Landscape and Visual Impact Assessment

Perdaman Urea Project

CW1082100

Prepared for
Perdaman Pty Ltd

12 March 2020

Cardno
Shaping the Future

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Abbreviations and Glossary

Abbreviations	
Abbreviation	**Definition/Qualities**
DEM	Digital Elevation Model
DSM	Digital Surface Model
DTM	Digital Terrain Model
ESD	Environmental Scoping Document
LiDAR	Laser Imaging, Detection and Ranging
OUV	Outstanding Universal Value
UNESCO	United Nations Educational, Scientific and Cultural Organization
Glossary[1]	
Term	**Definition/Qualities**
Character	A distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, and often conveys a distinctive 'sense of place'. This term does not imply a level of value or importance.
Landscape	A grouping of the landscape into areas that have broadly similar patterns of landform, vegetation, land use or settlement
Magnitude of change	The extent of change that will be experienced by receptors. This change may be adverse or beneficial. Factors that could be considered in assessing magnitude are: the proportion of the view / landscape affected; extent of the area over which the change occurs; the size and scale of the change; the rate and duration of the change; the level of contrast and compatibility.
Mitigation	Measures to avoid, reduce and manage identified potential adverse impacts.
Photomontages	A visual representation of a proposal from a particular receptor viewpoint, on a photographic base. The methodology for the preparation of any photomontage and its accuracy should be defined.
Receptor	A place, route, viewer audience or interest group which may receive an effect and require assessment.
Sensitivity	Capacity of a landscape or view to accommodate change without losing valued attributes. Includes the value placed on a landscape or view by the community through planning scheme protection, and the type and number receivers.
Viewpoint	The specific location of a view, typically used for assessment purposes.
Viewshed	Areas visible from a particular location (may be modelled or field-validated).
Visual Amenity	The attractiveness of a scene or view.
Visibility Analysis Map (VAM)	A map illustrating areas of land with views to a particular feature. This may be modelled or field-validated, and assumptions must be stated. A digitally modelled analysis is usually based on a digital terrain model, and may also incorporate the screening effect of vegetation and built form. Other terms, such as Zone of Visual Influence (ZVI), Zone of Theoretical Visibility (ZTV), Potential Visibility Zone, Visual Envelope, may be used, but should be defined.

[1] Based on Landscape and Visual Assessment AILA Guidance Note for Queensland

1 Introduction

1.1 Purpose

This study forms part of a suite of environmental impact assessments prepared with respect to the Perdaman Urea Project in the Karratha region, as part of the Environmental Review Document (ERD). It considers submissions made by the Department of Water and Environmental Regulation (DWER) and Commonwealth Department of the Environment and Energy (DoEE) in response to the Draft Environmental Scoping Document (ESD), prepared by Cardno (May 2019) and further comments on the Draft ERD (submitted October 2019) made by the EPA. The proposal was determined to be a controlled action under the EPBC Act, including controlling provisions for National Heritage Places (sections 15B & 15C) as identified in the Draft ESD.

This Landscape and Visual Impact Assessment report responds to the key environmental factors identified in the Draft ESD ('Social Surroundings') and considers the relevant guidelines for an assessment of this type. It assesses the proposed Project during operations, including associated infrastructure and capital works, in addition to a cumulative assessment of the proposed development in the context of the Burrup Strategic Industrial Area (BSIA) within which the proposed Project site is located (Figure 1-1).

This report also identifies the existing landscape character and visual and scenic attributes of the study area, with respect to the National Heritage Listed areas associated with the *Murujuga* cultural heritage and rock art sites in the Burrup Peninsula, including the potential impacts on the National Heritage values of the place.

1.2 Project Description

The Proponent proposes to establish a urea production plant using natural gas as feedstock in the Burrup Strategic Industrial Area (BSIA), approximately 8 km from Dampier and 20 km north-west of Karratha on the north-west coastline of Western Australia (WA) (Figure 1-1 *inset*). The BSIA is a state designated area for industrial development managed by LandCorp. The Project has been granted Project of State Significance status under the Lead Agency Framework by the WA Government, and has been granted Major Project Facilitation Status (MPFS) by the Commonwealth Government.

The Urea plant will have a production capacity of approximately 2 million tonnes per annum (Mtpa) on Sites C and F within the BSIA on the Burrup Peninsula (Figure 1-1). The Project involves piping natural gas from the nearby Woodside LNG plant to the Project site. The approvals for the connection from the Dampier to Bunbury Natural Gas pipeline (DBNGP) to the plant's battery limits will be the responsibility of the gas supplier (Woodside). The Project will transport urea product along the existing East West Common User Service Corridor, via a closed conveyor, for shipment from the nearby Dampier Port.

The proposed location (Sites C and F) falls within the industrial areas defined by the Burrup Maitland Industrial Estates Agreement (BMIEA). Sites C and F will be connected by an easement to accommodate an elevated causeway for road and infrastructure requirements. This low lying tidal band effectively separates the Peninsula from the mainland, requiring causeways for access and infrastructure. The granulated urea product will be transported by closed conveyor along the existing East West Service Corridor through to Dampier Port, where new facilities will include a stockpile and loading arm. Pilbara Ports Authority (PPA) will be responsible for the shipping berths, and any necessary associated impact assessment within the Dampier Port. This visual impact assessment is of the proposed facilities shown below in Figures 1-1 to 1-2 and includes consideration of the buildings and infrastructure on Sites C & F, including the proposed causeway, realignment of Hearson Road, the conveyor, storage shed at the port and shiploading facilities, plus clearing, but not the port and shipping berths (which are existing).

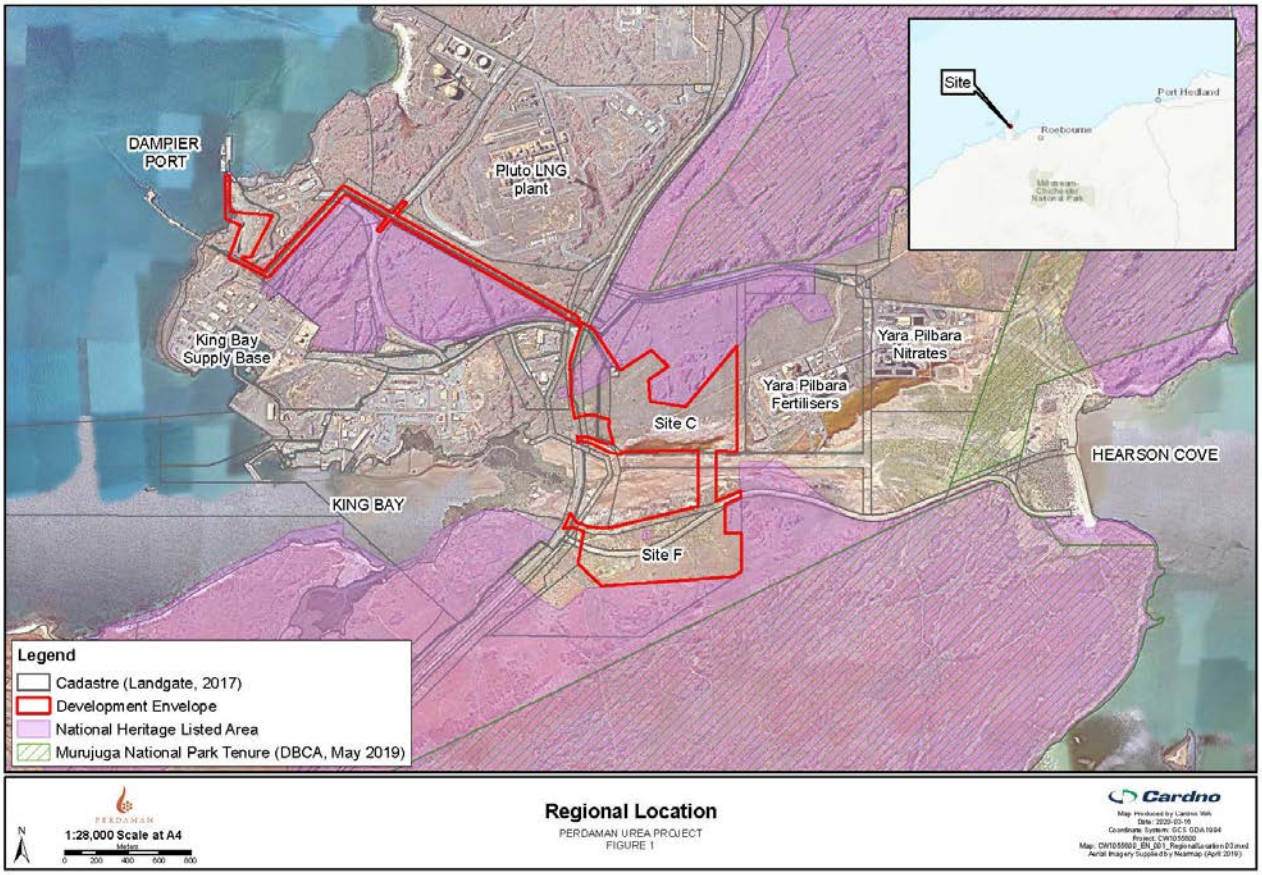


Figure 1-1 Regional Location

The Project site is located adjacent to Murujuga National Park owned by the Murujuga Aboriginal Corporation (MAC) and leased back to the State of Western Australia. Murujuga National Park is jointly managed by representatives of MAC and the Department of Biodiversity Conservation and Attractions (DBCA). A number of existing industrial activities surround the Project site (Figure 1-1) as described in Table 1-1 below, and will be considered as part of the cumulative impact assessment (section 5.5):

Table 1-1 Surrounding industrial development

Project name/	Proponent	Description
Dampier Ports	Pilbara Ports Authority	Port facilities and infrastructure
Toll Dampier Supply Base	Toll	Energy and marine logistics
Burrup Material Facility	Woodside	Onshore and offshore support facilities
King Bay Support Facility	Shell/Woodside	Fuel supply facilities base
Yara Pilbara Nitrates	Burrup Nitrates Pty Ltd	Ammonia production plant
Karratha Gas Plant	North West Shelf/Woodside	Production, storage and transfer of gas
Pluto LNG Plant	Woodside	Gas processing from offshore fields

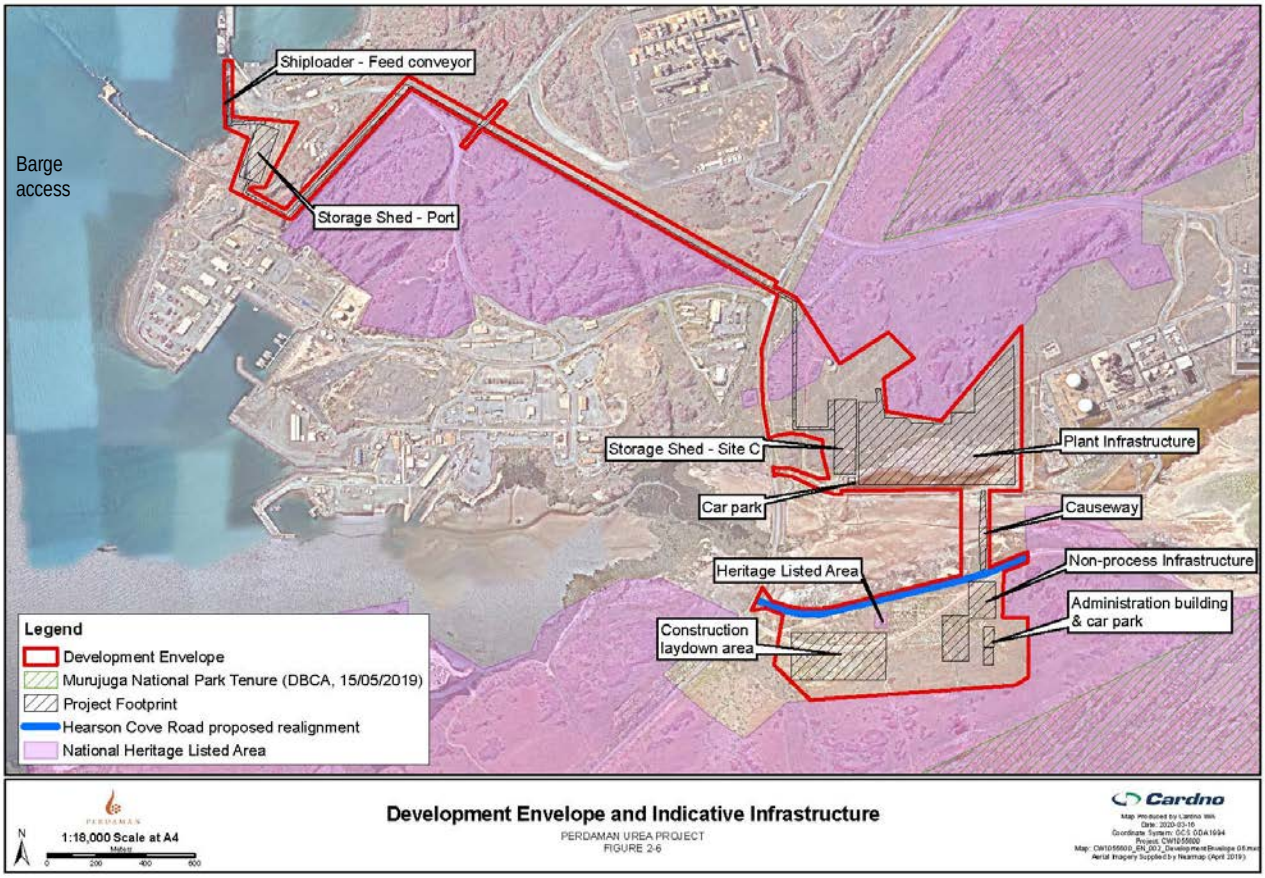


Figure 1-2 Proposal development envelope

Based on the ESD, the physical elements of the Project comprise the following (see Figure 1-2):

> The combined footprint of the proposed urea production plant includes approximately 34 hectares for Site C and approximately 32.6 ha for Site F, while the causeway easement linking both sites is approximately 1.5 ha;

> Proposed access to Site C will be from Burrup Road (although the easement has yet to be confirmed; see options Figure 1-2). Access to Site F will be from Hearson Cove Road, which is proposed to be realigned either to the north or south of Site F (Figure 1-2);

> The proposal includes plant infrastructure and logistics buildings, with Site C buildings ranging in height from 8m to 30m while the Urea product storage shed is 45m tall and the air separation unit 60m tall. Site F includes non-process infrastructure, carparking and administration buildings (to 8m). During construction, Site F will also include laydown areas, which will be rehabilitated following the construction phase;

> A 145m tall flare stack is also proposed on Site C;

> A proposed conveyor links Site C with the Burrup Service Corridor to the Dampier Port;

> A product storage shed and load out facilities are also proposed at the port site;

> The road to Hearson Cove is proposed to be realigned to the existing gazetted road reserve at the northern extent of Site F and will bisect the operational footprint of this Site;

> The gas supply pipeline requires clearing of 1 ha to link to existing gas pipeline easements.

The proposed footprint (including the East West Service Corridor) abuts the National Heritage Listed (NHL) areas and both Sites C and F, and the proposed Hearson Cove Road realignment, include areas of NHL.

The construction period will be approximately 2020 – 2023. The land infrastructure works are expected to take approximately 3 years.

2 Approach and Methodology

2.1 Introduction

As required in the ESD, a landscape and visual impact assessment is required to assess the potential impacts to the 'Social Surroundings' key environmental factor, and consideration of the cumulative impacts of the Project in combination with the existing industrial development on the surroundings (Figure 1-1, Table 1-1).

The approach to this study has been informed by the *Visual Landscape Planning in Western Australia: A Manual for Evaluation Assessment, Siting and Design* (WA Australian Planning Commission, 2007) and responds to the ESD requirements to inform the Environmental Review Document. This study describes the existing landscape and visual qualities as well as identifying and assessing possible visual impacts of the Project, including significant views, panoramas and focal points, landmarks, waterways and other features which contributes to the amenity of the area, scenic integrity and landscape character values, as well as the potential aesthetic values of the National Heritage Listed areas. It comprises two parts:

> **Existing Landscape and Visual Environment**

  The first part of this technical study describes and assesses the existing landscape and visual environment of the study area, in terms of landscape character and scenic values, views, view corridors and landscape sensitivity. This includes description of the Burrup Peninsula study area in terms of its contribution to character, scenic amenity and natural landscape values, as well as the aesthetic values of the NHL area and Murujuga National Park.

> **Future Landscape and Visual Environment**

  The second part of this assessment addresses the elements of the proposed urea Project and the potential impact on the existing landscape character, and visual environment. This phase includes an assessment of the potential beneficial and adverse impacts of the Project on the landscape character and visual qualities of the surrounding area, and includes recommendations for visual impact mitigation or management methods (where applicable), including assessment of night lighting.

