Proposed Gas to Synthetic Hydrocarbons Plant, Burrup Peninsula, Western Australia

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Syntroleum Sweetwater LLC

Report and recommendations
of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
Bulletin 985
July 2000

ISBN. 0 7307 6607 1
ISSN. 1030 - 0120
Assessment No.1270

Summary and recommendations

Syntroleum Sweetwater LLC, proposes to construct and operate a natural gas to synthetic hydrocarbons plant, a natural gas supply pipeline, eight product pipelines, and a product loading facility at the Dampier Public Wharf on the Burrup Peninsula in the Pilbara region of Western Australia. This report provides the Environmental Protection Authority's (EPA's) advice and recommendations to the Minister for the Environment on the environmental factors relevant to the proposal.

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

Relevant environmental factors

In the EPA's opinion, the following are the environmental factors relevant to the proposal, which require detailed evaluation in the report:

(1) Terrestrial flora - direct impacts from clearing and indirect impacts;

(2) Terrestrial fauna - impacts on fauna habitat;

(3) Gaseous and particulate emissions - limiting emissions to acceptable levels;

(4) Greenhouse gas emissions - minimisation of greenhouse gas emissions; and

(5) Risk and hazards - ensuring that the proposal is compatible with adjacent land uses.

Conclusion

The EPA has considered the proposal by Syntroleum Sweetwater LLC to construct and operate a natural gas to synthetic hydrocarbons plant, a natural gas supply pipeline, eight product pipelines, and a product loading facility at the Dampier Public Wharf on the Burrup Peninsula.

The EPA believes that of the five environmental factors identified as being relevant to the proposal, terrestrial flora, terrestrial fauna and greenhouse gas emissions were the most significant. The EPA determined that the remaining factors of gaseous and particulate emissions and risk and hazards could be managed to meet its objectives for the following reasons.

In relation to gaseous and particulate emissions emanating from the proposed plant, the EPA is aware that air quality modelling indicates that potential impacts from oxides of sulphur (SO_X), volatile organic compounds (VOCs), particulates, and carbon monoxide (CO) will be negligible, and that ground level concentrations for oxides of nitrogen (NO_X) under normal operating conditions will be below the relevant National Environmental Protection Measure (NEPM) standard. The EPA understands that ground level concentrations for NO_X under emergency operating conditions will also be below the NEPM standard outside the plant boundary, but there may be potential exceedances within the plant boundary. However, the EPA is aware that the likelihood of these exceedances occurring is very small due to the fact that the emergency generators producing the NO_X will only be used for a few hours per year, if at all, combined with the very small number of hours per year that the extreme (cyclonic) weather conditions needed to cause the exceedances, do actually occur. The EPA also acknowledges the commitments made by the proponent to adopt and implement best engineering practice in relation to limiting NO_X emissions from the plant by installing a tail gas combustor which produces the lowest NO_X emissions reasonably practicable, and by incorporating NO_X reducing equipment in other relevant areas of the plant, as well as ensuring that NO_X emissions from the proposed plant will, at a minimum, comply with the relevant emissions standards.

The EPA considers that risk and hazards arising from the project will be manageable in view of the fact that the project is located within a designated industrial area, is remote from potentially conflicting land uses, and risk modelling indicates that construction and operation of the proposed plant and associated pipelines will comply with relevant EPA risk criteria. The EPA

has also taken into account the various commitments made by the proponent in order to minimise risk and hazards. Further reinforcing the EPA's view is its understanding that, where appropriate, the design and construction of the proposed plant and associated pipelines, and other related infrastructure will need to comply with the requirements of AS2885, the *Petroleum Pipelines Act 1969*, the Australian Pipeline Industry Association (APIA) Code of Environmental Practice, and the *Explosives and Dangerous Goods Act 1961* which is administered by the Department of Minerals and Energy (DME).

In assessing the potential impacts on terrestrial flora and fauna the EPA has been made aware that the drainage features located in the south-western portion of the site, whilst not including any rare species, do contain vegetation community assemblages which probably do not occur elsewhere on the Burrup Peninsula. The proponent intends to use this portion of the site as a construction laydown and future plant expansion area, and will also construct a wastewater treatment plant and drainage sump within it. Although the EPA does not consider this to be a major impediment for the proposal, it would expect the proponent to disturb as little of this area as possible. In this regard, the EPA welcomes the commitments made by the proponent to demonstrate good corporate citizenship by using every possible endeavour to minimise impacts upon the drainage features located in the south-western portion of the site during construction and operation of the plant, and to disturbing only the areas that are essential to the construction and operation of the plant.

Whilst the EPA acknowledges the topographical and native title constraints of the site which prevent the plant configuration being modified and / or moved in an easterly direction away from the drainage features, it raises a particular problem for the EPA in that environmental values are being compromised by native title issues. The EPA considers it unfortunate that the proposed plant could not be located within the nearby Maitland Industrial Estate as this estate has been through the environmental assessment process. The EPA suggests that Government should identify other sites in the region which contain the same vegetation community assemblages and subsequently secure them from future industrial development. The EPA supports the flora and fauna surveys undertaken by DRD of the wider Burrup outside designated industrial areas and recommends that they be extended to include designated industrial land so that this issue does not arise again for future industrial development proposals.

In regard to greenhouse gas emissions, the EPA is aware that this proposal will be a significant contributor to Western Australia's greenhouse gas emissions: the emissions represent about 0.27% of Australia's total greenhouse gas emissions. However, the EPA acknowledges that the proponent will design and operate the plant in accordance with "best practice". The EPA also acknowledges the commitments made by the proponent regarding implementation of "no regrets" measures and investigation into and reporting on "beyond no regrets" measures. The EPA believes that this factor is manageable provided that Condition 7 includes a requirement for the proponent to set a target for the reduction of total net "greenhouse gas" emissions and / or "greenhouse gas" emissions per unit of product over time, and to report annually on progress made in achieving this target.

In view of the above, the EPA has therefore concluded that it is unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the proponent's commitments and the recommended conditions set out in Appendix 5 and summarised in Section 4.

Recommendations

The EPA submits the following recommendations to the Minister for the Environment:

(1) That the Minister notes that the proposal being assessed is for the construction and operation of a natural gas to synthetic hydrocarbons plant, a natural gas supply pipeline, eight product pipelines, and a product loading facility at the Dampier Public Wharf on the Burrup Peninsula.

(2) That the Minister considers the report on the relevant environmental factors as set out in Section 3;

(3) That the Minister notes the EPA's other advice regarding future development in the Pilbara region;

(4) That the Minister notes that the EPA has concluded that it is unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 5 and summarised in Section 4, including the proponent's commitments; and

(5) That the Minister imposes the conditions and procedures recommended in Appendix 5 of this report.

Conditions

Having considered the proponent's commitments and information provided in this report, the EPA has developed a set of conditions which the EPA recommends be imposed if the proposal by Syntroleum Sweetwater LLC to construct and operate a natural gas to synthetic hydrocarbons plant, a natural gas supply pipeline, eight product pipelines, and a product loading facility at the Dampier Public Wharf on the Burrup Peninsula is approved for implementation. These conditions are presented in Appendix 5. Matters addressed in the conditions include the following:

(a) that the proponent shall fulfil the commitments in the Consolidated Commitments statement set out as an attachment to the recommended conditions in Appendix 5;

(b) that the proponent shall demonstrate to the requirements of the Environmental Protection Authority, that there is in place an Environmental Management System;

(c) that prior to commissioning, the proponent shall prepare a Greenhouse Gas Emissions Management Plan to ensure that "greenhouse gas" emissions from the project are adequately addressed, best available efficient technologies are used, a target is set for the reduction of total net "greenhouse gas" emissions and/or "greenhouse gas" emissions per unit of product over time, and that progress made in achieving this target is reported annually to the Environmental Protection Authority;

(d) that at least six months prior to decommissioning, the proponent shall prepare a Final Decommissioning Plan to the requirements of the Environmental Protection Authority, which shall address the removal of plant and infrastructure, the rehabilitation of all disturbed areas to a standard suitable for agreed new land uses, and the identification of contaminated areas, including provision of evidence of notification to relevant statutory authorities;

(e) that prior to commencement of construction, the proponent shall prepare a written prescription for contractor work practices covering plant and pipeline construction and operation, to ensure that work practices are carried out at the level of international best practice, to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection and the Department of Minerals and Energy; and

(f) that for each five years following the commencement of construction, the proponent shall submit a Performance Review report to the Department of Environmental Protection evaluating the outcomes and environmental performance over the five years.

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1. Introduction and background

This report provides the advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for the Environment on the environmental factors relevant to the proposal by Syntroleum Sweetwater LLC, to construct and operate a natural gas to synthetic hydrocarbons plant, a natural gas supply pipeline, eight product pipelines, and a product loading facility at the Dampier Public Wharf on the Burrup Peninsula (Figures 1 and 2).

The proposal was referred to the EPA on 25 March 1999 and in April 1999 the level of assessment was set at Consultative Environmental Review (CER) under Section 38 of the *Environmental Protection Act 1986.*

The CER document was made available for a public review period of four weeks commencing on 8 November 1999 and ending on 6 December 1999.

The EPA's decision to assess the proposal at the level of CER was based on five main factors, namely terrestrial flora, terrestrial fauna, gaseous and particulate emissions, greenhouse gas emissions, and risk and hazards.

Further details of the proposal are presented in Section 2 of this report.

Section 3 discusses environmental factors relevant to the proposal.

The Conditions and commitments to which the proposal should be subject, if the Minister determines that it may be implemented, are set out in Section 4.

Section 5 provides other advice by the EPA, Section 6 presents the EPA's conclusions and Section 7, the EPA's recommendations.

Appendix 1 lists the people and organisations which made submissions during the public review period. References cited in the EPA's report are provided in Appendix 2. The environmental factors considered during the assessment are listed in Appendix 3, while Appendix 4 summarises the assessment of relevant environmental factors. Appendix 5 comprises the environmental conditions recommended by the EPA and the commitments made by the proponent. Appendix 6 contains a summary of submissions and the proponent's response to submissions and is included as a matter of information only and does not form part of the EPA's report and recommendations.

Issues arising from this process and which have been taken into account by the EPA appear in the report itself.

2. The proposal

Syntroleum Sweetwater LLC intends to construct and operate a natural gas to synthetic hydrocarbons plant, a natural gas supply pipeline, eight product pipelines, and a product loading facility at the Dampier Public Wharf on the Burrup Peninsula, approximately 1,300km north of Perth, Western Australia. The location of the proposed plant in both a regional and local context is shown in Figures 1 and 2. The proposed plant site has an area of about 74 hectares. The actual plant itself occupies an area of approximately 50 hectares within this site area.

The plant will utilise the proprietary Syntroleum Process to produce 1,240 tonnes or 10,000 barrels of synthetic crude oil per day using approximately 135 terajoules of natural gas per day. Natural gas will be obtained from the Woodside Onshore Gas Plant via a natural gas supply pipeline.

The synthetic crude oil produced is able to be refined into a range of specialty products such as lubricants and diesel fuel.

In addition to the construction of the proposed plant, the proposal will also include the following ancillary components:

(a) the realignment of a section of Hearson Cove Road, including improvements to Burrup Road;

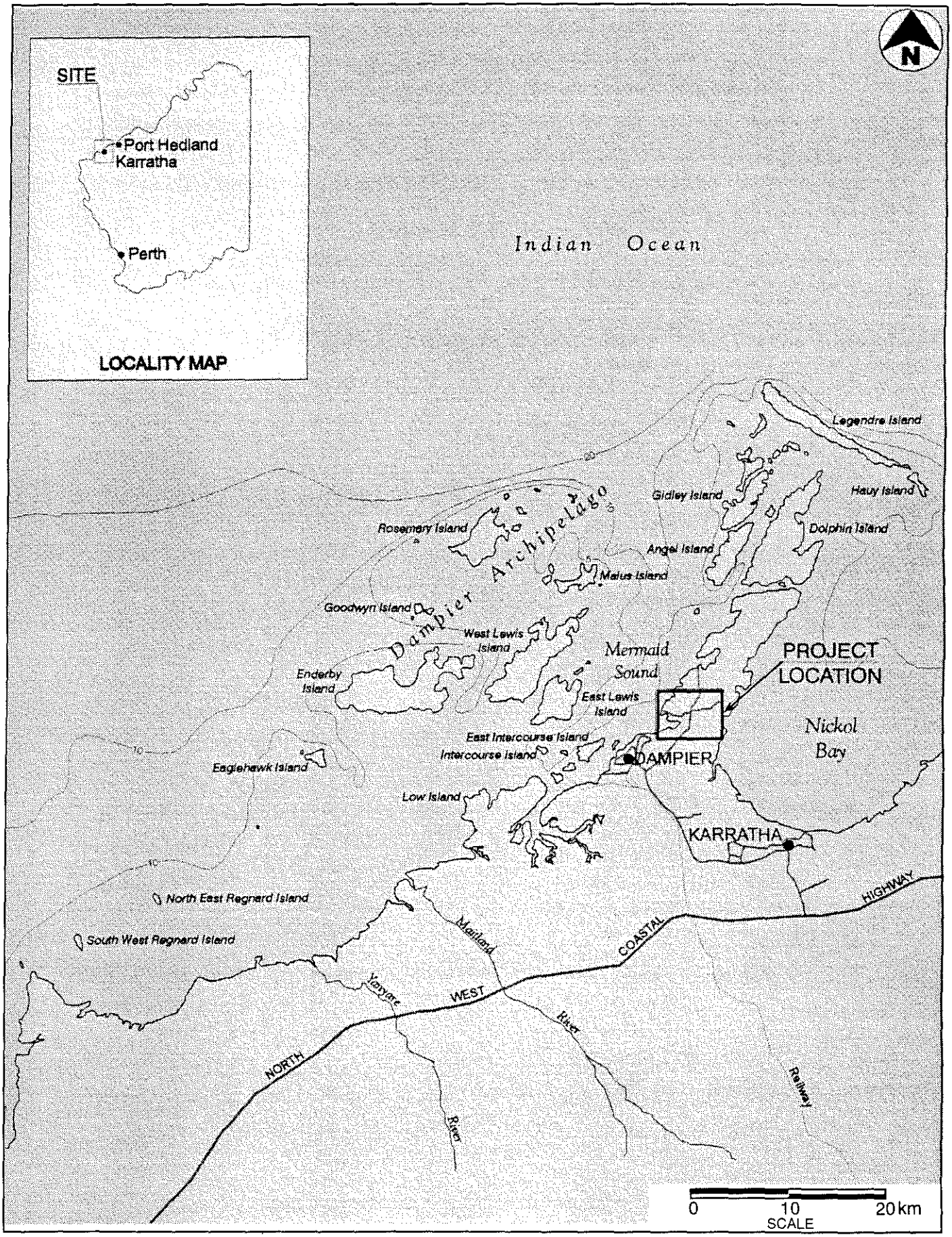

Figure 1. Project Location - Regional Map (Source: Figure 1.2 HLA - Envirosciences, 1999a).

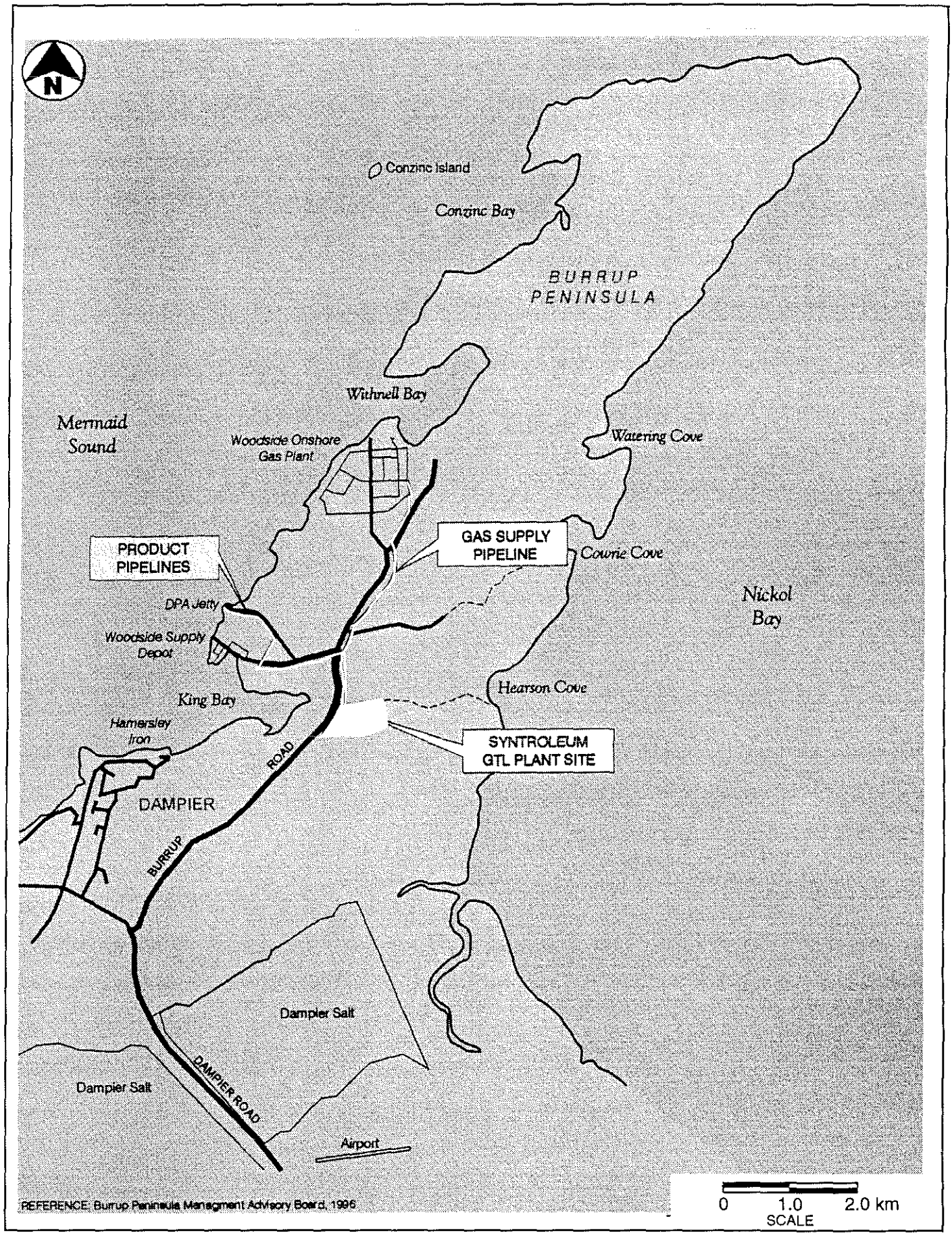

Figure 2. Project Location - Locality Map (Source: Figure 1.3 HLA - Envirosciences, 1999a).

(b) the construction of a natural gas supply pipeline from the Woodside Onshore gas plant to the Syntroleum plant; and

(c) the construction of eight product pipelines from the Syntroleum plant site to the Dampier Public Wharf; and

(d) a product loading facility and other improvements at the Dampier Public Wharf.

The main characteristics of the proposal are summarised in Table 1 below.

Table 1: Summary of key proposal characteristics

Element	Description
Project purpose	To produce synthetic hydrocarbons from North West Shelf natural gas using the proprietary Syntroleum Process, for sale to domestic and international markets.
Project life	25+ years.
Major project components	(1) Syntroleum Gas to Synthetics (GTS) plant of nominal 1,240 tonnes per day (10,000 barrels per day) capacity. (2) Approximately 5km long gas supply pipeline from the Woodside Onshore Gas Plant to the Syntroleum GTS plant. (3) Eight product pipelines approximately 4.5km long from the Syntroleum GTS plant to the Dampier Public Wharf. (4) Realignment of Hearson Cove Road. (5) A product loading facility and other improvements at the Dampier Public Wharf.
Plant Location	King Bay - Hearson Cove Industrial Area (adjacent to the intersection of Burrup Road and Hearson Cove Road).
Plant site area	Total site area: Approximately 74 hectares. GTS plant area: Approximately 50 hectares. Plant site construction laydown areas: Approximately 10 hectares.
Plant facilities	(1) Syngas production Auto Thermal Reactor (ATR). (2) Air compression area. (3) Syngas compression area. (4) Hydrogen recovery areas. (5) Fischer - Tropsch section. (6) Catalyst reactivation. (7) Paraffinic oil hydroheater. (8) N - paraffin fractionation. (9) Paraffin product separation. (10) Hydro - isomerization / dewaxing. (11) Lube oil distillation. (12) Product storage and transport area. (13) Utilities area. (14) General plant areas / boiler. (15) Firewater area. (16) Bio - treating system area. (17) Stormwater run - off treatment and storage pond. (18) Control building and electrical room. (19) Warehouse and offices. (20) Plant access roads and car parking.
Plant operation	Continuous - 24 hours per day, 365 days per year.
Plant storage capacities	Sixty day storage for all products.

Plant inputs:	
Natural gas	Nominal 135 terajoules per day from the Woodside Onshore Gas Plant.
Water	Approximately 3 million litres per day.
Power supply	Operational power generated internally.
Nominal plant emissions:	
Carbon monoxide (CO)	525 tonnes per year
Carbon dioxide (CO_2)	1.16 million tonnes per year
Oxides of nitrogen (NO_X)	2,340 tonnes per year
Sulphur dioxide (SO_2)	45 tonnes per year
Particulate matter (total suspended)	115 tonnes per year
Volatile organic compounds	170 tonnes per year
Process effluent discharges	Nil - residual process water to be evaporated (approximately 1.6ML / day)
Water sludge	20 - 30 tonnes per day
Stormwater	12mm 'first flush' stormwater impoundment / treatment system to be installed for process areas. Discharge to King Bay following treatment. Sent to wastewater treatment system if it is off - specification.
Noise	During construction: Predicted maximum L_{A10} <35dB(A) at nearest residential area (Dampier). During operation: Predicted maximum L_{A10} 29dB(A) at Dampier and 36dB(A) L_{A10} at Hearson Cove.
Risk	Less than 1 in 10^6 outside the GTS plant boundaries. Less than 7 in 10^8 at zero metres from the gas supply pipeline. Less than 7 in 10^7 at zero metres from the product pipelines.

Source: Table 1.1 from the CER

Figure 3 illustrates the process flowchart / mass balance diagram for the proposed plant, and Figure 4 provides details of the plant layout. A detailed description of the proposal is provided in Section 1.2 of the CER (HLA-Envirosciences Pty Limited, 1999a).

3. Relevant environmental factors

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and the conditions and procedures, if any, to which the proposal should be subject. In addition, the EPA may make recommendations as it sees fit. The identification process for the relevant factors is summarised in Appendix 3.

It is the EPA's opinion that the following are the environmental factors relevant to the proposal which require detailed evaluation in this report:

(a) Terrestrial flora - direct impacts from clearing and indirect impacts;

(b) Terrestrial fauna - impacts on fauna habitat;

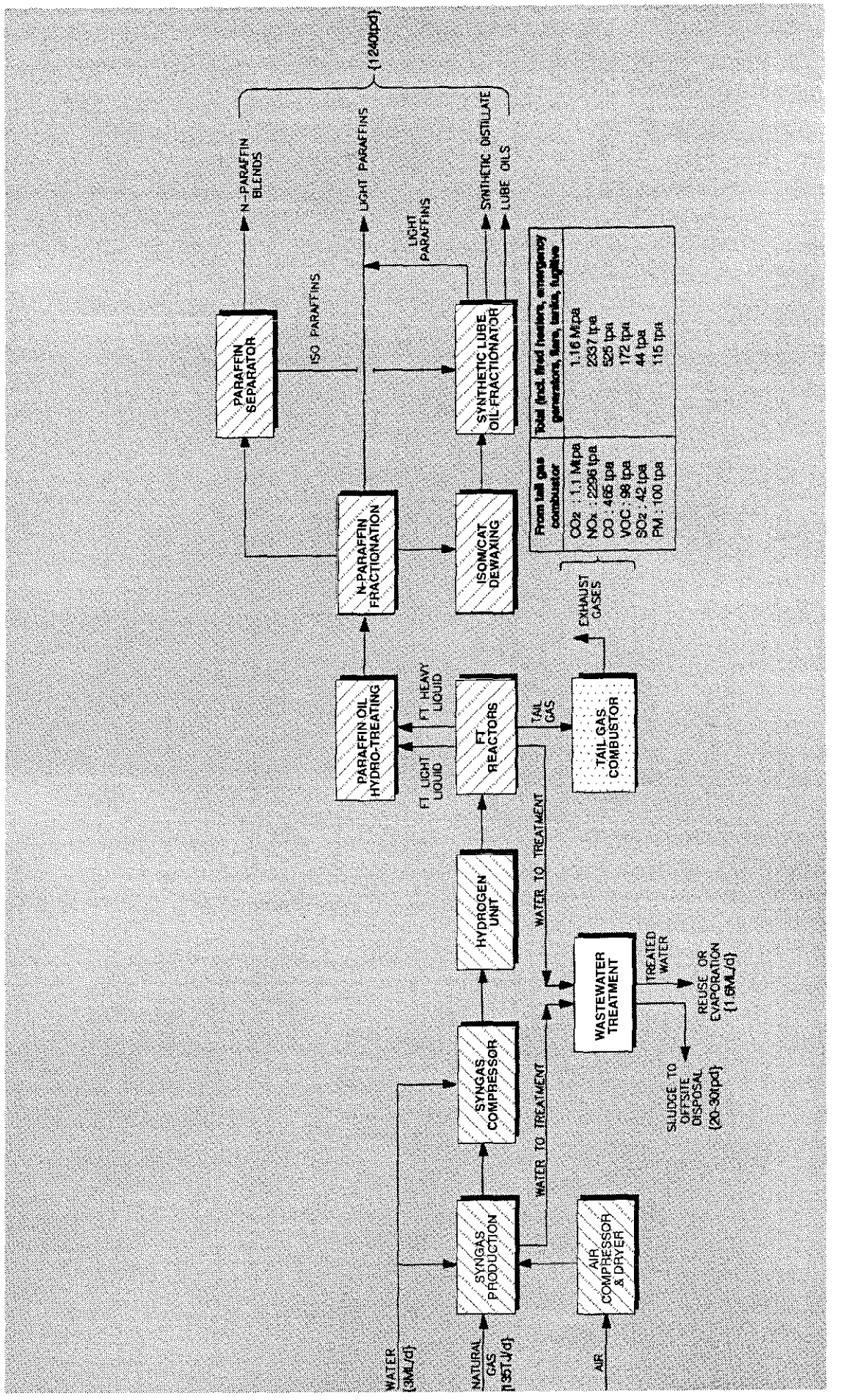

Figure 3. Process flowchart/mass balance diagram (Source: Figure 3.2 HLA - Envirosciences, 1999a).

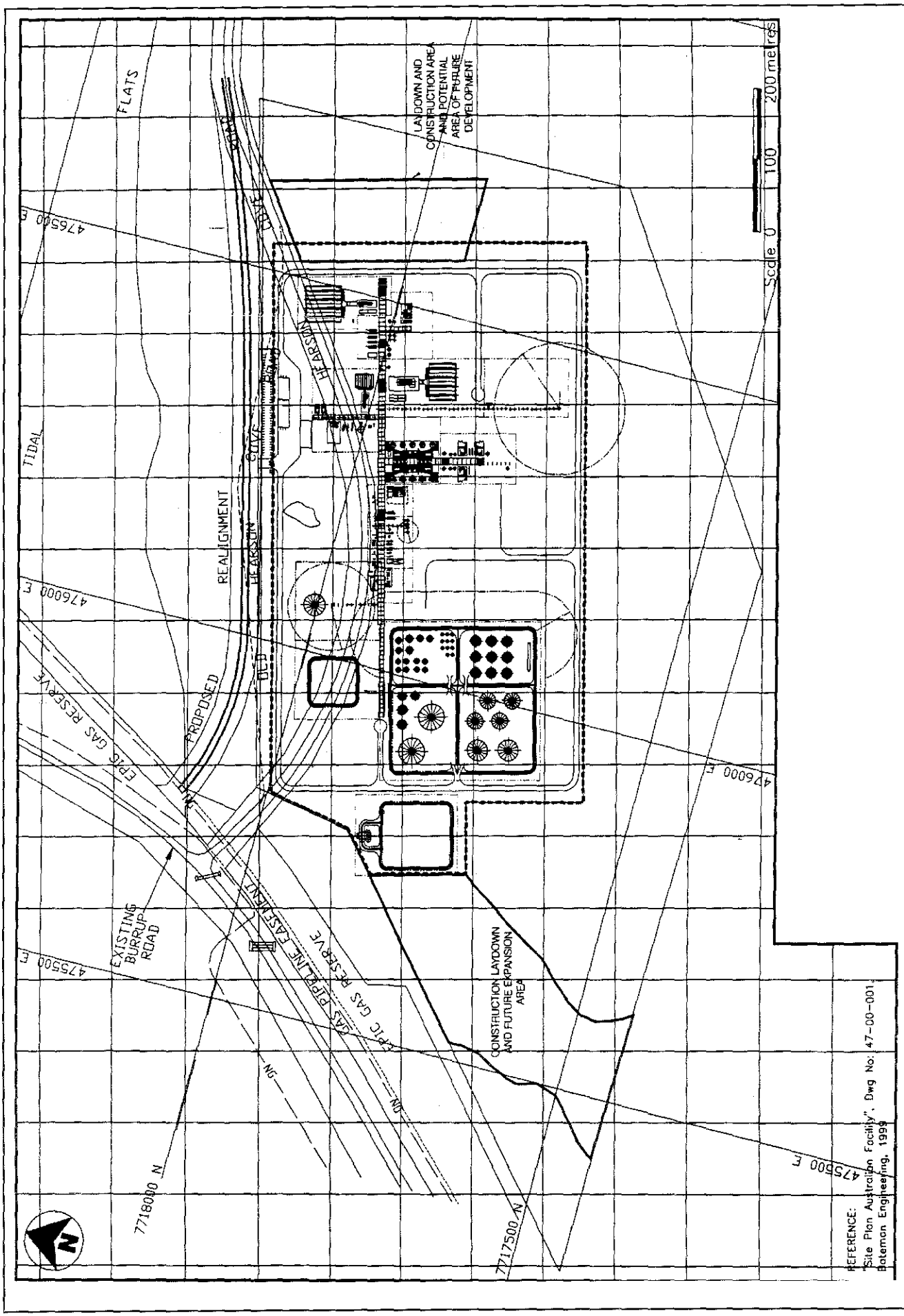

Figure 4. Proposed plant layout (Source: Figure 3.3 HLA - Envirosciences, 1999a).

(c) Gaseous and particulate emissions - limiting emissions to acceptable levels;

(d) Greenhouse gas emissions - minimisation of greenhouse gas emissions; and

(e) Risk and hazards - ensuring that the proposal is compatible with adjacent land uses.

The above relevant factors were identified from the EPA's consideration and review of all environmental factors (preliminary factors) generated from the CER document and the submissions received, in conjunction with the proposal characteristics.

Details on the relevant environmental factors and their assessment is contained in Sections 3.1 - 3.5. The description of each factor shows why it is relevant to the proposal and how it will be affected by the proposal. The assessment of each factor is where the EPA decides whether or not a proposal meets the environmental objective set for that factor. A summary of the assessment of the environmental factors is presented in Appendix 4.

3.1 Terrestrial flora

Description

Plant construction and realignment of Hearson Cove Road

The construction of the proposed plant and related pipeline infrastructure will have the following impacts upon vegetation communities and Declared Rare and Priority Flora:

- flora will be removed for siting of facilities;
- priority species will be disturbed;
- there will be an increased potential for run-off shadowing;
- on-site and off-site sensitive habitats and significant vegetation communities, including mangroves, will be affected; and
- exotic weeds may be introduced and spread.

The introduction of exotic weed species is possible if machinery has come from an infested area and has not been washed down. New exotics may include Noogara Burr and Double Gee (*Emex australis*). The spread of existing exotics is highly likely if not adequately controlled.

Although the proposed plant will occupy an area of approximately 50ha, construction activities will require the disturbance of an area of approximately 55ha. The realignment of Hearson Cove Road adjacent to the northern boundary of the site will necessitate the disturbance of an additional 4ha. Hence, a total area of 59ha will be disturbed and all vegetation within this area will be removed to facilitate construction. The various vegetation units found on the site are shown in Figure 5. The impact of construction of the plant on natural vegetation will be limited as the majority of the proposed plant site will be situated on previously disturbed areas.

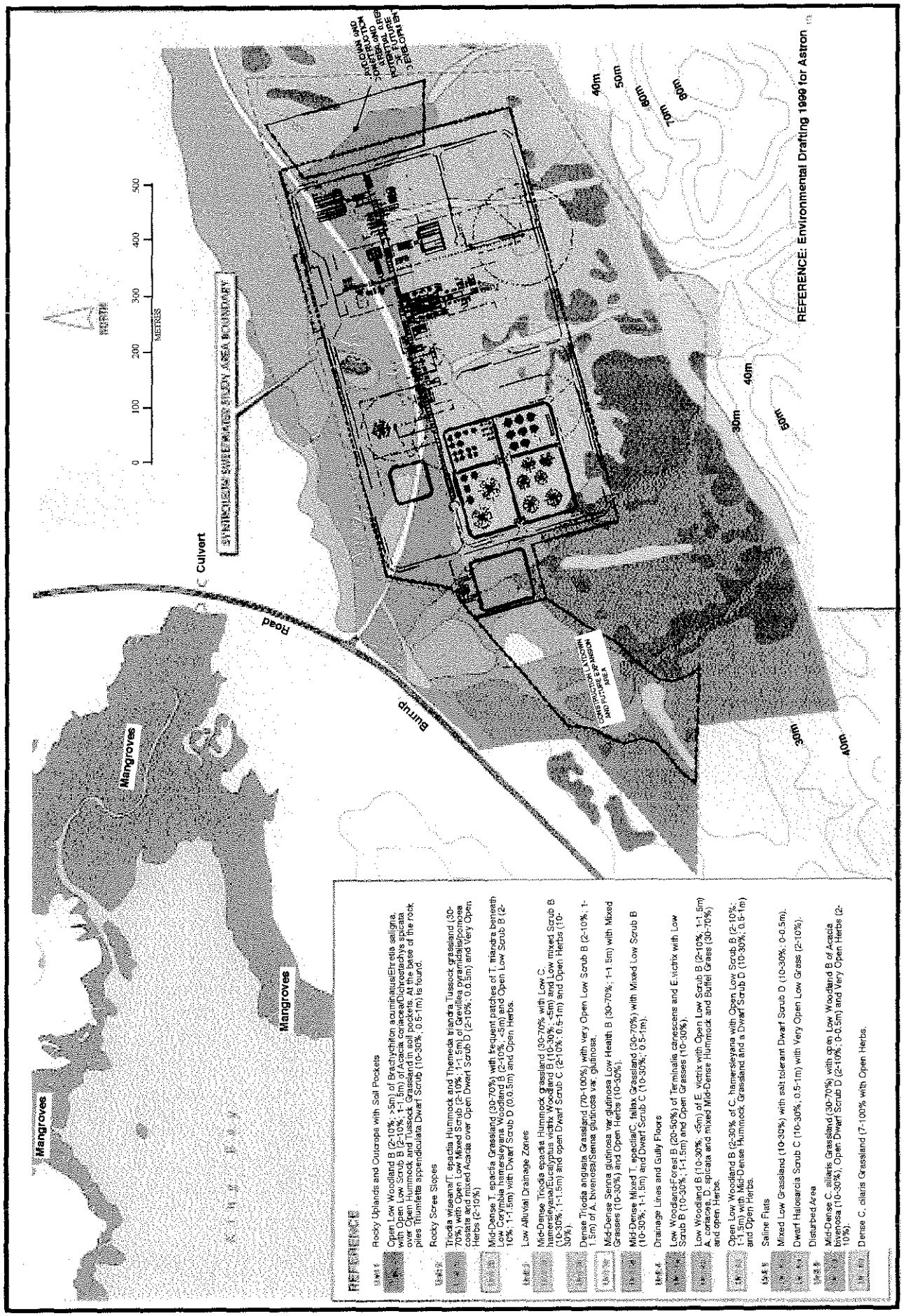

Figure 5. Vegetation units on the proposed plant site (Source: Figures 3.3 and 4.3 HLA-Envirosciences, 1999a).

Previous rehabilitation practices have resulted in the dominance of the exotic grass species *Cenchrus ciliaris* (buffel grass) in this disturbed area. The approximate percentage of the areas of each vegetation unit found within the 59ha area to be disturbed that need to be removed for construction of the proposed plant and Hearson Cove Road, are presented in Table 2 below.

