



# Browse LNG Precinct



## Browse Liquefied Natural Gas Precinct Strategic Assessment Report

(Draft for Public Review)

December 2010

# Appendix B-3

## Site Selection Evaluation Report Part A



Department of  
Industry and Resources

# NDT

Northern Development Taskforce  
**Site Evaluation Report, Part A**

September 2008

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## 1. Foreword

This report has been prepared by the Northern Development Taskforce which was established by the Carpenter Government in June 2007.

One of the key tasks of the Taskforce has been to identify a potential location, or locations, for the processing of Browse Basin gas in the Kimberley. On 4 July 2008, the Taskforce released an interim report that identified eleven potential sites for evaluation of technical, environmental and heritage issues.

Further analysis of those sites was subsequently carried out and this report is a result of that process. It short-lists four sites that are considered technically viable for the purpose of gas processing.

The report is being released as part of the ongoing consultative process, and in accordance with the Strategic Assessment Agreement entered into between the Government of Western Australia and the Australian Government in February 2008.

Chair, Northern Development Taskforce

## 2. Purpose of this Report

The purpose of the Northern Development Taskforce (NDT) site evaluation report is to document technical data and the outcome of stakeholder consultation undertaken in support of the assessment of potential sites in the Kimberley for the development of a LNG hub for the processing of Browse Basin gas reserves. This report is the second of three reports to be released under the Strategic Assessment process agreed by the Government of Western Australian and the Australian Government as outlined in the NDT interim report July 2008.

The site evaluation report, and the process which informed it, will also provide the Traditional Owners of the Kimberley through their representatives, the Kimberley Land Council, with information to assist them with their decision-making regarding the granting of their agreement to gas processing in the Kimberley.

The NDT is also seeking public comment on the report and advice from the Environmental Protection Authority (EPA) and Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA) on the short list of sites recommended as a result of this site evaluation process. A final site selection report will be released following the public comment period, receipt of EPA and DEWHA advice and the outcome of the Traditional Owner decision making process.

## 3. Site Assessment

The NDT established a Site Evaluation Panel to conduct the site assessment for each location identified in the interim report. Detail of these sites is available on the Department of Industry and Resources website [www.doir.wa.gov.au/ndt](http://www.doir.wa.gov.au/ndt). In addition, a further two sites were added by the Traditional Owners Taskforce established by the Kimberley Land Council (KLC). One of these sites, Cape Voltaire had previously been considered by industry and not selected, while the Anjo Peninsula is a new site.

The Site Evaluation Panel recommendations are as follows:

### **Gourdon Bay**

Though this site is significantly technically constrained and economically challenging, it is broadly supported as potentially one of the more benign sites for net environmental impacts subject to further studies on the potential habitat and flight pathways for migratory birds (given that Gourdon Bay is situated between two Ramsar wetland sites). Development would impact on the pearling, fishing and local Aboriginal communities and would present significant pressures and challenges on the tourism infrastructure and the character of Broome as a tourism destination.

**It is recommended this site be subject to the hub design concept study, heritage studies and regional impact studies and considered for a LNG hub.**

### **Quondong Point**

This site is recognised as technically viable for development though not without having significant impact on the pearling industry. Development would also present significant pressures and challenges on the tourism infrastructure and the character of Broome as a tourism destination. Quondong Point is a major recreation area for Broome residents and is of considerable Aboriginal cultural significance.

**It is recommended this site not be subject to further consideration due to the proximity of more viable sites further north along the same coastal area.**

## **James Price Point**

James Price Point or an area to the north of the Point is recognised as technically viable for development though not without having some impact on sensitive marine areas and the pearling and fishing industries. Development would also present significant pressures and challenges on the tourism infrastructure and the character of Broome as a tourism destination. In particular, studies into fish aggregation and whale migration will be critical to establishing whether impacts can be avoided or minimised. The advantage of a site close to Broome is that it would leave the Aboriginal lands in the north of the Peninsula free of industrial development. In addition, shared infrastructure such as the Broome airport would reduce the total hub footprint.

**It is recommended this site be subject to the hub design concept study, heritage surveys and regional impact studies and considered for a LNG hub.**

## **North Head**

North Head is considered technically viable for a hub though the marine environment poses significant challenges for the development of port facilities of sufficient size to service known and unknown proponents. As a North Head development would be in conflict with the developing Aboriginal tourism sector, very innovative design and operational strategies would need to be adopted to avoid significant impact on the whole of the north of the Dampier Peninsula. North Head is situated within a whale migration aggregation area and studies currently underway will be critical to establishing whether any likely impacts can be avoided or minimised to acceptable levels. Development of this site would also present significant pressures and challenges on the tourism infrastructure and the character of Broome as a tourism destination, though not to the same extent as Gourdon Bay and James Price Point.