This study is based on a combination of desktop review of aerial photography, topographic data and information from previous studies undertaken in the region, in addition to field work and operational guidelines, including:

> Environmental Scoping Document (Cardno, July 2019);

> Guidance Note for Landscape and Visual Assessment (AILA QLD June 2018)

> Visual Landscape Planning in Western Australia: A Manual for Evaluation Assessment, Siting and Design (VLP WA Australian Planning Commission, 2007)

> Operational Guidelines for the Implementation of the World Heritage Convention (UNESCO, 2015);

> Public Environmental Review for Burrup Nitrates Pty Ltd (ERM, 2010)

2.2 Visual Impact Analysis Principles

The report addresses the likely visual and landscape character impacts of the proposed urea plant on the existing and intended character and amenity of the area. In particular, this has involved consideration of:

> Visibility (where will the proposed development be seen from, and by whom?);

> Appearance (what will it look like, in local character context?); and

> Visual impacts (what significant views and viewers will be affected, and to what extent, relative to what is currently visible in the viewshed).

General principles which guide consideration of the above include the VLP in WA Guideline (2007) and the '*Guidance Note for Landscape and Visual Assessment'* (2018) as outlined in the Australian Institute of Landscape Architects, Queensland, which consider that:

> a view is any sight, prospect or field of vision as seen from a viewpoint, and may be wide or narrow, partial or full, pleasant or unattractive, distinctive or nondescript, and may include background, midground and/or foreground elements or features;

> in general, water and natural elements are preferred over urban scenes, mountains over flat land, and views are preferred which include both mid-ground elements (with some detail discernible) and background and skyline features, and focal points (e.g. hills and islands) are valued. Panoramic views with a number of distinctive elements are more attractive and desirable than narrow view corridors or single elements. Diversity is generally preferred over uniformity, and heritage over modernity, but consistency and coherence of built form are also valued;

> viewpoints (including residences and public places) may have primary views in one direction (e.g. to an attractive or distinctive feature) and secondary views in other directions. The distinction may be related to desirability of views (e.g. ocean or river views) or viewing distance, or to viewpoint orientation;

> when assessing the significance of views, for example in prioritising scenery and sightlines for planning scheme protection, or in evaluating the landscape and urban character of a place, views from public spaces (streets, lookouts, parks etc.) assume greater importance than private residential views. In general, no resident has a 'right' to a view, but impacts on private residential views are taken into account where their retention could reasonably be expected from interpretation of the planning scheme; and

> views dominated by, or with a high proportion of attractive features (such as ocean or mountains) are considered to be more significant than those with only a minor or distant proportion of such elements.

The above principles also have some bearing on the reasonable expectations of residents, stakeholders and the community, but of greater relevance are their expectations of amenity based on existing land use patterns, planning designations and development controls, and development approvals.

2.3 Assessment Approach

The selection of an appropriate method has been influenced by characteristics of the study area and proposed development, and the landscape and visual assessment required as part of the EPA objectives including '*To protect social surroundings from significant harm'*. In defining the relevant social surroundings the ESD (Item 8 of Table 3-1) identifies that social surroundings include *the aesthetic, cultural, economic and social surroundings of a person*, and include potential impacts and risks such as:

- Impact on the amenity of the area and the values attributable to that amenity (including the Murujuga National Park cultural and biodiversity values).
- Changed arrangements for access to Hearson Cove resulting from the relocation of the access road to the Cove and to Deep Gorge, both of which are popular recreational, cultural and educational places for local community groups, tourist, and local Aboriginal groups.
- Potential threat and impacts of the proposed urea plant including local landscape disturbance, increased transport and shipping and increased industrial presence on the aspirations for a World Heritage listing.

The methodology adopts a viewpoint-based approach to the identification of existing landscape and visual conditions (within a broad character context), followed by analysis of Project visibility, assessment of visual impacts and likely changes to landscape character. The sensitivity of viewsheds (a combination of scenic quality, view corridor extent and expectations of viewers) is an important consideration, particularly in the context of the NHL areas and the aspiration for World Heritage Listing of Murujuga National Park.

The methodology is based on the VLP Manual and is also based on the AILA Guidance Note for Landscape and Visual Assessment (2018) which recommends the following format:

1. Describe and analyse the existing conditions
2. Describe the proposed development
3. Identify effects and categorise potential impacts
4. Explore opportunities to modify the Project and / or mitigate adverse effects
5. Identify and categorise residual impacts i.e. with mitigation incorporated (if required)

Visual impact assessment is generally based on determining sensitivity based on combining the criteria of sensitivity of receptors (including landscape and viewer), with the nature and magnitude of visual change, and impact and significance of impact. In this case, however, since the subject land is not sensitive *per se*, sensitivity refers only to the viewer (viewpoint/viewshed) and specifically those viewpoints which are sensitive (see section 3.3 below). Similarly, the magnitude of change refers to the extent of visibility, not as a % of Field of View, but as an intrusive element which contracts with the visible surroundings, and especially the 'scenic landscapes' identified in Table 3-1 in Section 3.4 Murujuga Management Plan.

The significance of impacts is therefore derived from combining the magnitude of visual change with sensitivity of the receptor as tabled below:

Table 2-1 Impact significance – the nature & magnitude of impacts

MAGNITUDE OF CHANGE	**high**	moderate	high	high
	moderate	moderate	moderate	high
	low	low	moderate	moderate
	negligible	low	low	low
		low	**moderate**	**high**
		SENSITIVITY (Viewers/viewpoints)		

The significance values are made against the baseline situation and are expressed as high/medium/low, reflecting the importance of the predicted impact, which may also act to 'flag' prioritisation for mitigation.

2.4 Visual Catchment Study Area

Based on the above, a study area was defined at regional and district scale as context and to include the areas potentially within view of the proposal, as seen from roads, public places, residences and other visual receptors. The study area includes Dampier, parts of Karratha and the Burrup Peninsula, located between 500m and >6.5km from the subject land, and is based on the foreground, middleground and background distances zones of the VLP in WA Manual (Figure 2-1 and section 2.4.5).

The landscape and visual assessment study area provides the contextual areas for consideration of all components of the Project (Figure 2-1). Within this area, the landscape values have been assessed by desktop review of aerial photographs and topographic data, then validated or amended by field inspection. The existing landscape features, character, values and views relevant to the site and study area are described below in a district and regional context (section 2.4.2 and 4.1).

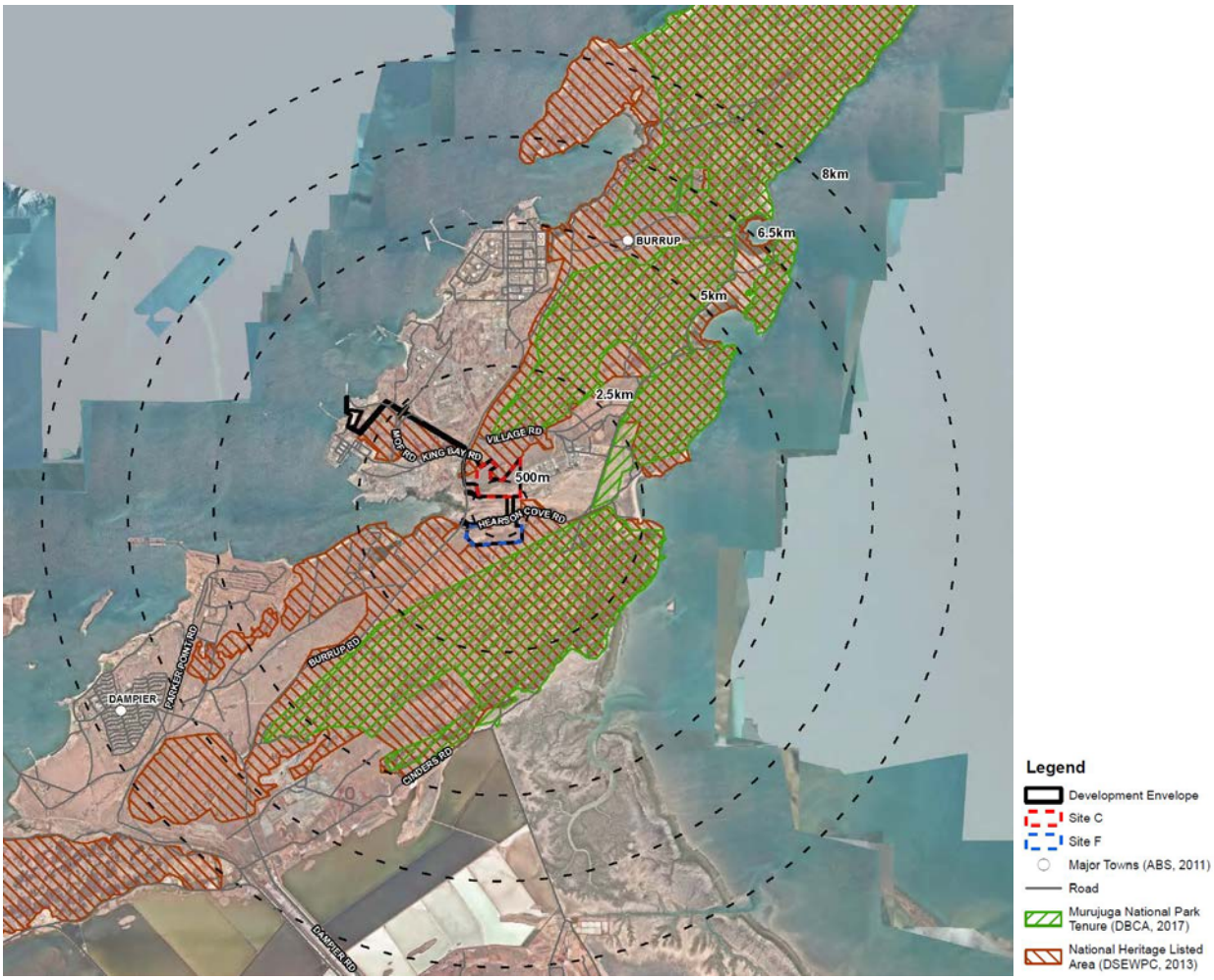


Figure 2-1 Landscape and Visual Impact Assessment Study Area

2.4.1 Landscape Character Context

The existing environment of the Burrup Peninsula and the local study area provides the landscape character and scenic amenity context and baseline conditions, against which the effects of the proposed development can be assessed. Several Landscape Character Types (LCTs) are identifiable as having similar visual characteristics based on topography, vegetation, land use and settlement patterns. In this case, the dominant LCTs include:

1. Coastline – including the beaches, bays, the waters of the Dampier Archipelago and Indian Ocean, Nickol Bay, and dunes and mangroves;
2. Lowlands – supratidal flats, drainage channels, valleys and gorges;
3. Rocky outcrops; including red rock scree, and outcrops including headlands;
4. Urban and Industry – including towns, industry, roads, ports and wharves.

2.4.2 Viewer Groups

The viewer groups potentially affected by the proposed developments comprise mainly residents of the region, workers in the BSIA, local indigenous clan groups, and visitors to the region, with the latter including tourists travelling largely by road, or on foot, with some recreational boating occurring in the offshore waters. The Burrup Peninsula (*Murujuga*) is important as cultural heritage as well as an important social and recreational resource for local community groups (Indigenous and non-Indigenous) and national and global appreciation.

Community appreciation of scenery (both landscape and seascape) is based largely on the extent, diversity, integrity and naturalness of landscape features and characteristics visible from public viewpoints (such as lookouts, parks and beaches), tourist or recreation sites, or while travelling. While landscape appreciation from

private residences is also important, the location of the proposed development is not close to or within view of any residents, hence, assessment of views from private residences has not been undertaken for this study.

The visibility of the proposed Project has been assessed by adopting a view corridor approach (based on points located within the site) in addition to analysing the viewsheds of selected viewpoints, such as from important view corridors, scenic route sections or sensitive receptors. Five viewer groups were identified relevant to this VIA, with each group likely to have different scenic expectations:

1. Recreational users: residents and visitors to Burrup and nearby beaches including Hearson Cove and other bays for fishing, boating, swimming and camping;
2. Traditional owners;
3. Bushwalkers, National Park users and visitors wanting to visit the 'gallery' of petroglyphs;
4. On-site workers and contractors, and freight/truck drivers.
5. Residents of Dampier/Karratha.

For each of these viewer groups scenic demand categories have been identified based on an assessment of likely annual usage (relative numbers of each group) and their likely scenic expectations i.e. the degree to which viewers might expect and appreciate attractive unspoilt scenery as part of their visual experience. A scenic demand rating has then been allocated on this basis. The rating categories used for each of these criteria are high, medium or low, as shown in Table 2-2.

Table 2-2 Viewer Group 'Scenic Demand' levels

	Viewer Groups	Relative Numbers	Likely Relative Scenic Expectations	Viewer Group Scenic Demand Level
1	Recreational users	High	Medium	Medium
2	Traditional owners	Unknown	High	High
3	National Park users and tourists visiting 'open air gallery'	High	High	High
4	On-site workers and contractors	Medium	Low	Low
5	Residents of Dampier and Karratha	Medium	Medium	Medium

2.4.3 Visibility

Visibility is a key consideration in assessing the sensitivity of a site to development or change, and the visual impacts of developments. Preliminary desktop assessment of places within view of the Project site (by topographic maps and air-photos) was followed by Visibility Analysis modelling (VAM) and field verification as seen from roads and selected viewpoints. The VAM maps areas within view of the area and the proposed Project within a GIS (ArcGIS) Digital Surface Model (DSM), based on a combination of LiDAR and a Digital Terrain Model (DTM) derived from between 50cm and coarser 25m grids. The DSM includes terrain and heights of vegetation and structures (refer to Figure 2-2) and forms the basis for the VAM analysis.

With respect to the proposed Project, the VAM models a number of 'visibility points' placed virtually on each component of the Project (buildings, infrastructure and towers/stack). The VAM map for each Project component shows, by graded colours, the proportion of development visible from different parts of the surrounding areas (Figure 5-1, refer to Appendix B). Places and sensitive visual receptors likely to be within view of the proposal include public places, private roads and popular visiting places especially from significant petroglyphs within the NHL areas or MNP.

The night time environment was not modelled as part of this assessment, however field work was able to inform the existing night time lighting and verify previous impacts assessments of the night time condition on the Burrup Peninsula[2].

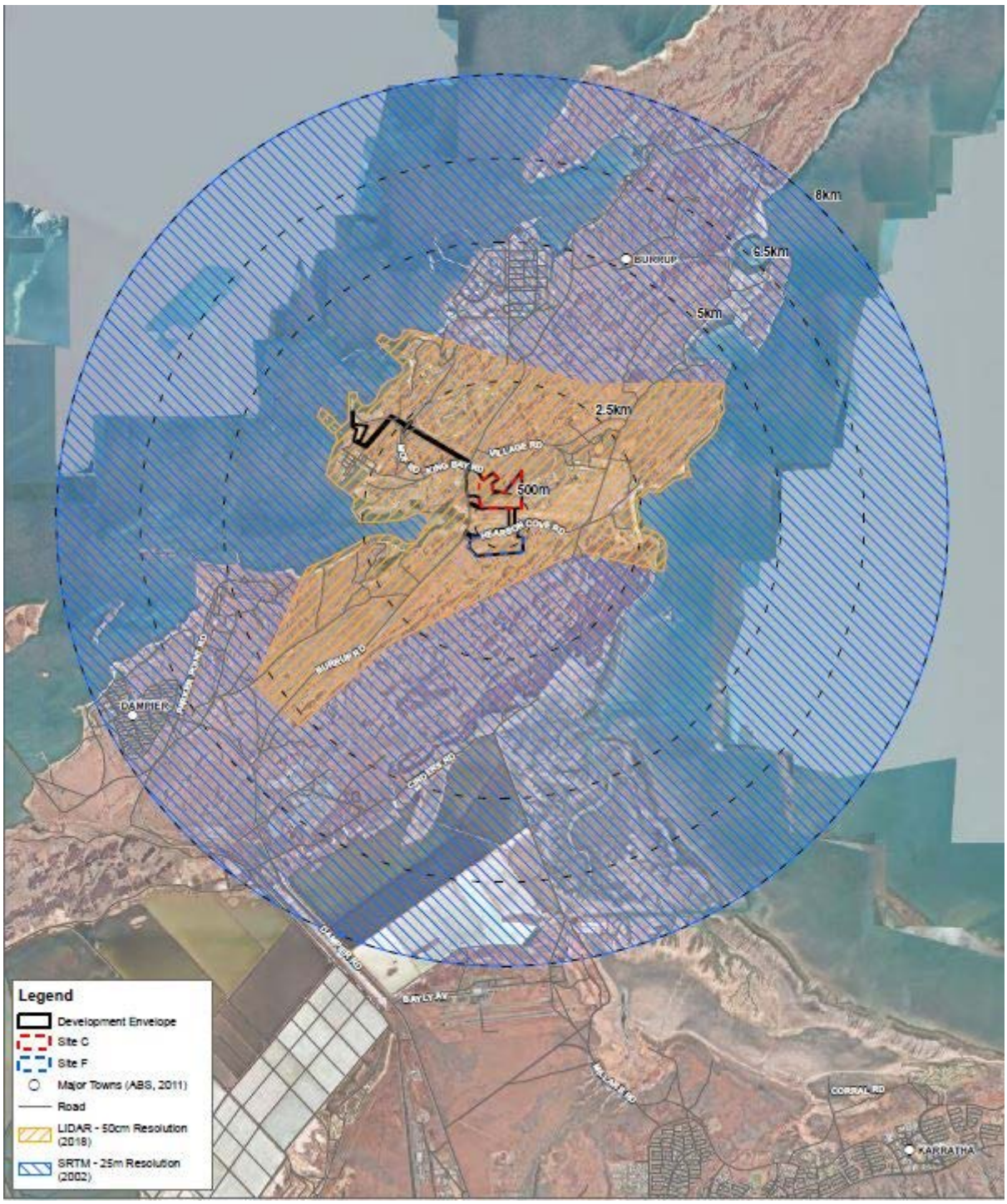


Figure 2-2 Elevation Sources (Cardno 2019) **(See Appendix B for full-sized figures)**

2.4.4 Viewpoints

Important viewpoints (VPs) were identified based on desktop analysis and from the VAM mapping (Figure 5-1) and were inspected and photographed as reference points for viewshed assessment, sampling the direction and distance as representative of potentially affected views. The subject site is visible from surrounding areas, including the nearby industrial areas of the BPIA, the nearby collector roads and recreational users of Hearson

[2] Based on the Public Environmental Review for Burrup Nitrates Pty Ltd (ERM, 2010)

Cove Road (accessing Hearson Cove and/or Deep Gorge) and Burrup Road (servicing industrial estate workers, freight, haulage, tourists and visitors).

