

Boodarie Strategic Industrial Area

Development Plan - March 2014

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ENDORSEMENT PAGE

IT IS HEREBY CERTIFIED THAT THE BOODARIE STRATEGIC INDUSTRIAL AREA DEVELOPMENT PLAN WAS ADOPTED BY RESOLUTION OF THE WESTERN AUSTRALIAN PLANNING COMMISSION ON

_____ (DATE)

SIGNED FOR AND ON BEHALF OF THE WESTERN AUSTRALIAN PLANNING COMMISSION

(AN OFFICER OF THE WESTERN AUSTRALIAN PLANNING COMMISSION DULY AUTHORISED BY THE COMMISSION PURSUANT TO SECTION 24 OF THE *PLANNING AND DEVELOPMENT ACT (2005)* (AS AMENDED) FOR THAT PURPOSE)

IN THE PRESENCE OF:

_____ (WITNESS)

_____ (DATE)

AND BY RESOLUTION OF THE TOWN OF PORT HEDLAND ON

_____ (DATE)

PURSUANT TO THE RESOLUTION OF THE TOWN OF PORT HEDLAND, THE SEAL OF THE TOWN OF PORT HEDLAND WAS AFFIXED IN THE PRESENCE OF

(MAYOR, TOWN OF PORT HEDLAND)

(CHIEF EXECUTIVE OFFICER, TOWN OF PORT HEDLAND)

_____ (DATE)

(TOWN OF PORT HEDLAND SEAL)

THIS DEVELOPMENT PLAN IS PREPARED UNDER THE PROVISIONS OF THE TOWN OF PORT HEDLAND'S TOWN PLANNING SCHEME 5

Table of Modifications

Table of Modifications to the Boodarie Strategic Industrial Area Development Plan

Modification No.	Description of Modification	Endorsed by Town of Port Hedland	Endorsed by WAPC

Executive Summary

The Boodarie Strategic Industrial Area (BSIA) Development Plan provides for the nationally significant, long term strategic industrial development of Boodarie, Port Hedland. The Development Plan will coordinate the detailed land use and development of the BSIA, including the provision of proponent funded services and infrastructure.

The Development Plan ensures that the State and National drive for diversified industry has been recognised and maintained, while balancing the needs of industrial users and sustainability of the local community.

To facilitate the effective functioning of the BSIA, strategic infrastructure corridors are identified connecting the BSIA to the Port of Port Hedland. The BSIA is positioned to accommodate strategic downstream resource processing industries related to the ore and petro-gas resources of the Pilbara region. The proximity of the Port to the BSIA has the potential to create a world-class heavy industrial estate which specialises in multi-product, downstream resource processing.

DEVELOPMENT PLAN OBJECTIVES

- Provide a framework to guide coordinated development of the BSIA and future planning approvals in order to optimise capacity for strategic industrial use.
- Provide industry with a comprehensive information pack, in the form of this Development Plan and associated reports, to facilitate appropriate types and forms of development within the BSIA.
- Establish specific infrastructure corridors that provide an essential link between the Port and the BSIA.
- Establish Port capacity and access to enable optimal industrial development and export within the BSIA.
- Facilitate development through the Planning Scheme and a Development Plan process, coupled with an identified Estate Management and approvals structure.

STATUTORY SUPPORT

The BSIA is zoned 'Strategic Industry' under the Town of Port Hedland's Town Planning Scheme 5 (TPS5), requiring comprehensive planning prior to the commencement of industrial development. The Development Plan further reinforces the intent, objectives and planning requirements for the BSIA.

INDUSTRIAL SEPARATION

The Development Plan, and in particular identification of precincts and preferred land uses has been prepared based on the outcomes of a series of relevant emission assessments including acoustic, quantitative risk, and air quality assessments.

Externally, the protection of the BSIA from incompatible or proximity to sensitive uses is empowered by the Boodarie Industrial Buffer Special Control Area.

INDUSTRIAL ECOLOGY

The industrial ecology input and output assessment provides the foundation for utility demand forecasting, and assists in identifying industrial synergy opportunities for the BSIA. The input and output assessment has implications for industrial land use placement, relationship to infrastructure corridors, and transport connections.

Industry clustering is a critical element to allow for the development of synergies within the BSIA and the surrounding region, as well as a mechanism to optimise utility infrastructure and associated costs. Industry clustering is facilitated through the designation of industry precincts and the placement of associated industries within them.

INDUSTRIAL DESIGN CONSIDERATIONS

The success of the BSIA largely depends on providing for industry operational requirements and efficient access to the Port. This in turn requires a carefully considered layout of infrastructure corridors.

The preparation of the BSIA Development Plan was based on a set of criteria including:

- An estimation of industries' requirements relative to central infrastructure corridor access;
- Infrastructure corridor componentry;
- Port capacity;
- Proximity to Port;
- Industrial synergies; and
- Industrial layout and separation requirements.

The design of the BSIA and lot layout has been developed with consideration to the criteria, and tested against the emission assessments to ensure it is appropriate for the anticipated industrial uses. A summary of this information is provided on the BSIA Opportunities and Constraints Plan *Figure 4*.

Key consideration was also given to achieving integration between the Port Hedland Port Authority Multi User Outer Harbour Port Master Plan, the Inner Harbour and development proposed within the BSIA. To this extent, Worley Parsons was engaged to consider the interface between the Port Master Plan and the BSIA Development Plan; identifying requisite development and design outcomes.

The BSIA Development Plan, Plan 1 and *Figure 5*, incorporates a site responsive approach which provides for the development of diversified industry through providing flexibility for industrial operational needs whilst taking into account environmental considerations. The Development Plan and supporting Precinct Plan are intended to guide the location of land uses within the BSIA. As industries locate over time, the Precincts can be reassessed. If an industrial developer demonstrates as part of the business case that it should be located in an alternative location to the preferred precinct, this may occur subject to business case approval by the Department of State Development (DSD) and LandCorp.

DEVELOPMENT IMPLEMENTATION AND ESTATE MANAGEMENT

The development of the BSIA is to be proponent driven and all infrastructure funded by proponents in line with the objectives and vision of the DSD and LandCorp. Proponents are therefore responsible for the construction of all infrastructure required to service their sites. Where necessary, this infrastructure may extend beyond their own landholdings. The benefits associated with shared services are acknowledged and LandCorp and DSD will require a proponent's servicing strategy to investigate the opportunity for the construction of shared services to benefit the whole of the BSIA

The Estate Management Group is headed by DSD fulfilling the role of Lead Agency, with LandCorp undertaking the ongoing management of the BSIA.

As the Estate Manager, LandCorp will hold tenure of the BSIA, and land will be leased to proponents. DSD and LandCorp will approve proponents for leasehold upon review of a business case to be submitted with expressions of interest for the industrial lots.

Prior to lodgement of proponents' planning proposals for consideration by the Town of Port Hedland or undertaking works, it is a requirement that proposal be endorsed by DSD and LandCorp.

1 Part One – Statutory Section

1.1 DEVELOPMENT PLAN AREA

The Development Plan applies to the Boodarie Strategic Industrial Area, as identified on the Location Plan – *Figure 1*.

1.2 DEVELOPMENT PLAN CONTENT

The Development Plan comprises:

- Part One – Statutory Section

Part One of the Development Plan includes the Development Plan Map and provisions and requirements that have statutory effect.

- Part Two – Explanatory Section

Part Two of the Development Plan justifies and clarifies the provisions contained in Part One, and is used as a reference guide to interpret and implement Part One. Part Two does not have statutory effect.

- Appendices

Technical reports, supporting plans and maps.

1.3 INTERPRETATION

Unless otherwise specified in this part, the words and expressions used in this Development Plan shall have the respective meanings given to them in the Town of Port Hedland Town Planning Scheme No. 5 (the Scheme) including any amendments gazetted thereto.

1.4 OPERATION

In accordance with clause 5.2.7 of the Scheme, the Development Plan shall come into operation on the date it is adopted by the Western Australian Planning Commission (WAPC).

1.5 DEVELOPMENT PLAN MAP

The Development Plan Map (Plan 1) depicts the extent and boundary of the Development Plan area. The road structure, land requirements and rail network applicable to the Development Plan area are identified.

1.6 LAND USE AND SUBDIVISION REQUIREMENTS

The subdivision and development requirements are to be in accordance with the Development Plan Map. The Development Plan Map outlines the zone applicable to the Development Plan area. The zone designated under this Development Plan applies to the land within it as if the zone were incorporated into the Scheme.

Land Use permissibility within the Development Plan area shall be in accordance with Table 1 and section 7.2 under the Scheme.

1.6.1 GENERAL SUBDIVISION AND DEVELOPMENT REQUIREMENTS

The Development Plan applies to the area zoned 'Strategic Industry' pursuant to the Town of Port Hedland Town Planning Scheme No. 5.

The Boodarie Strategic Industrial Area Development Plan provides long term guidance for the staged development of the BSIA undertaken by proponents.

The Precinct Plan contained within this draft Development Plan is intended to guide the location of land uses within the BSIA. As industries locate over time, the Precincts can be reassessed. If an industrial developer demonstrates as part of the business case that it should be located in an alternative location to the preferred precinct, this may occur subject to business case approval by DSD and LandCorp.

Additional to complying with the provisions of the draft Development Plan, proponents are required to seek planning approval prior to the commencement of any works in accordance with these Planning Scheme provisions. Any departure or alteration to the BSIA Development Plan is to be advertised for public submissions in accordance with the Planning Scheme.

1.6.1.1 DEVELOPMENT

The land use permissibility shall be in accordance with Table 1 of the Scheme.

TABLE 1 – LAND USE PERMISSIBILITY WITHIN THE STRATEGIC INDUSTRY ZONE

Land Use	Permissibility
Harbour Installation	P
Industry Extractive	AA
Industry Noxious	SA
Industry Resource Processing	P
Infrastructure	P
Storage Facility/depot/laydown area	IP
Motor Vehicle Wash	IP
Office	IP
On-site Canteen	IP
Warehouse	IP
Carpark	IP
Emergency Services	AA
Public Utility	AA

Those uses not listed above are ~ a development that is not permitted. In particular, Transient Worker Accommodation is not permitted within the Strategic Industry zone in accordance with section 7.2 of the Scheme.

P – permitted by TPS 5

AA – not permitted unless the Town of Port Hedland grants planning approval

SA - not permitted unless the Town of Port Hedland grants planning approval after giving notice in accordance with TPS 5 requirements

IP - not permitted unless the Town of Port Hedland determines the use is incidental to the predominant use.

~ a development that is not permitted by the Scheme.

In addition to Table 1, all development shall be in accordance with the Development Requirements of the Scheme, including clause 6.7.3, and the special control provisions under section 7.2.

Notwithstanding the above, development within the BSIA is subject to the requirements of the Development Plan and may only be permitted when it is in accordance with these requirements.

The lodgement of a Development Application shall include the provision of the following technical documentation and any other documentation considered relevant:

Estate Management Group

- Servicing Strategy
- Construction Management Plan
- Corridor requirements and management plan (if applicable)
- PAM time use management (if applicable)
- Industrial Ecology Assessment (if applicable)
- Scope of works/staging strategy

Town of Port Hedland

- Acoustic Assessment
- Air Quality Assessment
- Traffic Management Plan
- Local Water Management Strategy (LWMS) – to the satisfaction of the Department of Water
- Quantitative Risk Assessment
- Fire Management Assessment
- Aboriginal Heritage Assessment (if applicable)

The Estate management group consists of DSD as the lead Agency with the ongoing management of the BSIA undertaken by LandCorp (Western Australian Land Authority) as identified below:

- LandCorp, in conjunction with DSD, will be responsible for the review and approval of proponent driven development within the BSIA prior to lodgement of any Development Application with the Town of Port Hedland.
- The Estate Management Group will be responsible for approving leases to future proponents, advising on proposed developments and use of infrastructure within the BSIA. Consideration will be given to the Development Plan, technical reports and operational requirements of proponents to ensure the BSIA is developed to the full potential for downstream resource processing and a strategic industry.
- Additional to the management of proponent driven development aspects, the Estate Management Group will, in the first instance act on behalf of the BSIA industries in liaison with the PHPA to ensure the provision of berths remains available for the operational needs of the BSIA.
- All Development Applications shall be signed by the Department of State Development and LandCorp prior to lodgement with the Town of Port Hedland.

2 Part Two – Explanatory Section

1 Introduction

1.1 INTRODUCTION

The Boodarie Strategic Industrial Area Development Plan will coordinate the detailed land use and development of the Boodarie Strategic Industrial Area (BSIA), including the provision of proponent funded services and infrastructure. This Development Plan was commissioned under the Heavy Use Industrial Lands Strategy (HUILS) to guide heavy industrial development in Boodarie, Port Hedland. DSD and LandCorp are implementing the Heavy Use Industrial Land Strategy which aims to bring key new industrial estates towards a basic “project ready” status, by achieving land-based approvals in preparation for occupancy by significant industrial projects.

The BSIA is in close proximity to the Port Hedland Port with connections to the inner harbour, the proposed outer harbour and Lumsden Point through strategic infrastructure corridors and linkages. The proximity of the Port to the BSIA has the potential to create a world-class heavy industrial estate which specialises in multi-product, downstream resource processing.

The development opportunities, synergies and potential connections of the BSIA to surrounding land uses and infrastructure enhance the viability of the locality for heavy industrial uses.

The formulation of the Development Plan has involved an analysis of the opportunities, constraints, strengths and weaknesses relating to the BSIA. These are further detailed within the Development Plan report.

The Development Plan ensures that the State and National drive for diversified industry has been maintained, while balancing the needs of industrial users and sustainability of the local community. Careful attention has been paid to ensuring appropriate integration between development proposed within the BSIA and within Port land.

Key local planning documents and State initiatives have been considered within this Development Plan.

This Development Plan has been prepared on behalf of LandCorp and Department of State Development (DSD) with the input of the following consultants:

Consultant	
Urbis	Development Plan Reporting
urbanplan	Land Use and Corridor Planning Development Plan Reporting
Worley Parsons	Land Use and Corridor Planning Integration of Port Master Plan and BSIA Development Plan
Whelans	Survey and Mapping
GHD	Industrial Ecology – Input and Output Quantitative Risk Assessment Utilities Planning Transport Planning Stormwater Management Groundwater Monitoring Flora and Fauna Investigations
RPS	Aboriginal Heritage
Cardno	Coastal Vulnerability Report

Herring Storer Acoustics	Acoustic Assessment
Air Assessments	Air Quality Assessment
Strategen	Environmental Gap Analysis

The Development Plan report is structured as follows:

- **Part One – Statutory Section**
Part One of the Development Plan includes the Development Plan Map and provisions and requirements that have statutory effect.
- **Part Two – Explanatory Section**
Part Two of the Development Plan justifies and clarifies the provisions contained in Part One, and is used as a reference guide to interpret and implement Part One. Part Two does not have statutory effect.
- **Appendices**
Technical reports, supporting plans and maps.

1.2 PROJECT PURPOSE

The purpose of this Development Plan is to facilitate the development of the BSIA for a variety of heavy industrial developments, specialising in downstream resource processing.

The Development Plan fulfils the statutory requirements of the Town of Port Hedland's Town Planning Scheme No. 5 (TPS 5) in establishing the appropriate framework for development.

1.3 ESTATE MANAGEMENT

The development of the BSIA is to be proponent driven. Expressions of Interest on the lease of lots shall include a business case which appropriately justifies the location and activity in accordance with the Development Plan and Precinct Plan contained within this report. These will be reviewed by DSD and LandCorp. If an industrial developer demonstrates as part of the business case that it should be located in an alternative location to the preferred precinct, this may occur subject to business case approval by DSD and LandCorp.

Prior to lodgement of a Development Application with the Town of Port Hedland, endorsement of a proponent's proposal must be obtained from LandCorp and DSD.

As a proponent driven development, staged development of the BSIA does not imply a commitment from either State or Local Governments to provide serviced land or the infrastructure required to make the area function. Proponents are therefore responsible for the construction of infrastructure required for their business.

As part of the determination and approval process, proponents are required to undertake detailed site investigations in accordance with the TPS 5 and other State Policies and achieve associated approvals from relevant referral agencies.

If considered necessary, the Town of Port Hedland may permit the Development Plan to be extended outside the BSIA to facilitate By-Product Storage, where in its opinion this would not prejudice the orderly and proper development of the area.

1.4 INTEGRATION WITH THE PORT HEDLAND PORT

LandCorp and DSD have consulted with the Port Hedland Port Authority (PHPA) regarding infrastructure connections and berthing which are under the Port's jurisdiction. Ensuring sufficient allocation of berths in the inner and proposed outer harbours, and connections to and from the BSIA is critically important. The PHPA is supportive of the development of the BSIA, and has recently worked with LandCorp to resolve the interface with the Port. The PHPA is in the process of finalising its revisions to its Multi User Outer Harbour (MUOH) Port Master Plan, and it was agreed with the DSD that the alignment of these plans with the BSIA was essential.

Worley Parsons was recently commissioned by DSD to prepare a Combined Port Area and Boodarie Master Plan Technical note (refer Appendix XIII) in recognition of the need for co-ordination between the Port and the BSIA. The purpose of this technical note is to document the preparation of the resulting Combined Port Area and BSIA Master Plan, adopting the two plans as the basis of this process and addressing any outstanding issues at the interface with these plans.

As a consequence of the findings and recommendations of the Worley Parsons Technical Note, modifications have been made to the Development Plan including fine tuning to the alignment of the shared infrastructure corridors. The various supporting reports included as Appendices of the BSIA Development Plan have been reviewed in the context of the technical note and it was concluded that it did not have any consequence to the findings of the supporting reports. It was determined that it was therefore not necessary to update the supporting reports to reflect the modified Development Plan.

2 Site Context

2.1 LOCATION

Located within the Town of Port Hedland, the BSIA is situated four kilometres west of the South Hedland town site and approximately 12 kilometres south of the Port Hedland town site, as detailed in *Figure 1*.

The BSIA Development Plan comprises and applies to a Strategic Industry Zone adjacent the Great Northern Highway. The area is separated from sensitive uses in the Planning Scheme by a Special Control Area buffer. The BSIA Development Plan Area includes Infrastructure Corridors that provide connections to the Port of Port Hedland. The Development Plan Map conceptually identifies how these corridors extend outside of the Development Plan area, connecting into Port land to the north and extending further south from the BSIA.

2.2 AREA AND LAND USE

The BSIA consists of approximately 4,190 hectares (which includes the buffer) of largely undeveloped land with small scale land uses in operation. The area within the Boodarie Industrial Buffer SCA comprises 15,736 hectares with a number of similarly small scale land uses. These include sand extraction, mineral storage leases and power generation facilities. The site is bisected by a number of regional service mains, including the APA Group gas pipeline, which comprises the main infrastructure servicing the Alinta gas fired power station

2.3 LEGAL DESCRIPTION AND OWNERSHIP

There are many leasehold land tenure arrangements within the BSIA. An extensive land tenure ordinance report undertaken by Whelans - *Current Land Use and Interests Report* is attached as Appendix I under External Reports.

In summary, the majority of the land is currently held by the Crown and is the subject of the "Boodarie" Pastoral Lease held by BHP Billiton (BHPB), the De Grey - Mullewa stock yard route, a Stock holding Reserve vested in the Town of Port Hedland and a number of General Purpose and Mining Leases for Infrastructure and sand extraction purposes (Refer Appendix A).

The land is subject to numerous power, gas and water easements.

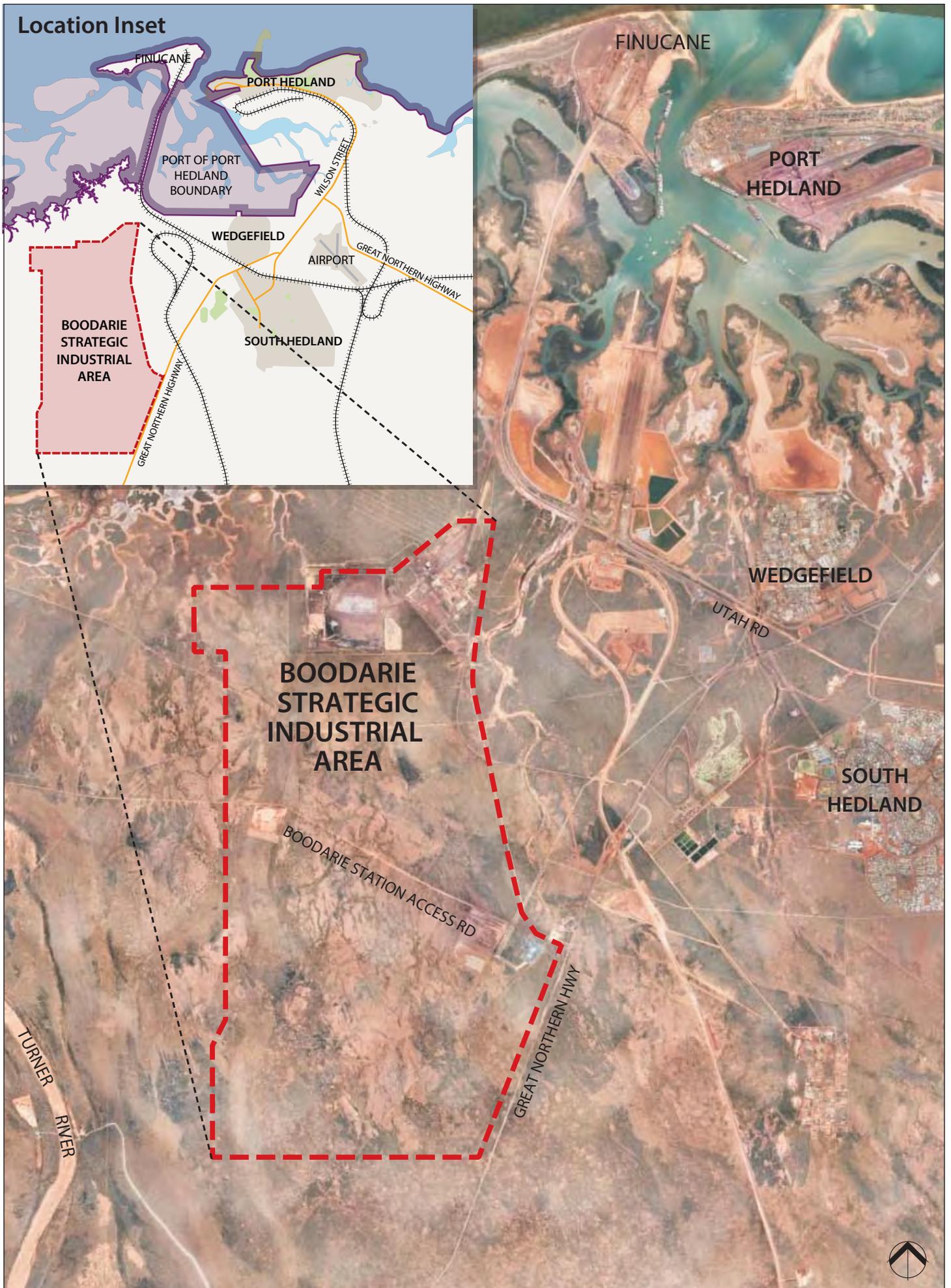


Figure 1 - Location Plan
 BOODARIE STRATEGIC INDUSTRIAL AREA

DATE 20.03.2014

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urban|design
 plan|development



3 Planning Background

3.1 STRATEGIC PLANNING FRAMEWORK

3.1.1 DRAFT STATE PLANNING STRATEGY

The Western Australian Planning Commission (WAPC) released the Draft State Planning Strategy for public comment in December 2012. The strategy provides a collaborative approach to planning within Western Australia, reflecting the need to inform the planning framework in light of the growth and change occurring within the various sectors.

Key strategic directions are set out to influence the development of Western Australia. The strategic directions and objectives relevant to the development of the BSIA can be summarised as:

- Facilitating coordinated and sustainable economic development through innovation and diversity in development and investment in infrastructure.
- Facilitating a sustainable supply of affordable land for future development, particularly in regional hotspots.

The Draft State Planning Strategy identifies the North West Sector as a key contributor to Australia's GDP. This is primarily driven by the expansion in the resources sector and ever increasing demands. The Strategy outlines the opportunities for growth within both the economic and social sector, identifying the key interdependencies between economic and population growth.

Diversification of economic developments and business operations is encouraged in order to secure a sustainable economic future for the North West Sector.

The approaches set out within the Strategy to achieve the relevant objectives include:

- Ensure an appropriate and unconstrained land supply is available.
- Ensure the required infrastructure is in place to support growth and development.
- Provide opportunities for diversification in the economy.
- Promote Industrial Ecology and clustering of ancillary industries.
- Ensure appropriate accessibility is provided through movement networks and connections within Western Australia, nationally and internationally.
- Encourage development to occur in defined precincts to avoid incompatible uses restricting development.

The development of the BSIA is in line with the objectives of the Draft State Planning Strategy. The Development Plan facilitates strategic industrial land which provides additional support industries to the existing economic drivers within Port Hedland.

3.1.2 PILBARA PLANNING AND INFRASTRUCTURE FRAMEWORK

Prepared by the WAPC, the Pilbara Planning and Infrastructure Framework (2012) sets the strategic framework for the Pilbara region to 2035.

