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Vopak Terminals Australia

Natural Fuel Limited

Vopak Terminals Sydney and Natural Fuels Australia Ltd

Proposed Sydney Biodiesel Terminal

Environmental Assessment

January 2007

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Statement of Validity

	Submission of Environmental Assessment
	Prepared under the Environmental Planning and Assessment Act 1979, Section 75H
Environmental assessment prepared by:	
Name	Julian Ardas
Qualifications	BSc (Hons), MURP, CPP
Address	GHD Pty Ltd 10 Bond Street Sydney NSW 2000
In respect of:	The proposed biodiesel project at 49 Friendship Road, Port Botany (Application Number 06_0179)
Project to which Part 3A applies	
Applicant name	Vopak Terminals Sydney Pty Ltd Natural Fuels Australia Ltd c/o
Applicant address	Vopak Terminals Sydney Pty Ltd PO Box 191 MATRAVILLE NSW 2036
Land to be developed	49 Friendship Road, Port Botany
Proposed development	Construction and operation of a Biodiesel Terminal.
Environmental assessment	An environmental assessment is attached
Certificate	I certify that I have prepared the contents of this document and to the best of my knowledge: ◗ It is in accordance with the requirements of Part 3A; ◗ It contains all available information that is relevant to the environmental assessment of the development to which it relates; and ◗ The information contained in the document is neither false nor misleading.
Signature	
Name	Julian Ardas
Date	11 January, 2007

List of Abbreviations

ASSP	Acid Sulphate Soil Procedure
BLB	Bulk Liquids Berth
B followed by number	Percentage of mineral diesel blend with biodiesel – e.g. B20 = 20% biodiesel / 80% mineral diesel
CASA	Civil Aviation Safety Authority
CEMP	Construction Environment Management Plan
CO	Carbon Monoxide
DA	Development Application
dB(A)	Decibels (A-weighted)
DCP	Development Control Plan
DEC	Department of Environment and Conservation
DEH	Commonwealth Department of Environment and Heritage
DP	Deposited Plan
DoP	Department of Planning
ENCM	Environmental Noise Control Manual
EPA	Environment Protection Authority
EP&A Act	Environmental Planning and Assessment Act
EPBC Act	Environment Protection Biodiversity and Conservation Act
ESD	Emergency Shut Down
FIP	Fire Indicator Panel
ha	Hectares
INP	Industrial Noise Policy
JUHI	Joint User Hydrant Installation Facility (at Sydney Airport)
JORTL	Jointly Operated Road Tanker Loading Facility
KPA	Kilopascals
km	Kilometre
kV	Kilovolts
kW	Kilowatts

$L_{A\ number}$	Level of noise at maximum sound power levels for only brief stages during a measured period
L_{A90}	Level of noise exceeded for 90% of the sample time; it represents the background level of noise experienced during the measurement period.
LEL	Lower Explosion Limit
LH	Low-High
LHH	Low-High-High
LPG	Liquified Petroleum Gas
M	Metres
m^3	Cubic metres
m^3/hr	Cubic metres per hour
mg/L	Milligram per litre
mg/m^3	Milligram per cubic metre
ML	Megalitre (1,000,000 litres)
mm	Millimetres
MTBE	Methyl tertiary butyl ether
NEPM	National Environmental Protection Measure
NO_x	Oxides of Nitrogen
NPI	National Pollution Inventory
Ohm	The resistance of a conductor in which one volt produces a current of one ampere.
OMP	Operational Management Plan
PASS	Potential Acid Sulphate Soils
PHA	Preliminary Hazard Analysis
Pmpy	Per million per year
POEO Act	Protection of the Environment Operations Act
Pphm	Parts per hundred million
RTA	Roads and Traffic Authority
SEPP	State Environmental Planning Policy
Site A	Relates to the development of Vopak Site A Terminal at 49 Friendship Road Port Botany for storage and distribution of petroleum and chemical bulk liquids

Site B	Relates to the development of Vopak Site B Terminal at 20 Friendship Road Port Botany for storage and distribution of petroleum bulk liquids
SFL	Safe Fill Limit (maximum tank capacity in cubic metres)
SPC	Sydney Ports Corporation
The Code	Generic term to mean the appropriate applicable Australian Standard / Act / Regulation or Recognised Code of Practice as the basis for design and equipment requirements.
TSC Act	Threatened Species Conservation Act
µg	Micrograms
UEL	Upper Explosive Limit
VOC	Volatile Organic Compounds
VPD	Vehicles Per Day
Vpd	Vehicles per day
Vph	Vehicles per hour
Vtpd	Vehicle trips per day
Vtph	Vehicle trips per hour
WWTP	Waste Water Treatment Plant

Executive Summary

Context of the proposal

In the year 2004-05 over 15 billion litres of mineral diesel was consumed in Australia for energy and transport purposes. Due to population expansion and economic growth, the consumption market of mineral diesel is expected to grow approximately 2% per annum for the next two decades.

It is anticipated that no new local refining works would be undertaken to offset this growth and mineral diesel imports are therefore required to meet local demand. However, recent technological advancements, favourable economic conditions and identification of the environmental benefits of biofuels have resulted in market interest towards the local production and use of biodiesel as an alternative to importing mineral diesel.

Therefore Vopak Terminals Sydney Pty Ltd and Natural Fuels Australia Ltd are proposing to construct and operate a biodiesel facility at Port Botany NSW. The facility would be located at the Vopak Site A Terminal at 49 Friendship Road Port Botany and integrate with existing bulk liquid storage and distribution infrastructure. For the purpose of this Environmental Assessment the biodiesel facility is referred to as 'the proposal'.

This Environmental Assessment supports an application for project approval from the Minister of Planning for the proposal. The Environmental Assessment has been prepared by GHD Pty Ltd on behalf of Vopak Terminals Sydney Pty Ltd and Natural Fuels Australia Ltd in accordance with Part 3A of the *Environmental Planning and Assessment Act 1979*. The Environmental Assessment addresses the Director-General's requirements as issued on 25 July 2006.

The proposal

The proposal involves the construction and operation of a biodiesel processing plant, storage tanks and associated infrastructure. The proposal includes construction of a biodiesel processing plant on a cleared portion of the Vopak Site A Terminal (Lot 5). The proposal would also require refurbishment of the Vopak Site A Terminal (Lots 3 and 4) to re-use some of the existing tanks, pumps, loading/unloading facilities, fire protection system and other miscellaneous facilities. Lot 3 and 4 would also incorporate new infrastructure support facilities including a new administration building, two utilities building, two workshops, car parking for 58 spaces and switchroom.

The development is to be achieved in two stages. Stage one of the proposal involves:

- One train biodiesel facility with capacity to produce 143 ML/year of B100 grade biodiesel;
- Reuse of 20 existing tanks with a storage capacity of 16,600m^3;

- Three new storage tanks (18.7m in diameter and 18m in height) with a total storage capacity of 13,650m^3;
- Eight minor storage tanks with a total capacity of 440m^3;
- Storage tank support infrastructure, including:
  - One new pump manifold;
  - One new walkway;
  - One new main hose exchange and three new hose exchanges;
  - Provisions for a Waste Water Treatment Plant designed for biodiesel waste water treatment;
  - Appropriate bunding works; and
  - Appropriate piping works.
- Operation support infrastructure, including:
  - Expansion to existing east substation;
  - Administration and operational car parking for 58 spaces;
  - A new two storey administration building (24m x 18m and 7m in height);
  - NFAL work shop (10m x 10m and 4m in height);
  - Switchroom (10m x 4m and 4m in height);
  - Utilities building 18m x 10m and 8m in height);
  - Three cooling towers (5.271m in height); and
  - New fencing arrangements and streetscape landscaping.
- A new DN150 CS pipeline biodiesel transfer from Site A to Site B for storage at Site B (Note: no works required at Site B other than pipe connection into existing Site B infrastructure).

Stage two of the proposal involves:

- Demolition and removal of existing Site A infrastructure including:
  - Flammable product drumming facility (removed);
  - Warehouse, which includes maintenance workshop, and spares storage (relocated);
  - Combustible products drumming facility (removed);
  - Control room for Vapour Emission Control System (VECS) (relocated); and
  - Class 3 drum storage bund (removed).
- One train biodiesel facility with capacity to produce 143 ML/year of B100 grade biodiesel;
- Reuse of one existing tanks with a storage capacity of 400m^3;
- Five new storage tanks (a maximum 15.5m in diameter and 18m in height) with a total storage capacity of 8,850m^3;
- Six minor storage tanks with a total capacity of 320m^3;
- Storage tank support infrastructure, including:

- Appropriate bunding works; and
- Appropriate piping works.

- Operation support infrastructure, including:
  - Utilities building 15m x 10m and 8m in height;
  - Cooling towers (max three, 5.271m in height); and
  - Workshop and amenities building (20m x 9m and 4m in height).

The plant train would be designed for a continuous 24-hour production of 360 tonnes of biodiesel per day, equating to a total of approximately 120,000 tonnes per year (143 ML/year). Approximately 12,200 tonnes per year of pharmaceutical grade glycerine would also be produced from the process. A similar plant train (stage two) would be installed in the future.

The processing plant would produce B100 (indicating 100% biodiesel) grade of biodiesel. The biodiesel would then be transferred by pipeline to Vopak Site B tank farm area (located at 20 Friendship Road, Port Botany) and stored in a dedicated storage tank (Tk0625). From this tank, the biodiesel would be exported by ship or electronically blended with mineral diesel as per customer requirements (e.g. for B5, B10 or B20) via the loading rack at the Site B road tanker loading gantry.

The cost of the proposal would be in the order of $30 million for the first stage. The construction period would take approximately 44 weeks for stage one and would employ between 30 – 50 staff during different phases of construction.

Environmental impact assessment

The construction and operation of the proposal has been assessed in accordance with Part 3A of the *Environmental Planning and Assessment Act 1979*. It addresses all the relevant Environmental Planning Instruments applicable to the proposal and the Director-General's Requirements issued on 25 July 2006.

Key environmental issues identified and assessed (the key assessment requirements specified by the Director-General's Requirements) include potential impacts from risks and hazards, traffic and transport, air quality, noise, water quality, waste and the visual environment.

These studies found that the proposal is unlikely to significantly affect sensitive receivers such as residents or result in an adverse affect on the environment.

Other issues identified and assessed include context and setting, urban design, terrestrial ecology, topography, geology and soils, socio-economic, the marine environment, heritage and utilities and services. In addition, the principles of ecologically sustainable development and cumulative impacts have been considered.

The Environmental Assessment found that, provided the mitigation and management measures outlined in the statement of commitments are implemented, the construction and operation of the proposal is unlikely to significantly affect the environment.

Project justification

Sydney's population is expected to increase by one million people by 2031. The growth expected in Sydney will result in stress and pressure on infrastructure, the environment, liveability and economic prosperity. Industries such as bulk liquids storage and distribution are also facing significant development pressure from growth.

Recent trends in the energy industry have resulted in market interests towards alternative fuel based products. These trends include rising worldwide demand and prices for refined oil based products such as mineral diesel, local refining capacity constraints, government incentives and identification of the potential environmental benefits of renewable biofuels.

The proponent has recognised that these trends result in an opportunity to manufacture, store and transport biodiesel produced locally as a competitive alternative to importing mineral diesel.

Port Botany and surrounds is identified as having strategic importance due to its role in trade and cargo handling by providing petroleum fuel for functions such as transportation and energy. By investing in a biodiesel facility and locating it in the strategically important bulk liquid trade and cargo handling area of Port Botany, the proposal represents a significant step forward to establishing an alternative fuel supply side capability for the NSW mineral diesel market.

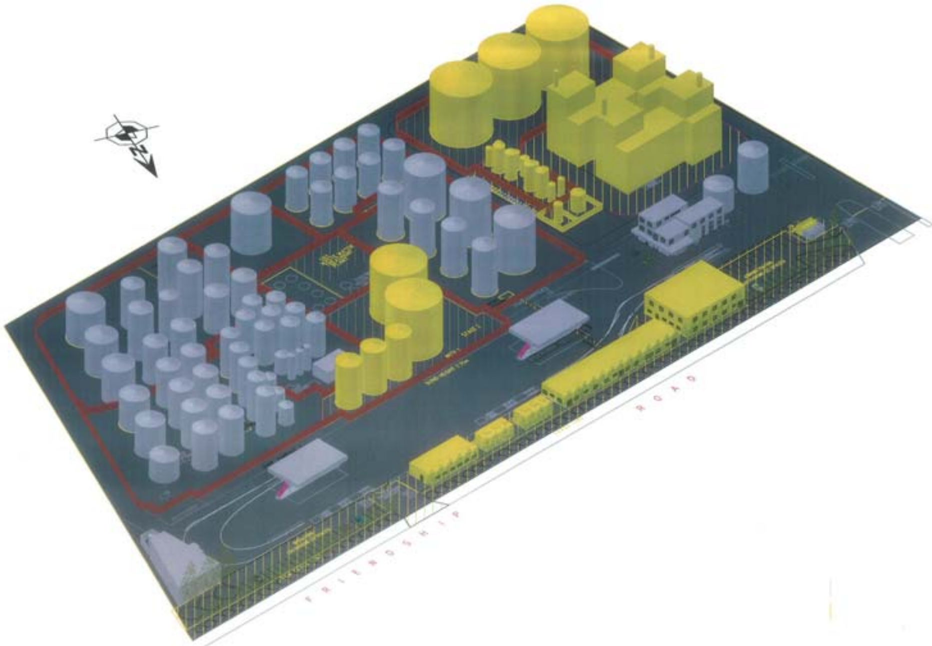
The Environmental Assessment has identified a number of potential economic, social and environmental benefits, which include:

- Increased specialisation and industry clustering of bulk liquids storage and transport;
- Improved energy and bulk liquids supply;
- Local and regional development;
- Improved urban air quality and thus improved public health;
- Reduced emissions of greenhouse gases and vehicle exhaust;
- Assisting the economy by way of a degree of independence from high oil prices and import substitution; and
- Development of a renewable fuel industry and alternative energy supply side capability.

The proposal has been sited within an area of cleared and disturbed land, identified as being suitable for the intended use of the proposal. The proposal is consistent in context and character with its built form and land use zoning.

It is considered that potential environmental impacts can be adequately mitigated provided the mitigation and management measures outlined in the statement of commitments are strictly implemented. These measures include the preparation and implementation of a construction environment management plan and operational environment management plan to ensure that all recommendations are implemented and monitored to ensure compliance with relevant legislation and conditions imposed.

Should planning consent not be granted, the benefits the proposal brings to the economy, members of society and the physical environment, would be lost as an opportunity cost. Therefore, the proposal is considered to be in the public interest and is appropriately situated in Port Botany.



ES 1.1 Photomontage of proposal (new infrastructure in yellow), looking south (courtesy Bilfinger Berger)

Part A Introduction and Context

1. Introduction

1.1 Overview

This Environmental Assessment has been prepared by GHD Pty Ltd (GHD) on behalf of Vopak Terminals Sydney Pty Ltd and Natural Fuels Australia Ltd (together referred to as the 'proponent') to construct and operate a biodiesel facility at 49 Friendship Road, Port Botany (known as Vopak Site A Terminal).

1.2 The proposal

1.2.1 The proposal

The proponent is proposing to construct and operate a biodiesel facility within an existing chemical and petroleum handling facility at Port Botany NSW. The existing facility is owned and operated by Vopak Terminals Sydney Pty Ltd (Vopak). The proposal would utilise existing infrastructure and a cleared area the Vopak site for the purpose of producing, storing and distributing biodiesel. The proposal would take place upon land at the Site A Terminal but would integrate with other existing facilities in the locality.

For the purpose of this report, the construction and operation of the biodiesel facility is referred to as 'the proposal'. The proponent is seeking project approval from the Minister for Planning for the proposal.

1.2.2 Location of the proposal

Vopak Site A is located at 49 Friendship Road Port Botany approximately 13 km south of the Sydney CBD. The four-hectare Vopak Site A Terminal is described as Lots 3,4 and 5 in Deposited Plan 635791. The biodiesel production facility would be sited on a cleared area of the site (Lot 5) and modifications to Lots 3 and 4 are also required. Sydney Ports Corporation is the landowner of Vopak Site A.

1.2.3 Key features of the proposal

The proposal involves the construction and operation of a biodiesel processing plant, storage tanks and associated infrastructure. Vopak would provide storage and distribution infrastructure, utilities and infrastructure management facilities. Natural Fuels Australia Ltd would provide the biodiesel processing plant and associated infrastructure.

The proposal includes construction of a biodiesel processing plant on a cleared portion of the Vopak Site A Terminal (Lot 5). The proposal would also require refurbishment of the Vopak Site A Terminal (Lots 3 and 4) to re-use some of the existing tanks, pumps, loading/unloading facilities, fire protection system and other miscellaneous facilities. Lot 3 and 4 would also incorporate new infrastructure support facilities including a new administration building, two utilities building, two workshops, car parking for 58 spaces and switchroom.

The development is to be achieved in two stages. During the first stage, a one train biodiesel plant and associated infrastructure, storage and utilities would be provided. The second train of the same capacity and the necessary additional facilities would be provided during stage two.

Natural Fuels Australia Ltd plans to engage LURGI to deliver the biodiesel processing plant train for stage one of the proposal. The plant train would be designed for a continuous 24-hour production of 360 tonnes of biodiesel per day, equating to a total of approximately 120,000 tonnes per year (143 ML/year). Approximately 12,200 tonnes per year of pharmaceutical grade glycerine would also be produced from the process. A similar plant train (stage two) would be installed in the future.

The processing plant would produce B100 (indicating 100% biodiesel) grade of biodiesel. The biodiesel would then be transferred by pipeline to Vopak Site B tank farm area and stored in a dedicated storage tank (Tk0625). From this tank, the biodiesel would be exported by ship or electronically blended with mineral diesel as per customer requirements (e.g. for B5, B10 or B20) via the loading rack at the Site B road tanker loading gantry.

The cost of the proposal would be in the order of $30 million for the first stage and employ eight full time staff during operation. The construction period would take approximately 44 weeks for stage one and would employ between 30 – 50 staff during different phases of construction.

1.2.4 Purpose and benefits of the proposal

The primary purpose of the proposal is to establish an alternative fuel supply capability and distribute it to the diesel market for a commercial return on investment. Secondary purposes of the proposal aim to achieve this and include:

- Utilisation of existing bulk liquids infrastructure to maximise competitiveness;
- Penetration of the diesel and bulk liquids market at a cost-effective entry point;
- Investment in knowledge and experience in all facets of the biodiesel industry including technical know-how, supplier / customer administration, fuel transport logistics and marketing.

The proposal would provide benefits such as:

- Environmental benefits from improved urban air quality and reduced emissions of greenhouse gases (refer to section 1.4.3 for more details);
- Significant progress in the development of a renewable fuel industry and market;
- Social and economic benefits, including:
  - Regional development in areas of agricultural produce;
  - Efficiency and market competition within the petroleum industry;
  - Consumer awareness, confidence and value in biofuels;
  - Increases in productivity levels;

- – Surety and increased supply of petroleum fuels within the Sydney market place through resource substitution;
  - – A degree of independence from the effects of price pressures experienced in oil producing nations; and
  - – Economic confidence in fuel price stability.
- Other identified benefits include:
  - – An existing facility to store an environmentally sensitive fuel product;
  - – Reduced environmental risks associated with the storing and transportation of bulk liquids;
  - – Increased specialisation of the Port Botany area in bulk liquids storage, handling, transport and processing; and
  - – Knowledge sharing and innovation in the petroleum industry.

1.3 The proponent

1.3.1 Vopak Terminals Sydney Pty Ltd

Vopak Terminals Sydney Pty Ltd is a company that provides bulk liquid services (storage, transport, bulk handling, packaging and distribution) and access to distribution facilities to independent operators and large corporations. These bulk liquids include fuel-based products used for energy and transport functions throughout NSW.

Vopak operates two bulk liquid storage terminals in Port Botany. The first is known as the Site A Terminal and is located at 49 Friendship Road. The second facility, known as the Site B Terminal, is located at 20 Friendship Road. Both sites store petroleum products.

Vopak owns and operates an international network of 73 terminals with a storage capacity of more than 20 million cubic metres in 29 countries; approximately 155 deep-sea tankers (including strategic alliances), coastal vessels and inland tank barges; over 3,000 tank containers; and a number of strategically placed logistic warehouses.

Vopak employs a worldwide workforce of approximately 3,450 employees; Vopak Australia employs approximately 60 employees. Vopak's shares are listed on the Amsterdam Euronext stock exchange.

Current approved Site A facility

The existing Site A Terminal was established in 1979 to serve an identified need for an independent bulk liquid chemical distribution facility in the greater Sydney Region. The facility caters for the distribution of bulk liquid chemicals to chemical manufacturers, oil companies, and chemical traders who sell into the local markets.

The current facility is also integrated into a wider network of petroleum and liquid fuels transport infrastructure with other Vopak facilities (Vopak Site B), oil industry corporations including Caltex Banksmeadow and Caltex Kurnell, Terminals Pty Ltd, and the Sydney Ports Corporation.

Consequently, Vopak infrastructure is a critical part of an oil industry network that ensures other bulk liquid and cargo distribution facilities in the immediate area operate in an efficient and environmentally safe manner.

1.3.2 Natural Fuels Australia Limited

Natural Fuels Australia Limited was incorporated in February 2005. The company is one of four companies grouped under the parent company Natural Fuel Limited. Natural Fuels Australia Limited was formed to build a sustainable and renewable energy business in emerging yet strong alternative energy growth markets.

As part of a strategy to develop a renewable energy business, Natural Fuels Australia Limited intends to manufacture biodiesel and pharmaceutical glycerine from renewable sources through a number of subsidiaries, either wholly owned or joint venture type vehicles, in select countries.

Over the last two years Natural Fuel Limited has undertaken extensive, independently verified, market research and due diligence into the viability of biodiesel plants in Australia, the United States and Singapore. During this time, Natural Fuel Limited has formed a number of strategic relationships with key biodiesel industry participants.

Natural Fuels Australia Limited has company headquarters in Perth and has offices in Houston, USA and Singapore. Natural Fuels Australia Limited's first biodiesel plant in Darwin will begin operation in late 2006.

1.3.3 Darwin Biodiesel Plant

Natural Fuel Australia Ltd is currently commissioning the Darwin Biodiesel Plant, which will be the Company's first biodiesel production facility in Australia. The Darwin Biodiesel Plant is located at the East Arm Port and railhead, strategically adjacent to the new Darwin Industry Fuel Terminal. The plant's location in Darwin will enable ready access to global supply chain logistics and advantageous distribution networking by road, rail and sea.

Figure 1.1 Darwin biodiesel plant under construction (July 2006) (Source NFAL)

1.4 Proposal background

The proposal has progressed from a concept to a practical project that can be implemented due to:

- Changes and advancements in knowledge and technology;
- Favourable market advantages;
- Prospect of commercial returns;
- Federal government support (refer to Section 1.4.3 for more details);
- Changes in environmental regulations, for example reduction in the sulphur content of fuel; and
- Financial investments in ecologically sustainable projects, for example financial investor markets that seek access to a diversified portfolio of high-quality environmentally friendly assets.

1.4.1 What is biodiesel?

Biodiesel is a form of biofuel – a fuel that is derived from a renewable source of combusted material that can be beneficially used for energy purposes. Biofuels stem from agricultural products and the carbon dioxide produced from their combustion can be recycled as renewed biofuel.

Biodiesel is a liquid made from animal fats and vegetable oils. It has properties similar to mineral diesel. The production of biodiesel involves a process of transesterification, which includes mixing of vegetable oils (or animal fats) with alcohol (e.g. methanol) in the presence of a suitable alkaline catalyst (such as sodium methylate).

After the chemical reaction takes place within the mixing trains, the product is separated within a settler tank and allowed to separate into an ester-rich phase (which is upgraded to biodiesel by washing with water) and a denser glycerine (which is vacuumed dried, distilled and refined to pharmaceutical grade glycerine).

The benefits of biodiesel is that it provides an alternative to fossil fuel based product by either substitution in its entirely (called B100) or blended into mineral diesel products as a percentage, e.g. B10 (where B10 = 10% added biodiesel). The advantage of a B10 or B20 grade of biodiesel is that it provides a ‘drop in’ technology in that no new equipment, or equipment modifications, is necessary.

1.4.2 How is biodiesel made?

Biodiesel is produced by the transesterification of animal fats or vegetable oils (triglycerides) with methanol (alcohol) in the presence of a suitable catalyst (e.g. Sodium Methylate). The reaction from the transesterification process produces biodiesel and a by-product of glycerine (sugar).

The transesterification process involves intensively mixing methanol, vegetable oils (such as palm oil, palmolein) and the catalyst via two reactors. The reactors mix and settle the feed stock to enable separation into methyl ester and glycerine.

The first reactor provides initial mixing and then separation by gravity between the denser glycerine and methanol and the more buoyant methyl ester. The denser glycerine and methanol are redirected to a methanol recovery unit for distillation. From here the methanol is reused at the start of the process. The glycerine within the methanol recovery unit is settled and directed to the glycerine water evaporation column.

The buoyant methyl ester from Reactor 1 is directed to a second reactor where the catalyst is added once more. This enables the transesterification of the product towards a more chemically dominated methyl ester form. Once again a separation by gravity between the more buoyant methyl ester and dense methanol / glycerine takes place.

The methyl ester from Reactor 2 is directed to a wash water column where it is washed of any residual methanol and glycerine. Once washed, the methyl ester is purified via dry vacuuming to B100 grade biodiesel. The denser methanol / glycerine from Reactor 2 contains excess methanol and catalyst, which is redirected to the front end of Reactor 1.

The glycerine and methanol residuals from the wash water column are redirected to the methanol recovery unit for distillation with glycerine and methanol from Reactor 1. Hence all methanol is consumed within the process.

Once water from the glycerine water evaporation column is removed, the left over crude glycerine product is vacuum dried into pharmaceutical glycerine. The left over wastewater byproduct is either redirected into the wash water column or discharged from the process as a waste stream. Refer to Figure 1.2 for a flow diagram of the transesterification process.

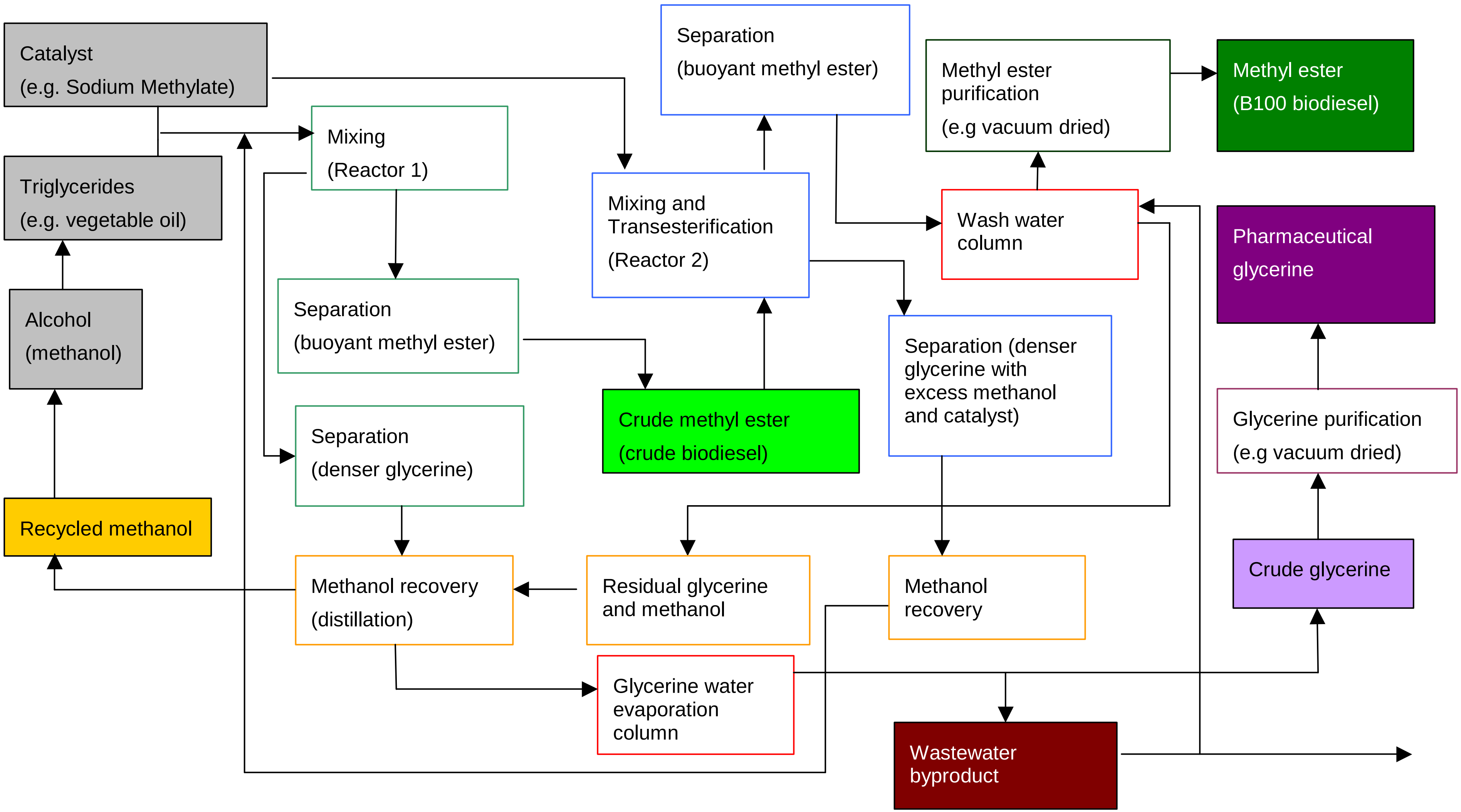


Figure 1.2 Biodiesel process flow

1.4.3 Environmental benefits of biodiesel

Biodiesel reduces global warming gas emissions such as carbon dioxide (CO_2) when compared to fossil fuel energy sources such as mineral diesel. Biodiesel originally stems from plants, which take CO_2 from the atmosphere as part of its growth cycle. After the oil is extracted from the plants and converted into biodiesel, the burned biodiesel will produce CO_2 and other emissions, which return to the atmosphere.

However unlike mineral diesel (which results in 100% of its CO_2 production remaining in the atmosphere), this cycle does not add to the net CO_2 concentration in the atmosphere because the next plant crop growth phase will reuse the CO_2 from the combusted biodiesel (US Department of Energy: pp 4: 2006).

Because fossil fuels are used to produce biodiesel, the recycling of CO_2 with biodiesel is not 100%, but substituting biodiesel for mineral diesel reduces life-cycle CO_2 emissions by 78%. B20 Biodiesel (i.e. 20 % biodiesel and 80% mineral diesel) reduces CO_2 by 15.66%. This includes fossil energy used to produce the biodiesel (process train and infrastructure), transport requirements, fossil fuels used to produce fertilisers and pesticides for the feedstock, fossil fuels used to produce steam and electricity, and methanol used in the manufacturing process (US Department of Energy: pp 4: 2006).

B100 biodiesel (i.e. 100% biodiesel) contains approximately 10% oxygen by weight. The presence of oxygen in the fuel allows it to be burnt more completely and therefore fewer unburned fuel emissions result. This means that vehicle exhaust pollutants, such as particulate matter, hydrocarbons and carbon monoxide, decrease when biodiesel is used in most modern four-stroke engines (US Department of Energy: pp 5: 2006).

Some vehicle emissions are toxic to human health. Using B100 biodiesel can eliminate up to 90% of these toxic emissions and by 20% - 40% if using B20. The positive effects of biodiesel on air toxics are heavily supported by numerous studies (US Department of Energy: pp 5: 2006).

Biodiesel can also compliment fuels that have low sulfur content. Emissions of sulfur oxides and sulfates are a major component of acid rain and there is a government regulatory shift to reducing the sulfur content of mineral diesel. A problem experienced in the manufacturing of low sulfur fuels is that its lubricant properties decline significantly. Biodiesel, in contrast, has high level of lubricity and a blend of 1-2% in low sulfur fuel brings lubricity back to a specified value (Pramanik and Tripathi: pp 53: 2005).

Biodiesel degrades about four times faster than mineral diesel and within approximately 28 days, pure biodiesel degrades 85% to 88% in water (internet reference: http://www.biodiesel.org/: July 2006). Hence the application of biodiesel is well suited for machinery that is used in marine environments.

Another interesting environmental aspect of biodiesel is its flash point. The flash point is the lowest temperature at which vapours from a fuel will ignite on application of a small flame. The flash point for mineral diesel is 62° Celsius and for biodiesel is 127° Celsius (for B100). This makes biodiesel a safer product to handle, store and use than fossil fuel based products. The flash point of mineral diesel increases with the percentage of biodiesel used.

1.4.4 Starting a new renewable fuel industry

There are currently commercial risks associated with establishing and operating a mainstream biofuel industry in Australia. A report to the Australian Federal Government by the biofuels taskforce in August 2005 identified start-up barriers likely to be experienced by prospective investors in biofuels. These barriers include:

- Oil companies in a highly competitive environment have no commercial reason to surrender market share to others – whether to oil or biofuels suppliers;
- Consumer confidence remains poor following the ethanol events of 2002-03. Subsequently, automobile associations and vehicle manufacturers generally have been cautious about giving unequivocal messages of confidence;
- The first mover into bulk mainstream fuel blend retailing faces considerably higher commercial risks than later entrants because:
  - It would incur infrastructure and marketing start up costs;
  - It may need to discount prices;
  - It may not attract new customers; and
  - It may not be able to secure reliable and sufficient feedstock at competitive market prices.
- Prospective biodiesel companies cannot collude to avoid the risks of first market movers.

For these reasons until July 2011, domestic producers will be protected and encouraged to establish a biofuels industry. However, Australian producers have much higher costs of production and subsequently, the international oil majors may wait until 2011 when local protection is eased and access to cheaper markets offshore becomes available.

It is therefore imperative that smaller local producers be given opportunities and support to establish a market before the Federal government eases protection status. To do this the Federal government has a biofuel production target of 350 ML by 2011, start-up capital grants and fuel excise benefits. However, the following actions has also been recommended by the biofuels taskforce to support local producers and include:

- The labelling standard for biofuels be modified – currently ethanol labels appear like a warning label even though factual evidence suggest no effects on automobile engines;
- Information on vehicle and fuel capability be provided to consumers – for example labels on fuel filler caps;
- Consistency with world's best practice – for example a common biodiesel blend in the United States is B20; and
- Consumer confidence, and health outcomes, could be improved by increasing the level of compliance inspections for fuel quality standards.

1.5 Guide to approval requirements and environmental assessment

The proposal is subject to Part 3A approval under the Environmental Planning and Assessment Act 1979 (EP&A Act). The Environmental Assessment and approval requirements specified by Part 3A of the EP&A Act apply to the proposal as a whole.

The Minister for Planning is the approval authority for the proposal, and an Environmental Assessment (this document) is required to support the application for project approval in accordance with the requirements of the EP&A Act.

Further information on the assessment requirements for the proposal is provided in Chapter 3.

1.5.1 Purpose and scope of environmental assessment

The Environmental Assessment has been prepared in accordance with the EP&A Act. The Environmental Assessment provides:

- Information on the proposal, including its strategic context and justification and the alternatives considered;
- An assessment of the potential environmental impacts of the proposal, with a focus on the key assessment requirements (see below); and
- Measures proposed to minimise and manage potential environmental impacts.

The Environmental Assessment focuses on the key assessment requirements specified by the Director-General's Requirements. These are summarised in Table 1.1 together with a reference to where they are addressed in this document (a full copy of the Director-General's Requirements are included in Appendix A).

Table 1.1 Director-General Requirements and where they are assessed in the EA

Director-General Requirements	Where addressed in EA
General Requirements	
Executive Summary	Executive Summary
Detailed description of the project including the: ◗ Need for the project; ◗ Alternatives considered; and ◗ Various components and stages of the project	Section 1, 5 and 6
Consideration of any relevant statutory provisions	Section 3
An overview of the environmental impacts of the project (including an environmental risk analysis) and identification of the key issues for further assessment, taking into consideration the issues raised during consultation	Section 7 and 8
A detailed assessment of the key issues specified below and any other significant issues identified in the environmental risk	Section 2, 7, 8 and 10

Director-General Requirements	Where addressed in EA
analysis, which includes: ◗ A description of the existing environment; ◗ An assessment of the potential impacts of the project, including any cumulative impacts; ◗ A description of the measures that would be implemented to avoid, minimise, mitigate, offset, manage, and/or monitor the impacts of the project	
A draft Statement of Commitments, outlining environmental management, mitigation and monitoring measures	Section 9
A conclusion justifying why the site is suitable for the proposed development, and why the project should be approved	Section 10
A signed statement from the author of the Environmental Assessment certifying that the information contained in the report is neither false nor misleading	Front of document
Key Issues	
Hazards and Risks – including consideration of the proposal against the relevant provisions of *State Environmental Planning Policy No.33 – Hazardous and Offensive Development*	Section 7.1
Traffic Impacts – including details of traffic volumes generated by the project and an assessment of the capacity and safety of the proposed transport route	Section 7.2
Air Quality – including vapour emissions	Section 7.3
Noise Impacts – including construction and operation noise impacts	Section 7.4
Water Quality – including the potential for spillage of contaminants on the site, along pipeline routes, and at shipping terminals to ensure there are no off-site impacts.	Section 7.5, also refer to Sections 7.1 and 8.7 for design and control measures to minimise risks of piping spills, spills affecting the marine environment etc
Waste Management	Section 7.6
Visual Amenity – including the visual impact of the proposal on publicly accessible locations	Section 7.7
References	
The Environmental Assessment must take into account relevant State government technical and policy guidelines.	Noted
Consultation	
During the preparation of the Environmental Assessment, you must consult with the relevant local, State or Commonwealth government authorities, service providers, community groups, affected landowners and any affected Commonwealth	Section 4

Director-General Requirements	Where addressed in EA
government authorities. In particular you must consult with: ◗ NSW Department of Environment and Conservation; ◗ NSW Roads and Traffic Authority; ◗ NSW Maritime Authority; ◗ NSW Fire Brigades; ◗ Randwick City Council; ◗ Sydney Ports Corporation; and ◗ Sydney Airport Corporation. The consultation process and the issues raised must be described in the Environmental Assessment.	
Deemed refusal period	
60 days	Noted

1.5.2 Contents of environmental assessment

The Environmental Assessment is structured as follows

- **Part A Introduction and context** – provides a background to biodiesel and the Environmental Assessment (Chapter 1); a description of the location and existing environmental features of the site and surrounds (Chapter 2); information on the assessment requirements under relevant legislation and environmental planning instruments (Chapter 3); and a summary of the consultation that has occurred (Chapter 4).
- **Part B Information on the proposal** – contains the strategic assessment of the proposal and alternatives considered (Chapter 5) and the features of the proposal (Chapter 6).
- **Part C Environmental assessment** – describes the results of the assessment of key environmental issues as identified by the Director-General's Requirements (Chapter 7) and a general environmental risk analysis (Chapter 8).
- **Part D Conclusion** – provides a draft statement of commitments made by the proponent in relation to the mitigation, management and monitoring of potential environmental impacts (Chapter 9) and provides the project justification, the principles of ecologically sustainable development and conclusions to the Environmental Assessment (Chapter 10).

2. Location and setting

2.1 Regional setting

Vopak Site A is located at Port Botany, approximately 13 km south of the Sydney CBD. Port Botany is heavily industrialised due to Port operations including the Brotherson Dock, a container dock facility where Patrick Stevedores and Port Botany Container Park, amongst others, are located.

The suburbs to the northeast and east of Port Botany include Banksmeadow, Port Botany, Matraville, Phillip Bay, Little Bay and Chifley. The suburb of La Perouse is located to the southeast (refer to Figure 2.1).

The nearest residential areas to the proposal are approximately one km to the southeast at Phillip Bay and La Perouse. The proposal is therefore substantially within an industrial environment and is well removed from residential areas.

Figure 2.1 Regional setting

2.2 Local setting

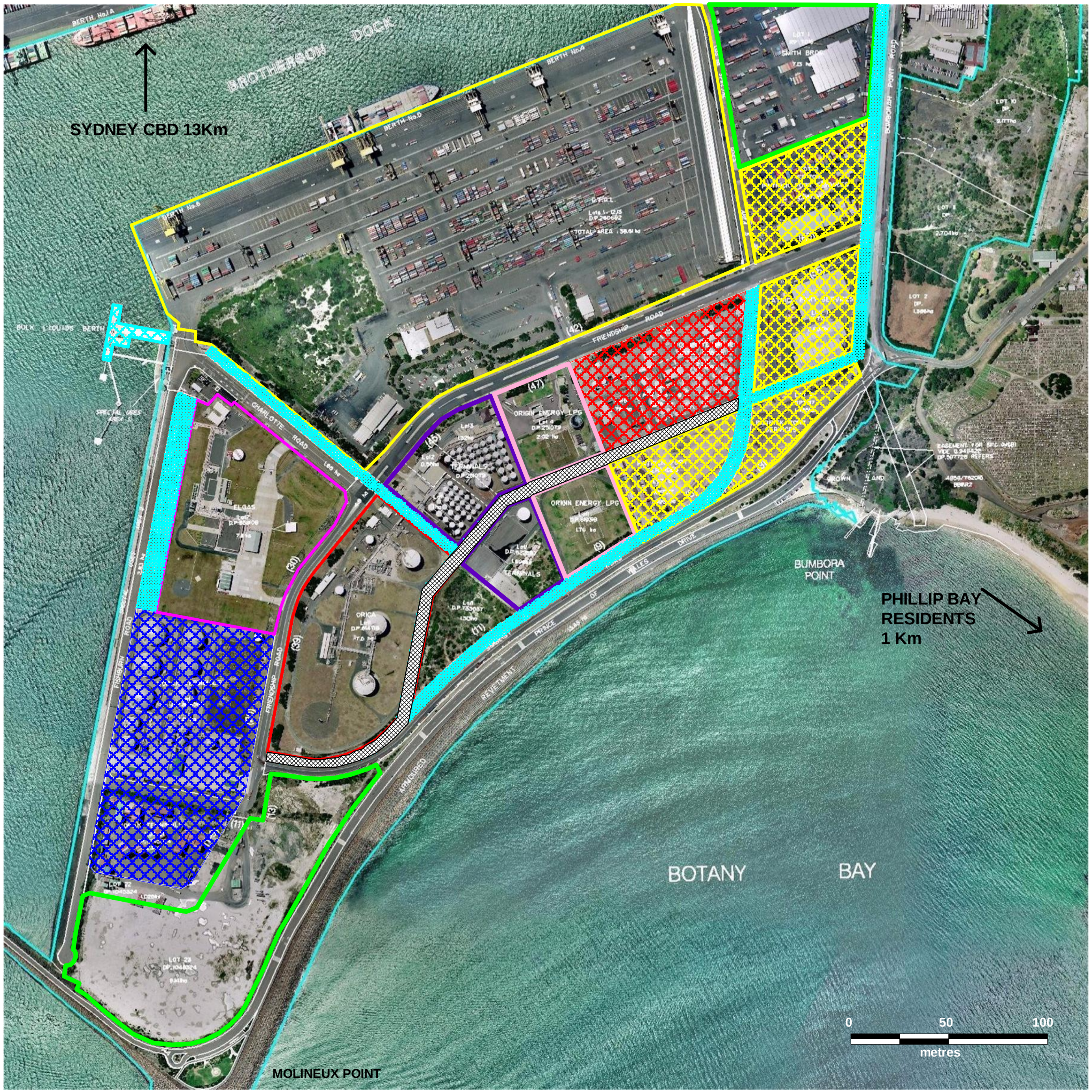
The Vopak Site A Terminal is located on relatively flat, stable land with few undisturbed natural features. There are two distinct types of cargo handling and storage trade that have established a presence in Port Botany. These two trades include import and export of container and bulk products (liquids and gas).

Industries located adjacent to Vopak Site A include:

- Origin Energy LPG Ltd (bulk liquids / gas);
- Patrick Port Services (container trade); and
- P&O Ports (container trade).

The built form of the adjacent suburbs of Banksmeadow and Port Botany is characterised by a mix of port related and industrial land uses (refer to Figure 2.2). Matraville and Phillip Bay are more diverse in built form and include industrial, commercial, residential and open spaces dedicated to recreation (refer to Figure 2.1).

FIGURE 2.2



- Vopak Site A
- Vopak Site B
- P & O Trans Aust. Holdings Ltd
- P & O Ports
- Bulk Liquid Berth
- Patrick Port Services
- Elgas
- ORIGIN ENERGY
- Terminals Pty Ltd
- Orica Australia Pty Ltd
- Special Use Area
- Proposed Pipeline Route

N

CLIENT
VOPAK/NATURAL FUELS AUSTRALIA LTD

PROJECT
SYDNEY BIODIESEL TERMINAL

TITLE
PORT BOTANY LANDUSE

GHD MANAGEMENT ENGINEERING ENVIRONMENT

DRAWN	AS	REVISION	A
CHECKED		SCALE	1:2000
DRAWING REF 21/14828/Z001	DATE 10/09/2006	SIZE	A4

G:\Projects\21\14828\CADD\GIS\Map Documents\Z001

2.3 The site

The Site A Terminal is a four hectare site located at 49 Friendship Road, Port Botany (refer to Figure 2.3) and comprises:

- Lot 3 DP 635791 (2.477 hectares);
- Lot 4 DP 635791 (0.7580 hectares); and
- Lot 5 DP 635791 (0.7792 hectares).

Vopak holds a 20-year lease with an extension option over the site from the Sydney Ports Corporation.

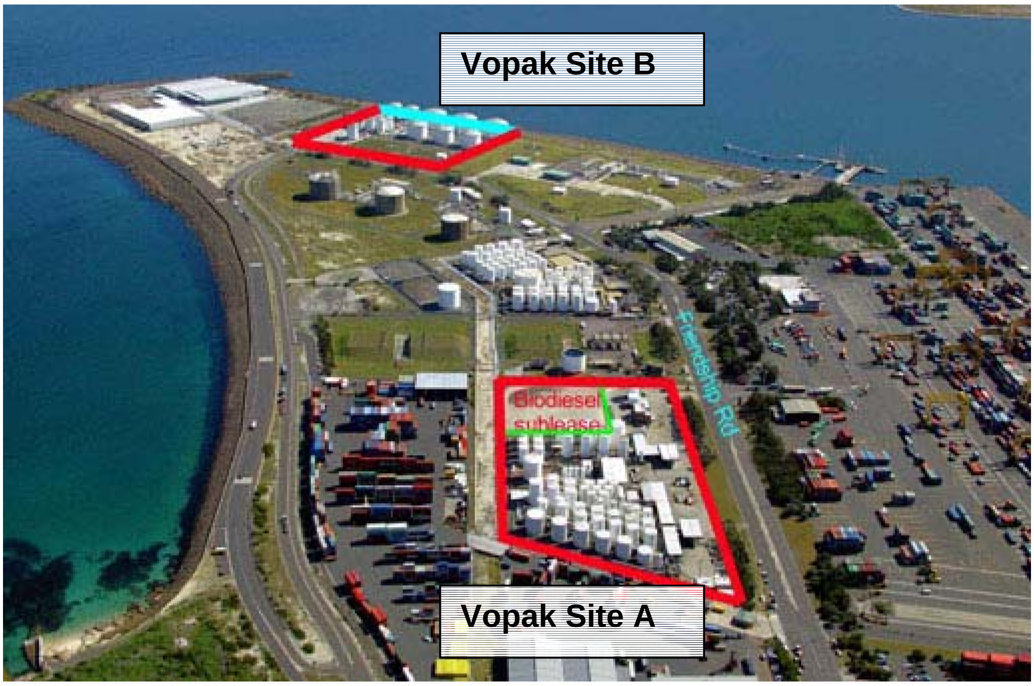


Figure 2.3 The site (source NFAL)

2.3.1 Context and setting

For the purpose of this report, 'the site' refers to the Vopak Site A Terminal (i.e. Lots 3,4 and 5) together with the Sydney Ports Corporation pipeline corridor from Vopak Site A to Vopak Site B Terminal as illustrated in Figure 2.2.

Friendship Road bounds the Site A Terminal to the north; an emergency access road is located to the south; and Prince of Wales Drive is located south of the emergency access road.

2.3.2 Ownership and land use

The site is owned by Sydney Ports Corporation. Vopak is the lessee and user of the site. Lots 4 and 5 of the site have been substantially modified since 1979 for the purpose of bulk liquids storage and handling. This includes approval for product storage capacity of 36 000m^3, which comprises 60 tanks of differing capacities. Lot 5 originally housed the Jointly Operated Road Tanker Loading (JORTL) LPG Storage Facility, which was built in 1983 and made redundant and fully removed in 2002. Lot 5 is not currently occupied.

The Sydney Ports Corporation pipeline corridors are designated service corridors and include pipe work for the purpose of bulk liquid transportation.

2.3.3 Geology, topography and soils

The site forms part of an area of reclaimed land, which was formed from hydraulic landfill during the early 1970s.

The proposal study area is situated within the central coastal portion of the Sydney Basin, and comprises a sequence of Permo-Triassic sandstone and shales, overlain in part by Cainozoic sediments. Diatremes, dolerite dykes and dolerite sills varying in age from Jurassic to Tertiary intrude the gently-deformed sedimentary sequence.

A due diligence environmental assessment was undertaken by ERM Pty Ltd (2002) to assess whether use of Lot 5 as a JORTL LPG facility had impacted soil and groundwater conditions for the site. The investigations concluded no observable impacts to soil or groundwater conditions attributable to the use of a JORTL LPG facility.

The ERM investigations described the geology of Lot 5 as concrete and asphalt underlain by fill material, which was encountered to a maximum depth of 5 metres below ground level. The fill consisted of greyey light to brown fine to medium grained sand, which was moist. The sand became saturated at depths greater than approximately 2.8 metres below ground level.

Lots 3 and 4 are covered in concrete and include bunded areas. The current Environmental Protection License does not mandate due diligence assessment of potential contamination within these areas (known as ‘hot spots’). However, Vopak has acknowledged that there are possibly a small number of potential ‘hot spots’ within Lot 3 and 4 and these ‘hot spots’ are assessed as part of Vopak’s own environmental due diligence responsibilities.

An acid sulphate soils assessment for the Port Botany expansion identified the area as disturbed land. Geolight undertook investigations within the vicinity of the site in two stages in 1991 and 1992 as part of the Sydney LPG Cavern project. The Geolight investigations found that potential acid sulphate soils are unlikely within the top two metres of the surface soil.

2.3.4 Groundwater and hydrology

The site is located within the boundaries of Botany Sands Aquifer. The general pattern of groundwater flow is southwesterly towards Botany Bay with higher levels west of Botany Industrial Park, attributed to a reduction in extraction rates and higher rainfall in that area (URS: 2003: pp17-2).