Viewing distance also affects viewer perceptions of the landscape extent and discernible features, in that relatively small areas are seen in foreground views but with fine details noticeable (of structures, vegetation, water and soil type), whereas a greater area is seen at background view distances but with little overall detail. At middleground distances, textures and colours are rougher and contrasts are more apparent. Development (including clearing and earthworks) occupy a progressively smaller proportion of the seen landscape with greater viewing distance.

The following viewing distances are adopted for this study (from WA DPI, 2007):

> Foreground: to 500m

> Midground: 500m to 6.5km

> Background: 6.5 km to 16 km, and beyond (where visible).

2.4.5 Visual Sensitivity

The 'visual sensitivity' of affected areas refers to the number of viewers, the duration of their views, and their expectations of scenic significance (as different from Viewer Groups). Views from within the NHL place from people seeking a cultural experience associated with 'the open air gallery' were also considered.

Preliminary mapping of the study area identified major roads (Burrup and Dampier Hwy), and areas of high public usage likely to have views over the site, and these were confirmed or amended by drive-around survey photographs, taking note of screening vegetation and existing built form, as well as local character features.

Following the fieldwork survey and VAM, visual receptors and viewpoints were verified as part of the Visibility Analysis Map (VAM) modelling in the DSM (Figure 5-1) and viewer sensitivity was rated from high to low according to viewer distance, landscape character type and number of viewers.

2.4.6 Visual assessment

In order to evaluate potential impacts during operational stages, the model was used to check sightlines to operating areas from key viewpoints. The potential visibility and likely appearance of the proposal was assessed through a number of photomontages from 9 receptor locations. These were also reviewed by visibility modelling to determine visibility and extent of change, and field checked.

Assessment of the significance of visual impacts, in terms of the identified landscape values of the study area, and the risks associated with such impacts, including mitigation measures, were further considered in sections 5 and 6.

2.5 National Heritage Listing

The Dampier Archipelago (which includes the Burrup Peninsula and Murujuga National Park) was listed as a National Heritage Listed Place on 3 July 2007. The assessment of impacts to the National Heritage Listed Place of the Dampier Archipelago has been informed by a literature review of the following key sources:

> The Operational Guidelines for the Implementation of the World Heritage Convention (UNESCO, 2011);

> The Matters National Environmental Significance - Significant Impact Guidelines 1.1 (DEWHA, 2009); and

> Study of the Outstanding Universal Value of the Dampier Archipelago (McDonald, 2011);

Although the Dampier Archipelago has not been inscribed on the World Heritage List it is a National Heritage Place and has previously been evaluated against the World Heritage criteria and the significance threshold of Outstanding Universal Value (OUV), for the Australian Heritage Council (McDonald *et al.*, 2011).

For a property to be considered to have OUV, it must meet one or more of ten criteria listed in the Guidelines, as well as meeting several other requirements. One of those criteria is aesthetic value. McDonald *et al.* (2011) propose that the Dampier Archipelago can meet at least three of the Criteria, including criterion (vii) in that it contains..."*superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance*". However, given the existing industry on the Peninsula, it is doubtful that this criterion will form grounds for

World Heritage Listing. For this reason, the aesthetic value in particular World Heritage criterion (vii) will not be considered as part of this LVIA.

3 Policy Context and Legislative Review

3.1 National Heritage Place Values

As described above, the Dampier Archipelago was listed as a National Heritage Listed Place on 3 July 2007. Although it has been argued to meet a number of the criteria for World Heritage listing with respect to its Aboriginal cultural or natural heritage, at this stage, the place does not meet the OUV criteria and has therefore not been included on the World Heritage List by UNESCO. Accordingly, this visual and landscape character assessment does not consider the proposal against World Heritage scientific, aesthetic or cultural criteria.

The nomination of the Dampier Archipelago to the National Heritage List refers to these natural aesthetic attributes of the Burrup, as a "…*place of unparalleled artistic, cultural, religious and historical significance, as well as a place of magnificent natural beauty"; where the "magnificent mountains of the Pilbara meet the Indian Ocean*" (Summary of Significance; Nomination 1).

The National Listed Place comprises approximately 36,860ha of the Burrup Peninsula and the surrounding islands in the Archipelago (Figure 3-1). It covers most of the northern arm of the Peninsula, and surrounds the industrial exclusion areas of the Burrup and Maitland Industrial zones, and the tidal flats from King Bay to Hearson Cove. From here, the NHL boundary extends southwest through Dampier to the West (and mid-West) Intercourse Islands. The boundary skirts around the urban and industrial areas of Dampier and Karratha, and excludes the loading port islands of the East and Mid East Intercourse Islands.

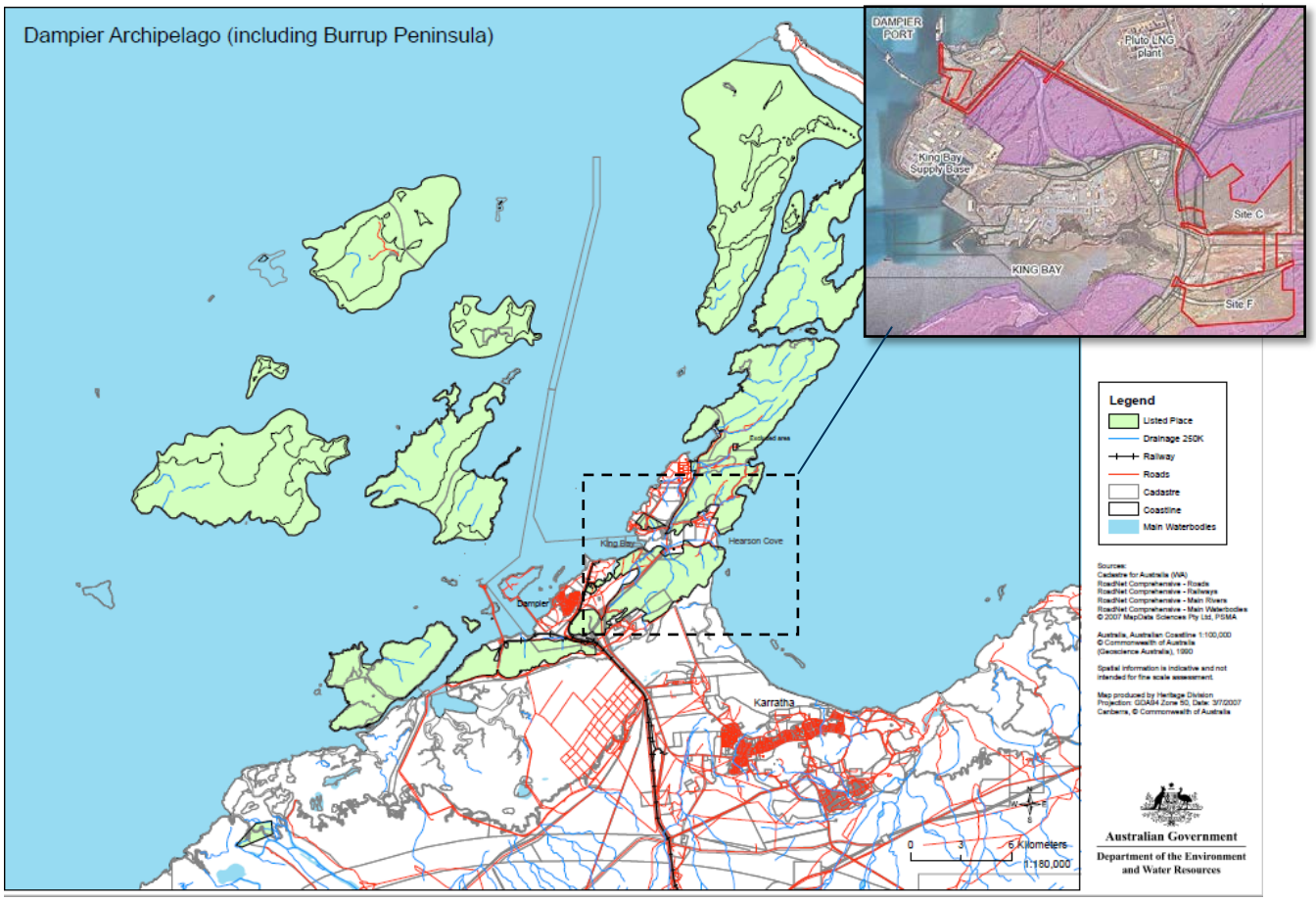


Figure 3-1 Dampier Archipelago - National Heritage Listed Place ***(inset: proposed subject sites)***
https://www.environment.gov.au/heritage/places/national/dampier-archipelago

As shown in the Site Layout in Figure 1-2 and in the Inset of Figure 3-1, the subject land is surrounded by the NHL area to the north of Site C and south of Site F, and south of the conveyor. There are a number of incursions into the NHL boundary, including a small area north of the Site C adjacent to Burrup Road for the

conveyor easement. Site F also includes a small rectangular area designated as part of the NHL. Roads such as Burrup Road and Village Road also run through the NHL area.

The values of the Burrup Peninsula have also been addressed to varying degrees in a number of strategic planning documents, as follows.

3.2 State Planning Strategy 2050

The State Planning Strategy (SPS) 2050 is the overarching plan for WA and sets a clear vision for the State. The SPS identifies the subject land as within the infrastructure and resource land activity area of the Northern sector of the State, comprising the Pilbara and Kimberley Regions, however it also acknowledges the unique natural environment of the Northern sector, and recommends that a balance is required between the environment and its opportunities for economic development (p.29)

The vision for the Pilbara region builds on these elements and defines the aspirations and strategic directions for the region, which aim (4) to *'protect significant landscapes'* as well as *'manage the State's natural resources in a sustainable manner'*.

3.3 Local Planning & Land Use Strategies

The relevant local government planning scheme for the region is the City of Karratha Local Planning Scheme No 8 (updated to include amendments 15/01/2019). The Scheme has specific precinct objectives, including for the Burrup Peninsula (4.3) which aim to:

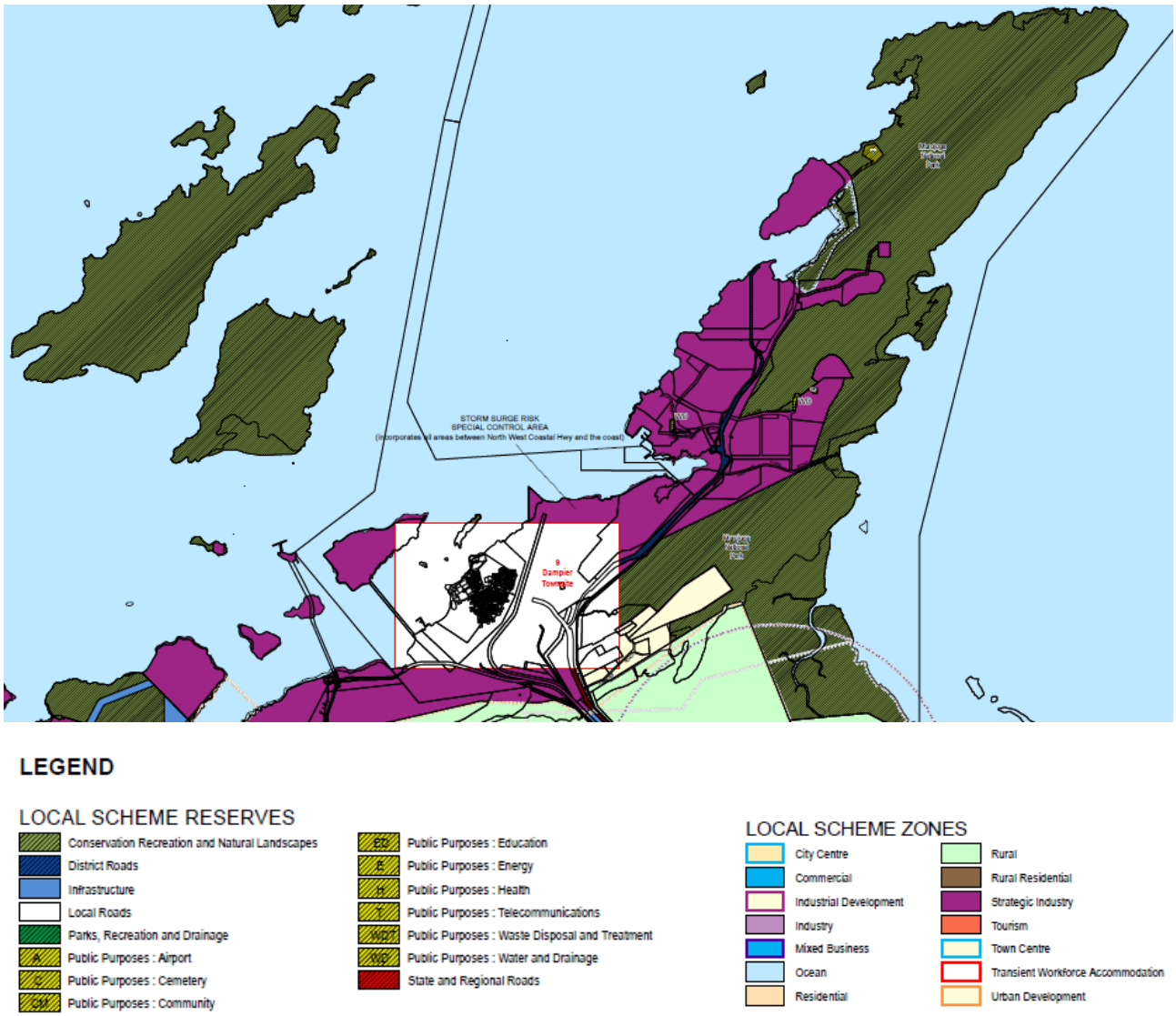
a) Retain an appropriate balance between the Burrup's recreational, industrial, and environmental and heritage assets.

b) Acknowledge Hearson Cove as a key recreational node.

c) Adopt the principles and policies of the Burrup Peninsula Land Use and Management Strategy.

The Burrup Peninsula Land Use Plan and Management Strategy (1996 revised 2005) is a strategic land use planning document which informed the allocation of land on the Burrup Peninsula for industry, conservation, heritage and recreation to inform statutory planning frameworks (including Schemes and development assessment) for the region. It identifies the subject land within Policy Area D (King Bay – Hearson Cove) and includes a guiding Policy Statement requiring development be '*designed and located to minimise impacts on values (including landscape) of the adjoining Conservation, Heritage and Recreation Area*'.

Part of this adjoining Conservation, Heritage and Recreation designation includes National Heritage Listed Places including the Murujuga National Park.



