

Appendix N Visual Amenity Assessment



Report

East Arm Wharf Expansion Project: visual impact assessment.

14 FEBRUARY 2011

Prepared for
Department of Lands and Planning
Darwin, Northern Territory

42214001

URS

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Abbreviation

Description

DEM	Digital elevation model
DLP	Department of Lands and Planning
DPC	Darwin Port Corporation
EAW	East Arm Wharf
EIS	Environmental Impact Statement
km	Kilometer
NRETAS	Department of Natural Resources, Environment, the Arts and Sport
NT	Northern Territory
NVIS	National Vegetation Inventory System
URS	URS Australia Pty Ltd

Introduction

1.1 Background

The Darwin Port Corporation (DPC) and the Northern Territory Department of Lands and Planning (DLP) are managing the staged expansion of East Arm Wharf (EAW). The EAW precinct currently comprises a 754 m berth wharf, approximately 18 ha of hardstand area, and a single rail line spur linking the wharf to the Adelaide-Darwin rail line. Since the existing EAW development was approved in 1993, utilisation of the EAW for export of bulk minerals has increased, and storage / stockpiling requirements have increased. Given these demands on EAW infrastructure, as well as further requirements of the Department of Defence and other industries, an expansion of the existing EAW is proposed by the DLP, which is the subject of this Environmental Impact Assessment.

The proposed expansion of EAW broadly comprises four separate developments within the EAW precinct. The scope of this Environmental Impact Statement (EIS) includes the four main developments, along with required works associated with these developments. The four main proposed developments within the scope of this EIS are:

- Barge ramp and hardstand
- Marine Supply Base
- Additional rail loop spur into the bulk stockpile area
- Extension of the existing East Arm Wharf Key Line.

URS Australia Pty Ltd was commissioned to carry out environmental work associated with DLP preparation of the EIS and this assessment of the visual impacts of the Project was prepared in part fulfilment of that commission.

In 2009 URS completed a visual impact assessment for the proposed INPEX Gas Plant EIS at Blaydin Point, adjacent to EAW. As this study was only scoped as a desktop assessment with no field component, with permission from INPEX, URS have used some of the results from that study to carry out this visual impact assessment for the EAW upgrade.

1.2 Scope of work

This visual impact assessment considers the changes to the visual amenity of the four proposed developments mentioned above within the EIS at East Arm, Darwin Harbour. The key receptors to visual amenity changes are the Darwin and Palmerston communities, and as such the visual impact assessment is based on the views from key points around the shoreline of Darwin Harbour.

The visual impact assessment was carried out through a desktop study and identification of options that would mitigate any identified visual impacts. These phases are described in more detail as follows:

Desktop study

The desktop study included a review of the conceptual layout of the developments, including any tall or wide infrastructure such as cranes, jetties and breakwalls that will extend into Darwin Harbour. 3D design files were not available at the time of modelling, so heights have been estimated based on surrounding surveyed infrastructure and topography. This review also allowed for an understanding of the functional design requirements of major infrastructure, such as the length of breakwalls.

1 Introduction

A list of viewpoints of interest to the community from around Darwin Harbour was compiled in consultation with government authorities. A viewshed analysis was undertaken to plot the likely visual catchments of the development areas, from the various viewpoints of interest.

Assessment of visual impact

In order to quantify the Project's visual impact from different perspectives around Darwin Harbour, the viewpoints were classified in terms of distance, proportion of the view taken up by the Project facilities, number of potential viewers, and values of the viewing area. The results of these classifications were presented in a visual assessment matrix.