Groundwater occurs and moves in both the shallow sand sediments and deeper sandstone under the site due to the primary and secondary permeability of underlying rocks. The shallow sand sediments of the Botany Bay deposits (the Botany Sands) are an important local aquifer in numerous areas around Botany Bay.

The reclaimed Port area is relatively flat, with minimal slope to enable surface water to flow into Port Botany. Given the existing nature of the fill material immediately below the surface of the site, a relatively high rate of rainfall infiltration is anticipated in areas without impervious surfaces. However, the existing site (Vopak Site A) consists of large areas of impervious paving and bunded surfaces.

The ERM Pty Ltd investigations in 2002 revealed groundwater depths of 2.6 – 2.7 metres below the surface, however this depth may be greater due to current drought conditions.

2.3.5 Terrestrial ecology

There are a few remaining patches of the natural vegetation in the suburb of Port Botany and these are degraded and of low ecological and conservation significance. The most significant vegetation in the area is the heathlands of the Botany Bay National Park some 2 km southeast. Botany Bay National Park is well known for its ecological and historical significance and includes sensitive communities of dense low growth shrubs, which have limited growth due to the skeletal soils and salt-laden winds.

The vegetation on the site (including SPC's dedicated pipeline corridor) has been cleared. There are no trees on Vopak Site A or the SPC pipeline corridor that require removal or pruning.

The URS study (2003) into the expansion of Port Botany container terminal and a Master Plan for Molineux Point (BBC Consulting: 2002) found no significant floral communities that would be expected to occur within the vicinity of the study area of the container terminal or at Molineux Point. The expansion area of the container terminal is approximately 1.2 km north of Vopak Site A and Molineux Point is approximately 1 km southwest of Vopak Site A.

The URS study identified 86 listed *Threatened Species Conservation Act* (TSC Act) and *Environment Protection Biodiversity Conservation Act* (EPBC Act) faunal species that were previously recorded in the vicinity of the SPC Port Botany container terminal area. Of the 86 species identified, 23 shorebirds and one seabird were identified as having a moderate to high likelihood of occurrence (URS: 2003: pp 20-18).

The 1995 EIS for the Vopak Site B development identified the Molineux Point area as a possible habitat for the Pied and the Sooty Oystercatcher (*Haematopus)* and these two birds are listed as vulnerable under the TSC Act.

The Master Plan for Molineux Point found the habitat is such that faunal species including small lizards and birds may utilise Molineux Point (BBC Consulting Planners: 2002: pp 22).

2.3.6 Marine environment

Port Botany is located on the northern foreshore of Botany Bay. Botany Bay is not a typical estuary in that a sand bar is not present near its entrance (MacIntyre, 1975). Therefore, Botany Bay could be considered as an extension of the open ocean. However outside the main shipping channel the bay is relatively shallow (mean depth approximately 5m) and shoals westward. The width of the entrance of the bay is approximately 1.1 km and is exposed to wind from all directions. Tidal processes are the predominate influence of circulation and flushing of the Bay.

Over the years Botany Bay has been modified substantially due to the construction of a revetment wall, dredging and industrial activities on the northern side of the Bay (Airport runway, Port Botany, Molineux Point and relocation of the Cooks River). Such activities have considerably modified wave action in the Bay.

Two rivers discharge into the Bay – the Cooks and Georges. The Cooks River was relocated further west to accommodate the Sydney Airport runway. During wet weather events, stormwater and groundwater pollution is generated from the surrounding industrial and high-density built environment. The contaminated, sediment laden, fresh stormwater settles in the tranquil regions of the bay including enclosed embayments, depressions around the Cooks River and within dredged channels. However the absence of fine-grained sediments within other areas of Botany Bay indicates that the Bay is well flushed and sediments do not accumulate but are transported out of the Bay with the ebb tide.

The bathometry of the bay has altered due to dredging for shipping channels and ship turning points.

There are three main habitat types in the Botany Bay marine environment, these include:

- Seagrass Beds (including *Posidonia australis*, *Zostera capricorni*, *Halophia oralis*, and *Caulerpa taxifolia*);
- Mangroves communities; and
- Unvegetated soft sediments, which consist of sand and shell debris and silt within dredged channels.

There are a wide range of benthic invertebrates and fishes within Botany Bay (e.g. flathead and flounder). In addition there are potentially threatened species that may use the marine environment of the bay including birds, fishes, marine mammals and marine reptiles.

2.3.7 Socio-economic

The Port Botany area provides a dedicated area for bulk liquids storage and handling and is of important strategic significance to the Sydney and NSW economy. The industrial and commercial enterprises in the Port Botany area provide significant employment opportunities for the local and regional population, rate levy generation for local authorities and subsequent contributions to local social infrastructure.

In 2003, the SPC commissioned a report on the economic value of Sydney's Ports. The value of bulk liquids and gas generated from SPC Ports (e.g. operations in Port Botany and Sydney Harbour) for the financial year 2001/02, are summarised in Table 2.1.

Table 2.1 provides an econometric indication of the value of bulk liquids and gas trade within SPC ports. Although this sector has a relatively low labour loading and unloading operation, the high processing and land transport activity means that the sector provides a total economic impact of $567 million pa, generates over 3,800 full-time equivalent jobs, $458 million pa in household income and a value added estimate of $305 million.

Table 2.1 Economic value of bulk liquids and gas at SPC Ports

Indicator	Direct effect	Flow-on effect	Total effect
Output[1] ($A million)	265	302	567
Value Added[2] ($A million)	139	166	305
Employment (full time equivalent jobs)	1,602	2,267	3,869
Household Income[3] ($A million)	-	-	458.3

Table Source: SPC: 2003: pp7

[1] Output is defined as gross business revenue from port related firms

[2] Value added is defined as the net contribution of port related firms to Gross State Product

[3] Resulting from combined direct and flow-on employment

3. Statutory framework

3.1 Permissibility of the proposal

The site (including SPC pipeline corridors) is zoned 4B (Port Botany Zone) under Clause 16 of the Randwick Local Environmental Plan 1998.

The objectives of Randwick Local Environmental Plan 1998 zone No 4B are:

> *(a) to facilitate the development and operation of Port Botany as a major cargo handling and distribution centre, and*
>
> *(b) to allow a range of activities which complement the continued and effective operation of the port, and*
>
> *(c) to encourage development of, and accommodate innovation in, the sources of economic growth, and*
>
> *(d) to enhance and improve the physical environment by minimising disturbances caused by air pollutants, water pollutants, noise pollutants and other pollutants, and*
>
> *(e) to enable development for the purposes of retailing or commercial offices only where it is associated with, and ancillary to, port related activities or where it serves the daily convenience needs of the local workforce.*

In this zone, development for the purposes of bulk stores, port facilities, potentially hazardous industries and potentially offensive industries is permissible with development consent.

The proposal would expand the operational capacity of the existing Vopak Site A Terminal, thus allowing for ongoing and increase productivity of port operations. The proposal would not adversely affect the efficiency of port operations or the Port Botany Environment (refer to Section 7 and 8). Therefore the proposal is consistent with the aims of Randwick Local Environmental Plan 1998 and is permissible with consent.

The purpose of Clause 37 of Randwick Local Environmental Plan 1998 is to reinforce the importance of the role and function of the land within Zone No 4B to the continued operation of Port Botany as a major shipping and cargo handling facility. The clause states:

> *The Council may grant consent to the development of land within Zone No 4B only if it is satisfied that the proposed development is, by virtue of the nature of the activity or activities involved, suited to being in close proximity to Port Botany and will not adversely affect the continued operation of the port.*

The proposal contributes to the specialised functions of cargo handling and trade associated with port operations. The proposal aims to enhance Port Botany infrastructure and productivity levels and would not adversely affect the operations of the Port. The proposal is therefore consistent with Clause 37 of Randwick Local Environment Plan 1998.

3.2 Approval authority

The EP&A Act forms the statutory framework for planning and environmental assessment in New South Wales. Implementation of the EP&A Act is the responsibility of the Minister for Planning, The NSW Department of Planning, relevant State statutory authorities and local Councils.

The EP&A Act contains three parts relevant to planning approvals and environmental assessment:

- Part 3A provides for control of 'major infrastructure or other projects' that require approval from the Minister for Planning;
- Part 4 generally provides for the control of 'local development' that requires development consent from the local Council; and
- Part 5 provides for the control of 'activities' that do not require development consent and are undertaken or approved by a determining authority.

The need or otherwise for development consent is set out in environmental planning instruments (EPIs) – State Environmental Planning Policies (SEPP), Regional Environmental Plans (REP) or Local Environmental Plans (LEP).

3.2.1 Part 3A of the Environmental and Planning and Assessment Act 1979

Part 3A of the EP&A Act consolidates the assessment and approval regime for all major infrastructure or other projects that need the approval of the Minister for Planning. Clause 75 B of the EP&A Act states:

> *This Part applies to the carrying out of development that is declared under this section to be a project to which this Part applies:*
>
> > *(a) by a State environmental planning policy, or*
> >
> > *(b) by order of the Minister published in the Gazette.*
>
> *The carrying out of particular development, or development for a program or plan of works or activities, may be so declared.*

Therefore Part 3A applies to developments declared under a SEPP (e.g. SEPP Major Projects) and other projects, sites, plans or programs declared by the Minister as having significance to the region or State of NSW.

Clause 75 D of the EP&A Act states the Minister is the approval authority for Part 3A and as such:

> *(1) A person is not to carry out development that is a project to which this Part applies unless the Minister has approved of the carrying out of the project under this Part.*
>
> *(2) The person is to comply with any conditions to which such an approval is subject.*

The proponent is therefore seeking project approval from the Minister of Planning for the proposal under Part 3A of the EP&A Act.

3.2.2 State Environmental Planning Policy (Major Projects) 2005

The *State Environmental Planning Policy (Major Projects)* (the Major Projects SEPP) clarifies what constitutes a major project for the purpose of planning approval under Part 3A of the EP&A Act.

Clause 6 of the SEPP defines Part 3A projects:

> *(1) Development that, in the opinion of the Minister, is development of a kind:*
>
> > *(a) that is described in Schedule 1 or 2, or*
> >
> > *(b) that is described in Schedule 3 as a project to which Part 3A of the Act applies, or*
> >
> > *(c) to the extent that it is not otherwise described in Schedules 1–3, that is described in Schedule 5,*
>
> *is declared to be a project to which Part 3A of the Act applies.*

The following Part 3A project definition is included in Schedule 1, Clause 10 (2) of Major Projects SEPP:

> *Development with a capital investment value of more than $20 million for the purpose of:*
>
> > *(a) bulk liquid storage facilities, or*
> >
> > *(b) gas storage facilities, or*
> >
> > *(c) chemical storage facilities.*

The proposal would have a capital investment of $30 million and, as such, is a project to which Part 3A applies.

The following Part 3A project definition is also included in Schedule 2 (Part 3A projects - specified sites):

> *Port and Related Employment Lands*
>
> *(1) Botany*
>
> *Development within the area identified on Map 5 to this Schedule for the purpose of:*
>
> > *(a) a shipping berth, shipping terminal or associated building, structure or work, or*
> >
> > *(b) a facility that manufactures, stores or uses significant quantities of dangerous goods and meets the criteria in State Environmental Planning Policy No 33—Hazardous and Offensive Development of being potentially hazardous, or*

The proposal is within Map 5 and is consistent with definitions (b) of Schedule 2 specified sites – port and employment related land. As such, the proposal is a project to which Part 3A applies.

3.2.3 Summary

- The proposal is within land zoned for bulk liquid processing and storage and is permissible with consent;
- The proposal is a project to which Part 3A of the EP&A Act applies;
- The Environmental Assessment and approval requirements specified by Part 3A of the EP&A Act applies to the site and the proposal as a whole;
- The Minister for Planning is the approval authority for the proposal, and an application for approval must be made to the Department of Planning; and
- The proponent intends to seek project approval from the Minister for Planning for the proposal.

3.3 The application process

3.3.1 Director-General's Requirements

Under Clause 75 F of the EP&A Act, the Director-General is required to prepare and issue the proponent with the requirements for undertaking the Environmental Assessment. The Director-General's Requirements identify key issues and other matters of the proposal to be addressed by the proponent and the level of assessment required.

The Director-General's Requirements were issued on 25 July 2006. A copy of the requirements is included in Appendix A. The key issues and other matters identified by the Director-General for consideration are outlined in Table 1.1 together with a reference to the section of this report that addresses the matter.

3.3.2 Exhibition

If the Environmental Assessment is considered to meet the Director-General's requirements, the Department will place the Environmental Assessment on public exhibition for at least 30 days. During the exhibition period, submissions will be invited from relevant agencies and members of the public.

The Department may provide the proponent with a copy of any submissions or a summary of the issues raised in the submissions. The proponent may be asked to respond to the issues and may modify the project and the draft statement of commitments to issues raised in the submission.

If the proposal or statement of commitments are modified in response to issues raised, a Preferred Project Report would be prepared to describe the scope of the revised project. The Director-General would make this report public.

3.3.3 Assessment and determination

Following the exhibition period, the Department will, on behalf of the Minister, review the Environmental Assessment, any Preferred Project Report and submissions received. Once the Department has completed its assessment, a draft Assessment

Report will be prepared for the Director-General by the Department of Planning, which may include recommended conditions of approval.

The recommended conditions will refer to the statement of commitments and may modify them and/or add additional provisions

The Assessment Report will then be submitted to the Minister for determination. The Minister may refuse the project, or approve it with any conditions considered appropriate.

The Minister's determination and the Director-General's Assessment Report will be published on the Department of Planning's web site immediately following determination.

3.4 Other relevant Environmental Planning Instruments

3.4.1 Applications of other environmental planning provisions

Under Section 75 R (3) of the EP&A Act, Environmental Planning Instruments (other than State Environmental Planning Policies) do not apply to or in respect of an approved Part 3A project. However, for the purpose of this Environmental Assessment, consideration was given to relevant environmental planning instruments and guidelines.

3.4.2 State Environmental Planning Policies

SEPP 11 – Traffic Generating Developments

The general aims of *State Environmental Planning Policy No. 11 – Traffic Generating Developments* are to ensure that the Traffic Authority:

> *(a) is made aware of, and*
>
> *(b) is given an opportunity to make representations in respect of, development referred to in Schedule 1 or 2.*

Schedule 1(j) includes:

> *Transport terminals, bulk stores, container depots or liquid fuel depots or the enlargement or extension of any existing transport terminal, bulk store, container depot or liquid fuel depot by increasing by more than 8 000 square metres the area of land or the gross floor area of buildings used for that purpose.*

The project has been referred to the Roads and Traffic Authority for consultation. Details of consultation are provided in Chapter 4.

SEPP 33 – Hazardous and Offensive Development

Under SEPP 33, a hazardous industry is a *'development for the purposes of an industry which, when the development is in operation and when all measures proposed to reduce or minimise its impact on the locality have been employed…would pose a significant risk in relation to the locality: (a) to human health, life or property; or (b) to the biophysical environment.'*

An offensive industry is defined as a '*development for the purposes of an industry which, when the development is in operation and when all measures proposed to reduce or minimise its impact on the locality have been employed… would emit a polluting discharge…. in a manner which would have a significant adverse impact in the locality or on the existing or likely future development on other land in the locality*.'

The proposal is classified as a hazardous industry under the SEPP 33 guidelines. A Preliminary Hazard Analysis was undertaken by Pinnacle Risk Management to assess the risks of the proposal to the management of hazardous materials. The Preliminary Hazard Analysis report from Pinnacle Risk Management is included in Appendix D.

3.4.3 Regional Environmental Plans

There are no Regional Environmental Plans that are considered to be relevant to the proposal.

3.4.4 Local Environment Plans

Randwick Local Environment Plan 1998 is the relevant LEP applicable for the proposal. Table 3.1 illustrates the clauses within Randwick LEP.

Table 3.1 Randwick Local Environment Plan provisions

Clause	Comment	Proposal compliance
Clause 40A MasterPlans States: (1) Despite any other provisions of this plan, consent may be granted to a development application made in respect of a site area consisting of more than 4,000 square metres of land:	The Randwick LEP is superseded by Section 75 R (3) of the EP&A Act (refer to Section 3.4.1). The proposal is located on land approximately 4 hectares in area but does not involve the redevelopment to another land use of the entire 4 hectares. The proposal is located primarily on Lot 5, which is approximately 0.8 hectares in area with some new storage tanks within areas of existing approved development for the purpose of storage tanks. The proposal does not break significantly from the existing approved land use of the Site A Terminal – namely for bulk liquids storage and handling. Therefore a masterplan is not considered necessary. It is also noted that the proposal has been planned to integrate with existing facilities (for example Vopak Site B) to avoid transport of bulk liquids via road tankers and to maximise efficiency. In addition the proposal is considered to be holistic in its approach by addressing a range of issues incorporating the environmental, economic and social spheres (e.g. refer to Sections 7 and 8).	N/A
Clause 42B Contaminated Lands	The proposal would not require remediation of contaminated lands	N/A

3.5 Policy framework

3.5.1 Development control plans

There are no Development Control Plans that are considered to be relevant to the proposal.

3.5.2 City of Cities – A plan for Sydney's future – Metropolitan Strategy

The Sydney Metropolitan Strategy is a broad framework to secure Sydney's place in the global economy by promoting and managing growth. Economic, social and environmental sustainability are the guiding principles of the plan, which aims to enhance liveability, strengthening economic competitiveness, ensure fairness, protect the environment and improve governance. Seven core strategies (subjects) have been identified to achieve these aims, including:

- Economy and employment;
- Centres and corridors;
- Housing;
- Transport;
- Environment and resources;
- Parks and public places; and
- Implementation and governance.

The Port Botany area and surrounds have been identified as a key 'Specialised Centre' within the centres and corridor strategy of the metropolitan plan because it performs a vital economic and employment role (i.e. trade and cargo handling).

The centres and corridor vision for identified strategic centres, including Port Botany and surrounds, is to support a cluster of business and knowledge based activities to such areas. Actions have been identified to guide strategic planning in this context and include:

- Establish employment capacity targets;
- Establish a strong centres initiative;
- Strengthen centres management;
- Use government assets and investments to support centres; and
- Ensure sufficient commercial and office sites in strategic centres.

3.5.3 Sydney Ports Corporation Green Port Guidelines

Sydney Ports Corporation commissioned Arup Sustainability to develop a green port guideline checklist.

The aim of the guideline is to improve the environmental sustainability of new developments and to encourage continuous environmental improvement of existing activities on the land SPC manages. Developers are asked to consider the guidelines during planning and application stages of a project or activity and demonstrate compliance by completing the associated Green Port Guidelines Checklist.

The proposal incorporates these principles where appropriate and the checklist is located in Appendix H.

3.6 Other legislative requirements

3.6.1 NSW legislation

A variation of the existing licence for the Site A Terminal, License No. 6581, under the *Protection of the Environment Operations Act 1997* will be required. The proponent will apply for this variation prior to the commencement of operations.

3.6.2 Commonwealth legislation

The primary objective of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is to ‘provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance.’

The proposal does not involve any matters of national environmental significance that trigger a referral under the EPBC Act.

4. Statutory and community consultation

4.1 Statutory consultation

Statutory consultation involved correspondence / liaison with the following Government Departments and Authorities as specified in the Director-General's Requirements:

- NSW Department of Environment and Conservation;
- NSW Roads and Traffic Authority;
- NSW Maritime;
- NSW Fire Brigades;
- Randwick City Council;
- Sydney Ports Corporation;
- Sydney Airport Corporation; and
- Affected residents and relevant community groups.

Responses received from these organisations are summarised below in terms of issues they believed should be addressed by the Environmental Assessment. Full responses are provided in Appendix B.

In addition to the Government Departments and Authorities listed in the Director General's Requirements, the proponent and GHD undertook consultation with Sydney Water Corporation in respect to trade wastewater that would be generated from the proposal.

4.1.1 Department of Environment and Conservation

An email from DEC, dated 20th September 2006, indicated that DEC considered the input streams to the proposed plant did not appear to be waste. DEC also advised that the by-product/waste outputs from the facility and the proposed destinations and uses of those by-products/wastes also do not seem to give rise to any waste licensing requirement.

However, DEC highlighted the need to determine licensing arrangements associated with the biodiesel proposal and the correct license for the Vopak Facility.

4.1.2 NSW Roads and Traffic Authority

A letter dated 28 August 2006, from the RTA indicated that the following issues are to be included in the traffic impact assessment of the proposed development:

- The proposed means of vehicular access to/from the site;
- Likely daily and peak traffic movements likely to be generated by the proposed development and the increase in the level and type of traffic associated with the proposal;

- Impact of the proposed development on surrounding arterial road network and intersections and the need and associated funding for upgrading or road improvement works;
- Consideration of the need for the preparation of a local area traffic management plan;
- An assessment of the likely impact of truck traffic upon nearby residential areas due to the development of the site;
- Details of the anticipated route of trucks on the major arterial and local road network; and
- An assessment of the potential increase in toxicity levels of loads transported on arterial and local roads and consequently, the preparation of an incident management strategy for accidents, if relevant.

4.1.3 NSW Fire Brigades

A letter, dated 5th September 2006, from the NSW Fire Brigade (NSWFB) supplied the following comments:

'No adverse fire safety issues were noted in the submitted preliminary assessment. It is the legislated responsibility of the NSWFB to protect life and property from fire and hazardous material incidents, therefore the support for the proposal is conditional upon all relevant standards and codes being adhered to, in particular, bunded areas, firefighting equipment, installed fire alarms and associated equipment. The NSWFB awaits the opportunity to review any further assessments, in particular, any forth coming Fire Safety studies'.

4.1.4 Randwick City Council

An email, dated 10 August 2006, from Randwick City Council indicated the Environmental Assessment should address the following issues:

- Statutory requirements including Clause 16, 37, 40A and 42B of Randwick Local Environment Plan;
- Hazard Analysis;
- Ecological issues arising from impacts on Botany Bay;
- Potential noise, odour and pollution impacts;
- Acid Sulphate Soil;
- Visual impacts;
- Traffic;
- Drainage;
- Landscape;
- Pipeline transfers; and
- Construction issues.

4.1.5 Sydney Ports Corporation

An email dated 14th August 2006 from the Sydney Ports Corporation indicated that the comments made on the submission provided by Vopak to the Department of Planning for Director General's requirements are still valid. SPC also made ongoing comments and have provided input into EA throughout its production, prior to being submitted to Department of Planning.

Sydney Ports Corporation supports the proposed Biodiesel proposal as it is an appropriate port use and complements the existing facilities within the Port Botany Bulk Liquids precinct.

4.1.6 Sydney Airport Corporation

An email dated 11th September 2006 from the Sydney Airport Corporation indicated that the Sydney Airport Corporation Ltd had the following to offer for the Environmental Assessment:

- Operational height of equipment. It is unclear what the ground height of the development site would be, although it appears to be under the maximum height of the obstacle limitation surface of 51 metres AHD. Construction cranes through this height would require regulatory approval via Sydney Airport Corporation Limited;
- Any plumes emanating from the stack must be less than 4.2 m/s velocity at the maximum height of the obstacle limitation surface;
- All lighting construction and operational must be compliant with *MOS 139 9:21 Lighting in the vicinity of aerodromes*; and
- Strategically, provision for jet fuel storage across the Port should be assessed against the relative long-term demand and would include maintaining an easement for an additional pipeline reserve along Foreshore Road towards the airport.

4.1.7 NSW Maritime

A letter, dated 4 August 2006, from NSW Maritime indicated that should the proposal be undertaken on land owned by NSW Maritime (i.e. below the high mean water mark, including wharf structures) then appropriate land owners consent / notifications would be required in accordance with Clause 8F of the EP&A Regulations.

Any structures on land owned by NSW Maritime authorisation with the requirements of Section 13T of the *Maritime Services Act 1935* would also be required. In addition, works within 10 metres of land owned by NSW Maritime may require approval in accordance with Section 13TA of the *Maritime Services Act 1935*.

No other issues were raised by NSW Maritime.

The proposal does not involve any works below the high mean watermark, including wharf structures, on NSW Maritime land or within 10 metres of land owned by NSW Maritime. Therefore the proponent does not require issuing of any notifications or seek any approvals from NSW Maritime.

NSW Maritime raised no environmental concerns or issues to be addressed in the environmental assessment.

4.1.8 Sydney Water Corporation

An email, dated 8th August 2006, from the Sydney Water Corporation raised the following issues:

- No estimate has been provided of the quantity of potable water required for the project;
- The preliminary assessment did not provide any estimate of trade wastewater quantity and quality;
- The primary purpose of the (existing) consent is for the treatment of the washing of tanks and flushing of transfer lines. A variation of the current consent would be required to discharge through the current discharge points. Or alternatively a new consent should be sought should a separate connection be required;
- The 'Preliminary Assessment' does not explain how the new trade wastewater streams would be integrated into the existing pre-treatment plant facilities; and
- Elaborate on the statement page 8 of the Preliminary Assessment 'bunded (contaminated) areas to drain to wastewater treatment plant'.

4.2 Community consultation

4.2.1 La Perouse Local Aboriginal Land Council

La Perouse Local Aboriginal Land Council did not advise of requirements or comments in regards to the Environmental Assessment.

4.2.2 La Perouse Precinct Committee

La Perouse Precinct Committee did not formally write to advise of requirements or comments in regards to the Environmental Assessment. However, informal telephone discussions with the Chairman of the La Perouse Precinct Committee, indicated concern about the use of waste oils/sewer traps etc, as feed oil 'which might be road freighted through neighbouring suburbs' to the plant as opposed to ship imported vegetable oils.

The LURGI technology/plant is only applicable to the vegetable oils (e.g. palm oil / palmolein). The process is not designed for, nor can it accommodate, waste fats/oils from recovery operations of food outlets, sewage treatment plants etc.

The proponent has indicated a commitment that the biodiesel process would not involve feed oils from recovery operations of food outlets, sewage treatment plants etc. This commitment would be incorporated into the statement of commitments for the proposal.

4.2.3 Botany Bay Catchment Alliance

An email, dated 13th August indicated that the Botany Bay Catchment Alliance would not participate in the Environmental Assessment process.

4.3 Issues raised and where addressed in the Environmental Assessment

Table 4.1 Consultation issues raised and where addressed in EA

Issue	Where addressed in EA
Department of Environment and Conservation	
Licensing requirements under the *Protection of Environment Operations Act 1997*	Refer to Section 9.1.2
NSW Roads and Traffic Authority	
The proposed means of vehicular access to/from the site	Section 7.2 and Appendix E (specialist traffic report)
Likely daily and peak traffic movements likely to be generated by the proposed development and the increase in the level and type of traffic associated with the proposal	Section 7.2 and Appendix E (specialist traffic report)
Impact of the proposed development on surrounding arterial road network and intersections and the need and associated funding for upgrading or road improvement works	Section 7.2 and Appendix E (specialist traffic report)
Consideration of the need for the preparation of a local area traffic management plan	Section 7.2 and Appendix E (specialist traffic report)
An assessment of the likely impact of truck traffic upon nearby residential areas due to the development of the site	Section 7.2 and Appendix E (specialist traffic report)
Details of the anticipated route of trucks on the major arterial and local road network	Section 7.2 and Appendix E (specialist traffic report)
An assessment of the potential increase in toxicity levels of loads transported on arterial and local roads and consequently, the preparation of an incident management strategy for accidents, if relevant	No detailed assessment undertaken, however the proposal is likely to result in a decrease in vehicle exhaust emissions – refer to Section 1.4.3.
NSW Fire Brigades	
All relevant standards and codes being adhered to – in particular, bunded areas, firefighting equipment, installed fire alarms and associated equipment	Refer to Sections 6, 7.1 and Appendix D
Randwick City Council	
Statutory requirements including Clause 16, 37, 40A and 42B of Randwick Local Environment Plan	Section 3, 8.3 and 8.4
Hazard Analysis	Section 7.1 and Appendix D

Issue	Where addressed in EA
Ecological issues arising from impacts on Botany Bay	Section 8.7
Potential noise, odour and pollution impacts	Section 7.3 and 7.4
Acid Sulphate Soil	Section 8.4
Visual impacts	Section 7.7
Traffic	Section 7.2 and Appendix E
Drainage	Section 7.5
Landscape	Section 8.3
Pipeline transfers	Section 6 and Figure 2.2
Construction Issues	Section 7 and 8
Sydney Ports Corporation	
Sydney Ports suggests that Vopak explore options to limit the tank heights to 24m as a breach of this limit would set a precedent for other developments at the Port. The height limits that have been set assist to minimise visual impact of the port and we should not allow exceptions to this when they can probably readily accommodate shorter tanks.	Refer to Section 6.4 and 7.7
Section 1.6.1 states that the development is consistent with Schedule 2, Clause 7(1a) of the Major Projects SEPP. This is only the case if there is direct pipeline connection from the BLB to the biodiesel facility. If so, then this is acceptable. If not, then it will be necessary to remove the reference to meeting Clause 7(1a).	Refer to Section 3.2.2.
SPC landscaping and fencing requirements along Friendship Rd need to be included as part of the site plan for the proposed development and we should specify a timing by which it needs to be implemented e.g. prior to commencement of operations of stage 1.	Refer to Section 7.7
Complete and submit the SPC Green Port Guidelines to Sydney Ports Corporation prior to lodgement of the Part 3A application.	Refer to Appendix H
Sydney Airport Corporation	
Operational height of equipment. It is unclear what the ground height of the development site, although it appears to be under the maximum height of the obstacle limitation surface of 51 metres AHD. Construction cranes through this height will require regulatory approval via Sydney Airport Corporation Limited	Refer to Sections 6.4, 7.7 and 8.3
Any plumes emanating from the stack must be less than 4.2 m/s velocity at the maximum height of the obstacle limitation surface	Refer to Section 7.3 and Appendix F
All lighting construction and operational must be compliant with MOS 139 9:21 Lighting in the vicinity of aerodromes	Refer to Section 7.7

Issue	Where addressed in EA
Strategically, provision for jet fuel storage across the Port should be assessed against the relative long term demand. Would include maintaining easement for an additional pipeline reserve along Foreshore Road towards the airport.	Jet Fuel not part of this proposal. Provisions for jet fuel would not be hindered by the proposal.
Sydney Water Corporation	
No estimate has been provided of the quantity of potable water required for the project.	Section 6.14 and 8.9
The preliminary assessment did not provide any estimate of trade wastewater quantity and quality	Section 6.15
The primary purpose of the (existing) consent is for the treatment of the washing of tanks and flushing of transfer lines. A variation of the current consent would be required if you wanted to discharge through the current discharge points. Or alternatively a new consent should be sought should a separate connection be required	Noted
The 'Preliminary Assessment' does not explain how the new trade wastewater streams would be integrated into the existing pre-treatment plant facilities	Section 6.15 and Figure 6.2
Elaborate on the statement page 8 of the Preliminary Assessment 'bunded (contaminated) areas to drain to wastewater treatment plant'	Section 6.13 and 7.5
La Perouse Precinct Committee	
Concern about the use of waste oils/ sewer traps etc. as feed oil 'which might be road freighted through neighbouring suburbs' to the plant as opposed to ship imported vegetable oils	Statement of Commitments - Table 9.1.

Part B Information on the Proposal

5. Strategic assessment

5.1 Overview

Recent trends in the energy industry have resulted in market interests towards alternative fuel based products. These trends include rising worldwide demand and prices for refined oil based products such as mineral diesel, local refining capacity constraints, government incentives and identification of the potential environmental benefits of renewable biofuels.

The proponent has recognised that these trends result in an opportunity to manufacture, store and transport biodiesel produced locally as a competitive alternative to importing mineral diesel. By investing in a biodiesel facility and locating it in the strategically important bulk liquid trade and cargo handling area of Port Botany, the proposal represents a significant step forward to establishing an alternative fuel supply side capability for the NSW mineral diesel market.

5.2 Need for the proposal

The consumption market for automotive diesel in Australia for the financial year 2004-05 was approximately 15,185 ML (15 billion litres) of product and represents an increase of 5% from consumption in 2003-04 (ABARE: 2005: pp 56). Overall consumption is expected to grow approximately 2% pa over the next two decades and accounts for economic and population growth, efficiency and demand management measures.

During 2004-05, Australian production of automotive, industrial and marine diesel was 12,844 ML (12.8 billion litres) a decrease of 608 ML (or 4.5%) from production in 2002/03 (ABARE: 2005: pp 29). The decrease in production capacity is attributed to local refineries being forced to upgrade refinery technology to produce lower sulphur fuels product.

Despite the importance of refining capacity, it is anticipated that no new local refining capacity would be added to meet the needs of local consumption. The reason being the large financial investments to meet tighter sulphur specifications have crowded out investments in increasing refining capacity to meet local demand, and, where capital finance is available, constraints from environmental issues, local resistance to new refineries and difficulty in gaining development approvals.

The net result is a disparity between local refining capacity and market demand within the national diesel market. This disparity exceeded 2,300 ML nationally in 2004-05 and will continue to grow in the next two decades. The bulk of refined products are therefore likely to be imported from other producing nations, including those in Asia and the Middle East.

The effect of this importation of significant refined oil quantities becomes more pronounced should the cost of a barrel of oil increase. Recent trends have indicated that oil prices have steadily increased to over $US 40 barrel (bbl)(refer to Figure 5.1).

In July 2006, the price of oil increased to over $US 78 bbl (internet reference: www.opec.com), which is comparable with the record prices felt in the early 1980s.

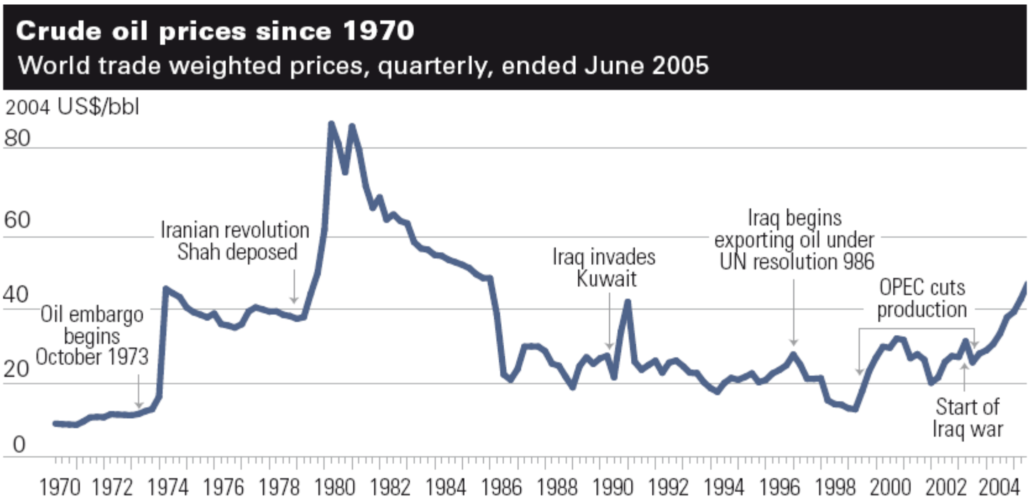


Figure 5.1 Crude oil prices since 1970 (Source DIT&R: 2005: pp 8)

Products of natural resources, like mineral diesel, are generally considered to be economically inelastic in nature – that is a 10% increase in price corresponds to less than 10% decrease in demand. To illustrate the concept of elasticity the current social and economic foundation of today's modern society is substantially through transport functions – e.g. travel to and from work, shopping and deliver goods and services etc. Hence members of society reliant on transport functions would require (and pay) for these services despite price hikes in oil from time to time.

The recent trend in oil price has resulted in consumers spending a larger budget share on transport products such as mineral diesel. The result is market interest towards alternatives and substitutes that could ease reliance on imported refined fuel products in the hope that it would introduce competition, and therefore lower the burden of expenditure on essential goods and services – such as transport.

Biofuels act as an alternative and can help offset the supply / demand shortfall and soften the impact of high costs of imported refined products. This can be achieved by blending locally produced renewable products (e.g. biodiesel) with mineral diesel.

In addition to the strategic economic trends and local refining capacity constraints, environmental considerations have also partly driven demand for cleaner fuels. Biodiesel offers many tangible environmental benefits than its fossil fuel counterpart. These benefits include, among others, reduce greenhouse gas and vehicle emissions (refer to Section 1.4.3 for more details).

However, the introduction of biodiesel to the market is currently experiencing start-up barriers (refer to Section 1.4.4). To offset the anticipated high dependence on fuel imports as well as to spur local market growth and allow establishment of alternative fuels, the Australian Government has provided incentives to establish renewable energy sources by way of a 'Cleaner Fuels Grant Scheme'. This scheme allows the development of a biodiesel industry setup by 2011. The proposal aims to take advantage of this scheme and establish an alternative fuel energy supply capability.

Therefore, the proposal is a key part of a drive for alternative sources of fuel that would:

- Partly compensate for the loss of refining capacity;
- Reduce the burden on imports of refined fossil fuels;
- Achieve an environmental benefit through its use; and
- Establish a biofuel supply side capability.

5.3 Suitability of the site

5.3.1 Regional context

The Sydney Metropolitan Strategy (DoP: 2005) acknowledged that to ensure Sydney is a prosperous and fair city, planning needs to provide for centres with different functions in all parts of the metropolitan area. By identifying centres of different types, in different parts of the city, application of resources, planning and investment can be efficiently targeted to enable a fair distribution of economic activity across the city. Key aspects of this plan therefore, are to establish a typology of centres and support these through State and local planning and infrastructure development.

Port Botany and the surrounding area are identified as a 'Specialised Centre' because of its ability to perform a vital economic and employment role for the metropolitan region (because of its unique role in trade and cargo handling). Eight other areas were identified as Specialised Centres and include, among others, Macquarie Park, St Leonards, Olympic Park / Rhodes and Sydney Airport.

The plan identifies the importance of industry clustering and specialisation of centres because evidence suggests that clustering and specialisation improves business transactions, promotes continuous learning and spurs economic innovation.

Therefore part of the strategy includes the adoption of an employment capacity target within specialised centres to meet the 500,000 extra jobs required by 2031 to cater for Sydney's population growth and global competitiveness. Specialised Centres in Sydney have a combined 2031 employment capacity target of 247,000 jobs. Port Botany and environs have been identified as having a (direct) employment capacity target of 12,000 jobs, an increase of 6.5% from 11,264 (2001 figures).

In addition to creating an employment capacity target, the metropolitan strategy identifies planning within Specialised Centres to be supported and encouraged in their specialised functions.

The proposal supports the metropolitan strategy. The proposal enhances the clustering and specialisation of Port Botany area, contributes to its employment capacity target and reinforces the significance of Port Botany and environs as a vital economic and employment role for the greater metropolitan region. Therefore the suitability of the site is consistent with the Sydney Metropolitan Strategy.

5.3.2 Local context

The former Department of Urban Affairs and Planning (now DoP) prepared an updated cumulative risk assessment study of the existing Port Botany area published in 1996 entitled Landuse Safety Study Overview Report.

The key findings and recommendations of this study relevant to the proposal were that:

- Proposed new installations for the Port Botany area did not significantly affect public risk as most facilities are located well away from residential activity;
- There is a slight increase in societal risk with the inclusion of new facilities mainly due to the increase in road movements of dangerous goods; and
- New developments should involve consultation with key stakeholders and the local community.

The proposal is consistent with local planning risk assessment, which has identified the area as suitable for uses such as bulk liquids handling and distribution. Consultation with key stakeholders and the community is outlined in Section 4.

5.4 Alternatives to the proposal

Alternatives to a biodiesel facility include the status quo and demand management approaches to diesel consumption. The status quo involves import demand for mineral diesel increasing 2% pa and these forecasts account for demand management approaches (ABARE: 2005: pp 29 and pp 57). Therefore, despite the ongoing influence of conservation programs, demand for diesel is still expected to increase.

The status quo, ‘do nothing’ approach would also threaten the proposal’s many economic, environmental and social benefits and result in an opportunity costs. Therefore remaining with the status quo is deemed as both unviable and not in the public interest.

Alternatives to the location of a biodiesel facility were also investigated. The key considerations on the location of a biodiesel facility relate to:

- Scale of production;
- Proximity to import facilities;
- Proximity to sizable local market;
- Proximity to good transport networks;
- Proximity to export facilities; and
- Ability to blend with mineral diesel markets.

The New South Wales market is the second largest Australian market for diesel oil. Due to government regulated blend standards, the use of biodiesel is predominantly through blending with mineral diesel to various percentages (B10 = 10% added biodiesel). The largest multi-user and independent import facility for diesel oil is located at the Vopak Site B facility in Port Botany. Importation of certain feedstock for worldscale biodiesel plants also requires the facility to be on a regular shipping route for vegetable oil and petroleum product carriers.

By locating the proposal in Port Botany, the proposal benefits from a source of mineral diesel to blend B100 into B20 or B10 and import the critical feedstock. Hence the location is strategically sited to take advantage of required infrastructure within the same locality.

A fundamental barrier to the start-up of a biodiesel industry in the country is access to the diesel market at a cost effective entry point. By locating the proposal within the specialised petroleum handling and distribution centre of Port Botany, the proposal would benefit from easy market access in the highly competitive petroleum environment.

In addition, by locating the proposal at Port Botany, the proposal would introduce new technology and competition among the more traditional fossil fuel based petroleum companies. This would foster additional competition, innovation and knowledge sharing of the benefits of biodiesel.

5.5 Objectives of the proposal

The objectives of the proposal are to:

- Manufacture biodiesel from renewable agricultural sources;
- Transport feedstock, alcohols, biodiesel and glycerine to and from identified markets;
- Provide infrastructure to store feedstock, alcohols and biodiesel;
- Reuse existing Vopak Site A infrastructure where practicable;
- Utilise existing cleared and unoccupied land; and
- Create a commercial return on investment.

6. The proposal

6.1 General description

The proposal is the construction and operation of a biodiesel processing plant, storage tanks and associated infrastructure. Vopak would provide storage and distribution infrastructure, utilities and infrastructure management facilities. Natural Fuel Australia Ltd would provide the biodiesel processing plant and associated infrastructure.

The proposal would require refurbishment of the Vopak Site A Terminal (Lots 3 and 4) and to re-use some of the existing tanks, pumps, loading/unloading facilities, fire protection system and other miscellaneous facilities. In addition, the proposal would require construction of a biodiesel processing plant and associated facilities on a cleared portion of the Vopak Site A Terminal (Lot 5).

The development is to be achieved in two stages. During the first stage, a one train biodiesel plant and associated infrastructure, storage and utilities would be provided. The second train of the same capacity and the necessary additional facilities would be provided during stage two.

Natural Fuel Australia Ltd plans to engage LURGI to deliver the complete biodiesel processing plant train for stage one of the proposal. The plant train would be designed for a continuous 24-hour production of 360 tonnes of biodiesel per day, equating to a total of approximately 120,000 tonnes per year (143 ML/year). Approximately 12,200 tonnes per year of pharmaceutical grade glycerine would also be produced from the process. A similar plant train (stage two) would be installed in future.

The processing plant would produce B100 (indicating 100% biodiesel) grade of biodiesel. The biodiesel would then be transferred to Vopak Site B tank farm area and stored in a dedicated storage tank (Tk0625). From this tank, the biodiesel would be exported by ship or electronically blended with mineral diesel as per customer requirements (e.g. for B5, B10 or B20) via the loading rack at the Site B road tanker loading gantry.

The cost of the proposed development would be in the order of $30 million for the first stage. The construction period would take approximately 44 weeks for stage one and would employ between 30 – 50 staff during different phases of construction.

6.2 Stage one of the proposal

Stage one of the proposal involves:

- One train biodiesel facility with capacity to produce 143 ML/year of B100 grade biodiesel;
- Reuse of 20 existing tanks with a storage capacity of 16,600m^3;
- Three new storage tanks (18.7m in diameter and 18m in height) with a total storage capacity of 13,650m^3;
- Eight minor storage tanks with a total capacity of 440m^3;

- Storage tank support infrastructure, including:
  - One new pump manifold;
  - One new walkway;
  - One new main hose exchange and three new hose exchanges;
  - Provisions for a Waste Water Treatment Plant designed for biodiesel waste water treatment;
  - Appropriate bunding works; and
  - Appropriate piping works.
- Operation support infrastructure, including:
  - Expansion to existing east substation;
  - Administration and operational car parking for 58 spaces;
  - A new two storey administration building (24m x 18m and 7m in height);
  - NFAL work shop (10m x 10m and 4m in height);
  - Switchroom (10m x 4m and 4m in height);
  - Utilities building 18m x 10m and 8m in height);
  - Three cooling towers (5.271m in height); and
  - New fencing arrangements and streetscape landscaping.
- A new DN150 CS pipeline biodiesel transfer from Site A to Site B for storage at Site B (Note: no works required at Site B other than pipe connection into existing Site B infrastructure).

6.3 Stage two of the proposal

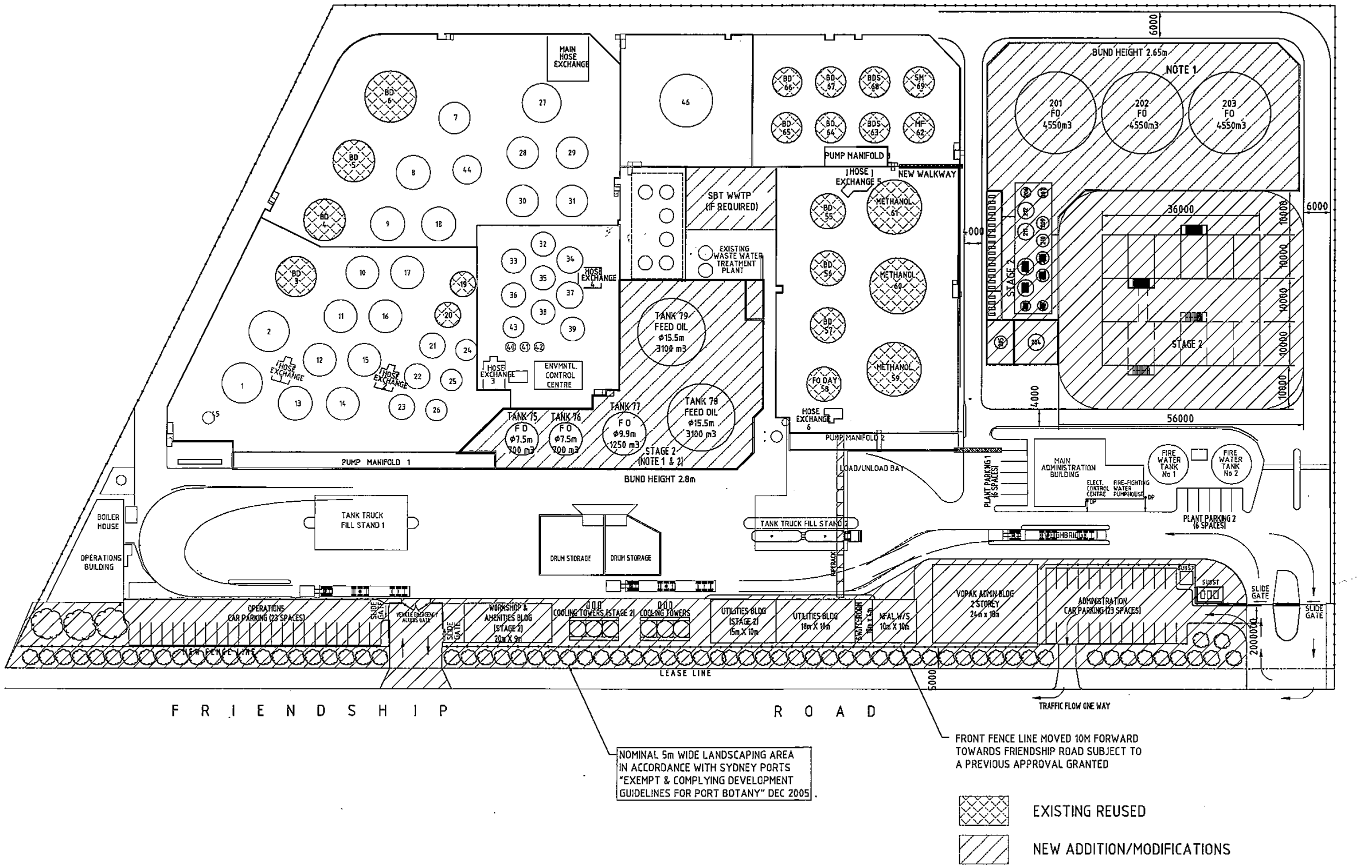
Stage two of the proposal involves:

- Demolition and removal of existing Site A infrastructure including:
  - Flammable product drumming facility (removed);
  - Warehouse, which includes maintenance workshop, and spares storage (relocated);
  - Combustible products drumming facility (removed);
  - Control room for Vapour Emission Control System (VECS) (relocated); and
  - Class 3 drum storage bund (removed).
- One train biodiesel facility with capacity to produce 143 ML/year of B100 grade biodiesel;
- Reuse of one existing tanks with a storage capacity of 400m^3;
- Five new storage tanks (a maximum 15.5m in diameter and 18m in height) with a total storage capacity of 8,850m^3;
- Six minor storage tanks with a total capacity of 320m^3;
- Storage tank support infrastructure, including:
  - Appropriate bunding works; and

  - Appropriate piping works.
- Operation support infrastructure, including:
  - Utilities building 15m x 10m and 8m in height;
  - Cooling towers (max three, 5.271m in height); and
  - Workshop and amenities building (20m x 9m and 4m in height).

The proposed site layout is shown in Figure 6.1. A process drawing is shown in

Figure 6.2. A cross section drawing is shown in Figure 6.3. Full engineering drawings, cross section and photomontages are provided in Appendix C.



