



Government of **Western Australia**
Department of **Industry and Resources**

NDT

Northern Development Taskforce
Final Site Evaluation Report

December 2008

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1. Foreword

The then Government of Western Australia established the Northern Development Taskforce in June 2007. The scope of the Taskforce included negotiation and coordination of issues associated with development of Browse Basin gas reserves.

The role of the Taskforce has been to manage across-government planning processes and stakeholder consultation regarding the selection and development of a suitable location or locations for the establishment of an LNG processing precinct in the Kimberley.

The Taskforce released an Interim report in July 2008 which detailed the process and criteria to be used in the selection of a preferred site and provided a preliminary technical assessment of 43 sites previously identified by industry and Government as having some potential for development. The Interim report recommended eleven sites for further evaluation of their suitability, based on an analysis of technical and environmental constraints identified at each site. The site evaluation criteria were subject to a public comment period.

In October 2008 a two-part Site Evaluation Report was released, along with over fifteen hundred pages of appendices consisting of environmental reports, data, maps and Taskforce working documents. The reports were prepared following comprehensive site evaluation and stakeholder consultation involving over one hundred people with professional expertise in oil and gas, the environment, heritage, fishing, pearling, planning, tourism and Aboriginal culture. The reports recommended four sites, all of which were supported by the Traditional Owners, for further evaluation as having the potential to be used as a site for a multi-user LNG processing precinct.

The Site Evaluation report was subject to a public comment period with 243 written and 46 verbal submissions received. The Taskforce responded to the issues raised and provided all documentation to the Environmental Protection Authority (EPA) for advice under the *Environmental Protection Act 1986* (WA) in accordance with the Strategic Assessment Agreement entered into between the State and Commonwealth Governments in February 2008.

During this period, the Taskforce continued to evaluate the four sites, engaging WorleyParsons Services Pty Ltd to undertake geo-technical assessments of the sites, completing environmental studies and holding further consultations with industry, the Kimberley Land Council, Aboriginal communities and local Government.

The release of this final Site Evaluation Report concludes a key element of the process. Attention will now turn to completion of a full environmental assessment of the preferred site, regional impact assessments, heritage surveys and negotiations over land tenure.

Anne Nolan
Chair, Northern Development Taskforce

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2. Executive Summary

The purpose of the Northern Development Taskforce (NDT) *Preferred Kimberley Site Selection Report* is to make recommendations on the nomination of a preferred location in the Kimberley for the establishment of a multi-user LNG processing precinct.

This report has been prepared subsequent to the public release of the section 16e advice provided to the Western Australian Minister for the Environment under the Strategic Assessment provisions of the Western Australian *Environmental Protection Act 1986 (WA)* (EP Act)

The NDT, in addition to receiving the advice of the EPA, has drawn from studies commissioned from WorleyParsons Services on the geotechnical suitability of sites and their analysis of alternative development options outside the Kimberley and from the continuing assessment activities of State and Commonwealth government agencies.

The NDT acknowledges the evaluation of environmental constraints detailed in the EPA advice which is consistent with the further analysis of the previously short-listed sites outlined in this report.

The NDT recognises the potential impact of the proposed development on Aboriginal communities, culture and heritage and supports the early identification of the preferred site to ensure sufficient time is available to comprehensively assess social impacts, and gain a full understanding of the heritage significance of the site and its environment.

The comparison of sites has for the first time included a preliminary assessment of the economic viability of the sites alongside those criteria used in the site evaluation process. This is contextualised in Figure 1 below:

Location	Technical		Economic	Environment		Heritage		Indigenous Impact	Socio - Economic
	Marine	Terrestrial		Marine	Terrestrial	Natural	Indigenous		
Anjo Peninsula	GREEN	GREEN	RED	GREEN	ORANGE	RED	ORANGE	GREEN	ORANGE
North Head	ORANGE	ORANGE	GREEN	RED	ORANGE	ORANGE	ORANGE	RED	ORANGE
James Price Point	ORANGE	GREEN	ORANGE	ORANGE	GREEN	ORANGE	ORANGE	ORANGE	ORANGE
Gourdon Bay	RED	ORANGE	RED	GREEN	GREEN	GREEN	ORANGE	ORANGE	GREEN

RED	Significant constraints
GREEN	Limited constraints
ORANGE	Constrained but manageable

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In the NDT's assessment, and consistent with the section 16e advice of the EPA, the James Price Point location offers a responsible balance between likely environment and heritage constraints, social impacts and the development of the Browse Basin gas resource. This site should be the subject of a Strategic Assessment process to be submitted to the EPA and the Commonwealth Department of the Environment, Water, Heritage and Arts (DEWHA).

The NDT notes that should a development proceed at James Price Point, consideration will need to be given to the impact on Broome as a major tourism destination.

3. Recommendations

The NDT recommends the nomination of the James Price Point coastal area as the preferred location for a Kimberley LNG processing precinct. In nominating this area the NDT further recommends that Aboriginal heritage and geotechnical studies are undertaken to assist in determining a final site for the industrial precinct, port facilities and other multi-user infrastructure.

The NDT recommends that North Head be considered as an alternative site to James Price Point for a limited LNG processing development in the event that the James Price Point coastal area has unforeseen technical limitations that would preclude the establishment of a multi user LNG processing precinct.

4. Background

The Browse Basin is a large (180,000km²) basin located within the Australian North West Shelf. It is divided into four sub-basins. Some 29 exploration permits are currently in force in the Browse Basin locality. Internal government analysis suggests that the potential gas reserves for the Basin are reasonably expected to exceed those in the North West Shelf with current reserves estimated at 27.5 Trillion cubic feet (Tcf) of gas and in excess of some 600 million barrels of condensate.

The Browse LNG development operated by Woodside Energy Limited (WEL) involves the development of three offshore gas-condensate fields in the Browse Basin, being Torosa, Brecknock and Calliance (as well as a related exploration well). Current estimated contingent resource for the three fields is approximately 18Tcf of gas and 300 million barrels of condensate.

WEL is scheduled to decide its choice of location as to where it will process its Browse Basin gas reserves by late January 2009 (either the Burrup Peninsula or a Kimberley coastline site) and make a financial investment decision in 2010. The processing of gas is likely to occur within the period 2013-2015.

