Methanol Complex, Burrup Peninsula

Methanex Corporation

Report and recommendations
of the Environmental Protection Authority

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Summary and recommendations

Methanex Australia Pty Ltd proposes to establish a methanol complex on the Burrup Peninsula, consisting of two nominal 6,000 tonne per day (tpd) methanol plants, two air separation units, methanol storage (220,000 tonnes), a desalination plant, transport of raw materials and products to and from the plant site and ship loading operations at Dampier Port. The first of the two methanol facilities will be a Lurgi Oel-Gas-Chemie plant that employs the "latest generation technology", incorporating a primary and secondary reformer. The technology has not been chosen for the second methanol plant since it will not be constructed in the near future. This report provided the Environmental Protection Authority's (EPA's) advice and recommendations to the Minister for the Environment and Heritage 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 and Heritage 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

The EPA decided that the following environmental factors relevant to the proposal required detailed evaluation in the report:

(a) Terrestrial flora – vegetation clearing, weed invasion from construction activities and potential impacts from the dry deposition of acidic gases;

(b) Terrestrial fauna – impacts on fauna habitat;

(c) Gaseous emissions – limiting emissions to acceptable levels;

(d) Greenhouse gas emissions – minimisation of greenhouse gas emissions as part of plant design, and commitment to seeking ongoing reduction in net emissions over the project life;

(e) Liquid effluent management – limiting discharges to acceptable levels;

(f) Noise – minimising impacts on the amenity at Hearson Cove;

(g) Visual impact – minimising impacts on the amenity at Hearson Cove;

(h) Aboriginal heritage – impacts of gaseous emissions on petroglyphs; and

(i) Off-site individual risk – acceptable risk to adjacent land users.

There were a number of other factors which were relevant to the proposal, but the EPA is of the view that the information set out in Appendix 3 provides sufficient evaluation.

Conclusion

The EPA has considered the proposal by Methanex to establish a mega methanol complex on the Burrup Peninsula, including a desalination plant, transport of materials, and a ship loading operation at Dampier Port.

The vegetation in the King Bay – Hearson Cove Valley has high conservation value and part of the floristic variation appears to be uncommon elsewhere on the Peninsula (Trudgen, 2001). The EPA recognises that the valley has been identified for industrial purposes in the endorsed Burrup Peninsula Land Use Plan and Management Strategy (O'Brien Planning Consultants, 1996) and therefore some impacts on the vegetation in the area will occur. The EPA is generally satisfied that the proponent has optimised the layout of facilities within its project lease to minimise impacts on vegetation, although it is concerned that two sites of significant vegetation on the south-west corner of the lease may be impacted. The EPA recommends a review of the area of disturbance during the detailed design phase.

Most of the vertebrate species occurring around the Burrup Peninsula are widely distributed throughout the Pilbara and no fauna species endemic to the Burrup Peninsula were observed on the lease. The EPA accepts that construction will result in the removal of some habitats. It notes that the project is not likely to impact on any Specially Protected (Threatened) Fauna or have a direct impact on larger fauna species. The EPA is satisfied that the plant layout and infrastructure has been sited to minimise disturbance to habitats for non-molluscan fauna. The EPA is also satisfied with the fauna study undertaken by the proponent to target species of fauna considered to be poorly understood.

The main gaseous emission will be oxides of nitrogen (NOx). The proposed NOx emissions are significant, representing approximately 12% of the total emissions from existing, approved and proposed industrial sources in the region. However, the proponent is proposing to utilise low NOx burners and the EPA therefore considers that these emissions will be reduced as low as reasonably practicable. The EPA is satisfied that the ground level concentration of nitrogen dioxide will be well below the NEPM Standard at the population centres. However, because insufficient information is currently available to specifically determine the impacts of NOx and other gaseous emissions on vegetation, ephemeral pools and petroglyphs the EPA recommends that the proposed stack configuration and parameters be reviewed in order to further reduce the local impacts on the Burrup Peninsula, particularly the nearby elevated terrain. The EPA endorses the study of the potential impacts of acidic gases on petroglyphs that is being coordinated by the Office of Major Projects and considers that impacts on other environmental values should be investigated as a matter of priority. The EPA is satisfied that the proposal is not expected to increase ozone levels in the region.

Based on the information provided, the EPA is satisfied that the technology being proposed by the proponent is more thermally efficient than modern conventional technology. The EPA is satisfied that that the proposed greenhouse gas intensity of 0.41 tCO_{2E} / t methanol represents current best practicable technology. The EPA notes that energy will be recovered from waste gas streams during normal operation, rather than being sent to flare. The EPA has no objection to the proposed gas turbine being simple cycle, given that it will be small (12 MW) and used primarily to provide electricity during start-ups.

The proponent proposes to discharge its brine and wastewater to Mermaid Sound via the Water Corporation's multi-user discharge system. The EPA commends the proponent for utilising a number of water conservation and re-use strategies. The EPA is of the opinion that the concentration of metals, particularly copper, in the effluent can be reduced further and recommends that the proponent review the options available to achieve further reductions. The EPA is particularly concerned that during upset or worst case conditions the copper concentration in the discharge is expected to exceed the ANZECC/ARMCANZ (2000) 99% species protection level at the edge of the proposed 0.01 km^2 mixing zone. It therefore expects the proponent to demonstrate that "best practice" is being proposed with respect to the copper discharge.

The complex is expected to meet the *Environmental Protection (Noise) Regulations 1997* at the plant boundary and at Dampier, however, it will be a significant contributor to noise levels at Hearson Cove. The EPA is satisfied that the preliminary plant design incorporates best practicable noise reduction measures. The EPA is also satisfied with the proponent's commitment to utilise an acoustic engineer during the detailed design phase in order to reduce noise levels at Hearson Cove as low as reasonably practicable.

The EPA is of the view that special endeavours are required to minimise impacts of industrial development, including the proposed methanol complex, on the visual aesthetics of Hearson Cove. The EPA considers that it is likely that additional screening measures will be required at the Cove in order to help preserve recreational values.

Earthworks are likely to result in the disturbance of nine archaeological sites and potentially a further five sites. The proponent has recently completed Aboriginal Heritage surveys with each of the three claimant groups and submitted a report to the Department of Indigenous Affairs. The EPA is satisfied that on-site impacts will be acceptable, given that the proponent is required to comply with the provisions of the *Aboriginal Heritage Act 1972*.

The individual fatality risk contour meets the EPA criteria at the site boundary and along the entire length of the product pipeline and is therefore acceptable. The cumulative risk at Hearson Cove beach is significantly less than the EPA criteria and is also acceptable. The proposal is not considered to have an impact on societal risk levels as there are no significant populations outside the site within the effect zones.

The EPA has concluded that the proposal is capable of being managed in an environmentally acceptable manner such that it is most unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Section 4, including the proponent's commitments.

A considerable number of new projects have been proposed for the Burrup Peninsula and the level of potential cumulative impacts would increase significantly if all projects were to proceed. The EPA has provided advice in 'Other Advice" regarding the issue of potential cumulative impacts.

Recommendations

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

1. That the Minister notes that the proposal being assessed is for a methanol complex to be established on the Burrup Peninsula, consisting of two nominal 6,000 tpd methanol plants, two air separation units, methanol storage (220,000 tonnes), a desalination plant, transport of raw materials and products to and from the plant site and ship loading operations at Dampier Port.
2. That the Minister considers the report on the relevant environmental factors as set out in Section 3;
3. 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 4, and summarised in Section 4, including the proponent's commitments;
4. That the Minister imposes the conditions and procedures recommended in Appendix 4 of this report;
5. That the Minister notes the EPA's Other Advice.

Conditions

Having considered the proponent's commitments and the information provided in this report, the EPA has developed a set of conditions that the EPA recommends be imposed if the proposal by Methanex Corporation to construct and operate two nominal 6,000 tpd methanol plants, two air separation units, methanol storage (220,000 tonnes), a desalination plant, transport of raw materials and products to and from the plant site and ship loading operation at Dampier Port, is approved for implementation.

These conditions are presented in Appendix 4. Matters addressed in the conditions include the following:

(a) that the proponent be required to fulfill the commitments in the Consolidated Commitments statement set out as an attachment to the recommended conditions in Appendix 4. The commitments cover the preparation of a Construction and an Operation Environmental Management Program which will include the following Plans:

- Flora and vegetation management;
- Landscaping
- Fauna management;
- Erosion and sediment control;
- Dust management;
- Noise management;
- Solid waste management;
- Liquid waste management;

- Hazardous materials management;
- Pre-commissioning management;
- Construction safety management;
- Cultural Heritage;
- Traffic management;
- Cyclone contingency;
- Methanol spill contingency; and
- Water quality management.

The remainder of the conditions address the following:

(b) preparation and subsequent implementation of decommissioning plans;

(c) preparation and implementation of a Greenhouse Gas Emissions Management Plan;

(d) review of the stack configuration and parameters to reduce impacts on elevated terrain;

(e) composition of brine and wastewater discharge and demonstration that best practicable technology will be adopted to reduce metals, including copper, as low as reasonably practicable;

(f) Noise Management Plan to minimise impacts on the amenity of Hearson Cove;

(g) Visual Amenity Management Plan to minimise impacts on the amenity of Hearson Cove; and

(h) Compliance audit and performance reviews, and a decommissioning plan.

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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 and Heritage on the environmental factors relevant to the proposal by Methanex Australia Pty Ltd (Methanex), to establish a methanol complex, consisting of two 6,000 tonne per day (tpd) methanol plants, on the Burrup Peninsula.

The proposal was referred to the EPA on 16 November 2001 and on 26 November 2001 the level of assessment was set at Public Environmental Review (PER) under Section 38 of the Environmental Protection Act 1986. The PER was made available for a public review period of four weeks commencing on 15 April 2002 and ending on 13 May 2002.

The EPA's decision to assess the proposal at a PER level of assessment was based on 9 main factors, namely terrestrial flora, terrestrial fauna, gaseous emissions, greenhouse gas emissions, wastewater discharge, noise (with respect to social amenity of Hearson Cove), visual impacts, Aboriginal Heritage (including impacts of gaseous emissions on petroglyphs) and public risk (methanol production, storage, transfer and shipping).

Further details of the proposal are presented in Section 2 of this report. Section 3 discusses the 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 5 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

Methanex proposes to develop a methanol complex on the Burrup Peninsula, approximately 1300 kilometres north of Perth. The selected project site is located in the King Bay – Hearson Cove Industrial Area (Figure 1), approximately 6 and 10 kilometres from the towns of Dampier and Karratha respectively. Approximately 84 hectares of the 100 hectare site will be cleared to accommodate the methanol complex.

The proposed methanol complex will include, two nominal 6,000 tpd methanol plants, two air separation units, methanol storage (220,000 tonnes), a desalination plant, transport of raw materials and products to and from the plant site and ship loading operations at Dampier Port. The proponent expects the methanol complex to be capable of producing up to 5 million tonnes per annum of methanol (350 days per year at 14,000 tpd) through debottlenecking and design improvements to the plants. The proponent's intention is to complete construction of the first plant by mid 2005 and the second approximately 5 years later depending on the market demand for methanol.

Methanol is manufactured from natural gas (feedstock), oxygen and water. A simplified process flow chart for methanol production is shown in Figure 2 and a preliminary plant layout is shown in Figure 3. The main process steps are as follows:

- feed gas desulphurisation;
- saturation of the feed gas stream;
- reforming of the feed gas to produce "syngas" (mainly hydrogen, carbon monoxide and carbon dioxide);
- synthesis of methanol from the syngas;
- methanol purification by distillation; and
- methanol storage.

Details of each process step is provided in Section 4.2 of the PER (prepared for Methanex by SKM, 2002).

The proponent has chosen Lurgi Oel-Gas-Chemie (Lurgi) to provide the technology for the first methanol plant. The Lurgi "Mega-Methanol technology employs the "latest generation technology", incorporating a primary and secondary reformer. This technology is considered to be more efficient than conventional technology since it utilises the controlled combustion of natural gas within the secondary reformer to create heat for the endothermic reforming reactions in the primary reformer. Heat is also recovered from the process to produce high pressure steam that is used to provide the motive energy for the steam turbine drivers in the complex, including two 12 MW generators. A small gas turbine (12 WM) will also be operated in "hot standby" to ensure uninterrupted power supply to the plant.

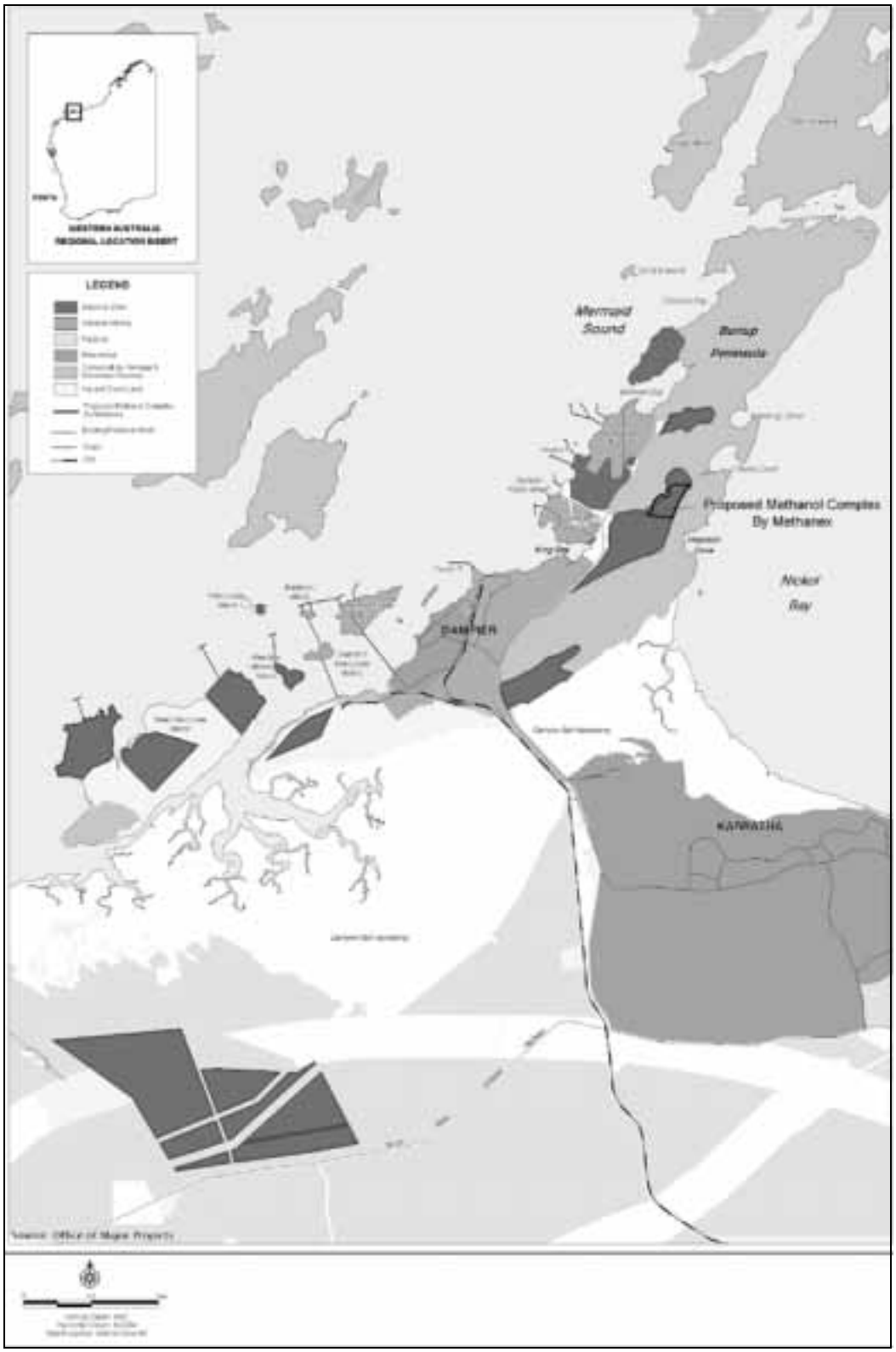

Figure 1: Project location (Source: Figure 1-1 SKM, 2002)

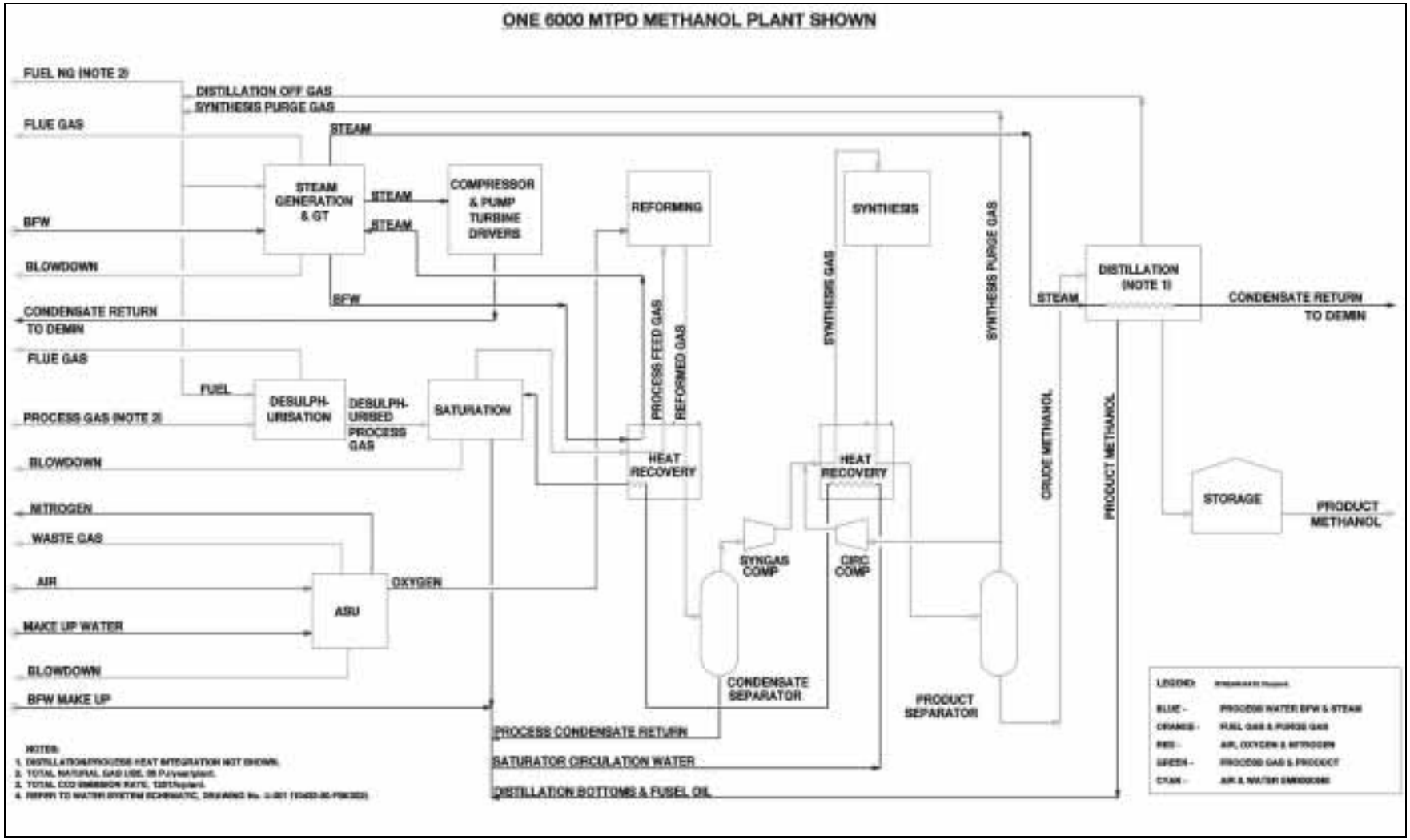

Figure 2: Process flow chart (Source: Figure 4-1 SKM, 2002)

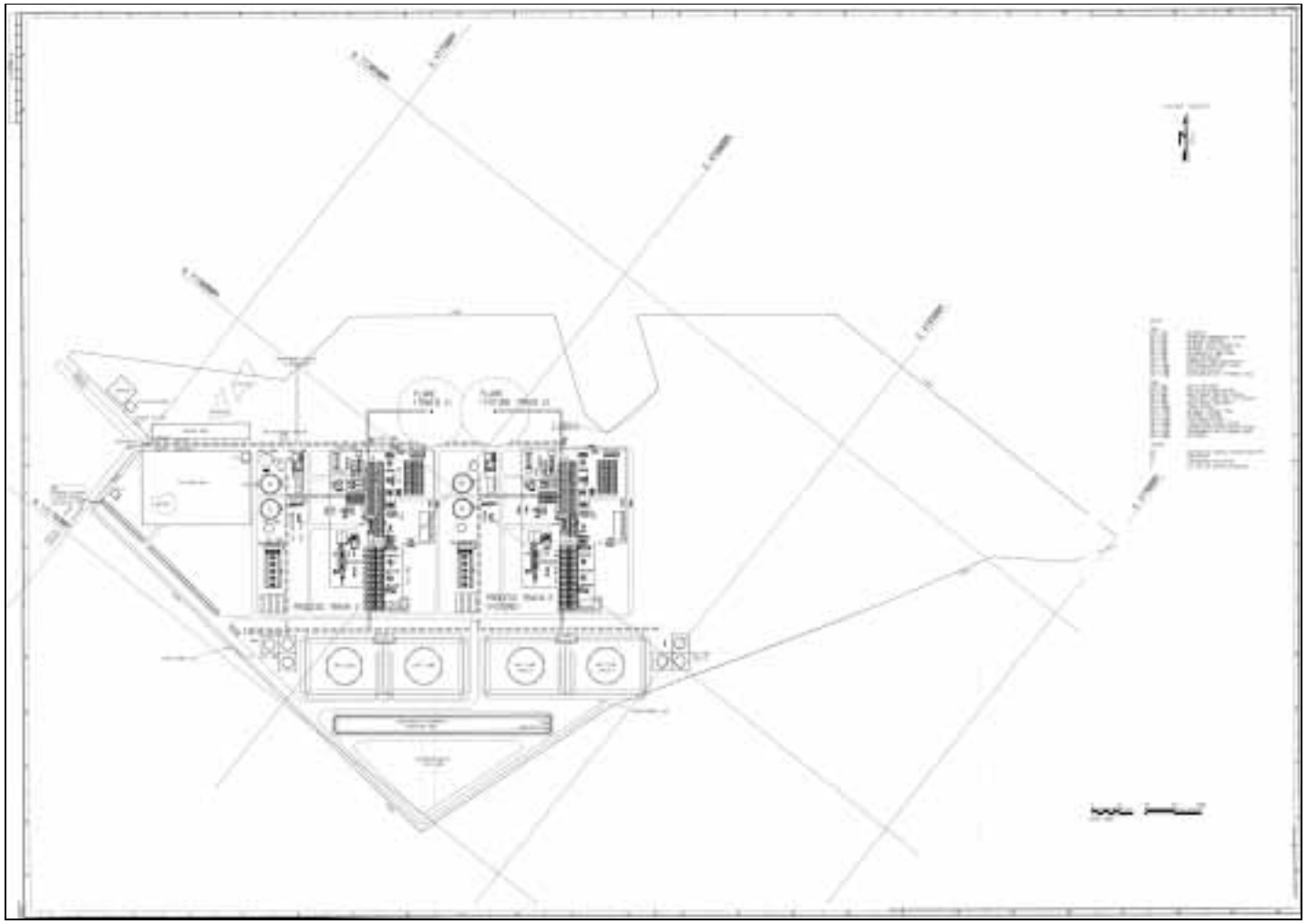

Figure 3: Preliminary plant layout (Source: mg engineering Lurgi)

The main characteristics of the proposal are summarised in Table 1 below. A detailed description of the proposal is provided in Section 4 of the PER (SKM, 2002).

Table 1: Summary of key proposal characteristics

Characteristic	Description
Project purpose	To produce methanol from natural gas using "latest generation technology".
Project life	Over 25 years.
Complex capacity	Maximum of 5 million tonnes per annum from two production plants.
Lease Area	Approx 100 hectares.
Site area (Area of disturbance)	Approx 56 hectares for two plants and 28 hectares for expansion. Total of approximately 84 hectares.
Complex facilities Process plant Air separation unit Product storage Power generation Water systems Steam generation Utilities Support facilities	 2 x 6,000 tonne per day methanol production plants. 2 x 3,000 tonne per day oxygen cryogenic air separation units. 4 x 55,000 tonne storage tanks, 4 rundown tanks and 2 crude methanol tanks. 30 megawatt/plant primary and 5 megawatt emergency generation. Desalination for up to 15 megalitres perday of fresh water for potable, steam systems and cooling tower make-up. Demineralisation systems to produce high pressure steam quality water. Three level steam system (125, 50 and 5 bar gauge) generated from heat recovery and auxiliary boilers. Instrument and plant air systems. Wastewater treatment systems for domestic, process and contaminated stormwater. Nitrogen reticulation from the air separation unit. Administration, maintenance, laboratory, emergency response & control room facilities.
Complex operation	24 hours per day for 365 days per year
Complex reliability	Each plant will require a shutdown for catalyst replacement and predictive and preventative maintenance once each 3-4 years. (The design case is for an average 350 operational days over a 3 year period.)
Seawater requirements	Up to 55 megalitres per day.
Natural gas input	About 400 terajoules per day for two plants
Natural gas pipeline	1100 mm diameter nominal pipeline.
Product export pipeline	750 mm diameter insulated pipeline (above ground) from the proposed site to the Port (approximately 5 kilometres).
Port facilities	Two berths, dedicated and/or shared, for the total facility production provided by the Dampier Port Authority.
Complex efficiency	33 – 35 gigajoules per tonne of methanol (high heating value)
Construction period	27 months for the first plant.
Workforce	1000 at peak construction, up to 150 for normal operation.
Catalysts Desulphurisation Reforming Synthesis	 Cobalt Molybdenum/ Nickel Molybdenum hydrogenation and Zinc Oxide desulphurisation catalysts. Nickel steam reforming catalyst. Copper methanol synthesis catalyst.
Noise	65 dB(A) at the lease boundary..
Solid wastes Collected by contractor for recycling/re-use and disposal	Waste generated from operation of two plants. Batteries, paper, cardboard, sludge and solvents – about 80 tonnes per year. Scrap metal about 104 tonnes every 3 to 4 years (turnaround). Waste oil – about 44 kilolitres every 3 to 4 years (turnaround).
Returned to vendor Landfill Recycled Composted	Catalyst waste. – about 640 tonnes every 3 to 4 years (turnaround). Fluorescent tubes, lamps – about 2000 in number every year. General refuse – about 150 tonnes per year Ceramic fibres – about 80 tonnes every 3 to 4 years (turnaround). Glass, plastics and chemicals – about 2.3 tonnes per year. Organic waste – about 0.4 tonnes per year.

Characteristic	Description	
Wastewater		
Brine, Treated Wastewater & Cooling Tower Blowdown	Up to 45 megalitres per day.	
Brine	Up to 44,000 kilolitres per day.	
	Discharge on entry to return system (milligrams per litre)	Calculated annual load to return line (kilograms per year)
Total Dissolved Solids	55,000	-
Anti-scalants	3.82	50,380
Anti-foaming agent	0.32	4,220
Cooling tower blowdown	Up to 900 kilolitres per day.	
	Maximum discharge on entry to Methanex' brine return line (milligrams per litre)	Calculated annual load to return line (kilograms per year)
Copper	Negligible.	
Zinc	1	160
Phosphate	9	1,420
Total Phosphorus	3	470
Neutralising Amines	0.3	50
Polymeric Dispersants	16	2,510
Free Biocides	Zero.	Zero.
Treated Wastewater	Up to 700 kilolitres per day.	
	Maximum discharge on entry to Methanex' brine return line (milligrams per litre)	Calculated annual additional load to return line (kilograms per year)
Free chlorine	0	0
Total hydrocarbons	10	2,080
Methanol	15	3,120
Copper	0.5	50
Nickel	1	100
Zinc	1	100
Chemical Oxygen Demand	100	20,800
Ammonium	10	1,460
Total Nitrogen	10	1,460
Note: Annual load based on average conditions and does not include background concentrations in seawater. Levels of Chemical Oxygen Demand discharged based on average conditions. No data for maximum conditions.		
Domestic	Up to 10 kilolitres per day. Irrigated on landscaped areas.	
Biological Oxygen Demand	20 milligrams per litre	
Total suspended solids	30 milligrams per litre	
Coliforms	<1000 colony-forming units per 100 millilitres (thermotolerant coliforms)	
Stormwater	Dual stormwater system: ▪ Stormwater directed to a stormwater pond for analysis, treatment or discharged to clean stormwater system depending on results. ▪ Stormwater pond sized to contain first 100 mm of any storm event with minimum capacity of 20,000 cubic meters. ▪ Run-off subsequent to the first 100 mm will be diverted into the clean stormwater system. ▪ Clean stormwater directed through interceptors into natural watercourses. Discharge to natural watercourses via a weir or other design in such a way to prevent erosion. ▪ Stormwater in the bunded areas will be analysed prior to discharge. If contaminated, it is directed to the stormwater pond and if clean, to the clean stormwater system.	
Total dissolved solids	1000 milligrams per litre	
pH	6-9	
Total suspended solids	10 milligrams per litre	
Note: All analysis to be based on 24 hour composite samples unless otherwise agreed.		

Characteristic	Description		
Approximate gaseous emissions	Estimated Maximum Rate (kilograms per hour)	Calculated per tonne methanol (kilograms per tonne of methanol)	Calculated Annual Load (tonnes per year)
NO_x	483	0.35	1,745
SOx	3.2	Nil	1.7
CO	1,052	0.1	553
VOC	3.9	0.22	1,121
PM_{10}	2.5	Nil	Nil
CO_2	254,310	410	2.0 million
Greenhouse Gas Intensity	0.35 – 0.45 tonne CO_2 per tonne of methanol, on average 0.41 with 2.1% CO_2 gas.		

Note. Atmospheric emissions based on best conservative estimates from preliminary FEED for two nominal 6,000 tonne per day production plants. Greenhouse gas emissions are expected and approximate emissions from maximum production of 5 million tonnes per annum determined over the life cycle of the methanol conversion catalyst. Annual loads calculated assuming average 350 normal operating days per year.

Prior to the release of the PER (SKM, 2002), Methanex had not finalised selection of the technology provider and was considering both the Lurgi process and the Synetix (formerly ICI) Leading Concept Methanol (LCM) process. The information provided in the PER was therefore generic in nature and emissions data represented the most conservative estimate of the two technologies. Although there have been no major changes to the proposal since selecting the Lurgi technology, the proponent has provided more specific process information and a better estimate of emissions to the environment. The proponent has advised that although the technology provider for the second plant has not been selected, since it will not be constructed in the near future, its emissions will not be greater than those proposed for the first methanol plant. The proposed emissions are based on conservative estimates from preliminary front end engineering design for two 6,000 tpd methanol plants. However, the proponent has advised that the proposed pollutant emission rates and total annual loads will not be exceeded should production ultimately be increased up to 5 Mtpa of methanol.

The proponent has proposed an amendment to the lease boundary as originally described in the PER (SKM, 2002). An extension (approximately 4 ha) in the southwest corner of the lease (see Figure 4) is required to house a visitors centre, car park and access road.

The following ancillary components of the project are not included in this proposal since different proponents will be responsible for obtaining environmental approval:

- the establishment of a multi-user service corridor for the natural gas and product pipelines;
- the construction of a seawater supply pipeline and a brine and wastewater discharge pipeline; and
- the construction of a dedicated liquid loading facility near the existing Dampier Public Wharf.

The potential impacts of the proposal initially predicted by the proponent in the PER document (SKM, 2002) and their proposed management are summarised in Section 3.

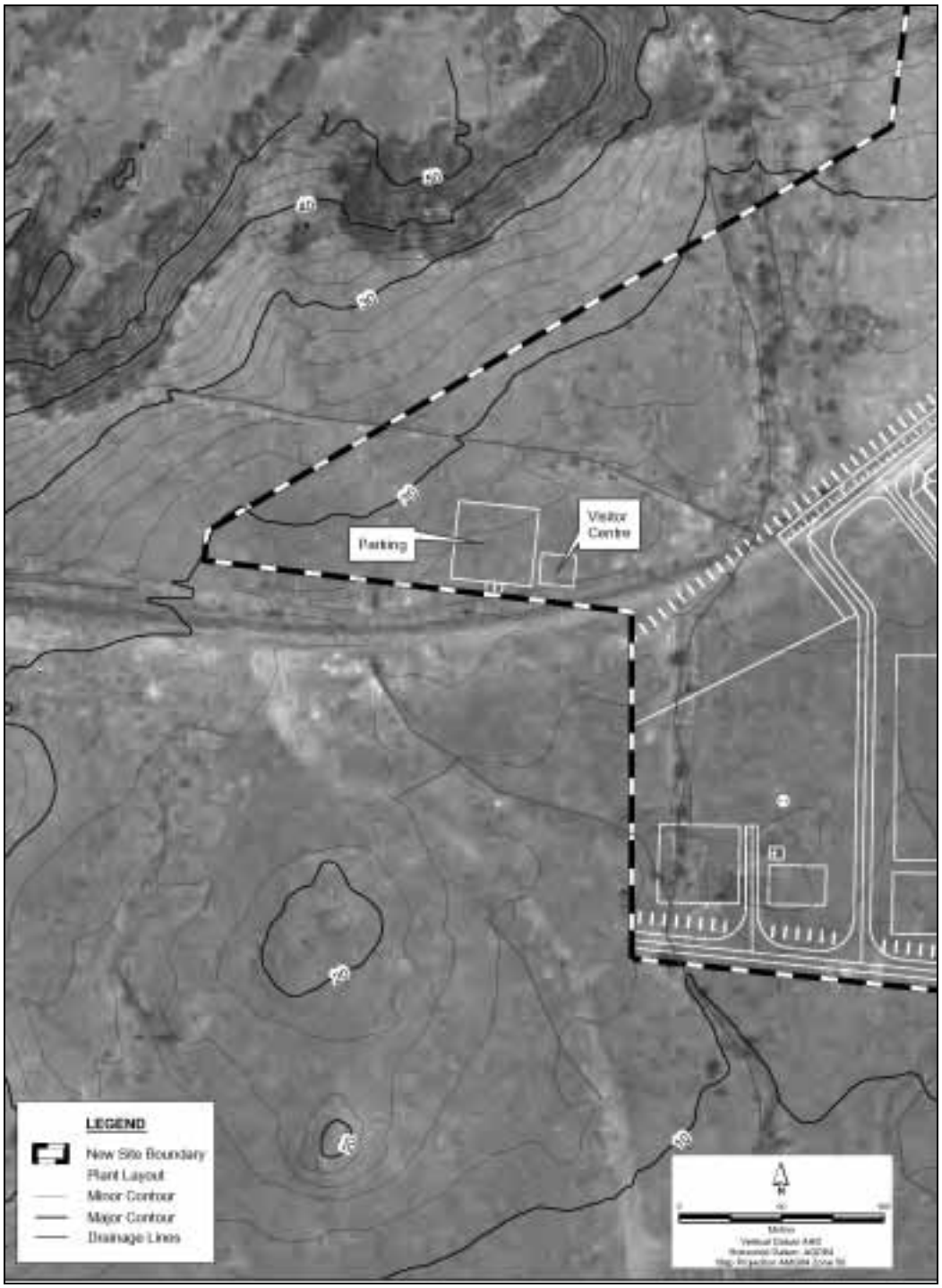

Figure 4: Amendment to lease (Source: Figure 6-2 SKM, 2002c)

3. Relevant environmental factors

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment and Heritage 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 selected for detailed evaluation in this report is summarised in Appendix 3. The reader is referred to Appendix 3 for the evaluation of factors not discussed below. A number of these factors, such as landform and drainage, are relevant to the proposal, but the EPA is of the view that the information set out in Appendix 3 provides sufficient evaluation.

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

(a) Terrestrial flora – vegetation clearing, weed invasion from construction activities and potential impacts from the dry deposition of acidic gases;

(b) Terrestrial fauna – impacts on fauna habitat;

(c) Gaseous emissions – limiting emissions to acceptable levels;

(d) Greenhouse gas emissions – minimisation of greenhouse gas emissions as part of plant design, and commitment to seeking ongoing reductions in net emissions over the project life;

(e) Liquid effluent management – limiting discharges to acceptable levels;

(f) Noise – minimising impacts on the amenity at Hearson Cove;

(g) Visual impact – minimising impacts on the amenity at Hearson Cove;

(h) Aboriginal heritage – direct impacts, as well as, indirect impacts from gaseous emissions on petroglyphs; and

(i) Off-site individual risk – acceptable risk to adjacent land users.

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

Details on the relevant environmental factors and their assessment are contained in Sections 3.1 - 3.9. 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.

3.1 Terrestrial flora

Description

Original Lease boundary

The Burrup Peninsula supports vegetation that is quite distinct from the adjoining mainland (Blackwell et al., 1979; Trudgen, 2002). At a regional level, all of the vegetation associations can be considered to be rare, given the apparent geographical restriction of these floristic communities and the relatively small total area occupied by each association (Trudgen, 2002). The King Bay – Hearson Cove valley is the only broad valley with gentle lower slopes and consequently has the best stands of a part of the range of vegetation structural/dominance units on the Burrup Peninsula. The overall value of this vegetation is increased by the fact that it occurs on both sides of the valley in catenas that extend from the tops of the rocky ridges down to the tidal flats (Trudgen, 2001).

Direct Impacts on Vegetation

Biota Environmental Sciences Pty Ltd (Biota) was commissioned to investigate and survey the flora and fauna occurring on the proposed project site. A dry season vegetation survey (Biota, 2002a) was conducted during October and November 2001. A desk top assessment (Biota, 2002b) of the conservation significance of the site's flora and vegetation was also undertaken after the release of the PER (SKM, 2002). The proponent committed to undertake a survey to document flora species present during the wet season provided sufficient rainfall is received prior to construction.

The vegetation survey identified ten vegetation types within the project site. A detailed description of each type is provided in Section 5.75 of the PER (SKM, 2002). The conservation significance and extent of the vegetation types are summarised in Table 2. Apart from within the rehabilitated area, the vegetation was found to be in very good or excellent condition.

Table 2: Conservation significance of the project site vegetation

Vegetation Type	Extent within Project Site		Conservation Significance
	ha	%	
Colluvial Slope Vegetation			
AiHcTwTe	23.74	23.7	Moderate: best representation within the King Bay - Hearson Cove valley; relatively undisturbed.
AbTwTe	22.39	22.3	
AbGpTeTw	0.37	0.4	
Rockpile / Rocky Outcrop Vegetation			
AoBaFbReSs	1.31	1.3	High: substantial representation beyond Burrup is unlikely; supports Priority 1 flora; relatively undisturbed; good representation of northern flora elements.
BaEveTe	0.10	0.1	High: very restricted on Burrup; supports Priority 1 flora; relatively undisturbed.
Creekline Vegetation			
EviAbTaTe	1.96	1.9	Moderate: relatively undisturbed; support habitat specific flora.
ChAiAcTe	2.69	2.7	
TcTe	0.36	0.4	
GpTa	0.58	0.6	
Rehabilitation Vegetation			
ACc	46.77	46.6	Low: degraded
TOTAL	**100.27**	**100**	

Source: Table 5-4 of the PER (SKM, 2002).

The two vegetation types found within the Rockpile/Rocky Outcrop landform (AoBaFbReSs and BaEveTe) are considered to have high conservation significance. The colluvial slope and the creekline vegetation types are relatively undisturbed and have moderate conservation significance due to their relatively limited representation.

Approximately 84 hectares of the lease area (100 hectares) will be cleared to accommodate the methanol complex, although about 55% of this area was previously disturbed by Woodside in order to provide temporary accommodation for its construction workforce. The indicative preliminary envelope of disturbance on a site vegetation map is shown in Figure 5.

The regional conservation significance of the flora and vegetation of the proposed site (Biota, 2002b) was assessed by overlaying the proposed development area on the vegetation mapping of Trudgen (2002) as detailed in Appendix 6. The rockpiles and rocky outcrops along the north western boundary of the project site will be avoided. However, the following three vegetation units will be significantly cleared (i.e. more than 30%) by the proposed development alone:

- the rockpile vegetation unit BaEveTa may be completely cleared. It has not been identified elsewhere on the Burrup;
- the grassland unit Er is expected to be 77% cleared. This vegetation has very limited representation on the Burrup (2.2 ha mapped); and
- the degraded vegetation type Ta/*Cc (0.9 ha) is considered to be of moderate to low conservation significance and will be completely cleared.

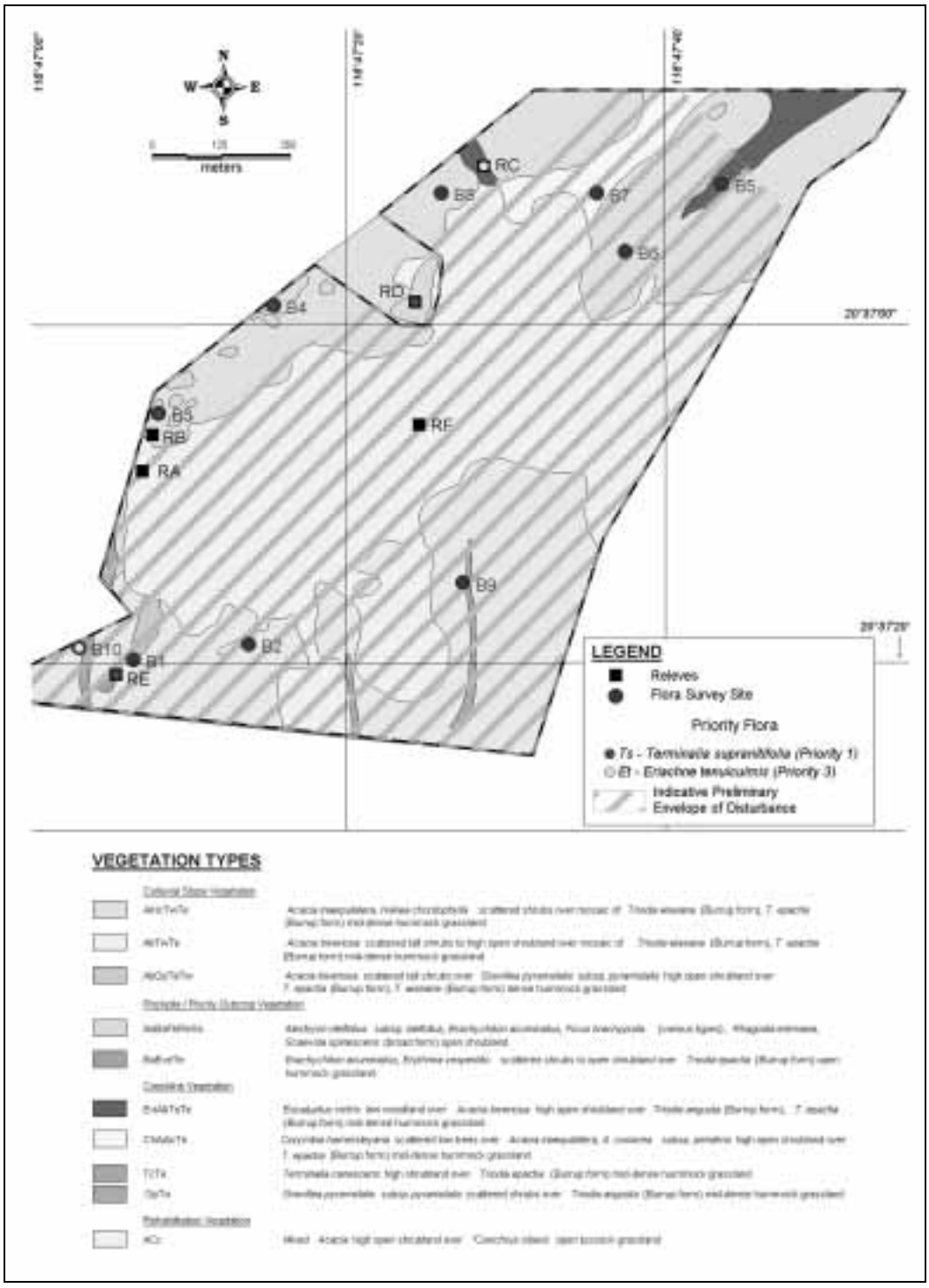

Figure 5: Vegetation Map (Source: Figure 7-1 SKM, 2002)

A total of 101 flora species (88 native species) were recorded on the site during the dry season survey. No Declared Rare Flora were located, but two Priority Flora, *Terminalia supranitifolia* (Priority 1) and *Eriachne tenuiculmis* (Priority 3) were recorded. The proposal is expected to have an impact on one of four *T. supranitifolia* sites (approximately 5 individuals) and on one of two *E. tenuiculmis* sites (approximately 5 individuals) as shown in Figure 5. A number of other flora taxa recorded on the lease were considered to be of interest mainly due to their restricted geographical range and/or undescribed status. These flora are listed below and described in Section 5.7.8 of the PER (SKM, 2002):

- *Corchorus walcottii;*
- *Indigofera monophylla* (Burrup form);
- *Rhynchosia* sp. Burrup (82-1C);
- *Tephrosia* aff.*supine* (MET 12,357);
- *Triodia* spp. (Burrup forms);
- *Triumfetta appendiculata* (Burrup form)
- *Euphorbia tannensis* subsp.*eremophila* (burrup form); and
- *Paspalidium tabulatum* (Burrup form).

The desktop review (Biota, 2002b) based on findings presented in Trudgen (2002) indicated that an additional 57 flora species may occur on the proposed site, including 11 taxa identified as being of particular conservation significance. A follow up wet season survey (subject to sufficient rainfall prior to construction) would help confirm if any of these additional species actually occur on the project site.

Thirteen introduced species were recorded on the lease, including four species that are not native to the State (*Cenchrus ciliaris, Aerva javanica, Agave American* and *Malvastrum americanum*). The remainder, although endemic to the Pilbara, do not occur naturally on the Burrup Peninsula. The introduced species are mostly restricted to the disturbed areas.

Amended Lease Boundary

Since the release of the PER (SKM, 2002) the proponent proposed an extension of approximately 4 ha to the southwest corner of the lease as shown in Figure 6. Biota was commissioned to undertake a flora survey of the extension area (Biota, 2002c). Approximately 0.2 ha within the extension area will be cleared, impacting two of the six vegetation units (Figure 6). Vegetation unit AoIltw is of moderate conservation significance and vegetation unit D is of low conservation significance (Appendix 6). An additional 22 flora species were recorded on the lease extension that were not recorded for the main Methanex lease (Biota, 2002a). No Declared Rare Flora occur in the extension area and the only Priority flora species, *Eriachne tenuiculmis* (Priority 3) recorded was located in a creekline and will not be impacted by the proposed development.

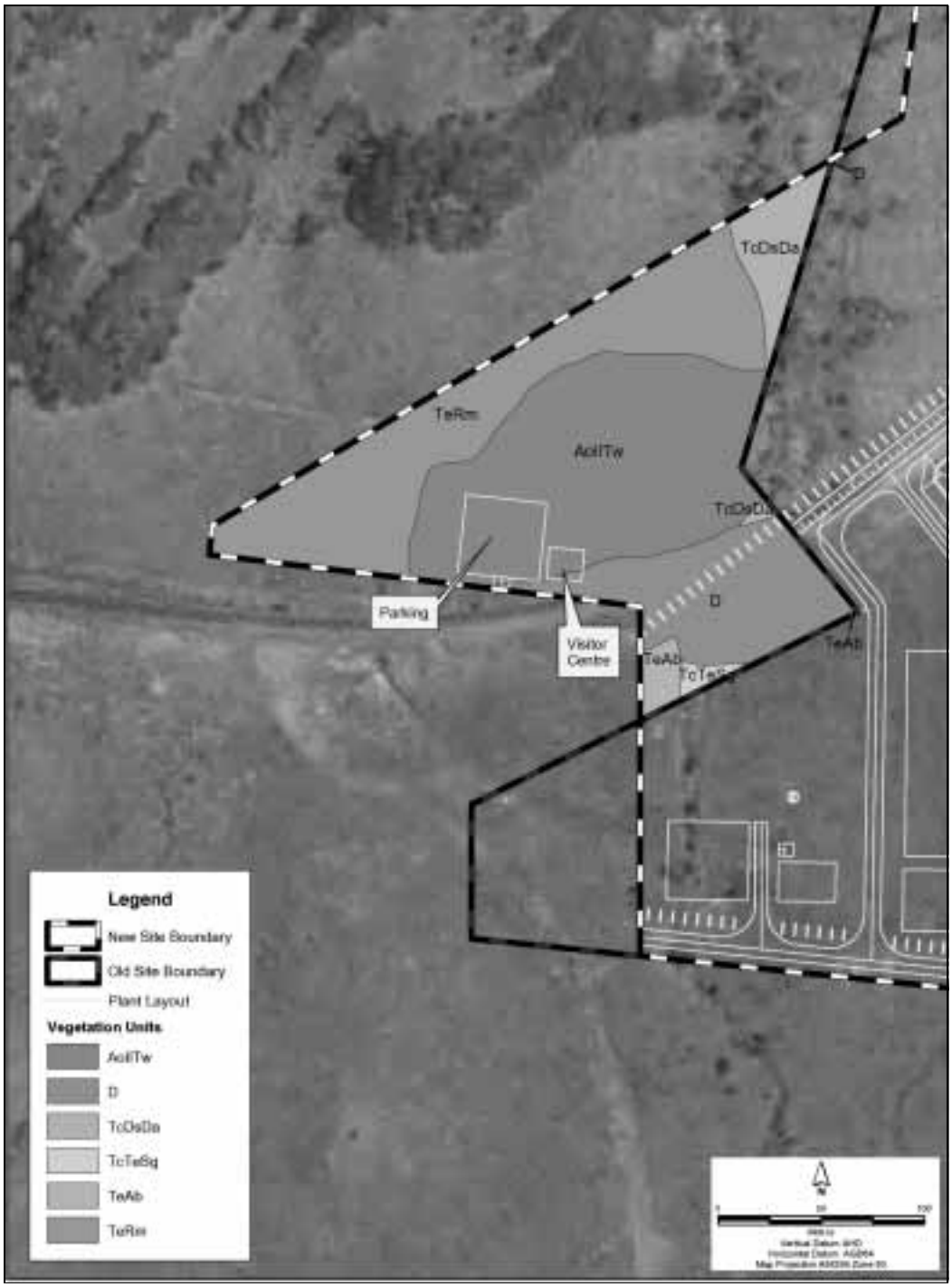

Figure 6: ***Vegetation units within lease extension (Source: Figure 6-3 SKM, 2002c)***

The proponent has committed to develop and implement a Flora and Vegetation Management Plan as part of its Construction Environmental Management Program and that the plan will include:

- results and recommendations of a wet season vegetation survey (provided sufficient rainfall prior to construction)
- site clearance procedures;
- a review of vegetation units Er and BaEveTe to minimise disturbance as far as practicable through the process of plant optimisation during the detailed engineering design and construction phases; and
- weed management.

The proponent has also committed to develop a Landscaping Plan that includes consultation with CALM for re-establishing local native flora, including Priority flora, where practicable.

Indirect Impacts on Vegetation

The methanol complex, along with other industrial projects, may cumulatively over a period of time have an impact on the vegetation on the Burrup Peninsula through the deposition of acidic gases. Dry deposition (fall-out of acidic gases and particulates on the ground surface without any interaction with water) is expected to be the dominant mechanism on the Burrup Peninsula by which atmospheric pollutants are deposited on terrestrial and aquatic environments. However, the impacts of acidic gaseous emissions on the Burrup Peninsula vegetation have not been investigated in any detail and acceptable deposition loads for the protection of vegetation in this region (taking into account low rainfall and frequent morning dews) have not been established.

Submissions

Comments raised in submissions focused on:

- the inadequacy of the information in the PER, in particular the absence of a wet season survey, the proposed clearing of rockpile and creekline vegetation and the lack of data to evaluate impacts within a regional context;
- concerns about the cumulative impacts from industry on vegetation types within the King Bay – Hearson Cove Industrial Area, including the potential impacts on vegetation and flora from the deposition of acidic gases.

Assessment

The area considered for assessment of direct impacts on vegetation is the proposed plant site while the Burrup Peninsula and surrounding region is considered for the potential indirect impacts on vegetation from acidic emissions.

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

- protect Declared Rare and Priority Flora consistent with the provisions of the Wildlife Conservation Act 1950;
- protect flora listed in the Schedules of the Environment Protection Biodiversity Act 1999; and
- maintain the abundance, species diversity, geographical distribution and productivity of vegetation communities.

In its assessment, the EPA is mindful of the fact that through the Burrup Peninsula Land Use Plan and Management Strategy (O'Brien Planning Consultants, 1996) about 5,400 hectares (62%) of the Burrup Peninsula has been set aside for conservation, recreation and heritage protection, and that the King Bay – Hearson Cove valley has been set aside for industrial development. The EPA is aware that the Burrup Peninsula supports vegetation that is quite distinct from the adjoining mainland and that the King Bay – Hearson Cove valley is the only broad valley with gentle lower slopes and consequently has the best stands of a part of the range of vegetation structural/dominance units on the Burrup Peninsula. The EPA has previously recognised the importance of the floristic communities in the valley, and has required proponents to demonstrate how they have or they will ensure that their site plan takes into account the most important of the floristic communities and avoids impact to the greatest extent practicable.

The EPA notes that the indicative preliminary envelope of disturbance (84 hectares) represents worst-case and it expects the proponent to endeavour to reduce the proposed area of disturbance during the detailed design phase. It notes that the proponent proposes to minimise impacts on significant vegetation by avoiding disturbance to rockpiles and rocky outcrops on the north-western boundary of the site and by optimising the use of previously disturbed vegetation. However, the EPA is concerned that two sites of significant vegetation (grassland Er and rockpile BaEveTe) located on the south-western corner of the lease are likely to be impacted, since it is the planned entry point for plant services. The EPA considers that the proponent should particularly undertake all reasonable endeavours to preserve the rocky outcrop vegetation, since it has not been identified elsewhere on the Burrup and is likely to be poorly represented. It notes that the proponent has committed to develop a Flora and Vegetation Management Plan that includes a review of the area of disturbance during the detail design phase with a view to avoiding or minimising disturbance to these two vegetation units.

The EPA is of the opinion that where practicable, clearing associated with construction of the site for the second methanol plant should be delayed until just prior to construction, particularly if vegetation of moderate or high significance is likely to be impacted. The EPA expects the proponent to review of the area of disturbance prior to construction of the first methanol plant and provide justification, should it require the site for the second methanol plant to be cleared as part of the initial site works.

The EPA notes that the introduced species of flora were mostly recorded in the rehabilitated area (47 hectares) of the lease, and that other vegetation types are in very good condition. The EPA considers the potential import of new weed species and the transfer of existing weed species to be a real threat to the conservation value of remnant vegetation in the valley. The EPA notes that the proponent has committed to address weed management in its Flora and Vegetation Management Plan. It considers that close attention is also required by the relevant authorities to ensure that any fill material, if required, is obtained from a suitable, weed free source and that proposed weed control measures are strictly followed during construction.

The EPA notes the proposed change to the lease boundary and considers the proposed impact on vegetation within the 4 ha lease extension to be acceptable.

The EPA notes that the PER (SKM, 2002) highlights the potential for vegetation on the Burrup Peninsula to be indirectly impacted by existing and future industry through the dry deposition of acidic gases. The EPA is concerned that the discharge of acidic gases from existing industry on the Burrup Peninsula may in the long term be a potential threat to the health of vegetation in the region, and acknowledges that additional acidic emissions can only exacerbate the situation. The EPA considers as a first step that there is a need to:

- determine the deposition rates of acidic gases from proposed and existing industry; and
- establish criteria that would be protective of the Burrup vegetation.

The EPA considers a conservative approach with respect to the discharge of acidic gases from additional sources must be taken, given that the potential impacts cannot be determined at this stage. The issue is discussed further in Section 3 (Gaseous Emissions) and Other Advice.

Summary

Having particular regard to the:

(a) indicative envelope of disturbance that shows optimal use of previously disturbed vegetation and avoidance of vegetation of high conservation significance along the north western boundary of the site;

(b) minimal impact on Priority flora; 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 with respect to direct impacts. The potential cumulative impacts on vegetation from acidic gases are further discussed in Other Advice.

3.2 Terrestrial fauna

Description

Zoogeographically, most of the vertebrate species occurring around the Burrup Peninsula are widely distributed throughout the Pilbara and through much of the Eyrean Subregion (Astron, 1999). None of the reptile, mammal or bird species recorded from or likely to occur within the project site are endemic to the Burrup Peninsula. The habitats found within the project site are typical to the Burrup and include rockpiles and rocky outcrops, drainage lines and colluvial slope vegetation. Approximately 47 hectares of the lease is rehabilitated vegetation and therefore a large proportion of the original habitats occurring on the site have been previously removed.

Biota was commissioned to undertake a suitable fauna survey of the project site. Since the vertebrate fauna of the Burrup has been previously investigated by CALM and others, the proponent obtained agreement with CALM to undertake a study that targeted five fauna that are considered to be the least understood. The targeted fauna being:

- land snails (Gastropoda: Pulmonata);
- mounds of the Western Pebble-mound Mouse (*Pseudomys chapmani)*;
- the small marsupial *Planigale sp*.;
- the lizard *Lerista 'muelleri'*; and
- bat fauna.

Four species of land snails were identified (*Quistrachia legendrei*, *Rhagada* sp. 12, *Pupoides* aff. *beltianus* and *Purpoides contraries*). *Q. legendrei* and *Rhagada* sp. 12 occur predominately on or around rockpiles. Impacts on these snails is expected to be minimal since the plant will be sited to avoid disturbance to the main area of rockpiles located on the north western boundary of the lease. The two pupilloid gastropods are mainly found on pebbly calcrete soils and adjacent brown loam soils of undisturbed areas and therefore will be impacted by the project. However, their distribution on the Burrup and in other countries, is widespread.

Three *P. chapmani* pebble mounds were located within the site, but none showed evidence of recent use. Similarly, no *Planigale* sp. and *L. muelleri* were trapped or recorded within the project site, although they were found to occur in the surrounding area. Four *Planigale* sp.1 were trapped in pits near the water tanks on Village Road and one *L. muelleri* was captured in a pit trap near Mt Wongama.

Three bat species (*Chalinolobus gouldii*, *Vespadelus finlaysoni* and *Taphozous georgianus*) were positively identified from echolocation call attributes, either foraging within or over the project site. These species have been recorded previously on the Burrup Peninsula. An additional bat species (*Mormopterus loriae*) call was identified from mangal habitat at Cowrie Cove. Biota considered it unlikely for any of the bat species to be roosting within the project area given the condition of a large proportion of the existing habitats (Biota, 2002a).

Fourteen other vertebrate fauna species, including the Bush Stone-curlew *Burhinus grallarius* which is listed on the CALM Threatened Fauna Listing (Priority 4), were recorded opportunistically during the survey, both within the project site and at nearby CALM trapping sites. Other fauna species of conservation significance known to inhabit the Burrup Peninsula are the Water-rat *Hydromys chrysogaster* and the Pilbara Olive Python *Liasis olivaceus barroni*. However, the proposed complex is unlikely to impact on these fauna species as they favour the rockpile or mudflat habitats. Previous assessments have indicated that developments are not considered likely to impact directly on any listed migratory birds that utilise the area (Astron, 2001).

Biota conducted a fauna assessment (Biota, 2002c) of the proposed lease extension. The two fauna habitats in the study area were "colluvial slopes and rock outcrops on the slopes" and "narrow incised creeks". No significant or specially protected fauna were recorded to occur within this area. Five mounds of the pebble mouse were recorded, but all were old and abandoned. Tentative initial identifications of land snails collected from the extension area indicate that they are the same species that were recorded from the greater Methanex lease, with the exception of the freshwater snail recorded from the creekline on the eastern boundary. This location will not be impacted by the proposed development.

The proponent has committed to prepare and implement a Fauna Management Plan in order to provide guidance during construction. An outline of the plan is provided in the PER (SKM, 2002) and includes:

- cataloguing the presence and quantity of the pebble mound mouse;
- procedures for fauna handling and evacuation;
- introduced species; and
- limiting disturbance to designated areas.

The proponent has committed to avoid disturbance to rockpile habitats (favoured by land snails, the Pilbara Olive Python and bats) where practicable. The proponent has already completed a commitment to contribute to taxonomic research programs coordinated by the WA Museum, investigating *Rhagada* sp., *Planigale* sp. and *Delma pax*.

Submissions

CALM expressed concern about the cumulative impacts of atmospheric emissions from industry on fauna.

Assessment

The area considered for assessment of this factor is the project lease.

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

- protect Specially Protected (Threatened) Fauna and their habitats, consistent with the provisions of the Wildlife Conservation Act 1950;
- protect fauna listed on the Schedules of the Environment Biodiversity Conservation Act 1999; and
- maintain the abundance, species diversity, geographical distribution of terrestrial fauna.

The EPA notes that the habitats found within the project site are typical to the Burrup peninsula and that none of the reptile, mammal or bird species recorded from or likely to occur within the project site are endemic to the Burrup. It also notes that a significant portion of the habitats on the lease has been previously removed. The EPA supports the approach adopted by the proponent in the fauna study in targeting five species of fauna that are considered to be poorly understood. The EPA is satisfied that the proposed layout for the complex layout will minimise disturbance to habitats for non-molluscan fauna. The EPA notes that although the project will impact on two species of land snails (*Pupoides* aff. *beltianus* and *Purpoides contraries*), their distribution is widespread.