Storage Details for SBT Stage 1

Item	Tank	Tank	Tank Vol	Comments
	Dia, m	Ht, m	m3	
Feed Oil Tank 1 - Tank 201	18.7	18	4550	
Feed Oil Tank 2 - Tank 202	18.7	18	4550	
Feed Oil Tank 3 - Tank 203	18.7	18	4550	
New Minor Storage Tanks (Tanks 204 to 212, No 208)			440	8 Tanks
Total New Stage 1			14090	
Existing Tanks used for Feed Oil			650	1 Tank
Existing Tanks Used for Biodiesel			8750	13 Tanks
Existing Tanks Used for Methanol			6400	4 Tanks
Existing Tanks Used for Sod Methylate			400	1 Tanks
Existing Tanks Used for Glycerine			400	1 Tanks
Total Reused			**16600**	
Total SBT			**30690**	
Total Site			**50340**	

Storage Details for SBT Stage 2

Item	Tank	Tank	Tank Vol	Comments
	Dia, m	Ht, m	m3	
Feed Oil Tank 4 - Tank 79	15.5	18	3100	
Feed Oil Tank 5 - Tank 78	15.5	18	3100	
Feed Oil Tank 6 - Tank 77	9.9	18	1250	
Feed Oil Tank 7 - Tank 76	7.5	18	700	
Feed Oil Tank 8 - Tank 75	7.5	18	700	
New Minor Storage Tanks (Tanks 231 to 236)			320	6 Tanks
Total Additional New Stage 2			9170	
Existing Tanks Used for Glycerine			400	1 Tank
Total Reused			400	
Total Additional for Stage 2			9570	
Total New Stage 2			**23260**	
Total Reused			**17000**	
Total SBT			**40260**	
Total Site			**59510**	

Figure 6.1 Proposed site layout

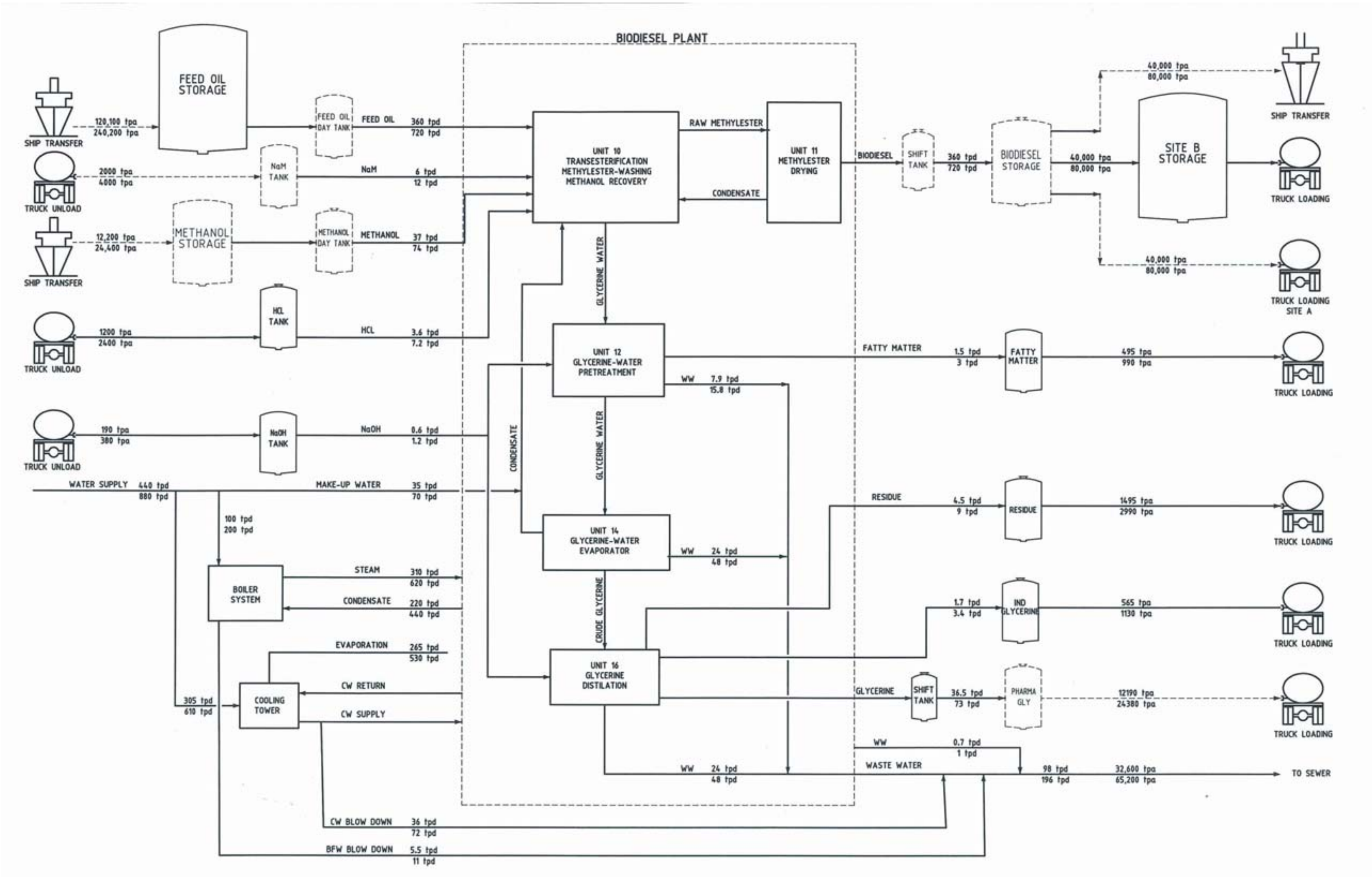


Figure 6.2 Process drawing of the proposal

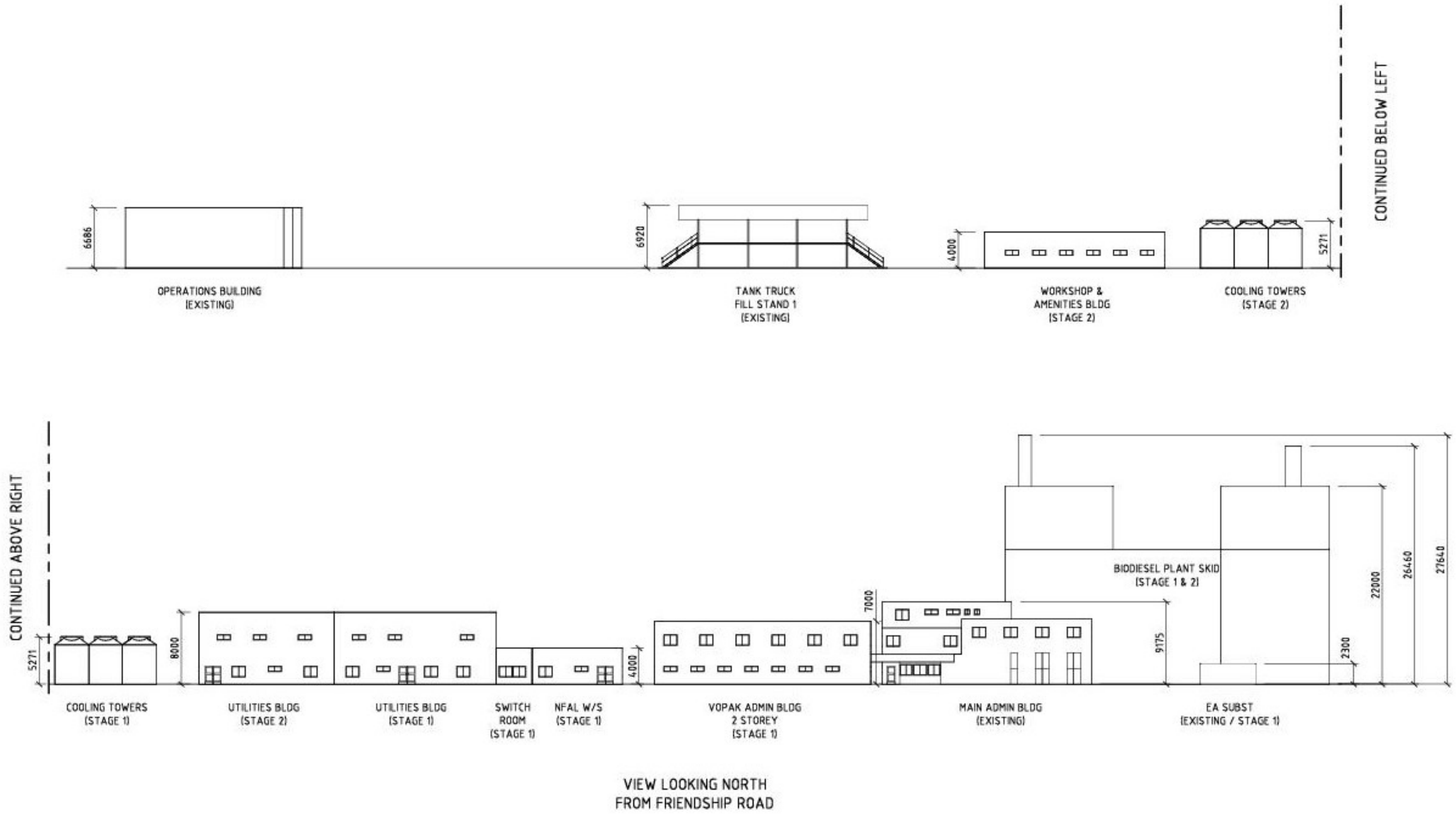


Figure 6.3 Cross section of proposal looking north from Friendship Road

6.4 Storage tanks

The site currently houses 70 tanks for storage of 36,250m^3 of bulk liquid products. The proposal would result in the site housing 81 tanks after Stage 1 for storage of 50,340m^3 of bulk liquid products. The proposal would house 92 tanks after Stage 2 for storage of a combined total 59,510m^3 of bulk liquid products.

All new tanks would not exceed 18 metres in height. The largest tanks would be for feed oil, which would be 18 metres high and 18.5 metres in diameter.

The main storage tanks for the feed oil would be built on the vacant plot. Methanol, sodium methylate and biodiesel products would be stored in the existing tanks at Site A and one tank at Site B for storing biodiesel.

All new storage tanks would be designed and constructed in accordance with:

- AS1940: The storage and handling of flammable and combustible liquids; and
- AS1692: Tanks for flammable and combustible liquids; or
- API: 650 Welded Steel Tanks for Oil Storage and would comply with all other required regulations.

New feed oil tanks would be heated using hot water and would be insulated to minimise atmospheric cooling. A new steam water heater to produce hot water using steam from the steam system and associated tank and pumps would be provided in the new utilities building.

One recirculation / transfer pump is provided to provide facility for recirculation, transfer among tanks and for transfer to the day tank. Currently existing pump 58, having capacity of about 50-70 m^3/hr, is proposed to be used. If a higher transfer / recirculation rate is to be achieved, a new pump with a higher capacity would be required.

As methanol would be imported by ship, about 5,000-6,000m^3 of storage facility would be required. Three existing 2,000m^3 tanks have been allocated. Methanol is a flammable substance, and the allocated existing tanks are designed for storage of flammable liquids with suitable fire protection facilities and nitrogen blanketing provision.

The existing 400m^3 tank 62 would be used as a day tank for Methanol. The methanol day tank has suitable fire protection facilities and nitrogen blanketing provision.

The existing 400m^3 tank 69 would be used for the storage of Sodium Methylate. This is also a flammable substance and tank 69 is designed for storage of flammable liquids with suitable fire protection facilities and nitrogen blanketing provision.

The existing eleven tanks are allocated for use for storage of biodiesel. These tanks include tanks 3-6 in bund area 1, tanks 64-57 in bund area 5 and tanks 55-57 in bund area 6. The total capacity of all these tanks combined would be 7,800 m^3. An additional 3,000 m^3 existing tank at Site B would also be used for storage of biodiesel at Site B.

Existing tanks proposed to be used for biodiesel storage do not have the facility for recirculation. It should be noted that transfer pumps for all these tanks are currently located at pump manifolds located close to the road (at a significant distance from respective tanks) for truck loading/unloading convenience.

A recirculation facility for additive mixing is to be provided to all tanks, hence a mixing jet nozzle and significant additional piping would need to be provided.

The existing 400m^3 tank 19 would be used for the storage of the pharmaceutical grade glycerine. This tank has a facility for blanketing with nitrogen to prevent the ingress of water. The tank also has hot water heating facility.

If additional storage capacity for pharmaceutical glycerine is required, the tank 20 located next to 19 can be used for the purpose. Tank 19 and 20 are exactly similar in design and other facilities.

The existing 750m^3 tank 58 would be used as day tank for feedstock and would have electric heating.

The existing 400m^3 tanks 63 and 68 would be used as biodiesel shift tanks.

The existing two fire water tanks and pumping system for Site A would be used to meet fire protection requirements for new facilities.

Smaller tanks would be required for storage of hydrochloric acid and liquid caustic to service the biodiesel processing plant. Expected tank size in each case has been judged on the expected delivery schedules available and the necessary volumes for continuous safe plant operation.

A number of small tanks and associated pumps would be required for the reagents, intermediates and by-products of the process.

6.5 Product throughput

The LURGI technology/plant is only applicable to the vegetable oils (e.g. palm oil / palmolein). The process is not designed for, nor can it accommodate, waste fats/oils from recovery operations of food outlets, sewage treatment plants etc.

For the 2 train model the following product throughput would be required/generated:

- Input:
  - 'Feed Oils' @ 240,000 tonnes per year (ship every 3 weeks @ 14 000 t (17 ships per annum)). Feed oils would include palm oil, palm kernel oil and the other listed alternatives such as palmolein, canola oil, soya bean oil, and other vegetable oils. The particular oil that would be used would vary depending on market supply and demand at any given time;
  - Methanol @ 24,500 tonnes per year (ship every 2 months @ 4000 t (6 ships per annum));
  - Sodium Methylate @ 4,000 tonnes per year (18 ISO containers per month);
  - Caustic Soda @ 400 tonnes per year (1 ISO container every 3 weeks); and
  - Hydrochloric Acid @ 2,400 tonnes per year (10 ISO containers per week).

- Output:
  - Biodiesel @ 240 000 tonnes per year, split 80 000 tonnes per year ship export, 80 000 tonnes per year truck loading at Site B and 80 000 tonnes per year truck loading at Site A;
  - Pharmaceutical Glycerine @ 24,400 tonnes per year (24 ISO containers per week); and
  - Waste water and fatty residue (unspecified amount at this stage).

6.6 Pumps

All eleven existing pumps (3-6, 55-57, 64-67) would be used for transfer of biodiesel to/from the existing biodiesel tanks.

The existing pump 58 (if pump capacity is acceptable) would be relocated near the oil tanks for feed oil circulation and transfer from storage tank to the feed tank.

Three new feed oil pumps would be provided in the new pump manifold area for supplying feed oil to the biodiesel processing train plant. Another new feed oil pump would be located in place of relocated pump 58 to supply feed oil from the day tank to the biodiesel processing train plant.

The existing pumps 63 and 68 would be relocated from pump manifold area 2 to pump manifold area 3. These pumps would be used for transfer of biodiesel from the shift tanks to the storage tanks at Site A and B.

Existing pumps (59-61) would be used for transfer of methanol from trucks to the respective storage tanks and day tank. The same pumps would also be used for transfer of methanol from storage tanks to the day tank.

New methanol feed pump would be provided at pump manifold 3 to supply methanol from day tank and storage tanks to the biodiesel processing train plant.

The existing pump 69 would be used for truck unloading of sodium methylate to the respective tank. New sodium methylate feed pump would be provided at pump manifold 3 to supply sodium methylate to the biodiesel processing train plant.

The existing pump 19 located at the pump manifold 1 would be used for truck loading of glycerine from the glycerine tank.

The existing ship export pumps (if pump capacity is acceptable) located at the main hose exchange area would be used for ship export of biodiesel from Site A.

The existing pump 62 would be removed, as it is no longer required. Two new truck-unloading pumps (one for HCl and one for caustic) would be located at pump manifold 2 in place of relocated/removed pumps.

6.7 Pipeline transfers

To facilitate efficient export of biodiesel to road tankers and/or ship, a 3,000 m^3 capacity tank at Vopak Site B would be allocated to biodiesel. A new pipeline would be required to connect Site A (finished biodiesel tank farm area) to the main transfer manifold in Vopak Site B (refer to Figure 2.2).

Finished (certified) biodiesel would be transferred to the Site B tank on a daily basis. The proposal would therefore require pipelines to integrate with the biodiesel processing plant and the Vopak Site B facility for ultimate distribution to the market. This includes the following lines:

- A new 150 mm pipeline connecting Site A and Site B dedicated biodiesel tank farm areas; and
- Integrated pipelines to transport feed-stock and processed materials to the storage tanks, processing plant and output lines within the Vopak Site A Terminal.

Existing lines to and from the Sydney Ports Corporation Bulk Liquids Berth and Vopak Site A would also be utilised for import product feed and export of biodiesel.

The existing DN200 SS pipeline connecting the Site A (main hose exchange) to the Bulk Liquids Berth would be used for ship export of biodiesel. The export pumps located at the main hose exchange at Site A would be able to ship export biodiesel at about 200 m^3/hr from any nominated biodiesel tank at Site A.

New export pumps would be required if 200 m^3/hr export flow rate achievable with the existing pumps is not acceptable for the project.

Another existing DN200 SS pipeline connecting Site A (Hose Exchange 5) to the Bulk Liquids Berth would be used for ship import of feed oils and methanol at about 300-400 m^3/hr flow rate. The pipeline can be pigged[4] to avoid cross-contamination between fluids.

A new DN150 CS pipeline connecting Site A (Hose Exchange 5) to Site B (3,000 m^3 tank) would be provided to transfer biodiesel from Site A to Site B. This tank has already all connections and facilities for tanker loading of 100% biodiesel and for ship export. Facility for blending biodiesel with diesel to load B10 is not included in this project at this stage.

Blends of feedstock oils, Sodium Methylate, Methanol and a number of reagents, intermediates would be fed from the Vopak tanks directly to the biodiesel plant either on a continuous 24 hour operation or as required by the processing plant. Similarly product, byproducts, intermediate streams would be transferred from the processing plant to the Vopak storage facilities. An integrated protocol system of process controls and interlock logic would operate between both facilities to ensure continuous and safe transfer.

The glycerine would be piped to the existing tank 19 following temporary storage in a ‘shift tank’ where it would undergo required quality testing by NFAL.

[4] The process of pipeline ‘pigging’ involves the propulsion of an object known as a pig, equivalent in size to the internal diameter of the pipeline, by nitrogen pressure through the pipeline. The process performs a cleaning and displacement function as the pig moves along the length of the pipeline.

The biodiesel would be piped for temporary storage to 'shift tank' (existing tanks 63 & 68) where it would undergo required quality testing by NFAL before its release to storage tanks.

The companies would have responsibility for the pipelines on their own sites and the change of responsibility would occur at the flanges on the pipe work at the boundary of the two sites.

6.8 Road tanker loading

Existing loading and unloading facilities at Site A would be used for loading and unloading of different materials (products and feed fluids).

The Site A Road Tanker Loading facilities are controlled by a combination of logistics procedures (weighbridge, customer authorisation, stock control and operations authorisation processes) and operations personnel carrying out the loading process in conjunction with the driver. The controls are generally manual (hose connection, pump start/ control etc) hence the two man operation. This system has been used successfully at site A since 1979.

Therefore loading schedules are created and a planned daily loading sequence is developed. This enables the facility to ensure that filling times would be kept to a minimum and also that the number of road tankers waiting to load would be minimised.

Biodiesel would be loaded from the Site B road tanker area once transferred from Site A via pipeline. No other products as part of this proposal would be loaded from the Site B Road Tanker area.

6.9 Processing plant train

The processing plant would consist of five units integrated into one plant structure to perform the following processes in order to create biodiesel:

- Transesterification;
- Methylester drying;
- Glycerine water treatment;
- Glycerine water evaporation; and
- Glycerine distillation.

The processing plant would occupy an area of 12 m x 36 m. The majority of equipment, fittings and pipes would be stainless steel and operate under low temperatures and pressures. It is assumed that the plant would be constructed in modular form. The modules would be transported on multi-wheel trailers to the prepared site for installation.

6.10 Utility buildings and workshops

The proposal requires the construction of new utility buildings and workshops. All new buildings and workshops would be located at the eastern end of the facility, fronting Friendship Road.

All buildings would be designed and constructed to appropriate Australian and Industry Standards and include appropriate fire safety provisions.

Vopak administration building

This building would be located adjacent to the administration car parking lot. The administration building would be a 2 storey (24 x 18 metres and 7 metres in height) building similar to the existing main administration building. The administration building would be used for general administration of Vopak operations.

NFAL Workshop

Adjacent to the Vopak administration building, a 10 x 10 metre workshop would be built for the NFAL biodiesel plant. The building would be 4 metres in height and would allow for general maintenance and repairs associated with the biodiesel plant.

Utilities buildings

Two utilities buildings would be required for the proposal, one for each stage. The first stage utility building would be slightly larger (18 x 10 metres) than the second stage building (15 x 10 metres). Both buildings would be 8 metres in height.

The utilities building would house the controls and equipment required to manage the new control system for the storage infrastructure for the proposal, motor control centre and instrumentation control for both NFAL plant and Vopak plant infrastructure.

Workshop and amenities building

Construction of the stage two processing train would require an additional workshop and amenities building. This building would be approximately 20 x 9 metres and located adjacent to the emergency vehicle access gate. The building would be 4 metres in height.

The purpose of the workshop and amenities building is to provide adequate staff provisions and workshop space to service the biodiesel plant and extra demand anticipated.

6.11 Access and car parking

Access to Vopak Site A would be via Friendship Road. The existing access from Friendship Road is via a security gate at the northwestern end. The proposal would require minor modifications to the access way to enable access to the proposed new administration car parking lot. The car park design enables one-way loop direction with exit from the car park closer to the proposed administration building.

The proposed administration car parking lot would allow car parking for 23 spaces. An additional car parking lot is proposed to be located at the northern end of Vopak Site A and would also cater for 23 spaces. A smaller car plant parking for six spaces is located in front of the fire water tanks and main administration building. The car parks would be sealed and marked in accordance with existing standards.

Emergency access provisions to Site A is provided at the northern end, adjacent to the additional car parking lot.

6.12 Site layout

The general layout includes defined areas and boundaries for storage tanks, pumps, transfer points and the biodiesel processing unit. The proposal also includes additional car parking, security gate facilities, utility and control room facilities, workshops and administration buildings.

The administration building, utility and control room, workshop, carpark and staff amenities would all be located along the frontage of Friendship Road. The processing plant would be located on a cleared plot of land on the southwestern end of the Site A Terminal.

As it is anticipated that demand for the biodiesel product would increase, the proposal allows for space provisions for a second processing plant, associated small storage tanks, the second cooling tower and extension of the utilities building.

6.13 Bund areas

All storage tank areas also include bunded areas to contain spills in accordance with AS1940. This includes bunded areas for 100% of tank volume + 10% for any overspill. Bunds include common bund areas and separate bund areas depending on the product stored in the tanks.

The required bund height is 2.65 metres based on 110% of the largest tank volume. The distance from the three feed tanks to bund wall is less than the distance as required in accordance with AS1940. However, AS1940 Clause 5.8.3 (h) provides for an alternative; '*...where it can be demonstrated that a reduced distance would be appropriate due to viscosity or other considerations*'. These tanks would only store C2 Combustible materials and the design is/has been verified by an accredited Dangerous Goods Consultant.

A letter from Dangerous Goods Consultants LCF and Associates (refer to Appendix C), dated 5th January, provided the following additional information:

> Tanks 201, 202 and 203 would contain C2 feed oils, and tanks 75, 76, 77, 78 and 79, which may store either C2 feed oils or C1 biodiesel. All of the above tanks are 18 metres high, Tanks 201, 202 and 203 are 6.3 metres from the bund wall, which is 2.65 m high.
>
> Tanks 75, 76, 77, 78 and 79 are 3 to 4 metres from the bund wall, which is 2.8 m high.
>
> AS 1940 requires a distance of approximately 7.7 metres from tank to bund wall, for tanks of this height.

It is noted that AS 1940 is not a mandatory code under the NSW Occupational Health and Safety Amendment (Dangerous Goods) Regulation 2005. It is listed as a relevant code. Normal practice is to implement the requirements of AS 1940 unless the intent of the code is achieved by an alternative method.

The intent of the bund to bund wall separation distance specified in AS 1940 is to reduce the risk that liquid released from penetrations in the tank might project out of the bund. Common alternative methods of controlling this risk for bulk storages in Australia include:

- Provision of tank insulation, with a substantial outer cladding; and
- Provision of a splash guard; this must be adequately supported.

Provision of either of the above controls would be accepted as appropriate methods of achieving the intent of AS 1940 – 2004.

Spill containment principles are discussed in detail in section 9.7 of the WorkCover Code of Practice 2005 for the storage and handling of dangerous goods point (d) of Clause 9.7.3 states "*Any bund wall or barrier shall be high enough to catch all leaks*."

It is noted that other international standards control this risk by locating nozzles away from bund walls and assessment of the risk of corrosion or mechanical penetration of the tank shell.

Separate bunds are provided for acid storage tank and caustic storage tank.

6.14 Utility requirements

The utility building would house the hot water boiler. Cooling towers (three for each stage and approximately 5.3 metres in height) would be located adjacent to the utilities building. Natural gas would be used for fueling the boilers and the existing line would need to be upgraded to supply natural gas to the boiler.

The facility itself would be powered by electricity supplied by Energy Australia.

Other utility requirements and connections include the following:

- Potable water;
- Cooling water;
- Instrument air;
- Steam and hot water;
- Nitrogen;
- Stormwater;
- Wastewater;
- Fire water; and
- Fire foam.

The switchgear for the additional drives in the Vopak storage area would be located in the existing switch room adjacent the NFAL workshop and utilities building as shown on the layout drawing (refer to Figure 6.1).

Approximately 880 Kilolitres of potable water per day would be required for the proposal when operating at full capacity (i.e. stage 2).

6.15 Biodiesel wastewater treatment

Estimated wastewater generation details from the biodiesel plant (stage 1) for the proposal are given in Table 6.1.

Table 6.1 Biodiesel wastewater stream concentrations

Waste stream	Flow rate	COD			Salt Content		TDS	Flow rate
	m^3/hr	kg/hr	kg/day	mg/l	kg/hr	kg/day	mg/l	kL/day
Domestic Waste Water	0.03	0.01	0.24	333	0.0066	0.1584	220	0.72
Cooling Water Blow Down	1.5	0	0	0	2.25	54	1,500	36
Boiler Package Plant	0.23	0	0	0	0.345	8.28	1,500	5.52
Sealing water	1	2.8	67.2	2,800	0	0	0	24
Used Process Water	1	29.7	712.8	29,700	1	24	1,000	24
Wash Water from Still	0.33	16.2	388.8	49,091	11.4	273.6	34,545	7.92
Total	4.09	48.71	1,169	11,910	15.0	360.0	3,668	98.16

The cooling water blow down and boiler blow down process streams would be generated from the Vopak owned plant infrastructure area. The rest of the process waste streams would be generated from NFAL owned plant area.

The Vopak site has a current site stormwater effluent discharge license. It would not be possible to treat additional process effluent in the existing smaller size Vopak system. The process wastewater would therefore be discharge to the Sydney Water sewer network as trade waste for treatment at Malabar Sewage Treatment Plant.

Existing Site A treatment facility would be used for any potentially contaminated stormwater effluent from the Vopak storage tank area.

6.16 Instrument air and nitrogen

The existing nitrogen supply system would be used to supply nitrogen requirements of Vopak's area and NFAL's plant area.

The existing instrument air system would supply instrument air for the Vopak storage area instruments and control valves.

A new facility would be provided, if necessary, to provide instrument air for the NFAL plant and plant infrastructure facilities.

6.17 Steam and hot water

The steam production and supply system and the condensate return system would be provided by Vopak to meet the NFAL steam requirements and to provide steam for the hot water system.

Steam from this boiler would be used to produce 300-400 kW hot water required for the Vopak storage tanks.

The steam boiler would be designed / specified to use both natural gas and biodiesel as fuel.

6.18 Fire protection

All the existing equipment to be used for the biodiesel processing plant does not require any additional fire protection systems. All new tanks and the biodiesel processing plant are located in a vacant plot. Existing fire water and fire foam headers are running around this plot with a number hydrants and monitors. Minor modifications are only required to connect this area to the existing water and foam headers.

6.19 Civil and structural works

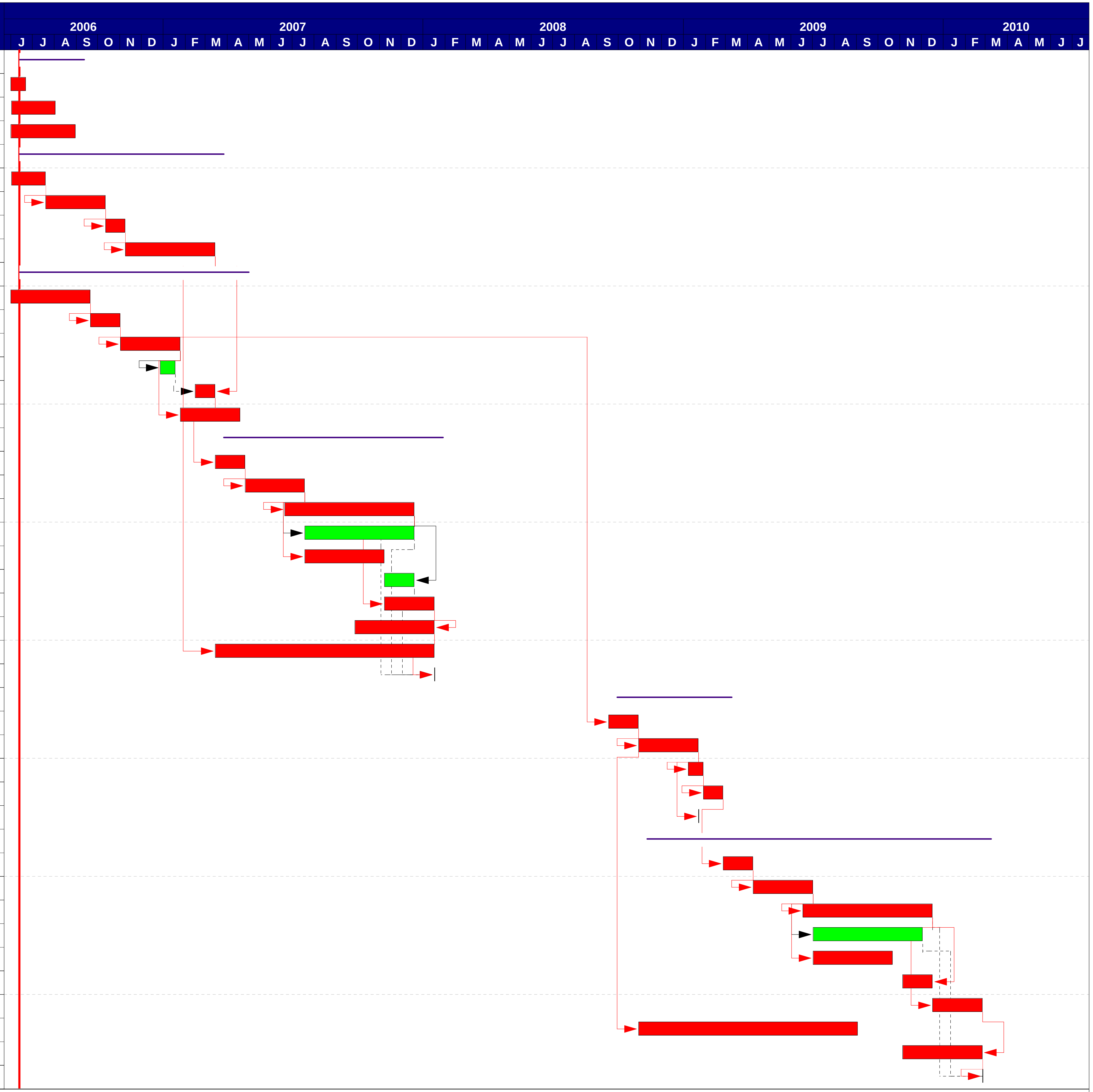
The following works would be required as part of the proposal:

- Earthworks – including compaction, excavation of loose sand soils, removal of redundant pipe work and importation of fill materials;
- Car parking – paving and appropriate markings and comply with appropriate standards;
- Fencing alignment works and landscaping where required along Friendship Road street frontage;
- Emergency access – perimeter road and appropriate surface material;
- Stormwater system – replaced where appropriate due to excavation works, bunded (potential contaminated) areas to drain to wastewater treatment system, general hardstand areas to drain to existing stormwater system; and
- Bunded areas to comply with relevant Australian and industry code standards.

6.20 Construction program

The construction phase for stage one of the proposal is expected to start March 2007 and an early finish date at January 2008. The construction phase for stage one works would take approximately 44 weeks. Stage two constructions works is anticipated to start in October 2008 and finish in February 2010. The construction phase for stage two would take approximately 69 weeks. A construction schedule for the proposal is shown below.

Activity ID	Description	Rem Dur	Early Start	Early Finish
0001	**Engineering Phase**	**13w ***	**01/06/2006**	**30/08/2006**
0002	Scoping design	3w	01/06/2006	21/06/2006
0003	+/- 10% estimate	9w	02/06/2006	02/08/2006
0004	FEED	13w	01/06/2006	30/08/2006
0005	**Approval Phase**	**41w ***	**01/06/2006**	**14/03/2007**
0016	Preliminary EIA to Landowner & DoP	7w	02/06/2006	19/07/2006
0026	Prepare EIA based on above	12w	20/07/2006	11/10/2006
0036	Obtain Landowners consent	4w	12/10/2006	08/11/2006
0046	Approval by DoP incl. Public Display	18w	09/11/2006	14/03/2007
0006	**Specification Finalization Phase**	**46w ***	**01/06/2006**	**18/04/2007**
0047	Complete FEED	16w	01/06/2006	20/09/2006
0057	Review Design	6w	21/09/2006	01/11/2006
0067	Commence full design	12w	02/11/2006	24/01/2007
0087	Tender Packages out for bid	3w	28/12/2006	17/01/2007
0097	Assess & let contracts	4w	15/02/2007	14/03/2007
0147	Design Completion	12w	25/01/2007	18/04/2007
0007	**Construction Phase - Stage One**	**44w ***	**15/03/2007**	**16/01/2008**
0077	Bulk Earthworks	6w	15/03/2007	25/04/2007
0037	Civil work Stage 1	12w	26/04/2007	18/07/2007
0117	Tank Construction	26w	21/06/2007	19/12/2007
0127	Process piping	22w	19/07/2007	19/12/2007
0017	Building works	16w	19/07/2007	07/11/2007
0027	Change Tank Allocations	6w	08/11/2007	19/12/2007
0167	Civil works Stage 2	10w	08/11/2007	16/01/2008
0137	E&I Installation	16w	27/09/2007	16/01/2008
0107	**Construct & Deliver module (by**	**44w**	**15/03/2007**	**16/01/2008**
0157	**Commence Commissioning - Stage**	**1d**	**17/01/2008**	**17/01/2008**
0177	**Planning and Design of Stage Two**	**23w ***	**18/09/2008**	**25/02/2009**
0187	Review Design	6w	18/09/2008	29/10/2008
0197	Commence Full Design	12w	30/10/2008	21/01/2009
0207	Tender packages out to bid	3w	08/01/2009	28/01/2009
0217	Assess and let contracts	4w	29/01/2009	25/02/2009
0227	Design Completion	1d	22/01/2009	22/01/2009
0237	**Construction Phase - Stage Two**	**69w ***	**30/10/2008**	**24/02/2010**
0247	Bulk Earthworks	6w	26/02/2009	08/04/2009
0267	Civil work Stage 3	12w	09/04/2009	01/07/2009
0277	Tank Construction	26w	18/06/2009	16/12/2009
0287	Process piping	22w	02/07/2009	02/12/2009
0297	Building works	16w	02/07/2009	21/10/2009
0307	Change Tank Allocations	6w	05/11/2009	16/12/2009
0317	Civil works Stage 4	10w	17/12/2009	24/02/2010
0327	Construct & Deliver module (by others)	44w	30/10/2008	02/09/2009
0337	E&I Installation	16w	05/11/2009	24/02/2010
0347	**Commence commissioning - Stage**	**1d**	**25/02/2010**	**25/02/2010**



Start date	01/06/2006
Finish date	25/02/2010
Data date	01/06/2006
Run date	30/10/2006
Page number	1A

Sydney Biodiesel Terminal Rev 3

Early bar
Progress bar
Critical bar
Summary bar
Progress point
Critical point
Summary point
Start milestone point
Finish milestone point

Part C Environmental Assessment

7. Key assessment requirements

7.1 Risks and hazards

Pinnacle Risk Management Pty Ltd prepared the Preliminary Hazard Analysis (PHA) for the proposal. A summary of the PHA is provided below. The full report is provided in Appendix D.

The main aims of the PHA study are to:

- Review the hazards and risks associated with the proposed new facility and the adequacy of the proposed safeguards;
- Evaluate the level of risk from the proposed new facility to surrounding land uses and compare the risk levels with the risk criteria published by the DoP in HIPAP No 4 (Department of Urban Affairs & Planning (NSW) *Hazardous Industry Planning Advisory Paper No 4 – Risk Criteria for Land Use Safety Planning*, 1992); and
- Where necessary, submit recommendations to Vopak to ensure that the facility is operated and maintained at acceptable levels of safety and that effective safety management systems are used.

7.1.1 Methodology

The PHA has been conducted as follows:

- The project scope was reviewed to identify potential hazardous events, their causes and consequences. Proposed safeguards were also included in this review;
- The consequences of the potential hazardous events with possible off-site impact were evaluated (as per HIPAP 4, Department of Urban Affairs & Planning (NSW) *Hazardous Industry Planning Advisory Paper No 4 – Risk Criteria for Land Use Safety Planning*, 1992);
- Included in the analysis is the risk of propagation from hazardous events in nearby processing equipment;
- The likelihood and hence risk of the potential hazardous events with the possibility for off-site harm were then assessed using appropriate qualitative and/or quantitative techniques (e.g. a risk matrix) to determine if there is any possible increase to existing off-site risk levels. The risk results are compared to the criteria set in HIPAP 4, Department of Urban Affairs & Planning (NSW) *Hazardous Industry Planning Advisory Paper No 4 – Risk Criteria for Land Use Safety Planning*, 1992; and
- A comparison is made to the existing Port Botany regional study (DUAP, *Port Botany Land Use Safety Study, Overview Report*, 1996) to determine if there is any impact on cumulative risk.

7.1.2 Hazard Identification

A summary of the materials associated with the proposal is described below.

Vegetable Oils:

Palm oil, palm kernel oil and canola oil have flash points typically above 270^{o}C, i.e. they are difficult to ignite combustible materials. The typical melting points for palm oil and palm kernel oil are at ambient temperatures, e.g. 25 to 40^{o}C. These vegetable oils are not soluble in water. Pinnacle Risk Management has previously reviewed vegetable oils (Pinnacle Risk Management, *Spill Prevention Strategy, Bulk Liquids Handling, White Bay, Sydney Harbour, Sydney Ports Corporation*, 13 November 2005). This study shows that these materials pose negligible risk to the environment due to their low toxic properties.

Hydrochloric Acid:

Hydrochloric acid is a Class 8 Dangerous Good (corrosive substance); Packing Group II. Hydrochloric acid is normally supplied as a 33wt% solution. It is a clear to slightly yellow fuming solution with a pungent odour.

Hydrochloric acid reacts violently with alkalis and sodium hypochlorite (the latter reaction evolves chlorine gas). It is highly corrosive to most metals with evolution of hydrogen gas (i.e. a highly flammable gas).

Exposure to hydrochloric acid can lead to severe burns and irritation. Prolonged exposure can lead to dermatitic effects. Hydrochloric acid is not classifiable as a human carcinogen.

Hydrogen chloride gas can be released to the atmosphere by evaporation from spills of concentrated hydrochloric acid. It is toxic and acts as a respiratory irritant. It has a readily noticeable odour at low concentrations (around 0.3 ppm) that do not constitute an acute hazard; therefore the odour acts as a hazard warning. The Time Weighted Average (TWA) exposure limit for hydrogen chloride for an eight hour day is 5 ppm.

If involved in a fire, toxic fumes can be evolved.

Sodium Hydroxide:

Sodium Hydroxide (i.e. caustic soda) is a Class 8 Dangerous Good (corrosive substance); Packing Group II.

Caustic soda is a colourless liquid. It is highly alkaline and hence corrosive to human tissue and can cause serious injury to skin and eyes. Inhalation of any mist containing caustic soda can result in respiratory irritation and lung conditions such as pulmonary oedema.

It is typically transported as a 46 – 50 wt% solution although lower strengths are also produced.

Caustic soda is corrosive to aluminium, zinc, lead, brass and tin. A product of reaction with metals is hydrogen (i.e. a highly flammable gas). Care is therefore required when maintaining pipework etc containing caustic soda as hydrogen flash fires can occur, e.g. hot work in cutting through pipes.

It reacts vigorously with acids. When mixed with ammonium salts, ammonia gas will be evolved. Caustic soda will react exothermically with water. It will also attack many glasses and ceramic materials. When mixed with some organic matter (e.g. milk residues), carbon monoxide can be evolved.

Caustic soda will absorb carbon dioxide to form solid deposits, e.g. white solid deposits from small valve leaks.

Depending on the production method, caustic soda may contain trace impurities such as mercury. Mercury bioaccumulates and can cause nervous system damage. Therefore, any sludge should be considered for the presence of mercury.

When spilt, caustic soda is very slippery. At low ambient temperatures, higher strength caustic soda can freeze.

All carbon steel tanks containing caustic soda above $40^{o}C$ should be stress relieved to minimise corrosion rates.

Fatty Matter:

This is a by-product of the process and is essentially a pumpable mixture of soap derivatives. The biodiesel production process will generate approximately 990 tonnes per year of fatty matter. It is anticipated that this fatty matter has value as a potential fuel source for various industrial heating processes.

Glycerine:

Glycerine is 1,2,3-Propanetriol, which is a stable material under normal operating procedures. It is not classified as dangerous and is biodegradable. It has a melting point of approximately $18^{o}C$. Above $22^{o}C$, it is soluble in water.

Glycerine's boiling point is above $288^{o}C$ and its flash point is above $199^{o}C$. Therefore, it is difficult to ignite. Its autoignition temperature is approximately $400^{o}C$. If it does ignite, toxic products of combustion can result, e.g. acrolein.

Biodiesel:

Biodiesel is a generic name for fuels produced by the transesterification of a vegetable oil. This process produces a diesel fuel with similar properties to diesel obtained from crude oil fractionation but with a lower viscosity.

The flash point for biodiesel is above $100^{o}C$ (typically $160^{o}C$) and its boiling point is typically above $205^{o}C$. Products of combustion, if ignited, are carbon dioxide, carbon monoxide and water.

Normally, biodiesel will contain no hazardous materials such as benzene (which is present in petroleum based diesel).

It is insoluble in water and a stable material.

Methanol:

Methanol is a flammable liquid with a flash point of around $12^{o}C$, a boiling point of $64^{o}C$ and an autoignition temperature of $464^{o}C$. Methanol vapour is flammable in the range of 5.5 to 37% in air and a saturated air-methanol mixture is flammable over a wide temperature range. As methanol is handled above its flashpoint (i.e. at ambient temperature), any loss of containment could result in formation of a flammable mixture.

Methanol vapour is heavier than air and vapours may therefore concentrate in drains or hollows.

A methanol flame is practically invisible in daylight, which complicates fire fighting. The methanol flame does not produce soot, although formaldehyde and carbon monoxide form during combustion when insufficient oxygen is available for complete combustion. Water is unsuitable as an extinguishing agent for fires involving large amounts of methanol because it is miscible with the compound (mixtures containing small amounts of methanol also burn). Protein based alcohol resistant foams are suitable.

Whilst explosions involving methanol vapours can and have occurred, these have been in processing equipment or confined spaces, for example the vapour space in tanks.

Methanol liquid has no known self decomposition type reactions that could cause explosions. It reacts with oxidising agents, for example chlorine or chlorine dioxide.

Methanol is also toxic. It is a scheduled poison and is toxic through inhalation, ingestion and dermal absorption. It has a TWA of 200 ppm and an STEL of 250 ppm. It is not classified as a carcinogen.

Methanol is also mildly toxic to aquatic life.

Methanol is aggressive towards copper, zinc, magnesium, tin, lead and certain grades of aluminium. For the latter, compatibility problems exist only when the methanol is 100% pure.

Sodium Methylate:

Sodium methylate used at the biodiesel plants will be a 30% solution, i.e. 30% will be sodium methoxide and 70% will be methanol. Therefore, this material exhibits similar properties to methanol (as detailed above). It is a clear liquid, which is partly miscible in water.

Sodium methylate is toxic to personnel if swallowed, if in contact with skin or if inhaled.

It is a subsidiary risk DG Class 8 as the pH is approximately 13 (i.e. alkaline).

Sodium methylate boils at approximately 92^{o}C, has a flash point of 32^{o}C and an autoignition temperature of 445^{o}C. The explosive limits are 5.5 to 44 vol%.

When in contact with various metals, e.g. aluminium, magnesium and zinc, hydrogen can be evolved (i.e. a flammable gas).

7.1.3 Hazardous Event Identification Word Diagram

In accordance with the requirements of *Guidelines for Hazard Analysis*, it is necessary to identify hazardous events which could be caused by the proposed operations. As recommended in HIPAP 6, the PHA focuses on “atypical and abnormal events and conditions. It is not intended to apply to continuous or normal operating emissions to air or water”. The latter are discussed elsewhere in the EA.

In keeping with the principles of PHAs, credible, hazardous events with the potential for off-site effects have been identified. That is, "slips, trips and falls" type events are not included nor are non credible situations such as an aircraft crash occurring at the same time as an earthquake.

The credible, significant incidents identified are summarised in the Hazard Identification Word Diagram (Table 7.1). The diagram presents the causes and consequences of the events, together with major preventative and protective features that are included as part of the design. For presentation purposes, the table is divided into four processing areas, i.e.:

- Biodiesel plants;
- Terminal operations – tanks (including Site B – Tank 0625), road tanker loading and terminal piping;
- Pipeline Corridor; and
- The Bulk Liquids Berth.