Table 2: Vegetation removal for the plant site and Hearson Cove Road

Vegetation Unit	Unit No.	Representative Flora Species [1]	Approximate percentage of each vegetation unit to be removed from the 59ha area that will be disturbed
Rocky Uplands and Outcrops	1	*Brachychiton acuminatus*[2] *Ehretia saligna* Acacia coriacea*Dichrostachys spicata* *Triumfetta appendiculata*[2] *Terminalia supranitifolia*[2]	5 percent
Scree Slopes	2(a)	*Triodia wiseana* *Triodia epactia* *Themeda triandra* *Grevillea pyramidalis* *Ipomoea costata* Mixed *Acacia*	30 percent
	2(b)	*T. epactia* *T. triandra* *Corymbia hamersleyana* *T. appendiculata*[2]	50 percent
Low Alluvial Drainage Zones	3(a)	*T. epactia* *C. hamersleyana* *Eucalyptus victrix*	95 percent
	3(b)	*Triodia angusta* *Acacia bivenosa* *Senna glutinosa* var. *glutinosa*	50 percent
	3(c)	*S. glutinosa* var. *glutinosa* *T. appendiculata*[2]	90 percent
	3(d)	*T. epactia* *Chrysopogon fallax*	50 percent
Drainage Lines and Gully Floors	4(a)	*Terminalia canescens* *E. victrix*	50 percent
	4(b)	*E. victrix* *A. coriacea* *D. spicata*	50 percent
	4(c)	*C. hamersleyana*	20 percent
Saline Flats	5(a)	*Cenchrus ciliaris*[3] *Trianthema turgidifolia*	60 percent
	5(b)	*Halosarcia halocnemoides* *Sporobolus virginicus*	50 percent
Disturbed Areas	6(a)	*C. ciliaris*[3] *A. bivenosa*	90 percent
	6(b)	*C. ciliaris*[3]	90 percent

Notes: 1. Refer to Chapter 4 of the CER for comprehensive list of species
2. Priority plant species
3. Weed species

Source: Table 5.1 of the CER

Table 2 shows that much of the vegetation units within the site that contain priority species will be retained. Conversely, much of the vegetation units that contain weed species will be removed.

The following three priority plant species were found on the study site during the flora survey:

- *Brachychiton acuminatus;*
- *Terminalia supranitifolia*; and
- *Triumfetta appendiculata.*

All of the priority species were identified in the rocky uplands and outcrop areas. The majority of this area will be unaffected by construction of the proposed plant and the realignment of Hearson Cove Road. *T. appendiculata* identified on scree slopes and in low alluvial drainage zones is likely to be disturbed during construction works. This species is widely distributed over the Burrup Peninsula and in the project areas that will not be directly affected (ie. rocky uplands and outcrops). The CER indicated that *T.appendiculata* will be replanted in rehabilitation areas, and that seed collection for the priority species has already begun. Seed collection is very dependent on seasonal changes and some years may not produce the seed quality necessary to collect enough seeds to get the propagation numbers that are needed. Seed collection will continue through the seasons.

Construction of the natural gas supply and product pipelines

The construction of the gas supply pipeline will require the disturbance of the length of the pipeline routes, from the proposed plant site to the Woodside Onshore Gas Plant (OGP). The width of the gas supply pipeline corridor will be 20m. The pipeline will be buried over the majority of the route to a depth of 1.2m. In difficult rocky ground near the Epic pipeline, the gas supply pipeline will be located above ground and protected with rock armour. The pipeline route from the Woodside OGP to about 1km north of the plant site is to be aligned through previously disturbed corridors that are at various stages of revegetation. From this point south it first crosses very rocky hills near Burrup Road, and then through the tidal flats.

The most significant impacts resulting from the construction of the gas supply pipeline relate to the drainage systems that cross the proposed route. There will be some removal of the woodland species *Eucalyptus victrix*, *Corymbia hamersleyana*, *Eucalyptus xermothcia* and *Terminalia canescens*. Dense *Triodia angusta* grassland will be removed along much of the pipeline route. The dense *Stemodia grossa - Amannia baccifera* community that occurred in the drainage line at the time of the survey will also be directly affected.

A 100 metre length of the gas supply pipeline corridor will be too narrow to work within and some rockpiles will be removed to widen the corridor. Priority tree species occur in these rockpiles. *T. supranitifolia*, a Priority 1 species, was only found on the eastern side of the corridor, while *B. acuminatus* occurred on both sides. No more than two *B. acuminatus* trees need to be destroyed along this route.

In addition to the loss of tree species discussed above, removal of vegetation along the pipeline route is likely to have other indirect impacts on the environment. These include:

- the spread of weed species after disturbance; and
- the disturbance of soil structure, which, in turn, affects the type and rate of vegetative regrowth.

Construction of the product pipelines will require the disturbance of the length of the pipeline routes, from the plant site to the Dampier Public Wharf. The width of the product pipeline corridor will be 20m. The product pipelines will be located at ground level and protected with rock armour for the majority of the route. The pipelines will be buried where road crossings are necessary. From the plant to the point where the product lines turn west and go under the Burrup Road, the product lines run approximately parallel with the gas line, through the tidal flats and then the rocky hills. The impacts of the proposed pipeline are therefore confined to the same corridor in part as the natural gas supply pipeline.

Removal of vegetation along the product pipeline route will be minimal but some vegetation will be destroyed. Trees, including the priority species *T. supranitifolia*, will be removed where the pipeline route is intersected by rockpiles along the Water Corporation track and the Materials Off-Loading Facility Road (now officially known as MOF Road). However, the majority of vegetation to be removed is dominated by the weed Buffel Grass and other native colonising species, such as *Rhynchosia minima*, *Boerhavia gardneri*, *Portulaca oleracea*, *Streptaglossa decurrens* and *Trichodesma zeylamium*.

While mangrove communities represent an area of distinct ecological importance in the Dampier Archipelago, offering habitat for juvenile fish, crustaceans, turtle and invertebrates, as well as protecting the coastline from erosion, none of the "regionally significant" mangroves (EPA,

2000) will be affected. The King Bay mangrove community is dominated by two mangrove species, *Avecinnia marina* and *Rhyzophora stylosa.* Less than 0.5ha of this community will be impacted upon by the construction of the product pipelines. However, there is the potential for indirect impact on these mangroves due to uncontrolled run-off from construction areas as well as through spillage, leakage or discharge of contaminants into the King Bay tidal flats. Nevertheless, these mangroves are in a designated industrial area and are not located within any "regionally significant" areas as defined by Guideline 4 in draft EPA Guidance No. 1 - Guidance for the protection of tropical arid zone mangroves along the Pilbara coastline. Guideline 4 states that the EPA will adopt the presumption that development proposals in these areas would likely be found to be environmentally acceptable subject to:

- a high priority being placed on protecting tropical arid zone mangroves, their habitat and dependent habitats; and
- any development being planned and designed to keep impacts on mangroves, their habitats and dependent habitats to a minimum practicable level.

Submissions

Submissions received in relation to this factor expressed concerns about the adequacy of the vegetation and flora survey undertaken, the need to trial the propagation of Priority species, the spread of weeds, adequate rehabilitation, seed collection, the need for a topsoil management plan, impacts on the drainage system in the south-western part of the plant area and the nearby mangrove community.

Assessment

The area considered for assessment of this factor is the proposed plant site, the natural gas supply and product pipeline routes, and adjacent areas.

The EPA's environmental objectives for this factor are to:

(1) Protect Declared Rare and Priority Flora consistent with the provisions of the *Wildlife Conservation Act 1950* and the *Commonwealth Endangered Species Protection Act 1992*; and

(2) Maintain the abundance, species diversity, geographical distribution and productivity of vegetation communities.

The EPA understands that the drainage features located in the south-western portion of the site, whilst not including any rare species, do contain vegetation community assemblages which probably do not occur elsewhere on the Burrup Peninsula. The proponent intends to use this portion of the site as a construction laydown and future plant expansion area, and will also construct a wastewater treatment plant and drainage sump within it. Although the EPA does not consider this to be a major impediment to the proposal proceeding, it would expect the proponent to disturb as little of this area as possible. In this regard, the EPA welcomes the commitments made by the proponent to demonstrate good corporate citizenship by using every possible endeavour to minimise impacts upon the drainage features located in the south-western portion of the site during construction and operation of the plant, and to disturbing only the areas that are essential to the construction and operation of the plant. The EPA notes the other commitments made by the proponent in relation to the establishment of a native garden, weed control, topsoil management, rehabilitation, and seed collection.

Whilst the EPA acknowledges the topographical and native title constraints of the site which prevent the plant configuration being modified and / or moved in an easterly direction away from the drainage features, it raises a particular problem for the EPA in that environmental values are being compromised by native title issues. The EPA considers it unfortunate that the proposed plant could not be located within the nearby Maitland Industrial Estate as this estate has been through the environmental assessment process. The EPA suggests that Government should identify other sites in the region which contain the same vegetation community assemblage and subsequently secure them from future industrial development. The EPA

supports the flora and fauna surveys undertaken by DRD of the wider Burrup outside designated industrial areas and suggests that they be extended to include designated industrial land so that this issue does not arise again for future industrial development proposals.

The natural gas supply and product pipeline corridors will also affect some significant flora and vegetation communities. However, Syntroleum has committed to using the King Bay to Hearson Cove Service Corridor for its product pipelines if it is established within a timeframe which meets Syntroleum's requirements. DRD is presently involved in facilitating the establishment of a multi-user service corridor which would meet Syntroleum's requirements. The proposal to establish this corridor has already been referred to the EPA and the EPA considered that the establishment of the proposed service corridor would be environmentally acceptable subject to:

- best management practices being adopted and implemented during the construction of the proposed service corridor, particularly in relation to the management of impacts on flora and fauna, vegetation communities, surface hydrology, and the control of weeds; and
- the implementation of the environmental management commitments that were made by DRD, particularly in regard to undertaking a vegetation survey of the wider Burrup Peninsula which includes the corridor area.

The establishment of the multi-user infrastructure corridor will help to consolidate the potential environmental impacts of this proposal and future infrastructure development linked to new industrial projects, into one location, and will reduce the environmental impacts caused by the random development of separate corridors to service individual industries. This will greatly assist the environmental assessment of future industrial proposals establishing within the region.

The natural gas supply pipeline will be aligned along the eastern side of the Burrup Road reserve for the majority of its length except for a span of about 2.5km. This 2.5km span of the reserve cannot be used as Main Roads WA requires the available space for future widening of Burrup Road, and the reserve already contains the Epic Gas Pipeline and the Water Corporation's water pipeline. Locating the natural gas supply pipeline within this span would also introduce a greater risk impact than using the chosen route, mainly due to the presence of the Epic Gas Pipeline. The topography of this span is rocky and hilly and there are Aboriginal heritage sites within it. The EPA considers that the chosen route represents the best compromise from an environmental perspective.

The EPA notes the following commitments made by the proponent in order to minimise the impact on terrestrial flora:

(1) Syntroleum commits to establishing a native garden within the plant site boundary or in another appropriate site. The native garden will be established using species listed in Flora and Fauna Assessment report of CER, and will contain, at a minimum, 100 percent of the Rare and / or Priority plant individuals that are destroyed during construction.

(2) Syntroleum commits to ensure that all construction equipment is washed down prior to coming on site. Equipment washdown areas will be established in areas near the wharf for equipment brought in by sea and south of Dampier Salt for equipment brought in by road. Washdown residues to be disposed of in accordance with DEP / CALM / Shire of Roebourne requirements.

(3) Syntroleum commits to counting all Rare and / or Priority plant species within disturbance areas and will officially notify CALM of the number of each species to be removed. At a minimum, 100 percent of any Rare and / or Priority plant individuals that are to be destroyed, will be replaced with identical species in landscaping, rehabilitation or the native garden.

(4) Syntroleum commits to undertake seed collection of priority and other native plant species.

(5) Syntroleum commits to prepare a rehabilitation plan and closure report and submit it to the DEP and CALM at least 2 months prior to construction commencing. The rehabilitation plan will include a weed management plan and a topsoil management plan.

(6) Syntroleum commits to initiate a flora sampling program in accordance with the scope of work issued by the DEP. The report will be submitted to the DEP when it is completed.

(7) Syntroleum commits to using the lightest method of clearing that is reasonably practicable in the areas that will be rehabilitated.

(8) Syntroleum commits to disturbing only the areas in the western drainage areas of the site that are essential to the construction and operation of the plant.

(9) Syntroleum commits to demonstrate good corporate citizenship in minimising impacts on vegetation and fauna during construction and operation of the plant.

(10) Syntroleum commits to using the King Bay to Hearson Cove Service Corridor when routing the product pipelines, if it is operational within an acceptable timeframe to allow Syntroleum to complete the design and financial requirements of the project.

Summary

Having particular regard to the:

(a) topographical and native title constraints of the site;

(b) flora surveys that have been undertaken by DRD; and

(c) commitments made by the proponent, particularly in regard to demonstrating good corporate citizenship by using every possible endeavour to minimise impacts upon the drainage feature located in the south-western portion of the site during construction and operation of the plant;

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor.

3.2 Terrestrial fauna

Description

Construction of plant facilities and related infrastructure will impact upon the habitats of local, transient and migratory fauna species. The project also has the potential to directly affect fauna during the construction phase.

With regard to sensitive habitats, a large proportion of the plant and road relocation site is disturbed land that is lacking in species richness. The other habitats on the site are well represented on the Burrup (Astron Environmental, 1999). While it is unlikely that permanent populations of vertebrate fauna exist on the plant site, the alluvial gullies and tall woodlands in the south west of the site provide a rich habitat for nesting birds and provide shade for kangaroos. The rocky uplands behind the plant site may be a habitat for the rare and endangered Rock Wallaby.

Zoogeographically, most of the vertebrate species with the potential to occur in the areas affected by the project are widely distributed throughout the Pilbara and through much of the Eyrean Subregion (Astron Environmental, 1999). Although some Pilbara endemic species, such as the Pilbara Ningaui (*Ningaui timealeyi*), have the potential to occur within the affected areas, no endemic fauna species are limited to just these areas or the nearby surrounds. None of the species listed for the Burrup Peninsula are believed to be restricted to the peninsula. However, a number of species represent isolated populations, are listed on the CALM Reserve List, or are locally or regionally restricted in range. It is likely, however, that no restricted, threatened or priority listed species will be detrimentally affected by the proposed development.

The CER indicated that a native molluscs survey conducted by the Western Australian Museum of Natural Science found no species that could be regarded as rare and/or endangered in the

context of their total geographic range (Slack-Smith and Kendrick, 1999). However, the status of the plant-site populations should be evaluated in the context of the survival of these species within the region. The CER also indicated that the designation of a large area of the Burrup Peninsula as 'Conservation, Heritage and Recreation Areas' under the *Burrup Peninsula Land Use Plan and Management Strategy, 1996*, should ensure the long-term viability of native snail populations in the region.

Most of the fauna habitats present within the areas affected by the project are typical of those located within the local region and are well represented within the surrounding areas. However, the wide, relatively dense stand of *Eucalyptus victrix / Corymbia hamersleyana* trees that occupy the broad drainage line of the proposed gas supply pipeline route is a poorly represented fauna habitat on the Burrup Peninsula. The fact that this drainage line spreads into a broad drainage fan before discharging into the King Bay system means that it hosts a relatively large population of *E. victrix*. More typically, *E. victrix* are found in narrow stands (often in single tree rows) along steep narrow drainage lines where water flows too rapidly to allow large tree growth and steep rocky slopes restrict population size (V. Long, pers. comm.). A number of larger branches on the older *E. victrix* trees in the broad drainage line had substantial hollows. These offer significant roosting, nesting and refuge sites for a wide variety of fauna species. The presence of a large number of these older trees within a confined area on the Burrup Peninsula therefore makes this drainage line a locally restricted and potentially significant fauna habitat.

Submissions

The submissions received in relation to this factor expressed concerns about the adequacy of the fauna survey, particularly in regard to its timing, scope and the sampling undertaken, the proponent ignoring the advice of its consultant in relation to the survey of native molluscs, the long term viability of the native snail species, and the impact on the habitat areas of reserve listed fauna species.

Assessment

The area considered for assessment of this factor is the proposed plant site, the natural gas supply and product pipeline routes, and adjacent areas.

The EPA's environmental objectives for this factor are to:

(1) Protect Specially Protected (Threatened) Fauna and their habitats, consistent with the provisions of the *Wildlife Conservation Act 1950* and the *Commonwealth Endangered Species Protection Act 1992*; and

(2) Maintain the abundance, species diversity and geographical distribution of terrestrial fauna.

The proposed plant has the potential to impact upon significant fauna habitats which occur within the site and along the natural gas supply and product pipeline corridors. Of particular significance are the drainage features located in the south-western portion of the site (see Terrestrial flora factor).

The natural gas supply and product pipeline corridors will also affect terrestrial fauna habitat. However, Syntroleum has committed to using the King Bay to Hearson Cove Service Corridor for its product pipelines if it is established within a timeframe which meets Syntroleum's requirements. DRD is presently involved in facilitating the establishment of this corridor to meet Syntroleum's requirements. The natural gas supply pipeline will be aligned along the eastern side of the Burrup Road reserve for the majority of its length except for a span of about 2.5km. The EPA considers that the chosen route represents the best compromise from an environmental perspective.

The EPA notes the following commitments made by the proponent in order to minimise the impact on terrestrial fauna:

(1) Syntroleum commits to conducting a snail survey for a 30 to 40 hectare area in the southern rocky hills area adjacent to the south side of the plant.

(2) Syntroleum commits to conducting another fauna survey concentrating on the western drainage areas of the plant site.

(3) Syntroleum commits to disturbing only the areas in the western drainage areas of the site that are essential to the construction and operation of the plant.

(4) Syntroleum commits to demonstrate good corporate citizenship in minimising impacts on vegetation and fauna during construction and operation of the plant.

(5) Syntroleum commits to using the King Bay to Hearson Cove Service Corridor when routing the product pipelines, if it is operational within an acceptable timeframe to allow Syntroleum to complete the design and financial requirements of the project.

The EPA understands that the fauna and mollusc surveys referred to in the above commitments have been completed, and whilst there are no endemic fauna species limited to the plant site, the information gathered further highlights the relatively high conservation value and significance of the plant site in relation to fauna habitat, in the overall context of the Burrup Peninsula.

In view of the above, the EPA suggests that Government should identify other sites in the region which contain similar fauna habitats and subsequently secure them from future industrial development. The EPA supports the flora and fauna surveys undertaken by DRD of the wider Burrup outside designated industrial areas and suggests that they be extended to include designated industrial land so that this issue does not arise again for future industrial development proposals.

Summary

Having particular regard to the:

(a) widespread distribution of most of the vertebrate species with the potential to occur within the plant area;

(b) the information gathered from the fauna surveys that have been undertaken; and

(c) commitments made by the proponent;

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor.

3.3 Gaseous and particulate emissions

Description

Table 3 below details the estimated emissions of air pollutants from the proposed plant during operation (including emergency situations such as shutdowns etc).

Table 3: Air emissions from the plant

Emission Source	Pollutant - tonnes / year				
	Nitrogen oxides (NO_x)	Carbon monoxide (CO)	Volatile organic compounds (VOCs)	Sulphur dioxide (SO_2)	Particulate matter (PM)
Fired Heaters	27.9	13.9	5.6	1.1	5.6
Tail Gas combustor	2,296	465.8	98.1	42.6	100.5
Emergency Generators	4.2	2.4	0.1	0	0
Flare	8.7	43.0	4.4	0	8.6
Tanks	0	0	43.7	0	0
Fugitive	0	0	19.8	0	0
Total	**2,337**	**525**	**172**	**44**	**115**

Source: Table 5.8 of the CER

An assessment of the project's impact on air quality was prepared by CSIRO Atmospheric Research (CSIRO, 1999). This report investigated the impact of the proposed Syntroleum plant on the air quality of the region, and was included in Appendix I of the CER.

Two different modelling approaches were used. The first approach uses The Air Pollution Model (TAPM), to assess whether emissions from the plant are likely to contribute to photochemical smog formation. The second approach uses the model AUSPLUME to predict the near source ground level concentrations (GLCs) from the proposed plant.

TAPM modelling

TAPM was developed by the CSIRO Division of Atmospheric Research and consists of prognostic meteorological and air pollution modules which can be run for multiple-nested domains. TAPM was used in a worst-case scenario mode; two months which maximise the potential for recirculation / stagnation of pollutants (south-easterly synoptic winds to oppose the generally north-westerly sea breeze and / or light synoptic winds) were modelled.

Photochemical smog modelling examined the impact of the proposed plant on the existing GLCs of nitrogen oxides (NO_x), nitrogen dioxide (NO_2), ozone (O_3) and airborne particles less than 10 microns in diameter (PM_{10}). The two months selected for modelling had the greatest potential for the recirculation / stagnation of pollutants. These months were August 1997 and March 1998. Two emission scenarios were modelled with TAPM:

Scenario T1: Existing and proposed emissions from Woodside's Onshore Gas Plant, Hamersley Power Station, Plenty River Ammonium Nitrate Plant and Pilbara Explosives Company (PEXCO) Ammonium Nitrate Plant.

Scenario T2: Scenario T1 and the proposed Syntroleum plant.

The maximum predicted GLCs predicted occurred in March and are presented in Table 4 below.

Table 4: Maximum air emission ground level concentrations (March)

Emission	Scenario T1	Scenario T2	NEPM Standard
NO_x, hourly averaged	101ppb	99ppb	
NO_2, hourly averaged	63ppb (119μgm^{-3})	62ppb (117μgm^{-3})	120ppb
O_3, hourly averaged	71ppb (139μgm^{-3})	70ppb (137μgm^{-3})	100ppb
O_3, 4 hourly averaged	60ppb (118μgm^{-3})	58ppb (114μgm^{-3})	80ppb
PM_{10} daily	3μgm^{-3}	3μgm^{-3}	50μgm^{-3}

Source: Table 5.9 of the CER

The reason for the predicted decrease in GLCs of O_3 and NO_x in Scenario T2 which includes the additional emissions from the Syntroleum plant are as follows. Decreases are found in O_3 because of oxidation of the increased NO by O_3. The chemical process is non-linear, therefore emission of more NO_x and more VOCs can alter the chemistry to ultimately produce lower maximum GLCs of NO_x, for example by 'speeding up' the chemical production of gaseous and non-gaseous nitrogen products.

The maximum GLCs of NO_x and NO_2 occurred in the region extending from the proposed Plenty River plant to just south of the proposed Syntroleum plant, while the maximum predicted GLCs of O_3 occurred just off the north-east tip of the Burrup Peninsula. The highest GLCs at Dampier and Karratha do not increase with the addition of the Syntroleum plant.

None of the predicted values exceed the National Environment Protection Measure (NEPM) standard (National Environment Protection Council, 1998).

AUSPLUME modelling

AUSPLUME is a Gaussian plume dispersion model and is designed to predict GLCs of pollutants emitted from sources such as stacks, area sources and volume sources.

The AUSPLUME modelling that was undertaken examined the impact of the proposed plant on the existing GLCs of nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), particulate matter (PM_{10}) and volatile organic compounds (VOCs).

Three emission scenarios were modelled with AUSPLUME:

Scenario A1: The proposed Syntroleum plant in isolation.

Scenario A2: The existing and proposed emissions from Woodside Offshore Petroleum, Hamersley Power Station, Plenty River Ammonium Nitrate Plant and Pilbara Explosives Company (PEXCO) Ammonium Nitrate Plant.

Scenario A3: The existing situation with the proposed Syntroleum plant (A1 + A2).

The proposed Syntroleum plant was studied in its normal operational mode and also under abnormal conditions (emergency conditions, shut-down, start-up). Table 5 below shows a summary of AUSPLUME results under normal conditions.

It should be noted that the NO_2 results in Table 5 relate to Scenario A3, and the SO_2, CO, PM_{10} and VOCs results relate to Scenario A1.

Table 5: Summary of AUSPLUME results under normal conditions

Pollutant	Highest predicted GLCs µg/m³	NEPM Standard µg/m³	NEPM Standard timeframe	Comments
NO_2	2.6	56	Yearly	Scenario A3 Table 6.5 (CSIRO, 1999)
SO_2	0.06	52	Yearly	Scenario A1 Table 6.7 (CSIRO, 1999)
CO	139 (41.7)	10,000	8-hourly	Scenario A1 Table 6.8 (CSIRO,1999), 8-hourly is longest NEPM standard, no yearly
PM_{10}	12.2 (3.4)	50	Daily	Scenario A1 Table 6.9 (CSIRO,1999), Daily is longest NEPM standard, no yearly
VOCs	306	5680*	hourly	Scenario A1 * No NEPM standard, 5680 µg/m³ is the resulting concentration from Woodside stacks, Table 6.11 (CSIRO,1999).

Source: CSIRO, 1999. (1998 data set included data during Cyclone Vance. Figures in brackets indicate results without Cyclone Vance data)

It should also be noted that these levels are the highest predicted levels. Over the great majority of the year the levels are a fraction of these levels. These levels occur in the hills to the south of the plant site and not in populated areas.

Normal conditions - NO_2

Table 6: Highest combined ground level concentration results for NO_2

Stack height (metres)	With or without Cyclone Vance	Highest combined (A3) GLC result NO_2 (μgm^{-3})
30.5	Including Cyclone Vance	168
15.2	Without Cyclone Vance	223
15.2	Including Cyclone Vance	278
24.4	Including Cyclone Vance	174
NEPM standard	-	225

Source: Table 5.11 of the CER

As shown in Table 6 above, if the combustor stacks are 15.2m high, the highest hourly averaged GLCs were 262, 140 and 278μgm^{-3} (including background O_3 titration effects) for scenarios A1, A2 and A3, respectively. These occurred within the proposed Syntroleum plant site boundary under tropical Cyclone Vance conditions (hourly averaged northerly wind greater than 11.5ms^{-1} and neutral stability). The top three values were under these conditions and are the result of the plumes from the combustor stacks being caught in the building wakes.

The modelling undertaken to date indicates that if the combustor stacks are raised to 30.5m high, building wake effects become less significant and the highest hourly averaged GLCs become 77, 140 and 168μgm^{-3} (including background O_3 titration effects) for scenarios A1, A2 and A3, respectively. These values are below the applicable NEPM standard (National Environment Protection Council, 1998). The values for the 24.4m stack are also below the NEPM standard. The stack height selected for the combustor will be 24.4m or slightly lower depending on the final design conditions and further modelling.

When tropical cyclone Vance was removed from the meteorological data set the highest hourly averaged GLCs assuming 15.2m high stacks were 107, 140 and 183μgm^{-3} (including background O_3 titration effects) for scenarios A1, A2 and A3, respectively. They occurred on the highest terrain point about 2km south of the proposed Syntroleum plant, during stable night-time conditions with weak northerly winds.

The highest predicted value of 278μgm^{-3} with 15.2m stacks is above the NEPM standard but is due to meteorological conditions that are not common. A cyclone like Vance typically occurs several times between November and April each year. Outside of these meteorological conditions the predicted GLCs are well below the NEPM standard. The highest hourly averaged GLCs do not increase in populated areas as a result of the proposed Syntroleum plant.

The CER indicated that the Syntroleum project has no impact on NO_2 levels at Dampier, Karratha, King Bay or Hearson Cove based on the results of the AUSPLUME model (Table 6.3 CSIRO, 1999).

Normal conditions - SO_2, CO, PM_{10} and VOCs

Predicted GLCs for SO_2, CO, PM_{10} and VOCs are not significant and in the case of SO_2, CO, and PM_{10}, are below the NEPM standards. It should be noted that there is currently no NEPM standard for VOCs. The maximum observed hourly average GLC of CO at Dampier between May 1998 and January 1999 was 741μgm^{-3} (CSIRO, 1999). The NEPM standard is 10,000μgm^{-3}, 8 hourly average.

The maximum observed daily average GLC of PM_{10} at Dampier between May 1998 and January 1999 was 44μgm^{-3} (CSIRO, 1999). The NEPM standard is 50μgm^{-3}, daily average.

No background data is available for SO_2 and VOCs at Dampier.

Abnormal conditions - NO_2

Abnormal conditions are during shutdowns, stoppages and maintenance when the emergency generators are operating.

The highest predicted hourly-averaged GLCs for both scenarios A1 and A3 were equal at 368µgm^{-3} (including background O_3 titration effects). The highest GLCs were predicted to occur at the proposed Syntroleum plant during the afternoon, with north-westerly to north-north-westerly winds of about 6ms^{-1}. Conditions were generally neutral or slightly stable with a low mixing depth (less than 100m). The high values are the result of the plumes from the 12m high stacks of the emergency generators being caught in the building wake of building C. The top 100 hourly averaged GLCs are all due to the emergency generators. This suggests that taller stacks should be used on the emergency generators or that they be relocated away from building C.

The increase in the maximum hourly averaged GLC in populated areas due to the abnormal conditions is small, except at Hearson Cove where a 7µgm^{-3} increase is predicted.

Although the highest 53 values (including background O_3 titration effects) exceed the NEPM standard, it is highly unlikely that these abnormal conditions would occur in practice over an extended period. This is because the impacts from the emergency generators were assessed as if they operated 365 days per year, 24 hours per day (8760 hours per year), when in actual fact they are likely to operate for only 8 to 64 hours per year (0.1 to 0.7 percent of the year).

The CER indicated that the Syntroleum plant will be connected to mains power. Hence, in most of the planned shutdowns for maintenance and other problems, there will be no need to run the emergency generators.

Abnormal conditions - CO, PM_{10} and VOCs

The highest eight-hourly averaged GLC for CO does not exceed the NEPM standard, although there is a significant increase in the predicted value over that for normal conditions. GLCs are not significant for PM_{10} and are well below the NEPM standard. Although there is currently no NEPM standard for VOCs, the predicted GLCs are relatively low.

Odour

There will be no significant odours emanating from the plant. The products themselves are not odorous and none of the processes produce any significant odours.

Other impacts

It is not anticipated that the gas emissions from the proposed plant will have any impact on the rock petroglyphs on the south side of the plant site. The NO_2 levels are on average very low. Under normal operating conditions the highest level predicted is below the NEPM standard and it does not occur in the area of the petroglyphs. The SO_2 levels are essentially negligible. The weather on the Burrup is not conducive to acid rain. There are not any other air emissions that could be anticipated to impact the rock.

Submissions

The DEP indicated that a model such as AUSPLUME which employs simplistic building wake calculations etc, should not be used for fine tuning stack heights, and questioned whether the proponent would adopt and implement best engineering practice to reduce NO_X emissions by installing a tail gas combustor which produces the lowest NO_X emissions possible, and by incorporating NO_X reducing equipment in other parts of the plant.

The Conservation Council of WA questioned whether the proponent would monitor atmospheric emission levels across the life of the project to validate the estimates obtained from modelling, and requested that additional details be provided on the dust control measures referred to in Section 7.2.6 of the CER.

Assessment

The area considered for assessment of this factor is whole of the Burrup Peninsula, and includes the townsites of Dampier and Karratha.

The EPA's environmental objectives for this factor are to:

(1) protect the surrounding land users, such that dust emissions will not adversely affect their welfare and amenity or cause health problems;

(2) ensure that emissions of NO_X, SO_X, hydrocarbons, toxics, particulates and smoke are assessed and meet acceptable standards and the requirements of the *Environmental Protection Act 1986*;

(3) ensure that all reasonable and practicable measures are taken to minimise discharges of NO_X, SO_X, hydrocarbons, toxics, particulates and smoke; and

(4) ensure that conditions which could promote the formation of photochemical smog are managed to minimise the impact.

In regard to gaseous and particulate emissions, air quality modelling indicated that ground level concentrations for NO_X under normal operating conditions will be below the relevant NEPM standard. Ground level concentrations for NO_X under emergency operating conditions will be below the NEPM standards outside the plant boundary, but there will be potential exceedances within the plant boundary. However, the likelihood of these exceedances occurring is very small due to the fact that the emergency generators will only be used for a few hours per year, if at all, combined with the very small number of hours per year that the extreme (cyclonic) weather conditions needed to cause the exceedances occur.

The air quality modelling also indicated that impacts from oxides of sulphur (SO_X), volatile organic compounds (VOCs), particulates, and carbon monoxide (CO) will be insignificant.

In response to the concerns raised by the Conservation Council of WA regarding dust control measures and air emissions monitoring, the proponent indicated that the construction contractors will develop the details of construction dust control in conjunction with Roebourne Council and the Pilbara Region Office of the DEP, and that some monitoring is anticipated, although the details have not been finalised yet. Furthermore, the DEP currently operates an air quality monitoring station in Dampier. This monitoring station would allow the impact on ambient air quality arising from the operation of the proposed plant on the nearest residential areas to be ascertained. The EPA also understands that monitoring of stack emissions from the proposed plant will be specified through the Works Approval and Licensing process.

The EPA notes that Syntroleum has made the following commitments in relation to gaseous and particulate emissions:

(i) Syntroleum commits to design the plant in order to ensure that the National Environment Protection Measure (NEPM) standard of 225 micrograms per cubic metre for Nitrogen Dioxide (NO_2) will be met, even in worst case conditions, at every offsite location.

(ii) Syntroleum commits to adopting and implementing best engineering practice in relation to limiting NO_X emissions from the plant by installing a tail gas combustor which produces the lowest NO_X emissions reasonably practicable, and by incorporating NO_X reducing equipment in other relevant areas of the plant.

(iii) Syntroleum commits to ensure that the construction contractors develop the details of construction dust control in conjunction with Roebourne Council, and the Pilbara Region Office of the DEP.

Summary

Having particular regard to the:

(a) commitments made by the proponent; and

(b) the predicted impacts obtained from the air quality modelling results for the project being below relevant NEPM standards;

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor.

3.4 Greenhouse gas emissions

Description

Estimated plant emissions

The proposed natural gas to synthetic hydrocarbons plant will emit approximately 1.16 million tonnes of CO_2 per year from process emissions. If additional energy is required, a further 0.14 million tonnes of CO_2 per year will be emitted from the plant as a result of burning some of the diesel fuel and white oil products to generate additional energy for the plant (Table 5.12 of the CER). However, during the assessment process the proponent has advised that the additional energy source will not be required. The greenhouse gas emissions from the Syntroleum plant represent about 0.3% of Australia's 1990 baseline for greenhouse gases (386Mtpa). A breakdown of the quantities of CO_2 emitted from various sections of the plant is given in Table 7 below.

Table 7: Estimated CO_2 emissions from the plant

Source	CO_2 Emissions (tpa)
Flare	27,700
Emergency Generators	160
Fired Heaters	33,300
Tail Gas Combustor	1,101,400
Total emissions from plant	**1,160,000**

Greenhouse gas reduction measures evaluated by the proponent

The proponent considered a number of approaches to reduce greenhouse gas emissions. These included:

- state-of-the- art construction;
- preselection of the Engineering, Procurement and Construction (EPC) Contractor;
- use of medium pressure gas as an alternative to high pressure gas supply;
- cogeneration to generate electricity for off-site users;
- use of waste heat for a desalination plant;
- use of leakless technology;
- reuse of tail gas; and
- afforestation for carbon sequestration.

The opportunities for these reduction measures are considered below.

The CER document indicated that state-of-the-art construction will be employed for the natural gas supply line to the plant and the lines within the plant. The proponent has consulted with energy companies in relation to the construction of state-of-the-art gas supply and interior gas line technology to insure that the leaks of CH_4 are kept to the minimum available under current technology. Other methods to prevent heat loss and reuse energy in the project are being perfected and will continue to be researched through the design and operational phases of the project.

For example, as compression energy is the primary energy consumer in the Syntroleum Process, engineering studies conducted by Bateman and Kellogg Brown & Root have

demonstrated that the heat generated by the two catalytic reactions in the process can be captured in the form of mechanical and electrical energy sufficient to supply all of the plant's needs plus a surplus for other uses if desired. This design is planned for the Burrup plant. Syntroleum has developed several heat integration and power recovery schemes to broaden the flexibility of the Syntroleum Process and, in some cases, lower the capital cost as well as the number of pieces of major equipment necessary for operation of a plant. In each of these improvements, energy is used more efficiently. If less energy is required to power the compressors, more will be available for cogeneration, heating in a desalinisation plant or sale of steam to nearby industrial processes that use steam energy.