The Framework acknowledges that an increase in population within the region will need to be supported by a robust, diverse and sustainable economy. The initial diversification is to stem from the industry supply chain and downstream resource processing. Future diversity is seen to come from an increase in knowledge based industries and increased export capacity.

A well connected transport network is highlighted as a key component in the expansion of economic activity within the Pilbara. Providing for accessibility and connectivity through individual transport networks and between various modes of transportation is required. Facilitating locally, regionally, nationally and internationally connected networks which can be utilised in all weather conditions is paramount in the ongoing viability of development within the region.

The need to supply significant amounts of industrial land to support the expansion of existing projects and facilitate future development is acknowledged. The unique drivers for land are recognised, as are the requirements for large areas of land to meet operational requirements. Strategic Industrial Areas, including the BSIA will provide for much of the demand as outlined within the HUILS.

3.1.3 HEAVY USE INDUSTRIAL LAND STRATEGY

As mentioned earlier in this report, this Development Plan was commissioned under the Heavy Use Industrial Lands Strategy (HUILS) to guide heavy industrial development in Boodarie, Port Hedland. HUILS identified key new industrial estates for the development of heavy industry within Western Australia. The HUILS aims to facilitate the initial stages of these estates to reach project ready status and allow significant industrial developments to be established. DSD is responsible for implementing the strategy and funding has been allocated to enable this.

The BSIA was identified as a priority estate by DSD on the basis of its significant potential to support downstream processing in Port Hedland. DSD has progressed the initial planning phase, leading to the preparation of this Development Plan in facilitating the release of land for development.

3.1.4 PORT HEDLAND AREA PLANNING STRATEGY

The Port Hedland Area Planning Study (2003) (PHAPS) provides a framework to guide State decision-making and detailed planning at the local level for a planning horizon of 20 to 25 years.

The PHAPS identified the potential for downstream resource processing associated with the resource extraction projects which were at the time, being established in the locality.

The need to provide land and infrastructure to provide for the diversifying economy was acknowledged. The Strategy aims to provide for the indicative planning needs, land uses, expansion areas, and future infrastructure within Port Hedland in order to avoid land use conflicts and promote development.

The establishment of the BSIA is a pro-active approach to provide land and infrastructure in a suitable location for strategic industry. The Strategy envisages the BSIA as having a heavy industry core surrounded by support industry, with linkages to the Port of Port Hedland.

3.1.5 PILBARA'S PORT CITY GROWTH PLAN

This Town of Port Hedland document provides high level, strategic guidance for the future development of South Hedland, Port Hedland and surrounding areas. The Town of Port Hedland and WAPC endorsed the Pilbara's Port City Growth Plan in December 2012 as the Town's Local Planning Strategy, replacing the Land Use Master Plan 2008.

The growth plan seeks to deliver sustained and diversified economic growth, population growth and to enhance community and environmental opportunities through the revitalisation of the Town of Port Hedland locality. The key connections between economic growth and population growth are highlighted consistently within the document.

Industrial growth within Port Hedland is to allow for the orderly release of industrial land to allow for economic growth across a range of industries. Land within planned industrial areas such as BSIA is to be released in order to facilitate the movement of heavier industry from the existing industrial areas, such as Wedgefield, and allow for the expansion of additional heavy/strategic industry (Refer *Figure 2*).

The growth plan allows for flexibility in planning areas through the use of the precincts. This allows local level planning to occur in a manner which responds to the opportunities and challenges that occur as the Port Hedland locality grows.

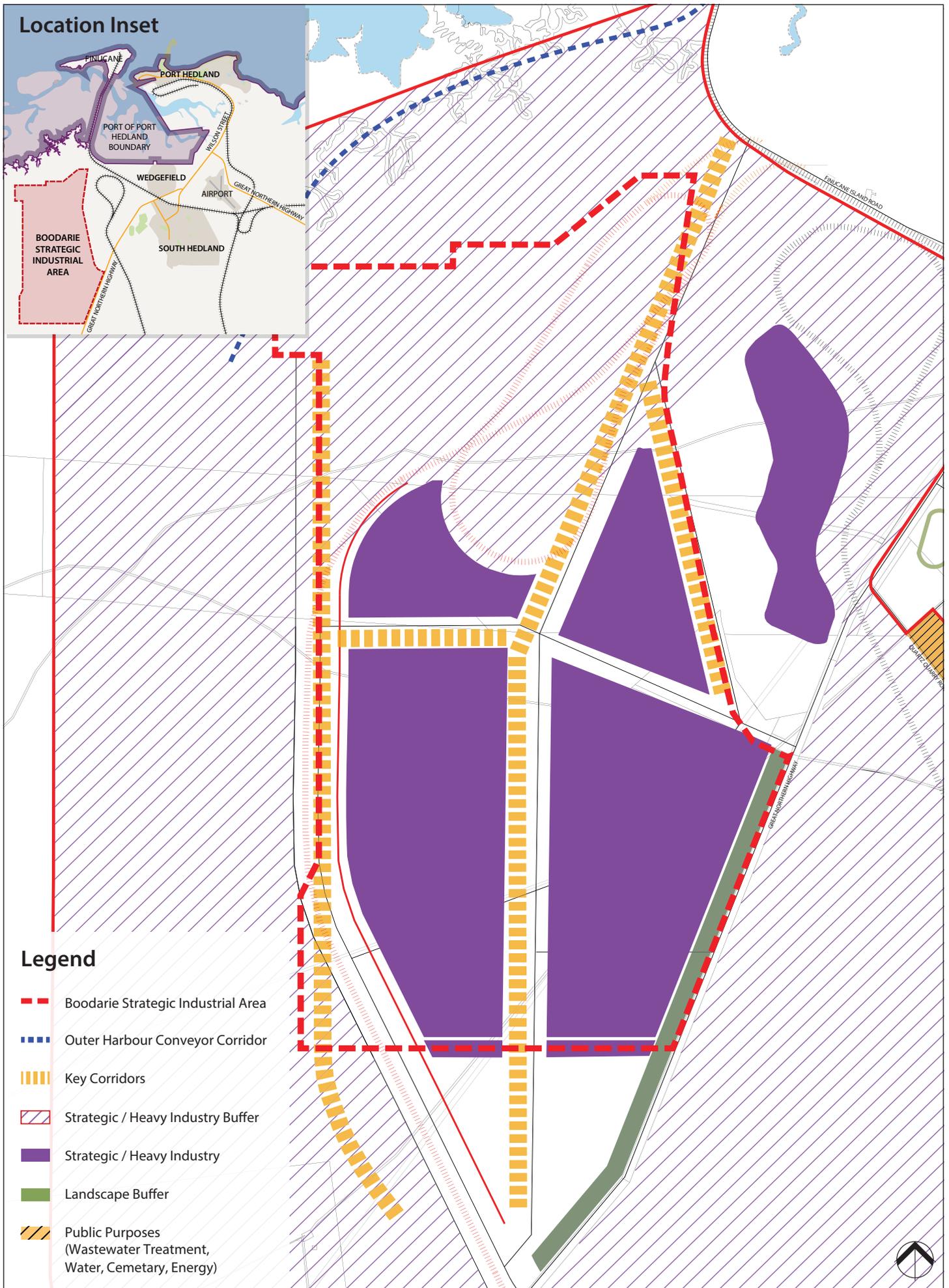


Figure 2 - Pilbara's Port City, Growth Plan

BOODARIE STRATEGIC INDUSTRIAL AREA

DATE 20.03.2014

DWG NO 002

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urban design
plan development



3.2 STATUTORY PLANNING FRAMEWORK

3.2.1 TOWN OF PORT HEDLAND TOWN PLANNING SCHEME NO. 5

The land subject to the BSIA Development Plan is zoned 'Strategic Industry' under the Town of Port Hedland TPS 5 (Refer *Figure 3*). In addition, TPS 5 identifies the subject land as being contained within the boundary of the Boodarie Industrial Buffer Special Control Area.

Parts V to VII of TPS 5 require comprehensive planning to be undertaken prior to strategic industrial development occurring on land within the 'Strategic Industry' zone.

Under TPS 5 the intent of the 'Strategic Industry' zone is to accommodate strategic industrial development, and restrict development which may obstruct the operation of such activities.

When considering development within the 'Strategic Industry' zone the Council is required to ensure:

- The optimal overall effectiveness of the zone as a strategic industrial area, which utilises major infrastructure, synergies between other industries and enables downstream resource processing;
- Development is economically significant at either a regional or national level;
- Development will directly provide goods and services to support or complement existing industry; or
- It will not generate significant adverse effects on the infrastructure, economy or community of the local area.

In order to assist in protecting the development and operation of the BSIA, additional controls are applied under TPS 5 for the Boodarie Industrial Buffer Special Control Area (SCA), within which the BSIA is located. Further, these controls have been strengthened via Amendment No. X to TPS 5. Amendment No X has introduced a range of updated and new provisions to protect the BSIA from any adverse impacts from potentially sensitive uses. These new provisions include:

- Prohibition of sensitive uses being developed within the SCA;
- Broadening the matters that council shall have regard for when considering a planning application within the SCA;
- Requiring referral of development applications to the Department of State Development and LandCorp; and
- Providing for the consideration of flooding from the Turner River for all future development within the SCA.

Further, in accordance with Amendment No. X, when considering applications for development within the SCA, Council shall have regard to:

- The Boodarie Strategic Industrial Area Development Plan;
- Whether the proposal is compatible with any existing or proposed future use or development within the 'Strategic Industry' zone;
- The existing, proposed or likely risks, hazards and nuisance (including, but not limited to noise, odour and light) associated with the 'Strategic Industry' zone; and
- The potential impacts of the proposal on the efficient development of the Boodarie Strategic Industrial Area.

All applications for development under TPS 5 will be assessed and determined by Council including consultation with relevant State departments and other relevant authorities to ensure the proposal does not conflict with intentions for industry and infrastructure development in the zone.

Land Use Permissibility is outlined within the Zoning Table of TPS 5. Table 1 of the Scheme outlines the uses which can be established within the 'Strategic Industry' zone.

TABLE 2 – LAND USE PERMISSIBILITY WITHIN THE STRATEGIC INDUSTRY ZONE

Land Use	Permissibility
Harbour Installation	P
Industry Extractive	AA
Industry Noxious	SA
Industry Resource Processing	P
Infrastructure	P
Storage Facility/depot/laydown area	IP
Motor Vehicle Wash	IP
Office	IP
On-site Canteen	IP
Warehouse	IP
Carpark	IP
Emergency Services	AA
Public Utility	AA

Those uses not listed above are ~ a development that is not permitted. In particular, Transient Worker Accommodation is not permitted within the Strategic Industry zone in accordance with section 7.2 of the Scheme.

P – permitted by TPS 5

AA – not permitted unless the Town of Port Hedland grants planning approval

SA - not permitted unless the Town of Port Hedland grants planning approval after giving notice in accordance with TPS 5 requirements

IP - not permitted unless the Town of Port Hedland determines the use is incidental to the predominant use.

~ a development that is not permitted by the Scheme.

Notwithstanding the above, development within the BSIA is subject to the requirements of the Development Plan and may only be permitted when it is in accordance with these requirements.

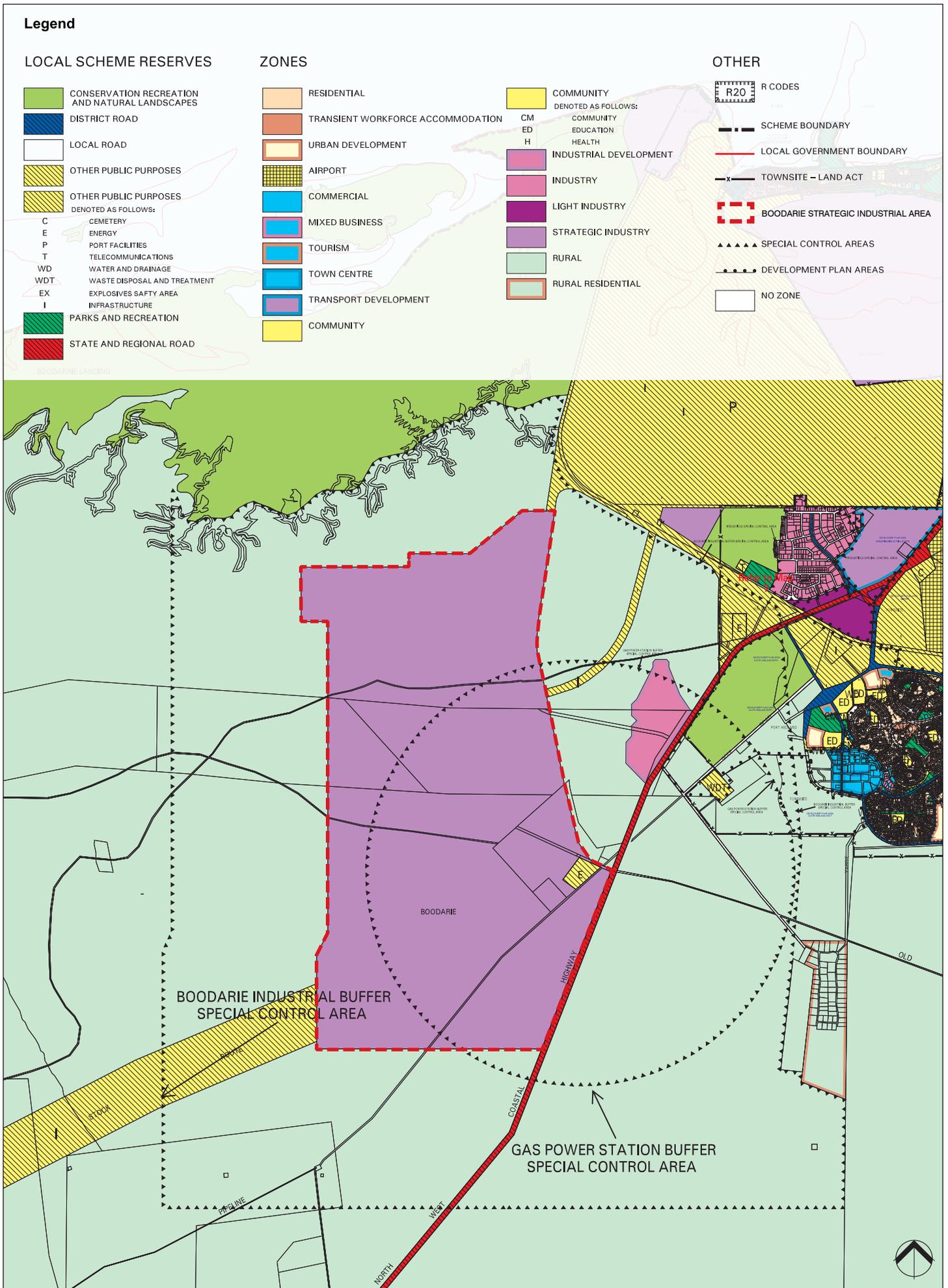


Figure 3 - Scheme Zoning
 BOODARIE STRATEGIC INDUSTRIAL AREA

4 Site Conditions

4.1 LANDFORM AND SOILS

4.1.1 LAND SYSTEMS

Land systems are described in terms of geology, landscape, soil and vegetation types. Van Vreeswyk *et al.* (2004) completed an inventory of the 102 land systems occurring in the Pilbara Region.

The BSIA is predominately within the Uaroo land system that is described as broad sandy plains supporting shrubby hard and soft spinifex grasslands. Land to the north of the BSIA is within the Littoral land system. The Littoral land system is described as bare coastal mudflats with mangroves on seaward fringes, sapphire flats, sandy islands, coastal dunes and beaches.

4.1.2 GEOLOGY

The study area is located within the Abydos Plain. The geology of this area is described as Quarternary alluvium near the coast, with Archean granite; other Archean rocks outcropping in small hills, ranges and dykes being located further inland.

The geology of the Uaroo land system is described as Quaternary colluvium and alluvium. The geology of the Littoral land system consists of quaternary mudflat deposits, clay, salt and sand and eolian sand.

4.1.3 SOILS

The gradients within the BSIA are very moderate, with the majority between 0% and 1%. Essentially the site grades south to north from the highest point of 18 metres AHD to the lowest of 8 metres adjacent to the South West Creek near the Port Authority's boundary.

A prominent sand ridge transverses the western margin of the site on a north to south trend and having an average elevation of 16 metres AHD. This ridge and a second ridge further west co-jointly act as a physical flood barrier to Turner River.

The site comprises Pindan clayey sands consisting of Pleistocene red brown flood plain alluvium comprising silty sands.

4.1.4 GEOTECHNICAL ANALYSIS

GHD undertook Geotechnical Investigations and an Acid Sulphate Soil investigation over the BSIA in January 2013. The results of this are summarised below, with the full report attached at Appendix IV.

Generally the investigation indicates that the soil conditions are reasonably consistent across the entire development plan area and comprise of a topsoil layer overlying mixed flood plain deposits. The floodplain deposits were observed to consist of an upper silty sand unit overlying clayey sand. Further, iron cemented layers were locally intersected within the clayey sand.

To expedite the initial stages of the development, LandCorp required more detailed investigations to facilitate the early release of Stage 1 and Stage 2, with the balance of the development area to be completed when practical. Stage 1 comprises an area of approximately 460 hectares to the south of Boodarie Station Access Road, whilst Stage 2 is approximately 310 hectares in area located north of Boodarie Station Access Road. The balance of the study area designated 'Preliminary Study Area' is approximately 4,000 hectares in area.

STAGE 1

Stage 1 is located to the south of Boodarie Station Access Road and is generally flat lying, situated within an elevation range of RL+10.0m AHD to RL+11.5m AHD (Australian Height Datum). The surface is lightly vegetated with low lying shrubs and grass.

A basic summary of findings for the Stage 1 area is as follows:

- Topsoil within Stage 1 comprises fine to medium grained sand / silty sand, ranging in depth from 0.2 to 0.3 metres with variable organic content.
- The upper silty sand unit comprising pale brown to brown, fine to medium grained sand, ranging in depth 0.0 to 1.6 metre with low to none plasticity silt, and is considered appropriate for re-use as an engineered fill.

The clayey sand unit, typically comprises brown, fine to medium grained sand, extending beyond the depth of the test pits, with low to medium plasticity clay and a trace to some gravel. These soils are reactive and are sensitive to variations in moisture content.

STAGE 2

Stage 2 is located north of Boodarie Station Access Road and is generally flat, similar to Stage 1, situated within an elevation range of RL+11.5m AHD to RL+12.0m AHD.

A basic summary of the results for the Stage 2 area is provided below:

- Topsoil within the Stage 2 area was intersected in all locations at depths between 0.2 and 0.4 metres and consisted of loose, pale brown, fine to medium grained sand.
- The upper silty sand unit observed in Stage 2 was similar to that in Stage 1, comprising pale brown, fine to medium grained sand, with nil to low plasticity silt ranging in depth from 0.0 to 1.8 metres. This sand unit is considered appropriate for re-use as engineered fill.
- Similar to Stage 1, the clayey sand unit extended beyond the depth of test pits and consists of brown, fine to medium grained sand, with low to medium plasticity clay and traces of gravel. These soils are reactive and are sensitive to variations in moisture content.

PRELIMINARY STUDY AREA

The Preliminary Study Area is predominately situated within an approximated elevation range of between RL+7.5m AHD and RL+17.5m AHD, with a gentle decline (approximately 1(V) in 750(H)) from south to north. A south to north trending ridge is situated along the western boundary of the site. The ridge is generally indicated to be elevated around 2m to 3m above the surrounding ground levels except at the southern extent where it is up to 5m higher in elevation.

The surface vegetation across the site generally comprises low lying shrubs and grass, with localised areas supporting young to mature trees. Existing fence lines were observed throughout the site, in particular along the fringes of Boodarie Station Access Road and the Great Northern Highway.

A total of 85 test pits were excavated to depths of between 1.0m and 4.5m. The selection of test pits was set out to provide a representative coverage of the BSIA. A basic summary of the results for the Preliminary Study Area is provided below:

- Topsoil observed in all test pit locations except one, was intersected in all locations at depths between 0.2 and 0.3 metres and consisted of loose, pale brown, fine to medium grained sand.
- The upper silty sand unit was observed at approximately half of the test pit locations and comprised pale brown to brown, fine to medium grained sand, with nil to low plasticity silt ranging in depth from 0.0 to 1.5 metres. This sand unit is considered appropriate for re-use as engineered fill.

The clayey sand unit was intersected in all of the test pit locations and extended beyond the depth of test pits. The clayey sand unit consists of brown, fine to medium grained sand, with low to medium plasticity clay and traces of gravel. These soils are reactive and are sensitive to variations in moisture content. The majority of the BSIA is located within a low lying area which is prone to flooding. Placement of fill will be required to achieve proposed development levels across the site. Foundation bearing capacity and soil settlement estimates note that lightly loaded industrial structures can be accommodated on the final engineered fill. Additional geotechnical investigation and analysis is necessary to support the design of heavily loaded or settlement sensitive structures.

Groundwater was intersected in test pit TP76, situated at the north-west corner of the BSIA. The groundwater depth, estimated to be 4.2m from a ground surface elevation, is approximately RL +7 metres AHD. It should be noted that the groundwater level intersected during the field investigation does not necessarily represent the highest expected groundwater levels.

4.1.5 ACID SULPHATE SOILS

A review of Department of Environmental Regulation (DER) Acid Sulphate Soil (ASS) risk mapping indicates the BSIA overlies an area of no known ASS risk within 3m of the natural soil surface. It does not prove conclusively there is no ASS in the area.

All sample locations for the combined geotechnical and ASS test pits were positioned within Stage areas 1 and 2 of early development or at road swale locations and drainage inverts. Soil samples were taken to 3 metres depth with the expectation that drainage invert levels will be between 1.5 to 2.0 metres below ground level.¹

Based on the fairly consistent lithological observations and the negligible potential acid generation as indicated by the laboratory results, the risk of excavating ASS during excavation of the road swales in potential early stages of development is very low. For these reasons, it is anticipated the soils to be excavated during construction of the swales to a depth of 2.0 metres below ground level will not require treatment for ASS.

4.2 BIODIVERSITY AND NATURAL ASSETS

4.2.1 VEGETATION DESCRIPTION

A Flora and Fauna Assessment was undertaken by GHD in June 2010. The results of this are summarised below, with the full report attached at Appendix V.

The BSIA falls within the Roebourne sub region of the Pilbara Biogeographic region of Western Australia. The environment of this sub region has been described as coastal and sub-coastal plains with a grass savannah of mixed bunch and hummock grasses and dwarf shrub steppe of *Acacia stellaticeps* or *A. pyrifolia* and *A. inaequilatera* (Kendrick and Stanley, 2001). The uplands of the region support *Triodia* hummock grasslands and the ephemeral drainage lines support *Eucalyptus victrix* or *Corymbia hamersleyana* (Kendrick and Stanley, 2001).

¹ If the invert levels estimated for the pit tests become deeper than currently proposed or the road swale locations drastically deviate from the current locations proposed, between the time of writing this report and when construction commences, then GHD suggests further soil investigation may be required.

Broad scale mapping (Beard, 1979) indicates two vegetation associations are present within the BSIA. The majority of the BSIA is within vegetation association 589, described as Short bunch grassland - savanna / grass plain (Pilbara) / Hummock grasslands, grass steppe; soft Spinifex. The northern and southern parts of the BSIA are within vegetation association 647 described as Hummock grasslands, dwarf- shrub steppe; *Acacia translucens* over soft Spinifex.

The vegetation in the BSIA was classified into nine vegetation types, including cleared/disturbed vegetation, where clearing or other activities have fundamentally altered the composition of the native vegetation. There is considerable overlap between vegetation communities due to the similarity of underlying geology and landform.

The vegetation within the study area is dominated by low open heath over tussock grasslands, with changes due to differing dominance of individual grass/*Triodia* species, fire and other disturbances. Tussock grasslands are present with emergent tree overstorey species (Eucalypt and Acacia) on the sandplains.

Of note, there are three vegetation communities that samples have not been obtained from. These included areas with very few species present, such as open tidal flats/creekline and cleared/degraded areas. The tidal flats vegetation is too open to incorporate traditional plot based or relief surveys. In the cleared/degraded areas vegetation is absent, or with flora species known to respond to disturbances.

4.2.2 VEGETATION EXTENT TYPE AND STATUS

A vegetation type is considered underrepresented if there is less than 30 percent of its original distribution remaining. The remaining extent of the vegetation associations present within the BSIA is considered intact, with close to 100% of the pre-European extent of the vegetation types considered to be remaining.

4.2.3 VEGETATION CONDITION

The vegetation condition of the BSIA was rated using the vegetation condition rating scale developed by Keighery (1994) that recognises the intactness of vegetation as defined by the following:

- Completeness of structural levels;
- Extent of weed invasion; Historical disturbance from tracks and other clearing or dumping; and
- The potential for natural or assisted regeneration.

The native vegetation within the study area was assessed to be predominately in *Excellent* condition. The vegetation structure within much of the BSIA however, has been severely impacted by fire with evidence of fire scarring occurring. Other disturbances across the study area include tracks/roads, power lines, cattle grazing, and the existing Alinta power station.