Table 7.1 Hazard Identification Word Diagram

Event ID No.	Hazardous Event	Causes	Possible Consequences	Proposed Prevention and Mitigation Control Measures
Biodiesel Plants				
1	Fires from spills	Spills of methanol and sodium methylate are more likely to be involved in fires rather than biodiesel, glycerine and vegetable oils Spills can be the result of mechanical failures, e.g. corrosion of pipes or vessels, or operational errors due to human factors or control problems (e.g. faulty high level protection) This event covers all credible causes for losses of containment within the plant bunded areas. The consequences of these releases, irrespective of the causes, are collectively assessed later in this report	Spills are contained within the bunded areas around the biodiesel plants. Fire size will depend on spill size and the time delay to ignition. Toxic products of combustion will be evolved from fires.	◗ Plant design specifications, e.g. stainless steel for piping and minimum flanges ◗ Equipment inspection and maintenance procedures ◗ Operating procedures and training ◗ Commissioning checks on the adequacy of the control system ◗ Control of ignition sources ◗ Fire protection systems, e.g. hydrants, foam, monitors and fire extinguishers, as currently available on the site
2	Overpressure of the methanol column	Loss of condenser, e.g. cooling water failure, or failure of the steam pressure control	Condensing in the vent condenser prior to venting to atmosphere via the exhaust air scrubber	◗ High pressure trip on the steam flow to the reboiler ◗ Flame arrestor installed on the exhaust air scrubber discharge to prevent flashback

Event ID No.	Hazardous Event	Causes	Possible Consequences	Proposed Prevention and Mitigation Control Measures
3	Pump fires	Pumps being deadheaded or seal failures	Localised fire at pump	◗ Pump deadhead instrumented protection and recycle lines ◗ Preventative maintenance for pumps ◗ Fire protection systems, e.g. hydrants, foam, monitors and fire extinguishers, as currently available on the site
4	Decomposition of sodium methylate	Mixing of sodium methylate with water to give caustic soda and methanol	Process upset and poor reaction	◗ Controls to prevent water ingress such as nitrogen padded vessels and control on the use of hoses
5	Explosion involving dried sodium methylate	Spills of sodium methylate drying and hence an explosion can result	The dried substance may spontaneously ignite on contact with air. Reacts violently with water producing flammable methanol and corrosive sodium hydroxide. Attacks many metals forming hydrogen. Explosions can result in damage to plant and equipment in the spill area	◗ Containment of sodium methylate within the process piping and equipment ◗ Spill response procedures
6	Operator exposure to sodium methylate	Losses of containment of sodium methylate	Sodium methylate can kill nerve cells before the pain is detected	◗ Containment of sodium methylate within the process piping and equipment ◗ Operator training and knowledge ◗ Personnel protective equipment (PPE)
7	Exhaust air washing column inefficient	Loss of reflux water flow, loss of cooling water to reflux cooler	Air / methanol stream to atmosphere	◗ Flow measurement, water pump running status ◗ Flame arrestor installed on the exhaust air scrubber discharge to prevent flashback

Event ID No.	Hazardous Event	Causes	Possible Consequences	Proposed Prevention and Mitigation Control Measures
8	Spills of hydrochloric acid or caustic soda	Tank overflows, losses from piping systems or vessels failures	Potential for injury to operators or damage to the environment	◗ Containment of sodium methylate within the process piping and equipment ◗ High level protection in vessels ◗ Process area bunded ◗ PPE for the operators
9	Overpressure in the vent system	Vent path blocked, e.g. shut valve or high level in vessel, e.g. the collecting vessel	Piping system failure resulting in a loss of containment. Fire, if ignited	◗ Operating procedures for valves positions ◗ High level protection in tanks ◗ Process area bunded ◗ Control of ignition sources ◗ Spill response procedures ◗ Fire protection systems, e.g. hydrants, foam, monitors and fire extinguishers, as currently available on the site
10	Corrosion of piping due to hydrochloric acid	Hydrochloric acid entering piping systems not designed for acid service due to pumps stopping and reverse flow	Corrosion of piping systems and losses of containment	◗ Automatic isolation valves installed at the appropriate piping tees ◗ Non return valves ◗ Process flows monitored and alarmed
11	Operators exposed to high residue temperature	Manual discharge of waste product into drums	Potential for burn injuries	◗ Operator training and procedures ◗ PPE for the operators
12	Overpressure in evaporators	Loss of steam control	Evaporation of evaporators contents and overpressure	◗ Pressure relief valves ◗ Steam flow and pressure measurement / alarms

Event ID No.	Hazardous Event	Causes	Possible Consequences	Proposed Prevention and Mitigation Control Measures
13	Corrosion (tank farm)	Process upset in the fatty matter separator	Glycerine ingress to the fatty matter collecting tower. Potential for corrosion if discharged to the tank farm	◗ Separator design ◗ Manual operation ◗ Sight glass provided
14	Cooling tower fire	Cooling tower shutdown and dries out. Source of ignition, e.g. maintenance work	Destruction of the tower	◗ Control of ignition sources ◗ Fire protection systems, e.g. hydrants, foam, monitors and fire extinguishers, as currently available on the site
15	Loss of containment of cooling tower dosing chemicals	Spills and leaks	Potential for injury to operators and to damage the environment	◗ Chemical dosing systems are small in size and will be bunded
16	Legionella bacteria in the cooling tower	Warm water temperature and failure of the chemical dosing program	Sickness to people who come into contact with the water / tower	◗ Chemical dosing programme to be implemented and tests are to be regularly performed
17	Accidents, vehicle damage resulting in spillage This event applies to all plant areas	Reckless driving, illegal driving, impact with other mobile equipment e.g. forklifts, inadequate training, inattention/distraction	Injuries to people, loss of containment of materials	◗ Site speed limit ◗ Physical barriers, e.g. bunding and bollards ◗ Driver training ◗ Pedestrian walkways identified ◗ Drug and alcohol policy
18	Breach of security / sabotage This event applies to all plant areas	Disgruntled employee or intruder	Possible release of product with consequences as per 1. above	◗ Security measures include fencing, CCTV, intruder beams, security patrols, operator / driver vigilance ◗ Process SCADA computer alarms monitored

Event ID No.	Hazardous Event	Causes	Possible Consequences	Proposed Prevention and Mitigation Control Measures
19	Contaminated fire water runoff This event applies to all plant areas	Fire which requires the application of fire water	Contaminated fire water runoff leading to environmental impact	◗ Storage tanks and process plant bunded ◗ Emergency containment within waste water systems and other bunded areas
20	Aircraft crash This event applies to all plant areas	Pilot error Bad weather Plane fault	Propagation to tank / bund / processing plants fires Impact to people (radiant heat and/or exposure to products), property and the environment (products of combustion)	◗ As per aviation standards
21	Strong winds, earthquakes This event applies to all plant areas	Strong winds cause equipment damage etc	Loss of containment leading to a fire if ignited (as above)	◗ The tanks are designed API 650 / AS 1692 / AS 1170 to resist the combined effects on internal pressure due to contents, weight of platforms, ladders, live loads, wind loads, earthquake forces and hydrostatic test loads ◗ Operations stopped in adverse weather conditions

Event ID No.	Hazardous Event	Causes	Possible Consequences	Proposed Prevention and Mitigation Control Measures
Terminal Operations – Tanks (including Site B – Tank 0625), Road Tanker Loading and Terminal Piping				
22	Major mechanical failure of tank	Metal fatigue Faulty fabrication Corrosion of tank base / weld Tank explosion due to lightning strike / breach of hazardous area ignition source controls Adjacent tank on fire Blocked vent	Large spillage of flammable, combustible or corrosive materials in bund. Fire if flammable or combustible materials ignited For historical tank explosions, some tanks have rocketed away from the foundations Impact to people (radiant heat and/or exposure to products), property and the environment (products of combustion and corrosive materials)	◗ Tanks designed to API 650 ◗ Regular maintenance and inspection procedures ◗ Tank and site fire protection facilities available ◗ Explosions only occur when ullage vapour is between LEL and UEL. At steady state conditions, the combustible materials tank ullage is below LEL. Design conforms to AS1940 requirements. Methanol and biodiesel tanks are nitrogen padded (biodiesel is padded for product quality reasons) ◗ Tanks bunded ◗ PPE and safety shower / eyewash

Event ID No.	Hazardous Event	Causes	Possible Consequences	Proposed Prevention and Mitigation Control Measures
23	Pipe failure (within the Terminal)	Corrosion Impact Maintenance work Pressure surge	Major spillage of flammable, combustible or corrosive material. Fire if flammable or combustible materials ignited. Impact to people (radiant heat and/or exposure to products), property and the environment (products of combustion and corrosive materials)	◗ Regular maintenance and inspection procedures ◗ Emergency isolation valves ◗ Fire fighting system (including foam) ◗ Pipes in bunded areas ◗ Pipelines surge study ◗ The piping is designed to ASME 31.3 / AS 4041 to resist the combined effects on internal pressure due to contents, wind loads, earthquake forces and hydrostatic test loads ◗ PPE and safety shower / eyewash
24	Spillage of flammable, combustible or corrosive material to the bunds	Tank overfilled during transfer Tank drain valve left open or tank sampling valve left open, e.g. human error Loss of containment at pigging stations Leak in the Main Hose Exchange during a transfer	Spill into bund Bund fire if flammable or combustible material ignited Possible tank fire and boil over Impact to people (radiant heat and/or exposure to products), property and the environment (products of combustion and corrosive materials)	◗ Fire fighting as above ◗ Tank level device(s) installed as appropriate ◗ Emergency shutdown system ◗ Operating procedures for manual tank transfers ◗ For Site B, tank sample and dewatering valves are double valved with last valve spring-closed (deadman). Other drain valves etc are blanked off or in the manifold area have kamvalok dry-breaks ◗ Main Hose Exchange area at Site A is existing and there are established procedures for connections ◗ PPE and safety shower / eyewash

Event ID No.	Hazardous Event	Causes	Possible Consequences	Proposed Prevention and Mitigation Control Measures
25	Leak during road tanker transfer	Failure of flexible connection / hose Leak from valves or fittings Road tanker overfill	Leak of material in road tanker bay Fire if flammable or combustible materials ignited Impact to people (radiant heat and/or exposure to products), property and the environment (products of combustion and corrosive materials)	◗ For Site B, high level of surveillance and use of leak detection & shutdown systems (e.g. Scully overfill protection) ◗ For Site A, two man operation ◗ Drivers are well trained so as to minimise chance of operator error & ensure quick response to leaks ◗ For Site B, road tanker bays to be fitted with automatic foam deluge system ◗ For Site A, manual water deluge system with foam capabilities ◗ Ignition sources controlled ◗ PPE and safety shower / eyewash
26	Road tanker drive-away incident	Failure of procedures and hardware interlocks	Leak of material in road tanker bay Fire if flammable or combustible materials ignited Impact to people (radiant heat and/or exposure to products), property and the environment (products of combustion and corrosive materials)	◗ Driver training ◗ Driver not in cab during filling ◗ For Site A, Vopak operator controls the loading and supervises the driver ◗ For Site B, brakes interlocked prior to connection and until disconnection ◗ Road tanker bays to be fitted with deluge system (as above) ◗ For Site B, drain to the Oily Water Tank which is level alarmed ◗ PPE and safety shower / eyewash

Event ID No.	Hazardous Event	Causes	Possible Consequences	Proposed Prevention and Mitigation Control Measures
27	Leak at product pumps	Pump seal, shaft or casing failures	Leak of material Fire if flammable or combustible materials ignited Impact to people (radiant heat and/or exposure to products), property and the environment (products of combustion and corrosive materials)	◗ Condition monitoring and preventative maintenance of pumps ◗ Pumps are bunded ◗ Fire fighting as above ◗ For Site B, drain to the Oily Water Tank which is level alarmed ◗ For Site A, Vopak operator controls the loading and is present in the pump area ◗ PPE and safety shower / eyewash
28	Road accident (off-site)	Bad road or traffic conditions	Most likely outcome is no loss of load Leak of flammable or combustible material may occur, leading to fire Impact to people (radiant heat and/or exposure to products), property and the environment (products of combustion and corrosive materials)	◗ Design of road tankers to survive accident without a loss of containment - pipes and running gear designed to shear off ◗ Driver training and choice of routes to reduce accident potential
29	Methanol in the vegetable oil tanks	Contamination from filling, e.g. residual methanol left in piping	Methanol will layer on top of the palm oil and therefore a risk of ignition is present. Explosion / fire	◗ Pipeline cleaning procedures as currently used at Site A ◗ Inspection and testing of tank contents
30	Overheating of vegetable oil tanks or pharmaceutical glycerine	Failure of the hot water system to internal tank heaters	Heating of the vegetable oils or pharmaceutical glycerine, potential to approach flash points	◗ The hot water temperature to the internal tank heaters is controlled to keep the vegetable oils / pharmaceutical glycerine below their flash points ◗ Temperature measurement and alarms for the vegetable oil tanks ◗ Control of ignition sources

Event ID No.	Hazardous Event	Causes	Possible Consequences	Proposed Prevention and Mitigation Control Measures
31	Mixing of hydrochloric acid with caustic soda or other non compatible material	Filling the wrong tank, mixing of spills	Reaction, heat and vapours evolved with local impact only	◗ Design in accordance with applicable Standard AS 3780, physical separation of products, separate bunds, bunds dedicated with manual drainage valves, adequate material selection, PPE, training, monitoring programs, procedure for managing change, spill management procedures, safety shower / eyewash stations
Pipeline Corridor				
32	Pipeline failure external to the terminal, i.e. in the pipeline corridor	Corrosion Impact Maintenance work Pressure surge Vandalism / third party activity	Spillage of flammable, combustible or corrosive material. Fire if flammable or combustible material ignited. Impact to people (radiant heat and/or exposure to products), property and the environment (products of combustion)	◗ The existing pipes in the pipeline corridor at Port Botany are under the control of Sydney Ports Corporation procedures ◗ Regular maintenance and inspection procedures ◗ Emergency isolation valves ◗ Pipelines surge study ◗ Routine inspections during transfers
Bulk Liquids Berth				
33	There is a range of shipping related hazardous events at a berth. These include: grounding, striking (a ship moored at the berth is struck by a passing ship), collision between two ships, impact with the wharf (historically the most common), ship fire and explosions, foundering / capsize, structural failure, aircraft strike, sabotage, terrorism, natural events and overfills. The accident outcomes for the above causes for a loss of containment of products could be a fire (pool fire) and/or environmental effect, including fish and bird kill. These events can also lead to injuries due to radiant heat impact and/or equipment damage. Explosion and/or fires will also release products of combustion such as carbon dioxide, carbon monoxide, water vapour, NOx, soot etc. These potential hazardous events can occur now at the BLB or immediate area for the materials either transferred from a ship (i.e. methanol and vegetable oils) or loaded to a ship (e.g. biodiesel). There are no new potential hazardous events at the BLB as a result of the proposed biodiesel plants.			

Event ID No.	Hazardous Event	Causes	Possible Consequences	Proposed Prevention and Mitigation Control Measures
34	Losses of containment can occur from the transfer system while a ship is being loaded / unloaded	Causes include water hammer from, for example, fast closing of valves, movement of the ship away from the wharf, line failures due to mechanical impact from a vehicle, corrosion, mechanical defect (e.g. poor weld), flange leaks and thermal expansion of trapped liquid causing overpressure, hose or hose coupling failures, and human error, e.g. leaving drain valves open	Loss of containment of flammable or combustible material. Fire if ignited. Environmental impact (products of combustion and water pollution). Injury to personnel. Damage to berth and/or ship	As per existing, the berth is controlled by Sydney Ports Corporation. Hoses are inspected and routinely tested. Any automated valves are slow closing. Vehicle movement at the berth is restricted. The berth requires access via a security gate. Procedures exist to purge lines with nitrogen to prevent liquid being trapped and causing thermal overpressure. Procedures and training. The berth transfer area has a spills drip tray and a larger containment tank underneath

7.1.4 Risk Analysis

Tank and Bund Fires

The credible, potential fire hazardous events associated with the proposed biodiesel plants and storages are pool fires due to losses of containment being ignited.

Whilst natural gas is to be used for a new boiler, it is already on the site, the line will be buried and is supplied by the standard natural gas mains system. Therefore, the risk associated with the new boiler is similar to the existing and is not analysed further within this study.

The potential fire events associated with the new plants and reused tanks / bunds are detailed in Table 7.2. This data is used in the fire modelling.

Table 7.2 Fire Scenarios Calculation Data

Item No.	Item Description	Width m	Length m	Eq. D m	Burndown Rate mm/min	Liquid Density kg/m^3	SEP kW/m^2
1	Tanks 4, 5 and 6 bund – biodiesel (this also applies to the bund holding tanks 3 and 19)	60	55	57	4	840	35
2	Tanks 62 to 69 bund – biodiesel	45	30	36	4	840	35
3	Tanks 55 to 61 bund – biodiesel	40	60	48	4	840	35
4	Tanks 201 to 203 bund – vegetable oil	69	33	45	4	880	35
5	Biodiesel plant bunded area – small spill of approximately 6 m diameter	-	-	6	4	840	60
6	Biodiesel plant bunded area – moderate spill of approximately 12 m diameter	-	-	12	4	840	35

7	Biodiesel plant bunded area – spill covering entire plant bunded area	15	40	22	4	840	35
8	Tank 0625 (Site B) bund - biodiesel	22	34	27	4	840	35
9	Tank 6 top fire – 11.7 m diameter tank and 12.2 m high biodiesel (this conservatively applies to tanks 3, 4 and 5)	-	-	11.7	4	840	35
10	Tanks 63 to 68 top fire – 6.7 m diameter tank and 12 m high biodiesel	-	-	6.7	4	840	60
11	Tanks 62 and 69 top fire – 6.7 m diameter tank and 12 m high methanol	-	-	6.7	3	790	35
12	Tanks 55 to 58 top fire – 7.6 m diameter tank and 16.4 m high biodiesel and palm oil	-	-	7.6	4	840	60
13	Tanks 59 to 61 top fire – 12.5 m diameter tank and 16.5 m high methanol	-	-	12.5	3	790	25
14	Tanks 201 to 203 top fire – 18.7 m diameter tank and 18 m high vegetable oil	-	-	18.7	4	880	35

15	Tank 0625 (Site B) top fire - 15 m diameter tank and 18 m high biodiesel	-	-	15	4	840	35
16	Tanks 75 to 79 bund – vegetable oil	33	43	34.6	4	880	35
17	Tanks 75 and 76 top fire – 7.5 m diameter tank and 18 m high vegetable oil	-	-	7.5	4	880	35
18	Tank 77 top fire – 9.9 m diameter tank and 18 m high vegetable oil	-	-	9.9	4	880	35
19	Tanks 78 and 79 top fire – 15.5 m diameter tank and 18 m high vegetable oil	-	-	15.5	4	880	35

Given the large distance to the nearest residential area (approximately 1 km to the east) and the estimated radiant heat levels from the potential fire events, there is no risk of injury or fatality in residential areas. Correspondingly, the risk criteria for fatality and injury in residential areas are satisfied for radiant heat from fires.

Whilst some of the estimated levels of radiant heat at neighbouring industrial areas theoretically can lead to fatality, it is more probable that should a bund fire occur, people within the pipeline corridor (rare event) or in the nearest corner of the Origin Energy site will be either evacuated as per the established Port Botany emergency response procedures or escape before a fully developed bund fire occurs. Therefore, it is unlikely that fatality at these industrial neighbouring areas will result from these events.

Products of Combustion

There is a potential risk to those attending a fire emergency (and possibly off-site) of effects from toxic products of combustion, e.g. carbon oxides and smoke, as well as vaporised product (i.e. not combusted).

Impact from toxic products of combustion will only be significant, generally, local to the fire. Hot products of combustion rising from a fire typically have a temperature in the range 800-1200^{o}C and a density a quarter that of air (Lees: 1996).

Hence, a buoyant plume is formed (as seen when smoke is emitted from a chimney) and the combustion products rise and are dispersed as per the prevailing wind / weather conditions. Several runs of the Brigg's Plume Model for various combinations of weather / wind conditions and fire temperatures show that the plume rises from an 18.7 m diameter tank fire to at least 110 metres and then disperses via passive dispersion in the down wind direction. Momentum effects continue to cause the plume to rise whilst it is dispersing. The results are shown in Table 7.3. The results also show that plume rise is insensitive to fire temperature variations of 800^{o}C +/- 100^{o}C (not shown). An efflux velocity of 5 m/s for the products of combustion is taken for the fire event.

Table 7.3 Fire Plume Rise Modelling

Wind (m/s) / Weather	Initial Height of Plume, m
5 D	110
3 E	190
2 F	280

Therefore, unless a temperature inversion exists where reverse atmospheric currents can occur (i.e. air slumps to the ground as opposed to air eddies that rise), no effect at ground level is expected. Note that dispersion models best account for temperature inversions by using F class stability (i.e. typically when the adiabatic lapse rate is positive). The models, however, do not include the provision for air slumping to ground.

Tank Explosions

An internal explosion is more credible in either the methanol or sodium methylate tanks due a failure of the nitrogen padding system, oxygen being introduced to the vapour space and a source of ignition is present.

Internal explosions have the potential to cause harm through overpressures and possibly missiles. TNO (*Methods for the Determination of Possible Damage* (*The Green Book*), 1992) has developed a methodology for estimating overpressures from internal explosions and it is used as follows.

For these scenarios, the large tanks are chosen to be two thirds full, i.e. 13,600m^{3} for tanks 59 to 61 and 278 m^{3} for tanks 62 and 69. This is due to the conservative nature of the model in estimating the resultant overpressures due to ignition of the vapour in the tank's ullage.

From the explosion modelling, the distances to specified overpressure levels for two internal tank explosion scenarios are shown in Table 7.4.

The effects from explosion overpressures are summarised in Table 7.5. With regard to risk in residential and other sensitive areas no unacceptable risks (fatality or injury) exist. This is due to the distance between the site and these areas of interest, i.e. approximately 1 km.

Table 7.4 Distance to Specified Levels of Explosion Overpressure (from tank centres) for Potential Internal Tank Explosion Scenarios

	Distance to Specified Overpressure, m (from the centre of the Thermal Oxidiser)					Distance to Nearest Site Boundary, m
	70 kPa	35 kPa	21 kPa	14 kPa	7 kPa	
Tanks 59 to 61	38	59	81	109	181	45
Tanks 62 and 69	11	17	23	31	51	17

Table 7.5 Effects of Explosion Overpressure

Overpressure, kPa	Physical Effect
3.5	90% glass breakage No fatality, very low probability of injury
7	Damage to internal partitions and joinery 10% probability of injury, no fatality
14	Houses uninhabitable and badly cracked
21	Reinforced structures distort, storage tanks fail 20% chance of fatality to person in building
35	Houses uninhabitable, rail wagons & plant items overturned. Threshold of eardrum damage, 50% chance of fatality for a person in a building, 15% in the open
70	Complete demolition of houses Threshold of lung damage, 100% chance of fatality for a person in a building or in the open

Overpressures from the potential internal tank explosions for five tanks (methanol and sodium methylate) have the potential to cause propagation at neighbouring (i.e. above 14kPa). However, the combined likelihood for five tanks is approximated to be 33 x10^{-6} per year. This is below the Department of Urban Affairs & Planning (NSW) *Hazardous Industry Planning Advisory Paper No 4 – Risk Criteria for Land Use Safety Planning* criterion and is therefore considered acceptable. As the combined likelihood for five internal tank explosions is also below 50 pmpy, then the risk of fatality due to overpressures at neighbouring industrial areas is also acceptable.

Vapour Cloud Explosions and Flash Fires

The possibility of vapour cloud explosions and flash fires have been included in this assessment. These events are not deemed credible as:

- The process involves flammable and combustible liquids;
- The process is operated at atmospheric pressure or vacuum conditions, therefore, releases are not likely to create flashing liquid / vapours;
- The process temperatures are generally close to ambient except where vacuum conditions exist (again, releases are not likely to create flashing liquid / vapours); and
- The plant equipment and piping sizing is relatively small (e.g. 50 mm piping is common throughout the plant). Therefore, relatively small amounts of inventory exist within the equipment and piping. The probability of vapour cloud ignition only becomes significant above 5 tonnes of vaporised product.

Therefore, vapour cloud explosions and flash fires have not been analysed in this assessment.

Pipeline Corridor

From the review of historical incidents associated with pipelines, the main cause for losses of containment is third party activities (corrosion and mechanical failures are the other main contributors). Third party activities typically account for 20 to 60% of recorded losses of containment for piping systems outside of site boundaries.

Work by De La Mare and Andersen (1981) concluded that the failure rates of pipelines appear similar even where the fluid handled and the environment are different; that the failure rates of oil pipelines depend on the diameter (inversely proportional), that about half of the failures can be attributed to external factors; and that pipelines tend to exhibit wearout failure. The consistency of the data presented above supports these conclusions.

Losses of containment for pipelines external to a site boundary can be assumed, however, for the pipelines at Port Botany, the pipes run in well-defined corridors and the transfer operations are closely supervised. Therefore, an approximate reduction in the loss of containment likelihood of at least one order of magnitude is expected for these lines.

The new pipeline of interest will be used to transport biodiesel, i.e. a combustible liquid. The other pipelines used for the two biodiesel plants are existing, they already convey both flammable and combustible materials and hence the risk associated with these lines does not significantly change.

Given an ignition probability of approximately 0.1% for biodiesel, then the risk of pipeline fires in the Port Botany pipeline corridor associated with the new line is acceptably low.

Bulk Liquids Berth

Existing lines to and from the Sydney Ports Corporation Bulk Liquids Berth and Vopak Site A will also be utilised for import of feedstock (methanol and vegetable oils) and export of biodiesel.

As both feedstocks and products are dedicated materials to the biodiesel plants, there will be a net increase in cross-berth movements. However, the biodiesel used to blend with mineral diesel will result in an equivalent reduction of mineral diesel oil import.

Currently, vegetable oils, methanol and diesel are transferred from ship-to-shore at the BLB. Therefore, the consequences of a spill at the Bulk Liquids Berth do not change as a result of this project.

Overall, the total feedstock increase (by ship-to-shore transfers) is estimated at 265,000 per year. This amount is off-set by a reduction of diesel imports of approximately 240,000 tonnes per year. Correspondingly, there is a small net increase of 25,000 tonnes per year transferred at the Bulk Liquids Berth.

Given this relatively small increase in tonnage transferred at the Bulk Liquids Berth and that no new materials (and hence consequential impacts) are involved then there is correspondingly only minor changes to risk here. The fire protection and emergency response are currently designed for these types of materials and hence the existing systems will remain appropriate.

Aircraft Impact

The site is an established site, which does lie under one of the main approaches to Sydney airport. However, as the facility will lie on the plot formerly occupied by the LPG JORTL facility, the incremental risk due to an aircraft crash is unlikely to be increased.

The outcomes of any aircraft crash on this site will be dominated by larger hazardous events in other processing and storage areas as well as the ensuing fire from the plane wreckage. This is an existing risk for the site and the proposed changes to the site have negligible effect. As shown in other risk assessments for the Port Botany area (Lake, I. & Novo, R.: 1997), the likelihood of this type of event is acceptably low.

These events were reviewed and none of them were found to pose any significant risk to the container storage area given the proposed safeguards.

Road Transport

There will be less than one extra vehicle movement per day for the two plants (a small increase). On further analysis, the change in the products stored and transported from Site A will result in a reduction in road tankers and an increase in the use of Isocontainers (the latter being of higher integrity design).

The bulk of the road transport is associated with glycerine, a non Dangerous Good. Therefore, given the net small increase in road vehicle movements (the bulk of which is glycerine) and the increased use of higher integrity Isocontainers, there will be minimal change to transport risk associated with the site.

Cumulative Risk

Cumulative risk for the Port Botany area was considered by the Department of Urban Affairs and Planning (now DIPNR) in 1996 (*Port Botany Land Use Safety Study, Overview Report*).

As shown in this PHA, the proposed changes to the Vopak site will have negligible impact on the cumulative risk results for the Port Botany area. The recommendations from this 1996 study have been reviewed to determine if the proposed changes are consistent with the intent of these recommendations. In summary, all current proposed changes to the Vopak site have been found to be consistent with the intent of the recommendations and do not contribute to unacceptable cumulative risk in the Port Botany area.

With respect to the impact on cumulative off-site risk from Site A, the results show that there is negligible off-site risk from the proposed biodiesel plants. In particular, the site cumulative risk is expected to have decreased when compared to the risk levels imposed during the period when JORTL was operational.

On-site Propagation of Incidents

The risk of off-site propagation due to fires and internal tank explosions was discussed above and found to be acceptable. Propagation of an incident could also occur within the Vopak site. The event likelihoods remain the same and, as shown previously, are acceptably low.

Propagation due to radiant heat from a potential fire to metallic structures can occur if the impacted area is subjected to 23 kW/m^2 or higher without any emergency response action, e.g. the application of cooling water. Propagation to cause damage to nearby metallic structures is predicted to occur for scenarios:

- 1 (tanks 4, 5 and 6 bund – biodiesel);
- 2 (tanks 62 to 69 bund – biodiesel);
- 3 (tanks 55 to 61 bund – biodiesel);
- 10 (tank top fires 63 to 68 – biodiesel);
- 12 (tank top fires 55 to 58 – biodiesel and palm oil);
- 14 (tank top fires 201 to 203 – vegetable oil); and
- 16 (tanks 75 to 79 bund – vegetable oil).

Whilst the event likelihoods are acceptably low, the following control measures are employed at the site to either prevent or mitigate the risk of propagation.

Prevention Control Measures

- Equipment inspection and maintenance procedures;
- Operating procedures, e.g. manual tank transfers, and training;
- Commissioning checks on the adequacy of the control system;
- Control of ignition sources, e.g. no smoking on site and hot work permit system;

- Site speed limit (reduces risk of impact events);
- Physical barriers, e.g. bunding and bollards;
- Security measures include fencing, CCTV, intruder beams, security patrols, operator / driver vigilance;
- Process SCADA computer alarms monitored;
- The tanks are designed API 650 / AS 1692 / AS 1170 to resist the combined effects on internal pressure due to contents, weight of platforms, ladders, live loads, wind loads, earthquake forces and hydrostatic test loads;
- Operations stopped in adverse weather conditions;
- Explosions only occur when ullage vapour is between the Lower Explosion Limit (LEL) and Upper Explosive Limit (UEL). At steady state conditions, the combustible materials tank ullage is below LEL. Design conforms to AS1940 requirements. Methanol and biodiesel tanks are nitrogen padded (biodiesel is padded for product quality reasons);
- Tank level device(s) installed as appropriate;
- Instrumentation and electrical systems designed to AS2430 for hazardous areas; and
- Tanks are earthed.

Mitigation Control Measures

- Site emergency response plan;
- Fire protection systems, e.g. hydrants, foam, monitors, tank spray systems and fire extinguishers, as currently available on the site;
- Spill response procedures; and
- Emergency isolation valves and shutdown system.

Incident propagation can also occur due to overpressures or missiles from a potential internal tank explosion (i.e. the methanol or sodium methylate tanks 59 to 62 and 69). For overpressures, propagation is considered possible if the impacted area is subjected to 21 kPa or higher. Under worst case conditions, propagation is possible for all methanol and sodium methylate tanks.

Whilst the event likelihoods are acceptably low, the above fire preventative control measures are generally applicable at the site to prevent the risk of propagation. Mitigation control measures are also as shown above but others may be required, e.g. medical response, depending on the consequences of the potential explosions (as detailed in the existing emergency response plan).

Risk to the Biophysical Environment

The main concern for risk to the biophysical environment is generally with effects on whole systems or populations. For the proposed changes at Port Botany, it is suitably located away from residential areas. However, due to the nature of the activities, there are operations, e.g. shipping, where losses of containment can adversely impact the marine environment. Major fires can also effect the environment (combustion products). Spills within the Terminal are contained within bunding and the effluent system.

Whereas any adverse effect on the environment is obviously undesirable, the results of this study show that the risk of losses of containment is acceptable. No incident scenarios were identified where whole systems or populations could be affected by a release to the atmosphere, waterways or soil.

For completeness, risks to the biophysical environment due to loss of containment events are summarised below.

Liquid Wastes

There are four main liquid wastes from the proposed biodiesel plants. These are as follows:

- Waste Water:

This will be disposed of to sewer via a Trade Waste Agreement with Sydney Water. The Trade Waste Agreement will apply Sydney Water's latest Acceptance Criteria and the total volume for the two plants is 65,200 tonnes per year.

- Fatty Matter

This is a by-product of the process and is essentially a pumpable mixture of soap derivatives. The biodiesel production process will generate approximately 990 tonnes per year of fatty matter. It is anticipated that this fatty matter has value as a potential fuel source for various industrial heating processes or used in animal feed pellets.

- Glycerine Type II (Industrial Glycerine)

Another by-product of the process is Glycerine Type II or industrial grade glycerine that has minor impurities. Approximately 1,130 tonnes per year of this material will be generated. This material also has potential for a fuel source for various industrial heating processes or used in animal feed pellets.

- Glycerine Residue

The final by-product is a residue of glycerine, fats, oils, polyols, sodium chloride and water. Approximately 2,990 tonnes per year of this material will be generated. This material also has value and can be used in animal feed pellets.

Products Stored in Bunded Areas

Spillages of products from the tanks and adjacent piping are contained in the bunds. The bunded areas are sized to contain the entire contents of the single tank so that a total loss of contents does not spill over the bund, plus an allowance for rainwater, fire water, hosing down etc. The two biodiesel plants are also similarly bunded.

Non compatible materials, e.g. hydrochloric acid and caustic, are separately bunded.

Bund water will be analysed prior to determining further treatment options, e.g. trade waste, treatment in the existing dissolved flotation plant or to be recovered into existing waste storage tanks for subsequent removal by licensed waste contractors.

Drainage Systems and Site Grades

These have been designed so that in the event of fire, fire water run off containing any materials is held on site, away from plant equipment and buildings. All open areas are paved.

Small spills will be contained using the existing spill response kits, which include absorbent material.

Other spills can occur as a result of road tanker operations, failures of the pipes in the pipeline corridor and at the Bulk Liquids Berth. The materials involved and the net change in transport frequency does not impose additional significant risks to the Port Botany area.

Gaseous Emissions

Combustion of the stored products, caused by ignition following a spillage or leak, will release products of combustion (e.g. carbon dioxide, carbon monoxide, soot, vaporised product [unburnt] and water vapour. For typical wind / weather conditions, the products of combustion from a fire will rise due to momentum and buoyancy. Local impact can be expected for very still conditions only (in which case, emergency response is required for evacuation). The products of combustion are unlikely to include any materials that present a long-term risk to the biosphere.

Hydrocarbons vapour emissions whilst tanker filling are as per existing site practices and no new significant changes are expected.

The plant has a number of vents included in the design. The design rates from these vents are small. The impact from these releases is being separately analysed (refer to Section 7.3).

Solid Wastes

Spent activated carbon is flushed with water and dumped into a waste skip. This material is the disposed to landfill in a wet state. Other solid wastes are non-hazardous, office and plant waste products to landfill.

7.1.5 Concluding summary

The risks associated with the proposal and their associated operations at Port Botany have been assessed and compared against the DoP risk criteria.

In summary:

- Fires:
  - No risk of injury or fatality at residential areas or other sensitive land uses as the separation distance is large, i.e. 1 km or larger;
  - Three fire events have the potential to cause fatality in neighbouring industrial areas, however, their likelihood is acceptably low and there exists a high probability of escape; and

- Two fire events have the potential to cause propagation at neighbouring industrial facilities, however, the combined likelihood (approximately 8 pmpy) is less than the acceptable criterion of 50 pmpy.
- Internal tank explosions:
  - No risk of injury or fatality at residential areas or other sensitive land uses as the separation distance is large, i.e. 1 km or larger; and
  - Five internal tank explosion events have (conservatively) the potential to cause fatality or propagation damage in neighbouring industrial areas, however, however, the combined likelihood (approximately 33 pmpy) is less than the acceptable criterion of 50 pmpy.
- The likelihood of a fire associated with the new biodiesel pipeline in the pipeline corridor is acceptably low (approximately $1x10^{-7}$ per year).
- There are no significant risk impacts at the Bulk Liquids Berth associated with this project.
- Societal risk is qualitatively concluded to be acceptable given:
  - Few events analysed in the study have the potential for off-site impact and, for the ones that do, their likelihood is acceptably low;
  - The risk of off-site individual fatality is low and acceptable, and;
  - The population density in the Port Botany area is relatively low.
- There are no significant risk impacts on road transport associated with this project as there will be less than one extra vehicle per day and greater use will be made of the higher integrity Isocontainers.

Therefore, the results of the PHA show that the risks associated with the proposal comply with the DoP guidelines for tolerable fatality, injury, irritation and societal risk. Also, transport risk, risks to biophysical environment, the risk of propagation and the impact on cumulative risk in the Port Botany area from potential hazardous events are acceptable.

7.1.6 Mitigation and management measures

The following mitigation and management measures would be implemented:

- Include in the updated safety management systems (including training programs) appropriate information concerning the new hazards associated with sodium methylate. Whilst this material does not contribute significantly to off-site risk, management of spills will require special attention to protect site based personnel handling the material;
- The existing stormwater system under the biodiesel plants area has no isolation valve in the final pipe leaving site. Suitable means is to be provided to ensure spills do not leave the site via this stormwater piping system;
- For automated tank transfers, two independent tank level switches should be installed (or equivalent) to reduce the likelihood of tank overfilling to an acceptable level (as per current practice at Site B); and

- The proposal tanks would be designed in accordance with the latest version of Australian Standards 1940 (AS1940), AS1670 for fire alarms and AS2941 for pump sets.

7.2 Traffic and transport

This section contains a summary of the traffic study prepared for the proposal by GHD. The full report is provided in Appendix E. The assessment for traffic, access and transport comprises the following components of work:

- Existing Conditions – a review of existing road characteristics, adjacent development, traffic volumes, intersections performance, public transport accessibility and pedestrian and cyclist facilities; and
- Future Conditions – calculates additional traffic generated during the construction stages and future operation of the proposed facility, assesses the adequacy of the network to support the proposed activity and the performance of the network under these proposed conditions.

7.2.1 Existing environment

The information below on the existing road network has been provided from a study prepared by Masson Wilson Twiney – February 2004.

Access Roads

Friendship Road and Simblist Road currently provide a one-way traffic system along Simblist Road and Friendship Road, which was implemented at the end of October 2006. The one-way system operates in a clockwise manner along Simblist Road (from Prince of Wales Drive to Friendship Road) and Friendship Road (from Simblist Road to Bumborah Point Road).

Simblist Road is a wide two-lane road, with each traffic lane accommodating through traffic as well as truck queuing. The main function is to provide access to the sites along it. It also has a strategic function as a possible relief road to Friendship Road, and as an emergency access in the event of a situation, which would require the closure of Friendship Road to traffic.

Foreshore Road provides arterial road access to Vopak Site A from General Holmes Drive and Beauchamp Road.

Foreshore Road and Botany Road west of Bumborah Point Road are divided roads, which were purpose built or upgraded to serve truck traffic to Port Botany.

Beauchamp Road together with Denison Street provides principal access routes to the Port Botany area from the north (via Wentworth Road, Southern Cross Drive, Eastern Distributor). These are both four lane undivided roads.

Bumborah Point Road is a four lane undivided road. Apart from providing access to the State Transit Authority bus depot and the Alcatel cable factory, its principal purpose is to serve the Port Botany area. Its intersection with Botany Road is controlled with traffic signals, whereas the intersection with Friendship Road is priority controlled, with Bumborah Point Road traffic having priority.

In summary, all roads to and from the Vopak Site A are of industrial standard and have been built to accommodate heavy vehicles.

There are currently 39 parking spaces on site. Access is provided through the entrance on Friendship Road.

Existing Traffic Generation at Vopak - Site A

Based on information provided by Vopak, the existing traffic generation characteristics of the Site A Terminal is provided in Table 7.6.

Table 7.6 Existing traffic generation

Road Tankers	**24 vpd**
Staff	31 vpd
Visitors / Contractors	8 vpd

The daily and peak hour traffic generation of the existing operation is set out in Table 7.7 The traffic generation due to the existing operations is in the order of:

- 22 vehicle trips per hour during AM peak period, comprising, 2 visitor/contractor trips (1 In and 1 Out), 15 employee trips (15 In) and 5 heavy vehicle movements (2.5 In and 2.5 Out);
- 7 vehicle trips per hour during PM peak period, comprising 2 visitor/contractor trips (1 In and 1 Out) and 5 heavy vehicle movements (2.5 In and 2.5 Out); and
- The total daily weekday traffic generation of the existing site is in the order of 126 (63 In/ 63 Out) vehicle trips per day (vtpd).

Table 7.7 Total existing traffic generation

Component	Morning Peak (vtph)*	Evening Peak (vtph)*	Daily Trips (vtpd)**
Visitors/Contractors Traffic	2	2	16
Employee Traffic	15	-	62
Heavy Vehicle Traffic	5	5	48
Total	**22**	**7**	**126**

***vtph = Vehicle trips per hour**

**** vtpd = Vehicle trips per day**

Existing Traffic Volumes

Traffic count data was obtained from automatic counters that were installed for the Port Botany South Precinct Transport Management Study 2004, which is assumed to still represent the current situation. The following are the locations that automatic counters were placed:

- Military Road – east of Bumborah Point Road;
- Simblist Road – west of Prince Wales Drive;
- Friendship Road – north of Simblist Road;
- Friendship Road – west of Bumborah Point Road;
- Bumborah Point Road – south of Friendship Road;
- Bumborah Point Road – south of Botany Road; and
- Botany Road – east and west of Bumborah Point Road.

The results of the automatic counts indicate that the access roads for Port Botany, Bumborah Point Road and Military Road combined carry around 9,650 vehicles per day, with a peak of around 900 vehicles per hour. Over the average weekday, 27% of this traffic is articulated trucks and 23% is rigid trucks. The remaining 50% of daily traffic is light vehicles. Traffic travelling to the Vopak site are unlikely to use Military Road as this is considered more a local access route. Therefore heavy vehicles can be assumed to travel to the Vopak site from Bumborah Point Road.

Intersection Operation

The performance of the existing road network is largely dependent on the operating performance of key intersections that are critical capacity control points on the road network. The capacity of a road network is generally governed by the operation of its intersections. It is therefore appropriate to consider intersection operation as a measure of capacity of the road network. The criteria for evaluating the operational performance of intersections is provided by the RTA Guidelines to Traffic Generating Developments.

The Port Botany South Precinct Transport Management Study surveyed and analysed a number of key intersections. Current levels and performance measures are outlined in Table 7.8.

Table 7.8 Existing peak hour intersection operation

Intersection	Control	Morning Peak Hour		Evening Peak Hour	
		Average Delay	LOS	Average Delay	LOS
Bumborah Pt/Simblist/Military	Priority	5.6	A	5.7	A
Bumborah Pt/Friendship	Priority	6.4	A	6.3	A
Bumborah Pt/Botany	Signals	16.8	B	17.4	B
Botany/Beauchamp	Signals	20.4	B	18.0	B

Note: Average delay = Average delay in seconds per vehicle; for all movements signalised intersections, for most delayed movement at unsignalised intersections

LOS = Level of Service

Table 7.8 indicates that all intersections operate satisfactorily with some spare capacity.

Truck Queuing

The Masson Wilson Twiney report noted that in the morning a rolling queue forms on Simblist Road as container trucks wait to move to the P&O Container Terminal for processing. This queue moves for periods up to 15 minutes and impacts on the operation of the Simblist Road/Friendship Road intersection and on property accesses along the route.

Truck queuing issues were also identified at the following locations:

- Simblist Road – irregular queuing in two lanes with apprehended adverse impacts on the new access to/from the Patrick Container yards and warehouse development on the northern side of Simblist Road;
- Friendship Road – on the northern side opposite Terminals. This prevents terminals trucks from parking opposite the site to complete paperwork prior to departure; and
- Friendship Road – access to Vopak Site A is affected in the early morning hours by trucks queuing to enter the Patrick warehouse development on the northern side of Friendship Road.

Crash Statistics

A search of the Roads and Traffic Authority crash database has been undertaken for the five-year period September 2000 – June 2005.

The data shows that there were no crashes recorded by the RTA in the vicinity of the proposed development. The data indicates that in total three (3) crashes occurred on Friendship Road, two (2) were in the vicinity of Charlotte Road and the third near the intersection of Bumborah Point Road. Two of these crashes resulted in injuries.

The crash data was identified to be unrelated to the operation or activities in the vicinity of the proposed development.

7.2.2 Environmental impact assessment

Construction impacts

Traffic Generation

Traffic generation information has been provided by Vopak and indicates that a minimum of 25 and a maximum of 75 construction vehicles (heavy and light) would access the site on a daily basis, of those construction vehicles a minimum of 20 and a maximum of 60 workers would arrive in light vehicles. Therefore based on the maximum scenario it is assumed that the worse case would be 75 construction vehicles per day consisting of 15 heavy and 60 light vehicles per day during construction.

A summary of the additional traffic movements during the construction period is shown in Table 7.9 below:

Table 7.9 Construction period traffic movements – worse case

Activity	Additional Daily traffic (vpd)	Additional AM Peak construction traffic (vph)	Additional PM Peak construction traffic movements (vph)
Heavy Vehicles	15	4	4
Workers	60	12	12
Total	**75**	**16**	**16**

Construction Period Road Network and Intersection Performance

Based on the above traffic generation predictions, the surrounding network and intersections would need to accommodate an additional 16 vph from the construction of the proposed development. Referencing to Austroads – Part 5 Intersections at Grade Figure 4.2 Practical Absorption Capacity this increase can easily be accommodated.

Traffic Assignment during Construction

Due to the site proximity the options for accessing the site under the one-way traffic system along Simblist and Friendship Roads (implementation October 2006), the routes are as follows:

- Via Botany Road – Bumborah Point Road and Simblist Road; and
- Via Bunnerong Road – Military Road and Simblist Road.

Under the one-way traffic system all traffic would approach the site from Simblist Road, however Military Road is only likely to be used by traffic from the southern section of the eastern suburbs therefore the following traffic assignment has been adopted:

- 90% of vehicles approach/ depart the site via Bumborah Point Road, and
- 10% of vehicles approach/ depart the site via Military Road.

Local Transport and Other Transport Issues

Pedestrian and Cyclists

The increase in truck movements generated by the construction at the site is not likely to impact on or change the paths used by the pedestrian and cyclists in the vicinity of the site. Friendship Road and Simblist Road do not have footpaths; this is a port related area with industrial uses where the number of pedestrians and cyclists are expected to be low.

Public Transport

The nearest bus service is located on Bumborah Point Road near Friendship Road. The level of public transport servicing the site is considered adequate and would not be adversely affected by the construction at the site.

During the construction of biodiesel plant the existing Site A would continue to operate normally, access to construction activities in Site A would be through the existing access to Site A.

Concluding summary

Traffic generation by the proposed construction activity would impact on the road network surrounding the site.

The worse case scenario for the construction period would be that approximately 75 vehicles per day would be generated.

In the event that several trucks arrive at the same time, it is anticipated that construction truck traffic would be contained to the site.

This increase in traffic would impact on Friendship Road, Simblist Road and Bumborah Point Road; these roads have been identified to be appropriately designed with some spare capacity and therefore able to accommodate this traffic.

The majority of traffic movement has been identified to occur outside of peak commuter periods and thus the impact on the operation performance of the surrounding road network would be minimal.

Operation Impacts

Operation Traffic Generation

Under post development conditions, the number of personnel on site at any one time is likely to be 40. One of the fundamental concepts behind the proposal is that it would utilise existing storage tanks for a large part of the process. Stage one would see a reduction in the chemicals stored on site, complemented by the storage of feed and finished goods stocks largely brought in by ships. A comparison of the existing annual versus proposed annual truck generation is shown in Table 7.10.

Table 7.10 Existing and future annual heavy traffic generation

	Site A - Existing (annual)	Site A - After Completion of Stage 1 (annual)	Site A - After Completion of Stage 2 (annual)	Site A Difference (annual)
Road Tankers	2730	780	1560	-1170
ISO Containers IN	180	227	454	274
ISO Containers OUT	470	786	1572	1102
	3380	**1793**	**3586**	**206**

The annual difference between the existing and proposed heavy traffic generation results in an increase of approximately 1vpd.

A comparison of daily and peak hour traffic generation for Site A incorporating both staff vehicles and trucks at the existing and proposed development site is set out in Table 7.11.

Table 7.11 Existing and proposed total traffic generation

Component	Existing			Proposed		
	Morning Peak (vtph)	Evening Peak (vtph)	Daily Trips (vtpd)	Morning Peak (vtph)	Evening Peak (vtph)	Daily Trips (vtpd)
Visitors/Contractors Traffic	2	2	16	2	2	16
Employee Traffic	15	0	62	15	0	90
Heavy Vehicle Traffic	5	5	48	5	5	50
Total	22	7	126	22	7	156

Therefore after the completion of Stages 1 and 2 the actual increase in heavy vehicles to and from the site is 2 vtpd, resulting in an overall increase in vehicles of 30 vtpd.

Future Road Network and Intersection Performance

Based on the above traffic generation predictions in Table 7.11, the surrounding network would need to accommodate an additional 2 vph from this proposed development.

Referencing to Austroads – Part 5 Intersections at Grade Figure 4.2 Practical Absorption Capacity this increase can easily be accommodated.

Intersection Performance

The additional staff vehicle and truck movements generated from the operation of the proposed development are considered to be minimal and unlikely to have a significant affect on the performance of intersections in the vicinity of the proposed site.

Pedestrian and Cyclists

The increase in truck movements generated by the operation of the site is not likely to impact on the pedestrian and cyclists in the vicinity of the site. Friendship Road and Simblist Road do not have footpaths; this is a port related area with industrial uses where the number of pedestrians and cyclists are expected to be low.

Public Transport

The nearest bus service is located on Bumborah Road near Friendship Road. The level of public transport servicing the site is considered adequate and would not be adversely affected by the operation of the site post development.

On site Parking

The site will incorporate an additional nineteen (19) spaces to accommodate the likely number of additional employees; this will increase the number of on site parking spaces to a total of 58.

The number of staff is expected to increase by fourteen (14), totalling 45, with the expected number of staff on site at one time being 40.

Therefore in the worse case scenario that all staff where on the site at the same time being a total of forty-five (45) which occurs at the same time as eight (8) visitor or contractor vehicles, totalling 53; the proposed parking increase in parking capacity to 58 is considered appropriate for this site.

The existing access point to the site will be modified to accommodate a two-way entry/exit to a proposed car parking area designated for administration staff and visitors.

The existing access point to the site would be modified to accommodate a one-way entry/exit to a proposed car parking area designated for administration staff and visitors.

Development in Port Botany

Randwick City Council has commented that although the proposal would reduce the number of road tankers accessing the site, that there would be no reduction in road movement. Council's Traffic Engineer indicates that the reduction in chemical storage on Site A would simply be generated elsewhere in Port Botany and therefore this development in the long term would potentially result in an increase in traffic generation. The traffic management of the anticipated relocation of chemical storage to another location within Port Botany does not form part of this application and therefore it is not possible to address by the proponent. However, it is expected that this need would fall under the planned expansion of Port Botany, which can be expected to be managed through expanding the vehicle operating times for road haulage over 7 days a week and 24 hours a day instead of concentrating around the working week and typical normal working day. The arrival of heavy vehicles would be proposed to be managed through providing time slots for specified vehicles at container sites and terminals situated in the area.

Traffic Assignment during operation

Vopak is aware of local traffic issues, including the need to avoid the use of local roads (for example Stephen Road and Botany Road west of their intersection with Foreshore Road) for non-local bulk liquid deliveries. It is considered that Vopak has demonstrated compliance with external road network conditions for existing operations and that this would not be altered for the proposal.

A commitment has been added to the statement of commitments, which states that during the life of the project, the proponent shall ensure that vehicles associated with the project do not transport hazardous goods along Stephen Road and Botany Road west of their intersection with Foreshore Road, unless for local deliveries only. This would be incorporated into conditions of contract for the trucking companies.

Concluding summary

The actual increase in heavy vehicles to and from the site is 1 vpd, resulting in an overall vehicle increase of 15 vpd. The additional staff vehicle and truck movements generated from the operation of the proposed development are considered to be minimal and unlikely to have a significant affect on the performance of intersections in the vicinity of the proposed site.

7.2.3 Mitigation and management measures

- A Construction Traffic Management Plan (CTMP) would be developed and submitted to SPC for review and approval prior to construction. A copy of the CTMP would be sent to the RTA and Randwick City Council prior to construction; and
- During the life of the project, the proponent shall ensure that vehicles associated with the project do not transport hazardous goods along Stephen Road and Botany Road west of their intersection with Foreshore Road, unless for local deliveries only.

7.3 Air quality

This section contains a summary of the Air Assessment prepared for the proposal by GHD. The full report is provided in Appendix F. The assessment for airborne constituents from the operation of the proposal comprised the following components of work:

- Description of the site and operation process;
- Compilation of an emissions inventory from sources associated with the construction and operation of the proposed Biodiesel facility;
- Analysis of the local meteorology;
- Dispersion modelling using AUSPLUME to produce contours of predicted ground level concentration of air pollutants identified in the emissions inventory; and
- Discussion of air quality impacts for all relevant pollutants.

7.3.1 Existing environment

Existing background levels of odour are not readily available for the area surrounding the proposed facility.

The National Pollutant Inventory (NPI) database was searched for all facilities located within the general area as the Vopak site (postcodes 2036 and 2019), which reported methanol emission rates for 2004 – 2005. The search results are compared against the anticipated methanol emissions from the proposal in Table 7.12 below.

Table 7.12 NPI - methanol emissions to air

Industry	Methanol Emissions to Air (kg/year) [1]
Huntsman Corporation Australia Pty Ltd (2019)	330
Qenos Pty Ltd – Qenos Alkathene and Alkatuff Plants (2019)	160
Qenos Pty Ltd – Qenos Olefines and Site Ultilities Plant (2019)	3,800
Orica Australia Pty Ltd (2036)	31
TOTAL	**4,322**

(1) NPI database search accessed 17 August 2006. Excludes undefined diffuse emission sources in the category of domestic/commercial solvents/aerosol

7.3.2 Environmental impact assessment

Construction Phase

The dominant source of air emissions during the construction phase of the project would be dust generated from surface operational activity during construction; however, with proper construction management, the impact of these emissions is expected to be negligible, especially because roads are sealed, the site is located in an existing industrial zone and the nearest residential premises is located 1 km away.

Operational Phase

The primary air quality impact associated with the operation of the proposed biodiesel plant would be emissions of odorous volatile organic compounds (VOC). Other air emissions such as combustion products emitted from the natural gas fired boilers would be minimal.

Odour

Odorous emissions from the tank storage of biodiesel and feedstock (vegetable oils) are expected to be negligible due to the low vapour pressures (<2mm Hg[5]) of these substances. Tanks used to store these substances would have a pressure relief valve on the vent and would breathe directly to atmosphere when the pressure inside exceeds the design value within the storage tank. Theses tanks are only expected, if at all, to vent during the hotter months of the year when thermal expansion of air in the tank headspace occurs, and during tank filling, both of which would only occur intermittently. The emitted odour, if detectable, is expected to be low in strength and inoffensive because only vegetable oils, as opposed to animal fat, would be used as feedstock.

[5] Hg = millimetre of mercury, which is a unit of measure for vapour pressure

Additionally, all emissions from the biodiesel process operations would be conducted in a closed system, serviced by a ventilation system that discharges to a two-stage wet scrubber.

Emissions from the above sources are therefore not considered further in this assessment.

The anticipated odour emission from the proposed facility, with the highest potential to cause off-site odour impact, is expected to be the discharge of methanol vapour because methanol has a relatively high vapour pressure and is odorous.

Therefore, there are two potential odour sources that will be included in this assessment, namely, (i) the methanol scrubber exhaust, and (ii) the methanol storage tanks (via the vapour emission control system (VECS)). The potential emissions from these sources are detailed below.