The Ichthys Joint Venture (Inpex) plans to develop the Ichthys gas and condensate field, which is located in the Browse Basin approximately 440 km north of Broome, and has current estimated recoverable resource of approximately 9.5Tcf of gas and 312 million barrels of condensate and LPG.

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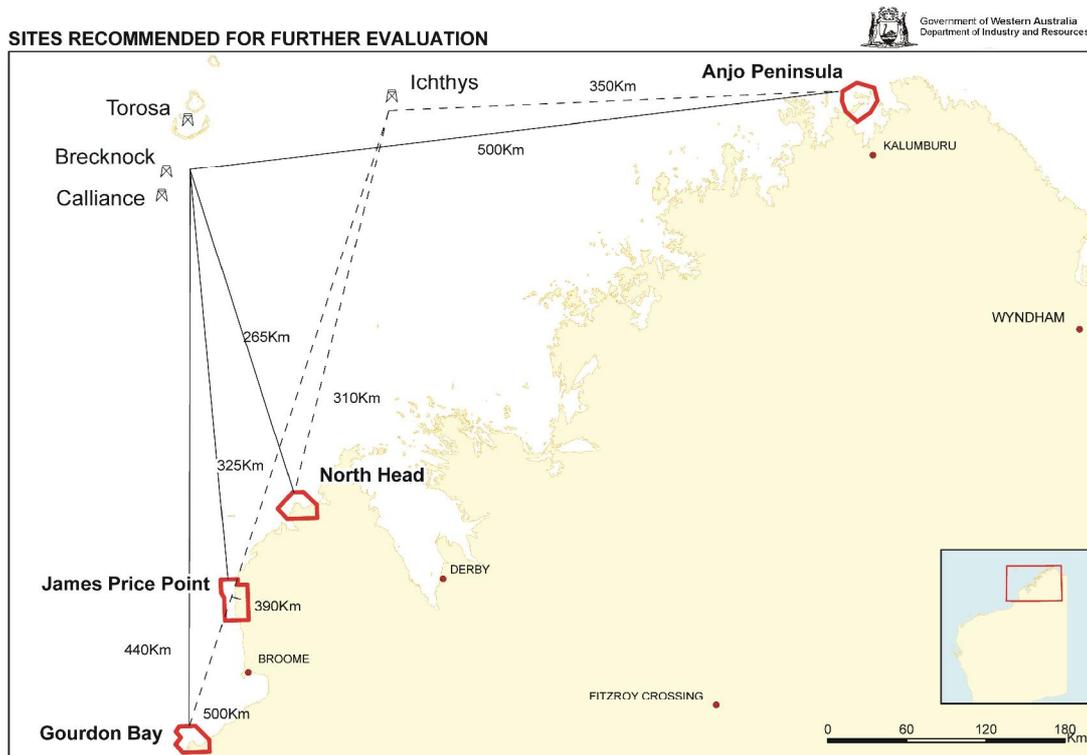
Inpex has recently announced that its choice of location for processing gas from its Ichthys gas field is to pipe it (sub-sea) to Darwin.

The establishment of a single LNG processing precinct on the Kimberley coast is intended to provide the location and common-user infrastructure required to ensure the efficient development of the Browse Basin gas reserves, the ability to prevent the costly duplication of ports, airports and accommodation, and a means to limit environmental and heritage impacts on the Kimberley.

Since July 2007 the NDT has undertaken a thorough assessment of more than 40 potential LNG precinct locations in the Kimberley region. Following extensive public and government consultation with all affected stakeholders the NDT released its Interim Report on 4 July 2008. This report identified eleven (11) of these sites for further evaluation of technical, environmental and heritage issues.

After further extensive evaluations and stakeholder workshops the NDT released its Site Evaluation Report on 15 October 2008 which identified four (4) potential sites for an LNG precinct in the Kimberley:

- Gourdon Bay (situated south of Broome)
- James Price Point (located on the Dampier Peninsula);
- North Head (located on the Dampier Peninsula); and
- Anjo Peninsula (situated in the far north of WA)



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The NDT site evaluation has been conducted as an open and transparent process allowing the active participation of all major stakeholders. The NDT facilitated the release of information to the public through the NDT website (www.doir.wa.gov.au/ndt) in the form of published NDT reports, GIS data and maps, NDT commissioned independent environmental research and relevant studies provided to the NDT by other agencies.

The NDT has released seven significant environmental research papers and two technical reports and has contributed to ongoing studies on Whale migration and Dugong habitats. The NDT has also established off-shore met-ocean and on-shore meteorological data collection stations to assist with the modelling of environmental impacts.

The public consultation process has included two public comment periods following the release of the NDT Interim Report (June 2008) and the Site Evaluation Report Parts A & B (September 2008) and this has been supplemented by ongoing meetings with stakeholders, community meetings, public meetings and the Aboriginal consultation process facilitated by the Kimberley Land Council (KLC).

5. Summary of Site Comparisons

The following dot point summary highlights the key opportunities and constraints for each of the short listed sites:

Anjo Peninsula

Technical attributes and constraints:

- significant distance to gas field requiring long pipeline
- natural harbour with access to deep water close to site
- suitable for multiple port facilities
- close to markets reducing shipping distances
- suitable geo-technical conditions for the construction of multiple LNG plants
- existing airstrip and off-shore support infrastructure

Environmental and heritage sensitivities:

- within a region of likely national heritage value
- considered part of Kimberley wilderness
- area of high biodiversity

Socio – economic sensitivities:

- remote site with no road access
- within wilderness tourism region
- limited positive impact on broader Kimberley economy due to isolation
- site supported by Traditional Owners
- fly in/fly out workforce operation

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Conclusion – key insights

- A technically suitable site that is unlikely to be economically viable to develop and operate as an LNG precinct.
- Location supported by Traditional Owners indicating a capacity to manage Aboriginal heritage impacts, however, the LNG precinct operations could impact on national heritage values to be found in the immediate region.
- Community and government concern about opening up of the north Kimberley to industrial development.