3.4 Murujuga National Park Management Plan

Murujuga National Park covers an area of 4,913 hectares within the Burrup Peninsula and is privately owned by the Murujuga Aboriginal Corporation (MAC) and jointly managed with the Department of Environment and Conservation. As the majority of the park has been included on the National Heritage List (Dampier Archipelago (Figure 3-2) the Management Plan also addresses management of the National Heritage values. Although the Park does not include the subject land *per se*, it surrounds the industrial zones along the north, east and southern boundaries and encloses industrial development between Burrup Road and the western coastline. This proximity means that any development in industrial zones may be visible and potentially affect the visual amenity within the Park, and detract from the natural landscape values of the area. Therefore, consideration of the landscape values and the overall management of the National Park area provides a useful context.

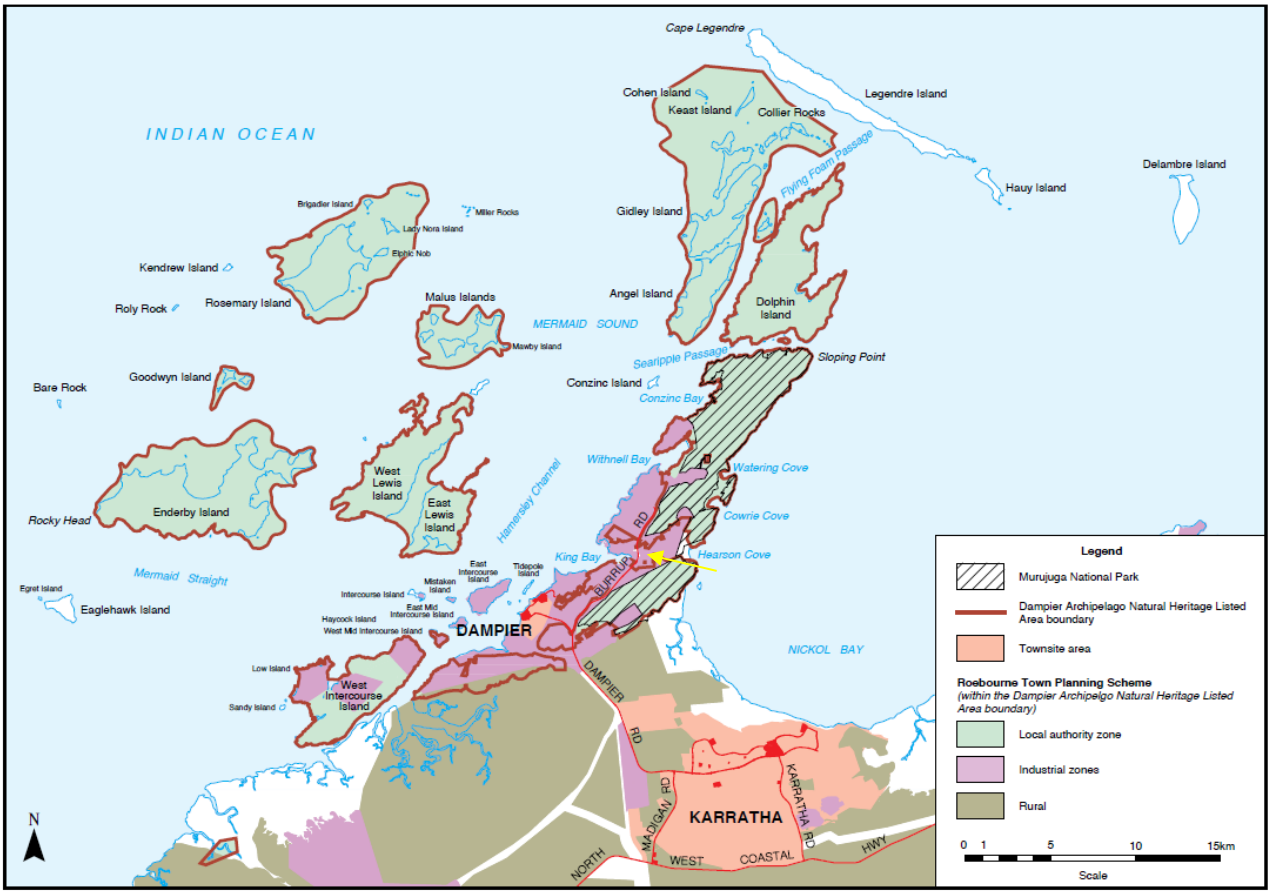


Figure 3-2 Murujuga National Park and NHL Place boundary **(Source: MNP Management Plan) (Yellow arrow indicative of subject land)**

The Murujuga National Park MP aims to maintain key values of the Park, including (but not limited to) natural and recreational values of the area, including the *outstanding scenic landscapes of great contrast (the red rocky scree slopes and rock piles, narrow valleys, and extensive vistas provided by the ranges with adjacent bright blue coastal waters).*

As part of the landscape management of the Murujuga National Park, the MP acknowledges the importance of a landscape's visual quality as "*a resource in its own right*" (p.65) and aims to ensure that the visual qualities of this landscape is retained. The MP defines 'visual quality' as those "…*characteristics (qualities) of a landscape or the degree of excellence in terms of naturalness, distinction and public exposure/perception….as determined by its context of geomorphology, hydrology, soils, vegetation, land use and cultural heritage values"*.

The MP also acknowledges that natural and cultural values also lend to commercial opportunities, attracting Aboriginal heritage and nature-based tourism. Although there is no value-based mapping available, the following values and provisions of the MNP MP are relevant to consideration of the Perdaman Project, as tabulated in Table 3-1.

Table 3-1 Management Plan

Management Directions	Applicability to Project and Landscape Values
Key Values	
Recreational values	***Provisions ('Managing Visitors')*** The recreational values acknowledge the '*outstanding scenic landscapes of great contrast (the red rocky scree slopes and rock piles, narrow valleys, and extensive vistas provided by the ranges with adjacent bright blue coastal waters' acknowledging that visual quality of a landscape* is a "*resource in its own right*"

Management Directions		Applicability to Project and Landscape Values
		The concern for visual landscape is reflected in the objective *viz* "To protect and enhance the park's visual landscape qualities" as well as the guidelines for the management of (p.66) and strategies proposed to manage and maintain the high quality visual landscapes of the area.
	Guideline[3]	**Provisions to manage visual resources** • Site-specific visual landscape factors should be identified and evaluated prior to undertaking management activities. • Roads, recreation sites and walking tracks should focus views onto distinctive features by selecting the best siting and alignment. • Road design and construction should remain subordinate to landscape elements by utilising minimum design standards, limited cuts and fill, minimum clearing widths, undulating edges and sensitive alignment. • Interpretive and explanatory signage should be used before and during operations that alter landscape character, such as new recreation site development, and weed control adjacent to travel routes and walking trails. • Where structures are required they should be sympathetic in design, materials and colour to complement surrounding landscape elements and be carefully sited away from major natural focal points, out of viewer sightlines and where vegetation or landform screening can be used. • Optimum siting and alignments for infrastructure such as roads, recreation sites and walking tracks should be selected. • Infrastructure should be designed so that it complements the surrounding landscape elements and siting it away from major natural focal points, out of viewer sightlines and where vegetation or landform screening can be used. • Essential firebreaks should follow natural landform, vegetation, or land-use patterns and lines in the landscape, wherever possible. • Prescribed burning should be carried out by employing prescriptions that minimises visible impacts. • Previously disturbed areas within high visual landscape zones should be given the highest priority for rehabilitation until the desired standard of visual quality is attained.
	Strategies	1. Encourage all Burrup Peninsula land managers to participate in the preparation of a landscape management strategy for the whole of the peninsula. 2. Ensure appropriate input into the assessment of proposed developments that impact on the park's landscape values. 3. Liaise with neighbouring land managers to ensure landscape management guidelines are considered in developments, and participate in processes related to such developments. 4. Promote and complement the area's landscape values through all park management activities.

[3] Based on Policy Statement No 34 Visual resource management of lands and waters managed by CALM (CALM 1989)

4 Existing Landscape and Visual Environment

4.1 Regional Context

The proposed subject land is located on the Burrup Peninsula in north-west Western Australia in the Pilbara Region, part of the City of Karratha. The City includes the towns of Dampier, Karratha, Point Samson, Roebourne and Wickham. The subject land is located on the supra-tidal lowlands of the Peninsula, between Hearson Cove and King Bay within the Dampier Archipelago. The site is framed by the rocky outcrops of the Murujuga National Park and is located between the coastline, Deep Gorge in the south, and the Industrial Estates of the BSIA. To the southwest and southeast of the subject land lies the townships of Dampier, and the mining town of Karratha.

In between the rocky outcrops and the shoreline, native grasslands dominate the higher elevation terrestrial band while exposed lowlands are punctuated by mangrove inlets and rugged headlands along the coastline. The city of Karratha is near the coastline of the Indian Ocean, and its suburbs are located on the flats of the region, which provide inter urban breaks between Karratha, and the adjoining beach settlements of Bulgarra and Cleaverville.

The Pilbara has the richest array of rock engravings in Australia. Dampier Archipelago provide a spectacular array of engraved art (McDonald 2005). The Burrup Peninsula also offers a world-class experience of rock art, offering panoramic views of rocky outcrops around the subject land from many roads and lookouts along the Dampier Highway and other receptors. The Burrup Peninsula represents a unique juxtaposition of NHL places and potential World Heritage Areas. This dramatic combination of geomorphology and Indigenous cultural heritages creates a diverse and spectacular landscape, and a high scenic quality and aesthetic which contributes in part to its popularity as a major tourist and visitor destination in the region.

Industry and urban mining camps also form part of the region's current character, including the industrial estates of the BSIA on the Peninsula, and original camp settlements such as Karratha and Dampier. Land use around the Peninsula is diverse, with the most significant industries being iron ore, solar salt, natural gas, liquefied natural gas (LNG), liquefied petroleum gas (LPG), and ammonia production. The region also produces gold and other minerals and contains Australia's largest ports, longest private railways and largest iron ore and petroleum production facilities. Industry in the region has become a tourist attraction in itself, with people visiting the port in Dampier, Dampier Salts, the gas Project on the Burrup Peninsula and the iron ore mines at Newman and Tom Price. These major resource enterprises coexist with Western Australia's natural resources, including the world-renowned national parks (Karlamilyi and Karijini), Australia's largest fringing reef (Ningaloo Marine Park), the Montebello and Barrow islands, and the many islands of the Dampier Archipelago as well as pastoralism, nature-based tourism and Traditional lands. The coastal waters also sustain both a commercial fishing industry (the Nickol Bay and Exmouth Bay prawn fishery) and a high level of recreational fishing.

The Pilbara has a variety of natural features, from escarpments and plateaus, alluvial, granite and basalt plains to offshore islands. Hummock grasslands and woodlands dominate the vegetation of the region and there are smaller areas of acacia shrublands, tussock grasslands, salt marshes, mangroves and eucalypt woodlands along water courses. The Murujuga National Park lies on the northern part of the Peninsula, and falls within the Roebourne subregion of the Pilbara Craton bioregion (Environment Australia 2001).

4.1.1 Physical Description

Large outcrops and ranges of fractured red boulder slopes dominate the rugged landscape of the Burrup Peninsula. The land is elevated from the typically low and flat coastal plains of the west Pilbara. There are numerous gorges, creeks and drainage lines cutting across the landscape, which provide variety in the landscape. This landscape is distinctive in its appearance and is restricted to the Burrup Peninsula and some nearby islands and adjacent mainland. In overall morphology, the Burrup Peninsula is divided into two sections. Between Hearson Cove and King Bay, a low lying expanse of supratidal mud flat and sand dunes, between one and two kilometres wide, effectively separating the northern and southern elevated rocky sections of the

peninsula. Tidal mud flats characterise the sheltered bays along both eastern and western coasts of the peninsula including northern Conzinc Bay, Hearson Cove, Cowrie Cove, and Watering Cove). The highest point on the peninsula is south of Hearson Cove (132 metres) while Mt Burrup (129 metres) and Mt Wongama (122 metres) are prominent on the northern Burrup Peninsula. The intervening low lying area provides access between the north and south of the Peninsula, however, it is frequently inundated, dividing the Burrup Peninsula into two islands.

4.1.2 Recreation

The Burrup Peninsula is an important recreational and social resource for the region due to its significant natural and aesthetic qualities. The iconic features of the northwest have been described by Tourism WA as providing '*awe and ore'* rugged outback experiences throughout the Archipelago, including the 'Staircase to the Moon', marine-life experiences combined with 10,000 artworks across the Peninsula[4]. The combination of rugged landscapes surrounded by clear coastal waters and secluded coves attracts residents from the nearby towns of Karratha and Dampier, as well as tourists. Swimming, kayaking, fishing, boating and camping are some of the popular activities in the region, as well as visitors taking in the open air gallery of the petroglyphs. Hearson Cove is a popular swimming destination, while Withnell Bay provides an informal boat launch allowing recreational boaters access to Mermaid Sound. The Murujuga National Park covers an area of 4,913 ha on the Peninsula, and remains largely undeveloped, thus retains its outstanding and distinctive natural landscape values. There is also an element of industrial tourism, with visitors interested in viewing Australia's most resource rich region, its industrial infrastructure, big ships and the biggest port. The stark contrast between the neighbouring industrial landscape, and the natural and cultural landscape offers a range of recreational experiences, and provides unique interpretation opportunities throughout the Dampier Archipelago.

4.1.3 National Heritage Listed Place & National Parks

Archaeological sites in Murujuga National Park are material evidence of past habitation and use by Traditional Owners. The area contains a wide range of archaeological features such as shell middens, stone artefact scatters, quarries, stone arrangements, ceremonial and mythological sites, graves, and petroglyphs. Approximately 2,000 localities on the Burrup Peninsula are registered as listed 'sites'[5] (DIA 2007a). A number of the sites on the register were included with poor survey control and the actual location needs to be verified. The majority of this data has been collected from current and proposed industrial areas and has primarily focused on petroglyphs. Conservative estimates based on transect surveys of the northern Burrup by Veth *et al.* indicate that there could be in excess of 6,000 sites on the Burrup Peninsula.

In a 2009 survey of Deep Gorge, 42 sites and over 3,215 motifs were identified in a 3.84 hectare area. There was a density of 837 motifs per hectare. Some have estimated that there may be up to a million engravings in the Dampier Archipelago area. Petroglyphs are the area's most prevalent and visible archaeological feature, and are made by removing the outer weathered surface of the rock to reveal the paler-coloured weathered material or fresh rock beneath. Their abundance, density and variety of subject matter and styles are a large part of what makes the Burrup Peninsula remarkable. This has been recognised by the designation of protected areas under the Aboriginal Heritage Act and the area's inclusion on the National Heritage List. There are also exclusive rights to the use of protected areas under the Aboriginal Heritage Act, including the northern portion of the Burrup Peninsula (PA no. 43) and the 'Climbing Men' site (PA no. 56) near Withnell Bay.
The protected area on the northern Burrup Peninsula covers about 1,200 hectares and includes extensive art, quarry sites and other evidence of occupation (Bird & Hallam 2006). Petroglyphs can readily be seen from many roads and tracks, beaches and picnic spots. There is very limited knowledge of less accessible areas: however, this difficulty of access is the primary means by which these areas are currently protected.

[4] https://www.westernaustralia.com/au/Destination/Karratha/56b266c3d5f1565045da9dac#/

[5] 'Sites' range from single cultural components, such as isolated artefacts or individual petroglyphs, to large site complexes with a range of cultural components. Thus, 'sites' can vary in extent from perhaps a metre square to thousands of square metres.

4.2 Local Context

The Project visual catchment comprises the Burrup Peninsula and is made up of the following broad landscape character types: lowland areas (including Deep Gorge), and urban and industrial or port precincts of the BSIA and King Bay wharf. Offshore waters between the Peninsula west to the Dampier Archipelago and the Islands, as well as the inshore waters east of Hearson Cove and King Bay, have also been broadly assessed (Figure 4-1).

> **Coastline** – the Burrup Peninsula coastline and the waters of the Dampier Archipelago and the Indian Ocean, including the bays (King Bay, Withnell Bay, Conzinc and Hearson Cove), Dampier Islands (approximately 54), and the foredunes, mangroves and sandy beaches;

> **Lowlands** – drainage channels and 'narrow valleys', scrublands, and the supratidal flats;

> **Rocky outcrops**; the steep rugged red rock scree slopes in the north and south of the Peninsula;

Industry/Urban – including the Burrup Strategic Industrial Area (BSIA) and the Dampier Port and wharves, industrial islands of Dampier and Karratha townships.