Different configurations of GTL plants based on the Syntroleum Process can also change the energy sources within the plant and the excess energy produced. For example, a steam turbine can be incorporated into the process and utilise the steam produced by the Auto Thermal Reactor (ATR) and Fischer-Tropsch reactions to produce energy for compression, electrical power and commercial sale. In addition, Syntroleum has developed a configuration that utilises the low heating value residue stream from the process as feedstock for a specially designed gas turbine that can utilise very low heating value gas. The use of these measures has significantly reduced potential greenhouse gas emissions by improving energy efficiency.

Syntroleum has preselected the EPC Contractor team of INA Constructions and Bateman Engineering at the development stage in order to be sensitive to the environmental requirements of the project and to understand them at the early stage design. Syntroleum's agreements with INA / Bateman include taking into consideration greenhouse gases and other environmental impacts. The quantity of greenhouse gas savings is estimated at 0.5% assuming that the contractor can work with equipment suppliers, especially the tail-gas combustor manufacturer to get the best possible and most appropriate equipment for the plant.

The CER document also indicated that there is potential for the use of "medium pressure" gas to be supplied to the project. The typical pressure of gas supplied to industrial users on the Burrup Peninsula is 8.5 to 10.5MPa. The proponent has worked with potential gas suppliers in order to supply gas at 4.8MPa. The reduction in compression compared to the typical supply pressure and then the reduction in decompression at the plant site, would probably save about 30,000 tonnes of CO_2 per year to the greenhouse gas load for the project. It is highly likely that this option will be selected by the proponent.

Cogeneration was designed into the proposed plant at an early stage of development. About 100MW of power could be supplied to an outside user if a sufficient economic return could be provided. The CER document stated that discussions between the proponent and Western Power indicated that the conditions existing on the Burrup Peninsula in the current environment were not appropriate for cogeneration as the current electricity market does not support the construction of a large cogeneration facility. As a result, the plant has since been redesigned to provide an energy balance with the plant's own power needs. However, the Minister for Resources Development has indicated that he will ensure that Western Power and the Department of Resources Development note the concerns expressed by the Minister for the Environment in relation to greenhouse gas emissions from the proposed plant when considering energy sector development in the Pilbara area, and that he will request Western Power to expedite its work with the area's generators to overcome the present limitation of the grid, which will encourage the establishment of a large capacity cogeneration facility.

The proponent and the Department of Resources Development have indicated that flexibility will be allowed for in the design of the plant to enable the provision of heat energy to a proposed desalinisation plant in the vicinity. The current design makes use of the waste heat to get rid of the plant's wastewater by evaporation. This design feature saves on the energy required for a more complicated wastewater disposal system and also helps to preserve the local marine environment.

The proponent has committed to using best engineering technology and management practices in designing, constructing and operating the plant to reduce greenhouse gas emissions as low as reasonably practicable. The CER indicated that during the design of the plant the proponent will consider the use of state-of-the-art technology for the reduction of fugitive emissions of natural

gas including graphite filled, stainless steel wound spiral flanges, energised seals within valves, and tertiary seals with intermediate packing on natural gas pipe connections.

Waste gas from the Syntroleum process is reused in the tailgas combustor to get the maximum heating value out of all the gas that is used. The only gas that is wasted or unused is flared during upsets to the system, shutdowns and emergencies. It is estimated that after the initial commissioning and testing period flaring will only be required once or twice per year.

The proponent investigated afforestation in Western Australia and New South Wales and determined that its capital would be spent more productively in research and development than in the timber business, particularly when the proponent holds no expertise in the timber growing business.

The estimated reduction in the quantity of greenhouse gas emitted which would result from the implementation of various reduction measures is shown in Table 8 below.

Table 8: Estimation of quantities of greenhouse gas emission reduction measures

Greenhouse gas emission reduction measure	% Estimated improvement from using this option	Tonnes per annum
State of the Art Construction	0.5%	6,000
Preselection of EPC Contractor	0.5%	6,000
Medium Pressure Gas	3%	30,000
Cogeneration	25%	340,000
Desalinisation Plant	8 to 15%	100,000 to 200,000
Leakless Technology	<0.1%	<130
Air instead of Pure Oxygen	Data Unavailable	Data Unavailable
Reuse of Tail Gas	20% - 100%	260,000 – 1,300,000
Afforestation	2% / 1000 hectares	26,000tpa / 1000 ha

Source: Table 5.17 from the CER

Submissions

The Department of Environmental Protection (DEP) expressed concern about the proponent not making a commitment to use cogeneration, waste heat recovery systems and afforestation to offset the predicted greenhouse emissions. The DEP questioned whether the proponent would make commitments to meet the requirements for membership in the Greenhouse Challenge, and if it would use best engineering technology and management practices reduce fugitive emissions of natural gas. The DEP also questioned whether the proponent had considered storing waste gas and recycling it back into the system, instead of flaring it off, in order to improve efficiency and reduce greenhouse gas emissions.

The Australian Greenhouse Office (AGO) does not accept the argument put forward in the CER that construction of the project will result in a minimum of 1,400,000 tonnes of CO_2 being eliminated from the atmosphere, and requested that relevant information from the proponent's consultants be provided to allow verification of the estimate of emissions. The AGO also requested that information be provided on where Syntroleum is in the process of signing a letter of intent and preparing a co-operative agreement in relation to the Greenhouse Challenge, and on how and when the proponent will consider which 'beyond no regrets' measures are expected to proceed.

Assessment

The EPA considers this proposal to be a significant contributor to Western Australia's greenhouse gas emissions, and its objectives in regard to this environmental factor from both a global and Australian context, consistent with the National Greenhouse Strategy, are to:

(1) estimate the carbon dioxide equivalent emissions from the plant;

(2) mitigate greenhouse gases emissions in accordance with the Framework Convention on Climate Change 1992, and in accordance with Australia's National Greenhouse Strategy as endorsed by the State Government. (Environmental Protection Authority Interim Guidance No. 12 'Minimising Greenhouse Gas Emissions', (EPA, 1998a));

(3) minimise greenhouse gas emissions in absolute terms and reduce emissions per unit product to as low as reasonably practicable; and

(4) estimate the gross amounts of greenhouse gases that may be sequestered from sink enhancement programmes.

Australia's greenhouse gas targets

In response to the predicted impact of increasing levels of greenhouse gases, International and National targets limiting the increases in emissions have been set. At the Kyoto Climate Change Conference of Parties in December 1997, the developed countries agreed to a collective target of at least a 5% decrease in greenhouse gas emissions from 1990 levels by the years 2008 -2012. Australia has particular national circumstances whereby it is a major net exporter of energy, its industries are energy intensive and it has a high industrial growth rate. Within this agreement, Australia was to limit its increase to no more than 8% above 1990 levels over the same timeframe.

In the absence of any measures to reduce emissions of greenhouse gases, Australia's emissions in 2010 are expected to increase by 43% from the 1990 levels. This is the figure which is shown in Table 9 below as the "business as usual" case. It is also expected that companies producing greenhouse gases will accept the Greenhouse Challenge and implement 'no regrets' improvements in their emissions, which will reduce the increase to 28% from the 1990 levels. 'No regrets' is a term used for measures that can be implemented by a company which are effectively cost neutral to a company, in other words it provides the company with returns in savings which offset the initial capital expenditure that may be incurred.

In the Prime Minister's statement prior to the Kyoto meeting and with the approval of the Commonwealth Cabinet, he stated "We are prepared to ask industry to do more than they may otherwise be prepared to do, that is, to go beyond 'no regrets', minimal cost approach where this is sensible in order to achieve effective and meaningful outcomes". This can be achieved by taking action both on-site and off-site. The six greenhouse gases which are covered by the Kyoto Protocol are carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride.

Australia as a whole is challenged to reduce greenhouse gas emissions by 24.5% from the predicted "Business as Usual" level in 2010 by implementing a combination of "no regrets" and "beyond no regrets" measures. This is equivalent to limiting greenhouse gas emissions in 2010 to 108% of Australia's 1990 emission levels.

Table 9: National Greenhouse Targets

National Greenhouse Strategy Target	Factored increase (based on 100 for no change) for Year 2010	Reduction percentage from "Business as Usual"
"Business as Usual"	143	
Implementation of "no regrets"	128	10.5%
PM Statement of "beyond no regrets"	118	17.5%
Inclusion of land use and trading - Kyoto target	108	24.5%
No change on 1990 emission level	100	

Source: National Greenhouse Strategy, 1998

The National Greenhouse Strategy (Commonwealth of Australia, 1998) provided some information as to the implementation of the Kyoto Protocol strategy. There are no State or project specific requirements in the National Strategy, although the strategy does indicate responsibility for measures for the Commonwealth and State governments.

Implementation plans are to be developed by States and Territories as subsidiary documents to the National Strategy.

These plans are to be guided by the same principles which have guided the National Strategy, namely:

- the need to have a Greenhouse response which is tailored to Australia's national interests;
- the need to integrate Greenhouse considerations with other government commitments;
- the pursuit of Greenhouse action consistent with equity and cost effectiveness and with multiple benefits;
- recognition of the importance of partnerships between governments, industry and the community in delivering an effective Greenhouse response; and
- the need for action to be informed by research.

In the assessment of the environmental factor of 'greenhouse gases' for the proposal, the EPA considered the agreement reached by the Australian Government at Kyoto in December 1997 and the subsequent Kyoto Protocol which was signed on 29 April 1998. It also considered the National Greenhouse Strategy (Commonwealth of Australia, 1998) which was released by the Australian Greenhouse Office in November 1998 and endorsed by the WA Cabinet on 5 August 1998 subject to four qualifications, which include: maintenance of international competitiveness, differentiation within Australia, the ongoing nature of the basis for Greenhouse Strategy and the cost of achieving greenhouse targets.

Assessment of the Syntroleum plant

Because the Syntroleum plant involves the application of new technology, it is difficult to define a "business as usual" benchmark for comparing the proposed plant's emissions with a 1990 baseline. In order to make a reasonable assessment the following analyses were made:

- comparison of the proposed plant with the 1990 pilot plant in terms of thermal efficiency;
- identification of other synthetic fuels plants as a basis for comparison;
- a life cycle analysis comparison of synthetic lubricants from the Syntroleum plant with conventional oil-based alternatives; and
- identification of "beyond no regrets" measures which could be adopted.

These four approaches are considered below.

Thermal efficiency of the proposed plant

The proponent advised (in a letter from TESSAG Industrie-Anlagen GmbH) that the overall thermal efficiency of the proposed plant is estimated to be 50%. This was determined from the formula below:

$$\text{Overall thermal efficiency} = \frac{\text{Lower Heating Value of products}}{\text{Lower Heating Value of total natural gas feed}}$$

To maximise heat recovery, waste heat will be utilised in various parts of the plant in the following ways:

- tail gas will be combusted to preheat the natural gas supply and process air, and for the production and superheating of high pressure steam;
- recovery of sensible heat in the synthesis gas generated in the Autothermal Reformer for the production of high pressure steam;

- recovery of exothermic heat in the Fischer-Tropsch reactors for the production of medium pressure steam;
- the installation of boiler feed water preheaters (heat exchangers) to recover lower temperature sensible heat in the synthesis gas from the Autothermal Reformer and from the reactor effluent stream from the Fischer-Tropsch Reaction Section. Additional steam will be generated which will be used to power steam turbine driven compressors; and
- the utilisation of low pressure (low energy content) steam in lithium bromide type absorption chillers in the Product Condensing and Recovery Section downstream of the Fischer-Tropsch Reactors.

The waste heat recovery measures and other process improvement measures would result in a reduction of approximately 54% in greenhouse gas emissions from the plant (from 2.5Mtpa CO_2 equivalent for the 1990 pilot plant to 1.16Mtpa CO_2 equivalent for the proposed plant). Thus, if the pilot plant is taken as a 1990 "business as usual" benchmark then the Syntroleum proposal has achieved a 54% reduction in greenhouse gases compared to the national target of 24.5%.

Comparison with other plants

Other synthetic fuels plants were identified in an attempt to compare their thermal efficiency with the Syntroleum proposal. These were the Shell Middle Distillate Synthesis Plant at Bintulu in Malaysia, Sasol Synthetic Fuels in South Africa, and Mossgas Pty Ltd in South Africa. However, because these plants use pure oxygen technology rather than air, suitable comparisons could not be made.

Syntroleum have proposed using air instead of pure oxygen for the following reasons:

(1) Safety and reliability - The use of air technology reduces the overall risk at the plant in comparison to oxygen technology. It is not certain that the risk contours for a 10,000 barrels per day Gas to Hydrocarbons (GTH) plant including an oxygen plant would have fit on the proposed Burrup site. Pure oxygen is a strong oxidiser and hydrocarbons are a fuel. Having them in close proximity requires extremely rigorous safety conditions.

(2) Capital cost - A plant including pure oxygen would be more expensive to construct than the Syntroleum plant.

(3) Ease of operation - Plant operation is considerably simpler without the oxygen plant.

(4) Area - Less land area is required without the oxygen plant.

(5) Product design - The catalysts that Syntroleum has developed are specific for the products that Syntroleum wishes to produce.

Life cycle analysis

A 'life cycle analysis' of the Syntroleum project indicates that there could be additional benefits derived from the use of some of the products that will be produced by the proposed plant. For instance, the synthetic lubricants that will be produced for automotive applications will generally have superior performance in comparison to conventional mineral-oil-based products, particularly in regard to reduced friction (1 - 3% better fuel economy in vehicles) and a much longer service life, which will reduce the total quantity of lubricants consumed over the life of a vehicle. The proposed plant will also produce diesel fuel that is free of sulphur and aromatic hydrocarbon and that has a higher cetane rating than petroleum-derived diesel fuel. This higher cetane rating may lead to improved fuel efficiency when used in diesel-fuelled vehicles, and the lack of sulphur and aromatic hydrocarbons will also result in reduced harmful exhaust emissions from these vehicles, particularly black sooty exhaust smoke. The proponent argues that the use of natural gas for the production of synthetic hydrocarbons keeps a significant amount of carbon locked up as products instead of being released into the atmosphere as CO_2 if the gas were burnt.

"Beyond no regrets" measures

The EPA understands that the State Government via the Water Corporation will facilitate the establishment of a desalination plant on the Burrup Peninsula to assist the project. The time frame for the construction of the desalination plant has not been clarified at this point in time, but it would be likely to coincide with the construction of the proposed plant. The EPA notes that the project will supply between 10 to 30MW of power via steam to the proposed desalination plant. The use of this energy would eliminate the need for the desalination plant to consume additional natural gas or electrical power, and would result in a reduction of about 100,000 tonnes per year of CO_2.

In addition, as noted above, the proponent has identified possible greenhouse gas reduction measures related to increased process and energy efficiencies. The EPA also expects the proponent to continue investigating greenhouse gas offset measures such as afforestation, and other measures to reduce the total net greenhouse gas emissions from the project. Afforestation would be of particular benefit to the Western Australian environment since in addition to sequestering carbon dioxide, this measure would also assist in reducing the salinity problem.

Proponent commitments

Syntroleum has made the following commitments in relation to greenhouse gas emissions:

(1) Syntroleum is committed to continue investigations of "beyond no regrets" measures to reduce greenhouse gas emissions, particularly afforestation projects.

(2) Syntroleum is committed to adhering to EPA Guidance Statement No. 12 and the National Greenhouse Strategy, including calculation of the greenhouse gas emissions from the proposed plant, determination of the greenhouse gas emissions from the plant periodically after it is built and in operation, and provision of details of the efficient technologies that will be used to reduce total greenhouse gas emissions.

(3) Syntroleum commits to entering into the Commonwealth Government's Greenhouse Challenge, including the commitment to monitor its greenhouse gas emissions, develop on-going emission reduction strategies, set a target for the reduction of total net "greenhouse gas" emissions and/or "greenhouse gas" emissions per unit of product over time, and to provide an annual report of its overall performance.

(4) Syntroleum is committed to using best engineering technology and management practices in designing, constructing and operating the plant to reduce greenhouse gas emissions to as low as reasonably practicable (ALARP).

Summary

Having particular regard to the:

(a) thermal efficiency of the proposed plant, given that it is the first of its type in the world in terms of technology;

(b) estimated savings in CO_2 equivalent of 54% of the 1990 "Business as Usual" level, which is above the target set in the National Greenhouse Strategy; and

(c) commitments made by the proponent regarding implementation of "no regrets" measures and investigation into and reporting on "beyond no regrets" measures;

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor provided that Condition 7 includes a requirement for the proponent to set a target for the reduction of total net "greenhouse gas" emissions and/or "greenhouse gas" emissions per unit of product over time, and to report annually of progress made in achieving this target.

3.5 Risk and hazards

Description

A Preliminary Risk Assessment (PRA) was carried out by Granherne Pty Ltd for the plant, the gas pipeline supplying the plant and the product pipelines to Dampier Public Wharf (Granherne, 1999). The PRA identified the hazards associated with the facilities, estimated the offsite risks, and provided recommendations to reduce the risks to 'as low as is reasonable practicable' (ALARP).

The main risks identified from the plant were from the release of process hydrocarbon vapours, some of which contain carbon monoxide (CO), which could result in a vapour cloud explosion or asphyxiation from the CO. A risk assessment was conducted which combined consequences and frequencies and the resultant risk contours (see Figure 6 below) indicate that the individual fatality risk at the plant boundary is below five in a million per year, well below the EPA's maximum acceptable individual risk fatality criterion of 50 in a million per year for hazardous industrial facilities at an industrial boundary (EPA, 1998). Almost all the risks can be contained within the land under the proponent's control. There will be no risk at the closest residential area in Dampier, which is located approximately 5km away.

The plant will be designed utilising the following safety systems:

(1) Fail safe deign for valves and systems;

(2) Emergency and operational shutdown systems;

(3) Fire, CO and gas detection systems;

(4) Firewater and foam systems; and

(5) Emergency power system.

For the natural gas pipeline running from the Woodside Energy gas plant to the Syntroleum plant, the main risk is from external interference, and the pipeline is buried to reduce this risk. The risk assessment for the natural gas supply pipeline classified the risk to the public from the pipeline as "Low", due to the remoteness of the pipeline, the absence of compressor stations and burying of the pipeline. The risk transect shows that the risk from this pipeline is well below the EPA's risk criterion of ten in a million for buffer areas.

For the product pipelines from the GTS plant to the Dampier Public Wharf, the main outcome from a breach of pipeline integrity is a pool fire where the breach occurs. The risk assessment indicated that the risk is low because of the infrequent use of the pipelines, (30 hours per month), and risk transect for the light synthetic pipeline showed that the risk of the fatality at the easement boundary was well below the EPA's risk acceptance criterion of ten in a million per year. There will be no product storage at the wharf.

Ship movement and loading operations at the Dampier Public Wharf will be conducted under the procedures established by the Dampier Port Authority (DPA). On average, eight ships per month will dock at the Dampier Public Wharf to be loaded and will consequently export product to markets. The frequency of a ship incident has been assessed and assumed to be similar to the risk associated with a release from the light synthetic paraffins pipeline along the pipeline route, although the consequences can be much larger.

Risk mitigation measures that the proponent will implement are:

- The wharf will be manned by authorised company personnel during loading. Provision will be made for isolation of product pipelines at the wharf.
- Whilst the DPA has primary role for coordinating the emergency response, the proponent and ship's personnel will retain primary responsibility for providing the response manpower and equipment.

The CER stated that because it is unlikely that the paraffins line could result in multiple fatalities offsite resulting from the consequences of releases of the light synthetic, societal risk has not been evaluated.

The CER also indicated that the following recommendations arising from the PRA in relation to potential risk reduction measures will be adopted by the proponent.

(1) Fittings and valves upstream of natural gas supply emergency shut-off valves will be minimised in order to limit the potential for extended releases of high pressure natural gas.

(2) The protection and location of emergency shutoff valves and depressurising valves in relation to potential leak sources is critical to ensure operability during a hazardous incident. Accordingly, emergency shutoff valves and depressurising valves in the vicinity of potential leak sources will be suitably protected and located.

(3) CO detection in partially or fully enclosed areas of the plant where the PRA, Quantitative Risk Assessment (QRA) and Hazard and Operability (HAZOP) studies determine that there is potential for CO accumulation, will be provided.

(4) Where possible all refractory lined pipes on reform gas outlet lines will be fully welded with no joints (gaskets) or major instrument fittings installed on the pipework, in order to limit the potential release sources. A "hot spot" management program will be included in the plant maintenance management system.

(5) Measures will be implemented to minimise the potential for the accumulation of hydrogen gas within an enclosed area where the PRA, QRA and HAZOP studies determine that there is a significant risk in the event of a leak of hydrogen rich gas. This particularly applies to equipment for the compression of synthesis or hydrogen gas and is based upon the low ignition energy of hydrogen gas and the high probability of detonation of a confined hydrogen gas cloud.

(6) The plant design will incorporate emergency shutdown, depressurisation and minimisation of inventories which can be isolated, for units in the plant containing hydrogen rich gases, where the PRA, QRA and HAZOP studies determine that there is a significant risk, given the speed at which a relatively large vapour cloud can form and the high probability of detonation of hydrogen gas.

(7) The plant design will incorporate emergency shutdown, depressurisation and minimisation of inventories which can be isolated, for "light" hydrocarbon liquid streams present at elevated temperatures and pressures, with a view to minimising the potential size of flammable vapour clouds in the event of a leak in areas where the PRA, QRA and HAZOP studies determine that there is a significant risk. Gas detection measures will also be included in areas where the PRA, QRA and HAZOP studies determine that there is a significant risk.

(8) The plant design will include hydrocarbon gas detection in areas where the PRA, QRA and HAZOP studies determine that there could be an accumulation of hydrocarbon gas in the event of a leak. This system is typically a stand alone system that provides detection and in some cases shutdowns. The details and extent of this system will be determined during a detailed process hazards analysis.

(9) The location of fire fighting equipment such as fire water pumps, monitors and hydrants and the location of other equipment associated with emergency facilities such as cabling to emergency shutdown and depressurisation valves, will be determined using the appropriate Australian Standards, fire safety codes and good engineering practice. These determinations will be reviewed in the PRA, QRA and HAZOP studies undertaken during the course of detailed design and corrected as appropriate.

(10) An Emergency Response Plan will be developed and implemented to meet the requirements of the Department of Minerals and Energy (DME) and State Emergency Services, for the gas supply pipeline, the product pipelines and the GTS plant before commissioning.

(11) A Safety Management System will be developed and implemented to meet the requirements of the Worksafe Standard for the Control of Major Hazard Facilities and the DME' requirements, for the GTS plant before commissioning.

(12) The QRA will be finalised before commissioning.

Submissions

The DEP indicated that there was a need for the proponent to include in its emergency response plan the exclusion of traffic on Hearson Cove Road in an emergency. DEP also saw the need for the proponent to undertake a detailed route risk assessment for the product pipelines, giving close attention to the design of road crossings. The DEP also suggested that the proponent would need to commit to prepare HAZOP studies for the plant design, and to prepare and trial an emergency response plan for ship loading in conjunction with the DPA, prior to the first ship being loaded.

The DME sought further clarification and information on the assumptions made in the PRA, the conclusions drawn from it, and several potential failure scenarios that were not considered. The DME indicated that a final Quantitative Risk Assessment (QRA) will be required prior to construction of the proposed plant. Similarly, a Safety report and Safety Management System will need to be prepared prior to commissioning, to the satisfaction of the Chief Inspector of Explosives and Dangerous Goods. This is because on the basis of the information presented in the CER, the plant would be classified as a Major Hazard Facility. The proponent has indicated that it will confirm the Major Hazard Facility classification with the DME once more detailed information becomes available on the storage quantities on site.

CALM expressed concern that gas supply pipeline route Option A was rejected by the proponent because it would pose a greater risk than the alternative route, but no clarification was provided in the proposal on what the greater risk is. CALM also indicated that there is a possibility of conflict of the gas supply pipeline with other pipeline routes, if the proposed Plenty River Ammonium Urea project goes ahead, and questioned whether this potential conflict of pipeline routes had been addressed.

The DPA suggested that the proponent needed to enter into a Memorandum of Understanding (MOU) with it regarding minimising the risk of spillage and leaks and emergency response procedures, and indicated that it would prefer the proponent's personnel to load product on to ships to minimise risk.

The Shire of Roebourne indicated that risk and hazards from plant should not compromise access to Hearson Cove.

Assessment

The area considered for assessment of this factor is the region immediately surrounding the proposed plant site, the natural gas supply and product pipeline routes, the product loading facility at Dampier Public Wharf, Hearson Cove Road and Hearson Cove itself.

The EPA's environmental objectives for this factor are to ensure that:

- risk is assessed and managed to meet the EPA's criteria for off-site individual fatality risk in EPA Interim Guidance No. 2 for 'Risk assessment and Management: Offsite Individual Risk from Hazardous Industrial Plant' (EPA, 1998b), the Department of Mineral and Energy's requirements in respect of public safety, and the Worksafe National Standard for the Control of Major Hazard Facilities (NOHSC, 1996); and
- public risk associated with implementation of the project is 'as low as reasonably practicable' (ALARP), and in compliance with acceptable standards.

The EPA's individual risk criteria as stated in EPA Guidance No. 2 (EPA, 1998b), which would apply to the proposed plant and other relevant infrastructure are as follows:

- fatality risk levels from industrial facilities should not exceed a target of fifty in a million per year at the site boundary for each individual industry, and the cumulative risk level imposed upon an industry should not exceed a target of one hundred in a million per year; and
- a fatality risk level for any non-industrial activity located in buffer zones between industrial facilities and residential zones of ten in a million per year or less, is so small as to be acceptable to the Environmental Protection Authority.

The plant currently has no neighbours so the buffer criterion of ten in a million would apply to the fenceline. The plant iso-risk contours illustrated in Figure 6 below indicate that this criterion is easily met. If any heavy industry is located to the north of the plant site then the higher criterion of fifty in a million could be afforded the Syntroleum plant provided there was a coordinated emergency response.

Hearson Cove Beach, which is a popular recreational area, is located 2.8km from the proposed plant site and will have risk levels significantly less than the EPA criterion of ten in a million per year. The closest residential area is located approximately 5km away in the township of Dampier. Accordingly, there will be no risk to residents.

The risk transects for both the light synthetic paraffins pipelines and the natural gas feedstock pipeline show that the risk of fatality is less than the risk acceptance criteria of ten in a million at the respective easement boundaries.

The risk related impact resulting from the loadout and shipping of light synthetic paraffins will be contained within the DPA Public Wharf lease area. Any loading / shipping incident could also result in major environmental impacts and the EPA considers it important that Syntroleum make an additional commitment to prepare and trial a shipping/loading incident response plan with the DPA and other agencies.

In relation to the concerns expressed by the DEP, the EPA notes that the proponent has indicated in its response to the summary of submissions that:

- it is likely that there will be scenarios identified in the emergency response plan that would require the closing of Hearson Cove Road during an incident;
- the potential for risk reduction options has been investigated in the work that was done for the AS2885 report on the pipelines, and risk levels will be low and little potential exists for further cost effective risk reduction consistent with the ALARP principle;
- road crossings will be designed very carefully and reviewed by Main Roads WA for Burrup Road, and the Shire of Roebourne for King Bay Road;
- the proponent will commit to undertake HAZOP studies of all critical plant systems and designs, and will consider the recommendations of the preliminary risk assessment, the quantitative risk assessment and the HAZOP studies in the design and operation of the plant;
- the proponent will commit to prepare a shipping emergency response plan in co-operation with the DPA;
- the Fire and Rescue Services, the State Emergency Service, CALM, the DEP, and the DME will be linked to the emergency response plan; and
- the proponent will trial a shipping emergency response plan in co-operation with the DPA as part of the normal preparations for the loading of product at the Dampier Public Wharf.

The EPA believes that the above information satisfactorily addresses the concerns expressed by the DEP.

On a similar basis, the EPA also believes that the proponent has satisfactorily addressed the numerous detailed concerns expressed by the DME pertaining to risk and hazards in its response to the summary of submissions. The proponent indicated that if a Safety Report is required by the Chief Inspector of Explosives and Dangerous Goods it will be prepared and submitted accordingly. The proponent has also committed to preparing a Safety Management System.

The proponent indicated in its response to the summary of submissions that the decision to choose gas supply pipeline route Option B was not simply a risk decision. The pipeline routes were selected on the basis of several factors, including the preference of Main Roads WA, the proponent's future expansion requirements, and DRD's preferences, as detailed below.

Main Roads WA indicated to the proponent that it would oppose the use of route Option A, and would not grant the appropriate easement because its proximity to Burrup Road would not allow the width of Burrup Road to be expanded in the future by the required 20 to 30m.

The proponent's preference for route Option B centred around the need to ensure that the chosen pipeline corridor route could accommodate additional pipelines to cater for possible future plant expansion. In addition because of route Option A's proximity to Burrup Road and other existing gas pipelines, it would require the resulting additional safety and risk concerns to be addressed in the design and construction of the pipeline via measures such as greater burial depth, thicker rock armour protection, increased pipeline wall thickness etc.

DRD's preferences related to the need to construct a multi-user pipeline corridor that could accommodate other pipelines and infrastructure in addition to the proponent's gas supply pipeline. Due to its proximity to Burrup Road, route Option A was not considered viable as it could not be expanded sufficiently to accommodate additional pipelines and other infrastructure to due the lack of space. DRD has recently referred the King Bay to Hearson Cove Infrastructure Corridor to the EPA and the proponent has agreed to work with DRD on the alignments that will best meet both its own needs and those of the State.

The EPA considers that the above information satisfactorily addresses the concerns expressed by CALM.

In regard to the concerns expressed by the DPA, the EPA notes that the proponent has indicated in its response to the summary of submissions that it plans to enter into a Memorandum of Understanding with the DPA. The proponent has indicated that it is considering a variety of methods for loading ships at Dampier Public Wharf, and negotiations regarding the exact structure of the loading operation will be undertaken. Whatever the specific relationships are at the wharf, the proponent will take responsibility for product loading.

The EPA notes that the proponent has indicated in its response to the summary of submissions that it will commit to keeping Hearson Cove Road open during construction. However, for brief periods during the initial construction of the new alignment of Hearson Cove Road, there may be slight delays while heavy equipment is moving across the road. In an emergency, Hearson Cove Road may be closed to allow emergency procedures to take place without interference from public traffic. The EPA considers that the above information satisfactorily addresses the concerns expressed by the Shire in this regard.

The EPA acknowledges the following commitments made by the proponent in regard to the management of risks and hazards:

(i) Syntroleum commits to preparing a emergency response plan for the GTS plant, gas supply and product pipelines, to the appropriate requirements of the DME and State Emergency Services.

(ii) Syntroleum commits to prepare a shipping emergency response plan in co-operation with the Dampier Port Authority. The Fire and Rescue Services, the State Emergency Service, CALM, the DEP, and DME will be consulted and linked to the emergency response plan. Syntroleum will trial a shipping emergency response plan in co-operation with the Dampier Port Authority as part of the normal preparations for the loading of product at the Dampier Public Wharf.

(iii) Syntroleum commits to prepare a Safety Management System (SMS) prior to commissioning, to the appropriate requirements of the DME.

(iv) Syntroleum commits to prepare a final Quantitative Risk Assessment (QRA) for the project prior to commissioning, to the appropriate requirements of the DME and the DEP.

(v) Syntroleum commits to ensure that risks and hazards associated with the proposed plant will not compromise access to Hearson Cove, except during an emergency situation where Hearson Cove Road may be closed to allow emergency procedures to take place without interference, in consultation with the DME and the DEP.

(vi) Syntroleum commits to ensure that the design and construction of the plant, natural gas supply and product pipelines, and other related infrastructure complies with the

requirements of AS1940, AS2885, AS4041, the *Petroleum Pipelines Act 1969*, the *Explosives and Dangerous Goods Act 1961*, and the Australian Pipeline Industry Association (APIA) Code of Environmental Practice, and other relevant standards and guidelines, where appropriate.

(vii) Syntroleum commits to design the road crossings of pipelines to ensure an acceptable level of safety during operations and construction, following discussions with the Shire of Roebourne, Main Roads WA the DME, the DEP and other relevant organisations, prior to construction.

(viii) Syntroleum commits to undertake HAZOP studies of all critical plant systems and designs, to the appropriate requirements of the DME. Syntroleum will incorporate the recommendations of the preliminary risk assessment, the quantitative risk assessment and the HAZOP studies in the final design and operation of the plant.

Summary

Having particular regard to the:

(a) commitments made by the proponent;

(b) project complying with the EPA's criteria for individual risk and the overall reduction of risk; and

(c) advice obtained from the DEP, DME, CALM and the DPA in relation to the management of risk and hazards;

it is the EPA's opinion that the proposal is capable of being managed to meet the EPA's environmental objective for this factor.

4. Conditions and commitments

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

In developing recommended conditions for each project, the EPA's preferred course of action is to have the proponent provide an array of commitments to ameliorate the impacts of the proposal on the environment. The commitments are considered by the EPA as part of its assessment of the proposal and, following discussion with the proponent, the EPA may seek additional commitments.

The EPA recognises that not all of the commitments are written in a form which makes them readily enforceable, but they do provide a clear statement of the action to be taken as part of the proponent's responsibility for, and commitment to, continuous improvement in environmental performance. The commitments, modified if necessary to ensure enforceability, then form part of the conditions to which the proposal should be subject, if it is to be implemented.

4.1 Proponent's commitments

The proponent's commitments as set in the CER and subsequently modified, as shown in Appendix 5, should be made enforceable.

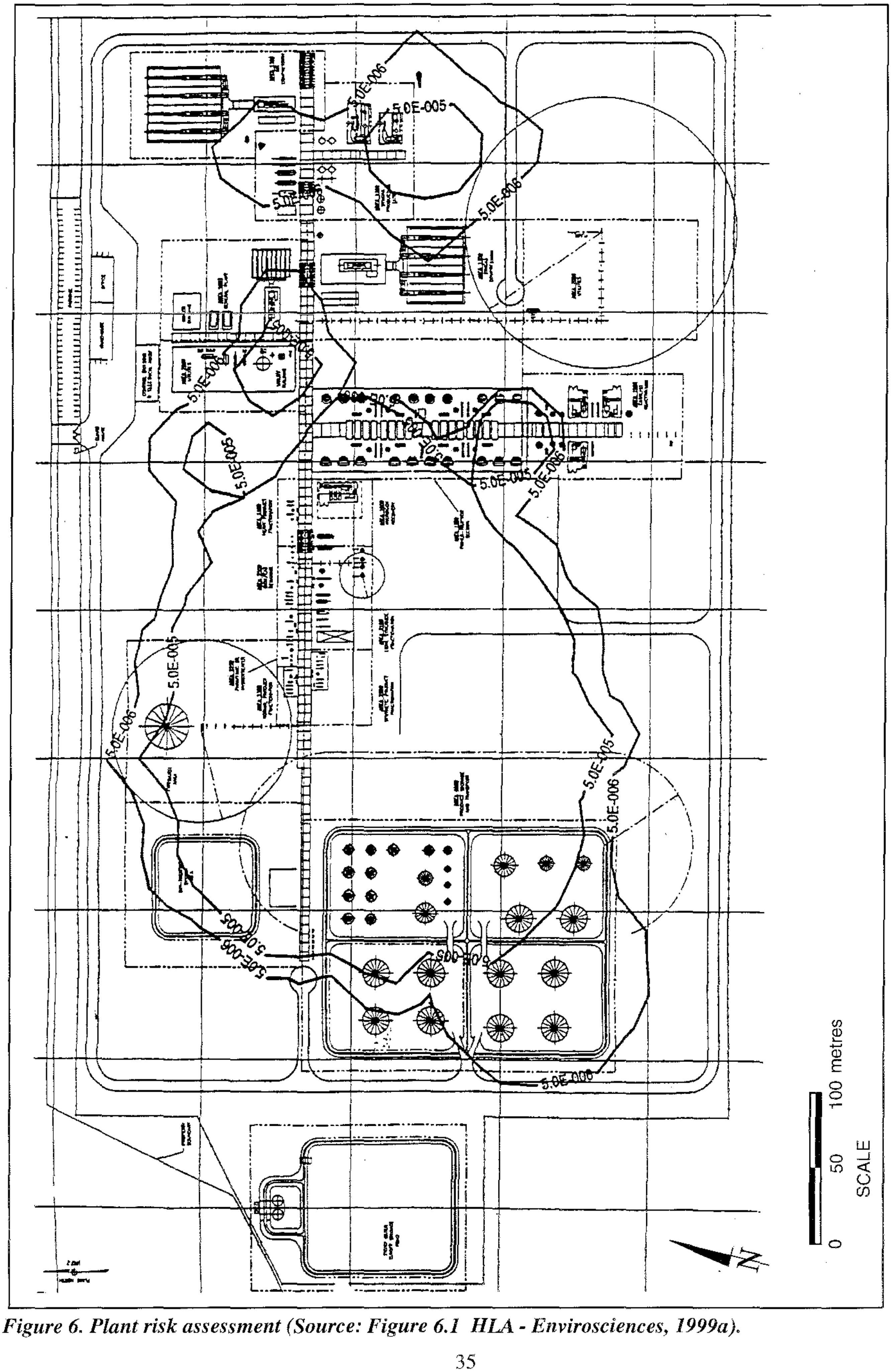

Figure 6. Plant risk assessment (Source: Figure 6.1 HLA - Envirosciences, 1999a).