North Head

Technical attributes and constraints:

- closest proximity to the Browse Basin gas field
- access to deep water close to the coast
- exposed coastline requiring a breakwater
- limited access to port facilities due to narrow headland
- unstable coastal geology and collapsing pindan soils
- elevated site with good protection from surge tide events

Environmental and heritage sensitivities:

- situated on the southern end of the whale calving / resting grounds
- Aboriginal cultural and heritage significance
- relative complexity and diversity of benthic habitats

Socio – economic sensitivities:

- close proximity to Aboriginal outstations and communities
- Aboriginal Reserve lands with existing long term leases
- close proximity to ecotourism, pearling and fishing activities
- limited community / social infrastructure
- industrialisation of northern Dampier Peninsula

Conclusion – key insights

- A technically difficult site that has the advantage of being the closest to the Browse Basin gas field and requires only limited dredging for the port.
- The North Head location may also assist with the potential for CO2 sequestration.
- Environmental approval conditions applied to this site are likely to constrain the scale and operations of the precinct and limit its effectiveness.
- Potential dislocation of people from outstations in proximity to the site has reduced Aboriginal support for the precinct at this location.

James Price Point

Technical attributes and constraints:

- significant elevated land areas that can accommodate multiple gas

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- access to deep water requiring major dredging
- exposure to cyclonic weather conditions impacting on port design and operability - need for breakwater
- close proximity to existing critical infrastructure (roads, ports, airport)

Environmental and heritage sensitivities:

- Aboriginal cultural and heritage significance (song line and sites)
- capacity to manage impacts to heritage sites through flexibility in the placement of industrial infrastructure
- interference with drainage lines, potentially altering surrounding vegetation/habitats; significance of vine thickets
- relatively limited biodiversity in marine and terrestrial environment

Socio – economic sensitivities:

- close proximity to Broome with potential benefits to local business
- potential negative impact on housing and accommodation in Broome
- potential impact on pearling and tourism industry
- close to social and community infrastructure
- vacant crown land

Conclusion – key insights

- A good site terrestrially offering flexibility of location to assist with optimisation of port access while also allowing for design solutions that may limit impact on Aboriginal heritage sites.
- Distance to the gas field and to deep water will significantly increase the cost of the pipelines and port infrastructure
- The close proximity to Broome will require the management of potential negative impacts on other industries, social infrastructure, housing and Broome’s reputation as a tourist destination
- Aboriginal heritage in the area will need comprehensive protection

Gourdon Bay

Technical attributes and constraints:

- land area that can accommodate multiple gas operators
- significant distance to gas field requiring long pipeline and gas compression
- access to deep water requiring major dredging and a long jetty
- exposure to cyclonic weather conditions impacting on port design and operability - need for breakwater
- limited access to port facilities due to narrow headland

Environmental and heritage sensitivities:

- situated close to sensitive coastal wetlands
- potential interference with drainage lines and freshwater soak
- area more prone to cyclone risks
- Aboriginal cultural and mythological significance

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Socio – economic sensitivities:

- close proximity to Aboriginal communities and outstations
- priority location for the pearling industry
- distance from Broome may lead to duplication of infrastructure

Conclusion – key insights

- A technically constrained site, at such a distance from the gas fields that it is uneconomic to develop the site as a precinct in comparison with alternative locations within the Kimberley or at existing brownfield sites outside the Kimberley.
- Environmental impacts of using this site are expected to be the lowest of the short-listed sites but the location and surrounding area is considered critical to the sustainability of the pearling industry.
- Aboriginal communities are in close proximity to the site and have determined exclusive possession native title rights over the area.

6. Scope of the proposed LNG processing precinct

The Gaffney Cline and Associates (GCA) *Browse Basin Gas Development Options Study* estimated that, based on discovered and estimated undiscovered gas, the Browse Basin could support production of up to 35 Mtpa – 50Mtpa of LNG. Approximately 3.5Mtpa of this total is expected to be processed off-shore by Shell using floating LNG infrastructure and the Browse Joint Venture (Woodside) propose the production on-shore of 15MTpa using two or three LNG trains with long term expansion plans for a third or fourth train (20-25Mtpa total). In addition the Ichthys Joint Venture (Inpex) intends to develop two LNG trains producing 8.4Mtpa, with Darwin as the preferred location for the on-shore processing plant.

It would appear from the known prospectivity of the field and industry's current commitment to choosing alternative processing locations outside of the Kimberley or off-shore, that the precinct would be unlikely to attract more than two gas processors operating no more than 6-8 LNG trains in total.

The LNG precinct will also produce limited amounts of LPG and condensate which will require appropriate storage and port infrastructure. The bulk of condensate production is expected to be shipped from primary processing platforms off-shore.

The GCA study also considered the potential of establishing downstream processing within the proposed LNG precinct inclusive of a gas-to-liquids plant, a methanol plant and an ammonia plant. The land area estimated for the required infrastructure for downstream processing was 300 hectares.

Anjo Peninsula has been identified by industry as a potential site in the longer term for the export or processing of mineral resources.

Of the four sites, James Price Point and Anjo Peninsula have the port capacity and land area to support downstream processing. North Head and Gourdon Bay, due to constricted port access, are more suited to a limited

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Pipeline access to the LNG Processing precinct site

The LNG processing precinct will receive gas from the upstream gas infrastructure via an underwater pipeline or pipelines. Companies intending to process gas at the precinct through their own gas trains will run their own pipelines to the precinct. Smaller gas fields may be developed by sending the gas to the upstream off-shore primary processing platforms before it is sent down an existing gas pipeline for processing in the precinct under third party processing arrangements.

Technically the gas pipeline needs to be laid in water of a consistent depth favouring sites closer to deep water. The southern two sites, James Price Point and Gourdon Bay are less viable in this regard than Anjo Peninsula and North Head due to the variable depth and shallowness of waters off the coast near their location. A potential remediation of this disadvantage would be to bring the gas on-shore at a point closer to the gas field and deep water and run it overland to the precinct site. An on-shore pipeline should if possible run along existing road easements to minimise environmental and community impacts.

In preparing the master plan for the LNG processing precinct the NDT will identify the pipeline access easements required for all future users.

7. Environmental Assessment – Site Evaluation

Strategic Assessment process

The site evaluations were conducted in accordance with the procedure and criteria outlined in the Strategic Assessment Agreement (SAA) entered into between the Commonwealth and Western Australian Governments.

The SAA is being facilitated by the NDT under the provisions of the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and the strategic assessment provisions of the Western Australian Environmental Protection Act 1986 (EP Act) through a concurrent and collaborative process.

The SAA required the NDT to publish a report on the site evaluation process and recommendations prior to the provision to the Western Australian Minister for the Environment of Section 16e EP Act advice from the Environmental Protection Authority (EPA) and separate advice from the Commonwealth Department of Environment, Water, Heritage and the Arts (DEWHA) on matters of national environmental significance.