Context

2.1 Conceptual Project design

The conceptual design of the EAW development areas on which this visual impact assessment is based included the following key components (refer Figure 2-1):

- Barge ramp and hardstand. This component of the proposed development is the establishment of a small barge ramp and hardstand area on the southern side of the peninsula, located adjacent to and west of the Paspaley lease, and east of the Wharf.
- Marine Supply Base. The infrastructure at this site would include:
 - A large hardstand area on existing reclaimed land. This area will be used for storage of supplies, and will also include an administrative building. A rock dump area of approximately 1 ha will be provided at the southern end, and a truck path will run along the seaward edge of the hardstand.
 - A rock load-out wharf adjacent to the southern end of the hardstand.
 - Wharf adjacent to northern end of hardstand for the accommodation of drilling mud and brine tanks and supply systems, potable water supply services, and fuel storage and supply systems.
- Additional Rail Loop. As dry bulk handling has increased, the current one way in / out rail access along East Arm peninsula is becoming inefficient so a 'balloon loop' to increase the storage capacity and efficiency of the rail network is proposed.
- Tug and small vessel berths. The current wharf has a capacity of four trade berths, all located on the southern side of the wharf. The existing four berths include a fuel berth, a container loading / unloading berth, and two dry bulk berths. Tug boats currently berth at Stoke Hill wharf, and there are no dedicated berths for customs boats and other smaller craft at EAW. Increased traffic at East Arm is necessitating a greater number of tug boats and customs vessels, and so a dedicated mooring facility suitable for tug, custom, and other small craft is proposed. The proposed facility will be situated north west of the liquids berth (at the western end of EAW).

Lighting

The EAW Precinct is currently lit at night-time to provide light for operability and plant safety. The additional structures will also be lit at night-time for the same reasons. To minimise lighting effects on surrounding areas, lights should be faced inwards as much as possible.

Emissions

Some of the emissions from the wharf facilities could be visible on occasion from short to medium distances, although management controls will be in place to minimise this. These may include dust generated during site clearing/earthworks, sediment disturbance during dredging and loading/unloading of ore; however controls such as water trucks to reduce dust could be employed here.

Operating hours

Construction activities are expected to be undertaken mainly during daylight hours. Operations at the facilities will be carried out 24 hours per day.

2 Context



Figure 2-1 Location of key project components for the EAW upgrade

2.2 Darwin Harbour landscape

The shoreline around Darwin Harbour contains relatively large tracts of undeveloped land, mainly comprising tidal flats vegetated by mangrove stands. Some residential, industrial and infrastructure development has been undertaken around the shorelines of East Arm, while the shoreline throughout Middle Arm is almost completely undeveloped.

Major man-made features of the shoreline within Darwin Harbour include the following:

- ConocoPhillips Darwin LNG Plant, on Wickham Point approximately 5 km to the west of East Arm Wharf;
- Darwin central business district, on the eastern side of the main body of the Harbour;
- Darwin Wharf Precinct, ship berthing, seaside promenades, parklands, landscaped gardens, hotels and alfresco dining, on the eastern side of the main body of the Harbour; and
- Suburban developments from Darwin in the north to Palmerston in the east of the harbour shoreline. A small residential area also exists in Mandorah, on the western side of the mouth of the Harbour.

These man-made features also represent the major sources of artificial light around Darwin Harbour, along with beacons throughout the Harbour that are used for shipping navigation. These light sources

2 Context

contribute to an overall light “glow” from the city area, which is visible (if very faintly) from up to 40 km away (M Guinea, Charles Darwin University, pers comm. Sept 2008).

Methodology

3.1 Viewpoints

Fourteen areas of interest to the visual impact assessment were identified for the INPEX Proposed development in consultation with the NT Department of Natural Resources, Environment, the Arts and Sport (NRETAS), with review from relevant government and non-government agencies including NT Tourism. These visual impact sites were selected to account for a range of viewing angles, potential receptor types and residential, cultural, heritage and tourism values. These same sites have been used for this visual impact assessment. The locations of identified viewpoints of interest to this study and their primary uses and values are listed in Table 3-1. Their locations around Darwin Harbour are presented in Figure 3-1.