The EPA notes the proposed change to the lease boundary and considers the potential impacts on fauna within the 4 ha lease extension to be acceptable.

Summary

Having particular regard to the:

(a) proposed indicative envelope of disturbance that indicates impacts on fauna habitats will be minimised;

(b) widespread distribution of the fauna likely to be impacted; and

(c) proponent's commitment to implement a Fauna Management Plan for ongoing monitoring and management of fauna,

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 Emissions

Description

The proposed Lurgi Mega-Methanol plant will utilise the "latest generation methanol technology" (SKM, 2002) which incorporates the controlled combustion of natural gas in a secondary reformer (autothermal reformer) to:

- provide a source of heat for the primary reformer endothermic reactions; and
- approach the ideal stoichiometry for the methanol process by combining a mix of hydrogen rich syngas from the primary reformer with carbon dioxide rich syngas from the secondary reformer.

The proposed technology is a more thermally efficient process than convention steam reforming and will result in an overall reduction in the volume of waste flue gases released to the environment.

The process information and emissions data provided by the proponent in the PER (SKM, 2002) was general in nature and represented the most conservative estimate of the two technologies (Lurgi Process and Synetix Leading Concept Methanol Process) that were being considered by the proponent. The proponent has now selected the Lurgi technology and provided a more accurate estimation of the gaseous emissions based on initial design data supplied by Lurgi.

The major gaseous emissions from the proposed methanol plants will be oxides of nitrogen (NOx) and to a lesser extent carbon monoxide (CO) and volatile organic compounds (VOCs). Sulphur dioxide (SO_2) emissions from the complex will be negligible since all natural gas will be desulphurised and the only emission source will be diesel fired emergency generators, which will be rarely required.

The proposed NOx emissions are significantly lower than the estimates in the PER (SKM, 2002) and now represent approximately 12% of the emissions from existing, approved and proposed industrial sources in the region as shown in Table 3.

Table 3: Cumulative industry NOx emissions from the Dampier area.

Source	NOx Emissions (tonnes per year)
Dampier Power Station	560
Woodside (with Trains 4 and 5)	8640
Syntroleum Synthetic Hydrocarbons Plant	1470
Burrup Ammonia Plant	503
Dampier Nitrogen	717
GTL Resources	403*
Proposed Methanex Plant	1745
Total	**14038**

* GTL Resources not included in cumulative modelling of gaseous emissions.

The major sources of NOx emissions under normal operations will be from the primary reformers and auxiliary burners as shown in Table 4. Only a small gas turbine is now proposed and NOx emissions from this source will not be significant particularly since it will mainly be utilised to provide electricity during startups.

Table 4: Combustion emissions (normal)

Source	Chimney Height (m)	Exit Temp. (°C)	Diameter (m)	Velocity (m/s)	NOx (g/s)	CO (g/s)
Plant 1						
Flue Gas Stack	35	160	3.7	20	20.8	2.2
Process Condensate Stripper	8.3	70	0.5	20		3.9
Flare Stack	35		1.4		0.028	
Gas Turbine Exhaust	20	480	3.0	8	0.83	1.9
Auxiliary Boiler Stack	30	190	3.7	6	6.39	0.8
Plant 2						
Flue Gas Stack	35	160	3.7	20	20.8	2.2
Process Condensate Stripper	8.3	70	0.5	20		3.9
Flare Stack	35		1.4		0.028	
Gas Turbine Exhaust	20	480	3.0	8	0.83	1.9
Auxiliary Boiler Stack	30	190	3.7	6	6.39	0.8
TOTAL					**56**	**17.6**

Source: Table 3-1 of the Supplement (SKM, 2002c).

The emissions of NOx and CO under worst case (start-up or emergency) conditions are expected to be significantly higher than during normal operations due to flaring as shown in Table 5. The worst case NOx emissions are lower than originally proposed, being approximately 75% of the estimate provided in the PER (SKM, 2002). The proponent expects worst case emissions to occur less than 1% of the time.

Table 5: Combustion emissions (worst case)

Source	**Emissions (kg/hr)**		
	NO_x	**CO**	**VOCs**
Unit 1 – Start Up			
Flue Gas Stack	75	8	-
Flare Stack	200	1,000	-
GT Exhaust	12	12	1
Auxiliary Boiler Stack	80	-	-
Scrubber	15	-	
Unit 2 - Normal	101	32	4.6
TOTAL	**483**	**1,052**	**5.6**

Source: Table 3-3 of the Supplement (SKM, 2002c).

The fuel burners in the primary reformer and the auxiliary burner zone are specified by Lurgi as low NOx burners with emissions not to exceed 200 mg/Nm3 (as NO_2 at 3% oxygen reference level, dry, at STP). The proposed NOx emissions are well below the Australian Environmental Council and National Health and Medical Research Council (1985) guideline for gas fired boilers (AEC/NHMRC, 1985). The burners in the gas turbines are also specified as low NOx and emissions will meet the EPA's Guidance Statement "Emissions of Oxides of Nitrogen from Gas Turbines" (EPA, 2000b) guideline value of 0.07 g/m^3.

The NOx emissions from the methanol complex were remodelled after the release of the PER (SKM, 2002) to predict the individual and cumulative impacts on local and regional air quality based on initial design data provided by Lurgi. The proposed NOx emissions are lower than previously estimated, but a corresponding reduction in ground level concentrations is not expected since proposed stack heights for the main emission sources have been reduced from 60m to 35m. The following models were used to predict impacts:

- DISMOD for near field predictions;
- TAPM to predict regional ozone concentrations; and
- AUSPLUME to assess the local impacts of the buildings and nearby terrain.

The nitrogen dioxide (NO_2) component of NOx of the plume was derived using monitoring data at Dampier, which indicated that the ratio of NO_2 to NOx generally remained well below 0.3.

DISMOD Modelling

DISMOD predicted that the proposed methanol complex would not result in an exceedance of the National Environmental Protection Measure (NEPM) 1-hour Standard for NO_2 (246 µg/m^3) as shown below in Table 6.

Table 6: Summary of DISPMOD predictions – NOx and NO_2 (normal and worst case operations)

Scenario	Maximum 1-hour Average Concentrations (µg/m^3)							
	Max. over Grid		Dampier		King Bay		Karratha	
	NO_x	NO_2	NO_x	NO_2	NO_x	NO_2	NO_x	NO_2
Existing + Approved	432	144	80	38	107	47	72	36
Normal Operation								
Methanex alone	141	57	36	25	47	28	16	16
Existing + Approved + Methanex	432	144	87	40	107	47	86	40
Cold Start								
Methanex Alone	252	90	71	36	105	46	39	26
Existing + Approved + Methanex	442	147	127	53	107	47	105	46

Source: Table 3-6 of the Supplement (SKM, 2002c).

The model predicted the maximum 1-hour ground level concentration of NO_2 from the methanol complex to be 57 µg/m^3 during normal operations and 90 µg/m^3 (36% of NEPM) during a cold start (worst-case) of one of the methanol plants. Modelling of cumulative impacts (SKM, 2002c) predicted that the maximum 1-hour ground level concentration of NO_2 (144 µg/m^3) would not change with the addition of Methanex (under normal operation). The maximum 1-hour ground level NO_2 concentration is predicted to be only slightly higher at 147 µg/m^3 (60% of NEPM) during a cold start of a methanol plant. The maximum impact is predicted to occur to the north east of Dampier, near the Woodside facility as shown in Figure 7. Although the NO_2 concentration at Karratha and Dampier is predicted to increase significantly during the startup of a methanol plant, it will remain well below the NEPM Standard.

TAPM Modelling

TAPM modelling gave similar results to DISMOD for the maximum cumulative ground level concentration of NO_2 as shown in Tables 6 and 7.

Table 7: Summary of maximum TAPM predictions – NO_2 and Ozone (O_3) (normal operation)

Scenario	Maximum NO_2 Concentrations (Jan – May 2000) ppb (μg/m^3)			
	Max. over Grid	**Dampier**	**King Bay**	**Karratha**
NO_2				
Existing Sources	69 (141)	42 (86)	48 (98)	26 (53)
Existing+Approved	77 (158)	40 (82)	50 (103)	36 (74)
Existing+Approved+Methanex	80 (164)	45 (92)	54 (111)	36 (74)
Ozone				
Existing Sources	122 (261)	87 (186)	96 (205)	62 (133)
Existing+Approved	110 (235)	80 (171)	69 (148)	59 (126)
Existing+Approved+Methanex	109 (233)	79 (169)	71 (152)	61 (131)

Source: Tables 3-7 and 3-8 of the Supplement (SKM, 2002c).

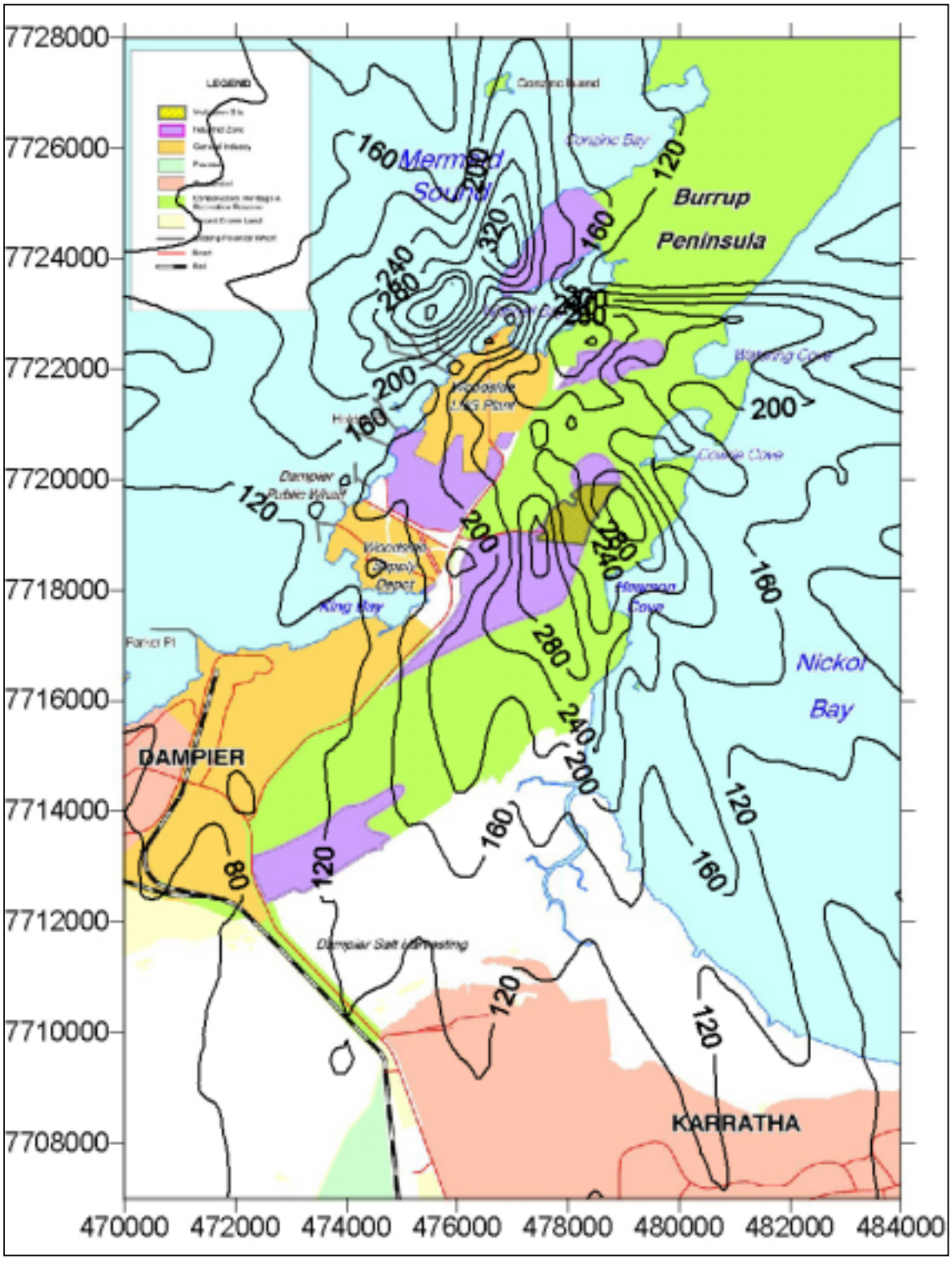

Figure 7: ***Predicted maximum 1-hour NOx concentrations (µg/m^3) from all sources – existing, approved and Methanex (Source: Figure 3-3 SKM, 2002c)***

The NO_2 concentrations are predicted to increase with the addition of the methanol plants and other approved sources, particularly at Karratha where an increase of approximately 40% over the existing scenario may be observed. TAPM modelling predicts that the NO_2 concentration at population centres will be well below the NEPM Standard, although the values obtained were higher than the DISMOD predictions.

The TAPM predictions for ozone generally show a small incremental decrease in ozone concentrations when the combined impact is compared with the existing situation (Table 7). The maximum ozone concentration is predicted to be 109 ppb, which exceeds the NEPM Standard (100 ppb). The ozone concentrations are however predicted to be below the Standard at the population centres.

AUSPLUME Modelling

AUSPLUME was used to assess the building wake effects and the effects of the nearby terrain on the plume dispersion from the methanol plants. The modelling results are summarised in Table 8.

Table 8: Summary of AUSPLUME Predictions – NOx and NO_2 (normal and worst case operations)

Scenario	Maximum 1-hour Average Concentration (µg/m^3)							
	Max. on Grid		Dampier		King Bay		Karratha	
	NO_x	NO_2	NO_x	NO_2	NO_x	NO_2	NO_x	NO_2
Normal Operations	**349**	119	19	19	22	21	22	21
Cold Start	756	241	39	26	43	27	41	27

Stack heights – flue gas stack (35m), flare stack (35m), auxiliary boiler stack (30m) and gas turbine stack (20m).
Source: Table 3-9 of the Supplement (SKM, 2002c).

Modelling of gaseous emissions from the methanol complex (in isolation) predicted that under certain meteorological conditions the plume would impact on the elevated terrain to the south of Hearson Cove. The maximum NO_2 ground level concentration is predicted to be 119 µg/m^3 (48% of the NEPM) during normal operations and up to 241 µg/m^3 (98% of the NEPM) during the cold start of one plant. However, cold starts are expected to be rare and therefore unlikely to coincide with worse-case meteorology.

AUSPLUME modelling predicts that for the current stack configuration and parameters, the boiler stack plumes will be forced lower by building wake effects. Modelling by the DEP for 60m stacks (as originally proposed) gave significantly lower ground level concentrations for NOx on the elevated terrain. Since DISMOD does not simulate building effects, the cumulative modelling is in error to the extent that building effects are significant. The proponent is reviewing a range of options to reduce near field impacts including the stack configeration, stack heights and exit gas velocities and temperatures.

As for TAPM and DISMOD, AUSPLUME predicts that impacts from the methanol complex will be relatively low at Karratha, Dampier and King Bay under both normal and worst case scenarios.

Atmospheric Depositions of Acidic Gases

The cumulative emission of acidic gases (predominately NOx) may potentially impact on vegetation, fauna and Aboriginal rock art within the Burrup Peninsula. Dry deposition (fall-out of gases and particulates on the ground surface without any interaction with water) is likely to be the dominant mechanism on the Burrup by which the acidic gases impact on terrestrial and aquatic environments. The proponent derived annual deposition rates of NOx using the inner grid results of TAPM. The maximum NOx deposition rate was estimated to be 0.36g/m^2/year (out to sea) and 0.29g/m^2/year (on land, adjacent to King Bay) as shown in Figure 8. The predicted deposition rates are significantly lower than the original estimates in the PER (SKM, 2002).

The impacts of acidic gaseous emissions on the Burrup Peninsula vegetation have not been investigated in any detail and acceptable deposition loads for the protection of vegetation in this region (taking into account low rainfall and frequent morning dews) have not been established. However, the revised estimate based on modelling results is below the critical loads determined for European vegetation types (0.5 – 3.5 gNOx/m^2/year).

Rocks, paintings and petroglyphs may also be susceptible to deterioration from the deposition of atmospheric emissions, as well as from natural factors such as weathering and microbial activity. However, currently there appears to be insufficient information available to determine the extent of the impact of acidic gases from existing industry on petroglyphs. Similarly the potential impacts from the dry deposition of acidic gases on ephemeral freshwater pools, molluscan and other fauna, and the marine environment has not been determined for the Burrup region. Additional information is provided in Section 8.4.1.8 and Appendix H of the PER (SKM, 2002).

Other Gaseous Emissions

The methanol plants will also emit VOCs (predominately methane and methanol), with the main sources being fugitive leaks and releases during ship loading. An estimation of the VOC emissions are shown in Table 9.

Table 9: VOC emissions

Source	VOC Emissions (t/yr)
Combustion sources	40
Fugitive leaks etc.	700
Tank vents	31
Loading to ships	350
TOTAL	**1,121**

Source: Table 3-2 of the Supplement (SKM, 2002c).

The methanol complex is not expected to emit any nuisance odorous emissions. Methanol has a faint alcohol-like odour, but since the odour threshold is approximately 2000 ppm, it is generally not detectable. Methanol will not normally be vented or discharged to atmosphere and will be flared during upset conditions. Tertiary methyl amine (TMA) is an odorous chemical that is present in the distillation waste gas stream. However, this stream will be recycled as fuel for the process and therefore will not be an odorous emission.

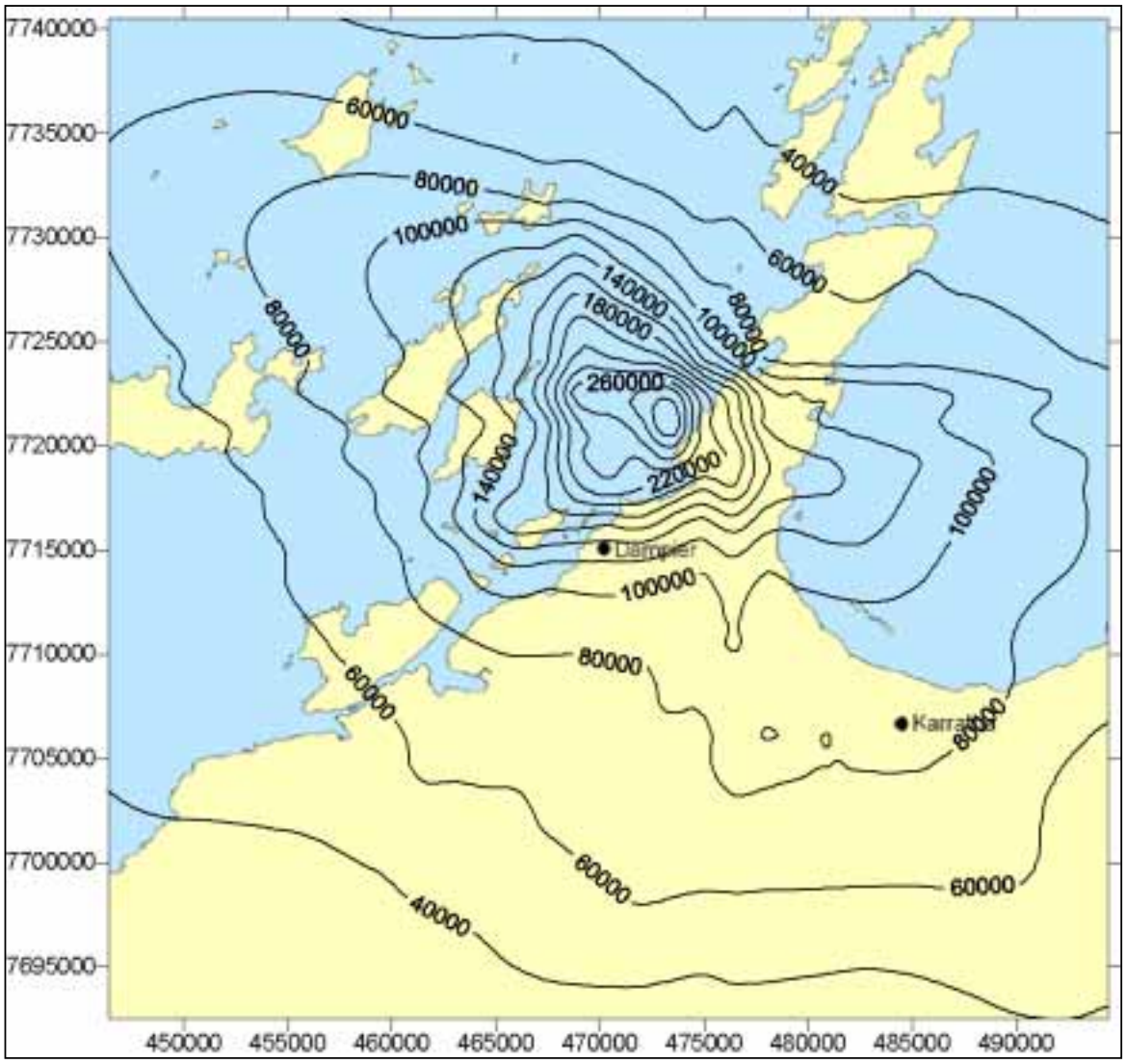

Figure 8: Predicted annual deposition rates of NOx (µg/m^2/yr) (Source: Figure 3-9 SKM, 2002c)

The proponent has committed to continue to investigate the optimum solution for the fuel and energy balance of the plant and minimise the emissions from the complex in accordance with EPA requirements that "all reasonable and practicable measures should be taken to minimise the discharge".

The proponent also committed to be part of an industry body (Burrup Industrial Council) to jointly manage cumulative environmental impacts, including impacts of gaseous emissions. Methanex recommended that the Council:

- undertake a baseline survey of petroglyphs in the vicinity of King Bay – Hearson Cove Industrial Area and monitor for potential impacts;
- investigate the cumulative impacts on vegetation and flora; and
- undertake a baseline survey of ephemeral pools occurring near the proposed industry.

Submissions

Comments raised in submissions focused on:

- concerns with respect to cumulative atmospheric emissions from industry and potential adverse impacts on calcrete pools in gullies, fauna including land snails, Aboriginal rock art and flora including mangroves;
- limitations in the PER (SKM, 2002) regarding the work on potential impacts from atmospheric deposition;
- the need to undertake scientific analysis of emissions and determine impacts on sites of Aboriginal cultural and heritage significance; and
- the need for additional information on NOx emissions and reduction measures.

Assessment

The area considered for assessment of this factor is the Burrup Peninsula and surrounding region, including the townsites of Dampier and Karratha.

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

- gaseous emissions, from this proposal in isolation and in combination with emissions from neighbouring sources and background concentrations meet appropriate emission and air quality standards for protection of human health, amenity and conservation values of the Burrup Peninsula; and
- all reasonable and practicable measures are taken to minimise all atmospheric discharges, particularly those with significant impacts.

The EPA considers:

- protection of human health can be achieved by meeting the NEPM standard at the nearest residential areas and Hearson Cove;
- minimising impacts on the amenity at Hearson Cove is of paramount importance, and can be achieved by ensuring no unreasonable odour impacts; and
- protection of conservation values, including vegetation health, fauna and petroglyphs to be important. However, there is limited information available to date on acceptability of impacts on these values.

The EPA notes that all natural gas to the plant will be desulphurised and commends the proponent for this effort to minimise the SO_2 load. The EPA is satisfied that SO_2 emissions will be negligible apart from rare occasions under emergency conditions. It is also satisfied that emissions from the proposed complex are not likely to result in any off-site odour impacts.

The EPA notes that NOx will be the most significant emission from the methanol complex and that the proposed emission represents approximately 12% of the total NOx emissions from existing, approved and proposed industrial sources in the region. The EPA notes that the proponent is proposing to utilise low NOx burners in the reformers and auxiliary burners which are the major sources of NOx emissions. The EPA also notes that low NOx burners will be installed on the gas turbines and that the proposed emission will meet the EPA's Guidance Statement "Emissions of Oxides of Nitrogen from Gas Turbines" (EPA, 2000b). The EPA is satisfied that the proposed NOx emission has been reduced as low as reasonably practicable.

The EPA notes that DISMOD and TAPM air dispersion modelling predicts that the ground level concentration of NO_2, in isolation and cumulatively with other industries will not exceed the NEPM Standard and should not impact human health. However, the EPA notes that AUSPLUME modelling of the methanol complex (in isolation) predicts the ground level concentration of NO_2 on the elevated terrain south of Hearson Cove will approach the NEPM Standard under worst dispersive conditions. The EPA notes that the NO_2 concentration at this site is predicted to be significantly lower for a 60m stack scenario as originally proposed. The EPA recommends that the proposed stack configuration and parameters be reviewed with the aim of negating or significantly reducing wake effects and minimising impacts on the elevated terrain.

The EPA notes that photochemical smog, which is formed by complex secondary reactions in the atmosphere and characterised by high concentrations of ozone at ground level, is the only other gaseous pollutant that is likely to have an off-site impact. The EPA notes that the TAPM smog model predicts that the NEPM Standard for ozone will be exceeded once per year within the region. However, the EPA also notes that the Standard is not predicted to be exceeded at the population centres. The EPA notes that modelling generally predicts a small incremental decrease in ozone concentrations when the combined impact from all sources is compared to the existing situation. The EPA considers that the proposal is not likely to result in an increase in regional smog levels and therefore is acceptable.

The EPA notes the concerns raised in submissions regarding the potential for acidic gases to cumulatively impact on flora, ephemeral pools and Aboriginal rock art and that currently there is a lack of data and information to fully evaluate these impacts. The EPA notes that the proponent has re-estimated annual deposition rates of NOx using TAPM and obtained results significantly lower than previously provided (SKM, 2002). The EPA considers that there is a need to provide verification of the deposition scheme and that estimates should be tested against estimates from other models such as ISC3. The EPA supports the joint investigation and ongoing management of the cumulative impacts of acidic gases and other gaseous emissions by a local industry body (see Other Advice).

The EPA notes that timing for construction of the second 6,000 tpd methanol plant depends on the market demand for methanol, and that the current target date for completion of its construction is 2010. The EPA considers that the currently proposed NOx emissions for the second plant should be reviewed just prior to construction in order to take into account:

- advances in dry low NOx burner and other NOx reduction technology; and
- the results from studies and additional information on the potential impacts of the dry deposition of acidic gases on flora, fauna and petroglyphs in the region.

Summary

Having particular regard to the:

(a) air dispersion modeling that predict that the NEPM Standard will not be exceeded for NO_2;

(b) proponent's commitments; and

(c) proposed Ministerial Conditions that require a review of the stack configuration and emission parameters,

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

The proposed methanol complex will discharge approximately 2.0 million tonnes of carbon dioxide (CO_2) per year, which represents 0.4% of Australia's 1990 baseline level for greenhouse gases of 503 $MtCO_{2E}$ (including land use change).

Approximately 70-80% of the natural gas used in methanol production is feedstock. The remaining 20-30% of the natural gas is combusted to provide heat for the process, and is the main source of greenhouse gases as shown in Table 10.

Table 10: Estimated CO_2e emissions from 5Mtpa methanol complex (normal operation)

Source	CO_2 Emissions	
	(t/d)	(kt/yr)
Flue Gas Stack	4,400	1,600
Flare	3	1
Gas Turbine	190	70
Auxiliary Boiler	980	363
VOC fugitive emissions	44	16
TOTAL	**5,617**	**2,050**

Source: Provided by SKM, Oct 2002.

The total greenhouse gas emission is a function of the energy efficiency of the selected technology, the natural gas specification and plant reliability. The proposed Lurgi technology employs the "latest generation technology", incorporating a primary and secondary reformer. It is more efficient than conventional technology as a portion of the natural gas is burnt within the process to create heat for the endothermic

reforming reactions in the primary reformer. Efficiency is also optimised by using distillation off gas and excess purge gas (not required for hydrogen recovery), as fuel for the steam reformer. Purge gas and distillation off gas are only flared during start-up, shut down and upset conditions. The Lurgi technology only requires a small (12 MW) gas turbine which will be used primarily to provide electricity during start-ups and therefore will be simple cycle rather than combined cycle gas turbine as originally proposed (SKM, 2002). The gas turbine will use approximately 2% of the total fuel requirements for the complex.

The proposed technology should achieve a design thermal efficiency of between 33 and 35 GJ/t of methanol and therefore will be more efficient than modern conventional steam reforming methanol technology (35 to 36 GJ/t). The proponent has advised that the thermal efficiency of its Chile methanol plants (commissioned in 1996 and 1999) and New Zealand plants (commissioned in 1983 and 1985) is approximately 36 and 39 GJ/t of methanol respectively.

The average greenhouse gas intensity (unit discharge of carbon dioxide per tonne of methanol produced) is expected to be 0.41 tCO_{2E}/t methanol over the life of the project (assuming a natural gas CO_2 content of 2.1%). This represents an approximate 40% reduction in greenhouse gas intensity on 1990 conventional technology which was estimated to be 0.6 to 0.8 tCO_{2E}/t methanol. The greenhouse gas intensity of the proponent's Chile plants (modern conventional) is 0.6 to 0.7 tCO_{2E}/t methanol and for the New Zealand plants (conventional) between 0.8 and 0.9 tCO_{2E}/t methanol. The PER (SKM, 2002) states that the total CO_2 emissions from the proposed 5 Mtpa methanol complex will be significantly less than emissions from Methanex's 2.4 Mtpa New Zealand facility. The proponent expects that since the proposed methanol complex will replace some of the production from less efficient operations, including Methanex's New Zealand plants, it will result in a net global reduction of greenhouse gases.

Methanex is one of the worlds's largest producers of methanol and currently achieves a plant reliability of 98% across its operating facilities in Chile, New Zealand and North America compared with an industry average of 80% over the last 5 years (CMAI, 2001).

The proponent has committed to:

- continue to research and develop the methanol process in order to improve efficiency and reduce gas usage and implement plant improvements where practicable;
- become a member of the Australian Industry Greenhouse Network;
- participate and assist in agreed studies and investigation into the effects and remedies, such as alternative fuel technology, other technology advances and mitigation measures, for greenhouse gas emissions where practicable; and
- adopt and implement practicable and feasible actions where appropriate to the global methanol industry.

Submissions
Comments raised in submissions focused on:

- the inadequacy of entering voluntary schemes with non-binding targets, such as Greenhouse Challenge.
- the need to develop a legally binding program to ensure the sequestration of an equivalent quantity of the carbon dioxide to be released;
- concerns that the proposed emission of carbon dioxide would make it difficult for Australia to meet the Kyoto targets.
- the need for information on greenhouse gas emissions from the desalination process and shipping.

Assessment

The EPA's environmental objective for this factor is to reduce emissions to a level which is as low as is practicable. To achieve this the EPA's environmental assessment objective is to ensure that potential greenhouse gas emissions from proposed projects are adequately addressed in the planning/design and operation of projects and that:

- best practice is applied to maximise energy efficiency and minimise emissions;
- comprehensive analysis is undertaken to identify and implement appropriate offsets; and
- proponents undertake an ongoing program to monitor and report emissions and periodically assess opportunities to further reduce greenhouse gas emissions over time.

The EPA is aware that Australia, under the Kyoto Protocol (if and when ratified), would be required to limit its increase in greenhouse emissions in 2008-12 to no more than 8% above 1990 levels. Current trends indicate that Australia would exceed its target under a "business as usual" scenario and will still do so with currently projected specific measures to reduce emissions (Australian Greenhouse Office, 2002). According the EPA, considers it necessary for greenhouse gas minimisation to be kept firmly in mind when considering new development proposals which are likely to significantly add emissions.

The EPA notes that the proponent is proposing to use "latest generation technology" and that the expected greenhouse gas intensity of 0.41 tCO_{2E}/t methanol over the life of the project represents a reduction in greenhouse gas emissions of approximately 40% on an estimated "business as usual" 1990 base case. Based on the available information, the EPA is satisfied that the proposed technology should lead to improved thermal efficiencies and significantly lower greenhouse gas intensities when compared with modern conventional steam reforming technology. The EPA notes that the energy is recovered from waste gas streams and not sent to flare during normal operation. The EPA has no objection to the proposed gas turbine being simple cycle, given that it will be small (12 MW) and used primarily to provide electricity during start-ups. The EPA is satisfied that Methanex will also minimise greenhouse gas emissions through efficient operation of the methanol complex, based on the high plant reliabilities achieved with its current operations. The EPA considers that the project represents current best practicable technology with respect to greenhouse gas emissions. The also EPA notes that although the Methanex proposal will result in a

measurable increase in Western Australia's greenhouse gas emissions, it may lead to an overall reduction in global greenhouse gas emissions, since a portion of the methanol production will be a replacement for production from less efficient operations.

The EPA notes that although the proponent has committed to continue to research and develop the methanol process and implement plant improvements where practicable, there has been no commitment to adopt any offset measures to further reduce greenhouse gas emissions. It also notes that the commitments do not include offset measures, such as establishing tree farms within Australia.

The EPA is of the opinion that all reasonable and practicable measures have been proposed by the proponent to minimise greenhouse gas emission from the plant. The EPA expects Methanex to apply principles of continuous improvement throughout the life of the project to strive to further reduce greenhouse gas emissions. In order to be consistent with other industrial projects assessed by the EPA to date, the EPA has recommended a condition that requires the proponent to prepare a Greenhouse Gas Emissions Management Plan, with the aim of reducing greenhouse gas emissions over the life of the project, and investigating appropriate offset measures.

Summary

Having particular regard to the:

(a) proposed thermal efficiency and greenhouse gas intensity;

(b) estimated savings in CO_{2E} of approximately 40% on the 1990 "business as usual" level;

(c) anticipated global greenhouse gas benefits through the replacement of methanol production from existing less efficient methanol plants; and

(d) proposed Ministerial Conditions and proponent's commitments,

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

3.5 Liquid Effluent Management

Description

Methanex proposes to construct a 15 ML/day desalination plant (Mechanical Vapour Compression) on site in order to meet its process water requirements. The desalination plant will require up to 55 ML/day of seawater and discharge up to 44 ML/day of brine. The proponent expects to source seawater from and discharge brine into Mermaid Sound via the Water Corporation's Multi-user Seawater Supply and Brine Discharge System.

Methanex also proposes to discharge process plant wastewater (approximately 1 ML/day) along with the brine discharge. The wastewater will comprise the following main liquid effluent streams as shown in Fig 9:

- demineralisation plant wastewater;
- saturator blowdown;
- cooling tower blowdown, (including boiler and air separation unit blowdowns); and
- miscellaneous plant drains.

The demineralisation plant wastewater and saturator blowdown, along with any discharges from the plant drains will be treated in a bio-treater (continuous aeration process) prior to entering the brine stream from the desalination plant. The cooling tower blowdown will be discharged directly to the brine stream without treatment.

The proponent will reduce/manage the discharge of contaminants to the marine environment by:

- utilising a fresh water cooling system in order to maximise the cycles of concentration, thereby minimising the discharge loads of water treatment chemicals;
- in-line neutralisation of biocide;
- pH control
- oily water separation for oil removal;
- bio-treatment to reduce organics and nitrogen and absorb metals;
- re-cycling of water within the process (steam and process condensate);
- minimising the release of dissolved metals from plant components by using approved corrosion inhibitors; and
- re-use of treated sewage for irrigation, reducing the discharge of nutrients, bacteria etc.

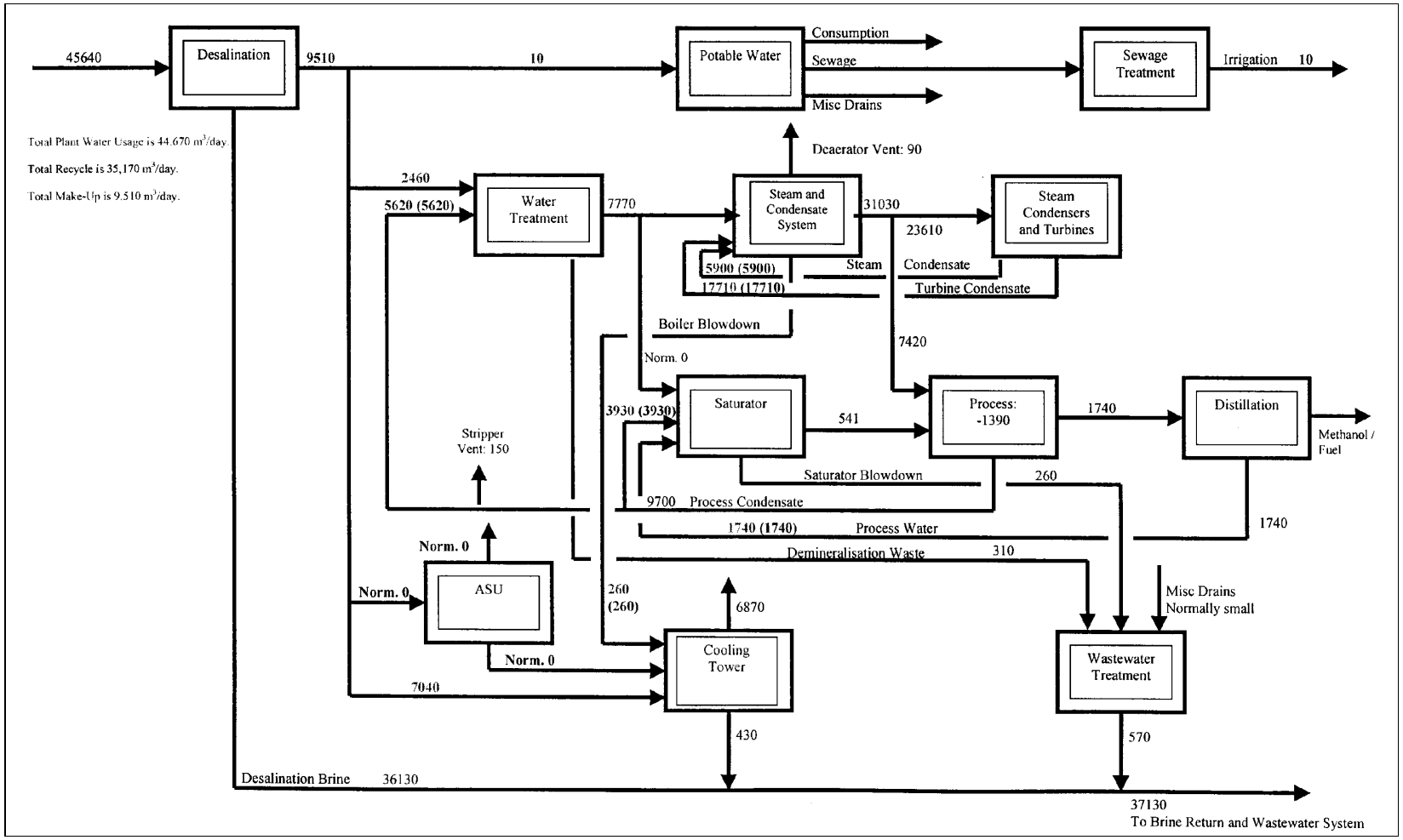

Figure 9: Methanol complex water balance (Source: Figure 4-2 SKM, 2002c)

Subsequent to the release of the PER (SKM, 2002), the proponent selected Lurgi to be the technology provider for the first methanol plant. The proponent provided additional and more detailed information on the physiochemical composition of the various streams within and waste streams from the complex based on initial design data supplied by Lurgi (see Appendix 7). A biological treatment plant will be installed to treat the saturator blowdown and demineralisation plant effluent streams. The treatment plant is specifically designed to remove nutrients and hydrocarbons from the wastewater, although by default it will also remove a large proportion of the dissolved metals. The following reductions are expected during normal operations:

- total hydrocarbons – from 18.2 mg/L to 10 mg/L;
- methanol – from 319 mg/L to 15 mg/L; and
- ammonia – from 1035 mg/L to 10 mg/L.

Under abnormal conditions (such as new catalyst or high temperature excursions) the concentration of metals in the saturator blowdown can increase significantly (Appendix 7). The treatment plant is expected to achieve the following reductions in metal concentrations within this waste stream during worst case operating conditions:

- copper – 35.4 mg/L to 0.5 mg/L;
- nickel – 7 mg/L to 1 mg/L; and
- zinc – 7 mg/L to 1 mg/L.

The estimated total annual loads and concentrations of the main contaminants and nutrients in the combined brine and wastewater discharge from the methanol complex (just prior to entering the multi-user system) are displayed in Table 11.

Table 11: Contaminant/nutrient loads and concentrations in brine and wastewater discharge

Contaminant/ Nutrient	Annual load (kg)	Average Concentration (mg/L)	Maximum Concentration (mg/L)	99% ANZECC criteria (mg/L)
Methanol	3,120	0.230	0.231	N/a
Copper	57	0.004	0.008	0.0003
Nickel	100	0.008	0.015	0.007
Zinc	260	0.019	0.035	0.007
Ammonia (N)	1,460	0.11	0.15	0.5
Nitrogen (N)	1,460	0.11	0.15	-
Phosphate (P)	1,420	0.104	0.173	-

Does not include background toxicant levels in seawater or desalination plant chemical additives.
Source: Table 4-5 of the Supplement (SKM, 2002c).

The contaminants and nutrients concentrations in the combined brine and wastewater discharge have been estimated based on expected effluent loads from the following two main waste streams:

- biological treatment plant effluent; and
- cooling tower blowdown (including boiler water and air separation unit blowdowns).

Characterisation of the combined discharge does not include:

- chemical additives that will be used in the desalination plant brine (such as antiscalants); or
- the contribution from contaminants and nutrients present within the intake seawater (from natural or anthropogenic sources) which are concentrated (by approximately 1.35) during desalinisation and discharged as part of the brine stream.

The proponent is proposing to use a antiscalant that is typically used in thermal desalination plants (a polycarboxylic acid) which contains phosphonic acid as the active ingredient and is estimated to increase the total phosphate load by 3 tonnes per annum.

Determination of the background concentrations of toxicants in seawater is required, to fully characterise the brine and wastewater discharge and to determine the quality of the seawater that will be diluting the effluent plume. The available data for Mermaid Sound are insufficient and inadequate to provide with any degree of surety a characteristic background level for heavy metals in seawater in this region. The proponent has undertaken sampling and analysis of the seawater in King Bay and Mermaid Sound and preliminary results suggest the concentration of copper and other metals in the seawater to be extremely high. However, such high metals concentrations are not consistent with results of other background seawater studies undertaken in marine waters around Australia. The Water Corporation is currently conducting a 12 month study to accurately determine the long-term average seawater quality in the region.

Although a comparison of the toxicant concentrations with the ANZECC/ARMCANZ (2000) 99% species protection guideline levels is presented in Table 11, the concentrations of some toxicants (particularly metals) in the brine and wastewater discharge may be significantly higher when the background levels in seawater are taken into consideration. Based upon the information provided, the added contaminants to the brine and wastewater discharge may exceed the ANZECC/ARMCANZ (2000) 99% species protection trigger levels for copper, nickel and zinc (by factors of 25, 2 and 5 respectively), on entry to the Water Corporation's multi-user system. However, these criteria are expected to be met at the edge of the approved outfall 0.01 km^2 mixing zone (EPA, 2002) for all toxicants with the exception of copper, with concentrations expected to be twice the criteria under worst case conditions.

The acute and chronic toxicity of methanol was assessed by the proponent in consultation with the DEP. It was concluded that algae/diatoms were the most sensitive to methanol and a 99% species protection trigger value of 11mg/L was recommended, which is well above the estimated methanol concentration in the brine and wastewater discharge (0.23 mg/L).

The Water Corporation will be responsible for managing the marine outfall, including monitoring of the total effluent and the quality of the marine environment against agreed environmental criteria. The Water Corporation has previously written to the EPA, providing details of its responsibilities in managing the multi-user facility. It will impose contractual obligations on Methanex and other system users, to ensure that the outfall complies with its Ministerial Conditions. The Water Corporation will require each system user to comply with Ministerial Conditions and requirements on

its outfall, without relying on any dilution from other system users. The Water Corporation has advised that it has no problem in accepting the proposed discharge from Methanex.

Domestic wastewater will be treated to secondary treatment standard, disinfected and used for irrigation within the project site. Stormwater will be managed by separating potentially contaminated and clean stormwaters. The first flush of stormwater from a potentially contaminated area will be directed to an impervious bund for treatment prior to discharge. Clean stormwater will be directed to silt traps then flow into natural drainage lines.

The proponent has committed to Prepare a Liquid Waste Management Plan that includes:

- details and performance of the biological treatment plant;
- details of monitoring, testing and reporting of liquid waste streams in the complex;
- details of monitoring points and parameters to be tested;
- compliance to the requirements of the Water Corporation , DEP and EPA; and
- criteria that trigger management actions.

The proponent has committed to investigate and implement practicable measures to minimise environmental impacts should monitoring of biota and sediments indicate an adverse impact as a direct result of Methanex's operations.

Submissions

Comments raised in submissions focused on:

- the need for additional data, including concentrations of contaminants in the seawater supply and all waste streams in order to fully characterise the proposed wastewater discharge;
- the need to demonstrate waste minimisation and best practice principles;
- the need to justify that the number and type of test species used for toxicity testing is in accordance with ANZECC requirements;
- licensing arrangements for the wastewater discharges;
- advising the proponent to seek advice from the EPA, DEP and the Water Corporation in relation to a number of the commitments and that the proponent's commitments need to be in line with the Water Corporation's commitments as detailed in Bulletin 1044 (EPA, 2002);
- inadequacy of the PER in addressing impacts on the marine environment from wastewater discharges and potential methanol spills; and
- the need for further information on the characterisation of stormwater runoff, test criteria and how potentially contaminated areas will be delineated from clean stormwater areas.

Assessment

The area considered for assessment of this factor is the marine environment in King Bay and Mermaid Sound.

The EPA's environmental objective for this factor is to maintain marine ecological integrity and biodiversity and ensure that any unacceptable impacts on locally significant marine communities are avoided. In its assessment, the EPA's considers that the proposal must demonstrate that the following two key and equally important elements have been met:

- waste avoidance/minimisation principles with respect to minimising toxicants and nutrient loads at source; and
- the environmental values are protected consistent with the National Water Quality Management Framework (ANZECC/ARMCANZ, 2000) as applied to the marine waters of Western Australia (EPA 2001b, 2001c).

The EPA notes that the proponent proposes to discharge a combined brine and treated wastewater stream into King Bay via the Water Corporation's multi-user Brine and Wastewater Discharge System. The EPA is aware that the Water Corporation has Ministerial approval (Ministerial Statement No. 567) to construct a Seawater Supply and Brine and Wastewater Discharge System that is capable of receiving the discharge from new industrial developments proposed for the Burrup Peninsula, including the Methanex complex.

The EPA notes that the proponent has estimated the flow and physiochemical composition of the brine and wastewater discharge from the complex based on initial design data that has been supplied by Lurgi (for the first methanol plant). The EPA notes that particular attention has been paid to water conservation through recycle and re-use and it considers the proposed wastewater stream (normally 1 ML/day) to be acceptable, given the size of the proposed methanol plants. The EPA notes that the proponent is proposing to install a biological treatment plant to treat the demineralisation plant waste stream, saturator blowdown and discharges from plant drains. The EPA notes that the bio-treater will significantly reduce the discharge of methanol (by 200 fold) and nitrogen (by 100 fold) during normal operations. The EPA also notes that by default the bio-treater is also expected to significantly reduce the discharge of metals, including copper, particularly under upset or worst case operating conditions.

The EPA requires the proponent to demonstrate and adopt best practicable technology and waste minimisation practices. The EPA is of the view that the proponent has not demonstrated that the proposed discharge of copper has been reduced "as low as reasonably practicable". The EPA considers that during detailed design, further consideration needs to be given to options to further reduce the copper concentration in the biological treatment plant discharge and this has been included in the recommended conditions.

The EPA notes that there is currently insufficient data available to characterise the seawater in Mermaid Sound, although the Water Corporation has commenced a study that will provide a comprehensive analysis of the intake and receiving water body. The EPA notes that the proposed discharge may be underestimated for some of the contaminants and nutrients given that it does not include the contribution from within the intake seawaters. The EPA also notes that the dilution factor for compliance with the ANZECC/ARMCANZ (2000) 99% species protection level at the edge of the 0.01 km^2 mixing zone (EPA, 2002) cannot be accurately estimated without water quality data for the receiving environment.

The EPA notes that the proposed discharge of contaminants (added by the process only) within the combined brine and wastewater stream is expected to exceed the ANZECC/ARMCANZ (2000) 99% species protection level for copper, nickel and zinc by factors of 25, 2 and 5 respectively, on entry to the multi-user pipeline. The EPA is particularly concerned that during upset or worst case conditions the copper concentration in the discharge is expected to be up to twice the ANZECC/ARMCANZ (2000) 99% species protection level at the edge of the proposed 0.01 km^2 mixing zone.

The EPA's preference is that the combined brine and wastewater discharge meets the ANZECC/ARMCANZ (2000) 99% species protection levels just prior to entry to the Water Corporation's multi-user system. However, it considers that compliance at the edge of the approved mixing zone (0.01 km^2) would be acceptable (without consideration of dilution from other system users) if best practicable technology has been demonstrated and utilised.

The EPA is mindful that, if the *natural* background concentration of a substance (eg. copper) in seawater was found to be very high, then it may not be possible to meet the ANZECC/ARMCANZ (2000) recommended 99 % species protection level at the edge of the mixing zone for that substance. If such high background levels were indeed confirmed, then the marine environment to which the discharge takes place would be considered as naturally atypical. The ANZECC/ARMCANZ (2000) guidelines document was developed for typical Australian and New Zealand marine systems, however it did recognise that marine systems do differ from one another. It also recognises that, for unusual marine systems, it may be necessary to derive guidelines based on local studies. In this event, the EPA would consider revising the species protection level to be met at the edge of the mixing zone, based on those studies.

Summary

Having particular regard to the:

(a) composition of the main effluent stream;

(b) proposed water recycle and re-use measures;

(c) proposed Ministerial Conditions and to proponent's commitments;

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor, subject to the proponent undertaking a detailed review of options available to further reduce the concentration of copper in the wastewater discharge.

3.6 Noise

Description

The proposed site is in the King Bay – Hearson Cove Industrial Area approximately six kilometres from the nearest residential area and within one kilometre of Hearson Cove, the only good recreational beach in the area that is accessible to two wheel drive vehicles. SKM engaged SVT Engineering Consultants (SVT) to undertake a preliminary environmental noise assessment of the methanol complex as initially proposed (data supplied by Kvaerner E&C Australia Pty Ltd) on the LCM plant design. An acoustic model was developed using the Environmental Noise Model (ENM) to predict the noise levels at the site boundary and at the two noise sensitive locations, Hearson Cove and Dampier.

Based on the preliminary plant layout and preliminary data on expected sound power levels for noisy equipment, the noise level from the complex was predicted to exceed the assigned noise levels at the site boundary by up to 10 dB(A) under worst case meteorological conditions. The following items were identified as being the major noise sources:

- gas turbine halls;
- steam turbines;
- air cooled condensers;
- fin fan coolers;
- boiler feed water pumps; and
- compressor suction and discharge piping.

The proponent proposed noise mitigation measures for the major noise sources as described in Section 8.4.4 of the PER (SKM, 2002). Remodelling of noise emissions from the attenuated complex indicated that the assigned boundary criteria of 65 dB(A) could be met.

Modelling of cumulative noise emissions predicted that the assigned noise levels at Dampier would be met under all meteorological conditions as shown in Table 11. Noise modelling predicted that Methanex would be the most significant noise contributor to noise levels at Hearson Cove. It predicted noise levels would be about 51 dB(A) at the northern section of Hearson Cove under the worst meteorological conditions and about 45 dB(A) at the northern beach shelter for westerly winds.

Table 12: Cumulative noise levels

Industry	Noise Level at Dampier L_{A10} dB(A)	Noise Level at Hearson Cove L_{A10} dB(A)
Methanex Methanol Plant*	23	51
Syntroleum Gas to Liquids Plant	31	37
Burrup Fertilisers' Ammonia Plant	<20	32
Plenty River Ammonia/Urea Plant	-	40
Cumulative Noise Level	**31**	**51**
Background Noise Level	**44**	**25-34**

* Based on LCM design, worst-case conditions at northern end of the Cove.
Source: Table 8-33 (modified) of the PER (SKM, 2002)

The noise emissions and impacts were subsequently reviewed after Lurgi was chosen to provide the technology for the first methanol plant. Lurgi conducted an acoustic assessment of the methanol plant, based on initial design data. The total sound power level of the plant at normal operating conditions was estimated to be 123 dB(A). The assessment confirmed that the *Environmental (Noise) Regulations 1997* could be met at the site boundary (for two methanol plants) and that the methanol complex would be an insignificant contributor to noise levels at Dampier.

SVT was engaged to undertake an independent review of Lurgi's acoustic assessment, with particular emphasis on noise impacts at the northern beach shelter at Hearson Cove. The sound power levels for the Lurgi plant items were reviewed and SVT considered the overall sound power output of the plant to be comparable with the results previously obtained for the LCM plant. SVT confirmed that its noise model provides a realistic indication of noise levels likely to be received at Hearson Cove. Based on a review of Lurgi's acoustic assessment of the plant and a comparison with the assessment undertaken for the LCM plant design, SVT expect the noise impact at the northern beach shelter for two operating plants will be of the order of 45-48 dB(A) for a 3m/s westerly wind. SVT concluded that "due consideration has been given to noise reduction during plant design and that the design is representative of best practice in terms of noise attenuation".

The *Environmental Protection (Noise) Regulations 1997* are silent on the applicable noise criteria for public places such as Hearson Cove. At the request of the EPA, MPR commissioned SKM to study the potential impacts on the amenity at Hearson Cove beach, including noise emissions, from the proposed industrial developments. The study (MPR, 2002) was completed after the release of the PER (SKM, 2002) and concluded "the development of the King Bay – Hearson Cove Industrial Precinct could lead to impacts on people's amenity when using the Hearson Cove Beach".

The proponent has committed to develop a Noise Management Plan that includes the following main elements:

- details of noise attenuation measures adopted;
- procedures to undertake compliance noise monitoring by suitably qualified personnel to distinguish between noise levels from local environmental sources and nearby operating industries;
- details of noise monitoring locations (to confirm compliance with boundary noise criteria and determine the contribution of noise at Hearson Cove); and
- reporting requirements.

Methanex has also committed to utilise an acoustic engineer during detailed design of the complex to identify where feasible and practicable noise attenuation measures can be implemented to further reduce noise at Hearson Cove.

Submissions

Comments raised in submissions focused on:

- recommendations of a further reduction in noise emissions from the complex of between 4 and 9 dB(A) to protect use and enjoyment of Hearson Cove;
- a comprehensive cumulative noise study should have been undertaken by MPR and addressed in the PER;
- concerns that low frequency noise could carry to Dampier;

- the PER failed to consider ground vibration and noise from construction blasting and nominated noise criteria for construction was considered to be unnecessarily high; and
- seeking a commitment to involve an acoustic engineer during the detailed design.

Assessment

The area considered for this factor is the project lease and surrounding area, including Dampier (nearest residential area) and Hearson Cove (recreational beach).

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

- noise emanating from the proposed plant will comply with statutory requirements specified in the *Environmental Protection (Noise) Regulations 1997*; and
- impacts on the amenity of Hearson Cove are minimised as low as reasonably practicable.

The EPA notes that the preliminary noise modelling of the methanol complex was undertaken by SVT and based on the LCM plant data. The EPA notes that subsequently, Lurgi was selected as the preferred technology provider and that it conducted an acoustic assessment of the methanol plant, based on its initial design data. The EPA also notes that SVT reviewed Lurgi's acoustic assessment and confirmed that its noise model provides a realistic indication of the noise levels likely to be received at the plant boundary and Hearson Cove.

The EPA notes that the SVT report discusses the main noise sources included in various sections of the plant, and concludes "that due consideration has been given to noise reduction during the design and that the design is representative of best practice in terms of noise attenuation". The EPA accepts that the preliminary plant design is representative of best practice for noise reduction measures, provided the recommendations in the SVT report are implemented.

Based on the information provided by the proponent, the EPA is satisfied that the *Environmental Protection (Noise) Regulations 1997* can be met at the site boundary and that the methanol complex will not be a significant noise contributor to noise levels at Dampier. However, the EPA notes that currently the methanol complex is expected to be the most significant contributor to noise levels at the Cove. The EPA notes that SVT has advised that it expects the noise impact from the methanol complex (two operating trains) at Hearson Cove (northern beach shelter for a 3 m/s westerly wind) will be of the order of 45-48 dB(A).

The EPA considers that it would be unreasonable to require Methanex or other proposed industrial development within Hearson Cove to reduce noise emissions to levels that could maintain the existing level of amenity for noise at Hearson Cove beach, given the existing low background noise levels and proximity of the proposed complex to the beach. The EPA encourages the proponent, during the detailed design phase, to continue to identify and then apply practicable noise reduction measures to minimise impacts at Hearson Cove (while achieving compliance with the Noise Regulations at the site boundary). The EPA recommends that noise modelling be redone, during the early stages of detailed engineering design. The noise model should be adapted to the Lurgi plant, to confirm the likely noise level at the Hearson Cove Beach. In its "Other Advice" the EPA has proposed an aspirational goal for noise levels at Hearson Cove in order to provide consistent guidance to Methanex and other proponents.

The EPA notes the proponents commitments include utilising an acoustic engineer during the detailed design phase and is satisfied that this approach will best ensure that all reasonable and practicable measures are taken to minimise the noise impact at Hearson Cove from the methanol complex.

Summary

Having particular regard to the:

(a) proposed noise attenuation measures;

(b) noise model predictions that the complex will comply with the *Environmental Protection (Noise) Regulations 1997* at the site boundary and Dampier; and

(c) proposed Ministerial Conditions and to proponent's commitments;

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

3.7 Visual Impacts

Description

The Burrup Peninsula has outstanding scenic values and is therefore a popular tourist and recreational area. The methanol complex will occupy an area of 84 hectares and contain plant structures up to 80m high. To raise the complex above the 1-in-100 year flood level the site will need to be cut and filled to an elevation of about 7 mAHD. The complex will not be visible from Dampier, but may be visible at night from lookout points in Karratha. Views of the methanol complex from a number of vantage points surrounding the project site are provided in Section 9.8 of the PER (SKM, 2002).

The complex will be clearly visible along Hearson Cove Road and at Hearson Cove. The dunes and vegetation at the Cove is expected to conceal the majority of the methanol complex when standing at the shoreline, but will provide minimal screening at the entrance to the Cove. Recreational uses of Hearson Cove include watching the stars, and at certain times of the month, the "Stairway to the Moon" effect. Since the methanol complex is clearly visible from Hearson Cove during the day, the plant lighting will be visible at night. The light spill is expected to be intrusive to users desiring a serene natural night environment, but is not likely to detract from the Stairway to the Moon effect since it is observed in a direction away from the complex.

Artificial light overspill will be minimised by following the *Australian Standard AS 4282 (Int) 1997 Control of the Obtrusive Effects of Outdoor Lighting* and special consideration will be given to the direction of plant lighting such that no direct light is angled at the Cove. Light spill can also impact on marine fauna, including nesting turtles, however, CALM has advised that there are no turtle nesting beaches on the Burrup Peninsula.

The proponent has committed to:

- develop a Landscaping Plan for the complex;
- implement and improve on AS4282 "Control of Obtrusive Effects of Outdoor Light" where practicable;
- consider colour options for the complex during detailed design; and
- document any complaints received from recreational users of Hearson Cove (and Cowrie Cove) on a register and investigate any substantiated complaints.

Submissions

Comments raised in submissions focused on:

- proposed management strategies not satisfactorily demonstrating how impacts on visual amenity will be minimised;
- concern that selecting colours for the complex that reflect heat, suggest that light or silvery colours may be chosen, which will not blend into the surroundings;
- the need for strategic planning outside the complex boundary to help screen it from Hearson Cove; and
- consideration being given to improving on the standard for light spill (AS 4282) where possible.

Assessment

The area considered for this factor is the project lease and surrounding area, including Dampier, Karratha and Hearson Cove.

The EPA's objectives are to ensure that the proponent considers aesthetic values, and that measures are put in place to;

- reduce the visual impact of the developments on the surrounding countryside as low as reasonably practicable; and
- manage potential impacts from plant light overspill to visitors at Hearson Cove.

The EPA acknowledges that the Burrup Peninsula has outstanding scenic values and is a popular tourist and recreational destination. However, the area is also strategically placed for industrial development and the EPA is conscious that through the endorsed Burrup Peninsula Land Use Plan and Management Strategy (O'Brien, 1996) the King Bay – Hearson Cove Valley has been designated for industry. The EPA therefore accepts that with industrial development in the region the existing level of visual amenity cannot be maintained, but it expects industry to take all reasonable steps to ensure that impacts from their operations on the amenity of Hearson Cove beach are as low as reasonably practicable.

The EPA notes that the complex will not be visible from Dampier. The EPA also notes that the complex may be visible from lookout points in Karratha at night and considers that the impact on amenity from this aspect will be acceptable. The EPA notes that the Methanex complex will be highly visible from Hearson Cove Road and that there will be little opportunity to conceal the operation since the terrain is flat and there is limited vegetation cover. However, the EPA expects that where ever practicable, the proponent will minimise impacts by for example adopting a suitable colour paint theme for the complex that blends in with the surrounds and by providing appropriate screening with vegetation, bunding or by other means.

The EPA is aware that Hearson Cove is a popular recreational beach and currently is the only "good" beach in the region that can be accessed by two wheel drive vehicles. The EPA is of the view that special endeavours are required to minimise impacts of industrial development, including the proposed methanol complex, on the visual aesthetics of the Cove (see Other Advice). The EPA considers that it is likely that additional screening measures will be required at the Cove to significantly reduce the visibility of the complex in order to preserve recreational values. The EPA considers that potential impacts on visual amenity would be best addressed jointly by Methanex and other local industry through the development of a Landscape Management Plan for Hearson Cove. The plan should include community consultation on approaches that could be taken to minimise visibility of the methanol plant during the day and light spill at night.

