahead of HDMS). FMG would also agree to commit to the inner loop being used for the settling of dredge spoil from HDMS operations at Harriet Point, in order to rationalise activities within a limited space and to reject overall impact.

8.10.5 Figure 5 of the PER also does not show FNA 5145, although it is shown (at a much larger scale) in Figure 3a. This may result in some confusion by the reader (Submission 4).

A: The original figure over which FMG's and HDMS' proposed infrastructure has been overlain was from the Port Planning Study Phase 2 Report (August 2003) for Port Hedland which did not show FNA 5145. Refer to Figure 3 (attached) which shows the HDMS FNA in relation to FMG's proposed rail layout at Port Hedland. FMG has recently completed an "Evaluation of Port Layout Alternatives" (Appendix 1) and the HDMS FNA 5145 is displayed on Figure 7 in this document along with an explanation of the relationship between FMG layouts and PHPA planning areas.

8.10.6 HDMS require the specific location of the FMG line within FNA 5145 (Submission 4).

A: FMG has provided information about its proposed rail loop as requested by HDMS and is willing to discuss and co-operate with HDMS to achieve more beneficial use of land in the port area (refer to letter to HDMS in Appendix D of the PER). Also refer to response 8.10.4 and 8.10.5.

8.10.7 The area of FNA 5145 falling within the PHPA lease, which is designated for the HDMS Project by the Iron Ore (HDMS) Agreement (1992) as amended on 22 October 2003, is currently the subject of discussions to finalise a lease to be issued to HDMS by the Port Hedland Port Authority (PHPA). In the FMG PER, Figure 5 shows a large rail loop overlapping this area and use of this land is referred to in the letter from Alan Watling to Russell Tipper, dated 30th August 2004 and contained in Appendix D. Use of this land by FMG has been discussed with HDMS and HDMS has advised that it is not acceptable (Submission 4).

A: FMG is aware that part of HDMS's proposed rail loop overlaps FNA 5145. Previous correspondence from HDMS requested further details of the rail loop, which was provided by FMG. Since this time no correspondence has been received, either verbal or written stating that the proposal to locate the rail loop within part of FNA5145 is unacceptable. Optimisation of facilities, reduction of environmental impacts and land use could be achieved by both parties if a mutually beneficial agreement were to be reached. FMG remains willing to discuss this issue with HDMS and PHPA.

8.10.8 HDMS would query the necessity for such a large loop, as to the best of its knowledge, all other proposed developments on the western side of the harbour propose the splitting of trains in remote marshalling yards to minimise the impact on and optimising the usage of the limited available harbour land (Submission 4).

A: FMG understands the need to optimise land in the port area. This partly explains the proposal to construct a rail loop that utilises the area of South West Creek, rather than in PHPA's areas A and B, that would be more suitable for other facilities. FMG has proposed a rail loop large enough to allow efficient materials handling at the desired rate of annual throughput, and avoiding splitting of trains and shunting, which would be a significant source of noise to the residents of Wedgefield. The specifications for the rail loop are discussed in Appendix 1.

8.10.9 The location of FMG's proposed railway relative to HDMS' proposed rail marshalling yards may unduly impede the HDMS operations (Submission 4). FMG needs to take into account the zoning of the land north of the Great Northern Highway for "Industrial Development" which should be preserved for future general industrial development and due to a shortage of suitable alternative sites (Submission 10).

A: The arrangement of the facilities of the marshalling yards is such that FMG's rail marshalling yards are to the east of FMG's main line, whereas HDMS is located to the west. As the tracks are separated in the area between BHPBIO railway and the North West Coastal Highway it should not unduly impede HDMS operations. Figure 3 shows the proposed location of FMG marshalling yards. FMG remains willing to exchange detailed information of rail and related infrastructure layouts with HDMS to come to a mutually beneficial outcome.

Land will be available either side (but mainly to the east), of the area proposed for industrial development. It is anticipated that any future industrial development in the area would not be incompatible with the proposed rail operations.

8.10.10 The proposed FMG line must cross the HDMS railway through the middle of its marshalling yard. This area will be frequently used and a crossing in this area would be impracticable from an operational perspective. This matter requires resolution, or at least clarification, as it is not shown in the PER how this crossing is to be achieved. An alternate resolution not involving the HDMS marshalling yard would be required, especially from a rail safety and operational viewpoint (Submission 4).

A: As part of the FMG hydrology investigations it was found that the proposed alignment parallel to HDMS railway near White Hills would adversely affect on flood waters to South Creek and hence possible flooding of South Hedland and Wedgefield. FMG therefore realigned its proposed rail corridor to avoid increasing the flood risk in these areas.

The arrangement of the facilities of the marshalling yards is such that FMG's rail marshalling yards will be to the east of FMG's main line, whereas HDMS marshalling yards will be located to the west of the main line. As the tracks are separated in the area between BHPBIO railway and the North West Coastal Highway it should not unduly impede HDMS operations. FMG remains willing to exchange detailed information of rail and related infrastructure layouts with HDMS to come to a mutually beneficial outcome.

DoIR and PHPA have recently commissioned Worley Parsons to investigate options for rail access into the western berths of the Port of Port Hedland (i.e. BHPBIO, HDMS and FMG railways).

8.10.11 Is there an opportunity to adopt the HDMS rail corridor for the FMG Project CALM believes that the HDMS alignment is environmentally superior (Submission 16).

A: The Proponent believes that there is no sound basis for the statement that the HDMS corridor is environmentally superior and in several areas FMG believes that there is strong evidence that the FMG corridor is superior. For example:

- As described in Section 2.3.1 of the Stage A PER (pages 9 – 11), just south of South Hedland (in the White Hills Area) FMG's proposed railway was realigned to move away from the HDMS alignment, to cross the South West Creek and continue up the western side of the Great Northern Hwy, before the existing road bridge, due to concerns that the original alignment further east (next to HDMS alignment) would increase the risk of flooding in South Hedland, by effectively damming the flood plain between South Creek and South West Creek.
- Also in Section 2.3.1 of the Stage A PER (pages 9 – 11), originally an alignment adjacent to the HDMS corridor was selected through the Yandeyarra Aboriginal Reserve. However initial discussions with key stakeholders indicated that excision of a portion of the reserve by a rail corridor would not be acceptable, and as a result of this an alignment was selected outside of the reserve.
- Also referenced in Section 2.3.1 of the Stage A PER, (pages 9 – 11) the initial conceptual alignment for FMG's corridor through the Chichester Ranges was immediately east of the proposed HDMS railway. However, a number of significant Aboriginal heritage sites were present in this area (requiring realignment of the corridor by up to 7 km to the east).
- In the port area, FMG's rail has been aligned to minimise impact on mangroves. FMG's port and rail layout requires the clearing of only 14.8 ha of mangroves, however the HDMS port and rail layout will result in the clearing of 89 ha of mangroves.

Although it is FMG's belief that ore from the HDMS Project will be transported on the FMG infrastructure, this relationship has not been finalised. Therefore, it is possible that the HDMS rail may proceed, based on a commercial decision by HDMS. HDMS has a right to build a railway down its corridor and that right is protected under its State Agreement. As HDMS has not finalised how the ore from its operations will be transported, it is unwilling to allow FMG to build its railway in its allocated corridor as this would eliminate this option for them. The State Agreement effectively protects HDMS from having to give up the corridor and the State Government is not able to force them to do so.

Based on the above constraint, during the alignment of the Stage A corridor FMG considered the hierarchy of control, with avoidance of environmental impact being the highest priority, followed by

minimising and mitigating impacts. During the investigation into the rail alignment, one of the primary objectives was to optimise its proximity to the existing BHPBIO and proposed HDMS rail corridor (including non-substantial changes to the HDMS alignment in the Chichester Range) to minimise impact on the environment and the community, while simultaneously optimising operating benefits. In the Stage A PER, FMG has considered all of the environmental impacts of its proposed alignment and outlined strategies to ensure they are managed to an acceptable standard.

8.10.12 FMG has committed to fence the railway after construction in consultation/agreement with the landholder. Given the conservation values of the Fortescue Marsh and the future inclusion of this area in a conservation reserve, CALM recommends that the proponent fence this part of the alignment. Fencing would be required only on the eastern side of the alignment as the BHPBIO rail is on the western side. At present the BHPBIO rail is fenced on both sides through the Marsh (Submission 16).

A: Consultation with landholders, CALM and other relevant parties will be carried out to determine fencing needs for the railway, including the proposed alignment through the Marsh.

8.10.13 The proponent commits to keeping the proposed corridor width to “generally less than 40 m”. This commitment is too vague and unsatisfactory. In order to keep clearing to a minimum, FMG should commit to strict environmental controls to contain any clearing to a defined area (Submission 16).