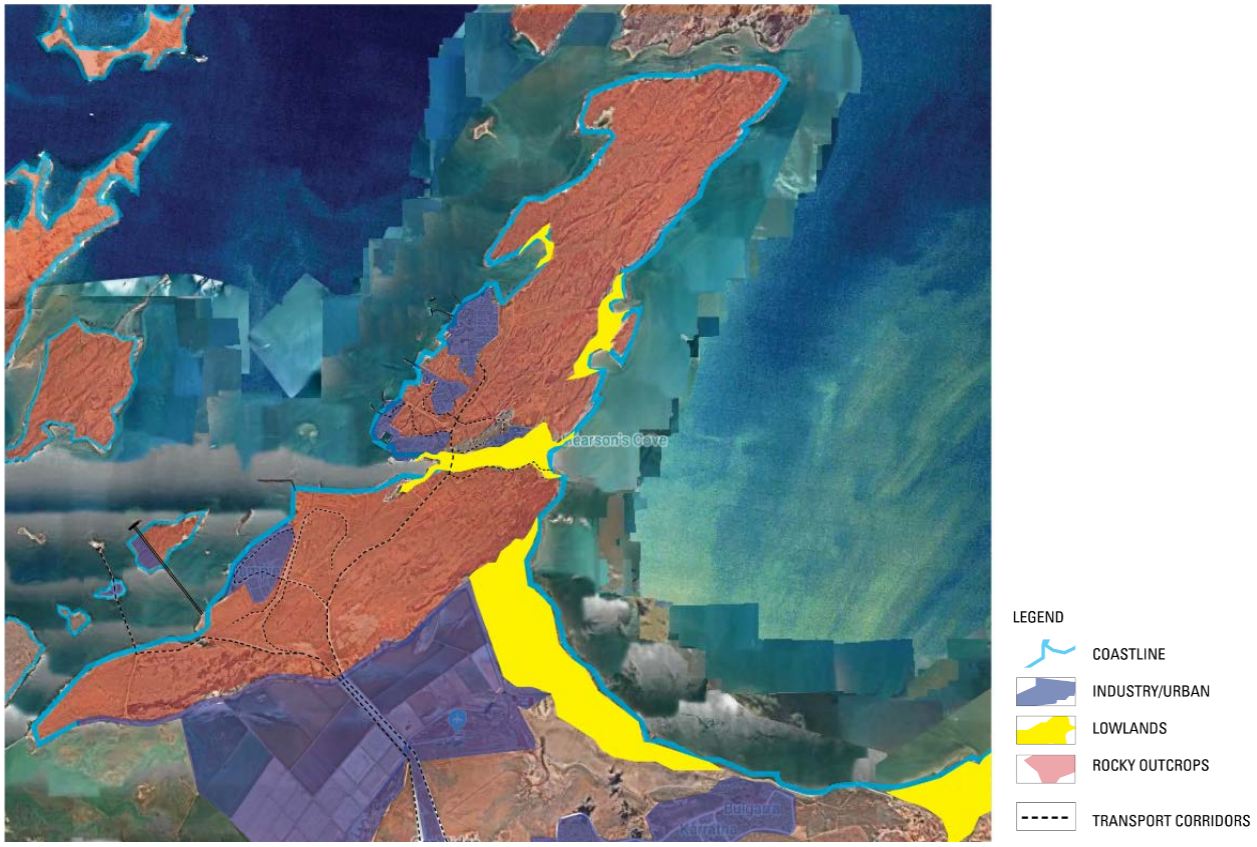


Figure 4-1 Broad Landscape Character Context

4.2.1 Coastline

The Burrup Peninsula coastline includes King Bay, Dampier, Nickol Bay, Withnell Bay, Hearson Cove and the waters of the Dampier Archipelago and the Indian Ocean, and includes small coastal shrubs, foredunes, mangroves and beaches around the Peninsula, as well as offshore waters and Islands within the Archipelago.

The estuarine fringe of King Bay and its tributaries define the edge between land and water and separates the Peninsula from the Archipelago islands of the Intercourse and Lewis groups of Islands. Mudflats and mangroves characterise Hearson Cove and King Bay, and the notorious 'Staircase to the Moon' is appreciated from Hearson Cove during certain weather events.

The low-lying area between King Bay and Hearson Cove is subject to inundation, as part of the tidal flats which characterise the central part of the Peninsula, and bisects the subject land between Sites C and F. The white sandy beaches and dunes of Hearson Cove, Conzinc Bay and other bays in the region are important recreational sites with locals and tourists alike. Hearson Cove is located at the eastern edge of the King Bay-

Hearson Cove valley. This valley is one of the most accessible areas on the peninsula, as it is low lying and free of the dramatic, rocky topography which makes the north and south areas of the peninsula largely inaccessible and inappropriate for industrial development. The access provided to industrial areas has also allowed easy access to recreational users of Hearson Cove and Withnell Bay (DEC, 2013).

The broad flat expanse of the area around Dampier, Karratha and Nickol Bay are best appreciated from elevated viewpoints, such as nearby local rocky outcrops or from lookouts such as the Dampier Salts Lookout or Karratha lookout as well as from planes approaching or departing Karratha Airport. Offshore views looking landwards take in white sandy beaches of the coves and the red rock of the rocky hills of the Peninsula above, and contribute to the rugged landscape character and scenic appeal of the landscape.

A north-west Burrup Peninsula beach. Photo – Stewart Caves

Sandy beach

Sand, mangroves and rocky coastline

Existing Context

As described above, the coastline is characterised by a combination of natural features, including mudflats, dunes, sandy beaches and mangroves.

The waters of Hearson Cove, King Bay and Withnell Cove are fringed by sandy or shelled beaches, and mangroves.

Visual Features

> Hearson Cove and Withnell Cove, including some dunes.

> Combination of rocky, shelly and sandy coastlines.

> Views to Islands of the Archipelago.

> Mangroves fringing parts of the coastal edge.

> The rocky outcrops form a dominant backdrop from beaches.

> Recreational, fishing and commercial vessels as well as cargo ships, reef fleet and barges.

Key Viewing Locations

> Views from beaches including Hearson Cove offering vistas over blue waters.

> Views offshore from boats.

At Night

> View from Hearson Cove is known for offering views of the full moon across the water ('Staircase to the Moon').

> The coastline is generally dark apart from recreational fishing boats, although the industrial area is well-lit to accommodate port activity.

Visual Sensitivity

The coastline of the Burrup Peninsula makes a significant contribution to the character of the region, and in its natural state is highly sensitive to change. Where industrial and port side activities characterise the coast, these areas are less sensitive to change.

4.2.2 Urban, Industrial and Port facilities

The region is dotted with relatively recent settlements established originally as a result of the mining boom and FIFO workers. Based on 2011 Census data, some suburbs have witnessed an established resident base such as Karratha, Dampier and Bulgarra. The coastal township of Dampier forms part of southern region of the Burrup Peninsula, and the Dampier Salt areas characterise the area between the Peninsula and the mainland suburbs of Gap Ridge. The industrial areas of the Burrup Peninsula are generally located centrally, on the western side of the mainland extending to the east towards Nickol Bay. This area is characterised by the Pluto LNG development, the Karratha Natural Gas treatment plant and the Burrup Nitrates plant. Other facilities include the King Bay Support Facility, the Oceanic Offshore and Burrup Material Facility, the Dampier Supply Base, and the Pilbara Ports Authority. Existing conveyors include rail lines which assist resource recovery from plant to port, with a number of wharves servicing the region. Major roads include the Dampier Highway and Burrup Road and smaller roads through the industrial areas of the Peninsula, including Parker Point Road and King Bay Road heading to the west, and Village and Hearson Road heading to the east of the Peninsula.

Patches of scrubby vegetation remain along the western coastline of the industrial zone, which is typically characterised by port and industrial buildings and structures including wharves, warehouses, boat ramps and other hardstand areas, set amongst rocky outcrops. Maritime and port operations include high-impact operations, including shipping. The outer waters of both the Indian Ocean and Nickol Bay also experience a range of vessels in the waterways, including tourist boats and cruises, navy boats and commercial fishing.

Burrup Nitrates and land adjoining subject land

Karratha Gas Plant (west coastline of Peninsula)

Existing Context

As described above, Dampier and Karratha are the largest settlements in the Pilbara region and are located on the coastal plains adjacent to the Indian Ocean and Nickol Bay. The industrial areas on the Peninsula include the LNG, Dampier Salts, Woodside and Dampier Port, and the Karratha airport services the region.

Visual Features

> Urban and industrial areas are set against a natural backdrop of rocky outcrops, desert and/or coastal waters and mangroves.
> Large scale industrial features include gas flares, salt works, tanks, commercial Port infrastructure and shipping.

Key Viewing Locations

> Burrup Road & Hearson Cove Road.
> Views from Dampier or Karratha.

At Night

> High district brightness areas.
> Lighting from towns and infrastructure corridors (houses, road/ street and rail lighting).
> Lighting from wharf and industrial activity.

Visual Sensitivity

Viewpoints within these areas are considered to be of low-level local visual sensitivity

4.2.3 Rocky Outcrops

The Burrup Peninsula is characterised by its red-rock outcrops and steep stony scree slopes, which defines and separates geographical and visual catchments between the coastlines and the low-lying coastal plains, and forms a prominent backdrop to the industrialised parts of the region. A number of viewing opportunities are available from scenic route sections, such as Burrup Road, and Mt Burrup, though there are no designated lookouts offering panoramic views of the region and the offshore waters of the Indian Ocean.

These rocks are important landscape character types of the region, forming a significant part of the visual landscape, however they are also the 'canvas' for significant rock art in the region and comprise a significant part of the National Heritage Listed area (Figure 4-2). The scenic qualities of the rocky outcrops form a backdrop to the sandy coves and mangroves, and the tidal flats of the Peninsula, and contribute to the iconic character and appeal of the region.

Figure 4-2 Rock piles in Deep Gorge (2019)

Rock outcrops (above) and petroglyphs in Deep Gorge

Existing Context

The rocky outcrops are the most characteristic landscape type of the Peninsula, however, they also help to restrict access due to terrain, elevation (up to 120m AHD), remoteness, and the sensitivity of the art work.

Visual Features

> Red rock outcrops form iconic skylines above otherwise flat landscapes.
> Native grasses in amongst scree.
> Lower foothills are characterised by stony slopes.

Key Viewing Locations (known)

> Deep Gorge and overlooking outcrops.
> Mt Burrup.
> Rocky Outcrops near Hearson Cove overlooking coastline.

Nominated Viewpoints

> VP06 from Deep Gorge.

At Night

> Predominantly dark except towards industrial and portside areas and towns of Dampier and Karratha.

Visual Sensitivity

Views from NHL places and rock art are locally, regionally and internationally appreciated, therefore highly sensitive to change.

4.2.4 Lowlands

The Burrup Peninsula is characterised by lowlying scrubland which is predominantly flat, sandy soil and sparsely vegetated with scattered low shrubs to open heath varieties of *Acacia bivenosa* and hummock grassland. This landscape unit also includes the supra-tidal flats and the ephemeral drainage channels or 'narrow valleys' between the rocky scree, which are variably wet or dry depending on the season (Figure 4-3). Some of these coastal and lowland areas are currently used for industry or resource production due to their accessibility and flat topography, but there remains expansive undeveloped lowland areas on the Peninsula.

Figure 4-3 Low-lying drainage channels or 'narrow valleys' below Mt Burrup **(2011 historical imagery Google Earth)**

View from Hearson Cove across hummocky grassland towards subject land

Existing Context

The Burrup Peninsula includes low-lying plains dominated by flat sandy soils and scrubland, and development including roads and industry.

Visual Features

> Roads traverse the lowland parts of the Peninsula.
> Broad flat landscapes with low vegetation enables long sightlines and expansive views.

Key Viewing Locations

> Burrup Road and Hearson Cove Road.

Nominated Viewpoints

> VP2 – 3 from Hearson Cove Road.

At Night

Open views enable night glow from clusters of industry, and car headlights are visible over vast distances.

4.3 Existing Night time character

As described in the landscape character context above (section 4.2.1 – 4.2.4) the existing night-time conditions of the Burrup Peninsula are predominantly dark except there is significant night glow in and around the industrial and portside areas of the BSIA, street-lighting along the Highway and main roads, and around the towns of Dampier and Karratha. The flare of the gas plant is also visible, and has become a landmark view popular with tourists. Smaller or intermittent lights 'twinkling' in the night are associated with the tops of transmission towers, moving vehicles or boats, or moored vessels, are also part of the night time environment around the Peninsula, although these result in less light spill and are transient/or temporary. The 'Stairway to the Moon' is also a popular event attracting visitors to the effects of the full moon on the waters of Hearson Cove.

4.4 Visual Analysis

4.4.1 Viewshed Sensitivity

The above LCTs are important landscape features in the region. The flat, low-lying plains including the tidal flats are generally sensitive to change, in that new built form is potentially visible from the surrounding rocky outcrops or coastline beaches. However, existing industrial development and commercial industries are high impact activities which form part of the existing mosaic of land use on the Burrup Peninsula.

As defined section 2 and Table 2-1 above, sensitivity in this case is based on the AILA QLD Note but has been redefined to emphasise the viewpoint or viewer sensitivity, *viz.* the ability of a viewer or viewpoint to tolerate change without losing valued attributes. The sensitivity therefore depends on the scenic demand level of viewers and their relative numbers and degree to which they expect and appreciate scenery. Viewpoints with relatively high annual numbers of viewers, or moderate numbers but high scenic demand, are considered to be sensitive, while viewpoints with low numbers and/or low scenic demand are categorised as 'not sensitive' (or 'Not Applicable'). Moderately sensitive viewpoints are those with low numbers of viewers (e.g. occasional bushwalkers), notwithstanding that they may express high scenic demand; and those with high numbers but low scenic expectations (e.g. urban lookouts, with views over existing development to distant natural scenery).

The viewpoints relevant to this assessment are listed in Table 4-1 with relative viewpoint sensitivity categorised as sensitive, moderate or low (i.e. 'not sensitive').

Table 4-1 Viewpoint Sensitivity

Viewpoint	Selected Viewpoints	Viewer Group (See S. 2.4.2)	Viewpoint Sensitivity
VP01	Burrup Road (>2km from site)	All	Low
VP02	Burrup Road/Hearson Road	All	Moderate
VP03	Hearson Cove Road	1, 3	Moderate
VP04	Burrup Road culvert	4	Low
VP05	Burrup Road (opposite Site C)	4	Low
VP06	Deep Gorge walking track	2, 3	Sensitive
VP07	Hearson Cove Beach BBQ area	1, 3	Sensitive
VP08, VP09	Burrup Road & King Bay industrial estate	4, 5	Low
VP10	Dampier town	5	Low
VP11	Karratha lookout	1, 5	Low

Based on the above, viewpoints of particular relevance to this study where the proposed development site is within that viewshed and has either a sensitive or moderate sensitivity rating is limited to the foreground and middle-ground areas, including:

> VP02 Burrup Road near the intersection with Hearson Cove Road, and VP03 Hearson Cove Road - these viewpoints are categorised as moderate sensitivity;

> VP06 Deep Gorge walking track and VP07 Hearson Cove Beach BBQ area are categorised as being sensitive; and

> The Karratha lookout VP11 has low viewpoint sensitivity (despite being a designated lookout) in that it overlooks the existing urban/industrial character of Karratha and on the Peninsula and is located approximately 10km from the subject site. This is also the case for VP10.

5 Landscape and Visual Impact Assessment

5.1 Impact Assessment

The following section provides an assessment of the visual impacts arising from the construction and operation of the Project during the day, and description of the night time operations. This impact assessment uses a viewpoint-based approach as outlined above in section 2.4, identifying key viewpoint locations to determine the potential impacts on surrounding visual amenity. These views represent publicly accessible viewpoints from a range of locations and viewing situations. Particular attention was paid to the coastal areas of the beaches and bays and sensitive receptors or places where viewers are expected to congregate such as significant rock art locations and NHL sites of significance such as Deep Gorge.

A shortlist of viewpoints was compiled based on viewer group and viewpoint sensitivity (see section 4) and compared to the 2010 assessment undertaken by ERM (based on the adjoining TANFF), which identified that a number of viewpoint locations were too far to permit views to both the TANFF site and the proposed Urea facility. These viewpoints were therefore not considered further, as part of the current assessment.

Nine viewpoints were selected based on the above to represent a range of views to evaluate the likely visual impact of the Project, including the landscape character and visual quality within the viewshed and its capacity to absorb the potential visual changes proposed by the Project. The extent to which the proposal could impact on the visual amenity and landscape character of the visual receptors has been assessed based on visibility mapping and selected photomontages.

5.1.1 Visual Analysis Mapping (VAM)

The likely visibility of the proposed Urea facility of Sites C and F and associated infrastructure was modelled by VAM for the study area using a DSM which includes existing vegetation, buildings and landform. The 145m tall flare stack has also been included in the model, but has been shown separate to the buildings so as to separate the likely visible differences between the stack and the remaining built form. The VAM is presented below in Figure 5-1 and shows places where only the stack would be seen (in yellow), places where the stack and built form will be visible from (in blue) and places only within view of the buildings (in pink). These analyses can be zoomed in to assist in understanding the extent of visibility on particular viewpoints, as shown at a larger scale in Appendix B.