Weed species are present within the study area, with the most common, Buffel grass, occurring primarily along the edges of tracks and roads and in other previously disturbed areas. Kapok Bush was also widespread along the creekline within the proposed powerline route.

4.2.4 THREATENED ECOLOGICAL COMMUNITIES

No Threatened Ecological Communities or Protected Ecological Communities were identified as occurring within the study area during the survey.

4.2.5 FLORA SPECIES

Vegetation within the study area is considered to represent a moderate degree of species diversity. A total of 144 taxa from 48 families were recorded from the study area. This list includes subspecies (subsp.), variations (var.), and hybrids (x). Two collections could only be identified to general level or could not be positively identified to species level due to lack of flowering parts or fruiting bodies.

4.2.6 SIGNIFICANT FLORA SPECIES

No Declared Rare or Priority Flora species were recorded during the field survey.

One of the species collected from the site *Stemodia lathraia* (identification confirmed by Robert Davis WA Herbarium) represents a significant (500km) range extension for this species. This species has only previously been collected from the Kimberley region.

A previously undescribed species of *Phyllanthus* (*Phyllanthus simplex sen.lat*) currently being described by Ian Telford at Australian National Herbarium) was collected. This species is not recognised as being of conservation significance.

4.2.7 INTRODUCED FLORA

Three weed species were recorded within the survey area; **Cenchrus ciliaris* (Buffel Grass), **Aerva javanica* (Kapok Bush), and **Chloris barbata* (Purpletop Chloris). These species were generally concentrated in previously disturbed areas such as along tracks and roads.

4.2.8 MULGARA FAUNA

Mulgara (*Dasyercus cristicauda*) is a conservation significant fauna species that is known to occur within the Port Hedland area. Mulgara have recently been recorded in the Wedgefield area in Port Hedland. Evidence of Mulgara fauna (scats and burrows) was observed within the BSIA during the field survey. A detailed fauna survey would be required to verify the presence of this species.

The majority of the study area was found to contain native vegetation in excellent condition, offering suitable habitat for native fauna. Some areas of the study area have been subject to inappropriate fire regimes that have reduced the habitat value in those areas. Clearing for tracks, roads, power lines, and other infrastructure (including the power station) have also reduced the habitat value within some sections of the study area.

The vegetation type described as *Acacia stellaticeps* low closed heath over tussock grassland of *Triodia schinzii* and *T. epactia* was found to contain prime habitat for Mulgara as evidence of the Mulgara species has been found throughout this vegetation type. These areas contained particularly high habitat value.

LandCorp has received approval for the clearing of not more than 81.35Ha of this habitat from the Department of Environmental Regulation, which is attached as Appendix F. Importantly, the approval includes a management plan setting out a process for the identification of Mulgara and relocation to suitable habitat. It is anticipated that this process would be typical for the balance of the BSIA

4.3 GROUNDWATER AND SURFACE WATER

4.3.1 GROUNDWATER MONITORING

GHD installed monitoring bores at strategic locations within the BSIA and undertook baseline groundwater monitoring to determine predevelopment groundwater levels and groundwater

quality over a period of 12 months. The results of this are summarised below, with the full report attached at Appendix VI.

A total of 7 groundwater monitoring wells were installed in December 2012 and the first round of groundwater level and groundwater quality monitoring was undertaken shortly thereafter. Between the third sampling in August 2013 and the fourth in October 2013, groundwater levels have stabilised, following the significant rain events recorded during the previous quarter, with reducing levels observed at two sampling sites. A groundwater level decline is observed in well GW6, which is possibly attributed to drilling activities in the area. A drop in levels has recorded at GW1, with a significant drop in groundwater levels was also noted in well GW2.

Groundwater quality has remained relatively stable with comparison to the initial round of monitoring. Groundwater quality at GW1 and GW2 is the most saline, possibly indicative of salt-water intrusion from the coast. Groundwater becomes fresher with distance to the south.

4.3.2 WATERCOURSES

Waterways and wetland areas within the Pilbara region are ephemeral, and typically flow or fill during seasonal rainfall events. A search of the Western Australian *EPBC Act* Protected Matters Search Tool indicates no wetlands or watercourses of significance in or adjacent to the study area.

South West Creek is an ephemeral watercourse/tidal creekline.

4.3.3 PUBLIC DRINKING WATER SOURCE AREA

Public Drinking Water Source Areas is a collective term used for the description of Water Reserves, Catchment Areas and Underground Pollution Control Areas as declared under the provisions of the *Metropolitan Water Supply, Sewage and Drainage (MWSSD) Act 1909* or the *Country Area Water Supply (CAWS) Act 1947*.

The DoW has recently arranged for the abolition of the Turner River Water Reserve, which was located within the Development Plan area. The DoW has confirmed that the CAWS Act 1947 no longer applies to land use activities within the Development Plan area.

4.3.4 SOUTH WEST CREEK – FLOODING

Flooding of SW Creek and storm surge areas are influential to determining the development parameters of the BSIA. Preliminary flooding and storm surge knowledge was derived from the GEMS study. Site specific detail has been provided through GHD's District Water Management Strategy (DWMS) as outlined in Section 7.0.

Studies undertaken by Jim Davies and Associates Pty Ltd (JDA) between 1994 and 2005 assessed the flooding potential of the BSIA and other infrastructure in the vicinity. The report reveals that there was significant uncertainty as to the interactions between the Turner River, South Creek and South West Creek that could result in additional flow to South West Creek during flooding of the Turner River.

Subsequent to JDA 1995, Global Environmental Modelling Systems (GEMS) undertook the Greater Port Hedland Storm-surge Study (GEMS 2000ii). GEMS suggested that the application of the predicted 100-year storm surge level as a downstream boundary condition to the flood modelling (as adopted by JDA 1995) represents a highly unlikely event and therefore adopted the high spring tide for their flood model.

4.3.5 PORT HEDLAND COASTAL VULNERABILITY STUDY

The Port Hedland Coastal Vulnerability Report (Cardno 2012), included as Appendix XIV under External Reports, was undertaken in order to identify the opportunities and constraints in meeting the infrastructure requirements Port Hedland faces as population and development opportunities grow. The full report is available from the Town of Port Hedland.

Port Hedland is noted to be vulnerable to impacts from tropical cyclones and pending climate change. The study covers a great deal of analysis and interpretation of modelling results to determine the combined influence of storm surge impacts in combination with flood analysis and coastal inundation. The BSIA is located within the study area, within Area 3; however there are no results specific to the BSIA.

The modelling work undertaken by Cardno (refer Appendix XIV under External Reports) specifically focuses on this BSIA locality in order to predict the impacts of flooding on the development area, along with the BSIA central infrastructure corridor, and the surrounding developments. In addition, the DWMS addresses site-specific drainage assessment, and provides further detail specific to development on the site.

The DWMS has established guidelines and a drainage master plan to which all industries must comply. This will be particularly important for sites such as Boodarie where the cost of fill is a significant factor in project development costs. All developers will require a complying framework within which to manage drainage at the boundaries of their sites to ensure effective functioning and viability of overall site drainage and fill levels. On the sites where smaller scale development takes place, such as support industrial areas, a uniform approach to coastal vulnerability and inundation must be clearly defined and enforced.

4.3.6 TURNER RIVER

GHD undertook a study on BSIA Hydrologic and Hydraulic Analysis of the Turner River Catchment, west of the BSIA, to assess implications for the Development Plan. The results of this are summarised below, with the full report attached at Appendix VII. This study conducted hydraulic modelling of the Turner River to estimate the peak 100 year water levels along the Turner River and subsequently highlight constraints on the BSIA.

The study highlighted:

- Flood levels associated with the Turner River and potential effects and risks to the BSIA.
- Options for future sand mining around the Turner River.

The BSIA is currently afforded flood protection by the sand ridge adjacent to the Turner River. The 100 year ARI flood levels are contained within the low lying valley between Turner River flood plain east bank and the sand ridge.

In order to ensure this level of protection remains and the operations of the BSIA are not compromised by further sand mining operations, the recommendations include:

- Provide for mining of the sand ridge subject to BSIA drainage levels. This is on the proviso that levels remain above the 100 year peak flood level (plus 50cm freeboard).
- Construct a levee between the two ridges to eliminate flood water within the low lying valley. This would provide for mining in line with the BSIA drainage levels.
- Provide for mining of the sand ridge to an extent which maintains a bund at a height consistent with the peak flood level and 500mm freeboard.

Amendment No. X to the Town of Port Hedland Town Planning Scheme includes the insertion of 2 new clauses under section 7.2 Boodarie Industrial Buffer Special Control Area to provide for the appropriate consideration of the Turner River and the adjacent sand ridge as part of any new development, including extractive industry. The new clauses comprise the following:

- *Clause 7.2.3: “When considering an application for planning approval with respect to land wholly or partly within the Boodarie Industrial Buffer Special Control Area, the proposal shall be referred to the Department of State Development and LandCorp.”*
- *Clause 7.2.4: “Prior to granting planning approval for development, including extraction, on land to which this clause applies the local government must consider:*
 - (a) The likelihood of the proposed development adversely affecting the efficiency and capacity of the Turner River and surrounding landscape to safely carry and discharge floodwaters, including any backwater flows; and*
 - (b) The likelihood of the proposed development adversely affecting the safety of land zoned ‘Strategic Industry’ during flood events.”*

4.4 HERITAGE

4.4.1 NATIVE TITLE

The Kariyarra People WAD6169/1998 are the registered native title claimants for the area in which the BSIA is located. Under the Native Title Act 1993, any proponents (government or non-government) are obliged to engage this group in any consultations and negotiations that could affect this group’s native title rights and interests. The Kariyarra People WAD6169/1998 must be involved in discussions relating to proposed activities within the BSIA.

4.4.2 HERITAGE SURVEY

McDonald Hale and Associates undertook an Aboriginal Heritage Survey of the Proposed Boodarie Industrial Estate in December 1998. In accordance with the Aboriginal Heritage Act 1972, The Department of Indigenous Affairs has registered 17 Other Sites of Aboriginal heritage significance within the BSIA (Refer Appendix B).

4.4.2.1 ABORIGINAL SITE IDENTIFICATION

An Aboriginal archaeological sites assessment was recently reviewed and updated by RPS for areas within and adjacent to BSIA. The findings of the Aboriginal Site Identification Assessment (April 2013) are summarised below, with the full report attached at Appendix VIII. The outcomes of the assessment will inform on-site processes for site works and support any Aboriginal Heritage approvals which are required for proposed activities. The results of the archaeological work were forwarded to the Karriyarra Marrapikurrinya for endorsement.

4.4.2.2 ARCHAEOLOGICAL SITES

Seventeen Aboriginal sites have previously been identified in the BSIA. Of these 17 sites, 5 have been de-registered as they do not meet the definition of sites under the AHA 1972. Section 18 permits have been granted to destroy 10 identified sites. In effect, this leaves two sites (BD 08-29/25647) and New Site 2 (Marlinyura/17023) which are subject to protection and management requirements.

In addition to the sites previously identified in the BSIA, 3 new archaeological sites were discovered. These consisted of artefact scatters and should be included as Aboriginal Heritage sites for protection.

The Aboriginal Heritage Act 1972 applies and accordingly RPS’s recommendation for the protected sites is:

That the sites should be cordoned off and avoided by development works. All onsite workers should be notified of the location of the site and avoided. If it is not possible to avoid site disturbance, a Section 18 application must be sought and granted prior to disturbance works.

4.4.2.3 ETHNOGRAPHIC SURVEY

Ethnographic investigations, including a site identification assessment, were undertaken by RPS . RPS worked in cooperation with local members of the *Marrapikurinya Karriyarra* to survey the subject site for any areas of ethnographic importance. The site survey and subsequent interviews with *Marrapikurinya Karriyarra* Elders, found that no sites of ethnographic or spiritual significance exist within the BSIA.

5 Opportunities and Constraints

This section includes an analysis of the opportunities and constraints which impact the BSIA. Surrounding land uses and existing and potential impacts are highlighted, and where appropriate, an indication of how the Development Plan is to be integrated into the surrounding area is outlined.

5.1 OPPORTUNITIES AND CONSTRAINTS PLAN

A review of the physical attributes of the subject site, the locational context and background documentation has highlighted a number of opportunities and constraints which have been taken into account in determining the design of the BSIA. A summary of the key Opportunities and Constraints is outlined below, and within *Figure 4*.

OPPORTUNITIES

- The significant opportunity that the BSIA establishes for downstream resource processing is derived from regional and major projects development, including the ore, salt and petro-gas resources.
- The protective statutory buffers to the BSIA provided by the Boodarie Industrial Buffers and Special Control Area.
- Established infrastructure surrounding the BSIA and opportunities to integrate.
- Proximity and access to the inner and proposed outer harbours of the Port of Port Hedland and associated infrastructure.
- Direct access to the Great Northern Highway at three junctions.

CONSTRAINTS

- The constraints and impacts represented by SW Creek, and the need to apply new resource information from the Port Hedland Coastal Vulnerability Study and GHD's DWMS assessment in further detailed Planning.
- The potentially expanding constraint created by future growth of tenements and the requirement to manage such tenements.
- The extent of BHP Billiton's Pastoral Lease on Lot 203, noting that it is due to lapse in June 2015.
- The potential constraint resulting from some of BHP Billiton's General Purpose Leases and the location of rail infrastructure proposed for the outer harbour project in the vicinity of access corridors to the Port, as well as multiple stockyards along the northern boundary of the BSIA.
- The extent of the lease area held by FMG.
- Stage 1 of the future Boodarie Stockyards (Reserve 50892) part contains a section of the Roy Hill Infrastructure rail corridor and is designated for the future Multi User Outer Harbour corridor. This land is currently reserved and managed by the PHPA under the Land Administration Act 1997 and is in the process of being vested in the PHPA under the Port Authorities Act 1999.
- The land designated for the Boodarie Stockyards Stage 2 (refer *Figure 4*) will soon be cleared of Native Title and will be excised from the current pastoral land and reserved for vesting in the PHPA.
- The importance of accommodating existing service corridor easements within future road or infrastructure corridors, whether the easements are in private or government agency ownership.
- The significant cluster of Heritage Registered Sites within the BSIA and adjacent SW Creek and potential Registered Sites within the PHPA (note the recommendation to seek a Section

18 determination and pursue mitigative research if the protection of these sites is not possible).

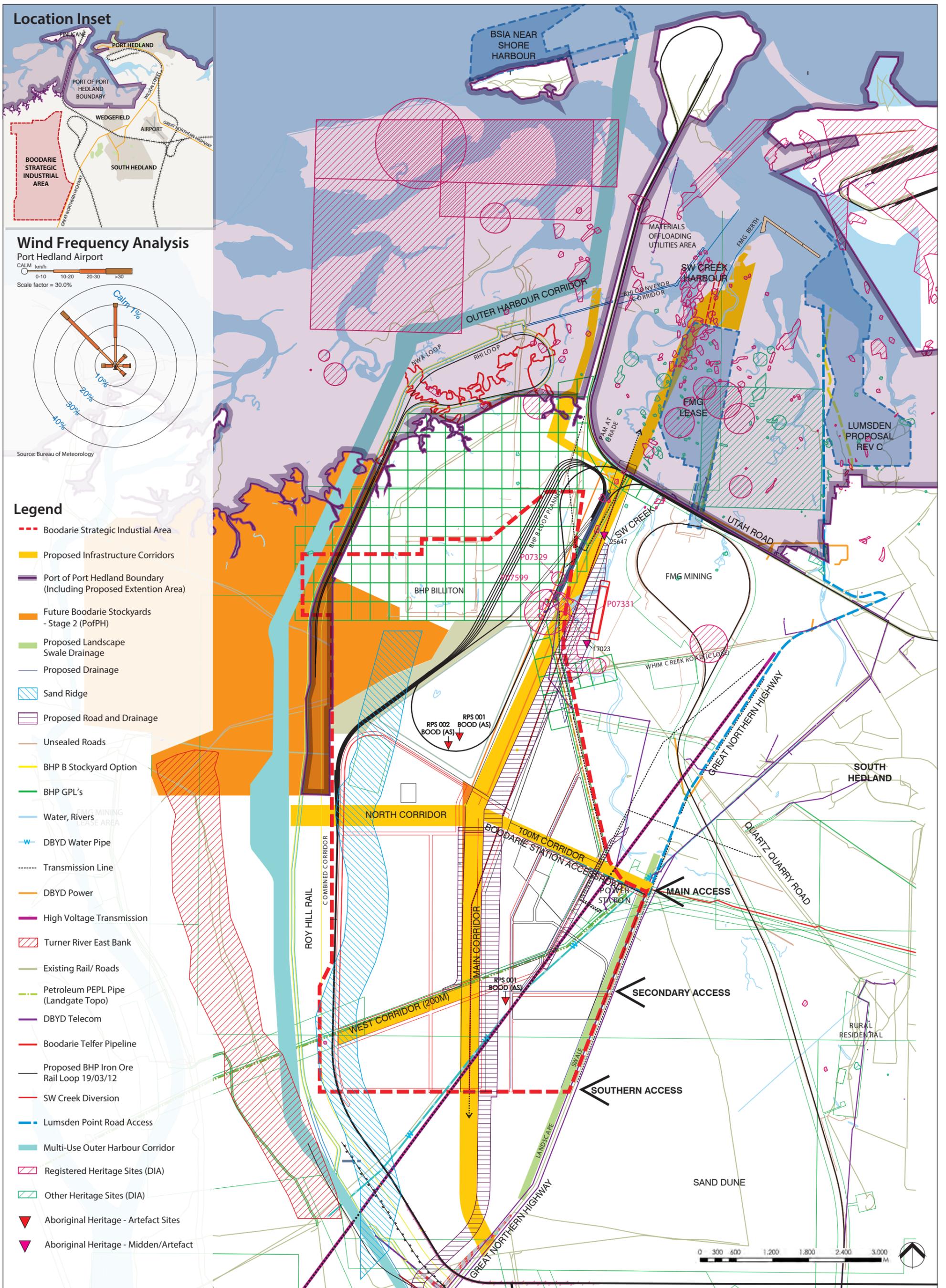


Figure 4 - Opportunities & Constraints

BOODARIE STRATEGIC INDUSTRIAL AREA

DATE 20.03.2014

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6 Spatial Landuse Considerations

6.1 INDUSTRIAL ECOLOGY

Industrial Ecology is about intelligent placement of associated industries to optimize—through industry collaboration—operational synergies and resource efficiencies. This may involve materials and by-products exchange, as well as finance and information.

The potential industrial ecology opportunities are documented in the GHD report attached as Appendix IX under External Reports. Outlined below is a summary of these findings.

The initial industry input and output assessment provides the foundation for utility demand forecasting and assists in identifying industrial synergy opportunities for the BSIA. The input and output assessment has implications for industrial land use placement, relationship to infrastructure corridors, and transport connections.

Tables 3 and 4 outline the full development estimates for the inputs and outputs resulting from operations within the BSIA.

TABLE 3 – BSIA MATERIAL AND SERVICE INPUTS

Power	1,100 mWGas
Gas	410,000 tJ/annum
High quality industry feedwater	21,700 ml/ annum
Lower quality industry feedwater	35,800 ml/annum
Raw Materials	39,400kt/annum

TABLE 4 – BSIA KEY INDICATIVE OUTPUTS

Effluent	56,400 kt/annum
Products	23,400 kt/annum
By-Products	4,400kt/annum

6.1.1 UTILITY DEMAND FORECASTING

Based on a set of high-level assumptions and industry input and output assessment, a forecast was undertaken for the demand for power, gas and water utilities. This is to assist proponents or utility providers with planning for timely delivery of required infrastructure and services, since timely service provision is integral to the staged development of the BSIA.

The projections made in this report assume a 50-year development timeframe for the provision of utilities.

6.1.2 CENTRALISED WATER, ENERGY, BY-PRODUCT FACILITIES

Securing water and energy supply and enabling storage and processing of large volumes of industrial by-products and wastes is critical to the successful development of the BSIA.

6.1.3 CENTRALISED INDUSTRY FEEDWATER FACILITY

When fully developed, the BSIA will require approximately 58 GL (per annum) of industry feedwater (high and low(er) quality). The lack of availability of well-priced feedwater can reduce the potential development of heavy industry. To facilitate its provision, the Development Plan allocates approximately 60 hectares in the centrally located Utility Precinct to produce fit-for-purpose industry feedwater. Such a facility could feed from various sources, including the Water Corporation pipeline which intersects the site, groundwater, industrial effluents generated within the BSIA, effluent from nearby municipal WWTP, desalination plant, seawater, or a combination of these sources. In order to future proof the provision of water within the BSIA, the Development Plan assumes supply from variable water sources, allowing for the use of any of them as development progresses.

6.1.4 CENTRALISED ENERGY FACILITY

Given the potentially significant energy requirements of the BSIA, it is proposed to allocate about 60 hectares for the development of a new centralised and joint industry energy facility in the Utility Precinct. This will create economies of scale and avoid the need for multiple smaller and underutilised facilities throughout the BSIA. Such a facility could produce electricity, steam, and chilled and/or hot air for industries in its proximity. Allowance should be made for the facility to feed from various energy sources, including gas, coal, renewables, and industry waste heat. Co-location of the centralised energy facility and the industry feedwater facility is recommended to enable the generation of feedwater or seawater desalination with industry waste heat.

6.1.5 CENTRALISED BY-PRODUCT FACILITY

Significant amounts of industrial by-products (both inorganic and organic) will likely be generated by operations within the BSIA. Rather than stockpiling large volume industrial by-products within the strategic core of the BSIA, there is potential to transfer them to a centralised storage facility in the southern part of the buffer zone. Such a centralised facility within the buffer would maximise industrial land use in the strategic core and could also facilitate the processing of industrial by-products into reusable materials.

6.1.6 PRECINCTS AND INDUSTRY CLUSTERING

The clustering of associated industries is at the heart of industrial ecology. Industry clustering is a critical element to allow for the development of synergies within the BSIA and the surrounding region, as well as a mechanism to optimise utility infrastructure and associated costs.

Industry clustering is facilitated through the designation of industry precincts and the placement of associated industries within them. Industry clustering options can be based on various parameters, such as water and energy consumption, risk profile, services and support, and processing of organic and/or inorganic materials. This assessment provides guidance on the types of industry clustering that can occur in the BSIA.

Based on the industry input and output assessment, previous research and reports, regional industrial synergies, and industry placement identified in the Industrial Ecology report, the Design Team located the industrial precincts within the BSIA according to the following criteria:

- Port Dependent and Material Intensive Industries
- Downstream Iron Ore Processing;
- Downstream Petroleum / Gas / Coal Processing;
- Resource Processing;
- Support industries; and
- By-product storage.

6.2 INFRASTRUCTURE AND CORRIDOR CONSIDERATIONS

The success of the BSIA largely depends on industry operational requirements and efficient access to the Port. This need for access in turn requires carefully considered infrastructure corridors. Without these, the full development of the BSIA will be difficult to realise. As previously mentioned, a Worley Parsons study was undertaken, providing recommendations to ensure infrastructure integration between the Port area and the BSIA. The results of this investigation were integral to preparation of the Development Plan. Outlined below are the key landuse considerations required to prepare a Development Plan that can facilitate the effective and efficient development of the BSIA.

6.2.1 INDUSTRY ASSOCIATION TO PORT

Based on the cross-correlation between the Industrial Ecology outcomes and the PHPA's Port Development Plan, the relationship of the proposed industries to the Port is summarised in the following Table 5.

TABLE 5 – RELATIONSHIPS OF INDUSTRIES TO PORT

Industry Type	Relationship to Port		Note
	Import	Export	
Iron Ore Processing	x	✓	<p>Export of processed iron ore (pellets or other product)</p> <p>Likely PAM corridor requirement to support construction.</p> <p>General cargo facilities required</p> <p>Dedicated berths required.</p>
Downstream Minerals Processing	✓	✓	<p>Could potentially involve import of feedstock (alumina etc)</p> <p>Likely PAM corridor requirement to support construction.</p> <p>General cargo facilities required</p> <p>Dedicated berths required.</p>
Power Generation	x	x	No relationship with the Port
Desalination	✓	✓	No direct relationship with the Port but access to sea water
Hydrocarbons Industry	✓	✓	<p>Import of feedstock via an offshore pipeline landing and corridor connection to the BSIA</p> <p>Export of refined oil or gas through the Port</p> <p>Likely PAM corridor requirement to support construction.</p> <p>General cargo facilities required</p> <p>Dedicated berths required, if industry such as LNG was developed, but for downstream processing, shared bulk liquids berth may be possible.</p>
Waste Disposal	x	x	No relationship with the Port
Support Industry	✓	x	Some industry may import equipment, parts or products through the Port

The above table demonstrates the critical linkages between listed industries and the Port. These linkages are also identified in the Port Hedland Port Ultimate Development Plan 2007 Rev C and updated Edition 2011, which shows the likely Port berth scenario to consist of four berths in South West Creek and a corridor connection to the Port to enable the BSIA (Refer Appendix C).

6.2.2 COMPATIBILITY OF INDUSTRY, STAGING AND PERCEIVED PORT FACILITY NEEDS

The establishment of industries within the BSIA that require a Port facility may drive preferred land selection to sites closer to the Port, creating competition for land and access to the corridors. However, proponents may have other considerations for preferred industrial placement.