A: FMG has committed to stringent environmental controls during both the construction and operational phases. A draft Construction Environmental Management Plan has been developed and will be reviewed prior to the commencement of activities. All clearing boundaries will be clearly marked on figures and in the field as described in Section 7.2.3 of the Stage A PER (page 130). Any additional clearing that is required outside these defined boundaries will require a clearing permit. The clearing permit is an internal process to ensure all environmental aspects are considered.

Given the length of the railway, 345 km, it is not possible to state that the entire construction corridor will be less than 40 m. The final width of the construction corridor will be based on local topography and associated earthworks. For example, in an area that requires a cut it may not be possible, from a safety aspect, to keep the corridor less than 40 m. In areas where the construction corridor exceeds the required width of the operational corridor, FMG has committed to rehabilitating and revegetating this area. Appropriate completion criteria for these areas will be developed through consultation with relevant stakeholders. However in other areas of flat topography it is likely that the corridor disturbed will be less than 40 m wide. Therefore on average the corridor width will be 40 m.

8.10.14 Section 2.3.1 Railway page 9 - Although the proposed FMG corridor parallels the proposed HDMS corridor, and the document makes continual reference to the studies completed for this alignment, there appears to have been no attempt to ground-truth some of the data from previous studies (Submission 16).

A: FMG makes reference to directly relevant studies such as flora and fauna surveys completed for the HDMS mine rail and port developments as these sites are in close proximity to the FMG's port and corridor. In places where the HDMS and FMG development areas overlap, the data arising from the earlier surveys is of direct relevance to FMG's assessment. The data and information have therefore been used as principal references both for local context and to provide for a better assessment of impacts in areas where the Project footprints overlap.

Ground truthing has been carried out including areas which overlap with the proposed HDMS development areas - refer to Appendix I (Fauna Survey) and Appendix H (Flora and Vegetation Survey). Given that biological surveys are based on representative sampling only, there will always be part of the Project which have not been completely ground truthed. It is FMG's intention to carry out further surveys for material sourcing areas such as borrow pits.

8.10.15 A number of questions were raised regarding the power supply to the rail line. These included:

- **How will power and communications be distributed along the rail corridor?**
- **When considering the power requirements for the rail (such as for signals) has solar power been considered?**
- **If power transmission lines are used within the vicinity of the Fortescue marsh will they be buried or equipped with deflectors to prevent collisions of water birds? (Submission 16).**

A: Communications will be via satellite, mobile telephone and radio transmitter – therefore communications will not require transmission lines. Power for the north-south rail line will only be required for signalling and at the permanent rail camp. FMG will consider solar power as the primary power source for signalling and power at the permanent rail camp will be supplied by diesel generators. Transmission lines in the vicinity of the Fortescue Marsh are not required for the Stage A Project but they will be considered in the Stage B Project.

8.10.16 The FMG Chichester Range alignment as it currently stands cannot be properly assessed or justified without the concurrent assessment of the two Projects given that the consultation between CALM and the proponent for an environmentally acceptable rail alignment for Stage B are still continuing. Accordingly, the final corridor alignment of Stage A is to an extent contingent on the outcomes of these negotiations and EPA assessment of Stage B (Submission 16).

A: The rail crossing of the Chichester Range was considered during the preparation of Stage A and CALM has been consulted on this alignment for a period of approximately 12 months. The alignment was selected to follow the BHPBIO and the proposed HDMS corridor as closely as possible. The current alignment is considered the most appropriate when considering environmental, engineering and cultural constraints. After consultation with the traditional owners, the alignment through the Chichesters was moved eastward of the HDMS alignment, to avoid a number of Cultural Heritage sites that had been encountered in the HDMS corridor.

All of the consultation that has been undertaken with CALM regarding the alternate rail alignments for Stage B have been assessed based on the proposed Stage A alignment proceeding. That is, the seven rail alternatives being considered for Stage B in consultation with CALM do not result in any change to the Stage A alignment. It is therefore not anticipated that any of the alternatives considered within Stage B will significantly impact on the Stage A alignment and therefore there is not a need for the two Projects to be assessed by the EPA or CALM concurrently. Despite this, whilst the public comment period for the two Projects does not overlap, both Projects are undergoing various stages of the Environmental Impact Assessment process concurrently.

8.10.17 Because the necessary surveys and studies have yet to be completed the final location of the mine has yet to be determined (meaning that the end-point of rail line cannot be determined). The remainder of the route of the rail line is only defined within a 2 km corridor and the design of the port has yet to be finalised. It is requested that external parties again be given the opportunity to make submissions on the revised Project details or on any material issues identified as the outstanding reports are finalised (Submission 13).

A: While mining is not part of the Stage A Project, impacts of mining and how they will be minimised and managed will be outlined in the Stage B PER, which was publicly released on the 17 January 2005.

The 2 km corridor will enable FMG to select the final alignment based on environmental, heritage and engineering constraints. The final port layout and rail alignment will be finalised in consultation with all relevant parties. Consultation regarding the Project as a whole will be ongoing throughout the life of the Project.

8.10.18 The State Government should insist that the construction of any rail line must be done in a cooperative manner, and that BHPBIO make their rail corridor available for this purpose (Submission 5). Is it possible to include the duplication of the FMG rail within the existing BHPBIO corridor (Submission 3)?

A: BHPBIO has an existing State Agreement covering its railway and associated corridor. The purpose of a State Agreement is to give the developers of Projects a degree of certainty about the conditions under which they will operate. State Governments do not generally change the terms of State Agreements, once signed, unless by mutual agreement. This is because unilateral changes by Government would result in future Projects being discouraged because of the uncertainty thereby engendered (increasing the risk known as “sovereign risk”). Thus the State Government effectively does not have the ability to force BHPBIO to share its corridor, since that power is not contained within BHPBIO’s existing relevant State Agreement.

For example, despite Hope Down’s prolonged attempts to get access to BHPBIO’s railway, including several court cases, they have still not obtained access to the railway. FMG’s railway will be open to third parties and that access will be enforced by a regulator. FMG has applied to the National

Competition Council to declare the BHPBIO railway available to other users, which if successful would result in a Federal regulator enforcing access terms, if BHPBIO continues to deny such access. However this process is likely to take several years and a positive outcome is not certain. FMG will still need to construct its railway to meet Project deadlines. It is hoped that a third railway could be avoided if HDMS were to use the FMG railway.

Given the above constraint, during the investigation into the rail alignment one of FMG's primary objectives was to optimise its proximity to the existing BHPBIO and proposed HDMS rail corridor (including non-substantial changes to the HDMS alignment in the Chichester Range) to minimise impact on the environment and the community, while simultaneously optimising operating benefits.

8.11 RAILWAY CROSSINGS, SIGNALS AND SIGNAGE

8.11.1 Concern was expressed about the cumulative effects on traffic on the great Northern Highway and associated safety concerns, by the location of the FMG crossing 1.4 km to the west of the proposed HDMS crossing (Submission 4).

A: It is acknowledged there will be some degree of cumulative impact to traffic due to level crossings if three proposed rail lines are constructed.

As part of FMG hydrology investigations it was found that the proposed alignment parallel to the proposed HDMS railway near White Hills would have an adverse effect on flood waters to South Creek and hence result in possible flooding of South Hedland and Wedgefield. FMG therefore realigned its proposed corridor to reduce the risk of flooding in these areas (refer to response 8.10.10 and 8.10.11). This is the reason for crossing FMG crossing 1.4 km to the west of the proposed HDMS crossing. FMG believes that the location of its crossing is environmentally superior.

FMG's rail is expected to be constructed and made available prior to the HDMS rail line being constructed. FMG proposes to make its railway available to third parties such as HDMS at commercially competitive rates. It is considered unlikely that two additional rail lines will be constructed in addition to the existing BHPBIO rail line. Despite this even if three railways were constructed it is unlikely that cumulative impacts to traffic from level crossings will be unacceptable, and FMG commits to consulting with Main Roads on an ongoing basis so that any issues are satisfactorily managed.

8.11.2 The locations of proposed crossings of the current HDMS railway centreline by the proposed FMG railway are not specified and not described in the PER. This information must be provided by FMG. HDMS would expect these to be grade-separated crossings at a height and horizontal clearance similar to other such crossings existing or proposed in the Pilbara (Submission 4).

A: Refer to Figure 4 of the Stage A PER – the proposed original alignment indicates an at grade crossing with approximately 800 m of common track, just prior to the North West Coastal Highway.

A similar at grade crossing is proposed on FMG's new alignment (although not shown on Figure 4).

8.11.3 Construction of a grade separated crossing of the Goldsworthy rail line, which is in close proximity to Port Hedland is likely to result in greater areas of rail disturbance (Submission 4).