4.2 Recommended conditions

Having considered the proponent's commitments and the information provided in this report, the EPA has developed a set of conditions which the EPA recommends be imposed if the proposal by Syntroleum Sweetwater LLC to construct and operate a natural gas to synthetic hydrocarbons plant on the Burrup Peninsula, is approved for implementation.

These conditions are presented in Appendix 5. Matters addressed in the conditions include the following:

(a) that the proponent be required to fulfil the commitments in the Consolidated Commitments statement set out as an attachment to the recommended conditions in Appendix 5;

(b) that the proponent shall demonstrate to the requirements of the Environmental Protection Authority, that there is in place an Environmental Management System;

(c) that prior to commissioning, the proponent shall prepare a Greenhouse Gas Emissions Management Plan to ensure that "greenhouse gas" emissions from the project are adequately addressed, best available efficient technologies are used, a target is set for the reduction of total net "greenhouse gas" emissions and/or "greenhouse gas" emissions per unit of product over time, and that progress made in achieving this target is reported annually to the Environmental Protection Authority;

(d) that at least six months prior to decommissioning, the proponent shall prepare a Final Decommissioning Plan to the requirements of the Environmental Protection Authority, which shall address the removal of plant and infrastructure, the rehabilitation of all disturbed areas to a standard suitable for agreed new land uses, and the identification of contaminated areas, including provision of evidence of notification to relevant statutory authorities;

(e) that prior to commencement of construction, the proponent shall prepare a written prescription for contractor work practices covering plant and pipeline construction and operation, to ensure that work practices are carried out at the level of international best practice, to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection and the Department of Minerals and Energy; and

(f) that for each five years following the commencement of construction, the proponent shall submit a Performance Review report to the Department of Environmental Protection evaluating the outcomes and environmental performance over the five years.

5. Other advice

The EPA believes that Government should identify other sites on the Burrup Peninsula or nearby areas which contain the same vegetation community assemblage as found in the south-western portion of the proposed site and subsequently secure them from future industrial development. Furthermore, additional flora and fauna surveys of the designated industrial areas identified in the Burrup Peninsula Land Use Plan and Management Strategy should be undertaken. These surveys will supplement the surveys that have already been undertaken within designated conservation, heritage and recreation areas on the Burrup Peninsula. This will enable a more comprehensive conservation plan to be developed which provides protection for important vegetation community assemblages. Consequently, environmental values, particularly native vegetation would not be compromised by other constraints on land, such as Native Title.

The EPA notes that the Maitland Industrial Estate is not being actively pursued by proponents currently intending to establish their projects within the region, even though it has been through the environmental assessment process. The location of projects within the Maitland Industrial Estate would overcome some of the sensitivities that are developing on the Burrup.

Furthermore, the EPA suggests that Government should expedite the establishment of the proposed King Bay to Hearson Cove Service Corridor in order to allow the proponent to locate the product pipelines running from the proposed plant to the Dampier Public Wharf within it.

The establishment of this infrastructure corridor will help to consolidate the potential environmental impacts of this proposal and future infrastructure development linked to new industrial projects, into one location. This will greatly assist the environmental assessment of future industrial proposals establishing within the region.

6. Conclusions

The EPA has considered the proposal by Syntroleum Sweetwater LLC to construct and operate a natural gas to synthetic hydrocarbons plant, a natural gas supply pipeline, eight product pipelines, and a product loading facility at the Dampier Public Wharf on the Burrup Peninsula.

The EPA believes that of the five environmental factors identified as being relevant to the proposal, terrestrial flora, terrestrial fauna and greenhouse gas emissions were the most significant. The EPA determined that the remaining factors of gaseous and particulate emissions and risk and hazards could be managed to meet its objectives for the following reasons.

In relation to gaseous and particulate emissions emanating from the proposed plant, the EPA is aware that air quality modelling indicates that potential impacts from oxides of sulphur (SO_X), volatile organic compounds (VOCs), particulates, and carbon monoxide (CO) will be negligible, and that ground level concentrations for oxides of nitrogen (NO_X) under normal operating conditions will be below the relevant National Environmental Protection Measure (NEPM) standard. The EPA understands that ground level concentrations for NO_X under emergency operating conditions will also be below the NEPM standard outside the plant boundary, but there may be potential exceedances within the plant boundary. However, the EPA is aware that the likelihood of these exceedances occurring is very small due to the fact that the emergency generators producing the NO_X will only be used for a few hours per year, if at all, combined with the very small number of hours per year that the extreme (cyclonic) weather conditions needed to cause the exceedances, do actually occur. The EPA also acknowledges the commitments made by the proponent to adopt and implement best engineering practice in relation to limiting NO_X emissions from the plant by installing a tail gas combustor which produces the lowest NO_X emissions reasonably practicable, and by incorporating NO_X reducing equipment in other relevant areas of the plant, as well as ensuring that NO_X emissions from the proposed plant will, at a minimum, comply with the relevant emissions standards.

The EPA considers that risk and hazards arising from the project will be manageable in view of the fact that the project is located within a designated industrial area, is remote from potentially conflicting land uses, and risk modelling indicates that construction and operation of the proposed plant and associated pipelines will comply with relevant EPA risk criteria. The EPA has also taken into account the various commitments made by the proponent in order to minimise risk and hazards. Further reinforcing the EPA's view is its understanding that, where appropriate, the design and construction of the proposed plant and associated pipelines, and other related infrastructure will need to comply with the requirements of AS2885, the *Petroleum Pipelines Act 1969*, the Australian Pipeline Industry Association (APIA) Code of Environmental Practice, and the *Explosives and Dangerous Goods Act 1961* which is administered by the Department of Minerals and Energy (DME).

In assessing the potential impacts on terrestrial flora and fauna the EPA has been made aware that the drainage features located in the south-western portion of the site, whilst not including any rare species, do contain vegetation community assemblages which probably do not occur elsewhere on the Burrup Peninsula. The proponent intends to use this portion of the site as a construction laydown and future plant expansion area, and will also construct a wastewater treatment plant and drainage sump within it. Although the EPA does not consider this to be a major impediment for the proposal, it would expect the proponent to disturb as little of this area as possible. In this regard, the EPA welcomes the commitments made by the proponent to demonstrate good corporate citizenship by using every possible endeavour to minimise impacts upon the drainage features located in the south-western portion of the site during construction and operation of the plant, and to disturbing only the areas that are essential to the construction and operation of the plant.

Whilst the EPA acknowledges the topographical and native title constraints of the site which prevent the plant configuration being modified and / or moved in an easterly direction away from the drainage features, it raises a particular problem for the EPA in that environmental values are being compromised by native title issues. The EPA considers it unfortunate that the proposed plant could not be located within the nearby Maitland Industrial Estate as this estate has been through the environmental assessment process. The EPA suggests that Government should identify other sites in the region which contain the same vegetation community assemblages and subsequently secure them from future industrial development. The EPA supports the flora and fauna surveys undertaken by DRD of the wider Burrup outside designated industrial areas and recommends that they be extended to include designated industrial land so that this issue does not arise again for future industrial development proposals.

In regard to greenhouse gas emissions, the EPA is aware that this proposal will be a significant contributor to Western Australia's greenhouse gas emissions: the emissions represent about 0.27% of Australia's total greenhouse gas emissions. However, the EPA acknowledges that the proponent will design and operate the plant in accordance with "best practice". The EPA also acknowledges the commitments made by the proponent regarding implementation of "no regrets" measures and investigation into and reporting on "beyond no regrets" measures. The EPA believes that this factor is manageable provided that Condition 7 includes a requirement for the proponent to set a target for the reduction of total net "greenhouse gas" emissions and/or "greenhouse gas" emissions per unit of product over time, and to report annually on progress made in achieving this target.

In view of the above, the EPA has therefore concluded that it is unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the proponent's commitments and the recommended conditions set out in Appendix 5 and summarised in Section 4.

7. Recommendations

Recommendations

The EPA submits the following recommendations to the Minister for the Environment:

1. That the Minister notes that the proposal being assessed is for the construction and operation of a natural gas to synthetic hydrocarbons plant, a natural gas supply pipeline, eight product pipelines, and a product loading facility at the Dampier Public Wharf on the Burrup Peninsula;
2. That the Minister considers the report on the relevant environmental factors as set out in Section 3;
3. That the Minister notes the EPA's other advice regarding future development in the Pilbara region;
4. That the Minister notes that the EPA has concluded that it is unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 5 and summarised in Section 4, including the proponent's commitments; and
5. That the Minister imposes the conditions and procedures recommended in Appendix 5 of this report.

Appendix 1

List of submitters

Organisations:

(1) Department of Conservation and Land Management
(2) Water and Rivers Commission
(3) Department of the Environment and Heritage, Environment Australia
(4) Conservation Council of Western Australia Inc
(5) Ministry for Planning, Pilbara Regional Office
(6) Department of Minerals and Energy, Explosives and Dangerous Goods Division
(7) Shire of Roebourne
(8) Dampier Port Authority
(9) The Friends of the Burrup Peninsula

Individual:

No submissions from individuals were received.

Appendix 2

References

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Appendix 3

Summary of identification of relevant environmental factors

Table 1: Summary of identification of relevant environmental factors

Preliminary environmental factors	Proposal characteristics	Government agency and public comments	Identification of relevant environmental factors
Biophysical			
Vegetation communities	Six broad vegetation associations were identified on the plant site, which included 14 different vegetation associations. Six broad vegetation associations were identified on both of the pipeline routes, which included 15 different vegetation associations. The project will have a direct impact on vegetation associations where species must be removed.	**The Friends of the Burrup Peninsula** • The proponent should choose pipeline location Option A as the pipeline would run through a road reserve which is already disturbed. • The potential for the spread of weeds is enormous. The proponent should heed and adopt the recommendations in Appendix C of the CER regarding weed control. • Concern about the removal of species such as *Terminalia supranatifolia* and *Brachychiton acuminatus*. Research should be undertaken to establish a propagation technique prior to removal. **Conservation Council of WA** • The proponent's commitment regarding weed management is inadequate. The issue of weed management needs to be addressed much more thoroughly by the proponent. • The proponent must ensure that adequate rehabilitation plans are put in place. It is anticipated that the proponent will provide a final rehabilitation and closure report that will be publicly available. • Concern about the lack of a topsoil management plan. Will the proponent include a topsoil management plan into their rehabilitation plan? • It is essential that the seed collection programme is completed before any development of the area commences, thereby ensuring that representative propagation of all affected species can be undertaken. **Department of Environmental Protection** • It has not been made clear whether the proposal intrudes into the valley and flowline system to the south. • The drainage system in the western to south-western part of the plant area contains a system of vegetation types which are of restricted occurrence on the Burrup Peninsula and which are identified as rare. • The overall context of the vegetation of the Burrup Peninsula is not comprehensively scoped. The Department of Conservation and Land Management raised similar concerns to those listed above.	Considered to be a relevant environmental factor. It will be assessed under the heading of Terrestrial flora.
Declared Rare and Priority Flora	Four priority plants, *Brachychiton acuminatus*, *Gymnanthera cunninghamii*, *Terminalia supranitifolia*, and *Triumfetta appendiculata* were identified on the plant site and the pipeline routes. Some declared rare or priority species will be removed during construction.	**The Friends of the Burrup Peninsula** • The timing of the vegetation, flora and fauna survey could not provide an accurate assessment of the flora along pipeline route Option B due to seasonal variations. More surveys are needed in other seasons. • Concern about the CER indicating that 50% of each priority species that is destroyed will be replaced in the native garden or landscaping. How and why was this figure chosen? • The propagation of Priority species should be trialed now as it would be too late after they have been removed to find out that they are difficult to propagate. • Would it be possible for the Shire of Roebourne to be funded to research the propagation of priority species from plants in the area? **Conservation Council of WA** • It is essential that 100% of any rare or priority species be rehabilitated. **Department of Environmental Protection** • The flora survey should have incorporated further sampling in order to better characterise the ephemeral flora. The Department of Conservation and Land Management raised similar concerns to those listed above.	Considered to be a relevant environmental factor. It will be assessed under the heading of Terrestrial flora.

Table 1: Summary of identification of relevant environmental factors (continued)

Preliminary environmental factors	Proposal characteristics	Government agency and public comments	Identification of relevant environmental factors
Biophysical (continued)			
Specially Protected (Threatened) fauna	Six broad fauna habitats were identified on the plant site. Five broad fauna habitats were identified on the pipeline routes. The project is likely to have an impact on terrestrial fauna.	**The Friends of the Burrup Peninsula** • The proponent is ignoring the advice of its consultant in relation to the survey of native molluscs and the long term viability of the native snail species. • The fauna survey appears to be totally inadequate in terms of timing and sampling area. More work needs to be done to provide comprehensive knowledge of the fauna that will be disturbed by construction. **Conservation Council of WA** • Concern that the project may impact on the habitat areas of reserve listed fauna species. The species numbers and habitat areas of any reserve listed species should be given every possibility of preservation. • The loss of habitat sites, particularly where this has the potential to affect habitat specific species and migratory species is of concern. **Department of Environmental Protection** • The fauna work undertaken was limited and could not possibly fully characterise the situation present at the relevant sites. • The short lead time for gathering of information is not appropriate for the semi-arid to arid environment of the Burrup. • It is not helpful to indicate that the whole plant site will be disturbed when it appears that 30 to 40% will be from the maps. • The statement made in the eighth dot point on page 2-7 of the CER is somewhat misleading. There is significant vegetation in the natural drainage areas on the site. **The Biodiversity Group of Environment Australia** • Reference to species covered by JAMBA and CAMBA listed in Table 4.1 of the CER is not correct.	Considered to be a relevant environmental factor. It will be assessed under the heading of Terrestrial fauna.
Marine ecology including sea floor, marine flora and flora, coral communities, and marine water, sediment and biota quality	The region supports a diverse range of species including fish, molluscs, corals, marine mammals and turtles etc. Possible impacts from TBT and ballast water discharge, and spillages during product loading operations	No comments received.	No further assessment by the EPA will be required.
Mangrove communities	Mangroves in King Bay occur north west of the plant site. A small portion of the mangrove community will be impacted for construction of the product pipelines.	**The Friends of the Burrup Peninsula** • Increased water flow from building rooves, concrete structures, road surfaces together with diversion of water from the hills behind the site will lead to significant increase in fresh surface water run-off into King Bay. What impact will this have on the natural fresh water flushing of the mangroves in King Bay? **The Biodiversity Group of Environment Australia** • Concern about the potentially adverse impacts of the proposed development on the saline flats, mangroves and intertidal wetlands of King Bay and its environs. Such impacts may include pollution of these sensitive wetlands through leakages, spillages or burst pipes from the product pipeline or loading facility. The Department of Conservation and Land Management raised similar concerns to those listed above.	Considered to be a relevant environmental factor. It will be assessed under the heading of Terrestrial flora.

Table 1: Summary of identification of relevant environmental factors (continued)

Preliminary environmental factors	Proposal characteristics	Government agency and public comments	Identification of relevant environmental factors
Biophysical (continued)			
Landform, drainage, and site hydrology, including impacts from flood events	The plant site consists of four landform units: rocky outcrops and scree slopes; valley, drainage gullies and alluvial fans; mud flats; and disturbed land. The peak water level associated with storm surge for a 1 in 100 year storm is 4.9m AHD, within the tidal flats north of the proposed plant site. The Shire of Roebourne will be responsible for the upkeep of Hearson Cove Road in the event that it is damaged.	**The Friends of the Burrup Peninsula** • What impact will changes to natural drainage have on the flora assemblages in the region, particularly the woodland areas? • Even though the plant site will be above the 1 in 100 year storm surge level, careful attention will be required to ensure that erosion will not spread fill material over the lower lying tidal surge zone. Should consider using bunding around plant nodes. • Who will be responsible for the upkeep of Hearson Cove Road in the event it is damaged by a tidal surge in the future?	No further assessment by the EPA will be required because the woodland areas on the plant site will be removed to build the plant. The other flora assemblages will not be impacted as the quantity and quality of the water flow will not be significantly impacted. Bunding is not appropriate as it does not provide safety against flooding and it would not offer any significant environmental advantages as the entire site is needed and cut and fill is balanced in the current design.
Pollution Management			
Gaseous and particulate emissions	Plant emissions will be: Nitrogen oxides (NO_x) - 2,340t/yr Carbon monoxide (CO) - 525t/yr Sulphur dioxide (SO_2) - 45t/yr VOC's - 170t/yr Particulates - 115t/yr The processes used in the plant will not produce odours. The products are not odorous. Construction may cause short term increases in local dust levels.	**Department of Environmental Protection** • A model such as AUSPLUME should not be used to fine tuning stack heights. • Will the proponent adopt and implement best engineering practice to reduce NO_x emissions by installing a tail gas combustor which produces the lowest NO_x emissions possible, and by incorporating NO_x reducing equipment in other parts of the plant? **Australian Greenhouse Office** • The estimate of N_2O emissions needs to be revised. If the estimate was scaled from recent national data on stationary energy, as opposed to NSW in 1990, emissions of N_2O would be over 1% of the project's total emissions. **Conservation Council of WA** • Will monitoring of atmospheric emission levels across the life of the project be undertaken as a means of validating the estimates obtained from modelling? • Can additional details be provided on the dust control measures referred to in Section 7.2.6 of the CER?	Considered to be a relevant environmental factor.

Table 1: Summary of identification of relevant environmental factors (continued)

Preliminary environmental factors	Proposal characteristics	Government agency and public comments	Identification of relevant environmental factors
Pollution Management (continued)			
Greenhouse gases	The plant will produce about 1.5 million t/yr of CO_2.	**Department of Environmental Protection** • Why hasn't the proponent made a commitment to use cogeneration, waste heat recovery systems and afforestation projects to offset the predicted greenhouse emissions? • Beyond no regrets measures should be used even though the mechanisms for implementing the Kyoto Protocol are not yet final. • Proponent needs to clarify if medium pressure gas will be supplied to the plant as a means of reducing greenhouse gas emissions. • Inaccuracies in third paragraph on page 5-36 of CER regarding proponent's investigation of afforestation in WA and NSW, which contradict advice from CALM on share farming operations. • The Executive Summary on page viii of the CER is incorrect in indicating that the Syntroleum process will have net benefits with respect to greenhouse gas impacts. • Would Syntroleum be prepared to make commitments to meet the requirements for membership for the Greenhouse Challenge? • Is Syntroleum prepared to make a commitment to use best engineering technology and management practices in an effort to reduce fugitive emissions of natural gas? • Instead of flaring off waste gas, has Syntroleum considered storing it and recycling it back into the system in order to improve efficiency and reduce greenhouse gas emissions? **The Australian Greenhouse Office** • Requested relevant information from consultants be provided to AGO to allow verification of the estimate of emissions. • The AGO does not accept the argument that construction of the project will result in a minimum of 1,400,000 tonnes of CO_2 being eliminated from the atmosphere. • Information on expected emissions of any synthesised gases needs to be provided in view of their global warming potential. Even a few tonnes could alter the project's emission profile significantly. • The proponent has committed to becoming a participant in the Greenhouse Challenge. Information on where they are in the process of signing a letter of intent and preparing a co-operative agreement should be provided. • Further information on how and when the proponent will consider which 'beyond no regrets' measures are expected to proceed, should be provided.	Considered to be a relevant environmental factor.
Surface water and groundwater quality	All areas of the plant site will be sited on hardstand surfaces and linked to the wastewater treatment system. During construction all up-slope runoff will be diverted away from any contamination. No wastewater will be generated.	**Conservation Council of WA** • Although the proponent's 'first flush' treatment system goes some way towards safeguarding the potential for contaminated surface water run-off from the site, more detail needs to be provided on the question of what will happen to subsequent surface water, especially should the first 12mm of run-off be found to be contaminated. It is essential that some monitoring and treatment mechanisms be put in place to treat this flow as well.	No further assessment by the EPA will be required because the water collected in the first flush system will be analysed. If it does not meet the relevant standard it will be treated prior to discharge. Run-off in excess of 12mm will have negligible contamination as all potential leak sources will be bunded.

Table 1: Summary of identification of relevant environmental factors (continued)

Preliminary environmental factors	Proposal characteristics	Government agency and public comments	Identification of relevant environmental factors
Pollution Management (continued)			
Liquid and solid waste disposal	Solid and liquid waste will be generated during the construction and operation phase of the project. All solid waste will be disposed of to Karratha landfill. Liquid wastes will be treated in the wastewater treatment system before being evaporated. The plant will be designed to remain undamaged in a 100 year storm event. The lowest elevation on the relocated Hearson Cove Road will be 5.1m in front of the plant site. The 100 year storm surge event seawater elevation is 5m. The plant will slope up from the road, toward the south, up to an elevation between 8 and 20 metres.	**Department of Conservation and Land Management** • Waste water and sewage effluent will be treated before evaporation. There is the possibility that this facility may be overtopped in a heavy rainfall event. The level of rainfall event that the facility can cope with should be ascertained.	No further assessment by the EPA will be required because it is highly unlikely that the waste water and sewerage treatment systems will be overtopped, and will need to comply with relevant standards and regulatory requirements.
Noise and vibration	Noise and vibration will be generated during the construction and operational phases of the project. The nearest residential area is located about 6km away from the plant in Dampier. Hearson Cove Beach is located about 2.8km away from the plant.	**Department of Environmental Protection** • Section 4.10 of the CER discusses the existing noise environment. The site assessed in this section comprises the proposed plant site only. The assessment site should have been the residential areas so that the predictions of noise from the plant can be compared with the existing environment. **Department of Conservation and Land Management** • The CER indicates that the nearest noise sensitive premises are six kilometres away at Dampier. However, the major recreation area at Hearson Cove is only 1.5 kilometres away, according to Figures 1.3 and Figure 2.5. Why was a noise assessment not conducted for Hearson Cove?	No further assessment by the EPA will be required because modelling indicates that the proposal will comply with the requirements of the Environmental Protection (Noise) Regulations 1997.
Light overspill	There is no artificial light source in the project area. Lighting will be designed to best practice and Australian Standard guidelines.	No comments received.	No further assessment by the EPA will be required.

Table 1: Summary of identification of relevant environmental factors (continued)

Preliminary environmental factors	Proposal characteristics	Government agency and public comments	Identification of relevant environmental factors
Social surroundings			
Risk and hazards	The operation of the plant and the product pipelines will lead to an increase in the risk of fatality from the release of hazardous liquids and gases.	**Department of Environmental Protection** • New commitment required to prepare HAZOP's for the plant design. • Need for emergency response plan to include exclusion of traffic on Hearson Cove Road in an emergency. • Need for detailed route risk assessment for the product pipelines, and close attention to design of road crossings. • Need for new commitment to prepare and trial an emergency response plan in conjunction with the Dampier Port Authority. **Shire of Roebourne** • Risk and hazards from plant should not compromise access to Hearson Cove. **Department of Minerals and Energy** • Potential knock-on effects have not been considered. Justification is required as to why they have not been considered. • Justification is required as to why the possibility of a hazardous event resulting from a leaking pipeline in the wharf area impacting on dangerous goods in transit storage, has not been considered. • Potential releases from the catastrophic failure of tanks, if any, and not limited to equipment containing gasoline, are required to be included in the risk assessment. • Justification is required as to why the possibility of events involving multiple pipelines (eg; knock-on from one pipeline to the others) has not been considered. • It is assumed in the PRA that the design of the vacuum distillation units will be such that overpressures created by an explosion in these units will be mitigated by venting and pressure relief systems. Justification for this assumption is required. • Section 8.3.2 of the PRA states that "the frequency of a jet fire was estimated for each leak hole size by multiplying the adjusted pipeline release frequency by the sum of the probability of immediate ignition and the probability of delayed ignition of the flammable vapour cloud." If this pipeline is to be in operation at all times, clarification is required as to why the frequency was adjusted. • The conclusion drawn from Hazardous Event 6.1 in Table A1.1 in Appendix 1 of the PRA indicated that the catastrophic failure of light synthetic paraffin tanks has not been considered due to the likelihood of this event being very low. Justification for this assumption is required. • Justification is required for the assumption that the release of hydrocarbon liquids in the process area will be detected and isolated within 60 seconds for 50mm hole size leaks and 120 seconds for 25mm hole size leaks. • Will the flow of the product be monitored for the entire loadout period which has been estimated to be 37 hours? In addition, how will small continuous releases which do not have a significant effect on the loadout rate be detected, and how has this been taken into consideration in the PRA? • Has the possibility of significant leaks such as a catastrophic failure from process equipment and/or tanks containing ATR stripper offgas, where depressurisation to the flare is not possible, been considered? Clarification is required as to why the risk transect for the light paraffins pipeline included in the CER document differs significantly from the previous revision of the PRA (ie; Revision B)? • A final Quantitative Risk Assessment (QRA) will be required prior to construction of the facility. Is the proponent aware that a societal risk analysis would be required should the QRA identify any events which have the potential to cause an off-site impact? • The CER document does not contain adequate storage details to enable the DME to determine whether the site will be classified as a Major Hazard Facility (MHF).	Considered to be a relevant environmental factor.

Table 1: Summary of identification of relevant environmental factors (continued)

Preliminary environmental factors	Proposal characteristics	Government agency and public comments	Identification of relevant environmental factors
Social surroundings (continued)			
Risk and hazards (continued)	The operation of the plant and the product pipelines will lead to an increase in the risk of fatality from the release of hazardous liquids and gases.	**Department of Conservation and Land Management** • Route Option A was rejected because it would pose a greater risk than the alternative route. There is no clarification in the proposal on what the greater risk is. • There is a possibility of conflict of the gas supply pipeline with other pipeline routes, if the proposed Plenty River Ammonium Urea project goes ahead. Has this potential conflict of pipeline routes been addressed? **Dampier Port Authority** • Need for MOU with the DPA regarding minimising risk of spillages and leaks and emergency response procedures. • Prefer proponent's personnel to load product onto ships to minimise risk.	Considered to be a relevant environmental factor.
Road transport and traffic impacts	Short delays may occur during some construction activities (eg. blasting). Increased traffic movements will be generated to and from the plant during operation. The proponent has indicated that it will work with the Shire of Roebourne on the best management of heavy vehicle movements to and from the site.	**Shire of Roebourne** • Any significant increase in heavy vehicle traffic movements during either construction or operation will need to be managed to minimise disturbance and hazards to general traffic in the area.	No further assessment by the EPA will be required in view of the proponent's undertaking to work with the Shire of Roebourne in managing road transport and traffic related impacts, and because the expected increase in the volume of traffic on Burrup Road and Hearson Cove Road will not cause undue disturbance or increased hazards to general traffic in the area.
Aboriginal culture and heritage	Thirteen archaeological sites are located on or in close to the proposed plant site. 35 sites lie within 100m of the proposed gas supply pipeline route. 31 sites lie within 100m of the proposed product pipeline. All sites, except P3051, will remain undisturbed or be preserved in situ. P3051, a previously disturbed shell scatter, will become subject of an application to the Minister to further disturb the site. Access to significant Aboriginal sites will be available from the south of the plant. The Dampier Climbing Men Area will be preserved.	**The Friends of the Burrup Peninsula** • The re-alignment of Hearson Cove Road and the location of the plant will prevent access to some significant aboriginal heritage sites which are tourist attractions. **The Australian Heritage Commission via Environment Australia** • The AHC recommends that the proponent take reasonable steps to ensure that any adverse effects are minimised on the location known as the Dampier Climbing Men Area, which is listed for the outstanding aesthetic values of a number of aboriginal engravings. • Although there has been some cross reference between the anthropological and archaeological surveys undertaken, the proponent should ensure that all recommendations for both anthropological and archaeological values are to the satisfaction of all interested aboriginal parties	No further assessment by the EPA will be required as representatives of the Aboriginal claimant groups have been adequately consulted, and the CER and other specific issues have been discussed with these them.

Table 1: Summary of identification of relevant environmental factors (continued)

Preliminary environmental factors	Proposal characteristics	Government agency and public comments	Identification of relevant environmental factors
Social surroundings (continued)			
Visual amenity and recreation	The proposed site is currently undeveloped and disturbed. The average height of plant structures will be 12m and up to 38m for the flare stack. There will be a visual impact from the pipelines where they are located at ground level. Improvements to the Hearson Cove Road will allow better access to Hearson Cove for recreational purposes. The proponent will work with the Shire of Roebourne on the visual aspects of the plant, and will construct the pipelines in a manner satisfactory to the DME, including minimising the visual impact of the pipelines as much as practical. The gas supply pipeline and the product pipelines will be covered for the majority of their respective routes. Where they are required to be above ground, the visual impact will be reduced as much as reasonably practicable.	**Shire of Roebourne** • Consideration should be given to improving the visual amenity of the plant. **The Friends of the Burrup Peninsula** • The visual impact of the above ground pipelines will be enormous even if they are located along pipeline route Option C. **Department Of Environmental Protection** • Section 5.2.14 of the CER does not mention the visual impact of the plant against the backdrop of the rust-red rock piles and yellow spinifex around the proposed site. This section should have included other measures to minimise the visual impact of the plant. **The Department of Conservation and Land Management** • The location of the plant will have an adverse visual impact for recreational users of Hearson Cove. No strategies for managing visual impacts were included in Chapter 7 of the CER.	No further assessment by the EPA will be required because the proponent has committed to reducing visual impact as much as reasonably practicable during all phases of the project. Measures will include selecting colours for the buildings that will be in sympathy with the surrounding area, developing a neat and tidy plant design, and ensuring that the off-site visual impact from lighting is minimised.

Appendix 4

Summary of assessment of relevant environmental factors

Table 2: Summary of evaluation of relevant environmental factors

Relevant environmental factors	Environmental objectives	Assessment	Advice
Biophysical			
Terrestrial flora	The EPA's environmental objectives for this factor are to: (1) Protect Declared Rare and Priority Flora consistent with the provisions of the *Wildlife Conservation Act 1950* and the *Commonwealth Endangered Species Protection Act 1992*. (2) Maintain the abundance, species diversity, geographical distribution and productivity of vegetation communities.	The area considered for assessment of this factor is the proposed plant site, the natural gas supply and product pipeline routes, and adjacent areas. The EPA understands that the drainage features located in the south-western portion of the site, whilst not including any rare species, do contain vegetaiion community assemblages which probably do not occur elsewhere on the Burrup Peninsula. The proponent intends to use this portion of the site as a construction laydown and future plant expansion area, and will also construct a wastewater treatment plant and drainage sump within it. Although the EPA does not consider this to be a major impediment to the proposal proceeding, it would expect the proponent to disturb as little of this area as possible. In this regard, the EPA welcomes the commitments made by the proponent to demonstrate good corporate citizenship by using every possible endeavour to minimise impacts upon the drainage features located in the south-western portion of the site during construction and operation of the plant, and to disturbing only the areas that are essential to the construction and operation of the plant. The EPA notes the other commitments made by the proponent in relation to the establishment of a native garden, weed control, topsoil management, rehabilitation, and seed collection. Whilst the EPA acknowledges the topographical and native title constraints of the site which prevent the plant configuration being modified and / or moved in an easterly direction away from the drainage features, it raises a particular problem for the EPA in that environmental values are being compromised by native title issues. The EPA considers it unfortunate that the proposed plant could not be located within the nearby Maitland Industrial Estate as this estate has been through the environmental assessment process. The EPA suggests that Government should identify other sites in the region which contain the same vegetation community assemblage and subsequently secure them from future industrial development. The EPA supports the flora and fauna surveys undertaken by DRD of the wider Burrup outside designated industrial areas and suggests that they be extended to include designated industrial land so that this issue does not arise again for future industrial development proposals. The natural gas supply and product pipeline corridors will also affect some significant flora and vegetation communities. However, Syntroleum has committed to using the King Bay to Hearson Cove Service Corridor for its product pipelines if it is established within a timeframe which meets Syntroleum's requirements. DRD is presently involved in facilitating the establishment of this corridor to meet Syntroleum's requirements following the provision of informal advice from the DEP under delegation from the EPA. The DEP's informal advice indicated that the establishment of the proposed service corridor would be environmentally acceptable subject to: • best management practices being adopted and implemented during the construction of the proposed service corridor, particularly in relation to the management of impacts on flora and fauna, vegetation communities, surface hydrology, and the control of weeds; and • the implementation of the proponent's environmental management commitments, particularly in regard to undertaking a vegetation survey of the wider Burrup Peninsula which includes the corridor area. The establishment of this infrastructure corridor will help to consolidate the potential environmental impacts of this proposal and future infrastructure development linked to new industrial projects, into one location. This will greatly assist the environmental assessment of future industrial proposals establishing within the region.	Having particular regard to the: (a) topographical and native title constraints of the site; (b) flora surveys that have been undertaken by DRD; and (c) commitments made by the proponent, particularly in regard to demonstrating good corporate citizenship by using every possible endeavour to minimise impacts upon the drainage feature located in the south-western portion of the site during construction and operation of the plant; it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor.

Table 2: Summary of evaluation of relevant environmental factors

Relevant environmental factors	Environmental objectives	Assessment	Advice
Biophysical (continued)			
Terrestrial flora (continued)	The EPA's environmental objectives for this factor are to: (1) Protect Declared Rare and Priority Flora consistent with the provisions of the *Wildlife Conservation Act 1950* and the *Commonwealth Endangered Species Protection Act 1992*. (2) Maintain the abundance, species diversity, geographical distribution and productivity of vegetation communities.	The natural gas supply pipeline will be aligned along the eastern side of the Burrup Road reserve for the majority of its length except for a span of about 2.5km. This 2.5km span of the reserve cannot be used as Main Roads WA requires the available space for future widening of Burrup Road, and the reserve already contains the Epic Gas Pipeline and the Water Corporation's water pipeline. Locating the natural gas supply pipeline within this span would also introduce a greater risk impact than using the chosen route, mainly due to the presence of the Epic Gas Pipeline. The topography of this span is rocky and hilly and there are Aboriginal heritage sites within it. The EPA considers that the chosen route represents the best compromise from an environmental perspective. **Proponent Commitments** Syntroleum commits to establishing a native garden within the plant site boundary or in another appropriate site. The native garden will be established using species listed in Flora and Fauna Assessment report of CER, and will contain, at a minimum, 100 percent of the Rare and / or Priority plant individuals that are destroyed during construction. Syntroleum commits to ensure that all construction equipment is washed down prior to coming on site. Equipment washdown areas will be established in areas near the wharf for equipment brought in by sea and south of Dampier Salt for equipment brought in by road. Washdown residues to be disposed of in accordance with DEP / CALM / Shire of Roebourne requirements. Syntroleum commits to counting all Rare and / or Priority plant species within disturbance areas and will officially notify CALM of the number of each species to be removed. At a minimum, 100 percent of any Rare and / or Priority plant individuals that are to be destroyed, will be replaced with identical species in landscaping, rehabilitation or the native garden. Syntroleum commits to undertake seed collection of priority and other native plant species. Syntroleum commits to prepare a rehabilitation plan and closure report and submit it to the DEP and CALM at least 2 months prior to construction commencing. The rehabilitation plan will include a weed management plan and a topsoil management plan. Syntroleum commits to initiate a flora sampling program in accordance with the scope of work issued by the DEP. The report will be submitted to the DEP when it is completed. Syntroleum commits to using the lightest method of clearing that is reasonably practicable in the areas that will be rehabilitated. Syntroleum commits to disturbing only the areas in the western drainage areas of the site that are essential to the construction and operation of the plant. Syntroleum commits to demonstrate good corporate citizenship in minimising impacts on vegetation and fauna during construction and operation of the plant. Syntroleum commits to using the King Bay to Hearson Cove Service Corridor when routing the product pipelines, if it is operational within an acceptable timeframe to allow Syntroleum to complete the design and financial requirements of the project.	Having particular regard to the: (a) topographical and native title constraints of the site; (b) flora surveys that have been undertaken by DRD; and (c) commitments made by the proponent, particularly in regard to demonstrating good corporate citizenship by using every possible endeavour to minimise impacts upon the drainage feature located in the south-western portion of the site during construction and operation of the plant; it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor.