Table 3-1 Primary values of the viewpoints considered in the visual impact assessment

Site	Use of the site, and values of views
Mandorah jetty	Tourism, low density residential
Darwin central business district (view from high-rise building)	Tourism, high density urban and residential
Survivors Lookout, Darwin Wharf precinct	Tourism, heritage
Stokes Hill Wharf, Darwin Wharf precinct	Tourism, heritage
Hilly residential area at Stuart Park	Medium density residential
Harbour foreshore at Tipperary Waters	Medium density residential
Harbour foreshore at Bayview	Medium density residential
Charles Darwin National Park Lookout	Tourism, heritage
East Arm public boat ramp	Tourism, recreation
Planned residential subdivision in Berrimah (highest ground)	Planned medium density residential
Palmerston suburban area (highest ground)	Medium density residential
Planned residential subdivision in Palmerston (highest ground)	Planned medium density residential
Elizabeth River Bridge	Transport, tourism
Planned residential subdivision in Weddell (highest ground)	Planned medium density residential

3 Methodology

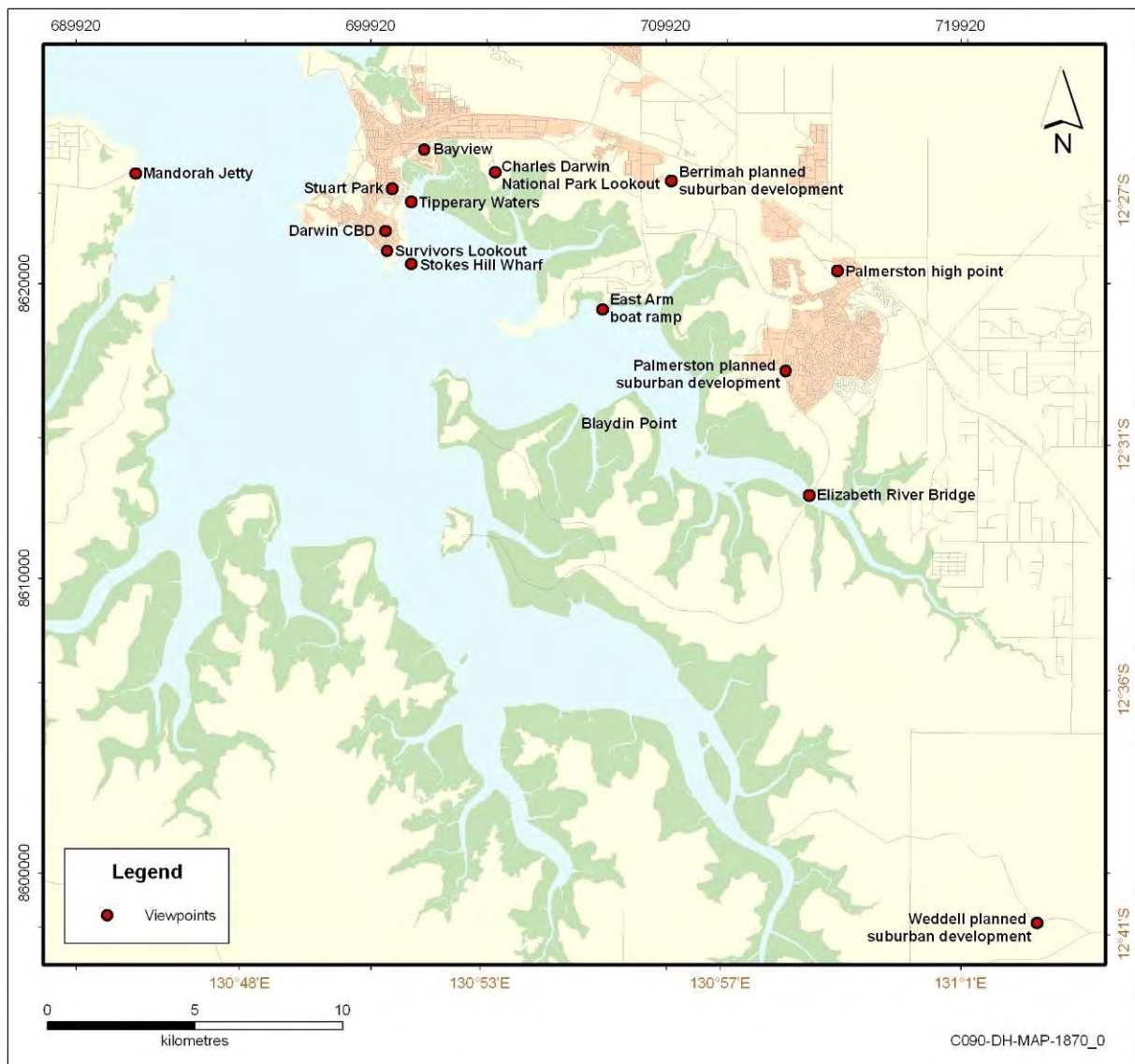


Figure 3-1 Viewpoints considered in the visual impact assessment

3.2 Viewshed analysis

Viewshed analysis identifies areas that are visible from a given location. Computer simulated viewsheds were created using the Viewshed Analysis module in *ArcGIS Version 9.3 Spatial Analyst* based on a detailed digital terrain model. Viewsheds were created for all the viewpoints of interest around Darwin Harbour (Figure 3-1).

The digital terrain model was based on the 1:10 000 orthophoto map sheets supplied by the NT Department of Planning and Infrastructure (DPI), which cover Darwin Harbour and its surrounds from the Cox Peninsula to East Point. Vertical accuracy was to ± 1 m or better, and horizontal accuracy was to 0.5 m or better.

3 Methodology

3.2.1 Pre-processing

The digital elevation model (DEM) utilised in this assessment did not include mangrove areas or the Darwin Wharf Precinct; rather, the coastline in these areas was interpreted from a separate set of coastline data.

The height of vegetation throughout the viewing catchment was modelled using the publicly available National Vegetation Inventory System (NVIS) vegetation mapping. The NVIS vegetation data is thematic and had to be converted to a raster (or grid) format with 10 m resolution. The vegetation mapping was intersected with land use mapping. Developed areas and areas of cleared land in the land use mapping were given zero elevation. The elevations in this combined vegetation–land use map were then added to the DEM to account for the height of woodland vegetation and the screening effect it could provide in the subsequent analysis.