A: It is not feasible at this location to construct an at grade separated crossing for this type of heavy haul, due to the need to maintain minimum grades. The use of a grade separated crossing would mean the resultant embankment would be too long to enable the construction of an unloading loop at Anderson Point.

8.11.4 The proposed FMG rail line crosses the existing Newman and Goldsworthy rail lines at three points. It is BHPBIO's belief that all crossings must be grade separated, both for reasons of safety and to avoid undue impacts on operational efficiency. The construction of grade separated crossings for iron ore rail lines requires that significant earthworks be undertaken, due to the low gradient necessary for the crossings. The PER provides no details as to the proposed manner in which these crossings will be undertaken, despite the potential environmental impacts associated with extensive earthworks (Submission 13).

A: Grade separation will be undertaken where practicable (i.e. prior to and after the Chichester Ranges). However it is not practicable for the rail loop at Port Hedland. The use of a grade separated crossing at Port Hedland would mean the resultant embankment would be too long to enable the construction of an unloading loop at Anderson Point.

8.11.5 Figure 2 inaccurately shows the planned HDMS rail corridor and railway, but it can be deduced that the proposed FMG railway, having crossed from the west to the east of the planned HDMS railway, then crosses the Mt Goldsworthy JV railway to Finucane Island some 200 m east of the crossing already proposed for the HDMS line. Such a crossing location would be untenable from a rail safety and operational viewpoint, particularly given the concerns BHPBIO has already expressed regarding the proposed HDMS rail crossing of this line. This matter has the potential for a cumulative operational impact on BHPBIO and requires clarification, and an acceptable solution (Submission 4).

A: FMG's line will cross the Mt Goldsworthy JV rail line (known as the BHPBIO rail line in the PER) between BHPBIO's signal box and the HDMS' crossing. FMG is aware of the safety and operational issues and believe that these issues are able to be appropriately managed with the involvement of all relevant stakeholders.

8.11.6 Signals and communications will be incorporated into the track during and after construction. No details of where (siting) this will take place and no detail of any education particularly in areas where these are going to be implemented for the very first time (i.e. roads leading to remote Aboriginal communities) (Submission 10).

A: FMG will make the public aware of new crossings through consultation with community groups

and other interested parties. Sign posts and advertisements will advise road users of any new crossings. Road crossings and signals will be constructed to meet all relevant legislation, guidelines and Australian Standards.

8.12 USE OF ACCESS ROADS

8.12.1 FMG intends to use the current Finucane Island access road as the access road for its operations. BHPBIO notes that this is a BHPBIO owned and operated road which, although open to the public for access to recreational areas at Finucane Island, has not been constructed to Main Roads Department standards. The road was designed for limited use, and there are doubts that the additional traffic generated by the FMG Project (and the HDMS Project) will be able to be safely accommodated on the road. If the road is to be upgraded or alternative access arrangements developed, it is likely to result in further disturbance to intertidal, mudflat and mangrove areas. These additional impacts are not identified in the proposal. Any proposal should be conditional upon access issues being addressed to the satisfaction of all road users and relevant regulatory bodies (Submission 13).

A: FMG will consult with BHPBIO, Main Roads and the Shire to determine what upgrade requirements, if any, are required for the Finucane Island access road. If an upgrade was required it will form a separate project to be jointly proposed by BHPBIO, Main Roads, the Shire and FMG.

8.13 OFFSETS

8.13.1 3,400 ha of land are proposed to be disturbed for construction and operation as a result of the proposed Stage A railway (page ix). This is a significant area to be disturbed, and if approved there would be a need for FMG to develop a substantial environmental offsets programme. Disturbing such a large linear area also has significant implications in terms of ongoing management of the area.

Environmental offsets suggested by Biota (e.g. Item 11, Section 10.1, Page 89, Appendix H) and supported by the proponent (Page 131, 135) are worthwhile and should be encouraged. However, these suggestions may not necessarily be the most appropriate offset strategies requiring attention from this Project. For example, further quantification of the biological values of the Fortescue Marsh and associated fringing woodlands would be a worthwhile offset given the potential impacts to this area, particularly by the proposed Stage B rail alignment, as would be the fencing of the proposed conservation reserve resulting from the pastoral lease exclusions in 2015. Similarly, the immediate establishment of the proposed Fortescue Marsh conservation reserve as a result of the proponent compensating affected pastoralists for the potential loss of income over the next decade as a result of its immediate relinquishment may be a

highly desirable offset (Submission 16).

A: The above offsets given as an example by CALM are not relevant to the key impacts of the Stage A Project. Refer to Section 4 for proposed offsets for the Project. FMG will consider off-sets relevant to the Stage B Project (which may or may not include the above examples) as part of the Stage B PER process.

8.13.2 Clearing of mangroves, particularly the cumulative impacts of the HDMS and FMG proposals as described on page 155 of the document, will have a significant impact on the total mangrove cover within the Port Hedland harbour. If the Project is approved, a suitable offset package should also be developed for this component of the Project (Submission 16).

A: Impacts on mangroves has been discussed in Section 3.1 of this document. Refer to Section 4 for proposed offsets for mangroves.

9. SUMMARY TABLES OF SUBMISSIONS

MATRIX IDENTIFYING ISSUES RAISED BY GENERAL PUBLIC AND CONSERVATION GROUPS TENDERING SUBMISSIONS TO DEVELOPMENT PROPOSAL

 = PRO DEVELOPMENT
 = ANTI DEVELOPMENT
 = NEUTRAL

SECTION	ISSUES	SUBMISSION NUMBER																	Sub Total
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
BIOPHYSICAL																			
5.1	HYDRODYNAMICS (Tides and Currents)																		
5.1.1	Acceleration of currents.										X	X							2
5.1.2	Potential effects of impoundment of water and increased saltation around mangroves										X	X							2
5.2	FLORA AND VEGETATION																		
5.2.1, 5.2.2, 5.2.6, 5.2.7, 8.10.13,	Impacts of clearing vegetation					X											X		2
5.2.3	Limited representation of bioregion in conservation reserves												X						1
5.2.4, 5.2.5, 5.2.8,	Detail the vegetation monitoring and flora survey (and deficiencies) conducted												X	X			X		3
5.2.5, 5.2.12	Lack of detail as to impacts of rail upon vegetation and priority flora													X			X		2
5.2.9	Failure to interrogate floristic data with PATN																X		1
5.11.10	Impacts to land systems associated with the Fortescue Marsh and restricted to the Fortescue Valley (Marsh, Cowra & Christmas LS)																X		1
5.2.11	Voucher specimens have not been lodged with CALM's Pilbara Regional and State Herbaria (and should have been)																X		1
5.2.13-5.2.16	Weed Management																X		1
5.3	MANGROVES																		
5.3.1-5.3.7, 5.3.12	Area of <i>A marina</i> impacted			X							X	X	X			X		X	6
5.3.8	Impact of bund wall, maintenance of tidal flushing										X	X							2
5.3.9	Impacts of Dust on mangroves										X	X							2
5.3.10	Monitoring of tidal flushing										X	X							2

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SECTION	ISSUES	SUBMISSION NUMBER																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Sub Total
5.3.11, 8.13.2	Offset packages (mangroves)					X					X	X	X				X		5
5.3.12, 5.3.13	Cumulative losses of open and closed mangrove associations															X			1
5.3.14 -5.3.18	EPA guidance 29															X		X	2
5.4	FIRE																		
5.4.1-5.4.2	Fire Management																X		1
5.5	FORTESCUE MARSH																		
5.5.1, 5.5.4	Fortescue Marsh – nationally important wetland					X											X		2
5.5.2	Fortescue Marsh – risk of impacts																X		1
5.5.3	Fortescue Marsh – hydrocarbon management																X		1
5.6	SURFACE WATER																		
5.6.1	Surface Hydrology – Cumulative Impacts				X	X	X				X	X	X	X					7
5.6.2, 5.6.8	Surface hydrology impacts of FMG's rail upon other railway structures				X									X					2
5.6.3	Could detailed designs be made publicly available										X	X		X					3
5.6.4, 5.8.5	Flooding of South West and South Creeks, impacts on North West Coastal Highway, Wedgefield, South Hedland, airport and the Broome turnoff on the highway			X		X	X				X	X	X						6
5.6.6	Impact of coincident ocean surge and peak in river flood										X	X							2
5.6.7	Impact of greenhouse-induced sea level rises on port facility's design												X						1
5.6.9, 5.6.12, 5.6.13, 5.8.14	Surface Hydrology – interruption of sheet flow (for dependent vegetation), culvert redirection and management actions												X			X	X		3
5.6.10	Engineering structures to maintain sheet flow to Mulga groves																X		1
5.6.11	Monitoring to detect vegetation impacts																X		1
5.7	STORM SURGE																		
5.7.1	Rock armouring for storm surge protection						X												1