The EPA Section 16e advice was released publicly on Friday 19 December 2008.

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The EPA noted the purpose of their current advice is to provide the EPA's early environmental advice in relation to the Western Australian Government's site evaluation process based on the objective of establishing an LNG processing multi-user precinct in the Kimberley to service the development of the Browse Basin gas fields.

The EPA stated that 'the Kimberley region of Western Australia is largely undeveloped and is recognised as having significant environmental, wilderness and heritage values. Much of it is considered to be iconic'.

In framing its advice the EPA has taken into account that once established the site is likely to attract further large proposals in the future. Hence, in providing its views it has considered not only attributes of the short listed sites but also the wider implications of selecting a site. It has also considered the context of the site and expandability beyond 1000 hectares.

The EPA strongly supports focussing development at a single site so that environmental impacts can be contained and operational efficiencies maximised in ways that will minimise environmental impacts.

The EPA also noted the range of public submissions on sites outside the Kimberley and indicated that the Section 16e advice is focussed primarily on those short listed sites included in the NDT Site Evaluation Report.

The EPA considers that the NDT Site Evaluation Report was a rigorous, inclusive and public process that resulted in the clear identification of high level environmental risks and values based on the data, resources and time available. The outputs from the NDT's review have enabled the EPA to consider the short-listed sites and provide early advice on the environmental impacts that would require attention during the next stage of the strategic assessment.

In summary the EPA concludes that:

- Gourdon Bay is the least environmentally constrained of the four sites.
- James Price Point is the least environmentally constrained of the Dampier Peninsula sites.
- From an environmental perspective, North Head and Anjo Peninsula are not suitable for large scale industrial development.

Site Specific Advice

Anjo Peninsula

The EPA is concerned that a precinct at Anjo Peninsula would impact significantly on the remoteness and wilderness values of the northern Kimberley. There are also significant terrestrial, biophysical values at the precinct location and major concerns of the potential impact on these values from any necessary road transport routes.

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The EPA noted vegetation mapping indicated a diverse environment supporting ten vegetation communities including savannah woodlands, grasslands and mangrove communities. The marine environment is also likely to support migratory species of National Environmental Significance (NES) such as whales, dugongs and the Australian snubfin dolphin.

The EPA also noted that the sandstone outcrops in the area contain numerous examples of Bradshaw and Wanjinna rock art.

Consequently, the EPA has concluded that Anjo Peninsula is not suitable for both environmental and wilderness value reasons.

North Head

The EPA noted the WorleyParsons advice that North Head is constrained in terms of space for jetties and expresses the view that it would be unwise to select a site without considering its potential for future expansion.

The EPA suggests that environmental risks are unlikely to be readily or reliably manageable in the North Head area. Depending on the outcome of air quality modelling and risk assessment, some of the 12-14 Indigenous settlements between 150 metres and 10 kilometers from the site may have to be closed down.

A precinct in this area is likely to be severely constrained by restrictions on its operational flexibility and require onerous and expensive management controls particularly in view of the proximity of whale calving and resting grounds and dugong habitat. In addition, the Lacepede Islands, an 'A' class nature reserve, are situated 35km from the site, further increasing the environmental sensitivity of the area. The EPA determined North Head was not suitable for large scale industrial development from a cumulative environmental impact perspective.

James Price Point

The EPA report indicates that environmental impacts of development at James Price Point would be manageable and that the risk of being constrained is low. It has major advantages and fewer disadvantages than North Head or Anjo Peninsula on environmental, indigenous, socio economic, community and tourism grounds. The EPA noted that whales, dugongs and billfish are present along the whole coastal area from Coulomb Point to Willy Creek and that fish aggregation areas off James Price Point will need evaluation and management. The area also provides habitat for migratory birds.

The EPA noted public interest in retaining access to the coastal areas and recommended the design of the precinct give consideration to minimising the scale of exclusion zones consistent with security and public safety concerns.

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Gourdon Bay

The EPA noted the WorleyParsons advice that Gourdon Bay is constrained in space for jetties and expressed the view that it would be unwise to select this site without considering the potential for future expansion. The EPA did consider that alternative strategies could be pursued to place a port within Gourdon Bay that could address the issues raised by using the Headland.

The EPA noted that the proposed site is located between two Ramsar wetlands, which are considered to be two of Australia's most important sites for migratory shorebirds and is considered of high value to the pearling industry. The site is also used for recreation and food supplementation by Aboriginal people. The EPA, however, states that Gourdon Bay is the least environmentally constrained of the four sites.

EPA advice of future process

The EPA supports the intent of the SAA to look at the precinct, the broader assessment of natural heritage values and the joint management of biodiversity and indigenous cultural heritage protection. It sees this process as representing a significant and welcome approach to development and suggests the three initiatives under the SAA should continue to be progressed in parallel as they are fundamental to achieving ecologically sustainable development and effective management of conservation and cultural values in the Kimberley.

Once the Government has selected a preferred site, the proponent of the LNG precinct will be required to commence a strategic environmental impact assessment of a defined 'Strategic Proposal' to determine the full extent of impacts from the precinct and evaluate the site's environmental capacity for future industrial development. It is intended this assessment will run concurrently with the strategic assessment of the same proposal under the Commonwealth EPBC Act.

The EPA will undertake an assessment of the strategic proposal under section 38 of the EP Act. An outcome of the strategic assessment would be to recommend conditions that should be applied to specific, future LNG proposals. Future proposals which are brought forward and which fit within the assessed strategic proposal, known as derived proposals, will generally not be subject to further assessment by the EPA.

Provision of DEWHA Advice

Preliminary advice has been received by the NDT from DEWHA in respect to the NDT site evaluation process and nominated short-listed sites. This advice is consistent with the EPA Section 16e advice but will be further reviewed by DEWHA subsequent to their consideration of the EPA report and the response to the EPA report provided to them by the NDT.

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8. Technical Assessment

WorleyParsons Services Pty Ltd (WorleyParsons) was contracted to undertake a comparative technical assessment of the four short listed sites and provide indicative siting of port and gas processing infrastructure.

The WorleyParsons *Browse On-shore LNG Precinct Siting Study*, dated 20 November 2008, investigated key opportunities and constraints associated with each site based on geo-technical studies and project definition information from potential gas processing proponents.