Summary

Having particular regard to the:

(a) proposed impacts at Dampier and Karratha;

(b) designation of King Bay – Hearson Cove Valley for industry;

(c) the EPA's recommendations for Hearson Cove (see Other Advice); and

(d) proponent's commitment;

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

3.8 Aboriginal Heritage

Description

The Burrup Peninsula is considered to contain one of the world's richest known concentrations of rock art (O'Brien, 1996). The proposal has the potential to impact directly on Aboriginal Heritage values directly through construction activities or possibly indirectly through long term deposition of acidic gases onto petroglyphs.

Direct Impacts on Aboriginal Heritage

A baseline archaeological survey undertaken by Vinnicombe (1997) was utilised to determine the potential impacts of the proposed complex on Aboriginal Heritage. The survey revealed that nine (seven registered) archaeological sites and potentially a further five sites will be impacted by the proposal. The sites are mostly occupation sites containing artefacts and/or shell scatter with six occurring on previously

disturbed land. Two additional registered Aboriginal Heritage sites occur within and near to the lease extension. The proponent has completed archaeological surveys of the project site with all three Aboriginal claimant groups and the "Section 18" report has been lodged with the Department of Indigenous Affairs. Methanex will ensure that nominated Aboriginal representatives are engaged during construction to monitor ground disturbances. The Construction Environmental Management Plan will outline procedures and actions to be taken in the event that an Aboriginal heritage site is exposed during excavations.

Indirect Impacts on Aboriginal Rock Art

The rock art of the Burrup consists largely of percussion petroglyphs and most is assumed to be made by direct impact (Bednarik, 2002). According to Bednarik, the petroglyphs occur in the following two forms:

- shallow petroglyphs made by bruising the dark brown mineral accretion (weathered zone) covering the unweathered core; and
- deep petroglyphs with design groove depths of between 5 mm and 12 mm.

The engravings and petroglyphs are susceptible to deterioration from natural processes such as weathering and microbial activity. Although no direct evidence is available, there is concern that the rate of deterioration may be accelerated by industry development, principally through the dry deposition of acidic gases.

A four year investigation into the potential impact of acidic gases on petroglyphs is being undertaken by the Office of Major Projects (OMP).

The proponent has committed to:

- develop a Cultural Heritage Plan that includes:
    - a cultural heritage protocol that addresses heritage surveys and ongoing consultations;
    - results and recommendations of archaeological and ethnographical surveys of the project site;
    - procedures to minimise disturbance to and manage heritage sites; and
    - procedures to document any complaints on a register and investigate substantiated complaints;

and

- develop an Aboriginal Awareness Program in consultation with Aboriginal groups for the construction and operation workforces.

The proponent has also committed to be a member of a "Burrup Industry Council" and to contribute to mutually agreed studies. Methanex has recommended that one such task be to conduct a baseline study of petroglyphs in the vicinity of the King Bay – Hearson Cove Industrial Area and monitor their condition to ensure there is no degradation of Aboriginal values.

Submissions

Comments raised in submissions focused on:

- the need for the Archaeological survey to be completed prior to construction and the results included in the PER;
- it being unacceptable that the proposal is likely to impact on an area proposed for World Heritage listing and that the proponent failed to obtain documented advice from the International Rock Art Federation;
- concerns that the PER did not provided convincing evidence that the cumulative impacts from acidic gases on rock art will be acceptable;
- the need for the proponent to better demonstrate that the Aboriginal groups have been adequately consulted and include their feedback about the proposed loss in the PER;
- the need for the induction program to include cross cultural awareness and the importance and national value of Aboriginal cultural and heritage sites; and
- the recommendation that an independent integrated regional review be conducted on indigenous heritage of proposed industrial projects on the Burrup Peninsula and to establish the relative cultural and archaeological significance of each site to potentially be affected.

Assessment

The area considered for assessment of direct impacts on Aboriginal Heritage sites is the proposed plant site, while the Burrup Peninsula and surrounding region is considered for assessment of the potential indirect cumulative impacts of acidic gases emissions from industry.

The EPA's objectives are to ensure that:

- the proposal complies with the requirements of the *Aboriginal Heritage Act 1972*;
- changes to the biological and physical environment resulting from the project do not adversely affect cultural associations with the area; and
- potential off-site impacts from acidic gases on petroglyphs can be managed.

The EPA notes that the baseline survey by Vinnicombe (1997) indicates that earthworks are likely to result in the disturbance of nine archaeological sites and potentially a further five sites. The EPA notes that the proponent has recently completed Aboriginal Heritage surveys with each of the three claimant groups and submitted a report to the Department of Indigenous Affairs. The EPA notes that Methanex will ensure that nominated Aboriginal representatives are engaged during construction to monitor ground disturbances and that set procedures will be followed in the event that an Aboriginal heritage site is exposed during excavations. The EPA is satisfied that on-site impacts will be acceptable, given that the proponent is required to comply with the provisions of the *Aboriginal Heritage Act 1972.*

The EPA notes the concern expressed in submissions regarding the potential for acidic gases from industry to cumulatively impact on petroglyphs on the Burrup Peninsula. Although there does not appear to be conclusive evidence indicating an accelerated rate of deterioration of petroglyphs in the region, the EPA acknowledges the potential for damage to occur in the long term. It recognises that any increase in

acidic emissions from new industrial projects on the Burrup Peninsula could only exacerbate the situation. The EPA is aware that OMP has commenced an investigation into the potential impact of acidic gases on petroglyphs, but understands that it is likely to be a few years before conclusive results are obtained. The EPA therefore considers that in the interim a precautionary approach should be adopted regarding proposed additional sources of NOx and other acidic gaseous emissions.

Summary

Having particular regard to the:

(a) proposed on-site impacts;

(b) the requirements of the *Aboriginal Heritage Act 1972*;

(c) proposed Ministerial Conditions with respect to NOx emissions; and

(d) proponent's commitments;

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

3.9 Off-site individual risk

Description

The proposed plant is to be located within the King Bay - Hearson Cove Industrial Area as shown in Figure 10. The selected site currently has no neighbours, but the sites to the south and south-west have been designated for specific industrial projects.

Halliburton KBR Pty Ltd was engaged to conduct a Preliminary Risk Assessment (PRA) of the proposed methanol facility, including the methanol transfer pipeline and ship loading operations (Halliburton KBR, 2002). The PRA was based on preliminary drawings only and a detailed Quantitative Risk Assessment (QRA) will be conducted prior to commissioning. The facility will be classed as Major Hazard and Methanex is therefore required to develop a Safety Report meeting the requirements of the National Standard – Control of Major Hazard Facilities [NOHSC:1014(1996)] to the satisfaction of the Chief Inspector of Explosives and Dangerous Goods.

The major hazards for the Methanex facility identified in the PRA as having a potential to result in an off-site impact were flammable gas (methane and hydrogen) and liquid (methanol) fires, vapour cloud explosions and toxic gas (carbon monoxide) release. The consequence distances derived for all fire and explosion scenarios associated with the methanol plant and product storage were found to be contained within the site boundary. The only two scenarios that were found to result in an offsite impact (for normal release sizes) were a release from the methanol export pipeline and a release of carbon monoxide as a result of plant failure under adverse meteorological conditions.

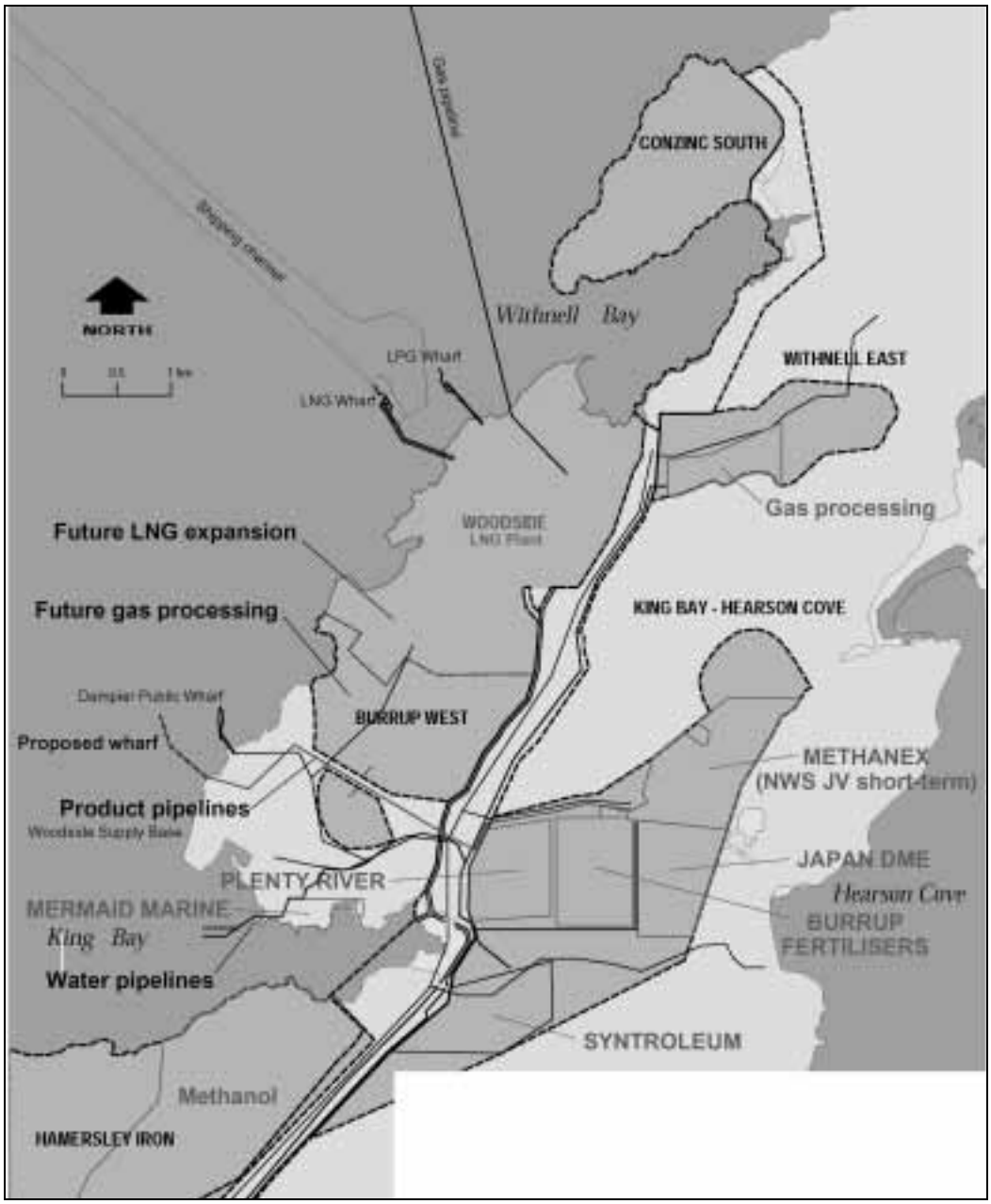

Figure 10: ***King Bay – Hearson Cove Industrial Area (Source: Department of Mineral and Petroleum Resources, Office of Major Projects)***

The fifty in a million individual risk contour for the proposed plant falls well within the site boundary and therefore complies with the EPA criteria (Figure 11). Apart from one small area (the Aboriginal rock art compound), the risk levels at the site boundary are below one in a million per year and the proposal will therefore not impose a significant risk on existing or future industries (Figure 12). The risk along the entire length of the proposed product pipeline will not exceed the EPA criteria of ten in a million per year for non-industrial activities or active open spaces in the buffer zone between industrial and residential zones. The pipeline risk transect results indicate that the distance from the product pipeline to the five per million per year risk level would not be greater than approximately 17m. However, the scope of the risk assessment did not include knock-on effects that could potentially occur within OMP's multi-user service corridor.

Quest Consulting Group conducted a study of risks associated with shipping activities in the Dampier Port (Quest, 2002). The risk of methanol release due to ship collision was predicted to be very low. The vessels will be doubled hulled and collisions therefore need to be severe enough to penetrate both hulls. If the tanker was to rupture, the methanol would rapidly diffuse into the water. The risk of a large spill (exceeding 100 tonnes) at the wharf was estimated to be low (approximately 1 chance in 5,000 per year). The total fire frequency from a methanol spill on the wharf was also calculated to be low (5×10^{-5} per annum). The PRA concluded that fire incidents at the jetty would be localised in their potential impact on people. A fire would not be expected to impact on public areas, given typical exclusion zones around the wharf.

The proposal is not considered to have an impact on societal risk levels as there will not be significant populations outside the site and within the effect zones.

The following safeguards will be built into the design of the complex:

- open plan to avoid the potential for accumulation and explosion of hydrogen in enclosed spaces;
- a flare system for planned or emergency releases of hydrocarbon streams;
- fail safe design of equipment;
- emergency Shutdown systems for individual plant items as well as the overall plant and methanol transfer system;
- methanol tanks of internal floating roof design with full spill containment;
- duplication of sensing devices (with two out three logic voting and two independent power supplies for critical equipment);
- fire and gas detection system and dedicated firewater system;
- emergency power; and
- a Safety Management System.

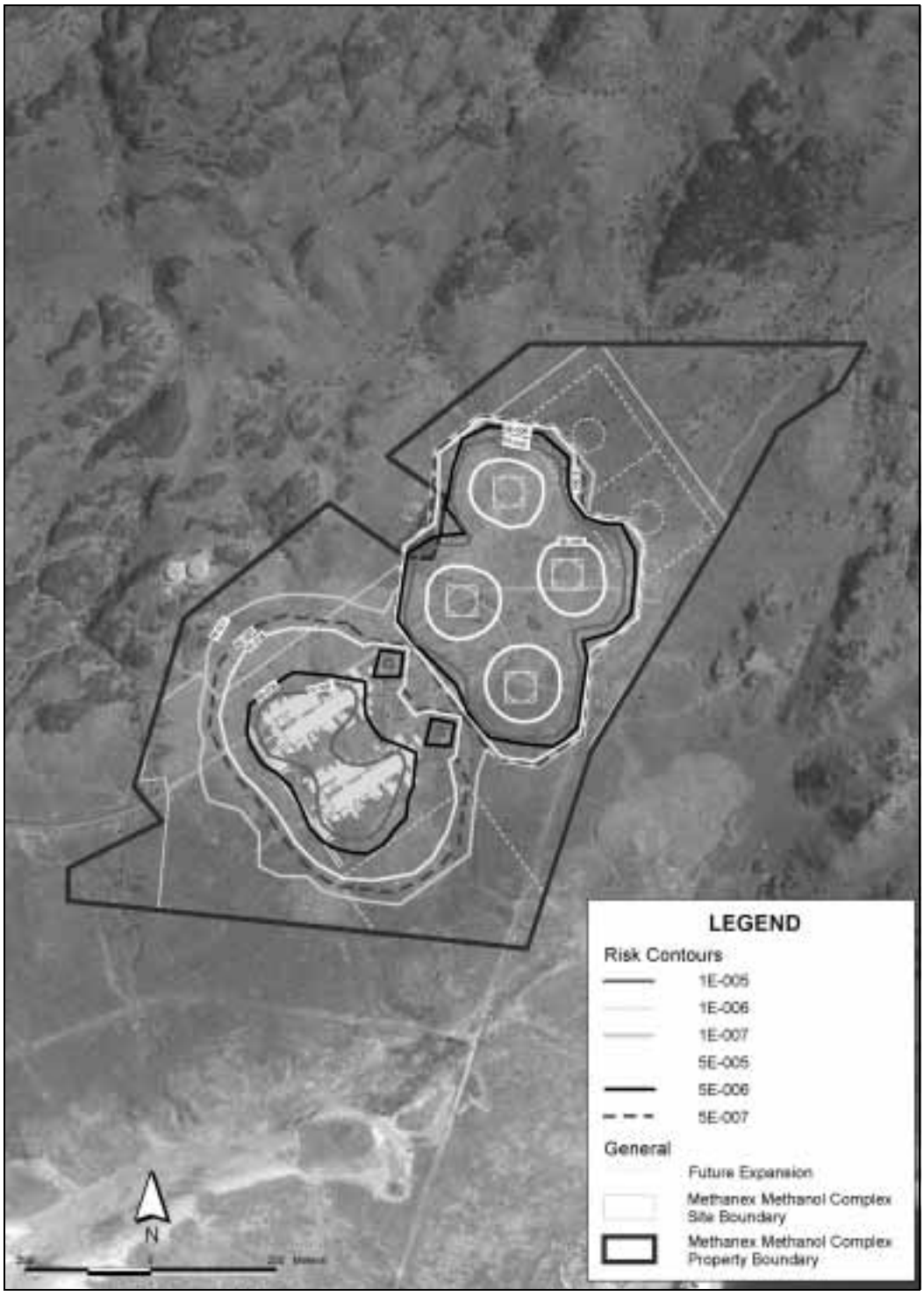

Figure 11: Individual risk contours (Source: Figure 9-1 SKM, 2002)

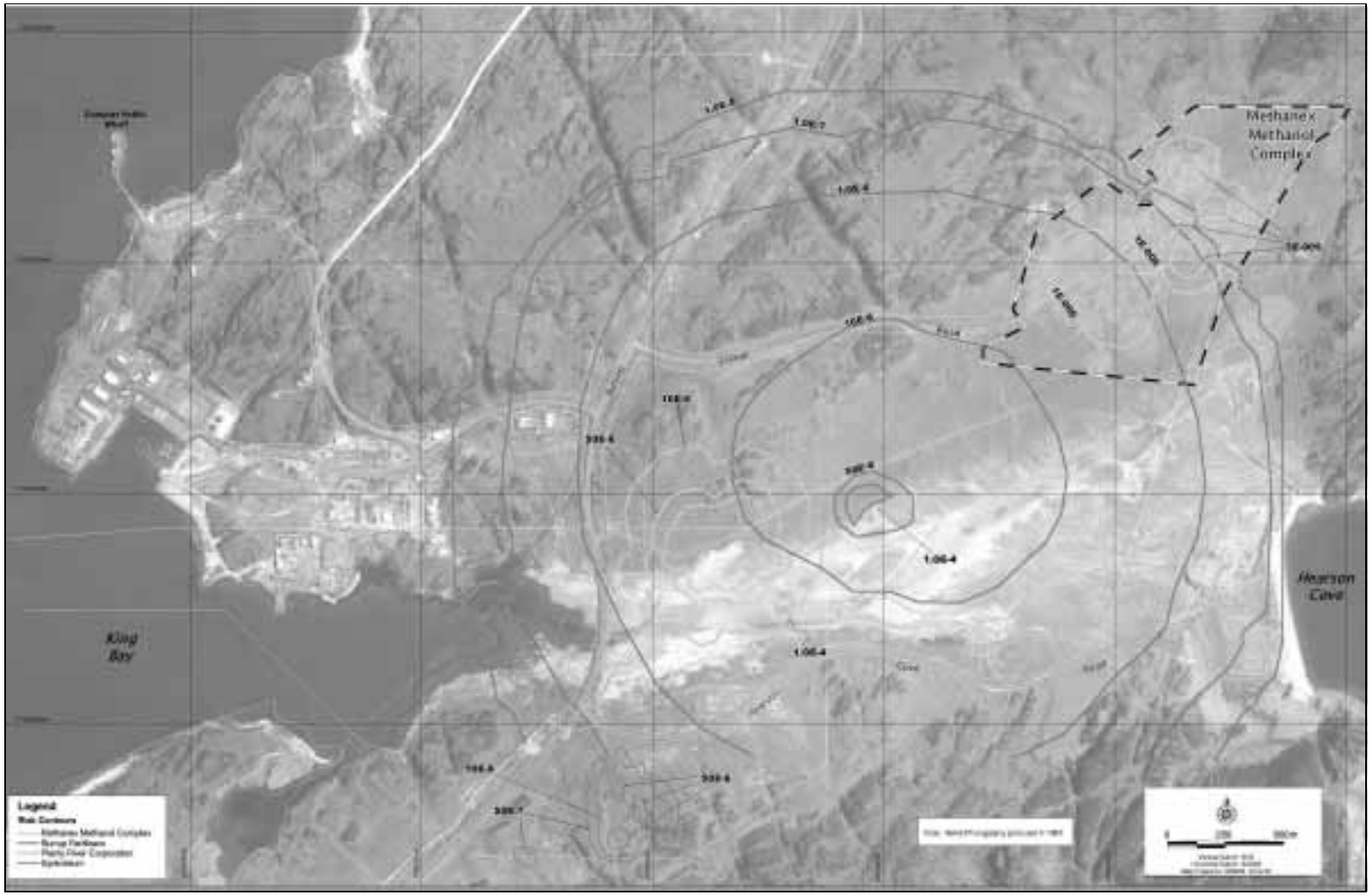

Figure 12: Cumulative risk contours (Source: Figure 9-4 SKM, 2002)

The proponent has advised that personnel on site will be equipped and trained to address all potential emergency situations related to the complex. An Emergency Response Plan will be developed in consultation with FESA and MPR and will include:

- provision of fire fighting equipment;
- reporting of fires;
- alarms and communication signals;
- muster points and evacuation procedures; and
- cyclone warning.

Although Methanex will be self reliant with respect to emergency response, it is prepared to develop and implement mutual aid systems with other local industry.

Submissions

Comments raised in submissions focused on:

- the need to consult MPR and FESA on several aspects of design and risk management including the sizing of the desalinated water storage tank, design and location of the methanol export pipeline and the development of the Operation Safety Report;
- the need to demonstrate the accuracy and reliability of the leak detection systems in the Safety Report;
- the need to consult MPR and FESA in the preparation of the Emergency Response Plan;
- justification for the exclusion of jet fires and the occurrence of a Boiling Liquid Expanding Vapour Explosion (BLEVE) from the calculation of risk;
- clarification on the size of the export methanol pipeline, additional isolation valves, consequence distances for release scenarios and design details and standards for the Fire and Gas Detection system and water curtain;
- better estimation of release volumes from the product pipeline and additional information on the possibility of failures while the pipeline was not in use;
- justification for excluding the possibility of catastrophic failures of the methanol export pipeline, installation of the pipeline above ground and that the potential for knock-on to other pipelines in the corridor will be low; and
- a commitment was sought from the proponent that there will be no demands made on managers of adjacent lands to extinguish any fires and that all emergencies associated with the plant will not require assistance from outside emergency services.

Assessment

The area considered for assessment of this factor is the proposed plant site and immediate surrounds, the methanol transfer and ship loading operations at the Dampier Public Wharf.

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

- ensure that the risk is managed to meet the EPA's criteria for off-site individual fatality risk (EPA Guidance Statement No. 2: *Off-site individual risk from Hazardous Industrial Plant*);
- ensure that the ALARP (as low as reasonably practicable) principle is demonstrated; and

- ensure that MPR's requirements in respect of public safety are met.

The EPA's individual risk criteria as stated in EPA Guidance Statement No.2 (EPA, 2000a), which would apply to the proposed plant and other relevant infrastructure are as follows:

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

The EPA notes that MPR has reviewed the PRA and based on its technical advice, the EPA is satisfied that the PRA is representative of the likely risk levels from the proposed methanol complex. The EPA notes that the PRA is based on preliminary drawings only and that MPR requires a thorough QRA to be completed prior to commissioning of the plant. The EPA understands that the choice of Lurgi technology would not cause a significant change in the preliminary risk contours.

The EPA notes that the individual fatality risk contour meets the EPA criteria at the site boundary (Figure 11) and along the entire length of the product pipeline and is therefore acceptable. The EPA also considers that the cumulative risk at Hearson Cove beach (Figure 12) will be acceptable, being significantly less than the EPA criteria of ten in a million fatalities in a year. The EPA notes that the proposal is not considered to have an impact on societal risk levels as there are no significant populations outside the site within the effect zones.

The EPA notes that the proponent is required to submit a Safety Report meeting the requirements of the National Standard for the Control of Major Hazard Facilities, to the satisfaction of the Chief Inspector of Explosive and Dangerous Goods. It notes the safety systems and risk reduction measures proposed by the proponent. The EPA also notes that MPR and FESA submissions sought additional information and justification on the approach to taken on a number of specific issues. The EPA understands that both Departments were satisfied with the responses provided by the proponent, given that the issues would also be more fully addressed within the Safety Report.

The EPA notes the concerns raised in the submissions regarding cumulative or knock-on effects within OMP's services corridor. The EPA expects that OMP will demonstrate that the products and other materials transferred within the corridor cumulatively meet the EPA's risk criteria (see Other Advice). The EPA notes that the risk of fire from a methanol spill at the wharf is low and that a fire incident at the jetty would be localised in the potential impact on people.

The EPA also notes the comments and concerns expressed by MPR, FESA and CALM on emergency response and that the proponent has committed to consult stakeholders with respect to emergency response. It notes that the proponent is prepared to be a member of a mutual aid system with other local industry (see Other Advice). The EPA also notes that the proponent has also committed to consult with FESA and CALM regarding fire protection procedures and in particular natural wild fires or controlled burns on adjacent lands.

Summary

Having particular regard to the:

(a) proposal meeting the EPA's individual fatality risk criterion;

(b) advice obtained from MPR in relation to the management of risk and hazards; 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.

4. Conditions and Commitments

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment and Heritage 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 PER (SKM, 2002) and subsequently modified, as shown in Appendix 4, should be made enforceable.

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 that the EPA recommends be imposed if the proposal by Methanex Corporation to construct and operate two nominal 6,000 tpd methanol plants, two air separation units, methanol storage (220,000 tonnes), a desalination plant, transport of raw materials and products to and from the plant site and ship loading operation at Dampier Port, is approved for implementation.

These conditions are presented in Appendix 4. 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 4. The commitments cover the preparation of a Construction and an Operation Environmental Management Program which will include the following Plans:

- Flora and vegetation management;
- Landscaping
- Fauna management;
- Erosion and sediment control;
- Dust management;
- Noise management;
- Solid waste management;
- Liquid waste management;
- Hazardous materials management;
- Pre-commissioning management;
- Construction safety management;
- Cultural Heritage;
- Traffic management;
- Cyclone contingency;
- Methanol spill contingency; and
- Water quality management.

The remainder of the conditions address the following:

(b) preparation and subsequent implementation of decommissioning plans;

(c) preparation and implementation of a Greenhouse Gas Emissions Management Plan;

(d) review of the stack configuration and parameters to reduce impacts on elevated terrain;

(e) composition of brine and wastewater discharge and demonstration that best practicable technology will be adopted to reduce metals, including copper, as low as reasonably practicable;

(f) Noise Management Plan to minimise impacts on the amenity of Hearson Cove;

(g) Visual Amenity Management Plan to minimise impacts on the amenity of Hearson Cove; and

(h) compliance audit and performance reviews, and a decommissioning plan.

5. Other Advice

While the Woodside LNG facility is still the only major industrial plant on the Burrup Peninsula, there has been considerable activity in the last two years on the assessment of proposals for the area and the following new projects are proposed for the Burrup:
Methanol Plant - GTL Pty Ltd
Export Ammonia Plant - Burrup Fertilizers Pty Ltd
Dimethyl Ether Project - Japan DME
Ammonia Urea Plant - Dampier Nitrogen Pty Ltd
Methanol Complex - Methanex Australia Pty Ltd
Gas to Synthetic Hydrocarbons Plant - Syntroleum Ltd
Extension to Nickol Bay Quarry
Multi-user Seawater Supply System and Wastewater Outfall - Water Corporation
Dampier Public Wharf Expansion.

The above group of projects represents a significant planned addition to the level of industrial development on the Burrup. When combined with the existing and planned expansions to Woodside LNG this group of projects would take up much of the available land zoned for industry on the Burrup.

The EPA recognizes the attractions of the Burrup Peninsula to industrial development focused around the supply of natural gas. However, the EPA encourages Government to commit to a long term plan for the establishment of infrastructure so as to have available the Maitland Industrial Estate for future development projects.

The Burrup is a special place, and on-going planning is required to ensure the orderly use of the areas available for industry, taking into account the community's increasing understanding of the environmental and social values of the Burrup Peninsula.

Clearly the level of potential cumulative impacts on the Burrup would increase significantly if all these projects are built. A discussion of the range of issues raised follows. This discussion applies to the Burrup as a whole and not all items necessarily apply to every industry.

Vegetation

The combined effect of industrial development on the vegetation of King Bay - Hearson Cove area is very high, due to the high incidence of bare areas (rock, mudflat or pre-disturbed) in the area. That is, there is limited vegetated area, much of which will be impacted. The combined area of vegetation is also significant compared to the amount of vegetated area in the Conservation area. Further work is need on cumulative effects and what action may be taken to ensure the survival of a representative proportion of vegetation communities. Although some individual assessments have been completed, most proposals have plans for future expansion of the plant site.

Most vegetation is limited in extent because of the large number of vegetation types forming the mosaic on the peninsula. At present what seems the most significant vegetation is less impacted by avoiding rockpiles. However, the cumulative impacts of industry on vegetation of midslope soils is an issue.

More survey work is required on the samphire vegetation communities of the salt flats as this vegetation has not been adequately surveyed.

Fauna

Various studies have identified the need for further snail surveys for cumulative impacts and for co-ordinated action to protect the Olive python and feeding areas for this species. These matters need to be addressed in a co-operative manner by industries on the Burrup with advice from CALM.

Marine

The limited background data on seawater quality around the Burrup is currently an issue. A program to acquire this data should be instigated to assist in the assessment of proposals and the setting of appropriate conditions on works approvals issued for developments on the Burrup.

Work is also urgently required to develop a better understanding of what constitutes an environmentally safe load of nutrients to Mermaid Sound and Nickol Bay. That understanding presently does not exist. A similar review of cumulative phosphorus inputs should be carried out for Mermaid Sound and Nickol Bay.

Due to lack of information about nitrogen impact on corals it is recommended that the Water Corporation be requested to include a coral monitoring program in their management program, with agreed indicators and management response by the participating industries if these indicators are exceeded. The Water Corporation could require management action from the companies, if the coral impact indicators were exceeded.

Air Quality

Air emissions from individual projects and as cumulative impacts have been assessed, using available NEPM limits. These limits were largely developed for the protection of human health. Effects on other organisms or natural processes can occur at lower concentrations of pollutants but no data on these effects are known for the range of native plants, animals and heritage items, such as rock art, that exist on the Burrup.

Air emission studies generally concentrate on the so called "criteria pollutants" including NOx, SOx and particulates. In some circumstances, other pollutants such as VOCs, PAHs and heavy metals may require consideration.

Photochemical smog and ozone may be of concern as the number of industries increases. While acid rain is a more familiar concern in other places, dry deposition is the more likely mechanism of pollutant deposition most of the time on the Burrup. Ammonia and urea may have deleterious effects on native plant growth and ecosystem composition in a naturally nutrient poor environment.

Some systems that may plausibly be affected by air emissions are plants, fresh water rock pools, land snail species know to have very limited distributions and petroglyphs (rock art).

The EPA notes that OMP, on behalf of the WA Government, has recently commenced a four year study to establish a baseline for petroglyphs condition and investigate potential threats to them from air emissions on the Burrup. In addition to this, the EPA considers there is a need for government/industry to develop and implement a management plan to monitor, evaluate and manage impacts on other conservation values, including vegetation, fauna and ephemeral pools. The EPA considers there is a need to:

- determine the deposition rates of acidic gases and nutrients (especially nitrogen) from proposed and existing industry on the Burrup; and
- establish criteria that would be protective of the Burrup vegetation, fauna, ephemeral pools and rock art.

The EPA understands that additional information would be required to achieve the above including more accurate dispersion and deposition modelling for the Burrup and appropriate monitoring of the health and growth of vegetation and fauna.

As more developments are placed on the Burrup, cumulative impacts and co-ordinated management will need to be carefully considered. As little is known about specific impacts in this environment, research, monitoring and management of cumulative impacts is essential. This applies particularly to the issue of ensuring that all the available air-shed capacity is not taken up by one or two industries. In this regard, the EPA encourages new and existing industry on the Burrup to minimise all emissions to the environment by utilising best practice management and best practicable technology/measures.

Noise and other Amenity Issues at Hearson Cove

Hearson Cove is the only local swimming beach with two wheel drive access. Potential noise, odour, aesthetic and light overspill impacts therefore require careful control.

All industries are required to meet the *Environmental Protection (Noise) Regulations 1997* which stipulate a 65dBA limit at the plant boundary. They are also required to take all reasonable and practicable measures to further reduce impacts. Cumulative modelling using current design parameters for the proposals currently mooted for the Burrup indicates a noise level of about 48dBA could occur at the northern beach shelter on Hearson Cove. The principle of "all reasonable and practicable measures" under the *Environmental Protection Act 1986* requires proponents to get impacts down as low as reasonably practicable within the definition in the Act. A cumulative level of 45dBA at the beach is recommended by the EPA as an aspirational goal to help maintain the amenity at Hearson Cove. While this aspirational goal is not mandatory, it provides some guidance on a target for all proponents to strive to achieve.

With regard to the whole range of amenity issues listed above, industry and government should be encouraged to work with the community to increase mutual understanding and acceptance of what are desirable and tolerable levels of amenity. Such an approach has commenced with work commissioned by the Office of Major Projects to define what some members of the community regard as acceptable noise levels.

Control of potential impacts at source is obviously an important and usual means of managing effects on Hearson Cove. It would also be possible to significantly improve the control of noise, visual and light overspill effects by providing screening at the beach. It is understood that a dune existed at the back of the beach prior to its removal for construction sand some years ago. It would be possible to replicate this feature, perhaps by using sand recovered from regular dredging operations off the west side of the Burrup, and then vegetating it with hardy local plants. A properly designed, located and landscaped sand bund would materially improve the control of noise, light and visual impacts on the beach. The EPA considers that the potential impacts on visual amenity would be best addressed jointly by local industry through the development of a Landscape Management Plan for Hearson Cove. The plan should incorporate community consultation on a range of approaches to minimise visibility of the industrial plants, including light spill at night.

An additional approach would be to provided two wheel drive access to another beach. The site most often mentioned is Conzinc Bay, on the northwestern side of the Burrup. Conzinc Bay is an attractive, sandy beach with much to recommend it as a recreation site, although it is not entirely screened from existing industry.

Careful consideration would, however, need to be given to opening up this site because a readily accessible road there could significantly increase recreational pressure on a greater proportion of the northern end of the Burrup, which is difficult to access at present. It is understood that there are petroglyphs and other conservation features on the northern half of the Burrup which could come under increased pressure from increased visitation. If access to Conzinc Bay were to be improved, then it should be done on the basis of careful expert planning and with concomitant

attention to an appropriate plan to manage the range of impacts that could be expected on a wider area of the northern Burrup.

Risk Management

There is a need for accurate cumulative risk contours for the Hearson Cove Industrial Area. Government should be encouraged to perform a cumulative risk analysis when detailed engineering designs are available for the existing and currently proposed industries for the Burrup.

At present there is no policy position on the acceptable risk levels that apply to a conservation and recreation zone such as that proposed for much of the Burrup. During the environmental impact assessment of projects to date, and interim risk level of 1 x 10-5 has been used as being acceptable for the non-industrial areas. There is a need to clarify the tenure and zoning of the balance of the non-industrial land on the Burrup to give certainty to the issue of safety management. Also, users of Hearson Cove traverse the area zoned for industry as they cross the Burrup. Attention needs to be given to an alternative egress route from Hearson Cove beach in the event of an emergency on the industrial land.

There is also a need to manage the cumulative risk associated with the multi-user service corridors, during the construction of individual pipelines, as well as during the operation of those pipelines. There is likely to be a number of pipelines carrying different substances including hazardous materials, and plans need to be in place to ensure events or knock-on effects which can lead to a release of hazardous materials are managed within acceptable limits.

An integrated emergency response management plan will also be required for the Burrup industrial area, as is the case now at Kwinana. The proposed Burrup Industrial Council may be the appropriate vehicle for such a plan. In this regard, attention also needs to be given to alternative egress arrangements from Hearson Cove in the event of an emergency. At present there is only one ingress and egress route to the beach and it is likely that the existing route will be paralleled, at least in part, by pipelines carrying hazardous materials like natural gas, methanol, synthetic diesel, ammonia etc.

Drainage and Flooding

Much of the land zoned for industry between King Bay and Hearson Cove is essentially a flood plain continuing inland from King Bay. Under storm surge conditions it is possible that much of the area would be flooded. New industrial plants will need to be built on fill to protect them from such flooding. Filling of the floodplain will reduce its natural capacity to store and handle flood waters which may lead to erosion and redirection of flood waters in ways which could have undesirable environmental impacts.

Attention needs to be given to a cumulative impact study of flood plain alteration and to the source and impacts of supplying fill material, which is in short supply on the Burrup. If dredge spoil is to be used as fill the impacts of salt draining from the fill on the terrestrial environment will need to be taken into account.

6. Conclusions

The EPA has considered the proposal by Methanex to establish a mega methanol complex on the Burrup Peninsula, including a desalination plant, transport of materials, and a ship loading operation at Dampier Port.

The vegetation in the King Bay – Hearson Cove Valley has high conservation value and that part of the floristic variation appears to be uncommon elsewhere on the Peninsula (Trudgen, 2001). The EPA recognises that the valley has been identified for industrial purposes in the endorsed Burrup Peninsula Land Use Plan and Management Strategy (O'Brien Planning Consultants, 1996) and therefore some impacts on the vegetation in the area will occur. The EPA is generally satisfied that the proponent has optimised the layout of facilities within its project lease to minimise impacts on vegetation, although it is concerned that two sites of significant vegetation on the south-west corner of the lease may be impacted. The EPA recommends a review of the area of disturbance during the detailed design phase.

Most of the vertebrate species occurring around the Burrup Peninsula are widely distributed throughout the Pilbara and no fauna species endemic to the Burrup Peninsula were observed on the lease. The EPA accepts that construction will result in the removal of some habitats. It notes that the project is not likely to impact on any Specially Protected (Threatened) Fauna or have a direct impact on larger fauna species. The EPA is satisfied that the plant layout and infrastructure has been sited to minimise disturbance to habitats for non-molluscan fauna. The EPA is also satisfied with the fauna study undertaken by the proponent to target species of fauna considered to be poorly understood.

The main gaseous emission will be oxides of nitrogen (NOx). The proposed NOx emissions are significant, representing approximately 12% of the total emissions from existing, approved and proposed industrial sources in the region. However, the proponent is proposing to utilise low NOx burners and the EPA therefore considers that these emissions will be reduced as low as reasonably practicable. The EPA is satisfied that the ground level concentration of nitrogen dioxide will be well below the NEPM Standard at the population centres. However, because insufficient information is currently available to specifically determine the impacts of NOx and other gaseous emissions on vegetation, ephemeral pools and petroglyphs the EPA recommends that the proposed stack configuration and parameters be reviewed in order to further reduce the local impacts on the Burrup Peninsula, particularly the nearby elevated terrain. The EPA endorses the study of the potential impacts of acidic gases on petroglyphs that is being coordinated by the Office of Major Projects and considers that impacts on other environmental values should be investigated as a matter of priority. The EPA is satisfied that the proposal is not expected to increase ozone levels in the region.

Based on the information provided, the EPA is satisfied that the technology being proposed by the proponent is more thermally efficient than modern conventional technology. The EPA is satisfied that that the proposed greenhouse gas intensity of 0.41 tCO_{2E} / t methanol represents current best practicable technology. The EPA notes that energy will be recovered from waste gas streams during normal operation, rather than being sent to flare. The EPA has no objection to the proposed gas turbine being simple cycle, given that it will be small (12 MW) and used primarily to provide electricity during start-ups.

The proponent proposes to discharge its brine and wastewater to Mermaid Sound via the Water Corporation's multi-user discharge system. The EPA commends the proponent for utilising a number of water conservation and re-use strategies. The EPA is of the opinion that the concentration of metals, particularly copper, in the effluent can be reduced further and recommends that the proponent review the options available to achieve further reductions. The EPA is particularly concerned that during upset or worst case conditions the copper concentration in the discharge is expected to exceed the ANZECC/ARMCANZ (2000) 99% species protection level at the edge of the proposed 0.01 km^2 mixing zone. It therefore expects the proponent to demonstrate that "best practice" is being proposed with respect to the copper discharge.

The complex is expected to meet the *Environmental Protection (Noise) Regulations 1997* at the plant boundary and at Dampier, however, it will be a significant contributor to noise levels at Hearson Cove. The EPA is satisfied that the preliminary plant design incorporates best practicable noise reduction measures. The EPA is also satisfied with the proponent's commitment to utilise an acoustic engineer during the detailed design phase in order to reduce noise levels at Hearson Cove as low as reasonably practicable.

The EPA is of the view that special endeavours are required to minimise impacts of industrial development, including the proposed methanol complex, on the visual aesthetics of Hearson Cove. The EPA considers that it is likely that additional screening measures will be required at the Cove in order to help preserve recreational values.

Earthworks are likely to result in the disturbance of nine archaeological sites and potentially a further five sites. The proponent has recently completed Aboriginal Heritage surveys with each of the three claimant groups and submitted a report to the Department of Indigenous Affairs. The EPA is satisfied that on-site impacts will be acceptable, given that the proponent is required to comply with the provisions of the *Aboriginal Heritage Act 1972*.

The individual fatality risk contour meets the EPA criteria at the site boundary and along the entire length of the product pipeline and is therefore acceptable. The cumulative risk at Hearson Cove beach is significantly less than the EPA criteria and is also acceptable. The proposal is not considered to have an impact on societal risk levels as there are no significant populations outside the site within the effect zones.

The EPA has concluded that the proposal is capable of being managed in an environmentally acceptable manner such that it is most unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Section 4, including the proponent's commitments.

A considerable number of new projects have been proposed for the Burrup Peninsula and the level of potential cumulative impacts would increase significantly if all projects were to proceed. The EPA has provided advice in 'Other Advice" regarding the issue of potential cumulative impacts.

7. Recommendations

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

1. That the Minister notes that the proposal being assessed is for a methanol complex to be established on the Burrup Peninsula, consisting of two nominal 6,000 tpd methanol plants, two air separation units, methanol storage (220,000 tonnes), a desalination plant, transport of raw materials and products to and from the plant site and ship loading operations at Dampier Port.
2. That the Minister considers the report on the relevant environmental factors as set out in Section 3;
3. 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 4, and summarised in Section 4, including the proponent's commitments;
4. That the Minister imposes the conditions and procedures recommended in Appendix 4 of this report;
5. That the Minister notes the EPA's Other Advice.

Appendix 1

List of submitters

Organisations:

Conservation Council of Western Australia
Department of Conservation and Land Management
Department of Mineral and Petroleum Resources – Office of Major Projects
Department of Mineral and Petroleum Resources – Explosives and Dangerous Goods Division
Department for Planning and Infrastructure – Coastal Facilities Directorate
Department for Planning and Infrastructure - Strategic Planning and Policy
Fire and Emergency Services
Main Roads Western Australia
Pilbara Development Commission
Water Corporation

Individuals:
One confidential submission

Appendix 2

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Appendix 3

Summary of identification of relevant environmental factors

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	The project will directly impact about 84 ha of the lease. Ten broad vegetation types occur on four landform types. Approximately 47% of the project site is located on land that has been previously disturbed. Clearing requirements for the project include: • 0.1ha (or 7%) – communities of high conservation significance; • 38ha (or 72%) – communities of moderate conservation significance; and • 46ha (or 98%) – communities of low conservation significance. Impacts on vegetation within service corridors (for gas, seawater, brine and wastewater and methanol pipelines) will be assessed by others.	**Department for Planning and Infrastructure** • Consider clearing only those elements required for the initial plant. • There is insufficient data to assess the regional impacts of clearing high conservation value vegetation. • There are some inconsistencies in statements as to whether the vegetation is significant or not. • Lack of wet season flora survey is considered unsatisfactory but recognise that proponents could wait years for an acceptable wet season. • Concerned about clearing of vegetation in the south west corner and the northern creek line vegetation. **Conservation Council of Western Australia** • Need to undertake an adequate flora survey and provide statistical information indicating percentage of each vegetation type remaining. This will enable a cumulative assessment. • There are unsubstantiated claims and unfulfilled commitments such as the commitment to undertake a wet season vegetation and flora survey. • A cumulative assessment should include a comprehensive study and there should be no destruction of any vegetation type that has less than 30% of its original extent remaining.	Considered a relevant environmental factor. It will be assessed under the heading of 'Terrestrial Flora'.
Declared Rare and Priority Flora	No declared rare flora occurs within the project site. Two Priority Flora species occur within the project lease in six locations - *Terminalia supranitifolia* (Priority 1) and *Eriachne tenuiculmis* (Priority 3).	**Department for Planning and Infrastructure** • Priority flora species proposed for relocation are species that have not shown good propagation rates in the past.	Considered a relevant environmental factor. It will be assessed under the heading of 'Terrestrial Flora'.
Specially Protected (Threatened) fauna	Four broad fauna habitats occur on the project site. Three abandoned mounds of the Pebble Mound Mouse a relocated on the project site. Four land snail species have been recorded. No fauna species of conservation significance have been recorded within the project site.	No comments received.	Considered a relevant environmental factor. It will be assessed under the heading of 'Terrestrial Fauna'.

Summary of Identification of Relevant Environmental Factors

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
Landform, drainage and site hydrology, including impacts from high tide flow events.	There are four main landform features including colluvial slopes, rockpiles/rocky outcrops, drainage lines and rehabilitation areas. Surface drainage across the site occurs in a north east and south-southeast direction. The project site is not located on the intertidal mudflats. Only a small portion of the south east corner of the site is below the 1-in-100yr flood level. This peak water level is 4.8 mAHD. Considering future sea level rises the 1-in-100 yr level may fall within the range of 4.84 mAHD and 5.04 mAHD.	No comments received.	No further assessment by the EPA will be required as the majority of the site (47%) has previously been disturbed. The site will be elevated to about 7mAHD to prevent potential flooding.
Water supply	Approximately 55ML/day of sea water will be supplied to the complex from the Water Corporation.	**Conservation Council of Western Australia** • The EIA of the proposal must assess the potential environmental impacts associated with the use of seawater in the production process. It is understood that the proponent intends to use 55ML/day of seawater.	No further assessment by the EPA will be required as the proponent will desalinate seawater as soon as it enters the site and will eliminate any potential impacts from seawater.
Water quality including surface water and increased shipping.	All areas of the process plant will be located on hard stand surfaces above the 1-in-100 yr flood level. The complex will be equipped with a dual stormwater system separating clean and potentially contaminated stormwater. First flush (up to 100mm) of rainfall from potentially contaminated areas will be treated. Subsequent rainfall will be diverted to the clean stormwater system.	**Department of Environmental Protection** • Stormwater is only proposed to cover TSS, methanol, THC, pH and TDS. • The PER has not considered the likelihood that other contaminants, eg. heavy metals, may be present in this runoff. • The test criteria have not been stated. • Need to characterise the quality of site runoff and need to commit to manage this runoff so that it will not result in water quality degradation. • The stormwater management plan (and site plan) needs to be more carefully designed, with a view to minimising stormwater contamination, promoting recycling and reuse. • How will clean stormwater areas and potentially contaminated stormwater areas be delineated? • How will deposition of atmospheric contaminants from other industries impact on the potential for stormwater drainage to be contaminated? **Department of Conservation and Land Management** • There is concern for the need to have a manual valve to divert rainfall subsequent to the first 100mm flush and the possibility of failure due to the	No further assessment by the EPA will be necessary as the proponent has committed to a Water Quality Management Plan. Potentially contaminated stormwater will be tested and then treated in a lined stormwater pond prior to discharge and clean stormwater will be directed to a gross pollutant and silt trap prior to discharge.

Summary of Identification of Relevant Environmental Factors

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		valve not being operated. The manual valve should be removed and the system designed so that it will still operate as indicated.	
POLLUTION			
Gaseous and particulate emissions	The plant emissions will be: • Nitrogen oxides – 3016 t/yr; • Sulphur dioxide – Nil; • Carbon monoxide – 798 t/yr; • VOC's – 1181 t/yr; and • Particulates – 50 t/yr. Dust will be generated during the construction phase of the complex.	**Environmental Protection Authority** • There are inconsistencies in the assessment of impacts from atmospheric deposition, lack of relevant data and scientific understanding. **Department of Environmental Protection** • No consideration given to the impact of atmospheric deposition of mangroves. • No information provided on impact pathways and effects of NOx and SOx on mangroves. The proponent needs to do further work. • Potential impact on petroglyphs, ephemeral pools and flora from dry deposition of NOx. Rainfall pH and impacts from dry acidic deposition should be investigated. Until impacts are understood a conservative approach to the discharge of acidic gaseous emissions must be taken. • Proposed NOx emissions will be a significant proportion of the cumulative emissions. The proponent should provide a listing of alternative NOx reduction technologies with cost estimates for each option considered to be feasible. • The proponent should become involved in the Dampier – Point Samson Dust Working Group. • Intention of DEP Regional Office to establish an Industry Liaison Committee to assist the coordination of Atmospheric Monitoring and Management. DEP would encourage the proponent to a have a representative on this committee. **Department of Conservation and Land Management** • PER has not provided convincing evidence that impacts on flora, fauna and rock art from cumulative emissions are acceptable. • CALM would like to be assured that the EPA considers in its recommendation that emissions from the plant, on a cumulative basis, will not adversely impact on calcrete pools in gullies; fauna including land snails; Aboriginal rock art; and flora including mangroves. **Conservation Council of Western Australia** • The PER refers to unsubstantiated claims and unfulfilled commitments for examples NOx and SOx levels will not exceed assigned levels. • It is vital that a Cumulative Impact Assessment process be followed for NOx emissions.	Considered a relevant environmental factor. NOx emissions from gas turbines exceed EPA criteria for gaseous fuels. Cumulative NOx emissions remain within NEPM guidelines.

Summary of Identification of Relevant Environmental Factors

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
Greenhouse gases	The complex will emit about 1.9 million tonnes of CO_2 per annum.	**Department of Environmental Protection** • The proponent's commitment to 10% reduction on 2000 greenhouse gas levels by 2008 is commendable. Is this achieved through replacement of older technology (sited in other countries?) with the proposed development at the Burrup or are other reduction measures proposed. • The current greenhouse commitment is not consistent with the intent of the Prime Minister's statement on greenhouse gas emissions. Can the proponent strengthen the commitment to include the adoption of practicable and feasible measures beyond the operation of the methanol complex to offset CO_2, such as investigation into the establishment of tree farms? • The transport component (shipping) of the greenhouse gas emission has not been included in the estimation of greenhouse gas emissions. **Conservation Council of Western Australia** • Vital that a cumulative impact assessment be undertaken for the assessment of CO_2 emissions. • Proponent's approach to resolving CO_2 emissions is unacceptable. Voluntary schemes are inadequate. Claims of a net reduction in CO_2 emissions are highly misleading. • PER has failed to account for CO_2 emissions from the desalination process. • Does the proponent understand that Australia has an international commitment to achieving an emissions levels of 108% of our 1990 level? • If this project is implemented, it will ensure that Australia does not meet its target of 108% of 1990 emissions levels and will be ineligible for a carbon global trading system. • Why has the proponent failed to address the option of plantations and managing environmental consequences of their enterprise? • The proponent must develop a comprehensive legally binding programme to ensure sequestration of an equivalent quantity of carbon dioxide. A program showing carbon right contracts must be negotiated with land holders prepared to enter into carbon sink arrangement. Details of the carbon sequestration program must be placed as Ministerial Conditions.	Considered a relevant environmental factor.

Summary of Identification of Relevant Environmental Factors

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
Noise	Noise will be generated during construction and will be about 39 dB(A) at Hearson Cove and <<30 dB(A) at Dampier during the operation of noisy equipment. Dampier is the nearest residential area (6km away). Operational noise from an attenuated complex will meet EPA criteria of 65 dB(A) at the boundary and will be about 51 dB(A) at the northern end of Hearson Cove. Noise at Dampier will be about 23 dB(A).	**Department of Environmental Protection**	Considered a relevant environmental factor.

Summary of Identification of Relevant Environmental Factors

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
Light Overspill	Lighting will be designed to meet Australian Standards. There are no known or recorded nesting turtle beaches on the Burrup.	**Department of Environmental Protection** • Check with CALM that Hearson Cove is not regarded as a turtle nesting site and that artificial lighting is not likely to effect turtle behaviour.	No further assessment by the EPA will be required.
Liquid Effluent Management	Brine, treated process wastewater and cooling tower blowdown will be discharged to King Bay via the Water Corporation's brine return line. On entry to the brine return line, the concentration of copper will exceed the ANZECC 99% species protection level. Domestic wastewater will be treated and re-used for irrigation minimising nutrient loads being discharged. Potentially contaminated stormwater will be tested and treated prior to being released to the environment.	**Department of Environmental Protection** • Who has the responsibility to be geared up for a methanol spill? • What is known of its effects on corals, mangroves and other marine communities? Is that knowledge adequate? If there is inadequate knowledge, then Methanex (in consultation with the Dampier Port Authority and the DEP) should commit to a program of research so that the design of methanol spill response plans can be optimised. • The testing of potentially contaminated stormwater is only proposed to cover TSS, methanol, THC, pH and TDS. The PER has not considered the likelihood that other contaminants, eg. Heavy metals, may be present in this runoff. The test criteria have not been stated. • The proponent needs to be able to characterise more fully the quality of site runoff, and needs to commit to manage this runoff so that it will not result in water quality degradation. • How will areas of designated as 'clean' or 'potentially contaminated' be delineated? • There is potential for contaminant atmospheric deposition from other industries to impinge on the Methanex site, creating the potential for stormwater drainage to be contaminated. • The PER has not calculated loads of proposed contaminants. • No demonstration has been given to nitrogen loading (from ammonia) that represents 'best practice'/waste minimisation. The proponent should look further at recycling or nutrient stripping. • It would be desirable to establish a works approval conditions for Methanex as based on the Burrup Fertilisers approach. These conditions strive to meet the 99 % species protection levels at the end of pipe, but also acknowledge that part of the proposal involves concentration of incoming seawater, and to allow for this. • EPA has provided guidance for industries wishing to enter the Water Corporation common user facility. They will be required to demonstrate waste minimisation and best practice in relation to the use of the 99 % species protection level.	Considered a relevant environmental factor to ensure that liquid effluent are as low as reasonably practicable and that the proponent can meet Water Corporation and DEP criteria for its wastewater discharge.

Summary of Identification of Relevant Environmental Factors

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		• Methanex will be required to meet effluent conditions on entry to the brine return line. The combined Methanex effluent just upstream of entry to the WC line should meet the 99 % species protection guidelines, or twice the WC seawater intake concentration, whichever is the greater. • A detailed screening analysis is recommended for the effluent upon commissioning and stabilisation of the effluent for use in licence review. • Insufficient data has been provided to characterise the waste streams from plant blowdowns, treated discharges and drains. Please provide options that are available to reduce discharges, particularly of copper and ammonia. Can the saturator blowdown be sent to a small demineralisation plant for retreatment in order to recover the water and separate the copper into a small concentrated wastestream for recovery? • Details of expected discharges from the desalination plant are required for each technology option under consideration. • DEP also request the 'proponent to specify in a table the number of dilutions that will be required to meet the least stringent of the above criteria for each of the toxicants.' **Department of Conservation and Land Management** • There is concern regarding the manual valve of the stormwater system, and the possibility of a failure due to the valve not being operated. CALM recommends that the manual valve be removed and the system designed so that it will still operate as indicated. **Water Corporation** • As part of the Corporation's commitment 6, they require all industrial process plants to provide appropriate toxicity and environmental fate data for all components of the effluent, to the satisfaction of DEP/EPA; and only use DEP/EPA approved process additives. • There is a need for clarity in that wastewater from Methanex will be licensed by DEP before it is accepted into the Corporation's wastewater pipeline.' • Commitments 8.03, 8.06 and 8.14 require (1) realignment in line with the Corporation's Commitments in Bulletin 1044, and (2) require advice from DEP and Water Corporation to ensure the wastewater conforms with the commitments placed on the end of the marine outlet in King Bay. • The PER is silent on the seawater supply and wastewater discharge pipeline system provided by the Corporation. Development of a duplicate seawater supply system will present immense delays for the Methanex Project because	

Summary of Identification of Relevant Environmental Factors

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		they will need to address some critical environmental and social issues. **Conservation Council of Western Australia** • The assessment must include the potential environmental impacts associated with the use of seawater in the production process. It is understood that the proponent intends to use 55ML/day of seawater. • The information presented on wastewater discharge into the marine environment is totally inadequate. It is unacceptable for Methanex to dismiss this issue as being the responsibility of the Water Corporation.	
Solid Waste	There will be a variety of solid wastes during construction and operation that will either be recycled, re-used, returned to the vendor, composted or disposed to landfill. Imported construction waste will be disposed in consultation with AQIS and Regional DEP.	**Department of Environmental Protection** • DEP would not support burning of construction or other wastes. • Encourage waste management planning with a suitable contractor • Follow philosophy of REDUCE, REUSE, RECYCLE.	No further assessment by the EPA will be necessary. Proponent has committed to implementation of waste management plans.
SOCIAL SURROUNDINGS			
Risk and Hazard	A Preliminary Risk Assessment indicates that individual, societal and cumulative risk are within EPA acceptance criteria. The proponent will manage own potential emergency incidents. Knock-on effects on other pipelines within corridors will be undertaken as part of OMP's corridor development plan.	**Department of Environmental Protection** • Can the proponent provide actual data on methanol spills during ship loading, including an estimate of the quantities released and the subsequent environmental impacts, rather than just an F-M curve as shown in Figure 9-3? **Department of Mineral and Petroleum Resources** • Is there a possibility for any interference between activities undertaken by Woodside on the proposed site and site preparation work for the Methanex plant? • Is the measurement of the product pipeline correct? If not, will there be a change in the results of the risk calculations if the size of the pipeline was 1100mm? • It is suggested that the Explosives and Dangerous Goods Division (EDG) of the DMPR and FESA be consulted when sizing the desalinated water storage tank, as the tank is to provide storage for firewater as well as fresh water. • Provide justification as to why the product pipeline should be located above-ground and why the possibility of catastrophic ruptures of the methanol export pipeline were not considered. • It appears that jet fires have not been included in the calculation of risk, as the maximum distance to which the heat radiation levels that could potentially damage equipment is 20m and hence the potential for knock-ons from these	Considered a relevant environmental factor.

Summary of Identification of Relevant Environmental Factors

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		events are assumed to be low. Confirm that this maximum distance was based on the worst credible scenario. If not, is there any event that could potentially have an impact on other items of equipment resulting in escalation? • What is the assumed duration for the depressurisation process in the event of a leak and provide justification for the use of this duration? • Confirm that the risks were calculated for 80-metre sections for the entire length of the pipeline. If not, advise of the appropriateness of the use of an 80-metre section for the calculation of risks from the entire length of the pipeline. • Advise of the appropriateness of not providing additional isolation valves along the length of the pipeline, given that the largest possible inventory that can be released in the event of a major event is approximately $900m^3$. • What other control measures will be provided to limit the size of a release and hence possible consequences? • How will leaks from the pipeline be detected while the pipeline is not being used for transfer operations?' • What consideration has been given to the failure frequency to include the possibility of failures while the pipeline is not being used for transfer operations?' **Fire and Emergency Services Authority** • A Boiling Liquid Expanding Vapour Explosion (BLEVE) and its consequences should be considered and the effects modelled and results included in the PER. • The Proponent does not state to what standard the Detection System will be in accordance with. • AS 2419.1 – Fire Hydrant Installations, which is called up by AS 1940, requires that 50% of the firewater be stored in two or more separate tanks and not a single container. • Hydrant protection should be provided within the above ground pipeline corridor at 200m centres and be readily accessible from the access track so that any fire within the corridor can be prevented from spreading to or from the pipeline. • The risk of a shipping incident occurring can be easily eliminated to zero by closing the Port when a Methanol Tanker or Woodside LNG Carrier is involved in berthing or manoeuvring operations or transiting the Port's approach channels. • Who will respond and operate firefighting facilities within the Complex during	

Summary of Identification of Relevant Environmental Factors

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		an emergency? This should be specified before approval is given to proceed and not prior to commissioning. • A dedicated permanent Fire Service is required to service the Burrup industries. The emergency response therefore needs to be determined at this stage of the approval process and not left to the last minute where Methanex could possibly opt out of its responsibilities by applying undue political and financial pressure on the Government and its Instrumentalities. • The Proponent has not detailed a standard that the water curtain will be required to comply with or what heat flux and its source they expect the system to deal with. • The Proponent should consider firebreaks and access tracks for protection from wildfires which are suitable for a 12 tonne fire appliance rather than an unproven water spray system that may not work due to the lack of water. **Department of Conservation and Land Management** • There will be inadequate resources to deal with emergency situations at the plant or in the services to and from the plant. If an emergency occurs that the plant has to deal with, the proponent will need to ensure that there will still be adequate numbers of people to handle both the emergency as well as keep the plant operational under these conditions. • There are concerns that there will be pressure put on fire managers to put the fire out from the plant staff as it may be adversely impacting on plant production. CALM recommends a commitment be made that all emergencies associated with the plant will not require assistance from outside emergency services and that there will be no demands made on managers of adjacent lands to extinguish any fires. • Consideration should be given to funding of permanent positions in this area.	
Traffic Management	Current access to the project site is made via Village Road. This road is sealed until the edge of the project site where it is unsealed and forms a track across the site providing access to Cowrie Cove. Traffic flows along Burrup Road and Village Road will increase during construction. Potential cumulative impacts with other industry who may commence construction at the same time.	**Main Roads Western Australia** • Work undertaken within the Burrup Road-road reserve is to be done to MRWA's requirements. • Works undertaken within the Burrup Road-road reserve is to be done in accordance with a MRWA approved Traffic Management Plan.	No further assessment by the EPA will be required in view that the proponent will commit to a Traffic Management Plan as approved by Main Roads

Summary of Identification of Relevant Environmental Factors

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
	Short delays may be experienced. Traffic increase will be minimal during operation.		
Visual Amenity	The complex will be visible from most view points surrounding the industrial area. At the southern end of Hearson Cove, low water mark, only the very tops of structures are visible. Majority of the complex is concealed. Methanol product pipeline will be above ground to facilitate maintenance inspections.	**Department for Planning and Infrastructure** • Use of fill to raise the plant, it may be possible to undertake strategic planning outside the boundary that may help screen the complex from Hearson Cove. The use of local species in the landscaping plan is supported. • light spill only addresses impacts on turtles and not other species. • The PER does not provide any evidence as to how residents are likely to respond to the visibility of the complex. • The PER does not provide a description of the landscape, including its visual character. Need to describe dominant colours of landscape to propose a colour scheme for structures, and describe visually dominant plants to recommend several species for screen planting e.g. on the dune at Hearson Cove. • There is no indication of the actual colour to be chosen. • There is no reference to the possibility of screening views from Hearson Cove, eg by additional planting at the back or top of the natural dune. • The PER should have provided additional photo images of views from Hearson Cove, including from the shoreline itself and from the water. **Department of Conservation and Land Management** • AS4282 'Control of Obtrusive Effects of Outdoor Light' should be used as guide, but consideration should be given to improving on this standard where possible to eliminate light spill. **Conservation Council of Western Australia** • The visual amenity of the King Bay - Hearson Cove area must be assessed through the cumulative impact assessment process.	Considered a relevant environmental factor. Amenity at Hearson Cove is an important social issue, as Hearson Cove is currently the only two wheel drive accessible beach on the Burrup.
Recreation	The methanol complex is located within a kilometre of Hearson Cove and south of Cowrie Cove. The access track to Cowrie Cove traverses over the project site and will need to be removed.	**Department of Environmental Protection** • There is strong community expectation that, if the project does go ahead, the loss of community amenity should be recognised and addressed. **Department for Planning and Infrastructure** • The Department supports the work being undertaken to provide an alternative access to Cowrie Cove. The loss of access to previously used beaches is undesirable, especially given the pressures on recreational facilities in the townsites. • The PER needs to acknowledge that Hearson Cove is the only easily accessible swimming beach for the townsites of Dampier and Karratha.	No further assessment by the EPA is required as the proponent is working with OMP in regard to the provision of alternative access to Cowrie Cove.