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SECTION	ISSUES	SUBMISSION NUMBER																	Sub Total
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
5.7.2	Design height (of structures) above storm surge levels						X												1
5.8	WATER SUPPLY																		
5.8.1,5.8.3	Efficient use of water at port , cumulative water demands								X		X	X					X		3
5.8.2	Reassessment if FMG supplies its own water at the Port																X		1
5.8.4, 5.8.5, 5.8.6, 5.7.8	Water for Railway construction																X	X	2
5.8.7	Impacts of abstraction on Stygofauna																	X	1
5.9	TERRESTRIAL FAUNA																		
5.9.1	Impact of (possible spread of) feral animals on native fauna												X						1
5.9.2	Restriction of fauna movement										X	X							2
5.9.3	Habitat Isolation / Fragmentation																X		1
5.9.4,5.9.5, 5.9.8-5.9.22	Fauna Surveys (Methodology / Timing / Adequacy)		X																1
5.9.6	Direct loss of fauna																X		1
5.9.7	Significant fauna / management plans																X		1
5.10	MARINE FAUNA																		
5.10.1	Dolphin utilisation of the harbour												X					X	2
5.10.2	Light pollution management / impacts on turtles																	X	1
5.10.3	Impacts on mangrove fauna																	X	1
5.11	STYGOFAUNA																		
5.11.1,5.11.3	Stygofauna (monitoring of species diversity and abundance, management consultation)												X					X	2
5.12	REHABILITATION																		
5.12.1, 5.12.3	Monitoring of final rehabilitation												X					X	2
5.12.2	Funding of decommissioning and rehabilitation												X						1
5.12.4	Rehabilitation plan																	X	1

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		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
POLLUTION																			
6.1	AIR –DUST																		
6.1.1-6.1.3, 6.1.5, 6.1.7, 6.1.9-6.1.18	Dust impacts Port Hedland (& Wedgefield)			X			X		X	X	X	X				X		X	8
6.1.4	Expansion of dust into Spinifex Hill and Cooke Point							X											1
6.1.11	Dust monitoring																	X	1
6.1.8, 6.1.19-6.1.31	Dust modelling / assumptions			X			X			X	X		X		X				6
6.1.6	Asbestos content in ore									X	X								2
6.2	AIR-GREENHOUSE GASES																		
6.2.1	Greenhouse gas minimisation									X	X								2
6.3	DREDGING																		
6.3.1, 6.3.9, 6.3.10, 6.3.11 6.3.14	Impact of dredging / siltation on marine areas and biota (turtle activities)										X	X			X	X			4
6.3.2, 6.3.3	Inadequate testing of marine sediments to be dredged.										X	X		X		X			4
6.3.4	Feasibility of vegetating dredge spoil															X			1
6.3.5, 6.3.8, 6.3.15	Reclamation area / settling ponds															X			1
6.3.6	Inadequate detail as to how stormwater runoff from road around dredge spoil deposition area will be captured.										X	X							2
6.3.7	Off shore disposal of contaminated dredge material										X	X							2
6.3.12	Design of port incomplete					X													
6.3.13	Ministerial Conditions												X						
6.4	HYDROCARBON AND CHEMICALS																		
6.4.1	Hydrocarbon management and emergency response										X	X							
6.5	NOISE AND VIBRATION																		
6.5.1, 6.5.3, 6.5.5, 6.5.6	Impact of noise on Port Hedland (Wedgefield)										X	X	X				X		4
6.5.2, 6.5.4	Noise modelling										X								1

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		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
6.5.6	Consideration of enclosure of conveyors to reduce noise levels in Port Hedland										X	X							2
6.6	WASTE MANAGEMENT																		
6.6.1	Waste management / minimisation / recycling										X	X							2
SOCIAL																			
7.1	ABORIGINAL HERITAGE																		
7.1.1	Lack of Aboriginal consultation	X																	1
7.1.2, 7.1.3	Protection of Aboriginal heritage sites, surveys									X				X					2
7.2	ACCOMMODATION																		
7.2.1	Lack of adequate housing			X				X		X	X								4
7.2.2	Effect of mining industry on community development					X													1
7.3	COMMUNITY SERVICES																		
7.3.1	Pressure on community services			X						X	X								3
7.3.2	Town of Port Hedland is a Decision Making Authority									X									1
7.3.3	Community and environment being disregarded in the drive for revenue			X															1
7.4	RECREATIONAL ACTIVITIES																		
7.4.1	Recreational use of port										X	X							2
7.5	SMALL BUSINESS SECTOR																		
7.5.1, 7.5.2	Impact on small business sector								X										1
OTHER																			
8.1	CUMULATIVE IMPACTS																		
8.1.1, 8.1.2, 8.1.3	Impacts of multiple railways, access to BHPBIO railway			X	X		X	X		X	X	X	X		X		X		10
8.1.4	Audits and inspections,			X															1
8.1.5	Project will limit future growth in the Port and add to pollution							X											1
8.2	IMPACT OF STAGE B PER ON STAGE A PER																		

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		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
8.2.1	Stage A and Stage B should be assessed concurrently			X										X			X		3
8.3	DETAILED INFORMATION																		
8.3.1, 8.3.2, 8.3.3	Insufficient information in PER					X				X				X		X			4
8.4	PROJECT DEVELOPMENT																		
8.4.1	FMG should share facilities with HDMS					X													1
8.4.2	Dedicated shiploader at Finucane Island						X												1
8.4.3	Access causeway to support load out conveyor to ship loading facilities										X	X							2
8.4.4	Option of stockpiling ore in sheds at Anderson Point										X	X							2
8.4.5	Clarification of the role of the primary screen house															X			1
8.4.6	Impact avoidance														X				1
8.4.7, 8.4.8	Viability				X											X			2
8.4.9	Long term project requirements ignored						X												1
8.5	ENVIRONMENTAL MANAGEMENT																		
8.5.1	Environmental Accountabilities																X		1
8.5.2	Environmental Management Plan, level of detail																X		1
8.6	SUSTAINABILITY																		
8.6.1, 8.6.4,	Impacts on landscape			X															1
8.6.2	Biodiversity hotspot												X						1
8.6.3	National strategy for ecologically sustainable development					X													1
8.7	PORT DEVELOPMENT																		
8.7.1, 8.7.2, 8.7.3	Suitability of Anderson Point for port			X		X	X												3
8.7.4, 8.7.5, 8.7.6, ,	Relocation/Utilisation of Boodarie Industrial Estate						X												1
8.7.7	Use of conveyors						X												1

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		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Sub Total
8.7.8	Rail infrastructure transects cattle yard									X									1
8.8	TEMPORARY AND PERMANENT FACILITIES																		
8.8.1, 8.8.2, 8.3.5, 8.3.6	Impacts and Rehabilitation of ancillary facilities (eg borrow pits)									X	X		X				X		4
8.8.3, 8.8.4	Location of permanent facilities (eg quarries, access roads, repeater stations, rail maintenance camps)												X				X		2
8.9	TENURE																		
8.9.1, 8.9.2, 8.9.3,	Project tenure (lack of and possible impacts of)								X	X									2
8.9.4	Zoning									X									1
8.9.5	State Agreement								X										1
8.10	RAIL ALIGNMENT																		
8.10.1, 8.10.13	Rail alignment dimensions, buffering									X							X		2
8.10.2	Use of BHPBIO's railway			X															1
8.10.3	Use of HDMS' railway				X														1
8.10.4 – 8.10.7	Location of FMG rail loop and infrastructure in FNA5145 (HDMS lease), impacts on HDMS's activities				X														1
8.10.8	Size of Rail Loop				X														1
8.10.9	Impact of FMG's rail upon HDMS' operations near marshalling yards									X									1
8.10.10	Design & Impacts of crossings of HDMS' & BHPBIO lines by FMG (lack of detail).				X														1
8.10.11	Environmental superiority of alignment, adoption of HDMS' alignment																X		1
8.10.12	Fencing of the alignment																X		1
8.10.14	Ground truthing previous studies																X		1