The WorleyParsons study was prepared on the assumption that the LNG processing precinct should allow for the co-location of at least two LNG processing operators sharing non process critical infrastructure. Process critical infrastructure that is unlikely to be shared includes jetties, berths and gas storage tanks. As a consequence, near shore land area and potential port operability were critical factors in the site assessment undertaken.

WorleyParsons developed guiding principles for the near shore and on shore aspects of the development. These are identified below:

Near Shore

- the location of on-shore infrastructure to be determined by closest access to deep water (required to minimise dredging and the length of shipping channels)
- the provision of breakwaters where required to ensure a target berth operability of 98%¹
- the provision of a single common user shipping channel, Materials Off-take Facility (MOF) and tug boat pens
- the use of single user LNG loading facilities to ensure processing efficiency.

On Shore

- the location of LNG storage tanks as close as practical to the jetty location and berth
- the location of the LNG trains in-line with prevailing winds to assist with cooling of the plant
- the location of the LNG trains in close proximity to the LNG storage tanks
- the accommodation and air support infrastructure to be shared between operators.

¹ Of the four sites assessed all but Anjo Peninsula would require a breakwater at an estimated cost in excess of

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The WorleyParsons report recommends that due to the separation distances required between process operators for safety assurance, the land area required for a two LNG operator precinct should total approximately 1000 hectares excluding any land area set aside for downstream processing. In addition a 3km buffer zone between the precinct and any urban development inclusive of a 500m public exclusion zone should be provided.

Site access and constructability assessments were undertaken along with identification of existing infrastructure that would complement the development of the LNG precinct.

In summary WorleyParsons identified the following opportunities and constraints for each site:

Anjo Peninsula

The Anjo Peninsula (Anjo) is strategically positioned to act as an LNG processing location for gas located at the north of the Browse Basin gas or gas yet to be discovered in the adjoining Bonaparte Basin. While within 350km of the Ichthys gas field and viable as a site for the Inpex operated project, the Anjo site would require a gas pipeline of over 500km to service the Woodside Browse project.

Anjo provides a natural harbour and deep water close to the coast offering significant advantages in port construction costs and operability. The site would not require the construction of a breakwater or major dredging.

The significant suitable coastline of the Mackenzie anchorage and West Bay would allow multiple operators and downstream processing to coexist with separate port infrastructure where required.

The onshore characteristics are also favourable with the topography allowing the optimisation of layouts for multiple LNG processing plants. The availability of the existing sealed Truscott airstrip was seen as a significant advantage for a site that was otherwise isolated and inaccessible.

Anjo does not have road access and the nearest major town is Kununurra some 310 km away by air. Current operations at Anjo include off-shore helicopter services and supplies are received via a barge from Wyndham. WorleyParsons considered the lack of road access, distance from existing social infrastructure and lack of ground water as major disadvantages in the construction and operational phases of the project.

North Head

North Head is the closest site of the four under assessment to both the Woodside Browse and Ichthys gas fields. The site has deep water within 4.5km of the coast but will require significant dredging to provide a shipping channel and turning basins alongside the berths. Due to the large tides and cyclonic conditions, a single common breakwater will be required to provide

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Access to the proposed port site is constrained due to the landform of the headland which limits the availability of land for storage tanks and port access corridors. WorleyParsons has identified a potential layout that will accommodate two LNG gas operators but with sub optimum separation between critical infrastructure. This constraint would also apply to downstream processing indicating North Head is likely to be only suitable for processing LNG and only a maximum of two operators.

The geo-technical assessment of North Head identified the presence of unstable limestone cliffs along the coastal area and near shore reefs. The unstable cliffs will require a significant set back (200m) of the plant and storage tanks further restricting land availability and the reefs will impact on pipeline approaches to the area. WorleyParsons recommends a drilling program to prove bedrock level and pindan thickness to confirm site suitability.

WorleyParsons noted the road access to the site from Broome but also indicated that the site could be cut off from Broome during extreme wet season conditions regardless of actions taken to upgrade road infrastructure. The existence of airstrips at Beagle Bay and Lombadina was also noted though it was anticipated neither of these could service the needs of the precinct fly in/fly out operations and a new airstrip would be required.

James Price Point

James Price Point is a generic name for a number of sites along the same coastal area. WorleyParsons assessed three potential sites in this area. Each of these sites was deemed viable for both the Woodside Browse and Ichthys projects.

The critical issue at James Price Point is the distance to deep water and the exposure to tides and cyclonic weather conditions. The distance to deep water ranges from 5.2km to 9.5km which impacts the length of shipping channel required and the resultant scale of dredging.

All sites will require a significant breakwater and the combined effects of both make James Price Point a more costly site to develop than North Head.

The advantage of James Price Point is the ability to co-locate multiple jetties and berths allowing for ease of expansion and more than two LNG processing operators, should that be required, during the life of the gas fields within the Browse Basin.

The onshore land areas are particularly favourable with large land areas capable of supporting downstream processing and the best elevation of any of the sites for protection against surge tides generated by extreme events.

The relative close proximity to Broome was seen as an advantage due to the availability of existing infrastructure particularly Broome airport and port, and social infrastructure that can support the construction and operational phases

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The availability of plentiful ground water in the area would offer an alternative to the requirement to have a desalination plant.

Gourdon Bay

Gourdon Bay would require a 500+ km pipeline from the Ichthys gas field and close to the same distance from the Woodside Browse gas fields. The likely need for gas compression combined with the cost of the pipeline would render this location unviable in comparison with the other three sites or the alternative option of piping the gas to a location outside the Kimberley that offers existing infrastructure.

The headland at Gourdon Bay offers the shortest distance to deep water (7.8km) but variable bathymetry in the area will impact on the scale of dredging required to create the shipping channel and turning basins and will make pipeline approach to shore problematic.

The site is exposed to south west swells and will require a significant breakwater for both the LNG berths and supporting infrastructure such as tug pens and material off-take facilities.

The constricted land area of the Gourdon Bay headland will make it difficult to optimise LNG plant layout due to competing needs for infrastructure in close proximity to the jetties. This constriction will limit this site to a maximum of two LNG operators.

Inland from the port zone a significant area of land is available for downstream processing should that be required. Land elevation is variable with parts of the site below the 10m elevation deemed necessary to ensure protection from extreme surge tide events.