Summary of Identification of Relevant Environmental Factors

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		Department of Conservation and Land Management • There is a lack of recreation sites on the Burrup and there is concern that alternative access to Cowrie Cove will not be provided as there is no commitment in this document or elsewhere to provide this access. If no alternative access is provided t it is likely that an alternative route will be created to Cowrie Cove illegally. • It is recommended as a condition of project approval alternative access is required to be provided to Cowrie Cove. This access should be as indicated in the Recreation and Tourism Masterplan completed by CALM.	
Aboriginal Heritage	Cultural surveys are still being undertaken by the proponent. Impact assessment was based upon previous surveys of the area by Vinnicombe (1997). Based on Vinnicombe (1997) nine sites (2 unregistered; 7 registered) will be impacted by the proposal, five other sites (3 unregistered, 2 registered) may be impacted.	**Department of Environmental Protection** • Potential impact on petroglyphs from the dry deposition of oxides of nitrogen is of concern. **Department of Conservation and Land Management** • Major concerns in regard to cumulative emissions and impacts on rock art. • CALM would like to be assured that the EPA considers in its recommendation that emissions from the plant, on a cumulative basis, will not adversely impact on Aboriginal rock art. **Conservation Council of Western Australia** • Assessment must ensure that there is no degradation of aboriginal values and that any assessment is consistent with the wishes of traditional owners. • Demonstrate that the Aboriginal people involved in meetings/ consultation were adequately equipped with the necessary understanding of the environmental issues at stake. • Unacceptable that Methanex claims they will undertake archaeological surveys and make ethnographic consultation prior to construction. Why has this work not been done already?' **Anonymous Submission** • Recommended that chemical and other scientific analysis of the interaction between potential emissions and local rocks, or other materials of Aboriginal cultural and heritage significance be undertaken. • No comprehensive integrated regional assessment has been carried out on the nature of full extent of this impact. It is recommended that a fully integrated regional review be conducted of the impact on indigenous heritage of proposed industrial projects on the Burrup Peninsula. • Although sites have been categorised in broad terms of composition in the PER they have not been graded in any meaningful sense in terms of potential	Considered a relevant environmental factor. All cultural surveys are yet to be completed by the proponent. Impacts from acidic deposition have been considered elsewhere by the EPA.

Summary of Identification of Relevant Environmental Factors

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		impact. There has been no attempt to identify the relative importance of any particular site in terms of relative cultural significance or number of engravings. It is not possible to determine from the information available in the PER the relative impact vulnerability of individual sites in the area. It is recommended that a comprehensive independent review be carried out of all sites potentially affected by the development to establish the relative cultural and archaeological significance of each site. • Of particular concern are those sites, which lie in currently undisturbed areas, in particular, the area extending into the low hills from the North West of the site. It is recommended that a comprehensive independent cultural and archaeological survey be carried out to identify and clearly locate all sites of significance proximate to the proposed Methanex development. • The PER does not take into account other developments (pipelines, service corridors, and construction of seawater pipeline and brine return line). It is recommended that a comprehensive, integrated and independent review document be prepared, which clearly identifies potential impacts on Aboriginal cultural and heritage of the proposed Methanex development as a whole. • This potential impact from a 27-month construction period must be carefully monitored and managed. It is recommended that a continuous monitoring program of Aboriginal cultural and heritage sites be instituted to minimise harmful impacts. • The significance of Aboriginal cultural and heritage sites on the Burrup means that the maximum possible protection should be accorded to those sites. Given the past often unhappy experiences of industrial development for Aboriginal people, maximum indigenous involvement is essential to minimise concerns. Thus, Aboriginal representatives should be included in all possible reviews and as part of the workforce at the Methanex development should it proceed.	
OTHER (IDENTIFIED BY PER)			
Accommodation	The construction workforce is expected to peak at 1000 and the operation workforce will be up to 150. There is a current lack of established housing in Karratha and Dampier. It is noted that sufficient land is available for building.	**Pilbara Development Commission** • It is an unacceptable solution for Methanex to accommodate its project workforce through the private housing market, or rely on existing accommodation stock in the Karratha/Dampier area. • The proponent should make firm commitments regarding the project's accommodation requirements, eg it will construct new accommodation for the project's construction *and* operations workforce. • The accommodation required for the project's operations workforce should be	No further assessment by the EPA will be required. The proponent is a member of the Nickol Bay Accommodation Taskforce and is involved in ongoing discussions in regard to accommodation. A workforce profile will be developed and forwarded to relevant planning

Summary of Identification of Relevant Environmental Factors

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		more detailed than expressed in the Review. **Department for Planning and Infrastructure** • Generally the 'Accommodation' section is vague and does not detail how the construction workforce is to be accommodated, other than it is unlikely to rely on the private market. • The proponent should provide additional information on the workforce accommodation once the full detail is known. • Information should be presented to the Western Australian Planning Commission's Infrastructure Coordinating Committee for consideration.	stakeholders.
Services and Facilities	Certain facilities including day care, general practitioner (GP) services, some recreational clubs/facilities and emergency services may struggle to support the community with an increasing population and will be placed under greater pressure. Some services and facilities have an existing problem and are currently under pressure. This may be exacerbated with increased population from industry.	**Pilbara Development Commission** • Methanex should consult with the Nickol Bay Infrastructure Committee to enable a coherent strategy to be developed with government agencies to meet the service and facilities requirements of the workforce. • Also of importance during the project's construction and operations phase is the input of local businesses. Local businesses and contractors should benefit from the project and the proponents needs to have a concerted awareness campaign among Karratha and Dampier businesses of what the supply requirements will be for the project. • The proponent should work with the Karratha and Districts Chamber of Commerce and Industry to maximise local business benefits.	No further assessment by the EPA will be required. The proponent will develop a workforce profile and forward it to relevant planning stakeholders. The proponent is a member of the Karratha and Districts Chamber of Commerce and Industry.

Appendix 4

Recommended Environmental Conditions and Proponent's Consolidated Commitments

Statement No.

Recommended Environmental Conditions

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

METHANOL COMPLEX, BURRUP PENINSULA

Proposal: The construction and operation of a methanol complex (consisting of two nominal 6,000 tonne per day methanol plants, two air separation units, 220,000 tonnes of methanol storage and a desalination plant); transport of raw materials and products to and from the plant site; and ship loading operation at Dampier Port.

The first methanol plant will be a Lurgi Oel-Gas-Chemie plant utilising the "latest generation technology" as documented in schedule 1 of this statement. The complex will use North West Shelf Gas for energy and as feedstock for the process.

Proponent: Methanex Australia Pty Ltd

Proponent Address: Level 8, QV1 Building,
250 St George's Terrace, PERTH WA 6000

Assessment Number: 1405

Report of the Environmental Protection Authority: Bulletin 1077

The proposal referred to above may be implemented subject to the following conditions and procedures:

Procedural conditions

1 Implementation and Changes

1-1 The proponent shall implement the proposal as documented in schedule 1 of this statement subject to the conditions of this statement.

Published on

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 and Heritage 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 and Heritage determines, on advice of the Environmental Protection Authority, is not substantial, the proponent may implement those changes upon receipt of written advice.

2 Proponent Commitments

2-1 The proponent shall implement the 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 the conditions in this statement.

3 Proponent Nomination and Contact Details

3-1 The proponent for the time being nominated by the Minister for the Environment and Heritage 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 and Heritage has exercised the Minister's power under section 38(7) of the Act to revoke the nomination of that proponent and nominate another person as the proponent for the proposal.

3-2 If the proponent wishes to relinquish the nomination, the proponent shall apply for the transfer of proponent and provide a letter with a copy of this statement endorsed by the proposed replacement proponent that the proposal will be carried out in accordance with this statement. Contact details and appropriate documentation on the capability of the proposed replacement proponent to carry out the proposal shall also be provided.

3-3 The nominated proponent shall notify the Department of Environmental Protection of any change of contact name and address within 60 days of such change.

4 Commencement and Time Limit of Approval

4-1 The proponent shall provide evidence to the Minister for the Environment and Heritage within five years of the date of this statement that the proposal has been substantially commenced or the approval granted in this statement shall lapse and be void.

Note: The Minister for the Environment and Heritage will determine any dispute as to whether the proposal has been substantially commenced.

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

The application shall demonstrate that:

- the environmental factors of the proposal have not changed significantly;
- new, significant, environmental issues have not arisen; and
- all relevant government authorities have been consulted.

Note: The Minister for the Environment and Heritage may consider the grant of an extension of the time limit of approval not exceeding five years for the substantial commencement of the proposal.

Environmental conditions

5 Compliance Audit and Performance Review

5-1 The proponent shall prepare an audit program in consultation with and submit compliance reports to the Department of Environmental Protection which address:

- the implementation of the proposal as defined in schedule 1 of this statement;
- evidence of compliance with the conditions and commitments; and
- the performance of the environmental management plans and programs.

Note: Under sections 48(1) and 47(2) of the *Environmental Protection Act 1986*, the Chief Executive Officer of the Department of Environmental Protection is empowered to audit the compliance of the proponent with the statement and should directly receive the compliance documentation, including environmental management plans, related to the conditions, procedures and commitments contained in this statement.

Usually, the Department of Environmental Protection prepares an audit table which can be utilised by the proponent, if required, to prepare an audit program to ensure that the proposal is implemented as required. The Chief Executive Officer is responsible for the preparation of written advice to the proponent, which is signed off by either the Minister or, under an endorsed condition clearance process, a delegate within the Environmental Protection Authority or the Department of Environmental Protection that the requirements have been met.

5-2 The proponent shall submit a performance review report every five years after the start of the operations phase, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority, which addresses:

- the major environmental issues associated with the project; the targets for those issues; the methodologies used to achieve these; and the key indicators of environmental performance measured against those targets;
- the level of progress in the achievement of sound environmental performance, including industry benchmarking, and the use of best available technology where practicable;
- significant improvements gained in environmental management, including the use of external peer reviews;
- stakeholder and community consultation about environmental performance and the outcomes of that consultation, including a report of any on-going concerns being expressed; and
- the proposed environmental targets over the next five years, including improvements in technology and management processes.

6 Decommissioning Plans

6-1 Prior to construction, the proponent shall prepare, and subsequently implement, a Preliminary Decommissioning Plan, which provides the framework to ensure that the site is left in an environmentally acceptable condition to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

The Preliminary Decommissioning Plan shall address:

1) rationale for the siting and design of plant and infrastructure as relevant to environmental protection, and conceptual plans for the removal or, if appropriate, retention of plant and infrastructure;

2) a conceptual rehabilitation plan for all disturbed areas and a description of a process to agree on the end land use(s) with all stakeholders;

3) a conceptual plan for a care and maintenance phase; and

4) management of noxious materials to avoid the creation of contaminated areas.

6-2 At least six months prior to the anticipated date of decommissioning, or at a time agreed with the Environmental Protection Authority, the proponent shall prepare a Final Decommissioning Plan designed to ensure that the site is left in an environmentally acceptable condition to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

The Final Decommissioning Plan shall address:

1) removal or, if appropriate, retention of plant and infrastructure in consultation with relevant stakeholders;

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 and proposed management measures to relevant statutory authorities.

6-3 The proponent shall implement the Final Decommissioning Plan required by condition 6-2 until such time as the Minister for the Environment and Heritage determines, on advice of the Environmental Protection Authority, that the proponent's closure responsibilities are complete.

6-4 The proponent shall make the Final Decommissioning Plan required by condition 6-2 publicly available, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

7 Greenhouse Gas Emissions Management Plan

7-1 Prior to commencement of construction of the plant, 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

- 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 Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

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) and comparison with the efficiencies of other comparable projects producing a similar product;

5) 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; and
- international flexibility mechanisms.

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 part 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; and

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 to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

7-3 The proponent shall make the Greenhouse Gas Emissions Management Plan required by condition 7-1 publicly available, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

8 Gaseous Emissions

8-1 Prior to submitting a Works Approval application for the first methanol plant, the proponent shall:

1) review and as necessary modify stack locations, heights, velocities and/or temperatures to preclude the effects of building wakes on gas plumes and to optimise plume rise; and
2) assess and where practicable implement effective measures in addition to those referred to in (1) above to further reduce the impact of gas plumes on elevated terrain,

to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

8-2 At least two months prior to submitting a Works Approval application for the second (nominal 6,000 tonne per day) methanol plant, the proponent shall submit a comprehensive report that includes:

1) the engineering design details for gaseous emissions, including stack heights, stack diameters, exit temperatures and exit velocities;
2) the estimated emissions of oxides of nitrogen and any other significant gaseous pollutants, under normal and worst case conditions; and
3) air dispersion modelling of oxides of nitrogen emissions, and other pollutants as required, to predict ground level concentrations within the region,

to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

8-3 At least two months prior to submitting a Works Approval application for the second (nominal 6,000 tonne per day) methanol plant, the proponent shall provide a comprehensive report to demonstrate that:

- the proposed technology is consistent with the "best practicable technology" (see note 3 at foot of statement), particularly with respect to oxides of nitrogen emissions, and that the proposed gaseous emissions meet current industry standards for similar operations in developed countries; and
- all feasible options (process/technology improvement and oxides of nitrogen control measures) to further minimise oxides of nitrogen emissions have been considered,

to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

8-4 The proponent shall incorporate the relevant design features arising from the reports and investigations required by conditions 8-1, 8-2 and 8-3, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

9 Brine and Wastewater Discharge

9-1 Prior to commissioning of the first methanol plant, and subject to availability of the Water Corporation's baseline seawater quality data, the proponent shall:

1) determine, for all non-negligible contaminants and nutrients, the total annual loads of contaminants and nutrients in the combined brine and wastewater discharge exiting the methanol complex (including contaminant and nutrients in the seawater intake); and
2) determine (for normal and worst case conditions) the concentrations of contaminants and nutrients (for agreed averaging periods) in the combined brine and wastewater discharge exiting the methanol complex,

to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

9-2 Prior to submitting a Works Approval application for the first methanol plant, the proponent shall demonstrate that the proposed brine and wastewater discharge from the methanol complex meets "best practicable technology" and waste avoidance/minimisation principles for heavy metals, including copper, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

9-3 Prior to submitting a Works Approval application for the first methanol plant, the proponent shall confirm that the proposed concentrations for all heavy metals, including copper, in the combined brine and wastewater discharge from the methanol complex (under normal and worst-case operations), meets (in order of preference):

- the ANZECC/ARMCANZ (2000) 99% species protection level just prior to entry to the multi-user brine and wastewater discharge system; or
- the ANZECC/ARMCANZ (2000) 99% species protection level at the edge of the approved mixing zone (currently 0.01 square kilometres), without consideration of dilution from other system users; or
- meet other limits, as determined by the Environmental Protection Authority on the basis of the regional background concentrations contaminants in seawater and/or on the basis of a comprehensive report (by or audited by an independent expert approved by the Environmental Protection Authority) demonstrating that the proposed discharge represents "best practicable technology";

to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

9-4 At least two months prior to submitting a Works Approval application for the second (nominal 6,000 tonne per day) methanol plant, the proponent shall conduct a review to:

1) characterise the physico-chemical composition and flowrate of all process wastewater streams within the methanol complex, including the desalination plant;

2) determine, for all non-negligible contaminants and nutrients, the total annual loads of contaminants and nutrients in the combined brine and wastewater discharge exiting the methanol complex (including contaminant and nutrients in the seawater intake); and
3) determine (for normal and worst case conditions) the concentrations of contaminants and nutrients (for agreed averaging periods) in the combined brine and wastewater discharge exiting the methanol complex,

to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

9-5 At least two months prior to submitting a Works Approval application for the second (nominal 6,000 tonne per day) methanol plant, the proponent shall demonstrate that the brine and wastewater discharge from the methanol complex meets "best practicable technology" and waste avoidance/minimisation principles for contaminants and nutrients, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority

9-6 At least two months prior to submitting a Works Approval application for the second (nominal 6,000 tonne per day) methanol plant, the proponent shall confirm that the proposed contaminant concentrations in the combined brine and wastewater discharge from the methanol complex (under normal and worst-case operations) meets (in order of preference):

- the ANZECC/ARMCANZ (2000) 99% species protection level just prior to entry to the multi-user brine and wastewater discharge system; or
- the ANZECC/ARMCANZ (2000) 99% species protection level at the edge of the approved mixing zone (currently 0.01 square kilometres), without consideration of dilution from other system users; or
- meet other limits, as determined by the Environmental Protection Authority on the basis of the regional background concentrations contaminants in seawater and/or on the basis of a comprehensive report (by or audited by an independent expert approved by the Environmental Protection Authority) demonstrating that the proposed discharge represents "best practicable technology";

to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority

9-7 Prior to submitting a Works Approval application for the second (nominal 6,000 tonne per day) methanol plant, the proponent shall confirm that the proposed load of nutrients will cause no resultant detectable change beyond natural variation in the diversity of the species and biological communities and abundance/biomass of marine life, beyond the designated mixing zone, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

10 Noise

10-1 Prior to construction, the proponent shall submit a Construction Noise Management Plan to minimise impacts on the amenity of Hearson Cove resulting from construction activities associated with the proposal, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

This Plan shall include:

1) noise monitoring;

2) complaint management procedures; and

3) routine operating procedures to be adopted for particular activities to keep noise below the estimated levels.

10-2 The proponent shall implement the Construction Noise Management Plan required by condition 10-1 to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

10-3 In the design phase, prior to awarding contracts for major noisy plant items (including items listed in the PER, SKM 2002, Table 8-30), the proponent shall submit a Noise Management Plan prepared or audited by a mutually acceptable independent acoustic engineer approved by the Environmental Protection Authority, to minimise impacts on the amenity of Hearson Cove resulting from activities associated with the proposal, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

This Plan shall include:

1) identification of all practicable measures to further minimise noise at Hearson Cove;

2) an acoustic model of the plant;

3) noise monitoring;

4) complaint management procedures; and

5) routine operating procedures to be adopted for particular activities to keep noise below the estimated levels.

10-4 The proponent shall implement the Noise Management Plan required by condition 10-3 to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

10-5 The proponent shall make the Noise Management Plan required by condition 10-3 publicly available to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

11 Visual Impacts

11-1 Prior to construction, the proponent shall prepare a Preliminary Visual Amenity Management Plan to provide a framework to ensure that impacts on the visual amenity of Hearson Cove will be minimised by consideration of the aesthetics of plant design and layout, and including options such as:

- adoption of a suitable colour paint theme for the complex which blends in with the surrounds; and
- appropriate screening of the complex with vegetation, bunding or other means,

to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

11-2 During final design and within 12 months following the commencement of construction, the proponent shall prepare the Final Visual Amenity Management Plan, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority

11-3 The proponent shall implement the Final Visual Amenity Management Plan required by condition 11-2, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

11-4 The proponent shall make the Final Visual Amenity Management Plan required by condition 11-2 publicly available to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

12 Work Practices

12-1 Prior to commencement of construction, the proponent shall submit 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 Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

12-2 The proponent shall ensure that the prescription of work practices required by condition 12-1 is implemented.

Procedures

1 Where a condition states "to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority", the Chief Executive Officer of the Department of Environmental Protection will obtain that advice for the preparation of written advice to the proponent.

2 The Environmental Protection Authority may seek advice from other agencies, as required, in order to provide its advice to the Chief Executive Officer of the Department of Environmental Protection.

Notes

1 The Minister for the Environment and Heritage will determine any dispute between the proponent and the Environmental Protection Authority or the Department of Environmental Protection over the fulfilment of the requirements of the conditions.

2 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 1986*.

3 With respect to "best practicable technology", "practicable" means "reasonably practicable having regard to, among other things, local conditions and circumstances (including costs) and to the current state of technical knowledge".

Schedule 1

The Proposal (Assessment No. 1405)

The proposal is to construct and operate a methanol complex on the Burrup Peninsula, approximately 1300 kilometres north of Perth. The location of the complex is in the King Bay-Hearson Cove Industrial Area, as shown in Figure 1 (attached). The project lease has an area of approximately 100 hectares of which approximately 84 hectares will be cleared.

The complex will comprise two 6,000 (nominal) tonne per day methanol plants. The first methanol plant will be a Lurgi Oel-Gas-Chemie plant utilising the "latest generation technology". The complex also includes two air separation units, methanol storage of 220,000 tonnes, a desalination plant, transport of raw materials and products to and from the plant site, and a ship loading operation at Dampier Port. Construction of the second plant is not expected to be completed until 2010, depending on the methanol market.

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

Table 1: Key Proposal Characteristics

Characteristic	Description
Project purpose	To produce methanol from natural gas using "latest generation technology".
Project life	Over 25 years.
Complex capacity	Maximum of 5 million tonnes per annum from two production plants.
Lease Area	Approx 100 hectares.
Site area (Area of disturbance)	Approx 56 hectares for two plants and 28 hectares for expansion. Total of approximately 84 hectares.
Complex facilities	
Process plant	2 x 6,000 tonne per day methanol production plants.
Air separation unit	2 x 3,000 tonne per day oxygen cryogenic air separation units.
Product storage	4 x 55,000 tonne storage tanks, 4 rundown tanks and 2 crude methanol tanks.
Power generation	30 megawatt/plant primary and 5 megawatt emergency generation.
Water systems	Desalination for up to 15 megalitres perday of fresh water for potable, steam systems and cooling tower make-up. Demineralisation systems to produce high pressure steam quality water.
Steam generation	Three level steam system (125, 50 and 5 bar gauge) generated from heat recovery and auxiliary boilers.
Utilities	Instrument and plant air systems. Wastewater treatment systems for domestic, process and contaminated stormwater. Nitrogen reticulation from the air separation unit.
Support facilities	Administration, maintenance, laboratory, emergency response & control room facilities.
Complex operation	24 hours per day for 365 days per year
Complex reliability	Each plant will require a shutdown for catalyst replacement and predictive and preventative maintenance once each 3-4 years. (The design case is for an average 350 operational days over a 3 year period.)
Seawater requirements	Up to 55 megalitres per day.
Natural gas input	About 400 terajoules per day for two plants
Natural gas pipeline	1100 mm diameter nominal pipeline.
Product export pipeline	750 mm diameter insulated pipeline (above ground) from the

Characteristic	Description	
	proposed site to the Port (approximately 5 kilometres).	
Port facilities	Two berths, dedicated and/or shared, for the total facility production provided by the Dampier Port Authority.	
Complex efficiency	33 – 35 gigajoules per tonne of methanol (high heating value)	
Construction period	27 months for the first plant.	
Workforce	1000 at peak construction, up to 150 for normal operation.	
Catalysts		
Desulphurisation	Cobalt Molybdenum/ Nickel Molybdenum hydrogenation and Zinc Oxide desulphurisation catalysts.	
Reforming	Nickel steam reforming catalyst.	
Synthesis	Copper methanol synthesis catalyst.	
Noise	65 dB(A) at the lease boundary.	
Solid wastes	Waste generated from operation of two plants.	
Collected by contractor for recycling/re-use and disposal	Batteries, paper, cardboard, sludge and solvents – about 80 tonnes per year. Scrap metal about 104 tonnes every 3 to 4 years (turnaround). Waste oil – about 44 kilolitres every 3 to 4 years (turnaround).	
Returned to vendor	Catalyst waste. – about 640 tonnes every 3 to 4 years (turnaround).	
Landfill	Fluorescent tubes, lamps – about 2000 in number every year. General refuse – about 150 tonnes per year Ceramic fibres – about 80 tonnes every 3 to 4 years (turnaround).	
Recycled	Glass, plastics and chemicals – about 2.3 tonnes per year.	
Composted	Organic waste – about 0.4 tonnes per year.	
Wastewater		
Brine, Treated Wastewater & Cooling Tower Blowdown	Up to 45 megalitres per day.	
Brine	Up to 44,000 kilolitres per day.	
	Discharge on entry to return system (milligrams per litre)	Calculated annual load to return line (kilograms per year)
Total Dissolved Solids	55,000	-
Anti-scalants	3.82	50,380
Anti-foaming agent	0.32	4,220
Cooling tower blowdown	Up to 900 kilolitres per day.	
	Maximum discharge on entry to Methanex' brine return line (milligrams per litre)	Calculated annual load to return line (kilograms per year)
Copper	Negligible.	
Zinc	1	160
Phosphate	9	1,420
Total Phosphorus	3	470
Neutralising Amines	0.3	50
Polymeric Dispersants	16	2,510
Free Biocides	Zero.	Zero.
Treated Wastewater	Up to 700 kilolitres per day.	
	Maximum discharge on entry to Methanex' brine return line (milligrams per litre)	Calculated annual additional load to return line (kilograms per year)
Free chlorine	0	0
Total hydrocarbons	10	2,080
Methanol	15	3,120
Copper	0.5	50
Nickel	1	100
Zinc	1	100
Chemical Oxygen Demand	100	20,800

Characteristic	Description		
Ammonium	10		1,460
Total Nitrogen	10		1,460
Note: Annual load based on average conditions and does not include background concentrations in seawater. Levels of Chemical Oxygen Demand discharged based on average conditions. No data for maximum conditions.			
Domestic	Up to 10 kilolitres per day. Irrigated on landscaped areas.		
Biological Oxygen Demand	20 milligrams per litre		
Total suspended solids	30 milligrams per litre		
Coliforms	<1000 colony-forming units per 100 millilitres (thermotolerant coliforms)		
Stormwater	Dual stormwater system: ▪ Stormwater directed to a stormwater pond for analysis, treatment or discharged to clean stormwater system depending on results. ▪ Stormwater pond sized to contain first 100 mm of any storm event with minimum capacity of 20,000 cubic meters. ▪ Run-off subsequent to the first 100 mm will be diverted into the clean stormwater system. ▪ Clean stormwater directed through interceptors into natural watercourses. Discharge to natural watercourses via a weir or other design in such a way to prevent erosion. ▪ Stormwater in the bunded areas will be analysed prior to discharge. If contaminated, it is directed to the stormwater pond and if clean, to the clean stormwater system.		
Total dissolved solids	1000 milligrams per litre		
pH	6-9		
Total suspended solids	10 milligrams per litre		
Note: All analysis to be based on 24 hour composite samples unless otherwise agreed.			
Approximate gaseous emissions	Estimated Maximum Rate (kilograms per hour)	Calculated per tonne methanol (kilograms per tonne of methanol)	Calculated Annual Load (tonnes per year)
NO_x	483	0.35	1,745
SOx	3.2	Nil	1.7
CO	1,052	0.1	553
VOC	3.9	0.22	1,121
PM_{10}	2.5	Nil	Nil
CO_2	254,310	410	2.0 million
Greenhouse Gas Intensity	0.35 – 0.45 tonne CO_2 per tonne of methanol, on average 0.41 with 2.1% CO_2 gas.		
Note. Atmospheric emissions based on best conservative estimates from preliminary FEED for two nominal 6,000 tonne per day production plants. Greenhouse gas emissions are expected and approximate emissions from maximum production of 5 million tonnes per annum determined over the life cycle of the methanol conversion catalyst. Annual loads calculated assuming average 350 normal operating days per year.			

Figure 1. Project location (attached).

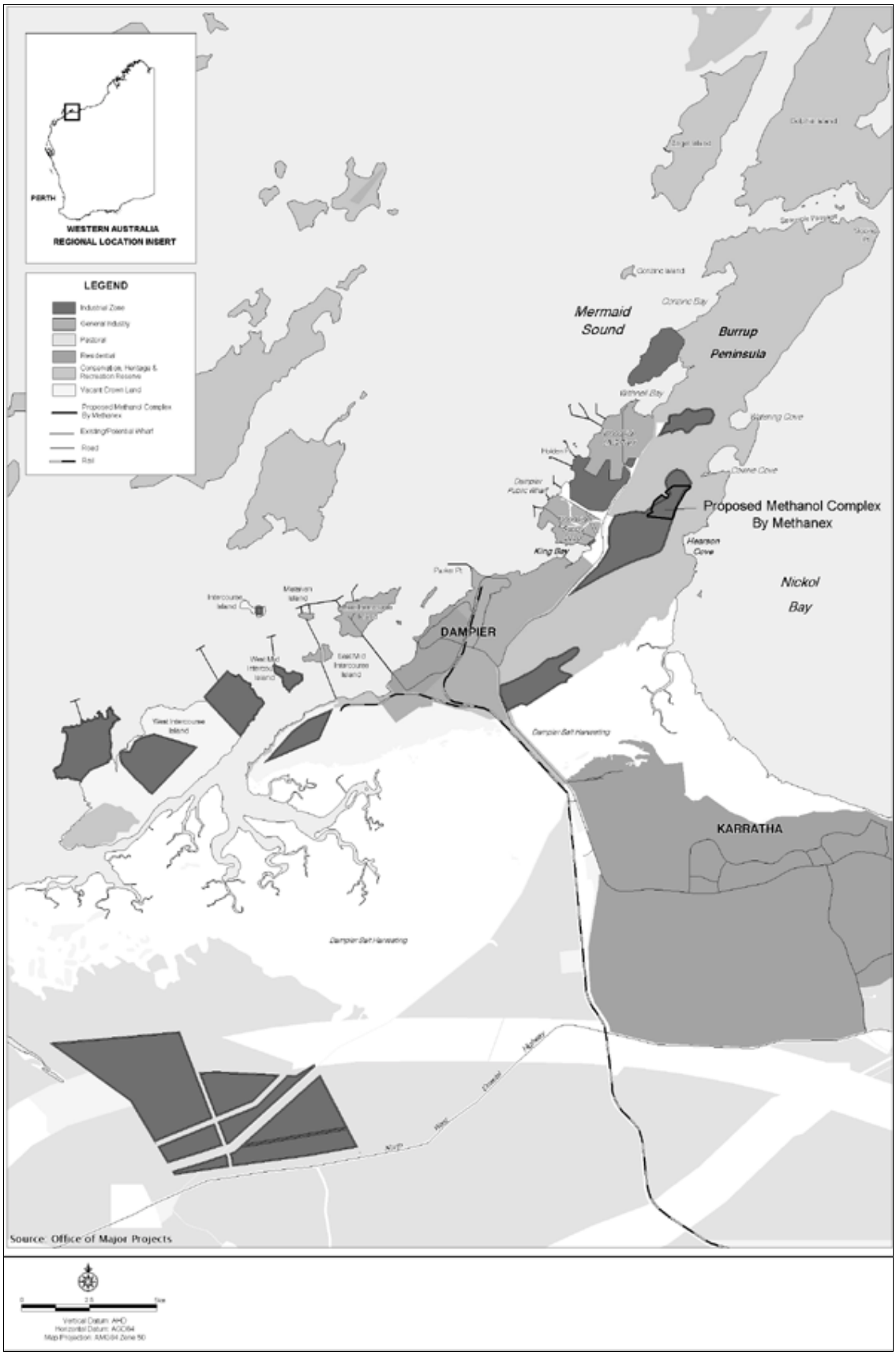

Figure 1: Project Location

Schedule 2

Proponent's Environmental Management Commitments

15 November 2002

METHANOL COMPLEX, BURRUP PENINSULA
(Assessment No. 1405)

METHANEX AUSTRALIA PTY LTD

Proponent's Consolidated Environmental Management Commitments (Assessment No. 1405)

No.	Topic	Description	Objective	Timing	Advice
1	Detailed Design Environmental Management	Report on the outcomes of the plant optimisation/detailed design process which includes: • Terrestrial flora and fauna; • Cultural heritage; • Noise emissions; • Atmospheric emissions; • Hazardous materials; • Risk; and • Visual amenity of Hearson and Cowrie Coves	To minimise further the impact on the environment through the plant optimisation/detailed design process and confirm compliance with regulatory guidelines.	Pre-construction	
1.1	Terrestrial Flora and Fauna	Review the final complex layout to: • minimise the envelope of disturbance particularly to vegetation of high or moderate significance; • minimise disturbance to vegetation units Er and BaEveTe as far as practicable; and • protect rockpile habitats where practicable.	To minimise impacts on vegetation communities in a regional context and impacts on Priority flora	Pre-construction	CALM
1.2	Cultural Heritage	Undertake cultural heritage surveys and report on the results and recommendations of archaeological and ethnographical surveys of the project site.	To minimise impacts on areas considered being of Aboriginal heritage and cultural significance.	Pre-construction	DIA
1.3	Noise	1. Re-evaluate noise emissions from the complex to: • confirm compliance with boundary noise criteria and to determine the contribution of noise at Hearson Cove; and • ensure that noise levels will meet 65 dB(A) LA10 at the boundary and that where feasible and practicable implement noise attenuation measures to improve on this level to minimise noise at Hearson Cove. 2. Utilise the expertise of an acoustic engineer to ensure that the best feasible and practicable noise attenuation measures are included during the final design of the methanol complex; 3. Upgrade the noise data sheets for plant equipment to include sound power and sound pressure levels in accordance with the recommendations made in the report on the Review of Lurgi's Noise Assessment of the Methanex Plant by SVT Engineering Consultants of October 2002.	To confirm compliance with boundary noise criteria and to reduce, where practicable, the contribution to noise at Hearson Cove.	Pre-commissioning	
1.4	Atmospheric Emissions	Investigate the optimum solution for the fuel and energy balance of the plant with a view to minimise the overall emissions from the complex where practicable.	To minimise atmospheric emissions where practicable and comply with relevant guidelines.	Pre-construction	

No.	Topic	Description	Objective	Timing	Advice
1.5	Hazardous Materials	Design all chemical and product storage bunds with sufficient capacity to contain the volume of the content of the largest tank and to contain 24 hours of rainwater for a 1-in-100 year 24hr event (ie additional 144mm).	To comply with relevant guidelines and conditions and to provide sufficient additional capacity to minimise the potential for overflows.	Pre-construction	MPR
1.6	Risk	Undertake a Quantitative Risk Assessment of the final detailed design of the complex, product pipeline and product loading activities.	To comply with relevant guidelines and minimise potential impacts on public safety.	Pre-commissioning	MPR
1.7	Visual Amenity of Hearson and Cowrie Coves	Investigate and implement feasible and practicable on site options to minimise the visual impact of the complex on amenity including: • Selection of colour of paint work in consideration of existing landscape colours, and heat reflective capabilities, etc; • Appropriate screening (Landscaping plan); and • Improvement on Australian Standard 4282 "Control of Obtrusive Effects of Outdoor Light," where practicable.	To ensure that impacts on amenity are minimised.	Pre-commissioning	
2	Construction Environmental Management	Develop a Construction and Pre-commissioning Environmental Management Programme that includes the following plans and actions: 1. Flora and Vegetation Management Plan; 2. Landscaping Plan; 3. Fauna Management Plan; 4. Erosion and Sediment Control Plan; 5. Dust Management Plan; 6. Noise Management Plan; 7. Solid Waste Management Plan; 8. Liquid Waste Management Plan; 9. Hazardous Materials Management Plan; 10. Pre-commissioning Management Plan; 11. Construction Safety Management Plan; 12. Cultural Heritage Plan; 13. Traffic Management Plan; and 14. Cyclone Contingency Plan. 15. Complaint Management Plan Implement the Construction and Pre-commissioning Environmental Management Programme.	To manage all relevant environmental factors associated with the construction phase of the project.	Pre-construction Construction	 CALM CALM, SoR CALM, WAM CSLC MPR AQIS MPR MPR, FESA, CALM DIA MRWA, SoR, FESA MPR, FESA

No.	Topic	Description	Objective	Timing	Advice
2.1	Terrestrial flora	Prepare a Flora and Vegetation Management Plan that includes: • results and recommendations of a wet season vegetation survey (provided sufficient rainfall prior to construction); • site clearance procedures; • consultation with CALM for managing impacts on Priority flora; and • weed management. Implement the Flora and Vegetation Management Plan	To document additional flora species, minimise impacts on vegetation communities in a regional context and manage construction impacts on vegetation, flora and particularly Priority Flora.	Pre-construction Construction	CALM
2.2	Terrestrial flora	Prepare a Landscaping Plan that includes: • consultation with CALM for re-establishing local native flora, including Priority Flora; • procedures to backfill and level all temporary excavations and pits; • a strategy to source fill from the project site where possible; and • procedures to obtain approval from the Shire of Roebourne if additional fill is required. Implement the Landscaping Plan	To maintain species abundance and minimise impacts on visual amenity.	Pre-construction Construction	CALM SoR
2.3	Terrestrial fauna	Prepare a Fauna Management Plan that includes: • results of a pre-construction fauna survey that catalogues the presence and quantity of the pebble mound mouse; • procedures for fauna handling and evacuating procedures; • procedures to control introduced species; and • procedures for ensuring disturbance is kept within designated areas of the project site. Implement the Fauna Management Plan	To monitor the presence of significant fauna.	Pre-construction Construction	WAM CALM
2.4	Erosion	Prepare an Erosion and Sediment Control Plan that includes procedures for erosion control, monitoring and reporting of the performance of drainage systems. Implement the Erosion and Sediment Control Plan	To minimise erosion within the site during construction and prevent off-site deposition.	Pre-construction Construction	CSLC
2.5	Dust	Prepare a Dust Management Plan that includes procedures for controlling dust emissions and monitoring of the performance of implemented dust control strategies. Implement the Dust Management Plan	To ensure dust generated during construction does not cause any environmental or human health problem or adversely impact on amenity.	Pre-construction Construction	

No.	Topic	Description	Objective	Timing	Advice
2.6	Noise	Prepare a Noise Management Plan that includes: • procedures to address the issue of ground vibration from blasting activities; and • procedures to address any noise complaints received during construction. Implement the Noise Management Plan	To ensure construction noise complies with Regulations and to protect the amenity at nearby Hearson Cove.	Pre-construction Construction	MPR
2.7	Solid waste	Prepare a Solid Waste Management Plan based on a waste management hierarchy and includes a solid waste inventory and procedures for sorting and disposing of solid wastes during construction. Implement the Solid Waste Management Plan	To minimise waste and the potential to contaminate ground and surface water or risk to public health.	Pre-construction Construction	AQIS SoR
2.8	Liquid waste	Prepare a Liquid Waste Management Plan based on a waste management hierarchy and includes a liquid waste inventory and procedures for treating and disposing of liquid wastes during construction. Implement the Liquid Waste Management Plan	To minimise waste and the potential to contaminate ground and surface water of risk to public health.	Pre-construction Construction	
2.9	Hazardous materials	Prepare a Hazardous Materials Management Plan for construction that includes procedures for: • establishment of purchasing and inventory controls; • storage, handling and spills; and • monitoring and auditing. Implement the Hazardous Materials Management Plan	To minimise waste and the potential to contaminate ground and surface water of risk to public health.	Pre-construction Construction	MPR
2.10	Pre-commissioning	Prepare a Pre-commissioning Management Plan that includes procedures for managing the activities (eg waste generation) associated with the testing of the complex following construction. Implement the Pre-commissioning Management Plan	To manage all relevant environmental factors associated with the pre-commissioning phase of the project.	Conceptual pre-construction Construction	
2.11	Safety	Prepare a Construction Safety Management Plan that addresses all work, safety and emergency response procedures required during construction including: • Provision of fire fighting equipment; • Reporting of fires; • Alarms and communication signals; • Muster points; • Evacuation procedures; and • Cyclone Contingency Plan detailing preparedness and procedures for the three different cyclone warning stages (blue, yellow and red). Implement the Construction Safety Management Plan	To minimise the risk to public safety and the potential creation of hazardous working environments.	Pre-construction Construction	MPR FESA CALM

No.	Topic	Description	Objective	Timing	Advice
2.12	Cultural Heritage	Prepare a Cultural Heritage Plan that includes: • a cultural heritage protocol that addresses heritage surveys and ongoing consultations; • recommendations of archaeological and ethnographical surveys of the project site relevant to construction; • procedures to minimise disturbance to and manage heritage sites; • An Aboriginal Awareness Program specific to the construction phase developed in consultation with Aboriginal groups; and • procedures to document any complaints on a register and investigate substantiated complaints. Implement the Cultural Heritage Plan	To minimise impacts on areas considered being of Aboriginal heritage and cultural significance.	Pre-construction Construction	DIA
2.13	Traffic	Prepare a Traffic Management Plan that will focus on: • traffic flow patterns and scheduling of traffic movements on road thoroughfare; • public safety, awareness and signage during construction; • the capacity of existing road conditions to support proposed heavy loads and road usage; • monitoring the transportation of oversized loads; • design and construction of roading within the plant site; and • restricting vehicle access to designated routes such that unnecessary disturbance to the surrounding environment is prevented. Implement the Traffic Management Plan	To minimise potential traffic impacts and ensure safety of public during construction.	Pre-construction Construction	MRWA SoR FESA
2.14	Amenity and Community Consultation	Prepare a Complaint Management Plan that includes: • A protocol to investigate and address any substantiated complaints received during construction, including complaints received from recreational users of Hearson and Cowrie Coves; and • A register of complaints. Implement the Complaint Management Plan	To minimise impacts on amenity, the community and to develop an ongoing working relationship with community members.	Pre-construction Construction	

No.	Topic	Description	Objective	Timing	Advice
3	Operation Environmental Management	Develop an Operation Environmental Management Programme (OEMP) that includes the following plans: 1. Flora, Vegetation and Landscaping Management Plan; 2. Fauna Management Plan; 3. Erosion and Sediment Control Plan; 4. Methanol Spill Contingency Plan; 5. Water Quality Management Plan; 6. Dust Management Plan; 7. Noise Management Plan; 8. Solid Waste Management Plan 9. Liquid Waste Management Plan; 10. Hazardous Materials Management Plan; 11. Aboriginal Awareness Programme; 12. Community Consultation Plan; and 13. Complaint Management Plan. Implement the Operational Environmental Management Programme.	To manage all environmental factors associated with the operational phase of the project.	Pre-commissioning	 CALM CALM CSLC DPA DPA, AQIS MPR DIA
3.1	Terrestrial flora	Prepare a Flora, Vegetation and Landscaping Management Plan that includes: • details of continuous weed, vegetation and Priority flora management; and • ongoing on-site management procedures for landscaped areas. Implement the Flora, Vegetation and Landscaping Management Plan.	To maintain species abundance and minimise operation impacts on vegetation, flora and visual amenity.	Pre-commissioning Operations	CALM
3.2	Terrestrial fauna	Prepare a Fauna Management Plan that includes operation procedures for: • maintaining hygiene and house keeping on the plant to prevent fauna from being encouraged to inhabit and attracted to the plant site; • fauna handling, recording and translocation procedures; and • procedures to control introduced species. Implement the Fauna Management Plan.	To monitor the presence and minimise disturbance of significant fauna.	Pre-commissioning Operations	CALM
3.3	Erosion	Prepare an Erosion and Sediment Control Plan that includes monitoring and reporting of the performance of sediment control strategies. Implement the Erosion and Sediment Control Plan.	To prevent off-site deposition of sediment during operation.	Pre-commissioning Operations	CSLC

No.	Topic	Description	Objective	Timing	Advice
3.4	Spillage	Prepare a Methanol Spill Contingency Plan that includes procedures to prevent methanol spills, spill response procedures, monitoring and reporting. Implement the Methanol Spill Contingency Plan.	To minimise the potential for spillage of methanol on water quality, the marine environment and public health.	Pre-commissioning Operations	DPA
3.5	Water quality	Prepare a Water Quality Management Plan that includes: • Procedures for testing, monitoring and reporting of potentially contaminated stormwater; • Details of monitoring points and parameters to be tested; • Adoption of AQIS guidelines, requirements of the Dampier Port Authority and appropriate ballast water management procedures; and • Procedure to inform vessel masters that no vessel hull scraping or antifoulant painting may take place in the Port of Dampier. Implement the Water Quality Management Plan.	To maintain the quality of surface water, minimise the impact of shipping on the marine environment and prevent the contamination of the marine environment from antifouling.	Pre-commissioning Operations	DPA AQIS
3.6	Dust	Prepare a Dust Management Plan that includes procedures to control dust emissions that may occur during operation. Implement the Dust Management Plan.	To minimise potential impacts on visual amenity and public health.	Pre-commissioning Operations	
3.7	Noise	Prepare a Noise Management Plan that includes: • Details of noise attenuation adopted; • Procedures to undertake compliance noise monitoring by suitably qualified personnel to distinguish between noise levels from local environmental sources and other nearby operating industries, if they exist; • Details of monitoring locations; and • Reporting requirements. Implement the Noise Management Plan.	To ensure that noise emissions comply with Regulations and meet EPA objective to protect amenity at Hearson Cove.	Pre-commissioning Operations	
3.8	Solid waste	Prepare a Solid Waste Management Plan based on a waste management hierarchy and includes a solid waste inventory and procedures for sorting and disposing of solid wastes. Implement the Solid Waste Management Plan.	To minimise waste and the potential to contaminate ground and surface water or risk to public health.	Pre-commissioning Operations	

No.	Topic	Description	Objective	Timing	Advice
3.9	Liquid waste	Prepare a Liquid Waste Management Plan that includes: • Details and performance of methods used to treat process wastewater prior to discharge to the brine return line. • Details of monitoring, testing and reporting of liquid waste streams in the complex; • Details of monitoring points and parameters to be tested; • Compliance with the requirements of the Water Corporation and Department of Environmental Protection; • Criteria that trigger management actions: and • The requirement to undertake 'Whole Effluent Toxicity Testing' of the brine and wastewater stream. Implement the Liquid Waste Management Plan.	To determine and minimise impacts on the marine environment and maintain marine water quality.	Pre-commissioning Operations	
3.10	Hazardous materials	Prepare a Hazardous Materials Management Plan that includes: • Procedures for maintaining an inventory of hazardous materials; • Storage and handling requirements; and • Spill response procedures. Implement the Hazardous Materials Management Plan.	To minimise the potential for groundwater and surface water contamination or risk to public health.	Pre-commissioning Operations	MPR
3.11	Aboriginal Heritage	Develop an Aboriginal Awareness Program in consultation with Aboriginal groups for the operations workforce. Implement the Aboriginal Awareness Program.	To minimise impacts on areas considered to be of Aboriginal heritage and cultural significance.	Pre-commissioning Operations	DIA
3.12	Community Consultation	Prepare a Community Consultation Plan that outlines a protocol to establish a Community Advisory Panel to facilitate ongoing consultation with the community. Implement the Community Consultation Plan.	To establish a working relationship with community members such that environmental and social impacts from the complex are minimised.	Pre- commissioning Operations	
3.13	Amenity and Community Consultation	Prepare a Complaint Management Plan that includes: • A protocol to address and investigate any substantiated complaints received during operation, including complaints received from recreational users of Hearson and Cowrie Coves; and • A register of complaints. Implement the Complaint Management Plan.	To minimise impacts on amenity, the community and to develop an ongoing working relationship with community members.	Pre-commissioning Operations	
4	Terrestrial fauna	Contribute to taxonomic research programs investigating *Rhagada* sp., *Planigale* sp. and *Delma pax* and report on the tasks and findings of the three programs.	To contribute to the knowledge base of Pilbara fauna.	Pre-construction	WAM

No.	Topic	Description	Objective	Timing	Advice
5	Marine Environment	Offer to become an active participant in the committee of Terminal Operators at the Dampier Port.	To assist in the implementation of the Dampier Port Authority's Marine Pollution Contingency Plan.	Pre- commissioning	DPA
6	Marine Environment	1. Participate in the development and operation of a Burrup Wastewater Management Framework for Water Corporation's Burrup sea water supply and brine return facilities; 2. If it is demonstrated to the proponent that an adverse environmental impact is occurring as a direct result of the proponent's wastewater discharge, investigate measures to minimise the impact and implement where fair, reasonable and practicable.	To minimise impacts on the marine environment and maintain marine water quality.	Operation	
7	Greenhouse gas emissions	Develop a framework agreement as part of joining the Greenhouse Challenge and implement the agreement.	To participate in the national programme of managing greenhouse gas emissions with the aim of minimising emissions where practicable.	Pre- commissioning	
8	Greenhouse gas emissions	Manage greenhouse gas emissions by: • Continuing to research and develop the methanol process in order to improve efficiency and reduce gas usage and implement plant improvements where practicable; • Becoming a member of the Australian Industry Greenhouse Network; • Joining the Burrup Industrial Council and participating and assisting in agreed studies and investigation into the effects and remedies, such as alternative fuel technology, other technology advances and off-set measures, for greenhouse gas emissions where practicable; and • Adopting and implementing practicable and feasible actions where appropriate to the global methanol industry.	To participate in the national programme of managing greenhouse gas emissions with the aim of minimising emissions where practicable.	Operation	AGO
9	Safety	Prepare a Safety Management System, a Safety Management Plan and a Safety Emergency Response Plan. The Safety Emergency Response Plan will be undertaken in consultation with CALM, MPR, FESA and other industry and will include: • Provision of fire fighting equipment and personnel; • Reporting of fires; • Procedures for managing external fires; • Alarms and communication signals; • Muster points; • Evacuation procedures; and • Cyclone Contingency Plan detailing preparedness and procedures for the three different cyclone warning stages (blue, yellow and red). Implement the Operation Safety Report.	To minimise the risk to public safety and the potential creation of hazardous working environments.	Pre- commissioning Commissioning	MPR, FESA, CALM, other industry

No.	Topic	Description	Objective	Timing	Advice
10	Regional environmental impacts	Seek to establish and participate with the Burrup Industrial Council in managing industry requirements for the Burrup Peninsula. Contribute to mutually agreed studies or investigations of cumulative impacts and implement practicable and feasible actions where appropriate to the methanol complex operation. As a member of the Council, participation will include: • Assisting where practicable in the development of an integrated emergency response system for the Burrup and development of a company protocol for participation; • Encouraging the formulation and implementation of a cumulative impact monitoring programme to assess the on-going impact of overall industry development and operation on the environment; • Encouraging a coordinated approach to the management of impacts on social amenity of the current and future residents of the region; • Encouraging the Council to act as a forum for a coordinated approach to greenhouse gas emissions abatement investigations.	To minimise the impact of industry on the social environment, recreational areas, flora and fauna, Aboriginal sites, aquatic environment and assist in mutual aid.	Operation	MPR
11	Regional Planning Requirements	Liaise with OMP to coordinate the planning of pipelines and other requirements within infrastructure corridors, and assist OMP to conduct a cumulative risk assessment to manage the risk/hazard to own pipeline	To ensure planning is undertaken in a coordinated manner such that the requirements for all Proponents are met.	Pre-construction	OMP
12	Regional Planning Requirements	Consult stakeholders on details of the product pipeline design.	To provide the opportunity for stakeholders to comment on the proposed pipeline design.	Prior to completion of final design.	MPR OMP CALM

Abbreviations:

AGO – Australian Greenhouse Office
AQIS – Australian Quarantine and Inspection Service
CALM – Department of Conservation and Land Management
CLSC – Commissioner for Soil and Land Conservation
DEP – Department of Environmental Protection
DIA – Department of Indigenous Affairs
MPR – Department of Mineral and Petroleum Resources
DPA – Dampier Port Authority
EPA – Environmental Protection Authority
EPC – Engineering, Procurement and Construction
FESA – Fire and Emergency Services Authority
MRWA – Main Roads Western Australia
OMP – Office of Major Projects
SoR – Shire of Roebourne
WAM – WA Museum

Appendix 5

Summary of Submissions and
Proponent's Response to Submissions

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1. Introduction

1.1 Background

Methanex Australia Pty Ltd ('Methanex') proposes to establish a methanol complex on the Burrup Peninsula in the King Bay – Hearson Cove Industrial Area which includes the site of the old Woodside construction village. The proposed location of the plant is approximately 10 and 6 straight-line kilometres from the towns of Karratha and Dampier, respectively.

The proposed complex will convert natural gas into liquid methanol at a design capacity of up to 14,000 tonnes per day for a nominal annual production of 5 million tonnes. The methanol produced by the proposed complex would be exported to the Asia Pacific region.

A Public Environmental Review (PER) document was prepared for the project in order to meet the requirements of the Environmental Protection Authority under the *Environmental Protection Act 1986*. The PER was available for public comment for a four week period commencing Monday 15 April and closing on Monday 13 May 2002.

At the commencement of the public review period, Methanex continued its ongoing stakeholder and public consultation programme with the establishment of attended displays in Karratha, Dampier and Roebourne. A series of stakeholder meetings were also held to continue the dialogue process. For this specific consultation period, several fact sheets and feedback forms were developed and provided to the community. Executive summaries of the PER document were also available to the community free of charge.

1.2 Response to Submissions

This document responds to the questions and issues arising from several submissions received during the public review period from the public and decision-making authorities. The submissions were received from:

- Department for Planing and Infrastructure;
- Department of Environmental Protection;
- Environmental Protection Authority;
- Department of Conservation and Land Management;
- Department of Mineral and Petroleum Resources;
- Main Roads Western Australia;
- Water Corporation;
- Fire and Emergency Services of Western Australia;
- Conservation Council; and
- Confidential Submission.

In total, 166 queries were raised. Each query is quoted directly from the submission and is grouped under the environmental factors listed below and Methanex provides a single response, where appropriate, that addresses all queries under the environmental factor:

- General;
- Atmospheric Emissions;
- Noise;
- Wastewater Discharges;
- Flora and Vegetation;
- Hydrocarbon, Hazardous and Solid Waste Management;
- Risk;
- Heritage;
- Traffic Management;
- Amenity; and
- Social Impacts.

A volume of technical appendices also accompanies this document and provides supporting data to assist the DEP in evaluating the proposal.

1.3 Commitments

Methanex has made a total of 38 commitments to manage potential environmental and social impacts in support of the proposal. A complete list of these is provided in **Appendix A**. Existing commitments mentioned in this report that have already been stated in the PER document are highlighted in blue. Newly established commitments are highlighted in green and are summarised below:

Commitment 12.01*: Liaise with the Office of Major Projects to coordinate the planning of pipelines and other requirements within infrastructure corridors.*

Commitment 12.02: *Consult with and provide details of pipeline design to the Department of Minerals and Petroleum Resources (Office of Major Projects and Hazardous Goods Division) and Department of Conservation and Land Management such that the Departments are given the opportunity to review and comment on draft designs.*

Commitment 12.03: *Utilise the expertise of an acoustic engineer to ensure that the best feasible and practicable noise attenuation measures are included during the final design of the Methanex methanol project on the Burrup Peninsula.*

Commitment 12.04: *During detailed design of the complex, Methanex will ensure that noise levels will meet 65dB(A) at the boundary and that where feasible and practicable noise attenuation measures will be implemented to improve on this level to minimise noise at Hearson Cove.*

Commitment 12.05: *Ensure that the Noise Management Plan for construction specifically addresses the issue of ground vibration from blasting activities.*

Commitment 12.06*: During the detailed engineering design process and the construction phase, disturbance to vegetation unit Er (Trudgen unit) and BaEveTe (Biota unit) will be reviewed and minimised as far as practicable.*

Commitment 12.07: *Methanex will commit to designing all chemical and product storage bunds with sufficient capacity to contain the volume of the contents of the largest tank and an extra height of 144mm to contain rainwater for a 1-in-100 year 24 hr rainfall event.*

Commitment 12.08: *Methanex will consult with the Fire and Emergency Services Authority and the Department of Conservation and Land Management regarding fire protection procedures and in particular natural wildfires or controlled burns on adjacent lands.*

2. General

2.1 Submissions

1) DEP questions (pg 4-8) 'why Methanex propose to produce freshwater from seawater with reverse osmosis when it could implement a thermal desalinisation plant? This aspect of the proposal is not defined, and no consideration of the relative environmental merits (eg energy efficiency) of these options have been given.'

2) The DEP notes that 'the proposal appears to be for a 14,000 tpd (5mtpa) methanol facility. However, emissions modelling and other aspects of the proposal, including risk and noise relate to two 6,000 tpd plants. The proposal should be consistent and amended to a nominal 4.2 million tonnes per annum (350 days at 12,000 tpd) to reflect the information provided in the proposal. Otherwise it should be clarified that each plant is expected to be capable of operating at 7,000 tpd and will meet the proposed emission limits at that production rate. Risk and noise will also need to be reviewed.'

3) The DEP notes that 'process flow charts provided in the PER are too general. The Guidelines specify mass balance diagram showing inputs, outputs and waste streams. This must be provided for the two technologies that are being considered by the proponent.'

4) The DEP notes that 'Figure 4-3 indicates that the proposed product pipeline will extend outside the Burrup West Corridor. To date, the Office of Major Projects has not obtained approval to clear and level that section of land.'

5) The DEP notes that 'the Construction Management Plans do not include blasting. A plan should be developed if blasting is required.'

6) CALM notes that 'the PER (pages 1-4) indicates the Office of Major Projects (OMP) has environmental approval from the Minister for the development of the Burrup West Service Corridor. This requires verification as this Department is unsure of the approval status.'

7) CALM notes that 'the process appears to provide large amounts of energy. There is no indication of the extent of excess energy. It appears any excess energy will be released to the environment via cooling towers. If there is excess energy in the system then consideration should be given to conversion into electrical power for the Pilbara electrical grid.'

8) CALM 'highlights that infrastructure corridors on the Burrup are very limited. Pipelines need to be built to the maximum appropriate size to allow for future expansion as well as use by future projects. There is no indication from the proponent that they are aware that infrastructure corridor space is limited. There is no indication the company is prepared to work with Government to minimise infrastructure requirements in the longer term or to share infrastructure with other existing or future projects. CALM recommends the following:
   - ❑ Detailed plans are required at a scale of 1:5,000 detailing the location and size of all pipelines and powerlines. These plans must be developed with the Office of Major Projects and detail the measures that will be taken to minimise impacts on future development in these corridors.
   - ❑ The recommendations and guidelines outlined in the report "Burrup Services Corridor – Development Plan" Feb 2001 by Department of Resources Development should be implemented.
   - ❑ A review of the above two items should occur. The Department of Conservation and Land Management's Pilbara Regional Manager would be interested in being involved in the review of the first item.'

9) The Conservation Council states that 'proposals must address the matter of Cumulative Impact Assessment (CIA). It is the Conservation Council's view that a CIA must be undertaken prior to any further consideration of proposals on the Burrup Peninsula. Such an assessment should be undertaken by independent professionals, but funded by proponents and those who already have site specific environmental approvals. As a proponent, Methanex Australia Pty Ltd should be supportive of a CIA study being undertaken. Such a study would demonstrate the credibility of Methanex' Responsible Care™ corporate philosophy.'

10) The Conservation Council provides a summary of the 'CIA and EIA issues that must be properly addressed before the proposal should proceed:
   - ❑ Discussion must be made of alternative locations, proving why these have not provided a better environmental alternative. The Conservation Council understands that the Maitland site would provide a viable alternative location. It is to be noted that the Maitland areas have been zoned industrial and that it has substantially lower environmental, heritage and spiritual values.
   - ❑ Full analysis of the risk of producing MTBE for Western Australia and for the nations who purchase this product.'

11) The Conservation Council notes that 'Section 3.5 contains an egregious case of a proponent failing to adequately discuss an extremely important issue. There is a perfectly viable alternative to the Burrup. The 3000 ha Maitland Industrial Estate is perfectly suited to projects such as this. Maitland is Buffel grass dominated clapped-out station country, which has already been rezoned for industrial use. By arguing to have the proposal on the Burrup Peninsula, Methanex has demonstrated an inability to understand a failed environmental planning processes. The information presented in 3.5.1 is not an evaluation of alternative sites. It is outrageous to suggest it is.'