**It is recommended this site be subject to the hub design concept study, heritage surveys and regional impacts studies and considered for a LNG hub.**

## **Perpendicular Head**

Perpendicular Head is considered technically viable for a hub and has a less challenging marine environment for the establishment of port facilities than North Head. The area has, in recent studies, been identified as a significant whale aggregation area. It is also likely to be important as dugong habitat and has high landscape values. Many Aboriginal outstations are located in the area along with eco-tourism businesses and independent tourist destinations. Development of this site would present significant pressures and challenges on the tourism infrastructure and the character of Broome as a tourism destination.

**It is recommended this site not be subject to further consideration due to the proximity of the less constrained North Head location in the same area.**

## **Packer Island**

Packer Island is considered technically viable for a hub but would require significant site works as the coastal geomorphology is seen as unstable and the low lying lands near the coast would require infill. The site has significant environmental diversity with a number of sensitive environments including mangrove forests, tidal creeks, monsoonal vine thickets and mobile dunes present. The marine environment is significant due to the proximity of a Humpback whale migration pathway and aggregation area for cows and calves. The area has Aboriginal cultural significance and the site is not supported by the Traditional Owners for development. Development of this site would also present significant pressures and challenges on the tourism infrastructure and the character of Broome as a tourism destination.

**It is recommended this site not be subject to further consideration due to environmental and Aboriginal culture and heritage concerns.**

## **Koolan Island**

Koolan Island does not have sufficient land for a suitable LNG hub site and would be uneconomic to develop for a single operator hub. The island is also environmentally constrained given its position in relation to the Buccaneer Archipelago. Development of this site would have some impact on marine tourism in this area.

**It is recommended this site not be subject to further consideration.**

## **Wilson Point**

Wilson Point can technically meet the demands of a LNG hub site; however the cost, difficulty and impact of creating 1000 hectares of level land would be prohibitive. The Camden Sound area is recognised as a central Humpback whale calving ground and also hosts the initial Kimberley pearling leases located in Kuri Bay.

Wilson Point has Aboriginal cultural and heritage significance. It is within a region of outstanding natural, indigenous and historical values which may potentially include values that may meet criteria for national and possibly international heritage listing. Being remote and inaccessible by land, major development brings the risk of the opening of the region to a range of environmental impacts including introduced pests and weeds, particularly if a road to the hub was constructed. The tourism industry believes that development of this site will have a major undermining impact on marine tourism in this area.

**It is recommended this site not be subject to further consideration.**

## **Maret Islands**

The Maret Islands do not have sufficient land to meet the area requirements for a suitably sized LNG hub site. The Maret Islands may be technically viable for a single company operated hub site processing up to 30 Mtpa of LNG which would represent a significant proportion of the estimated annual production from the field. The Maret Islands have the advantage of needing minimal site works and little shipping channel or dredging requirements. A high proportion of the islands' total land area would be impacted upon by development.

The Maret Islands sit 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 marine environment includes highly diverse coral reefs. It is noted that the Maret Islands lie outside of the main whale transit routes and have the best natural port conditions of any of the sites. INPEX has prepared project development strategies which it considers appropriate to avoid, minimise or mitigate all known environmental and heritage impacts. The tourism industry believes that development of this site will have a major undermining impact on marine tourism in this area.

**It is recommended this site not be subject to further consideration as a LNG hub.**

### **Cape Voltaire**

Cape Voltaire is a technically difficult site. It 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. As a remote mainland location, the potential for future road access would risk a range of environmental impacts, including pests and weeds with wider regional impacts.

Cape Voltaire is a destination for a range of Kimberley wilderness experiences and its development for a LNG hub would significantly undermine the viability of the region's tourism industry. Cape Voltaire has had limited technical, environmental and heritage study and it is likely further constraints will be identified if the site is short-listed. The tourism industry also believes that development of this site will have a major undermining impact on marine tourism in this area.

**It is recommended this site not be subject to further consideration.**

### **Anjo Peninsula**

At this time the assessment of the Anjo Peninsula site can only be based on desk top evaluations as on-ground technical and environmental studies have not yet been completed. The Traditional Owners suggested this location due to its current and likely future use as a support base for helicopters servicing the offshore gas fields of the north-west Kimberley.

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 tourism industry believes that development of this site will have some impact on marine and Aboriginal tourism in this area.

The site on the Anjo Peninsula identified by oil and gas consultants Gaffney Cline & Associates is of a similar distance from the gas fields as Gourdon Bay and is likely to be similarly technically and economically challenging.