9. Indigenous consultation

The Kimberley Land Council (KLC) has facilitated comprehensive consultations with Traditional Owners related to the Browse Basin gas development and site evaluation process. These consultations have continued in response to the release of the NDT site evaluation report and have included direct engagement with WEL as a potential gas processing proponent.

The KLC provided a detailed submission to the NDT as part of the public comment period following the release of the NDT Site Evaluation Report. The KLC also argued that two small LNG precincts in the Kimberley may be preferable to a single major precinct due to the likely cumulative impacts on sensitive marine environments and on Aboriginal communities.

In addition, the KLC noted the need for further technical, design, heritage and social impact studies to be undertaken.

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The KLC submission also provided comments on the four sites:

Gourdon Bay

- the proposed site is in close proximity to Aboriginal communities and outstations and is subject to exclusive possession native title rights and interests
- annual dredging is likely to be required potentially leading to on-going disturbance to the marine environment for the life of the project

James Price Point

- the area is subject to the Goolarabooloo / Jabirr Jabirr native title claim
- the KLC is concerned about the proposed marine structures for this site (breakwater, shipping channels and port) and their potential negative impact on the marine environment

North Head

- a native title claim over the North Head area is pending (Nyul Nyul).
- the proposed site is in close proximity to a number of Aboriginal communities and outstations
- the area is subject to a reservation that the land be used for the use and benefit of Aboriginal people and as a consequence leases and sub-leases could be adversely affected by the LNG precinct development
- has significant marine constraints that need further investigation

Anjo Peninsula

- the area is subject to the Wanjina Wunggur Unguu native title claim
- the land is reserved for the use and benefit of Aboriginal people
- may provide an opportunity to quarantine development away from populated areas and tourism infrastructure
- already has some infrastructure that can be used in the development
- no breakwater and only limited dredging would be required.
- shorter distance to gas markets for shipping
- road access would not necessarily need to be provided to the site which can be serviced by air and sea
- is already a degraded environment

Subsequent to the public comment period the KLC Traditional Owner Taskforce met and instructed the KLC to continue an engagement with the State, Commonwealth and industry on the proposed LNG development.

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The NDT received independent submissions from:

- Wunambal Gaambera Aboriginal Corporation strongly endorsing the Anjo Peninsula as the preferred location for an LNG precinct
- Ardi Indigenous Tourism Operators Inc expressing concerns over the potential impact on Indigenous tourism businesses associated with the North Head site
- Lombadina Community which is concerned about the social impacts of any development at North Head

The Goolarabooloo native title claimants also provided a submission expressing concern over culture and heritage issues at both James Price Point and North Head but indicated conditional support for the LNG precinct located at a site within the Goolarabooloo / Jabirr Jabirr claim where heritage impacts can be accommodated.

In November 2008 the NDT conducted community meetings at Middle Lagoon, Lombadina and Djarindjin. The meetings exposed significant community concerns over the impact of the LNG precinct at North Head on existing leases and sub leases, local indigenous tourism businesses, Aboriginal communities and outstations, and on the potential damage to heritage sites. Support for the development within the community emanated from a desire to move away from welfare dependence through the employment, business development and compensation funds associated with a native title land use agreement for the precinct. It was evident that the majority of non Traditional Owners living in the North Head region opposed the development.

In summary, there is demonstrated conditional support for the LNG precinct from the Traditional Owners of each of the short listed sites but greater opposition from the broader Aboriginal community to the North Head site.

10. Social Impact Assessment

A preliminary review of social impacts associated with each site has been undertaken by the NDT:

Anjo Peninsula

The Anjo Peninsula site would have limited significant social impact due to its remote location. Anjo Peninsula is approximately 230 kilometres from Wyndham and 621 kilometres from Broome. There are three outstations within a 20 kilometre radius of the site. Kalumburu, which has a population of approximately 350 people, is located 50 kilometres from the proposed site, however, currently there is no road access between Kalumburu and Anjo Peninsula.

An LNG precinct at the Anjo Peninsula would be serviced by a fly in/fly out workforce limiting the impact both negatively and positively on the Kimberley economy.

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The Anjo Peninsula site is in the vicinity of the Truscott airbase, which has a sealed airstrip. The Traditional Owners, the Wanjina Wunggurr Uunguu people, strongly support the site being used for LNG processing due to its current and likely future use as a support base for helicopters servicing the offshore gas fields of the North-West Kimberley. The Traditional Owners have also been actively participating in the Inpex feasibility studies on the Maret Islands with workers from Kalumburu being employed as trainees on a range of support activities. The Inpex engagement has reinforced the belief in the community that LNG processing at Anjo Peninsula will deliver substantial employment and business development opportunities. An LNG precinct at the Anjo Peninsula would be predominantly staffed by a fly in/fly out workforce limiting the contribution the precinct could make to the Kimberley economy.

The isolation of the site has both benefits and drawbacks. The direct social impact on local indigenous communities is likely to be minimal, however, the provision of community services to the site would be difficult.

Anjo Peninsula lies within a region of outstanding natural, indigenous and historical values which has potential to include values that may meet criteria for national and possibly international heritage listing. The area has significant heritage sites for indigenous and non-indigenous cultures and there is a pearling lease and holding sites within Napier Broome Bay. The Anjo Peninsula is also close to commercial fishing grounds and is popular with wilderness recreational fishing.

The Traditional Owners indicate that the development of an LNG processing precinct at Anjo Peninsula will assist them to look after their country, invest in tourism infrastructure and maintain their culture due to the financial and capability benefits associated with economic development on their country.

North Head

Development at North Head is likely to have significant social impacts on the Aboriginal communities and outstations in the vicinity of the site, as well as the emerging Aboriginal eco-tourism sector. North Head has registered Aboriginal heritage sites and the area is located on Aboriginal reserve lands.

There are over 20 Aboriginal communities or outstations with a total estimated population of 687 people within a 20 kilometre radius of the North Head site on the Dampier Peninsula. Beagle Bay, which is approximately 20 kilometres from North Head, is the largest community in this region, with a conservative population estimate of 300 people, based on 2006 Australian Bureau of Statistics (ABS) census figures. Approximately 70 people are living on outstations in close proximity to the North Head site and buffer zone area.

The Beagle Bay area is home to Traditional Owners and people who identify as part of the 'stolen generation' who were moved or who are the descendants of people who were moved to the missions at Beagle Bay and Lombadina from other parts of the Kimberley. These people are concerned that the LNG precinct will dispossess them of their current occupation of land on the Dampier Peninsula.