12) The Conservation Council claims that 'it is outrageous that through this PER process Methanex could be allowed to produce methyl tertiary butyl ether (MTBE), a substance which is considered to be too dangerous for Western Australian use. It is equally outrageous that the dangers of this substance have not been discussed in the PER. The Conservation Council notes the proponent's intention to sell this product to "…Methanex' customer base in the Asia-Pacific." Why is it acceptable to sell MTBE to Asian nations, while it is prohibited in Western Australia? In view of the company's preparedness to produce MTBE it is extremely difficult to find credible Methanex' Responsible Care™ corporate philosophy.'

2.2 Response

2.2.1 The Proposal

The proposal put forward in the PER is to establish a methanol complex comprising of two methanol plants, producing up to a total of 14,000 tpd for a nominal annual production of 5 million tonnes. The first plant will be constructed in 2003 and be operational by 2005, however the second plant is likely to come on-line by 2010 depending upon market demand. Current designs are for two 6,000 tpd plants and this is the capacity that the designers are able to guarantee for a certain reliability. From operating experience, Methanex confirms that it is usually the case that an additional 10% of the design capacity can be achieved during operation. Given technology advances and experience gained from operating the first plant, it is likely that improvements can be made to the design and operation of Methanex' second plant to maximise efficiency and capacity. Hence a *nominal* production of 7,000 tpd is stated for each plant.

For modelling purposes the complex capacity has been set at two plants each of 6,000 tpd, for 365 days per year. The additional 2,000 tpd will be achieved through several mechanisms, but principally through an increase in efficiency and de-bottlenecking. It is unlikely that such a capacity increase will result in the emission of additional noise. It may result in minor increases in emissions to atmosphere or water. As stated in the PER all emissions estimations are '*conservatively based on initial design estimates….and process data is representative of the maximum likely normal operations*'. The emissions estimate included allowance of about 20% to ensure this conservative approach.

Therefore, any increase in emissions that may result from the relatively small incremental increase in capacity, is accommodated within the approach that Methanex has taken during the emission estimation process (this addresses query 2).

The process flow charts provided in the PER were simplified such that the general public, unfamiliar with process engineering, could understand the methanol process and water stream flows. These flow charts are representative of latest generation methanol technology that is proposed.

Methanex has invested a considerable sum in commissioning two Front End Engineering Design (FEED) processes which are both based upon latest generation technology. Due to the competitive bid process, detailed mass balance sheets, process flow diagrams etc are not available at this time. Methanex is expected to make a final decision on the EPC contractor and technology in mid 2002. When this decision is made, Methanex will be able to discuss in detail the design of the plant with DEP (this addresses query 3).

2.2.2 Cumulative Impacts

The cumulative assessments for the following environmental factors were undertaken and documented in the PER document in Sections as referenced below:

- ❑ Atmospheric emissions (Section 8.4.1);
- ❑ Noise; (Section 8.4.4)
- ❑ Risk and hazard (Section 9.3.7); and

- Visual amenity (Section 9.8).

During the preparation of the PER, it became apparent that cumulative impacts of industry on a variety of environmental attributes were a concern of key stakeholders. These included:

- Amenity at Hearson Cove;
- Impact of atmospheric pollutants on vegetation, rock art and aquatic environments; and
- Clearing of vegetation within the King Bay – Hearson Cove valley.

Methanex recognises that the proposal may contribute to these cumulative issues. The cumulative impacts result from the formation of the King Bay – Hearson Cove Industrial Area. Therefore the Department of Mineral and Petroleum Resources (DMPR)(Office of Major Projects (OMP)) commissioned a strategic study in December 2001 to investigate potential cumulative impacts from proposed industry on the recreational amenity at Hearson Cove. The scope of the study specifically included (Sinclair Knight Merz, 2002):

- Assessment of the cumulative noise impacts at Hearson Cove beach in relation to amenity as well as compliance with noise regulations;
- Preparation of an air emissions inventory of the area;
- Modelling of local impacts of oxides of nitrogen, sulphur dioxide and dust (as PM10);
- Consideration of the likelihood of odour impacts; and
- Assessment of the visual intrusiveness of industry including light spill.

This study has been completed and was released by OMP in early July 2002.

Methanex agrees with the recommendations made by the Conservation Council that cumulative studies should be undertaken by appropriate professionals, with participation of government authorities and where appropriate be funded by proponents and those who already have site specific environmental approvals (this addresses query 9). Methanex has recommended the formation of an Industry Group for the Burrup and this is specifically stated as Commitment 8.01 in the PER document as follows:

*'**Commitment 8.01**: Methanex will seek to establish and will participate in the Burrup Industrial Council in managing industry requirements for the Burrup Peninsula. Methanex will contribute to mutually agreed studies or investigations of cumulative impacts and will implement practicable and feasible actions where appropriate to the methanol complex operation (page 8-2 of PER)'*

2.2.3 Maitland as an Alternative

Appropriate site selection studies were undertaken to determine that the Methanex site in King Bay – Hearson Cove Industrial Area on the Burrup was the most suitable location for the complex based upon several main site selection criteria (**Table 2-1**).

Table 2-1 Site Selection Criteria – Burrup versus Maitland

Selection Criteria	Methanex Site King Bay – Hearson Cove Burrup Peninsula	Maitland Estate
Availability of suitable industrial zoned land	♦	♦
Proximity of natural gas supply	♦	***X***
Reliability of natural gas supply	♦	♦
Proximity of year-round port facilities	♦	***X***
Availability of year-round port facilities	♦	***X***
Year-round access	♦	***X***
Availability of services eg power and water	♦	***X***
Environmental considerations	♦	***X***
Proximity of established communities with appropriate support facilities	♦	♦
Availability of skilled labour	♦	♦
Potential synergies with industry	♦	♦

Note: ♦ - favourable *X* - unfavourable

In settling on the current site, Methanex reviewed various sites around the Burrup Peninsula, including the King Bay – Hearson Cove Industrial Area, East and West Intercourse Island and Maitland Estate. In the first instance these studies included review of the key attributes for a successful project. This included minimal environmental impacts, proximity to deep water for product loadout, fresh or desalinated water for process use, road systems for equipment delivery and personnel and the provision of infrastructure. Proximity to population centres was considered important to minimise the risk to employees and contractors of accidents whilst travelling to and from work (this addresses query 11).

Methanex did not pursue Maitland Estate due to the non-availability of infrastructure, particularly the lack of proximity to deep water, the timing and cost to deliver this infrastructure and the environmental impact of providing this infrastructure. Costs were also prohibitive to the extent that the project would not have been viable. Whilst Maitland may provide an option for companies looking to base projects in the Pilbara in the future, it is understood that the issues Methanex has identified and how they relate to the Methanex project, still remain (this addresses query 10-point 1).

Methanex has worked extensively with all stakeholders to ensure the project can be operation in a timeframe that meets customer requirements in 2005. The ability to meet a 2005 timeframe was the key reason why Methanex transferred from Darwin to Western Australia. If the project is delayed at this late stage, or additional costs are imposed it fundamentally changes the attractiveness of Western Australia as a location for the Methanex project. Methanex is of the firm view that a change of site on the Burrup at this late stage would result in the project being placed in jeopardy, with little likelihood of the Methanex project proceeding in Western Australia.

2.2.4 MTBE

Methanex' proposal is to produce methanol and does not include the production of methyl tertiary butyl ether (MTBE) (this addresses queries 10-point 2 and 12). Methanex is a single product company only producing methanol. MTBE is one of methanol's many derivatives, but is not produced by Methanex.

MTBE is used as an additive in gasoline to displace harmful components such as lead and benzene (a known human carcinogen) and also to reduce the total volume of aromatics and olefins in gasoline. MTBE is an oxygenate adding oxygen to gasoline which allows it to burn more completely thereby reducing tailpipe emissions from vehicles. MTBE has been highly successful in improving air quality in major urban areas. The EPA of the USA credits the introduction of reformulated gasoline (which contains a mandatory use of oxygenates) with air quality improvements that are equivalent to removing 16 million cars from US roads.

Recent concern relating to MTBE and proposals to ban the substance arose from its detection in groundwaters/ drinking waters in California. MTBE is more soluble in water than other gasoline components (except ethanol, which is infinitely soluble in water). Since 1999 the Californian State government has proposed to ban MTBE in California from 1 January 2003 and more recently from 1 January 2004. The background to this ban is as follows:

a) Detection in Water Systems

Since the release of the University of California (UC) Report in 1998 which documents the detection of MTBE in ground and surface waters in California, an assessment was undertaken in August 2001 for the American Methanol Institute by Malcolm Pirnie Inc. The following information is a summary of this.

The UC Report predicted the magnitude of contamination (present and future) based on limited monitoring and several assumptions including (Malcolm Pirnie, 2001):

- No remediation of existing plumes;
- No biodegradation or adsorption of MTBE;
- Current detection trends for public water supply systems should be extrapolated to 2010 without consideration of implemented management strategies; and
- Contamination of surface water sources would continue due to boating use.

Given the advances made in MTBE research and new monitoring data the independent report shows that none of the above assumptions were correct and that the predictions of contamination made by the UC report are in fact an order of magnitude less.

No surface waters have been monitored in California with concentrations greater than 5 µg/L since 1999 and the number of public water supply wells with detectable MTBE has decreased from 1.2% (of 2,988 wells sampled) as stated by the UC report in 1988 to 0.6% (of 7,981 wells sampled) in July 2001.

MTBE has been found in the public drinking water supplies of California due to the ineffective management of gasoline containing MTBE when stored and handled. Management and maintenance of underground gasoline storage tanks in the US has historically been poor and gasoline leaks from these tanks have been responsible for the vast majority of MTBE detections in groundwater (UC, 1998). So not only is MTBE released but also a variety of far more harmful hydrocarbons that are also contained in gasoline. MTBE represents only a maximum of 15% of the volume of gasoline. A recent study has shown that 20 years after a gasoline leak, benzene (gasoline component that is a known carcinogen) can still be found in the ground up to 200m from the source. The source of the issue is related to the storage and management of gasoline rather than MTBE itself. The substantial reduction in detection in MTBE in groundwater is a direct result of improved adherence to gasoline storage regulations.

In conclusion, it is the storage facilities provided for gasoline that need to be improved rather than the prohibition of MTBE if the quality of surface and groundwaters are to be protected. Banning MTBE will not prevent further gasoline and hydrocarbons releases to the environment. It is effectively "shooting the messenger" to ban one component that happens to be the most readily detected where gasoline spill occurs.

b) Political Aspects

Oxygenates were mandated for use in the mid 1990's to improve air quality. MTBE and ethanol are competing oxygenates for reformulated gasoline in the US and have an 85% and 15% market share, respectively. Ethanol is mainly produced from corn and is primarily used in the US Mid-West where it is close to corn and agriculture production. Numerous issues regarding the use of ethanol include:

- It is heavily subsidised in all countries where it has found a market;

- Ethanol is reported to be an renewable resource, however the growing of corn and its processing to produce ethanol consumes more energy (mostly fossil fuels) than the energy content of the resulting ethanol and is therefore no more renewable than fossil fuels;
- Ethanol is high octane but is also of higher volatility than MTBE and therefore does not deliver the same air quality benefits;
- Ethanol increases air pollutants such as aldehydes, peroxyacyl nitrates (PAN), air pollutants that cause smog;
- Ethanol is more soluble in water than MTBE and causes harmful components such as benzene and toluene to leach through soils and groundwater more readily than they would without its presence; and
- Ethanol results in higher emissions of CO_2 in combustion when compared to MTBE.

Support for the ethanol industry in the US is related to the maintenance of agricultural income in the politically important Mid-West states. The ethanol industry and Mid West politicians have been prime movers behind the initiatives to ban MTBE in the US. Banning MTBE would result in a direct windfall to the three largest ethanol producers in the US who control 80% of the market.

Considering the above influencing factors relevant in the US, it is important to note the developments of MTBE in other nations. Following extensive studies, including thorough review of the US experience, Europe has recently endorsed MTBE's role as a valuable gasoline blend stock. Europe has recognised that the quality of gasoline infrastructure is a critical issue and has certainly out performed the US in this regard.

Methanex does not accept that MTBE has been banned in Western Australia because it is "too dangerous for Western Australia use". MTBE is a valuable component to help heavily polluted large cities in Asia to reduce harmful components in gasoline and improve air quality. To accept the misinformation propagated within the US as a reason for denying Asian cities access to MTBE is environmentally unsound.

2.2.5 Service Corridor Planning

The development of the complex requires infrastructure. This infrastructure includes the provision of service corridors for product pipelines to the port facilities, a gas pipeline from gas suppliers, water supply facilities and road access.

OMP has commissioned work to develop a master plan for the industrial estate. Design studies include:

- Overall estate organisation and management;
- Drainage;
- Corridor design and management; and
- Access regimes and plans.

Methanex is actively involved in these studies. It is sharing its expertise and experience in the development of this important infrastructure so that optimum and safe solutions are provided for all proposed industry. Methanex is committed to:

***Commitment 12.01**: Liaise with the Office of Major Projects to coordinate the planning of pipelines and other requirements within infrastructure corridors.*

***Commitment 12.02**: Consult with and provide details of pipeline design to the Department of Minerals and Petroleum Resources (Office of Major Projects and Hazardous Goods Division) and Department of Conservation and Land Management such that the Departments are given the opportunity to review and comment on draft designs.*

It is important to note that under the *Explosives and Dangerous Goods Act 1961,* Methanex is required to obtain a licence for the product pipeline to ensure that the pipeline is designed to the satisfaction of the Department of Mineral and Petroleum Resources.

The above commitments and compliance to the statutory requirement addresses query 8.

Methanex confirms that the proposal to develop the Burrup West Corridor has been referred to the EPA and was not required to be assessed under the *Environmental Protection Act 1986*. OMP has obtained approval from the EPA to develop the Burrup West Corridor. A parcel of land that extends from the Burrup West Corridor to the proposed new loading wharf is also proposed for the Burrup West Corridor and approval to develop this land is currently being sought by OMP (this addresses queries 4 and 6).

2.2.6 Blasting during Construction

During construction the Engineering Procurement and Construction (EPC) contractor will be undertaking some blasting on the site. Blasting is managed under the *Explosives and Dangerous Goods Act 1961* which specifically requires a permit from the Department of Mineral and Petroleum Resources. As part of obtaining a permit, a Blasting Management Plan is required such that issues of safety, noise and dust are appropriately managed to the satisfaction of the Department.

The Blasting Management Plan will be included as part of the Construction Management Programme (this addresses query 5).

2.2.7 Energy Use

Methanol is most typically manufactured from natural gas. The chemical conversion of natural gas to methanol involves high pressures and high temperatures and requires energy. Just like our homes, there are energy losses from the methanol process, and these losses, plus the energy consumed to drive the chemical conversion, result in the consumption of natural gas in excess of the needs for the product and hence CO_2 emissions when the fuel for the process is combusted.

All CO_2 emissions from a methanol plant represent losses of costly raw materials, so Methanex is driven towards energy efficiency and reduced CO_2 emissions.

Over 50 years the methanol industry has improved the energy efficiency of methanol production. Today the technology of manufacturing methanol is expected to only make marginal improvements of efficiency as energy integration within the production facilities has been maximised.

The majority of the energy losses from the methanol complex are to the air from the air fin-fan coolers and from the cooling tower. These cooling facilities are only used when all useable energy has been recovered and cannot be recovered for any other purpose. An example of this is the production of steam. Medium pressure steam, which is used in a number of steam turbines on the plant, is at nominally 390^{o}C and 41barg. This steam is used predominantly in pass through steam turbines resulting in low pressure steam at nominally 170^{o}C and 5barg. This steam is used as a heating medium within the plant and is a good energy source for low pressure applications such as methanol distillation. Energy sources available below 170^{o}C do not have much application and final cooling steps must emit energy to the atmosphere (this addresses query 7).

The energy integration on the process design is for the entire plant including desalination and the air separation unit. If steam were required for the desalination process this would need to be generated using natural gas in the auxiliary boiler.

A summary of desalination technologies is provided in **Table 2-2** which highlights that for the proposed methanol complex, a thermal desalination unit will result in the largest energy usage when compared with alternative technologies. The chosen technology must be compatible with the methanol production process to maximise efficiencies and reliability. Desalination technology should not be considered in isolation of the process as it has a large effect on the streams of energy/heat production and recovery and hence an overall effect on the energy efficiency of the complex (this addresses query 1).

Table 2-2 Desalination Technologies

Desalination Type	Description	Comments
Thermal Distillation	Seawater is heated using low pressure steam and the resulting vapour is condensed to give clean water.	Requires low pressure steam. For the Methanex complex this would require additional steam generation from the auxiliary boiler. Another factor against the use of this technology is the need to cool the resultant brine. Largest energy usage as the process does not have any excess low pressure steam to operate other plant utilities.
Mechanical Vapour Compression (MVC)	The vapour from heated seawater is compressed and the heat of compression is used to heat the seawater. Start up requires an external heat source such as steam and or electricity	Requires electricity to drive the vapour compressors. In Methanex' case this is approximately 3MW per plant. Electricity is supplied from burning gas in either the gas turbine or the auxiliary boiler to produce steam for a steam turbine. Cooling of the brine is achieved by heating the incoming water.
Reverse Osmosis (RO)	Water under pressure is purified by filtration through a membrane.	Requires electricity to drive high pressure water pumps. Less electricity requirement than for the MVC plant. Electricity is supplied from burning gas in either gas turbine or the auxiliary boiler to produce steam for a steam turbine. Requires a micro-filtration plant to pre-treat the seawater. No cooling is required for the brine.

3. Atmospheric Emissions

3.1 Submissions

13) The DEP notes that 'no consideration appears to have been given to the impact of atmospheric emissions on mangroves. Yet the emissions concentrations proposed from Methanex (eg NOx) are very close to European guidelines on vegetation effects from atmospheric emissions, and exceed Austrian guidelines in relation to sensitive plants. No information is provided on the impact pathways and effects of NOx and SOx on mangroves. The proponent needs to do further work in this area.'

14) The DEP notes that 'in Appendix H page 10, Methanex is the second highest NOx emitter after Woodside LNG.'

15) The DEP requests data on 'each discharge stack, including stack height, air flow and exit temperature (it should be clearly set out in the main body of the PER for easy reference).'

16) The DEP notes that 'the PER (Section 5.10) states that the maximum concentrations of all pollutants meets the NEPM standards. However, monitoring indicates that NEPM standards are not always met for particulates at Dampier.'

17) The DEP notes that 'the PER seems to indicate that adverse impacts from atmospheric deposition on petroglyphs, flora and ephemeral pools is likely in the short or long term, but it is shown as unlikely in Table 8-1.'

18) The DEP states that 'potential impact on petroglyphs, ephemeral pools and flora from the dry deposition of oxides of nitrogen is of concern. The rainfall pH and potential impacts from the dry deposition of acidic gases should be investigated as soon as possible. Until the impacts are understood a conservative approach to the discharge of acidic gaseous emissions must be taken.'

19) The DEP notes that 'in Section 8.4.1.5 it is stated that dry low NOx burners cannot be used on the gas turbines as the fuel contains more than 2% hydrogen and the flame becomes unstable. Since Methanex' proposed NOx emissions will be a significant proportion of the cumulative industry emissions it is important that the proponent provide a listing of alternative NOx reduction technologies along with cost estimates for each option considered to be feasible.'

20) The DEP states that 'Methanex' commitment to a 10% reduction on 2000 Greenhouse gas levels by 2008 is commendable. Is this to be largely achieved through the replacement of older technology plant (sited in other countries) with the proposed development at the Burrup Peninsula or are other reduction measures proposed?'

21) The DEP states that 'the proposed development will result in a significant increase in Australia's greenhouse gas emissions. The current greenhouse gas commitment is not consistent with the intent of the Prime Minister's statement on greenhouse gas emissions. Can the proponent strengthen the commitment to include the adoption of practicable and feasible measures beyond the operation of the methanol complex to offset carbon dioxide, such as investigations into the establishment of tree farms.'

22) The DEP notes that 'the transport component (including shipping) of the greenhouse gas emissions has not been included in the estimation of greenhouse gas emissions.'

23) The DEP understand that 'there is the potential to form TMA in methanol plants. This is not mentioned in the section on odours in the PER. Please provide information on TMA, including how it is formed, at what concentrations and how it can be removed or prevented from forming.'

24) The DEP notes that 'the PER states that methanol is not odorous (Section 8.4.3 - predicted outcome). However, methanol is described as having a strong or characteristic odour. Please provide an MSDS for methanol along with additional information to demonstrate that the emissions from fugitive and point sources (stacks) will be below the threshold of smell and appropriate exposure limits.'

25) The DEP would 'encourage representatives from Methanex to become involved in the Dampier-Point Samson Dust Working Group, which along with DEP representatives, includes interested parties from Industry and the Community.'

26) 'It is the intention of the DEP Regional Office to establish an Industry Liaison Committee to assist the coordination of Atmospheric Monitoring and Management (especially in Industry Corridors such as the Burrup Peninsula). We would encourage Methanex to have a representative on this committee.'

27) The EPA notes that 'the following with reference to Section 8.4.1.8 and Appendix H:
- Inconsistencies between Section 8.4.1.8 and Appendix H;
- Inconsistencies in the information including pH values for rain;
- More recent data should be included rather than O'Connor's work which is dated from 1970's;
- Lack of data to demonstrate the effects of acid deposition in dew which when evaporated can concentrate acid and accelerate impacts on rock art and occult precipitation;
- Lack of data of the effects on increased nitrogen on vegetation in the conservation reserves which are generally nutrient poor and critical nitrogen loads for this vegetation; and
- Lack of data to demonstrate the capacity of the ecosystem to buffer effects eg alkalinity and acid neutralisation potential of soil.'

28) CALM has 'a major concern with respect to cumulative atmospheric emissions from industry on the Burrup Peninsula on flora and fauna, as well as on rock art. This department believes that the PER has not provided convincing evidence that these impacts are acceptable. CALM will like to be assured that the EPA considers in its recommendation for this project that the emissions from the plant, when combined with emissions from other approved Burrup projects, will not in combination adversely impact on calcrete pools in gullies; fauna including land snails; Aboriginal rock art; and flora including mangroves.'

29) The Conservation Council states that 'it is extremely disappointing to read the PER and find a range of unsubstantiated claims and unfulfilled commitments. An example includes claims that NOx and SOx levels will not exceed assigned levels.'

30) The Conservation Council states that 'it is vital that the CIA process be followed for NOx emissions and for the assessment of CO_2 emissions before the proposal can proceed.'

31) The Conservation Council states that 'the Methanex approach to resolving the problem of this plant's emitting 2.25 Mtpa of carbon dioxide is unacceptable. Voluntary schemes with non-binding targets, such as the Greenhouse Challenge, are an inadequate response to an environmental issue as critical as global climate change. Table 8.26 (in the PER) claims that there will be a net reduction in CO_2 emissions through the proposal proceeding. This claim is highly misleading. The truth is there will be a greater quantity of CO_2 emissions pumped into the atmosphere, should this plant become operational. It is plainly dishonest to suggest that the Methanex Burrup plant will minimise greenhouse gas emissions in absolute terms (Ref. Page 8-52).'

32) The Conservation Council states that 'the PER has failed to account for the CO_2 emissions associated with the energy required in the water desalination process. It is understood that there will be 55ML/day of seawater that will be processed for use in the plant.'

33) The Conservation Council provide a 'summary of the CIA and EIA issues that must be properly addressed before the proposal can proceed:
   - Energy consumption and associated emission of greenhouse gasses, including those from the desalination plant should be included in the proposal's greenhouse gas calculations.'

34) The Conservation Council notes that the PER states that 'Methanex has followed closely the climate change issue. The company has failed to state that it supports the principles of the agreement, especially in relation to individual nations meeting their assigned Kyoto targets. Does Methanex understand that Australia has an international commitment to achieving an emissions level of 108% of our 1990 level? If Methanex understands this important issue, then it must demonstrate how its proposal can be managed to ensure that Australia meets this target. If Australia fails to meet its target, then it will not be eligible for the "global trading" system. If implemented this proposal will ensure that Australia does not meet its target of 108% of 1990 emissions levels, making Australia ineligible for a carbon global trading system.'

35) The Conservation Council suggests that 'plantations forming carbon sinks, would have the potential to sequestrate CO_2 produced through the Methanex plant's activity. Why has Methanex failed to address this option of managing the environmental consequences of their enterprise?'

36) 'It is the Conservation Council's contention that the proponent must develop a comprehensive, legally binding programme to ensure the sequestration of an equivalent quantity of carbon dioxide. A documented program showing carbon rights contracts must be negotiated with landholders prepared to enter into carbon sink arrangements. Details of the carbon sequestration program must be placed as Ministerial Conditions.'

37) An anonymous submission notes that 'notwithstanding the advanced technology to be used at the Methanex plant, clearly there will be some atmospheric emissions which may over time potentially damage sites of Aboriginal and cultural and heritage, and archaeological significance. Moreover, sites will also be exposed to emissions from other potential developments on the Peninsula. Given the world class nature of sites on the Burrup, potential risk to these sites should be minimised. It is recommended that an appropriate chemical and other scientific analysis of the interaction between potential emissions and local rocks, or other materials of Aboriginal cultural and heritage significance be undertaken to identify potential long term damage to sites.'

3.2 Response

The methanol complex will emit NOx, CO_2 and VOCs to the atmosphere under normal operations. The potential impacts of cumulative emissions are discussed in the PER. The following sections provide information which demonstrates that Methanex' proposed emissions will be as low as reasonably practicable (to address query 18):

- **Section 3.2.3** provides information on SOx emissions. The methanol complex will not emit SOx under normal operations.
- **Section 3.2.4** provides information on NOx emissions and the NOx reduction options that have been investigated by Methanex.
- **Section 3.2.6** provides information on CO_2 emissions and production efficiencies that can be achieved by adopting latest generation technology on the Burrup.

The PER provides a summary of the technical report 'Air Quality Assessment Methanol Complex – April 2002' which has been provided to the DEP separately as a Technical Appendix. This report (in Appendix D of the Technical Appendix of the PER) details all the assumed input and output data and includes information on stack heights, stack diameters, exit temperatures, flow velocities etc for the preliminary design. This information is provided in **Table 3-1** to address query 15.

In accordance with Methanex's conservative approach, the emission characteristics presented in **Table 3-1** are conservative with respect to ground level concentrations, ie any changes in parameter values should not generate increased ground level concentrations.

■ **Table 3-1 Combustion Sources as Modelled (Normal Operation) based on Current Best Estimates**

Source	Chimney Height m	Exit Temp. °C	Diameter m	Velocity m/s	NOx g/s	CO g/s	VOC g/s
Plant 1							
Gas Turbine	60	228	2.5	20	50	9.4	1.5
Desulphurisation Heater	60	400	1.0	15	0.4	0.04	0.1
Utility Boiler	60	250	1.0	15	0.4	3.1	0.01
Flare	60	1,000	-	-	0.06	0.06	0.1
Plant 2							
Gas Turbine	60	228	2.5	20	50	9.4	1.5
Desulphurisation Heater	60	400	1.0	15	0.4	0.04	0.1
Utility Boiler	60	250	1.0	15	0.4	3.1	0.01
Flare	60	1,000	-	-	0.06	0.06	0.1

3.2.1 Proposed and Cumulative Emissions

The proposed methanol complex in isolation and on a cumulative basis will not exceed National Environmental Protection Measure (NEPM) concentrations for NOx and SOx. As reported in the PER document (Tables 8-19; 8-20; and 8-22) NO_2 concentrations from the complex in isolation and on a cumulative basis are below the NEPM standard for NO_2 of 246 µg/m^3. Predicted concentrations (maximum over the grid) from DISPMOD, AUSPLUME and TAPM modelling are summarised in **Tables 3-2 and 3-3**. Included in these tables is the latest information from the assessment of cumulative air concentrations undertaken by DMPR (OMP) for all five industries proposed for the King Bay – Hearson Cove Industrial Area (Syntroleum, Plenty River, Burrup Fertilisers, Methanex and Japan DME) (this addresses queries 29 and 30).

■ **Table 3-2 Summary of maximum 1-hour NO_2 concentrations for normal operations**

Model	Methanex	Cumulative	
		PER	OMP Study*
DISPMOD	75 µg/m^3	142 µg/m^3	148 µg/m^3
AUSPLUME	68 µg/m^3	-	157 µg/m^3
TAPM	-	139 µg/m^3	-
NEPM Standard	**246 µg/m^3**	**246 µg/m^3**	**246 µg/m^3**

* Sinclair Knight Merz (July 2002). Strategic Assessment of Amenity at Hearson Cove Beach. Appendix B.2.

OMP's assessment was being undertaken in parallel with the preparation of Methanex' PER. This assessment has now been completed and was released by OMP in early July 2002.

■ **Table 3-3 Predicted maximum ground level concentrations for NO_2 and SOx (µg/m^3) under normal operations**

Pollutant	Averaging Period	Existing: Maximum Anywhere on Grid		Existing and Proposed: Maximum Anywhere on Grid		% of NEPM Anywhere on Grid	
		AUSPLUME	DISPMOD	AUSPLUME	DISPMOD	AUSPLUME	DISPMOD
Cumulative Emissions							
NO_2	1-hour	157	107	157*	148	73.6	69.3
	Annual	7.0	5.0	17.1	9.3	27.6	15.1
SOx	1-hour	1.1	0.7	9.0	9.2	1.6	1.6
	24-hour	0.2	0.1	1.6	0.9	0.7	0.4
	Annual	0.02	0.01	0.3	0.2	0.5	0.4
Methanex In Isolation							
NO_2	1-hour	68	75	-	-	27.6	30.5
SOx	1-hour	Nil	Nil	-	-	Nil	Nil

Source: Sinclair Knight Merz (July 2002). Strategic Assessment of Amenity at Hearson Cove Beach. Appendix B.2.
* Indicates that new industry has negligible effect on maximum concentrations and existing industry governs the level of maximum concentrations.

3.2.2 Ambient Air Quality

In Section 5.10 of the PER it is stated that '*maximum concentrations of all pollutants at Dampier are within the relevant NEPM standard*'. Methanex acknowledges that the DEP have found that NEPM standards for particulates have been exceeded on a number of occasions. This statement is corrected as follows (and addresses query 16):

'Maximum concentrations of NOx and SOx at Dampier are within the relevant NEPM standards. Monitoring results from the DEP indicate that particulate concentrations have exceeded the NEPM standard on a number of occasions'. As the Methanex operations is a gas and liquid based process and will not emit particulates, Methanex will not have any impact on particulates in Dampier under operating conditions.

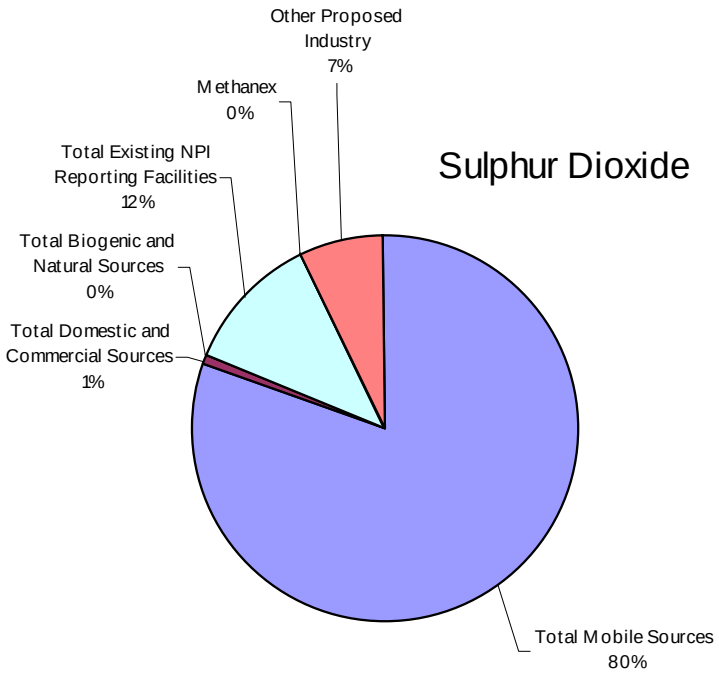
3.2.3 SOx Emissions

The methanol complex will not emit SOx under normal operations. Only under emergency situations, whereby diesel-fired emergency generators are used, will the complex produce approximately 7.5 g/s of SOx. From operating experience in New Zealand, emergency situations are likely to occur once every 2 to 3 years for a maximum period of 1 to 2 days depending upon the nature of the emergency situation.

Given an emergency situation, SOx emissions may be in the order of 1.3 t/yr depending upon the length of time diesel generators are operated. This contribution represents <0.1% of SOx from total existing and proposed sources (1,644 t/yr). This is also 1% of SOx emitted from the largest industry emitter on the Burrup. Under normal operations, the methanol complex will not emit SOx (or SO_2 – sulphur dioxide) (**Figure 3-1**) (this addresses query 29).

Figure 3-1 considers an area 40 km x 40 km approximately centred on the towns of Karratha and Dampier and illustrates the contribution of all sources of sulphur dioxide to the air shed. The area is similar to that considered by the DEP in the formulation of an emission inventory for the Burrup Peninsula in 1999.

■ **Figure 3-1 Methanex' contribution to cumulative sulphur dioxide emissions under normal operations as predicted from OMP's strategic assessment**

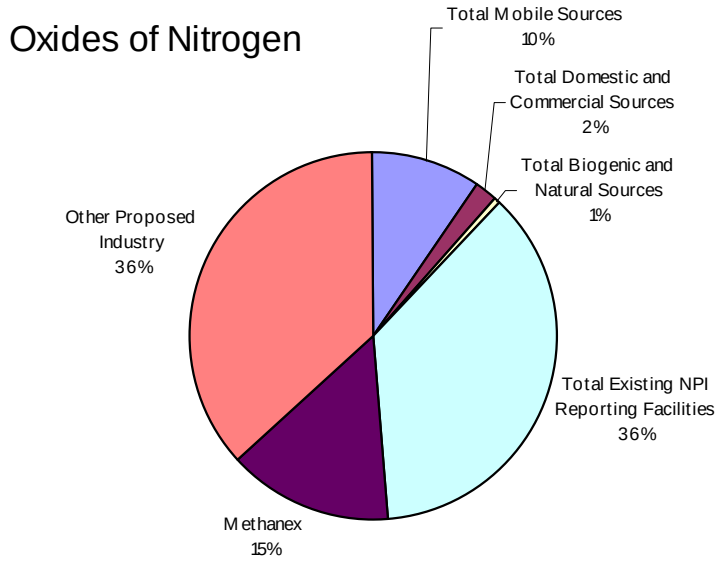


3.2.4 NOx Emissions

As NOx is emitted from combustion processes at high temperature there are a myriad of current and proposed NOx sources in the area. These range from industrial combustion processes such as Dampier Power Station and the Woodside LNG facility through to automobiles, ships, lawn mowers and bushfires. As a proposed industry, Methanex' methanol complex is forecasted to emit approximately 3,150 t/yr of NOx (given 365 normal operating conditions per year) which represents 15% of total existing and proposed NOx sources (21,011 t/yr) estimated by the OMP study for an area of 40 km x 40 km approximately centred on the

towns of Karratha and Dampier (**Figure 3-2**). As stated in the PER, Methanex' methanol complex will emit less than 40% of NOx emitted from the largest industry emitter in the region (this addresses queries 14, 29 and 30).

■ **Figure 3-2 Methanex' contribution to cumulative NOx emissions under normal operation as predicted from OMP's strategic assessment**



Methanex has provided the DEP a technical paper that discusses the technology, plant efficiency and resultant NOx emissions. The information below draws upon the data provided in this technical paper.

The primary source of NOx emissions from the complex is from the gas turbine systems (Section 8.4.1.5 of PER) which will burn a mixture of natural gas and waste gas recycled from the methanol synthesis reaction. The recycling of waste gas (20% hydrogen, 20% unreacted methane, 40% nitrogen, minor quantities of methanol, carbon monoxide and carbon dioxide) to the turbines and its hydrogen content prevents the use of dry low NOx burners on the turbines. As a result, the proposed emissions of NOx from the turbines exceed the recommended AEC/NHMRC National Guidelines for gas turbines operated on natural gas.

As stated in Section 8.4.1.5 of the PER, it is not considered practicable to install dry low NOx burners because instead of being recycled, the waste gas would have to be sent to flare and additional natural gas required to provide energy needed for the plant. Under a scenario of utilising dry low NOx burners, the resultant emissions would be:

- NOx emissions from the gas turbine would meet EPA guidelines as a minimum;
- CO_2 emissions would increase between 500,000 and 750,000 tonnes per annum; and
- SOx emissions from burning natural gas in the turbine will be about 0.26 g/s or 8,200 kg/yr.

The recycling of purge gas will reduce the global emission of CO_2,, while increasing the local emissions of NOx, and decreasing the overall consumption of natural gas.

On the basis of emissions, without any reference to energy efficiency, it is not beneficial to adopt dry low NOx burners and it has been demonstrated that the combined fuel gas provides the best emissions performance.

The use of steam turbines or boilers rather than the combined cycle gas turbines would result in a 15 to 20% reduction in efficiency which would have to be offset by the consumption of more natural gas.

Methanex is continuing to investigate, with the turbine supplier, the improvement of NOx emissions from the gas turbine in this waste gas application. Methanex will implement feasible and practicable applications. Preliminary investigations of current NOx reduction technology indicate that capital cost, increased maintenance and decreased reliability make their application impracticable. As stated in the PER:

***Commitment 8.09**: Methanex will continue to investigate the optimum solution for the fuel and energy balance of the plant and will seek to minimise the emissions from the complex in accordance to the EPA requirements that "all reasonable and practicable measures should be taken to minimise the discharge…". Methanex commits to continue these studies and to incorporate the latest techniques into the design to establish optimum emissions levels. As the technology of the utilisation of waste gas in Gas Turbines develops and becomes proven, Methanex commits to the adoption of all reasonable and practicable solutions to reducing the discharges.*

Investigations to date have considered the following for improving the NOx emissions:

a) Limiting the formation of thermal NOx in the gas turbine combustor by reducing the combustion temperature through:
   1) Evaporative cooling or fogging of combustion air prior to combustion.
   2) Injection of a diluent (e.g. water, steam or nitrogen) into the fuel gas or directly into the burning zone of the combustor, in order to lower the heating value of the fuel gas and increase the heat capacity of the exhaust gases.

b) Removing NOx after it has formed by:
   1) Selective Catalytic Reduction (SCR), where a reducing agent (ammonia) is used to reduce NOx to molecular nitrogen over a catalyst bed located at the cold end of the Heat Recovery Steam Generator (HRSG).

Incremental lifecycle costs have been evaluated for each of these cases (**Table 3-4**) (this addresses query 19) and on this basis implementation of any of these measures will not be practicable. Considering that the cumulative emissions modelling indicates that NEPM standards are more than met, Methanex has implemented all "Practicable" measures and the emissions from the complex are considered to be acceptable.

■ **Table 3-4 Summary of NOx reduction options investigated by Methanex**

Case	Humidification	Injection of a Diluent			SCR
	Evaporative Cooling	Demineralised Water	Superheated Steam	Nitrogen (98 vol%)	Ammonia
GT NOx reduction (%)	~10-20	~40	~40	~40	>40
Efficiency loss		0.2GJ/t	0.5 GJ/t	0.5 GJ/t	0.04 GJ/t
CO_2 Increase		100,000 t CO_2	250,000 t CO_2	250,000 t CO_2	20,000 t CO_2
Relative Cost	*	**	***	****	****
Comments	NO_x reduction is limited by ambient conditions. Not expected to achieve 77 ppmvd NO_x target.	Increased seawater consumption. Increased CO emissions.	Increased seawater consumption. Increased CO emissions.	Consumes additional power and cooling water for nitrogen compression. Increased CO emissions.	Ammonia transportation and storage required. Ammonia slip emissions. Spent catalyst – solid waste handling.

Note. Water and steam injection rates would need to be tripled to achieve a NO_x emission target of 25 ppmvd (at 15% oxygen) using either of these diluents only. This would more than double the incremental total lifecycle cost of these options.

3.2.5 Impacts of Atmospheric Pollutants (SOx and NOx) on the Environment

As with all atmospheric emissions, those from industry on the Burrup have the potential to impact on a variety of environmental attributes in the long term. A desktop assessment was undertaken as part of the PER to provide a preliminary understanding of the issues, impacts and further work required to fully understand and determine the impacts from industrial atmospheric emissions. From the preliminary information collected it is concluded that there is potential for some impact to occur on Aboriginal rock art (petroglyphs and engravings), vegetation and ephemeral freshwater pools on a cumulative basis over the long-term.

The likelihood of this impact should be stated as 'Moderate' rather than 'Unlikely' as in Table 8-1 of the PER given the definitions of 'Likelihood' in Table 7-1 in the PER and the contribution that emissions from the methanol complex will make to the airshed. As there is a general lack of site specific data to better determine the potential for the impacts to occur, the categorisation of the likelihood of this impact as 'Moderate' is considered appropriate (this addresses query 17). Table 8-1 is amended as follows:

■ **Table 3-5 Qualitative Risk Analysis - Potential Impacts during Operation from Atmospheric Emissions**

Potential Environmental Impact	Significance of Impact	Likelihood	Level of Risk
Adverse impact on the condition of flora, fauna, aquatic environments and petroglyphs from atmospheric (acidic) deposition.	Moderate	Moderate	Moderate

The preliminary assessment of atmospheric impacts on the environment was by no means intended to be a comprehensive one as a considerable amount of time, ongoing work, including scientific experiments and monitoring is required to accurately assess impacts from proposed atmospheric emissions from industry.

Having undertaken this exercise it has been difficult to draw any definitive conclusions that provide an accurate indication of any impacts that may occur from cumulative emissions. There is a general lack of published scientific data that is site specific for all areas of interest (rock art, vegetation (including mangrove), fauna (land snails), calcrete pools, stormwater and aquatic environments). European and Asian studies provide some information about impacts but the relevance of these to the conditions of the Pilbara is questionable. Similarly studies undertaken in the Kimberley in relation to impacts on rock art from bat excreta were also not considered to be totally relevant to the situation on the Burrup. Comparisons (eg deposition data with European guidelines) were made in the PER only for information purposes. The use of these comparisons is far from safely predicting potential impacts as it is considered important to compare 'apples with apples'. This makes it extremely difficult for Methanex to make any valued judgements without having to go to significant expense and time of implementing specific scientific experiments (eg fumigation tests, monitoring, baseline surveys etc). For Methanex alone to investigate further the impacts from atmospheric emissions is not practicable (this addresses queries 13, 18, 27, 28 and 37).

The recommendations of the PER includes the development of the Burrup Industrial Council and the encouragement for this Council to (pg 8-44 of PER):

- Undertake baseline surveys for rock art at least prior to the operation of proposed industries and to continue ongoing monitoring. This initial scope of work could be expanded to include '*chemical and other scientific analyses of the interaction between potential emissions and local rocks, or other materials of Aboriginal cultural and heritage significance'* (this addresses query 37);

- Investigate the cumulative impacts on vegetation and flora (which includes mangroves) in consultation with CALM and other experts in this field (this addresses query 13); and

- Undertake a baseline survey of ephemeral freshwater pools occurring near to proposed industry in consultation with CALM.

Obtaining a good scientific understanding of the processes and mechanisms leading to the potential impacts is important so that appropriate management measures are developed and successfully implemented.

Methanex understands that OMP is convening a task force to investigate the cumulative impact of air emissions from industry on Aboriginal rock art on the Burrup. Methanex actively supports the formation of this task force and will provide assistance as appropriate to ensure a timely and comprehensive investigation is completed.

3.2.6 Greenhouse Gas Emissions

The proposed methanol complex will adopt latest generation technology to develop a complex that is state-of-the-art, maximises efficiencies and minimises CO_2 emissions as far as practicable. The PER provides a detailed description of the improvements that have been made in the choice of technology and CO_2 emissions. The relationship between CO_2 emissions, energy efficiency and CO_2 content in gas is shown in Figure 8-12 of the PER. The energy efficiency of the methanol complex will be in the range of 33 to 34.5 GJ/t methanol with a natural gas with a range of 1 to 5% CO_2. This CO_2 range is within the gas specification of the gas contract. Using these parameters the emissions of CO_2 per tonne of methanol can range between 0.3 (minimum), 0.37 (expected) to 0.45 (maximum) tCO_2/t methanol (Sinclair Knight Merz, 2002c). The resultant greenhouse estimates for the range of values presented are provided in **Table 3-6**.

Greenhouse emissions from the transportation (shipping) of methanol from the wharf to Methanex' customer base in the Asia Pacific region will be generated by the consumption of fuel by the vessels. Emissions of methanol will be negligible. These emissions will occur regardless of the location of the Port, whether it is in Western Australia, New Zealand or South America for example. There are no practicable alternatives to transporting methanol and the customers for this product will take receipt of their product needs.

■ **Table 3-6 Estimated CO_{2e} emissions during normal operation from a 5Mtpa methanol complex**

Source	Expected Emissions (2.1% CO_2, 33.5Tj/tonne)		Minimum Emissions (1% CO_2, 33Tj/tonne)		Maximum Emissions (5% CO_2, 34.5Tj/tonne)	
	TCO_{2e}/t methanol	CO_{2e} (kt/yr)	tCO_{2e}/t methanol	CO_{2e} (kt/yr)	tCO_{2e}/t methanol	CO_{2e} (kt/yr)
CO_2 from combustion, inc flaring	0.371	1,855	0.30	1,500	0.45	2,250
Slippage of CH_4 from combustion	0.00043	2.2	0.00043	2.2	0.00043	2.2
VOC fugitive emissions	0.0034	16.8	0.0034	16.8	0.0034	16.8
Berthing	-	27.2	-	27.2	-	27.2
Land clearing	-	<0.5	-	<0.5	-	<0.5
On site vehicles	-	~5	-	~5	-	~5
Waste disposal	-	~1.53	-	~1.53	-	~1.53
TOTAL	**0.3816**	**1,908**	**0.3106**	**1,553**	**0.4606**	**2,303**

Notes
1. Electricity requirements for the plant are to be provided entirely from gas turbines and associated generators with this electricity also used to power the desalination plant (this addresses queries 32 and 33).
2. Annual emissions based on continuous plant operation with no shut downs and start ups.
3. Lower and higher emission factors of 0.30 and 0.45 tCO_{2e}/t methanol as supplied by Methanex.
4. Emissions from upstream processes such as the Woodside facilities are not included.
5. Source: Sinclair Knight Merz (2002c)

The Port of Dampier is located in close proximity to Methanex' customer base in the Asia Pacific. For this reason, the distance from place of production to customers is minimised and relatively short. The most probable alternative locations would be to ship methanol from South America and/or the Middle East, therefore resulting in much larger travelling distances and hence fuel consumption and greenhouse emissions.

Greenhouse emissions from berthing will always occur regardless.

An estimation of greenhouse emissions (CO_{2e}) from shipping activities while berthing was undertaken in response to query 22 based upon the following methodology and assumptions:

- Emission factors from Table A.2 and A.8 of AGO (1998) for Fuel Oil and International Marine Transport;
- Total hours per year that the ships are in berth is 4,800 hours, which is based on 200 ships per year and each ship is in berth for 24 hours;
- The average fuel consumption rate of the ships is 200 L/hr, which is based on a fuel usage of 4 tonnes per 24 hours and a specific gravity of fuel of 0.845. This is consistent with the fuel consumption rate of 0.3 L/kWh given in EPAV (1996) and US EPA (1995) for a 750 kW ship;
- Auxiliary engines operate 24 hours per day to generate electricity while in Port; and
- The energy density of the fuel is 40.8 MJ/L (Table A.2, AGO, 1998).

Based upon the above the contribution of shipping activities (berthing) is estimated to be 27 ktpa CO_{2e} (Sinclair Knight Merz, June 2002) which is about 1.4% of the expected emissions of 1,908 ktpa CO_{2e} as stated in **Table 3-6**.

Following this review of greenhouse emissions it is concluded that (Sinclair Knight Merz, 2002c):

- The sources neglected, land clearing, on site vehicles and waste disposal will make a negligible (<0.4%) contribution to the emissions.
- The annual emissions of CO_{2e} will be in the range of approximately 1.5 to 2.3 Mtpa with a likely value of around 1.9 Mtpa for 5 Mtpa of methanol production.
- The large uncertainty is primarily due to the feed gas composition, in particular the range of deliverable CO_2 content. As such, refinements in the CO_2e estimation for the smaller sources are considered unnecessary.

The methanol complex on the Burrup will add to Australia's greenhouse emissions, however on a global scale, a net reduction would be achieved for the following reasons:

- The first methanol plant will be a replacement for some of the production from Methanex' New Zealand operations. These operations are being replaced with latest technology resulting in a net reduction of CO_2 emissions on a global scale.
- The second methanol plant will be constructed when market demand requires. Introducing new and efficient, therefore low cost, methanol to the market places pressure on high cost, low efficiency production resulting in the closure of existing facilities which are anticipated to become non-competitive and shutdown as a result. This trend is illustrated in Section 8.4.2.3 of the PER (the above information addresses query 31).

Proposed industry for the King – Bay Hearson Cove Industrial Area will emit CO_2 and contribute to Australia's greenhouse gas emissions. Methanex has provided emissions data to Sinclair Knight Merz (2002) for OMP's strategic assessment (this addresses query 33). This assessment was released in early July 2002.

Methanex believes that managing greenhouse gas emissions is a global issue requiring global solutions. To impose financial penalties on the developers of Australia's resources of clean natural gas will not achieve sensible environmental outcomes. Wider use of natural gas and the displacement of less greenhouse friendly products and technologies are part of the solution to reducing global greenhouse gas emission and should be encouraged and not discouraged. This fact has been recognised by the current Australian government (and the Opposition) in expressly undertaking to ensure that Australian industry based on clean technologies is not competitively disadvantaged.

Methanex is part of a multi-national company that is strongly committed to minimising greenhouse emissions as detailed in Section 8.4.2 of the PER. Methanex' commitments in reducing greenhouse emissions are aimed at improving a business they know best to ensure that stringent self-imposed targets are achieved.

Methanex implements internal greenhouse gas improvement targets and various strategies have been established to achieve these targets across their global operations. These strategies will be specific to each operation and will vary from location to location. Global strategies, applicable to Methanex' operations worldwide will include:

- Continuation of research and development of technology improvements for the methanol industry; and
- Continuation of research and development of alternative fuels and fuel cell technology.

Specific to the proposed methanol complex, an initial greenhouse strategy that Methanex Australia have committed to, is to join Australia's Greenhouse Challenge (Commitment 8.10) (the above information addresses query 20, 35 and 36).

Commitment 8.10: *Prior to commissioning, Methanex will develop a framework as part of joining the Greenhouse Challenge. Methanex' participation in the Greenhouse Challenge will commence when the complex is in full operation.*

Commitment 8.11 outlines Methanex' position (and addresses queries 21, 34, 35 and 36):

Commitment 8.11*: As part of managing greenhouse gas emissions, Methanex will:*

- *Continue to research and develop the methanol process in order to improve efficiency and reduce gas usage and implement plant improvements where practicable;*
- *Become a member of the Australian Industry Greenhouse Network;*
- *As a member of the Burrup Industrial Council, Methanex will participate and assist in agreed studies and investigation into the effects and remedies, such as alternative fuel technology, other technology advances and off-set measures, for greenhouse gas emissions where practicable.*
- *Adopt and implement practicable and feasible actions where appropriate to the global methanol industry.*

3.2.7 Odour

Tertiary Methyl Amine (TMA) is produced within the process but is not emitted to the atmosphere. The gaseous stream containing TMA is the distillation waste gas. The waste gas will be recycled as fuel for the process and is therefore not vented to the atmosphere. As there are no fugitive emissions of TMA, TMA will not result in any odorous emissions (this addresses query 23).

The DEP have noted that methanol is stated as having a characteristic odour as specified on information provided on the National Pollutant Inventory database. Methanol is stated in the PER as being odourless, as it is generally not detectable. It has a faint alcohol-like odour (Malcolm Pirnie, 1999). The MSDS states that the Odour Threshold is 2000ppm (irritation at 1000ppm, poor olfactory warning properties).

A Material Safety Data Sheet (MSDS) for methanol has been provided to the DEP as a Technical Appendix.

Methanol is contained within the process and is not normally vented or discharged. During upset conditions any methanol vapour will be set to flare and not released directly to the atmosphere. Methanol is liquid at ambient temperature and is only released to the environment in the event of any spills or leaks (the above information addresses query 24). Methanex has established and proven spill response procedures for managing methanol spills/leaks from other operating plants and these will be adopted and amended where appropriate to suit the proposed methanol complex.

3.2.8 Councils, Committees and Working Groups

Methanex will be pleased to be part of a coordinated committee and/or working group. Considering the DEP's intention of addressing some of the regional environmental issues, Methanex would like to see some coordinated approach given to the formation of recommended Councils, Committees and Working Groups such that the proposed functions of these groups are not replicated resulting in work being duplicated.

In the PER, Methanex have recommended the implementation of an Industrial Council for the Burrup Peninsula. The formation of this Council has also been recommended by other approved Industry. This Council was envisaged has having representatives from industry and government to address various cumulative issues such as planning, environment and mutual aid.

It is suggested that careful attention, coordination and consultation be given in regard to the formation of additional working groups and committees. It is imperative that the planned objectives of the recommended councils, committees and working groups do not overlap and waste valuable resources (this addresses queries 25 and 26).

4. Noise

4.1 Submissions

38) The DEP states that 'the Noise Study assumes that the L_{A10} assigned level for Hearson Cove will be 60 dB(A), based on the requirement for that part of a noise-sensitive premises which is more than 15m from a building which is directly associated with the noise-sensitive use. This may not be an accurate view, since the advice DEP has received is that an area such as Hearson Cove would be classed as a "public place". While some public places are clearly premises within the meaning of the EP Act, others such as Hearson Cove would be considered as a public place that is not a premise. In this case, the noise regulations are silent on the applicable noise criteria.'

39) The DEP advise that 'the Department of Mineral and Petroleum Resources (DMPR) has commissioned a study to assess the potential cumulative impacts of industry on the noise amenity of Hearson Cove. The DEP's review of that study found that the discussion of noise amenity at Hearson Cove should centre on noise levels in the range 40 – 45 dB(A), when determined at the shelter at the southern end of the beach.'

40) The DEP note that 'the SVT Noise Study for the Methanex proposal presents noise contours which indicate that the predicted noise level at the southern end of the beach, for the noise-reduced plant, with a westerly wind blowing, would be 45 dB(A). (Westerly wind was chosen as a worst case for cumulative noise impacts from the group of industrial sites to the west of Hearson Cove).'

41) 'The DEP have assessed cumulative noise at Hearson Cove and are of the opinion that the Methanex complex would need to meet a noise contribution level of:
- 41 dB(A) to achieve a cumulative total of 45 dB(A), a reduction of 4 dB(A) beyond the noise-reduced levels in their PER; or
- 36 dB(A) to achieve a cumulative total of 40 dB(A), a reduction of 9 dB(A) beyond the noise-reduced levels in their PER.

The DEP are of the view that a 4 dB(A) reduction beyond that in the PER (to achieve a cumulative total of 45 dB(A)) should not be too difficult to achieve, given that the SVT report indicated that the noise reductions identified in their study were considered to be achievable. The 9 dB(A) reduction needed to achieve a cumulative total of 40 dB(A) at Hearson Cove would be much more difficult to achieve. Given that the design of the Methanex plant is only preliminary at this stage, the strategy DEP would consider for this assessment would be to establish a Ministerial Condition which required the proponent to incorporate high level acoustic advice in the design stage, and to provide a detailed acoustical design for the achievement of the 36 and 41 dB(A) noise contribution levels.'

42) The DEP notes that 'the PER indicates preferred assessment criteria for construction noise of 66 dB(A) for Dampier and 50 dB(A) for Hearson Cove (Table 7-8). These levels were set by adding 10 dB(A) to existing L_{A10} ambient noise levels, which is an approach that the DEP do not support. The levels are considered to be unnecessarily high, and lower targets should be set.'

43) The DEP notes that 'Commitment 7.03 provides for the preparation of a Noise Management Plan under Noise Regulation 13. This Noise Management Plan could be approved by the CEO of the Shire of Roebourne under delegated powers, and could set more appropriate target levels for Dampier and Hearson Cove than those given in the PER.'

44) The DEP note that 'the PER omits to consider ground vibration from construction blasting, and this is an issue which should be addressed in the construction Noise Management Plan. Appropriate criteria levels can be set using AS 2187. Airblast levels and ground vibration levels from construction blasting would normally require a monitoring program in order that the airblast levels in noise regulation 11 and the vibration criteria in AS 2187 are complied with for all blasts.'

45) The DEP notes that 'the PER does not discuss noise impacts, or whether blasting is required, for the construction of the product pipeline, which passes near other premises on its route to King Bay. This needs to be addressed in the Noise Management Plan.'

46) The Department for Planning and Infrastructure is 'concerned by the potential for noise to substantially affect the use and enjoyment of Hearson Cove. It is noted that the proponents have explained in some detail the noise attenuation measures for the plant, and that there remain opportunities to rearrange some of the noisier elements on the site further away from Hearson Cove. This is to be encouraged.'

47) The Department for Planning and Infrastructure is 'aware of the amenity study being undertaken by the Department for Petroleum and Mineral Resources, partly to determine noise criteria for the recreational areas. Approval to the PER noise modelling prior to criteria being set appears to be out of sequence.'

48) The Conservation Council states that 'noise impacts must be assessed through EIA and CIA processes before the proposal can proceed.'

49) The Conservation Council states that 'it is unacceptable that noise modelling has not been comprehensively undertaken. At a meeting in January it was stated that OMP would undertake cumulative noise impact studies. Why have these not been done?'

50) The Conservation Council notes that 'Section 8.4.4.1 suggests that Dampier will not experience noise-exhibiting tonality. This claim is unacceptable. Low frequency noise could carry to Dampier. It is to be noted that low frequency noise is found to be the most insidious.'

51) The Conservation Council states that 'it is extremely disappointing to read the PER and find a range of unsubstantiated claims and unfulfilled commitments. An example includes claims regarding noise modelling, and measure that will be taken to ensure that the proposal meets assigned noise levels.'

4.2 Response

4.2.1 Noise Criteria

The DEP note in their query that Hearson Cove would be classed as a "public place" rather than a premise. However, the further comment that some public places are clearly premises within the meaning of the *Environmental Protection Act* makes it very difficult for proponents to nominate a suitable criteria for Hearson Cove in the absence of clear definitions and guidance. The criterion quoted in the PER (pg 55) was nominated based on the information and definitions provided in the *Noise Regulations* (this addresses query 38).

OMP has completed a strategic assessment of noise amenity at Hearson Cove (Sinclair Knight Merz, July 2002). The EPA are currently reviewing the study results, but are yet to reach a conclusion (this addresses queries 39, 47 and 49).

Nominated noise criteria for construction is based upon existing daytime L_{a10} (average maximum noise levels) levels with an addition of 10 dB(A) which is considered to be an acceptable maximum variation in noise for construction activities taking place from 6am and 6pm. This results in criteria of 66 (56+10) dB(A) for Dampier and 50 (40+10) dB(A) for Hearson Cove. Methanex will ensure that the EPC contractor will comply with necessary standards and guidelines and in particular, AS2436-1981 '*Guide to Noise Control on Construction, Maintenance and Demolition Sites*' (this addresses queries 42 and 51).

4.2.2 Proposed Noise Emissions

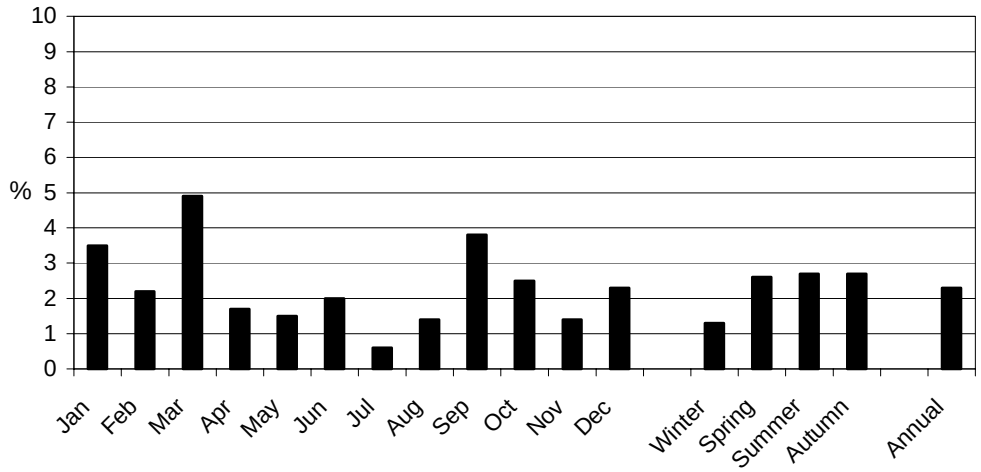
During construction, noise emissions at Dampier is predicted by modelling to be well below 30 dB(A) and a maximum of 43 dB(A) at Hearson Cove when noisy equipment are operating (eg drill rig) and given some attenuation by topography (Section 7.4.2.3 of PER). This level is acceptable and is well below noise levels determined by OMP's strategic assessment to affect usage and enjoyment of Hearson Cove (**Table 4-1**). These levels are relatively low and when compared to existing background levels, noise emissions at Dampier will be 26 dB(A) *below* background levels and emissions at Hearson Cove only 3 dB(A) *above* background levels.