As no 3D models of the proposed EAW development were available at the time of the study, heights of the various features (hardstand areas, jetties, breakwalls, etc) were estimated from the surrounding topographic features, this information was converted to a 3D surface and then to a grid format (10 m resolution) using natural neighbour interpolation in ArcGIS, it was merged with the DEM grid so that the cells from the proposed development would override the cells from the DEM.

The elevations of cells in the DEM model at the viewpoint locations (Table 3-1) were increased by 1.8 m to account for an average person's height in the viewshed analysis.

3.2.2 Site inspections

Site inspections were not carried out as part of this visual impact modelling, however site inspections were carried out at each viewpoint for the proposed INPEX gas plant development looking towards Blaydin Point (adjacent to EAW) to ground-truth the viewshed analysis for the INPEX project. Some discrepancies were identified between the results of the viewshed analysis and the actual vistas from the viewpoints. This was due to buildings or vegetation close to the viewpoint, or inaccuracy in the DEM. For instance, the viewsheds for Charles Darwin Lookout and the Palmerston suburban area suggested that the onshore development area, and hence EAW project, should be clearly visible. However, vegetation at those sites effectively screened Blaydin Point and EAW from view.

As the same viewpoint locations have been used and there have been no major land clearing or land development projects in these areas, it is assumed that the same sites will be screened from the Proposed EAW project.

3.3 Ranking of visual impacts

Visual impact at the various viewpoints was ranked according to the following criteria:

- Distance from the proposed development area;
- Proportion of the view taken up by the proposed onshore and nearshore facilities;
- Number of potential viewers; and
- Values of the viewing area.

Viewpoints from which the proposed development area was visible were broadly considered to be “medium” to “high” impact sites. Viewpoints where the view to EAW was significantly obscured by vegetation, buildings or topography were considered “low” (or “no”) impact sites.

Results

4.1 Viewshed analysis and ground-truthing

The viewshed analysis, showing the viewing catchment for each viewpoint of interest, is presented in Appendix A. Results from this preliminary task suggested that 12 of the total 14 viewpoints would be impacted to some extent by the Project. At the remaining sites the views of EAW were obscured by topography, suggesting no potential impact by the Project.

Previous site inspections (INPEX EIS, 2009) removed a further three viewpoints from the assessment, including the Charles Darwin National Park lookout due to vegetation screening, the planned residential area in Berrimah due to a small hill and the highest point in residential Palmerston due to vegetation. Therefore, the final list of viewpoints that could be impacted by the Project consisted of 9 sites. This process of deduction is presented in Table 4-1 below.