The modelling indicates that the proposed stack (only) will be visible from a wide visual catchment to the northeast and west with only scattered views possible from the south due to intervening topography of the Murujuga National Park. It will potentially be visible from Mt Burrup, Burrup Road, Withnell Bay, King Bay and Hearson Cove, and the towns of Dampier and Karratha, including the Karratha Lookout. It will also be visible from offshore views, including Mermaid Sound and Nickol Bay. The buildings, mainly concentrated on Site C, will be visible alongside the stack from high elevations along the mainland areas of the Peninsula, resulting in a scattered viewshed, although offshore views from Mermaid Sound and King Bay are more open. The proposed buildings (only) will be visible from limited views to the northeast of the site and Village Road within the Murujuga National Park, and follow the striated landscape patterning of the Peninsula with viewpoint generally limited to the rocky scree slopes.

The viewpoints for analysis are shown on the VAM (Figure 5-1) and are assessed in the following section.

5.1.2 Photomontages

Photomontages were also prepared from several vantage points to show the proposed facility in the context of its setting, from a range of visual receptors including public views from roads and recreational areas such as beaches, walking tracks and the Karratha lookout. The photomontage viewpoints were cross-checked with the VAM (Figure 5-1) and generally confirm visibility. Analysis of the photomontages has been undertaken as part of the viewpoint assessment below.

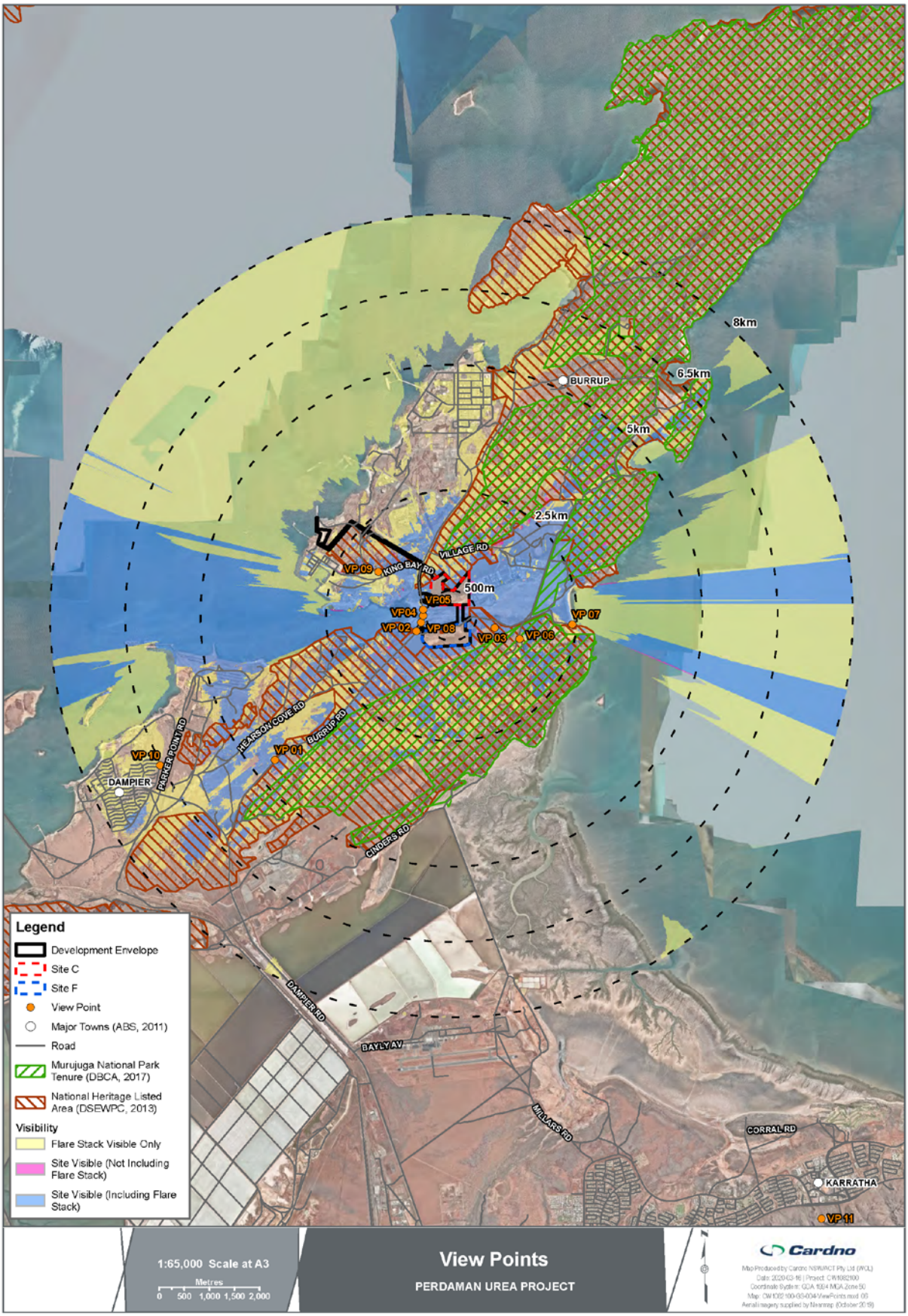


Figure 5-1 VAM showing the viewpoints and visibility of the proposed Perdaman facility **(refer Appendix B for larger version)**

5.2 Visual Analysis of the Proposed Project

5.2.1 VP01 Burrup Road

VPO1 is located on Burrup Road approximately 4km southwest of the subject site. From this section of road the view is expansive and includes glimpses of King Bay and the BSIA (left of Figure 5-2) to the Yara Pilbara ammonia plant tanks (right of Figure 5-2). The rocky outcrops form a distinctive backdrop from this view, although the skyline is punctuated in places by industrial elements.

Burrup Road is a major connector road running north-south on the Peninsula, and provides the main route between Dampier and Karratha for workers and transport to the industrial areas of the BSIA and the Dampier Wharf, as well as recreational vehicles visiting the rock art or beaches in the area. The VAM indicates that the proposed buildings and flare stack will be visible from much of Burrup Road including from this viewpoint, which has been confirmed in the montage view (Figure 5-3).

Figure 5-2 Existing view from VP01 Burrup Road heading north

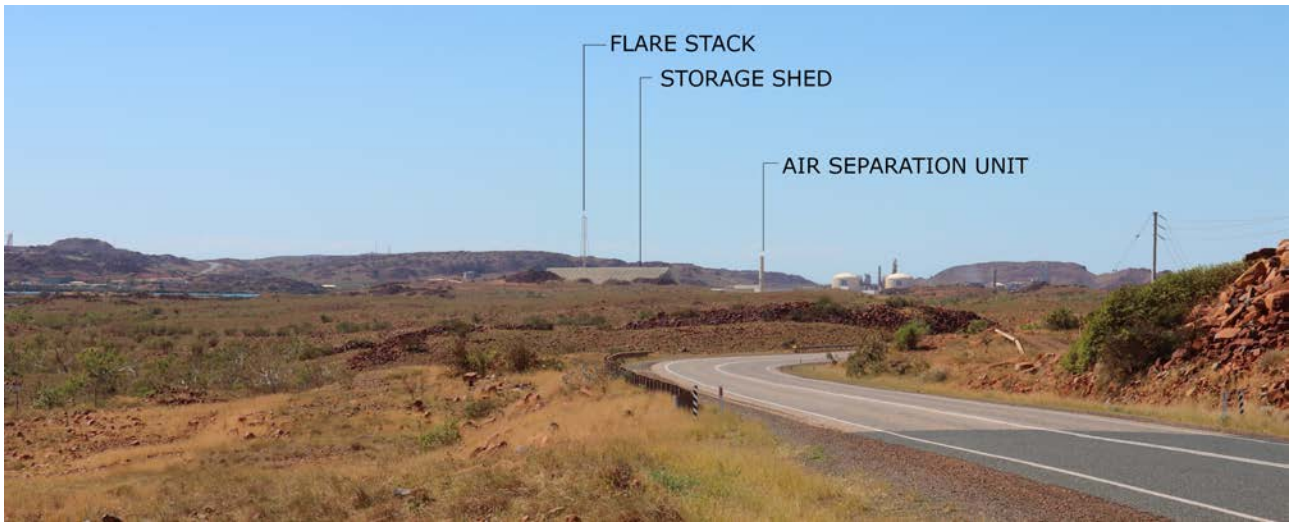


Figure 5-3 Proposed development from VP01 Burrup Road **(Photomontage: Cardno 2020)**

The photomontage (Figure 5-3) illustrates the likely appearance of the proposal from this viewpoint, and shows that the roofline of buildings on Site C are slightly visible above the intervening hills, but do not impact on the rocky skyline. The buildings are visible but are seen at a similar scale as the adjoining Yara Pilbara ammonia plant, and although the flare stack is apparent on the skyline from this view the overall development does not appear discordant with the existing industrial landscape as seen from VP01.

5.2.2 VP02, VP03, VP04 & VP05 Burrup Road/Hearson Cove Road

Viewpoint 02 is located on Burrup Road, 200 metres north of the intersection with Hearson Cove Road, looking northeast to Site C on the north of the tidal flats. Viewpoint 03 is located east of VP02 closer to Hearson Cove. Hearson Cove Road is the main access for Deep Gorge, Hearson Cove beach and Nickol Bay, so most traffic along this road will be visitors and tourists.

Viewpoint 04 is located on Burrup Road immediately north of the culvert, looking northeast, east and southeast from Burrup Road. The viewshed overlooks the supratidal flats and includes a mix of rocky scree and scrubland in a predominantly industrial landscape character (Figures 5-4, 5-6, 5-8). In both views, the Yara Pilbara ammonia plant is visible, although the flare of the existing LNG plant is particularly apparent in VP03. Viewpoint 05 is located on Burrup Road, immediately west of Site C, looking east, southeast and south along Burrup Road. This viewshed is dominated by the road and the southern rocky range and scree slopes with only the roadside infrastructure visible (Figure 5-10).

Figure 5-4 Existing view from VP02 Burrup Road

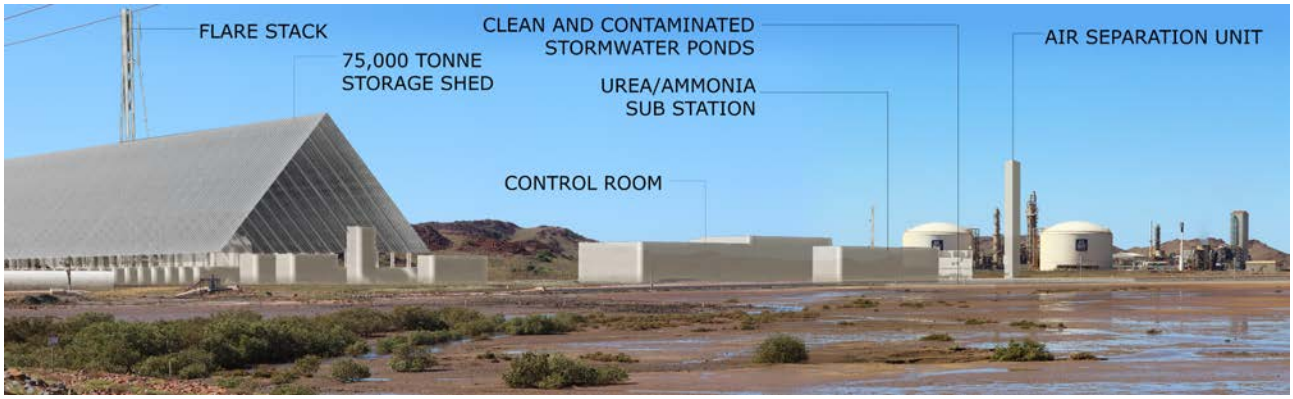


Figure 5-5 Proposed development from VP02 Burrup Road **(Photomontage: Cardno 2020)**

Figure 5-6 Existing view from VP03 Hearson Cove Road looking west

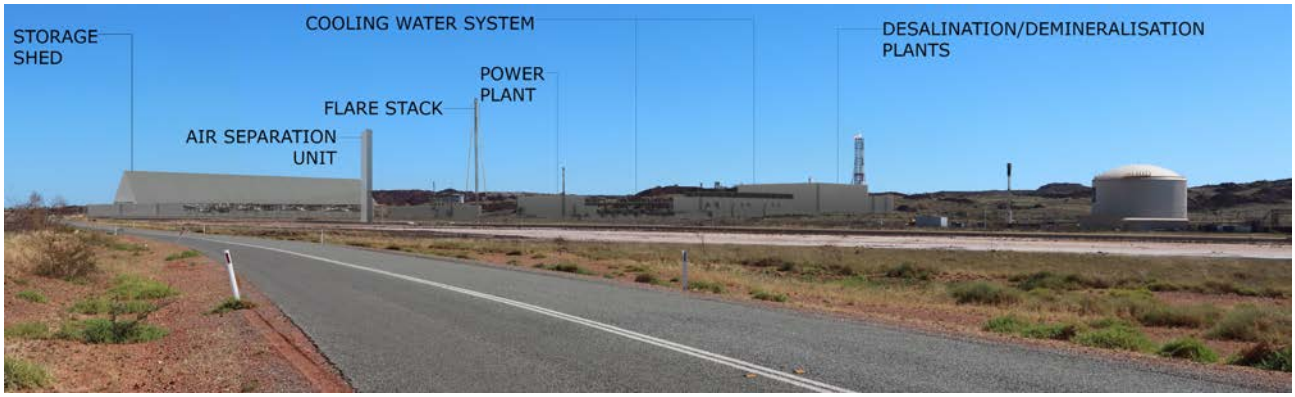


Figure 5-7 Proposed development from VP03 Hearson Cove Road (**Photomontage: Cardno 2020**)

Figure 5-8 Existing view from VP04 Burrup Road culvert Road

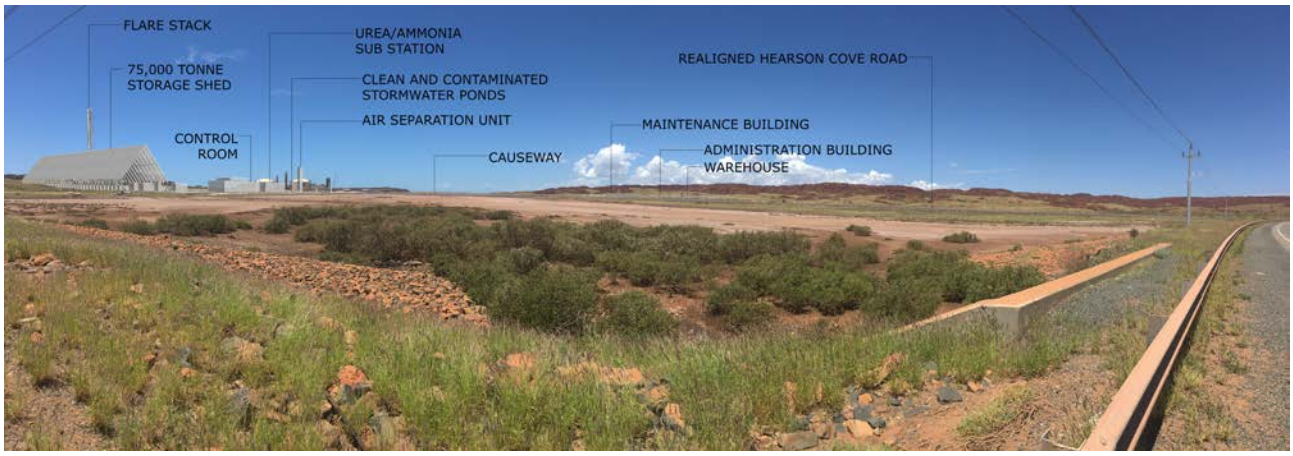


Figure 5-9 Proposed view from VP04 Burrup Road culvert Road **(Photomontage: Cardno 2020)**

Figure 5-10 Existing view from VP05 Burrup Road opposite Site C

Figure 5-11 Proposed view from VP05 Burrup Road opposite Site C **(Photomontage: Cardno 2020)**

The photomontages Figures 5-5, 5-7 and 5-9 illustrate that the proposed urea facility will dominate views from VP02, VP03, VP04 and VP08, especially when seen from ground level or as part of the driving experience. From Hearson Cove Road, in particular, the buildings will potentially present as a wall of development, and although consistent with the surrounding industrial area, will dominate the landscape when seen from close range views. Photomontages Figure 5-9 and 5-17 demonstrate that the development on Site F and the causeway linking it with Site C are both low in profile and are not prominent in the landscape. While the proposed buildings on Site F will be the only such features on this side of the valley, they are within the

viewshed which already contains multiple, prominent structures spread across the landscape. The photomontage Figure 5-11 (VP05) illustrates the scale and prominence of the Site C storage shed when viewed from Burrup Road.