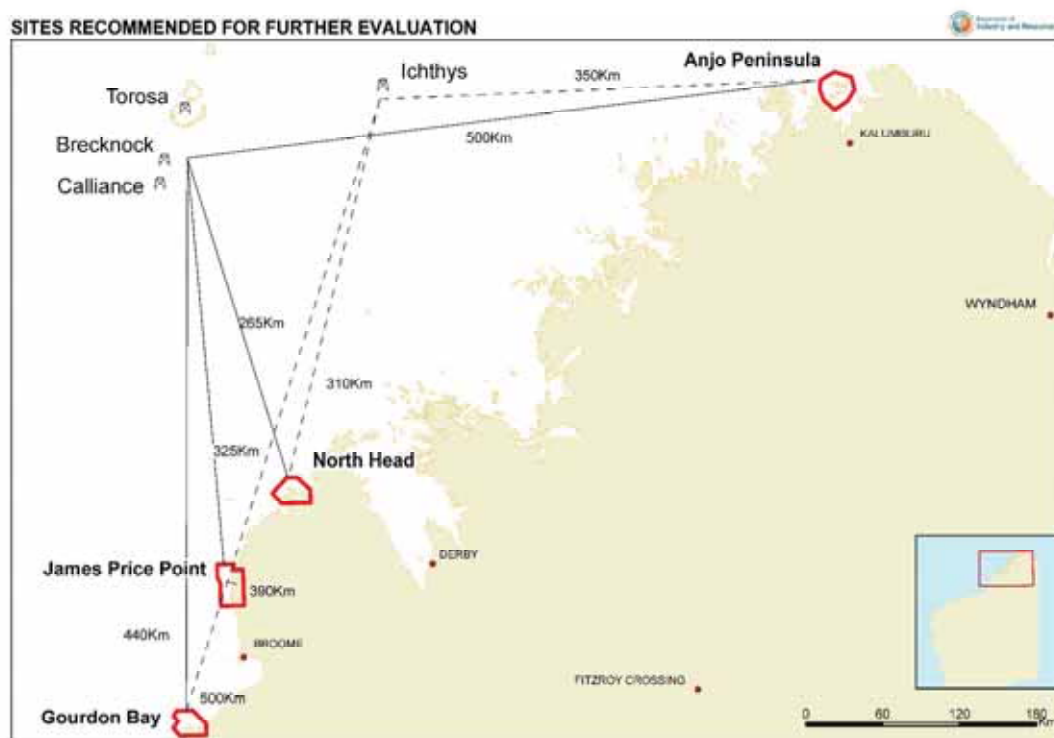
**It is recommended this site be subject to environmental site studies and a geo-technical assessment prior to further consideration as a site for a LNG hub.**



As such, the NDT site evaluation process has identified four potential locations for further assessment.

These are:

- **Gourdon Bay**
- **James Price Point**
- **North Head**
- **Anjo Peninsula**



It is important to note that Traditional Owners have not given any form of agreement to any site in the Kimberley being used for the processing of LNG but have actively participated in the site evaluation process and have agreed to proceed with a process that will lead to the identification of a preferred site.

In addition to the sites identified, the NDT acknowledges that Inpex Browse Ltd may wish to submit its draft Environmental Review and Management Plan and draft Environmental Impact Statement for the Maret Islands to the EPA and DEWHA respectively for consideration.

## 4. Evaluation Methodology

### 4.1. Technical Criteria Including Other Land Requirements

The NDT commissioned international oil and gas consultants Gaffney Cline & Associates (GCA) to validate the technical criteria used by industry in its screening of 43 sites in the Kimberley. GCA were also requested to independently technically evaluate sites previously short-listed by the oil and gas industry. GCA produced three separate reports which are available on the website of the Department of Industry and Resources [www.doir.wa.gov.au/ndt](http://www.doir.wa.gov.au/ndt) .

The technical criteria are:

- Elevation above 10-20 m Australian Height Datum (AHD) to protect hub from surge tides and extreme events;
- Elevated site close to coast (<4 kms to loading facilities) to limit cryogenic gas line length;
- Reasonably level site to minimize earthworks and ground disturbance;
- Geotechnical stability and workability, sands/rock to reduce piling requirements;
- Land slope less than 5 degrees at plant location;
- Deep water(14 m) access at port with limited need for dredging;
- Port / jetty capacity for multiple berths and jetty length <5kms;
- Reasonable shelter from long duration swell waves, minimal breakwater requirement;
- Substrate suitable for port infrastructure;
- Low ocean currents required for shipping ingress and exit. Wave heights and periods within acceptable range for berthing and port availability;
- Suitable shoreline access for gas pipelines; and
- Acceptable currents for LNG carrier manoeuvring <4 knots.

GCA also considered the piping of gas to various locations and advised that the relatively high content of carbon dioxide in the gas required the primary treatment of the gas as close to the gas field as possible due to the corrosive nature of the gas. Once “dried”, the gas can be piped over long distances but additional gas compression will be required for distances in excess of 500 kms from the field. GCA has indicated the respective size of the Woodside Browse and Inpex Browse projects required separate pipelines to the processing plant, hence upstream integration of the projects was not possible.