Photographs were taken at each viewpoint during the INPEX site inspections. Photographs that show EAW are presented in Appendix B.

Table 4-1 Development of final list of viewpoints, through viewshed analysis and site inspection

Viewpoint	Viewshed Analysis: East Arm Wharf visible (✓/x)	Site Inspection: East Arm Wharf visible (✓/x)	Site included in final assessment (✓/x)
1 Mandorah Jetty	✓	✓	✓
2 Darwin central business district (view from high - rise building)	✓	✓	✓
3 Survivors Lookout, Darwin Wharf precinct	✓	✓	✓
4 Stokes Hill Wharf, Darwin Wharf precinct	✓	✓	✓
5 Hilly residential area at Stuart Park	✓	✓	✓
6 Harbour foreshore at Tipperary Waters	✓	✓	✓
7 Harbour foreshore at Bay View	✓	✓	✓
8 Charles Darwin National Park Lookout	✓	x	x
9 East Arm public boat ramp	✓	✓	✓
10 Planned residential subdivision in Berrimah (highest ground)	✓	x	x
11 Palmerston suburban area (highest ground)	✓	x	x
12 Planned residential subdivision in Palmerston (highest ground)	x	x	x
13 Elizabeth River Bridge	✓	✓	✓
14 Planned residential subdivision in Weddell (highest ground)	x	x	x

4 Results

4.2 Ranking of viewpoints

Viewpoints from which the proposed development area was visible were broadly considered to be *Medium* to *High* impact sites. Viewpoints where the views to EAW were significantly obscured by vegetation, buildings or topography were considered *Low* or *No* impact sites. The visual impact rankings are presented in Table 4-2 below.

The only site rated “high” impact is the East Arm public boat ramp, as the proposed development would be clearly visible from this viewpoint, over a moderate distance. This view of the Project could potentially be experienced by a large number of people that utilise the boat ramp for recreational fishing, boating, or tourism.

The view from Stokes Hill Wharf in Darwin was rated “medium” impact, as were five other sites. The proposed development area would be visible from these viewpoints, but over relatively long distances and with some partial obstructions to this view. The proportion of the view taken up by the proposed development areas from these distances would be small.

The view from Mandorah, Berrimah and Palmerston (planned residential subdivision) were rated “low” impact, as the distance to East Arm Wharf is very long and would be barely visible. East Arm Wharf is not visible from Weddell, Elizabeth River Bridge, Charles Darwin National Park or from the highest point in Palmerston.

Table 4-2 Ranking of the Project's potential visual impact from affected viewpoints

Site	Values	Comments	Distance (km)	Visibility
1 Mandorah Jetty	Tourism Low-density residential	EAW is visible in the far distance from this location, with no obstructions. The proportion of the view taken up by the Project would be extremely low.	13.5	Low
2 Darwin central business district (view from high-rise building)	Tourism High density urban and residential	The proposed development area is clearly visible without obstruction. Viewers from this aspect may be long-term residents (e.g. apartments or offices).	5.1	Medium
3 Survivors Lookout, Darwin Wharf precinct	Tourism Heritage	Most of EAW is visible; the view is similar in nature to that from Stokes Hill Wharf but with buildings and wharf in the foreground. The long distance decreases the proportion of view taken up by the Project.	4.9	Medium
4 Stokes Hill Wharf, Darwin Wharf precinct	Tourism Heritage	EAW is clearly visible across the water, without obstructions. The distance and perspective reduces the proportion of the view that would be taken up by the Project. This site is considered an important tourism location within central Darwin.	4.3	Medium
5 Hilly residential area at Stuart Park	Medium density residential	EAW is visible from this area, although distant and partly obscured by buildings or vegetation close to the viewpoint.	5.8	Medium
6 Harbour foreshore at	Medium density residential	EAW is clearly visible from this area. The distance and perspective	5.5	Medium