Detailed noise modelling undertaken for the preliminary design of the methanol complex indicates that assigned boundary criteria of 65 dB(A) can be met and noise levels will be about 51 dB(A) at the northern section of Hearson Cove and about 45 dB(A) at the southern section of Hearson Cove for worst case meteorological conditions (NW winds and thermal inversion) (this confirms query 40)

Maximum noise levels at Hearson Cove are expected for prevailing north-westerly winds (light winds at 3m/s or less) in the presence of a thermal inversion. The percentage occurrence of worst case conditions at Hearson Cove is illustrated in **Figure 4-1** as reported by SVT (2002). March indicates the highest frequency of 4.9% and July the lowest with a frequency of 0.6%. On an annual average basis, worst case meteorological conditions for noise at Hearson Cove occurs at about 2.3% of the time (ie 8 days of the year). No data was available to assess the frequency of occurrence or strength of thermal inversions. This is expected to be very infrequent and will further reduce the predicted frequencies of maximum noise levels at Hearson Cove.

Minimum noise levels at Hearson Cove are experienced during prevailing easterly and south-easterly winds of less than 3m/s. The predicted noise level at Hearson Cove given these conditions and an attenuated complex based on front end engineering will range from 40 dB(A)(south) to about 45 dB(A) (north). The frequencies of these wind conditions are 1.0% for easterly and 1.4% for south easterly winds (SVT, 2002), which represents 3 and 5 days of the year, respectively.

■ **Figure 4-1 Percentage occurrence of worst case conditions at Hearson Cove**



As part of the FEED process, Methanex has stated in the design specification that the complex must meet 65 dB(A) at the boundary. Boundary criteria and predicted levels at Hearson Cove are achieved by adopting various noise attenuation controls which are outlined in the PER (Section 8.4.4.5). A reduction of about 10 dB(A) from noise attenuation controls are required such that 65 dB(A) at the boundary is met. Considerable investment is already being made to achieve this and recent indications from the FEED process suggests that such a reduction is difficult but may be achievable given further ongoing detailed investigations.

To consider further reductions, as recommended by the DEP (ie 4 to 9 dB(A) to achieve a contribution of 36 to 41 dB(A) and cumulative total of between 40 to 45 dB(A), respectively at Hearson Cove) will be extremely difficult and probably not practicable. Methanex' approach will be to minimise noise emissions from the complex as much as reasonably practicable (the above information addresses queries 39, 40 and 41).

Tonal impacts on Dampier are highly unlikely as Dampier is located some 6 kilometres to the south west of the methanol complex and several series of elevated rockpiles ie the Pistol Ranges occur within this distance that would eliminate some tonality. Although lower frequency noise is attenuated less than higher frequencies with increasing distance, the existing background levels in Dampier (44 dB(A)) will mask any tonality. Noise from the attenuated complex at Dampier will be 23 dB(A) which is about 20dB(A) less than existing levels. At this low level, tonality will not be an issue (this addresses query 50).

4.2.3 Revised Noise Emissions

Methanex has committed to review noise levels at Hearson Cove following the completion of the design process (this addresses query 46) which is likely to occur in 2002:

***Commitment 8.12**: Following the design process of optimising the plant layout, noise emissions from the complex will be re-evaluated to confirm compliance with boundary noise criteria and to determine the contribution of noise at Hearson Cove.*

Further to this commitment Methanex will:

***Commitment 12.03:** Utilise the expertise of an acoustic engineer to ensure that the best feasible and practicable noise attenuation measures are included during the final design of the Methanex methanol project on the Burrup Peninsula.*

***Commitment 12.04:** During detailed design of the complex, Methanex will ensure that noise levels will meet 65dB(A) at the boundary and that where feasible and practicable noise attenuation measures will be implemented to improve on this level to minimise noise at Hearson Cove.*

This will ensure that potential noise emissions from the complex are as low as reasonably practicable.

4.2.4 Cumulative Noise Emissions

As part of satisfying EPA guidelines for the preparation of the PER, an assessment of cumulative noise emissions was undertaken by Methanex. This investigation indicated that the proposed methanol complex would overshadow noise contributions from other industrial plants and that cumulative noise levels at Hearson Cove would be about 51 dB(A) for the preliminary plot plan.

A concern that has been raised from recent proposals is the absence of noise criteria in the *Noise Regulations* for recreational areas such as Hearson Cove. To protect the amenity at Hearson Cove, OMP undertook a strategic noise assessment to (Sinclair Knight Merz, July 2002):

- Determine the likely effect on amenity at Hearson Cove beach due to different levels of noise;
- Determine the cumulative noise level that would be received at the beach from the proposed industries; and
- Provide guidance on assessing the impact on amenity at the beach from noise emissions.

Workshops were held in Karratha to investigate what noise levels are acceptable and unacceptable to recreational users. Results from OMP's assessment are provided in **Table 4-1,** which describes the impact on amenity from various noise levels (this information addresses queries 47 and 48).

Table 4-1 Description of noise levels and maintenance of amenity

Noise level dB(A)	Discussion	Comparison to Other Noise Sources
62	Considered " unacceptable" by 90% of workshop participants and will likely result in people choosing not to use the beach. Masking of background noise will occur for 93% of the time, and background noise is not expected to exceed this level.	Similar to a larger/ busy business office or large store. Slightly louder than conversational speech.
55	41% of workshop participants found that the noise became "unacceptable" at this level. Masking of background noise is expected for 76% of the time, and background noise is not expected to exceed this level. Recommended maximum for passive recreation stipulated in the NSW Industrial Noise Policy.	Maximum noise level measured for someone walking on Hearson Cove Beach.
52	34% of workshop participants found that the noise became "unacceptable" at this level. This is the level at which 85% of workshop participants believe that the amenity of the beach would be affected and their usage and enjoyment of the beach would be affected. Masking of background noise is expected for 64% of the time, with background noise expected to exceed this level 2% of the time.	Similar to a private business office or an average house.
50	15% of workshop participants found that the noise became "unacceptable" at this level. Masking of background noise is expected for 56% of the time, with background noise expected to exceed this level 4% of the time. Recommended acceptable level for passive recreation stipulated in the NSW Industrial Noise Policy.	Minimum noise level measured for someone walking on Hearson Cove Beach.
48	11% of workshop participants found that the noise became "unacceptable" at this level. This is the level at which 85% of workshop participants believe that the amenity of the beach would be affected, but their usage and enjoyment of the beach would not be affected. Masking of background noise is expected for 45% of the time, with background noise expected to exceed this level 6% of the time.	Slightly quieter than a very quiet dishwasher during operation (quoted as 49dB).
45	No workshop participants indicated that this noise level was "unacceptable", 74% of participants rated it "marginal" or better. Masking of background noise is expected for 29% of the time, with background noise expected to exceed this level 11% of the time.	Background noise in a medium sized commercial office.
40	About 90% of workshop participants rated this noise level "marginal" or better and 40% of participants considered it still "acceptable". No participants found this noise level "unacceptable". This is the noise level at which approximately 85% of workshop participants believe that the amenity of the beach would just start to be affected, but their enjoyment of the beach would not be affected. Masking of background noise is expected for 1% of the time, with background noise expected to exceed this level 24% of the time.	Similar to a living room.
35	74% of workshop participants rated this noise level as "acceptable". No participants rated it as "marginal" or "unacceptable". It is estimated that approximately 85% of workshop participants consider that the amenity at the beach would not be affected. Minimal masking of background noise is expected, with background noise expected to exceed this level 44% of the time.	Similar to a library, a soft whisper, or the median background noise level at Hearson Cove Beach. Slightly above the background noise in the workshop (32-33 dB(A)).

Source: Sinclair Knight Merz (July 2002).

4.2.5 Noise Management Plan

A Noise Management Plan will be developed for the construction and operation phases of the proposal to manage and minimise noise emissions from construction activities and the operating complex. Methanex' commitments to prepare a Noise Management Plan is stated in Commitments 7.01 and 8.02. Further to the management plan Methanex commit to:

***Commitment 8.13**: Compliance noise monitoring will be undertaken by suitably qualified personnel to distinguish between noise levels from local environmental sources and other nearby operating industries if they exist.*

This will ensure that appropriate criteria have been met and that impacts to amenity are minimised.

To address potential ground vibration (query 44) from construction blasting Methanex will:

***Commitment 12.05:** Ensure that the Noise Management Plan for construction specifically addresses the issue of ground vibration from blasting activities.*

The Noise Management Plan will be prepared by the EPC contractor and will address noise and vibration issues from blasting as part of obtaining a blasting permit from the Explosives and Dangerous Division of DMPR before any blasting takes place. The scope of the Management Plan will be limited to Methanex' lease. Blasting that may be required for the product pipeline will be undertaken by OMP as part of the infrastructure and service corridor development plan. OMP will provide the corridor for the product pipeline which will be cleared and levelled for construction (this addresses query 45).

The implementation of a Noise Management Plan for the construction and operation phases and compliance noise monitoring is expected to meet the requirements of the Shire of Roebourne (this addresses query 43). A main concern of the Shire is expected to be the impact on amenity. Methanex will act promptly upon the receipt of any complaints as stated in the PER:

***Commitment 9.08:** Methanex will ensure that any complaints received from the community are documented on a register and substantiated complaints will be investigated to the satisfaction of the DEP.*

This commitment includes any complaints related to noise.

5. Wastewater Discharges

5.1 Submissions

52) DEP questions 'who has the responsibility to be geared up for a methanol spill? What is known of its effects on corals, mangroves and other marine communities? Is that knowledge adequate? If there is adequate knowledge, how is this being used in the design of methanol spill response plans. If there is inadequate knowledge, then Methanex (in consultation with the Dampier Port Authority and the DEP) should commit to a program of research so that the design of methanol spill response plans can be optimised.'

53) The DEP refers to Table 8-4. Methanol toxicity testing. 'Consistency with the ANZECC water quality management framework ideally requires toxicity tests on 5 test species to develop suitable guidelines. If there is information on less than 5 test species, then ANZECC recommends that additional safety factors are applied, reducing the guideline to a much lower, conservative level. DEP suggests that a diatom should also be included as part of the test program to fulfill all the ANZECC requirements and to produce a more robust methanol guideline, that will be of benefit both to the regulator and the operator.'

54) The DEP notes that 'potentially contaminated stormwater will be directed to the stormwater pond for retention and testing. If the tests meet particular criteria then it is proposed to dispose of this as if it were clean stormwater. If the tests fail to meet the criteria, then it is proposed to treat and then dispose to natural drainage lines. The DEP has a range of concerns in this respect:
   - ❑ The testing is only proposed to cover TSS, methanol, THC, pH and TDS.
   - ❑ The PER has not considered the likelihood that other contaminants, eg. Heavy metals, may be present in this runoff.
   - ❑ The test criteria have not been stated.
   - ❑ The proponent needs to be able to characterise more fully the quality of site runoff, and needs to commit to manage this runoff so that it will not result in water quality degradation.
   - ❑ The stormwater management plan (and site plan) needs to be more carefully designed, with a view to minimising stormwater contamination, promoting recycling and reuse, addressing the above dot points.'

55) The DEP notes that 'an assumption is made in the PER that it is possible to delineate areas of the site which will only generate 'clean' stormwater from those areas of the site which will generate 'potentially contaminated' stormwater. No explanation of how this differentiation will be made has been presented.'

56) The DEP states that 'no consideration seems to have been given to the fact that the Burrup Peninsula is increasingly becoming the site of a large industrial complex. Because of this, there is potential for contaminant atmospheric deposition from other industries to impinge on the Methanex site, creating the potential for stormwater drainage to be contaminated.'

57) The DEP notes that 'Table 8-35 applies a mass balance approach to estimate the characteristics of the composite wastewater discharge from Methanex to the Water Corporation Facility. There are several problems with this Table, which the company needs to address (a) contaminant concentration values in treated process wastewater and cooling tower blowdown streams

are believed to be based on licence limits set for an overseas plant, not for the actual performance of a best practice methanol producing plant. Hence these values are considered to be greatly overestimated; (b) concentration of contaminant parameters in the brine are assumed to be zero. On both of these counts the total waste stream characteristics are not correctly calculated.'

58) The DEP notes that 'the second column in Table 8-5 is derived from Table 8-35, and therefore is incorrectly estimated, for the reasons provided above.'

59) The DEP notes that 'Table 8-5 is based on the premise that the EPA will allow for 20 fold dilutions to occur within a mixing zone at the end of the WC outfall (footnote 2). *Even if* that premise were correct, the third column in Table 8-5 has been incorrectly calculated, because it has not taken into account the background contaminant concentrations in seawater which dilutes the effluent subsequent to discharge to King Bay.'

60) The DEP notes that 'the 20-fold dilutions should not be assumed. What the EPA has stated is that it wants to see every effort made to achieve waste minimisation and best practice.'

61) The DEP notes that 'the PER has not calculated loads of proposed contaminants corresponding to the values given in Table 8-5. The loads implicit in Table 8-5 are considered to be unacceptably high.'

62) The DEP highlights that 'it should also be noted that the quality of seawater near the WC pipe intake may be different from the background seawater quality diluting the effluent plume in a more offshore location. (This issue has been discussed with the WC).'

63) The DEP highlights that 'in the EPA's Bulletin 1044 Section 46 Report and Recommendations dealing with the WC's proposed upgraded multi-user seawater supply, the EPA has emphasised that individual system users will be required to demonstrate 'best practice' and waste minimisation principles.'

64) The DEP states that 'according to Table 8-35 the nitrogen loading (from ammonia) would be 4.3 tpa. No demonstration has been given that this represents 'best practice'/waste minimisation. The company should look further at recycling or nutrient stripping. This level of nitrogen load is a concern in the cumulative context.'

65) The DEP notes that 'in relation to Burrup Fertilisers, the Department has negotiated conditions of a Works Approval. It would be highly desirable to establish the same works approval conditions for Methanex. These conditions strive to meet the 99 % species protection levels at the end of pipe, but also acknowledge that part of the proposal involves concentration of incoming seawater, and to allow for this. Two key conditions are:
   - The Works Approval holder is required to provide to the DEP, characterisation data for the water at the intake site over a 12 month period, which will be used in setting limits for the operating licence. Monitoring should be conducted monthly.
   - The Works Approval holder shall construct the wastewater treatment plant so that under normal operating condition the water quality meets the following criteria at a monitoring point just prior to its discharge to Water Corporation's (WC's) multi-user brine discharge system: Here follows a Table of Parameters and limits. For the heavy metals and other toxicants the limits are set at the level of the EQG for 99 % species protection. Below the Table is the following note. Note: The concentration limits of the metals (Cd – Zn) may be re-determined following receipt of the characterisation data of the marine waters at the intake site. These limits shall be set at the above values or 2 times the concentration of the respective metals as determined from the characterisation data, whichever is the greater.'

66) The DEP requests that 'Table 8-5 should endeavour to meet 99 % species protection guideline or twice the quality concentration of intake pipeline at the point of entry to the WC common user facility. Participate in a seawater quality characterisation program for the intake and the area of diffuser.'

67) The DEP provides the following comments in regards to Table 8-6 and King Bay Baseline Monitoring Results – March 2002:
   - 'The monitoring sites shown in Fig 3-1 are not appropriate because, (a) seawater intake location is not monitored, (b) site 1 appears to be located at the old diffuser site, not the new diffuser site, (c) the reference site would be more suitably located along the 4-5 m depth contour (same depth as diffuser).'
   - 'The seawater quality is characterised at a point in water column just below the surface – is this appropriate? Should the survey be set at neap tides? Flood or ebb?'
   - 'Influence of resuspended sediment on TP and TN.'
   - 'Metals – clarify use of terminology 'below detection limits' and below 'limits of reporting'. Both LOR and detection limits should be quoted.'
   - 'No reference is made to the analysis techniques used, and whether these are the best commercially available.'
   - 'Are the ANZECC guidelines referenced in Section 3-2 based on ecosystem health or other?'
   - 'For physico-chemical parameters measured with probes, no reference is made to calibration checks on the instrument.'
   - 'Salinity profiles, with values ~31.5 ppt appear to be unrealistic (35.5-37 is thought to be a more realistic range for mermaid Sound).'
   - 'Temperature profile – would have expected temperatures in the range 28-30 for this time of the year, for mermaid Sound.'
   - 'Ensure instruments are properly calibrated for salinity, temperature and other physico-chemical parameters.'

68) The DEP notes that 'in Table 8-7 there is an issue with LOD and LOR What analyses were conducted? Higher resolution analyses may be required.'

69) The DEP states that the following with reference to page 8-21:
- 'The EPA has provided guidance for industries wishing to enter the Water Corporation common user facility. They will be required to demonstrate:
  - Waste minimisation; and
  - Best practice in relation to the use of the 99 % species protection level.'

70) 'DEP's preferred position is that Methanex will be required to meet effluent conditions at their point of entry to the WC common brine return line. The combined Methanex effluent just upstream of entry to the WC line should meet the 99 % species protection guidelines, or twice the WC seawater intake concentration, whichever is the greater. This is consistent with the position advanced by DEP in relation to other industries seeking entry to the WC common user facility.'

71) The DEP notes the following with reference to Table 8-12:
- 'Section 8.3.1.3 para 3 is considered unsatisfactory.'

72) The DEP recommends that 'a detailed screening analysis should be undertaken of the effluent upon commissioning and stabilisation of the effluent for use in licence review.'

73) The DEP provides the following comments in relation to Whole of Effluent toxicity testing:
- 'No justification has been given that the sampling of the NZ effluent streams plus the manipulation of the sample (both in NZ and at SKM) results in a reasonable representation of the effluent as described in the PER.'
- 'There appears to be serious quality control issues associated, for example, with the storage and transport times from NZ to Perth.'
- 'It is not clear whether the simulated effluent is supposed to represent the process waters, or the combined process and brine streams prior to entry to the WC common user facility.'
- 'The DEP does not accept that the effluent as represented in the PER is compatible with best practice and waste minimisation in 2002.'
- 'Therefore it cannot accept the toxicity results presented as being representative of the toxicity of the ultimate effluent.'
- 'One of the agreed operating principles for the Water Corporation's common user facility is that a particular industry's effluent limits will not be relaxed because further in-pipeline dilutions could be achieved in the Water Corporation's common brine disposal facility.'
- 'The Methanex process waters pre-dilute with the brine stream from the Methanex desalination plant prior to entry to the Water Corporation's facility. Such pre-dilution within the Methanex premises may be taken into account.'

'These results cannot be considered to be reliable on a number of grounds and are of limited usefulness. Further whole-of-effluent toxicity testing should be carried out once the nature of the proposed effluent has been better specified, and with greater attention given to quality control.'

74) The DEP notes that 'insufficient data has been provided to characterise the waste streams from plant blowdowns, treated discharges and drains. Please provide options that are available to reduce discharges, particularly of copper and ammonia. The boiler blowdown from another plant proposed for the Burrup will be sent to a demineralisation plant for recovery. Can the saturator blowdown be sent to a small demineralisation plant for retreatment in order to recover the water and separate the copper into a small concentrated wastestream for recovery.'

75) The DEP recognises that 'the desalination plant is a potential source of emissions to the marine environment. Details of expected discharges are required for each technology option under consideration.'

76) The DEP note that 'the water stream characterisation data is incomplete. DEP request that all toxicants that are not expected to meeting the following criteria on entry to the Water Corporation wastewater and brine discharge system:
- The ANZECC & ARMCANZ 99% species protection level; or
- Twice the inlet seawater concentration.'

DEP also request the 'proponent to specify in a table the number of dilutions that will be required to meet the least stringent of the above criteria for each of the toxicants.'

77) The DEP notes that the 'predicted toxicant discharge concentrations have been derived from operational data from the proponent's New Zealand plants. However, there appears to be no allowance for the large difference in the size of the two complexes.'

78) CALM notes that 'Figure 8-1 indicates that there will be a manually operated valve to separate the first flush 100mm from the clean stormwater subsequent to the first flush. There is concern with the need to have a manual valve to make the system work, and the possibility of a failure due to the valve not being operated. CALM recommend that the manual valve be removed and the system designed so that it will still operate as indicated.'

79) The Water Corporation note that 'on Page 8-20 (line 23) it is stated "...the Water Corporation will fulfil the following commitments: The total dissolved solids concentration of the brine stream shall not exceed 53,000 mg/L". Salinity is not specified in the commitments from Assessments 1378 or 1419.'

80) The Water Corporation note that 'on Page 8-19 (line 22) it is stated "The results from the wastewater toxicity tests will be available in April 2002. This information will be provided to decision-making authorities during assessment of the proposal". We will need this information to expedite design of our marine monitoring program.'

81) The Water Corporation note that on 'Page 8-19 (line 25) it is stated "The results will demonstrate the impacts of the proposed discharge of copper at a concentration of 0.021 mg/L. Copper will exceed ANZECC guidelines for a 99% level of protection but will comply with guidelines for a 95% level(s) of protection". As part of our commitments, we require all industrial process plants to provide appropriate toxicity and environmental fate data for all components of the effluent, to the satisfaction of DEP/EPA; and only use DEP/EPA approved process additives (Commitment 6).'

82) The Water Corporation note that on 'Page 8-27, Table 8-12, Section 8.3.14 & 8.4.4.1 (paragraph 1) "All process wastewater will be treated and tested such that the combined wastewater stream being discharged into the Water Corporation's brine return line meets the defined specifications for this stream". There is a need for clarity in that wastewater from Methanex will be licensed by DEP before it is accepted into the Corporation's wastewater pipeline.'

83) The Water Corporation note that on 'Page 8-66 (Line 44), it is stated "...Through this process, Water Corporation is developing water quality targets that must be met by industry who wish to discharge wastewater to King Bay..." Bulletin 1044, states DEP will develop targets as part of the Part 5 licensing process for each industrial process plant.'

84) The Water Corporation note that on 'Page 12-8, Table 12-2. Commitments 8.03, 8.06 and 8.14 require (1) realignment in line with the Corporation's Commitments in Bulletin 1044, and (2) require advice from DEP and Water Corporation to ensure the wastewater conforms with the commitments placed on the end of the marine outlet in King Bay.'

85) The Water Corporation states that the 'PER makes no reference to EPA Bulletin 1044 ("Upgrade of multi-user seawater supply and introduction of wastewater to ocean outfall, Burrup Peninsula, change to environmental conditions"). This is a major omission as Commitments 6, 7, 8, 11 and 12 have a direct influence on the content of the Methanex PER.'

86) The Water Corporation notes that 'the PER is silent on the seawater supply and wastewater discharge pipeline system provided by the Corporation. Development of a duplicate seawater supply system will present immense delays for the Methanex Project because they will need to address some critical environmental and social issues. It is thus suggested that Methanex seriously consider using state funded common user infrastructure that is intended for all proponents on the Burrup.'

87) The Conservation Council provides 'a summary of the CIA and EIA issues that must be properly addressed before the proposal can proceed:
   - ❑ The EIA of the proposal must assess the potential environmental impacts associated with the use of seawater in the production process. It is understood that the proponent intends to use 55ML/day of seawater.'

88) The Conservation Council states that 'the information presented on wastewater discharge into the marine environment is totally inadequate. It is unacceptable for Methanex to dismiss this issue as being the responsibility of the Water Corporation.'

5.2 Response

5.2.1 Seawater Supply

The proposed methanol complex will require around 55ML/day of seawater which is expected to be supplied to the site through the Water Corporation's proposal of a multi-user seawater supply system for the Burrup. Brine return is also expected to use the Water Corporation's system with the delivery point being at the boundary of Methanex' site. Details of the seawater supply are provided in Sections 1.3, 4.3, and specifically Section 8.4.7 of the PER (this addresses query 86).

Methanex is in discussions with the Water Corporation to ensure that the following meets the needs of the methanol complex and most importantly Best Practice:

- ❑ Quality of seawater that is provided;
- ❑ Reliable and continuous water supply;
- ❑ Optimum design of the outfall in respect to location and diffuser design; and
- ❑ Maximum diffusion of discharged brine and wastewater at the outfall such that impacts to the marine environment are minimised as far as practicable.

The establishment of a duplicate seawater supply system at this early stage is not desired by Methanex as any alternative would involve extra time and cost. However a duplicate may be required to ensure reliability. Methanex is working with the Water Corporation to ensure that the above listed items can be satisfactorily met prior to the acceptance of the Water Corporation's system (this addresses query 86).

Seawater is required so that fresh water can be produced for boiler feed water, cooling, and methanol production. As seawater enters the complex, its first treatment is desalination. No further seawater is used in the production process. Methanex will have a freshwater cooling unit rather than a salt water cooling tower. The reasoning for this is provided in Section 3.5.4 of the PER (this addresses query 87).

5.2.2 Water Re-Use

Water is a very important resource in the methanol process. It is utilised in the manufacturing process and to transfer energy around the complex, providing energy for turbines and heaters. Large quantities of water are circulated throughout the plant and particular attention is paid to water conservation, recycle and re-use, as treatment of raw water is both expensive and complex.

Figure 5.1 provides an estimated water balance for the Methanex methanol complex based on best currently available information. Key data for the water balance is summarised in **Table 5.1**.

From the water balance diagram it can be derived that the methanol complex water usage is estimated as 47,700 m^3/day. Make-up water from the desalination plant is approximately 22% of this, thus 78% of water used on the plant is derived from recycling and re-use. Losses of water to the atmosphere and water used for irrigation are approximately 92% of the make-up water or 21% of the total water usage. Wastewater that will be discharged with the brine from desalination is approximately 8% of the make-up water or 2% of the total plant usage. This approach to minimising the water requirements and waste water generated by the complex, clearly demonstrates Methanex' commitment to waste minimisation.

■ **Table 5-1 Key data for the water balance of the methanol complex**

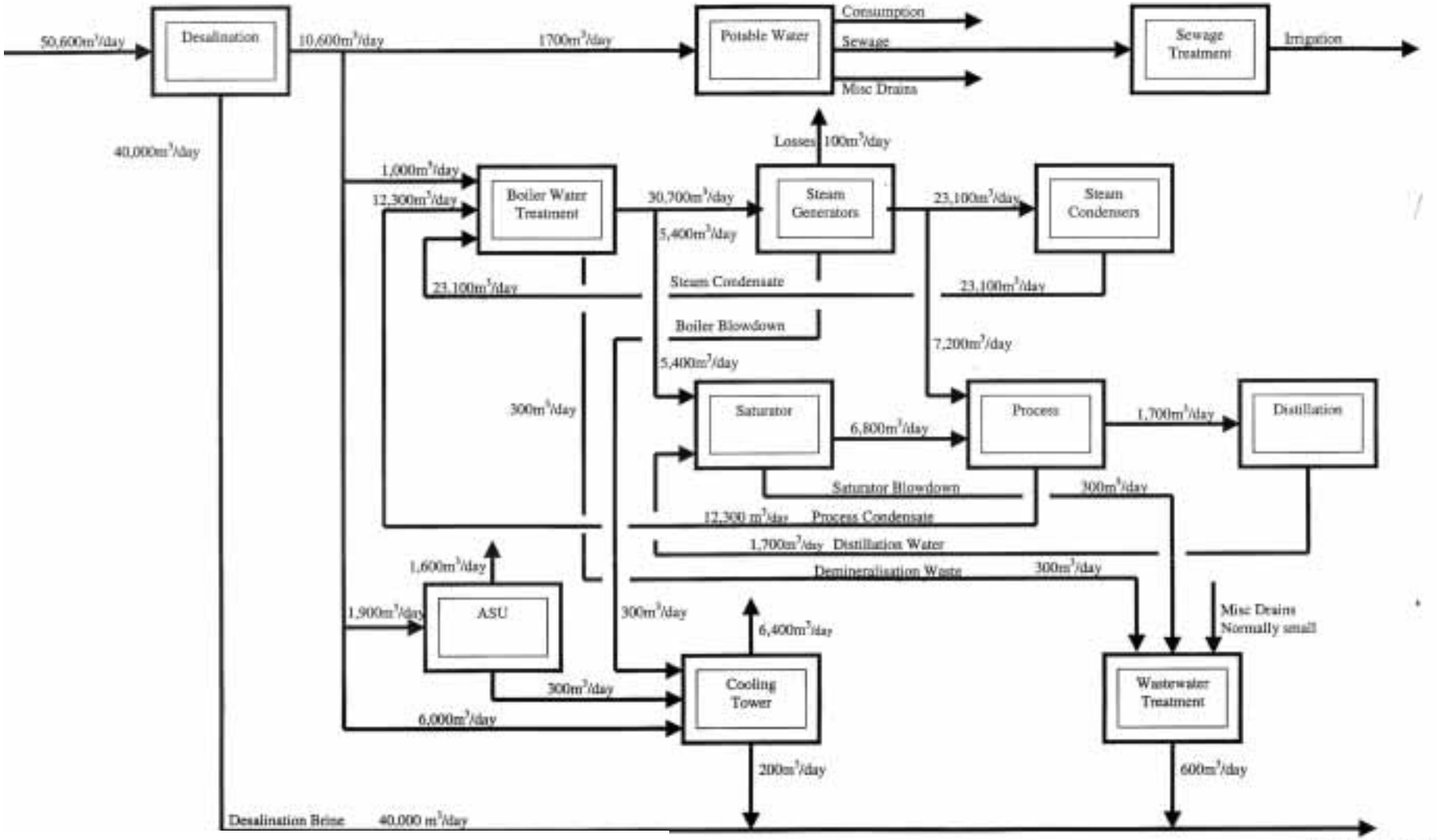
Process System	Description
Steam System	Steam is utilised at 3 pressures, High Pressure (125barg), Medium Pressure (50barg) and Low Pressure (5barg). The circulation rate within the steam system is 30,700m^3/d. Make-up is only a small proportion of this at 1,000 m^3/d.
Process System	Water is used in the manufacture of methanol. This system circulates 14,000m^3/d.
Cooling System	The cooling system is an open fresh water system circulating 24,000m^3/d. Water is lost from the cooling tower in the process of evaporation and a small flow as blowdown.
Inflow	10,600m^3/d of fresh desalinated water.
Outflow	17,000m^3/d Domestic consumption/sewage. 100m^3/d Steam losses. 8,000m^3/d Evaporation to the atmosphere. 800m^3/d Wastewater to the brine return system.

5.2.3 Brine Return and Treated Wastewater Discharge

With respect to providing a detailed discussion of the proposed wastewater discharges, Methanex is of the view that many of the Water Corporation's comments (queries 80 to 85) pertain to commercial arrangements between Methanex and the Water Corporation. Therefore Methanex does not believe it is appropriate to comment further on these issues in this document.

Methanex has provided the DEP with a paper that documents the treated wastewater stream and provides an indication of the typical composition from other waste streams. A summary of the discharges is provided below and illustrated in **Figure 5-2** to address queries 57 to 66, 69, 76 and 88.

■ **Figure 5-1 Methanex Methanol Complex Water Balance**



Note: Based on best available information and represents estimated average conditions.

The methanol process converts natural gas and water into methanol. The conversion process also produces trace quantities of other products such as ammonia, other alcohols and other hydrocarbons. The process takes place through reactions involving three catalysts. Contaminants in the wastewater streams thus result from the metals in the catalysts, zinc, nickel and copper, and from the process. The alcohols and hydrocarbon are predominantly recycled through the saturator. Further contamination may occur from the products of corrosion of the piping and vessels. These are not designed for and will be negligible in comparison to the components that have been specified.

Other chemicals/elements that are in the wastewater streams are additives for chemical treatment and elements that are already existing in the water at the time of receipt.

Water treatment chemicals are utilised to:

- Produce suitable quality water for use on the complex as potable water, process water, boiler feed water and cooling tower make-up water;
- Provide corrosion and deposition protection within systems that utilise water such as cooling water systems; and
- To treat wastewater to meet discharge specifications.

The design of the plant has not yet been finalised so final chemical inventories and usage rates are not available and will not become so until final chemical supply contracts have been concluded. From Methanex' knowledge of the operation of methanol plants, typical chemicals are detailed in **Table 5-2**. The MSDSs for each of these typical chemicals have been provided to the DEP.

There are three waste streams from the methanol complex that are expected to be discharged to the marine environment. These streams are:

- **Desalination Brine (Stream 2 in Figure 5-2).** This stream is the waste stream from the desalination plant. With the exception of additive process chemicals this stream will contain only what has come from the seawater supplied by the Water Corporation from King Bay. The DEP specifically request discharge information from each technology option under consideration for the desalination unit. It is not expected that there will be any significant differences in the brine. As previously mentioned in addressing query number 3, this information is not available at this time due to the competitive bid process of the two FEED processes. Indicative chemicals are indicated in Table 5.2. Details of process additives will become available following Methanex' decision on the EPC contractor for processing the Works Approval Licence (this addresses query 75).

- **Cooling Tower Blowdown (Stream 4 in Figure 5-2).** The design of the cooling system has yet to be completed and the treatment programme is not finalised. Chemicals that may potentially be used are given in Table 5-2. During finalisation Methanex will consult with the DEP and seek their approval for the treatment regime. Final details of the chemicals, their toxicity and the resulting loadings will be provided during this consultation process.

- **Treated Wastewater (Stream 8 in Figure 5-2).** Methanex currently operates in four areas of the world where treated wastewater and other streams, for example storm water and cooling tower blowdown are discharged into ocean outfalls. On this basis, a composite sample was prepared for what would be considered to be a typical waste from the proposed Burrup complex and Whole Effluent Toxicity testing was undertaken. The results indicated that at 200 times dilution (about 67 times dilution with brine plus three times dilution within mixing zone), Methanex' wastewater would meet a 99% acceptance level in the marine environment.

■ **Table 5-2 Typical chemicals that may be used for Methanex' Burrup methanol complex water treatment**

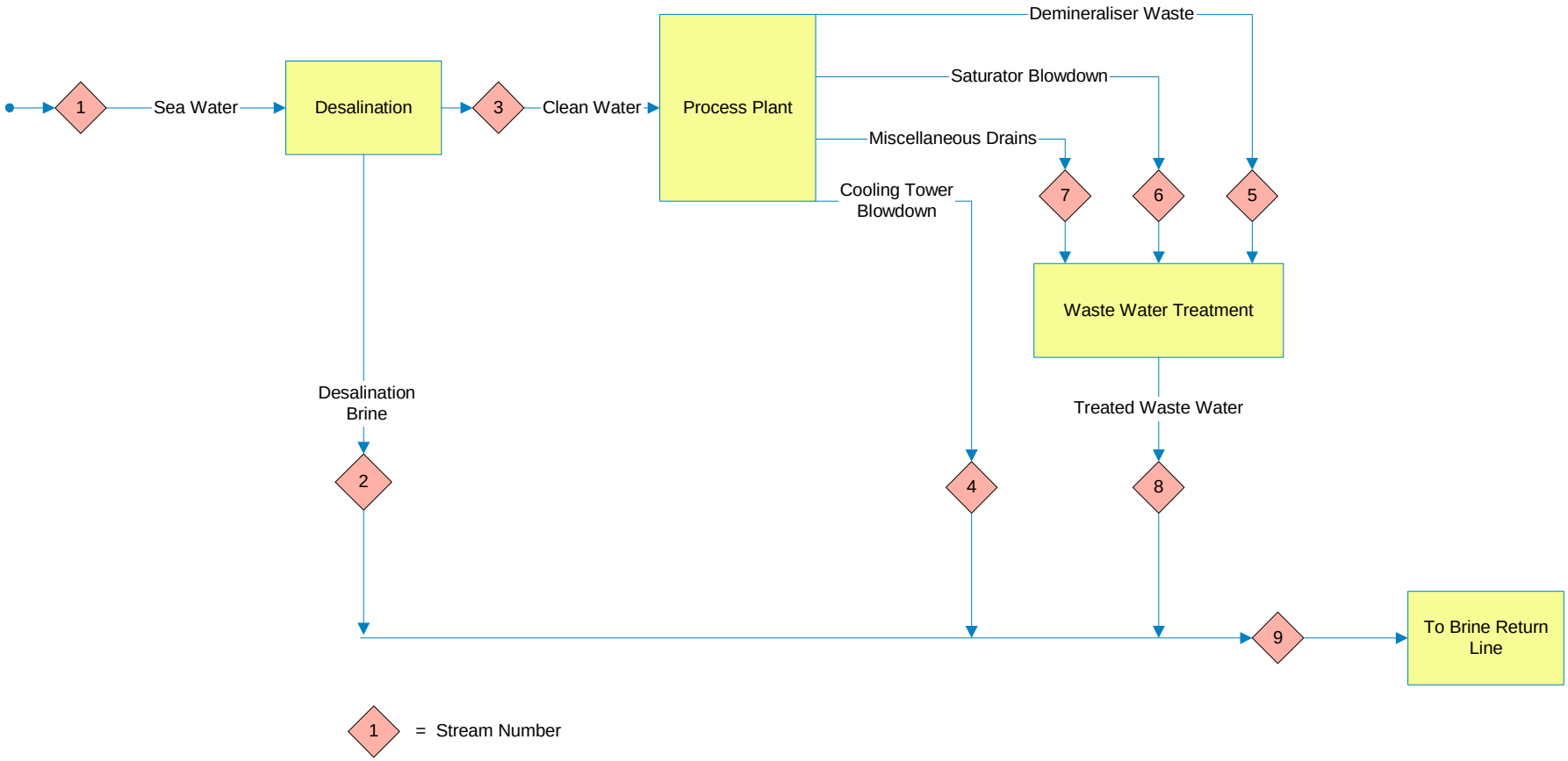
Plant Area	Treatment description	Data		Comment
		Chemical		
		Name	Number	
Desalination	Biocide Neutraliser		DCL 30	
Desalination RO	Antiscalant	Hypersperse	MDC220	
	Cleaners - Acid	Kleen	MCT103	Desalination cleaning cycles will be captured, neutralised and treated before disposal.
	Basic	Kleen	MCT511	
	Bio	Kleen	MCT882	
Desalination MVC	Antiscalant	Aquamax	LT19	
	Foam Control	Aquamax	AF	
	Cleaners - Acid	Sulphamic		Captured, Neutralised and treated.
	Brine return			
Boilers - Feed water	O2 Scavenger	Cortrol	OS7780	Consumed
	Neuralising Amine	Steamate	NA0760	Consumed
- HP	Dispersants	Optisperse	HTP73301	
		Optisperse	HTP73611	
- MP	Dispersants	Optisperse	HTP73304	
	Boiler blowdown to the cooling tower as make-up			
ASU	Galvanic Corossion Inh	Flogard	MS6207	
	Non Oxidising Biocide	Spectrus	NX1100	Neutralised
	Oxidising Biocide		CL2	Neutralised
	Blowdown to the cooling tower as make-up			
Cooling Water	Corossion Inh	Dianodic	DN2250/2760	either/or
	Scale Inh	Depositrol	PY5204	
	Galvanic Corossion Inh	Flogard	MS6207	
	Bio dispersant	Spectrus	BD1500	
	Oxidising Biocide		Cl2	Neutralised
	Non Oxidising Biocide	Spectrus	NX1100	Neutralised
	Biocide Neutraliser		DCL 30	
	pH Correction	Lime	40% Slurry	
	Cooling tower blowdown to the brine return			
Other Chemicls	Acid	H2SO4		Demineraliser regenerant and pH correction
	Caustic	NaOH		Demineraliser regenerant and pH correction
	Soda Ash	Na2CO3		Potable water pH correction
	Calcium Chloride	CaCl2		Potable water hardness

The characterisation of the treated wastewater stream is provided in **Table 5-3** which details the composition of this waste stream on the basis of average and maximum concentrations (this addresses queries 59 and 70).

Table 5-3 supersedes the information provided in Tables 8-5 and 8-35 on the PER. Thus addressing DEP's comments (queries 57 to 61, 63, 64 and 66) in regard to Tables 8-5 and 8-35. This information is representative of treated wastewater from Methanex' New Zealand operations. Water quality discharge data for Methanex' NZ operations from 1997 to 2001 have been provided to the DEP for information and consideration. Methanex has provided the FEED process with a design specification to meet a defined water quality and contaminant concentrations. The flow rates used to estimate discharge concentrations have been provided from preliminary design information. On this basis, the composition of wastewater is based on known and defined concentrations and flows from the preliminary design and as such the size of the complex is taken into account (this addresses query 77).

Methanex will be in a position to provide detailed information on quantitative data for process additives to the DEP to assist in obtaining approval for additives and processing the Works Approval Licence. Contaminant loading data for the treated wastewater stream is also provided in **Table 5-3** which is based upon average flows rates and average concentrations (this addresses queries 57 and 75).

■ **Figure 5-2 Simplified Water and Wastewater Flow Diagram**



■ **Table 5-3 Characterisation of Treated Wastewater and Brine Streams**

Waste Stream Composition													
	Parameter	Flow Rate	Temperature	TDS	Free Chlorine	pH	THC	Methanol	Copper	Nickel	Zinc	COD	Ammonia
Stream		m3/d		mg/L			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Incoming Seawater (1)	Average (a)	50,600		36,400					0.0043	0.0005	0.0019		
	Maximum (b)	55,000							0.008	0.001	0.003		
CT Blowdown (4)	Note that this stream is not finalised as detailed design is not complete. Flow rate expected to be 200 m3/d. DEP will be consulted and must approve the finalised treatment chemicals and thus the blowdown composition. (c)												
Treated WasteWater (8)	Average	600		10,000		6-9	5	7.5	0.25	0.5	0.5	50	5
	Maximum	700					10	15	0.5	1	1	100	10
	Loading in kg/year						1095	1643	55	110	110	10950	1095
Desal Brine (2)	Average	40,000		50,000					0.0059	0.0007	0.0026		
	Maximum	55,000							0.0110	0.0014	0.0041		
Combined Stream with Desal Brine (9) - Process additives only	Entry to BRS Average (d)	40,800	Average of 2 oC above the supplied seawater temperature	< 55,000			0.074	0.110	0.004	0.007	0.007	0.735	0.074
	Entry to BRS Maximum (e)	55,000	Average of 2 oC above the supplied seawater temperature	55,000			0.127	0.191	0.006	0.013	0.013	1.273	0.127
Combined Stream with Desal Brine (9) - Process additives and seawater contribution	Entry to BRS Average (f)	40,800	Average of 2 oC above the supplied seawater temperature	< 55,000	Zero	??	0.074	0.111	0.010	0.008	0.010	0.739	0.074
	Entry to BRS Maximum (g)	55,000	Average of 2 oC above the supplied seawater temperature	55,000			0.127	0.191	0.017	0.014	0.017	1.273	0.127
	99% ANZECC Level							n/a	0.0003	0.007	0.007		0.5
	2 X background seawater conc Average								0.0086	0.0010	0.0038		
	2nX background seawater conc Maximum								0.0160	0.0020	0.0060		
	DEP mixing zone Average						0.0062	0.0092	0.0008	0.0007	0.0008	0.0616	0.0062

Notes:

(a) Determined from average of 12 samples taken at proposed intake location in King Bay.

(b) Maximum from 12 samples taken at proposed intake location in King Bay.

(c) Low flow rate, any additives will have negligible contribution to wastewater

(d) Contribution from Treated Wastewater only.

(e) Contribution from Treated Wastewater only, max conc and max flow.

(f) Contribution from Treated Wastewater and Desalination Brine.

(g) Contribution from Treated Wastewater and Desalination, max conc and max flow.

(h) Loadings are calculated using average flow rates and average compositions.

(I) Concentrations of metals in Wastewater stream are representative of the treated water from the New Zealand plants. Monitoring of New Zealand outfalls indicate levels of copper of between 0.02 and 0.05 mg/L. This corresponds to treated wastewater levels of copper of 0.2 to 0.5 when the dilution factor of 10 arising from the stormwater and groundwater is taken into consideration.

(j) The DEP mixing zone is taken as 0.01km2 around the Water Corporation's proposed outfall. From information received from Burns and Roe Worley this equates to 12 times dilution.

The composition of treated wastewater (**Table 5-3**) is based upon online, 24-hour composite sampling of treated wastewater from existing operating plants. These concentrations have been specified for the FEED process and will be the likely concentrations from the proposed Burrup complex.

In the EPA's Bulletin 1044 Section 46 Report and Recommendations dealing with the Water Corporation's proposed upgraded multi-user seawater supply, the EPA emphasised that individual system users will be required to demonstrate 'best practice' and waste minimisation principles. The DEP have specified the following guidelines for proponents:

- The concentration limits of the metals in the wastewater should endeavour to meet 99 % species protection guideline or twice the quality concentration of intake pipeline at the point of entry to the Brine Return System (BRS), whichever is the greater; and
- Provided each industry can demonstrate best practice waste avoidance/minimisation strategies and meet "best practice", the edge of the previously approved mixing zone ($0.01km^2$) can be used as a guide for the 99% species protection level for toxicants (Bulletin 1044).

The preceding sections illustrate Methanex has implemented "best practicable waste minimisation" and that for the average treated wastewater case, Methanex will meet the ANZECC 99% level of protection trigger values at the edge of the DEP nominated mixing zone, $0.01km^2$, for treated wastewater (containing copper, nickel, zinc and ammonia) from the Water Corporation's King Bay Outfall for the total brine and treated waste water stream. Note that additives contained in the cooling tower blowdown and brine are not included here, as the characterisation of these waste streams have not been completed as previously discussed. Both the flow rate and contaminant concentrations are expected to be very low.

For the total brine and the average treated wastewater case, the concentration of copper exceeds the ANZECC 99% level of protection and marginally exceeds twice the average background concentration on entry to the BRS. With respect to nickel, average concentrations are marginally greater than the ANZECC 99% level of protection, and exceed twice the background concentrations and for zinc, concentrations exceed the 99% ANZECC level of protection and twice the background concentrations on entry to the BRS (this addresses query 76). Note that the background concentrations of seawater has been characterised on the basis of sampling undertaken on three occasions and are representative of preliminary background concentrations (Refer to **Table 5-3**, Notes (a) and (b)). A 12 month sampling programme is required to determine more accurately long-term average water quality conditions.

Toxicology studies indicate that the treated wastewater will achieve 99% levels of protection at a concentration factor of 0.5% which is well inside the DEP nominated mixing zone for treated wastewater.

The combination of relatively low flows and managed compositions indicate loadings (**Table 5-3**) are expected to be within the DEP indicated loading capacity of the receiving environment for normal operating conditions.

Methanex has confidence that its approach to minimisation of water use and extensive water recycling and re-use clearly demonstrates "best practice". Furthermore, the proposed wastewater treatment process discussed further in Section 5.2.6 below demonstrates the application of best practice within the methanol industry with respect to minimisation of wastewater contaminants. Therefore, Methanex has satisfied the guidelines presented in Bulletin 1044, in that it has demonstrated the implementation of appropriate waste avoidance/minimisation strategies, has demonstrated through preliminary ecotoxicology tests that site-specific toxicity data utilising indicative wastewater from existing plants that the proposed discharge will provide a 99% level of protection to the marine environment of King Bay, and finally the 99% species protection for individual toxicants should be met at "the edge of the previously approved mixing zone ($0.01\ km^2$) under normal operating conditions.

Methanex highlights that the project is not yet at the stage of obtaining works approval licences or operating licenses, as approval for project go-ahead must be granted first by the Minister for the Environment and Heritage. It is expected that this may occur in July/August 2002. Following the Minister's approval, Ministerial conditions will be issued and Methanex will be in a position to consider licensing arrangements (this addresses queries 65, 82 and 83).

As noted above, Methanex is liaising closely with DEP such that the requirements for wastewater characterisation (including details of process additives) and environmental fate data are met. Methanex has the benefit of site-specific toxicity data utilising indicative wastewater from existing plants to demonstrate that the proposed discharges will provide a 99% level of protection to the marine environment of King Bay. It also demonstrates that the predictions have a high likelihood of accuracy.

5.2.4 Methanol and Wastewater Toxicity

Methanex has completed methanol and wastewater toxicity tests as stated in the PER as Action Items 2 and 3 respectively to demonstrate the potential impacts of discharging treated wastewater to King Bay via the Water Corporation's proposed outfall. This also satisfies Commitment 8.03 and part of Commitment 8.06. The details and results of these tests have been reported to the DEP for their review and approval of the proposed wastewater discharges. Methanex will discuss the release of this information to the Water Corporation during progressive commercial discussions with the Corporation in regard to seawater supply and brine return (this addresses query 80).

The methodology for the methanol toxicity tests was undertaken in close consultation with Officers of the DEP. Four test species were used (**Table 5-4**) and existing data from an additional 8 species (**Table 5-5**) to establish 12 data points for determining a trigger value relevant to Australian conditions. This is well above the minimum requirement and represents data from a mixture of acute and chronic endpoints (this addresses query 53).

■ **Table 5-4 Summary of test species and endpoints for assessing toxicity of methanol**

No.	Species	Test Endpoint	Standard Operating Procedure (SOP)
1	Microalga (Isochrysis sp.)	72-hour growth inhibition	SOP #2-12
2	Rock oyster (*Saccostrea commercialis*)	48-hour larval development	SOP #2-11
3	Prawn (*Penaeus monodon*)	96-hour survival	SOP #2-8
4	Fish (Barramundi: *Lates calcarifer*)	96-hour imbalance	SOP #2-14

■ **Table 5-5 Existing data for acute methanol toxicity to marine species**

Species	Test duration	LC_{50} or EC_{50} (g/L)	Reference
Cockle (*Cerastoderma edule*)	96-h	3.3 – 10	1,2
Mussel (*Mytilus edulis*)	96-h	15.2 – 16.7	1,2
Rotifer (*Brachionus plicatilis*)	24-h	35.9 – 51.9	1,2
Copepod (*Nitocra spinipes*)	96-h	12.0 – 12.5	1,2
Brine shrimp (*Artermia salina*)	24-h	9.0 – 43.6	1,2
Common/Brown shrimp (*Crangon crangon*)	96-h	1.7	1,2
Fish (*Alburnus alburnus*)	96-h	28.0	1
Fish (*Agonus cataphractus*)	96-h	7.9 – 33.0	2

Reference sources: 1. US EPA (2001)
2. BC Research Inc. (2001)

The methanol toxicity report concluded that algae/diatoms seem to be the most sensitive to methanol than other taxa that were tested. A recommendation of the study was to investigate further the toxicity of methanol to other algae/diatoms.

Wastewater and methanol toxicity testing indicates that the proposed wastewater discharges will provide the receiving environment a level of protection of 99% (Sinclair Knight Merz, 2002a; 2002b) beyond the DEP's 0.01km^2 mixing zone. This confirms that Methanex' methanol complex will have a negligible impact on the marine environment. Follow up toxicity testing of wastewater following the operation of the methanol complex will also be undertaken to verify the composition of wastewater and toxicity results (Commitment 8.06) (this addresses query 72).

Methanex will have the expertise to respond to any potential methanol spills in the marine environment. A detailed description of the toxicity of methanol, the behaviour and nature of methanol in water and Methanex' responsibility is provided in Section 8.3.1.1 of the PER. Further to this, Methanex' commitment to develop a Methanol Spill Contingency Plan will provide guidance for spill response. The PER also clearly states that Methanex is working with the Dampier Port Authority to ensure that wharf design allows for Best Practice emergency response.

In the marine environment, the infinite solubility of methanol will result in rapid wave-, wind-, and tide-enhanced dilution to low concentrations (<1%) (pg 8-9 of PER). Once concentrations have been diluted below toxic levels, the dominant mechanism of methanol loss is expected to be biodegradation. Relative to conventional gasoline and diesel fuel, methanol is a safer and more environmentally benign fuel. Thus, hazards caused by gasoline releases will be more serious than those due to methanol releases, and these hazards will persist longer in the environment. Once methanol enters the marine environment, spill response procedures are ineffective. Methanex highlights that spill response must be focussed on capturing methanol before it enters the marine environment.

Computer simulations conducted in the past to model the advective dispersion of methanol (Machiele, 1989) have revealed that a 10,000 ton methanol release in the open sea would reach a concentration of 0.36% within an hour of the spill. While this example is indicative only, and in no way is meant to simulate a spill from the Dampier Wharf, it does demonstrate the rapid dilution associated with marine spills of methanol (the above information addresses query 52).

The DEP make a number of queries in relation to the Whole of Effluent toxicity report (query 73). A response is provided in relation to each dot point raised:

- To determine the potential impacts of Methanex' wastewater on the marine environment in King Bay it was considered logical that a sample from an operating methanol plant in New Zealand would provide some indication of the potential impacts that could be expected. This would provide Methanex an advantage over other proposed industry in that the potential effects of the proposed wastewater discharge is quantified. Methanex' New Zealand operations are similar in terms of wastewater discharges to the proposed methanol complex for the Burrup, in that the sources of the pollutants (eg metals, nutrients etc) in the waste streams are similar.

- The waste samples were transported to Sinclair Knight Merz' Ecotoxicity Laboratory in Sydney, not Perth as noted by DEP. As explained in the report, there were unexpected customs and quarantine complications which resulted in the maximum holding time of 48-hrs to be exceeded. This problem will not be encountered in the future as additional toxicity testing that will be undertaken will be with samples from the Burrup complex and will thus avoid customs and quarantine inspections.

- The simulated effluent is representative of the combined wastewater prior to being discharged to the brine return line, hence the term 'Whole Effluent Toxicity'.

- Methanex describes in **Section 5.2.6** below, the treatment mechanisms to be in place to achieve best practice and concentrations as defined in **Table 5-3**.

- It is clearly stated in the PER that the toxicity testing is 'representative' of the expected effluent from the proposed methanol complex. Methanex has committed to undertake toxicity testing of actual wastewater following the commissioning of the complex.

- Methanex has not referenced anywhere in the PER and is very well aware that other possible dilutions in the brine return line from other industry discharges are not to be considered in determining end point dilutions at the outfall. Methanex has only considered dilutions from its own operation and the mixing zone.

5.2.5 Stormwater

Stormwater on site will be managed by collecting the first flush (100mm) of potentially contaminated stormwater and then by diverting the remainder runoff to the clean stormwater system as contaminants would be removed by the first flush. First flush runoff will be tested and treated prior to being discharged to the environment.

Testing is proposed to cover total suspended solids, methanol, total hydrocarbons, pH and total dissolved solids. Approximately 20 years of operating experience in New Zealand indicates that the presence of heavy metals (lead, mercury etc) in runoff will be negligible. Operating experience also indicates that the above parameters sufficiently characterise the composition of the likely runoff. There is no current data to demonstrate the likely quantity of the expected atmospheric deposition of air pollutants from other proposed industry. Given that rainfall in the region is scarce, dominated by cyclonic activity and is usually heavy and of short duration, the large volume of runoff from a typical rainfall event is likely to dissolve and dilute any atmospheric deposition to negligible levels (this addresses query 56).

The issue of stormwater will be addressed in greater detail through the works approval process. When sufficient stormwater is available, Methanex will conduct daily grab samples and conduct analytic screening tests on the potentially contaminated runoff in order to assess contaminant loads to the marine environment. If the sampling reveals a detrimental effect on the environment, then Methanex will revise their stormwater management arrangements.

The test criteria for the above water quality parameters will be determined as part of obtaining a Works Approval Licence and approved by the DEP. This will also be specified in the Water Quality Management Plan (Commitment 8.02). This Plan will also be developed to the satisfaction of the DEP (the above information addresses query 54).

The complex will be designed with a dual stormwater system separating potentially contaminated runoff from clean stormwater runoff. The PER provides an indication of what areas of the complex are considered as potentially contaminated or clean. These areas will be separated by a specifically designed stormwater drainage system that will divert runoff to the appropriate system (ie clean or contaminated). For example, the process plant area is considered an area that may be potentially contaminated. This area will be equipped with drains that will send runoff to the potentially contaminated stormwater system where it will be tested and treated (this addresses query 55).

Current engineering designs indicate that the diversion of clean runoff following the first flush will be undertaken by activating an automatic valve in response to a certain water level being reached on the stormwater pond. The operation of the automatic valve will be monitored from the control room to ensure that it functions as planned. This will eliminate the need of relying on physical manual power to operate the valve manually under emergency situations (this addresses queries 71 and 78).

5.2.6 Wastewater Treatment, Management and Commitments

As stated in the PER, Methanex will treat and monitor the wastewater stream that will be discharged from the site such that it meets the requirements as agreed with the DEP/EPA (Commitment 8.14). It is noted that DEP, rather than Water Corporation as stated in the PER, will develop water quality targets that must be met by industries who discharge via the outfall (this addresses query 83). It is also understood that an agreement will be made with the Water Corporation on the specification of the wastewater that will be discharged to the brine return line. As such, the wastewater streams (8 and 9) will be monitored to ensure that specifications are met (this addresses query 82).

Methanex notes that the value of 53,000 mg/L for TDS was a limit previously agreed with the DEP for brine discharge. It is now noted that this value has been amended to 55,000 mg/L as stated in Bulletin 1044 (this addresses query 79).

The methanol complex will comprise numerous treatment mechanisms such that waste contaminants are minimised as far as practicable and that 'best practice' principles are achieved. As a minimum the following streams as identified in **Figure 5-2** will be treated as follows (in response to queries 64 and 69):

- **Desalination Plant Brine (Stream 2 in Figure 5-2)** – In-line biocide neutralisation will be undertaken to remove biocide (chlorine). This may include an agent such as sodium metabisulphate;
- **Cooling Tower Blowdown (Stream 4 in Figure 5-2)** – In-line biocide neutralisation and automated pH neutralisation;
- **Demineraliser Waste (Stream 5 in Figure 5-2)** – Automated pH neutralisation;
- **Saturator Blowdown (Stream 6 in Figure 5-2)** – Oily water separator for wax removal, feed tank to even variations in organic load, biotreater to reduce organics and adsorb metals; and
- **Miscellaneous Drains (Stream 7 in Figure 5-2)** – Automated pH neutralisation, oily water separator for oil removal, feed tank to even variations in organic load, biotreater to reduce organics and adsorb metals.

Overall the proposed wastewater treatment plant will have the capacity to treat the above streams as follows:

c) Neutralisation pit

- Automated acid and caustic addition for pH control;
- Sodium/ potassium metabisulphate addition for free chlorine neutralisation;
- Continuous monitoring of effluent for pH and free chlorine as well as manual sampling; and
- A surge volume will be included in the system to allow discharge to be stopped and wastewater re-circulated to provide time to investigate any potential problems;

d) Feed Tank

- Will comprise a low speed agitator to keep materials in suspension and well mixed;
- Sized for 24 hours of residence time under normal operation to even out variations in organic load. Further 24 hours of surge volume is incorporated to buffer against variations in rate; and
- Tank eliminates ingress of rainwater and dust keeping the biological load relatively constant, reducing VOC emissions and preventing infection.

e) Bio-Treatment Plant

- Comprise a biotreater (continuous aeration process);
- Discharge water will be monitored on-line and manually sampled. In the event of an exceedance of water quality limits, the discharge will be isolated and diverted back to the feed tank.
- Biomass will remove dissolved metals from wastewater; and
- Solids are dewatered and collected for offsite disposal.

Further to treatment, all discharge streams will have dual on-line monitoring of key parameters and back up by routine sampling. Discharge streams will be equipped with alarms to warn of potential problems. For example, on-line monitoring of the desalination brine will include the parameters of temperature, conductivity, pH and residual biocide.

Further treatment of the wastewater would typically involve the following steps and produce a stream of pure water that can be used in the plant and a waste stream containing all the contaminants.

1. The first step in the process would be an organic filter or removal process to remove the remaining trace organic compounds (methanol and hydrocarbons). This would usually be a regenerative resin based process requiring chemicals to clean and regenerate. A stream of regeneration waste will need to be neutralised and then processed further.
2. A demineralisation process to remove trace dissolved solids. This would normally be a resin based process requiring regeneration using further chemicals. The clean water stream from this process would be of sufficient quality to be reused on the plant. The regeneration waste will need to be neutralised and then processed further.
3. The regeneration waste from the previous two steps will still contain a large proportion of water. Disposal to a licensed handler or evaporation on site to form a solid sludge and then management via a solids wastes disposal mechanism are the options available.

To implement the above treatment would require the construction and installation of a multiple train demineralisation system. The system would include vessels, pumps, tanks, piping, valving and the attendant instrumentation and control system. The evaporation/crystallisation system would require land or more equipment. Operationally the systems would require chemicals and energy and in the case of an evaporator significant quantities of steam. The expenditure required to implement this treatment system would put the project in serious financial jeopardy.

In particular, as shown in **Figure 5-2** the saturator blowdown will be sent to the wastewater treatment plant. The DEP recommend in query 74 that this stream be sent to the demineraliser plant to recover water and remove copper into a small concentrated wastestream for recovery. As demonstrated Methanex has implemented considerable recycle and reuse of water within the plant. The saturator blowdown is already a small flow in comparison to the water usage within the plant and has a concentrated waste stream including alcohols and hydrocarbons. To treat in the demineraliser plant, as suggested, would require the removal of these components as described above. This is not considered to be practicable.

Methanex considers that the implementation of the above treatment processes are not practicable for the Methanex Burrup methanol complex and are not considered practicable by the methanol industry, as a whole. Methanex has demonstrated that their wastewater will meet acceptable criteria at the DEP nominated mixing zone of the Water Corporations brine return line to King Bay (0.01km^2) and that there will be negligible impact on the environment in accordance with the definition of those criteria.

5.2.7 King Bay Marine Survey

Methanex provides the following response to DEP query 67 in order of dot points as per the query:

- Methanex is in discussion with the Water Corporation who is expected to deliver Methanex a seawater supply with a certain quality specification. This specification, as agreed between Methanex and the Water Corporation, will define the quality of water that is entering the site.