Wet (Methanol) Scrubber

GHD was advised that the maximum methanol load on each methanol scrubber is estimated to be 1 kg per hour. This is considered by the proponent to be a conservative estimate, as it does not represent a continuous value for long-term plant operation. The methanol removal efficiency of the scrubber is expected to be in excess of 95%, thus the methanol emission rate from each methanol scrubber exhaust stack is estimated to be 0.05 kg per hour (438 kg per year). Table 7.13 shows the source release parameters and emission rates of the methanol scrubber.

Table 7.13 Source release parameters and emission rates – methanol scrubber

Source	Stack Height (m)	Stack Diameter (m)	Exit Velocity (m/s)	Exit Temp. (°C)	Emission Rate (kg/hr)
Train 1 - Methanol Scrubber	18	0.05	2.4	25 [1]	0.05
Train 2 - Methanol Scrubber	18	0.05	2.4	25 [1]	0.05

(1) Ambient temperature

Nitrogen, air and water vapour are the pollutants expected to be emitted from the scrubber vent. The use of demineralised water or condensate as the final wash stream should essentially eliminate any methanol in this stream. The methanol emissions will be low because the bulk of the methanol is recovered via the methanol recovery column and recycled in the process. All process equipment vents are discharged via the vent scrubber.

The expected pollutant rate and flow rate of the process ventilation is 20 kg/hr (vent design flow rate from the Darwin Biodiesel Plant scrubber vent), the stack height is approximately 25m and diameter is 0.05 m.

VECS - Methanol Storage Tanks

GHD was advised that the total methanol load sent to the VECS for treatment from the required methanol storage tanks would be approximately 5,600 kg per year. This estimate is based on tank emission modelling undertaken by Vopak using the computer software TANKS[6], which is a model developed by the US EPA and is designed for use by local, state, and federal agencies, environmental consultants, and others who need to calculate air pollutant emissions from organic liquid storage tanks.

The methanol removal efficiency of the activated carbon bed is estimated to be in excess of 90%, thus the methanol emission rate from the VECS exhaust stack is estimated to be approximately 560 kg per year or 0.064 kg per hour.

In addition, because of the projected change in product storage profile on Site A as a result of the proposal, the 'vapour loading' on the VECS would be smaller and more consistent than is the present case. The capability of the VECS type system is still the most effective means of controlling a wide range of VOC vapours in an industry such as bulk liquids handling and distribution.

The release parameters and source emission rates for the VECS are summarised in Table 7.14.

Table 7.14 Source release parameters and emission rates

Source	Stack Height (m)	Stack Diameter (m)	Exit Velocity (m/s)	Exit Temp. (°C)	Emission Rate (kg/hr)
VECS	18	0.25	20	25[1]	0.064

(1) Ambient temperature

As methanol would be imported by ship, a 5,000-6,000m^3 storage facility would be required. Three existing 2,000m^3 tanks have been allocated. Methanol is a flammable substance, and the allocated existing tanks are designed for storage of flammable liquids with suitable fire protection facilities and nitrogen blanketing provision. The existing 400m^3 tank 62 would be used as a day tank for methanol. The methanol day tank has suitable fire protection facilities and nitrogen blanketing provision - Refer to Section 6.4.

Hence methanol tanks will be fitted with nitrogen blanketing systems and the existing/new tanks for methanol allows for a design pressure of 7kPa (working pressure of 5 kPa) which is generally higher than most API 650 type tanks used in the terminal industry. Hence, the vapour emissions during storage are minimised.

Methanol and Sodium Methylate are the only VOCs involved in the process. The existing VECS system is documented by the manufacturer as being compatible with Methanol vapours (and is also approved by DEC since 1979). The proponent would utilise the VECS system for the Methanol /Sodium Methylate storage tanks. The VECS

[6]Available: http://www.epa.gov/ttn/chief/software/tanks/index.html

system is designed to handle both ship discharge situations and normal storage tank breathing.

Combustion Gases

Combustion products emitted from the natural gas fired (8.5 MW) boilers (2 units) during the production of process steam would be negligible.

These boilers would be designed to be compliant with the general standards of concentration prescribed in Schedule 4 of the *Protection of the Environment Operations (Clean Air) Regulation 2002.*

Emissions from these sources are therefore not considered further in this assessment.

Transfers

Products delivered by tanker truck include:

- Sodium Methylate @ 4,000 tonnes per year (18 ISO containers per month);
- Caustic Soda @ 400 tonnes per year (1 ISO container every 3 weeks); and
- Hydrochloric Acid @ 2,400 tonnes per year (10 ISO containers per week).

Methanol would be transferred to Site A via pipeline Methanol @ 24,500 tonnes per year (ship every 2 months @ 4000 tonnes (6 ships per annum)). Existing lines to and from the Sydney Ports Corporation Bulk Liquids Berth and Vopak Site A would be utilised for import product feed and export of biodiesel.

The transfers from the methanol storage tanks to the biodiesel plant are all hard piped (i.e. no hose or make/break connections) and therefore there are no vapour emissions as a result of these transfers.

Biodiesel would be loaded from Vopak Site B road tanker area once transferred from Site A via pipeline.

By definition, biodiesel, vegetable oils, hydrochloric acid, fatty matter and caustic Soda are not VOCs and therefore do not require vapour emission controls (because their vapour pressures are so low i.e < 2mm Hg @ 25C - which is the DEC definition of a VOC). Hence transfer points involving vegetable oil/biodiesel have not been considered - along with the storage of these compounds - because of their low vapour pressure (ie low volatility) and they not being defined as a VOC.

The air quality impacts of the Site B operations have been previously assessed, this included the use of biodiesel as part of the Site B B3 expansion.

Road tanker equipment at Site B includes a vapour recovery unit, suitable for gasoline, which has been installed close to the loading gantry. The unit has been sized for a five bay simultaneous gasoline loading operation.

Hydrocarbon vapours from the road tanker compartments are ducted to an underground condensate knock out tank and then to the vapour recover unit for recovery. Recovered product is pumped to a day tank or bulk tank. Also product from the day tank or bulk tank is cycled through the vapour recover unit as an absorbing medium for any hydrocarbon vapours. A minimum level is kept in the day or bulk tank to provide supply to the vapour recover unit.

The capacity of the vapour recovery unit is based on the number of road tankers loading simultaneously. The maximum instantaneous flowrate is 32 m^3 / min.

Product is recovered by carbon absorption in either of two absorption vessels. Regeneration of these vessels is achieved by vacuum regeneration followed by vacuum air purge. While one vessel is on line the other is undergoing regeneration.

Hydrocarbon vapours from the vacuum pump are passed to a product flushed packed absorber column where they are absorbed by the product and the discharge is pumped back to storage. The small amount of vapour that is not absorbed is recycled to the carbon absorber that is on-line.

Liquid hydrocarbon from the vacuum pump is discharged to a condenser where it is cooled by the product circulating from the product storage tank.

Meteorological data

Meteorological data from Sydney Mascot Airport for 1997 (8,520 hours) has been obtained and utilised within this assessment. Mascot Airport is located approximately 5 km northwest of the facility and is therefore considered to show site-representative meteorology for the Port Botany site.

The meteorological data to be used in dispersion modelling was analysed using the DEC guidelines set out in Approved Methods for the Modelling and Assessment of Air Pollutants in NSW and was found to demonstrate the expected trends.

Dispersion Modelling

AUSPLUME was configured to adapt the model to the facility and make best use of the measured emissions and meteorological data.

Emissions from the VECS and methanol scrubber exhaust stacks were modelled as point sources.

The NSW DEC criterion for scheduled sources is that the predicted maximum ground level concentration must not exceed the design criterion for the relevant pollutant listed in the DEC (2005) *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*. The predicted maximum concentration for this level 2 assessment is taken to be the 99.9th percentile concentration for simulations using an averaging time of 1-hour.

The air quality impact criterion for methanol is 3.0 mg/m^3 (1-hour average), which must be met at the nearest or likely future off-site receptor.

Four sensitive receptor sites have been selected encompassing the facility to the north, east and southeast to adequately describe the local amenities:

1. Yarra Point;
2. La Perouse Point Monument;
3. Banksmeadow Golf Course; and

4. Partanna Avenue, Matraville.

Although not strictly classified as sensitive receptors, to determine the sensitivity of off-site impact on elevated receptors, such as the straddle car operators on the adjacent P&O site, an additional model simulation was conducted for the worst-case odour concentration with all receptors set at a height of 12 metres above ground level (i.e. approximate height of straddle car operators).

Predicted maximum (99.9 %ile, 1-hour) ground level concentrations of methanol at these sensitive receptors are shown in Table 7.15.

Table 7.15 Predicted 1-hour ground level methanol concentrations (99.9%ile, 1-hour average)

Pollutant	**Receptor**				
	Criterion	1	2	3	4
Methanol (mg/m^3)	3.0	0.0033	0.0021	0.00051	0.0011

The model results presented in Table 7.15 show that compliance to the DEC criterion for methanol is readily achieved.

Given that the incremental impact assessment criterion is achieved by almost three orders of magnitude, it is very unlikely that the cumulative impact (incremental plus existing background levels) would exceed air quality goals.

To determine the sensitivity of off-site impact on elevated receptors, such as the straddle car operators on the adjacent P&O site, an additional model simulation was conducted for the worst-case odour concentration with all receptors set at a height of 12 metres above ground level (i.e. approximate height of straddle car operators). For this simulation the PRIME algorithm was turned off to insure that the model predictions represent worst-case concentrations that can be expected at the elevated receptors.

The maximum predicted methanol concentration at 12 metres above ground is well below the methanol criterion over the adjacent P&O site, with peak levels not exceeding 0.02 mg/m^3. Hence at a height of 12m there is still compliance to the DEC criterion.

7.3.3 Summary and Conclusions

The dominant source of air emissions during the construction phase of the project would be dust generated from surface operational activity during construction; however, with proper construction management, these emissions are expected to be negligible, especially because roads are sealed, the site is located in an existing industrial zone and the nearest residential premises is located 1 km away.

Odorous emissions from the tank storage of biodiesel and feedstock (vegetable oils) are expected to be negligible due to the low vapour pressures (<2mm Hg) of these substances. Tanks used to store these substances would have a pressure relief valve on the vent and would breathe directly to atmosphere when the pressure inside exceeds the design value within the storage tank. These tanks are only expected, if at all, to vent during the hotter months of the year when thermal expansion of air in the tank headspace occurs and during tank filling, both of which would only occur intermittently. The emitted odour, if detectable, is expected to be low in strength and inoffensive because only vegetative oils, as opposed to animal fat, would be used as feedstock.

In addition, the anticipated odour emission from the proposal, with the highest potential to cause off-site odour impact, is expected to be the discharge of methanol vapour because methanol has a relatively high vapour pressure and is highly odorous. Results of the air dispersion modelling indicate that compliance to the air quality impact assessment criterion for methanol is readily achieved with the air quality impact assessment criterion for methanol.

Based on the results of this assessment and the fact that the nearest sensitive receptor is approximately 1 km away, it can be concluded that odorous emissions from the proposed facility would not have a significant incremental affect on the local amenity.

7.3.4 Mitigation and management measures

The following mitigation and management measures have been identified to minimise the dominant source of air emissions during the construction phase:

- Trenching and pipe laying would be undertaken progressively along the route to minimise the area that is disturbed at any single point in time;
- Disturbed surfaces would be stabilised as soon as practicable;
- Equipment to be well maintained and limit instances of fuel combustion processes; and
- Where material stockpiles are necessary, the stockpile would be covered or watered down to prevent movement and disturbances from wind.

7.4 Noise

This section contains a summary of the Noise Assessment prepared for the proposal by GHD. The full report is provided in Appendix G. The assessment for noise generation from the construction and operation of the proposal comprised the following components of work:

- Compliance criteria determined;
- Review of existing background and attended noise measurements;
- Projection of new noises to the residential area;
- Summation of existing and projected noise;
- Assessment of compliance; and
- Comment on noise control requirements.

7.4.1 Existing environment

A background noise study for the operational Bulk Liquids Terminal Site B, which is located along Friendship Road further south of the current project site, was undertaken by EMS in September 1996.

It was considered that the previous noise monitoring location used to determine background noise levels was likely to represent ambient received noise levels from industry located along Friendship Road. In addition, as the local environment is viewed as similar to 1996, the previous monitoring results were considered valid and appropriate for use for this assessment[7].

Seven days worth of monitoring is typically undertaken for many noise assessments. However, the INP also states that where background noise levels may be considered relatively consistent day to day, as would be the situation for the Port area (trucks entering/exiting sites, loading and unloading activities), three days worth of monitoring is considered sufficient. Therefore the five days worth of data used to determine background noise levels is considered sufficient for this particular project.

As the local environment is viewed as similar to 1996, the previous monitoring results are considered valid and appropriate to use for this assessment.

EMS concluded that the nearest resident to the proposed operating site B was located at Phillip Bay at 36 Yarra Road, approximately 1.8 km from the eastern boundary of Site B. Yarra Bay is located between the site and the receiver.

The existing background noise levels at 36 Yarra Road, as measured by EMS for both day and evening periods is detailed in Table 7.16.

Table 7.16 Background noise levels – 36 Yarra Road

Period	Background Noise Levels (L_{90})
Day	45 dB(A)
Evening	25* dB(A)

Note - *Based on EPA's Environmental Noise Control Manual (ENCM), more stringent guidelines apply for night time periods where the existing background noise level is above the relevant acceptable limits as specified by the ENCM.

7.4.2 Environmental impact assessment

Construction Noise Criteria

Criteria for the construction phase applied to the assessment were sourced from Section 171 of the DEC's Environmental Noise Control Manual. The criterion was established using the provided background noise levels and applying a conversion

[7] Note – any changes to the local ambient noise environment since background monitoring was undertaken is likely to result in an increase in background noise, therefore the data used in this assessment is considered conservative.

factor based on the expected construction period. Construction noise criteria are shown in Table 7.17.

Table 7.17 Construction noise criteria

Construction Period	Level Restrictions (L_{10})	36 Yarra Road
Less than 4 weeks	Background + 20 dB	65
Less than 26 weeks	Background + 10 dB	55
More than 26 weeks	Background + 5 dB	50

Operational Noise Criteria

The Industrial Noise Policy (INP) provides guidance on the assessment of operational noise impacts. The guidelines include both intrusive and amenity criteria that are designed to protect receivers from noise significantly louder than the background level and to limit the total noise level from all sources near a receiver.

Intrusive noise limits set by the INP control the relative audibility of operational noise compared to the background level. Amenity criteria limit the total level of extraneous noise. Both sets of criteria are calculated and the lowest of the two in each time period normally apply. Table 2.2 in the INP provides modifications to the amenity criteria for existing levels of industrial noise.

Background noise data has been used from the previous noise assessment undertaken by EMS for location 36 Yarra Road. This residential receiver is considered representative of the local ambient noise environment for the nearest sensitive noise receivers to the Site A project and has therefore been used to determine appropriate noise criteria.

Project specific noise levels were determined based on Tables 2.1 and 2.2 of the NSW INP and measured background noise levels. Modifications to noise levels during the daytime period was undertaken based on Table 2.2 of the INP due to the influence of existing industrial noise.

Although the monitoring location at 36 Yarra Road is surrounded by commercial and light industry, the area is zoned residential and is therefore considered to be an 'urban' setting for assessment purposes.

The INP specifies that an urban area may be located in either a rural, rural-residential or residential zone, as defined by an LEP or other planning instrument.

The project specific noise levels are provided in Table 7.18.

Table 7.18 Project specific noise levels

Location - 36 Yarra Road			
Criterion	**Day 7 am to 6 pm[1]**	**Evening[2] 6 pm to 10 pm**	**Night 10 pm to 7 am***
A: Rating Background Level	45 $L_{A90(day)}$	25[3] $L_{A90(evening)}$	25[3] $L_{A90(night)}$
B: Intrusiveness Criteria (A + 5dB)	50 $L_{Aeq(15\ min)}$	35 $L_{Aeq(15\ min)}$	35 $L_{Aeq(15\ min)}$
C: Urban Amenity Criteria (Table 2.1 INP)	60 $L_{Aeq(day)}$	45 $L_{Aeq(evening)}$	45 $L_{Aeq(night)}$
D: Amenity Criteria: (INP Table 2.2 Adjusted)	50[4] $L_{Aeq(day)}$	45 $L_{Aeq(evening)}$	45 $L_{Aeq(night)}$
E: Project Specific Noise Level (Pg 21 INP)	50 $L_{Aeq(15\ min)}$	35 $L_{Aeq(15\ min)}$	35 $L_{Aeq(15\ min)}$

[1] Note – Day and night time periods as specified in EMS report, September 1996.

[2] – Note that the EMS report provided day and night time noise levels only. Therefore the night time noise levels were applied to evening, which is considered conservative for this assessment.

[3] - The INP states that where the rating background level is found to be less than 30 dB(A), then it is set at a minimum of 30 dB(A), therefore these values have been adjusted to 30 dB for further calculations.

[4] – Modification to acceptable noise level undertaken to account for existing level of industrial noise as per Table 2.2 of the INP.

Assessment of Potential Impacts

Construction Noise Assessment

The construction noise criteria are set for noise levels determined as $L_{10(15min)}$. During a full 15-minute period the machinery items to be used on site would operate at maximum sound power levels for only brief stages. At other times the machinery may produce lower sound levels while carrying out activities not requiring full power.

In addition, mobile machinery would likely move about during the 15 minutes, variously altering the directivity of the noise source with respect to individual receivers.

As it is likely construction activities would be undertaken over 26 consecutive weeks, the construction noise criterion should be considered as being Background + 5 dB(A). Therefore the construction criteria at the nearest residential receivers[8] would be 50 dB(A).

As exact construction equipment is unknown, typical noise levels produced by construction plant anticipated to be used on site were sourced from AS 2436 – 1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites and from

[8] Residence located at 36 Yarra Road and the built up areas of Matraville, Malabar Junction and Chifley has been assumed as the nearest residential receiver for the purpose of this assessment. Received sound pressure levels are assumed to be representative of the local ambient noise environment at this location.

GHD's internal database. The sound power levels were then distance attenuated from the proposed construction site. Propagation calculations take into account sound intensity losses due to spherical spreading, with additional minor losses such as atmospheric absorption, directivity and ground absorption ignored in the calculations. As a result, predicted received noise levels are expected to slightly overstate actual received levels and thus provide a measure of conservatism.

Received noise at each assessed distance from each item of plant on site is added, where appropriate, to determine the total received noise at that distance from construction activities and compared to the criteria.

Received noise produced by anticipated activities, during construction of the proposed facility is shown in Table 7.19 for a variety of distances to a typical receiver, with no noise barriers or acoustic shielding in place and with each plant item operating at full power.

Table 7.19 Predicted plant item noise levels, dB(A)

Plant Activity SWL dB(A)	40 m	80 m	160 m	320 m	640 m	1280 m
Crane 110	70	64	58	52	46	40
Backhoe 108	68	62	56	50	44	38
Compressor 100	60	54	48	42	36	30
Concrete Pump 109	69	63	57	41	35	29
Dump Truck 108	68	62	56	50	44	38
Water Tanker 109	69	63	57	51	45	39
Compactor 110	70	64	58	52	46	40
Concrete Saw 118	78	72	66	60	54	48
Paver 113	73	67	61	55	49	43

The sound power levels shown in Table 7.19 are maximum levels produced when machinery is operated under full load.

The cumulative sound power level of all items listed at the greatest distance (1,280 m) shown in Table 7.19 is calculated at 48 dB(A), which is still below the construction noise criteria (50 dB(A)) at the residential location across Yarra Bay.

As the nearest residential noise receivers are located at a distance of approximately one km from the proposed site location, it is unlikely that construction noise would adversely impact the noise environment of the residential area to the east, across Yarra Bay.

Operational Noise Assessment

Acoustic modelling was undertaken using Computer Aided Noise Abatement (CadnaA) to predict the effects of industrial noise generated by the proposed facility. It should be noted that modelling was undertaken in the absence of any noise attenuation parameters.

Table 7.20 lists the modelled operating machinery, equipment and/or activities and their respective sound power levels, as sourced from information provided by the client and the source heights of these noise generating equipment.

Table 7.20 Noise generating equipment

Equipment	Number Modelled	Modelled SWL dB(A)	Frequency * (Hz)	Height (m)
Tanker trucks	4	103	Spectral	1.5
Boiler	2	85	500	1
Cooling Water Pumps	5	96	500	1
Booster Pumps	3	99	Spectral	1

Note* - Frequency levels used based on ISO 9613.2 which states that if only A-weighted sound power levels of the sources are known (only A-weighted SWL provided in previous report), the attenuation terms for 500 Hz may be used to estimate the resulting attenuation.

Processing operations were modelled to represent a worst case scenario. Modelling was undertaken based on the following differing meteorological and operational conditions:

- Scenario 1 - Calm weather conditions, with no wind during day time periods;
- Scenario 2 - wind vector modelled with consideration to ISO 9613-2, which takes into account the excess attenuation from downwind propagation. A coefficient of 2 dB, which is likely to be conservative, has been used as the ISO 9613-2 deems values in excess of this exceptional;
- Scenario 3 – Class F concawe weather conditions, wind speed 2 m/s towards north east (residences adjacent to existing oil refinery opposite Bunnerong Road) during night time and early morning periods; and
- Scenario 4 – Class F[9] concawe weather conditions, wind speed 2 m/s towards south east (residences across Yarra Bay) during night time and early morning periods.

A worst case scenario was modelled where all items listed in Table 7.20 are modelled operating simultaneously.

[9] The default inversion parameter Class F has been used based on the area classified as a non-arid area.

Results of the modelling suggest project specific noise goals will be met within the built up residential areas of Phillip Bay, Chifley and Matraville as defined on the contour map during day, evening and night time plant operations (as shown in Figure 7.1 - Figure 7.4).

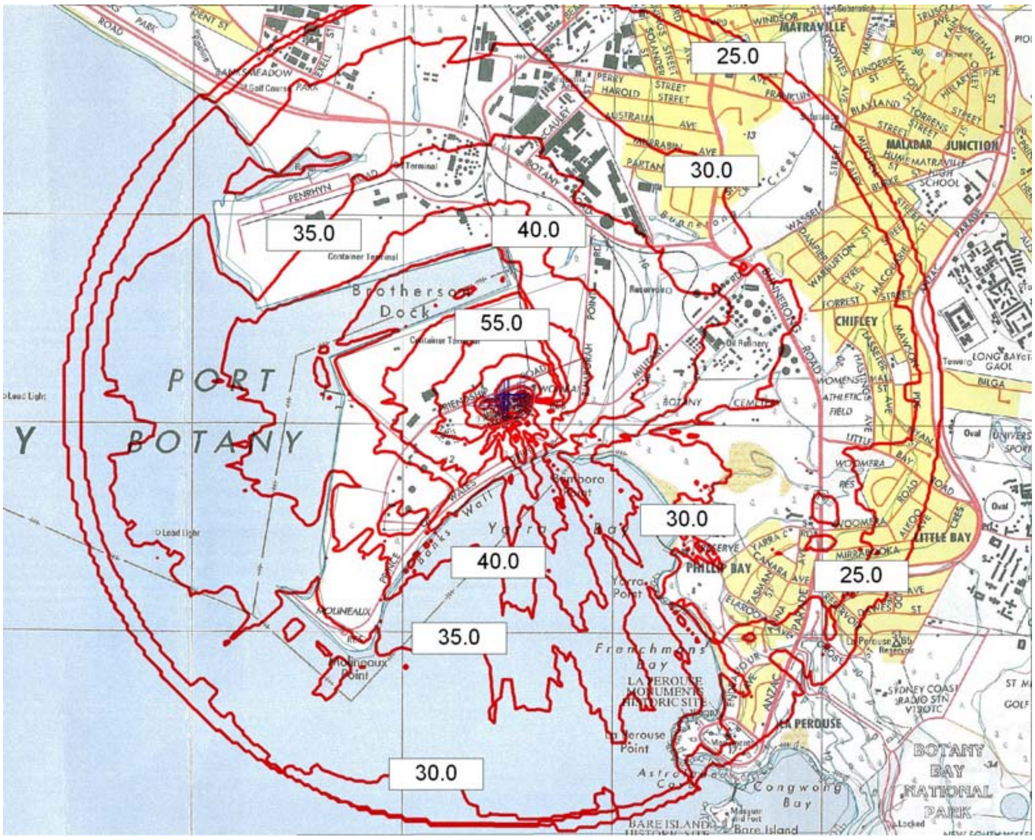


Figure 7.1 Modelled noise results – scenario 1, calm weather conditions

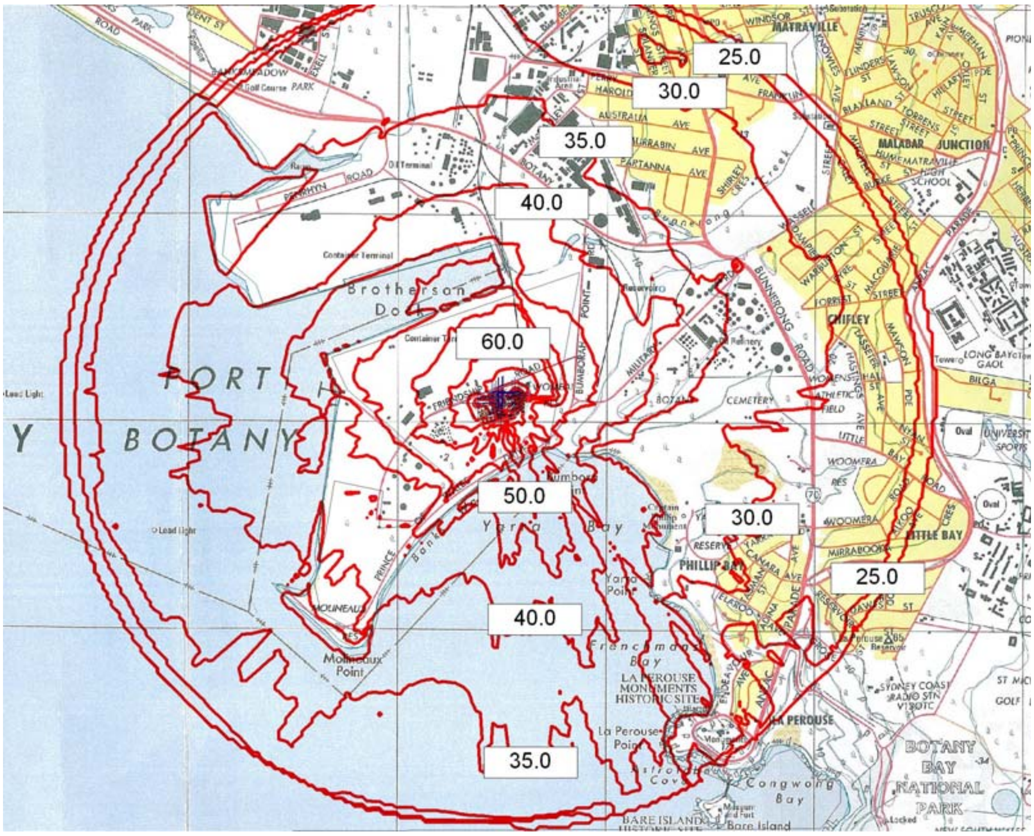


Figure 7.2 Modelled noise results – scenario 2, wind vector

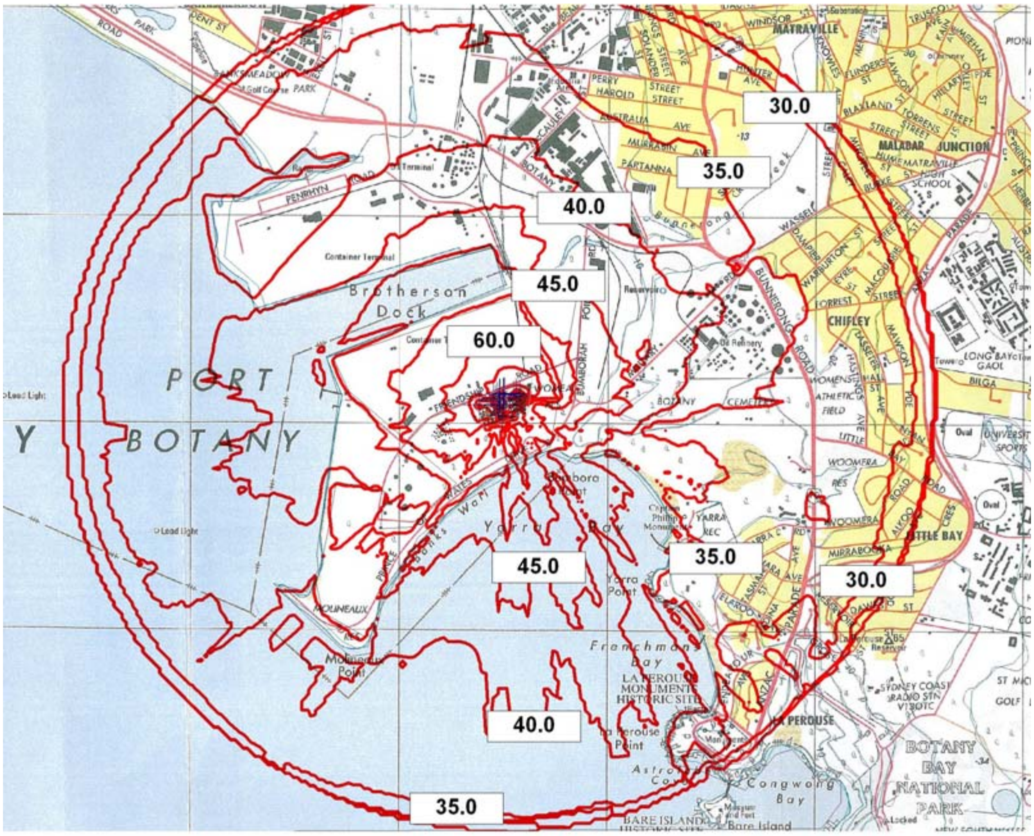


Figure 7.3 Modelled noise results – scenario 3, Class-F winds towards northeast

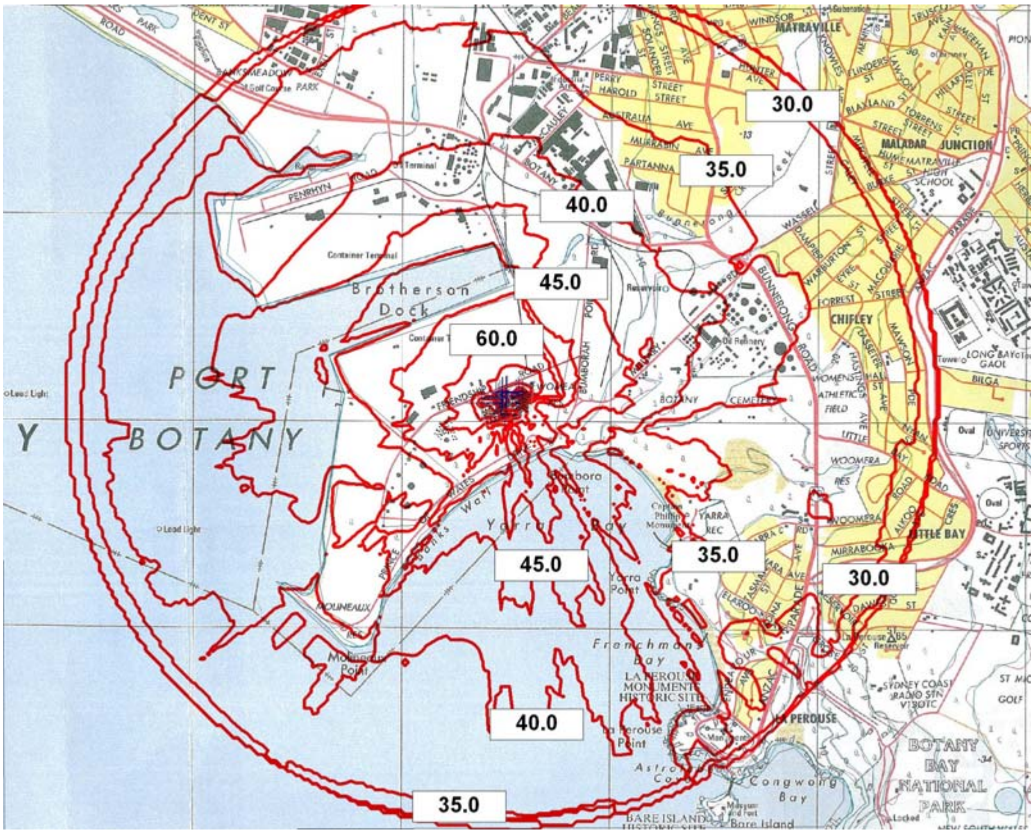


Figure 7.4 Modelled noise results – scenario 4, Class-F winds towards southeast

Predictive modelling has suggested the facility would achieve an operational contribution noise level of $L_{Aeq\ 15\ min}$ 35 dB(A) to occur at the nearest residential noise receivers to the facility, based on equipment and machinery modelled at the time of the assessment. Modelling was undertaken for a variety of meteorological conditions, including prevailing wind conditions and F-class winds towards the residential receivers.

If significant changes to design factors or equipment, re-modelling may be required in order to demonstrate that these changes will also meet the specified operational noise limits.

Under prevailing wind conditions with an F-class inversion towards the residential receivers located to the north east of the site (within Matraville), modelling suggests residential dwellings located adjacent to Bunnerong Creek (along the southern portion of the suburb of Matraville) has the potential to reach a maximum 38 dB(A) during operation of the facility. This would result in a maximum 3 dB(A) increase over the recommended operational noise level. However, a noise increase of 2 – 3 decibels is unlikely to be perceptible to the human ear.

The most significant noise contribution is most likely attributed to trucks idling on site. The modelling indicates that without trucks, the noise level drops down to around 36 dB(A) at the boundary of Matraville. A mitigation measure is that vehicles should be operated at low speed or power and should be switched off when not being used rather than left idling for prolonged periods.

Operational Road Traffic Noise Assessment

Operational traffic movements are primarily attributed to freight transport, including distribution of goods and products.

Both current and predicted road vehicle movements as indicated in GHD's traffic assessment report (August 2006) are presented in Table 7.21.

Table 7.21 Existing and proposed traffic generation

	Approximate Maximum Number of Vehicles Per Day
Existing Operations	55 VPD
Proposed Operations	60 VPD

Note VPD = vehicles per day

As the number of proposed vehicles, including heavy vehicle traffic and commercial vehicles is not expected to increase considerably during operation of the terminal facility, the noise environment is not considered to be affected by future operational road traffic movements.

Generally, in order to increase traffic noise levels by 3 dB(A) the amount of traffic would need to double. Given the negligible increase in vehicle movements, it is considered that the proposal would comply with the ECRTN and vehicle noise would increase by less than 2 dB(A).

7.4.3 Mitigation and management measures

The following mitigation and management measures have been identified to minimise potential adverse impact from noise:

- An Environmental Management Plan (EMP) for the project works should be developed for both construction and operational phases;
- During construction and operation, combustion engine plants, such as generators, compressors and welders should be checked to ensure they produce minimal noise with particular attention to residential grade exhaust silencers;
- As exact construction equipment is unknown, vehicles to be kept properly serviced and fitted with appropriate mufflers. The use of exhaust brakes should be eliminated, where practicable;
- Where practicable, all construction vehicle access to and from the construction site should be made only during normal working hours;
- Where practicable, construction and operational machines to be operated at low speed or power and should be switched off when not being used rather than left idling for prolonged periods;
- Construction and operational machines found to produce excessive noise compared to industry best practice should be removed from the site or stood down until repairs or modifications can be made;
- Where practicable, impact wrenches should be used sparingly with hand tools or quiet hydraulic torque units preferred during construction; and
- Noise modelling suggests that vehicular movements to and from the site and idling transport vehicles are most likely to influence the noise output from the operational site. Where practical, vehicles should be operated at low speed or power and should be switched off when not being used rather than left idling for prolonged periods.

7.5 Water quality

7.5.1 Existing environment

Stormwater

Botany Bay is the nearest waterway from the site. There are no streams or creeks near the Site A Terminal or along the SPC corridor to Site B. Stormwater generated in the Port Botany area would eventually discharge into Botany Bay.

Stormwater quality, as opposed to rainwater quality, varies significantly depending on what stage it is in the urban water cycle, surrounding land uses and any upstream / downstream management measures implemented.

Untreated stormwater is high in nutrients, bacteria and suspended solids compared to typical urban streams and has higher concentrations of suspended solids and metals than secondary treated sewage.

Roads, driveways, car parks etc are identified as a prominent source of stormwater pollutants including suspended solids and hydrocarbons. Vopak Site A is likely to be at higher risk to hydrocarbon and chemical contamination due to the operation of the site as a bulk liquids terminal.

The POEO Licence does not specify any stormwater discharge criteria and therefore does not authorise any pollutant discharge. Hence, Section 120 of the *POEO Act* applies and any discharge of pollutants is a breach of the Act. Vopak has a stormwater management procedure in place that ensures that all discharges are checked for pollutants prior to release. The procedure allows for segregation and treatment options for stormwater found not to be of the appropriate quality.

Existing stormwater at Vopak Site A is managed in three streams prior to release into the existing stormwater network:

1. Potentially contaminated stormwater, associated with the storage areas;
2. The road tanker loading bays and pump bays; and
3. Road / general hardstand runoff, associated with the balance of the site.

Contaminated stormwater

All storage tanks areas are bunded and sealed to AS1940 requirements. The existing site is approximately 90% bunded, with the remaining 10% being unbunded making up the water balance of the site.

Potentially contaminated runoff (rainfall) captured within the bunded areas is drained to a sump pit located within each bunded area. The Vopak stormwater management procedures require that samples and field testing be carried out at this point prior to release (to Botany Bay in Brotherson Dock).

If the stormwater fails the DEC standards within the procedural requirements then there are several options available to the operations personnel. The water can be diverted to a slops tank for disposal off-site to a licensed waste facility or it can be pumped to holding tanks and treated through the WWTP, which discharges to the Sydney Water sewer under an existing Trade Waste agreement.

Sludge generated from the WWTP operations is collected and removed off-site to an approved disposal site.

Road tanker loading bay

Stormwater and spillages from the road tanker loading bay area drains to an underground spillage-holding tank. This runoff is transferred to onsite slop holding tanks for offsite treatment.

Road / general hardstand runoff

The 10% of the site that makes up the remaining water balance outside of bunded areas is captured by a pit and pipe sub-surface stormwater system designed to discharge up to the 10-year average recurrence interval event. This runoff from the open road areas is directed to the final outlet pit, adjacent to the Friendship Road fence line, and then discharged to the existing stormwater network. An outlet valve is fitted to this final discharge pit and is currently being retrofitted with an actuator system to allow it to be closed remotely/automatically in the event of a spillage in the open areas in order to prevent any spillage from leaving the site boundary.

Potable water

Potable water is used on site for toilet flushing, general use purposes and for operational uses such as cleaning. Once potable water is used, the water is generally discharged to the sewer network for treatment at Malabar Sewage Treatment Plant, unless collected in bund areas.

There are no treatment facilities for reuse of potable water as the low potable water demand, minimal areas of landscaping and low staff members at the site discount the practicality and economics of installing a dedicated onsite potable water treatment plant.

7.5.2 Environmental impact assessment

Construction

Construction phase impacts are associated with the activities and aspects of the work. These have potential to lead to erosion, sediment transport, siltation and contamination of offsite waters. Typical activities and sources of potential impacts amongst others include:

- Earthworks undertaken immediately prior to rainfall periods;
- Work areas that have not been stabilised;
- Extraction of construction water from waterways during low rainfall periods;
- Stripping of topsoil, particularly in advance of construction works;
- Bulk earthworks and construction of pavements;
- Works within drainage paths, including depressions and waterways;
- Stockpiling of excavated materials;
- Storage and transfer of oils, fuels, fertilisers and chemicals; and
- Maintenance of plant and equipment.

Minimal demand on potable water during the construction phase is expected and no changes to potable water quality are likely as a result of the construction works.

Mitigation and management measures have been identified to manage potential impacts to off-site waters and such measures would significantly decrease the likelihood of adverse environmental impacts. The Mitigation and management measures are outlined in the statement of commitments and Section 7.5.4.

Operation

Stormwater

The proposal would not alter the existing stormwater management approach, namely to separate stormwater runoff into three streams:

1. Contaminated stormwater, associated with the storage areas;
2. The road tanker loading bay; and
3. Road / general hardstand runoff, associated with the balance of the site.

Contaminated stormwater

The storage tank area occupies 90% of the site and would remain bunded, draining to sump pits. New storage tanks would occupy existing bunded areas. Therefore no alteration or expansions to the existing bunded areas are required. No modifications to the WWTP system for stormwater collected in bunded areas are necessary as no increase in treatment design capacity is required.

Potentially contaminated runoff (rainfall) captured within existing bunded areas and new bunded areas for Vegetable Oil tanks etc, would be similar in operation to the existing stormwater management procedures. That is, potentially contaminated stormwater would be drained to a sump pit located within each bunded area. The Vopak stormwater management procedures require that samples and field testing be carried out at this point prior to release (to Botany Bay in Brotherson Dock).

If the stormwater fails the DEC standards within the procedural requirements then there are several options available to the operations personnel. The water can be diverted to a slops tank for disposal off-site to a licensed waste facility or it can be pumped to holding tanks and treated through the WWTP, which discharges to the Sydney Water sewer under an existing Trade Waste agreement.

The captured runoff from new tank areas, or from new products stored on site, such as methanol / palm oil, is suitable for treatment at the existing WWTP. Contaminants treated in the WWTP would be still be removed by an air stripping tower installed downstream of the WWTP. The WWTP would operate in accordance with the conditions of the DEC Environment Protection Licence issued for the site prior to discharge into the stormwater network.

Sludge, product spills and other waste streams generated from the WWTP would still be discharged to the slops collection tanks for re-blending with products or removed off-site to an approved disposal site.

Road tanker loading bay

The proposal does not alter the existing drainage water quality management within the Road Tanker loading bays. Stormwater and spillages from the road tanker loading bay area currently drains to an underground spillage-holding tank. This runoff is transferred to onsite slop holding tanks for offsite treatment.

Road / general hardstand runoff

Management of road / general hardstand runoff would remain the same as the existing system. At this stage the site is designed to manage flows up to the 10-year average recurrence interval event, however this may require a review to increase the design standard to a higher average recurrence interval event. The increase is likely to be marginal and is not expected to impact on the operation of the proposal. Road /

general hardstand runoff would continue to be routed to the existing interceptor pit, from where it is discharged to stormwater network via an actuated valve.

Potable water

The proposal would not alter the quality of existing potable water.

The biodiesel process involves the use of potable water for cooling towers and for boiler rooms etc. The water used during this process is recycled some 600 times before it is no longer suitable for its intended use and subsequently disposed. A new wastewater stream would therefore be generated from the biodiesel plant.

The wastewater stream from the biodiesel plant would be treated as a Trade Waste, consistent with the requirements of Sydney Water's Trade Waste protocols and treatment standards. The proposal includes an area designated for treatment of the biodiesel process wastewater to meet Sydney Water standards if this is required.

Trade Waste Water from the biodiesel plant would eventually be treated to tertiary standard at Malabar Sewage Treatment Plant. Malabar Sewage Treatment Plant is the largest in Australia and has the capacity to handle the expected load from the biodiesel process.

Tertiary treatment at Malabar Sewage Treatment Plant would return the biodiesel wastewater stream to near potable water standard prior to discharge as treated effluent.

7.5.3 Conclusion

The local stormwater network eventually discharges into Botany Bay. Most stormwater from Vopak Site A would have gone through an inspection and testing procedure prior to discharge; and any contaminated stormwater would either be treated on-site by the WWTP to the sewer or collected for disposal off-site in accordance with DEC requirements.

The proposal is designed and developed in accordance with existing management measures to adequately control stormwater and potable water. Provided these stormwater management measures are maintained, it is unlikely that the construction and operation of proposal would result in an adverse impact on general stormwater quality within Port Botany.

A new water stream would be generated in the form of Trade Waste Water during the operational phase of the proposal. This would require ongoing monitoring measures to ensure compliance with Sydney Water's trade waste protocols. These measures are included in the statement of commitments for the proposal.

With adoption of the mitigation and management measures outlined in the statement of commitments and Section 7.5.4, the construction or operational phase of the proposal is unlikely to significantly affect the water quality of Botany Bay or the operational capacity of Malabar Sewage Treatment Plant.

7.5.4 Mitigation and management measures

The mitigation and management measures nominated in the statement of commitments are expected to adequately control stormwater during operational phase of the project.

Construction phase impacts can be managed by implementation of a Construction Soil and Water Management Plan detailing construction phase stormwater management strategies in accordance with Landcom Soil and Construction, Managing Urban Stormwater (Landcom, 2004). These would include amongst others:

- General site practices and responsibilities;
- Material management practices;
- Stockpile practises;
- Topsoil practices; and
- Erosion control practices (earth sediment basins, straw bales, sediment fences, turbidity barriers, stabilised site accesses, diversions and catch drains).

Monitoring should be undertaken to ensure that stormwater management measures and for trade wastewater are working effectively. Monitoring would rely primarily on visual inspections and sampling. Visual inspections should be undertaken of bunded areas, pits, diversion and catch drains and all other stormwater conveyance structures. Grab samples should be taken for untreated and treated bunded stormwater and trade wastewater.

7.6 Waste management

7.6.1 Existing environment

Bulk liquids at Vopak Site A do not require special packaging or processing that result in large quantities of waste generation. The low staff requirements for unloading and loading bulk liquids result in low staff waste generation in comparison with other high staff industries. The waste currently generated at the site is low as existing operations are relatively static in waste generation.

The nature of the existing operations results in the following waste generation:

General maintenance waste

To operate the facility effectively, general maintenance of tanks, pumps, pipes etc is required and this results in generation of wastes. Most waste generated from maintenance operations is general workshop waste such as rags, gloves, general packaging material, and empty chemical drums, steel off-cuts and machinery spare parts.

Other general workshop waste includes liquid waste, such as paints, waste oils and lubricants, solvents, generated by production and maintenance processes within the site.

The site does not house trees, garden beds or large expanses of grass for outdoor visual amenity purposes. Therefore the site produces very little green waste such as grass clippings, leaves or plant/garden bed refuses. However weeds and vegetation has regrown in Lot 5, which has been largely controlled with a spraying program.

General office / staff waste

Office waste such as paper and other consumables such as printer cartridges are generated in the main Site A office. Newspapers, food scraps and soiled packaging, glass and plastic drinking containers are also generated in the staff rooms.

General operational waste

Wastewater is generated from existing operations and this is described in Section 7.5. Sludges are generated from wastewater are disposed of in accordance with the DEC license. Sludges generated would include oily sludges and water treatment sludges with chlorine residuals.

Airborne wastes, such as vapours generated at the road tanker loading bay and from tank losses, are directed to the Vapour Emission Control System (VECS) where the vapours are captured and converted to a waste stream (made up of water and various hydrocarbon liquids) which is then pumped to Waste Tank 45 for collection and disposal off-site in accordance with DEC requirements.

Spills generated on the site are directed to slops tanks. These tanks are used mainly to collect oil effluent, slop basins in the road tanker loading bays and dewatering from bulk tanks. Also product drainage from thermal reliefs, the water draw offs from all storage tanks and any major product spills are sent to these tanks. They are either reworked back into bulk tanks or discharged as required by the DEC license to road tankers in the loading bay for subsequent removal from the site.

7.6.2 Environmental impact assessment

Potential waste generation

Construction

As with any infrastructure and development project, the proposal has the potential to generate a number of different types of waste, which would require appropriate management and disposal in accordance with relevant state legislation and government policies.

Waste generated during construction of the proposal would include:

- Construction/demolition waste including excavation materials such as rock and topsoil, scrap metals, piping, asphalt, concrete, timber formwork and other materials from buildings and other structures that are to be replaced;
- Surplus materials used during site establishment such as safety fencing and barriers which may include plastics and metals;
- Wastewater including site run-off and water used to control dust;

- Domestic waste including food scraps, aluminium cans, glass bottles, plastic and paper containers and putrescible waste generated by site construction personnel;
- Ablution waste including waste from toilets and basins; and
- Waste oil and fuels.

Operational waste

Waste streams generated during the operation of the proposal would include:

- Four new waste streams generated from the biodiesel processing unit, including;
  - Fatty matter (maximum 990 tonnes per annum) - This is a by-product of the process and is essentially a pumpable mixture of soap derivatives. The biodiesel production process would generate approximately 750 tonnes per year of fatty matter. It is anticipated that this fatty matter has value as a potential fuel source for various industrial heating processes;
  - Glycerine Type II (maximum 1,100 tonnes per year) – This is an industrial grade glycerine (known as Glycerine Type II) that has minor impurities. This material also has value and can be used in animal feed pellets;
  - Distillation residue (maximum 2,990 tonnes per annum) – This is a residue of glycerine, fats, oils, polyols, sodium chloride and water. This material also has value and can be used in animal feed pellets; and
  - Trade wastewater (maximum 65,200 tonnes per annum) – This would be disposed of to sewer via a Trade Waste Agreement with Sydney Water. The Trade Waste Agreement would apply Sydney Water's latest acceptance criteria.
- Waste generated, such as food scraps and office refuse, as a result of the presence of additional work force; and
- Waste as outlined in Section 7.6.1.

General waste management for the proposal

Waste management in NSW is prioritised according to the principles of a resource management hierarchy, giving consideration to the principles of Environmental Sustainable Development. The principles embodied *in the Waste Avoidance and Resource Recovery Act 2001* (WARR Act) are as follows:

Table 7.22 Principles embodied in the Waste Avoidance and Resource Recovery Act 2001

Priority	Strategy	Action
1	Avoidance as top priority	Action to reduce waste generated by industry & government
2	Resource Recovery	Reuse, reprocessing, recycling and energy recovery
3	Disposal as last resort	Environmentally responsible management of disposal

Wherever possible, the proposal would be constructed and operated in accordance with the principles outlined in Table 7.22.

Reuse

Vopak is dedicating a substantial amount of tanks and equipment currently used for existing operations to be reused for the biodiesel project. This includes the reuse of 20 tanks, numerous pumps and existing infrastructure such as the transfer manifold and fire safety equipment.

Other reuse options from demolition materials such as scrap metal would be separated during the construction phase for subsequent disposal to a licensed waste management facility for eventual reuse.

Recycling

The operational phase would generate waste streams from the treatment of wastewater, any spillages and from the Vapour Recovery Unit. As with the existing operation, the waste stream would be directed to the Waste Tank (Tank 45) for subsequent off-site disposal in accordance with DEC requirements.

General recycling of office paper, glass and other consumables would take place where appropriate.

Disposal

Disposal to landfill would be minimised as far as practicable for economic reasons.