The compatibility of adjacent uses is another important consideration, as are boundary issues such as risk, dust, noise, emissions and proximity to corridors. Therefore industrial site allocations need to be reflected early within the precinct plan to avoid situations where neighbour constraints preclude a possible future industry.

As the Estate Manager, LandCorp will hold tenure of the BSIA and land will be leased to proponents. DSD and LandCorp will approve proponents for leasehold upon review of a business case. This management method will allow for consideration of land use synergies, efficiencies and operational needs within both individual activities and across the greater estate. Within the Port, the issues of efficient supply chain logistics and berth availability drive the need for the number of berths and their allocations for various industries. In the context of BSIA, it is recognised that berths in South West Creek are desirable and necessary for an efficient supply chain. The Development Plan presents a desirable Port capacity allocation for the ultimate development of BSIA.

LandCorp and DSD have consulted with the PHPA regarding infrastructure connections and berthing which are under the Port's jurisdiction. Of importance is ensuring sufficient allocation of berths in the inner and proposed outer harbours, and connections to and from the BSIA. The Port Authority is supportive of the development of the BSIA however, the interface with the Port has remained unresolved. The PHPA is in the process of finalising its revision to its MUOH Port Master Plan and it was agreed with the DSD that the alignment of these plans with the BSIA was essential.

More recently, and as noted in section 1.4 above, Worley Parsons were commissioned by DSD to prepare Combined Port Area and Boodarie Master Plan Technical note (refer Appendix XIII) in recognition of the need for co-ordination between the Port and the BSIA. The purpose of this technical note is to document the preparation of the resulting Combined Port Area and BSIA Master Plan adopting the two plans as the basis of this process and addressing any outstanding issues at the interface with these plans.

Critical to the BSIA, as documented in the technical note, the Port Authority has agreed to incorporate Boodarie's berth requirements as follows;

- Future berths AP6 and AP7 at Anderson Point in the Port Inner Harbour have been identified for the use of BSIA;
- The PHPA Master Plan identifies the development of a Near Shore Harbour for the BSIA in the Outer Harbour. Berths at this harbour will likely be for liquid bulk, break bulk/container and liquefied gas and other dangerous cargoes; and
- The use of Lumsden Point for the transport of modules to the BSIA.

6.2.3 INFRASTRUCTURE CORRIDORS AND COMPONENTRY

The BSIA's requirements for inward and outward goods have been quantified based on the recommendations of the BSIA Potential Port Hedland Port Trade Inputs Outputs and Corridor Requirements study prepared by GHD; this provides a review of likely infrastructure components, their alignments and space requirements, with estimates of required corridor widths. A summary of these requirements is outlined below, with the full report being attached as Appendix IX. The Worley Parsons technical note addressed the integration of infrastructure requirements and provisions between the Port Master Plan and the BSIA. Key recommendations from this investigation have been incorporated within the Development Plan

6.2.3.1 ALIGNMENT OF CORRIDORS

The Development Plan infrastructure corridors are placed to maximise their flexibility and minimise the complexity of any materials handling systems.

For the BSIA, the central infrastructure corridor development is premised upon:

- a mostly straight, direct alignment into the centre of the industrial estate via a central spine leading to the Port, with an additional connection to the proposed MUOH corridor outside of the BSIA;
- two connections between the main corridor of the BSIA and the proposed MUOH corridor to the west, allowing for changes in directions and transfer stations for the movement of construction materials and goods;
- ease of servicing and access to all sites provided by the central infrastructure corridor and associated perimeter corridor network ensures; and
- suitable corridor widths, with due consideration for the capacity needs of each transport mode.

6.2.3.2 PRE-ASSEMBLED MODULES

Large scale industrial plants are typically constructed using one of two methods: 'stick build' or 'modular'. A stick built plant is assembled on site from numerous small components that can easily be brought to site by road or sea. Alternatively, plants can be constructed from a number of large Pre-Assembled Modules (PAMs) that are moved to site. The size of these modules varies, with packages as large as 3,000 tonnes being typical on many projects, and sizes of 8,000 to 10,000 tonnes being considered.

Due to the size of PAMs, a dedicated reserve that falls within a well-defined gradient and width criteria is necessary to allow modules unhindered access to an allocated construction site, with consideration given to possible maximum module size.

Flexibility in the design of the corridor by addressing key criteria in corridor easements is necessary, including consideration of the following:

- Sufficient width to allow clear passage of the module;
- Gradients that are minimised;
- Close proximity to a Heavy Load Out wharf;
- Pavement and culvert construction to handle heavy loads;
- Sufficient overhead clearance to power lines or other infrastructure; and
- Adequate vertical and horizontal geometry.

It is necessary in planning to ensure an effective allowance for the PAM corridor width of 40 metres within the total corridor (as indicated in Table 6).

When in use, the PAM reserve will require time use management so as not to interfere with the operation of BHP Billiton's Goldsworthy Rail line. Acceptance of this approach by existing owners of rail corridors is essential.

6.2.3.3 CONVEYORS

Conveyors can be used to transport a variety of materials over long distances. In the case of BSIA, conveyors may be used to transport materials to and from the Port as well as between industries.

Within the conveyor corridor, road access will be required for maintenance, with allocation of space between the various conveyors to ensure these can operate without impact from maintenance activities on adjacent conveyors.

The key design consideration for corridors with conveyors included is to work towards minimising the curvature and intersection or transfer points. This drives the need to establish corridors in the straightest possible alignment between sites and the berths.

6.2.3.4 PIPELINES

Pipelines may carry a variety of products including liquids, slurries and gases. They can be constructed below ground level or may sit on sleepers or racks above ground. Depending on the type and size of pipeline, multiple lines may also be stacked vertically on top of each other.

Some pipelines, such as those carrying gas, may require separation distances to certain land uses or to other infrastructure. Easement widths will vary depending on the size of pipeline and product that it carries.

6.2.3.5 SUMMARY OF INFRASTRUCTRE CORRIDOR WIDTH

Based on the widths of the individual corridor components as outlined in sections above a summary of corridor widths is outlined in Table 6 below:

TABLE 6 – INFRASTRUCTURE CORRIDORS COMPONENT SUMMARY

Infrastructure	Nominal Easement Width / Notes
Pre-Assembled Modules Route	30m to 40m (36m height clearance)
Single Conveyor	10-12m (multiple conveyors add 5m per additional conveyor for individual user) Includes access track
Pipelines	Will vary depending on size of pipeline and any separation requirements For planning purposes, allow 10 – 12m for first pipeline and 4m for each additional pipeline for individual user.
Roads	Dependent on road type, but allow for roads and services corridor of 30 metres
Allowance for filling of corridor and batters	The total width of the corridor must consider the platform height above ground level to bridge the Goldsworthy Rail and for storm surge and drainage allowances, requiring an allowance of 10 metres clear either side of the total allowance.

A central corridor that meets sound materials handling practice and provides efficient access to Port capacity in South West Creek has been selected to align with all of the above requirements. Together with the overall capacity of the BSIA, this dictates the width and preferred alignment to deliver the most efficient outcomes.

The above challenges and final selection has been driven by six major factors including:

- The proposed BHPBIO outer harbour rail alignment;
- Integration with proposals of the PHPA Master Plan;
- The allocation and location of construction and shipping berths to the BSIA;
- The proximity to SW Creek and associated flood risk;
- The need to maintain drainage capacity; and
- The position of the FMG Port Lease areas.

Negotiations and analysis of these factors have led to an alignment with some direction changes and some additional fill and drainage works as shown on BHP Billiton's *Port Hedland Project Area: Proposed Corridor Concept October 2012* (Refer Appendix D). This alignment, and associated connection points, has been further refined by the outcomes of a Worley Parsons investigation. This investigation considered more recently available information including the Port Master Plan, the allocation of import and export shipping berths, revisions to alignments due to heritage matters and drainage crossings. It is expected that the precise location, width and content of the corridors will be subject to further detailed investigation and refinement as detailed planning and development progresses.

6.2.4 SHIPPING TONNAGES

For each precinct of strategic industry, estimates of the feedstocks and outputs from each project are given, approximating the annual tonnages of Port trade imports and exports. These are annual bulk estimates depicting trade that enters and leaves the Port at various times in smaller parcels or as break bulk quantities. Bulk estimates of cargo volumes can be related to shipping movements or other forms of transport to the BSIA.

The BSIA will cater for strategic, Port dependent and downstream processing industries essential to resource extraction within the region. BSIA shipping tonnages will not compare to that of iron ore shipping where large tonnages are exported. Instead relatively small ships will be used with a preference for protected Inner Harbour waters.

It is estimated the progressive development of the Port over time will result in various changes to inner harbour capacity and the proposed outer harbour development. The most recent advice on such changes from the PHPA includes:

- Future berths AP6 and AP7 at Anderson Point in the Port Inner Harbour;
- The development of a Near Shore Harbour for the BSIA in the Outer Harbour; and
- The use of Lumsden Point for the transport of modules to the BSIA.

6.2.5 DIRECT PORT ACCESS

In terms of priority, direct and efficient access to the Port will be a prime objective of many developers with import and/or export requirements. A direct connection is cheaper to construct and operate and allows more efficient and effective cargo movements.

Within the BSIA, careful attention needs to be given to placement of transport infrastructure; where a change in direction in any horizontal corridor alignment occurs, the corridor requires vertical transfer points for conveyors or a directional change for pipelines. Bridging of existing or proposed infrastructure or rail and drainage allocation has additional space needs. All of these requirements have cost, space, interface management and timing implications to be resolved each time an installation of additional corridor infrastructure occurs.

The most direct Port access is via the proposed central infrastructure corridor with secondary and less direct connection being provided by a road link to the east to Lumsden Point berths. Infrastructure corridor connections are also provided on an east-west alignment connecting the central corridor within the BSIA and the outer harbour infrastructure corridor to the west.

6.3 INDUSTRIAL SEPARATION

Consideration of separation distances between incompatible and sensitive land uses is a key aspect in providing for the operation of anticipated uses within the BSIA.

In order to determine appropriate separation distances, location of precincts and indicative development options, a series of emission assessments including acoustic, quantitative risk, and air quality have been taken into account. These studies are summarised below, with full reports being located within Appendices under External Reports.

6.3.1 ACOUSTIC ASSESSMENT

Herring Storer Acoustics developed an acoustic model to predict noise emissions from the proposed BSIA. The report, titled Boodarie Industrial Estate South Hedland Environmental Noise Assessment, is summarised below, with the full report attached at Appendix X.

The acoustic assessment shows allowable maximum sound power levels applicable to each industry if the BSIA was filled to capacity with a range of industries. The modelling demonstrates that a wide range of noise producing developments can be accommodated within the BSIA.

While the overall combined noise emissions from the BSIA would exceed the assigned L_{A10} night time noise level of 35 dB(A) at the boundary of the buffer. Compliance with the Regulations would still be achieved (as shown in Herring Storer Acoustics Appendix C of Appendix X, Figure C2), with noise emissions from individual industries complying with the “significantly contributing” requirements of the Regulations². In order to demonstrate compliance, noise emissions from each industry, when received at the boundary of the buffer zone, need to achieve an L_{A10} noise level of 30 dB(A), 5 dB below the assigned L_{A10} night time noise level.

While acoustic modelling indicates that the current BSIA buffer will provide suitable protection to surrounding noise sensitive premises, consideration of the required distances between industries and neighbouring industry premise boundaries will be needed during development planning stages should the locations and operations of uses differ from those anticipated. The compliance with noise levels will require individual developments to provide mitigating works and/or strategies at the cost of the proponents.

6.3.2 AIR QUALITY ASSESSMENT

The BSIA Air Quality Report prepared by Air Assessments (August 2012) describes a review of the adequacy of the BSIA buffer for the management of air quality impacts from future industries. The findings of the report are summarised below, with the full report attached at Appendix XI.

The methodology used dispersion modelling based on estimated air emissions and typical annual meteorology to predict ambient concentrations for comparison to criteria for acceptable impacts outside the buffer.

Dust (as PM₁₀) and NO_x as NO₂ are two air emissions common to the type of industrial developments anticipated for the BSIA and as such were considered –

DUST (AS PM₁₀) FROM LOW LEVEL SOURCES

For dust assessments in the state, generally the Department of Environment (DoE) assess predicted levels (including background levels) against the NEPM PM₁₀ criterion of a 24-hour average standard of 50 µg/m³, not to be exceeded more than 5 times per year. For the Port Hedland region however, this is impractical since the criterion is often exceeded due to background dust contributions alone (Note: exceedances due to background dust were 6 for the modelled year). Modelling with the background dust and the existing developments at Port Hedland, indicates that the number of exceedances would be 10 at Wedgefield, 7 at South Hedland and 6 at Bosna.

Modelling in this study including the proposed full iron ore handling development scenario (which is outside the Boodarie Strategic Industrial Area Structure Plan Area) and existing and background dust sources, indicated that the number of exceedances of the NEPM PM₁₀ standard would increase to 18 at Wedgefield, 10 at South Hedland and 10 at Bosna. This modelling did not include dust due to the potential processing plant stack emissions as they are relatively minor compared to dust off their stockpile areas and has negligible impact.

² For the purposes of subregulation (1) (a), a noise emission is taken to ‘significantly contribute to’ a level of noise if the noise emission as determined under subregulation (3) exceeds a value which is 5 dB below the assigned level at the point of reception.

Instead of the NEPM standard, the Port Hedland Dust Management Taskforce (Government of WA, 2010) adopted in March 2010 an interim (5 year) guideline measure for PM10 concentrations of 70 µg/m³ (24 hour average) with 10 exceedances per calendar year. This was for the area east of Taplin Street in Port Hedland. This criterion was based on advice from expert toxicologists that the NEPM PM10 standard was designed for an urban setting and never intended for iron ore dust. Modelling with the proposed full development scenario, together with existing and background dust, indicated that the number of exceedances of this criterion would increase from 2 to 3 at Wedgefield, from 1 to 2 at South Hedland and remain at 1 (due to background sources) at Bosna. These are all well below the criterion level of 10.

Notwithstanding the adequacy of the buffer to accommodate any dust issues, proponents should be required to propose appropriate mitigation techniques to reduce the potential of any dust issues.

NOX/NO₂ FROM ELEVATED SOURCES

Two industrial development scenarios for process industries were considered:

- One consisting of seven gas feedstock processing industries; and
- A more intensive scenario consisting of ten heavy industries used as a noise impact assessment scenario.

In both cases, the buffer is more than adequate for the dispersion of NO₂ emissions required to meet ambient standards.

6.3.3 QUANTITATIVE RISK ASSESSMENT

A Quantitative Risk Assessment (QRA) was undertaken by GHD in order to determine if the existing Special Control Area Buffer was adequate, and to ensure the BSIA and individual industries could be developed to their full potential. The findings of the Report for Boodarie Strategic Industrial Area: Concept Plan Quantitative Risk Assessment (July 2012) are summarised below, with the full report attached at Appendix XII.

Based on the indicative industry locations outlined within the Industrial Ecology Study, the QRA reviewed the risks associated with the locations of user groups in the BSIA. Seven (7) Major Risk Generators (MRG) were identified – being: Chlor-Alkali, Ammonia, Ethane Extraction, Titanium, Sodium Cyanide, Methanol and Ethylene Dichloride. The QRA reviewed the risks associated with these in order to confirm that cumulative risks generated could be contained within the buffer, and individual risk on site.

The QRA determined that the proposed buffer zone was adequate for the risk generated by the proposed user groups.

6.4 SPATIAL LANDUSE CONSIDERATIONS SUMMARY

There are a number of factors that must be considered when developing a suitable layout for large scale industrial uses.

Through the background investigations, technical reports and concept design layout options, the following factors, as outlined in Table 7, have been taken into account in the preparation of the Development Plan,

TABLE 7 – INDUSTRIAL LAYOUT SUMMARY

Site Constraints	<p>Site constraints affect the layout of the Development Plan. Aspects of consideration include existing service mains, topography, coastal and creek flood, gradient and drainage.</p> <p>Site Constraints have been discussed in Section 4, and highlighted on the opportunities and constraints plan (<i>Figure 4</i>)</p>
Prevailing Winds	<p>Prevailing winds across a site will influence the direction and dispersion of odours and emissions from industrial sites.</p> <p>This also needs to be considered in the context of compatible industry. For example hydrocarbons industry is typically very sensitive to air borne pollutants and therefore cannot be located downwind of iron ore stockpiles.</p>
Risk	<p>Application of the Qualitative Risk modelling to ensure adequate spatial allocation of land and separation of volatile industries to secure adequate buffer separation.</p>
Synergies	<p>A number of different industry groupings may evolve within Boodarie. The Industrial Ecology reporting identifies several potential industry groupings based on activity type and potential product exchange. The Development Plan utilises precincts in order to preserve the opportunity for compatible industries to locate together whilst retaining a level of flexibility for proponents in development locations. .</p>
Lot Sizes	<p>Lot sizes within Boodarie should be designed in a way that allows the assembly of multiple small parcels into large contiguous land holdings if required by industry.</p>
Proximity to Port	<p>All industry associated with the Port will desire a location as close to the Port as possible. However, consideration should be given to the products that they are likely to transport to the Port and their mode of transport (i.e., pipeline, conveyor, and road). At this stage industry proximity to Port is prioritised.</p>

7 Boodarie Strategic Industrial Area - Development Plan

7.1 VISION AND OBJECTIVES

7.1.1 VISION

The BSIA is positioned to accommodate strategic downstream resource processing industries related to the ore and petro-gas resources of the Pilbara region. The proximity of the BSIA to the Port has the potential to create a world-class heavy industrial estate which specialises in multi-product, downstream resource processing.

The location, connectivity and synergies between existing and future land uses associated with the BSIA highlight its position as a strategic long term heavy industrial development. These attributes further demonstrate the national significance of the BSIA in providing for the diversification of industry.

7.1.2 OBJECTIVES

The preparation of the BSIA has been guided by the following objectives:

- To provide a framework to guide coordinated development of the BSIA and future planning approvals in order to optimise capacity for strategic industrial use.
- To provide industry with a comprehensive information pack, in the form of this Development Plan and associated reports, to facilitate appropriate types and forms of development within the BSIA.
- To establish specific infrastructure corridors that provide an essential link between the Port and the BSIA.
- To establish Port capacity and access to enable optimal industrial development and export within the BSIA.
- To facilitate development through the Planning Scheme and a Development Plan process, coupled with an Estate Management and approvals structure.

7.2 OVERVIEW

The establishment of heavy industry at Boodarie is inevitably linked to production and export that rely heavily on feedstocks including iron ore, oil and gas from the Pilbara and North West Shelf. Demand for land for industrial development will increase, fuelled in part by accelerating resource development activity in the Kimberley.

The land available at Boodarie can accommodate the increased resource processing and associated industries, but an efficient, carefully planned linkage to the Port is critical to allow its full capacity to be exploited. The infrastructure corridor between the Port and the industrial estate must accommodate:

- Proponents' servicing roads;
- Movement of materials by pipelines and conveyors;
- Movement of Pre-Assembled Modules (PAMs) to support the increased activity expected in the area for transport of modular plant and building structures; and
- Power distribution and miscellaneous services.

To ensure the full potential of the BSIA can be achieved, the design team have allocated land for corridors of sufficient width to accommodate the above requirements.

7.3 DEVELOPMENT PLAN ELEMENTS

The preparation of the Development Plan has been based on a set of assumptions about industry inputs and outputs, as well as:

- An estimation of industries' requirements relative to central infrastructure corridor access;
- Infrastructure corridor componentry;
- Port capacity;
- Proximity to Port;
- Integration with existing and proposed Port infrastructure;
- Industrial synergies; and
- Industrial layout considerations.

Consequently, the Development Plan includes a number of key elements that are generally distinguished by different land use functions as outlined below:

Industrial development – Proposed to be developed as a strategic industrial estate, the Development Plan is intended to facilitate the development of a vast range of industrial development that can benefit from the proximity to the Port and future infrastructure provision.

Common Infrastructure Corridors - Dedicated land allocated for common infrastructure corridors that provides a logical connection between land and Port. The Common Infrastructure Corridors include conveyors, pipelines, roads, and a preassembled module route for the shared use by developers within the BSIA.

Utilities - The energy and water requirements of the BSIA support the allocation of a centralised and joint industry energy facility - this will create economies of scale and avoid the need for multiple smaller and underutilised facilities throughout the BSIA.

External influences and opportunities – Whilst not included within the boundary of the Development Plan, there are a number of externalities that either influence the industrial design within the Development Plan or are required to support Development:

- **By-Product Storage** - Significant amounts of industrial by-products (both inorganic and organic) will likely be generated by operations within the BSIA. It is intended that the stockpiling of the industrial by-products will occur in a centralised storage facility in the southern part of the buffer zone.
- **Multi User Outer Harbour CIC** – PPHA has designated a corridor to the west of BSIA which is referred to as the MUOH Corridor. Whilst outside of the boundary of the Development Plan, this is an important future corridor connection from the BSIA to both the BSIA Near Shore Harbour and the Outer Harbour and allows for public and private access roads, services easements, pipelines and conveyors.
- **Sand Ridge** - The BSIA is currently afforded flood protection by the sand ridge adjacent to the Turner River. The 100 year ARI flood levels are contained within the low lying valley between Turner River flood plain east bank and the sand ridge. A level of protection has been afforded to the Turner River via the proposed amendment in order to ensure this level of protection remains and the operations of the BSIA are not compromised.

7.4 ESTATE DESIGN

The BSIA Development Plan, (*Figure 5*) reflects a site responsive approach that gives full consideration to environmental quality, while responding to industrial operational needs and providing for the development of diversified industry.

The final lot layouts will be proponent driven and will evolve over time in accordance with the placement of infrastructure within corridors and layout of respective Precincts outlined within the Development Plan.

A transitional industrial placement model has been incorporated into the following locational criteria:

- The relationship of industrial land use to the Port is prioritised from downstream minerals processing, iron ore processing, then hydrocarbons and other industries, noting the central location of the energy precinct.
- When prioritising industrial Port location, consideration has been given to the nature of products transported and proximity to that transportation,
- Proximity to the common infrastructure corridors that provides a logical connection between land and Port. The Common Infrastructure Corridors include conveyors, pipelines, roads, and a preassembled module route for the shared use by developers within the BSIA.
- Prevailing winds influence the dispersion of emissions and therefore with QRA input, more volatile industries have been placed west or central within the BSIA.
- Preserve the opportunity for a transition of industrial uses to achieve compatible industrial location.
- Design of industrial precincts to allow multiple small parcels to be assembled into large contiguous land holdings.
- The Coastal Vulnerability Study assessment and recent water management strategies.
- Hazardous industrial uses warranting separation from sensitive uses, are located toward the core of the BSIA.
- Volatile Industries are proposed on the western margins of the Boodarie Strategic Industrial Area with adequate separation from adjoining volatile industries (these industries are to satisfy the requirements of Section 7.0 of the Planning Scheme).
- Less Hazardous industries are proposed on the eastern margins of the BSIA including support industries warranting high levels of access, which are placed adjacent to the Great Northern Highway.
- Support industries to be located in precincts adjacent the Great Northern Highway.
- By-product storage areas derived from BSIA industries are located outside the BSIA Strategic Industrial Zone with proximity to the Central Infrastructure Corridor.
- In terms of priority placement of industries warranting access to the Port, southern most industries gain access to the middle of the Central Infrastructure Corridor, and northern-most industries gain access to the outer margins of the central infrastructure corridor.