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North Head is also a significant commercial fishing ground and an important area for wild stock pearl oyster fishing. The coastal area between Beagle Bay and Lombadina is the focus of Aboriginal customary practice and is an important source of healthy food for the communities.

The North Head site would require a significant regional infrastructure upgrade, including an upgrade or new construction of a Dampier Peninsula airport and the upgrade and sealing of the Broome-Cape Leveque road. Although the road upgrade is already being planned by Main Roads, it is not clear whether the upgraded road would meet the standard required by the gas precinct project particularly during the construction phase.

The sealing of the Cape Leveque road would open the whole Dampier Peninsula to vehicle traffic bringing increased visitation to Aboriginal communities. This impact along with the mobility of gas precinct workers located on the Peninsula itself threatens to overwhelm communities and create competition for scarce natural resources such as beaches and fish.

The Aboriginal eco-tourism sector which is concentrated in the vicinity of Pender Bay is concerned that the gas precinct will both directly and indirectly impact on the sense of wilderness that attracts tourists to their camps, accommodation and tours.

The North Head site is likely to have a significant impact on Broome as most services to support the workers' accommodation will need to be sourced from Broome. The master plan for the site will need to make provision for a village for the location of both construction workers and around 300 to 600 permanent workers. Locating the permanent workforce in a village will almost certainly require the duplication of services that exist in Broome as the permanent workforce (in contrast to the construction workforce) are usually accompanied by families who need schools, clinics, recreation services and so on. It is further likely that, over time, the 'village' could grow to become an alternative town.

Other likely impacts on Broome include increased demand for air services, reduced availability of short-stay accommodation and increased pressure on the available workforce. There would also be a need to manage the impacts on the character of Broome as a tourism destination.

James Price Point

The James Price Point site has limited direct social impact as there is no permanent population within 20 kilometres of the proposed site, with the nearest communities about 30 kilometres away.

However, James Price Point is a popular recreational area for both Aboriginal and non-Aboriginal users. The offshore area is known for its world-class game fishing and there are pearling leases nearby. There are also numerous registered Aboriginal heritage sites in the vicinity inclusive of the Lurujarri heritage trail which follows a continuous song line down the West coast of the Dampier Peninsula.

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Whilst the LNG precinct would, for the life of the project, restrict public access to highly valued recreational areas, the potential to enact a comprehensive land management plan between Broome and the Coulomb Point conservation reserve could significantly benefit the environment for the longer term benefit of the Broome community.

The site is located approximately 58-68 kilometres north of Broome, by road. As a result of the site's proximity to Broome, shared infrastructure and services such as the Broome airport and port would potentially reduce the total precinct footprint. The permanent workforce and their families are likely to be located in or near Broome, which has necessary services such as schools and health services. These services would need progressive upgrading and augmenting and these benefits would also be shared with the town and the tourism industry.

However, other possible impacts on Broome include increased demand for air services, reduced availability of short-stay accommodation and increased pressure on the available workforce. There would also be a need to manage the impacts on the character and reputation of Broome as a tourism destination resulting from the introduction of the oil and gas processing industry into the region.

Gourdon Bay

Gourdon Bay is very accessible as it is within 40 kilometres of the Great Northern Highway. However, the site would have social impacts on the tourism industry, fishing, pearling and local Aboriginal communities.

Gourdon Bay is a high-value area for both recreational and commercial fishing, and there are several high value pearling leases in the vicinity. Development would have impacts on the eco-tourism businesses close to the site including an existing caravan park. There are also concerns that this site could have impact on the character of Broome as a tourism destination, including increased demand on air services, reduced availability of short stay accommodation and increased pressure on the available workforce.

Gourdon Bay is 140km south of Broome and would require the establishment of accommodation infrastructure and the likely duplication of airport capable of servicing the fly in/fly out workforce.

The Gourdon Bay site would have social impacts both positive and negative on local Aboriginal communities. The site is located 27 kilometres from Bidadanga which is the largest single Aboriginal community in Western Australia, with a population of about 800 people. There are also several outstations in the vicinity, and development may result in the relocation of some of these outstations.

Gourdon Bay is significant to Aboriginal people for customary practice, food gathering, recreation and has mythological significance.

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Regional Impact Assessment

It should be noted that the impacts discussed above provide only a preliminary overview of the regional impact issues.

The NDT has committed to undertake comprehensive strategic impact assessment studies as part the SAA.

The NDT has established a Regional Impacts Group and, as part of the next phase of the strategic assessment, a social impact assessment (including a tourism impact assessment and a fisheries, aquaculture and pearling impact assessment) and an infrastructure impact assessment will be undertaken. The NDT did not support undertaking these studies prior to the EPA providing advice about which sites are potentially suitable for an LNG precinct.

The comprehensive social impact assessment will anticipate the social impacts on the affected indigenous population, local and regional populations, and provide a process to mitigate, monitor and manage the likely impacts of the project. This includes establishing the current level of services, their capacity and then projecting the likely impacts of the project.

The regional infrastructure assessment will include identifying existing and future housing and land capacity, as well as any additional capacity required as a result of associated industrial development. In particular the development of a supply base in the Kimberley is independent of any decision to process the gas onshore in the Kimberley.

The supply base will service the upstream offshore infrastructure and include port, logistics and helicopter services. Broome is currently supporting the exploration phase of the Browse Basin with additional supply infrastructure being utilised at the Truscott airstrip and the Lombadina airstrip. The Derby/West Kimberley Shire is promoting the longer term establishment of a supply base at Point Torment to compliment the existing Broome facilities.

11. Preliminary analysis of alternative sites and options

In February 2008, the Commonwealth and Western Australian Governments entered into a SAA under the provisions of the EPBC Act for the selection and management of a site(s) for a multi-user liquefied natural gas (LNG) precinct to service the Browse Basin gas reserves off the Western Australian Kimberley coast.

The process for selecting the LNG precinct, as set out in the SAA, includes an analysis of alternative gas processing options outside of the Kimberley, focussing on locations that already have substantial industrial infrastructure, inclusive of floating LNG. The Australian Department of the Environment, Water, Heritage and the Arts (DEWHA) engaged consultants GHD Pty Ltd, to prepare a comparative analysis of the feasibility of alternative locations for the development of a multi-user LNG precinct outside of the Kimberley region.