4 Results

Site	Values	Comments	Distance (km)	Visibility
Tipperary Waters		reduces the proportion of the view that would be taken up by the Project.		
7 Harbour foreshore at Bayview Haven	Medium density residential	EAW is visible from this area, although distant and partly obscured by housing and vegetation.	6.4	Medium
8 Charles Darwin National Park lookout	Tourism Heritage	EAW is not visible from this vantage point due to tree cover close to the lookout, which completely obscures the view in that direction.	5.3	None
9 East Arm public boat ramp	Recreation Tourism	EAW is clearly visible, with no obstructions across the water. This is the closest viewpoint to the proposed development area. The proposed defence laydown area and barge landing will be seen from this location.	1.5	High
10 Planned residential subdivision in Berrimah (highest ground)	Planned medium-density residential	EAW is obscured from this viewpoint by a small hill in the middle distance. Some of the Project infrastructure may be partly visible at the sides of this hill.	6.5	Low
11 Palmerston suburban area (highest ground)	Medium-density residential	EAW is completely obscured from this viewpoint by vegetation in the middle-distance.	10.8	None
12 Planned residential subdivision in Palmerston (highest ground)	Planned medium-density residential	This area is vegetated with tall trees. Therefore the view to EAW is heavily obscured for a person standing at ground level.	9.5	Low
13 Elizabeth River Bridge	Transport route Tourism	This viewpoint is relatively close to EAW, but the view is obscured by a hill on Middle Arm and mangrove vegetation in between the bridge and EAW. While there may be a large number of viewers from this angle, most are likely to be very transient (i.e. in vehicles travelling across the bridge), reducing the viewing time.	11.7	None
14 Planned residential subdivision in Weddell (highest ground)	Planned medium-density residential	EAW is not visible from this vantage point due the landform (hills) and vegetation in that direction. The distance to East Arm Wharf from this site is large, at around 25 km.	25	None

Impacts and Management options

5.1 Vegetated buffers

Retaining a strip of naturally occurring vegetation around as much of the proposed development area will “buffer” the visual impact of the site to receivers at some viewpoints, (e.g. around the proposed rail loop). Some of the proposed infrastructure (such as cranes) will be taller than the existing tree line and will not be completely hidden, but the retention of vegetation in the foreground (when viewed from the east) will reduce the otherwise stark contrast between the proposed development area and surrounding undeveloped mangrove coastline. However, it is recognised that the nature of the proposed infrastructure (jetty’s and wharfs) precludes the retention of shoreline vegetation around some parts of the proposed development area, and that these areas would need to be cleared of vegetation.

5.2 Lighting

Light from the proposed development areas will be attenuated to some extent over the 4-km distance to Palmerston, and 10-km distance to the Darwin central business district.

Infrastructure could be finished with a matt or anti-reflecting surface to minimise glare from the sun to the surrounds during daylight hours.

5.3 Air emissions

Visual impact should be considered when developing air emissions management controls for the Project. The possible negative impact of smoke and dust on the viewshed around East Arm Wharf (and further offsite) may be reduced through actions such as:

- Committing not to burn vegetation;
- Controlling dust by wetting down exposed surfaces during dry weather; and
- Conducting clearing work in stages, where practicable, to minimise total exposed area.

Acknowledgements

Viewshed Photographs

Visual Assessment site photographs of Darwin Harbour, taken in 2009 for the INPEX proposed gas plant development EIS on Blaydin Point, INPEX, Perth WA.

Limitations

URS Australia Pty Ltd (URS) has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of Northern Territory Government Department of Lands and Planning and only those third parties who have been authorised in writing by URS to rely on the report. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the Proposal dated 4 August 2010.

The methodology adopted and sources of information used by URS are outlined in this report. URS has made no independent verification of this information beyond the agreed scope of works and URS assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to URS was false.