Waste streams from the treatment of wastewater, any spillages and from the Vapour Recovery Unit that cannot be recirculated back into the product tanks would be disposed of in accordance with the DEC license.

The trade wastewater generated from the biodiesel process would be disposed of in accordance with Sydney Water Trade Waste requirements. Other waste generated from the biodiesel plant, including fatty matter and distillation residuals would be separated and stored on site for reuse as valued product or disposal off-site in accordance with any DEC requirements.

Potential impacts

The biodiesel process generates additional waste streams and these streams would be managed in accordance with relevant State legislation. The waste streams generated from the biodiesel plant is not expected to significantly affect the environment as the waste are generally considered non-toxic and would be disposed to an appropriate waste handling facility.

The existing waste management protocols for the management of waste water, airborne waste or spillages etc governed by the DEC licence would not alter as a result of the proposal. The tanks reused and new tanks constructed for the proposal would be subject to same waste measures as existing product storages.

Provided existing systems are appropriately maintained and operated, potential impacts are likely to be minor. Minor impacts are likely to arise from periods of technical failures, however there is adequate back up provisions – such as power generation, storage tanks and bunded areas.

Overall, Vopak has developed a well-maintained and effective operational waste management process. Provided the waste measures already in place are maintained and used for the proposal, there is unlikely to be a significant affect on the environment in terms of waste management.

Construction and operational waste would also be managed in accordance with the principles outlined in Table 7.22 and the mitigation and management measures outlined in Section 7.6.3. Provided these principles and measures are strictly implemented, the construction and operational phase of the proposal is unlikely to significantly affect the environment, as waste would be managed to best practice standards.

7.6.3 Mitigation and management measures

The following mitigation and management measures would be implemented to minimise adverse waste generation:

- A Construction Environment Management Plan and an Operational Environment Management Plan would be prepared to address waste generated during the construction and operational phase of the proposal. This would focus on minimising the volumes of waste generated through careful planning of works. The plan would also focus on waste minimisation according to the hierarchy of avoidance, reuse, recycle, and finally disposal. All waste disposals would occur in accordance with the EPA *Environmental Guideline: Assessment, Classification and Management of Liquid and Non-Liquid Waste (2004 edition)*.
- A sufficient number of suitable receptacles for general waste and recyclable materials would be provided for waste disposal on site, including sufficient bins to allow separation of wastes for recycling and conform with DEC guidelines for construction waste;
- Surplus soil material (spoil) created as a result of the proposal would be reused in landscaping and rehabilitation works as a first priority. Any waste material unable to be re-instated would be transported to land that can lawfully receive that waste;
- All waste would be securely stored to ensure that any pollutants are prevented from escaping;
- Construction vehicles would be securely covered to prevent spilling and loss of waste during transportation;
- The work site would be left clean and free of any debris and other rubbish at the end of the works;
- Where feasible, suitable construction and operational waste would be recycled in accordance with the NSW Waste Avoidance and Resource Recovery Strategy 2003;

- All waste to managed in accordance with EPA Environmental Guideline: Assessment, Classification and Management of Liquid and Non-Liquid Waste (2004 edition); and
- Trade Waste Water to be managed in accordance with Sydney Water's Trade Waste protocols.

7.7 Visual amenity

7.7.1 Existing environment

The proposal is within a regional industrial area, dominated by shoreline port facilities and Sydney Airport runway. Such facilities significantly characterise the Port Botany visual environment through the use of large cranes, docking facilities, support industries and shipping and air traffic. These developments can be seen from as far south as Kurnell and along the western foreshores of Botany Bay stretching from Kyeemagh to Dolls Point.

The former State Pollution Control Commission (now DEC) conducted a visual assessment of the Botany Bay foreshores in 1979. It characterised the Port Botany visual area as administrative buildings, bulk liquid storage tanks, container cranes, gas flares, container stacks, container ships, oil tankers and chemical tankers. These developments provide a context upon which the proposal can be assessed.

A revetment wall, known as Banks Wall upon which runs a four-lane roadway (Prince of Wales Drive) dominates the visual environment of eastern side of the Port Botany peninsula. The revetment wall is a sloping concrete block wall, rising 14.5m above the high tide water level. The wall's edge gives the area a very built up character and built-form when viewing from the suburbs of Phillip Bay and La Perouse. The revetment wall height is approximately 10 metres above the reclaimed land on Molineux Point and is a highly visible feature within the locality.

Molineux Point provides a viewing vista towards the south to the Kurnell Peninsula, with its natural wetland area of Towra Point, natural terrestrial landscape of Botany Bay National Park (south) and the heavily industrialised section of the peninsula related to the Caltex Oil Refineries.

The nearest residential land use can be found approximately one km to the southeast at Phillip Bay. The suburbs of La Perouse, Phillip Bay and Henry Head, located to the southeast along the shoreline from Port Botany, provide recreational users along the shoreline and with a viewing vista towards Port Botany. High points located within these suburbs also provide a viewing vista towards Port Botany.

On a local scale, the Port Botany environment is generally flat and cleared of vegetation and has low natural amenity value due to the scenic dominance of the built environment, which includes ships docking, container terminals, bulk liquid terminals and Sydney Airport.

Bulk liquid facilities in Port Botany area have approximate tank heights of up to 26.9m (Orica Hydrocarbon). Container cranes in the locality exceed 55m in height. The nearby surrounding storage tanks to the west of the Site A Terminal include Origin Energy LPG storage facility, Orica Australia and Vopak Site B. To the north, south and east of the facility are container terminal parks including Patrick Port Services and P&O Ports.

7.7.2 Environmental impact assessment

Construction

Potential impacts from construction of the proposal would be associated with work crew requirements, spread of construction activities, types of machinery used and materials stockpiled.

The most significant construction impact would be the use of cranes to install the biodiesel module and tanks.

A low level crane (less than 20m) would be used on site for a period of 6 months for general construction work. For the biodiesel module (erection/ completion), a 28m high crane would be required for 11 weeks (lowered at end of each working day) and a 60m high crane would be required for 1 week (lowered at end of each working day).

This impact would short-term only and the use of cranes would cease once construction is completed. An example of the type of visual impact during the construction of the proposal is provided in Figure 1.1 and Figure 7.5, which illustrates the type and height of cranes for the construction of the Darwin biodiesel plant.

Figure 7.5 The use of construction cranes at the Darwin biodiesel plant

The visual impacts of construction cranes would be temporary (note that a 44 week construction program is proposed for stage one). The location of the site within the area of Port Botany would also reduce the construction visual impact of the proposal as existing container facilities use large cranes (up to 55m in height – refer to Figure 7.6), which would provide a degree of visual draw away from the construction of the proposal.

Other construction impacts, such as spread of materials and work force is unlikely to be a significant impact as the distance of sensitive receivers, such as residents, from the site (approximately one km) and the temporary nature of construction, indicate that potential visual impacts associated with these aspects of construction of the proposal are unlikely to significantly affect such receivers.

Nearby industries are unlikely to be affected due to the distance from the proposal and existing operational amenity of nearby industries would diminish potential visually intrusive impacts.

Operation

The State Pollution Control Commission (1979) report analysed viewing points and the impact of allowing maximum allowed height of facilities at Port Botany. The report identified the following issues relevant to the site:

- For close observers the key viewing point will be from Prince of Wales Drive and the road along the top of the revetment wall;
- Medium distance views from the east and south-east, i.e., Phillip Bay and La Perouse from the land and water will be partially obscured by the revetment wall;
- For long distance views, a structure over 30 m high, when viewed from areas such as Kyeemagh and Brighton Le Sands, would break the skyline. From Captain Cooks Landing Place at Kurnell, structures for the proposed site would be visually comparable if they were below 25 m high; and
- Other potential prominent long distance views are outside a 6km radius from Port Botany and would not be discernible to the naked eye.

According to the State Pollution Control Commission report a number of objectives were developed to protect and improve the visual resources of the Botany Bay environment. Objectives of relevance to the proposed expansion are examined below.

Reduce the visual impact of the Port: The 14.5m revetment wall, the backdrop provided by the Airport and surrounding developments (including the Port's gantry cranes) and nearest residences being located one km away, all assist in the partial screening / amelioration of the impact of the proposal.

Protect views of Port Botany: The site forms part of the Port Botany visual area. The proposal is compatible with the visual features typical of the area; it is compatible with the existing use as a Port related function and within the general context of existing development.

Preserve and protect natural features: Identified natural features include La Perouse ridge, Forest Road ridge and Cape Solander. The visual impact of the proposal on natural features is described below.

The proposal when viewed from areas such as Kyeemagh and Brighton Le Sands would not break the La Perouse Ridgeline, as the proposal does not involve structures greater than 30 metres.

The Forest Road ridge represents the background component of the views from the east of the site, i.e., La Perouse and Little Bay. The proposal would break the ridgeline if viewed from relative ground levels, although the dominant elements of that view would remain generally unchanged.

Cape Solander forms the background of the proposal when viewed from sections of Foreshore Road, Lady Robinsons Beach and Sir Joseph Banks Park. Views by motorists along Foreshore Drive will be screened by vegetation and views from Lady Robinsons Beach and Sir Joseph Banks Park will be dominated by mid-ground views of the facilities at Port Botany.

Short range and long range views to Site A

The maximum height of any infrastructure on the site would be 29.5 m for distillation columns. The maximum height of the tanks forming part of the proposal would be comparable in height to those forming part of the existing Site A Terminal, i.e. 18 m. The colour of the tanks is required to be white to minimise heat absorption and consequent evaporative losses and comply with existing Australian Standards.

The proposal would not have a significant impact on the nearest sensitive receivers at La Perouse / Phillip Bay as the Site A Terminal is not entirely visible from these points due to the topography of the land and existing facilities that front Bumbora Point.

Residents along the western foreshores of Botany Bay would not see the entire Vopak Site A facility as it would be screened by existing development along Molineux Point and the container terminal. The SPCC report identified that structures over 30m would break the skyline for these long-range views. The proposal does not involve any structures over 30m.

However, there exist a long-range view when looking from Kurnell (e.g. Captain Cook Memorial). This view is a regional view rather than local view. The 1979 SPCC report identified structures would be comparable if limited to 25m. The highest structure is 29.5m for distillation columns and would break the skyline when viewed from ground level along the Kurnell foreshore.

The distillation columns are unlikely to contrast significantly with existing Port Botany infrastructure when seen from Kurnell and are unlikely to be a dominant visible element in the landscape when viewing from the memorial. In addition, the columns are not bulky or a highly reflective colour in characteristics. The Vopak Site A is also partly screened by Patrick Port Services and Origin Energy when viewing from Kurnell.

The long-range visual impact of the processing facility would not significantly degrade the amenity visual value of Port Botany from Kurnell. The Port Botany regional environment is a working port where structures of various types, including cranes, tanks, lighting masts and container stacks have been erected well over the 24 metre limit currently exercised by SPC at Vopak Site A. In addition, other regional development around the Port Botany peninsula, including industries associated with

Sydney Airport and general urban consolidation, has altered the regional view from Kurnell since the release of the 1979 SPCC report.

A photo and super imposed photo of the proposal, when looking from Yarra Bay Sailing Club, is illustrated in Figure 7.6 and Figure 7.7. Items in yellow indicate new infrastructure, however in reality new infrastructure would harmoniously fit in with existing infrastructure (i.e. the tanks would be white in accordance with existing tanks). The figure demonstrates that even from relatively close points, the biodiesel facility is obscured by existing development in the foreground and background.

Therefore when looking from areas further away, such as Kurnell, Figure 7.7 demonstrates that the facility is unlikely to significantly affect visual amenity of the Port Botany environment due to the views of new infrastructure being largely lost within the existing built environment.

Figure 7.6 Vopak Site A, when looking from Yarra Bay sailing club (photo: Vopak 2006)

Figure 7.7 Superimposed photo of the proposal, looking from Yarra Bay sailing club (courtesy Bilfinger Berger)

Street frontages

The biodiesel facility itself would be located behind the existing administration building and would be mostly screened from the street frontage facing Friendship Road. The new storage tanks would blend in with existing tanks and therefore no significant impacts on the existing street frontage view are expected from the new tanks.

However, the views from the street frontage and the exits and entries from the Vopak Site A facility would alter due to the construction of support buildings (for example the administration and workshop buildings) and traffic modifications. An existing security fence screens much of the site from the street frontage and this security fence would remain for the proposal. The statement of commitments will include a measure that all new buildings would be built according to the appropriate standard and code, would be designed to harmoniously fit in with existing buildings at Site A and consider street frontage views from Friendship Road. These standards and codes include, but not limited to:

- *Building Code of Australia* (BCA);
- AS1250 SAA *Steel Structures Code*;
- AS1657 *Fixed Platforms, walkways & stairways*;
- AS3600 *Concrete Structures Code*;
- AS3000 SAA *Wiring Rules*;
- CCAA T55/CIA Z10-2005 *Guide to Tilt-up Design and Construction*; and
- AS/NZS 2311 *Guide to the Painting of Buildings*.

The site does not include vast amounts of landscaping to soften hard edges due to the requirements for bunded areas and for security reasons. However, the existing front fence is to be relocated approximately 10 m closer to the Friendship Road kerb. The existing main entrance gate would not be affected by the proposal.

The SPC landscaping policy requirements (in accordance with Sections 5.1 and 5.2 of the *Exempt and Complying Development Guidelines for Port Botany*) will require a 5m wide section of landscaping along the Friendship Road frontage and fencing standards. The detailed design would incorporate landscaping and fencing standards that would be consistent with these requirements, which include:

- To enhance the visual and environmental quality of Port Botany through the provision of suitable landscaping areas;
- To establish a 5 metre wide landscape buffer strip adjoining the mown grass nature strip or roadway;
- To provide landscaping which does not affect the level of security experienced by a particular site;
- To enhance the overall visual and environmental quality whilst address the potential fire risk and maintaining a high level of security;

- To establish a long-term commitment to landscape maintenance which is consistent with ESD principles and addresses day-to-day issues of litter control, rubbish dumping, Port security and weed management;
- To ensure that all areas are kept neat and tidy at all times; and
- Chain wire fencing (maximum 3500 mm in height) inclusive with optional three strand barb wire along the top portion of the fence;
- Fencing is to be black in colour including black PVC, powder coated or the like.

Refer to Figure 6.1 for the approximate fence location and approximate landscaping layout.

Lighting impacts

Lighting requirements for proposal would be designed to Australian Standard 1680.1 - 2002 minimum requirements.

Light spillover would also comply with CASA requirements to ensure the operations of Sydney Airport are not affected and that external lighting is minimised from spill off site.

It is therefore considered that light spillover would be minor, minimal and mitigated to the appropriate Australian Standards so as not to affect the operations of Sydney Airport, nearby properties or public land.

7.7.3 Conclusion

The proposal would not have a significant visual impact. There are a number of factors that support this conclusion including:

- Construction impacts would be short term and would be adequately mitigated;
- In the context and scale of existing infrastructure, the proposal would not introduce any element that would contrast significantly or visually affect the existing amenity value of Port Botany;
- The proposal has been generally designed to limit intrusive skyline views by complying with tank height restrictions;
- Long range views, including those from Kurnell, are unlikely to be altered significantly as existing foreground and background development results in new infrastructure at Vopak Site A being largely lost within the existing built environment;
- Measures will be implemented to ensure that all new buildings would be built according to the appropriate standard and code, will be designed to harmoniously fit in with existing buildings at Site A and consider street frontage views from Friendship Road;
- Lighting requirements for proposal would be designed to Australian Standard 1680.1 - 2002 minimum requirements; and
- All lighting during construction and operational would be compliant with *MOS 139 9:21 Lighting in the vicinity of aerodromes*.

7.7.4 Mitigation and management measures

The following mitigation and management measures would minimise potential impacts on the visual environment:

- All worksites to be left clean and tidy and the contractor shall maintain the site in an orderly manner;
- Construction works would be completed within the shortest possible timeframe;
- All work equipment and materials would be contained within the designated boundaries of the work site;
- On completion of the works all equipment, materials and refuse relating to construction of the works would be removed from the work areas;
- All waste generated during the course of the works would be removed from the work area as soon as practicable and disposed in accordance with DEC waste management guidelines (*Assessment, Classification and Management of Liquid and Non-Liquid Waste 2004 edition*);
- All new buildings would be built according to the appropriate standard and code will be designed to harmoniously fit in with existing buildings on the site and consider street frontage views from Friendship Road; and
- New landscaping would be designed in accordance with the SPC landscape policy (Sections 5.1 and 5.2 of the *Exempt and Complying Development Guidelines for Port Botany*) and agreed upon prior to construction;
- Lighting requirements for proposal would be designed to Australian Standard 1680.1 - 2002 minimum requirements; and
- All lighting during construction and operational would be compliant with *MOS 139 9:21 Lighting in the vicinity of aerodromes*.

8. General environmental risks analysis

8.1 Overview

The preceding chapter addressed the key potential environmental impacts associated with the proposal.

In addition to the key potential impacts, there are a range of other issues to be considered to address the appropriate environmental assessment framework for the construction and operation of the proposal. These issues include:

- Context and setting;
- Built form;
- Topography, geology and soils;
- Terrestrial ecology;
- Socio-economic;
- Marine environment;
- Heritage; and
- Utilities and services.

8.2 Context and setting

The proposal is to be located within the local area of Port Botany. Port Botany was developed as a major port in the early 1970s. The storage facilities within the Port Botany area primarily include tank farms for the purpose of bulk liquids and gas storage and large container parks. The storage tanks are required to be white to comply with existing Australian Standards and are bulky in nature.

The proposal consists of utilising an existing tank farm, which is entirely within the existing context and setting of bulk liquids storage facilities. However the proposal would also introduce a unique biodiesel plant to the Port Botany area.

The biodiesel plant is a minor structure in terms of existing infrastructure at Port Botany. The biodiesel plant's need and subsequent contextual setting at Port Botany represents modern urban built-form benefits of industry clusters, well-connected supply chains and integration of facilities for economical, logistical and environmental reasons. The biodiesel plant itself is entirely within the context and setting of Port Botany as a working port for the purpose of bulk liquids.

In addition the proposal is consistent with existing port functions in that it would:

- Form part of an established port and industrial area identified as being suitable for bulk liquids storage and handling;
- Would contribute to the economic significance of the area; and
- The existing land is physically suitable for the proposal.

8.2.1 Mitigation and management measures

It is considered that the proposal would not have a significant impact in terms of context or setting, as the proposed use of the site remains dedicated to service SPC operations and bulk liquids; therefore no mitigation or management measures are identified.

8.3 Built form

The existing urban environment of Port Botany is a working port environment, dedicated to servicing import and export operations. Incremental development to service the BLB has occurred since the 1970s when the dock was built and as the demand for fuel based products increased.

The relative early studies undertaken for the BLB area of Port Botany by the State Pollution Control Commission in 1979 provided early urban environment guidelines for development in the area. This has resulted in an orderly development of Port Botany for land uses identified as being suitable for container and bulk liquids transport and storage.

Existing and proposed developments are required to comply with relevant Australian and industry standards for the design of storage tanks and safety features. The proposal incorporates these design standards to ensure that infrastructure such as storage tanks, buildings and fire safety equipment are designed to best practice standards. Refer to Section 6 and 7.1 for more details on relevant design standards.

The height of all buildings and structures erected may be controlled both by the provisions of the Commonwealth *Civil Aviation (Buildings control) Regulations* and by SPC's requirements. Under the regulations, buildings and structures over a certain height (measured above ground level and including all vents, chimneys, aerials, TV antennae, construction cranes, etc) in a portion of the land within Port Botany will require the approval of the Federal Airports Corporation.

The proposal was forwarded to Sydney Airport Corporation Limited for comment. Discussions with the Sydney Airport Corporation indicate that the defining height from which point the Sydney Airport Corporation will undertake thorough investigation is 51AHD (i.e. 51m above Australian Height Datum). The tanks would have an overall maximum height of 18m and 29.5m for distillation columns, and is therefore substantially within the Sydney Airport Corporation height criteria.

However during construction phase a 60m crane would be used for approximately one week. The Sydney Airport Corporation Limited may include approval conditions under Civil Aviation Safety Authority guidelines for the duration of this period to ensure operations of the airport is not affected.

Separate height restrictions may also be applied by the SPC to the various zones within the development. The height of structures would not exceed 29.5m (i.e. distillation columns). This height is inconsistent with the State Pollution Control Commission 1979 report, which identified a height of 25m as being appropriate for facilities at Port Botany when viewing from Kurnell.

Condition 23 from the Sydney Port Corporation Preliminary Development Requirements (1998) states:

> *'Separate height restrictions will be applied by the SPC to the various zones within the development. The height of tanks and other structures in the petroleum products area shall not exceed 24.0m and in the liquid chemical and petro-chemical products area the maximum height shall be 18.0m. Varying height limitations will apply to the different sections of the dry products storage areas'*

The storage tanks would be limited to 18 metres in height and the Lurgi Plant Module is of the order of 15m in height. However, as mentioned previously, the design includes distillation columns, which would be of the order of 29.5m in height. Therefore dispensation from the Sydney Ports Corporation from Condition 23 is required.

As noted in the visual assessment, the visual impact of the distillation column is unlikely to significantly affect the long-range visual amenity of the Port Botany region when viewing from Kurnell (refer to Section 7.7.2).

The internal area of the Site A does not include areas of landscaping as landscaping the internal areas of the Site A would increase security risks and increase potential fire fuel. Therefore the use of landscaping as an effective measure to soften bulky or hard edges associated with the site or proposal is considered ineffective. However, the existing front fence is to be relocated approximately 10 m closer to the Friendship Road kerb. The existing main entrance gate would not be affected by the proposal.

The SPC landscaping policy requirements (in accordance with Sections 5.1 and 5.2 of the *Exempt and Complying Development Guidelines for Port Botany*) will demand a 5m wide section of landscaping along the Friendship Road frontage and fencing standards. The detailed design would incorporate landscaping and fencing standards that would be consistent with these requirements, which include:

- To enhance the visual and environmental quality of Port Botany through the provision of suitable landscaping areas;
- To establish a 5 metre wide landscape buffer strip adjoining the mown grass nature strip or roadway;
- To provide landscaping which does not affect the level of security experienced by a particular site;
- To enhance the overall visual and environmental quality whilst address the potential fire risk and maintaining a high level of security;
- To establish a long-term commitment to landscape maintenance which is consistent with ESD principles and addresses day-to-day issues of litter control, rubbish dumping, Port security and weed management;
- To ensure that all areas are kept neat and tidy at all times; and
- Chain wire fencing (approximately 3500 mm in height) inclusive with optional three strand barb wire along the top portion of the fence;

Fencing is to be black in colour including black PVC, powder coated or the like. Refer to Figure 6.1 for the approximate fence location and approximate landscaping layout.

Master Plan

As part of the statutory consultation process, Randwick City Council requested that the Environmental Assessment address Randwick Local Environment Plan Clause 40A Master Plan provisions, which primarily is to ensure that development in large sites occur in an integrated and holistic manner.

As noted in Section 3.4.4, the proposal is consistent with existing land uses of the Site A – namely for bulk liquids storage and handling. This aspect of the proposal indicates that the Randwick LEP Master Plan provisions are not relevant for this proposal.

It is noted that the proposal has been planned to integrate with existing facilities (for example Vopak Site A and B) to avoid transport of bulk liquids via road tankers and to maximise efficiency. In addition the proposal is considered to be holistic in its approach by addressing a range of issues incorporating the environmental, economic and social spheres (e.g. refer to Section 7 and 8).

8.3.1 Mitigation and management measures

The following mitigation and management measures would be implemented to minimise the potential for adverse impacts on urban design:

- All new tanks are to have a maximum height of 18 metres;
- All other structures, other than distillation columns, are to have a height limit of less than 24 metres;
- Dispensation from Sydney Ports from condition 23, which is to apply only to the distillation columns; and
- Landscape mitigation measures outlined in Section 7.7.4

8.4 Topography, geology and soils

Reference should be made to Section 2.3.3 for a description of the existing site conditions.

A due diligence Environmental Assessment was undertaken by ERM Pty Ltd (2002) to assess whether use of Lot 5 as a JORTL LPG facility had impacted soil and groundwater conditions for the site. The investigations concluded no observable impacts to soil or groundwater conditions attributable to the use of a JORTL LPG facility.

The ERM investigations revealed:

- Bore hole soil samples reported concentrations of Volatile Organic Compounds (VOCs) that were below the labatory detection limits and the assessment criteria;
- VOCs were not detected in any groundwater sample; and

- Groundwater samples exceeded the guideline criteria for zinc, however there is no potential for zinc to be associated with Vopak's use of the site and is likely to be sourced from historic filling activities and the industrial use of the Port Botany area.

An acid sulphate soils assessment for the Port Botany expansion identified the Port Botany area as disturbed land. Provided excavation works do not encroach on the high water mark, Potential Acid Sulphate Soils (PASS) are likely to remain undisturbed.

The site is located within the boundaries of Botany Sands Aquifer. Groundwater levels within the aquifer are influenced by rainfall and extraction rates from private bores. Historical monitoring of groundwater levels has been sporadic. The general pattern of groundwater flow is southwesterly towards Botany Bay with higher levels west of Botany Industrial Park attributed to a reduction in extraction rates and higher rainfall in that area (URS: 2003: pp17-2).

8.4.1 Environmental impact assessment

Construction

Lots 3 and 4 are covered in concrete and include bunded areas. The current Environmental Protection License does not mandate due diligence assessment of potential contamination within these areas (known as 'hot spots').

Vopak initiated an in house (due diligence) site investigation eight (8) years ago and have resurveyed the site several times since (i.e. ongoing monitoring) by a DEC Accredited Site Auditor.

The identified hot spots were small and quite localised and none were near any fence line (i.e. potential for off-site migration is minimised) and were judged not to be significant enough to warrant remediation. Several of the hot spots showed attenuation (i.e. natural reductions) over the resurvey periods. The proponent would continue this process and conduct remediation if the results changed significantly in accordance with the recommendations of the DEC Accredited Site Auditor.

The proposal would not involve earthworks that would significantly alter the topography or geology of the site. Excavation would be limited to pipework where required or for foundation support and bunding. It is expected that excavation works would be minor therefore reducing the potential for unearthing of PASS.

Unearthing of PASS may potentially affect the environment through the release of acid leachate, however standard mitigation and management measures significantly reduce the risk associated with PASS and will be incorporated into the statement of commitments.

In addition, earthworks are likely to result in sediment disturbance and potential runoff into nearby stormwater network. Provided the mitigation and management measures outlined in 8.4.2 are implemented, these impacts can be adequately managed.

It is noted that the Botany Sands Aquifer has been impacted by industrial development and subsequently the groundwater regime is classified as a 'high risk resource' due to contamination from surrounding industrial developments (i.e. Botany Industrial Park).

However, known contaminated plumes, plume paths and the groundwater protection zone is located north of the Port Botany Container Terminal, some 1.5 km from the BLB. It is therefore unlikely that contaminated groundwater would migrate towards the BLB and SPC pipeline corridors.

Groundwater may be encountered during shallow trenching operations for laying pipeline infrastructure. Groundwater is not expected within 2.6 metres of the surface. Groundwater levels within Botany Sands Aquifer are influenced by rainfall and extraction rates (URS: 2003: pp17-9). Due to the decline in extraction rates, groundwater levels is likely to rise, however this may be offset to some extent by drought conditions. Regardless, the minor nature of the works and backfilling trenches with the excavated materials, it is unlikely that proposal would impact on groundwater levels or the existing groundwater regime.

Operation

The Vopak stormwater management procedures requires that samples and field testing be carried out for potentially contaminated water prior to release to the environment (i.e. Botany Bay in Brotherson Dock).

If the stormwater fails the DEC standards within the procedural requirements then there are several options available to the operations personnel. The water can be diverted to a slops tank (i.e. Waste Tank 45) for disposal off-site to a licensed waste facility or it can be pumped to holding tanks and treated through the WWTP, which discharges to the Sydney Water sewer under an existing Trade Waste agreement.

The stormwater management procedures therefore indicate that there is low potential for contamination of groundwater from Vopak Site A operations.

8.4.2 Mitigation and management measures

The following mitigation and management measures would be implemented to minimise the potential for adverse impacts on topography, geology and soils:

- A Construction Soil and Water Management Plan would be developed as part of a construction environment management plan and would be consistent with those specified in Landcom's 'Managing Urban Stormwater: Soils and Construction' (Landcom: 2004);
- Disturbed areas would be stabilised as soon as possible following completion of works;
- Stockpiles would be covered or stabilised to prevent transport of sediment from the work site;
- Sediment control devices such as silt fences would be installed on all drainage lines downstream in the vicinity of the work area;
- At the completion of construction and stabilisation of the land surface, all stormwater control devices would be removed;
- Outdoor construction works would not take place during or immediately after high intensity or prolonged rainfall;

- All roads and footpaths affected by construction would be kept free of all waste, loose sand, soil, aggregates and clay deposits;
- An Acid Sulphate Soil procedure would be developed in response to potential unearthing of Acid Sulphate Soils. This would be consistent with the measures in the Acid Sulphate Soil Management Advisory Committee Guidelines;
- In the event that contaminated groundwater is discovered, a groundwater management plan would be developed and implemented;
- Site contamination investigations would continue and would be conducted to identify 'hot spots' and, where required, decontamination measures would be developed to manage/remove any identified areas of contamination. The investigations would be conducted in accordance with the requirements of the Department of Environment and Conservation.
- Any 'hot spots' that are found to have contamination levels exceeding environmental guidelines would be subsequently remediated in accordance with SEPP 55 legislation procedures; and
- Appropriate disposal of any contaminated soil or water in accordance with DEC waste management guidelines.

8.5 Terrestrial ecology

Reference should be made to Section 2.3.5 for a description of the existing site condition.

The URS study into the expansion of Port Botany Container Terminal (2003) and the 2006 Environmental Assessment for the Vopak Site B B3 expansion found that TSC Act and EPBC Act listed migratory birds might utilise the Penrhyn Estuary and Molineux Point. However other suitable habitat areas within the Port Botany was not identified. This includes the Vopak Site A area.

The studies identified the Penrhyn Estuary as the likely habitat for many of these species (located approximately 1.5 km north of Vopak Site A). Molineux Point has also been identified as a potential habitat for some species including the *Charadrius bicinctus* (Double-banded Plover), *Limicola falcinellus* (broad-billed Sandpiper) and the *Sterna albifrons* (Little Tern). Molineux Point is located approximately 1 km southwest of Vopak Site A.

The 1995 EIS for the Vopak Site B development identified the Molineux Point area as a possible habitat for the Pied and the Sooty Oystercatcher (*Haematopus)* and these two birds are listed as vulnerable under the TSC Act.

8.5.1 Environmental impact assessment

The site consists of land reclaimed as part of the SPC expansion of the Port area in the 1970s. Native plants are unlikely to establish an extensive vegetation community due to disturbed land, exposure to salt-laden winds, lack of nearby native floral plants and communities to establish a seed base and poor quality soil.

The habitat of Lot 5 is such that faunal species including small lizards and birds may utilise the site. The proposal would result in a loss of this habitat. Such a loss is considered insignificant, as the site is not a recognised ecological feature of importance or significance to the regional ecological environment or the community.

Whilst the Vopak Site B EIS study in 1995 and the URS Study for container terminal expansion in 2003 identified a number of TSC and EPBC listed migrating birds as occurring in the vicinity of Port Botany, the studies show that likely potential habitat include the Penrhyn Estuary and possibly Molineux Point. The Penrhyn Estuary and Molineux Point are located approximately 1.5 km and 1 km respectively from Vopak Site A.

The SPC pipeline corridor is cleared of vegetation and does not include suitable habitat for migrating birds.

It is therefore doubtful whether the proposal site and SPC pipeline corridors, or the immediate vicinity, is a major habitat for migratory bird species when they are likely to utilise areas of the Penrhyn Estuary, rocky foreshores of Molineux Point or places further afield - e.g. Boat Harbour and Towra Point wetland on the southern foreshores of Botany Bay (URS: 2003).

8.5.2 Assessment under TSC Act and EPBC Act

The assessment of potential impacts on migratory species indicates that the proposal is unlikely to have an impact on migratory bird species and that an 'Assessment of Significance' under the TSC Act is not required.

Migratory bird species are also listed under the EPBC Act. However the proposal is unlikely to affect these species, therefore, a Referral to the Department of Environment and Heritage is not required, as the proposal is unlikely to constitute a controlled action.

There are number of factors that support this conclusion the proposal is unlikely to affect the TSC Act and EPBC Act listed species and communities, including;

- The proposal is located on cleared and disturbed land;
- The proposal site is currently utilised and/or was utilised as part of previous land uses and as such provides low potential for suitable flora and faunal habitat to be established;
- The site of the proposal and the immediate vicinity is unlikely to provide ideal habitat for migratory bird species due to the current site built form, lack of vegetative cover and suitable conditions (e.g. intertidal mudflats);
- Other more potentially suitable habitats exists nearby, including the Penrhyn Estuary; and
- The proposal does not impact on the rocky foreshore areas of Molineux Point or the Penrhyn Estuary where such habitats are identified as being suitable for migratory birds.

8.5.3 Mitigation and management measures

The proposal is unlikely to affect the terrestrial ecology. Therefore no specific mitigation and management measures are identified.

8.6 Socio-economic

The socio-economic environment was briefly discussed in Section 2.3.7.

The social environment can be characterised by identifying indicators, which can include econometric data (e.g. employment levels, household income, productivity levels), social activities, philosophical way of life and world views, culture, tradition or social functions that exists for a person, community group or place.

The Vopak operation alone can be econometrically measured to provide an indicator of economic value. Currently the Vopak Site A facility services approximately three ships per month, with an added value contribution to the Gross State Product[10] in order of $730,000 per ship (SPC: 2003: pp8). Therefore approximately $26.3 million pa is contributed to the NSW Gross State Product from Vopak operations from ship visits alone.

Direct and indirect household income generated by Vopak operations is approximately $16 million p.a[11]. Direct and indirect jobs generated from Vopak operations are approximately 14 full-time equivalent jobs per $1 million of output (EconSearch: 2003: pp15), therefore Vopak currently contributes approximately 368 direct and indirect jobs to the economy.

Other social indicators are more difficult to measure and/or relativists in nature, and include philosophical values, feelings of happiness and well-being, externality values and perceptions on existing social fabric and governance.

8.6.1 Environmental impact assessment

Construction

The proposal is expected to financially cost the proponent approximately $30 million and would directly generate an average construction workforce between 30 and 50 personnel during a 44 week stage one construction period. Assuming an average income of construction workers of approximately $85,000 pa[12], a construction utilisation of 30 workers for 44 weeks, the construction phase is estimated to directly generate approximately $2.158 million in construction worker household income before tax.

Payroll and contractors fees are then filtered through the economy by multiplier effects, i.e., effects attributable to expenditure arising from income received during construction. Construction would also result in indirect effects such as the production of

[10] Gross State Product is a measurement of economic output

[11] Multiplier of 0.61 to every $1 of economic output (EconSearch: 2003: pp15).

[12] Supplied by Vopak and based on technical skills, knowledge and experienced required for construction of bulk liquids storage facilities.

necessary piping, plant and instrumentation and other construction materials necessary during the construction phase. These would not be made on the site of the proposal.

There is unlikely to be significant social impacts from the construction of the proposal (i.e. amenity based impacts) on sensitive receivers as the proposal is located approximately one km from the nearest residents at Phillip Bay. Therefore potential direct construction impacts such as traffic impacts, visual views, noise and general air quality (addressed as key issues in Section, 7.2, 7.3, 7.4 and 7.7) are unlikely to significantly affect local communities.

Operational

An economic survey of the Australian economy in 2004 by the Organisation for Economic Co operation and Development (OECD) found that:

> *'Productivity measures consistently show that output …while rising briskly, remains well below that in technologically leading countries. Policies most prominent in this respect encompass those which foster competition in product markets and thus promote the growth of multifactor productivity and the wider use of new technologies'*[13]*.*

The SPC (2003: pp 8) estimate that for each bulk liquid and gas vessel visiting the port creates an added value contribution to the Gross State Product in order of $730,000. The operational phase of the proposal would generate an additional 23 ships per annum (includes stage two process train). Therefore the operational stage of the proposal would contribute an additional $16.8 million to the Gross State Product per annum, an increase in economic output of 64% at the Vopak facility.

The operation of the proposal would create an additional 8 fulltime employees. The indirect and direct jobs during the operational period, based on a multiplier of 14 full time jobs per every $1 million of output, is therefore estimated that the proposal would create 224 full-time equivalent direct and indirect jobs.

Whilst the direct Vopak staff numbers are low, the extra operational productivity would produce significant indirect job growth due to the transport and logistical requirements of distributing bulk liquids.

Direct and indirect household income is also likely to increase should the proposal be granted planning consent. It is estimated, using a multiplier of 0.61, the proposal would generate approximately $10.2 million per annum in household income.

It is also important to recognise that society also contributes to promoting the biofuels industry in order to establish market foundations (refer to Section 1.4.4). ABARE's calculations yield an estimate cost of $90 million (in 2004–05 terms in 2009–10) and $72 million (in 2004–05 dollars) in the long term (post-2015) for subsidising the biofuel industry (Commonwealth Government: 2005: pp 118).

[13] Policy Brief, *Economic Survey of Australia, 2004*, OECD, January 2005

However it is considered that these costs do not reflect recent forecasts to long term higher than average oil prices experienced since June 2005, or, consider externality benefits such as air quality benefits and subsequent savings in the health industry.

Another potential social benefit of biodiesel and the proposal is that an appropriate substitute for imported refined oil based products is developed. The benefit, for example, is that existing social functions (such as transportation requirements) reliant on imported refined oil products are maintained without requiring significant social behaviour change.

There is unlikely to be significant social impacts from the operation of the proposal (i.e. amenity based impacts) on sensitive receivers as the proposal is located approximately one km from the nearest residents at Phillip Bay. Therefore potential direct operational impacts such as traffic impacts, visual views, noise and general air quality (addressed as key issues in Section, 7.2, 7.3, 7.4 and 7.7) are unlikely to significantly affect local communities.

8.6.2 Mitigation and management measures

The following mitigation and management measures would be implemented to minimise adverse socio-economic impacts:

- The general community will have the opportunity to register interest, view the EA and write a submission through the Department of Planning 30-day submission period; and
- Nearby industries and the SPC would be provided with targeted information in relation to the construction timetable and identification of potential impacts.

8.7 Marine environment

Reference should be made to Section 2.3.6 for description of the existing environment. Reference should also be made to Section 7.5.

Threatened species, such as whales, have been known to enter Botany Bay on occasions as they undertake their annual migration past the eastern coast of NSW. Oyster farming and aquaculture have been established on the southern shores of Botany Bay. Botany Bay is also used for recreational fishing.

A submarine pipeline exists between Caltex Kurnell to Caltex Banksmeadow via Yarra Bay and transports fuel based products to the market.

Shipping activities

The shipping channel to the Brotherson Dock is some 210 m wide and is dredged to a minimum depth of 18 m. The ship turning basin has been dredged to 14.4 m. Commercial shipping visits to Port Botany (and Sydney harbour) are controlled by the SPC, which has jurisdictional responsibility within a four nautical mile limit to sea.

Approximately 1,200 ships have visited Port Botany every year over the past five years of which approximately 165 visit the BLB (SPC: 2005). As ships must also exit the bay by the same route, the total number of ship movements in and out of the Bay is approximately 2,400 per year.

The expansion of the Brotherson Dock will increase the number of ship visits to Port Botany. A study by Access Economics and Maunsell (2003), as part of the Port Botany Container Terminal expansion EIS, forecasted ship visits to Port Botany under a moderate productivity scenario till 2025. Under this scenario, shipping visits to Brotherson Dock is expected to increase by 932 visits per year. In addition, accounting for growth in BLB shipping visits and to the Caltex wharf at Kurnell, it is estimated that shipping visits could reach approximately 3,000 visits (Access Economics and Maunsell: 2003).

Hence theoretically ship movements (in and out) could reach approximately 6,000 per year from 2025 (or approximately 17 movements a day). However, it should be recognised that further technological and port operational improvements may actually decrease ship movements due to infrastructure being able to handle larger ship sizes for the same demand compared to smaller ship sizes delivering smaller total cargo with demand levels constant.

At present, the shipping patterns for Vopak Site B for mineral diesel would suggest that the 'replacement biodiesel' quantity of 240,000 tonnes per year would mean the reduction in shipping imports of mineral diesel of the order of 16 cargo shipments per year @ 15,000 tonnes per shipment.

Despite the offset that would apply, petroleum tankers would continue to arrive at the same rate albeit with smaller parcels of mineral diesel. The net increase in shipping is therefore 23 ships for the 2 train model and 20 ships for the single train model.

Associated with the changes in shipping patterns is an alteration in the berth occupancy caused by differing ship pumping rates for the palm oil and methanol compared to petroleum tankers. Generally, the chemical type tankers that bring these products have pumping capacities of the order of 20% of petroleum tankers; hence the number of hours alongside the berth can change significantly.

It is anticipated that the recent berth occupancy figures of approximately 360 hours per month (approximately 50% berth occupancy) would increase by the following:

- For Stage 1 (one train biodiesel) would result in an additional 80 hours per month for biodiesel products with an additional 15 hours per month increase in petroleum/gas shipping. Therefore a total of 455 hours per month (62% berth occupancy);
- For Stage 2 (two train biodiesel) would result in 80 hours per month increase from an expected average 2010 berth occupancy of 475 hours per month. However 40 hours per month reduction is anticipated due to larger petroleum ships. Therefore a total of 515 hours per month (70% berth occupancy).

This increase also allows for the planned usage of two marine loading arms for Vopak Site B discharges as of 2007 and the increase in throughput from the Vopak Site B facility.

8.7.1 Environmental impact assessment

The proposal does not involve any construction activities within the waters of Botany Bay. Therefore the proposal is unlikely to affect marine hydrodynamics, threatened species, wetlands or seagrasses within Botany Bay. Construction impacts that could potentially affect the marine environment in Botany Bay involve landside impacts. These impacts are likely to involve activities that result in a migration of potential impacts from land to water and include sedimentation run-off and discharge waters from the stormwater system.

Sedimentation and stormwater runoff can result in turbidity and water quality impacts, however, provided that the topography, geology and soil mitigation and management measures outlined in Section 8.4.2 are implemented, such impacts can be significantly minimised.

During operation, the proposal would protect stormwater run-off quality through the operation of a WWTP to treat potential hydrocarbon contamination for stormwater captured in bunded areas. In addition, stormwater collected in non-bunded areas are diverted to a common drainage system, which collects stormwater and directs it straight to an interceptor pit, fitted with a trash rack and weir arrangements, from which it is then discharged into Botany Bay.

The Vopak stormwater management procedures requires that samples and field testing be carried out for potentially contaminated water prior to release to the environment (i.e. Botany Bay in Brotherson Dock).

If the stormwater fails the DEC standards within the procedural requirements then there are several options available to the operations personnel. The water can be diverted to a slops tank (i.e. Waste Tank 45) for disposal off-site to a licensed waste facility or it can be pumped to holding tanks and treated through the WWTP, which discharges to the Sydney Water sewer under an existing Trade Waste agreement.

The stormwater management procedures therefore indicate that there is low potential for contaminated groundwater or surface water from Vopak Site A operations would migrate to Botany Bay and adversely affect the marine environment.

Potential operational impacts are likely to also include leakages from pipes within the SPC pipeline corridor that may potentially result in a migration of contaminates to the marine environment. Experience has suggested that bulk liquid pipeline failures is a rare event and are often attributed to pipe type, age and influence from nearby structures or trees (for example tree roots). Such causes of pipeline failures can be mitigated through the use of materials (e.g. stainless steel) and dedicated use of pipeline corridors (e.g. absence of trees with extensive root systems). Therefore the pipes and pipeline corridor used for the proposal would be/are specifically designed for transporting hazardous bulk liquids.

In addition, both Vopak and SPC undertake monitoring of pipeline performance. This ensures that any leaks are detected early and plugged to prevent significant adverse environmental damage from leakages. Spill response kits that include spill absorbers are also available should a leak from pipelines spill significant quantities of bulk liquids within the SPC pipeline corridors.

8.7.2 Shipping impact

The BLB currently handles approximately 165 commercial ship visits per year. Botany Bay currently receives approximately 1,200 commercial ships per year.

In the current context of shipping visits, the proposal represents a total of 23 additional visits per annum. This represents an increase of approximately 2% on existing ship visits to Botany Bay.

However, the expansion of Port Botany container trade and productivity improvements to other commercial shipping operations in Botany Bay may increase ship visits to approximately 3,000 by 2025. Under this Scenario, the proposal's shipping operations would decrease to less than 1% of total ship visits in 2025.

The proposal would, after the installation of stage two, increase berth occupancy. It is noted that there is only one bulk liquids berth for some seven bulk liquid storage companies located throughout Port Botany. Existing information and world wide Vopak experience indicates that berth occupancy of 60 to 65% is acceptable for chemical bulk liquid ports and 80 to 85% for petroleum only ports with single operators able to control tank ship arrival times. Based on this information and experience, the Port Botany BLB maximum occupancy will be between 60 to 65%

Current berth occupancy is at approximately 54%. Berth occupancy is expected to rise to approximately 62% when the Vopak B2 Petroleum Terminal Expansion is completed in late 2006 but is expected to decrease to 56% by 2007, due to the installation of the Vopak second Marine Loading Arm together with an increase in ship sizes. Stage 1 of the proposal would increase berth occupancy to approximately 71% and Stage 2 of the proposal would add a further 10 to 15%. Therefore berth occupancy is unlikely to be affected until the second train comes on line.

The current round of rationalisation in the industry (i.e. second Marine Loading Arm and larger ship sizes) would provide benefits to all the SPC and all BLB users from early 2007 onwards by enabling the delay of a second berth from approximately 2007 to 2008/2009. Therefore the decrease in berth occupancy below 65% is likely to hinge upon SPC providing a second BLB in 2008/2009. The next increase in ship sizes is not expected until 2015/ 2016.

The increase in shipping operations and berth occupancy presents two potential marine environment impacts – hazardous spills and introduction of exotic marine pests. The SPC are responsible for providing environmental protection services in regards to commercial shipping in both Sydney Harbour and Botany Bay. These responsibilities include:

- Administer dangerous goods transported in marine waters;
- Provide a 24 hour emergency response crew for spills into marine waters;
- Clean up and investigation of spills;
- Prosecution of spill offenders; and
- Provide 24 hour port communication.

The SPC has a large inventory of oil spill equipment and invests approximately $11 million a year on preparedness, prevention and protection of the marine environment (SPC: 2005). With such measures in place by the SPC, it is considered that the proposal's potential for hazardous spills to adversely affect the marine environment is manageable to best practice standards.

In addition to potential hazardous spills, the introduction of marine pests from ship hulls and ballast water exchange represents a potential environmental impact. The Australian Quarantine Inspection Service (AQIS) is the regulatory body responsible for the management of international vessels and ballast water exchange inside Australian territorial waters.

In July 2001, the AQIS initiated new rules for ballast water discharges. These include the prohibition of ballast water discharges within Australia's 12 nautical mile territorial sea without approval from AQIS. Should international ballast waters be discharged in Australian waters, the AQIS uses the Ballast Water Decision Support System to determine risks posed by discharges. The Ballast Water Decision Support System is highly precautionary in favour of potential environmental risks and subsequently ballast waters discharges from international ships inside Australian waters are a rare event (Barry and Bugg: 2002). Since Port Botany regularly receives more imports than exports, there is a requirement for most ships to take on ballast water rather than undertake a discharge.

In addition, management of marine pests is mitigated by anti-fouling paints to prevent marine pests attaching to ship hulls and anchors. Ships docking at Port Botany do not require use of anchors as cables perform docking functions. It is also illegal for ships to clean hulls while docking in ports and to discharge accumulated sediments in hulls while in Australian waters.

With such measures in place by the AQIS, it is considered that the proposal's potential for ships to introduce marine pests to adversely affect the marine environment is manageable to best practice standards.

8.7.3 Concluding summary

Based on the above discussion, it is therefore unlikely that the proposal would result in significant changes to current ecological processes that exist in the marine environment. There are a number of factors that support this assessment including:

- The proposal does not involve any construction activities within the waters of Botany Bay or along the foreshore;
- Potential impacts of the proposal, such as sedimentation, contaminated stormwater runoff and pipeline spills, can be managed at the landside before entering the marine environment;
- The SPC have a significant role in pollution prevention and have invested in the required infrastructure to respond to potential spills – including spill absorption kits and a dedicated emergency response crew;

- The AQIS have implemented strict guidelines to control international shipping operations, including control of ballast waters outside of Australia's marine zone; and
- Specific mitigation and management measures have been identified to protect the water quality and hence the marine environment (refer to Section 8.7.4).

8.7.4 Mitigation and management measures

The following mitigation and management measures would be implemented to minimise potential adverse impacts on the marine environment.

- Measures outline in Section 7.5.4.

8.8 Heritage

A search on the NSW Heritage Council web site (July: 2006) for State Heritage Register items and statutory listed items revealed no items of heritage significance on the site or within the vicinity of the site.

GHD contacted the La Perouse Aboriginal Land Council for identification of issues to be assessed in the EA. The council did not provide GHD with any EA assessment requirements or identification of indigenous issues, however, it is considered, that due to the site being located on reclaimed land, the site is unlikely to contain indigenous archaeological relics. The closest recorded Indigenous site is approximately 200 m to the southeast of the Site A Terminal.

Due to absence of indigenous and non-indigenous heritage, the proposal would not result in any heritage impacts.

8.9 Utility and services

The services and utilities in the area include:

- Communications connections;
- Electricity and energy (i.e. natural gas) connections;
- Sewerage and potable water connections;
- Port infrastructure;
- Stormwater infrastructure; and
- An integrated bulk liquids pipe distribution network to distribute petroleum products to the market.

8.9.1 Environmental impact assessment

The proposal would require connection to the abovementioned utility services. These connections would be done in consultation with utility departments, SPC and other petroleum companies. Potential impacts are likely to include temporary disruptions to services during connections.

Due to low staff requirements and operation procedures of the site, the proposal would not generate significant amounts of electricity or potable water consumption. However, the processing facility would require electricity and potable water to produce the biodiesel.

The impacts of electricity consumption would be minor, as the grid would readily supply the electricity and biodiesel production results in a net decrease in CO_2 releases.

The proposal requires a potable water demand of approximately 880 KL/day when operating on a two-train basis. Recent trends in Sydney indicate water demand is over 600 GL per year (non-restricted use). The proposal therefore represents an increase of approximately 0.05% on average annual demand. This increase can be readily accommodated and would not impact on local residents or businesses.