  Methanex concurs with the DEP that "the quality of seawater near the WC pipe intake may be different from the background seawater quality diluting the effluent plume in a more offshore location. As part of the Works Approval process, Methanex will discuss with the DEP and Water Corporation any pre-construction background monitoring required to characterise the seawater quality at various locations related to the development. Methanex and the Water Corporation are currently preparing documentation in preparation for a workshop involving the DEP, Water Corporation, Industrial proponents and the

OMP. This workshop is intended to develop guiding governance over the operation of the seawater supply and brine return facilities such that all are clear as to the inter-relationships and duplication of tasks is avoided.

a) Site 1 is the old diffuser location. Monitoring was undertaken prior to the new diffuser location being confirmed. Methanex and Sinclair Knight Merz were not aware that the Water Corporation was considering a new location for the diffuser at the time of sampling. Subsequent sampling has been undertaken at the new location and this information will be provided to the DEP.

b) The reference site sampled (6.7m) was at the same depth of the outfall monitoring site (6.8m). This is clearly stated in the King Bay Baseline Monitoring Results report provided to the DEP.

c) The quality of water just below the surface represents the best water quality conditions of the water column. Water column profiling was undertaken and this indicates that turbidity increases significantly with depth. As a result water quality conditions are expected to deteriorate with depth.

- Ideally a marine survey of water quality conditions should include monitoring at neap and spring tides and flood and ebb flows. For a long term monitoring programme this would be appropriate, however the objectives of the baseline survey that was undertaken was to obtain preliminary data on existing conditions.

- Resuspended sediment is expected to increase total phosphorus and total nitrogen levels that are measured as there would be a significant portion of phosphorus and nitrogen bound to sediment. The partition of bound nutrients and dissolved nutrients is stated in Table 8-6 of the PER.

- The terms of 'level of reporting' and 'level of detection' are used in the report to illustrate the lowest concentration of the parameter that can be detected by the laboratory. They are both used to represent this value. From here on in, the term practicable quantification limit (PQL) will be used as this is the correct term and will be in line with the terminology used by the ANZECC guidelines. PQL is defined as The Practical Quantitation Limit (PQL) is the lowest level achievable among laboratories within specified limits during routine laboratory operations. The PQL represents a practical and routinely achievable detection level with a relatively good certainty that any reported value is reliable (Clesceri et al. 1998) (this addresses query 68). The PQL is often around 5 times the method detection limit.

- Section 2 of the King Bay Baseline Monitoring Results report details the methods used for water quality and sediment sampling and analysis. The analyses were carried out by a NATA accredited laboratory.

- ANZECC guidelines specified in Section 3.2 of the report relate to marine inshore waters as stated in Table 3.3.4 of the ANZECC guidelines titled 'Default trigger values for physical and chemical stressors for tropical Australia for slightly disturbed ecosystems'. The guidelines outline that the default values are application to north west Australia based on data derived from various regions including north of Carnarvon.

- Probes used to establish dissolved oxygen, salinity, temperature, turbidity and pH profiles were calibrated and provided to Sinclair Knight Merz by the NATA accredited laboratory.

- Subsequent marine sampling and salinity profiling have indicated that a salinity of about 36.1 percent exists. It is suspected that there may be a problem with the salinity probe supplied from the laboratory. Any further sampling will be undertaken with a new probe.

- The temperature of water in King Bay varies depending upon wind and temperature conditions of the day. Sampling undertaken in March indicates that water temperatures ranged from 31.5 to 32.7°C. for a warm and still day. Sampling in May, also on a warm and still day but slightly cooler conditions than in March, showed water temperatures of about 27°C.

- Table 8-7 in the PER provides details of the existing metals in water as detected by the NATA credited laboratory. In many instances it was found that the criteria defining a 99% level of protection was lower than the detection limits. Subsequent sampling that has been undertaken to date was provided to a laboratory where lower PQLs could be achieved. These PQLs are:

  - Cadmium – 0.5 µg/L;
  - Chromium - 1 µg/L;
  - Copper – 0.5 µg/L;
  - Zinc – 0.5 µg/L.
  - Lead – 1 µg/L;
  - Mercury – 0.1 µg/L;
  - Nickel – 1 µg/L; and

  The results of the subsequent sampling conducted at the site of the proposed seawater intake in King Bay and analysed using the lower PQLs are given below.

■ **Table 5-6 King Bay Intake Location - Metals in Water measured in Incoming Tide**

Incoming tide			
Metal	**PQL (µg L^{-1})**	**King Bay Intake Location**	
		Surface	**Bottom**
Cadmium (Ca)	0.5	<0.5	<0.5
Chromium (Cr)	1	<1.0	<1.0
Copper (Cu)	0.5	6	4.7
Nickel (Ni)	1	<1.0	<1.0
Lead (Pb)	1	<1.0	<1.0
Zinc (Zn)	0.5	2.7	2
Mercury (Hg)	0.1	<0.1	<0.1

■ **Table 5-7 King Bay Intake Location – Metals in Water measured in Outgoing Tide**

Outgoing tide			
Metal	**PQL (µg L^{-1})**	**King Bay Intake Location**	
		Surface	**Bottom**
Cadmium (Ca)	0.5	<0.5	<0.5
Chromium (Cr)	1	<1.0	≤1.0
Copper (Cu)	0.5	3.3	4
Nickel (Ni)	1	<1.0	<1.0
Lead (Pb)	1	<1.0	<1.0
Zinc (Zn)	0.5	1.3	1.7
Mercury (Hg)	0.1	<0.1	<0.1

6. Flora and Vegetation

6.1 Submissions

89) The DEP states that 'the Qualitative Risk Analysis on potential environmental impacts (Table 7-4) appears to underestimate the likelihood of weeds. Weeds are almost certain to be introduced on the site and surrounding areas if there are no mitigation measures, particularly if fill is required.'

90) The DEP notes that 'the vegetation clearing (Table 7-6) and subsequent information provided (Methanex Burrup Site Vegetation and Flora Regional Context Assessment, May 2002) does not show the cumulative impacts with other industries in the King Bay – Hearson Cove Area. This information will be useful in order to determine if the total amount of significant vegetation to be removed from the area meets the EPA criteria.'

91) The DEP notes that 'in Section 7.3.3.1 the proponent indicates that rockpiles and rocky outcrops that border the site to the north and north-west will be avoided where possible. Will the proponent include this as a commitment?'

92) The DEP notes that 'two additional aspects should be included in Table 7-4 as follows:

Potential Environmental Impact	Significance of Impact	Likelihood	Level of Risk
Spread of weeds on the Peninsula	Moderate	Likely	Moderate/ Significant
Introduction of new weeds	Minor	Low	Moderate

Buffel grass and Kapok bush are prolific seed producers and a great deal of care will be required to work from free to infested areas and to bury "infested" topsoil.'

93) The Department for Planning and Infrastructure 'is pleased to see that the company has attempted to locate the bulk of its operations on already disturbed land, but it intends to clear the total area needed for two plants at the outset. While the reasons for doing this are understood, it is suggested that consideration be given to clearing only those elements required for the initial plant. This may be advantageous, as loss of vegetation cover is the prime cause of erosion from wind and water. Heavy rains experienced in cyclonic conditions could cause sediment to be washed away causing undesirable off-site impacts.'

94) The Department for Planning and Infrastructure does 'have concerns regarding the clearing of high conservation value vegetation when there is insufficient data to assess the regional impacts of its loss. The PER notes that a regional study will provide context for this by April 2002, but it is difficult to ask people to make an informed submission when this information is not available.'

95) The Department for Planning and Infrastructure notes that 'there is inconsistency in some of the statements as to whether the vegetation is significant or not. The report states that the King Bay-Hearson Cove Valley vegetation types are not known elsewhere on the Burrup, therefore the impacts are considered to be significant (p.7-13). On the following page the report

says "the vegetation types occur elsewhere on the Burrup. Clearing requirements for the proposal will not significantly impact on communities in the regional context." As the regional study is not available, what is the basis for this statement?'

96) The Department for Planning and Infrastructure notes that 'the lack of a wet season flora survey is considered unsatisfactory, although it is recognised that the proponents could have to wait years for an acceptable wet season, which would be unreasonable.'

97) The Department for Planning and Infrastructure notes that the 'clearing of vegetation in the south west corner and the northern creek line vegetation community is of concern to the Department. The south west corner comprises the rock pile/rocky outcrop community containing priority taxa and the creek line, which, if removed, will result in a loss of 90% of this community in the King Bay-Hearson Cove area. The northern creek line community forms 23% of the vegetation unit in the entire Burrup and this is considered to be approaching a significant loss.'

98) The Department for Planning and Infrastructure notes that 'the Priority Flora species proposed for relocation is a species that has not shown good propagation rates in the past.'

99) The Conservation Council recommends that 'this proposal should not be allowed to proceed before an adequate flora survey has been conducted and without the supporting statistical information presenting scenarios indicating the percentage of each vegetation type remaining should all the proposed Burrup developments proceed. This would enable a cumulative assessment to be made of the impacts of this proposal on the vegetation values of the area. This would enable a clear determination to be made on how the proposal meets the EPA's Position Statement No. 2 Environmental Protection of Native Vegetation in Western Australia. The representation levels of the vegetation complexes should be presented in the context of the local (15 km) area. This will involve the determination of detailed representation statistics. The figure will need to be accompanied by a discussion of the representation of the genetic diversity of the species that may occur within the complexes.'

100) The Conservation Council states that it is 'extremely disappointing to read the PER and find a range of unsubstantiated claims and unfulfilled commitments. An example includes the commitment to doing a wet season vegetation and flora survey.'

101) The Conservation Council provides 'a summary of the CIA and EIA issues that must be properly addressed before the proposal can proceed:
- A comprehensive study of the vegetation communities that would be impacted on by the proposal and mapping of the area's vegetation communities. There should be no destruction of any vegetation type that has less than 30% of its original extent remaining.'

6.2 Response

6.2.1 Clearing of Vegetation

Clearing requirements for the complex will be about 84ha as defined by the preliminary envelope of disturbance in Figure 7-1 of the PER. A large portion of this envelope will need to be cleared at the outset to provide room for the first plant and laydown areas required for construction. In addition all land clearing for the second plant that requires blasting will need to be done with that for the first plant, as it is inappropriate to blast so close to an operational plant. A Construction Plan is in the process of being prepared by the proposed EPC contractors. This Plan will detail the clearing requirements within the envelope. Methanex will encourage the EPC contractor to investigate the potential for minimising the clearing requirements. However, given the need for laydown areas and that all blasting be done at the time of initial construction, it is unlikely that the area to be initially cleared can be significantly reduced (this addresses query 93).

In Section 7.3.3.1 of the PER it is stated that 'disturbance to the rockpiles and rocky outcrops that border the project site to the north and northwest will be avoided, where possible.' Methanex confirms that this is adopted as a management strategy (this addresses query 91).

Methanex wishes to commence construction in the first quarter of 2003 which is towards the tail end of the wet season. Earthworks will thus commence in the dry season and it is expected that the EPC contractor will have prepared any exposed surfaces where required and construct a drainage system so that by the following wet season, runoff can be successfully managed.

An Erosion and Sediment Control Plan will also be developed and implemented as part of the construction and pre-commissioning Environmental Management Plan (Commitment 7.01) (the above information addresses query 93).

6.2.2 Weeds

Qualitative Risk Analyses represented in Table 7-4 indicates the likelihood of weed introduction as being unlikely which is defined in the PER as being '*the event could occur at some time'*. It is agreed that if no management strategies were implemented then it would be '*almost certain'* that weeds would be introduced. This term is defined in the PER as '*the event is expected to occur in most circumstances*'. Having adopted the strategies nominated in the PER then the likelihood would be considered as 'unlikely' or 'rare'(this addresses query 89).

The risk of potential impacts related to weeds, as recommended by the DEP (query 92), is defined below in accordance to the definition of terms stated in Tables 7-1, 7-2 and 7-3 of the PER. The level of risk is relevant to a situation where no management strategies are implemented.

■ **Table 6-1 Qualitative Risk Analysis – Potential Impact from Weeds**

Potential Environmental Impact	Significance of Impact	Likelihood	Level of Risk
Spread of weeds on the Peninsula	Moderate	Moderate	Moderate
Introduction of new weeds	Minor	Unlikely	Moderate

Methanex is aware of the environmental issue of weeds. Weed Management Plans will be established as part of the Construction Management Programme (Commitment 7.01) and specific attention will be given to the management of imported fill.

6.2.3 Regional Assessment

A regional assessment of vegetation and a desktop wet season survey was undertaken by Biota Environmental Sciences. The lack of rainfall in Karratha has prevented Methanex from undertaking a wet season survey. A desktop assessment was undertaken to provide some information for the EPA's consideration. Methanex commits to undertake a wet season field survey prior to construction given sufficient rains are received (Commitment 7.02). The regional assessment and desktop wet season survey have been provided to the DEP for review. A summary of the results from the regional assessment is provided in **Table 6-2** and identifies the significance of the impacts that are proposed to address queries 94 to 97, 99 and 100.

The assessment concludes that three vegetation units will be significantly cleared (>30%) based upon information provided by Trudgen (2002):

- The rockpile vegetation type defined as BaEveTe vegetation unit by Biota (2002) cannot be directly matched with any of Trudgen's vegetation types. Trudgen (2002) identified a number of different rockpile vegetation type, although these were not mapped separately, however none of these had *Erythrina vespertilio* as a dominant species. The stand of BaEveTe vegetation occurs over 0.1ha within the lease area. Rockpile vegetation on the Burrup occurs over 2,060ha (Trudgen, 2002) and the impact on the 0.1ha represents a negligible impact (<0.1%) on rockpile vegetation. Considering that Trudgen did not go into the detail of mapping subtypes of rockpile vegetation there is insufficient data to determine the regional significance of the impact on the particular vegetation subtype. Using the information that is available, ie total area of all types of rockpile vegetation, the methanol complex will have negligible impact.

- The grassland *Er* unit will be cleared in the order of 77% in a regional context. This vegetation has a very limited representation on the Burrup Peninsula (2.2ha mapped by Trudgen (2002)).

- Ta/*Cc will be completely cleared, however this represents a degraded vegetation type invaded by Buffel grass and is considered to be of only moderate to low conservation significance.

Recognising the significance of the potential clearing requirements for the complex on vegetation unit Er (Trudgen, 2002) Methanex makes the following commitment:

***Commitment 12.06**: During the detailed engineering design process and the construction phase, disturbance to vegetation unit Er (Trudgen unit) and BaEveTe (Biota unit) will be reviewed and minimised as far as practicable.*

6.2.4 Priority Flora

Methanex has been made aware by numerous stakeholders that the Priority species that occur within the project site are difficult to re-establish. During the preparation of re-establishment plans, Methanex will seek the advice of CALM and others who have relevant experience in re-establishing Priority species (this addresses query 98).

6.2.5 Cumulative Impacts

Vegetation mapping of the Burrup as produced from the Burrup Vegetation Survey has only been recently published (March/April 2002). This mapping can be utilised to provide a cumulative assessment of vegetation impacts in a regional context from industry proposed within the King Bay – Hearson Cove Industrial Area.

Methanex recommends that this cumulative assessment be undertaken by an independent organisation prior to industry becoming established. Methanex is not in a position to acquire necessary information from proposed industry (this addresses queries 90 and 101).

■ **Table 6-2 Summary of impacts in a regional context**

Trudgen (2002) vegetation unit	Distribution	Associated Species	Cons. Sig.†1	Percent area cleared (Probable level of impact†2)
ChAbTa	Numerous (>50) stands, broadly distributed to north and east of study area. Recorded on valley floor and lower slopes, with calcrete material in the soil.	*Corymbia hamersleyana, Acacia bivenosa, Indigofera monophylla* (Burrup form), *Triodia angusta* (Burrup form), *T. epactia* (Burrup form), *Acacia colei, *Cenchrus ciliaris, Grevillea pyramidalis* subsp. *pyramidalis, Hakea lorea* subsp. *lorea, Chrysopogon fallax, Corchorus walcottii*	Moderate	1% Not significant
AbaTa	Small number (<10) of relatively large stands. Recorded on a plain by a creek, behind a tidal area, extending to the north-east of the study area.	*Acacia bivenosa, A. ampliceps, Triodia angusta* (Burrup form), (*T. epactia* (Burrup form)), *Eucalyptus victrix*	Moderate	<1% Not significant
AbImTw	Moderate number (10-50) of relatively small stands.	*Acacia bivenosa, Indigofera monophylla* (Burrup form), *Corchorus walcottii, Triodia wiseana* (Burrup form), *Rhynchosia cf. minima*	Moderate	0% No clearing required
AiImTw	In numerous small stands to west, north and east of study area. Recorded on valley slopes, with cobbly-pebbly red-brown loam.	*Acacia inaequilatera*, (*A. colei*), *Indigofera monophylla* (Burrup form), *Triodia wiseana* (Burrup form), *T. epactia* (Burrup form), *Acacia bivenosa*	Moderate	10% Not significant
Er	Two small stands. Recorded only within study area and at the mouth of a gully, near a coastal flat, to the south-west.	*Eriachne* sp., *Corchorus walcottii, Indigofera monophylla* (Burrup form)	Moderate to high	77% Significant
AbImTe	Small number of relatively large stands; main representation in the Hearson Cove Valley, extending southwest from the study area. Recorded on gentle slopes.	*Acacia bivenosa, Indigofera monophylla* (Burrup form), *Triodia epactia* (Burrup form), *Acacia colei, Trianthema turgidifolia, Stylobasium spathulatum, Eriachne mucronata, Aristida holathera* var. *holathera*	Moderate	9% Not significant
AbTa	Small number of small stands; main representation in the Hearson Cove Valley, extending southwest from the study area. Recorded on gently sloping areas near tidal flats and creeks.	*Acacia bivenosa, Triodia angusta* (Burrup form), *Trianthema turgidifolia, Indigofera monophylla* (Burrup form), *Trichodesma zeylanicum* var. *zeylanicum*	Moderate to high	26% Not significant
AbCwTe	Moderate number of stands, both west and east of the study area. Recorded on lower broad valley slopes.	*Acacia bivenosa, Indigofera monophylla* (Burrup form), *Corchorus walcottii, Triodia epactia* (Burrup form), *Streptoglossa decurrens, Swainsona formosa, Triumfetta appendiculata* (Burrup form)	Moderate	9% Not significant
AcImTe	Numerous stands throughout peninsula.	*Acacia colei, A. elacantha, Grevillea pyramidalis* subsp. *pyramidalis, Indigofera monophylla* (Burrup form), *Triodia epactia* (Burrup form), *T. wiseana* (Burrup form), *Acacia bivenosa, Hakea lorea* subsp. *lorea, Rhynchosia* cf. *minima*	Moderate	<1% Not significant
AiTw	Small number of relatively small stands.	*Acacia inaequilatera, A. bivenosa, Triodia wiseana* (Burrup form), *Rhynchosia* cf. *minima, Tephrosia* aff. *supina* (MET12,357), *Cullen pustulatum, Pterocaulon sphacelatum, Scaevola spinescens* (narrow form)	Moderate	13% Not significant
AoIlTw	Moderate number of small stands.	*Acacia bivenosa, A. orthocarpa, Grevillea pyramidalis* subsp. *pyramidalis, Indigofera linnaei, Crotalaria medicaginea* (Burrup form; B65-11), *Triodia wiseana* (Burrup form), **Cenchrus ciliaris, Paspalidium tabulatum* (Burrup form), *Triumfetta appendiculata* (Burrup form), *Tephrosia* aff. *supina* (MET 12,357)	Moderate	17% Not significant
TeAb	Moderate number of large stands; large representation in Hearson Cove Valley, to west of study area. Recorded on gentle to moderate slopes in the base of the valley, and in a low area between coastal dunes to the northeast.	*Triodia epactia* (Burrup form), *Acacia bivenosa, Tephrosia* aff. *supina* (MET 12,357), *Rhynchosia* cf. *minima, Swainsona pterostylis*	Moderate	3% Not significant

Trudgen (2002) vegetation unit	Distribution	Associated Species	Cons. Sig.†1	Percent area cleared (Probable level of impact†2)
GpCwTe	Moderate number of usually small stands, mainly south-west of the study area; only in the King Bay - Hearson Cove area. Recorded on gentle slopes and shallow valleys, near drainage gullies.	*Grevillea pyramidalis* subsp. *pyramidalis, Corchorus walcottii, Triodia epactia* (Burrup form), *Acacia coriacea* subsp. *coriacea, A. bivenosa, Corymbia hamersleyana, Crotalaria medicaginea* (Burrup form; B65-11), *Dichrostachys spicata, Cymbopogon ambiguus, Chrysopogon fallax*	Moderate	11% Not significant
EvTa	Moderate number of usually small stands, mainly north of the study area. Recorded in small creeklines, flowlines and flat-bottomed valleys, often with rockpiles upslope.	*Eucalyptus victrix, Acacia coriacea* subsp. *coriacea, Triodia angusta* (Burrup form), *Acacia bivenosa, Corchorus walcottii, Indigofera monophylla* (Burrup form), *Triodia epactia* (Burrup form), *Cyperus vaginatus, Dicliptera armata*	Moderate	0% No clearing required
EvTwTh	Small number of stands, main representation in valley extending north-east from study area. Recorded on lower slopes and valley floor.	*Eucalyptus victrix, Triodia wiseana* (Burrup form), *Themeda* sp. Burrup (B84), *Corymbia hamersleyana, Triodia angusta* (Burrup form), *Rhynchosia* cf. *minima, Acacia bivenosa, A. colei, A. coriacea* subsp. *coriacea, Indigofera monophylla* (Burrup form)	Moderate	3% Not significant
ChGpTe	Small number of stands, north of the study area. Recorded from an area of lower slopes and colluvial plains on reddish rocky clay.	*Corymbia hamersleyana, Grevillea pyramidalis* subsp. *pyramidalis, Acacia orthocarpa, A. bivenosa, A. coriacea* subsp. *coriacea, Triodia epactia* (Burrup form), *Acacia pyrifolia*	Moderate to high	17% Not significant
TcTeSg	Moderate number of usually small stands. Recorded in rocky flowlines or creek beds and gullies between rockpiles.	*Terminalia canescens, Stemodia grossa, Triodia epactia* (Burrup form), *Eriachne tenuiculmis, Dicliptera armata, Acacia coriacea* subsp. *coriacea, Dichrostachys spicata, Sesbania cannabina, Cymbopogon ambiguus*	Moderate to high	9% Not significant
(Te)Sv	Moderate number of relatively small stands.	*Sporobolus virginicus, Triodia epactia* (Burrup form), *Eragrostis falcate, Acacia bivenosa, Trianthema turgidifolia, Swainsona pterostylis*	Moderate	5% Not significant
Sm	Numerous relatively small stands.	*Halosarcia* spp., *Frankenia* spp.	Moderate	<1% Not significant
**CcTa*	Mapped in one drainage area extending south from the study area.	**Cenchrus ciliaris, Triodia angusta* (Burrup form), *Pluchea* sp. Releve CcTa1	Moderate to low	6% Not significant
*Ta/*Cc*	Mapped in one drainage area extending south from the study area.	*Triodia angusta* (Burrup form) / **Cenchrus ciliaris*	Moderate to low	100% Significant
Tw	Numerous, widespread stands.	*Triodia wiseana* (Burrup form), *Corymbia hamersleyana, Acacia bivenosa, Cymbopogon ambiguus, Ipomoea costata*	Moderate	<1% Not significant
'R' Units corresponding to AoBaFbReSs	Likely to be widespread	*Alectryon oleifolius, Brachychiton acuminatus, Ficus brachypoda, Rhagodia eremaea, Scaevola spinescens*	Moderate to high	0% No clearing required
'R' Units corresponding to BaEveTe	Likely to be restricted	*Brachychiton acuminatus, Erythrina vespertilio, Triodia epactia* (Burrup form)	Moderate to high	Insufficient Data
D	Disturbed or rehabilitated areas	**Cenchrus ciliaris,* various other largely non-native species	Low	6.8% Not significant

†1 Conservation significance as defined in the PER: High = vegetation with a particularly limited representation on the Burrup Peninsula, in excellent condition, and/or supports flora of particular conservation value – disturbance should be avoided; Moderate = vegetation in good to excellent condition – disturbance should be minimised; Low = vegetation has been substantially modified from the natural state by clearing, weed invasion etc – disturbance should be concentrated in these areas.

†2 NI = No impact (no clearing required); NS = No significant impact (clearing of <30% of the vegetation type); S = Significant impact (clearing ≥30% of the vegetation type).
NMS Not mapped separately by Trudgen (2002).

7. Hydrocarbon, Hazardous and Solid Waste Management

7.1 Submissions

102) The DEP notes the following with reference to Table 8-12:
- ‘Section 8.3.1.3 paragraph 4 is considered risky.’

103) CALM is concerned that ‘the bund capacity will not be adequate during a cyclone. During these periods of intense weather the plant will have a skeleton staff, if any. Access to the site by other staff in the event of a failure may well be extremely limited or not possible for an extended period. The greatest risk of failure for tanks is during extreme events. Methanex has proposed to interconnect bunds via manually operated valves. This will help increase bund capacity, however the need for manually operated valves is questionable. Little advantage is seen in manually operated valves, as it is unlikely any one will venture out to operate them at the height of a cyclone.’

‘This Department has asked for the following bund specifications on offshore fuel facilities and on the Pilbara coast, as well as installing this type of bund for its own facilities in the Pilbara national parks:
- Bunds must comply with Department of Mineral and Petroleum Resources Dangerous Goods Storage standards.
- Bunds must also be capable of handling all the fuel from the largest tank in the bund and all the water that would fall into the bund during a 1:100 year 24 hr rainfall event.
- Bunds are designed to shed the water falling in them before the tank products in the event of overflow.’

‘In regard to methanol, the last point is not required as methanol is miscible with water and this would see methanol released to the environment. CALM recommends the following:
- Diesel: The above bund specifications should be implemented on the diesel storage facility.
- Methanol:
  - The above bund specifications should be applied, except for dot point 3.
  - All bunds should be interconnected without manual valves.
  - If a case can be made for manual valves then these should be left open at all times, except in the event of a spill and people are at the bund and monitoring the spill.’

104) The DEP wish to emphasise the ‘following guidelines:
- DEP would not support the burning of construction or other wastes;
- We would encourage them to plan their waste management requirement with a suitable contractor; and
- Follow the philosophy of REDUCE, REUSE, RECYCLE with regards to all wastes.

7.2 Response

The capacity of the bunds will be at least 110% of the volume of the largest vessel and will also include capacity of an additional volume for 100mm rainfall. Methanex has investigated the potential of increasing the capacity of each bund. A 1-in-100 year event for 24 hours is about 6mm/hr or 144mm. An additional 44mm can be accommodated and the rainwater from a 1-in-100 year 24 hour rainfall event can be contained:

Commitment 12.07: *Methanex will commit to designing all chemical and product storage bunds with sufficient capacity to contain the volume of the contents of the largest tank and an extra height of 144mm to contain rainwater for a 1-in-100 year 24 hr rainfall event.*

All bunding will be designed in accordance with the *Explosives and Dangerous Goods (Dangerous Goods Handling and Storage) Regulations 1992* and will also need to be licensed by the Department for Mineral and Petroleum Resources.

The bunds surrounding the product storage tanks will have manual valves that will remain closed. Normally open valves negate the purpose of having separate bunds (the above information addresses queries 102 and 103). Given the capacity of each bund to accommodate 1-in-100 year event for 24 hours and 110% of the storage vessel, it is highly unlikely that there will be a requirement during unusual weather (when it may be dangerous to venture outside) to access the valves.

Methanex will develop a Waste Management Plan as part of the Construction Management Programme to the satisfaction of the DEP. This Plan will address the issues raised by the DEP. It is noted that the DEP do not support burning of waste and this will be considered during the preparation of the Plan when detailed information on construction wastes is known. Any imported construction waste will need to be disposed in accordance with the requirements of the Australian Quarantine Inspection Service (AQIS). The Plan will consider the contractors that are available in the area and potential for these contractors to take waste. The philosophy of REDUCE, REUSE and RECYCLE will be adopted for the Waste Management Plan and has been included in the specific guidelines provided to the two prospective EPC contractors (this addresses query 104).

8. Risk

8.1 Submissions

105) The DEP notes that 'in Section 8.3.1.1 is stated that less than $1m^3$ of methanol is expected to be released during spills from failed connections or blown lines. Surely there is the potential for a large quantity to be released from a 1.1m diameter pipeline discharging at 2,400 tonnes per hour (0.7 tonnes per second) simultaneously to two ships. If the blown line is just upstream of the automatic shutoff valve then the line will continue to drain out until repairs are effected. Can the proponent provide actual data on methanol spills during ship loading, including an estimate of the quantities released and the subsequent environmental impacts, rather than just an F-M curve as shown in Figure 9-3.'

106) The Department of Mineral and Petroleum Resources advises that the *Explosives and Dangerous Goods Act 1961* provides the requirements for storage and handling of explosives and dangerous goods, as stated in Table 1-2. However, the *Explosives and Dangerous Goods Act 1961-1986* referred on page 1-8 does not exist.'

107) The Department of Mineral and Petroleum Resources notes that 'in Section 2 (page 2-1) it is indicated a large proportion of the proposed site is leased and will be utilised by Woodside Energy for the Train 4 project until December 2003. Is there a possibility for any interference between activities undertaken by Woodside on the proposed site and site preparation work for Methanex plant which is scheduled to commence in the first quarter of 2003?'

108) The Department of Mineral and Petroleum Resources notes that 'in Table 4-1 (page 4-1) it is stated that the size of the export methanol pipeline is 1100mm. It is assumed that this is the measurement of the outer diameter of the pipeline including the insulation, as it appears that the preliminary risk assessment (Appendix 7) was based on the size of the pipeline being 750mm. If not, will there be a change in the results of the risk calculations if the size of the pipeline was 1100mm?'

109) With respect to Section 4.3.7, the Department of Mineral and Petroleum Resources suggests that the Explosives and Dangerous Goods Division (EDG) of the Department of Mineral and Petroleum Resources, and the Fire and Emergency Services Authority be consulted when sizing the desalinated water storage tank, as the tank is to provide storage for firewater as well as fresh water.'

110) The Department of Mineral and Petroleum Resources advises that 'in Section 4.4.3 (page 4-10) it is recommended that EDG be consulted during the detailed engineering design stage regarding the design and location of the methanol export pipeline, as justification will be required as to why the pipeline should be located above-ground. The justification needs to be in the form of a demonstration that the chosen option will reduce the risks from the operation of the pipeline, to as low as reasonable practicable (ALARP) levels and that the potential for knock-on to other pipelines in the corridor and vice versa will be low.'

111) The Department of Mineral and Petroleum Resources advises that 'storage of dangerous goods may need to be licensed under the provisions of the *Explosives and Dangerous Goods Act 1961*, depending on the type and quantity of dangerous goods to be stored during construction.'

112) The Department of Mineral and Petroleum Resources notes 'that in Section 9.4.1 (page 9-17) it is indicated that a Construction Safety Management Plan will be developed to comply with the National Standard for the Control of Major Hazard Facilities. Please note that the National Standard does not include requirements for a construction safety management plan.'

113) The Department of Mineral and Petroleum Resources notes 'that in Section 9.4.2 (page 9-17) (and Commitment No. 9.02) it is stated that the Operation Safety Report will be established in consultation with FESA. Please note that a Safety Report meeting the requirements of the National Standard for the Control of Major Hazard Facilities, needs to be developed to the satisfaction of the Chief Inspector of Explosives and Dangerous Goods. Therefore, it is recommended that Methanex consult EDG in the preparation of the Safety Report, and FESA and EDG in the preparation of the emergency response plan.'

114) The Department of Mineral and Petroleum Resources request 'with reference to Section 5.3.2 for Methanex to provide justification as to why the possibility of catastrophic ruptures of the methanol export pipeline was not considered.'

115) The Department of Mineral and Petroleum Resources notes that 'in Section 5.4 it appears that jet fires have not been included in the calculation of risk, as the maximum distance to which the heat radiation levels that could potentially damage equipment is 20m and hence the potential for knock-ons from these events are assumed to be low. Please confirm that this maximum distance was based on the worst credible scenario, eg high-pressure release from a full-bore rupture of a 100mm pipework or a large high-pressure release from a process vessel. If not, is there any event that could potentially have an impact on other items of equipment resulting in escalation? In addition, what is the assumed duration for the depressurisation process in the event of a leak and provide justification for the use of this duration.'

116) The Department of Mineral and Petroleum Resources notes that 'in Section 6.2.2 it is indicated that the overall failure frequencies were calculated on an 80m section of the pipeline. Please confirm that the risks were calculated for 80-metre sections for the entire length of the pipeline. If not, as failure frequencies used for pipeline leaks are based on per metre of pipe, please advise of the appropriateness of the use of an 80-metre section for the calculation of risks from the entire length of the pipeline.'

117) The Department of Mineral and Petroleum Resources notes that 'it is indicated in Section 2.2.2 that the consequence distances derived for all release scenarios associated with the methanol process plant and product storage were found to be within the site boundary. Please provide explanation for this statement given that:
- Section 1.2 indicates that those events shown to have off-site impact or potential to escalate and cause off-site impact were carried forward for frequency analysis and assessment of the risk level; and
- Risk is a function of consequence and likelihood of an event occurring, and the risk levels at some sections of the boundary exceed $1x10^{-6}$ (Figure 9-1).'

118) The Department of Mineral and Petroleum Resources notes that 'Appendix B indicates that the lengths of the pipework were estimated by scaling off the layout drawing and multiplying by a factor of 5 to account for elevation and direction changes. Is this layout drawing, the drawing of a similar methanol plant or the preliminary drawing of the proposed plant? If it is the former, please advise of the appropriateness of using the drawing, as the proposed plant is said to be the world's largest methanol production plant.'

119) The Department of Mineral and Petroleum Resources advises that 'the accuracy and reliability of the monitoring devices for detection of leaks from the pipeline will need to be demonstrated in the Safety Report, to be appropriate for their function, as small continuous leaks from the pipeline (which do not cause a significant pressure reduction) may be difficult to detect.'

120) The Department of Mineral and Petroleum Resources notes that 'there will only be isolation valves provided on either end of the pipeline. Please advise of the appropriateness of not providing additional isolation valves along the length of the pipeline, given that the largest possible inventory that can be released in the event of a major event is approximately $900m^3$. What other control measures will be provided to limit the size of a release and hence possible consequences? In addition, the proponent will need to demonstrate in the Safety Report for the plant, the adequacy of measures taken to prevent and minimise the consequences of major accidents. Also, how will leaks from the pipeline be detected while the pipeline is not being used for transfer operations?'

121) The Department of Mineral and Petroleum Resources notes that 'as the pipeline will remain full between methanol transfer operations, it may increase the failure frequency which has been modified to account for the periods while methanol transfer operations are not being carried out. What consideration has been given to the failure frequency to include the possibility of failures while the pipeline is not being used for transfer operations?'

122) 'The Fire and Emergency Services Authority (FESA) has reviewed Chapter Nine of the PER and it is our opinion that a Boiling Liquid Expanding Vapour Explosion (BLEVE) and its consequences should be considered and the effects modelled by the Proponent and results included in the PER. According to Standards Australia Handbook H76 – Dangerous Goods Initial Emergency Response Guide - and past experience, a BLEVE can and will affect every person and property located within 1,500m of the point of initiation. Therefore, the Proponent should consider the effects of a BLEVE on the above plant, any neighbouring facility and the Port load out area and provide risk treatments that will reduce the possibility of a BLEVE occurring. '

123) FESA notes that 'the Proponent under Section 9.3.5 of the PER states that a Fire and Gas Detection System will be provided. However, they do not state to what standard the Detection System will be in accordance with. Also sub clause – Fire Protection Systems – states that a fire hydrant and hose reel system in accordance with AS 1940 will be provided together with a dedicated water storage facility. However, AS 2419.1 – Fire Hydrant Installations, which is called up by AS 1940, requires that 50% of the firewater be stored in two or more separate tanks and not a single container as suggested in the PER.'

124) FESA notes that 'under Clause 9.3.6.2 – Methanol Transfer Pipeline Risk Transect Calculation – the Proponent considered fires within the above ground pipeline corridor to the Port Facility. It is the opinion of FESA that hydrant protection should be provided within in the above ground pipeline corridor at 200m centres and be readily accessible from the access track so that any fire within the corridor can be prevented from spreading to or from the Methanex pipeline.'

125) Officers from the Department of Planning and Infrastructure have advised FESA that 'the Water Corporation of WA is likely to install a water main within the Pipeline Corridor and the Proponent should be able to negotiate to have fire hydrants installed during construction of the main. Alternatively the pipeline could be buried and eliminate the risk.'

126) FESA suggests that 'the risk of a shipping incident occurring, as outlined in Clause 9.3.6.5, can be easily eliminated to zero by closing the Port when a Methanol Tanker or Woodside LNG Carrier is involved in berthing or manoeuvring operations or transiting the Port's approach channels.'

127) FESA notes that 'the Proponent has stated that adequate firefighting facilities will be provided in Chapter 9.4 of the PER. However, there is no mention of who will respond and operate the firefighting facilities within the Complex during an emergency to prevent and minimise any collateral environmental impact. The Proponent should detail who will respond to any fire emergency within in the Complex before approval is given to proceed and not prior to commissioning as indicated in the document.'

128) It is the opinion of FESA that 'due to the growing number of major hazard facilities that will be located at the Burrup and the associated risks to the environment, a dedicated permanent Fire Service is required to service the Burrup industries. The State Government, together with the established industries and Methanex may have to finance the establishment of the Fire Service to mitigate the effects of a fire or chemical spillage on the environment. The emergency response therefore needs to be determined at this stage of the approval process and not left to the last minute where Methanex could possibly opt out of its responsibilities by applying undue political and financial pressure on the Government and its Instrumentalities.'

129) FESA notes that 'the Proponent also details that a water curtain will be installed on the perimeter fence to shield the plant from external fires. The Proponent has not detailed a standard that the water curtain will be required to comply with or what heat flux and its source they expect the system to deal with.'

130) FESA advise that 'the Proponent consider firebreaks and access tracks for protection from wildfires which are suitable for a 12 tonne fire appliance rather than an unproven water spray system that may not work due to the lack of water. Alternatively, earth bunding or lightweight heat shield/fence may also prove to be a better option to prevent the transfer of heat flux between the Methanex Complex and neighbouring plants.'

131) CALM is concerned that 'there will be inadequate resources to deal with emergency situations at the plant or in the services to and from the plant. This inability to manage emergencies quickly and efficiently may lead to greater environmental damage. Significant reliance is placed on the availability of emergency services being available in Dampier to assist in an emergency. If an emergency occurs that the plant has to deal with, the proponent will need to ensure that there will still be adequate numbers of people to handle both the emergency as well as keep the plant operational under these conditions.'

'There are concerns at the potential for secondary impacts by extending plant operational and management demands in relation to fire into the fire management in the surrounding natural environment outside the lease. When a fire occurs on the land around the plant, the people responsible for managing fires in the surrounding areas should remain free to make decisions regarding whether or not to let the fire continue to burn. There are concerns that there will be pressure put on fire managers to put the fire out from the plant staff as it may be adversely impacting on plant production. CALM recommends:

- A commitment be made that all emergencies associated with the plant will not require assistance from outside emergency services. If this cannot be made then arrangements should be agreed with FESA on the handling of these emergencies. Consideration should be given to funding of permanent positions in this area.
- A commitment is given by the proponent that there will be no demands made on managers of adjacent lands to extinguish any fires.
- In designing the plant layout the document "Planning for Bushfire Protection" December 2001, (FESA & Western Australian Planning Commission) be consulted and incorporated.'

8.2 Response

8.2.1 General

Methanex notes the following in response to queries 106, 112 and 113:

- Correct reference to applicable legislation in Table 1-2 of the PER should refer to *Explosives and Dangerous Goods Act 1961*;
- The National Standard for the Control of Major Hazard Facilities does not include requirements for a Construction Safety Management Plan; and
- The Operation Safety Report will be developed to the satisfaction of the Chief Inspector of Explosives and Dangerous Goods.

Woodside Energy will utilise a portion of the Methanex project site for the construction of the second trunkline until, at the latest, the end of 2003. Consultation is already taking place between the parties to ensure that the utilisation of the site by both parties proceeds in an appropriate fashion (this addresses query 107).

The Preliminary Risk Assessment was undertaken for the export methanol pipeline at a size of 750mm. The value of 1100mm provided in Table 4-1 is incorrect and represents the likely size of the natural gas pipeline (this addresses query 108).

Methanex considers it imperative that the requirements of the Department of Mineral and Petroleum Resources (DMPR) (Explosives and Dangerous Goods) and FESA are consulted in regard to the following in response to queries 109, 110 and 111:

- Design and sizing of the desalinated water tank such that adequate provision is made for firewater;
- Design and location of the methanol product pipeline to reduce the risks such that the principle of ALARP is met and potential knock-on effects are minimised;
- Licence to store dangerous goods prior to the commencement of storage of any dangerous goods during construction (if any) and operation, ie methanol product tanks and bunding;
- Operation Safety Report and Emergency Response Plan;
- Demonstrating in the Safety Report the accuracy and reliability of monitoring devices for detecting leaks from the pipeline and the adequacy of measures to prevent and minimise consequences of major accidents; and
- Demonstrating in the Emergency Response Plan who will respond and operate fire fighting facilities and the requirements of external assistance from FESA and others.

It is noted that many of the above listed items come under the jurisdiction of DMPR, however similar concerns have been raised by FESA. Methanex will consult with both DMPR and FESA such that the requirements of both parties are adequately addressed.

8.2.2 Release Scenarios

With reference to Section 2.2.2 and consequence distances, the points raised by the Department of Mineral and Petroleum Resources in query 117 are correct. The statement in Section 2.2.2 that "the consequence distances derived for all release scenarios associated with the methanol process plant and product storage were found to be within the site boundary" is incorrect, as some CO dispersion distances went beyond the site boundary under adverse meteorological conditions.

The statement in Section 2.2.2 applies only to fire and explosion scenarios, and should read as "the consequence distances derived for all *fire and explosion* scenarios associated with the methanol process plant and product storage were found to be within the site boundary". The oversight is regretted, however it does not affect the overall findings of the PRA. The risk level assessed remains unchanged.

8.2.3 Catastrophic Ruptures

In addressing query 114 the following information is provided. Catastrophic ruptures of the methanol product pipeline were not considered for a number of reasons. For a major failure to occur, there must be an impact failure from large equipment. Underground gas transmission pipelines have been known to fail catastrophically from impact with excavation equipment. However, such failure was not considered likely for the methanol transfer pipeline for the following reasons:

- The pipeline operates at relatively low pressures (1470 kPag maximum).
- It is well established that for a puncture to propagate to a rupture, the ratio between tensile and hoop stress must be low. In the present case, the hoop stress is low (low pressure) and therefore, the ratio of tensile to hoop stress is very high, and therefore a puncture would not propagate to a rupture, if the wall thickness is maintained.
- The pipeline runs above ground and will be painted and as such, subject to low external corrosion potential. Methanol is non-corrosive to carbon steel and therefore the potential for internal corrosion is low. There is low overall potential for wall thinning from corrosion.
- The pipeline will be hydrotested and critical welds radiographed as part of the installation.
- The pipeline will be pressure tested periodically to ensure integrity.

In view of the above, a catastrophic failure as a failure mode is considered unlikely, even in the event of an external impact, and hence not considered.

8.2.4 Jet Fires

In relation to query 115 of jet fires the following justification is provided. It is the established process industry design practice that separation distances between plant items are not based on the worst credible scenario. Rather, they are based on what is considered to be a high frequency type of release scenario due to a large number of potential release sources.

Typical higher frequency release scenarios are: flange gasket leaks, small bore pipework failures (e.g. instrument nozzles). These are not only difficult to detect, but a potential fire may continue for some time, resulting in escalation. It is difficult to identify a failure mode for full bore failure of 100mm pipework in a non-corrosive environment, except as a result of a vehicle/ crane impact. Otherwise full bore failure of larger pipes generally occur only as a result of escalation of smaller fires from scenarios outlined above.

Methanex had previously commissioned Halliburton KBR to undertake a layout risk assessment study, in order to establish safe separation distances between plant equipment items. The release scenarios outlined above were used as the basis for the study. The distance to heat radiation levels that could potentially damage equipment were assessed in this study to be 20m. The layout is based on this finding.

Halliburton KBR also undertook a separation distance assessment based on the Dow Fire and Explosion index, in the layout study for Methanex. The distances obtained from Dow Fire and Explosion index, and those obtained from small release modelling were very similar.

Should a full bore failure occur as a result of impact, it would be detected immediately, so that effective response such as ESD, isolation and depressuring to flare can be undertaken before escalation could occur. These issues will be addressed during detailed design, when vessel/ pipework inventories would be available, and blowdown studies would be completed.

The main reasons why jet flame modelling was not undertaken in the PRA were: (a) Separation distances to prevent escalation from potentially higher frequency small releases have been built into the layout design based on a previous study; and (b) Escalation modelling is not possible at the PRA stage as details on inventories and blowdown studies would be undertaken only at the detailed design stage. At the PRA stage, only process flow diagrams (PFD's) had been developed and P&ID's were yet to be developed.

During detailed design a Quantitative Risk Assessment will be undertaken and the escalation potential will be re-assessed and built into process safeguarding systems and emergency response procedures.

8.2.5 PRA Methodology

The lengths of pipework (Appendix B of PRA) were estimated by scaling off the layout drawing from the preliminary drawings of the methanol complex. A Quantitative Risk Assessment will be undertaken on the final design of the complex and will confirm the results of the PRA.

Failure frequencies were calculated on an 80m length of pipeline. The failure frequencies were initially calculated per metre-year. Since the maximum impact distance was about 80m, it was decided to follow a simplistic approach of calculating the risk for 80m sections of the pipe, which would apply for the entire length of the pipeline, regardless of the location of the leak (this addresses query 116).

In a rigorous approach of risk transect calculation, the following methodology is used:

1. The heat radiation probit equation is divided into say 3 discrete points (10% chance of fatality for 6-10 kW/m^2, 50% chance of fatality for 10-14 kW/m^2, and 100% chance of fatality for > 14 kW/m^2).
2. The distance (R) to the specified heat radiation level (6, 10 or 14 kW/m^2) is calculated for the pool fire.
3. A distance (y) is selected, perpendicular to the pipeline (y- direction). It is clear that if y > R, that point would not be affected by fire radiation at that level.
4. A distance (L) along the length of the pipeline is calculated, that would affect the target at y. L/2 extends equally on either side of the leak location. Therefore, $L = 2 \times \text{sqrt}(R^2-y^2)$.
5. The fire frequency per metre-year is multiplied by the distance L, and the probability of fatality at that heat radiation level.
6. Steps 2 to 5 are repeated for other heat radiation levels, and corresponding risk value is calculated.
7. Steps 2 to 6 are repeated for the next fire scenario, until all the pipeline failure scenarios are covered (4 in all)
8. At each value of y, the risk at that point from various contributors (4 incidents and 3 heat radiation levels, giving 12 points in all) are summed to obtain the total risk.
9. Steps 2 to 8 are repeated for each value of y. The plot of risk versus y is the risk transect.

It was found that the risk transect calculated from the simple approach given in the PRA and a more rigorous calculation done subsequently in response to the Department's queries differed very little, giving confidence in the values provided in the PRA (the above information addresses query 118).

8.2.6 Pipeline Failure

When no transfer of methanol occurs for ship loading, the transfer pump is shutdown, the pipeline is isolated at the tank farm and at the jetty. The line is not under pressure at that time. Since the pipeline runs across an undulating land, the gradient is small, and a leak, should it occur at that time, would be restricted to the inventory in the pipeline between the nearest high point and the leak location. Since the pipeline design has not yet been undertaken, details of the gradient were not available at the time of conducting the PRA. Assuming, say, a distance of say 100m between the high point and the leak location, the quantity of a methanol spill would be about 34.5 tonnes. The leak would soak into the ground and there would be temporary sterilisation of the soil, however, the methanol would biodegrade relatively quickly. The risk management measures are walking the line even during periods when the line is inactive. This will be covered in the Methanex Safety Management System and Environmental Management Plan.

Given the scenario where methanol is released from a leaking pipeline onto the ground, methanol will be in liquid form and will infiltrate the ground surface. As described in the PER (Section 8.3.1.1) a release of pure methanol (99.9%) is likely to have an adverse impact on the immediate area of the spill, ie the uptake of pure methanol is likely to be fatal to vegetation and fauna. With increasing distance from the release point, methanol will degrade quickly by the following processes (Malcolm Pirnie, 1999):

- Biodegradation;
- Presence of indigenous methanol-degrading microbes;
- Oxidation by methylotrophs;
- Chemical oxidation and electron transfer;
- Adsorption;

- Volatilisation; and
- Vaporisation.

Methanol will persist in soil and groundwater for a short period of time. Table 8-2 in the PER provides details of the estimated half-lives of methanol in various environmental mediums. The impacts and toxicity of methanol on various organisms is provided in Appendix F of the PER (the above information addresses queries 105 and 121).

There is a potential for knock-on effects on other pipelines and vice versa, other pipelines may have the potential to impact on the methanol product pipeline. These cumulative impacts will be assessed by OMP during the development of the minimum design criteria for use of the corridor.

Preliminary design indicates that isolation valves will only be installed at either end of the methanol product pipeline. The number of isolation valves that will be installed will be reviewed during detailed design and following the outcomes of the Quantitative Risk Assessment (QRA). The QRA and the Safety Report will demonstrate whether or not additional isolation valves are required. Similarly measures to the limit the size of a methanol release will be investigated at the same time (this addresses query 120).

8.2.7 Leak, Fire and Gas Detection

The design of the complex has not yet progressed to the detail where leak detection systems have been investigated. This will be undertaken as part of the detailed engineering design and the QRA. It is expected that these detection mechanisms will assist in minimising the inventory lost when there is a failure.

It is an accepted practice in the oil industry to leave cross-country product lines filled with fuel even during periods when the line is inactive, and manage the risk through surveillance procedures (this addresses query 120).

The Fire and Gas Detection System and access to the site during an emergency will be designed during the detailed engineering phase and in consultation with FESA. Methanex notes that AS1940 for Fire Protection Systems refers to AS2419.1 '*Fire Hydrant Installations'* and specifies the requirements that 50% of the firewater be stored in two or more separate tanks and not a single container. This requirement will be adopted in the design of the complex.

Similarly the fire protection system will be designed during the detailed engineering phase and will address the requirement to protect the complex from external fires. This system will be designed in consultation with FESA (the above information addresses queries 119, 123 and 129).

8.2.8 BLEVE

Methanol is not a substance that has the potential to readily result in a Boiling Liquid Expanding Vapour Explosion (BLEVE). Methanex have considered this scenario in response to query 122 and there are potentially two main causes:

- In the event that the storage vessel is exposed to external heat, for example bund fire, the heat is transferred to the product and may cause the more volatile components to vapourise locally. The volatile components may expand rapidly causing the product above the localised heating to be violently ejected from the storage tank; or

- If a tank has a surface fire the heat from the burning liquid/vapour gradually conducts down through the product. If the product storage has a water interface the water may very rapidly turn to steam, expand and have the same effect as in the above scenario.

The above two scenarios are unlikely to occur for the following reasons:

- For the first scenario, the vapour produced would be released via the storage tank vent system without the rapid expansion effect;
- Methanol product is stored in the product tanks as 99.99% methanol and therefore contains no water; and
- Methanol and water are miscible.

8.2.9 Corridor Planning

The methanol product pipeline will be installed within the multi-user service corridor being provided and managed by OMP. Methanex is in close discussions with OMP to minimise the risk levels from the product pipeline. A specific topic includes access and emergency response (this addresses query 130). FESA's advice will be provided to OMP during the planning process and coordination of the service corridor.

Methanex is aware that a water main within the service corridor is planned. Detailed discussions with OMP are underway in regard to the provision of such items for corridors. This forms part of the development plan for the industrial precinct. The nominated manager/ or management committee of the service corridor (yet to be decided) will be responsible for managing the operation of the service corridor (this addresses queries 124 and 125).

8.2.10 Shipping Risks

Methanol shipping risks have been found to be acceptable and as such there is no requirement for the Port to be closed whilst a methanol ship is berthing, manoeuvring or transiting the Port's approach channels. The frequency of methanol ships is expected to be about 3 per week for the operation of two methanol plants. Methanex will liaise with the Dampier Port Authority to ensure that the necessary management procedures are in place to minimise the risk related to shipping movements (this addresses query 126).

8.2.11 Emergency Response

The following information is provided to address queries 127, 128 and 131. In the design of the plant and the development and provision of emergency response services, Methanex will provide for the ability to be able to manage all potential emergency incidents. Personnel on the site will be equipped and trained to address all potential emergency situations related to the complex. The emergency response provisions will not rely on others for assistance.

Methanex has identified the need for a coordinated approach in regards to emergency response and services for industry on the Burrup. The PER highlights that existing services may be insufficient to meet the needs of proposed industry. Methanex' experience in the area of emergency response is to develop and implement mutual aid systems with other local industry. Methanex will bring this experience to the development of the Industrial Council on the Burrup. It is recommended that this Council be established and membership be an automatic process for approved projects such that defined actions and progress can be made in addressing the numerous cumulative issues relevant to industry which includes fire services.

Methanex' operating experience in other parts of the world has demonstrated that mutual aid systems have been effective given that responsibilities are clearly outlined. Mutual aid systems may not necessarily involve the provision of response teams but may focus on the supply of or shared use of equipment, communications and other similar resources.

Methanex is prepared to participate in such a system as part of the coordinated Burrup Industrial Council (Commitment 8.01). As part of this Council, OMP, FESA and other relevant stakeholders will be consulted.

During stakeholder consultation, CALM highlighted to Methanex the need for the methanol complex to operate unaffected if external fires were allowed to burn. This requirement will be incorporated into the design of the methanol complex and as such Methanex is able to make the following commitment:

Commitment 12.08: *Methanex will consult with the Fire and Emergency Services Authority and the Department of Conservation and Land Management regarding fire protection procedures and in particular natural wildfires or controlled burns on adjacent lands.*

Further to this, the information provided by the document "Planning for Bushfire Protection" produced by FESA and Western Australian Planning Commission will be reviewed and considered during the design of the plant layout.

9. Heritage

9.1 Submissions

132) The DEP queries 'the implications of the Heritage Listings in Section 6.2.2 of the PER and have the two organisations been consulted? Note: Hearson Cove does not actually appear on the Register of Heritage Places.'

133) The Department for Planning and Infrastructure states that 'the almost certain loss of sites is noted. While the acceptability of this loss is a matter for determination between the proponent and the aboriginal custodians, it would be helpful to have included in the report any feedback provided to Methanex about the proposed loss.'

134) The Conservation Council provides 'a summary of the CIA and EIA issues that must be properly addressed before the proposal can proceed:
- The assessment process must ensure that there is no degradation of aboriginal values and that any assessment is consistent with the wishes of traditional owners.'

135) The Conservation Council notes that 'Section 9.9 claims that meetings with aboriginal groups have given Aboriginal people the opportunity to express their environmental concerns. In making this claim Methanex should demonstrate that the Aboriginal people involved were adequately equipped with the necessary understanding of the environmental issues at stake. If Methanex cannot demonstrate that the Aboriginal people were adequately equipped with necessary environmental information then it should be concluded that consultations were not conducted in a fair and reasonable manner.'

136) The Conservation Council is aware that 'Methanex claims they will undertake Archaeological surveys and make ethnographic consultation prior to construction. This is unacceptable. This survey work should be a requirement of doing an adequate PER. Why has this work not been done already?'

137) The Conservation Council concludes that 'the proponent has failed to acknowledge that the proposal is likely to impact on an area proposed for World Heritage listing. Robert G. Bednarik, President of the International Rock Art Federation, describes the Burrup as the world's richest petroglyph gallery. It is unacceptable that the proponent has failed to provide documented advice on the proposal from the International Rock Art Federation.'

138) An anonymous submission notes that 'although relatively comprehensive, the PER covers only the Methanex project, which is one of several significant industrial projects being undertaken on the Burrup Peninsula. Taken together these developments represent a significant impact on indigenous heritage of the region. At this point, it appears that no comprehensive integrated regional assessment has been carried out on the nature of full extent of this impact. It is recommended that a full integrated regional review be conducted of the impact on indigenous heritage of proposed industrial projects on the Burrup Peninsula.'

139) An anonymous submission notes that 'whilst all sites registered and unregistered are likely to be important to the local indigenous community, in terms of impact a major issue is the definition of what constitutes a site. Although sites have been categorised in broad terms of composition in the PER based on the Vinnicombe Survey, they have not been graded in any meaningful sense in terms of potential impact. For instance, engravings have been identified in the Review as being of special significance to Aboriginal heritage and culture, and are the most common sites in the area. However, there has been no attempt to identify the relative importance of any particular site in terms of relative cultural significance or number of engravings. Thus, it is not possible to determine from the information available in the PER the relative impact vulnerability of individual sites in the area. It is recommended that a comprehensive independent review be carried out of all sites potentially affected by the development to establish the relative cultural and archaeological significance of each site.'

140) An anonymous submission notes that 'of particular concern in terms of the impact on Aboriginal heritage and culture of the Methanex development are those sites which lie in currently undisturbed areas. In particular, there is an area extending into the low hills from the North West of the proposed Methanex development, which contains an undetermined number of engravings that have not been exhaustively surveyed. This area is proximate to and likely includes registered site number 10615 shown on the map identifying the preliminary envelope of disturbance in Figure 6.1 of the PER. Although it is understood that Methanex has indicated this area will not the disturbed, it will be important to ensure safeguards are in place. It is recommended that a comprehensive independent cultural and archaeological survey be carried out to identify and clearly locate all sites of significance proximate to the proposed Methanex development.'

141) An anonymous submission notes that 'a particular shortcoming of the Review is that it does not take into account other developments directly connected to the Methanex proposal. These are identified in Page 2 of the PER and include impacts

related to the construction of the natural gas pipeline, impacts related to provision of service corridors for the product pipeline, impacts related to the construction of the sea water pipeline and saline water return line. Although, as the review notes, impact studies on these developments will be provided by others, it is important to properly consider the integrated impacts on Aboriginal heritage and culture of the proposed development in its entirety. It is recommended that a comprehensive, integrated and independent review document be prepared, which clearly identifies potential impacts on Aboriginal cultural and heritage of the proposed Methanex development as a whole.'

142) An anonymous submission notes that 'the significant construction work force required for a period of some 27 months has the potential to impact on sites of Aboriginal cultural and heritage significance. This potential impact must be carefully monitored and managed. It is recommended that a continuous monitoring program of Aboriginal cultural and heritage sites be instituted to minimise harmful impacts.'

143) An anonymous submission noted that 'although it is recognised that Methanex has already indicated an intention to address some aspects of the concerns outlined, the significance of Aboriginal cultural and heritage sites on the Burrup Peninsula means that the maximum possible protection should be accorded to those sites. Given the past often unhappy experiences of industrial development for Aboriginal people, maximum indigenous involvement is essential to minimise concerns. Thus, Aboriginal representatives should be included in all possible reviews and as part of the workforce at the Methanex development should it proceed.'

9.2 Response

Aboriginal cultural surveys commenced in May 2002 and Methanex is making progress with the three Aboriginal claimant groups to determine the impacts on cultural sites and to ensure that impacts to any significant sites are minimised where possible. Methanex notes that it would have been ideal to include this information in the PER, however due to the timeliness of Aboriginal consultations it was not possible and existing survey data from Vinnicombe (1997) was used to predict potential impacts. Detailed information collected by Vinnicombe and which formed Appendices to the main report was not available to Methanex for review. As a result, the significance of the proposed impacts could not be described in the PER and such information could only be obtained during cultural surveys (this addresses queries 133, 136 and 139). Although one of the cultural surveys has been completed, the results are not yet available.

The survey by Vinnicombe was dedicated to the King Bay – Hearson Cove area but appears to be limited to the boundaries of the areas zoned for industrial development. Many sites may occur adjacent to the industrial area which include areas beyond that of the existing water tanks, ridge lines north of Hearson Cove and the Pistol Ranges. Methanex recommends that these areas be surveyed as a task of the Burrup Industrial Council (Commitment 8.01) to obtain baseline information such that cumulative impacts from industry can be determined and minimised to maintain the cultural value of the Burrup (this addresses query 140).

Methanex is developing a working relationship with Aboriginal claimant groups to ensure that their requirements are met and that the Aboriginal values of the area are not significantly impacted. Representatives of claimant groups have been consulted and invited to attend project briefing sessions to discuss the environmental impacts of the proposal. Representatives were briefed on the following environmental topics in December 2001:

- Project approval process;
- Environmental impacts:
  - Clearing requirements;
  - Loss of vegetation;
  - Potential loss of Aboriginal sites;
  - Emissions to the atmosphere;
  - Waste discharges; and
- Proposed management of impacts.

Representatives were invited to attend project briefing sessions in Karratha in April 2002 to discuss in detail the environmental investigations undertaken, the impacts and outcomes and proposed management. Unfortunately, no attendance was made from either of the three claimant groups (this addresses query 135).

Appropriate management will be in place during construction and operation to ensure that the potential to impact on sites of significance is minimised. This includes the implementation of a cultural heritage protocol (Commitment 9.06) and an Aboriginal Awareness Program (Commitment 9.07). Methanex is in Native Title discussions with Aboriginal representatives and the outcomes of these are yet to be decided. A Construction Environmental Management Plan, addressing Aboriginal heritage, will also be implemented during construction and monitored by the Construction Manager. During the operation phase, Methanex will encourage local Aboriginal people to participate in the Community Advisory Panel (Commitment 11.01) that Methanex will establish. As the consultation process continues for this project, Aboriginal representatives will always be invited to attend project briefing sessions where they are able to express any concerns or obtain information (this addresses queries 135, 142 and 143).

A number of submissions recommend that a cumulative assessment be undertaken to ensure that there is no degradation of Aboriginal values. An independent consultant should undertake this assessment with assistance from industry and as a task item under the responsibility of the Burrup Industrial Council. Such an investigation can not be undertaken by a single Proponent due to the confidential nature of information required to undertake such an assessment.

