3

Alternatives

A number of alternatives to various aspects of the proposed development were considered during concept development. These included locations for the development, locations of various components within the favoured project location, scenarios for port facilities development, alternatives to foreshore reclamation, dredge methodology and dredge spoil management, sources of raw materials, and environmental management techniques for moderate or higher risk impacts.

3.1 Project Location

The number of sites suitable for large scale deep water port development in the vicinity of Darwin is limited. East Arm, located in the Port of Darwin, was designated for this type and scale of development prior to the development of the current wharf facility (Acer Vaughan, 1993). The EAW is classified as DV (Development) Zone in the NT Planning Scheme (NTG, 2010) and the suitability of the location from a planning perspective is detailed in Chapter 4.

East Arm was selected for the location of the expanded port facility because of the existing deep water port infrastructure present at the site. The environmental and social impacts of further developing an existing industrial site are considerably less than for a 'Greenfields' (i.e. previously undeveloped) site. The close proximity of East Arm to Darwin, Palmerston, and the Darwin-Adelaide rail line will also decrease the operational impacts of the development, relative to a location further from Darwin. If the EAW was replaced by a facility in a new location, there would also be significant impacts and costs associated with decommissioning of the existing site, as well as impacts associated with the new site.

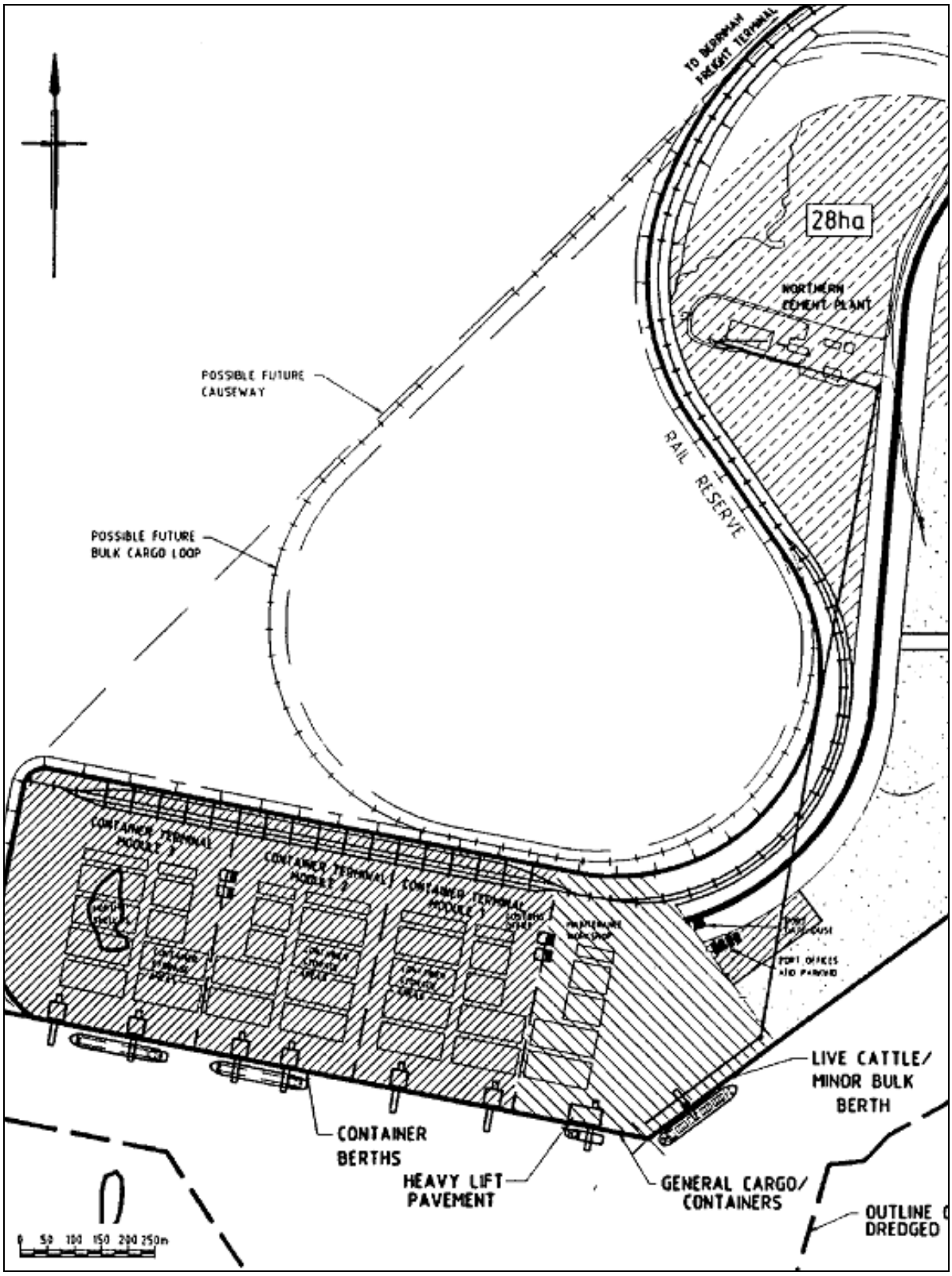
A site at Glyde Point on the Gunn Point Peninsula has previously been assessed for potential large scale industrial development including a deep water port facility (KBR, 2003). Relative to Glyde point, the impacts of a deep water port at East Arm are smaller in scale, as the site is already disturbed. East Arm is also well placed between Darwin and Palmerston (refer Figure 1-1), access to East Arm is considerably easier, and necessary ancillary infrastructure is already in place.