8.9.2 Mitigation and management measures

Potential impacts on services and utilities would be mitigated by liaison with:

- The SPC and relevant utility and service providers regarding timing of connections to the services, location of services and utilities on the site;
- Relevant petroleum distributors that could potentially be impacted in regards to timing of connections with the integrated bulk liquids pipe distribution network; and
- Utility and service providers to confirm the location of services and utilities prior to construction commencing.

Part D Conclusion

9. Draft statement of commitments

Section 75F(6) of the EP&A Act states that the Director-General may require the proponent to include in an environmental assessment a statement of the commitments the proponent is prepared to make for environmental management and mitigation and management measures on the site. In accordance with this requirement, this section provides the commitments for environmental mitigation, management and monitoring for the proposal.

9.1 Mitigation and management measures

The following table provides a consolidated summary of the mitigation and management measures recommended in this EA and timing of mitigation and management measures. These measures form the proponent's draft statement of commitments for environmental mitigation, management and monitoring for the proposal.

Table 9.1 Draft statement of commitments

Mitigation / management measures	Timing
General management plans	
Construction Environmental Management Plan, incorporating: ◗ Construction Soil and Water Management Plan; ◗ Construction Traffic Management Plan; ◗ Acid Sulphate Soil procedure; and ◗ A waste management plan in accordance with the *EPA Environmental Guideline: Assessment, Classification and Management of Liquid and Non-Liquid Waste (2004 edition)*. ◗ Mitigation and management measures identified in this EA and any subsequent approval conditions as issued by the Minister.	During construction
Operational environment management plan incorporating: ◗ A waste management plan in accordance with the *EPA Environmental Guideline: Assessment, Classification and Management of Liquid and Non-Liquid Waste (2004 edition)*. ◗ Mitigation and management measures identified in this EA and any subsequent approval conditions as issued by the Minister.	During operation
Risks and hazards	
Include in the updated safety management systems (including training programs) appropriate information concerning the new hazards associated with sodium methylate. Whilst this material does not contribute significantly to off-site risk, management of spills will require special attention to protect site based personnel handling the material	Updated before operation
The existing stormwater system under the biodiesel plants area has no isolation valve in the final pipe leaving site. Suitable means is to be	Detailed design phase

Mitigation / management measures	Timing
provided to ensure spills do not leave the site via this stormwater piping system	
For automated tank transfers, two independent tank level switches should be installed (or equivalent) to reduce the likelihood of tank overfilling to an acceptable level (as per current practice at Site B)	Detailed design phase
The proposal tanks would be designed in accordance with the latest version of Australian Standards 1940 (AS1940), AS1670 for fire alarms and AS2941 for pump sets.	Detailed design phase
Traffic and transport	
A Construction Traffic Management Plan (CTMP) would be developed and submitted to SPC for review and approval prior to construction. A copy of the CTMP would be sent to the RTA and Randwick City Council prior to construction.	Before construction
During the life of the project, the proponent shall ensure that vehicles associated with the project do not transport hazardous goods along Stephen Road and Botany Road west of their intersection with Foreshore Road, unless for local deliveries only. This would be incorporated into conditions of contract for the trucking companies.	During operation
Air quality	
Trenching and pipe laying would be undertaken progressively along the route to minimise the area that is disturbed at any single point in time.	During construction
Disturbed surfaces would be stabilised as soon as practicable.	During construction
Equipment to be well maintained and limit instances of fuel combustion processes.	During construction
Where material stockpiles are necessary, the stockpile would be covered or watered down to prevent movement and disturbances from wind.	During construction
Noise	
An Environmental Management Plan (EMP) for the project works would be developed for both construction and operational phases.	Before construction and operation
During construction and operation, combustion engine plants, such as generators, compressors and welders should be checked to ensure they produce minimal noise with particular attention to residential grade exhaust silencers.	During construction and operation
Construction vehicles to be kept properly serviced and fitted with appropriate mufflers. The use of exhaust brakes should be eliminated, where practicable.	During construction
Where practicable, all construction vehicle access to and from the construction site should be made only during normal working hours.	During construction
Where practicable, construction and operational machines to be operated at low speed or power and should be switched off when not being used rather than left idling for prolonged periods.	During construction and operation

Mitigation / management measures	Timing
Construction and operational machines found to produce excessive noise compared to industry best practice should be removed from the site or stood down until repairs or modifications can be made.	If required
Where practicable, impact wrenches should be used sparingly with hand tools or quiet hydraulic torque units preferred during construction.	During construction
Noise modelling suggests that vehicular movements to and from the site and idling transport vehicles are most likely to influence the noise output from the operational site. Where practical, vehicles should be operated at low speed or power and should be switched off when not being used rather than left idling for prolonged periods.	During construction and operation
Water quality	
Construction phase impacts can be managed by implementation of a Construction Soil and Water Management Plan detailing construction phase stormwater management strategies in accordance with Landcom Soil and Construction, Managing Urban Stormwater (Landcom, 2004). These would include amongst others: ◗ General site practices and responsibilities; ◗ Material management practices; ◗ Stockpile practises; ◗ Topsoil practices; and ◗ Erosion control practices (earth sediment basins, straw bales, sediment fences, turbidity barriers, stabilised site accesses, diversions and catch drains).	During construction
Monitoring should be undertaken to ensure that stormwater management measures and for trade wastewater are working effectively. Monitoring would rely primarily on visual inspections and sampling. Visual inspections should be undertaken of bunded areas, pits, diversion and catch drains and all other stormwater conveyance structures. Grab samples should be taken for untreated and treated bunded stormwater and trade wastewater.	During construction and operation
Waste Management	
A sufficient number of suitable receptacles for general waste and recyclable materials would be provided for waste disposal on site, including sufficient bins to allow separation of wastes for recycling and conform with DEC guidelines for construction waste.	During construction
Surplus soil material (spoil) created as a result of the proposal would be reused in landscaping and rehabilitation works as a first priority. Any waste material unable to be re-instated would be transported to land that can lawfully receive that waste.	During construction
All waste would be securely stored to ensure that any pollutants are prevented from escaping.	During construction and operation
Construction vehicles would be securely covered to prevent spilling and loss of waste during transportation.	During construction
The work site would be left clean and free of any debris and other	After construction and before

Mitigation / management measures	Timing
rubbish at the end of the works.	operation
Where feasible, suitable construction and operational waste would be recycled in accordance with the *NSW Waste Avoidance and Resource Recovery Strategy 2003*.	During construction and operation
All waste to managed in accordance with *EPA Environmental Guideline: Assessment, Classification and Management of Liquid and Non-Liquid Waste (2004 edition)*.	During construction and operation
Trade Waste Water to be managed in accordance with Sydney Water's Trade Waste protocols.	During operation
Visual	
All worksites to be left clean and tidy and the contractor shall maintain the site in an orderly manner.	During and after construction
Construction works would be completed within the shortest possible timeframe.	During construction
All work equipment and materials would be contained within the designated boundaries of the work site.	During construction
On completion of the works all equipment, materials and refuse relating to construction of the works would be removed from the work areas.	During and after construction
All waste generated during the course of the works would be removed from the work area as soon as practicable and disposed in accordance with DEC waste management guidelines (*Assessment, Classification and Management of Liquid and Non-Liquid Waste 1995*).	During construction
All new buildings would be built according to the appropriate standard and code will be designed to harmoniously fit in with existing buildings at Site A and consider street frontage views from Friendship Road.	Detailed design phase
New landscaping would be designed in accordance with the SPC landscape policy (Sections 5.1 and 5.2 of the Exempt and Complying Development Guidelines for Port Botany) and agreed upon prior to construction.	Detailed design phase
Lighting requirements for proposal would be designed *to Australian Standard 1680.1 - 2002 minimum requirements*.	Detailed design phase
All lighting during construction and operational would be compliant with *MOS 139 9:21 Lighting in the vicinity of aerodromes*.	During construction and operation
Built form	
All new tanks are to have a maximum height of 18 metres.	During operation
All other structures, other than distillation columns, are to have a height limit of less than 24 metres.	During operation
Dispensation from Sydney Ports from condition 23, which is to apply only to the distillation columns.	Before construction

Mitigation / management measures	Timing
Topography, geology and soils	
Disturbed areas would be stabilised as soon as possible following completion of works.	During and after construction
Stockpiles would be covered or stabilised to prevent transport of sediment from the work site.	During construction
Sediment control devices such as silt fences would be installed on all drainage lines downstream in the vicinity of the work area.	During construction
At the completion of construction and stabilisation of the land surface, all stormwater control devices would be removed.	After construction
Outdoor construction works would not take place during or immediately after high intensity or prolonged rainfall.	During construction
All roads and footpaths affected by construction would be kept free of all waste, loose sand, soil, aggregates and clay deposits.	During construction
An Acid Sulphate Soil procedure would be developed in response to potential unearthing of Acid Sulphate Soils. This would be consistent with the measures in the Acid Sulphate Soil Management Advisory Committee Guidelines	If required
In the event that contaminated groundwater is discovered, a groundwater management plan would be developed and implemented.	If required
Site contamination investigations would continue and would be conducted to identify 'hot spots' and, where required, decontamination measures would be developed to manage/remove any identified areas of contamination. The investigations would be conducted in accordance with the requirements of the Department of Environment and Conservation.	During operation
Any 'hot spots' that are found to have contamination levels exceeding environmental guidelines would be subsequently remediated in accordance with SEPP 55 legislation procedures	If required
Appropriate disposal of any contaminated soil or water in accordance with DEC waste management guidelines.	If required
Socio-economic	
The general community will have the opportunity to register interest, view the EA and write a submission through the Department of Planning 30-day submission period.	Before EA determination
Nearby industries and the SPC would be provided with targeted information in relation to the construction timetable and identification of potential impacts.	During construction
Utilities and services	
Liaison with the SPC and relevant utility and service providers regarding timing of connections to the services, location of services and utilities on the site.	During construction
Liaison with relevant petroleum distributors that could potentially be impacted in regards to timing of connections with the integrated bulk	During construction

Mitigation / management measures	Timing
liquids pipe distribution network.	
Liaison with utility and service providers to confirm the location of services and utilities prior to construction commencing.	Before construction
Miscellaneous	
Feed oils would be limited to vegetable oils as described within the Environmental Assessment. Feed oils would not involve the use of waste fats/oils from recovery operations of food outlets, sewage treatment plants etc.	During operation
The proponent shall carry out the project generally in accordance with the Environmental Assessment dated January 2007	During construction and operation

9.1.1 Reporting and monitoring

In the event of development consent being granted for the proposed expansion, a number of studies will need to be prepared in relation to hazard. Such studies will include:

- Fire Safety Study;
- Hazard and Operability Study (HAZOP);
- Final Hazard Analysis (HAZAN);
- Construction Safety Study; and
- Transport of Hazardous Materials Study.

These studies will be required to be submitted at least one month prior to the commencement of construction.

An Emergency Plan and Safety Management System will need to be submitted prior to the commencement of operations.

SPC will be given sufficient notice to attend the Hazard and Operability Study workshop. SPC attendance is mandatory.

Incident reporting and a hazard audit will be required after commencement of operations. Annual reports would also be required after commencement of operations.

Monitoring of groundwater will be required in accordance with SPC lease conditions and will be installed at the completion of the Site A Terminal.

The DEC will require the proponent to keep appropriate records of emissions under the terms of the DEC's license conditions for the operations of the facility.

9.1.2 Approvals and licenses

Licences and approvals would be obtained where necessary to satisfy all statutory and legal requirements for the project. The Site A Terminal is scheduled under the *Protection of the Environment Operations Act 1997*. The existing Site A Terminal is subject to DEC license No. 6581 and this license outlines the monitoring and the pollution load limits of the operation.

The operational license in existence for the Site A Terminal would need to be amended to include the elements of the proposed expansion. A Dangerous Goods License has been obtained for the Site A Terminal and would need to be amended to reflect the proposal.

The input streams to the biodiesel plant are not considered to be waste. The by-product/waste outputs from the facility and the proposed destinations and uses of those by-products/wastes also do not seem to give rise to any waste licensing requirement and wastewater treatment facility. However, the proponent, in this case, Natural Fuels Australia Limited, would obtain, if necessary, a DEC license to satisfy all statutory and legal requirements for the facility.

The Stored Chemical Information Database is regularly updated as part of WorkCover Authority requirements. The format would be amended to accommodate the proposal.

The construction contractor would also be required to comply with statutory requirements, which relate directly to work practices namely:

- Trade Practices Act 1974; and
- Occupational Health and Safety Act 2000.

9.1.3 Construction and operational environmental management plans

An environmental management plan outlines the environmental goals of a project, the mitigation and management measures to be implemented, the timing of implementation, responsibilities for implementation and management, and a review process to determine the effectiveness of the strategies.

A construction environment management plan (CEMP) would be prepared by the proponent (or nominated contractor). An operational environmental management plan (OEMP) would be prepared by the proponent according to each of their respective operational roles (NFAL for the biodiesel plant, Vopak for other elements such as storage tanks).

The objectives of the plans are to:

- Ensure that the works are carried out in accordance with statutory requirements and relevant non-statutory policies;
- Ensure that the works are carried out in accordance with the assessments detailed in this Environmental Assessment to mitigate the potential for adverse environmental impacts;
- Ensure that employees engaged to undertake the works comply with the conditions detailed in the CEMP/OEMP, as well as occupational, health, safety & rehabilitation requirements; and
- Identify management responsibilities and reporting requirements to demonstrate compliance with the CEMP/OEMP.

The environmental management plans are working documents and would be amended should strategies initially implemented be found to be inadequate to manage adverse environmental impacts. The environmental management plans would therefore typically involve:

- A list of any conditions of approval as outlined by the NSW Department of Planning;
- Mitigation and management measures identified in this Environmental Assessment;
- Actions to be taken, the responsibility and timing of those actions;
- Statutory requirements applicable to the proposal and responsibility for those requirements;
- Environmental goals and objectives;
- A framework for reporting, surveillance, auditing and monitoring of environmental goals and objectives and construction and operational processes;
- Detail training requirements for relevant personnel in environmental awareness and best practice in implementing environmental management systems;
- Details of emergency response procedures and identification of appropriate contact names and corrective actions;
- List complaint handling procedures; and
- Details of quality assurance and risks management systems.

Given the nature of the proposal and the proximity to similar hazardous facilities, a key component of the environmental management plans would be emergency responses due to events occurring at the proposal site or other bulk liquid storage facilities that have the potential to affect construction and operation of the proposal.

10. Project justification and conclusion

10.1 Achieving the project objectives

Should the proposal be granted planning approval, the objectives of the proposal would be achieved because:

- Upfront capital investment requirements would be committed;
- Commercial risks of entering a biodiesel industry are accepted;
- Biodiesel processing infrastructure would be installed;
- Existing bulk liquids storage and transport infrastructure would be utilised;
- Utilisation of existing land identified as being suitable for bulk liquids storage and transportation;
- Environmental and risks management infrastructure and monitoring programs would be implemented;
- Make use of staff and management facilities for ultimate selling to the diesel market; and
- An alternative and renewable fuel supply capability and market would be created.

10.2 Consequence of not proceeding

The Environmental Assessment has identified a number of potential benefits should planning consent be granted and include benefits within the economic, social and environmental spheres. Should planning consent not be granted, the benefits the proposal brings to the economy, members of society and the physical environment, would be lost as an opportunity cost.

In addition should the proposal not be granted approval, the proponent is likely to experience ongoing start-up barriers of establishing a sustainable biofuel industry in Sydney in what is already acknowledged as a challenging environment.

The ‘do nothing’ option is therefore considered as both unviable and not in the public interest.

10.3 Ecologically sustainable development

The proposal has been assessed against the following four principles of ecologically sustainable development listed in the *Protection of the Environment Administration Act 1991*:

- The precautionary principle;
- The principle of inter-generational equity;
- The principle of biological diversity and ecological integrity; and
- The principle of improved valuation of environmental resources.

An assessment of compliance of the proposal with these principles is provided below

Precautionary principle

The precautionary principle states that:

If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

In the application of the precautionary principle, public and private decisions should be guided by:

(a) *careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and*

(b) *an assessment of the risk-weighted consequences of various options*

A range of environmental investigations, including hazards and risks, traffic, air quality and noise impacts, have been undertaken during the preparation of this Environmental Assessment to ensure that the potential environmental impacts are able to be understood with a high degree of certainty. The proposal has evolved to avoid environmental impacts where possible, introduce mitigation and management measures where practicable, and would provide a tangible environmental benefit.

Together these three aspects of the proposal would outweigh potential adverse environmental impacts. No mitigation and management measures have been deferred due to lack of scientific certainty. The proposal is therefore considered to be consistent with the precautionary principle.

Principle of inter-generational equity

The principle of inter-generational equity states that:

The present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.

The site evolved from past land reclamation activities, is appropriately zoned and has support infrastructure that is suitable for the proposal. The proposal would not result in any impacts that are likely to impact on the health, diversity or productivity of the Port Botany environment for future generations.

The proposal has been specifically designed to reduce potential environmental risks and mitigation and management measures would be implemented to minimise adverse affects on the environment. The proposal is a significant step towards an alternative renewable fuel industry. The proposal is therefore considered to be consistent with the principle of inter-generational equity.

Principle of biological diversity and ecological integrity

The principle of biological diversity and ecological integrity state that:

Conservation of biological diversity and ecological integrity should be a fundamental consideration.

The proposal has been designed to avoid impacts on biological diversity and ecological integrity wherever possible. The proposal has been sited on cleared and disturbed land and is not recognised as having significant ecological value or habitat potential for a diverse flora and fauna community. No floral habitats were identified and the proposal does not encroach on any potential faunal habitats. Therefore the proposal is considered to be consistent with the principle of biological diversity and ecological integrity.

Improved valuation of environmental resources

The principle of improved valuation of environmental resources state that:

Environmental factors should be included in the valuation of assets and services, such as:

(i) polluter pays – that is, those who generate pollution and waste should bear the cost of containment, avoidance and abatement;

(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste; and

(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits and minimise cost to develop their own solutions and responses to environmental problems.

The potential environmental benefits that the proposal would offer to future generations is considered significant and includes:

- Reduce greenhouse and vehicle exhaust emissions;
- Improve air quality;
- Investment in a sustainable and renewable technology; and
- Potential economic advantages.

Despite these benefits, the proposal involves considerable first mover commercial risks of entering into the biodiesel market. In addition, the proposal incorporates significant environmental risks management measures for the storage and distribution of biodiesel products.

Together, first mover commercial risks and environmental measures have substantially increased the actual financial and potential cost of the proposal. This indicates that the proponent has significantly appreciated environmental resources, values and outlooks. The proposal is therefore considered to be consistent with the principle of improved valuation of environmental resources.

10.4 Cumulative impacts

Cumulative environmental impacts arise when the proposal is considered in conjunction with existing or ongoing development, and the potential negative impacts and positive benefits that the proposal would create when considered in this form. All development projects have potential negative and positive cumulative impacts.

Examples of potential positive cumulative impacts of the proposal include:

- The eventual use of a renewable fuel and associated positive environmental impacts, such as reduce vehicle emissions, which may result in a healthier standard of living due to a decrease in air toxics;
- Increase economic activity and hence additional jobs and general economic productivity; and
- Increase awareness of biofuels and hence increased confidence in the use of biofuels, which may strengthen the biofuels market.

Examples of potential negative cumulative impacts include:

- Increased risks in hazardous goods handling;
- Increase air emissions from tank storage in conjunction with existing tank emissions in Port Botany;
- Increase air emissions due to additional staff and construction workforce travel and to and from the site;
- Increase in handling of flammable goods outside of the proponent's control, such as road tanker transport once filled with biodiesel, which may result in adverse impacts, such as product spillages, either by the road tanker driver or a third party.

Where the proponent has direct control over potential negative cumulative impacts, it is considered that the proponent has identified measures to manage such impacts to best practice standards (see for example, Section 7.1 and the measures identified to reduce risks and hazards).

Potential indirect negative cumulative impacts, such as the increase in handling of flammable goods outside of the proponent's control, which may result in adverse impacts either by the road tanker driver or a third party, are considered to be outside the scope of proponent responsibility. It is considered that negative indirect impacts are beyond the proponent's ability to reasonably and fairly influence directly in order to entirely avoid such impacts. However, the proponent would influence such impacts where it can reasonably do so and is expected to, for example by ensuring appropriate procedures are followed for filling of road tankers (see for example Section 6.8 on road tanker loading).

Therefore where the proponent has direct control over potential negative cumulative impacts, measures have been taken, or would be taken, to minimise such impacts. Where there exists indirect impacts, and the proponent is not entirely responsible for such impacts, measures would be taken by the proponent to ensure impacts are managed to best practice standards for those elements directly associated with the proposal.

10.5 SPC Green Port Guidelines

The aim of the SPC Green Port Guideline is to improve the environmental sustainability of new developments and to encourage continuous environmental improvement of existing activities on the land SPC manages. Developers are asked to consider the guidelines during planning and application stages of a project or activity and demonstrate compliance by completing the associated Green Port Guidelines Checklist.

The checklist has been completed and is provided in Appendix H.

10.6 The public interest

During the consultation phase, community groups with an interest in the future planning of the Botany Bay region were invited to participate in the EA process. Whilst no formal correspondence was received by GHD in regards to the EA (refer to Section 4.2) informal discussions were undertaken and issues raised were addressed (refer to Section 4.2.2). In addition, the local council (Randwick City Council) and other statutory authorities were invited to participate in the EA process (refer to Section 4.1). The Department of Planning sought advice from relevant statutory authorities prior to the EA being released for public exhibition.

The significant benefit the proposal brings to the wider community (e.g. provides an alternative renewable fuel supply capability – refer to Section 5) provides the basis to justify the proposal being in the public interest.

The community groups or statutory authorities have raised no significant issues to date that would preclude the proposal from receiving development consent. It is therefore considered that the proposal is in the public interest.

10.7 Conclusion

The Environmental Assessment has been prepared in accordance with Part 3A of the EP&A Act 1979 to assess the potential environmental impacts associated with the proposal. The provisions of the *SEPP (Major Projects) 2005* apply to the proposal.

A range of detailed environmental investigations was undertaken during the preparation of the Environmental Assessment to assess the potential environmental impacts in accordance with the NSW Department of Planning Director-General's Requirements for the proposal. These included assessment on key issues involving potential environmental impacts in risks and hazards, traffic and transport, air quality, noise, water quality, waste and visual. In addition, a general environmental risks analysis was undertaken and an assessment of the proposal with the principles of Ecologically Sustainable Development was completed.

The proposal has been sited within an area of cleared and disturbed land, identified as being suitable for the intended use of the proposal (refer to Section 5.3). The proposal is consistent in context and character with its built form and land use zoning. The Environmental Assessment has also identified a number of potential benefits within the economic, social and environmental spheres.

No significant adverse impacts have been identified from the Environmental Assessment, or the studies that accompany it.

It is considered that potential environmental impacts can be adequately mitigated provided the mitigation and management measures outlined in the statement of commitments are strictly implemented. These measures include the preparation and implementation of a construction environment management plan and operational environment management plan to ensure that all recommendations are implemented and monitored to ensure compliance with relevant legislation and conditions imposed.

Since the proposal is unlikely to significantly affect the environment and a number of benefits have been identified, it is therefore recommended that the proposal receive approval, subject to the statement of commitments identified in the Environmental Assessment.

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State Pollution Control Commission (1979), *The Landscape of Botany Bay - A Visual Study,* Environmental Control Study of Botany Bay, Sydney, Australia, 1979

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Sydney Ports Corporation, *Commerce and Logistics Review 2003/04*, Sydney Ports Corporation, 2004

Sydney Ports Corporation, *Environmental Report*, Sydney Ports Corporation, 2003

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Sydney Ports Corporation, *Trade Report 1 July 2004 to 30 June 2005*, Sydney Ports Corporation, 2005

URS, *Port Botany Expansion Environmental Impact Statement*, Volume 1,2 and Appendices, Sydney Port Corporation / URS, 2003

US Department of Energy, *Biodiesel Handling and Use Guidelines*, 2nd Edition, US Department of Energy, March 2006

Appendix A

Director-General Requirements

Director-General's Requirements

Section 75F of the *Environmental Planning and Assessment Act 1979*

Project	Construction and operation of a biodiesel terminal, which includes: • plant trains producing up to 240,000 tonnes per year of biodiesel and 24,400 tonnes per year of glycerine; • 12 new storage tanks and re-use of 20 existing tanks with a total capacity of 30,700 m^3; and • pipelines, pump stations and utility building.
Site	49 Friendship Road, Port Botany in the Randwick local government area
Proponent	Vopak Sydney Terminals Pty Ltd
Date of Issue	8 August 2006
Date of Expiration	8 August 2008
General Requirements	The Environmental Assessment (EA) must include • an executive summary; • a detailed description of the project including the: – need for the project; – alternatives considered; and – various components and stages of the project; • consideration of any relevant statutory provisions; • an overview of the environmental impacts of the proposal, identifying the key issues for further assessment and taking into consideration any issues raised during consultation; • a detailed assessment of the key issues specified below and any other significant issues identified in the general overview of the environmental impacts of the proposal (see above), which includes: – a description of the existing environment; – an assessment of the potential impacts of the project, including any cumulative impacts; – a description of the measures that would be implemented to avoid, minimise, mitigate, offset, manage, and/or monitor the impacts of the project; • a draft Statement of Commitments, outlining environmental management, mitigation and monitoring measures; • a conclusion justifying why the site is suitable for the proposed development, and why the project should be approved; • a signed statement from the author of the EA certifying that the information contained in the report is neither false nor misleading.
Key Issues	• **Hazards and Risks** – including consideration of the proposal against the relevant provisions of *State Environmental Planning Policy No.33 – Hazardous and Offensive Development*; • **Traffic Impacts** – including details of traffic volumes generated by the project and an assessment of the capacity and safety of the proposed transport route; • **Air Quality** – including vapour emissions; • **Noise Impacts** – including construction and operation noise impacts; • **Water Quality** – including the potential for spillage of contaminants on the site, along pipeline routes, and at shipping terminals to ensure there are no off-site impacts; • **Waste Management**; and • **Visual Amenity** – including the visual impact of the proposal on publicly accessible locations.

References	The Environmental Assessment must take into account relevant State government technical and policy guidelines. While not exhaustive, guidelines which may be relevant to the project are included in the attached list.
Consultation	During the preparation of the Environmental Assessment, you must consult with the relevant local, State or Commonwealth government authorities, service providers, community groups, affected landowners and any affected Commonwealth government authorities. In particular you must consult with: • NSW Department of Environment and Conservation; • NSW Roads and Traffic Authority; • NSW Maritime Authority; • NSW Fire Brigades; • Randwick City Council; • Sydney Ports Corporation; and • Sydney Airport Corporation. The consultation process and the issues raised must be described in the Environmental Assessment.
Deemed refusal period	60 days

State Government Technical and Policy Guidelines - For Reference

Aspect	Policy /Methodology
Air Quality	
	Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DEC, Aug, 2005)
Environmental Management Systems	
	Guidelines for the preparation of Environmental Management Plans (DIPNR, 2004)
	Hazardous Industry Planning Advisory Paper No. 3 – Environmental Risk Impact Assessment Guidelines (DUAP, 1996)
Noise	
	Environmental Criteria for Road Traffic Noise (EPA, 1999)
	Environmental Noise Management - NSW Industrial Noise Policy (DEC, Dec, 1999)
Risk Management	
	Risk Criteria for Land Use Planning: Hazardous Industry Planning Advisory Paper No. 4 (DUAP, 1992)
Safety and Hazards	
	Major Industrial Hazards Advisory Papers No 1 - Safety Assurance (Dept Planning, 2005) *Draft*
	Major Industrial Hazards Advisory Papers No 2 - Notification, Classification and Prioritisation (Dept Planning, 2005) Draft
	Major Industrial Hazards Advisory Papers No 3 - Hazard Identification, Risk Assessment and Risk Control (Dept Planning, 2005) *Draft*
	Major Industrial Hazards Advisory Papers No 4 - Safety Management Systems (Dept Planning, 2005) *Draft*
	Major Industrial Hazards Advisory Papers No 5 - Safety Reporting (Dept Planning, 2005) *Draft*
	Major Industrial Hazards Advisory Papers No 6 - Training and Education (Dept Planning, 2005) *Draft*
	Major Industrial Hazards Advisory Papers No 7 - Emergency Planning (Dept Planning, 2005) *Draft*
	Major Industrial Hazards Advisory Papers No 9 - Accident Reporting and Investigation (Dept Planning, 2005) *Draft*
	The storage and handling of flammable and combustible liquids (Standards Australia, 2004, AS 1940-2004)
	Bunding and Spill Management (DEC, 2001)
Soils	
	Contaminated Sites: Sampling Design Guidelines (EPA, 1999)
	Contaminated Sites: Guidelines for the NSW Auditor Scheme (EPA, 1999)
Traffic & Transport	
	Guide to Traffic Generating Development (RTA, 1993)
	RTAs Road Design Guide (RTA, 1996)

Appendix B

Statutory and Community Consultation

NEW SOUTH WALES FIRE BRIGADES
RISK MANAGEMENT DIRECTORATE

Amarina Avenue, Greenacre NSW 2190
Private Locked Bag 12, Greenacre NSW 2190

General Enquiries — Telephone: (02) 9742 7400 — Facsimile: (02) 9742 7486
Fire Investigation & Research — Telephone: (02) 9742 7395 — Facsimile: (02) 9742 7385

Home Page: www.fire.nsw.gov.au — Corporate Email: info@fire.nsw.gov.au
Risk Management email: rmd.nswfb@fire.nsw.gov.au — ABN: 12 593 473 110

Your Ref: 21/14828/121399
Our Ref: FSD/HAZ/127313

Contact: A Bruce/mjs

- 5 SEP 2006

GHD Pty Ltd
10 Bond Street
SYDNEY NSW 2000

Attention: Mr Martin Karm

Dear Sir

Vopak Terminals
49 Friendship Road
PORT BOTANY

I refer to your correspondence dated 31 July 2006, regarding the above premises.

An Officer of the NSW Fire Brigades (NSWFB) has reviewed the submitted documentation and based on the information supplied provides the following comments:

No adverse fire safety issues were noted in the submitted preliminary assessment. It is the legislated responsibility of the NSWFB to protect life and property from fire and hazardous material incidents, therefore the support for the proposal is conditional upon all relevant standards and codes being adhered to. In particular, bunded areas, firefighting equipment, installed fire alarms and associated equipment. The NSWFB awaits the opportunity to review any further assessments, in particular, any forthcoming Fire Safety studies.

Should you have any further enquiries regarding any of the above matters, please do not hesitate to contact the Fire Safety Division.

Yours faithfully

For Commissioner

RTA

ID 06/1312

Julian Ardas
Manager, Environmental Planning GHD

Proposed Expansion to Bulk Liquids Storage Terminal – Site A (Biodiesel Terminal), Friendship Road, Port Botany.

Dear Julian

I refer to your letter recent e-mail requesting the RTA to provide comments for consideration for the preparation of the Environmental Assessment under Part 3A of the Environmental Planning and Assessment Act for the above site.

The RTA would like the following issues to be included in the traffic impact assessment of the proposed development:

1. The proposed means of vehicular access to/from the site;

2. Likely daily and peak traffic movements likely to be generated by the proposed development and the increase in the level and type of traffic associated with the proposal;

3. Impact of the proposed development on surrounding arterial road network and intersections and the need and associated funding for upgrading or road improvement works.

4. Consideration of the need for the preparation of a local area traffic management plan;

5. An assessment of the likely impact of truck traffic upon nearby residential areas due to the development of the site;

6. Details of the anticipated route of trucks on the major arterial and local road network;

7. An assessment of the potential increase in toxicity levels of loads transported on arterial and local roads and consequently, the preparation of an incident management strategy for accidents, if relevant.

Please refer further queries to James Hall on (02) 8814 2047

Yours faithfully

Charles Wiafe
Landuse Development Manager
28 August 2006

Roads and Traffic Authority
ABN 64 480 155 255
Level 2, 81 Flushcombe Road
Blacktown NSW 2148
PO Box 558 Blacktown NSW 2148
DX8120 Blacktown
T 131 782
www.rta.nsw.gov.au

4 August 2006

Mr Martin Karm
Environmental Planner
GHD
10 Bond Street
SYDNEY NSW 2000

Dear Mr Karm

Proposed Biodiesel Project – 49 Friendship Road, Port Botany
Preliminary Assessment

I refer to your correspondence of 26 July 2006 regarding the Preliminary Assessment report for the proposed Biodiesel Project at Friendship Road Port Botany.

It is understood that the proposal is considered to be a Major Project and will be assessed under Part 3A of the *Environmental Planning and Assessment Act 1979*. Based on the information provided, it would appear that the majority of the works would occur on land owned by Sydney Ports Corporation.

In the event that works would be undertaken on land owned by NSW Maritime, (ie. below the Mean High Water Mark, including the wharf structures) then the appropriate land owners consent / notifications will be required in accordance with Clause 8F of the *Environmental Planning and Assessment Regulation 2000*.

Any structures proposed on land owned by NSW Maritime approval would require authorisation in accordance with the requirements of 13T of the *Maritime Services Act 1935*. In addition, works within 10 metres of land owned by NSW Maritime may require approval in accordance with the requirements of 13TA of the *Maritime Services Act 1935*.

Please direct any further correspondence or queries to our Senior Environmental Scientist, Suzanne Harris on 9364 2472 or via e-mail sharris@maritime.nsw.gov.au.

Yours sincerely

Ivan Patrick
A/Manager, Property Planning
Maritime Property Division

SHartson@sydneyports.com.au
14/08/2006 10:28 AM

To Martin.Karm@ghd.com.au
cc APalmer@sydneyports.com.au
bcc
Subject Re: Reminder 11/8/06 SPC Vopak Biodiesel Consultation

Martin

The comments made on the submission provided by Vopak to DoP for DG requirements are still valid. We will also make any further comments when we receive the draft EA, prior to it being submitted to DoP.

Sydney Ports supports the proposed Biodiesel proposal as it is an appropriate port use and complements the existing facilities within the Port Botany Bulk Liquids precinct.

Regards
Sarah Hartson
Operations Manager Property
T: (02) 9296 4797
F: (02) 9296 4768
M: 0409 394 644

Martin.Karm@ghd.com.au
11/08/2006 09:25

To: SHartson@sydneyports.com.au
cc: Julian_Ardas@ghd.com.au
Subject: Reminder 11/8/06 SPC Vopak Biodiesel Consultation

Reminder email for SPC consultation for Vopak Biodiesel project.

Hi Sarah,

As discussed on the phone today, GHD Pty Ltd is preparing an Environmental Assessment under Part 3A of the Environmental Planning and Assessment Act 1979 for a proposed Biodiesel Terminal at 49 Friendship Road Port Botany.

We have just received the Director General's Requirements for the project from the NSW Department of Planning.

One of the requirements is that we consult with Sydney Ports Corporation regarding the proposal.

Attached is a copy of the Preliminary Assessment prepared to seek the Director General's requirements.

It would be appreciated if you could provide any comments for consideration in the Environmental Assessment, including details of other approvals that

Sydney Water

"COLIN HOFF"
<COLIN.HOFF@sydneywater.com.au>
08/08/2006 06:00 PM

To <Martin.Karm@ghd.com.au>
cc
bcc
Subject Reply to Preliminary Assessment for the Bio Plant

Hello Martin,

This document is a "Preliminary Assessment" and is difficult for me to comment on as it doesn't contain a lot of detail in regards to water usage and wastewater discharge. Presumably this will come later in the EIS.

No estimate has been provided of the quantity of potable water required for the project. However Speaking to Jay an estimated 100 kilolitres discharge is likely meaning an additional 120 kilolitres water usage which wouldn't be a problem.

The preliminary assessment did not provide any estimate of trade wastewater quantity and quality. The statement on page 5 under "Output" was "waste water and fatty residue (unspecified amount at this stage)". Once again speaking to Jay the quantity and quality of the wastewater would most likely meet with our approval assuming the data from Darwin was right.

On page 7 "no details have been provided at this stage for the effluent generated from the processing plant, however a treatment area has been set aside should treatment of the effluent is required prior to discharge with existing water treatment infrastructure. The current wastewater treatment plant on site is designed for collection and treatment of stormwater collected in bunded areas housing petroleum and chemical products." Can I respectfully suggest that the primary purpose of the consent is for the treatment of the washing of tanks and flushing of transfer lines. A variation of the current consent would be required if you wanted to discharge through the current discharge point or DAF . Or alternatively a new consent should be sought should a separate connection be required.(this separate connection may or may not be treated and Jay apparently will do some studies on this)

The "treatment area" shown on the plan on page 15 includes some tanks that are currently being used as a part of the existing pre-treatment plant. The "Preliminary Assessment" does not explain how the new trade wastewater streams will be integrated into the existing pre-treatment plant facilities.

Could you please elaborate on the statement from page 8 "bunded (contaminated) areas to drain to wastewater treatment plant" ?.

Vopak has been requested to fit a Backflow Prevention Device to the outlet end of the water meter and as at last week hasn't fitted it.

Colin Hoff
Customer Service Representative

Goodwin James
<James.Goodwin@environment.nsw.gov.au>

01/09/2006 05:31 PM

To "'Martin.Karm@ghd.com.au'" <Martin.Karm@ghd.com.au>

cc "'Keiran.P.Thomas@planning.nsw.gov.au'" <Keiran.P.Thomas@planning.nsw.gov.au>, Fowler David <David.Fowler@environment.nsw.gov.au>, Horkan Kieran

bcc

Subject FW: REMINDER 28/8/06 Fw: DEC consultation Proposed Vopak Biodiesel Terminal

Martin,

I refer to your request below regarding DEC consultation for the Part 3A Environmental Assessment for the proposed Vopak Site A Biodiesel Terminal. I
apologise for the delay in getting this response to you.

We were advised of the biodiesel proposal in late June 2006 by the Department of Planning (DoP). The DoP was seeking advice at that time on whether the facility would require an Environment Protection Licence, and noted that "... the proponent indicated that they would not require a licence from the DEC".

DEC considered that the facility may require licensing (most likely as a waste activity) and advised the DoP of the additional information required to determine if this would be the case. Further discussion of these questions took place between DEC, DoP and the proponent at the site meeting on 7 July, following which DEC was able to advise DoP that:
"The DEC noted at the meeting on Friday that all feedstocks for the biodiesel plant will be pure vegetable oil grown from crops from domestic and transnational sources (i.e. cannola, palm oil, soya). This information should be confirmed by the applicant. Based on this information, the feedstocks are not defined as "liquid food waste" or "oil waste". Therefore, the proposal does not appear to be a 'waste facility' or 'petroleum works' as defined by schedule 1 of the Protection of the Environment Operations Act 1997 (POEO Act) and would not require a licence. However, at the meeting, Vopak advised that sludge and other wastes may be produced as part of the proposal. This needs to be further investigated/characterised/managed and depending on the findings, may require a licence under schedule 1 of the POEO Act."

DEC has not received any further advice on the "sludge and other waste" and it therefore remains unclear whether the facility requires a licence.

However, DEC also notes that many of the infrastructure elements required for the biodiesel plant will be sited on the adjacent Vopak premises, which is already the subject of an Environment Protection Licence. DEC has reviewed that attached preliminary assessment and considers it would be valuable to meet with the proponent (including Vopak) and GHD to better understand the licensing implications of the biodiesel plant and the way in which the various aspects of the plant's infrastructure requirements are distributed between the Vopak site and the proposed sub-lease to Natural Fuels Australia.

DEC appreciates the tight timeframes associated with preparation of the Environmental Assessment for the proposal and will be available for the requested meeting as a matter of priority. Please do not hesitate to contact
me on 9995 6847 to discuss this matter further.

Regards

Goodwin James <James.Goodwin@environment.nsw.gov.au>

20/09/2006 10:51 PM

To "'Julian.Ardas@ghd.com.au'" <Julian.Ardas@ghd.com.au>

cc Martin.Karm@ghd.com.au, neil.trillo@vopak.com, Akhurst Rebecca <Rebecca.Akhurst@environment.nsw.gov.au>, "'Keiran.P.Thomas@planning.nsw.gov.au'"

bcc

Subject RE: Sydney Biodiesel - DEC Questioon relating to By-products

Julian,

Thank you for this advice. Our waste specialists have reviewed the material and have given the following indications (based on the information as presented): "the input streams to the proposed biodiesel plant do not appear
to be waste. The by-product/waste outputs from the facility and the proposed destinations and uses of those by-products/wastes also do not seem to give rise to any waste licensing requirement". Please note this is not a legal opinion but suggests that the biodiesel plant as proposed would not trigger a requirement for waste-related licensing.

However, we happened to be meeting with Vopak today to discuss some unrelated matters and this highlighted the licensing complications associated with the biodiesel proposal as currently structured. I therefore reiterate the advice in e-mail of 1st September that "DEC has reviewed that attached preliminary assessment and considers it would be valuable to meet with the proponent (including Vopak) and GHD to better understand the licensing implications of the biodiesel plant and the way in which the various aspects of the plant's infrastructure requirements are distributed between the Vopak site and the proposed sub-lease to Natural Fuels Australia".

Regards

James Goodwin

-----Original Message-----
From: Julian.Ardas@ghd.com.au [mailto:Julian.Ardas@ghd.com.au]
Sent: Wednesday, 13 September 2006 1:50 PM
To: Goodwin James
Cc: Martin.Karm@ghd.com.au; neil.trillo@vopak.com
Subject: Sydney Biodiesel - DEC Questioon relating to
By-products

<< File: Sydney Biodiesel Project.doc >>
James,

attached is the response from NFAL which had been requested by Vopak.

If you require further product specification detail please let us know.

Thank you.

Julian Ardas
Manager, Environmental Planning
jardas@ghd.com.au
Tel: 02 9239 7387 | Fax: 02 9239 7193 | Mobile: 0425 212 333

GHD | CLIENTS PEOPLE PERFORMANCE
10 Bond Street Sydney NSW Australia 2000 | http://www.ghd.com.au

"Chan, Joseph" <joseph.chan@syd.com.au>

11/09/2006 09:29 AM

To <Martin.Karm@ghd.com.au>

cc

bcc

Subject RE: Reminder email 11/8/06 SACL Vopak Biodiesel / Consultation

History: This message has been replied to and forwarded.

Martin,

Have sought advice internally, and have the following to offer for your assessment:

- Operational height of equipment. It is unclear what the ground height of the development site, although it appears to be under the maximum height of the obstacle limitation surface of 51 metres AHD. Construction cranes through this height will require regulatory approval via SACL
- Any plumes emanating from the stack must be less than 4.2 m/s velocity at the maximum height of the OLS
- All lighting construction and operational must be compliant with *MOS 139 9:21 Lighting in the vicinity of aerodromes*
- Strategically, provision for jet fuel storage across the Port should be assessed against the relative long term demand.
    - Would include maintaining easement for an additional pipeline reserve along Foreshore Road towards the airport.

Joseph

-----Original Message-----
From: Martin.Karm@ghd.com.au [mailto:Martin.Karm@ghd.com.au]
Sent: Wednesday, 23 August 2006 4:51 PM
To: Chan, Joseph
Cc: Julian_Ardas@ghd.com.au
Subject: Fw: Reminder email 11/8/06 SACL Vopak Biodiesel Consultation

Hi Joseph - Thought I would send you a reminder re the Vopak Site A proposal. It would be good if the SACL respond as soon as possible as we are in the final stages of the EA.

Regards

Martin Karm
Environmental Planner, Environmental Planning

mkarm@ghd.com.au
Tel: 02 9239 7166 | Fax: 02 9239 7193

GHD | CLIENTS PEOPLE PERFORMANCE
10 Bond Street Sydney NSW Australia 2000 | http://www.ghd.com.au

P please consider the environment before printing this email

Your Ref: 117842.doc

9 August 2006

Mr Martin Karm
GHD Pty Limited
10 Bond Street
SYDNEY NSW 2000

Dear Sir,

RE: Preliminary Environmental Assessment Report for the proposed biodiesel project at (Vopak Site) at 49 Friendship Road, Port Botany

I refer to the above-mentioned matter as raised in your e-mail to Council's Manager Development Assessment, Mr Kerry Kyriacou, dated 26 July 2006 and the accompanying preliminary Environmental Assessment Report for the above-mentioned project pursuant to State Environmental Planning Policy (Major Projects) 2005 and Part 3A of the Environmental Planning and Assessment Act 1979.

Council would require that the following issues be addressed in any assessment of the project:

- **Statutory Requirements**

  - **Clause 16 Zone No 4B (Port Botany Zone)**

    The land is zoned 4B – Port Botany. This clause, amongst other things, lists the landuses that are permissible in the zone. Appropriate assessment of the proposed development, its permissibility and consistency with the objectives of the zone should be undertaken.

  - **Clause 37 Development in the Port Botany industrial area**

    Clause 37 states that Council may grant consent to land in Zone 4B only if it is satisfied that the proposed development is for port-related activity or activities and will not adversely affect the continued operation of the port. Statements clearly addressing this matter should be included in the Environmental Assessment Report for this project.

  - **Clause 40A Master Plans**

    Council notes that the area of Site A in which the biodiesel plants will be built and located is 4 hectare. Clause 40A of Randwick LEP requires the preparation and adoption of a master plan for the redevelopment of sites having an area in excess of 4,000 square metres and which must be adopted and in force prior to the grant of development consent. Whilst these provisions are now superseded by the provisions of the EP&A Act that now allow for development on large sites to be staged or for a DCP to be prepared, you are requested to address the intent of the Master

Planning process in the environmental assessment and include an assessment of the proposed development in the broader context of the future strategic direction of both the Vopak site(s) and the overall Port Botany, and in doing so, address holistically a range of issues including distribution of landuses, traffic, and ecological sustainability. In summary, the proposed development must have regard to the broader objectives underlying the Randwick LEP's Master Plan provisions which, primarily, is to ensure that development in large sites occur in an integrated and holistic manner. In this regard Council notes that the current proposal for the biodiesel facility is one of a number of proposals that have been referred to Council over recent years for redevelopment of different parts of the Vopak Sites A and B in Port Botany.

- **Clause 42B Contaminated Land**

Clause 42B requires that contaminated land be remediated and be suitable for its intended use. Accordingly, contaminated land should be remediated in accordance with SEPP No. 55 and the Contaminated Land Management Act.

- **Hazard Analysis**

Council notes that a quantitative risk analysis is being undertaken by Pinnacle Risk Management Pty. Limited. Notwithstanding this, the proposal must comply with the provisions of SEPP No 33 including the requirement for a Preliminary Hazard Analysis. Consideration should then be given to the application of any HAZOP methodology if necessary, and emergency response systems to address any potential loss of containment or similar emergency event. The potential for risk expanding towards the airport should also be assessed. Council also notes that the preliminary Environmental Report states that the facilities associated with the proposed B3 expansion will be designed in accordance with the latest version of Australian Standards 1940 (AS1940), AS1670 for fire alarms and AS2941 for pump sets. These matters should be included in the proponent's Statement of Commitment that will form part of the Environmental Assessment for this project or alternatively included as a condition in any Instrument of Approval for the project.

- **Ecological issues arising from impacts on Botany Bay**

The proposal should address any potential ecological impacts, including, but not limited to, the following:

- Loss of biodiversity in the Botany Bay
- Disturbance of acid sulphate soil particularly related to any earthworks
- Impacts on water quality
- Impact on the groundwater levels and quality including the Botany Aquifer
- Impact on wetland areas

Statements clearly addressing these issues should be included in the Environmental Assessment Report for this project.

- **Potential noise, odour and pollution impacts**

As the proposal may potentially be a Department of Environment and Conservation (DEC) Scheduled Premises, DEC should appropriately condition any approval to ensure that protection of the environment, and the amenity of the nearby industrial and residential land, is maintained in regards to air emissions, water treatment and disposal and acoustic amenity.

It should be noted that Council regularly receives complaints from residential neighbours pertaining to increased noise nuisances during the night and evening periods from the Sydney Ports area creating sleep disturbance. Appropriate acoustical assessment and report should be prepared by a suitably qualified acoustic consultant for the proposed development. The report should demonstrate that noise and vibration emissions from the development will comply with the relevant provisions of the Protection of the Environment Operations Act 1997, Environmental Protection Authority Noise Control Manual and industrial Noise Policy.

The proposal should ensure that the proposed changes to the facility and the operation of all plant and equipment shall not give rise to an ‘offensive noise’ as defined in the Protection of the Environment Operations Act 1997 and Regulations. In this regard, the operation of the premises and plant and equipment shall not give rise to a sound pressure level at any affected premises that exceeds the background L A90 15 min noise level, measured in the absence of the noise source/s under consideration by more than 5dB(A). The source noise level is assessed as an LAeq, 15 min and adjusted in accordance with the NSW Environmental Protection Authority’s Industrial Noise Policy 2000 and Environmental Noise Control Manual (sleep disturbance).

The potential for odour and any other pollution from the future uses on the site should be addressed. There are to be no emissions or discharges from the premises which would give rise to a public nuisance or result in an offence under the Protection of the Environment Operations Act 1997 and Regulations.

These matters should be included in the proponent’s Statement of Commitment that will form part of the Environmental Assessment for this project or alternatively included as a condition in any Instrument of Approval for the project.

- **Acid Sulphate Soil**

  The subject site is located within an area within which acid sulphate soils occur. Accordingly, the proposal must recognise and plan for any constraints that these soils are likely to pose and, therefore, have regard to the assessment advice contained in the Randwick City Council’s Advice on Acid Sulphate Soils and the NSW Acid Sulphate Soil Manual.

- **Visual impacts**

  It is noted that there will be an increase in visual bulk from the site as a result of the height, bulk and scale generated by the plant process train and additional tanks. Accordingly, consideration should be given in the Assessment Report to the treatment of key edges (in particular the street frontages, entries and exits) to improve visual amenity.

- **Traffic**

Council notes the claim in the Preliminary Assessment Report that the proportion of product to be delivered by road tanker would decrease to a net impact of -1950 primarily as a result of *“a reduction in chemicals stored on site, complemented by the storage of feed and finished goods stock largely brought in by ships”* (page 12). Council would contend that whilst this reduction may be true for the new proposal per se, there will be no reduction in the overall road movement in the wider area (that is, the 1950 road movements reduced for Site A will simply be generated elsewhere in Port Botany) because (as indicated in the Preliminary Assessment Report) *“the reduction in chemical storage at Vopak Site A is anticipated to be relocated elsewhere in Port Botany as there is a surplus of available chemical tankage in the market place* ***and hence the number of road tanker movements associated with this relocation will remain the same****”.*

In fact, the proposal will result in an increase in traffic movement in Port Botany under Stage Two of the proposed development which will double the volumes utilised in Stage One. In effect, the project in the long run would potentially result in an increase in traffic generation. In view of this, Council raises concern that this increase would result in adverse impact on the surrounding road network.

Accordingly, the proposal must consider the traffic impacts in the Port Botany area, not just in the immediate vicinity of the subject site.