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		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Sub Total
8.10.15	Power supply to the rail line																X		1
8.10.16, 8.10.17	Assessment of railway alignment, concurrent assessment of two projects													X				X	2
8.10.18	Use of BHPBIO's corridor for construction of rail			X															1
8.11	RAILWAY CROSSINGS, SIGNALS, SIGNAGE																		
8.11.1	Impact of rail level crossing on traffic on Great Northern Highway				X														1
8.11.2, 8.11.4	Crossing locations. Grade separated crossings.				X														1
8.11.3	Impacts of earthworks associated with crossing the Goldsworthy rail disturbance				X														1
8.11.5	Crossing of Mt Goldworthy JV line				X														1
8.11.6	Signals, communications and education detail lacking									X									1
8.12	USE OF ACCESS ROADS																		
8.12.1	Use of BHPBIO's Finucane Island access road													X					1
8.13	OFFSETS																		
8.13.1	Proposed environmental offsets																X		1
8.13.2	Clearing of mangroves, offsets to compensate																X		1

Topic	Objectives	Actions	Timing	Advice from
		fauna species) (if required) <ul style="list-style-type: none"> • Operations Dust Management Plan • Mangrove Monitoring and Management Plan • Hydrocarbon Management plan/Oil Spill Contingency Plan • Introduced Pests Management Plan • Dredging and Reclamation Management Plan • Acid Sulphate Management Plan • Noise Management Strategy • Operations Noise Management Plan • Cultural Heritage Management Plan 		
		3. The proponent will ensure that its contractors comply with requirements of the EMP's through the environmental awareness program.	During construction and operations.	DoE DoIR
Terrestrial Flora and Vegetation,	Maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities.	4. Design infrastructure to avoid declared rare and priority flora and species of conservation significance, and minimise disturbance to flora and vegetation communities. 5: Carry out rare flora surveys in areas not previously adequately surveyed (i.e. borrow Pits) 6: Fund a detailed research program into relevant taxonomic research at PhD level or equivalent	During the design phase. Prior to railway construction Prior to railway construction	CALM CALM CALM

Topic	Objectives	Actions	Timing	Advice from
Weed Hygiene and Management Plan	Maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities.	7. Prepare of a Weed Hygiene and Management Plan that contains procedures to minimise the introduction and spread of weeds, including: <ul style="list-style-type: none"> • identifying target weeds; • hygiene and wash down procedures for all plant and equipment; • control measures that may be necessary for some species; • monitoring and any follow-up control including reporting to relevant authorities. 	Prior to port construction.	CALM APB
		8. Implement the approved Weed Hygiene and Management Plan.	During construction and operations.	CALM APB
Fire Management Plan	Reduce the risk of unplanned fires and provide contingency measures to minimise any impacts in the event that a fire is started.	9. Prepare a Fire Management Plan to include work procedures for all welding and grinding work, personnel fire hazard procedures, fire response vehicles on site and bushfire contingency plans.	Prior to port construction.	CALM
		10. Implement the approved Fire Management Plan.	During construction and operations.	CALM

Topic	Objectives	Actions	Timing	Advice from
Revegetation and Rehabilitation Plan	Maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities.	11. Prepare a Revegetation and Rehabilitation Plan to address: <ul style="list-style-type: none"> • management and characterisation of topsoil; • seed collection and spreading; • topsoil recovery, stockpiling and respread; • surface stabilisation and other treatments; • rehabilitation strategies; and • monitoring and maintenance. 	Prior to railway construction.	CALM
		12. Implement the approved Revegetation and Rehabilitation Plan.	During construction and operations	CALM
Terrestrial Fauna	Maintain the abundance, species diversity and geographical distribution of terrestrial fauna.	13. Design infrastructure to avoid specially protected (threatened) fauna habitats, other significant fauna habitats, and minimise disturbance to fauna habitats in general.	During the design phase.	CALM
		14; Prepare and implement a specific Fauna Management Plan for each significant fauna species identified if located within the Project area.	Prior to railway construction if required	CALM
		15: Fund a detailed research program at PhD level or equivalent.	For a period of three years at the onset of railway construction.	CALM
Marine Fauna	Minimise the impact of the port facility on marine fauna in the port area.	16. Install frequency controlled lighting to avoid affecting hatchling and juvenile turtle orientation, and minimise light overspill from the port facility, providing shielding (of lights) if necessary.	Prior to port commissioning.	DoE, CALM

Topic	Objectives	Actions	Timing	Advice from
		17: Implement a Monitoring program to determine the effectiveness of controlled lighting on Turtles	During commissioning	DoE, CALM
Water Supply	Maintain (sufficient) quality of groundwater so that existing potential uses, including ecosystems maintenance are protected.	18. Monitor groundwater levels and pumping rates in each water supply bore to ensure sustainable abstraction rates are not exceeded.	During railway construction and operations.	DoE (WRC) DoIR
Stygofauna Management Plan	Maintain the abundance, diversity and geographical distribution of subterranean fauna.	19. Prepare a Stygofauna Management Plan if groundwater drawdowns in water supply bores are greater than anticipated. 20. Implement the approved Stygofauna Management Plan if groundwater drawdowns in water supply bores are greater than anticipated.	Prior to railway construction if required During railway construction and operations if groundwater drawdowns are greater than anticipated.	DoE (WRC) WA Museum CALM DoE (WRC) WA Museum CALM
Water courses and wetlands	Maintain the integrity, functions and environmental values of watercourses and sheet flow.	21. Design and construct the Project to minimise disturbance to natural surface water flows.	During the design phase.	Main Roads WA CALM PHPA
		22. Design and construct bridges, culverts and other drainage structures to maintain surface water flows if there are dependent ecosystems downstream.	During the design phase.	Main Roads WA CALM PHPA

Topic	Objectives	Actions	Timing	Advice from
Dust Management Plan: Construction	Protect the surrounding land users such that dust and particulate emissions will not adversely impact upon their welfare and amenity or cause health problems and ensure that dust emissions, both individually and cumulatively, meet appropriate criteria and do not cause an environmental or human health problems.	23. Prepare a Construction Dust Management Plan that addresses: <ul style="list-style-type: none"> • minimising the generation of dust; • minimising the dust emissions off-site; • ambient monitoring programmes • outlines a complaints process. 24. Implement the approved Construction Dust Management Plan. 25. Manage cumulative dust emissions during construction in Port Hedland in consultation with the other industries in the area.	Prior to port construction. During port and railway construction. During Port construction.	DoE DoIR PHPA DoE DoIR PHPA PHPA Other Industries in Port Hedland
Dust Management Plan: Operations	Protect the surrounding land users such that dust and particulate emissions will not adversely impact upon their welfare and amenity or cause health problems and ensure that dust emissions, both individually and cumulatively, meet appropriate criteria and do not cause an environmental or human health problems.	26. Prepare an Operations Dust Management Plan that addresses: <ul style="list-style-type: none"> • minimising the generation of dust; • minimising the dust emissions off-site; • ore stockpiles moisture content; • monitoring network; • ambient monitoring programs • outlines a complaints process. 	Prior to port commissioning.	DoIR PHPA DoE

Topic	Objectives	Actions	Timing	Advice from
		27. Compare particulate dust modelling parameters used in the Stage A PER with those used in the DoIR Port Hedland Cumulative Dust Impact study, and undertake supplementary modelling if required to confirm cumulative dust impact modelling results. 28. Manage cumulative dust emissions during operations in Port Hedland in consultation with the other industries in the area. 29. Implement the approved Operations Dust Management Plan .	When DoIR Study Complete During operations. During operations.	DoIR DoE PHPA Other Industries in Port Hedland DoIR PHPA DoE
Mangroves	To maintain the ecological function, abundance, species diversity and geographic distribution of marine biota and habitat in order to protect ecosystem health, in accordance with the principles identified in Perth Coastal Waters Environmental Values and Objectives (EPA, 2000);	30. Develop a Mangrove Monitoring and Management Plan 31. Implement the Mangrove Monitoring and Management Plan 32. Fund further research into the impacts of dust deposition on mangrove condition, extending studies already completed in the harbour by CSIRO. 33. Carry rehabilitation of mangroves, 3m either side of the rail loop.	Prior to port construction. On completion of Port construction For at least three years commencing prior to port commissioning. During port construction	DoE DoE DoE DoE

Topic	Objectives	Actions	Timing	Advice from
Water Quality – surface and groundwater	To maintain or improve the quality of surface and groundwater, to ensure that existing and potential uses, including ecosystem maintenance is protected.	34. Treat any waste water or surface water runoff that is potentially contaminated prior to discharging to the environment. 35 Install appropriate measures to control surface runoff and ensure there are minimal impacts to water sensitive vegetation will be installed along the rail line according to ground and vegetation conditions	During construction and operations. During the detailed design phase	DoE PHPA DoE
Hydrocarbon Management Plan/Oil Spill Contingency Plan	To maintain or improve the quality of surface and groundwater, to ensure that existing and potential uses, including ecosystem maintenance is protected.	36 Have in place and make publicly available, a Hydrocarbon Management Plan / Oil Spill Contingency Plan for the Port addressing: <ul style="list-style-type: none"> • spill prevention • clean-up procedures. 37. Implement the approved Hydrocarbon Management Plan / Oil Spill Contingency Plan.	Prior to port construction. During construction and operations	PHPA PHPA
Marine Pest Management Plan	Maintain the ecological function, abundance, species diversity and geographic distribution of marine biota and habitat in order to protect ecosystem health.	38. Develop an Introduced Marine Pests Management Plan addressing: <ul style="list-style-type: none"> • Pest species • Support any monitoring conducted by PHPA • Management measures 39. Implement the approved Introduced Marine Pests Management Plan	Prior to port construction. During port construction and operations.	PHPA AQIS PHPA