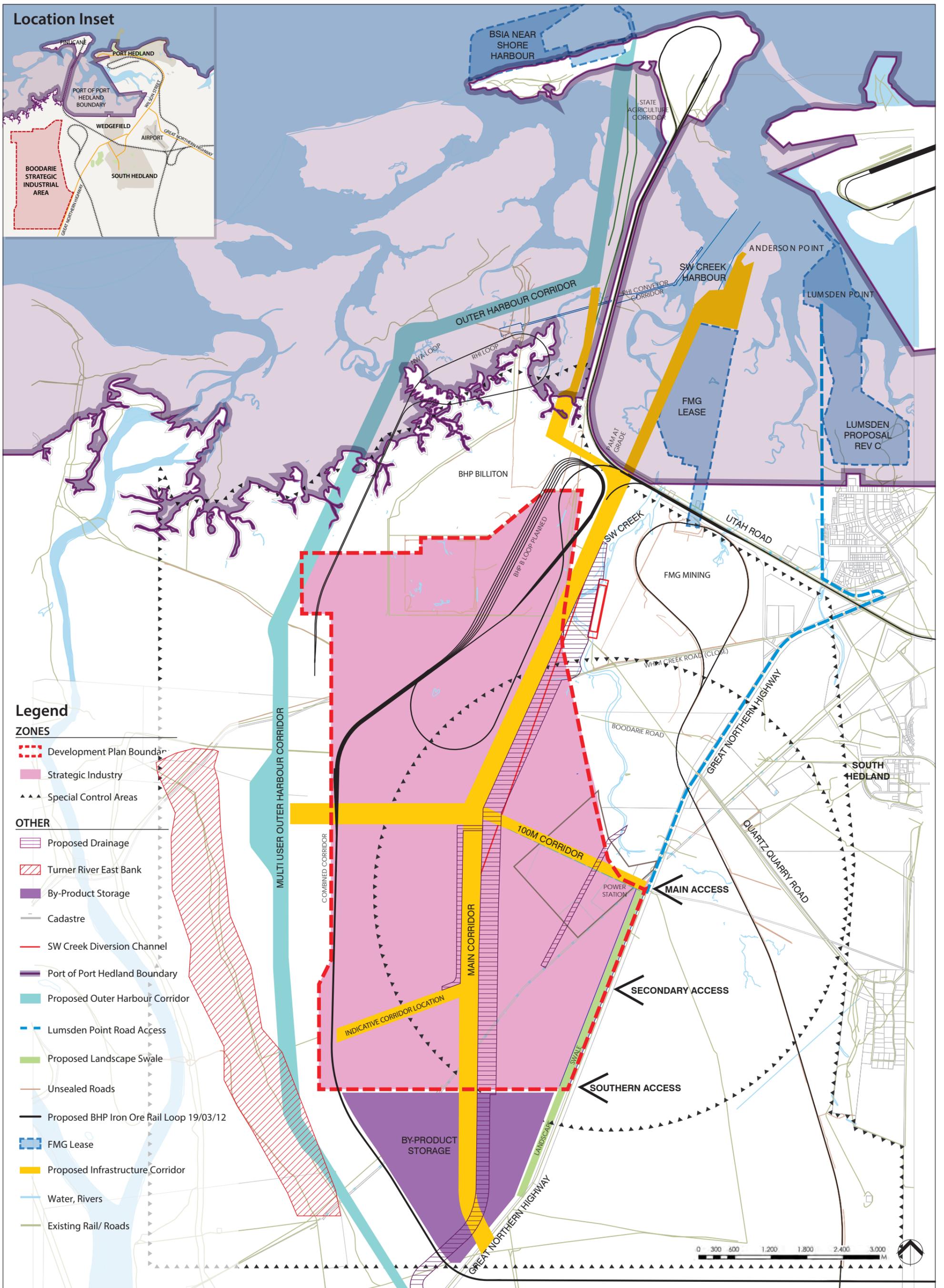


Figure 5 - Development Plan

BOODARIE STRATEGIC INDUSTRIAL AREA

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7.5 PROPOSED PRECINCTS

The transitional industrial placement desired in Section 7.4 coupled with the industrial ecology and industry clustering has informed the preparation of Precincts within the BSIA.

Whilst identifying Precincts and potential industry types within Precincts, the Development Plan promotes flexibility rather than locking in land uses too early in the development process. As noted in section 6.1 of this report, as industries locate over time, the Precincts can be reassessed. Conversely, if an industrial developer demonstrates as part of the business case that it should be located in an alternative location to the preferred precinct then this may occur subject to business case approval.

The following Precincts and potential industry types are as follows (Refer *Figure 6*):

Precinct	Potential Industry Types
Port Dependent Industries	Large scale processing plant (liquids – not defined) Large scale processing plant (conveyors – not defined)
Downstream Iron Ore Processing	Sintered iron plant Integrated steel making plant Ferromanganese production plant Iron carbide plant
Downstream Petroleum and Gas Processing	Methanol plant Ammonia / urea plant Ethane extraction Sodium cyanide plant
Non Ferrous Processing	Industry that deals with the processing of metals other than iron and iron-base alloys
Utilities	Gas Fired Power Station Waste-to-energy and material recovery facility Industry feedwater facility Energy facility (electricity, steam, heat, chill)
Support	Industry that requires import equipment, parts or products through the Port
By Product Storage	Industrial by-products (both inorganic and organic)

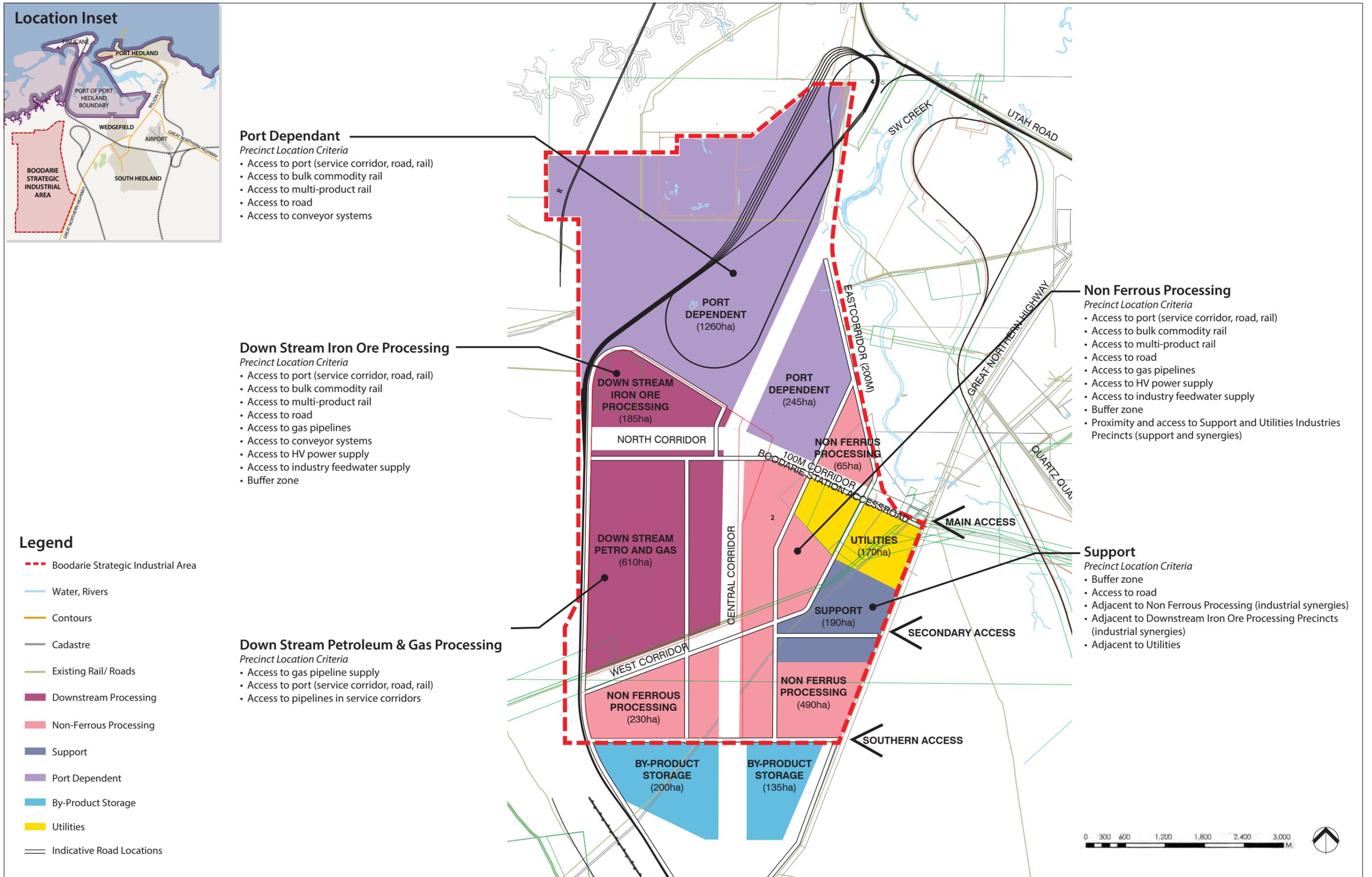


Figure 6 - Precinct Plan

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7.6 COMMON INFRASTRUCTURE CORRIDORS

Within the BSIA all corridors are considered strategic critical infrastructure, including corridors providing access to the Port. The BSIA will provide for development of export based industries and as such will require access to deep-water Ports. To ensure success of the BSIA, it will therefore be necessary to provide for the development of sufficient corridors and corridor width, enabling connections to the Inner Harbour, Outer Harbour and Lumsden Point with land uses within the BSIA.

The layout of infrastructure within each corridor needs to be arranged to provide cost effective arrangement of materials handling infrastructure. In general, this is achieved by minimising changes in direction and avoiding wherever possible the intersection of items with each other. Ideally within the middle of the corridor they will be sequenced to accommodate the logical alignments with berth locations which are suited to particular ship types and loading systems. In this regard, preliminary planning has been undertaken for the corridors to assess the space required and the necessary operating and installation infrastructure necessary for a viable corridor alignment. Subject to the staging of development of the BSIA, the sequencing will be confirmed and will be subject to design at the development stage.

The location and design of the Common Infrastructure Corridors is based on:

- Provision of sufficient land for infrastructure corridors connecting industries to each other and to transportation hubs like the Port.
- The most critical infrastructure corridors will be those providing access to the Port from the BSIA - accordingly corridor width and straight alignment is critical.
- The allocation of shipping berths to the BSIA, guiding the location of transport for imports, exports and construction materials.
- Applying the key criteria for PAM Reserves including width, pavement for heavy loads, overhead clearance, and adequate vertical and horizontal geometry.
- Placement of infrastructure within the corridor is sequenced so that those furthest from the Port occupy the central infrastructure corridor with those closest to the Port occupying the edge to minimise infrastructure crossing.
- Ensuring a straight corridor for conveyors to minimise the number of transfer stations.
- Consideration of some pipeline separation requirements, such as those carrying gas, otherwise a degree of flexibility in the placement exists.
- Enabling the exchange of materials between industries within the BSIA.
- Design of intersections and carriageways within the BSIA to accommodate the turning movements of quad road trains.

The Development Plan includes key infrastructure corridors (being the main north-south Central and Western corridors) and two east-west corridors intersecting with main central corridor and providing an efficient connection to the outer harbour corridor to the west. Most of the outer harbour corridor is located outside of the BSIA, except for a small portion which enters the Development Plan area to the northwest. The inclusion of the north south and east west corridors is driven by the location of berths as provided for by PHPA in the Port Hedland Port Master Plan. The common infrastructure corridors are illustrated within *Figure 7* as follows;

Central CIC - The central infrastructure corridor requirement, including the PAM and road requirements, is 300 metres. When allowance is made for the finished corridor levels, including line, grade separation of the Goldsworthy Rail, batters and drainage, an allowance of at least **300 metres gross width** in plan form is considered appropriate, since batters to the central infrastructure corridor alone require significant space.

Central Diversion CIC - The 300m Infrastructure Corridor diverts into two corridors in the vicinity of the Goldsworthy Rail. The first of these corridors is proposed to be 200m wide and travels along the same alignment as the original 300m corridor towards the inner harbour. The second corridor is 120m wide and travels west initially before rerouting in a northbound direction and joining the Multi User Outer Harbour Corridor.

West CIC - Feeding into the central infrastructure corridor, the west CIC has been reduced to an allowance of 100 metres on the basis that it is in the southern portion of the BSIA and is likely to service a smaller number of industrial entities. This corridor will only be provided if and when it is required and has therefore been nominated as an indicative corridor location.

North CIC – Initial designs indicated the need for a northern infrastructure corridor of 100m in width on a north-west/south-east alignment. This corridor would have connected the central corridor with the outer harbour corridor. The north CIC has been deleted and replaced with a direct east-west corridor linking the central corridor and a relocated outer harbour corridor. Due to this alignment, servicing additional industrial land and having a direct connection, its width has been increased to approximately 200m.

Multi User Outer Harbour CIC – As noted in section 7.3 above, PHPA has designated a corridor to the west of BSIA which is referred to as the MUOH Corridor. Whilst outside of the boundary of the Development Plan, this is an important future corridor connection from the BSIA to both the BSIA Near Shore Harbour and the Outer Harbour and allows for public and private access roads, services easements, pipelines and conveyors. Given its future importance, the MUOH Corridor is identified on the Development Plan for context purposes.

7.7 PORT CAPACITY AND ACCESS

The industrial ecology outcomes highlighted within the BSIA Industrial Ecology Report for the ultimate development of the BSIA provide the basis of the assessment of demand for Port facilities. In particular, likely industries in the BSIA include those that can be characterised as Port users with the following needs:

- Typically utilise panamax size ships or smaller for the majority of trade;
- Are not tidally constrained as for Iron Ore vessels;
- Are engaged in bulk liquids and dry bulk trade;
- Require dedicated berths to maintain their supply chain reliability and throughput; and
- Will have direct linkage via the corridor to the industrial estate.

These criteria are the basis for allocating the berths required for each user, assuming where possible multi-user facilities, and where necessary, dedicated berths.

From the industrial ecology outcomes, as supported by LandCorp and DSD, the multi-user berth requirement can be summarised as follows:

- 1 Bulk Liquids berth;
- 2 Dry Bulk berths; and
- 1 heavy load out facility to meet PAM requirements.

A range of vessel sizes is applied to estimate future berth requirements at the Port. While the individual berth capacity will not always be fully utilised due to freight logistics, these assumptions provide the guidance needed to plan for the long-term development of the BSIA.

Based on the mix of industries in the scenario proposed by GHD a total of 3 to 4 berths are required. Should the means of import/export into BSIA change, this will also influence the number of berths required.

Further, a Special Purpose Mooring (SPM) or possibly a berth for bulk liquid feedstocks such as oil and gas may be required.

The need to provide a corridor to the Outer Harbour is highlighted through the needs analysis.

Further clarity on this matter is provided within the Worley Parsons Combined Port Area and Boodarie Master Plan Technical note (refer Appendix XIII).

- Berth availability – Given the magnitude of the iron ore industry in the Pilbara region, berth availability is limited within Port Hedland. The original intent was that up to four berths would be made available within South West Creek for BSIA use including the export of product and import of feedstock. The significant growth in the iron ore export potential within the Pilbara region has seen this allocated capacity reduced to two berths and the need for outer harbour capacity to supplement this need.
- Future berths AP6 and AP7 at Anderson Point have been identified for the use of BSIA. This berth capacity is necessary in order to allow throughput for products destined for and originating for the BSIA. It is also important that the land backing and supporting these berths to accommodate corridor alignments and berth approaches also be secured to support the product handling and module load out requirements.
- BSIA Near Shore Harbour – While bulk products can be handled on exposed offshore berths in the outer harbour, PHPA has considered protected harbour basin solutions as many unit cargoes and bulk liquids may require a more protected berth than what is available in exposed conditions.
- The PHPA Master Plan identifies the development of a Near Shore Harbour for BSIA in the Outer Harbour. Berths at this harbour would be for liquid bulk, break bulk/container and liquefied gas and other dangerous cargoes. It should be noted that the BSIA Near Shore Harbour would require significant funding to develop and may be difficult to justify in a Phase 1 development for smaller projects. As such, whilst its development possibility must be secured to align with the full development potential of the BSIA, any first proponent who might also be required to develop other enabling infrastructure might benefit from an inner harbour berth where development costs for Port facilities might help shed some of the establishment costs at the BSIA. This further reinforces the need to ensure that berths AP6 and AP7 are reserved for the use of BSIA, and in parallel secure the proposed outer harbour to secure the future development potential.
- Lumsden Point – This location was investigated as a potential option for the transport of modules to the BSIA. The proposal is that modules of the scale of up to 5,000 tonnes may need to be moved from a berth to the BSIA. This places significant constraints on the alignment and grade of the proposed haul road alignment. In fact, the preference to keep such large packages outside of general public traffic and the complexity of moving such large items over long distances on public roads including Great Northern Highway limits the applicability of Lumsden Point to bulk construction materials and pieces of smaller size.

Berths AP6 and AP7 at Anderson Point are considered to be the best workable solution for large module transport working with a Lumsden facility for the bulk of other construction materials. The two facilities will work hand in hand to support the construction effort and volumes of materials to be moved. It should also be noted that the facilities at Berth AP6 and AP7 would best be considered as a versatile design which can support module load out along with product handling. The configuration of the materials handling on the berths was not considered in detail.



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										Copyright © WorleyParsons Services Pty Ltd		BOODARIE STRATEGIC INDUSTRIAL AREA CORRIDOR WIDTH WITH VARIED CONSTRUCTION SEQUENCING SHEET 1
										WORLEYPARSONS PROJECT No.		DRG No 301012-01355-CI-DSK-0002
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Figure 7 - Central Infrastructure Corridor Cross Section

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LOCATION: I:\Projects\301012-01355 Boodarie Master Plan\11.0 Drawings\Civil\Transport\SK1\301012-01355-CI-DSK-0002.dgn
 USER NAME: allan.walker
 SAVE DATE & TIME: 8/06/2012 11:38:42 AM
 PLOT DATE & TIME: 8/06/2012 11:38:42 AM

8 Movement Network

BSIA Traffic Assessment was undertaken by GHD in April 2013. A summary of these requirements is outlined below and illustrated within *Figure 8*, with the full report being attached as Appendix II.

8.1 TRAFFIC GENERATION

Traffic generation was estimated by an analysis of:

- The purpose, geography and layout of the planned industrial estate;
- The materials input and output analysis derived from the industrial ecology scenario and associated haulage estimates;
- Expected employee numbers;
- Bus transfers; and
- Individual daily trips.

The traffic analysis considered the full development to 2031, in addition to interim development. Intersection treatments to the three main access points into the BSIA from Great Northern Highway (GNH) were integral to the assessment.

8.2 FORECAST TRAFFIC VOLUMES AT INTERSECTIONS WITH GNH

The Development Plan provides for three main access points from to the BSIA from GNH. These access points will ultimately provide appropriate levels of accessibility to the development. The location of these access points has been based on:

- Separation distances that allow for sufficient merging;
- Future grade separated interchanges;
- Posted speed limits of 110 km/h; and
- Recommendations from Main Roads.

The report has noted that if access to the Port is not available via the BSIA central infrastructure corridor then there will be additional haulage impacts to the three main proposed intersections with GNH.

8.2.1 INTERNAL ROADS AND INTERSECTION CONTROLS

The preferred internal road hierarchy and forecast traffic volumes on key roads are identified on Figure 2 within GHD's report. The forecast traffic volumes on the access roads connecting to GNH are estimated at 1,350 to 3,050vpd. This indicates that a single carriageway is likely to accommodate the BSIA development traffic with no anticipated capacity issues.

In view of the road train activity accessing the BSIA, the three main access roads from GNH should accommodate right turn facilities to allow following traffic to pass. Internal intersections with the main access roads that connect with the Great Northern Highway should be channelised to include right and left turn lanes on the access roads.

The cross section of access roads should comprise an overall reserve width of 35.2m consisting of: 2 x 5.1m verge, 2 x 5m traffic lane, 15m median with turn lanes where required. This excludes servicing requirements. It is considered that all other internal road pavements should be 10m wide within a 25m reserve excluding necessary servicing requirements.

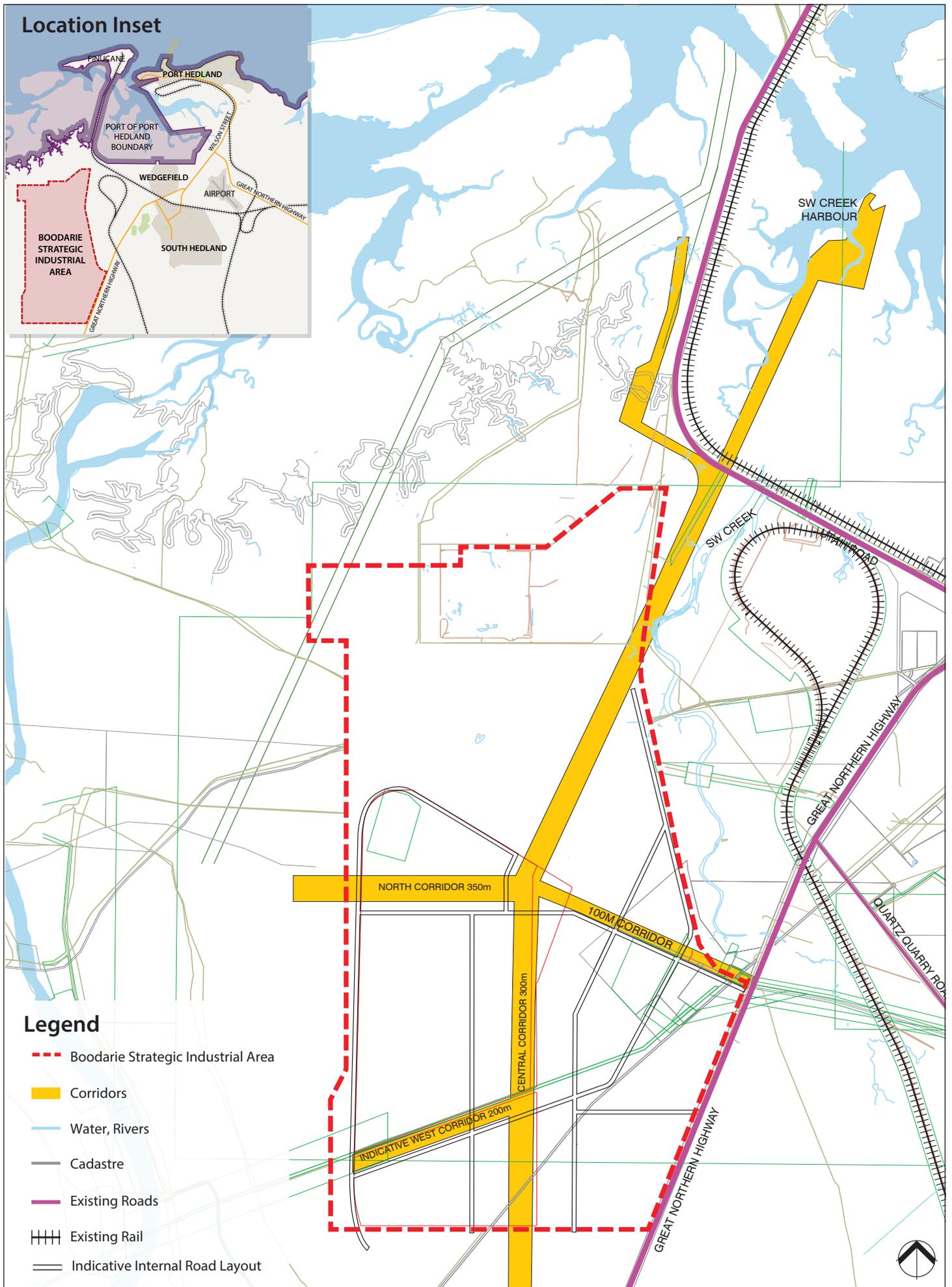


Figure 8 - Movement Network

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8.3 GREAT NORTHERN HIGHWAY

The current road capacity of the GNH single carriageway is 12,000vpd. The increase in traffic volumes to 2031 without the BSIA development is estimated at 5,720vpd and is therefore well within the current road capacity. With the addition of BSIA development, it is estimated additional traffic of 1500 to 6170vpd would occur, increasing the daily volume from 7,220 to 11,890vpd. This will be at the upper level of capacity for a single carriageway.

In view of the increased activity associated with the BSIA, it is considered that the speed limit on GNH should be reduced adjacent to the site from 110km/h to 90km/h.

8.4 GNH INTERSECTION ANALYSIS

The analysis of the three main access intersections with GNH, namely, North, Central and South considered the following:

- minor modification to the existing intersection to allow two egress lanes in the main access road have been assumed; and
- a speed limit of 110km/h is maintained on GNH.

Figures within the GHD report recommended intersection layouts for the ultimate development for the three main access roads.

The traffic analysis has concluded that a right and left turn lane in GNH are required together with a two lane approach in each of the main access roads and the left turn under stop sign control. For the north and central main access, an acceleration lane is recommended for right turning traffic and in view of the heavy vehicle movement, an acceleration lane for the south access is desirable.

It is understood that only 25% of development is likely to occur by 2031, whereas the traffic analysis assumes full development by 2031. Therefore the intersection construction should be staged to effect:

- T Intersections with left and right turn lanes in the first stage; and
- as development increases, the intersections will need to be upgraded to include acceleration lanes for the right turn movement at the northern and central main access points.

To support these decisions, the traffic generated by the development should be carefully monitored over time and intersection upgrade introduced when required.

8.5 INTERIM DEVELOPMENT

Analysis of the traffic has been undertaken assuming the development of initial stages gain access via the existing Boodarie Station Access Road.

The analysis indicates that a single approach lane in the Boodarie Station Access Road is likely to operate satisfactorily for the interim development.

It is noted that southbound through traffic speed on GNH is likely to be impacted at peak times. Therefore localised widening should be considered to reduce the risk of rear end collision caused by traffic being unable to pass right turning traffic.

8.6 AUSTRROADS INTERSECTION TREATMENT

An annual traffic growth rate of 6% over 5 years on GNH represents 338vph resulting in approximately 16 right turning movements into the BSIA. The current right turn into Boodarie Station Access Road during the am peak hour is likely to be around 16 turning movements. These movements are approaching the threshold of Austroads standards, confirming the need for intersection upgrade as traffic volumes increase on the GNH and from within the site.

8.7 OFF AND ON ROAD PARKING

The car parking demand for each land use should be justified by proponents as part of future development applications. It is considered that car parking restrictions should be imposed to prohibit parking on verges to avoid conflicting movements.

8.8 HIGH WIDE LOADS (HWL)

Adequate access should be provided for High Wide Load activity within the BSIA. A preferred route through the BSIA from Great Northern Highway is via the central main access road. It is recommended a secondary route via the South main access road be provided to improve accessibility and circulation for oversize loads. High Wide Load access would connect to the Central Corridor road system and would likely form part of the PAM corridor access.