3.2 Alternative Scenarios for Port Facilities

With the existing East Arm site confirmed as the optimum location for the proposed development, various design permutations were investigated and assessed. The locations of the MSB, barge ramp, and tug / small vessel berths were selected primarily because of access to water of sufficient depth, access to road infrastructure, and sufficient space for hardstand and storage areas. Although the proposed location of the MSB is confirmed, it is noted that the MSB layout is subject to amendment by the successful proponents (i.e. the future MSB operators).

The DEIS for the current EAW development (Acer Vaughan, 1993) contemplated a rail loop to facilitate bulk unloading and carriage manoeuvring / shunting activities (refer to Figure 4-1). The location of the loop was originally proposed to be adjacent to the container berth and storage area of the wharf structure, on reclaimed land to the south of Northern Cement and west of Berrimah Road. A similar loop location is also depicted in the BHP Billiton (2009) EIS for the proposed expansion of Olympic Dam Project.

3 Alternatives



Source: Acer Vaughan, 1993

Figure 3-1 Rail loop concept design proposed in 1993 EAW EIS

Siting of the proposed project components, including the rail loop, has been designed so as to minimise the dredging required. The proposed rail loop has therefore been relocated to existing land to the north of Berrimah Road (refer to Chapter 2 and Figure 2-1 for more details).

An alternative to the proposed rail loop, namely a single rail spur adjacent to the existing track, was also considered. This option was discounted, however, due to infrastructure constraints. If a spur is constructed instead of a loop, trains would be required to reverse out of the EAW, based on the current development scenario. A spur arrangement would therefore be less efficient than a rail loop.

3.3 Alternative Dredging Methods and Dredge Spoil Reuse / Disposal

Locations of project components and related channels have been selected with the objective of minimising the volume of dredging required. This objective limits alternative dredging locations, as any realistic alternatives would involve greater dredging volumes. The duration of the dredging program could be reduced, however, by increasing the size of the dredging fleet mobilised. The specific selection of dredging equipment to be utilised is also yet to be finalised.

Reuse and disposal of dredged material will be undertaken in accordance with the Dredging and Spoil Management Framework for Darwin Harbour (AECOM, 2009a). This Framework identifies the following guiding principles relating to reuse and disposal of dredged spoil:

- Maintain consistency with strategic planning
- Manage Impacts on the natural environment
- Maximise beneficial reuse of dredged material
- Maximise social / economic benefit from dredging and spoil management activities

In addition to the above principles, the reuse / disposal strategy is influenced by practical considerations including the quantity and characteristics of dredged material, location of dredging relative to reuse / disposal sites, accessibility of the dredging sites to various dredging equipment, and the availability of alternative fill materials. All of these factors, and the requirements of the dredging Framework (AECOM, 2009a), will be considered when determining the final disposal and reuse arrangement.