Topic	Objectives	Actions	Timing	Advice from
		40 Prevent hull cleaning and scraping at the FMG berth	During port construction and operations.	PHPA
		41. Comply with AQIS requirements in relation to ballast water control.	During port construction and operations.	AQIS
Dredging and Reclamation Environmental Management Plan	To ensure that dredge wastes do not adversely affect environmental values, or the health, welfare and amenity of people and land uses.	42. Carry out plume modelling to confirm that turbidity from dredging will not extend outside the harbour	Prior to port construction	PHPA DoE
		43. Prepare a Dredging and Reclamation Environmental Management Plan that includes: <ul style="list-style-type: none"> • detailed geotechnical studies to be undertaken; • detail of dredging and reclamation works; • quarantine measures for dredging contractors; • surface runoff management; • contingency measures if impacts unacceptable; • Discharge water management • monitoring program. • sediment quality monitoring 	Prior to port construction.	PHPA DoE EPA
		44. Implement the Dredging and Reclamation Environmental Management Plan.	During port construction and maintenance dredging during operations.	PHPA DoE
Acid Sulphate Soil Management Plan	Minimise disturbance of Acid Sulphate Soils (ASS) and manage potential impacts.	45 Develop an Acid Sulphate Management Plan	Prior to port construction	PHPA DoE
		46. Implement the approved ASS Management Plan.	During port construction and operation	PHPA DoE

Topic	Objectives	Actions	Timing	Advice from
Noise Management Strategy	Ensure noise levels comply with statutory requirements and acceptable (and appropriate) standards.	47. Prepare a Construction Noise Management Plan in accordance with Regulation 13 of the Noise Regulations, to detail hours of operation, proposed equipment, expected impacts to noise sensitive premises and noise management measures.	Prior to port construction.	Shire of Port Hedland DoE DoIR
		48. Implement the Construction Noise Management Plan.	During port and railway construction.	PHPA DoE
		49. Prepare a Noise Management Strategy for the port and rail operations that: <ul style="list-style-type: none"> • minimises noise emissions from operations; • minimises disturbance to residences from rail operations; • identifies noise reduction strategies leading to compliance with the noise regulations; • outlines monitoring program to confirm modelled and actual noise emissions and assess compliance; • details a complaints process. 	Prior to operations.	PHPA DoE
Aboriginal Heritage	Ensure the proposal complies with requirements of the <i>Aboriginal Heritage Act 1972</i> and that changes to the biological and physical	51. Complete ethnographic and archaeological surveys of the proposed port and railway corridor.	During operations.	PHPA DoE
		51. Complete ethnographic and archaeological surveys of the proposed port and railway corridor.	Prior to the start of port construction.	DIA PNTS

Topic	Objectives	Actions	Timing	Advice from
	environment resulting from the Project do not adversely affect cultural associations with the area.	52. Develop a Cultural Heritage Management Plan for the Project in consultation with the Aboriginal Traditional Owners.	During the design phase.	DIA PNTS
		53. Implement the Cultural Heritage Management Plan in consultation with the Aboriginal Traditional Owners.	During construction, operations and decommissioning.	DIA PNTS

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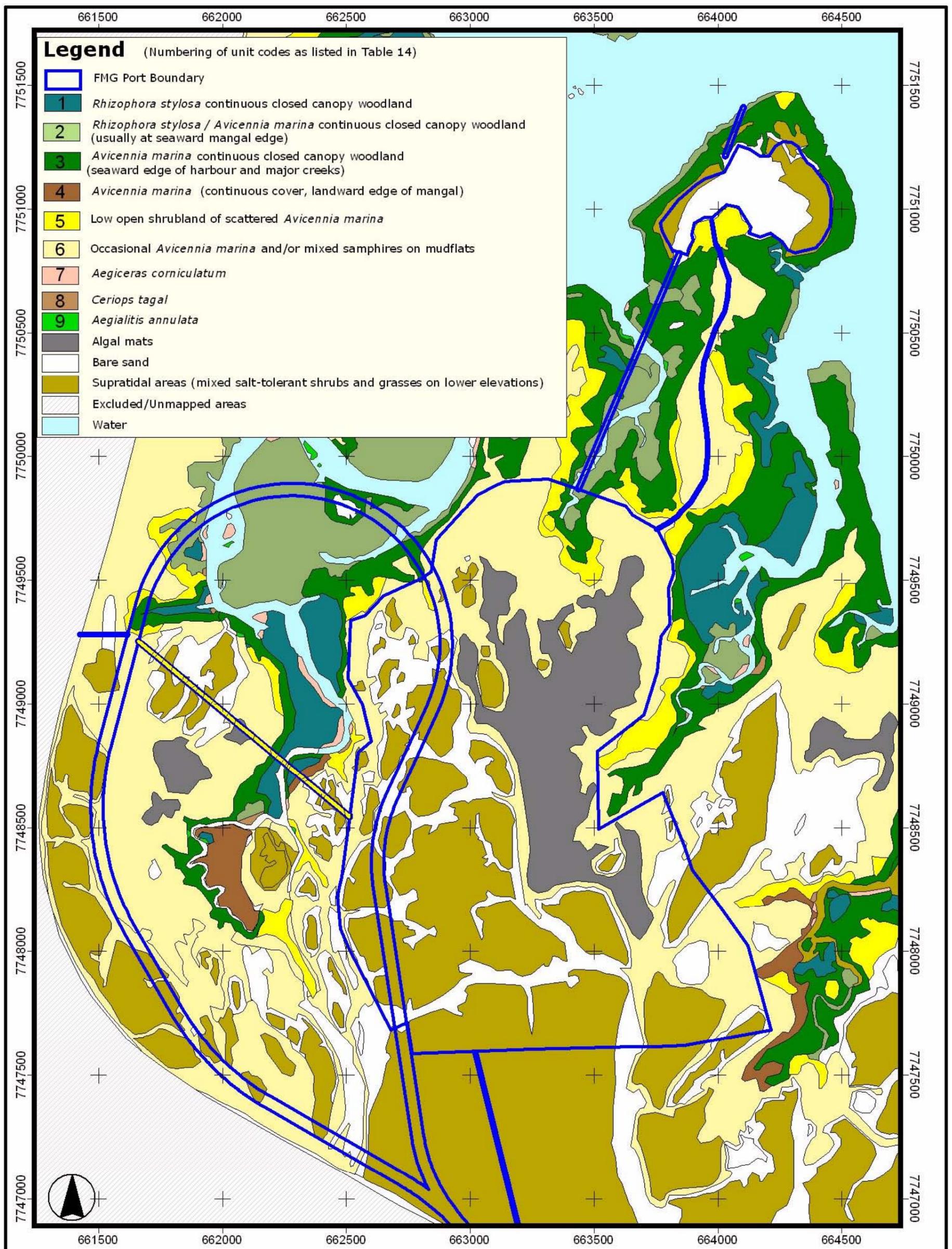
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FIGURES

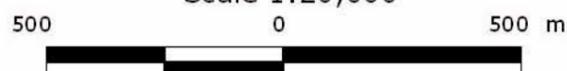
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Mangrove Distribution in the revised FMG Port Site