GCA recommended a 950 hectare site be identified for a hub which would allow for up to 10 gas trains (50 -70 Mtpa LNG), a gas to liquids plant and an ammonia plant. In addition to the industrial land area, the site would need to offer appropriate buffer zones between the plant and other areas of occupation. The hub will require additional land for an airstrip should it be located away from existing infrastructure, and worker accommodation, work camps and associated areas may be sited outside of the hub industrial precinct to integrate better with local area planning. It should be noted that assessment of consequential impacts from associated activities and infrastructure outside of the hub will occur as part of the strategic assessment.

## 4.2. Advantages of a Hub

The GCA report has identified potential capital expenditure savings on installed cost of between \$85US million and \$2US billion for a single gas processing hub over stand-alone projects. The capital savings are dependant on the level of project integration. In addition, it identified estimated operational savings of \$290US million per annum based on a total of 18 Mtpa of gas production from four trains. Off-setting these gains is the cost (estimated to be \$4-6US million per km) of piping the gas to a hub site compared with individual processing site options, including Scott Reef for the Woodside Browse project and the Maret Islands for the Inpex Browse project.

The major advantage of establishing a gas processing hub is that both known and currently unknown gas processing proponents will have certainty of access to a site approved for processing infrastructure. The hub will provide the operating environment to ensure world's best practice in environmental management and emissions control, plant maintenance, health and safety, heritage protection and accident and hazard response. A hub will also ensure that the Kimberley community benefits from employment and business opportunities.

A single gas processing hub to service Browse Basin gas reserves has important environmental benefits confining impacts to a single suitable location and avoiding piecemeal industrial development along the remote Kimberley coastline. A single hub also substantially reduces the total footprint of environmental impact, minimising the cumulative impacts of multiple port facilities, shipping lanes and support infrastructure such as airstrips, lay-down areas and accommodation requirements. It also limits intrusive night time impact of light shine along this remote coastal region.

As such, a range of terrestrial and marine requirements have been described for the evaluation process that would be required for a suitably sized gas processing hub.

## 4.3. Consultation

The NDT established a Site Evaluation Panel to undertake the site assessment process. The panel consists of senior officers with relevant expertise from a range of government departments including:

- Industry and Resources;
- Environment and Conservation;
- Indigenous Affairs;
- Planning and Infrastructure;
- Office of Native Title;
- Fisheries;
- Tourism Western Australia;
- LandCorp;
- The Heritage Council; and
- Kimberley Development Commission.

This report draws upon this group's consideration of the environmental, heritage and socio-economic values that could be impacted upon by a LNG hub development. Where possible, these have been evaluated on a regional and/or site specific basis.

The process involved the gathering of both quantitative and qualitative information, the design and execution of selective marine and terrestrial studies, field trips with Traditional Owners and the preparation of preliminary assessments. It culminated in a series of evaluation workshops in the Kimberley and Perth during July and August 2008. Detailed information on these workshops is presented in Part B of this report.

As part of the workshop process the NDT Site Evaluation Panel rated sites according to criteria established within the Strategic Assessment terms of reference. The NDT Site Evaluation Panel recommendations reflect the objective of identifying a single location or locations suitable for the establishment of a gas processing hub.

The Traditional Owners have fully participated in the NDT process while also preparing their own evaluation of sites from a traditional and contemporary culture, heritage and social impact perspective. Due to cultural protocols and sensitivities, public release of this information will be determined by the Kimberley Land Council (KLC).

The NDT has also utilised a number of working groups that draw on the expertise and experience of a range of stakeholders. These groups include representatives from:

- The Kimberley Land Council and Traditional Owners;
- Environment groups including a range of non-government organisations and experts;
- The Kimberley community;
- Industry groups;
- Commonwealth and Local Government;
- Tourism sector; and
- Fisheries sector.

## 5. Next Steps

### 5.1. Public Comment

This site evaluation report is being released for public comment for a 28-day period and will be the subject of advice on its findings from the EPA and DEWHA.

Those comments, along with the advice from the EPA and DEWHA will inform the next stage of the Strategic Assessment process.

Copies of the Report can be downloaded from the Department of Industry and Resources website at [www.doir.wa.gov.au/ndt](http://www.doir.wa.gov.au/ndt) or is available on CD by contacting the Northern Development Taskforce on 9222 0963 or 9222 0568.

Send submissions to:

“Site Evaluation Submissions”  
Northern Development Taskforce  
Department of Industry and Resources  
100 Plain Street, East Perth. WA. 6004

Submissions close on 11 November 2008

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