This report was prepared between December 2010 and February 2011 and is based on the conditions encountered and information reviewed at the time of preparation. URS disclaims responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

Appendix A Viewshed analyses

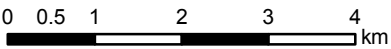
Contents

1. Mandorah jetty
2. Darwin central business district (high-rise building)
3. Survivors Lookout, Darwin Wharf precinct
4. Stokes Hill Wharf, Darwin Wharf precinct
5. Hilly residential area at Stuart Park
6. Harbour foreshore at Tipperary Waters
7. Harbour foreshore at Bayview
8. Charles Darwin National Park Lookout
9. East Arm public boat ramp
10. Planned residential subdivision in Berrimah (highest ground)
11. Palmerston suburban area (highest ground)
12. Planned residential subdivision in Palmerston (highest ground)
13. Elizabeth River Bridge



Legend

- Viewshed Location
- Project Location
- Area Visable from Viewshed Location



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Client
**Department of Planning
and Infrastructure**

Project
**EAST ARM WHARF
EXPANSION PROJECT
VISUAL IMPACT ASSESSMENT**

Title
MANDORAH JETTY

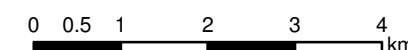
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Legend

-  Viewshed Location
-  Project Location
-  Area Visible from Viewshed Location



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Client Department of Planning and Infrastructure
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Project EAST ARM WHARF EXPANSION PROJECT VISUAL IMPACT ASSESSMENT
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Title DARWIN CENTRAL BUSINESS DISTRICT (HIGH-RISE BUILDING)
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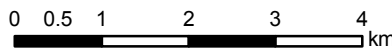
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Legend

-  Viewshed Location
-  Project Location
-  Area Visible from Viewshed Location



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Project EAST ARM WHARF EXPANSION PROJECT VISUAL IMPACT ASSESSMENT
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Title SURVIVORS LOOKOUT DARWIN WHARF PRECINCT

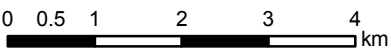
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Legend

-  Viewshed Location
-  Project Location
-  Area Visible from Viewshed Location



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Client Department of Planning and Infrastructure
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Project EAST ARM WHARF EXPANSION PROJECT VISUAL IMPACT ASSESSMENT
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Title STOKES HILL WHARF DARWIN WHARF PRECINCT

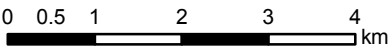
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Legend

-  Viewshed Location
-  Project Location
-  Area Visible from Viewshed Location



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Client Department of Planning and Infrastructure
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Project EAST ARM WHARF EXPANSION PROJECT VISUAL IMPACT ASSESSMENT
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Title HILLY RESIDENTIAL AREA AT STUART PARK

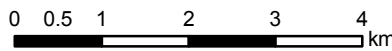
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Legend

-  Viewshed Location
-  Project Location
-  Area Visible from Viewshed Location



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Client Department of Planning and Infrastructure
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Project EAST ARM WHARF EXPANSION PROJECT VISUAL IMPACT ASSESSMENT
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Title HARBOUR FORESHORE AT TIPPERARY WATERS

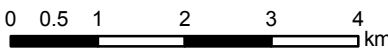
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Legend

-  Viewshed Location
-  Project Location
-  Area Visible from Viewshed Location



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Project EAST ARM WHARF EXPANSION PROJECT VISUAL IMPACT ASSESSMENT
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Title HARBOUR FORESHORE AT BAYVIEW
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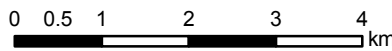
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Legend

-  Viewshed Location
-  Project Location
-  Area Visible from Viewshed Location



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Project
**EAST ARM WHARF
EXPANSION PROJECT
VISUAL IMPACT ASSESSMENT**

Title
**CHARLES DARWIN NATIONAL
PARK LOOKOUT**

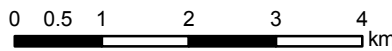
Figure: Rev: A
A3





Legend

- Viewshed Location
- Project Location
- Area Visible from Viewshed Location



Drawn: JD Approved: JVRB Date: FEB 2011

Job No: 42214000 File No: 42214000-VS-015.mxd

Client
**Department of Planning
and Infrastructure**

Project
**EAST ARM WHARF
EXPANSION PROJECT
VISUAL IMPACT ASSESSMENT**

Title
**NEW EAST ARM
PUBLIC BOAT RAMP**

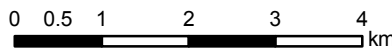
Figure: Rev: A
A3





Legend

-  Viewshed Location
-  Project Location
-  Area Visible from Viewshed Location



Drawn: JD Approved: JVRB Date: FEB 2011

Job No: 42214000 File No: 42214000-VS-001.mxd

Client
**Department of Planning
and Infrastructure**

Project
EAST ARM WHARF
EXPANSION PROJECT
VISUAL IMPACT ASSESSMENT

Title
PLANNED RESIDENTIAL
SUBDIVISION IN BERRIMAH
(HIGHEST GROUND)