Table 2: Summary of evaluation of relevant environmental factors (continued)

Relevant environmental factors	Environmental objectives	Assessment	Advice
Biophysical (continued)			
Terrestrial fauna	The EPA's environmental objectives for this factor are to: (1) Protect Specially Protected (Threatened) Fauna and their habitats, consistent with the provisions of the *Wildlife Conservation Act 1950* and the *Commonwealth Endangered Species Protection Act 1992*. (2) Maintain the abundance, species diversity and geographical distribution of terrestrial fauna.	The area considered for assessment of this factor is the plant site, the natural gas supply and product pipeline routes, and adjacent areas. The plant has the potential to affect significant fauna habitats which occur within the site and along the natural gas supply and product pipeline corridors. Of particular significance are the drainage features located in the south-western portion of the site. The natural gas supply and product pipeline corridors will also affect terrestrial fauna habitat. Syntroleum has committed to using the King Bay to Hearson Cove Service Corridor for its product pipelines. DRD is presently involved in facilitating the establishment of this corridor. The natural gas supply pipeline will be aligned along the eastern side of the Burrup Road reserve for the majority of its length except for a span of about 2.5km. The EPA considers that the chosen route is the best compromise from an environmental perspective. **Proponent Commitments** Syntroleum commits to conducting a snail survey for a 30 to 40 hectare area in the southern rocky hills area adjacent to the south side of the plant. Syntroleum commits to conducting another fauna survey concentrating on the western drainage areas of the plant site. Syntroleum commits to disturbing only the areas in the western drainage areas of the site that are essential to the construction and operation of the plant. Syntroleum commits to demonstrate good corporate citizenship in minimising impacts on vegetation and fauna during construction and operation of the plant. Syntroleum commits to using the King Bay to Hearson Cove Service Corridor when routing the product pipelines, if it is operational within an acceptable timeframe to allow Syntroleum to complete the design and financial requirements of the project.	Having particular regard to the: (a) widespread distribution of most of the vertebrate species which may occur within the plant area; (b) the information gathered from the fauna surveys undertaken; and (c) commitments made by the proponent; it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor.
Pollution Management			
Gaseous and particulate emissions	The EPA's environmental objectives for this factor are to: (1) Protect the surrounding land users, such that dust emissions will not adversely impact upon their welfare and amenity or cause health problems. (2) Ensure that emissions of NO_X, SO_X, hydrocarbons, toxics, particulates and smoke are assessed and meet acceptable standards and the requirements of the *Environmental Protection Act 1986*. (3) Ensure that all reasonable and practicable measures are taken to minimise discharges of NO_X, SO_X, hydrocarbons, toxics, particulates and smoke. (4) Ensure that conditions which could promote the formation of photochemical smog are managed to minimise the impact.	The area considered for assessment of this factor is whole of the Burrup Peninsula, and includes the townsites of Dampier and Karratha. In regard to gaseous and particulate emissions, air quality modelling indicated that ground level concentrations for NO_X under normal operating conditions will be below the relevant NEPM standard. Ground level concentrations for NO_X under emergency operating conditions will be below the NEPM standards outside the plant boundary, but there will be potential exceedances within the plant boundary. However, the likelihood of these exceedances occurring is very small due to the fact that the emergency generators will only be used for a few hours per year, if at all, combined with the very small number of hours per year that the extreme (cyclonic) weather conditions needed to cause the exceedances occur. The air quality modelling also indicated that impacts from oxides of sulphur (SO_X), volatile organic compounds (VOCs), particulates, and carbon monoxide (CO) will be insignificant. In response to the concerns raised by the Conservation Council of WA regarding dust control measures and air emissions monitoring, the proponent indicated that the construction contractors will develop the details of construction dust control in conjunction with Roebourne Council and the Pilbara Region Office of the DEP, and that some monitoring is anticipated, although the details have not been finalised yet. Furthermore, the DEP currently operates an air quality monitoring station in Dampier. This monitoring station would allow the impact on ambient air quality arising from the operation of the proposed plant in the nearest residential areas to be ascertained. The EPA also understands that monitoring of stack emissions from the proposed plant will be specified through the Works Approval and Licensing process. **Proponent commitments** Syntroleum commits to design the plant in order to ensure that the National Environment Protection Measure (NEPM) standard of 225 micrograms per cubic metre for Nitrogen Dioxide (NO_2) will be met, even in worst case conditions, at every offsite location. Syntroleum commits to adopting and implementing best engineering practice in relation to limiting NO_X emissions from the plant by installing a tail gas combustor which produces the lowest NO_X emissions reasonably practicable, and by incorporating NO_X reducing equipment in other relevant areas of the plant. Syntroleum commits to ensure that the construction contractors develop the details of construction dust control in conjunction with Roebourne Council, and the Pilbara Region Office of the DEP.	Having particular regard to the: (a) commitments made by the proponent; and (b) the predicted impacts obtained from the air quality modelling results for the project being below relevant NEPM standards; it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor.

Table 2: Summary of evaluation of relevant environmental factors (continued)

Preliminary environmental factors	Environmental objectives	Assessment	Advice
Pollution Management (continued)			
Greenhouse gas emissions	The EPA objectives in regard to this environmental factor, consistent with the National Greenhouse Strategy, are to: (1) estimate the carbon dioxide equivalent emissions from the plant; (2) mitigate greenhouse gases emissions in accordance with the Framework Convention on Climate Change 1992, and in accordance with Australia's National Greenhouse Strategy as endorsed by the State Government. (Environmental Protection Authority Interim Guidance No. 12 'Minimising Greenhouse Gas Emissions', (EPA, 1998a)); (3) minimise greenhouse gas emissions in absolute terms and reduce emissions per unit product to as low as reasonably practicable; and (4) estimate the gross amounts of greenhouse gases that may be sequestered from sink enhancement programmes.	The proposed plant will emit approximately 1.16Mtpa of CO_2 from process emissions. The greenhouse gas emissions from the Syntroleum plant represent about 0.3% of Australia's 1990 baseline for greenhouse gases (386Mtpa). The EPA considers this proposal to be a significant contributor to WA's greenhouse gas emissions, and its objectives in regard to this environmental factor from both a global and Australian context, consistent with the National Greenhouse Strategy, are to: (1) estimate the carbon dioxide equivalent emissions from the plant; (2) mitigate greenhouse gases emissions in accordance with the Framework Convention on Climate Change 1992, and in accordance with Australia's National Greenhouse Strategy as endorsed by the State Government; (3) minimise greenhouse gas emissions in absolute terms and reduce emissions per unit product to as low as reasonably practicable; and (4) estimate the gross amounts of greenhouse gases that may be sequestered from sink enhancement programmes. *Australia's greenhouse gas targets* Australia as a whole is challenged to reduce greenhouse gas emissions by 24.5% from the predicted "Business as Usual" level in 2010 by implementing a combination of "no regrets" and "beyond no regrets" measures. This is equivalent to limiting greenhouse gas emissions in 2010 to 108% of Australia's 1990 emission levels. *Assessment of the Syntroleum plant* Because the Syntroleum plant involves the application of new technology, it is difficult to define a "business as usual" case benchmark for comparing the proposed plant's emissions with a 1990 baseline. In order to make a reasonable assessment the following analyses were made: • comparison of the proposed plant with the 1990 pilot plant in terms of thermal efficiency; • identification of other synthetic fuels plants as a basis for comparison; • a life cycle analysis comparison of synthetic lubricants from the Syntroleum plant with conventional oil-based alternatives; and • identification of "beyond no regrets" measures which could be adopted. These four approaches are considered below. *Thermal efficiency of the proposed plant* The proponent advised (in a letter from TESSAG Industrie-Anlagen GmbH) that the overall thermal efficiency of the proposed plant is estimated to be 50%. To maximise heat recovery, waste heat will be utilised in various parts of the plant in the following ways: • tail gas will be combusted to preheat the natural gas supply and process air, and for the production and superheating of high pressure steam; • recovery of sensible heat in the synthesis gas generated in the Autothermal Reformer for the production of high pressure steam; • recovery of exothermic heat in the Fischer-Tropsch reactors for the production of medium pressure steam; • the installation of boiler feed water preheaters (heat exchangers) to recover lower temperature sensible heat in the synthesis gas from the Autothermal Reformer and from the reactor effluent stream from the Fischer-Tropsch Reaction Section. Additional steam will be generated which will be used to power steam turbine driven compressors; and • the utilisation of low pressure (low energy content) steam in lithium bromide type absorption chillers in the Product Condensing and Recovery Section downstream of the Fischer-Tropsch Reactors.	Having particular regard to the: (a) thermal efficiency of the proposed plant, given that it is the first of its type in the world in terms of technology (b) estimated savings in CO_2 equivalent of 54% of the 1990 "Business as Usual" level, which is above the target set in the National Greenhouse Strategy; and (c) commitments made by the proponent; it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor.

Table 2: Summary of evaluation of relevant environmental factors (continued)

Preliminary environmental factors	Environmental objectives	Assessment	Advice
Pollution Management (continued)			
Greenhouse gas emissions (continued)	The EPA objectives in regard to this environmental factor, consistent with the National Greenhouse Strategy, are to: (1) estimate the carbon dioxide equivalent emissions from the plant; (2) mitigate greenhouse gases emissions in accordance with the Framework Convention on Climate Change 1992, and in accordance with Australia's National Greenhouse Strategy as endorsed by the State Government. (Environmental Protection Authority Interim Guidance No. 12 'Minimising Greenhouse Gas Emissions', (EPA, 1998a)); (3) minimise greenhouse gas emissions in absolute terms and reduce emissions per unit product to as low as reasonably practicable; and (4) estimate the gross amounts of greenhouse gases that may be sequestered from sink enhancement programmes.	The waste heat recovery measures and other process improvement measures would result in a reduction of approximately 54% in greenhouse gas emissions from the plant (from 2.5Mtpa CO_2 equivalent for the 1990 pilot plant to 1.16Mtpa CO_2 equivalent for the proposed plant). Thus, if the pilot plant is taken as a 1990 "business as usual" benchmark then the Syntroleum proposal has achieved a 54% reduction in greenhouse gases compared to the national target of 24.5%. *Comparison with other plants* Other synthetic fuels plants were identified in an attempt to compare their thermal efficiency with the Syntroleum proposal. These were the Shell Middle Distillate Synthesis Plant at Bintulu in Malaysia, Sasol Synthetic Fuels in South Africa, and Mossgas Pty Ltd in South Africa. However, because these plants use pure oxygen technology rather than air, suitable comparisons could not be made. Greater energy efficiencies in plant process by using oxygen are offset by the additional energy required to extract oxygen from air. *Life cycle analysis* A 'life cycle analysis' of the project indicates that there could be benefits derived from the use of some of the plant products. The synthetic lubricants that will be produced for automotive applications will generally have superior performance in comparison to conventional mineral-oil-based products, particularly in regard to reduced friction (1 - 3% better fuel economy in vehicles) and a much longer service life, which will reduce the total quantity of lubricants consumed over the life of a vehicle. The plant will also produce diesel fuel that is free of sulphur and aromatic hydrocarbon and that has a higher cetane rating than petroleum-derived diesel fuel. This higher cetane rating may lead to improved fuel efficiency when used in diesel-fuelled vehicles, and the lack of sulphur and aromatic hydrocarbons will also result in reduced harmful exhaust emissions from these vehicles, particularly black sooty exhaust smoke. *"Beyond no regrets" measures* The State Government via the Water Corporation will facilitate the establishment of a desalination plant on the Burrup Peninsula to assist the project. The EPA project will supply between 10 to 30MW of power via steam to the proposed desalination plant. The use of this energy would eliminate the need for the desalination plant to consume additional natural gas or electrical power, and would result in a reduction of about 100,000 tonnes per year of CO_2. The proponent has also identified possible greenhouse gas reduction measures related to increased process and energy efficiencies. The EPA also expects the proponent to continue investigating greenhouse gas offset measures such as afforestation, and other measures to reduce the total net greenhouse gas emissions from the project. **Proponent Commitments** Syntroleum is committed to continue investigations of "beyond no regrets" measures to reduce greenhouse gas emissions, particularly afforestation projects. Syntroleum commits to adhering to EPA Guidance Statement No. 12 and the National Greenhouse Strategy, including calculation of the greenhouse gas emissions from the proposed plant, determination of the greenhouse gas emissions from the plant periodically after it is built and in operation, provision of a general description of the efficient technologies to be used to reduce total greenhouse gas emissions. Syntroleum commits to entering into the Commonwealth Government's Greenhouse Challenge, including the commitment to monitor its greenhouse gas emissions, develop on-going emission reduction strategies, set a target for the reduction of total net "greenhouse gas" emissions and/or "greenhouse gas" emissions per unit of product over time, and to provide an annual report of its overall performance. Syntroleum is committed to using best engineering technology and management practices in designing, constructing and operating the plant to reduce greenhouse gas emissions to as low as reasonably practicable (ALARP).	Having particular regard to the: (d) thermal efficiency of the proposed plant, given that it is the first of its type in the world in terms of technology (e) estimated savings in CO_2 equivalent of 54% of the 1990 "Business as Usual" level, which is above the target set in the National Greenhouse Strategy; and (f) commitments made by the proponent; it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor.

Table 2: Summary of evaluation of relevant environmental factors (continued)

Preliminary environmental factors	Environmental objectives	Assessment	Advice
Social surroundings			
Risk and hazards	The EPA's environmental objectives for this factor are to ensure that: • risk is assessed and managed to meet the EPA's criteria for off-site individual fatality risk in EPA Interim Guidance No. 2 for 'Risk assessment and Management: Offsite Individual Risk from Hazardous Industrial Plant' (EPA, 1998b), the Department of Mineral and Energy's requirements in respect of public safety, and the Worksafe National Standard for the Control of Major Hazard Facilities (NOHSC, 1996); and • public risk associated with implementation of the project is 'as low as reasonably practicable' (ALARP), and in compliance with acceptable standards. The EPA's individual risk criteria as stated in EPA Guidance No. 2 (EPA, 1998b), which would apply to the proposed plant and other relevant infrastructure are as follows: • fatality risk levels from industrial facilities should not exceed a target of fifty in a million per year at the site boundary for each individual industry, and the cumulative risk level imposed upon an industry should not exceed a target of one hundred in a million per year; and • a fatality risk level for any non-industrial activity located in buffer zones between industrial facilities and residential zones of ten in a million per year or less, is so small as to be acceptable to the Environmental Protection Authority.	The area considered for assessment of this factor is the region immediately surrounding the proposed plant site, the natural gas supply and product pipeline routes, the product loading facility at Dampier Public Wharf, Hearson Cove Road and Hearson Cove itself. The plant currently has no neighbours so the buffer criterion of ten in a million would apply to the fenceline. The plant iso-risk contours illustrated in Figure 6 below indicate that this criterion is easily met. If any heavy industry is located to the north of the plant site then the higher criterion of fifty in a million could be afforded the Syntroleum plant provided there was a coordinated emergency response. Hearson Cove Beach, which is a popular recreational area, is located 2.8km from the proposed plant site and will have risk levels significantly less than the EPA criteria of ten in a million per year. The closest residential area is located approximately 5km away in the township of Dampier. Accordingly, there will be no risk to residents. The risk transects for both the light synthetic paraffins pipelines and the natural gas feedstock pipeline show that the risk of fatality is less than the risk acceptance criteria of ten in a million at the respective easement boundaries. The risk related impact resulting from the loadout and shipping of light synthetic paraffins will be contained within the DPA Public Wharf lease area. Any loading / shipping incident could also result in major environmental impacts and the EPA considers it important that Syntroleum make an additional commitment to prepare and trial a shipping/loading incident response plan with the DPA and other agencies. In relation to the concerns expressed by the DEP, the EPA notes that the proponent has indicated in its response to the summary of submissions that: • it is likely that there will be scenarios identified in the emergency response plan that would require the closing of Hearson Cove Road during an incident; • the potential for risk reduction options has been investigated in the work that was done for the AS2885 report on the pipelines, and risk levels will be low and little potential exists for further cost effective risk reduction consistent with the ALARP principle; • road crossings will be designed very carefully and reviewed by Main Roads WA for Burrup Road, and the Shire of Roebourne for King Bay Road; • the proponent will commit to undertake HAZOP studies of all critical plant systems and designs, and will consider the recommendations of the preliminary risk assessment, the quantitative risk assessment and the HAZOP studies in the design and operation of the plant; • the proponent will commit to prepare a shipping emergency response plan in co-operation with the DPA; • the Fire and Rescue Services, the State Emergency Service, CALM, the DEP, and the DME will be linked to the emergency response plan; and • the proponent will trial a shipping emergency response plan in co-operation with the DPA as part of the normal preparations for the loading of product at the Dampier Public Wharf. The EPA believes that the above information satisfactorily addresses the concerns expressed by the DEP. On a similar basis, the EPA also believes that the proponent has satisfactorily addressed the numerous detailed concerns expressed by the DME pertaining to risk and hazards in its response to the summary of submissions. In particular, the proponent indicated that the details of the required storage facilities are still being developed, and when available will be supplied to DME for assessment which will enable the DME to determine whether the plant site will be classified as a MHF. Furthermore, if a Safety Report is required by the Chief Inspector of Explosives and Dangerous Goods it will be prepared and submitted accordingly. The proponent indicated in its response to the summary of submissions that the decision to choose gas supply pipeline route Option B was not simply a risk decision, and the pipeline routes were selected on the basis of several factors, including the preference of Main Roads WA, future expansion options, the preferences of DRD and overall costs. The proponent has met with Plenty River, Epic Energy, Main Roads WA, Water Corporation, Shire of Roebourne, Telstra, DOLA, DRD and other parties interested in the pipeline route. DRD has recently referred the King Bay to Hearson Cove Infrastructure Corridor to the EPA and the proponent has agreed to work with DRD on the alignments that will best meet both its own needs and those of the State. The EPA considers that the above information satisfactorily addresses the concerns expressed by CALM.	Having particular regard to the: (a) commitments made by the proponent; (b) project complying with the EPA's criteria for individual risk; and (c) advice obtained from the DEP, DME and the DPA in relation to the management of risk and hazards; it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor.

Table 2: Summary of evaluation of relevant environmental factors (continued)

Preliminary environmental factors	Environmental objectives	Assessment	Advice
Social surroundings (continued)			
Risk and hazards (continued)	The EPA's environmental objectives for this factor are to ensure that risk is assessed and managed to meet the EPA's criteria for off-site individual fatality risk in EPA bulletins 611 and 627, the Interim Guidance No. 2 for 'risk assessment and Management: Offsite Individual Risk from Hazardous Industrial Plant' (EPA, 1998b), and the Department of Mineral and Energy's requirements in respect of public safety. These require that: (1) risk levels from industrial facilities should not exceed a target of fifty in a million per year at the site boundary for each individual industry, and the cumulative risk level imposed upon an industry should not exceed a target of one hundred in a million per year. (2) A risk level for any non-industrial activity located in buffer zones between industrial facilities and residential zones of ten in a million per year or less, is so small as to be acceptable to the EPA. (3) Public risk associated with implementation of the project is 'as low as reasonably practicable' (ALARP), and in compliance with the criteria. (4) The Safety Management System for the proposed plant and other relevant infrastructure complies with DME requirements and with the National Standard for the Control of major hazard facilities (NOHSC, 1996).	In regard to the concerns expressed by the DPA, the EPA notes that the proponent has indicated in its response to the summary of submissions that it plans to enter into a Memorandum of Understanding with the DPA. The proponent also pointed out that it is considering a variety of methods for loading ships at Dampier Public Wharf, and negotiations regarding the exact structure of the loading operation will be undertaken. Whatever the specific relationships are at the wharf, the proponent will take responsibility for product loading. The EPA notes that the proponent has indicated in its response to the summary of submissions that it will commit to keeping Hearson Cove Road open during construction. However, for brief periods during the initial construction of the new alignment of Hearson Cove Road, there may be slight delays while heavy equipment is moving across the road. In an emergency, Hearson Cove Road may be closed to allow emergency procedures to take place without interference. The EPA considers that the above information satisfactorily addresses the concerns expressed by the Shire in this regard. **Proponent Commitments** Syntroleum commits to preparing a emergency response plan for the GTS plant, gas supply and product pipelines, to the satisfaction of the DME and State Emergency Services. Syntroleum commits to prepare a shipping emergency response plan in co-operation with the Dampier Port Authority. The Fire and Rescue Services, the State Emergency Service, CALM, the DEP, and DME will be consulted and linked to the emergency response plan. Syntroleum will trial a shipping emergency response plan in co-operation with the Dampier Port Authority as part of the normal preparations for the loading of product at the Dampier Public Wharf. Syntroleum commits to prepare a Safety Management System (SMS) prior to commissioning, to the satisfaction of the DME. Syntroleum commits to prepare a final Quantitative Risk Assessment (QRA) for the project prior to commissioning, to the satisfaction of the DME and the DEP. Syntroleum commits to ensure that risks and hazards associated with the proposed plant will not compromise access to Hearson Cove, except during an emergency situation where Hearson Cove Road may be closed to allow emergency procedures to take place without interference, to the satisfaction of the DME and the DEP. Syntroleum commits to ensure that the design and construction of the plant, natural gas supply and product pipelines, and other related infrastructure complies with the requirements of AS1940, AS2885, AS4041, the *Petroleum Pipelines Act 1969*, the *Explosives and Dangerous Goods Act 1961*, and the Australian Pipeline Industry Association (APIA) Code of Environmental Practice, and other relevant standards and guidelines, where appropriate. Syntroleum commits to design the road crossings of pipelines to ensure an acceptable level of safety during operations and construction, following discussions with the Shire of Roebourne, Main Roads WA and other relevant organisations, prior to construction, to the satisfaction of the DME and the DEP. Syntroleum commits to undertake HAZOP studies of all critical plant systems and designs, to the satisfaction of the DME. Syntroleum will incorporate the recommendations of the preliminary risk assessment, the quantitative risk assessment and the HAZOP studies in the final design and operation of the plant.	Having particular regard to the: (d) commitments made by the proponent; (e) fact that the project will comply with the EPA's criteria for individual risk; and (f) advice obtained from the DEP, DME and the DPA in relation to the management of risk and hazards; it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor.

Appendix 5

Recommended Environmental Conditions and Proponent's Consolidated Commitments

Statement No.

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED (PURSUANT TO THE PROVISIONS OF THE ENVIRONMENTAL PROTECTION ACT 1986)

GAS TO SYNTHETIC HYDROCARBONS PLANT, BURRUP PENINSULA

Proposal: The proposal is to construct and operate a natural gas to synthetic hydrocarbons plant, a natural gas supply pipeline, eight product pipelines, and a product loading facility at the Dampier Public Wharf on the Burrup Peninsula, approximately 1,300 kilometres north of Perth (as documented in Schedule 1 of this Statement).

Proponent: Syntroleum Sweetwater, LLC

Proponent Address: Tulsa, Oklahoma – United States of America

Assessment Number: 1270

Report of the Environmental Protection Authority: Bulletin 985

The proposal to which the above report of the Environmental Protection Authority relates may be implemented subject to the following conditions and procedures:

Procedures

1 Implementation

1-1 Subject to these conditions and procedures, the proponent shall implement the proposal as documented in schedule 1 of this statement.

1-2 Where the proponent seeks to change any aspect of the proposal as documented in schedule 1 of this statement in any way that the Minister for the Environment determines, on advice of the Environmental Protection Authority, is substantial, the proponent shall refer the matter to the Environmental Protection Authority.

1-3 Where the proponent seeks to change any aspect of the proposal as documented in schedule 1 of this statement in any way that the Minister for the Environment determines, on advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

2 Proponent Commitments

2-1 The proponent shall implement the consolidated environmental management commitments documented in schedule 2 of this statement.

2-2 The proponent shall implement subsequent environmental management commitments which the proponent makes as part of the fulfilment of conditions and procedures in this statement.

3 Proponent

3-1 The proponent for the time being nominated by the Minister for the Environment under section 38(6) or (7) of the Environmental Protection Act 1986 is responsible for the implementation of the proposal until such time as the Minister for the Environment has exercised the Minister's power under section 38(7) of the Act to revoke the nomination of that proponent and nominate another person in respect of the proposal.

3-2 Any request for the exercise of that power of the Minister referred to in condition 3-1 shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the proposal in accordance with the conditions and procedures set out in the statement.

3-3 The proponent shall notify the Department of Environmental Protection of any change of proponent contact name and address within 30 days of such change.

4 Commencement

4-1 The proponent shall provide evidence to the Minister for the Environment within five years of the date of this statement that the proposal has been substantially commenced.

4-2 Where the proposal has not been substantially commenced within five years of the date of this statement, the approval to implement the proposal as granted in this statement shall lapse and be void. The Minister for the Environment will determine any question as to whether the proposal has been substantially commenced.

4-3 The proponent shall make application to the Minister for the Environment for any extension of approval for the substantial commencement of the proposal beyond five years from the date of this statement at least six months prior to the expiration of the five year period referred to in conditions 4-1 and 4-2.

4-4 Where the proponent demonstrates to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority that the environmental parameters of the proposal have not changed significantly, then the Minister may grant an extension not exceeding five years for the substantial commencement of the proposal.

5 Compliance Auditing

5-1 The proponent shall submit periodic Compliance Reports, in accordance with an audit program prepared in consultation between the proponent and the Department of Environmental Protection.

5-2 Unless otherwise specified, the Chief Executive Officer of the Department of Environmental Protection is responsible for assessing compliance with the conditions, procedures and commitments contained in this statement and for issuing formal, written advice that the requirements have been met.

5-3 Where compliance with any condition, procedure or commitment is in dispute, the matter will be determined by the Minister for the Environment.

Conditions

6 Environmental Management System

6-1 In order to manage the environmental impacts of the project, and to fulfil the requirements of the conditions and procedures in this statement, prior to ground-disturbing activity, the proponent shall demonstrate to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection that there is in place an environmental management system which includes the following elements:

1 An environmental policy and corporate commitment to it;

2 Mechanisms and processes to ensure:

(1) planning to meet environmental requirements;

(2) implementation and operation of actions to meet environmental requirements;

(3) measurement and evaluation of environmental performance; and

3 Review and improvement of environmental outcomes.

6-2 The proponent shall implement the environmental management system referred to in condition 6-1.

7 Greenhouse Gas Emissions Management Plan

7-1 Prior to commissioning, the proponent shall prepare a Greenhouse Gas Emissions Management Plan:

- to ensure that "greenhouse gas" emissions from the project are adequately addressed and best available efficient technologies are used to minimise total net "greenhouse gas" emissions and/or "greenhouse gas" emissions per unit of product; and

- to mitigate "greenhouse gas" emissions in accordance with the Framework Convention on Climate Change 1992, and consistent with the National Greenhouse Strategy;

to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection.

This Plan shall include:

1 calculation of the "greenhouse gas" emissions associated with the proposal, as indicated in "Minimising Greenhouse Gas Emissions, Guidance for the Assessment of Environmental Factors, No. 12" published by the Environmental Protection Authority;

2 specific measures to minimise the total net "greenhouse gas" emissions and/or the "greenhouse gas" emissions per unit of product associated with the proposal;

3 monitoring of "greenhouse gas" emissions;

4 estimation of the "greenhouse gas" efficiency of the project (per unit of product and/or other agreed performance indicators);

5 an analysis of the extent to which the proposal meets the requirements of the National Greenhouse Strategy using a combination of:

- "no regrets" measures;
- "beyond no regrets" measures;
- land use change or forestry offsets;
- international flexibility mechanisms; and

6 a target set by the proponent for the reduction of total net "greenhouse gas" emissions and/or "greenhouse gas" emissions per unit of product over time, and annual reporting of progress made in achieving this target.

Note - In Section 5 above, the following definitions apply:

(1) "no regrets" measures are those that can be implemented by a proponent which are effectively cost neutral and provide the proponent with returns in savings which offset the initial capital expenditure that may be incurred.

(2) "beyond no regrets" measures are those that can be implemented by a proponent which involve some additional cost that is not expected to be recovered.

7-2 The proponent shall implement the Greenhouse Gas Emissions Management Plan required by condition 7-1.

7-3 The proponent shall make the Greenhouse Gas Emissions Management Plan required by condition 7-1 publicly available, to the extent that this will not breach required confidentiality with regard to commercial and proprietary information, to the requirements of the Environmental Protection Authority.

8 Decommissioning Plans

8-1 Prior to construction, the proponent shall prepare a Preliminary Decommissioning Plan that provides the framework to ensure that the site is left in a suitable condition, with no liability to the State, to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection.

The Preliminary Decommissioning Plan shall address:

1 rationale for the siting and design of plant and infrastructure and conceptual plans for its removal or, if appropriate, retention;
2 conceptual rehabilitation plans for all disturbed areas and a process to agree on the end land use(s); and
3 management of noxious materials to avoid the creation of contaminated areas.

8-2 At least six months prior to the anticipated date of decommissioning, or at a time agreed with the Department of Environmental Protection, the proponent shall prepare a Final Decommissioning Plan designed to ensure that the site is left in a suitable condition, with no liability to the State, to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection.

The Final Decommissioning Plan shall address:

1 removal or, if appropriate, retention of plant and infrastructure;
2 rehabilitation of all disturbed areas to a standard suitable for the agreed new land use(s); and
3 identification of contaminated areas, including provision of evidence of notification to relevant statutory authorities.

8-3 The proponent shall implement the Final Decommissioning Plan required by condition 8-2 until such time as the Minister for the Environment determines that decommissioning is complete.

8-4 The proponent shall make the Final Decommissioning Plan required by condition 8-2 publicly available, to the requirements of the Environmental Protection Authority.

9 Work Practices

9-1 Prior to commencement of construction, the proponent shall prepare a written prescription for contractor work practices covering plant and pipeline construction and operation, to ensure that work practices are carried out at the level of international best practice, to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection and the Department of Minerals and Energy.

9-2 The proponent shall ensure that plant and pipeline construction and operation comply with the prescription referred to in condition 9-1.

10 Performance Review

10-1 Each five years following the commencement of construction, the proponent shall submit a Performance Review to the Department of Environmental Protection:

- to document the outcomes, beneficial or otherwise;
- to review the success of goals, objectives and targets; and
- to evaluate the environmental performance over the five years;

relevant to the following:

1 environmental objectives reported on in Environmental Protection Authority Bulletin 985;

2 proponent's consolidated environmental management commitments documented in schedule 2 of this statement and those arising from the fulfilment of conditions and procedures in this statement;

3 environmental management system environmental management targets;

4 environmental management programs and plans; and/or

5 environmental performance indicators;

to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection.

Note: The Environmental Protection Authority may recommend changes and actions to the Minister for the Environment following consideration of the Performance Review.

Note

1 The proponent is required to apply for a Works Approval and Licence for this project under the provisions of Part V of the Environmental Protection Act.

Schedule 1

The Proposal

The proposal is to construct and operate a natural gas to synthetic hydrocarbons plant, a natural gas supply pipeline, eight product pipelines, and a product loading facility at the Dampier Public Wharf on the Burrup Peninsula, approximately 1,300 kilometres north of Perth. The location of the plant is shown in Figures 1 and 2. The plant site has an area of about 74 hectares. The actual plant will occupy an area of approximately 50 hectares within this site.

The plant will utilise the proprietary Syntroleum Process to produce 1,240 tonnes or 10,000 barrels of synthetic crude oil per day using approximately 135 terajoules of natural gas per day. Natural gas will be obtained from the Woodside Onshore Gas Plant via a natural gas supply pipeline.

The synthetic crude oil produced is able to be refined into a range of specialty products such as lubricants and diesel fuel.

In addition to the construction of the plant, the proposal will also include the following ancillary components:

(a) the realignment of a section of Hearson Cove Road, including improvements to Burrup Road;

(b) the construction of a natural gas supply pipeline from the Woodside Onshore gas plant to the Syntroleum plant;

(c) the construction of product pipelines from the Syntroleum plant site to the Dampier Public Wharf; and

(d) a product loading facility and other improvements at the Dampier Public Wharf.

The main characteristics of the proposal are summarised in Table 1 below.

Table 1: Summary of key proposal characteristics

Element	Description
Project purpose	To produce synthetic hydrocarbons from North West Shelf natural gas using the proprietary Syntroleum Process, for sale to domestic and international markets.
Project life	25+ years.
Major project components	(1) Syntroleum Gas to Synthetics (GTS) plant of nominal 1,240 tonnes per day (10,000 barrels per day) capacity. (2) Approximately 5km long gas supply pipeline from the Woodside Onshore Gas Plant to the Syntroleum GTS plant. (6) Eight product pipelines approximately 4.5km long from the Syntroleum GTS plant to the Dampier Public Wharf. (7) Realignment of Hearson Cove Road. (8) A product loading facility and other improvements at the Dampier Public Wharf.
Plant Location	King Bay - Hearson Cove Industrial Area (adjacent to the intersection of Burrup Road and Hearson Cove Road).
Plant site area	Total site area: Approximately 74 hectares. GTS plant area: Approximately 50 hectares. Plant site construction laydown areas: Approximately 10 hectares.

Plant facilities	(1) Syngas production Auto Thermal Reactor (ATR). (2) Air compression area. (3) Syngas compression area. (4) Hydrogen recovery areas x 2. (5) Fischer - Tropsch section. (6) Catalyst reactivation. (7) Paraffin oil hydroheater. (8) N - paraffin fractionation. (9) Paraffin product separation. (10) Hydro - isomerization / dewaxing. (11) Lube oil distillation. (12) Product storage and transport area. (13) Utilities area. (14) General plant areas / boiler. (15) Firewater area. (16) Bio - treating system area. (17) Stormwater run - off treatment and storage pond. (18) Control building and electrical room. (19) Warehouse and offices. (20) Plant access roads and car parking.
Plant operation	Continuous - 24 hours per day, 365 days per year.
Shutdown time	Orderly shutdown - 2 hours. Emergency shutdown - 10 minutes.
Plant storage capacities	Sixty day storage for all products.
Plant inputs: Natural gas Water Power supply	 Nominal 135 terajoules per day from the Woodside Onshore Gas Plant. Approximately 3 million litres per day. Operational power generated internally:
Nominal plant emissions: Carbon monoxide (CO) Carbon dioxide (CO_2) Oxides of nitrogen (NO_X) Sulphur dioxide (SO_2) Particulate matter (total suspended) Volatile organic compounds Process effluent discharges Water sludge Stormwater	 525 tonnes per year 1.16 million tonnes per year 2,340 tonnes per year 45 tonnes per year 115 tonnes per year 170 tonnes per year Nil - residual process water to be evaporated (approximately 1.6ML / day) 20 - 30 tonnes per day 12mm 'first flush' stormwater impoundment / treatment system to be installed for process areas. Discharge to King Bay following treatment. Sent to wastewater treatment system if it is off - specification.
Noise	During construction: Predicted maximum L_{A10} <35dB(A) at nearest residential area (Dampier). During operation: Predicted maximum L_{A10} 29dB(A) at Dampier and 36dB(A) L_{A10} at Hearson Cove.
Risk	Less than 1 in 10^6 outside the GTS plant boundaries. Less than 7 in 10^8 at zero metres from the gas supply pipeline. Less than 7 in 10^7 at zero metres from the product pipelines.

Source: Table 1.1 from the CER

Figure 3 illustrates the process flowchart / mass balance diagram for the proposed plant, and Figure 4 provides details of the plant layout. A detailed description of the proposal is provided in Section 1.2 of the CER (HLA-Envirosciences Pty Limited, 1999a).