A draft DMP has been prepared for the proposed EAW expansion and is included as **Appendix B** and summarised in Chapter 27. It details the size of the dredge fleet, the types of dredging equipment most suitable for this project, and reuse / disposal of dredged material. The draft DMP submitted with this DEIS discusses the currently preferred scenario; the proponent may however investigate other alternatives to the dredging processes described within.

One option that may be further investigated is dredging and temporary storage of the spoil into Darwin Harbour prior to disposal at the INPEX Icthys Gas Field Development Project dredge spoil disposal ground (INPEX Browse, 2009). Further exploration of this strategy will be dependent on timing requirements, specifically whether dredging of channels must be undertaken prior to the commencement of other project components. Under this scenario, spoil would be temporarily deposited at a relatively deep section of Darwin Harbour, where it is less likely for the material to be reincorporated into currents. It would later be reclaimed and disposed of offshore after other works have been completed.

Another alternative that may be further explored involves disposal of dredging material in the existing ponds at EAW and disposal of excess dredge material at the INPEX Icthys Gas Field Development Project dredge spoil disposal ground (INPEX Browse, 2009).

Both these options may be further explored under the DMP. Any further investigation of the alternative dredging scenario described would include modelling (similar to that undertaken for the existing proposed methodology – refer Chapter 8 and Appendix B). This work, if undertaken, would be included in the Supplement to the DEIS.

3.4 Alternative Sources of Raw Materials for the Project

A RLO Study conducted by Aurecon (2011) found that efficient and practicable options for sources of raw materials within the vicinity of Darwin, specifically materials for filling, reclamation, and bund construction, are limited. Quarry material for armouring of bunds is likely to be sourced from the quarries utilised for the recent INPEX wharf development at Middle Arm (refer to Chapter 2).

Fill material will be sourced from onsite as much as is practicable, particularly from dredging activities where possible.

The Phyllite material expected to occur within the EAW expansion areas is considered unlikely to be an ideal reclamation filling material (AECOM, 2009b). This is because Phyllite in the Darwin harbour is typically weathered, weak and friable (URS, 2004). It is noted by AECOM (2009b), however, that Phyllite material from Darwin Harbour has previously been used as fill for the EAW Stage 1 development. It may be possible to utilise excavated Phyllite for some filling / reclamation purposes, but the extent to which it is possible will not be confirmed until construction is underway. Dredged material which is not reused will be disposed of to sea at the dredge spoil disposal ground proposed by INPEX for the Icthys Gas Field Development Project (INPEX Browse, 2009).

Construction / demolition waste from the Darwin area will also be utilised for filling and / or armouring where possible, depending on the chemical and physical suitability of the material.

Final sources of material will be determined by the contractors responsible for construction of the proposed development.

3.5 Alternative Management Techniques for Moderate to High Impacts

All potential environmental and social aspects associated with the project have been subject to a risk assessment process, in order to identify key aspects. The risk assessment process has identified the key environmental and social impacts associated with those aspects (refer Chapter 25).

Alternative management techniques have been considered for moderate to high impacts, adopting the following hierarchy of impact mitigation strategies:

- Impact avoidance
- Impact assessment
- Impact minimisation
- Identification of mitigation measures
- Assessing mitigation measure effectiveness
- Mitigation plan selection
- Monitoring and adaptive management.

3.6 Consequences of Adopting the "No Development" Option

The main alternative considered was not proceeding with the proposed expansion of the EAW. The objective of the proposed development, however, is to increase operational efficiency as trade and traffic volumes have increased since the current EAW format was developed, and to facilitate growth and operational efficiency as trade and traffic grow in the future, as forecast.

The increased operational efficiency associated with the proposed EAW expansion, and associated facilitation of increased trade volumes, will have positive effects on the local, regional and national economy. If the proposed development does not go ahead, the opportunity of these positive effects on the local, regional and national economy will be lost.

It should also be noted that DPC has consulted with existing NT barge operators and identified the need for a new barge ramp and dedicated storage facility. Defence demand for an additional ramp associated with the introduction of new amphibious vehicles has also been identified.

For the above reasons, the 'do nothing' option is not considered a viable alternative.

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