5.2.3 VP06 Deep Gorge

This viewpoint is located near the track to Deep Gorge, south of Hearson Cove Road approximately 1.5 km northwest of the subject site. Deep Gorge is a world-renowned location for its 'open air gallery' of rock art.

Figure 5-12 Existing View from VP06 Deep Gorge

The proposed flare stack will be visible from this viewpoint, as indicated in the VAM (Figure 5-1) and shown in Figure 5-13, although rocky terrain will obscure views to the proposed buildings, and other infrastructure on Sites C and F. From this viewpoint, the appearance of the proposed flare stack will appear taller and larger on the ridgeline compared to the current situation, although the current view (Figure 5-12) takes in the existing industrial landscape including the Yara Pilbara ammonia plant and the flare of the LNG plant behind the rocky scree.

Figure 5-13 Proposed view from VP06 Deep Gorge **(Photomontage: Cardno 2019)**

Although the proposed flare stack is taller than the Pluto LNG plant flare stack in the background, its lattice structure appears lightweight and visually permeable, which helps to reduce its general appearance of bulk and scale as seen from this view. The air separation unit on Site C will not be visible from VP06.

5.2.4 VP07 Hearson Cove Beach BBQ area

This viewpoint is located on the beach at Hearson Cove, east of the subject land. As there are no views to the site from Hearson Cove Beach (below the foredunes), as evidenced in the VAM (Figure 5-1) (and illustrated in VP06 of the 2010 ERM report) the BBQ area was used as a representative viewpoint from which day-visitors would potentially view the subject site and proposed development.

The current view (Figure 5-14) includes the sandy beach and bollards near the picnic shelter and barbeques. From this view, the existing ammonia plant tanks are visible owing to their pale colour, while the towers and flares in the background dominate the landscape due to their height as they punctuate the skyline.

Figure 5-14 Existing view from VP07 Hearson Cove Beach BBQ area

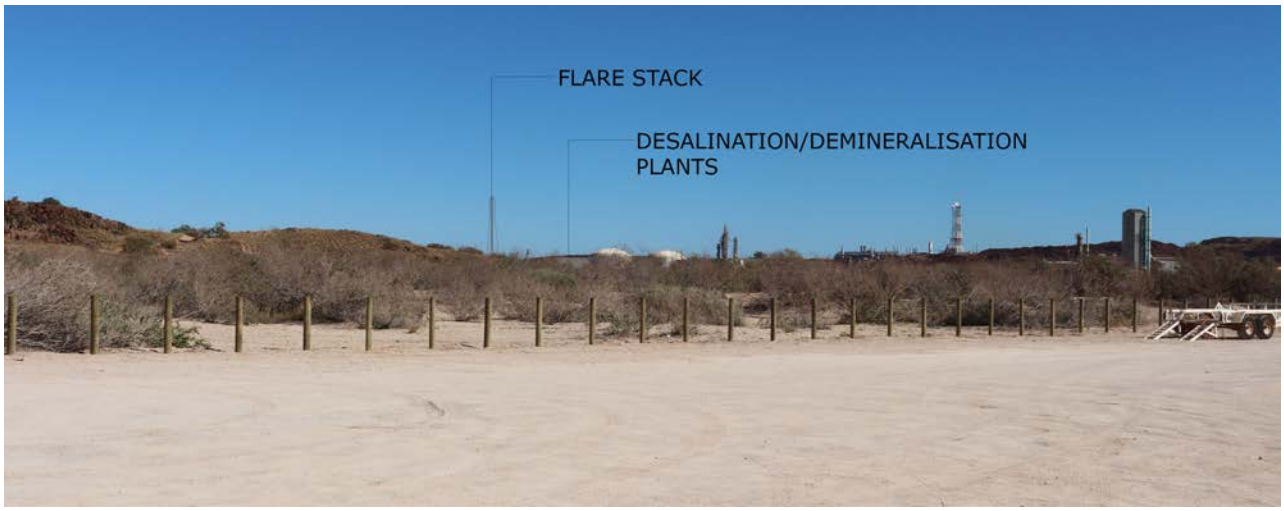


Figure 5-15 Proposed view from VP07 Hearson Cove Beach BBQ area **(Photomontage: Cardno 2019)**

Figure 5-15 indicates the likely appearance of the proposal from this viewpoint, and shows that the roofline of buildings on Site C are slightly visible above the dunes, but are lower in height than the surrounding industrial tanks and towers. Although the flare stack will be taller than other industrial structures as seen from this viewpoint, it is a lightweight metal structure (i.e. not solid) and is visually permeable. The night time impact of the flare stack will be minimal and restricted to once or twice each year – the flare stack will only be used for purging in upset conditions or during shutdowns and is not required during normal processing operations. Further to this, the lighting to the stack will be consistent with other intermittent 'twinkling' night time lighting within the industrial zone.

5.2.5 VP08 & VP09

The view from VP08 from Burrup Road looking southeast takes in Site F which is proposed on the southern side of the supra-tidal flats dividing the Peninsula. The VAM (Figure 5-1) indicates that there will be views to the proposed development from the industrial areas of the Burrup Peninsula, particularly from King Bay Road, and Mof Road (VP09). From this viewpoint (near the intersection with King Bay Road) the proposed flare stack and buildings will potentially be visible behind the stockpiles in the middle ground, although this view has not been modelled due to its low sensitivity rating (refer Table 4-1).

Figure 5-16 Existing view from VP08 Burrup Road south of the culvert

Figure 5-17 Proposed view from VP08 Burrup Road south of the culvert **(Photomontage: Cardno 2019)**

Figure 5-18 Existing view from VP09 Mof Road

5.2.6 VP10 Dampier town

The VAM indicates that the flare stack will be visible from the Dampier township approximately 7 km southwest of the proposed site, and views of the buildings may also be possible from elevated parts of the estate near Hill Road. Figure 5-19 shows the existing Google Earth street view from Lawson Drive and the BSIA and towers associated with industry which are visible on the skyline. This viewpoint has not been modelled due to the distance from the proposed urea facility, and the existing industrial landscape which dominates most views from Dampier.

Figure 5-19 Existing view from VP10 Lawson Drive **(Google Earth 2019)**

5.2.7 VP11 Karratha Lookout

This viewpoint is located behind the town of Karratha, and is a popular designated lookout elevated above the township. Existing views take in the urban footprint of Karratha on the coastal plains, with Nickol Bay in the middle ground, and the rocky outcrops of the Burrup Peninsula in the background. Karratha is flat and low apart from the telecommunications tower (centre) while other towers dot the skyline in the background, including the LNG gas flare (left of Figure 5-20) and telecommunication towers on or near Mt Burrup. Although the LiDAR extents relied upon for the VAM (Figure 5-1) did not extend as far as Karratha, the existing view (combined with the view arc on Figure 5-1) suggests that the proposed flare stack will be visible from the lookout. This was verified by photomontages shown in Figures 5-21 and 5-22).

Figure 5-20 Existing view from VP11 Karratha Lookout

Figure 5-21 Proposed view from VP11 Karratha Lookout **(see Inset view in Figure 5-22 Photomontage: Cardno 2019)**

Figure 5-22 Proposed view - zoomed in view from VP11 Karratha Lookout **(see Figure 5-21 Photomontage: Cardno 2019)**

5.3 Visual Impacts in Landscape Character Context

5.3.1 Overview

The visualisations indicate that the proposed urea Project will be seen from several viewing locations within the Burrup Peninsula, but is generally seen within the context of other existing industrial facilities. The following assessment identifies the visual impacts (additional to the existing situation) as seen from viewing locations within the corresponding Landscape Character Type context areas.

Coastline

The proposed Project will be visible from offshore viewpoints in Nickol Bay and Mermaid Sound, as shown in the VAM, however, the proposed buildings will be screened from most beaches by a combination of intervening topography, including foredunes, rocky hills and headlands, and vegetation. The flare stack will be more visible from coastal views, including from Hearson Cove, the beaches south of King Bay, parts of Cowrie Cove and Withnell Bay, but is not visible from Aramvee Beach, or Conzinc Cove.

As seen from the coastline or from offshore views, the built form will generally comprise a small part of any coastal viewshed despite the height of the flare stack being noticeably taller than other structures in the area. The scenic expectations of visitors to the coastline are medium to high (based on Table 2.2) however existing industrial development is already a significant part of the coastal setting, and access to the coastline is unavoidably through an industrial landscape.

Urban, Industrial and Port

The VAM also indicates that the proposed Project and the associated works will be visible from a number of viewing locations within the urban and industrial Landscape Character context area, including the town of Dampier and the industrial and port activity in King Bay and Dampier Wharves. The photomontage view from the Karratha Lookout VP11 behind the town also indicates the visibility of the flare stack from this viewpoint.

A number of viewpoints from the BSIA will have direct sightlines to the proposed buildings. However, while the industrial footprint has increased, and user movement through the area is high, the scenic demand of this viewer group is relatively low given many of those viewers live and work within the same urban/industrial setting. From elevated views in outer estate suburbs of Dampier and Karratha (VP10), industrial development is already visible from some houses and roads, including the Karratha lookout (VP11), and the proposed increase in height or scale is not expected to be readily distinguishable from any of the viewpoints within this context area.

Rocky Outcrops

The proposed Project and construction works will be visible from this landscape character context due to their high elevation relative to the surrounding flat landscape. Significant outcrops to the north and south of the subject land, including Mt Burrup and rocky headlands, are shown in the VAM as being within view of the proposal. However, this terrain is rough and largely inaccessible by vehicle, so much of this setting forms part of the backdrop to other viewsheds, rather than being viewing points *per se*. The flare stack however will be visible from accessible parts of Deep Gorge, as seen in VP06. There may be other elevated and/or less accessible locations on the Peninsula which are occasionally visited, to view petroglyphs or for other reasons, from which the proposed development may be visible. These are modelled in the VAM, but have not been field verified or confirmed by photomontages.

Lowlands

The VAM indicates that much of the low-lying parts of the Peninsula is screened from view of the proposal, including low coastal scrublands and the ephemeral gullies which channel water in peak times. Filtered views of the proposed buildings may be visible from some of the gullies. However views from the scrub above the dunes and tidal flats near Hearson Cove Road and the Hearson Road and Burrup Road causeway offer clear views to the proposed Project site which are not capable of screening by either topography or the existing low scrubby vegetation.

However, as most development and infrastructure on the Peninsula (roads, buildings, rail) is located on the lowlands, the proposal will also be seen in the context of existing industrial development, which forms an intrinsic (and not unexpected) part of the landscape character of this area. However, the proposed Site F will be noticeable in that it is located to the south of the tidal flats.

5.4 Summary of Landscape and Visual Impacts

5.4.1 Impacts on Viewers

Although the proposal will intensify the industrial use on the Peninsula, its operational requirements will not result in significant visual impacts or changes to landscape character as seen from most viewpoints, and the lighting at night and movement of vehicles will not be unduly dissimilar to the existing light sources and movement of vehicles along Burrup Road and Dampier Highway, servicing the industrial areas of the BSIA and the Port.

Both the building works and infrastructure works on Sites C and F are consistent with the existing and intended industrial character of the central Burrup area as seen from most viewpoints, and there will be no significant impacts on visual amenity due to viewing distance. The conveyor (although not modelled) will potentially be visible from some viewpoints, but will not be noticeable in its industrial setting. However, during construction phases of the proposed Project (including the proposed realignment of Hearson Cove Road and construction of the causeway) there will potentially be a perceived intensification of disturbance in the landscape, albeit temporary, especially by visitors heading to Hearson Cove beach.

Activity at and near the Dampier Port including the feed conveyor, storage shed and associated port infrastructure will also be visible from views within the King Bay area, however as these are extensions of activities and equipment currently seen to be associated with the Port and will only be visible from within the industrial area, the impacts are considered minor.

Overall, the visual impacts on most viewpoints are already mitigated through site selection: the location is within an existing industrial area, is at low elevation with relatively low visual exposure screened by rocky terrain (generally inaccessible), dunes and mangroves screening views from offshore, at considerable distance from residential areas. The height, bulk and scale of the proposal is most apparent as seen from Hearson Cove Road, as indicated in VP03 looking west and from Burrup Road in VP02 looking northeast.

5.4.2 Lighting

As mentioned above, lighting design has not yet been detailed although it is anticipated that there will need to be extensive lighting during construction of the Project and associated road works. Lighting will also be extensive (though dispersed) between night-time operations on Site C, and the conveyor and shiploading at the wharf. Site F will include carpark and security lighting only.

The lighting associated with Sites C and F and portside activity will contribute to the existing cluster of night time lighting in amongst the Yara ammonia plant, and near the King Bay industrial area, but will be more muted than the nearby Port security lighting. The additional lighting should not significantly increase light glow any more than is currently emitted from the BSIA, however, the Project's close proximity to Hearson Cove will potentially increase the night sky 'glow' as seen from the beach, and might form a perceptible impact on tourists' appreciation of the full moon 'Staircase to the Moon' event, although more specific night light analysis would need to be undertaken. The main visible lighting impacts in the long term will be associated with Site C, as seen from Hearson Cove Road.

5.4.3 Impacts on Landscape Character

As discussed above, the proposal may appear incongruous with landscape character context. The construction phase will not change the character of the shipping channel or port, although in the long term the more frequent presence of industrial built form and increased shipping will cause a relatively minor change to the perceived character of the Peninsula.

5.4.4 Impacts on National Heritage Listed Values

Due to the close proximity of the proposed Project sites to the NHL areas (including small incursions of the site into protected places), there will potentially be impacts on these places. However, as specific locations of significance are generally not known due to local law, apart from the most popular and well-documented places, assessment of impacts has focused on Deep Gorge as representative of this area (and landscape setting). As shown from VP06 and Figures 5-12 and 5-13, the view of the proposal from Deep Gorge will be visible from near the walking track, as used by visitors and tourists, whose scenic expectations are high.

However, as indicated in Figure 5-13, neither the scenic or cultural attributes of the NHL areas, nor their integrity, will be affected by the proposed Project as seen from Deep Gorge.

5.5 Cumulative Visual Impacts

There will be construction-related activity associated with the Project at several sites, as well as future operational changes visible in a number of locations including Sites C and F, the causeway, Hearson Cove Road works, the conveyor and the infrastructure on or near the Port. In combination, these changes will be noticeable but dispersed, such that they are unlikely to be of sufficient scale, extent or rapidity of change to cause significant impacts on the landscape values or character of the viewshed, except from Hearson Cove Road.

As indicated earlier in the report, the mainland built form elements of the proposed Project will cause visual impacts which are quite different in nature to those project-related visual impacts associated with the port and facilities and service corridors, where visual impacts are likely to be transient or supplement existing infrastructure. These impacts are likely to be cumulative only in the sense that they convey, when combined, an impression that the Burrup Peninsula industrial area and adjacent coastline are already industrialised, and are coming under increased pressure for development.

When considered in relation to the existing industrial development (including the sites described in Table 1-1), the cumulative visual impacts of the proposed Project will intensify the visibility and prominence of development on the Peninsula. The height of the flare stack, in particular, will result in some additional visual impact (in this case, increased visibility) while the proposed use will result in some increased transport (road and rail) and overall activity, including night time activity. The additional impact of lighting may intensify the existing night time glow of the industrial area, however, it will not be a significant visual change, except for lighting on the flare stack, which will be seen from most views as a distant light twinkling in the sky, alongside the other towers in the area. Unlike the Pluto LNG flare stack which is more or less continuously alight, the stack proposed in this project will be alight only once or twice each year during upset conditions or during shutdowns but not as a part of normal processing operations. Overall, the extent to which the proposed Project will create additional impacts on the landscape character or detract from the visual amenity of the region is low and generally acceptable, given the existing and future intended character of the BSIA is for strategic/heavy industry.

5.6 Mitigation Measures

In general, the low-lying location in an existing industrial area, combined with the surrounding topography, absence of residential receptors and overall distance attenuation mitigates most landscape and visual character impacts. The Project design also incorporates elements which help to mitigate impacts, such as the light-weight open (semi-transparent) 'lattice' appearance of the flare stack. Open structures are preferred where possible, especially for structures visible against the skyline, as they allow partial views through. Although the buildings are solid, the proposed varying rooflines of buildings on Site C provide some relief from the 'big box' characteristic of most industrial built form. However, due to the scale of the proposed development there is likely to be a limit to the opportunities for harmonious visual integration, particularly as seen from close-range views such as Hearson Cove Road, where the proposed buildings of Site C will potentially present as a wall of development (Figure 5-7).