Methanex' commitment to the Burrup Industrial Council is clearly outlined in the PER (Commitment 8.01) (this addresses queries 134, 138 and 141).

The abundance of rock art on the Burrup Peninsula has been recognised by the International Rock Art Federation. The Federation has submitted a proposal for the Burrup to be World Heritage listed. Several documents highlight that the Burrup represents one of the world's richest collection of rock art and this is reflected in the PER in Section 6.3. Although the Burrup is well known for its heritage values, five new areas have been dedicated for industrial development (1,820ha) and a considerable portion set aside as conservation reserves (5,400ha) as detailed in the Burrup Peninsula Land Use Plan and Management Strategy. This planning has been approved and endorsed by Government and in doing so the location of Methanex' complex is likely to have a negligible impact on the IFRAO proposal for listing the Burrup as a World Heritage Area (this addresses query 137).

The Methanex complex will be located on a site that has been previously disturbed. The site was previously the location of the Woodside construction camp which occupied over 50% of the area that is proposed to be disturbed by the methanol complex. From this aspect, the environmental values of most of the site have already been degraded.

Heritage listings stated in the PER (query 132) are addressed in Section 11.2.4 of this document in response to query 146.

10. Traffic Management

10.1 Submissions

144) Main Roads Western Australia reiterates the following:
- ‘All work undertaken by the Proponent within the Burrup Road-road reserve are to be done to MRWA's requirements; and
- That works undertaken by the Proponent within the Burrup Road-road reserve are done in accordance with a MRWA approved Traffic Management Plan.'

10.2 Response

Methanex confirms, in response to query 144, that any proposed works within the Burrup Road-road reserve will be undertaken to the satisfaction of MRWA and that MRWA will be informed and provided information on any proposed activities within the road reserve. Methanex will ensure that the Traffic Management Plan will be provided to MRWA for approval.

11. Amenity

11.1 Submissions

145) The DEP requests that ‘a check be made with CALM that Hearson Cove is not regarded as a turtle nesting site, and that artificial lighting at the plant site is not likely to effect turtle behaviour.'

146) The Department for Planning and Infrastructure notes ‘that Hearson Cove is registered with the Heritage Council as a significant landscape, although it appears the Heritage Council has not been consulted.'

147) The Department for Planning and Infrastructure notes that ‘the use of fill to raise the plant approximately 7m AHD for flood protection raises the plant considerably in terms of its view from the recreational area. Subject to discussions with CALM, it may be possible to undertake some strategic planning outside the boundary that may help screen the complex from Hearson Cove. The use of local species in the landscaping plan is supported.'

148) The Department for Planning and Infrastructure notes that ‘light spill has been addressed as it relates to impacts on turtles, but not its impacts on other species. While recognising there may be inadequate research into other species, the management strategy should try to minimise the amount of light reaching the beach, and this is supported by the Department.'

149) The Department for Planning and Infrastructure notes that ‘the PER does not provide any evidence as to how residents are likely to respond to the visibility of the complex. The dominance of the plant when viewed from Hearson Cove may disturb those who want a more natural, undisturbed landscape.'

150) The Department for Planning and Infrastructure notes that ‘the PER does not provide a description of the landscape, including its visual character, thus making it difficult to analyse impacts and propose strategies. For example, a description of the dominant colours in the landscape could have resulted in a proposed colour scheme for the structures, and a description of the visually dominant plants would provide several species recommended for screen planting, or at least indicate if the required heights are feasible e.g. on the dune at Hearson Cove.'

151) The Department for Planning and Infrastructure notes that ‘the management strategies outlined at 9.8.1.2 do not demonstrate satisfactorily how impacts will be minimised. There is no indication of the actual colour to be chosen, and the reference to colours reflecting heat suggests that a light or silver colour may be proposed. Neither of these will blend into the surroundings in that an earth colour such as reddish orange would. There is no reference to the possibility of screening views from Hearson Cove, eg by additional planting at the back or top of the natural dune. Additional landscape management principles could have been provided, for example the desirability of providing a simple, contained, cohesive appearance through use of a single colour paint scheme; grouping structure together where feasible; using local materials/colours where feasible.'

152) The Department for Planning and Infrastructure advises that 'the PER should have provided additional photo images of views from Hearson Cove, including from the shoreline itself and from the water. We presume the PER is correct in its expectation that the dunes will conceal the majority of the plant when standing at the water's edge.'

153) The Department for Planning and Infrastructure provides the following comments on the specific view simulations provided:
- 'View point 3: The view from this location may cause the most loss of amenity to locals and tourists. The PER should provide additional strategies to address the visibility of the plant from this location. Supplementary planting on the dune, using local species that grow to shrub height, would be appropriate. Even plants of 2-3 metres located on the dune could reduce the impact of the plant by obscuring at least the bottom portion of the tanks and other structures.
- Viewpoint 5: The relevance of these view locations needs clarification. If viewpoint 5 is from the access track to Cowrie Cove, additional planting in the immediate vicinity of the plant could be an appropriate strategy. The photo simulation suggests the tanks would be a different colour to the other structures. However, it would be preferable for all structures to be the same colour, to give a more unified, cohesive appearance.
- Viewpoint 6: It is unclear whether this view would be normally seen by the general public, or just by workers at the plant. In any case, the view would look less dominant in this view if there was additional planting at the road bend, especially on the north side, on the road cutting.'

154) The Department of Conservation and Land Management notes that 'they are concerned that AS4282 'Control of Obtrusive Effects of Outdoor Light' may not be the best that can be done to eliminate light spill and that a higher level of light spill control may be possible. CALM recommends that AS4282 should be used as guide, but consideration should be given to improving on this standard where possible to eliminate light spill.'

155) The Conservation Council provides 'a summary of the CIA and EIA issues that must be properly addressed before the proposal can proceed:
- The visual amenity of the King Bay - Hearson Cove area must be assessed through EIA and CIA processes.'

11.2 Response

Following the concerns raised by the Department for Planning and Infrastructure regarding the visual amenity at Hearson Cove, Methanex extended the scope of work of three-dimensional modelling that was undertaken for the PER by modelling the methanol complex from six additional view points. All six view points are from Hearson Cove standing at high-water and low-water marks to provide some indication of the likely appearance of the complex that can be expected by recreational users.

Modelling presented in the PER, illustrated views where the complex was most visible. It is expected that members of the public visiting the area will be able to get the best view of the complex, and possibly the Industrial Area, by standing within the vicinity of the existing water tanks located along Village Road. Access to this area may become restricted following the development of the Industrial Area. Alternative look outs are numerous as many of the low rockpiles and some elevated tracks along Hearson Cove Road can provide a good view of the complex and the Industrial Area as you look over the low-lying intertidal mudflats.

11.2.1 Visual Amenity

The methanol complex will be visible from certain locations at Hearson Cove. The location of the six additional view points from Hearson Cove are illustrated in **Figure 11-1**. A description of these views follows to address query 152:

- **View Point 1: Figure 11-2** illustrates the expected view of the methanol complex whilst standing at the high-water mark at the southern end of Hearson Cove. Approximately two-thirds of the complex is concealed behind the dunes with only the tops of tall buildings and structures being visible. The terrain model indicates that all four product storage tanks will not be visible, however it is expected that the tops of the tanks may potentially be seen over the dunes. The model is based on 2m contour data from 1997 which may not accurately reflect the existing topography and hence indicate that the tanks are concealed.

- **View Point 2: Figure 11-3** illustrates the expected view of the methanol complex whilst standing at the low-water mark at the southern end of Hearson Cove. The majority of the complex is concealed with only the highest portion of two tall structures being visible. The storage tanks are not visible.

- **View Points 3 and 4: Figure 11-4** illustrates the view from the high-water and low-water marks at the northern end of Hearson Cove (just south of the mangroves). The view looks towards the existing water tanks in the background. From both view points 3 and 4 the complex, including the storage tanks, is completely concealed by the dune and vegetation.

- **View Point 5: Figure 11-5** illustrates the view of the complex from the spillway at the northern end of Hearson Cove. The complex and storage tanks are clearly visible from this location. Established shrubs and low trees provide little opportunity for changing this view.

- **View Point 6: Figure 11-6** illustrates the view of the complex from the tip of the mangrove area at the northern end of Hearson Cove. The majority of the complex is visible with only small portions being concealed by vegetation.

As described in the PER, it is very difficult to screen a plant the size of the proposed methanol complex. It has been suggested that the establishment of trees and colouring of the complex should be implemented. However, the establishment of tress on the Burrup is very difficult as soil depths are limited. Tall trees in the order of about 5 m typically grow along drainage lines. Some shielding is provided by tall shrubs and low trees on dunes of Hearson Cove. These are typically 1.5 to 2m in height and only provide a limited amount of shielding. To establish a vegetation buffer of greater height along the dunes will require the

SINCLAIR KNIGHT MERZ
Sinclair Knight Merz
263 Adelaide Terrace
PO Box H615 Perth
WA 6001 Australia

METHANEX METHANOL COMPLEX
VIEW POINT INDEX

FIGURE 11-1

SINCLAIR KNIGHT MERZ
Sinclair Knight Merz
263 Adelaide Terrace
PO Box H615 Perth
WA 6001 Australia

METHANEX METHANOL COMPLEX
VIEW OF THE COMPLEX FROM VIEW POINT 1

FIGURE 11-2

SINCLAIR KNIGHT MERZ
Sinclair Knight Merz
263 Adelaide Terrace
PO Box H615 Perth
WA 6001 Australia

METHANEX METHANOL COMPLEX
VIEW OF INDUSTRY FROM VIEW POINT 2

FIGURE 11-3

Hearson Cove - North High-water Mark

Hearson Cove - North Low-water Mark

SINCLAIR KNIGHT MERZ
Sinclair Knight Merz
263 Adelaide Terrace
PO Box H615 Perth
WA 6001 Australia

METHANEX METHANOL COMPLEX
VIEW OF THE COMPLEX FROM VIEW POINT 3

FIGURE 11-4

SINCLAIR KNIGHT MERZ
Sinclair Knight Merz
263 Adelaide Terrace
PO Box H615 Perth
WA 6001 Australia

METHANEX METHANOL COMPLEX
VIEW OF THE COMPLEX FROM VIEW POINT 5

FIGURE 11-5

SINCLAIR KNIGHT MERZ
Sinclair Knight Merz
263 Adelaide Terrace
PO Box H615 Perth
WA 6001 Australia

METHANEX METHANOL COMPLEX
VIEW OF INDUSTRY FROM VIEW POINT 6

FIGURE 11-6

introduction of non-local species known to grow successfully in sandy soils with limited nutrients and water. Introduction of non-local species is considered undesirable. Such a buffer would need to be established by government, as this area is outside of the designated 'Industrial Area' (this addresses queries 147, 150, 151 and 153).

Methanex is unable to confirm the colours which the complex will be painted as the design is still in the preliminary stages. However, the ability for the colour to blend in with the environment will be considered when choosing the colour. Figure 9-10 in the PER illustrates that the storage tanks may be a different colour to the plant. These colours are generic and during modelling the affect and direction of the sun were also included.

Figure 9-11 in the PER illustrates a view from the current Village Road. This view was used as the local community is familiar with this road and can personally relate to the illustration as it is used to gain access to Cowrie Cove.

Methanex will consider the colour options for the complex during detailed design (the above information addresses queries 150, 151 and 153).

Views of the complex as presented in the PER, were displayed on posters during community consultations in Karratha, Dampier and Roebourne. There were mixed reactions from the community however stakeholders were generally familiar with what to expect. Some community members did not know what to expect but were positive. Some understood that if they wanted industry to establish in the area this is the type of industry that they would need to accept. A very small number of community members were against industrial development in general and did not want any industry to be visible from Hearson Cove (this addresses query 149).

11.2.2 Cumulative Impacts

The Department for Mineral and Petroleum Resources have undertaken a cumulative visual assessment of the Industrial Area and have modelled in detail the views of all industry proposed for the area. Panoramic views of the industrial area were taken from several views including Hearson Cove. This strategic assessment was released in early July 2002 (this addresses query 155).

11.2.3 Light Spill

The objectives of minimising the impact from light spill is to ensure that light reaching the beach is minimised as far as practicable. Whilst the PER specifically discussed the impact on turtles, the management strategies that will be adopted will be aimed at minimising direct light at the beach and thus minimising potential impacts on other fauna and recreational users 2002 (this addresses query 148).

Methanex will implement and improve on AS4282 '*Control of Obtrusive Effects of Outdoor Light*' where practicable (this addresses query 154).

Appendix I of the PER provides a detailed assessment of the potential impacts on marine fauna (turtles) from light spill. Peter Kendrick of CALM (Karratha) was consulted during this assessment and his advice has been referenced. It is clearly stated that CALM advises '*turtles are not known to currently use this beach for nesting*' (this addresses query 145).

11.2.4 Heritage

The listing of Hearson Cove on the Heritage Council's database was verified on 13 May 2002. The listing provided on the database indicates that the site name of '*Burrup Peninsula and Hearsons Cove (8663)*' is listed on the Municipal Inventory only and is not a registered heritage site. This is also the case for other sites listed in Table 6-5 of the PER which have been erroneously specified as being registered. **Table 11-1** provides a correct listing of registered sites searched under 'Shire of Roebourne, Karratha, Dampier and Burrup Peninsula' in response to queries 132 and 146. It was also noted that the name of the listing for Hearson Cove and the ID Number differs to search results obtained in January 2002. It is unknown why the naming of this listing has changed.

The registered heritage sites listed in **Table 11-1** are well removed from the Burrup Peninsula.

■ **Table 11-1 Registered heritage sites listed by the Heritage Council's database**

Place Name	ID Number	Location	Status
Beagle Bay Mission Church	3630	Beagle Bay, Dampier Peninsula	Registered
Lombadina Mission	690	Lombadina, Dampier Peninsula	Registered
Cooya Pooya Station	3376	35km S of Roebourne	Registered
Cossack Cemetery	3232	Settlers Beach Rd, Cossack	Registered
Cossack Post and Telegraph Office	2347	Pearl St, Cossack	Registered
Cossack Precinct	3239	Cossack	Registered
Cossack School (Ruins)	3230	Cnr Perseverance & Fraser Sts, Cossack	Registered
Customs House and Bond Store	2345	Cnr Pearl St and Cossack Rd, Cossack	Registered
Galbraith's Store	2344	Pearl St West, Cossack	Registered
Holy Trinity Anglican church	2332	Hampton St Roebourne	Registered
Jarman Island Lighthouse and Quarters	2337	Jarman Island, Cossack	Registered
Land Backed Wharf - Cossack	3231	Cossack Rd, Cossack	Registered

Place Name	ID Number	Location	Status
Mount Welcome House	2343	109 Hampton St, Roebourne	Registered
Old Roebourne School	2341	Hampton St Roebourne	Registered
Police Quarters, Lockup and Service Buildings	3229	Settlers Beach Rd, Cossack	Registered
Roebourne Hospital and Kitchen Block	2339	Hampton St, Roebourne	Registered
Roebourne Police Station and Gaol Precinct	2319	Queen St, Roebourne	Registered
Roebourne Post Office	2334	Sholl St Roebourne	Registered
The Old Court House	2346	Cnr Pearl and Perseverance Sts, Cossack	Registered

12. Social Impacts

12.1 Submissions

156) The DEP state that 'Hearson Cove is the main swimming/tourist beach for Karratha and surrounds, and there are no others that are as suitable in terms of access and lack of mangroves/rocks. While Methanex have been part of the public consultation process to consider this, there is still considerable concern about the proximity of this large production plant to this extremely important public area. There is strong community expectation that, if the project does go ahead, the loss of community amenity should be recognised and addressed.'

157) The Pilbara Development Commission notes that 'in Section 9.6, Methanex indicates it is aware of the current accommodation shortage in the Karratha/Dampier area and is a member of the Nickol Bay Accommodation Taskforce that is working to resolve the shortage. In subsection 9.6.1, Methanex advises that it is unlikely to depend on the private housing market to accommodate the project's estimated 750-person construction workforce. The Review states accommodation will also need to be found for the project's operational workforce estimated to be 130 to 150 persons. Given the current accommodation shortage in the Karratha/Dampier area, the Commission believes that it is an unacceptable solution for Methanex to accommodate its project workforce through the private housing market.'

158) The Pilbara Development Commission recommends that 'Methanex should make more firm commitments regarding the project's accommodation requirements. In particular, the accommodation required for the project's operations workforce should be more detailed than expressed in the Review. In the event Methanex is unable to share accommodation facilities with other projects planned for the Burrup Peninsula, it should give an in-principle commitment that it will construct new accommodation for the project's construction *and* operations workforce. Again, the project should not rely on existing accommodation stock in the Karratha/Dampier area.'

159) The Pilbara Development Commission states that 'subsection 9.6.2 lists the management strategies Methanex intends to use in relation to accommodation. The second strategy listed is: *"Continue to liase with relevant parties in developing a suitable accommodation plan for the construction workforce" (Public Environmental Review p9-20).* The Commission believes this strategy is somewhat incongruous to the decision of the Western Australian Cabinet Standing Committee on Regional Policy taken on 19 February 2002 that was subsequently endorsed by Cabinet. The Standing Committee resolved to create a sub-group of the Nickol Bay Accommodation Taskforce for the purpose of seeking accommodation proposals from major companies proposing to develop on the Burrup Peninsula and Maitland Estate and that this sub-group comprise of officers from the Commission, Shire of Roebourne, Department of Minerals and Petroleum and the Department of Planning and Infrastructure. The Commission recommends the above strategy be amended to read: *"Liase with the Nickol Bay Accommodation Taskforce sub-group in developing a suitable accommodation plan for the construction workforce".*'

160) The Department for Planning and Infrastructure notes that 'generally the 'Accommodation' section is vague and does not detail how the construction workforce is to be accommodated, other than it is unlikely to rely on the private market. The proponent should provide additional information on the workforce accommodation once the full detail is known, focussing on the exact number of workers to be employed, the expected family status of these employees, the proposed location of the construction workforce accommodation, and a strategy to show how the workforce (temporary and permanent) is to be housed. This information should be presented to the Western Australian Planning Commission's Infrastructure Coordinating Committee for consideration.'

161) The Pilbara Development Commission states that 'on page 4-12, the Review states that the operational workforce for the project is expected to be sourced locally. The Commission believes that Methanex should work with the (future) amalgamated Pilbara College of TAFE to assess the skills base of the Karratha/Dampier area for the project and design the necessary training courses that will enable local residents to learn the necessary skills to work on the Methanex Project.'

162) The Pilbara Development Commission states that 'also of importance during the project's construction and operations phase is the input of local businesses. The Commission strongly argues that for local businesses and contractors to benefit from the Methanex Project, Methanex needs to have a concerted awareness campaign among Karratha and Dampier businesses what the supply requirements will be for the Project. To that end, it is recommended that Methanex work with the Karratha and Districts Chamber of Commerce and Industry to achieve this objective.'

163) The Pilbara Development Commission notes that 'in Section 9.7, the Review details Methanex' planned strategies to manage the demand for education, health, recreation and emergency services resulting from the workforce. The

Commission recommends that Methanex consult with the Nickol Bay Infrastructure Committee to enable a coherent strategy to be developed with government agencies to meet the service and facilities requirements of the Methanex Project workforce.'

164) The Department for Planning and Infrastructure 'supports the work being undertaken to provide an alternative access to Cowrie Cove. Given the importance of outdoor recreation in the area, the loss of access to previously used beaches is undesirable, especially given the pressures on recreational facilities in the townsites.'

165) The Department for Planning and Infrastructure notes that 'Section 9.11 Recreation Areas needs to acknowledge that Hearson Cove is the only easily accessible swimming beach for the townsites of Dampier and Karratha. The recreational values of Hearson Cove are being further investigated.'

166) CALM notes that Section 9.11 indicates that 'access to Cowrie Cove will need to be removed and that alternative access to Cowrie Cove is being investigated. There is a lack of recreation sites on the Burrup and we are concerned that alternative access to Cowrie Cove will not be provided as there is no commitment in this document or elsewhere to provide this access. If alternative access is not provided there will be increased pressure on other sites on the Burrup and it is likely that an alternative route will be created to Cowrie Cove illegally.'

CALM has 'proposed an alternative access route to Cowrie Cove in our document "Burrup Peninsula (Moora Joorga) Conservation, Heritage and Recreation Areas. Recreation and Tourism Masterplan" 1999. This provides for potential access to Cowrie Cove via a proposed new track north from Hearson Cove. CALM recommends as a condition of project approval alternative access is required to be provided to Cowrie Cove. This access should be as indicated in the above Departmental document.'

12.2 Response

12.2.1 Accommodation

In response to queries 157 to 160 the following information is provided. As stated in Section 9.6.1 of the PER, sufficient accommodation for the construction workforce is unlikely to be provided by the private housing market. Methanex is well aware of the accommodation shortage issues in Karratha and has joined the Nickol Bay Accommodation Taskforce to assist in providing a coordinated planning approach to solve the accommodation needs for proposed industry. A number of options and potential synergies are under review by Methanex to accommodate the construction and operation workforces and these are being investigated in close liaison with key stakeholders.

Methanex is not in a position to provide further information on how the operational workforce will be housed as further information would be unreliable at this early stage of the proposal. Methanex has committed to providing a workforce profile (Commitment 9.04) which will assist in developing a housing strategy for the operation workforce. This profile will contain information including:

- Number of employees; and
- Proposed accommodation strategy and location

This information will be provided to the Western Australian Planning Commission's Infrastructure Coordinating Committee and the Nickol Bay Infrastructure Committee for consideration as part of fulfilling Commitment 9.04.

Methanex is aware that it may have to invest directly in housing or facilitate the investment in additional housing to ensure that the housing needs of its staff are met.

Recognising that there is the potential for shortage of housing and accommodation in Karratha and Dampier, Methanex will:

- *Continue to actively participate in meetings and workshops, and assist the Nickol Bay Accommodation Taskforce wherever possible;*
- *Liaise with the Nickol Bay Accommodation Taskforce sub-group in developing a suitable accommodation plan for the proposed workforce; and*
- *Comply with the Shire of Roebourne's Development Approval Conditions.*

12.2.2 Employment

Methanex has operational recruitment plans that involve the employment of locals and training of these locals at one of Methanex' existing facilities before plant start up. Methanex has already consulted with the West Pilbara College and is aware that the College has the capacity to introduce tailor-made courses for industry, which will most likely be utilised (this addresses query 161).

12.2.3 Services and Facilities

Methanex will utilise local resources where practicable. Methanex is a member of the Karratha and Districts Chamber of Commerce and Industry and is therefore well placed to investigate the potential for local businesses providing resources and services to the project (this addresses query 162).

The PER highlights the potential demand for education, health, recreation and emergency services from proposed industry on the Burrup. Methanex will consult with coordinated planning groups such as the Nickol Bay Infrastructure Committee to assist government in their objectives of addressing service and facility requirements (this addresses query 163).

12.2.4 Coastal Access

The Office of Major Projects will be providing an alternative access route to Cowrie Cove as part of the infrastructure and service development of the King Bay – Hearson Cove Industrial Area. Methanex has advised OMP that an alternative access route needs to be provided well in advance of March 2003, when construction will commence. Methanex is prepared to assist OMP in developing an alternative route (this addresses queries 164 and 166).

12.2.5 Recreation Areas

Methanex is aware that Hearson Cove is the only readily accessible beach for Karratha and Dampier that only requires a two-wheel drive vehicle. Other recreational beaches require a four-wheel drive vehicle. As such, Hearson Cove is very popular and is an important recreational area to the community of both of these towns (this addresses query 165).

The PER details the potential environmental and social impacts from the project and Methanex has nominated management strategies and commitments to minimise the impact of the complex on Hearson Cove. Methanex has demonstrated the best environmental performance they can achieve (this addresses query 156).

The Office of Major Projects has commissioned a strategic assessment of the amenity at Hearson Cove in regard to the cumulative impacts from proposed industry and is alternative amenities in the King Bay – Hearson Cove Industrial Area. The cumulative impact assessment has been completed and was released in early July 2002 (this addresses query 166).

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14. Abbreviations

AEC	Australian Environment Council
CALM	Department of Conservation and Land Management
CIA	Cumulative Impacts Assessment
CO_2	Carbon Dioxide
CO_{2e}	Carbon Dioxide Equivalents
DEP	Department of Environmental Protection
DMPR	Department of Mineral and Petroleum Resources
EDG	Explosives and Dangerous Goods
EIA	Environmental Impact Assessment
EPA	Environmental Protection Authority
EPC	Engineering, Procurement and Construction
FEED	Front End Engineering Design
GJ/t	Giga joules per tonne
H_2	Hydrogen
H_2O	Water
HRSG	Heat Recovery Steam Generator
MSDS	Material Safety Data Sheet
MTBE	Methyl Tertiary Butyl Ether
Mtpa	Million tonnes per annum
MVC	Mechanical Vapour Compression
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
NO_x	Nitrogen Oxides
OMP	Office of Major Projects
PER	Public Environmental Review
RO	Reverse Osmosis
SCR	Selective Catalytic Reduction
SO_x	Sulphur Oxides
TMA	Tertiary Methyl Amine
tpd	Tonnes per day
UC	University Of California
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Carbon
WC	Water Corporation

Appendix A Methanex' Commitments

■ **Table A-1 Summary of Proposed Management Commitments (Assessment No. 1405)**

No.	Topic	Description	Objective	Timing	Advice
1	Construction Environmental Management	Develop a Construction and Pre-commissioning Environmental Management Programme. The CEMP will consist of a series of management plans that will include: ■ Flora and Vegetation Management Plan (encompassing weed management); ■ Landscaping Plan; ■ Fauna Management Plan; ■ Erosion and Sediment Control Plan; ■ Dust Management Plan; ■ Noise Management Plan; ■ Solid Waste Management Plan; ■ Liquid Waste Management Plan; ■ Hazardous Materials Management Plan; ■ Pre-commissioning Management Plan; ■ Construction Safety Management Plan; ■ Cultural Heritage Plan; ■ Traffic Management Plan; and ■ Cyclone Contingency Plan. Implement the Management Programme.	To manage all relevant environmental factors associated with the construction phase of the project.	Prior to construction Prior to construction	 CALM CALM CALM CSLC DMPR DMPR DMPR
2	Noise	Ensure that the Noise Management Plan for construction specifically addresses the issue of ground vibration from blasting activities.	To minimise noise and vibration during blasting.	Prior to construction	DMPR
3	Terrestrial Flora and Vegetation	Undertake a wet season vegetation survey provided sufficient rainfall is received prior to earthworks commencing on site.	To document additional flora species that may occur on the project site and provide suitable management where appropriate to minimising potential impacts.	Prior to construction	
4	Terrestrial Flora and Vegetation	Consult with CALM in the development of suitable management procedures, as part of the CEMP, for managing impacts to Priority flora.	To manage impacts on vegetation, flora and particularly Priority flora.	Prior to construction	CALM
5	Terrestrial Flora and Vegetation	Disturbance to vegetation unit Er (Trudgen unit) and BaEveTe (Biota unit) will be reviewed and minimised as far as practicable.	To minimise impacts on vegetation communities in a regional context.	Prior to construction	
6	Terrestrial Fauna	Contribute to taxonomic research programs investigating *Rhagada* sp., *Planigale* sp. and *Delma pax.*	To expand the current knowledge base of fauna and their distribution on the Burrup Peninsula and the Pilbara.	Prior to construction	WAM
7	Construction Environmental Management	All temporary excavations and pits will be backfilled and levelled.	To ensure that no adverse impacts occur from the establishment of excavations and pits.	Following construction	
8	Construction Environmental Management	Fill will be sourced from the project site where possible. Additional fill will be required and approval from the Shire of Roebourne will be obtained to extract fill from an alternative source.	To ensure that no potential adverse impacts occur as a result of the introduction of unsuitable fill and gravel.	Prior to construction	SoR CALM

No.	Topic	Description	Objective	Timing	Advice
9	Operation Environmental Management	Seek to establish and participate with the Burrup Industrial Council in managing industry requirements for the Burrup Peninsula. Contribute to mutually agreed studies or investigations of cumulative impacts and implement practicable and feasible actions where appropriate to the methanol complex operation.	Minimise the impact of industry on the social environment, recreational areas, flora and fauna, Aboriginal sites, aquatic environment and assist in mutual aid.	Operation	
10	Operation Environmental Management	Develop an Operation Environmental Management Programme (OEMP). The OEMP will consist of a series of management plans and will include: ■ Flora and Vegetation Management Plan; ■ Landscaping Plan; ■ Fauna Management Plan; ■ Erosion and Sediment Control Plan; ■ Methanol Spill Contingency Plan; ■ Water Quality Management Plan; ■ Dust Management Plan; ■ Noise Management Plan; ■ Solid Waste Management Plan ■ Liquid Waste Management Plan; and ■ Hazardous Materials Management Plan. Implement the Programme.	To manage all relevant environmental factors associated with the operation phase of the project.	Prior to commissioning Operation	 CALM CALM CALM CSLC DMPR
11	Marine Environment	Prepare a Methanol Spill Contingency Plan. Implement the Plan.	To minimise the potential for contamination and adverse affects on the marine environment.	Prior to commissioning Operation	
12	Marine Environment	Offer to become an active participant in the committee of Terminal Operators and assist, where necessary, in the co-ordinated planning of spill response at the Dampier Port.	To minimise the potential occurrence of spill and to minimise the impacts of spills on the marine environment.	Prior to commissioning	DPA
13	Marine Environment	Undertake 'Whole Effluent Toxicity Testing ' of the proposed brine and wastewater stream subsequent to plant start up and the availability of actual brine and return wastewater.	To determine the impacts of wastewater discharge on the marine environment.	Operation	
14	Marine Environment	Adopt AQIS guidelines, requirements of the Dampier Port Authority and appropriate ballast water management procedures.	To minimise the impact of shipping on the marine environment.	Operation	DPA AQIS
15	Marine Environment	Inform vessel masters that no vessel hull scraping or antifoulant painting may take place in the Port of Dampier.	Prevent the contamination of the marine environment from antifouling.	Operation	
16	Atmospheric Emissions	Continue to investigate the optimum solution for the fuel and energy balance of the plant and minimise the emissions from the complex in accordance with EPA requirements that "all reasonable and practicable measures should be taken to minimise the discharge…" Continue these studies and incorporate the latest techniques to establish optimum emissions levels. As the technology of the utilisation of waste gas in gas turbines develops and becomes proven, adopt all reasonable and practicable solutions to reducing the discharges.	Minimise atmospheric emissions where practicable and comply with relevant guidelines.	Operation	
17	Atmospheric Emissions	Develop a framework agreement as part of joining the Greenhouse Challenge and implement the agreement.	To participate in the national programme of managing greenhouse gas emissions with the aim of minimising emissions where practicable.	Prior to commissioning	

No.	Topic	Description	Objective	Timing	Advice
18	Atmospheric Emissions	As part of managing greenhouse gas emissions, Methanex will: ■ Continue to research and develop the methanol process in order to improve efficiency and reduce gas usage and implement plant improvements where practicable; ■ Become a member of the Australian Industry Greenhouse Network; ■ As a member of the Burrup Industrial Council, Methanex will participate and assist in agreed studies and investigation into the effects and remedies, such as alternative fuel technology, other technology advances and off-set measures, for greenhouse gas emissions where practicable. ■ Adopt and implement practicable and feasible actions where appropriate to the global methanol industry.	To participate in the national programme of managing greenhouse gas emissions with the aim of minimising emissions where practicable.	Operation	
19	Noise	Re-evaluate noise emissions from the complex to confirm compliance with boundary noise criteria and to determine the contribution of noise at Hearson Cove.	To confirm compliance with boundary noise criteria and to determine the contribution to noise at Hearson Cove.	Prior to construction	
20	Noise	Utilise the expertise of an acoustic engineer to ensure that the best feasible and practicable noise attenuation measures are included during the final design of the Methanex methanol project on the Burrup Peninsula.	To confirm compliance with boundary noise criteria and to ensure noise emissions are as low as reasonably practicable.	Prior to construction	
21	Noise	During detailed design of the complex, Methanex will ensure that noise levels will meet 65dB(A) at the boundary and that where feasible and practicable noise attenuation measures will be implemented to improve on this level to minimise noise at Hearson Cove.	To confirm compliance with boundary noise criteria and to ensure noise emissions are as low as reasonably practicable.	Prior to construction	
22	Noise	Undertake compliance noise monitoring by suitably qualified personnel to distinguish between noise levels from local environmental sources and other nearby operating industries, if they exist.	To identify areas of potential exceedance or confirm compliance with statutory guidelines.	Operation	
23	Waste Management	Treat process wastewater prior to discharge to the brine return line such that the quality of water will meet or exceed regulations.	Comply with relevant guidelines and conditions.	Operation	
24	Hazardous Materials Management	Design all chemical and product storage bunds with sufficient capacity to contain the volume of the contents of the largest tank and an extra height of 144mm to contain rainwater for a 1-in-100 year 24hr event.	Comply with relevant guidelines and conditions and provide sufficient additional capacity to minimise the potential for overflows.	Prior to construction	DMPR
25	Public Safety	Inform the EPC contractor that they are required to prepare and implement a Construction Safety Management Plan that will address all emergency response procedures required during construction. In general, the Construction Safety Management will address: ■ Provision of fire fighting equipment; ■ Reporting of fires; ■ Alarms and communication signals; ■ Muster points; ■ Evacuation procedures; and ■ Preparedness and procedures for the three different cyclone warning stages (blue, yellow and red).	To minimise the risk to public safety and the potential creation of hazardous working environments.	Prior to construction	DMPR
26	Public Safety	Prepare an Operation Safety Report that encompasses a Safety Management System, a Safety Management Plan and a Safety Emergency Response Plan. Implement the Operation Safety Report.	To minimise the risk to public safety and the potential creation of hazardous working environments.	Prior to commissioning Commissioning	FESA

No.	Topic	Description	Objective	Timing	Advice
27	Public Safety	Consult with FESA and CALM regarding fire protection procedures and in particular natural wildfire or controlled burns on adjacent lands.	To minimise the risk to public safety and plant operation.	Prior to commissioning	FESA CALM
28	Public Safety	Develop a Traffic Management Plan that will focus on: ■ Traffic flow patterns and scheduling of traffic movements such that impacts on road thoroughfare and the general public is minimised; ■ Public safety, awareness and signage during construction; ■ The capacity of existing road conditions to support proposed heavy loads and road usage; ■ Monitoring the transportation of oversized loads; ■ Design and construction of a one-way loop road around the plant footprint; and ■ Restricting vehicle access to designated routes such that unnecessary disturbance to the surrounding environment is prevented. Implement the Plan.	To minimise potential traffic impacts and ensure safety of public during construction.	Prior to construction Construction	MRWA SoR FESA
29	Public Safety	Develop a workforce profile that will detail the demographics of the expected workforce, a timeline, the required accommodation, and likely education and recreational requirements. Forward the workforce profile to : ■ Education Department of Western Australia; and ■ Shire of Roebourne	To provide information to key planning stakeholders such that appropriate provisions can be made in the planning of social infrastructure of Karratha and Dampier.	Prior to construction and commissioning	
30	Heritage	Undertake archaeological and ethnographical surveys of the project site with relevant Aboriginal groups.	To minimise impacts on areas considered being of Aboriginal heritage and cultural significance.	Prior to construction	DIA
31	Heritage	Develop a cultural heritage protocol which will include heritage surveys and ongoing consultations with Aboriginal groups. Implement the protocol.	To minimise impacts on areas considered to be of Aboriginal heritage and cultural significance.	Prior to construction Construction	DIA
32	Heritage	Develop an Aboriginal Awareness Program in consultation with Aboriginal groups for the construction and operation workforces. Implement the Program.	To minimise impacts on areas considered to be of Aboriginal heritage and cultural significance.	Prior to construction. Construction and operation	DIA
33	Heritage	Document any complaints received from the community on a register and investigate substantiated complaints.	To ensure that environmental impacts are minimised.	Construction and operation	
34	Decommissioning	Prepare a Preliminary Decommissioning Plan which provides a framework to ensure that the site is left in a suitable condition should decommissioning take place. The plan will include: ■ The rationale for the siting and design of the complex and infrastructure; ■ The conceptual plans for the removal of the complex and infrastructure; ■ If appropriate the rationale for any plant, buildings or equipment that might be retained; ■ The conceptual rehabilitation plans for all disturbed areas; ■ A process to agree on end land use(s); ■ Conceptual management plans to deal with any contamination issues; and ■ A conceptual public consultation plan concerning the decommissioning.	To restore the project lease as near as practicable to its 'as found' condition and leave it in a safe condition.	Prior to commissioning	DMPR

No.	Topic	Description	Objective	Timing	Advice
35	Decommissioning	Prepare a Final Decommissioning Plan designed to leave the site in a suitable condition. This plan will expand on the Preliminary Decommissioning Plan and provide details of: ■ The plans for the removal of plant, buildings and equipment; ■ The rational for the retention of any plant, buildings or equipment; ■ The rehabilitation plans for the disturbed areas; ■ An end land use(s) agreement; ■ The management plans for dealing with contaminated areas; and ■ A record of the public consultation undertaken to finalise the plan.	To restore the project lease as near as practicable to its 'as found' condition and leave it in a safe condition.	Six months prior to last day of methanol production	DMPR
36	Community Consultation	Establish a Community Advisory Panel for its production facilities on the Burrup to enable ongoing consultation with the community.	To establish a working relationship with community members such that environmental and social impacts from the complex are minimised.	Prior to commissioning	
37	Regional Planning Requirements	Liaise with OMP to coordinate the planning of pipelines and other requirements within infrastructure corridors.	To ensure planning is undertaken in a coordinated manner such that the requirements for all Proponents are met.	Prior to construction	OMP
38	Regional Planning Requirements	Consult with and provide details of pipeline design to the DMPR (OMP and Hazardous Goods Division) and CALM such that the Departments are given the opportunity to review and comment on draft designs.	Design pipelines to best practice and provide the opportunity for stakeholders to comment on the proposed pipeline design.	Prior to construction	DMPR OMP CALM

Abbreviations:

AQIS – Australian Quarantine and Inspection Service
CALM – Department of Conservation and Land Management
CLSC – Commissioner for Soil and Land Conservation
DEP – Department of Environmental Protection
DIA – Department of Indigenous Affairs
DMPR – Department of Mineral and Petroleum Resources
DPA – Dampier Port Authority
EPA – Environmental Protection Authority
EPC – Engineering, Procurement and Construction
FESA – Fire and Emergency Services Authority
MRWA – Main Roads Western Australia
OMP – Office of Major Projects
SoR – Shire of Roebourne
WAM – WA Museum

Notes:

1: PER commitment 8.03 to undertaken methanol toxicity testing has been completed and therefore removed from the above list.
2: Commitments numbered >12.01 are new commitments formed as part of Methanex' response to submissions.

Appendix 6

Vegetation Mapping Units of Trudgen

Vegetation mapping units of Trudgen (2002) occurring in the Methanex site.

Trudgen (2002) veg unit	Distribution	Assoc. Species	Cons. Sig.†1	Area mapped within Methanex lease	Area mapped in the King Bay – Hearson Cove Valley	Area mapped on the Burrup Peninsula	Approximate ha disturbed - % of total (Probable level of impact†2)
ChAbTa	Numerous (>50) stands, broadly distributed to north and east of study area. Recorded on valley floor and lower slopes, with calcrete material in the soil.	*Corymbia hamersleyana, Acacia bivenosa, Indigofera monophylla* (Burrup form), *Triodia angusta* (Burrup form), *T. epactia* (Burrup form), *Acacia colei, *Cenchrus ciliaris, Grevillea pyramidalis* subsp. *pyramidalis, Hakea lorea* subsp. *lorea, Chrysopogon fallax, Corchorus walcottii*	Mod	7.9 ha	10.3 ha	103.2 ha	1.1 ha - 1% (NS)
AbaTa	Small number (<10) of relatively large stands. Recorded on a plain by a creek, behind a tidal area, extending to the north-east of the study area.	*Acacia bivenosa, A. ampliceps, Triodia angusta* (Burrup form), (*T. epactia* (Burrup form)), *Eucalyptus victrix*	Mod	3.0 ha	6.5 ha	14.6 ha	0.1 ha - <1% (NS)
AbImTw	Moderate number (10-50) of relatively small stands.	*Acacia bivenosa, Indigofera monophylla* (Burrup form), *Corchorus walcottii, Triodia wiseana* (Burrup form), *Rhynchosia cf. minima*	Mod	1.1 ha	2.3 ha	78.2 ha	0 ha - 0% (NI)
AiImTw	In numerous small stands to west, north and east of study area. Recorded on valley slopes, with cobbly-pebbly red-brown loam.	*Acacia inaequilatera,* (*A. colei*), *Indigofera monophylla* (Burrup form), *Triodia wiseana* (Burrup form), *T. epactia* (Burrup form), *Acacia bivenosa*	Mod	4.7 ha	6.1 ha	41.1 ha	4.3 ha - 10% (NS)
Er	Two small stands. Recorded only within study area and at the mouth of a gully, near a coastal flat, to the south-west.	*Eriachne* sp., *Corchorus walcottii, Indigofera monophylla* (Burrup form)	Mod to high	1.7 ha	1.7 ha	2.2 ha	1.7 ha - 77% (S)
AbImTe	Small number of relatively large stands; main representation in the Hearson Cove Valley, extending southwest from the study area. Recorded on gentle slopes.	*Acacia bivenosa, Indigofera monophylla* (Burrup form), *Triodia epactia* (Burrup form), *Acacia colei, Trianthema turgidifolia, Stylobasium spathulatum, Eriachne mucronata, Aristida holathera* var. *holathera*	Mod	2.2 ha	21.7 ha	23.5 ha	2.1 ha - 9% (NS)
AbTa	Small number of small stands; main representation in the Hearson Cove Valley, extending southwest from the study area. Recorded on gently sloping areas near tidal flats and creeks.	*Acacia bivenosa, Triodia angusta* (Burrup form), *Trianthema turgidifolia, Indigofera monophylla* (Burrup form), *Trichodesma zeylanicum* var. *zeylanicum*	Mod to high	2.6 ha	6.5 ha	6.8 ha	1.8 ha - 26% (NS)
AbCwTe	Moderate number of stands, both west and east of the study area. Recorded on lower broad valley slopes.	*Acacia bivenosa, Indigofera monophylla* (Burrup form), *Corchorus walcottii, Triodia epactia* (Burrup form), *Streptoglossa decurrens, Swainsona formosa, Triumfetta appendiculata* (Burrup form)	Mod	7.8 ha	11.4 ha	64.5 ha	5.7 ha - 9% (NS)
Trudgen (2002) veg unit	**Distribution**	**Assoc. Species**	**Cons. Sig.†1**	**Area mapped within Methanex lease**	**Area mapped in the King Bay – Hearson Cove Valley**	**Area mapped on the Burrup Peninsula**	**Approximate ha disturbed - % of total (Probable level of impact†2)**
AcImTe	Numerous stands throughout peninsula.	*Acacia colei, A. elacantha, Grevillea pyramidalis* subsp. *pyramidalis, Indigofera monophylla* (Burrup form), *Triodia epactia* (Burrup form), *T. wiseana* (Burrup form), *Acacia bivenosa, Hakea lorea* subsp. *lorea, Rhynchosia* cf. *minima*	Mod	0.1 ha	7.0 ha	677.6 ha	0.1 ha - <1% (NS)

Trudgen (2002) veg unit	Distribution	Assoc. Species	Cons. Sig.†1	Area mapped within Methanex lease	Area mapped in the King Bay – Hearson Cove Valley	Area mapped on the Burrup Peninsula	Approximate ha disturbed - % of total (Probable level of impact†2)
AiTw	Small number of relatively small stands.	*Acacia inaequilatera, A. bivenosa, Triodia wiseana* (Burrup form), *Rhynchosia* cf. *minima, Tephrosia* aff. *supina* (MET12,357), *Cullen pustulatum, Pterocaulon sphacelatum, Scaevola spinescens* (narrow form)	Mod	1.5 ha	1.5 ha	11.4 ha	1.5 ha - 13% (NS)
AoIlTw	Moderate number of small stands.	*Acacia bivenosa, A. orthocarpa, Grevillea pyramidalis* subsp. *pyramidalis, Indigofera linnaei, Crotalaria medicaginea* (Burrup form; B65-11), *Triodia wiseana* (Burrup form), **Cenchrus ciliaris, Paspalidium tabulatum* (Burrup form), *Triumfetta appendiculata* (Burrup form), *Tephrosia* aff. *supina* (MET 12,357)	Mod	1.0 ha	3.6 ha	5.8 ha	1.0 ha - 17% (NS)
TeAb	Moderate number of large stands; large representation in Hearson Cove Valley, to west of study area. Recorded on gentle to moderate slopes in the base of the valley, and in a low area between coastal dunes to the northeast.	*Triodia epactia* (Burrup form), *Acacia bivenosa, Tephrosia* aff. *supina* (MET 12,357), *Rhynchosia* cf. *minima, Swainsona pterostylis*	Mod	1.5 ha	42.5 ha	85.2 ha	2.6 ha - 3% (NS)
GpCwTe	Moderate number of usually small stands, mainly south-west of the study area; only in the King Bay - Hearsons Cove area. Recorded on gentle slopes and shallow valleys, near drainage gullies.	*Grevillea pyramidalis* subsp. *pyramidalis, Corchorus walcottii, Triodia epactia* (Burrup form), *Acacia coriacea* subsp. *coriacea, A. bivenosa, Corymbia hamersleyana, Crotalaria medicaginea* (Burrup form; B65-11), *Dichrostachys spicata, Cymbopogon ambiguus, Chrysopogon fallax*	Mod	1.1 ha	7.9 ha	7.9	0.9 ha - 11% (NS)
EvTa	Moderate number of usually small stands, mainly north of the study area. Recorded in small creeklines, flowlines and flat-bottomed valleys, often with rockpiles upslope.	*Eucalyptus victrix, Acacia coriacea* subsp. *coriacea, Triodia angusta* (Burrup form), *Acacia bivenosa, Corchorus walcottii, Indigofera monophylla* (Burrup form), *Triodia epactia* (Burrup form), *Cyperus vaginatus, Dicliptera armata*	Mod	0.1 ha	1.4 ha	8.3 ha	0 ha - 0% (NI)
Trudgen (2002) veg unit	**Distribution**	**Assoc. Species**	**Cons. Sig.†1**	**Area mapped within Methanex lease**	**Area mapped in the King Bay – Hearson Cove Valley**	**Area mapped on the Burrup Peninsula**	**Approximate ha disturbed - % of total (Probable level of impact†2)**
EvTwTh	Small number of stands, main representation in valley extending north-east from study area. Recorded on lower slopes and valley floor.	*Eucalyptus victrix, Triodia wiseana* (Burrup form), *Themeda* sp. Burrup (B84), *Corymbia hamersleyana, Triodia angusta* (Burrup form), *Rhynchosia* cf. *minima, Acacia bivenosa, A. colei, A. coriacea* subsp. *coriacea, Indigofera monophylla* (Burrup form)	Mod	2.3 ha	8.1 ha	11.2 ha	0.3 ha - 3% (NS)
ChGpTe	Small number of stands, north of the study area. Recorded from an area of lower slopes and colluvial plains on reddish rocky clay.	*Corymbia hamersleyana, Grevillea pyramidalis* subsp. *pyramidalis, Acacia orthocarpa, A. bivenosa, A. coriacea* subsp. *coriacea, Triodia epactia* (Burrup form), *Acacia pyrifolia*	Mod to high	4.3 ha	5.9 ha	9.8 ha	1.7 ha - 17% (NS)

Trudgen (2002) veg unit	Distribution	Assoc. Species	Cons. Sig.†1	Area mapped within Methanex lease	Area mapped in the King Bay – Hearson Cove Valley	Area mapped on the Burrup Peninsula	Approximate ha disturbed - % of total (Probable level of impact†2)
TcTeSg	Moderate number of usually small stands. Recorded in rocky flowlines or creek beds and gullies between rockpiles.	*Terminalia canescens, Stemodia grossa, Triodia epactia* (Burrup form), *Eriachne tenuiculmis, Dicliptera armata, Acacia coriacea* subsp. *coriacea, Dichrostachys spicata, Sesbania cannabina, Cymbopogon ambiguus*	Mod to high	0.3 ha	1.2 ha	3.4 ha	0.3 ha - 9% (NS)
(Te)Sv	Moderate number of relatively small stands.	*Sporobolus virginicus, Triodia epactia* (Burrup form), *Eragrostis falcate, Acacia bivenosa, Trianthema turgidifolia, Swainsona pterostylis*	Mod	1.4 ha	25.3 ha	29.9 ha	1.4 ha – 5% (NS)
Sm	Numerous relatively small stands.	*Halosarcia* spp., *Frankenia* spp.	Mod	0.2 ha	36.0 ha	100.0 ha	0.2 ha - <1% (NS)
**CcTa*	Mapped in one drainage area extending south from the study area.	**Cenchrus ciliaris, Triodia angusta* (Burrup form), *Pluchea* sp. Releve CcTa1	Mod to low	0.1 ha	1.8 ha	1.8 ha	0.1 ha - 6% (NS)
*Ta/*Cc*	Mapped in one drainage area extending south from the study area.	*Triodia angusta* (Burrup form) / **Cenchrus ciliaris*	Mod to low	0.9 ha	0.9 ha	0.9 ha	0.9 ha – 100% (S)
Tw	Numerous, widespread stands.	*Triodia wiseana* (Burrup form), *Corymbia hamersleyana, Acacia bivenosa, Cymbopogon ambiguus, Ipomoea costata*	Mod	0.9 ha	12.1 ha	82.7 ha	0.8 ha - <1% (NS)
'R' Units corresponding to AoBaFbReSs	Likely to be widespread	*Alectryon oleifolius, Brachychiton acuminatus, Ficus brachypoda, Rhagodia eremaea, Scaevola spinescens*	Mod to high	0.5 ha	48.3 ha (NMS)	2068.3 ha (NMS)	0 ha - 0% (NI)
'R' Units corresponding to BaEveTe	Likely to be restricted	*Brachychiton acuminatus, Erythrina vespertilio, Triodia epactia* (Burrup form)	Mod to high	0.1 ha			0.1 ha - Insufficient Data (S?)
D	Disturbed or rehabilitated areas	**Cenchrus ciliaris*, various other largely non-native species	Low	49.2 ha	84.0 ha	676 ha	46 ha – 6.8% (NS)

†1 Conservation significance as defined in the PER: High = vegetation with a particularly limited representation on the Burrup Peninsula, in excellent condition, and/or supports flora of particular conservation value – disturbance should be avoided; Moderate = vegetation in good to excellent condition – disturbance should be minimised; Low = vegetation has been substantially modified from the natural state by clearing, weed invasion etc – disturbance should be concentrated in these areas.

†2 NI = No impact (no clearing required); NS = No significant impact (clearing of <30% of the vegetation type); S = Significant impact (clearing ≥30% of the vegetation type).

NMS Not mapped separately by Trudgen (2002).

Appendix 7

Physio-chemical composition of the brine and wastewater discharge

■ **Table 4-3 Physiochemical Composition of Water Stream Flows**

Water Stream	Operating Condition	Flow m^3/day	Temp. °C	TSS mg/L	TDS mg/L	pH	THC mg/L	MeOH mg/L	Alkalinity P/M mg/L	Sulphate mg/L	Chloride mg/L	Si mg/L	Na mg/L	Cu mg/L	Ni mg/L	Zn mg/L	K mg/L	Fe mg/L	Ca mg/L	Mg mg/L
Brine	Normal	36,130	2°C[1]		45,000															
	Maximum	43,200	2°C[1]		55,000															
Desalinated Water	Normal	9,510	25/35		<10	7														
	Maximum	11,800																		
Potable Water	Normal	5							0.0/0.1	0.8	3	0.1	3	Negl.			0.1		0.3	2
	Maximum	10																		
Demineralised Water	Normal	7,770	40			6.5-7.5						<0.01	<0.01					<0.01		
	Maximum																			
Regeneration Water	Normal	310		<3000	10,200	6.5-9.5				9000	<500		1700						<200	
	Maximum	480																		
Boiler Feed Water	Normal	31,030	50															<0.01		
	Maximum	-																		
Boiler Blowdown	Normal	260		10		10			10/12			1	6					1		
	Maximum	310		10		10			10/12			1	6					1		
Process Condensate (raw)	Normal	9,700	75/70	30					>280				0.1		Negl.	Negl.		0.01		
	Maximum	-																		
Process Condensate (stripped)	Normal	5,620	40	30					280 (total)				0.1							
	Maximum	-												5	2	2		0.1		
Process Condensate (ex-CSAC)	Normal	5,620							280											
	Maximum	-																		
CSAC regeneration water	Normal	Included in 'Regeneration Water'																		
	Maximum																			
Process Condensate (degassed)	Normal	5,620							<280											
	Maximum	-																		
Steam Condensate	Normal	5,900																		
	Maximum	-																		
Turbine Condensate	Normal	17,710																		
	Maximum	-																		
Distillation Water	Normal	1,740	120				25 g/L	10						<0.001						
	Maximum	-					-	100						5	2	2		0.1		
Saturator Circulation	Normal	26,080				5-6	~40	~700						<0.02						
	Maximum	-					~80	~1500						100	40	40		2		
Saturator Blowdown	Normal	260				5-6	~40	~700						<0.02						
	Maximum	310					~80	~1500						100	40	40		2		
Cooling Tower Circulation	Normal	400,000	30			8			0.0/110	10	40	1	45	Negl.		1	1	0.3	120	20
	Maximum	480,000	30			8			0.0/110	10	40	1	45	Negl.		1	1	0.3	120	20
Cooling Tower Blowdown	Normal	430	40			8			0.0/110	10	40	1	45	Negl.		1	1	0.3	120	20
	Maximum	860	40			8			0.0/110	10	40	1	45	Negl.		1	1	0.3	120	20
Wastewater Treatment Feed	Average	570		1600	5,500		20	300		4800	300		900	25	9	9			100	
	Maximum	690												45	18	18				
Wastewater Treatment Effluent	Average	570		1000		6 – 9	10	15						0.25	0.5	0.5				
	Maximum	690		1000		6 - 9	10	15						0.5	1	1				
ASU Cooler Blowdown	Normal	0				8			0.0/0.5	10	40	0.6	37.8			1.5	1		3	20
	Maximum	0				8			0.0/0.5	10	40	0.6	37.8			1.5	1		3	20
Reactor Jacket Blowdown	Normal	0																		
	Maximum	0																		

Notes:
1 – Above seawater receiving temperature.
2 – Cooling tower composition is based on recycle of boiler blowdown and blowdown from ASU;
3 – Flow data refers to simplified water balance.
4 - Filter backwashing at regular intervals.
5 – Blank cells indicate negligible concentrations <0.001mg/L or limit of detection whichever is greater.
6 – Maximum concentrations are indications only. Do not represent absolute values.

Table 4-3 Physiochemical Composition of Water Stream Flows (continued..)

Water Stream	Operating Condition	Chemical Oxygen Demand mg/L	Total Nitrogen mg/L	Phosphate mg/L	Ammonium[3] (as N) mg/L	Neutralising Amines[2] mg/L	Organic Scale mg/L	Polym. Dispersants mg/L	Aromatic Triazoles mg/L	Surfactants mg/L	Biocides mg/L	Free Halogen mg/L
Brine	Normal											0
	Maximum											0
Desalinated Water	Normal											
	Maximum											
Potable Water	Normal											
	Maximum											
Demineralised Water	Normal											
	Maximum											
Regeneration Water	Normal		1900		1900							
	Maximum											
Boiler Feed Water	Normal											
	Maximum											
Boiler Blowdown	Normal			10		0.8		18[1]				
	Maximum											
Process Condensate (raw)	Normal		100		100							
	Maximum											
Process Condensate (stripped)	Normal		100		100							
	Maximum											
Process Condensate (ex-CSAC)	Normal		Negl.		Negl.							
	Maximum											
CSAC regeneration water	Normal	Included in 'Regeneration Water'										
	Maximum											
Process Condensate (degassed)	Normal											
	Maximum											
Steam Condensate	Normal											
	Maximum											
Turbine Condensate	Normal											
	Maximum											
Distillation Water	Normal											
	Maximum											
Saturator Circulation	Normal	~1150	~30		~30							
	Maximum	~2000	~60		~60							
Saturator Blowdown	Normal	~1150	~30		~30							
	Maximum	~2000	~60		~60							
Cooling Tower Circulation	Normal											
	Maximum											
Cooling Tower Blowdown	Normal			9		0.3		16			0	0
	Maximum			9		0.3		16				
Wastewater Treatment Feed	Average	520	1040		1040							
	Maximum											
Wastewater Treatment Effluent	Average	100	7		7							
	Maximum		10		10							
ASU Cooler Blowdown	Normal			4.5				1.89			30	0.2
	Maximum											
Reactor Jacket Blowdown	Normal											
	Maximum											

Notes: 1 – Iron based
2 – Neutralising amines are volatile and travel via steam to coat pipework.
3 – Ammonium measured as Total Nitrogen

■ **Table 4-4 Chemical Additives to Water Stream Flows**

Water Stream	Operating Condition	Aquamax LT19 Antiscalant [1] mg/L	Aquamax AF Foam Control [1] mg/L	Chlorine mg/L	Sulphamic Acid Cleaning Chemical mg/L	OS7780 Oxygen Scavenger mg/L	NA0760 Corrosion Inhibitor mg/L	Polymeric dispersants mg/L	HTP73301 Dispersant mg/L	HTP3611 Dispersant mg/L	DN2250 Corrosion Inhibitor mg/L	PY5204 Deposit Control mg/L	MS6207 Corrosion Inhibitor mg/L	BD1500 Bio-dispersant mg/L	NX1100 Biocide mg/L
Brine	Normal														
	Maximum	3.82	0.32												
Desalinated Water	Normal														
	Maximum														
Potable Water	Normal														
	Maximum														
Demineralised Water	Normal														
	Maximum														
Regeneration Water	Normal														
	Maximum														
Boiler Feed Water	Normal														
	Maximum					1.2	1.5		1.2	1.2					
Boiler Blowdown	Normal														
	Maximum							~18							
Process Condensate (raw)	Normal														
	Maximum														
Process Condensate (stripped)	Normal														
	Maximum														
Process Condensate (ex-CSAC)	Normal														
	Maximum														
CSAC regeneration water	Normal														
	Maximum														
Process Condensate (degassed)	Normal														
	Maximum														
Steam Condensate	Normal														
	Maximum														
Turbine Condensate	Normal														
	Maximum														
Distillation Water	Normal														
	Maximum														
Saturator Circulation	Normal														
	Maximum														
Saturator Blowdown	Normal														
	Maximum														
Cooling Tower Makeup	Normal														
	Maximum			5											
Cooling Tower Circulation	Normal														
	Maximum										15	20	5		- 30
Cooling Tower Blowdown	Normal														
	Maximum														
Wastewater Treatment Feed	Normal														
	Maximum														
Wastewater Treatment Effluent	Normal														
	Maximum														
ASU Cooler Blowdown	Normal														
	Maximum														
Reactor Jacket Blowdown	Normal														
	Maximum														

Notes: 1 – The components in Aquamax LT 19 and AF are discharged in the brine stream.

- **Table 4-5 Waste Stream Characterisation**

Stream	Parameter	Flow Rate	Temperature	TDS	Free Chlorine	pH	THC	Methanol	Copper	Nickel	Zinc	COD	Ammonia	Total Nitrogen	Phosphate	Total Phosphorus	Neutralising Amines	Polym. Dispersants	Biocides	Aquamax LT19 (Antiscalant)	Aquamax AF (Foam Control)
		m^3/day	C	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Desalination Brine (2)	Average	36,130	Average of 2 °C above the supplied seawater temperature	45,000	0															3.82	0.32
	Maximum	43,200	Average of 2 °C above the supplied seawater temp.	55,000	0																
Cooling Tower Blowdown (4)	Average	430	42		0	8			Negligible		1				9	3	0.3	16	Negl.		
	Maximum	860	42		0	8			Negligible		1				9	3	0.3	16	Negl.		
Treated Wastewater (9)	Average	570			0	6 - 9	10	15	0.25	0.5	0.5	100	7	7							
	Maximum	690			0	6 - 9	10	15	0.5	1.0	1.0		10	10							
Combined Stream (10) - Contaminants added by the process only	Entry to BRS Average	37,130	Average of 2 °C above the supplied seawater temperature	<55,000	0		0.154	0.230	0.004	0.008	0.019	1.5	0.11	0.11	0.104	0.035	0.003	0.185	0	3.7	0.3
	Entry to BRS Maximum	44,750	Average of 2 °C above the supplied seawater temp.	55,000	0		0.154	0.231	0.008	0.015	0.035		0.15	0.15	0.173	0.058	0.006	0.307	0		
Loadings (based on average conditions for metals	kg/yr				0		2081	3121	52	104	261	20805	1456	1456	1413	471	47	2511	0	50376	4220
Concentration at 0.01km^2 Mixing Zone	Average				0		0.013	0.019	0.0003	0.0006	0.0016	0.1279	0.009	0.009	0.009	0.003	0.0003	0.0154	0	0.31	0.026
	Maximum				0		0.013	0.019	0.0008	0.001	0.003		0.013	0.013	0.014	0.005	0.0005	0.026	0		
99% ANZECC Level			-	-	-	-	-	-	0.0003	0.007	0.007		0.5								

Notes:
1 – Background seawater concentrations are not included. There is a potential that contaminants existing in seawater can be concentrated in the process.
2 – Cooling tower blowdown. The flow will change and chemical dosing is changed accordingly to maintain chemical levels within the cooling water system.
3 – Total Phosphorus includes only phosphate from cooling tower blowdown.