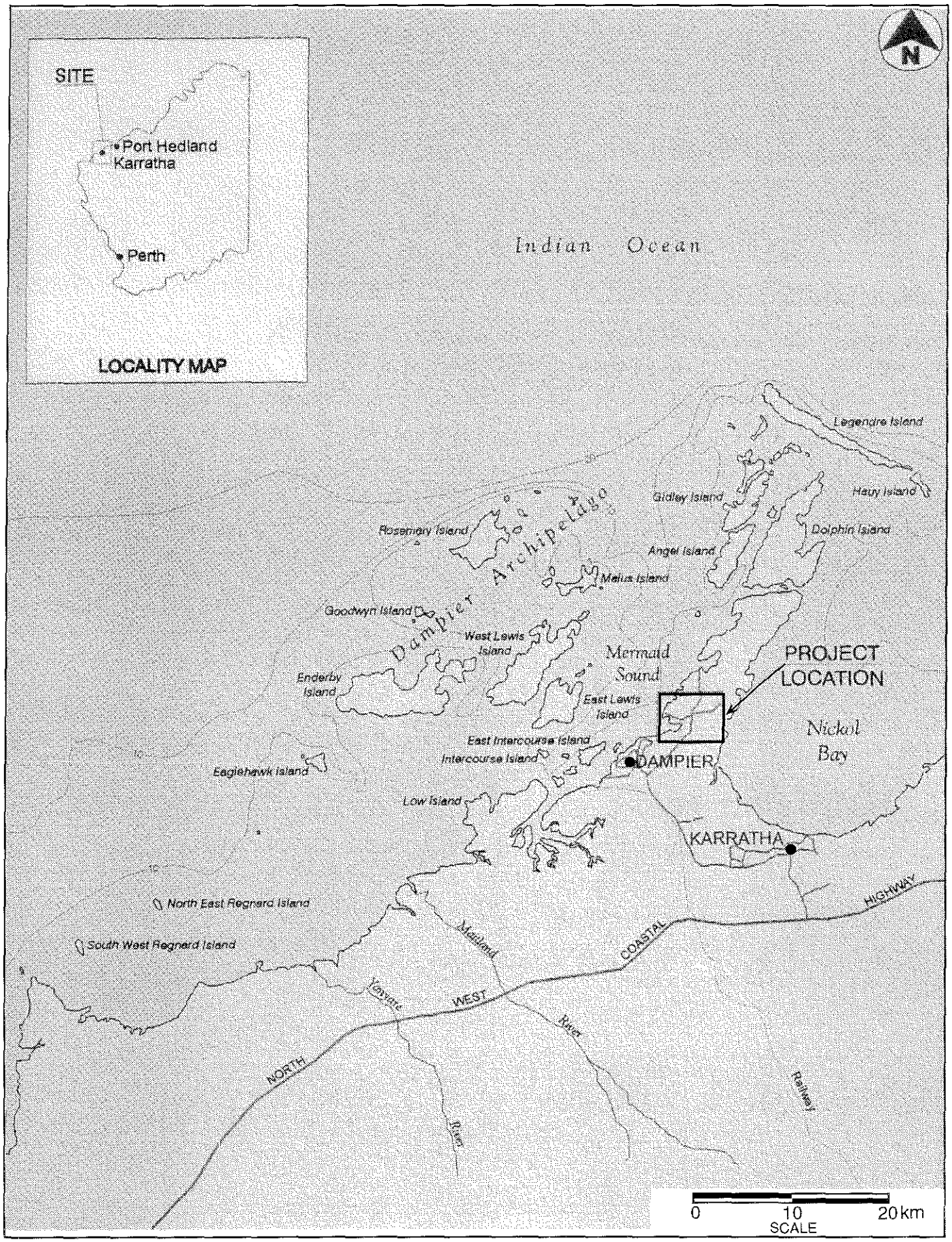

Figure 1. Project Location - Regional Map (Source: Figure 1.2 HLA - Envirosciences, 1999a).

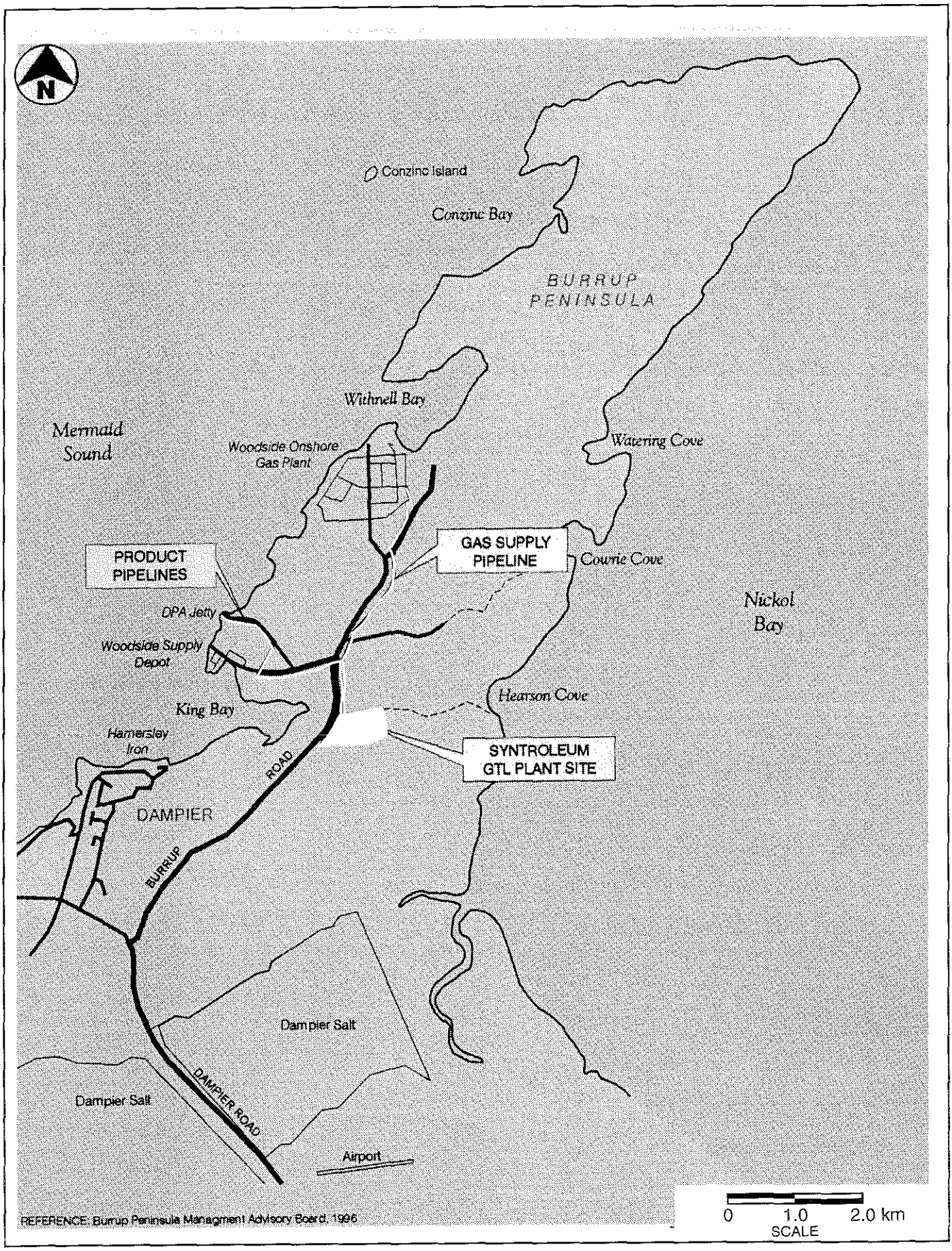

Figure 2. Project Location - Locality Map (Source: Figure 1.3 HLA - Envirosciences, 1999a).

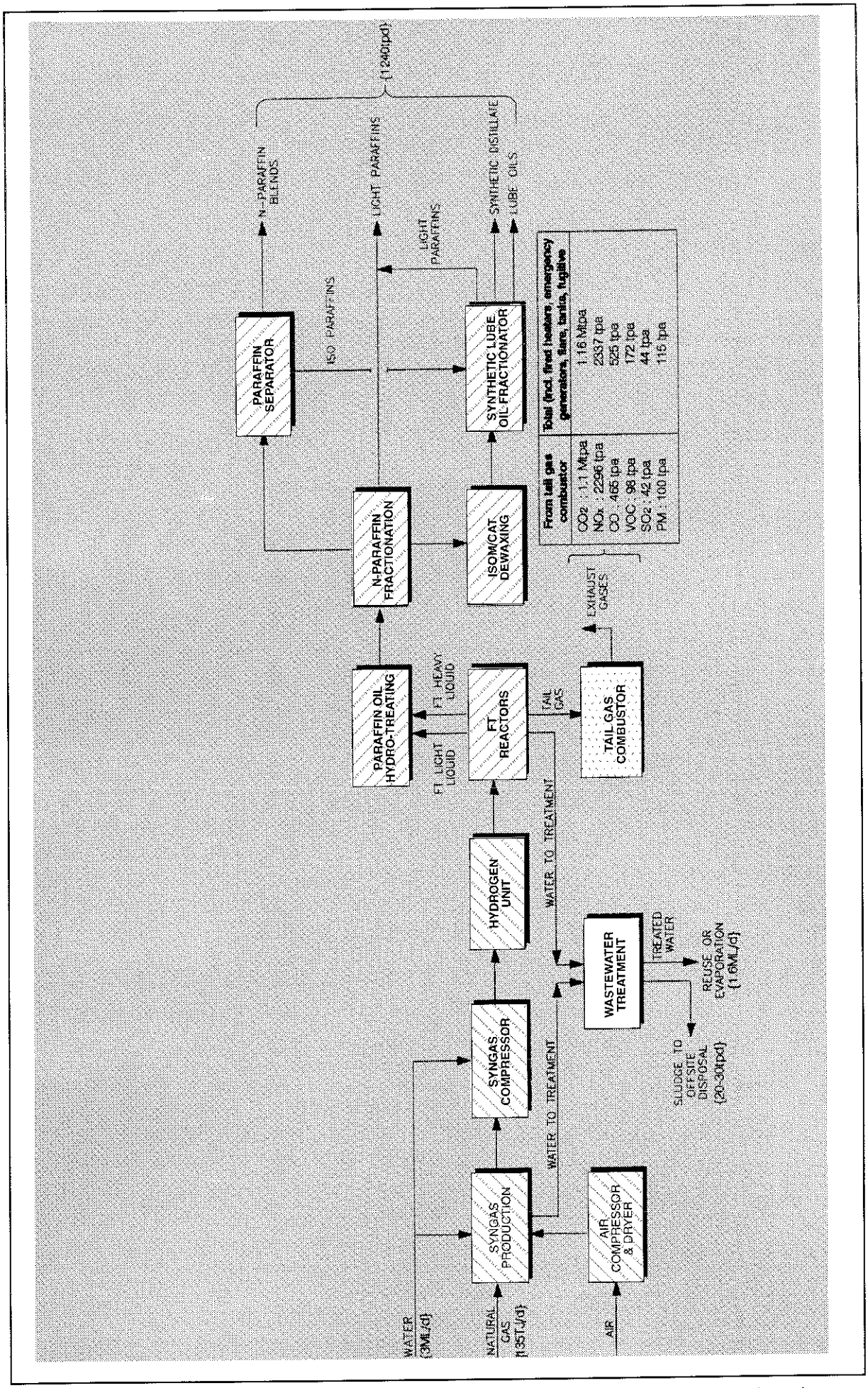

Figure 3. Process flowchart/mass balance diagram (Source: Figure 3.2 HLA - Envirosciences, 1999a).

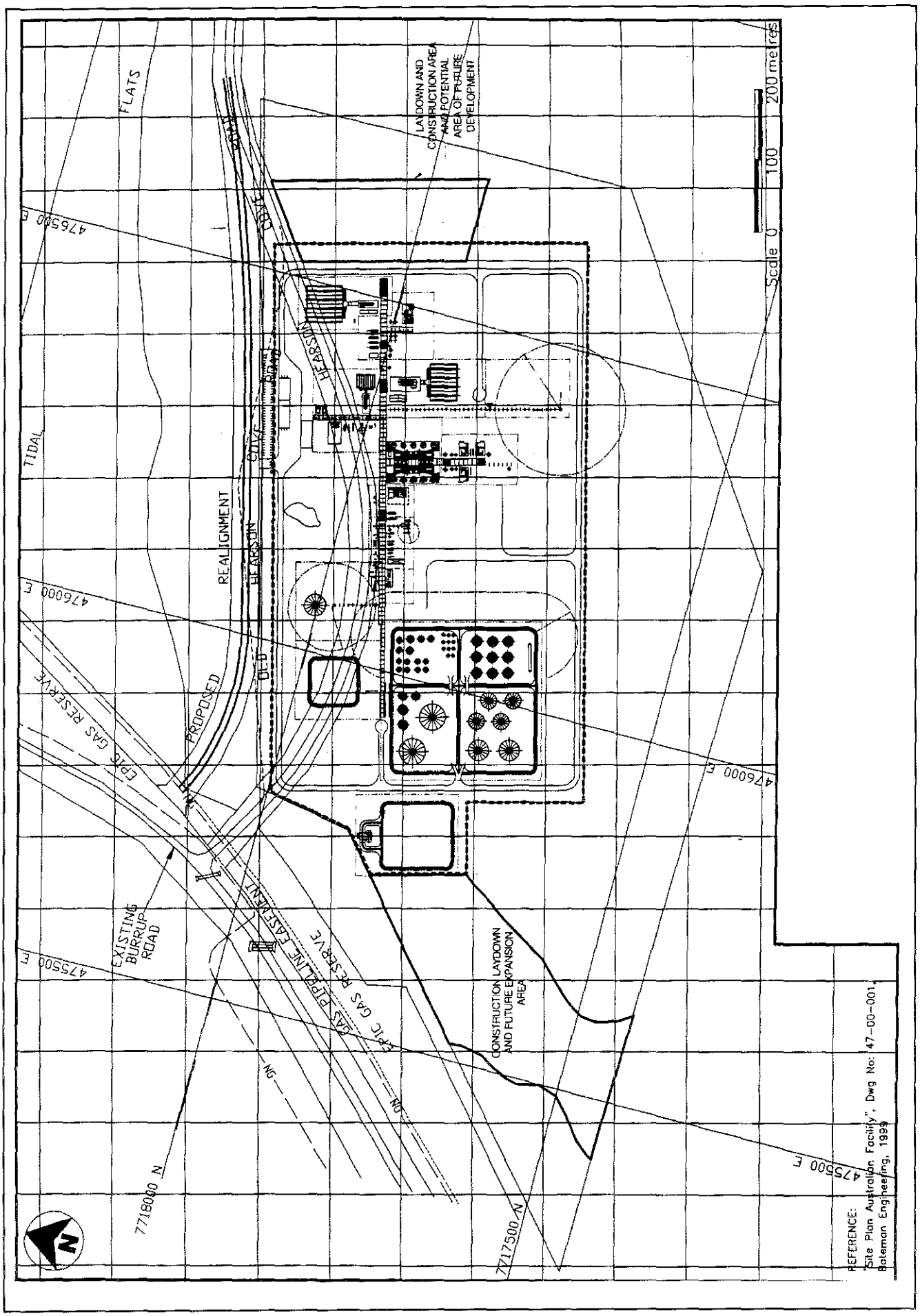

Figure 4. Proposed plant layout (Source: Figure 3.3 HLA - Envirosciences, 1999a).

Schedule 2

Proponent's Consolidated Commitments

No	Topic	Action	Objective	Timing	Advice
1	Terrestrial flora	Syntroleum commits to establishing a native garden within the plant site boundary or in another appropriate site. The native garden will be established using species listed in Flora and Fauna Assessment report of CER, and will contain, at a minimum, 100 percent of the Rare and / or Priority plant individuals that are destroyed during construction.	To maintain the species richness of the area, and maintain priority species.	During rehabilitation.	DEP, CALM
2	Terrestrial flora	Syntroleum commits to ensure that all construction equipment is washed down prior to coming on site. Equipment washdown areas will be established in areas near the wharf for equipment brought in by sea and south of Dampier Salt for equipment brought in by road. Washdown residues to be disposed of in accordance with DEP / CALM / Shire of Roebourne requirements.	To prevent weed species, possibly attached to construction equipment from establishing on the Burrup Peninsula.	During construction.	CALM, DEP, Shire of Roebourne.
3	Terrestrial flora	Syntroleum commits to counting all Rare and / or Priority plant species within disturbance areas and will officially notify CALM of the number of each species to be removed. At a minimum, 100 percent of any Rare and / or Priority plant individuals that are to be destroyed, will be replaced with identical species in landscaping, rehabilitation or the native garden.	To maintain abundance and distribution of Priority species.	Prior to start of construction / During rehabilitation.	CALM
4	Terrestrial flora	Syntroleum commits to undertake seed collection of priority and other native plant species.	To ensure local seed is available for rehabilitation works.	Already started.	CALM
5	Terrestrial fauna	Syntroleum commits to conducting a snail survey for a 30 to 40 hectare area in the southern rocky hills area adjacent to the south side of the plant.	Ensure that mollusc species and numbers are accurately determined and species abundance is maintained in the areas surrounding the plant site.	Already started.	DEP, CALM.
6	Terrestrial fauna	Syntroleum commits to conducting another fauna survey concentrating on the western drainage areas of the plant site.	Ensure that fauna species and numbers are accurately determined in the western drainage area of the site.	Already started.	DEP
7	Terrestrial flora	Syntroleum commits to prepare a rehabilitation plan and closure report and submit it to the DEP and CALM at least 2 months prior to construction commencing. The rehabilitation plan will include a weed management plan and a topsoil management plan.	Ensure that the affected areas to be rehabilitated will be as weed free as reasonably practicable, and able to augment the growth of local species.	Submit 2 months prior to construction.	DEP, CALM
8	Terrestrial flora	Syntroleum commits to initiate a flora sampling program in accordance with the scope of work issued by the DEP. The report will be submitted to the DEP when it is completed.	Ensure that the full range of wet and dry season flora species are investigated, especially in the western drainage area of the site.	Already started	DEP
9	Terrestrial flora	Syntroleum commits to using the lightest method of clearing that is reasonably practicable in the areas that will be rehabilitated.	Ensure that replanting is not hampered by excessively compacted soils.	During Construction.	DEP

No	Topic	Action	Objective	Timing	Advice
10	Terrestrial flora and fauna	Syntroleum commits to disturbing only the areas in the western drainage areas of the site that are essential to the construction and operation of the plant.	Minimise flora and fauna impacts in the western drainage area of the plant site.	During planning and construction.	DEP
11	Terrestrial flora and fauna	Syntroleum commits to demonstrate good corporate citizenship in minimising impacts on vegetation and fauna during construction and operation of the plant.	Minimise flora and fauna impacts especially in the western drainage area of the plant site.	During planning and construction.	DEP
12	Greenhouse gas emissions	Syntroleum commits to continue investigations of "beyond no regrets" measures to reduce greenhouse gas emissions, particularly afforestation projects.	To find ways to minimise greenhouse gas impacts.	Biannually after commissioning	EPA
13	Greenhouse gas emissions	Syntroleum commits to adhering to EPA Guidance Statement No. 12 and the National Greenhouse Strategy, including calculation of the greenhouse gas emissions from the proposed plant, determination of the greenhouse gas emissions from the plant periodically after it is built and in operation, provision of a general description of the efficient technologies to be used to reduce total greenhouse gas emissions.	To minimise total greenhouse emissions as much as reasonably practicable.	Biannually after commissioning	DEP
14	Greenhouse gas emissions	Syntroleum commits to entering into the Commonwealth Government's Greenhouse Challenge, including the commitment to monitor its greenhouse gas emissions, develop on-going emission reduction strategies, set a target for the reduction of total net "greenhouse gas" emissions and/or "greenhouse gas" emissions per unit of product over time, and to provide an annual report of its overall performance.	To meet requirements of the Greenhouse Challenge and minimise total greenhouse gas emissions as much as reasonably practicable.	July-Dec 2000	DEP, and the Australian Greenhouse Office (AGO).
15	Greenhouse gas emissions	Syntroleum commits to using best engineering technology and management practices in designing, constructing and operating the plant to reduce greenhouse gas emissions to as low as reasonably practicable (ALARP).	To minimise greenhouse gas emissions during design and construction of the plant.	During design and operation.	DEP
16	Risk and hazards	Syntroleum commits to preparing a emergency response plan for the GTS plant, gas supply and product pipelines, to the appropriate requirements of the DME and State Emergency Services.	To minimise risk to public and worker safety.	Prior to commissioning	DME and the State Emergency Services.
17	Risk and hazards	Syntroleum commits to prepare a shipping emergency response plan in co-operation with the Dampier Port Authority. The Fire and Rescue Services, the State Emergency Service, CALM, the DEP, and DME will be consulted and linked to the emergency response plan. Syntroleum will trial a shipping emergency response plan in co-operation with the Dampier Port Authority as part of the normal preparations for the loading of product at the Dampier Public Wharf.	To minimise risk, including the risk of spillages or leaks, prepare an emergency response plan, and ensure that all contingencies for emergencies at the wharf have been considered.	Prior to the first loadout of product.	DPA, DME, DEP, SES, CALM, and Fire and Rescue Services.
18	Risk and hazards	Syntroleum commits to prepare a Safety Management System (SMS) prior to commissioning, to the appropriate requirements of the DME.	To minimise risk to public and worker safety.	Prior to commissioning	DME
19	Risk and hazards	Syntroleum commits to prepare a final Quantitative Risk Assessment (QRA) for the project prior to commissioning, to the appropriate requirements of the DME and the DEP.	To minimise risk to public and worker safety.	Prior to commissioning	DME, DEP

No	Topic	Action	Objective	Timing	Advice
20	Risk and hazards	Syntroleum commits to ensure that risks and hazards associated with the proposed plant will not compromise access to Hearson Cove, except during an emergency situation where Hearson Cove Road may be closed to allow emergency procedures to take place without interference, in consultation with the DME and DEP.	To ensure that risks and hazards associated with the proposed plant will not compromise access to Hearson Cove.	During construction and operation.	DME, DEP
21	Risk and hazards	Syntroleum commits to ensure that the design and construction of the plant, natural gas supply and product pipelines, and other related infrastructure complies with the requirements of AS1940, AS2885, AS4041, the *Petroleum Pipelines Act 1969*, the *Explosives and Dangerous Goods Act 1961*, and the Australian Pipeline Industry Association (APIA) Code of Environmental Practice, and other relevant standards and guidelines, where appropriate.	To ensure that the design and construction of the plant, natural gas supply and product pipelines, and other related infrastructure complies with the requirements of relevant legislation, standards and guidelines.	During design and construction	DME, DEP
22	Risk and hazards	Syntroleum commits to design the road crossings of pipelines to ensure an acceptable level of safety during operations and construction, following discussions with the Shire of Roebourne, Main Roads WA, the DME, the DEP and other relevant organisations, prior to construction.	To minimise risk factors and ensure safety of the gas and product pipelines during construction and operation.	Prior to construction of crossings.	Shire of Roebourne, Main Roads WA, DME and DEP.
23	Risk and hazards	Syntroleum commits to undertake HAZOP studies of all critical plant systems and designs to the appropriate requirements of the DME. Where appropriate, Syntroleum will implement the recommendations of the preliminary risk assessment, the quantitative risk assessment and the HAZOP studies in the design and operation of the plant.	To minimise risk and promote safety.	During design and operation.	DME
24	Gaseous and particulate emissions	Syntroleum commits to design the plant in order to ensure that the National Environment Protection Measure (NEPM) standard of 225 micrograms per cubic metre for Nitrogen Dioxide (NO_2) will be met, even in worst case conditions, at every offsite location.	To minimise Nitrogen Dioxide emissions at all offsite locations and to at least meet the 225µg/m^3 NEPM standard.	During design.	DEP
25	Gaseous and particulate emissions	Syntroleum commits to adopting and implementing best engineering practice in relation to limiting NO_x emissions from the plant by installing a tail gas combustor which produces the lowest NO_x emissions reasonably practicable, and by incorporating NO_x reducing equipment in other relevant areas of the plant.	To minimise NO_x emissions from the plant as much as reasonably practicable	During design.	DEP
26	Gaseous and particulate emissions	Syntroleum commits to ensure that the construction contractors develop the details of construction dust control in conjunction with Roebourne Council, and the Pilbara Region Office of the DEP.	To minimise dust during construction.	Prior to and during construction.	DEP Pilbara, Shire of Roebourne.
27	Surface water quality	Syntroleum commits to disposing hydrotest water in a manner satisfactory to the DEP and Shire of Roebourne.	Ensure that there is no water pollution in King Bay.	During Construction.	DEP, Shire of Roebourne.
28	Surface water quality	Syntroleum commits to sampling treated stormwater prior to discharge. Effluent quality will be compared with licence criteria / water quality standards. Effluent diverted to wastewater treatment system if not in accordance with standards.	To minimise potential for pollution of King Bay and Mermaid Sound.	During Operation.	DEP
29	Marine water, sediment and biota quality	Syntroleum commits to requiring any vessel carrying Syntroleum products to meet the AQIS guidelines including disposal of ballast water.	Ensure ballast water and other health risk issues are managed to AQIS standard.	Prior to first loadout.	DPA

No	Topic	Action	Objective	Timing	Advice
30	Aboriginal heritage	Syntroleum commits to ensure that all identified archaeological sites, with the exception of P3051, will remain undisturbed or be preserved in situ. P3051, a previously disturbed shell scatter, will become subject of an application to the Minister for Aboriginal Affairs to further disturb the site.	To maintain and preserve cultural heritage.	During construction and operation.	DEP, Aboriginal Affairs Department.
31	Aboriginal heritage	Syntroleum commits to ensure that during earthworks on areas of ground that have not previously been disturbed, Aboriginal representatives will be employed to monitor preparatory earthworks. In this context, earthworks is defined as cut to a depth of 500mm or fill to a depth of 500mm or more.	To identify items of archaeological significance.	During initial earthworks.	DEP, Aboriginal Affairs Department, Aboriginal custodians.
32	Traffic impacts	Syntroleum commits to ensure that through traffic will be retained on all local roads during the construction phase. Short delays may be necessary during some construction activities (eg. blasting, heavy lifts transport).	To maintain access to all areas of the Burrup Peninsula.	During construction.	Main Roads, Shire of Roebourne.
33	Environmental management	Syntroleum commits to prepare Environmental Management Plans (EMP's) for each major component of the construction works, namely: 1. Syntroleum Gas to Synthetics (GTS) plant 2. Hearson Cove Road realignment 3. Gas Supply Pipeline 4. Product Pipelines 5. Ship loading facility at the Dampier Public Wharf	To manage environmental aspects of development.	Prior to start of construction.	DEP
34	Environmental management	Syntroleum commits to develop and implement an Environmental Management System (EMS) in accordance with the principles of AS/NZS ISO 14001. The EMS will include Environmental Management Plan(s) for operation of all facilities associated with the project. The EMP for ship loading and usage of Dampier Port will be developed in consultation with the Dampier Port Authority.	To effectively manage environmental aspects of the Project.	Initial EMS prior to commencement of operations. Implementation on-going.	DEP
35	Visual impact	Syntroleum commits to minimise the visual impact of the plant by painting appropriate surfaces with colours that are in sympathy with the surroundings where reasonably practicable.	Reduce any negative visual impacts of the plant.	During design.	DEP
36	Other	Syntroleum commits to ensure that best practice technology will be employed in the design of the Project.	To minimise atmospheric, noise and wastewater emissions and to prevent pollution of the environment.	Design phase.	DEP, DME
37	Other	Syntroleum commits to notifying the Shire of Roebourne in relation to any potential considerations for additional worker housing.	Ensure that town planning objectives are met.	Prior to and during construction.	Shire of Roebourne
38	Other	Syntroleum commits to get development consent from the Council.	Ensure that Council standards are met.	Prior to construction.	Shire of Roebourne

No	Topic	Action	Objective	Timing	Advice
39	Other	Syntroleum commits to minimising the disruption of traffic and the impact on road structures from heavy vehicle movements on advice from the Shire of Roebourne and Main Roads WA.	Ensure minimum disruption of traffic, minimum impact on road structures.	Prior to and during construction.	Shire of Roebourne, and Main Roads WA.
40	Other	Syntroleum commits to using the King Bay to Hearson Cove Service Corridor when routing the product pipelines, if it is operational within an acceptable timeframe to allow Syntroleum to complete the design and financial requirements of the project.	Reduce impacts along King Bay Road and MOF Road if possible.	Prior to critical point in financial decision making process.	DEP, DRD

Appendix 6

Summary of Submissions and Proponent's Response to Submissions

1. AIR QUALITY AND GREENHOUSE GASES

Question 1.1

Can the proponent outline measures used to minimise greenhouse gas emissions, such as the use of cogeneration, waste heat recovery systems, and afforestation projects?

Response

Cogeneration is a significant part of the Syntroleum project supplying electrical power to electrical equipment within the plant and supplying steam driving power to the large compressors as well. Syntroleum will provide a letter from TESSAG which will include more detail on the heat recovery efficiency of the plant. Syntroleum also considered the production of electrical power for use off site by power consumers in the region. Discussions with Western Power and DRD revealed that the demand for power in the region was currently not great enough to justify the expense of improving the power grid and making the other necessary improvements to the infrastructure that would be required. Syntroleum has made a study of afforestation projects including meeting with former CALM Executive Director Syd Shea to discuss the possibility of afforestation in south-west WA. Syntroleum is committed to continued study of afforestation projects.

Question 1.2

On page 5-34 of the CER document, one of the conclusions made regarding greenhouse gas emissions associated with the project is that "The mechanisms for implementing the Kyoto Protocol are not yet final." This statement is irrelevant as Australia and Western Australia have adopted the National Greenhouse Strategy. The Prime Minister, in his Statement of 1997, indicated that industry is expected to go beyond 'no regrets'. Most importantly, the Environmental Protection Authority (EPA) has released Guidance Statement No.12 titled Minimising Greenhouse Gas Emissions, which sets out expectations of industry if their greenhouse significant projects are to proceed in Western Australia. Is the proponent prepared to make a commitment to adhere to EPA Guidance Statement No. 12 and the National Greenhouse Strategy?

Response

Syntroleum is committed to adhering to EPA Guidance Statement No. 12 and the National Greenhouse Strategy using the following strategies. Syntroleum has calculated the Greenhouse Gas emissions from the proposed plant and will determine the Greenhouse Gas emissions from the plant periodically after it is built and in operation. Syntroleum will indicate the efficient technologies to be adopted to minimise total greenhouse emissions. These technologies include improved catalyst and heat management. Syntroleum is committed to entering into the Commonwealth Government's Greenhouse Challenge.

Question 1.3

On page 5-30 of the CER document, the section titled, Case 5 - Plant Not Built, Equivalent Quantity of Coal Converted to Liquid and Burned, is somewhat simplistic. For example, if the Syntroleum plant is not built, the LNG could possibly be exported to Japan where it could displace coal in traditional coal-fired power stations, with significant greenhouse gas reductions. Can the proponent clarify this further?

Response

Syntroleum believes that the comparisons of various uses of natural gas shown in the CER are useful as an illustration of the relative impact of the Syntroleum project. Syntroleum believes that Western Australia is engaged in selling natural gas to a variety of users, not just those who will replace coal.

Question 1.4

Page 5-35 of the CER document indicates that there is a 95% chance that the option to use "medium pressure" to be supplied to the project will be selected in an effort to reduce greenhouse gas emissions. The use of this option needs to be finalised one way or the other by the proponent prior to it being considered by the EPA. Could the proponent could confirm whether this option will be used for this proposal?

Response

Syntroleum proposes to use medium pressure gas from the Woodside Plant to supply the project.

Question 1.5

The third paragraph on page 5-36 of the CER document dealing with Syntroleum's investigation of afforestation in Western Australia and New South Wales contains some inaccuracies. For instance, the Department of Conservation and Land Management (CALM) advertise that share farming operations with them could produce a profit rather than an expense. Any trees planted will sequester carbon, regardless of whether there is an additional bonus of carbon credits. If for example, the Syntroleum project funded a 1000ha afforestation project with CALM as manager, which would negate the need for any relevant expertise from Syntroleum, the trees could not only sequester carbon, they could be planted in areas where they could help remediate salinity problems. With such a high greenhouse gas emitting project, Syntroleum should be doing everything possible in regard to adopting and implementing afforestation. Can the proponent provide information in regard to its consideration of this option?

Response

Syntroleum recognises that tree planting is a greenhouse offsetting process and is therefore committed to undertaking a studies of tree plantation establishment for use as a greenhouse gas sink. The issue of Greenhouse credits given to companies investing in forestry projects has not been determined by the Australian Greenhouse Office as a matter of policy and therefore Syntroleum is not able to determine its most cost effective greenhouse mitigation strategy until these offsets have been determined.

Syntroleum estimates that it has spent about $US10 million ($Aus16 million) in the development of the catalyst improvements that have reduced greenhouse gas emissions from the Syntroleum plant by 13%. This 13% saving is equal to about 300,000 tonnes of CO_2 per year in the 10,000 barrel per day plant proposed for the Burrup. If a 50,000 barrel per day plant were to be built somewhere in the world, the impact of the new catalyst would be 1.5 million tonnes of CO_2.

In Table (4) (page 17) of a paper written by Syd Shea, Gavin Butcher, Peter Ritson, John Bartle and Paul Biggs entitled *The Potential for Tree Crops and Vegetation Rehabilitation to Sequester Carbon in Western Australia*, the present value cost to establish and manage a Maritime Pine Plantation is estimated at $1701 per hectare. Assuming 103 tonnes of carbon per hectare would be sequestered over a 30 year period (as shown in Table (4)), the equivalent CO_2 sink would be 12.6 tonnes per hectare.

(44t CO_2/12 t Carbon) x (103 tonnes/hectare) / 30 years = 12.6 tonnes CO_2/hectare

In order to offset the 300,000 tonnes of CO_2 that was saved in the Syntroleum Burrup plant by the development of the new catalyst, it would require about 23,800 hectares. The cost of establishing and managing 23,800 hectares of maritime pine plantation would be $40 million.

(300,000 t CO_2/year) / 12.6 t CO_2/hectare = 23,800 hectares

23,800 hectares x $1701/hectare = $40 million

If a 50,000 barrel per day plant were built somewhere in the world using the same catalyst technology, it would require an investment of $200 million to offset the greenhouse impacts as effectively as the new catalyst. Clearly, the $US10 million investment in the catalyst technology is far more significant in terms of greenhouse gas emission offsets than tree planting. As the Fischer-Tropsch technology changes and the understanding of tree planting options changes, Syntroleum will revise its assessment of tree planting for offsetting greenhouse emissions accordingly.

Question 1.6

The Executive Summary on page viii of the CER document indicates that the Syntroleum process will have net benefits with respect to greenhouse gas impacts. How can this be correct given that the project will result in an emission of about 17% of Australian total emissions from the industrial emissions sector or about 140% of current Western Australian emissions from that sector?

Response

Syntroleum admits that in isolation the project does not have net benefits with respect to Greenhouse gas emissions. The statement in the Executive summary was meant to indicate that the project would have net benefits compared to the most common uses of natural gas from the Northwest Shelf. In other words if the same amount of gas that is proposed for the Syntroleum project were used to supply LNG or the domestic gas market, there would be more greenhouse gas emissions.

Question 1.7

Would Syntroleum be prepared to make commitments to monitor its greenhouse gas emissions, develop on-going emission reduction strategies, submit greenhouse gas reduction targets, and to provide an annual audit of its performance in order to meet the requirements for membership for the Greenhouse Challenge?

Response

Syntroleum is prepared to commit to membership in the Greenhouse Challenge including the commitment to monitor its greenhouse gas emissions, develop on-going emission reduction strategies, submit greenhouse gas reduction targets, and to provide an annual audit of its performance.

Question 1.8

In the section titled, Beyond No regrets Measures on page 5-37 of the CER document, the fourth dot indicates that during the design of the plant, Syntroleum will consider the use of state of the art technology for the reduction of fugitive emissions of natural gas. In order for Syntroleum to be seen to be adopting and implementing best engineering technology and management practices it should definitely use this technology. Would Syntroleum prepared to make a commitment to use this technology in an effort to reduce fugitive emissions of natural gas?

Response

Syntroleum is committed to using the best engineering technology and management practices in designing, constructing and operating the plant to reduce greenhouse gas emissions to as low as reasonably practicable (ALARP). Some of the engineering options being considered include mechanical seals on valves, joints and flanges, state-of-the-art flare technology, high efficiency tail gas combustor, proprietary Fischer-Tropsch catalyst design to increase the percentage of

methane to long chain hydrocarbons, state-of-the-art hydrotreater to use the minimum energy possible, state-of-the-art waste heat boiler to recover the maximum energy possible, and proprietary methods of heat control and steam control to insure that the maximum amount of heat is recovered and to insure that the reaction is carried out safely.

Question 1.9

The fifth dot point on page 5-34 of the CER document indicates that the designers of the project have considered all possible efficiency methods to minimise greenhouse gas emissions, including flare gas recovery. However, the dot point on the top of page 5-36 indicates that the only natural gas that is wasted or unused is flared during upsets to the system, shutdowns and emergencies, and that it is estimated that following initial commissioning and testing, that this will only be required once or twice per year. Instead of flaring off this waste gas, has Syntroleum considered storing it and recycling it back into the system in order to improve efficiency and reduce greenhouse gas emissions?