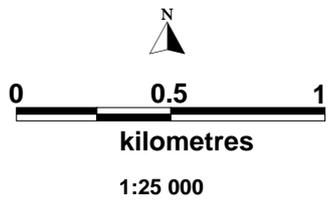
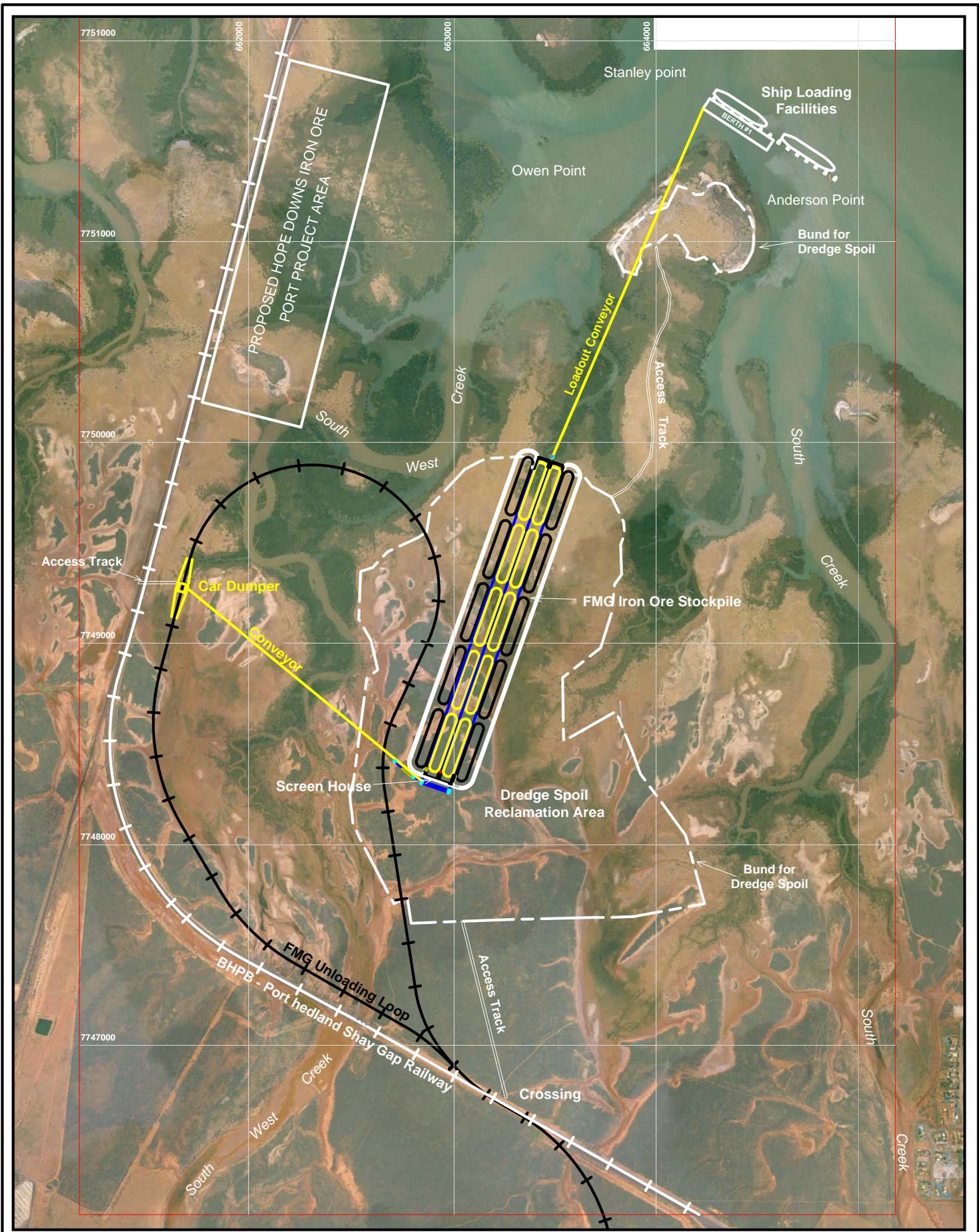
Figure 1

Scale 1:20,000

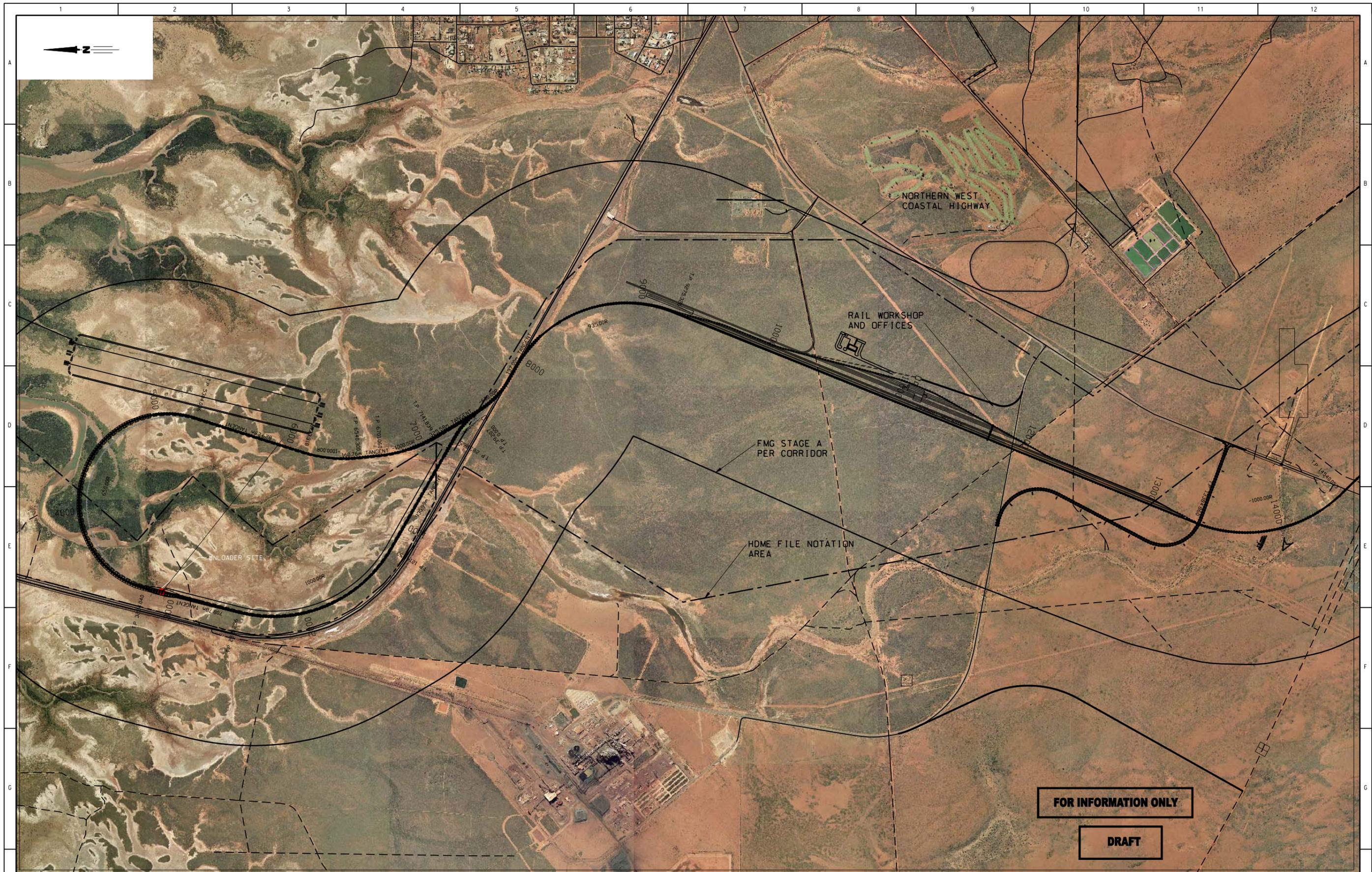


BIota Biota
Environmental
Sciences

Data from aerial photography and field verification
February 1993 and revised 2004
Eric Paling, Environmental Science, Murdoch University
Halpern, Glick, Maunsell Pty Ltd



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Figure 2. 'Indicative Port Layout'	
Author: FMG	Date: 6th April 2004
Drawn: P Sawers	Revised: 10/03/2005
Dwg No.: FMG 05019	Report No.:
Projection: GDA 94 Zone 50	Scale: 1:25,000



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CLIENT		
SCALE	1 : 12500	A1

PILBARA IRON ORE & INFRASTRUCTURE PROJECT		
RAIL FACILITIES		
MARSHALLING YARDS & LOOP		
PER CORRIDOR LAYOUT		
PROJECT No:	DWG No:	REV:
300/07519	06100-RA-SK-0013	A

Figure 4: Elevation values for upper and lower limits of mangroves and lower samphire limits (solid line = mean, dashed = ± 1 SE).