The following provides guidance for additional mitigation measures:

Design controls:

- use 'natural' coloured materials/finishes for the buildings and roof forms to reduce visual contrast, which are non-reflective;
- provide variety and articulation to the walls and rooflines of the buildings facing Hearson Cove Road to assist in reducing the 'boxed' appearance; and
- increase building setback from the road (if practicable).

Vegetative Screening

- provide fast growing trees and shrubs along the property boundary and/or within the Hearson Cove road reserve.

Given the constraints of the area (topography, shallow soils, and unreliable rainfall) the preferred option to mitigate visual impacts from Hearson Cove Road is through the above mentioned design controls.

To mitigate night time impacts, it is recommended that all lighting be designed for minimum glare, including downward directed lights, using low lumen to maintain minimum operational and safety standards.

6 Conclusion

The proposed urea Project will intensify the industrial use of the BSIA in the central part of the Burrup Peninsula, however, its overall impact on visual amenity and landscape character is minor. The Project is large in scale, however, the subject land is not significant nor sensitive per se (it contains none of the *outstanding scenic landscapes of great contrast* that the Murujuga National Park MP seeks to maintain), and the proposed Project will be seen by a relatively small number of sensitive receptors travelling through the industrial estate, to get to Deep Gorge or Hearson Cove beach. However, even from these views (including the close-range views from Hearson Cove Road Figures 5-6 and 5-7), the proposed Project will be seen in the context of surrounding industry, and as part of an overall industrial landscape that is ear-marked for further growth under the leasing agreements of the Department of State Development for the BSIA.

Although the cumulative effect of industrial development may impact on the longer term aspirations for the World Heritage listing of the Burrup Peninsula with respect to its aesthetic values (criterion vii), the proposed Project is generally outside of the NHL areas, and the existing industry is already likely to affect the ability of the Peninsula to meet this criteria.

Overall, the proposed urea Project has been designed and located to minimise impacts on the landscape and scenic values of adjoining or nearby heritage places and areas of recreation, in accordance with the 'Burrup Peninsula Land Use Plan and Management Strategy', and therefore satisfies the EPA objective to '*protect social surroundings from significant harm'*.

7 References

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17BPerdaman Urea Project

APPENDIX A

PROPOSED DEVELOPMENT PLANS

Cardno
Shaping the Future

Dampier Bulk Liquids Berth and Public Wharf

DAMPIER PORT

Pluto LNG plant

King Bay Supply Base

Yara Pilbara Nitrates

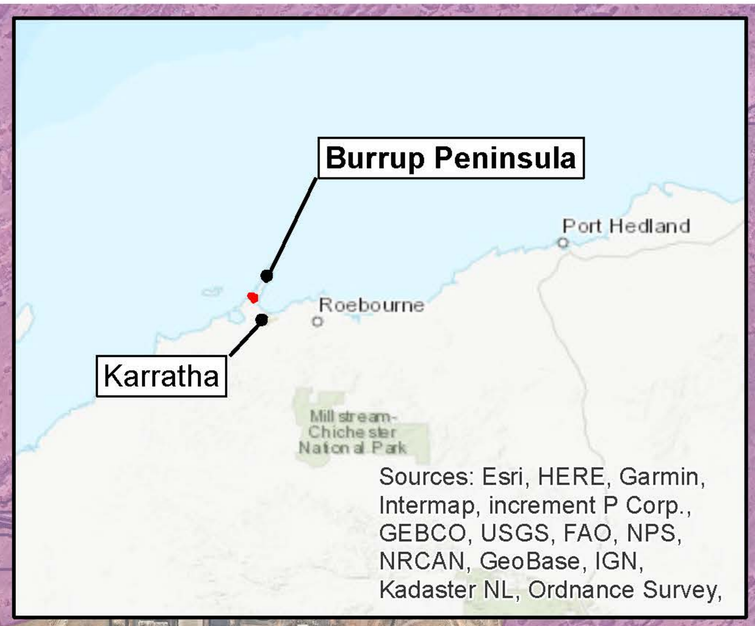
Yara Pilbara Fertilisers

Site C

Site F

KING BAY

HEARSON COVE



NORTH

Legend

- Development Envelope
- National Heritage Listed Area
- Cadastre (Landgate, 2017)

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FILE: K:\Projects\CW1055600_Perdaman_Chemicals_and_Fertilisers_Permits_and_approvals\5_Technical\Water and Environment\Comps_Drawings_File_Notes\arc\GIS\Build\CW1055600_EN_001_RegionalLocation 02.mxd

Cardno

Date
15/05/2019

Size
A4

Scale
1:28,000

0 200 400 600 800m

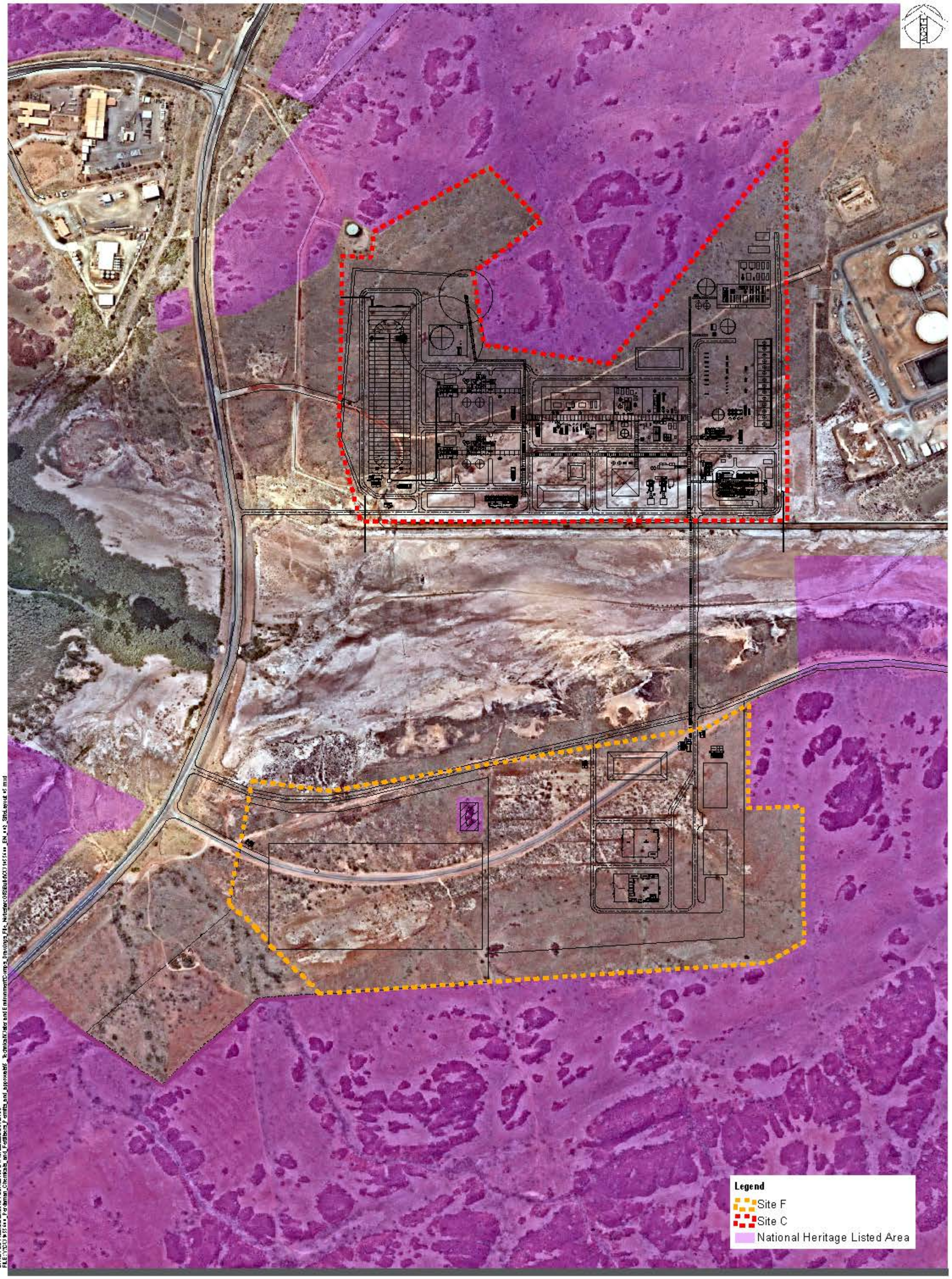
REGIONAL LOCATION

PERDAMAN UREA PROJECT

ENVIRONMENTAL SCOPING DOCUMENT

FIGURE 2

CW1055600_EN_001_REGIONALLOCATION 02



Cardno

Date
29/03/2019

Size
A3

Scale
1:6,000

0 150 300Meters

INDICATIVE SITE LAYOUT

PERDAMAN UREA PROJECT

ENVIRONMENTAL REVIEW DOCUMENT

FIGURE X

CW1055600_EN_002_SITELAYOUT 05

DATE PLOTTED:29/03/2019 12:21:38 AM BY: NAELLE.BOUDONIS
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17BPerdaman Urea Project

APPENDIX

B

VISIBILITY ANALYSIS MAPPING

Cardno
Shaping the Future

8km
6.5km
5km
2.5km
500m
BURRUP
DAMPIER
MOF RD
KING BAY RD
VILLAGE RD
HEARSON COVE RD
PARKER POINT RD
BURRUP RD
CINDERS RD
DAMPIER RD
BAYLY AV
MILLARS RD
CORRAL RD
KARRATHA

Legend

- Development Envelope
- Site C
- Site F
- Major Towns (ABS, 2011)
- Road
- Murujuga National Park Tenure (DBCA, 2017)
- National Heritage Listed Area (DSEWPC, 2013)

1:65,000 Scale at A3

Metres

0 500 1,000 1,500 2,000

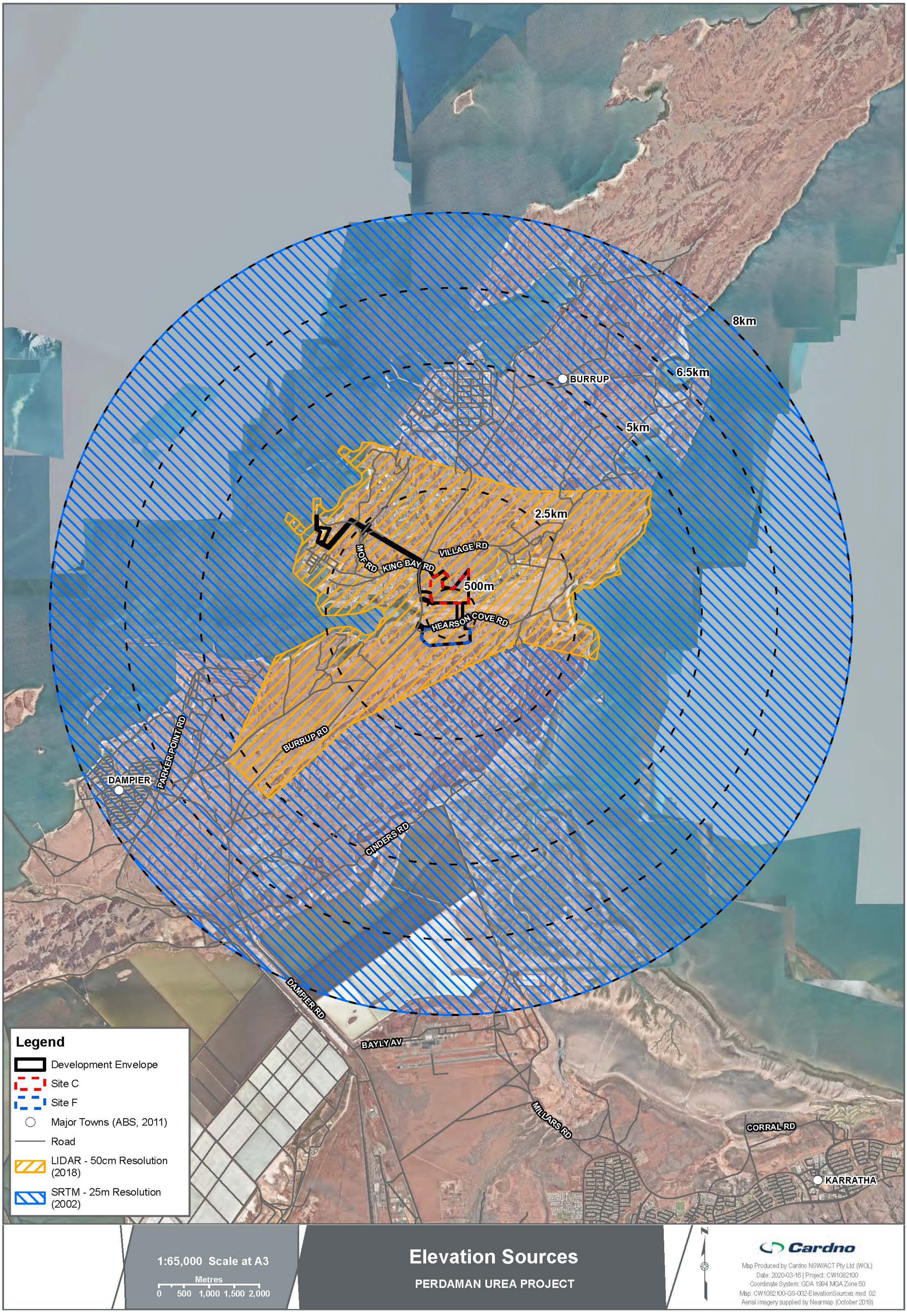
Study Area

PERDAMAN UREA PROJECT

N

Cardno

Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2020-03-16 | Project: CW1082100
Coordinate System: GDA 1994 MGA Zone 50
Map: CW1082100-GS-001-StudyArea.mxd 02
Aerial imagery supplied by Nearmap (October 2019)


8km
6.5km
5km
2.5km
500m
BURRUP
KARRATHA
DAMPIER
VILLAGE RD
MOF RD
KING BAY RD
HEARSON COVE RD
BURRUP RD
PARKER POINT RD
CINDERS RD
DAMPIER RD
BAYLY AV
MILLARS RD
CORRAL RD
Legend
Development Envelope
Site C
Site F
Major Towns (ABS, 2011)
Road
LIDAR - 50cm Resolution (2018)
SRTM - 25m Resolution (2002)
1:65,000 Scale at A3
Metres
0 500 1,000 1,500 2,000
Elevation Sources
PERDAMAN UREA PROJECT
N
Cardno
Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2020-03-16 | Project: CW1082100
Coordinate System: GDA 1994 MGA Zone 50
Map: CW1082100-GS-002-ElevationSources.mxd 02
Aerial imagery supplied by Nearmap (October 2019)

8km
6.5km
5km
2.5km
500m
BURRUP
KING BAY RD
MOF RD
VILLAGE RD
HEARSON COVE RD
BURRUP RD
PARKER POINT RD
DAMPIER
CINDERS RD
DAMPIER RD
BAYLY AV
MILLARS RD
CORRAL RD
KARRATHA

Legend

- Development Envelope
- Site C
- Site F
- Major Towns (ABS, 2011)
- Road
- Murujuga National Park Tenure (DBCA, 2017)
- National Heritage Listed Area (DSEWPC, 2013)

Visibility

- Flare Stack Visible Only
- Site Visible (Not Including Flare Stack)
- Site Visible (Including Flare Stack)

1:65,000 Scale at A3

Metres

0 500 1,000 1,500 2,000

Visibility

PERDAMAN UREA PROJECT

N

Cardno

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Date: 2020-03-16 | Project: CW1082100
Coordinate System: GDA 1994 MGA Zone 50
Map: CW1082100-GS-003-Visibility.mxd 03
Aerial imagery supplied by Nearmap (October 2019)

8km
6.5km
5km
2.5km
500m
BURRUP
KARRATHA
DAMPIER
VP 01
VP 02
VP 03
VP04
VP05
VP 06
VP 07
VP 08
VP 09
VP 10
VP 11
KING BAY RD
VILLAGE RD
HEARSON COVE RD
BURRUP RD
PARKER POINT RD
CINDERS RD
DAMPIER RD
BAYLY AV
MILLARS RD
CORRAL RD

Legend

- Development Envelope
- Site C
- Site F
- View Point
- Major Towns (ABS, 2011)
- Road
- Murujuga National Park Tenure (DBCA, 2017)
- National Heritage Listed Area (DSEWPC, 2013)

Visibility

- Flare Stack Visible Only
- Site Visible (Not Including Flare Stack)
- Site Visible (Including Flare Stack)

1:65,000 Scale at A3

Metres

0 500 1,000 1,500 2,000

View Points

PERDAMAN UREA PROJECT

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