9 Utilities

9.1 INFRASTRUCTURE CAPACITY

Provision of infrastructure to developments is to be proponent driven. . Whilst industry proponents will be required to generate their own enabling infrastructure such as power and water, constructing and servicing infrastructure for their own needs, the benefits associated with shared services are acknowledged.

LandCorp and DSD will require a proponents servicing strategy to investigate the opportunity for these to be constructed as shared services to benefit the whole of the BSIA. In this regard, initial investigations have been undertaken in relation to the sharing of some infrastructure items as discussed in further detail within this section of the report.

The existing infrastructure capacity in terms of communications, power, water supply, and gas supply are outlined below and depicted in *Figure 9: Utilities*.

9.2 COMMUNICATIONS

There is an optic fibre cable installed to the former HBI plant and Alinta Energy Power Station. Telstra will require a site for an exchange and possibly further sites for mobile phone towers.

Reticulation through the BSIA will be undertaken through standard pit and pipe networks, possibly to NBN standards, with the long development time frames expected.

9.3 POWER

Power reticulation and main distribution will originate from the Alinta Energy and Horizon Power station and switchyard/HV infrastructure located at Boodarie and Wedgefield Sub Station, possibly with augmentation from the Hedland Terminal.

Depending upon timing of demand, distribution is expected to consist of a network of HV feeders and substations, with reticulation networks supplying individual industries or clusters of lots. Once more load distribution data is available from potential industries, then fine tuning of the locations closer to the centre of gravity of the demand can be undertaken, as well as the spread of the 33 kV / 415 V substations locations.

To supply the initial stages of development, Horizon Power have indicated that a new 33MVA 66/22kV transformer and switchboard would be required to support the load connection at the Wedgefield Sub Station. A new 22kV feeder of approximately 7kms is required to supply the requested load.

A gas-fired power station with a permanent generation capacity of approximately 200MW is planned for Lot 601. Construction will commence in 2014 and the plant is proposed to be fully commissioned by mid-2016. Power from the plant will be available to support mine and Port infrastructure in the Pilbara, as well as Horizon Power's residential load.

9.4 WATER SUPPLY

Untreated water is currently supplied to the Alinta Energy Power Station from the Water Corporation's Yule Borefield pressure main which traverses the BSIA to the Corporation's South Hedland tank site, with BHPB being directly supplied from that tank site.

The quantity of low and high quality feedwater required for the industrial proponents is high and is to be provided from a combination of sources including existing and new borefields and aquifers, desalination, effluent re-use from wastewater, and possible surface water sources.

Existing WaterCorp infrastructure is at or near capacity, with additional supply expected to come from upgraded or new borefields and desalination. Other sources could include the de-activated Turner River Aquifer and surface water harnessing.

Low quality untreated water supply could also include sources from groundwater and desalination, as well as effluent re-use and surface water harvesting. The Water Corporation is currently investigating a non-potable scheme to supply industry in Port Hedland, and will look at all options for supply and demand from potential industry proponents.

If required by proponents, high quality/potable water for future development of Boodarie, particularly for the initial development, may be supplied by either direct feed from the Water Corporation's South Hedland Tank Site or from a new tank storage facility potentially located on the higher ground to the south west of the BSIA, up from the nearby Turner River. The new storage facility would be supplied from the South Hedland Tank Site, or other alternative high quality water sources as and when established.

A possible interim option in lieu of new tanks is to utilise existing de-commissioned tanks owned by the Corporation at their Turner River borefield and landholdings; however, this would be subject to further planning and asset condition assessment.

To enable the first stage of development, the Water Corporation has recently agreed in principle to servicing the first 10 lots of development with potable water from the South Hedland scheme.

For the Strategic Industry Area, water could be direct fed from the Corporation's South Hedland facility. Once many industries require supply, however, it may be more efficient to have a centrally located supply storage facility.

Consideration in the Development Plan has also been given to the establishment of a centrally located industry feedwater facility within the BSIA to harvest, recycle and produce water from various potential water sources for industrial use.

During consultation for the Development Plan, the WaterCorp advised that it is the License holder for water supply and wastewater in Port Hedland and South Hedland. The BSIA is partly within the current Water Services Licence Area issued by the Economic Regulation Authority (ERA). The central and south-western portions of the BSIA are not covered by the licence area, and should Stage 1 be in this area the proponents would need to submit a formal request to WaterCorp to become the licensed water service provider, and apply to the Economic Regulation Authority (ERA) to extend the licence area.

The preferred proposal would be for water supply via a 150mm to 200mm reticulation size main from the vicinity of the Elevated Tank at South Hedland. A less preferable alternative would be an off-take from the bore water main, with either an elevated tank or booster pump near the first stages of development.

An agreement in principle would be required from LandCorp, the Town of Port Hedland and Pilbara Cities prior to finalisation of a subdivision agreement. All proposals will be fully funded by the proponent.

9.5 GAS SUPPLY

Gas is currently supplied to the site via the APA Group pipeline, which supplies gas to BHPB, the Alinta Energy Power Stations (through agreement with BHPB) and through to Telfer. Current mains are already at contracted capacity, and will either require further upgrading or new mains to supply any new demand. Proponents are required to liaise with APA to determine individual gas requirements and servicing if required.

9.6 PRIORITY BASIC RAW MATERIALS AND KEY EXTRACTION AREAS

Sand extraction for the construction industry from a sand ridge along the western margin of the site is currently the only significant raw material extraction. BJ Young undertakes this under an allocated mining lease M45/681 expiring 9 June 2017. The company is pursuing an extension of the lease further along the sand ridge.

Whilst it is recognised that sand is an important material for the development of the region, future extraction operations should not impact the development of the BSIA. In particular, future sand extraction projects must consider the potential of flooding as a result of mining the sand ridge along the western boundary of the BSIA. The height of the sand ridge should be maintained at appropriate levels to mitigate against the potential flooding from the Turner River.

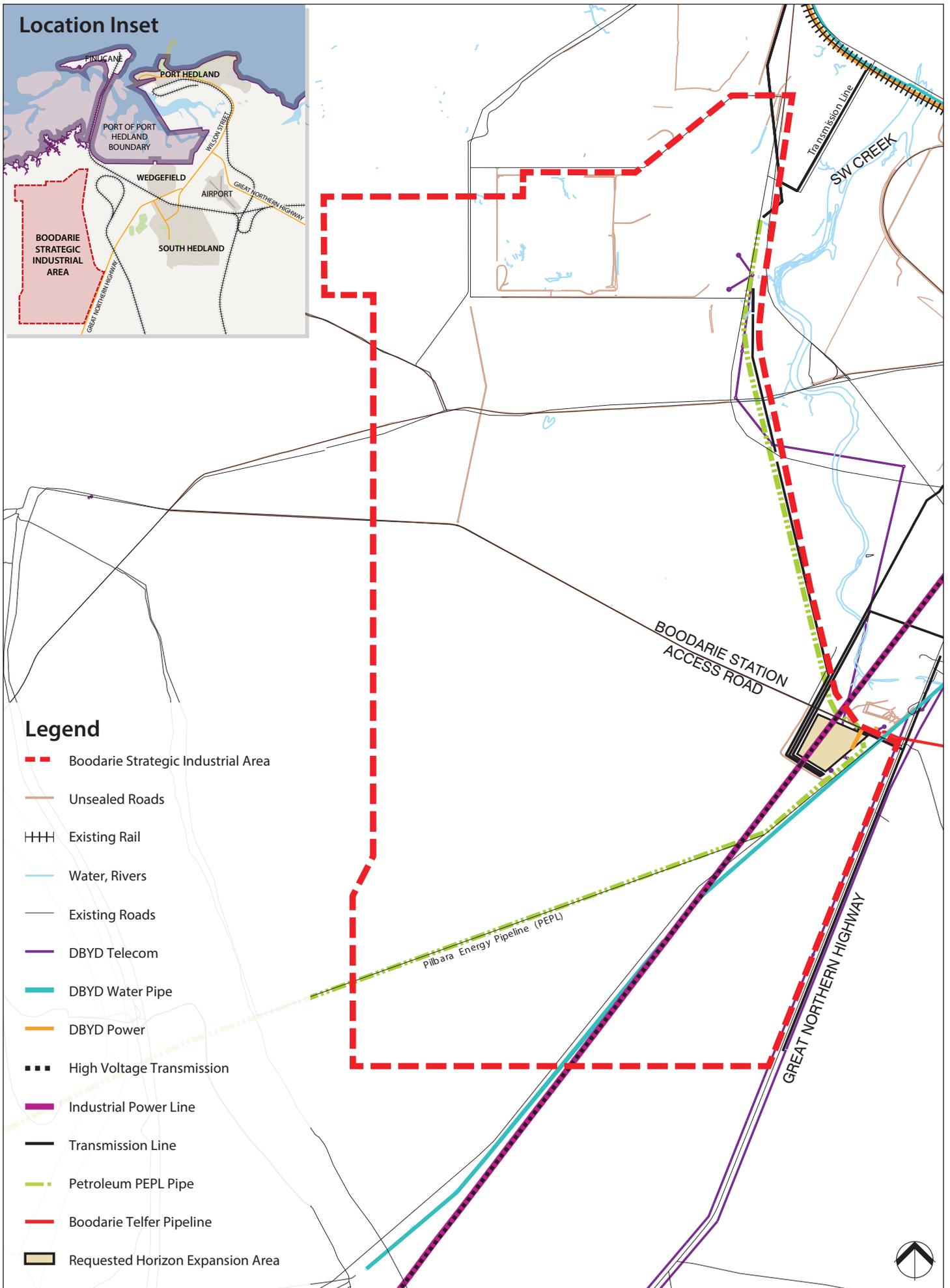


Figure 9 - Utilities

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10 Water Management

Best practice management of water resources is essential to the success of the BSIA. While demand will be generally continuous, supply may be highly varied due to the seasonality of rainfall patterns in the Pilbara, with long dry periods followed by heavy falls during cyclone season, and because of the varied quality of sources.

Successful development will require appropriate management strategies for stormwater, groundwater, waste water, and potable water use and re-use. The Boodarie Strategic Industrial Area District Water Management Strategy reviews the demands of all four areas in detail, covering sources, flows, usage, and disposal. A summary of these requirements is outlined below, with the full report being attached as Appendix III.

10.1 STORMWATER

For stormwater, the overarching management criterion is to:

- Safely convey surface water flows away from the site, maintaining ecological protection;
- Convey the catchment runoff for up to the 1 in 100 year average recurrence interval event out of the area without affecting other downstream uses; and
- Protect infrastructure and assets from inundation and flooding

As the central infrastructure corridor will act as a levee, sub-surface culverts will need to be designed to appropriate year average recurrence intervals to enable passage of stormwater to SW Creek.

Drainage system – Earlier investigations undertaken by Worley Parsons have been undertaken under the premise that the existing drainage system must be maintained in the development of the BSIA. The existing system collects water into South West Creek which then travels north through culverts under BHPB's Goldsworthy Rail Line. Any excess flows are diverted west along the southern side of this railway before travelling north as the rail turns.

Development of the BSIA infrastructure corridor would need to ensure that this drainage system is maintained. Given the constraints present in the location of the BSIA Infrastructure Corridor, the previous investigation undertaken by Worley Parsons proposed to construct a diversion within South West Creek and to maintain the system in the vicinity of the Goldsworthy Rail Line.

10.2 GROUNDWATER

For groundwater the objective is to maintain quality at pre-development levels and if possible, improve the quality of water leaving the development area to maintain and restore ecological systems in the sub catchment in which the development is located.

Clearance to groundwater is adequate across the BSIA therefore groundwater will not impact on lot levels, underground services or table drains. Furthermore, depth to groundwater along the sand ridge is great enough that proposed cutting of the ridge will not reduce clearance to groundwater to unacceptable levels. It is considered that the potential for groundwater levels and quality to be impacted is low and no specific management strategy is proposed.

10.3 WASTEWATER

Management of wastewater will require onsite treatment and disposal using either septic tanks or ATUs for low volume wastewater discharge, or dedicated private wastewater treatment plants (WWTPs) for higher volume discharge. Recycled water is recommended for irrigation and / or process water, with the viability of such a scheme reviewed as part of future planning and option analysis.

10.4 POTABLE WATER

For potable water use and re-use the objectives for integrated urban water management for the development are:

- Minimise total water use in BSIA.
- Investigate with the relevant authorities on substituting drinking quality water with fit-for-purpose water for non-drinking water uses. The State water strategy (Government of Western Australia, 2003) sets a target of 20% reuse by 2012. The development could potentially aim to reduce the use of scheme/potable water by providing an alternative fit for purpose water supply for non-drinking use.
- Potable water use outside of buildings should be limited and as efficient as possible.
- Encourage the installation of 5 Star Plus provisions for all new fittings.
- Promote the use of native plants

11 Implementation

This section discusses the approach to industrial land supply and implementation of the Development Plan provisions.

11.1 STATUTORY CONTEXT

The Development Plan provides long term guidance for the staged development of the BSIA undertaken by proponents.

The Development Plan as endorsed by the Town of Port Hedland fulfils the statutory requirements of Part V of the Town of Port Hedland TPS 5, in particular the requirements of the Precinct Objectives and Additional Planning Matters given in Appendix 6.

This is further reinforced by the 'Strategic Industry' zone that requires the provision of comprehensive planning through Part VI and Part VII of the Scheme as stipulated in clauses 6.7 and 7.2 prior to strategic industrial development.

The Precinct Plan contained within this Development Plan is intended to guide the location of landuses within the BSIA. As industries locate over time, the Precincts can be reassessed. If an industrial developer successfully demonstrates as part of the business case that it should be located in an alternative location to the preferred precinct, this may occur subject to business case approval by DSD and LandCorp.

Additional to complying with the provisions of the Development Plan, proponents are required to seek planning approval prior to the commencement of any works in accordance with these Planning Scheme provisions. Any departure or alteration to the BSIA Development Plan is to be advertised for public submissions in accordance with the Planning Scheme.

11.2 DEVELOPMENT APPROACH

11.2.1 ESTATE MANAGEMENT STRUCTURE

The development of the BSIA is to be proponent driven as guided by DSD and LandCorp. The Estate management group consists of DSD as the lead Agency with the ongoing management of the BSIA undertaken by LandCorp (Western Australian Land Authority) as identified below:

- LandCorp, in conjunction with DSD, will be responsible for the review and approval of proponent driven development within the BSIA prior to lodgement of any Development Applications with the Town of Port Hedland.
- The Estate Management Group will be responsible for approving leases to future proponents, advising on proposed developments and use of infrastructure within the BSIA. Consideration will be given to the Development Plan, technical reports and operational requirements of proponents to ensure the BSIA is developed to the full potential for downstream resource processing and a strategic industry.
- Additional to the management of proponent driven development aspects, the Estate Management Group will, in the first instance act on behalf of the BSIA industries in liaison with the PHPA to ensure the provision of berths remains available for the operational needs of the BSIA.

11.2.2 LEASE AND DEVELOPMENT OF LOTS

The lease and development of lots will be managed by the Estate Management Group as outlined in the development structure below. Proponents will be required to seek approval from the management group prior to leasing lots within the BSIA, and prior to submitting a development application to the Town of Port Hedland as depicted *Figure 10*. All Development Applications must be signed by both DSD and LandCorp.

Proponents will be required to provide development specific management plans which are consistent with the Development Plan requirements. Where appropriate the proponents will be required to demonstrate that the proposed development has been reviewed by relevant agencies and key stakeholders within the BSIA locality.

In the event that Green Title subdivisions are pursued in assembling land to be leased to proponents, it is anticipated that standard conditions of subdivision would include those outlined in Appendix G.

FIGURE 10 – LAND TENURE PROCESS

11.2.3 TECHNICAL DOCUMENTATION

The following Technical Documentation is required to be prepared and submitted to the satisfaction of the relevant authorities and the Estate Management Group:

Estate Management Group

- Servicing Strategy (Including but not limited to roads, drainage, onsite effluent disposal, water, etc.)
- Construction Management Plan
- Corridor requirements and management plan (if applicable)
- PAM time use management (if applicable)
- Industrial Ecology Assessment (if applicable)
- Scope of works/staging strategy

Town of Port Hedland

- Acoustic Assessment
- Air Quality Assessment
- Traffic Management Plan
- Local Water Management Strategy (LWMS) – to the satisfaction of the Department of Water
- Quantitative Risk Assessment
- Fire Management Assessment
- Aboriginal Heritage Assessment (if applicable)

11.3 DEVELOPER FUNDING

As a result of the size, nature and staging and development timeframes associated with the development of the BSIA, all infrastructure and servicing is to be proponent driven and funded.

To facilitate the appropriate timing of infrastructure and cost recovery for the foundation tenants, details of and arrangements for the delivery of such infrastructure and servicing should be provided as part of the Servicing Strategy.

There is no commitment from either State or Local Governments to produce serviced land or provide the necessary infrastructure required to make the area function.

11.4 PORT PLANNING

Planning for Boodarie provides for access to berths in South West Creek in the Inner Harbour, directly through the central infrastructure corridor. There are also potential connections to the proposed Multi-User Outer Harbour and road access to the proposed Lumsden Point.

Further co-ordination in relation to berthing requirements will be undertaken between DSD and The Port of Port Hedland as development proceeds.

11.5 TIME MANAGEMENT – PAM RESERVE

When in use the pre-Assembled Modules (PAM's) reserve will require time use management to regulate any impact on the operation of the BHP Goldsworthy Rail Line. Preparation of an agreement between rail operators and the Estate manager will be required.

11.6 ABORIGINAL HERITAGE

Archaeological assessment has already occurred specifically in relation to the proposed BSIA. A number of recommendations that arise from this assessment are listed below. Review of this research, and ethnographic assessment, will be conducted with the Kariyarra People WAD6169/1998, as the registered native title claim group, as proposed activities within the BSIA are specified.

The following recommendations have been made by RPS with respect to the recognition and management of heritage matters:

RECOMMENDATION 1

It is advised that the previous archaeological assessment work carried out in relation to the BSIA be provided to the Kariyarra People WAD6169/1998, as the registered native title claim group, for review and comment. In addition, ethnographic assessment of the BSIA will be conducted with the Kariyarra group. Reports and other relevant correspondence arising from these consultations will also be provided to the Department of Aboriginal Affairs (DAA).

RECOMMENDATION 2

LandCorp should advise personnel working onsite within the Project Area of the existence and location of Aboriginal sites of Artefact Scatter:

- Site 001 BOOD [AS]
- Site 002 BOOD [AS]
- Site 003 BOOD [AS]

RECOMMENDATION 3

RPS Cultural Heritage considers Site 001 BOOD [AS], Site 002 BOOD [AS] and Site 003 BOOD [AS] to be Aboriginal archaeological sites to which the Aboriginal Heritage Act (1972) (AHA) applies and therefore should be avoided.

RECOMMENDATION 4

Any proposed ground surface works should be restricted to the areas deemed void of Aboriginal sites. RPS recommends cordoning off Site 001 BOOD [AS], Site 002 BOOD [AS] and Site 003 BOOD [AS] using high visibility flagging tape affixed to star picket barrier fences if disturbance work is to take place near these sites. The site buffer boundaries for each site in Chapter 6 should be used as the exclusion zone perimeter fence.

RECOMMENDATION 5

Should an application be made to disturb the newly identified sites (RPS Site BOOD 001 to 003 [AS]) they must first be recorded to Section 18 levels by a suitably qualified cultural heritage consultant, prior to applying for a Section 18 application to the Minister of Indigenous Affairs.

RECOMMENDATION 6

It is recommended that LandCorp avoid disturbance works at DIA AHIS sites:

- New Site 2 (Marlinyura)/17023; and BD 08-29/25647 be avoided.
- If LandCorp is not able to avoid direct impact and/or risk of harm on these two sites, a Section 18 application must be sought and granted by the Minister of Indigenous Affairs prior to the commencement of development works.

Disclaimer

This report is dated November 2013 and incorporates information and events up to that date only and excludes any information arising, or event occurring, after that date which may affect the validity of Urbis Pty Ltd's (Urbis) opinion in this report. Urbis prepared this report on the instructions, and for the benefit only, of Landcorp (Instructing Party) for the purpose of Preparation of a BSIA Development Plan (Purpose) and not for any other purpose or use. Urbis expressly disclaims any liability to the Instructing Party who relies or purports to rely on this report for any purpose other than the Purpose and to any party other than the Instructing Party who relies or purports to rely on this report for any purpose whatsoever (including the Purpose).

In preparing this report, Urbis was required to make judgements which may be affected by unforeseen future events including wars, civil unrest, economic disruption, financial market disruption, business cycles, industrial disputes, labour difficulties, political action and changes of government or law, the likelihood and effects of which are not capable of precise assessment.

All surveys, forecasts, projections and recommendations contained in or made in relation to or associated with this report are made in good faith and on the basis of information supplied to Urbis at the date of this report. Achievement of the projections and budgets set out in this report will depend, among other things, on the actions of others over which Urbis has no control.

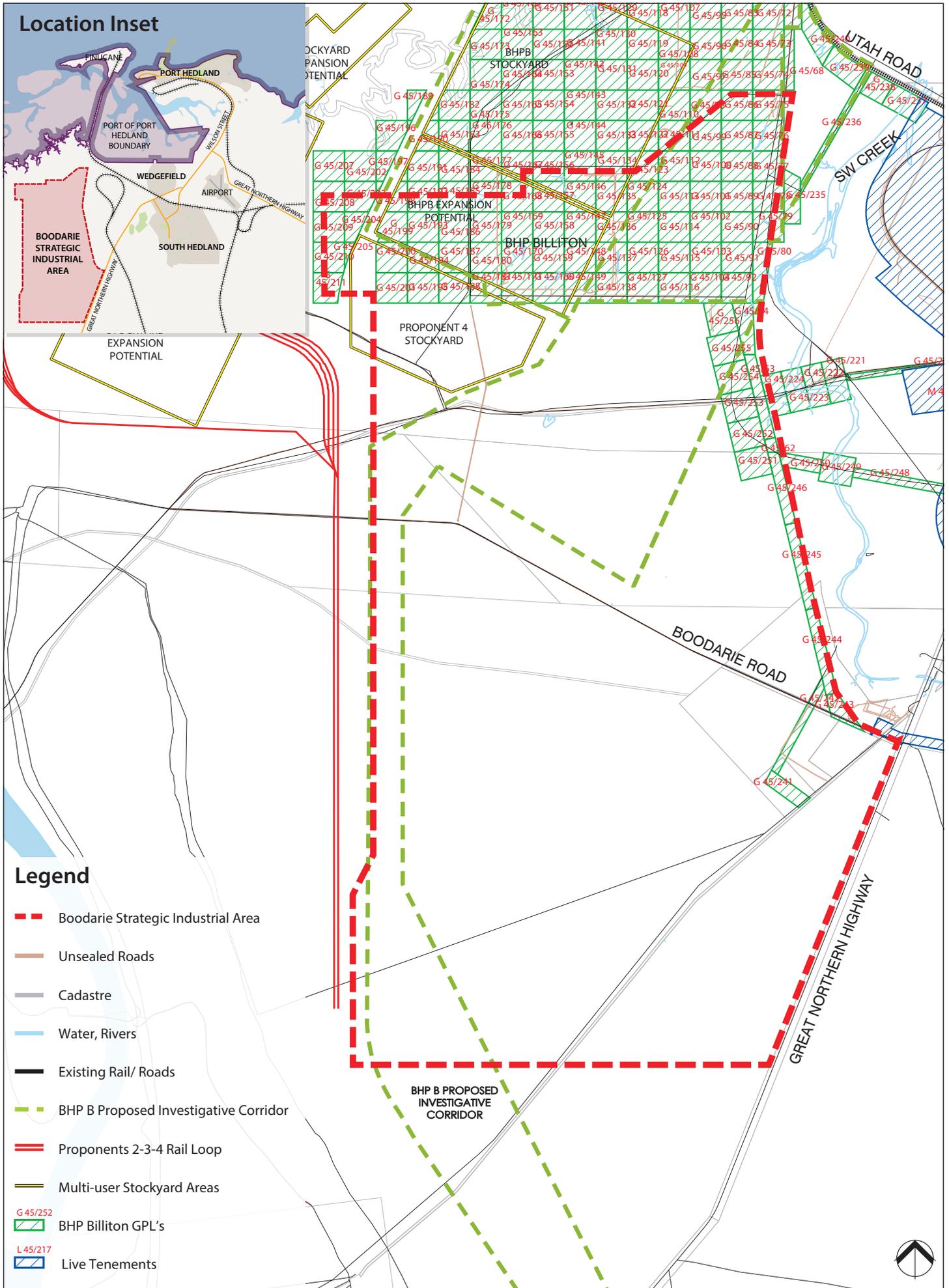
Urbis has made all reasonable inquiries that it believes is necessary in preparing this report but it cannot be certain that all information material to the preparation of this report has been provided to it as there may be information that is not publicly available at the time of its inquiry.

In preparing this report, Urbis may rely on or refer to documents in a language other than English which Urbis will procure the translation of into English. Urbis is not responsible for the accuracy or completeness of such translations and to the extent that the inaccurate or incomplete translation of any document results in any statement or opinion made in this report being inaccurate or incomplete, Urbis expressly disclaims any liability for that inaccuracy or incompleteness.