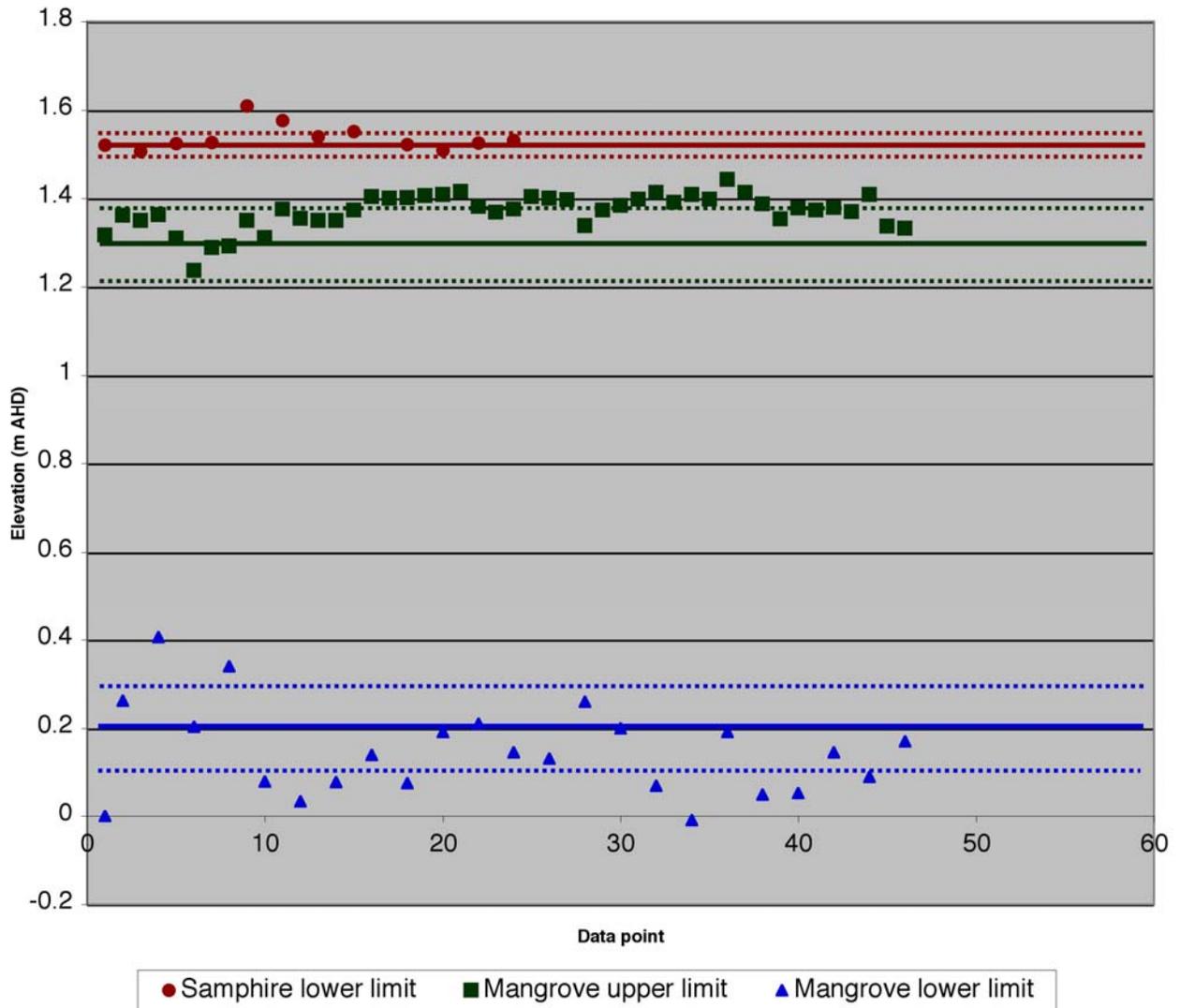
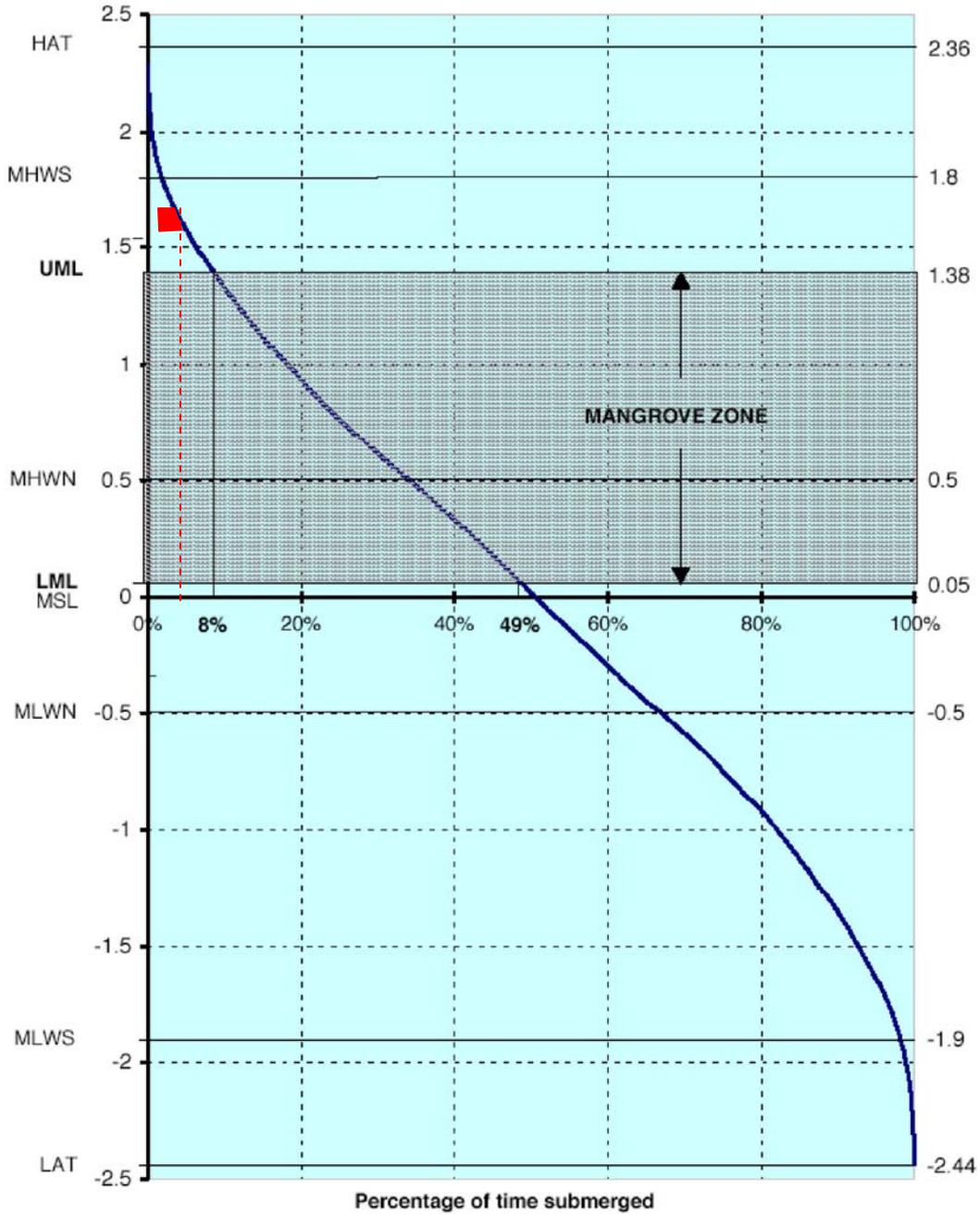


Figure 5: Submergence curve showing mangrove and samphire elevation ranges against proportion of time submerged.

(HAT = Highest Astronomical Tide, MHWS = Mean High Water of Springs, UML = Upper Mangrove Limit (mean plus one standard deviation), MHWN = Mean High Water of Neaps, MSL = Mean Sea Level, LML = Lower Mangrove Limit (mean minus one standard deviation), MLWN = Mean Low Water of Neaps, MLWS = Mean Low Water of Springs, LAT = Lowest Astronomical Tide).



Appendix 1

Evaluation of Port Layout Alternatives; Townley and
Associates

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Appendix 2

Figures illustrating Adequacy of Topographical Mapping to
Complete an Indicative Assessment of True Mangrove BPPH
Extent: Biota Environmental Services.

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Appendix 3

Mangrove BPPH Management Unit and Cumulative Loss
Calculations for the Revised FMG Port Design:
Biota Environmental Services.

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Appendix 4

Peer Review of Sediment Sampling Plan: URS

Sediment Contaminates and Acid Sulphate Soils: Oceanica

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Appendix 5

Cumulative Noise Impact from FMG, BHPBIO and HDMS Railways to Sensitive Noise Receptors: Lloyd Acoustics

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Appendix 6

Cumulative Biological Impacts of the Stage A Proposal: Biota Environmental Services

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Appendix 7

Potential Cumulative Impact of FMG Railway on the Existing BHPBIO and Approved HDMS Railways: Aquaterra

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Appendix 8

Flood Study Overview

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Appendix 9

Summary of PATN Analysis Results: Biota Environmental Services

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Appendix 10

DRAFT Borrow Pit Rehabilitation Procedure