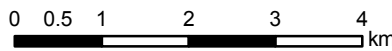
Figure: Rev: A
A3





Legend

-  Viewshed Location
-  Project Location
-  Area Visible from Viewshed Location



Drawn: JD Approved: JVRB Date: FEB 2011

Job No: 42214000 File No: 42214000-VS-011.mxd

Client
**Department of Planning
and Infrastructure**

Project
EAST ARM WHARF
EXPANSION PROJECT
VISUAL IMPACT ASSESSMENT

Title
PALMERSTON SUBURBAN AREA
(HIGHEST GROUND)

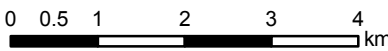
Figure: Rev: A
A3





Legend

- Viewshed Location
- Project Location
- Area Visible from Viewshed Location



Drawn: JD Approved: JVRB Date: FEB 2011

Job No: 42214000 File No: 42214000-VS-002.mxd

Client
**Department of Planning
and Infrastructure**

Project
EAST ARM WHARF
EXPANSION PROJECT
VISUAL IMPACT ASSESSMENT

Title
PLANNED RESIDENTIAL
SUBDIVISION IN PALMERSTON
(HIGHEST GROUND)

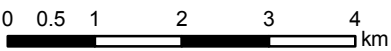
Figure: Rev: A
A3





Legend

-  Viewshed Location
-  Project Location
-  Area Visible from Viewshed Location



Drawn: JD Approved: JVRB Date: FEB 2011

Job No: 42214000 File No: 42214000-VS-013.mxd

Client
**Department of Planning
and Infrastructure**

Project
EAST ARM WHARF
EXPANSION PROJECT
VISUAL IMPACT ASSESSMENT

Title
ELIZABETH RIVER BRIDGE

Figure: Rev: A
A3



Appendix B Viewpoint photographs

Contents

1. Mandorah jetty
2. Darwin central business district (high-rise building)
3. Survivors Lookout, Darwin Wharf precinct
4. Stokes Hill Wharf, Darwin Wharf precinct
5. Hilly residential area at Stuart Park
6. Harbour foreshore at Tipperary Waters
7. Harbour foreshore at Bayview
8. Charles Darwin National Park Lookout
9. Planned residential subdivision in Berrimah (highest ground)
10. Palmerston suburban area (highest ground)
11. Planned residential subdivision in Palmerston (highest ground)
12. Elizabeth River Bridge

Note: A photograph from the planned residential subdivision in Weddell (south of Palmerston) was considered unnecessary due to the very long distance between this viewpoint and the proposed development area, and the hills and vegetation obstructing the view in that direction.

A photograph of the East Arm Boat ramp has been omitted as it is angled towards Blaydin Point and does not show the East Arm Wharf area.



Figure 1: View from Mandorah Jetty towards Blaydin Point



Figure 2: View from Darwin central business district (view from high-rise building) towards Blaydin Point



Figure 3: View from Survivors Lookout, Darwin Wharf precinct towards Blaydin Point



Figure 4: View from Stokes Hill Wharf, Darwin Wharf precinct towards Blaydin Point



Figure 5: View from hilly residential area in Stuart Park towards Blaydin Point



Figure 6: View from harbour foreshore at Tipperary Waters towards Blaydin Point



Figure 7: View from harbour foreshore at Bayview towards Blaydin Point



Figure 8: View from Charles Darwin National Park Lookout towards Blaydin Point



Figure 9: View from Planned residential subdivision in Berrimah (highest ground) towards Blaydin Point



Figure 90: View from Palmerston suburban area (highest ground) towards Blaydin Point



Figure 101: View from planned residential subdivision in Palmerston (highest ground) towards Blaydin Point



Figure 112: View from Elizabeth River Bridge towards Blaydin Point



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