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GHD has prepared a draft report for consideration at this phase of the site selection process. The final GHD report and additional research will inform the Strategic Assessment of any preferred Kimberley location.

The GHD analysis considered over 50 possible locations along the Western Australian Pilbara coastline, three along the Northern Territory coast and three options for offshore structures in northern Australian waters. GHD identified these sites through consultation with key stakeholders and a review of relevant literature.

The NDT engaged WorleyParsons to facilitate consultation with potential proponents from industry and undertake specific site reviews to provide the technical basis to commence the assessment of the precinct under the strategic assessment process. As part of this process, the development of onshore LNG facilities outside of the Kimberley region was considered.

Although a number of sites along the Pilbara coast present themselves as having some potential for an LNG precinct, there is very little on-the-ground information available for these sites. The draft GHD report noted that it would be inappropriate to conclude that the presence of some industry on the Pilbara coast equates to the region representing lower environmental values than the Kimberley.

The economic viability of a proposed site is affected by whether development will occur as a 'greenfield²' project. The costs of dredging and cryogenic export pipelines become increasingly important for greenfield developments. In general, any proposed site greater than 500 kilometres from the gas field is prohibitively expensive to develop from a greenfield situation. Therefore, economic constraints dictate that the site selected must be within 500 kilometres or already have significant industrial infrastructure present. As a minimum, this infrastructure would include a dredged shipping channel in close proximity to the coastline.

On this basis, several areas on the Pilbara coast were deemed unlikely to be economically feasible for a stand alone greenfield LNG processing plant as they are a significant distance from existing industrial infrastructure.

Selection of 'brownfield³' sites may, however, be constrained by impacts on the local or regional airshed. LNG liquefaction trains produce significant quantities of emissions which are subject to environmental approval conditions.

The draft GHD report cited recent modelling of the Burrup Peninsula that appears to suggest that approximately two thirds of the airshed capacity will be taken up when the Pluto LNG development comes on line. Significant further development, such as an LNG train to liquefy gas from the Browse Basin could effectively fill airshed carrying capacity.

Modelling for Pluto also indicated that pollution concentrations might exceed National Environmental Protection Measures during upset conditions. This was not considered to be significant due to the short timeframe and location of elevated ground-level concentrations at this site. However, these conditions might not be the case elsewhere. An airshed capacity issue could exist even in a greenfield site if an industrial concentration significantly larger than that existing on the Burrup Peninsula is proposed.

The draft GHD report highlighted that an uncontrolled imposition of a large industrial precinct can present significant challenges, even if a town already exists. There are no large urbanised areas along the North-West Coast capable of absorbing the workforce from the development of a precinct. Recent consultation indicates that the town sites of Karratha and Dampier are currently under significant pressure to supply local facilities and services due to the rapid growth in population caused by the resources boom.

Most of the North-West is subject to native title claims and the position of claimants in relation to industrial development is uncertain. Although little is known about Aboriginal heritage sites, the absence of listed sites does not indicate that nothing exists in these areas; rather it usually indicates that no survey has taken place.

There are limited potential LNG precinct locations in the Northern Territory and the draft GHD report identified only one site (Middle Arm Point) with significant infrastructure. The distance of these sites from the Browse Basin suggests that their development would be cost prohibitive. However, in the case of Middle Arm, where the proposed site for the Inpex gas precinct is located, existing LNG processing infrastructure would allow for some synergies in development. It is also noted that the economics of differing gas fields and markets allow some LNG processing proponents to pursue more costly options for the development of their gas resources and processing infrastructure.

Offshore LNG facilities offer some potential for processing close to the gas fields. However, this type of development would require each company to make individual investment with very little opportunity for synergy. The draft GHD report also noted that although floating LNG facilities have significant potential, at this stage the developing technology is not suitable for large gas resources such as the Browse Basin gas fields.

The site visit report prepared by WorleyParsons considered both Darwin and the Burrup Peninsula as alternative options for the development of onshore LNG facilities outside of the Kimberley. As part of this consideration it was expected that the additional length of subsea pipeline required for development at Darwin or the Burrup Peninsula, with an estimated cost of A\$4 million per kilometre, would negate any potential benefit of these alternative locations. Longer subsea pipelines also require additional and more costly processing such as offshore processing platforms and compressor stations.

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The distance from the Browse Basin gas fields to Darwin is over 1000 kilometres and in excess of 850 kilometres to the Burrup Peninsula. In comparison, the distance to the Kimberley coastline is between 250 and 500 kilometres.

The Burrup Peninsula is the site of the Woodside operated Karratha Gas Plant and currently runs five LNG processing trains. Apart from the long subsea pipelines required, the WorleyParsons report noted that the construction of a sixth processing train at the Burrup to process Browse gas could have other downsides including:

- space restrictions within lease boundaries;
- LNG Berth availability;
- shipping channel restrictions;
- available space to align trunkline and shore crossings; and
- complexity and safety in managing integration of an additional gas train into a 'brownfields' site.

The WorleyParsons and draft GHD independent analyses of the Burrup and Darwin sites concluded that although these sites remain options, they are less attractive than development in the Kimberley region due to economic and development issues and the marginal reduction, if any, that could be achieved in net environmental and heritage impacts over the proposed sites in the Kimberley.

The EPA in their advice on alternative location to a Kimberley LNG precinct states that "*should there be a decision by any company to pipe and process Browse gas to the Burrup, this would be viewed by the EPA as a significant proposal that would require detailed consideration and extensive evaluation of its environmental impacts and management under the WA EP Act*".

The EPA noted that development on the Burrup would likely to increase cumulative impacts on air quality, rock art and the terrestrial and marine environment. In response to alternative locations other than the Burrup the EPA noted that the NDT would address the evaluation of these options during the next phase of the Strategic Assessment.

12. References

Gaffney Cline and Associates (2008) - *Browse Basin Gas Technical Report Development Options Study – Reports 1-3*, Report to the Northern Development Taskforce, (May)

GHD (2008) – *Comparative Analysis of the Feasibility of Alternative Locations for the Development of a Liquefied Natural Gas Precinct*, Draft Report to the Commonwealth Department of Environment, Water, Heritage and Arts (December)

WorleyParsons (2008). *Browse LNG Precinct Siting Study*, Report to the Northern Development Taskforce (November)

WorleyParsons (2008) *Browse Basin Onshore LNG Precinct – Site Reconnaissance – Geological Report* (December)

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