This report has been prepared with due care and diligence by Urbis and the statements and opinions given by Urbis in this report are given in good faith and in the belief on reasonable grounds that such statements and opinions are correct and not misleading bearing in mind the necessary limitations noted in the previous paragraphs. Further, no responsibility is accepted by Urbis or any of its officers or employees for any errors, including errors in data which is either supplied by the Instructing Party, supplied by a third party to Urbis, or which Urbis is required to estimate, or omissions howsoever arising in the preparation of this report, provided that this will not absolve Urbis from liability arising from an opinion expressed recklessly or in bad faith.

Appendix A

BSIA Land Tenure and Interests



Legend

- - - Boodarie Strategic Industrial Area
- Unsealed Roads
- Cadastre
- Water, Rivers
- Existing Rail/ Roads
- - - BHP B Proposed Investigative Corridor
- = = = Proponents 2-3-4 Rail Loop
- Multi-user Stockyard Areas
- G 45/252 BHP Billiton GPL's
- L 45/217 Live Tenements

Appendix A - General Purpose Lease + BHP Billiton Investigative Corridor

BOODARIE STRATEGIC INDUSTRIAL AREA

DATE 20.03.2014

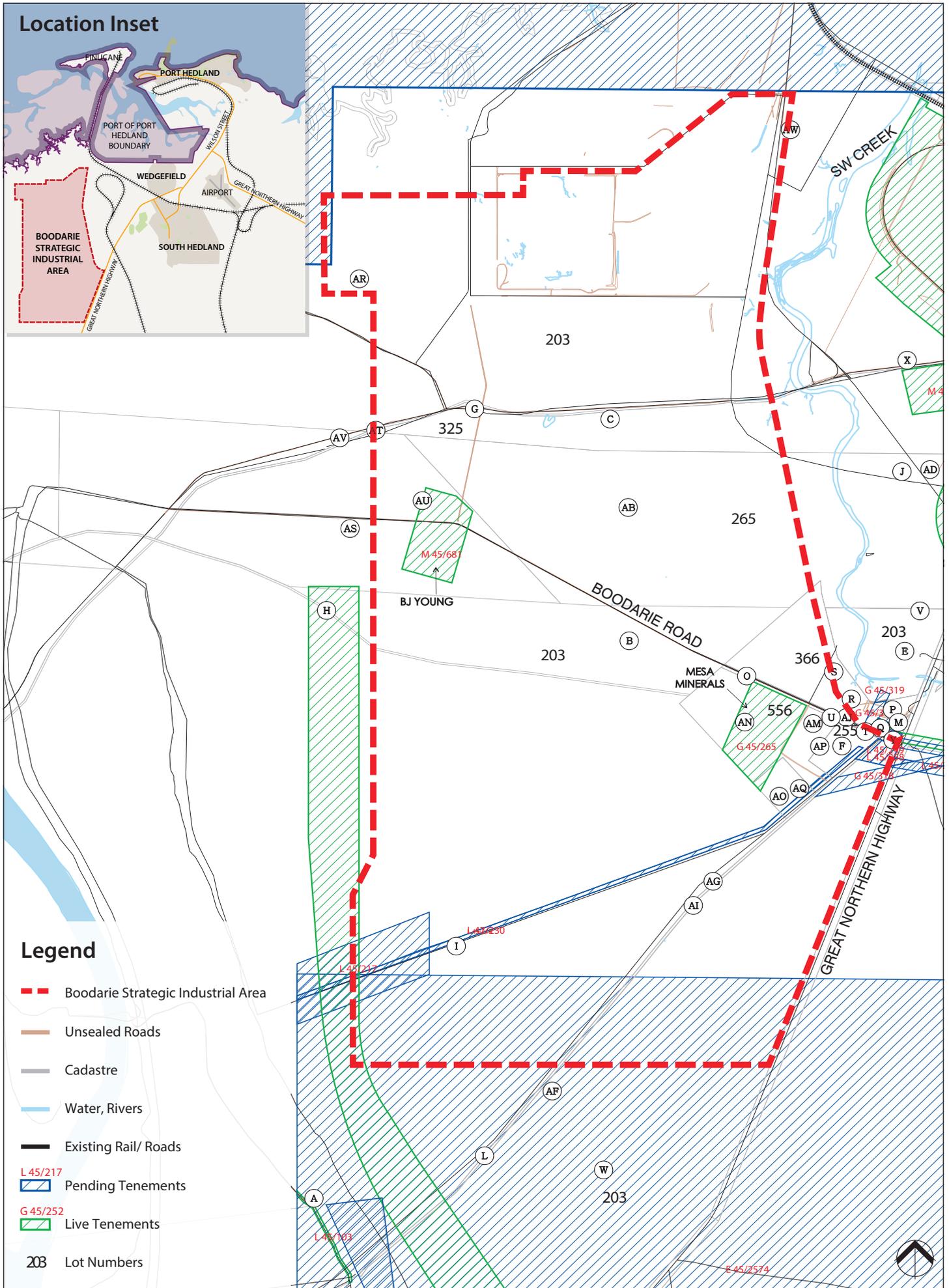
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Appendix A - Tenements and Proprietors

BOODARIE STRATEGIC INDUSTRIAL AREA

DATE 20.03.2014

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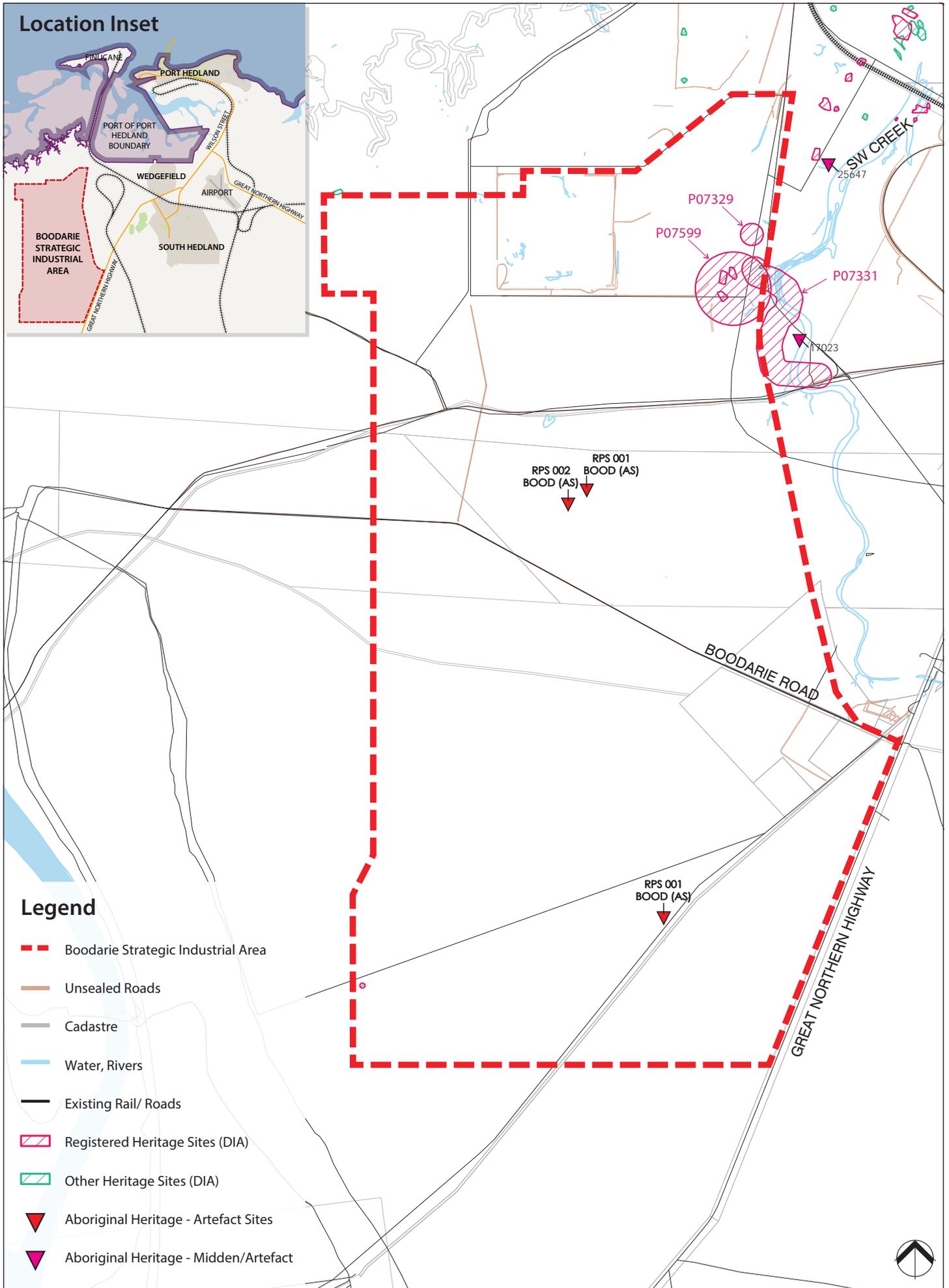
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ID	Lot_Name	Lot_Number	Proprietor
A	203	203	STATE OF WA
A	203	203	BHP BILLITON DIRECT REDUCED IRON PTY LTD
A	L 3114/618	0	PASTORAL LEASE
B	203	203	STATE OF WA
B	203	203	BHP BILLITON DIRECT REDUCED IRON PTY LTD
B	L 3114/618	0	PASTORAL LEASE
C	203	203	STATE OF WA
C	203	203	BHP BILLITON DIRECT REDUCED IRON PTY LTD
C	L 3114/618	0	PASTORAL LEASE
D	47	47	STATE OF WA
D	L GE J998591	0	LEASE
E	203	203	STATE OF WA
E	203	203	BHP BILLITON DIRECT REDUCED IRON PTY LTD
E	L 3114/618	0	PASTORAL LEASE
F	255	255	STATE OF WA
F	L GE L371264	0	LEASE
G	323	323	STATE OF WA
H	324	324	STATE OF WA
I	Easement - doc(203 - G225410)	0	EPIC ENERGY (PILBARA PIPELINE P/L)
J	265	265	STATE OF WA
J	UCL	0	UCL
K	308	308	STATE OF WA
K	UCL	0	UCL
L	R 33016	0	RESVE - MINISTER FOR WATER RESOURCES
L	273	273	RESVE - STATE OF WA
M	R 33016	0	RESVE - MINISTER FOR WATER RESOURCES
M	275	275	RESVE - STATE OF WA
N	370	370	STATE OF WA - VESTED PH PORT AUTHORITY
N	UCL	0	UCL
O	409	409	STATE OF WA
P	364	364	RESVE - M/O TOWN OF PORT HEDLAND
P	R 33593	0	RESVE - M/O TOWN OF PORT HEDLAND
Q	365	365	STATE OF WA
Q	L GE I891907	0	LEASE
R	Easement - doc(366 - F226096)	0	STATE ENERGY COMMISSION OF WA
S	UCL	0	UCL
S	366	366	STATE OF WA
T	322	322	STATE OF WA
U	UCL	0	UCL
U	397	397	STATE OF WA
V	Easement - doc(203 - H532364)	0	STATE ENERGY COMMISSION OF WA
V	Easement - doc(203 - H532364)	0	STATE ENERGY COMMISSION OF WA
W	203	203	STATE OF WA
W	203	203	BHP BILLITON DIRECT REDUCED IRON PTY LTD
W	L 3114/618	0	PASTORAL LEASE
X	376	376	STATE OF WA
Y	L 3114/618	0	PASTORAL LEASE
Y	203	203	STATE OF WA
Y	203	203	BHP BILLITON DIRECT REDUCED IRON PTY LTD
Z	555	555	STATE OF WA
Z	L GE L252825	0	LEASE
AA	R 50528	0	RESVE - HARBOUR PURPOSES
AA	556	556	RESVE - M/O PH PORT AUTHORITY
AB	487	487	STATE OF WA
AB	UCL	0	UCL
AC	EASEMENT - DOC(487 - H522488)	0	STATE ENERGY COMMISSION OF WA
AD	UCL	0	UCL
AD	487	487	STATE OF WA
AE	EASEMENT - DOC(487 - H522488)	0	STATE ENERGY COMMISSION OF WA
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AG	Easement - doc(203 - H532364)	0	STATE ENERGY COMMISSION OF WA
AH	Easement - doc(203 - H532364)	0	STATE ENERGY COMMISSION OF WA
AI	Easement - doc(273 - H532364)	0	STATE ENERGY COMMISSION OF WA
AJ	Easement - doc(397 - F226096)	0	STATE ENERGY COMMISSION OF WA
AK	EASEMENT - DOC(308 - H522488)	0	STATE ENERGY COMMISSION OF WA
AL	EASEMENT - DOC(265 - H522488)	0	STATE ENERGY COMMISSION OF WA
AM	UCL	0	UCL
AM	602	602	STATE OF WA
AN	600	600	STATE OF WA
AN	UCL	0	UCL
AO	Easement - doc (601-E-DOC F226096)	0	STATE ENERGY COMMISSION OF WA
AP	Easement - doc (602-E-DOC F226096)	0	STATE ENERGY COMMISSION OF WA
AQ	R 50884	0	RESVE - POWER STATION
AQ	601	601	RESVE - M/O REGIONAL POWER CORPORATION
AR	R 50892	0	RESVE - PORT PURPOSES
AR	1203	1203	RESVE - STATE OF WA
AS	1280	1280	RESVE - STATE OF WA
AS	R 50892	0	RESVE - STATE OF WA
AT	1204	1204	RESVE - STATE OF WA
AT	R 50892	0	RESVE - STATE OF WA
AU	1282	1282	RESVE - STATE OF WA
AU	R 9701	0	RESVE - STOCK ROUTE
AV	1281	1281	STATE OF WA
AW	L 3114/618	0	PASTORAL LEASE
AW	203	203	STATE OF WA
AW	203	203	BHP BILLITON DIRECT REDUCED IRON PTY LTD

Appendix B

Aboriginal Heritage



Appendix B - Aboriginal Heritage

BOODARIE STRATEGIC INDUSTRIAL AREA

DATE 20.03.2014

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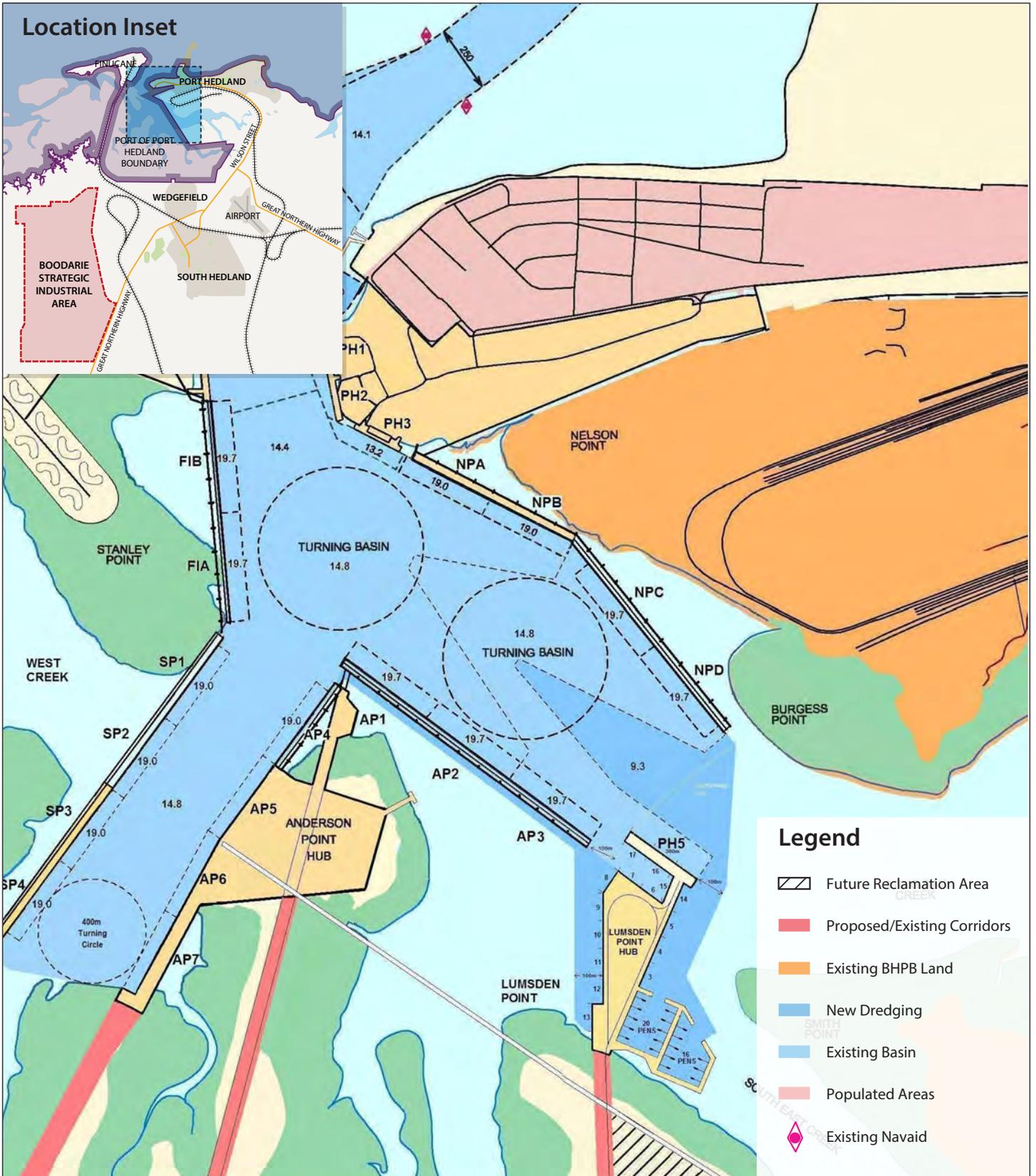
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Appendix C

Port Hedland Port Authority – Berth Placement



Appendix C - Boodarie Berth PHPA Placement

BOODARIE STRATEGIC INDUSTRIAL AREA

DATE 20.03.2014

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Perth, WA 6000 Australia

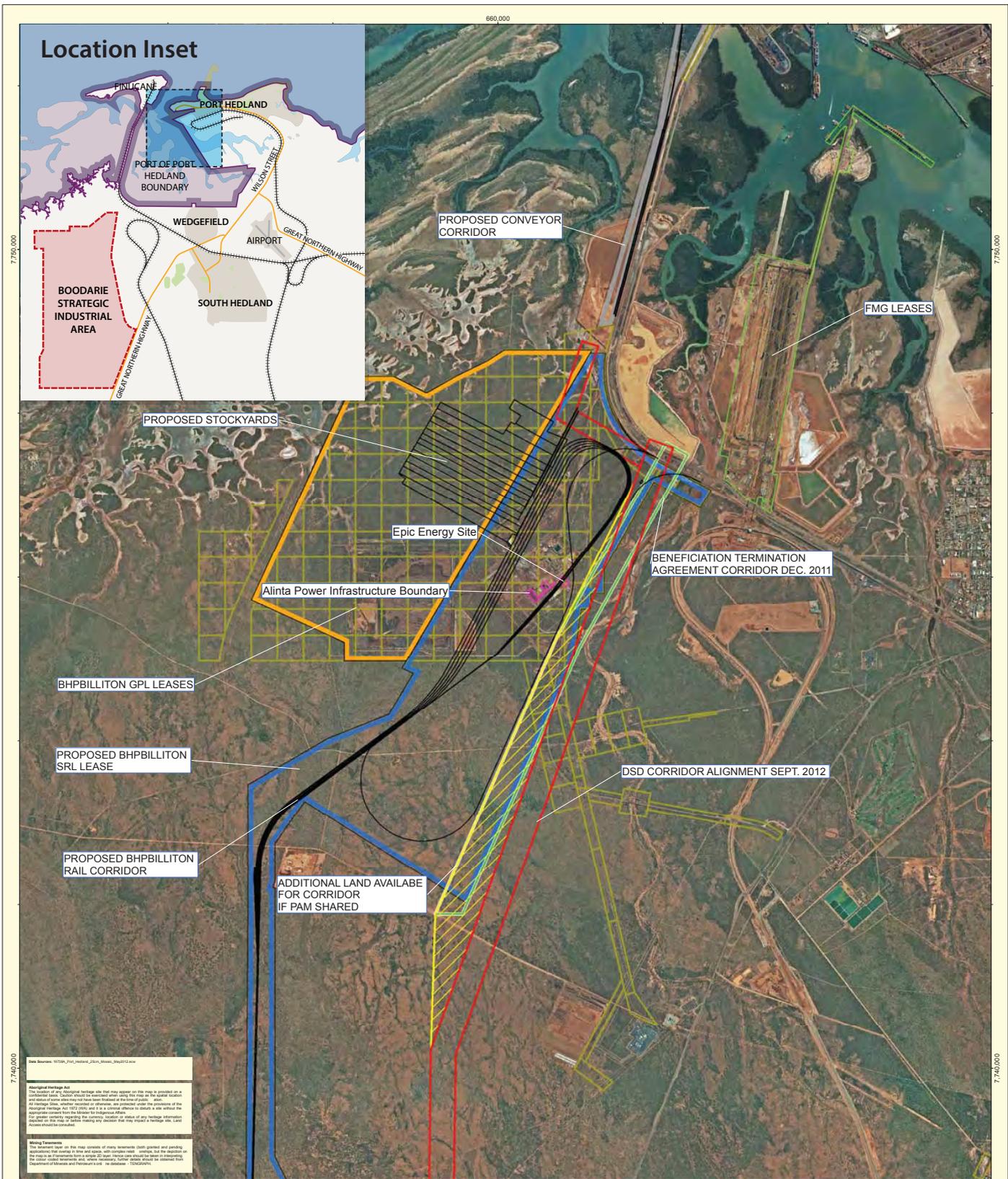
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Appendix D

BHP Billiton Amended Loop Corridor



Data Sources: 01208_Port_Infrastructure_Site_Review_08/2012.dwg

Aboriginal Heritage Act
 This corridor is an Aboriginal Heritage site that may contain sites that are considered to be of cultural significance. Such sites will be identified when using this map on the digital screen and details of any such sites may not have been included in this map. Any such sites will be identified when using this map on the digital screen and details of any such sites may not have been included in this map. Any such sites will be identified when using this map on the digital screen and details of any such sites may not have been included in this map.

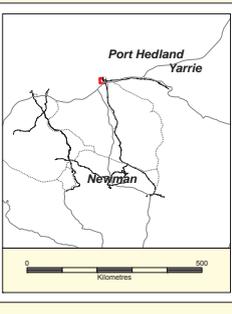
Warning
 This document is for the use of the client and is not to be used for any other purpose. It is the client's responsibility to ensure that the information contained herein is accurate and up-to-date. The client warrants that the information contained herein is accurate and up-to-date. The client warrants that the information contained herein is accurate and up-to-date.

Health Safety Environment and Community
bhpbilliton
 BHP BILLITON IRON ORE
 insourcing the future

PORT HEDLAND PROJECT AREA
PROPOSED CORRIDOR SEPT. 2012

Scale @ A0: 1:15,000
 Date: 3/10/2012
 Prepared: R. GREGORY
 Checked: M. LYTTLER
 Reviewed: M. DONOVAN

Project No: A312/30 T Rev C
 Figure: 8



LEGEND

- Proposed BHPBIO Infrastructure
- Alinta and Epic Energy Power
- Southwest Creek Corridor Alignment
- South West Creek Realignment Proposal
- Beneficiation Termination Agreement Corridor
- BHPBIO GPLs - Granted
- FMG Leases
- Conveyor Corridor
- Boodarie Stockyards
- Proposed SRL Licence

Appendix D - BHP Billiton Amended Loop Corridor
 BOODARIE STRATEGIC INDUSTRIAL AREA

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 Perth, WA 6000 Australia
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Appendix E

Stakeholder Consultation

LandCorp and DSD has consulted directly with all relevant agencies in informing the preparation of the BSIA Development Plan. A summary of consultation with each of those Agencies is listed below:

DEPARTMENT OF STATE DEVELOPMENT

DSD is the lead agency in the establishment and development of the BSIA. As such, DSD is supportive of the vision, objectives and intentions for the development of the BSIA. DSD has also facilitated support across government for the BSIA Development Plan.

DSD has facilitated the process of taking the BSIA from the inception of the project, to instigating concept planning and commissioning the relevant studies to support the preparation of the BSIA Development Plan.

TOWN OF PORT HEDLAND

The Town of Port Hedland is supportive of the creation of the BSIA. To expedite subdivisional development, the Town has taken into consideration the difficulty of service supply, and has agreed that where appropriate, it will consider supporting reduced forms of service supply.

WATER CORPORATION

Water Supply

The East Pilbara Water Supply Scheme serves Port Hedland, South Hedland and approved major industrial customers. This scheme draws water from the Yule River bore field to the west and the De Grey bore field to the east and is currently operating very close to its maximum capacity. WaterCorp is currently expanding the source, distribution and storage capacities to deliver additional water with a target date of mid-2014. As industrial precincts are treated on a case by case basis since they are dependent on numerous variable factors, planning for the expansion has not included the BSIA.