Response

The flare takes all types of gases including hydrogen, carbon monoxide, CO_2, methane, ethane, propane, butane and hot hydrocarbons that are liquids at "room temperature," but are gases at the process temperatures. The flare is specially designed for burning high kilojoule and low kilojoule gases because there could be a rich mix come from a shutdown of one unit or a lean mix of gases from another part of the plant. The flare takes the relief streams and normal vents from all parts of the plant. There is no consistent stream of gases that could be recycled. There is just no way that this unknown and widely varying group of gases could be recycled safely unless a whole new fractionation plant was put on the flare to separate the gases and even then it is unlikely that the stream of gases would be appropriate for recycling to the front of the plant. The natural gas feed that comes into the front of the plant is above 90% methane. It is unlikely that the gases going to the flare would ever be more than 50% methane. Since the flare system is designed to handle any shutdown or emergency on almost every piece of equipment within the plant, the sizing of any storage facility would be very difficult because almost any volume or flowrate of gases could be vented to the flare.

In the case of a planned major maintenance shutdown involving the entire plant, the natural gas line into the plant is shut off as part of the shutdown so there should be no unburned natural gas but at the most there would be very little (less than one thousandth of a percent of the total yearly gas) sent to the flare. In the case of an unplanned major shutdown the natural gas into the plant will still be shut off in less than 10 minutes (which means less than less than two thousandths of a percent of the total yearly gas).

Most of the process vessels will be registered pressure vessels and relief valves are mandatory according to the OH & S Regulations and AS 1210. All relief valves with hydrocarbons will need to go to a flare. No valves etc. are allowed in the relief line, and no items which can cause back pressure, which will stop the relief valve from operating properly are allowed. So the idea of collecting R/V vents will not be allowed. One would also not want to introduce a collection system where air could ingress and cause an explosion potential.

Question 1.10

A model such as AUSPLUME which employs simplistic building wake calculations etc, should not be used for fine tuning stack heights. Good engineering practice suggests that an appropriate stack height to be in the order of 30m, although this may be less if momentum plume rise is large. Stack heights below 24m should not be used. How does the proponent respond to the above concern?

Response

Syntroleum is investigating methods other than AUSPLUME for the design of the stack heights greater than 30 metres. A report will be made to DEP at the stage of the design where the stack and building locations have been finalised.

Question 1.11

A check on the results contained in Table 5.11 of the CER document has identified an error specifically relating to the 15.2m stack without the effects of Cyclone Vance. The indicated result of 223µg/m^3 should in fact be 183µg/m^3. How does the proponent respond to this information?

Response

The note in section 8, Appendix I (page 52) says that the levels must be increased by a maximum of 40µg/m^3 to account for the conversion of NO to NO_2 by the available ozone in the atmosphere. The second dot point under Normal Conditions: NO_2 indicates that the indicated result mentioned should be 183µg/m^3.

Question 1.12

The second paragraph in Section 8 of Appendix I of the CER document indicates that the conversion of NO to NO_2 has been taken into account by adding 40µg/m^3 to the NO_2 predictions. However, Tables 6.1 through to 6.5 and Tables 7.2 through to 7.4 in Appendix I have not been adjusted. This should have been done to improve the clarity of the report. Comment should also have been made on the adjusted levels of NO_2 for the annual average predictions presented in Table 6.6. Can the proponent please clarify the above concern?

Response

Syntroleum agrees that this would have added to the clarity of the report and apologises for the inconvenience that it caused.

Question 1.13

Will the proponent adopt and implement best engineering practice in relation to limiting NO_X emissions from the plant by installing a tail gas combustor which produces the lowest NO_X emissions possible, and by incorporating NO_X reducing equipment in other relevant areas of the plant?

Response

Syntroleum will make a commitment to adopt and implement best engineering practice in relation to limiting NO_X emissions from the plant by installing a tail gas combustor which produces the lowest NO_X emissions reasonably practicable, and by incorporating NO_X reducing equipment in other relevant areas of the plant. Detailed engineering studies are currently being carried out in order to optimise the tail gas combustor. No tail gas combustor in the world has ever burnt this group of gases in this quantity for this purpose. Not only will this be the best available technology and best engineering practice for this purpose, it will be the only one in the world of it's kind. At this stage of the design it is not possible to describe the type of NO_X reducing equipment to be provided. Syntroleum is also committed to ensure that NO_X emissions from the proposed plant will at a minimum comply with the relevant emissions standards and the National Environment Protection Measure (NEPM) standard of 225 micrograms per cubic metre for Nitrogen Dioxide (NO_2), even in worst case conditions at every offsite location.

Question 1.14

The estimate of N_20 emissions needs to be revised. If the estimate was scaled from recent national data on stationary energy, as opposed to NSW in 1990, emissions of N_20 would be over 1% of the projects total emissions. If possible, more precise estimates should be made. Can the proponent clarify the above concern?

Response

Based on the statements made on page 5-26. The NSW 1990 results show that the ratio of nitrous oxide to CO_2 was 8 x 10^{-6} to 1 so the N_2O estimated to be 11 tpa with equivalent of 3400. Assuming a level over 1%, say 1.1% of the total, would be an equivalent of 14,300 tpa of CO_2 equivalent or 46 tpa, about 4 times as much N_2O as was assumed based on the NSW data. In either of these scenarios the quantity of N_2O is not outside the accuracy of the CO_2 data. It would be easier to comment on the "national data on stationary energy" proposed in question 1.14 if the specific reference were quoted.

Question 1.15

Can the proponent provide information on the expected emissions of any synthesised gases in view of their global warming potential? Even a few tonnes could alter the projects emission profile significantly.

Response

The only synthesised gases that are produced are in the initial autothermal processing, where methane is converted to Carbon monoxide and hydrogen prior to being reformed in the Fischer Tropsch process to hydrocarbons. There is no discharge of this synthesised gas as it is all required to make the hydrocarbon product. Syntroleum will use the best practical engineering technology to insure that there are no leaks of this gas.

Question 1.16

The proponent has indicated that they have committed to becoming a participant in the Greenhouse Challenge. Can the proponent provide information on where they are in the process of signing a letter of intent and preparing a co-operative agreement?

Response

Syntroleum will begin discussions with the Australian Greenhouse Office following the guidance from DEP on the best timing for these discussions. The results and issues in these discussions will be reported to DEP.

Question 1.17

The proponent needs to ensure that the list of possible measures described consistently goes beyond technical developments that would be enacted to improve the efficiency of the plant. Can the proponent provide further information on how and when it will consider which 'beyond no regrets' measures are expected to proceed?

Response

All reasonably practicable measures will be taken to maximise plant efficiency in order to reduce greenhouse gas emissions.

Syntroleum will be using a flare system to convert waste vented hydrocarbons, relief valved hydrocarbons and unburnt hydrocarbons to CO_2 which will dramatically reduce the greenhouse load by 30,000 to 200,000 tonnes per year. Not all of the hydrocarbons to be flared would be

methane. It is likely that ethane, propane, butane, iso-butane and even some longer chain hydrocarbons that are gases at high temperature would also be flared. These hydrocarbons have a lower greenhouse potential than methane, but are still significant in the atmosphere. The precise volumes of each of these gases cannot be identified because the flare is used to burn relief and vented gases that must be eliminated from the system for safety reasons or maintenance shutdowns. The flare system includes a knockout drum which allows the higher boiling point (longer chain) hydrocarbons to cool and liquefy so they can be pumped back into the plant to be reused. The flare system was not considered as a "beyond no regrets" measure in the CER because a flaring system is required by Plant safety regulations.

The Syntroleum process reuses the heat created in the exothermic reactions in the Autothermal Reaction (making CO and H_2 from CH_4 and air) and the Fischer Tropsch Reactor (making long chain hydrocarbons out of CO and H_2). The reuse of this heat has been optimised through years of research at controlling the heat of the reactions and removing the heat from the reactor in the most efficient way possible. The heat is used to make steam which powers the major equipment in the plant. These include:

Air compressor - 60 to 80 MW

Syn Gas Compressor - 40 to 60 MW

Miscellaneous large motors (greater than 500 kW) run off steam turbine - 15 to 35 MW total.

Electricity Generation for smaller motors and power consumption 10 to 20 MW.

Energy for Desalinisation 100,000 lbs of steam per hour (about 10 to 30 MW).

The total comes to 135 to 225 MW. This is a significant amount of cogeneration although very little is sent off site. Please note these are approximations. The detailed design is only now being carried out.

Assuming all of this power were provided by electricity from a gas fired power plant at 40% efficiency, the power station would produce between 500,000 and one million tonnes of CO_2 per year.

135 MW x 24 hr/day x 365 day/yr x 1000 kW/MW = 11.9×10^8 kW-hr/year
(11.9×10^8 kW-hr/yr) x 3.6×10^6 Joules/kW-hr = 4.3×10^{15} Joules/year

54.4 Gg CO_2/PJ from page 11 of 17 (section 2.4) of the Fuel Combustion Workbook Chapter 2, published by the National Greenhouse Gas Inventory, Canberra.

4.3×10^{15} J/yr x 54.4 x (10^9 grams $CO_2/10^{15}$ J) = 2.33×10^{11} grams/yr
2.33×10^{11} grams/yr x 10^{-6} tonnes/gram = 233,000 tonnes CO_2/year

at 40% efficiency: (233,000 t/yr)/0.4 = 582,000 t CO_2/year
for 225 MW the same calculations give: 970,000 t CO_2/year

Syntroleum has also provided a letter indicating that there has been considerable cost and effort spent in the past 18 months developing a catalyst which will reduce greenhouse impacts by 13% over the estimated 1990 CO_2 value. This effort was undertaken after the process was determined to be financially viable.

Syntroleum has developed a state-of-the-art patented process. A process unique in the world, revolutionary in its scope and technologically more advanced than any similar process in the world. The development of the process has required 15 years of laboratory and pilot scale research and experimentation. The development of the process has cost millions of dollars and will cost millions more during the design.

Question 1.18

The Australian Greenhouse Office (AGO) noted that a number of reports on various environmental issues were provided by consultants. The AGO requested that similar information which underlies the section on greenhouse gas emissions be provided on a commercial-in-confidence basis if required, in order to allow verification of the estimates of emissions. Can the proponent provide the requested information?

Response

The only information provided by a consultant on GHG issues, was provided by Bateman Engineering. This information was not in a report format, but simply in a table which has been reproduced in the CER. All other reports are available in the Appendices.

Question 1.19

In relation to cumulative greenhouse emission impacts, the proponent needs to consider the impact that various solutions would have on Australia's ability to meet its target under the Kyoto Protocol. The AGO does not accept the argument that, "Construction of the Project will result in a minimum of 1,400,000 tonnes of CO_2 per year being eliminated from the atmosphere." The natural gas might stay in the ground, or more importantly for Australia's international commitment, be used during subsequent commitment periods or be exported. Can the proponent respond to the above concern?

Response

Syntroleum accepts the impacts on tonnes of CO_2 that the project would add to Australia's Kyoto protocol considerations if the project is considered in isolation. Syntroleum does not accept that the project will create significant negative global warming impacts if the project is considered globally. Global warming is a global problem and Syntroleum stands by it's belief that this project has net benefits with respect to global warming and a variety of other benefits.

Question 1.20

Can additional details be provided on the dust control measures the proponent refers to in Section 7.2.6 of the CER document?

Response

The construction contractors will develop the details of construction dust control in conjunction with Roebourne Council and the local DEP.

Question 1.21

While it is acknowledged that the proponent will undertake modelling with respect to air emissions which will include other anticipated sources, will monitoring of atmospheric emission levels across the life of the project be undertaken as a means of validating the model estimates?

Response

Some monitoring is anticipated but the details have not been finalised.

2. RISKS AND HAZARDS

Question 2.1

Even though the individual risk transect for the light paraffins product pipeline in Figure 9.2 of Appendix J is shown to be low, this is misleading as the frequency is a per annum frequency of a low use rate pipeline (ie; 37 hours per month). This means that the risk when the pipeline is actually being used is 20 times greater than that shown in Figure 9.2, and is around 1×10^{-6} at about 4m away from the pipeline. Whilst this is not very significant, the ALARP principle should be demonstrated and a detailed route risk assessment should be carried out to look at protection of the pipeline by burying, the collection of any leaks and diversion into sumps. In addition, the design of the crossing with Burrup Road, or any other roads, should be given close attention. In view of the above concern, will the proponent undertake a detailed route risk assessment for the product pipelines, and give close attention to the design of all road crossings as suggested?

Response

The potential for risk reduction options has been looked at in the work that was done for the AS 2885 report on the pipelines. In any case, the risk, as stated, is very low and so very little potential exists for cost-effective risk reduction. Typically the consultant has found that, with the exception of some 'software' issues, risks at this level are usually ALARP. The road crossing design will be considered very carefully and reviewed by Main Roads WA for Burrup Road and Council for King Bay Road.

Question 2.2

Emergency response is critical as a means of mitigating public and environmental risk. The Fire and Rescue Services, the State Emergency Service, CALM, the DEP, and the Department of Minerals and Energy (DME) also need to be linked to the emergency response plan. In view of the above concern, is the proponent willing to make a new commitment to prepare and trial a shipping emergency response plan in conjunction with the Dampier Port Authority and other relevant authorities and organisations, prior to the shipment of product?

Response

Syntroleum will make a commitment to prepare an emergency response plan in cooperation with the Dampier Port Authority. Discussions regarding agreements with Western Stevedores, Woodside and Hamersley Iron will be undertaken starting in early April 2000. The Fire and Rescue Services, the State Emergency Service, CALM, the DEP, and the Department of Minerals and Energy (DME) will be linked to the emergency response plan. Syntroleum will trial a shipping emergency response plan in cooperation with the Dampier Port Authority as part of the normal preparations for the loading of product at the Dampier Public Wharf.

Question 2.3

Is the proponent willing to make a new commitment to undertake HAZOP studies of all critical plant systems and designs and to implement the recommendations of the preliminary risk assessment, the quantitative risk assessment and the HAZOP studies, prior to finalisation of plant construction and operation?

Response

Syntroleum will commit to undertake HAZOP studies of all critical plant systems and designs. Syntroleum will consider the recommendations of the preliminary risk assessment, the quantitative risk assessment and the HAZOP studies in the design and operation of the plant.

Question 2.4

When realigned, Hearson Cove Road will run along the northern boundary of the site. Accordingly, any emergency response plan will need to include exclusion of public traffic along this road in the event of an emergency situation. Will the proponent incorporate this suggested measure into its emergency response plan?

Response

It is likely that there will be scenarios identified in the emergency response plan that would require the closing of Hearson Cove Road.

Question 2.5

The Dampier Port Authority (DPA) has indicated that it will require Syntroleum to enter into a Memorandum of Understanding (MOU) with the DPA in order to formalise operating procedures in relation to exporting the product over the wharf with the view to minimising the risk of spillage or leakage and formalising emergency response procedures. The MOU will extend to the management of ships calling at the port to load Syntroleum's product. It is expected that the MOU will be along similar lines to the MOU's that the DPA has with other major port users. Will Syntroleum comply with the DPA's requirement in regard to entering into a MOU with the DPA?

Response

Syntroleum plans to enter into a Memo of Understanding with the DPA. The discussions are planned to begin in early April 2000.

Question 2.6

The DPA has indicated that it strongly prefers that the task of loading the ships at the Dampier Public Wharf be carried out by Syntroleum personnel. This approach is consistent with other port users in the Port of Dampier and mitigates the risk accruing from the potential loss of knowledge of correct operating and emergency response procedures that may occur due to staff turnover if this task were subcontracted to a third party. The control, responsibility and accountability would then rest with Syntroleum to ensure that properly trained, appropriately skilled and suitably qualified personnel are available to perform this critical task. The DPA also indicated that, at a minimum, it would require that an appropriate Syntroleum employee continuously supervise and monitor the ship loading operations. How does the proponent respond in regard to this matter?

Response

Syntroleum is considering a variety of methods for loading ships at Dampier Public Wharf. Negotiations regarding the exact structure of the unloading operation will be undertaken following the decision to build the project in WA. Whatever the specific relationships are at the wharf, Syntroleum will take responsibility for the loading.

Question 2.7

The Shire of Roebourne indicated that risks and hazards associated with the proposed plant should not compromise access to Hearson Cove. The Shire also added that access to Hearson Cove must be maintained at all times. How does the proponent respond to this concern?

Response

Syntroleum will commit to keeping Hearson Cove Road open during construction. During brief periods during the initial construction of the new alignment of Hearson Cove Road, there

may be slight delays while heavy equipment is moving across the road. In an emergency Hearson Cove Road may be closed to allow emergency procedures to take place without interference.

Question 2.8

The Preliminary Risk Assessment (PRA) in Appendix J of the CER document concluded that none of the hazardous scenarios identified for the site were found to result in an off-site impact. It appears that the potential knock-on effects from an event to equipment located in close proximity which may have an escalating effect have not been considered. Can justification be provided as to why this has not been considered, and in particular, the effects of overpressure resulting from vapour cloud explosions on pipelines, process equipment and storage tanks?

Response

It is not true that the potential knock-on effects from an event in close proximity have not been calculated. The document looks at the major releases and effects and then concludes that the risk due to these is very small and that significant more effort at this stage was not required. The Risk consultant also made a statement in the report in Section 8 relating to escalation between inventories along the lines of limited process data, safeguarding philosophies and the overall low risks. The statement indicates that although escalation between inventories is possible, the probability of escalation and of the subsequent factors that might lead to off site impacts combine to make the frequency of the escalation event very low. The plant has low offsite risk as a result of the 'primary' initiating factors and so adding major consequences at much lower frequencies would not impact risk levels greatly.

Question 2.9

The PRA indicates that there will be no off-site impact from the loading operations at the wharf. It is envisaged that there will be dangerous goods stored in transit at the wharf. Can justification be provided as to why the possibility of a hazardous event resulting from a leaking pipeline in the wharf area impacting on dangerous goods in transit storage, has not been considered?

Response

It was assumed that there was a very low probability of dangerous goods being stored at the wharf, for more than one day, hence the frequency is low. That probability is lowered again with the loading of flammable materials. Then, if any dangerous goods were stored, special emergency response procedures would be put in place for those goods as specified by the DPA (especially since there will be the potential for flammable liquids being loaded). Thirdly, it was assumed that special emergency response plans would be in place on the wharf for Syntroleum's loading operations. The result is a possible release (low frequency), a possible ignition (low probability) and then a failure of separate emergency response systems (two very low probabilities) and the risk is next to negligible.

Question 2.10

Table 7.2 on page 43 in Appendix J of the CER document indicates that the maximum duration of release for gasoline in the process area has been taken as 300 seconds for modelling purposes. Potential releases from the catastrophic failure of tanks, if any, and not limited to equipment containing gasoline, are required to be included in the risk assessment. Can the proponent respond in regard to this concern?

Response

Catastrophic failure of tanks has not been included specifically. An investigation of such events found very little data to support an extensive investigation of catastrophic tank failure as an

initiating event such that justifying their inclusion in the report was very difficult. Large scale tank fires are included but not failure of the tanks into the bunds. In any case, the frequency of such events is anticipated to be extremely low and as such the risk would also be low. The properties of gasoline were used in the model as it is the most hazardous of any of the materials being produced and transported at the Syntroleum plant.

Question 2.11

It is assumed that there will be multiple pipelines for the loading of products for shipment. It appears that the PRA only includes the effects from the failure of a single pipeline. Can justification be provided as to why the possibility of events involving multiple pipelines (eg; knock-on from one pipeline to the others) has not been considered?

Response

Only one pipeline will be operating at any one time. The lines will be drained following loading. The lines that are not in use will not be pressurised when they are not in use. Any failure on a line that is pressurised would only impact empty tubes, not other lines full of pressurised, flammable materials. Secondly, the lines are buried for the great majority of the distance to the Wharf. This will actually restrict the likelihood of multiple lines being damaged by the initiating event because of the overall mass of the mound and will also restrict the likelihood of escalation from one to another because of the insulation of the soil. The risks may reasonably be expected to come mostly from the first line, even if the other lines were pressurised.

Question 2.12

It is assumed in the PRA that the design of the vacuum distillation units will be such that overpressures created by an explosion in these units will be mitigated by venting and pressure relief systems. Can the proponent provide justification for this assumption?

Response

This is normal design practice with such process items and so should be included within the detailed design.

Question 2.13

Section 8.3.2 of the PRA states that "the frequency of a jet fire was estimated for each leak hole size by multiplying the adjusted pipeline release frequency by the sum of the probability of immediate ignition and the probability of delayed ignition of the flammable vapour cloud." If this natural gas pipeline is to be in operation at all times, can the proponent provide clarification as to why the frequency was adjusted?

Response

The term "adjusted" is misleading and perhaps would be better removed. It refers to the calculation required to generate the length of pipeline that can sustain a release capable of impacting various points on the transect.

Question 2.14

The conclusion drawn from Hazardous Event 6.1 in Table A1.1 in Appendix 1 of the PRA indicated that the catastrophic failure of light synthetic paraffin tanks has not been considered due to the likelihood of this event being very low. Can the proponent provide justification for this assumption?

Response

No specific examples of this type of failure were found in the literature that were considered relevant and so the events were regarded as very low likelihood and hence low risk. Also refer to the response to Question 2.10.

Question 2.15

Can the proponent provide justification for the assumption that the release of hydrocarbon liquids in the process area will be detected and isolated within 60 seconds for 50mm hole size leaks and 120 seconds for 25mm hole size leaks?

Response

This is typical for onshore plant where target values range from seconds to minutes depending upon the operator and the sensitivity of the plant. The values are considered a reasonable 'middle ground' in the Risk Consultant's opinion.

Question 2.16

Section A5.6.2 of Appendix 5 of the PRA indicates that for pipeline leaks of 10mm and 50mm hole sizes, a decrease in product loadout rate will be detected at the port and that the pumps will be stopped as a result. Will the flow of the product be monitored for the entire loadout period which has been estimated to be 37 hours? In addition, how will small continuous releases which do not have a significant effect on the loadout rate be detected, and how has this been taken into consideration in the PRA?

Response

The product loadout operation will be monitored for the full 37 hours per month. Syntroleum will take responsibility for the loading operation. Small leaks have a negligible impact on risk, so they have not been considered in the risk calculations.

Question 2.17

Section A5.8.2 of Appendix 5 of the PRA indicates that where there is a significant process stream leak (ATR stripper offgas containing ammonia), the plant will be shut down and inventories depressurised to the flare within a 10 minute period. Has the possibility of significant leaks such as a catastrophic failure from process equipment and/or tanks containing ATR stripper offgas, where depressurisation to the flare is not possible, been considered?

Response

The plant will be designed such that in any foreseeable emergency or failure, all parts of the plant including ATR stripper offgas can be depressurised to the flare. The philosophy of the Risk consultant has been to consider catastrophic failure as having a probability so low as to not warrant further calculation.

Question 2.18

Can the proponent provide clarification as to why the risk transect for the light paraffins pipeline included in the CER document differs significantly from the previous revision of the PRA (ie; Revision B)?

Response

Syntroleum recognises that an error was made in the Revision B calculation. This error has been corrected.

Question 2.19

A final Quantitative Risk Assessment (QRA) will be required prior to construction of the facility. Is the proponent aware that a societal risk analysis would be required should the QRA identify any events which have the potential to cause an off-site impact?

Response

Syntroleum is aware of the requirement for a final QRA. Syntroleum understands that if the QRA identifies any events that have a greater than one in a million probability of causing off site impact, a societal risk analysis will be performed.

Question 2.20

Section 3.3 refers to the gas supply pipeline. The preferred pipeline route (Option B) goes through conservation, heritage and recreation areas. The alternative route (Option A) was rejected because "There is a restriction on the amount of space available in the Burrup road alignment as there are other pipelines close to the road, and locating the pipeline in this area would pose a greater risk than the alternative route." There is no clarification in the proposal on what the greater risk is. Is the risk greater if the larger size (750mm diameter) pipeline is constructed? More information is needed to substantiate this claim. The data should detail all relevant factors involved in determining the minimum safe offset required between pipelines on the Burrup and what size pipeline the proponent would prefer to build.

Response

The decision to chose Option B was not simply a risk decision. The pipeline routes have been selected based on consideration for several other factors including the preference of Main Roads WA, future expansion options, preferences of DRD and overall costs.

Question 2.21

There is a possibility of conflict with the gas supply pipeline and other pipeline routes, if the proposed Plenty River Ammonium Urea project goes ahead. Has this potential conflict of pipeline routes been addressed? Will the pipelines cross? Has any planned coordination between the potential pipeline routes taken place? Can the proponent clarify the above points of concern?

Response

Syntroleum has met with Plenty River, Epic Energy, Main Roads, Water Corp, Shire of Roebourne, Telstra, DOLA, DRD and other parties interested in the pipe route. DRD has recently submitted plans for an infrastructure corridor and Syntroleum has agreed to work with DRD on the alignments that will best meet the needs of the State as well as the needs of Syntroleum.

3. SURFACE WATER

Question 3.1

Figure 1.4 of the CER document clearly indicates that the natural drainage systems in the rocky slopes on the site are going to be considerably disrupted by the required earthworks. Furthermore, paragraph 6 of Section 5.1.3 of the CER document discusses the diversion of up-slope water from the site. However, it does not account for the increased water flow from building rooves, concrete structures, hard road surfaces and car parks that collect and shed rainwater. The presence of these structures will to some extent prevent rainwater from soaking

into the ground and together with the extra run-off and the diversion of water from the hills behind the site there is the potential for a significant increase in fresh surface water run-off into King Bay. What impact will these changes have on the natural fresh water flushing of the mangrove systems in King Bay?

Response

Impacts will be minor due to the very large catchment to the south of the plant site that will not be impacted by the project. A catchment of about 200 hectares will provide the majority of the rainfall runoff. The diversion of water around the site will not impact the total amount of freshwater runoff because all the water from those catchments now go to King Bay, so there will be no change to the volume from those catchments. The runoff from the site that is potentially contaminated will be collected and treated.

Question 3.2

The CER document does not contain any significant research on the potential impacts that the changes to natural surface water drainage features will have on the flora assemblages in the region, particularly the woodland areas. A lot more work needs to be undertaken to establish what effects these changes will have. How does the proponent intend to address this concern?

Response

The "woodland" areas on the plant site will be removed to build the plant. The other flora assemblages will not be impacted as the quantity and quality of the flow will not be significantly impacted.

Question 3.3

Although the proponent's 'first flush' treatment system goes some way towards safeguarding the potential for contaminated surface water run-off from the site, more detail needs to be provided on the question of what will happen to subsequent surface water, especially should the first 12mm of run-off be found to be contaminated. It is essential that some monitoring and treatment mechanisms be put in place to treat this flow as well. Can the proponent provide further information on the chosen system and justification of its suitability for climatic conditions at the proposed plant site?

Response

The critical aspect of first flush systems is the collection of the first flush of runoff water because that water carries the great majority of the pollutants. The NSW EPA has described design criteria for substances easily mobilised, such as soluble materials, fine dusts and silts as requiring 10mm to be collected in the first flush and substances that are more difficult to mobilise, such as oil, grease and other non-volatile hydrocarbons as requiring 15mm to be collected in the first flush. The Delaware Department of Natural Resources and Environmental Control recommends a half inch (12.7mm) for the control of first flush runoff. As described in section 5.2.2 the water collected in the first flush system will be analysed. If it does not meet the standard it will then treated prior to discharge. The 12mm first flush level has been selected because the Syntroleum plant will use state-of-the-art best practice technology to insure there are no leaks from the pipes that might need to be treated in the first flush system. The system will only have to treat the dust, dirt and particulate matter that is common to any site.

Syntroleum does not make the claim that there will be no leaks. It is understood that there will be some leaks. The quantity of the leaks will be reduced using the best available engineering technology to the extent that the first flush system controlling the first 12mm of runoff will be more than adequate. A worst case scenario can serve as an example.

Assuming that there were 10 leaks each starting on the same day and leaking 1 ml per hour, 24 hours per day for 30 days before they were identified by an operator and cleaned up. This would mean that there was 720 ml around each leak and assuming a density of 0.8, 5.8kg of oil. Although some of this oil may be expected to volatilise over the month that will not be included in this analysis. Assuming the area to be controlled for first flush will be 20 hectares, Table 3.3-1 can be made.

Table 3.3-1 shows the amount of oil that would be expected in each 3 ml of runoff. 3ml of runoff over 20 hectares is 600 m^3. Assuming that the amount of oil decreases in each successive 3ml of rain the concentration of oil would also decrease. Since the first 12mm would fill up the first flush tank, it is assumed that over 90% of the oil would have been collected and only the remaining 6% would still runoff. This means that the concentration of oil in the runoff would be only 0.5 mg/L even in the worst case. This is probably the level that would runoff a typical suburban road so it is not considered a significant factor.

Table 3.3-1 Summary of worst case leak oil in runoff

	m^3	% oil in runoff	kg oil in runoff	mg/L in runoff	ml rain
1st	600	49%	2.8	4.7	3
2nd	600	20%	1.2	1.9	6
3rd	600	15%	0.86	1.4	9
4th	600	10%	0.58	1.0	12
5th	600	5%	0.29	0.5	15
6th	600	1%	0.06	0.1	18
Total	3600	100%	5.8		

It is very unlikely that there would ever be this many leaks in the plant as the products must be controlled very carefully and in places where there could be major spills, such as the tank farm, there will be bunds that meet the safety standards.

Any areas where a major oil spill could take place will be bunded and any spills will be cleaned up immediately as per the plant safety plan.

4. NOISE AND VIBRATION

Question 4.1

Section 4.10 of the CER document discusses the existing noise environment. The site assessed in this section comprises the proposed plant site only. The assessment site should have been the residential areas so that the predictions of noise from the plant can be compared with the existing environment. Can the proponent respond to this concern?

Response

It is agreed that detailed monitoring of residential areas would have been useful in addition to the noise levels near the site. The nearest residential areas are about 6 km away from the site and modelling has shown that noise is not a critical concern in the residential areas.

Question 4.2

The CER indicates that the nearest noise sensitive premises are six kilometres away at Dampier. However, the major recreation area at Hearson Cove is only 1.5 kilometres away, according to Figures 1.3 and Figure 2.5. Given the importance of this site to the local population, and the high usage it receives, why was a noise assessment not conducted for Hearson Cove? Table 5.20 indicates that some noise modelling has been undertaken, based on it being 2.8 kilometres away. This distance is different to the value quoted in Figures 1.3 and Figure 2.5, above. Can the proponent clarify this point of concern?

Response

The scales on Figures 1.3 and 2.5 were printed in error. They should show the small bar as 3 kilometres long instead of 2 kilometres long. The analysis done at 2.8 kilometres, in Table 5.20, is correct for Hearson Cove Beach.

5. FLORA AND FAUNA

Question 5.1

On page 16 of Appendix M of the CER document states that "There appears to be no species of snails which could be regarded as rare and/or endangered in the context of their total geographic range. However the status of the Plantsite populations needs to be evaluated in the context of the survival of these species within the region." This is noted in the last paragraph on page 5-8 of the CER, but the conclusion drawn was that since a large portion of the Burrup Peninsula has been designated as 'Conservation, Heritage and Recreation Areas' under the *Burrup Peninsula Land Use Plan and Management Strategy, 1996*, this would somehow ensure the long term viability of the native snail species. It appears that the proponent is ignoring the advice of their own consultant. The research based advice should be adopted and enforced. How does the proponent respond to this concern?

Response

Syntroleum is committed to initiating a snail survey for a 30 to 40 hectare area in the Southern Rocky Hills area adjacent to the south side of the plant. There is a good indication that the study can be undertaken in mid-April with the report being available for submittal to the DEP in early May.

Question 5.2

The proponent should choose gas supply pipeline location Option A as described in paragraph 4 on page 3-7 of the CER document as it has the pipeline running through the road reserve which is already disturbed land and is designated for such use in the *Burrup Peninsula Land Use Plan and Management Strategy, 1996*. Option B on the other hand has the pipeline running through part of the land set aside for conservation, heritage and recreation in the same plan. The use of Option B would entail significant disturbance of a wide variety of flora assemblages, including some of the more significant vegetation types on the Burrup. How does the proponent respond to this concern?

Response

Main Roads WA has plans to widen the Burrup Road from two lanes to four lanes. The widening will be done predominantly to the east where the Option A corridor was to be located. Due to the proximity of the Epic pipeline already installed on the east side of the Burrup Road, there is not sufficient room to build the Syntroleum pipeline. Detailed discussions with DRD have indicated that option B fits best with DRD's plan to have an infrastructure corridor along the east side of Burrup Road. The DRD plan will attempt to minimise impacts for future pipelines as well as the Syntroleum pipelines.

Question 5.3

Page 7 of Section 3.3 of the CER document indicates that the timing of the vegetation, flora and fauna survey could not provide a totally accurate assessment of the flora on the pipeline route of Option B due to seasonal variations. Accordingly, more surveys are needed in other seasons to determine more accurately the species that will be impacted by the project. The limited size of the study area is also noted to have affected the conclusions drawn. How does the proponent respond to this concern?

Response

Syntroleum has initiated flora sampling after rains this season for the sections of the pipeline that were not investigated during wet weather. The first part of these studies was done in late March, but the area is still too wet to complete the investigations. The advice from Syntroleum's flora consultant is that it is best to complete the investigations in mid April so that the remaining species are flowering and seeding. As some areas were investigated during wet weather periods these will be investigated when the weather becomes drier so that the full range of species can be determined as accurately as practical. The report will be implemented in consultation with DEP.

Question 5.4

The fauna survey seems to be totally inadequate. It lacks depth of comprehensive sampling in time and in area. Much more work needs to be undertaken to provide a comprehensive knowledge of the fauna that will be disturbed by construction of the plant, and what impact this will have on the Burrup Peninsula as a whole. How does the proponent respond to this concern?

Response

Syntroleum is committed to conducting another fauna survey concentrating on the western drainage areas of the plant site. The study will be carried out in accordance with the scope of work required by the DEP and will include three to five consecutive days of small mammal trapping including pitfalls, elliot traps and tomahawk cage traps. It will also include three to five nights of spotlighting for the olive python. The sampling will be conducted in the April or early May 2000 so it will still encompass the "rainy" season, which has lasted longer than usual this year.

Question 5.5

There is grave concern that the project may impact on the habitat areas of reserve listed fauna species. The species numbers and habitat areas of any reserve listed species should be given every possibility of preservation. Any action that stands to impact directly on the habitat of such species should not be permitted. How does the proponent respond to this concern?

Response

Syntroleum is committed to conducting another fauna survey concentrating on the western drainage flowlines areas of the plant site. The study will include three to five consecutive days of small mammal trapping including pitfalls, elliot traps and tomahawk cage traps. The goal of this sampling will be to learn more about the presence of small mammals and lizards in the western drainage flowlines area. The new fauna survey will also include three to five nights of spotlighting for the olive python. The sampling will be conducted in the April or early May 2000 so it will still encompass the "rainy" season, which has lasted longer than usual this year.

Question 5.6

The potential for the spread of weed species during construction is enormous. The proponent's commitment regarding weed management is inadequate. The proponent should heed and adopt the recommendations outlined in Appendix C of the CER document in order to minimise any potential impacts. Will the proponent adopt and implement the recommendations in Appendix C pertaining to the control of weeds?

Response

Syntroleum is committed to developing and implementing a Weed Management Plan in consultation with CALM and the DEP. The plan will be submitted to CALM and the DEP at least two months prior to commencement of construction. The aspects of the plan that are required to be in place prior to commencement of construction, will be in place before construction commences. As described in Appendix C of the CER, the weed management program will include the washdown of equipment that has been used on other sites where exotic weeds may have been present. It will also include the monitoring of rehabilitated areas to insure that weeds have not spread into previously uninfested areas.

Question 5.7

Weed control particularly in relation to Buffel grass, Carribean Stylo, Ruby Dock and Kapok, must be undertaken prior to commencement of construction and preferably when the weeds are growing, and ideally when they are about to set seed after rain events. Weed control work undertaken should be from weed-free areas outwards, especially with linear clearing. Crossing points of infested areas should also be specifically managed. Furthermore, in strongly regenerating to undisturbed areas, any potential impact needs to be minimised by maintaining a narrow corridor, and through consideration of alternative ways of placing the pipelines to cause the least disturbance, such as using suspension if possible. Will the proponent include the above recommended measures in it weed management plan?