WaterCorp is the License holder for water supply and wastewater in Port Hedland and South Hedland. The BSIA is partly within the current Water Services Licence Area issued by the Economic Regulation Authority (ERA). The central and south-western portions of the BSIA are not covered by the licence area, and should Stage 1 be in this area, the proponents would need to submit a formal request to WaterCorp to become the licensed water service provider, and apply to the Economic Regulation Authority (ERA) to extend the licence area.

The preferred proposal would be for water supply via a 150mm to 200mm reticulation size main from the vicinity of the Elevated Tank at South Hedland. A less preferable alternative would be an off-take from the bore water main, with either an elevated tank or booster pump near the first stages of development.

An agreement in principle would be required from LandCorp, the Town of Port Hedland and Pilbara Cities prior to finalisation of a subdivision agreement. All proposals will be fully funded by the proponent.

Sewerage Disposal

WaterCorp will not be providing sewerage to the BSIA. All proposals will need to include a private scheme, or onsite effluent disposal.

HORIZON POWER

Reticulated power can be made available to the BSIA subject to appropriate increases in power generation. All additional infrastructure would be provided at the expense of the developer.

Horizon Power currently holds a Management Order in the BSIA. Horizon has sought to expand its power station site to develop a gas fired power station in order to facilitate the provision of ongoing future power supply. This area is identified on the Development Plan.

MAIN ROADS WESTERN AUSTRALIA

Main Roads has confirmed the placement of the three main access points into the BSIA. This is supported by GHD's traffic assessment to ascertain potential traffic load and associated intersection requirements. This traffic assessment is summarised within Section 8 and attached as Appendix II.

DEPARTMENT OF WATER

LandCorp, DSD and GHD's hydrologist have undertaken consultation with the Department of Water (DoW). It has been confirmed that a District Water Management Strategy (DWMS) is required to support the BSIA Development Plan. As such, a DWMS is detailed in Appendix E and attached as Appendix III. Formally, DoW is not obliged to support the Development Plan unless water supply is available.

PHPA

LandCorp and DSD have consulted with the PHPA regarding infrastructure connections and berthing which are under the Port's jurisdiction. Of importance is ensuring sufficient allocation of berths in the inner and proposed outer harbours, and connections to and from the BSIA. The Port Authority is supportive of the development of the BSIA. The interface with the Port was recently resolved. The PHPA is in the process of finalising its revision to its MUOH Port Master Plan and it was agreed with the DSD that the alignment of these plans with the BSIA was essential.

Recently Worley Parsons prepared a Combined Port Area and Boodarie Master Plan Technical Note (refer Appendix XIII under External Reports) in recognition of the need for co-ordination between the Port and the BSIA. The purpose of this technical note is to document the preparation of the resulting Combined Port Area and Boodarie Strategic Industrial Area (BSIA) Master Plan adopting the two plans as the basis of this process and addressing any outstanding issues at the interface with these plans.

Critical to the BSIA, as documented in the technical note, the Port Authority has agreed to incorporate Boodarie's berth requirements as follows;

- Future berths AP6 and AP7 at Anderson Point in the Port Inner Harbour have been identified for the use of BSIA;
- The PHPA Master Plan identifies the development of a Near Shore Harbour for the BSIA in the Outer Harbour. Berths at this harbour will likely be for liquid bulk, break bulk/container and liquefied gas and other dangerous cargoes; and
- The use of Lumsden Point for the transport of modules to the BSIA.

The Port Authority will work closely with the DSD and LandCorp on developments that may affect Boodarie.

STAKEHOLDER CONSULTATION

Access to the coast was raised during stakeholder consultation regarding the BSIA Development. In 2013 the Town of Port Hedland formally closed Whim Creek Road removing public coastal access.

Alternative coastal access is currently available via the Boodarie Station Access Road, however, this is a private road that BHPB constructed to provide access to the Boodarie Station homestead.

Roy Hill are currently obligated under endorsed management plans with the PHPA to maintain public access along the Boodarie Station Access Road until such time that an agreement is reached between BHPB and Roy Hill for an alternative road to be provided to the homestead.

As part of future works Roy Hill is required to construct a multi user common access road adjacent its rail line. Once constructed, this will provide public access to the west. In addition the Multi User Outer Harbour – Port Master Plan provides an infrastructure linkage (including a public road) from GNH along the future corridor.

Appendix F

Department of Environmental Regulation Approval



Government of **Western Australia**
Department of **Environment Regulation**

Your ref:
Our ref: CPS 5262/2
Enquiries: Derek Jenkins
Phone: 6467 5031
Fax: 6467 5532
Email: nvp@der.wa.gov.au

Mr David Cooper
Project Manager
Western Australian Land Authority T/A LandCorp
Locked Bag 5
Perth Business Centre
PERTH WA 6849

Dear Mr Cooper

NOTICE OF PROPOSED AMENDMENT TO CLEARING PERMIT CPS 5262/1

Please find enclosed a copy of proposed Clearing Permit CPS 5262/2. This amendment is a result of your request to amend condition 9 covered by Clearing Permit CPS 5262/1.

Thank you for the revised plan for the Management of Mulgara in the Boodarie Industrial Estate at Port Hedland and supporting information.

Please note, additional changes have been made to the permit to bring it in line with current practices.

Before making this amendment, I invite you to make any comments within 28 days regarding this matter in writing to:

Native Vegetation Conservation Branch
Department of Environment Regulation
Locked Bag 33
CLOISTERS SQUARE WA 6850

Under s51M(5)(a) of the *Environmental Protection Act 1986* you may waive the 28 day notice period in writing.

If you have any queries regarding this matter, please contact Mr Derek Jenkins at the Department's Native Vegetation Conservation Branch on 6467 5031.

Yours sincerely

Jane Clarkson
ACTING MANAGER
NATIVE VEGETATION CONSERVATION BRANCH

*Officer delegated under Section 20
of the Environmental Protection Act 1986*

30 January 2014



CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

Purpose Permit number:	CPS 5262/2
Permit Holder:	Western Australian Land Authority T/A LandCorp
Duration of Permit:	23 November 2012 – 23 November 2017

The Permit Holder is authorised to clear native vegetation subject to the following conditions of this Permit.

PART I – CLEARING AUTHORISED

1. Purpose for which clearing may be done

Clearing for the purpose of industrial development.

2. Land on which clearing is to be done

Lot 600 on Deposited Plan 70566 (Boodarie)

Lot 366 on Deposited Plan 42164 (Boodarie)

Lot 409 on Deposited Plan 28588 (Boodarie)

3. Area of Clearing

The Permit Holder must not clear more than 81.35 hectares of native vegetation within the area hatched yellow on attached Plan 5262/2.

4. Application

This Permit allows the Permit Holder to authorise persons, including employees, contractors and agents of the Permit Holder, to clear native vegetation for the purposes of this Permit subject to compliance with the conditions of this Permit and approval from the Permit Holder.

5. Type of clearing authorised

This Permit authorises the Permit Holder to clear native vegetation for activities to the extent that the Permit Holder has the right to access land under the *Land Administration Act 1997* or any other written law.

PART II – ASSESSMENT SEQUENCE AND MANAGEMENT PROCEDURES

6. Avoid, minimise etc clearing

In determining the amount of native vegetation to be cleared authorised under this Permit, the Permit Holder must have regard to the following principles, set out in order of preference:

- avoid the clearing of native vegetation;
- minimise the amount of native vegetation to be cleared; and
- reduce the impact of clearing on any environmental value.

7. Weed control

When undertaking any clearing or other activity authorised under this Permit, the Permit Holder must take the following steps to minimise the risk of the introduction and spread of *weeds*:

- clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;
- ensure that no *weed*-affected soil, *mulch*, *fill* or other material is brought into the area to be cleared; and
- restrict the movement of machines and other vehicles to the limits of the areas to be cleared.

8. Fauna management

The Permit Holder must implement and adhere to the document *Management of Mulgara in the Boodarie Industrial Estate at Port Headland – revised*, Ref: 2013-0057-002-gt, attached as Appendix A to this permit.

PART III - RECORD KEEPING AND REPORTING

9. Records must be kept

In relation to fauna management pursuant to condition 8 of this Permit:

- (a) the location of each Mulgara recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings or decimal degrees; and
- (b) the location and date where relocated fauna were released, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings or decimal degrees.

10. Reporting

- (a) The Permit Holder must provide to the CEO on or before 30 June of each year, a written report:
 - (i) of records required under condition 9 of this Permit; and
 - (ii) concerning activities done by the Permit Holder under this Permit between 1 July and 30 June of the preceding year.
- (b) If no clearing authorised under this Permit was undertaken between 1 July to 30 June of the preceding calendar year, a written report confirming that no clearing under this permit has been carried out, must be provided to the CEO on or before 30 June of each year.
- (c) Prior to 23 August 2017, the Permit Holder must provide to the CEO a written report of records required under condition 9 of this Permit where these records have not already been provided under condition 10(a) of this Permit.

DEFINITIONS

The following meanings are given to terms used in this Permit:

fill means material used to increase the ground level, or fill a hollow;

mulch means the use of organic matter, wood chips or rocks to slow the movement of water across the soil surface and to reduce evaporation; and

weed/s means any plant -

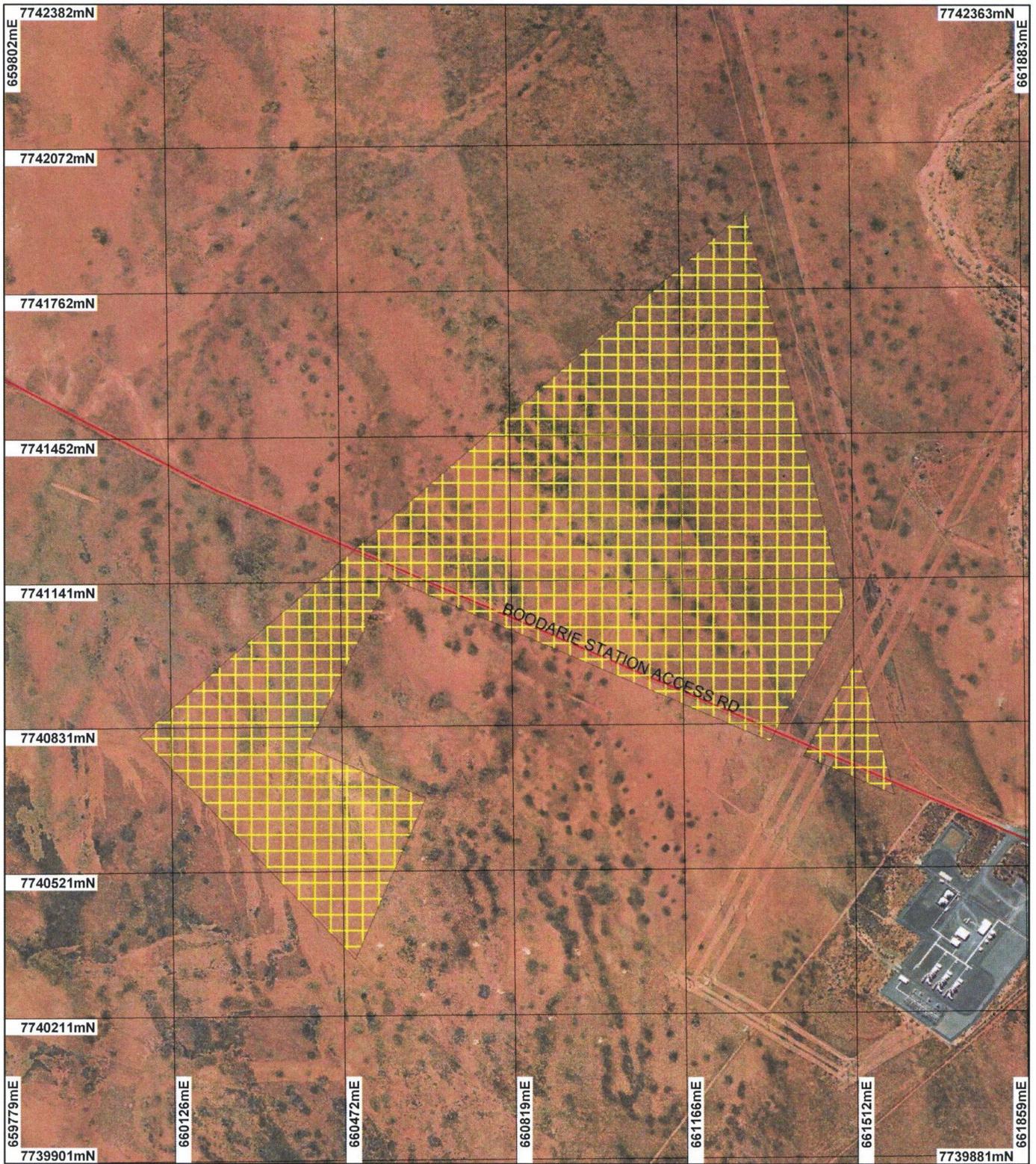
- (a) that is a declared pest under section 22 of the *Biosecurity and Agriculture Management Act 2007*; or
- (b) published in a Department of Parks and Wildlife Regional Weed Summary, regardless of ranking; or
- (c) not indigenous to the area concerned.

XXXXXXXXXX

*Officer delegated under Section 20
of the Environmental Protection Act 1986*

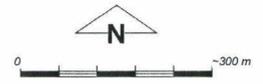
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Draft Plan 5262/2



LEGEND

-  Road Centrelines
-  Clearing Instruments
-  Areas Approved to Clear
- Port Hedland 50cm Orthomosaic - Landgate 2004



Geocentric Datum Australia 1994

Note: the data in this map have not been projected. This may result in geometric distortion or measurement inaccuracies.

..... Date

Information derived from this map should be confirmed with the data custodian acknowledged by the agency acronym in the legend.



Department of Environment and Conservation

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* Project Data is denoted by asterisk. This data has not been quality assured. Please contact map author for details.

Appendix A

Management of Mulgara in the Boodarie Industrial Estate at Port Hedland - revised

Management of Mulgara in the Boodarie Industrial Estate at Port Hedland - revised

1.1 Background

LandCorp applied for a Native Vegetation Clearing Permit to clear Lot 600 on Deposited Plan 70566 (Boodarie), Lot 366 on Deposited Plan 42164 (Boodarie) and Lot 409 on Deposited Plan 28588 (Boodarie). It is likely that this area supports Mulgara (*Dasyercus cristicauda* or *D. blythi*) as they have been caught in similar habitat nearby.

The Vegetation Clearing Permit included a condition relating to fauna management that read as follows:

- 9(a) Prior to undertaking any clearing authorised under this Permit, the area(s) shall be inspected by a *fauna specialist* who shall identify burrow/s suitable to be utilised by Crested-tail Mulgara (*Dasyercus cristicauda*);
- (b) Prior to clearing, any burrow identified in condition 9(a) shall be inspected by a *fauna specialist* for the presence of fauna listed in condition 9(a);
- (c) Where fauna are identified in relation to condition 9(b) of this permit, the Permit Holder shall ensure that:
 - i. No clearing of the identified burrow/s occurs, unless approved by the CEO;
 - ii. No clearing occurs within 50 metres of the identified burrow/s unless approved by the CEO;
 - iii. No taking of identified fauna occurs unless approved by the CEO.

LandCorp considered these conditions unworkable because of the continual referral to the CEO of the Department of Parks and Wildlife, should burrows be found.

In response to these conditions LandCorp engaged GHD to prepare an Environmental Management Plan to further detail the management strategies. The Department of Environment and Conservation (DEC; now Department of Parks and Wildlife; DPaW) indicated that it was not reasonable to rely on Mulgara relocating out of an area on their own accord (i.e. they are known to have high site fidelity) and a trapping and translocation program was required. They also indicated that Mulgara should not be trapped during the breeding season (i.e. May to September, inclusive). Furthermore, they indicated that measures such as barriers should be erected to ensure related individuals do not return to the disturbed area and that follow-up monitoring is undertaken to determine the success of the translocations.

Below is a proposed alternative management protocol that will protect Mulgara in the project area.

1.2 Conservation status of Mulgara

The Crest-tailed Mulgara (*Dasyercus cristicauda*) is currently listed as Vulnerable under the *EPBC Act 1999* and Schedule 1 under the *WA Wildlife Conservation Act 1950* and the Brush-tailed Mulgara (*Dasyercus blythi*) is listed as a Priority 4 species with the DPaW. In 2010, the Commonwealth Government indicated that for the purposes of the *EPBC Act* all Mulgara in the Pilbara would be considered to be *D. cristicauda* until the taxonomic issue has been resolved by the Australian Government Threatened Species Scientific Committee. In May 2012, Department of Sustainability, Environment, Water, Population and Communities (2012) released a discussion paper on the possibility of delisting *Dasyercus hillier* and listing *D. blythi* under the *EPBC Act*, presumably as a vulnerable species.

1.3 Conservation expectation for Mulgara

Based on recent Native Vegetation Clearing Permits and EPBC Controlled Action approvals, both the DPaW and the Commonwealth Department of the Environment (DoE) expect that no Mulgara are killed or injured



during the vegetation clearing program or subsequent land development. Mulgara in potential impact areas should be trapped and translocated to avoid these impacts. Special provisions are required during the breeding season to ensure that translocated lactating females do not leave their young in the burrow, as they would quickly perish.

1.4 Ecology

Mulgara are generally sedentary in contrast with some other small dasyurids and have high site fidelity and a low propensity for dispersal once a home range has been established (Masters 1998, Dickman et al. 2001, Masters 2003). Masters (2003) indicated home ranges vary in size from 1.0 to 14.4ha (mean 6.5ha), with some overlap, however, Kortner et al. (2007) reported home ranges for males to average 25.5ha and for females to average 10.8ha. Burrows are mostly used by a single individual, but males and females have been found together in a single burrow during the breeding season (Masters 2003, Thompson and Thompson 2007). Kortner et al. (2007) reported that 10 of 68 burrows they monitored were used by multiple Mulgara and one individual returned to the same burrow on 32 of 52 days monitored. Masters (2003) reported an individual's burrows in her study area were concentrated in a relatively small area, as the average maximum distance across a home range was about 440m. In the Pilbara, Thompson and Thompson (2007, 2008) reported catching nine Mulgara in an area of 22ha and 50 in 210ha, and about 200 trap-nights were required to catch each Mulgara in areas with a relatively high density; Mulgara are therefore not 'trap-friendly'.

1.5 Conservation actions

As clearing of the vegetation will most likely result in the demise of Mulgara, it is necessary that all individuals within areas to be cleared be relocated prior to the disturbance and vegetation clearing. The following sequence of actions is to be implemented:

- Action 1* The project area is investigated by a fauna specialist with a good knowledge of Mulgara habitat, burrows and ecology and based on this site investigation, areas potentially supporting Mulgara shall be mapped. The investigation will also include areas immediately adjacent to the project area to determine the potential for Mulgara to move in from adjacent areas.
- Action 2* Areas mapped as potentially supporting Mulgara are to be trapped within eight weeks of vegetation clearing. The trapping program will use baited aluminium box traps placed at 25m centres (i.e. 16 traps per ha) for a minimum period of 7 consecutive nights. Should a Mulgara be caught, then the trapping will continue until three consecutive nights are achieved without a capture. As approved by the Department of Parks and Wildlife (TF006261), traps will be cleared within 4 hours of sunrise, rebaited every third day or earlier if required and remain open during the day. All trapped vertebrates will be translocated (see action 5). Traps will be monitored for the impact of ants, and if ants are at a level where they could cause harm to trapped animals they will be closed and removed or moved. All-terrain vehicles are recommended for laying out and checking the traps to ensure that a large enough number of traps are used and that they are cleared sufficiently early each morning.
- Action 3* Upon the completion of trapping the project area will be again inspected for recent signs of Mulgara, and trapping will continue if recent signs are observed.
- Action 4* Any lactating female caught without young attached during the trapping program will have a radio-transmitter attached by a collar and released at the capture site. This female will then be located the following morning hopefully in a burrow with her young. The female and her young will be dug from the burrow and relocated as a family group. The collar will be removed from the lactating female prior to release as the behavioural impacts from radio-transmitters are unknown and could put the lactating mothers or dependant young at risk.
- Action 5* All Mulgara will be relocated into suitable habitat. Mulgara are relatively sedentary animals, however, previous radio-tracking experience indicates that Mulgara are capable of moving 450m or more each night when placed in an unfamiliar area. The relocation site will be chosen so that it has a large area of intact suitable habitat and is far enough away so that Mulgara are

unlikely to return to the project area. Ideally the relocation site will have no evidence of other Mulgara.

Action 6 All burrows recorded in the project area will be dug out and closed during the trapping program.

Action 7 Follow up monitoring using radio-transmitters of all released non-lactating females and male Mulgara will be conducted weekly for up to 6 weeks to determine whether relocations were successful. Juvenile Mulgara and lactating females will not be radio-collared.

1.6 Licensing

A Regulation 15 Licence has been issued to Terrestrial Ecosystems (TF006261) by the DPaW under the *Wildlife Conservation Act (1950)* to conduct the Mulgara trapping and relocation within the Boodarie Industrial Estate.

1.7 Reporting

A map of the entire area showing those areas that contain suitable habitat for Mulgara should be prepared prior to any trapping and translocation program.

A brief written report outlining the methodology, results and outcomes is necessary at the conclusion of Action 1.

It is a requirement of the Regulation 15 licence that all animals caught and translocated are reported to DPaW, which will be done near the expiration of the license.

A brief written report on the trapping and monitoring program, its outcome and the relocation program is required at the conclusion of each trapping, translocation and monitoring program. Maps showing the location of all traps, location of fauna captured, release sites and burrows should be produced. Supporting photos of the habitat, burrows and captures should be included in the report.

References

- Department of Sustainability Environment Water Population and Communities. 2012. Invitation to comment on the proposed delisting of *Dasyercus hillieri* and listing *Dasyercus blythi* under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Canberra.
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- Kortner, G., C. R. Pavey, and F. Geiser. 2007. Spatial ecology of the mulgara in arid Australia: impact of fire history on home range size and burrow use. *Journal of Zoology* **273**:350-357.
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- Masters, P. 2003. Movement patterns and spatial organisation of the mulgara, *Dasyercus cristicauda* (Marsupialia: Dasyuridae), in central Australia. *Wildlife Research* **30**:339-344.
- Thompson, G. G. and S. A. Thompson. 2007. Shape and spatial distribution of Mulgara (*Dasyercus cristicauda*) burrows, with comments on their presence in a burnt habitat and a translocation protocol. *Journal of the Royal Society of Western Australia* **90**:195-202.
- Thompson, G. G. and S. A. Thompson. 2008. Abundance and spatial distribution of five small mammals at a local scale. *Australian Mammalogy* **30**:65-70.

Appendix G

Draft Subdivision Conditions

The following conditions of subdivision are anticipated to be imposed by the WAPC:

1. The land being filled, stabilised, drained and/or graded as required to ensure that:
 - a) lots can accommodate their intended development; and
 - b) stormwater is contained on-site, or appropriately treated (Local Government)
2. Engineering drawings and specifications are to be submitted and approved, and works undertaken in accordance with the approved engineering drawings and specifications and approved plan of subdivision, for the filling and/or draining of the land, including ensuring that stormwater is contained on-site, or appropriately treated and connected to the local drainage system. Engineering drawings and specifications are to be in accordance with an approved Urban Water Management Plan (UWMP) for the site, or where no UWMP exists, to the satisfaction of the Western Australian Planning Commission (Local Government)
3. Prior to the commencement of subdivisional works, the landowner/applicant is to provide a pre-works geotechnical report certifying that the land is physically capable of development or advising how the land is to be remediated and compacted to ensure it is capable of development; and

In the event that remediation works are required, the landowner/applicant is to provide a post geotechnical report certifying that all subdivisional works have been carried out in accordance with the pre-works geotechnical report (Local Government)

4. A management plan detailing how risk of erosion and sedimentation impacts into nearby water bodies will be minimised during subdivision is to be:
 - a) prepared by the landowner/applicant and approved prior to the commencement of subdivisional works; and
 - b) implemented during subdivisional works (Local Government)
5. Arrangements being made to the satisfaction of the Western Australian Planning Commission for the filling and/or capping of any bores and/or wells, or the identification of any bore and/or well to be retained on the land (Local Government)
6. A fire management plan being prepared, approved and relevant provisions implemented during subdivisional works, in accordance with the WAPC's *Guideline Planning for Bushfire Protection Edition 2, May 2010 (in particular Appendix 3)* to the specifications of the Department of Fire and Emergency Services. (Department of Fire and Emergency Services)
7. A notification, pursuant to section 70A of the *Transfer of Land Act 1893* is to be placed on the certificate(s) of title of the proposed lot(s). Notice of this notification is to be included on the diagram or plan of survey (deposited plan). The notification is to state as follows:

'The lot(s) is/are subject to a fire management plan' (Local Government)
8. A notification, pursuant to Section 70A of the *Transfer of Land Act 1893* is to be placed on the certificate(s) of title of the proposed lot(s). Notice of this notification is to be included on the diagram or plan of survey (deposited plan). The notification is to state as follows:

'Reticulated utilities including water, sewerage and power are not available to the lot/s'
(Local Government)

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