Response

Syntroleum will commit to developing and implementing a weed management plan in consultation with CALM and the DEP. This plan will be submitting to CALM and the DEP at least two months prior to construction commencing. The pipeline construction contractor will be responsible for implementing the weed management plan for the pipeline routes. The pipeline contractor will not be selected until the financial aspects of the project have been completed, so it is difficult at this time to identify the time of year in which the weed management program will be initiated. Syntroleum will make all reasonably practicable measures to eradicated weeds during the wet season, in order to make the most impact. Crossing points of infested areas will be specifically managed. The construction corridor will be as narrow as reasonably practicable, especially in areas where there is a strong possibility of regeneration. Syntroleum will consider alternative methods of placing the pipelines, while at the same time insuring that Department of Minerals and Energy guidelines are met.

Question 5.8

Since the preferred Option C product pipeline route seems to largely follow existing disturbed areas, there are concerns about the removal of priority species such as *Terminalia supranatifolia* and *Brachychiton acuminatus*. It is noted that the proponent is committed to replacing a percentage of these species in a native garden to be established. However, it is known that *Terminalia supranatifolia* is extremely difficult to propagate. Research should be undertaken to establish a propagation technique using plant material and seeds etc from the area of the trees to be destroyed, prior to permission being granted for their removal. How does the proponent respond to this concern?

Response

Syntroleum has already undertaken seed collection to ensure that the maximum number of seasons are available. Syntroleum will commit to undertaking a seed propagation program as soon as possible prior to construction commencing. Syntroleum is also committed to using the King Bay to Hearson Cove Service Corridor if it is operational within an acceptable time frame to allow Syntroleum to complete the design and financial requirements of the project. The use of this service corridor should address the concern relating to the removal of priority species such as *Terminalia supranatifolia* and *Brachychiton acuminatus* if product pipeline route option

C were used. The completion date for the King Bay to Hearson Cove Service Corridor will be the subject of on-going discussions between Syntroleum and the Department of Resources Development.

Question 5.9

While the proponent's commitment to house a 50% representation of any disturbed priority species in a native garden is acknowledged, this is considered to be inadequate. It is essential that 100% of any rare or priority species be rehabilitated. The classification, rare and priority, should automatically imply that every effort must be made to preserve such species and certainly that no negative impacts should be permissible. The loss of these plants is unacceptable. The proponent should also explain how and why the figure of 50% has been chosen, particularly in relation to Priority 1 species. How does the proponent respond to this concern?

Response

Syntroleum will commit to planting at least 100% of the rare or priority species (although no rare species have been identified) in the native garden or in another appropriate site. The detailed form of the native garden has not yet been finalised. Consultation is required between Syntroleum and the Shire of Roebourne in order to determine the most appropriate design. The 50% figure was chosen early in the project review process based on an understanding of previous project requirements on the Burrup.

Question 5.10

The vegetation report for the plant site mentions that *Terminalia supranitifolia* does not regenerate well, and that preservation of populations is important. It is therefore critical that a commitment be made to attempt to propagate this species immediately. It renders ineffective any former commitment to re-establish this species after clearing if it is intractable under cultivation. The propagation of priority species should be trialed now as it would be too late after they have been removed to find out that they are difficult to propagate. How does the proponent respond to this concern?

Response

Syntroleum has engaged Astron Environmental to conduct seed collection and plant propagation. Seeds have been collected and the propagation program is in development now. Syntroleum is happy to receive advice from CALM, DEP and other state government departments and pass the information on to Astron Environmental. It is Syntroleum's view that Astron Environmental should take the lead in developing the research program.

Question 5.11

Point 11 in Section 7.2.7 of the CER document indicated that the propagation of native species would be done in conjunction with the Shire of Roebourne. Would it be possible for the Shire to be funded to research the propagation of these priority species from plants currently in the area, before it is too late?

Response

Syntroleum has engaged Astron Environmental to conduct seed collection and plant propagation. Seeds have been collected and the propagation program is in development now. Syntroleum is happy to receive advice from CALM, DEP, Shire of Roebourne and other state government departments and pass the information on to Astron Environmental. It is Syntroleum's view that Astron Environmental should take the lead in developing the research program.

Question 5.12

The proponent must ensure that adequate rehabilitation plans are put in place. It is anticipated that the proponent will provide a final rehabilitation and closure report that will be publicly available. How does the proponent respond to this concern?

Response

A rehabilitation plan and closure report will be put in place. The rehabilitation plan will include a weed management plan and top soil management plan. The plans will be reviewed by CALM and the DEP prior to implementation, and will be in place before construction commences. The rehabilitation plan will also consider temporarily disturbed sites such as pipeline corridors and laydown areas. Syntroleum will submit the plans at least two months prior to commencement of construction.

Question 5.13

There is a concern about the lack of a topsoil management plan, as this is normally an important part of any rehabilitation plan. Will the proponent include a topsoil management plan into their rehabilitation plan?

Response

A rehabilitation plan and closure report will be put in place. The rehabilitation plan will include a weed management plan and top soil management plan. The plans will be reviewed by CALM and the DEP prior to implementation, and will be in place before construction commences. The rehabilitation plan will also consider temporarily disturbed sites such as pipeline corridors and laydown areas. Syntroleum will submit the plans at least two months prior to commencement of construction.

Question 5.14

It is essential that the seed collection programme is completed before any development of the area commences, thereby ensuring that representative propagation of all affected species can be undertaken. How does the proponent respond to this concern?

Response

Syntroleum has begun a seed collection program with Astron Environmental. It will not be completed until Astron is satisfied that they have enough seeds and other plant material for propagation. The most critical areas for seed collection and rehabilitation are the pipelines. It is not intended to begin construction of the pipelines until about 18 months after final approvals are given. There may need to be seed collection up to and through this time and the propagation trials will continue through this time as well. Syntroleum will make all reasonably practicable efforts to complete the propagation program prior to the start of construction, while at the same time ensuring that enough time is allowed for the program to be completed appropriately.

Question 5.15

The loss of habitat sites, particularly where this has the potential to affect habitat specific species and migratory species is of concern. In the case of migratory species, the assumption made on page 4-9 of the CER document that "most would exploit a range of habitat types and resources" does not take into account the possibility that the site may be a significant area for such purposes as breeding and feeding. Nor does it account for the possibility of increasing pressure on both species numbers and the local environment resulting from higher concentrations of species numbers in the remaining habitats. More detail needs to be provided to address this concern before any approval for development is given. How does the proponent respond to this concern?

Response

Most of the migratory species occur in the mangal and associated mud flats. This proposal does not impact the mangal or mudflat areas adjacent to the site. Syntroleum recognises that there will be some loss of habitat in the other habitat areas and will minimise the impact as much as reasonably practicable.

Question 5.16

A commitment is required from the proponent for supplementary opportunistic sampling to characterise ephemeral flora present at other times of year. Such sampling will need to respond to capricious rain, and likely span more than one year to cover variation. Is the proponent prepared to make such a commitment?

Response

Syntroleum initiated a flora sampling program in late March 2000 in accordance with the scope of work issued by the DEP. The sampling and further survey will have to be completed in mid April, as flowering and seeding of several species were not complete enough to justify completing the survey in late March. The western drainage area has been carefully investigated in this survey. The report will be submitted to DEP when it is completed.

Question 5.17

The range of habitats present need to be monitored to assess the impact on them. This should happen before construction so that there is a benchmark which can be used for management and for rehabilitation assessment, and it should happen as a matter of priority. Some of the contingency for assessment along the general utility corridors could be shared with other projects. How does the proponent respond to this concern?

Response

The habitats along the pipeline routes have been monitored and will continue to be monitored during and after construction. The "habitat" within the footprint of the plant site will be completely disturbed, so there will be no study required following the construction. The western drainage area will be surveyed for flora and fauna in March, April and May 2000 in accordance with the scope of work issued by the DEP. The rocky habitat area to the south of the plant site has been monitored and the areas that have been disturbed and rehabilitated will be monitored after construction.

Question 5.18

On the rocky soils typical of the Pilbara the best practice for establishing temporary laydown and construction areas would include the use of the lightest form of clearing, such as skimming the surface with a grader blade to just remove the vegetation and no more. If the surface soil is almost completely undisturbed and roots and seed are left, regeneration is significantly enhanced. Heavy machinery should not be used to clear vegetation and its use should be closely confined to the absolute minimum area where it is needed for heavy work. Leaving the land surface intact is paramount. The lighter the equipment that can be generally used the less will be the disturbance and the better the final rehabilitation result. A commitment is required from the proponent to use the lightest form of clearing possible when removing vegetation to establish temporary laydown and construction areas. Is the proponent willing to make such a commitment?

Response

The proponent is committed to using the lightest method of clearing that is reasonably practicable in the areas that will be rehabilitated. The goal will be to allow the roots to stay in place, so that resprouting and regrowth is not hampered. The great majority of the plant site will be employed for the plant equipment, tanks, infrastructure, etc so there will be no need to use these light clearing methods on the majority of the plant site.

Question 5.19

The whole site of the proposed plant is clearly comprised of a range of microhabitats which form a system. Quite clearly much of the plant area is disturbed. However, it is not helpful to characterise it as all disturbed when it appears to be 30 to 40% from the maps. The management of these areas will be significantly different and the impacts should be minimised outside the disturbed area. A commitment is required from the proponent to implement efficient design in order to minimise the eventual footprint of the plant area so that impacts are minimised. Is the proponent willing to make such a commitment?

Response

The plant site was formally assigned to the Company by the State in line with the State Cabinet approved Burrup Land Use Management Plan. The viability of the site, would be greatly reduced if the SW area were to be declared unavailable for laydown and future plant expansion. Such a restriction would unreasonably affect the long-term future of the investment, because the plant represents the first commercialisation of the technology and plant expansion is very likely in due course. It would also limit the potential for design changes, which are absolutely vital in designing a plant that is the first of its kind in the world. Without the flexibility to install more tanks or adjust the plant layout, the design process is severely hampered.

Syntroleum has reviewed the potential for changing the footprint of the project. In regard to the plant itself, there is a minimum sized area of flat land required and the steep terrain at the southern part of the site provides little flexibility in location.

Syntroleum also reviewed optimum locations for laydown areas and selected land on either side of the plant. The ability to use more land on the eastern side is constrained by the demands of very heavy and immobile cranes used during construction. There is also a limit to the quantity of flat land on the eastern side and Syntroleum would not consider sloping land as that would introduce safety issues. An alternative laydown area in the tidal mud flat was rejected as it is not capable of supporting heavy loads and would necessitate transfer of equipment across a public road. Laydown areas away from the site bring deep compromises in project economics and introduce native title and possibly aboriginal heritage issues.

Similarly, alternative locations for the drainage sump were considered and found to be impractical. The area selected is optimum for natural drainage purposes while other possible locations significantly constrain the areas designated for laydown or plant expansion.

However, Syntroleum has no wish to needlessly disturb vegetation and will not do so. It intends to safeguard the vegetation areas that can be reasonably protected while still meeting the plant requirements. The western drainage area will be cleared in stages, where required, to allow safe construction of the tanks, storage of equipment if needed and other important construction considerations. In recognition of the higher values attached by the DEP to the land in the SW of the site, Syntroleum will minimise impacts wherever practicable, particularly in the drainage area. Measures will include the construction of earth and rock berms to protect valuable vegetation areas wherever reasonably practicable.

Question 5.20

It has not been made clear whether the proposal intrudes into the valley and flowline system to the south. This has significance because it would result in a ready avenue for weeds such as the aggressive buffel grass to form a nucleus into the as yet largely unaffected area to the south. This would compromise conservation values of the areas that have been identified for conservation. How does the proponent respond to this concern?

Response

Syntroleum will make every effort to preserve the flowline south of the rocky hills at the south of the site. There will be no needless impact on this area and the current design gives a very strong indication that there will be no impact in this area. It is unlikely that the area will be needed for construction laydown, so it is unlikely that it will be disturbed and therefore there would be no need to rehabilitate the area. The stream / runoff flow from the area to the south of the site, is in a northerly direction, so there would be no possibility of weeds flowing to the south due to runoff flows.

Syntroleum will clean up the weeds on the site during construction so there is likely to be less opportunity for weed migration after the plant is constructed than there is currently. Syntroleum will prepare a weed management plan that will be submitted to DEP at least two months prior to commencement of construction. The weed management plan will include procedures to help insure that buffel grass does not migrate to the south.

Question 5.21

The drainage system in the western to south-western part of the plant area contains a system of vegetation types which are of restricted occurrence on the Burrup Peninsula and which were identified as rare in the original survey undertaken of the area. On the site plan detailed in Figure 3.3 of the CER document this area corresponds to the construction laydown and future expansion area. It is recommended that this area be left undisturbed and be quarantined from disturbance as much as possible. Other options for laydown and construction areas should be considered, such as working within the final footprint or using the old Woodside borrow pit over the road to the west, with appropriate precautionary weed management. How does the proponent respond to this concern?

Response

The plant site was formally assigned to the Company by the State in line with the State Cabinet approved Burrup Land Use Management Plan. The viability of the site, would be greatly reduced if the SW area were to be declared unavailable for laydown and future plant expansion. Such a restriction would unreasonably affect the long-term future of the investment, because the plant represents the first commercialisation of the technology and plant expansion is very likely in due course. It would also limit the potential for design changes, which are absolutely vital in designing a plant that is the first of its kind in the world. Without the flexibility to install more tanks or adjust the plant layout, the design process is severely hampered.

Syntroleum has reviewed the potential for changing the footprint of the project. In regard to the plant itself, there is a minimum sized area of flat land required and the steep terrain at the southern part of the site provides little flexibility in location.

Syntroleum also reviewed optimum locations for laydown areas and selected land on either side of the plant. The ability to use more land on the eastern side is constrained by the demands of very heavy and immobile cranes used during construction. There is also a limit to the quantity of flat land on the eastern side and Syntroleum would not consider sloping land as that would introduce safety issues. An alternative laydown area in the tidal mud flat was rejected as it is not capable of supporting heavy loads and would necessitate transfer of equipment across a

public road. Laydown areas away from the site bring deep compromises in project economics and introduce native title and possibly aboriginal heritage issues.

Similarly, alternative locations for the drainage sump were considered and found to be impractical. The area selected is optimum for natural drainage purposes while other possible locations significantly constrain the areas designated for laydown or plant expansion.

However, Syntroleum has no wish to needlessly disturb vegetation and will not do so. It intends to safeguard the vegetation areas that can be reasonably protected while still meeting the plant requirements. The western drainage area will be cleared in stages, where required, to allow safe construction of the tanks, storage of equipment if needed and other important construction considerations. In recognition of the higher values attached by the DEP to the land in the SW of the site, Syntroleum will minimise impacts wherever practicable, particularly in the drainage area. Measures will include the construction of earth and rock berms to protect valuable vegetation areas wherever reasonably practicable.

Question 5.22

The flora survey should have incorporated further sampling in order to better characterise the ephemeral flora. It is quite possible that the ephemeral species list would have been extended and that species of significance may have been found, especially in the drainage areas which are amongst the most likely areas for them to found in as these areas focus water even in poor seasons. How does the proponent respond to this concern?

Response

Syntroleum initiated a flora sampling programme in late March 2000 in accordance with the scope of work issued by the DEP. The sampling and further survey will have to be completed in April and May 2000, as flowering and seeding of several species were not complete enough to justify completing the survey in late March. The western drainage area has been carefully investigated in this survey with one of the goals the better understanding of the ephemeral flora. The survey is being conducted in consultation with DEP. The report will be submitted to DEP when it is completed.

Question 5.23

At a broader level, the overall context of the vegetation of the Burrup Peninsula is not comprehensively scoped, so that it is being revealed on a case by case basis such as the current proposal, and consequently the impact may be greater than stated on the more scattered significant species. This may have implications for the pipelines more than the plant site itself. How does the proponent respond to this concern?

Response

The results of the vegetation survey of the Burrup Peninsula to be undertaken by DRD will be used to put the potential impact of the proposal in context. Preliminary feedback on rare and priority species will be sought from DRD as the survey progresses. The results of the study will have more implications for the pipeline design. The timing of the pipeline design will allow more consideration of the DRD Burrup vegetation survey, than may be available for the plant site design. The timing of the DRD study may limit the comparisons that can be made.

Question 5.24

The fauna work undertaken was limited and could not possibly fully characterise the situation present at the sites. It largely took the form of one opportunistic observation/sampling period with no trapping regime, and was supplemented by desktop work. As such it is more suited for referral rather than assessment. As a consequence of this, the following measures are required:

- the conservation of as much habitat as possible (including excluding weeds);
- the suppression of feral fauna;
- the use of high quality construction management; and
- more intensive and extensive sampling of the whole Burrup (coordinated by DRD) in order to characterise the fauna, especially the more cryptic species such as the Pilbara Olive Python.

How does the proponent respond to this concern?

Response

Syntroleum will take all reasonable efforts to prevent feral animals from establishing near the plant site. These will include control of the rubbish generated on the site. Food scraps will be given special consideration. All reasonable efforts will be made to design the outlets for runoff water so that they will not attract feral animals. There will be no discharge of untreated sewage to the environment.

Question 5.25

The King Bay wetlands provide foraging habitat for a broad range of migratory birds, including waders, terns, egrets and birds of prey, that are listed under three international agreements to which Australia is a signatory. These agreements are the Japan-Australia Migratory Birds Agreement (JAMBA), the China-Australia Migratory Birds Agreement (CAMBA) and the Convention on the Conservation of Migratory Species of Wild Animals (the Bonn Convention). Reference to these species, with the exception of those listed under the Bonn Convention, is included in various sections of the CER, but their listing in Table 4.1 has not been extended correctly. In this table the impression has been created that only four species are listed under international agreements whereas at least 27 species are actually listed under CAMBA alone. How does the proponent respond to this concern?

Response

The proposal will have no direct impact on the King Bay wetlands and mangroves as no construction will take place in these areas. Any impacts on the migratory bird habitat will be minimal. All practicable measures will be taken by Syntroleum during construction and operation of the proposed plant to ensure that impacts are minimised. Potential impacts such as an accidental spill of hydrocarbons are low risk and prevention and clean up procedures will be covered in the emergency response plan. Stormwater run-off from the plant site will be collected and tested prior to discharge. If the run-off is shown to be unsuitable for discharge it will be treated prior to discharge.

CAMBA – China-Australia Migratory Bird Agreement

1. Streaked Shearwater *Puffinus leucomelas* (*Calonectris leucomelas*)
2. Sooty Shearwater *Puffinus griseus*
3. Leach's Storm-Petrel *Oceanodroma leucorhoa*
4. White-tailed Tropicbird *Phaethon lepturus*
5. Red-footed Booby *Sula sula*
6. Brown Booby *Sula leucogaster*
7. Great Frigatebird *Fregata minor*
8. Andrew's Frigatebird *Fregata andrewsi*
9. Least Frigatebird *Fregata ariel*
10. Cattle Egret *Bubulcus ibis* (*Ardeola ibis*)
11. Great Egret *Egretta alba*
12. Eastern Reef Egret *Egretta sacra*

13. Yellow Bittern *Ixobrychus sinensis*
14. Glossy Ibis *Plegadis falcinellus*
15. Garganey *Anas querquedula*
16. Northern Shoveler *Anas clypeata*
17. White-bellied Sea-Eagle *Haliaeetus leucogaster*
18. Sarus Crane *Grus antigone*
19. Red-legged Crake *Rallina fasciata*
20. Corncrake *Crex crex*
21. Pheasant-tailed Jacana *Hydrophasianus chirurgus*
22. Painted Snipe *Rostratula benghalensis*
23. Grey Plover *Pluvialis squatarola*
24. Lesser Golden Plover *Pluvialis dominica*
25. Ringed Plover *Charadrius hiaticula*
26. Little Ringed Plover *Charadrius dubius*
27. Mongolian Plover *Charadrius mongolus*
28. Large Sand-Plover *Charadrius leschenaultii*
29. Caspian Plover *Charadrius asiaticus*
30. Little Curlew *Numenius borealis* (*Numenius minutus*)
31. Whimbrel *Numenius phaeopus*
32. Eurasian Curlew *Numenius arquata*
33. Eastern Curlew *Numenius madagascariensis*
34. Black-tailed Godwit *Limosa limosa*
35. Bar-tailed Godwit *Limosa lapponica*
36. Redshank *Tringa totanus*
37. Marsh Sandpiper *Tringa stagnatilis*
38. Greenshank *Tringa nebularia*
39. Wood Sandpiper *Tringa glareola*
40. Common Sandpiper *Tringa hypoleucos*
41. Grey-tailed Tattler *Tringa incana* (*Tringa brevipes*)
42. Terek Sandpiper *Xenus cinereus* (*Tringa terek*)
43. Ruddy Turnstone *Arenaria interpres*
44. Asian Dowitcher *Limnodromus semipalmatus*
45. Latham's Snipe *Capella hardwickii* (*Gallinago hardwickii*)
46. Pin-tailed Snipe *Capella stenura* (*Gallinago stenura*)
47. Swinhoe's Snipe *Capella megala* (*Gallinago megala*)
48. Red Knot *Calidris canutus*
49. Great Knot *Calidris tenuirostris*
50. Red-necked Stint *Calidris ruficollis*
51. Long-toed Stint *Calidris subminuta*
52. Sharp-tailed Sandpiper *Calidris acuminata*
53. Dunlin *Calidris alpina*
54. Curlew Sandpiper *Calidris ferruginea*
55. Sanderling *Crocethia alba* (*Calidris alba*)
56. Broad-billed Sandpiper *Limicola falcinellus*
57. Ruff *Philomachus pugnax*
58. Red-necked Phalarope *Phalaropus lobatus*
59. Grey Phalarope *Phaloropus fulicarius*
60. Oriental Pratincole *Glareola maldivarum*
61. Pomarine Jaeger *Stercorarius pomarinus*
62. White-winged Tern *Chlidonias leucoptera*
63. Black Tern *Chlidonias niger*
64. Caspian Tern *Hydropogne tschegrava* (*Hydroprogne caspia*)
65. Common Tern *Sterna hirundo*
66. Black-naped Tern *Sterna sumatrana*
67. Bridled Tern *Sterna anaethetus*
68. Little Tern *Sterna albifrons*
69. Lesser Crested Tern *Thalasseus bengalensis* (*Sterna bengalensis*)
70. Common Noddy *Anous stolidus*

71. Oriental Cuckoo *Cuculus saturatus*
72. White-throated Needletail *Hirundapus caudacutus*
73. Fork-tailed Swift *Apus pacificus*
74. Barn Swallow *Hirundo rustica*
75. Greater Striated Swallow *Hirundo striolata*
76. Yellow Wagtail *Motacilla flava*
77. Yellow-headed Wagtail *Motacilla citreola*
78. Grey Wagtail *Motacilla cinerea*
79. White Wagtail *Motacilla alba*
80. Great Reed-Warbler *Acrocephalus arundinaceus*
81. Arctic Willow Warbler *Phylloscopus borealis*

Question 5.26

The Biodiversity Group of Environment Australia is particularly concerned about the potentially adverse impacts of the proposed development on the saline flats, mangroves and intertidal wetlands of King Bay and its environs. Such impacts may include pollution of these sensitive wetlands through leakages, spillages or burst pipes from the product pipelines or loading facility. How does the proponent respond to this concern?

Response

All safety measures to protect against accidents will be taken based on procedures in the management plans and the emergency response plans that will be prepared for the plant and for the pipelines. These plans will be submitted to the DME and DEP two months prior to the first testing of the pipelines. The product pipelines do not operate continuously. They are pressurised only during the loading operations at the ships. During these loading periods the site is manned at the wharf and at the plant to insure that any emergencies, leakages or disruptions can be handled quickly and efficiently. This substantially reduces the risk of damage to the King Bay ecosystem.

6. MARINE ENVIRONMENT

Question 6.1

The plant site is apparently to be raised to above the 1 in 100 year storm surge level. The design of the site needs careful attention to ensure that erosion does not spread fill material over the lower lying tidal surge zone with consequent impacts on mangroves and the marine environment. An alternative to filling the whole site, including creeks, would be to use bunding around the plant nodes. How does the proponent respond to this concern?

Response

Bunding is not appropriate. It does not provide the safety against flooding and it would not offer any significant environmental advantages as the entire site is needed and cut and fill is balanced in the current design.

Question 6.2

Table 6.1 indicates the hazards identified as having a potential to have an offsite impact. However, there is no reference to possible ecological consequences in this analysis. Due to the importance of this ecosystem, how does the proponent respond to this concern?

Response

Table 6.1 is a summary of the Hazards that were considered for the Consequence Analysis. The chances of any of these hazardous events going offsite are minimal, as described in Chapter

6, Risk Analysis. As the risk to human life is considered acceptable, a further analysis for the impact on the ecosystem was not carried out. The risk analysis was considered for impact within 1 metre of the site boundary while the sensitive marine ecosystem is several hundred metres away.

7. ABORIGINAL HERITAGE

Question 7.1

The re-alignment of Hearson Cove Road and the proposed location of the plant appears to prevent access to some significant Aboriginal Heritage sites which are currently tourist attractions in the area. Section 7.3.10 of the CER document states that "Access to the gorge containing numerous rock engravings immediately to the south of the GTS plant site will be available to authorised personnel from the south of the plant site." This is not adequate as the public currently has access to these sites and this should definitely continue. How does the proponent respond to this concern?

Response

Access will be available from the south. This arrangement has been agreed as appropriate by the Native Title claimants.

Question 7.2

There is an aboriginal place listed in the Register of the National Estate within the vicinity of the proposed development site. This place, the Dampier Climbing Men Area, is listed for the outstanding aesthetic values of a number of aboriginal engravings. Although the Aboriginal Heritage Commission (AHC) record is yet to be upgraded in consultation with the local aboriginal custodians, it is likely that the place is also of significance to aboriginal people. The condition of the place is noted as being good and the engravings well preserved. The proposed development may have direct or indirect impacts on this place, particularly through increased access. The AHC therefore recommends that the proponent take reasonable steps to ensure that any adverse effects are minimised. How does the proponent respond to this concern?

Response

It is intended that any areas of significance will be preserved. This area was not mentioned in meetings during the heritage surveys. More information is required with respect to its location, etc.

Question 7.3

Although there has been some cross reference between the anthropological and archaeological surveys undertaken, the proponent should ensure that all recommendations for both anthropological and archaeological values are to the satisfaction of all interested aboriginal parties. How does the proponent respond to this concern?

Response

Representatives of all three aboriginal claimant groups have walked the pipeline routes with the archaeologists and the reports by Rory O'Connor have been signed by representatives of each group. The CER has been discussed with the claimant groups and specific issues discussed. No comments from any of the groups were received.

8. VISUAL AMENITY

Question 8.1

The Shire of Roebourne indicated that although the proponent has provided an artistic impression of the proposed plant, it has been difficult to undertake an assessment of the visual impact. The Shire recognises that complete screening of the plant is neither practical or desirable, but indicated that consideration should be given to improving the visual amenity of the plant in order to address this issue. How does the proponent respond to this concern?

Response

Syntroleum intends to work with Shire of Roebourne on the visual aspects of the plant.

Question 8.2

The visual impact of the above ground pipelines will be enormous even if they are located along the preferred Option C route alignment. How does the proponent respond to this concern?

Response

Syntroleum intends to construct the pipelines in a manner satisfactory to the Department of Minerals and Energy including minimising the visual impact of the pipelines as much as practical. Alternative pipeline routes will be considered in the course of the design process. The gas pipeline will be buried, except at the Woodside plant and the Syntroleum plant or possibly where an unforseen safety requirement makes bringing it above ground for a short distance. The product pipelines will be covered for the majority of the route. In the short distances in which the gas or product pipelines are above the ground, the visual impact will be reduced as much as reasonably practicable.

Question 8.3

Section 5.2.14 of the CER document does not mention the visual impact of the plant against the backdrop of the striking rust-red rock piles and yellow spinifex around the proposed site. This section should have also included other measures to minimise the visual impact of the plant, such as the use of colour bonded structural steel appropriately colour co-ordinated with the surrounding environment, or other sympathetic architectural techniques. How does the proponent respond to this concern?

Response

Syntroleum will consider this in the final design stages.

Question 8.4

The Department of Conservation and land Management (CALM) believes that the location of the plant will have an adverse visual impact for recreational users of Hearson Cove. CALM also indicated that no strategies for managing visual impacts were included in Chapter 7 of the CER. Can the proponent outline how it intends to minimise the visual impact of the proposed plant?

Response

The proponent is committed to reducing visual impact as much as reasonably practicable during all phases of the project, particularly during detailed engineering design, plant layout, and construction. Measures will include selecting colours for the buildings that will be in sympathy with the surrounding area, developing a neat and tidy design, and design of lighting so that the visual impact from off the site will be minimised.

9. OTHER ISSUES

Question 9.1

It is recommended that any alteration to pipeline routes, plant layout or road alignments as detailed in the CER document, regardless of whether they are minor or major, should be made available for public comment as amendments to the CER document. How does the proponent respond to this concern?

Response

Syntroleum will follow the guidance of the DEP on issues regarding further public review.

Question 9.2

The Shire of Roebourne indicated that it would want to participate in planning the accommodation for the construction workforce associated with the development. Is the proponent willing to negotiate with the Shire in relation to this matter?

Response

Syntroleum does not expect that there will be any requirement for additional housing in the area during construction but intends to work with the Shire on any new housing plans that are required.

Question 9.3

The Shire of Roebourne's Executive Management Team requests that the proponent undertake discussions with them throughout the whole development phase in order to ensure that Councillors and the community are aware of the status and impacts of the development. Is the proponent willing to undertake discussions with the Shire of Roebourne's Executive Management Team in this regard?

Response

Syntroleum intends to discuss the entire project with the Shire of Roebourne's Executive Management Team.

Question 9.4

The Shire of Roebourne indicated that should the proponent not enter into a State Agreement, it would need to obtain development approval from the Shire. How does the proponent respond to this concern?

Response

Syntroleum intends to get development consent from the Council.

Question 9.5

The Shire of Roebourne indicated that any significant increase in heavy vehicle movements during either construction or operation will need to be managed to minimise disturbance and hazards to general traffic moving through the area. How does the proponent respond to this concern?

Response

Syntroleum will work with the Shire of Roebourne on the best management of heavy vehicle movements.

Question 9.6

The proposed location of the re-aligned Hearson Cove Road is very close to the tidal surge zone. Who will be responsible for the upkeep of this road in the event of damage arising from tidal surges in the future?

Response

When the road is handed over to the Shire of Roebourne it will then be the Shire's responsibility just as with any other Shire road.

Question 9.7

Section 2.3.1 of the CER document indicated that the Maitland Industrial Estate was considered and dismissed for a number of reasons. We believe that the reasons given are not sufficient to dismiss this area as a potential site. The Maitland Industrial Estate already has an existing high pressure gas pipeline nearby which could supply the plant and therefore eliminate the need to establish new pipelines. Furthermore, the estate is flat and would require less costly earthworks to establish plant facilities. The savings achieved in these areas could offset the potentially higher costs of establishing an appropriate shipping facility. We urge that the Maitland Industrial Estate be reconsidered and that a survey be carried out for this area as has been done for the Burrup Peninsula site. How does the proponent respond to this concern?

Response

Extensive studies regarding the siting of the plant have been carried out to Syntroleum's satisfaction.

Question 9.8

The Pilbara Regional Office of the Ministry for Planning (MFP) indicated that Section 5.1.10 of the CER document is generally quite vague and does not acknowledge the full impact the project may have on the availability of private accommodation in Karratha. There is an apparent lack of detail on the number and spatial location of workers, and a lack of knowledge that other resource development companies may well be competing for the same accommodation resources. The option put forward by the proponent to take advantage of the existing supply of private housing in Karratha is generally not supported, as it is not practical should other resource projects go ahead. The MFP requested that the proponent provide additional information on workforce accommodation once full details are known, focussing on the exact number of workers to be employed, the expected family status of those employees, the proposed location of construction workforce accommodation and a housing strategy that does not rely fully on existing housing. The MFP also indicated that this information should be presented to the Infrastructure Co-ordinating Committee of the Western Australian Planning Commission for consideration and possible endorsement. Will the proponent provide the requested information to the above committee?

Response

Syntroleum has evaluated the existing housing situation, and considered the likelihood of other projects going ahead at the same time.

Question 9.9

The cumulative impact of this project must be considered in conjunction with the potential impacts from other projects, particularly in relation to the nearby mangrove community, and air and water pollution in general. How does the proponent respond to this concern?

Response

There will be no significant impacts from water pollution on the mangroves or other receiving waters. Syntroleum is not in a position to evaluate the impacts from other projects. The air quality studies by CSIRO did take into account the other projects in the area.

Question 9.10

In regard to the last paragraph on page 2-7 of the CER document, it is acknowledged that the product pipelines would have to be longer from the Maitland Industrial Estate. However, the development of the Maitland Industrial Estate would be in conjunction with other industry. So might not the combined gas offtake be designed to accommodate a range of industries and pressures. Similarly, the impact of one corridor to service Maitland would not have the same impact as eventually alienating one third of the Burrup Peninsula to industry, provided that this service corridor is well planned for future contingencies and maximises space utilisation. How does the proponent respond to this concern?

Response

The Maitland Industrial Estate was not overlooked. Extensive studies have been carried out in order to determine to most appropriate location for the proposed plant, which in this case was the chosen site on the Burrup Peninsula.

Question 9.11

No significant reasons are given for the proposed location of the plant on this site on the Burrup Peninsula. Many of the advantages documented in Section 2.3.1 could also be used for location of the plant at any of the industrial sites in the Karratha-Dampier area. Why was the Maitland Industrial Estate overlooked, when it has basic infrastructure already in place?

Response

The Maitland Industrial Estate was not overlooked. Extensive studies have been carried out in order to determine to most appropriate location for the proposed plant, which in this case was the chosen site on the Burrup Peninsula.

Question 9.12

Section 2.3.1 gives as one reason for rejecting the location of the plant within the Maitland Industrial Estate that "use of the existing high pressure (8.5MPa) gas pipeline that runs through the estate is not preferred as the plant has been designed to operate on medium pressure gas (4.8MPa)". There seems to be little support for this statement in the document. Could the following information be provided:

(1) Can the gas pressure be reduced to meet the plant's requirements? Advice has been received that this can be done and it would appear that the cost for a take-off facility is likely to be small in comparison to the cost of a separate lower pressure pipeline;

(2) Can the plant be redesigned to take the higher pressure gas?

(3) What are the costs associated with these alternatives?

(4) How do these costs relate to the overall cost of the project?

Response

The gas pressure can be reduced and it would be less expensive than building another pipeline. This is not the only factor to consider. Other expenses that would increase the overall cost are a) The price of the high pressure gas versus the price of the medium pressure gas, b) The increased greenhouse impacts of using high pressure rather than medium pressure gas, c) the cost of the additional length of product pipelines back to the wharf, d) the additional cost and time delays of native title negotiations for the greater length of pipeline, e) the added risk of using a longer pipeline and f) the construction difficulties of bringing heavy loads such a long distance from the port area.

Question 9.13

Section 2.3.1 also states that "the gas supply line is able to be constructed within already disturbed road easements". If this is the case, why is it that existing disturbed corridors for the supply pipeline are not the preferred route for the proposed site?

Response

The statement took into account engineering considerations about the possibility of constructing the pipes close to the roads. The other corridors have been selected based on consideration for several other factors including the preference of Main Roads WA, future expansion options, preferences of DRD and overall costs.

Question 9.14

The recent pipeline installed by Epic Energy on the Burrup Peninsula was completed to a very high environmental standard. Would the proponent be prepared to construct all future pipelines to the equivalent "best practice" standard?

Response

The pipelines will be constructed to "best practice" engineering standards. The standard may not be exactly equivalent because the standards have changed since the Epic Energy line was built and they may change further in the time before the Syntroleum lines are to be built. Syntroleum has had several meetings with Epic Energy since July 1999.

Question 9.15

Waste water and sewage effluent will be treated before evaporation. CALM indicated that there is the possibility that this facility may be overtopped in a heavy rainfall event. The level of rainfall event that the facility can cope with should be ascertained. Can the proponent clarify this point of concern?

Response

The plant will be designed to remain undamaged in a 100 year storm event. The low point elevation on the relocated Hearson Cove Road will be 5.1 metres in front of the plant site. The 100 year storm surge event seawater elevation is 5.0 metres. The plant will slope up from the road, toward the south, up to an elevation between 8 and 20 metres. Syntroleum is happy to discuss the parameters that CALM used to make the assessment that the facility could be overtopped in a heavy storm event.