Further, Council’s Traffic Engineer has requested that the proposed heavy vehicle routes to and from the site be included in the submission. The Traffic Engineer also advises that the Logistics Manager of Sydney Ports has obtained the concurrence of the Randwick Traffic Committee for the introduction of a one way loop system incorporating Simblist Road and Friendship Road. Consequently the proposal should conform with the proposed one way traffic operation (Friendship Road will be east bound only).

No traffic from the proposed development should use local residential streets. The Environmental Assessment Report should address the measures that will be taken to direct traffic arising from the expanded facility away from streets in residential areas. This matter should then be included in the proponent’s Statement of Commitment that will form part of the Environmental Assessment for this project or alternatively included as a condition in any Instrument of Approval for the project.

Any new access driveways, including modifications to existing driveways, should be designed in accordance with the RTA's Road Design Guide (February 2006).

- **Drainage**

Prior to site stormwater being discharged from the site it should be taken through pollutant traps capable of removing gross pollutants, oil, grease, sediments and silts. Runoff from the fuel dispensing/loading gantry areas should not be directed to the site stormwater system. It is recommended that any Instrument of Approval for the project include conditions regarding this matter or alternatively, is addressed by way of a commitment in the Statement of Commitment accompanying the Environmental Assessment for this project.

- **Landscape**

  The preliminary Environmental Assessment report has not provided any details of any vegetation affected by the proposal. Please note that approval under Council's Tree Preservation Order would be required to remove any tree/s covered by the order. Landscaping works to address the visual impact of the proposal should be included in the Environmental Assessment Report.

- **Pipeline transfers**

  Full details of the new pipeline (including the exact route) required to connect Vopak site A to Vopak site B shall be provided together with landowners consent for the installation of the pipeline through the pipeline corridor; adjacent to Simblist Road; and under Friendship Road. Sydney Ports Corporation (SPC) has confirmed that Friendship Road is owned by SPC.

- **Construction Issues**

  The impact of construction (in particular, noise, traffic and dust) on local and regional land-uses and local residents should be examined. Traffic and safety measures at construction stage should be detailed in the Environmental Assessment Report. This shall include the impacts associated with installation of the pipeline between Vopak sites A and B.

  Council's Traffic Engineer has advised that the Construction Traffic Management Plan should be submitted for the concurrence of the Randwick Traffic Committee.

Should you have any further enquiries on this matter, please contact David Ongkili on 9399 0793.

Yours faithfully,

Sima Truuvert
DIRECTOR – CITY PLANNING

Per: ………………………………….

"BBACA Chairperson" <chairperson@botanybay.info>

13/08/2006 07:31 PM

To "Peter Leate" <PLeate@energy.com.au>, <Julian_Ardas@ghd.com.au>

cc <Martin.Karm@ghd.com.au>

bcc

Subject Fw: ENVIRONMENTAL ASSESSMENTS - BOTANY BAY CABLE, VOPAK BIODIESAL

Dear Peter and Julian,

The correspondence below has in part been prompted by your recent requests for consultation. As outlined below BBACA will not participate in this severely flawed process.

Regards,
Lynda Newnam

----- Original Message -----
From: BBACA Chairperson
To: office@sartor.minister.nsw.gov.au
Sent: Sunday, August 13, 2006 7:28 PM
Subject: ENVIRONMENTAL ASSESSMENTS - BOTANY BAY CABLE, VOPAK BIODIESAL

Dear Minister Sartor,

Over the past month the Botany Bay and Catchment Alliance has been approached by 2 developers seeking 'community consultation' with us. I have copied the most recent request which has come from GHD acting on behalf of Vopak.

It appears from the correspondence that the developers are being directed by the Department of Planning(DOP) to engage community groups in consultation as part of the Environmental Assessment Process.

BBACA cannot be party to this process.

We believe that such a process has serious flaws:

1. While the DOP is advising the developer to consult with community, the DOP is not providing the community with any capacity/resources to consult. This places highly impacted and poorly resourced communities, in particular, in an impossible situation.

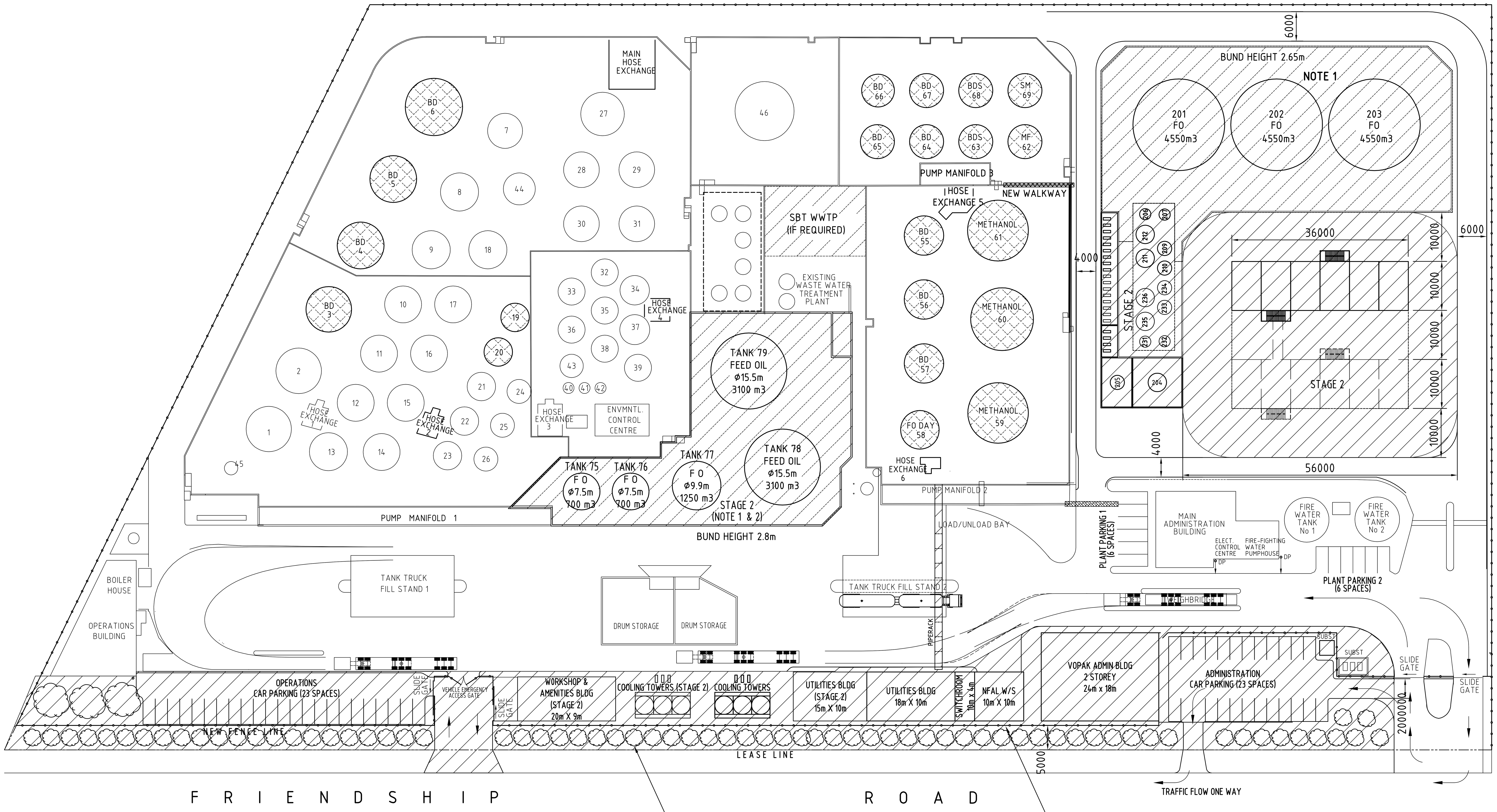
2. If community groups do not participate it can be interpreted that the community at large is not interested in the development and its impacts. One only has to recall the case of Rouse Hill and the DOP's interpretation of community interest along the lines: 'we didn't realise that the people

Appendix C

Engineering, process drawings, photomontages and dangerous goods AS 1940 information

Bilfinger Berger Services

LCF and Associates Pty Ltd



NOMINAL 5m WIDE LANDSCAPING AREA IN ACCORDANCE WITH SYDNEY PORTS "EXEMPT & COMPLYING DEVELOPMENT GUIDELINES FOR PORT BOTANY" DEC 2005

FRONT FENCE LINE MOVED 10M FORWARD TOWARDS FRIENDSHIP ROAD SUBJECT TO A PREVIOUS APPROVAL GRANTED

EXISTING REUSED

NEW ADDITION/MODIFICATIONS

Storage Details for SBT Stage 1

Item	Tank	Tank	Tank Vol	Comments
	Dia, m	Ht, m	m3	
Feed Oil Tank 1 - Tank 201	18.7	18	4550	
Feed Oil Tank 2 - Tank 202	18.7	18	4550	
Feed Oil Tank 3 - Tank 203	18.7	18	4550	
New Minor Storage Tanks (Tanks 204 to 212, No 208)			440	8 Tanks
Total New Stage 1			14090	
Existing Tanks used for Feed Oil			650	1 Tank
Existing Tanks Used for Biodiesel			8750	13 Tanks
Existing Tanks Used for Methanol			6400	4 Tanks
Existing Tanks Used for Sod Methylate			400	1 Tanks
Existing Tanks Used for Glycerine			400	1 Tanks
Total Reused			**16600**	
Total SBT			**30690**	
Total Site			**50340**	

Storage Details for SBT Stage 2

Item	Tank	Tank	Tank Vol	Comments
	Dia, m	Ht, m	m3	
Feed Oil Tank 4 - Tank 79	15.5	18	3100	
Feed Oil Tank 5 - Tank 78	15.5	18	3100	
Feed Oil Tank 6 - Tank 77	9.9	18	1250	
Feed Oil Tank 7 - Tank 76	7.5	18	700	
Feed Oil Tank 8 - Tank 75	7.5	18	700	
New Minor Storage Tanks (Tanks 231 to 236)			320	6 Tanks
Total Additional New Stage 2			9170	
Existing Tanks Used for Glycerine			400	1 Tank
Total Reused			400	
Total Additional for Stage 2			9570	
Total New Stage 2			**23260**	
Total Reused			**17000**	
Total SBT			**40260**	
Total Site			**59510**	

REV	DATE		BY	CHK	CIV/STR	MECH	E/I	PROCESS
G	11/12/06	STAGE TWO TANKS NUMBERED	W.B.	JS				
F	14/11/06	NOTES ADDED FOR LANDSCAPING	A.A.	JS				
E	2/11/06	REVISED FOR ONE WAY TRAFFIC FLOW ON FRIENDSHIP ROAD	W.B.	JS				
D	9/8/06	CAR PARK ENTRY & EXIT SHOWN	AFF	JS				JS
C	3/8/06	NEW STORAGE AREA NEAR WWTP REVISED	AFF	JS				JS
B	30-6-06	ISSUED FOR SUBMISSION	CB	AFF				JS

APPROVED

REFERENCE

DRAWING NUMBER	TITLE

NOTE:

1. DISTANCE FROM FEED OIL TANK TO BUNDWALL IS LESS THAN REQUIRED PER AS 1940. HOWEVER AS FEED OIL TANKS WILL BE INSULATED, SPLASH SHIELDS ARE NOT REQUIRED.

2 STORAGE CAPACITY MAY BE USED FOR BIODIESEL FOR STAGE 1

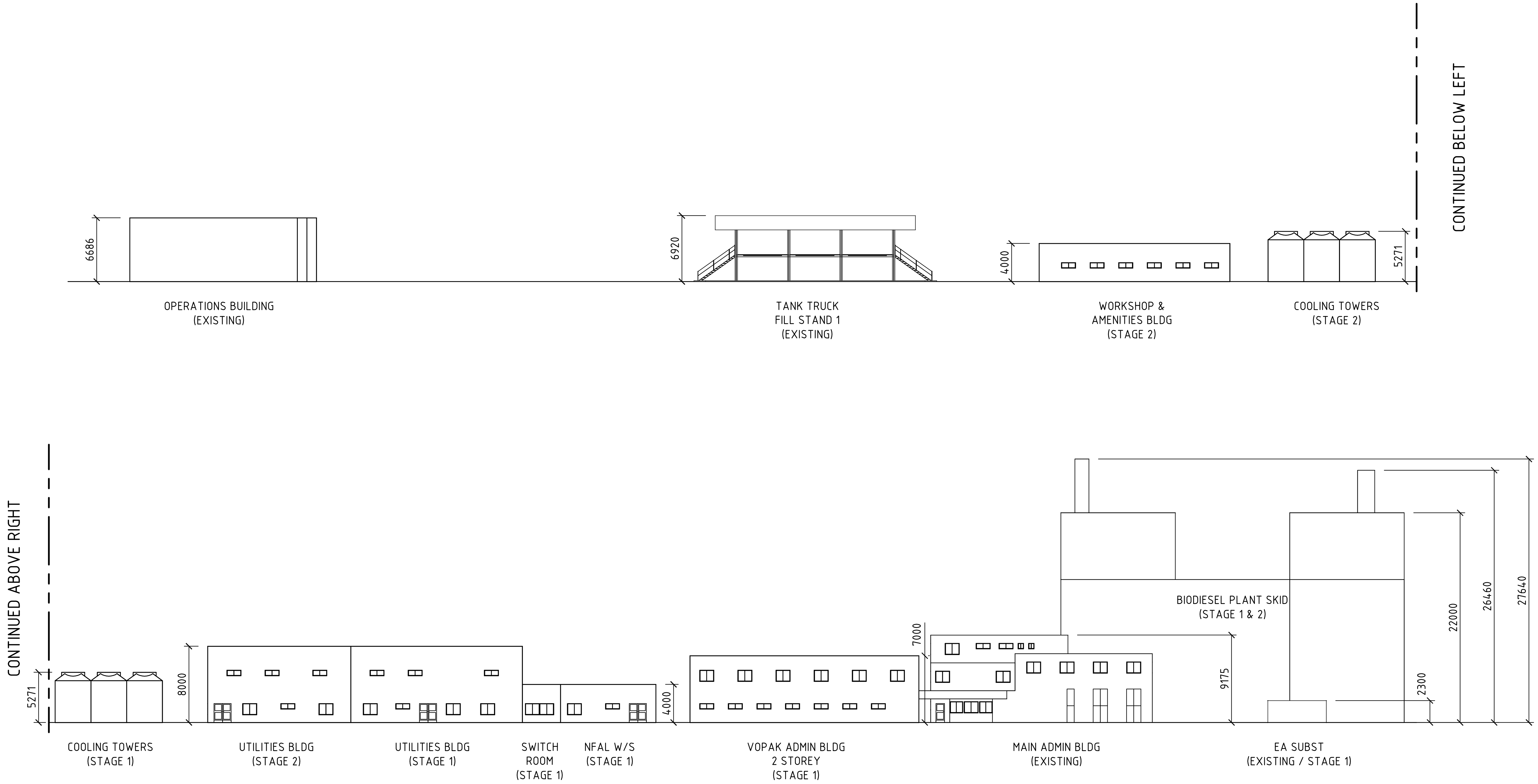
CONTRACT No.	07E235	
ENG. DESIGN BY	J. SHAH	
DRAWN	W. BRITO	19-05-06
CHECKED		
CIV & STRUCT DESIGN APPR.		
MECHANICAL DESIGN APPR.		
ELECT. & INSTR. DESIGN APPR.		
PROCESS DESIGN APPR.		
WEIGHTS CHECKED		

BILFINGER BERGER Services

VOPAK TERMINALS PTY. LTD.

SYDNEY - BIODIESEL TERMINAL (SBT) PROPOSED PLANT LAYOUT (FOR AUTHORITY APPROVALS)

Scale		BBSA DRG No	REV.
NONE	A1	07E235-81-003	G



VIEW LOOKING NORTH
FROM FRIENDSHIP ROAD

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE		BY	CHK	CIV/STR	MECH	E/I	PROCESS
A	01-11-06	ISSUE FOR REVIEW	C.B.	JS				
					APPROVED			

REFERENCE

DRAWING NUMBER	TITLE

CONTRACT No.	07E235	
ENG. DESIGN BY	J. SHAH	
DRAWN	C. BINNING	02-11-06
CHECKED		
CIV & STRUCT DESIGN APPR.		
MECHANICAL DESIGN APPR.		
ELECT. & INSTR. DESIGN APPR.		
PROCESS DESIGN APPR.		
WEIGHTS CHECKED		

BILFINGER BERGER Services

VOPAK TERMINALS PTY. LTD.

SYDNEY - BIODIESEL TERMINAL (SBT)
FRIENDSHIP ROAD
MAIN BUILDINGS ELEVATION

Scale		BBSA DRG No	REV.
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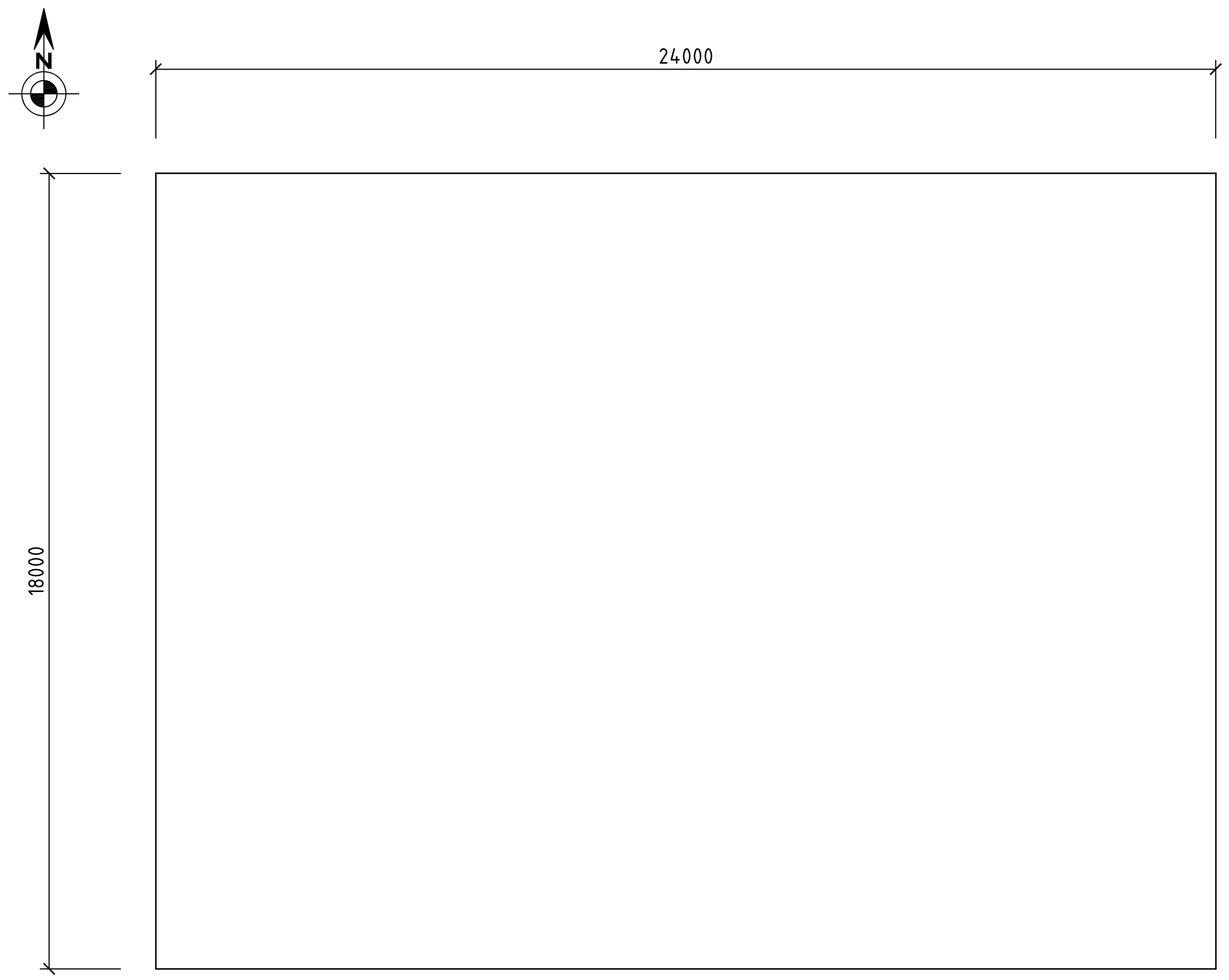
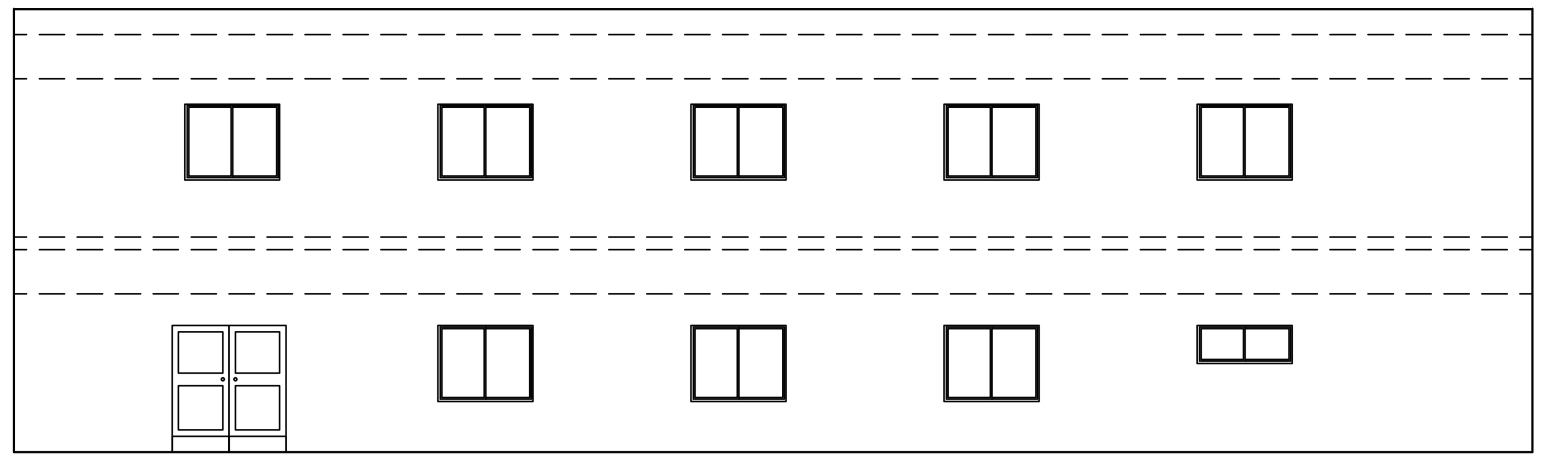
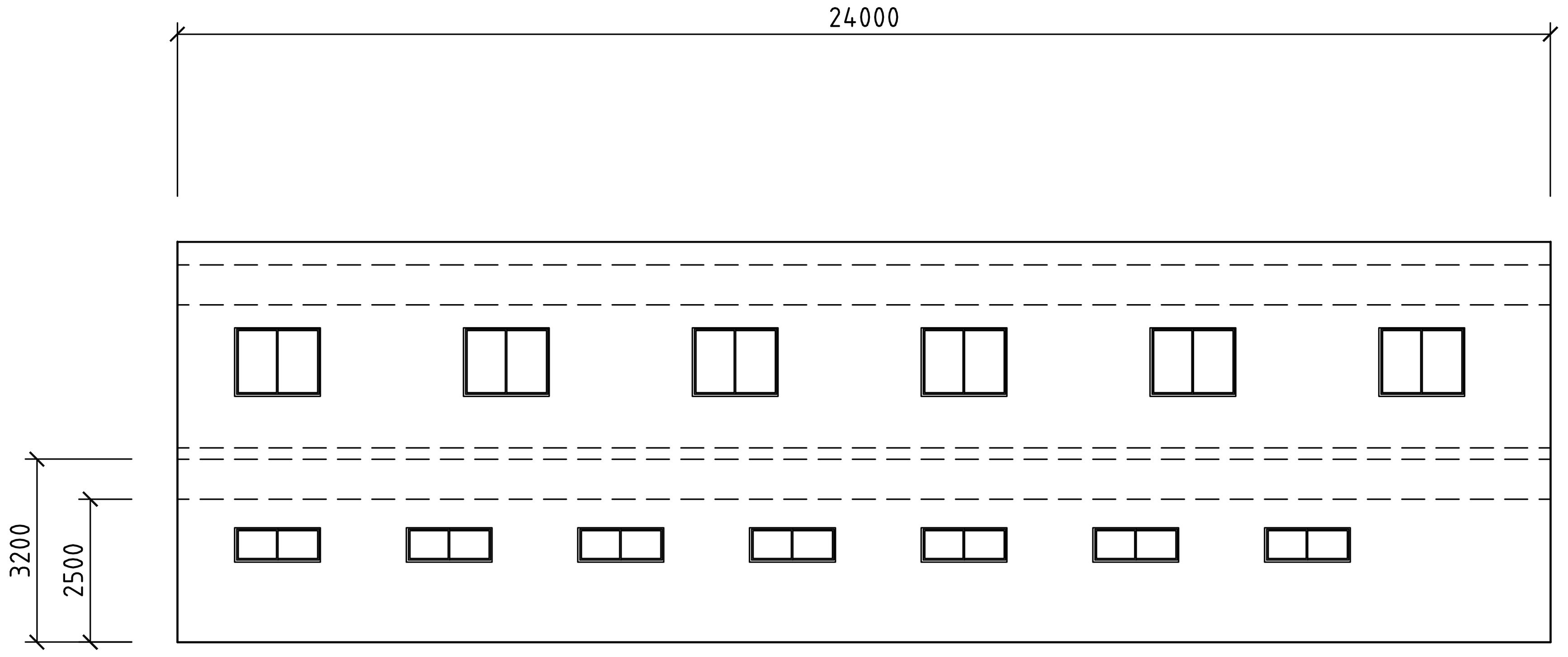


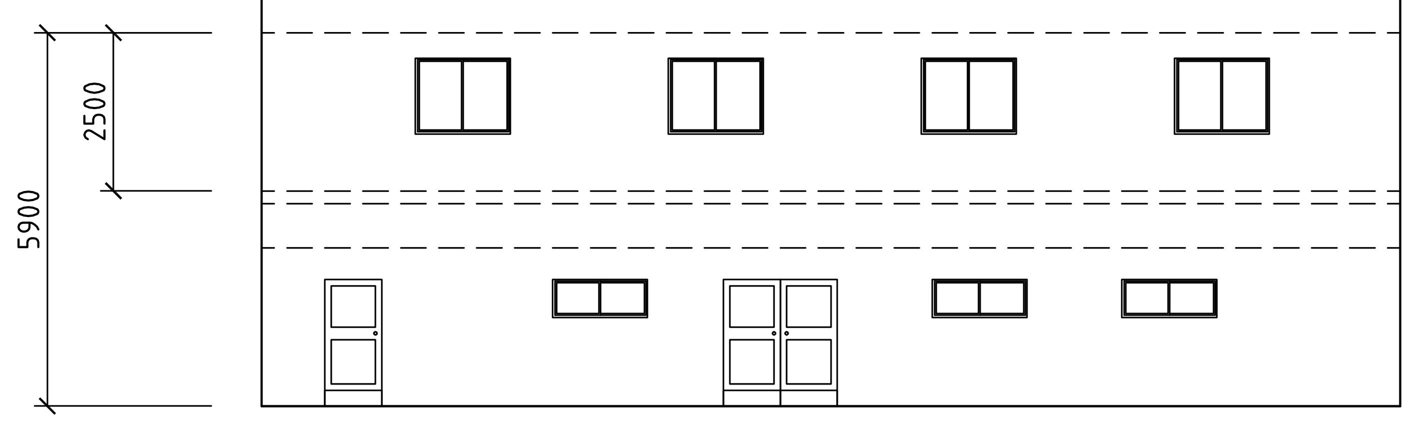
PLAN



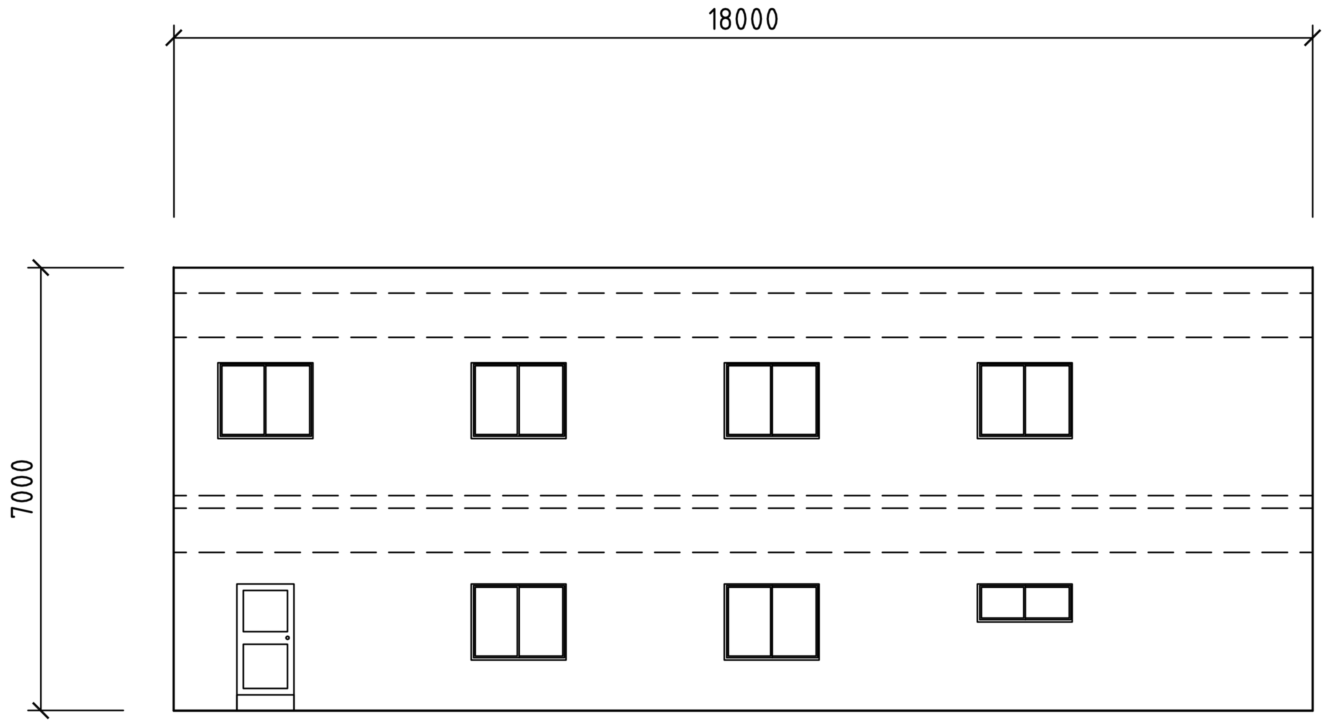
VIEW LOOKING SOUTH



VIEW LOOKING NORTH



VIEW LOOKING WEST



VIEW LOOKING EAST

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE		BY	CHK	CIV/STR	MECH	E/I	PROCESS
B	02-11-06	ISSUE FOR REVIEW	C.B.	JS				
A	01-11-06	ISSUE FOR REVIEW	C.B.	JS				
					APPROVED			

REFERENCE

DRAWING NUMBER	TITLE

CONTRACT No.	07E235	
ENG. DESIGN BY	J. SHAH	
DRAWN	C. BINNING	01-11-06
CHECKED		
CIV & STRUCT DESIGN APPR.		
MECHANICAL DESIGN APPR.		
ELECT. & INSTR. DESIGN APPR.		
PROCESS DESIGN APPR.		
WEIGHTS CHECKED		

BILFINGER BERGER Services

VOPAK TERMINALS PTY. LTD.

SYDNEY - BIODIESEL TERMINAL (SBT)
NEW ADMINISTRATION BUILDING
PLAN & ELEVATIONS

Scale		BBSA DRG No	REV.
1:100	A1	07E235-81-007	B

B	07-08-06	ISSUED FOR EIS	W.B.	JS				JS		
A	22-05-06	PRELIMINARY ISSUE	CB	JS				JS	---	
REV	DATE		BY	CHK	CIV/STR	MECH	E/I	PROCESS	DRAWING NUMBER	TITLE
					APPROVED				REFERENCE	

NOTES:

- - - - - - - - EXISTING AT SITE 'A'

——————— STAGE 1 NEW

STAGE 1 FLOW / STAGE 2 FLOW

TPD - TONNES PER DAY
TPA - TONNES PER ANNUM
WW - WASTE WATER

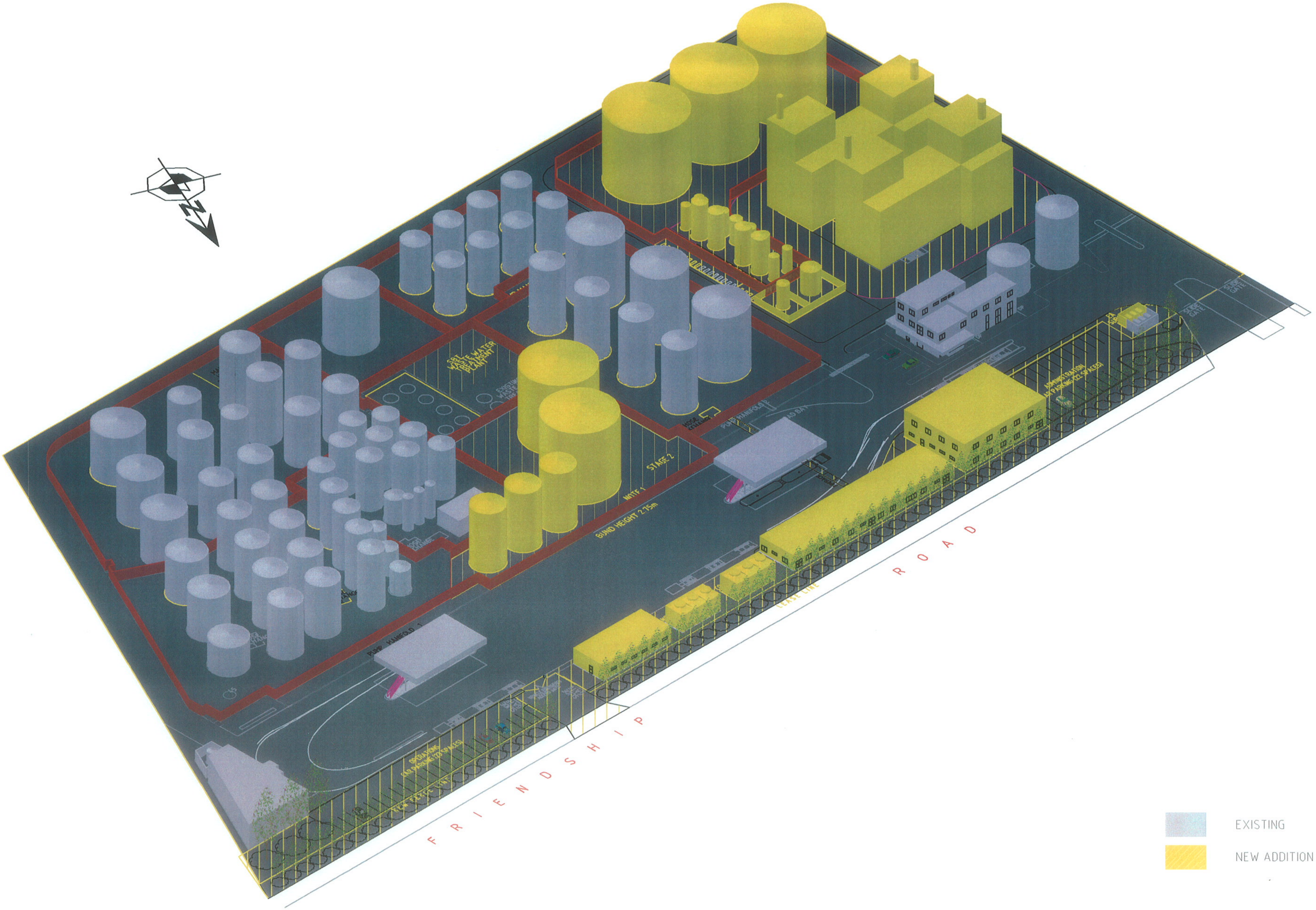
CONTRACT No.	07E235	
ENG. DESIGN BY	J. SHAH	
DRAWN	C. BINNING	22-05-06
CHECKED		
CIV & STRUCT DESIGN APPR.		
MECHANICAL DESIGN APPR.		
ELECT. & INSTR. DESIGN APPR.		
PROCESS DESIGN APPR.		
WEIGHTS CHECKED		

BILFINGER BERGER Services

VOPAK TERMINALS PTY. LTD.

SYDNEY BIODIESEL TERMINAL
OVERALL
PROCESS FLOW DIAGRAM

Scale: NONE | A1 | BBSA DRG No: 07-E235-86-006 | REV. B



A	01-08-06	ISSUED FOR SUBMISSION	W.B						---	
REV	DATE		BY	CHK	CIV/STR	MECH	E/I	PROCESS	DRAWING NUMBER	TITLE
					APPROVED				REFERENCE	

CONTRACT No	E235	
ENG. DESIGN BY		
DRAWN	W.BRITO	01-08-06
CHECKED		
CIV & STRUCT DESIGN APPR.		
MECHANICAL DESIGN APPR.		
ELECT. & INSTR. DESIGN APPR.		
PROCESS DESIGN APPR.		
WEIGHTS CHECKED		

BILFINGER BERGER Services

BILFINGER BERGER SERVICES (AUSTRALIA)

SYDNEY-BIODIESEL TERMINAL (SBT)
PROPOSED PLANT LAYOUT
VIEW LOOKING SOUTH

Scale	A1	BBSA DRG No	REV.
NONE		07E235-SK-003	A

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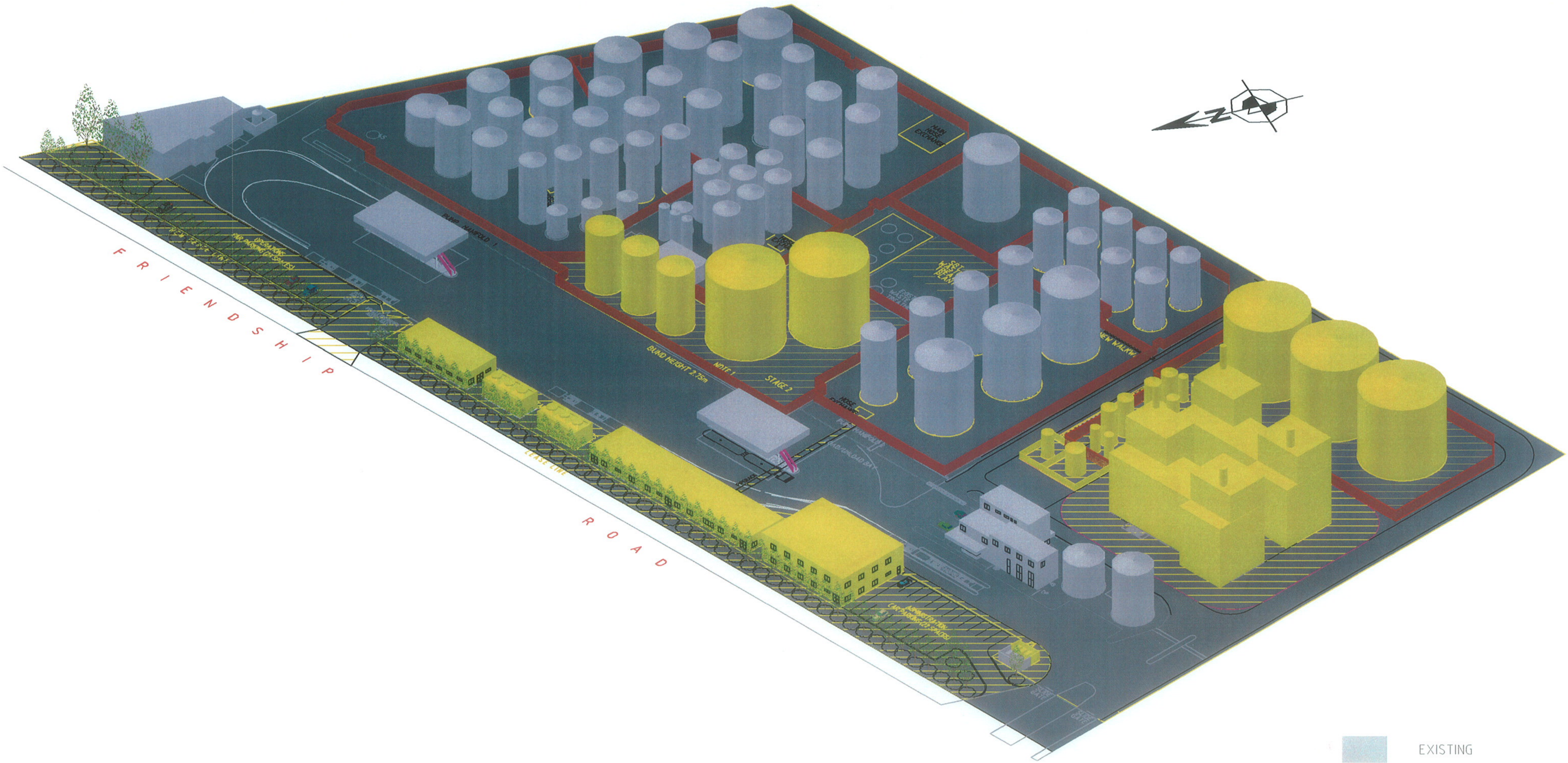

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REV	DATE		BY	CHK	CIV/STR	MECH	E/I	PROCESS
A	01-08-06	ISSUED FOR SUBMISSION	W.B					

APPROVED

REFERENCE

DRAWING NUMBER	TITLE

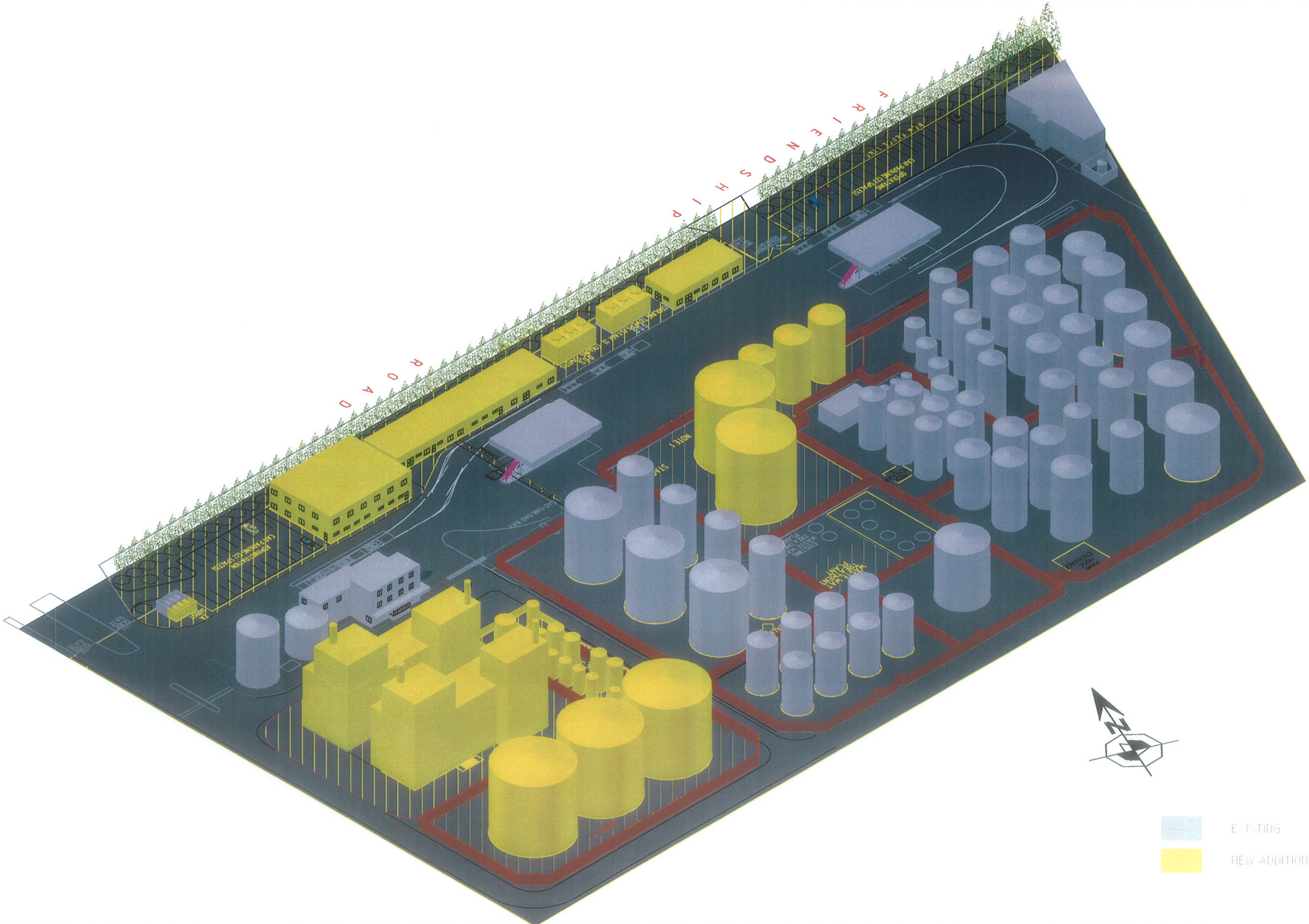
CONTRACT No	E235	
ENG. DESIGN BY		
DRAWN	W.BRITO	01-08-06
CHECKED		
CIV & STRUCT DESIGN APPR.		
MECHANICAL DESIGN APPR.		
ELECT. & INSTR. DESIGN APPR.		
PROCESS DESIGN APPR.		
WEIGHTS CHECKED		

BILFINGER BERGER Services

BILFINGER BERGER SERVICES (AUSTRALIA)

SYDNEY-BIODIESEL TERMINAL (SBT)
PROPOSED PLANT LAYOUT
VIEW LOOKING EAST

Scale NONE | A1 | BBSA DRG No 07E235-SK-002 | REV. A



REV	DATE		BY	CHK	CIV/STR	MECH	E/I	PROCESS
A	01-08-06	ISSUED FOR SUBMISSION	W B					
					APPROVED			

REFERENCE

DRAWING NUMBER	TITLE

CONTRACT No	E235	
ENG. DESIGN BY		
DRAWN	W BRITO	01-08-06
CHECKED		
CIV & STRUCT DESIGN APPR.		
MECHANICAL DESIGN APPR.		
ELECT. & INSTR. DESIGN APPR.		
PROCESS DESIGN APPR.		
WEIGHTS CHECKED		

BILFINGER BERGER Services

BILFINGER BERGER SERVICES (AUSTRALIA)

SYDNEY-BIODIESEL TERMINAL (SBT)
PROPOSED PLANT LAYOUT
VIEW LOOKING NORTH

Scale		BBSA DRG No	REV.
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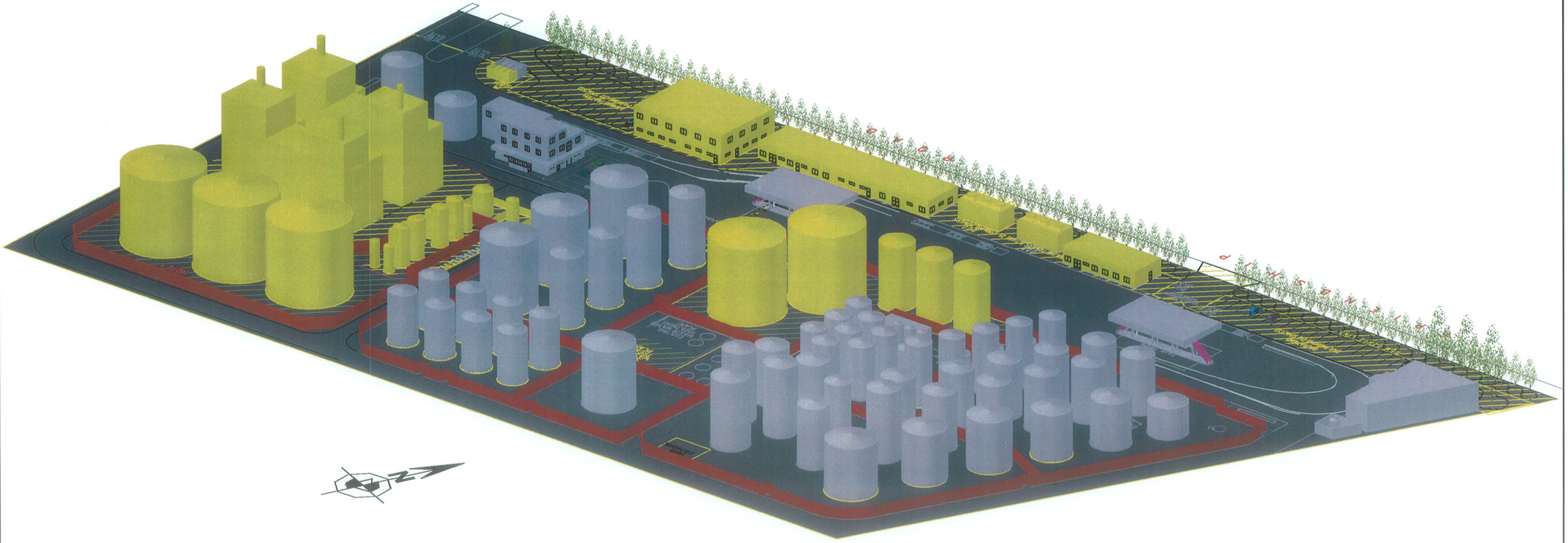


EXISTING

NEW ADDITION

REV	DATE		BY	CHK	CIV/STR	MECH	E/I	PROCESS	REFERENCE	DRAWING NUMBER	TITLE
A	01-08-06	ISSUED FOR SUBMISSION	W.B.							---	
					APPROVED						

CONTRACT No.	E235	
ENG. DESIGN BY		
DRAWN	W.BRITO	01-08-06
CHECKED		
CIV & STRUCT DESIGN APPR.		
MECHANICAL DESIGN APPR.		
ELECT. & INSTR. DESIGN APPR.		
PROCESS DESIGN APPR.		
WEIGHTS CHECKED		

BILFINGER BERGER Services

BILFINGER BERGER SERVICES (AUSTRALIA)

SYDNEY-BIODIESEL TERMINAL (SBT)
PROPOSED PLANT LAYOUT
VIEW LOOKING WEST

Scale	A1	BBSA DRG No	REV.
NONE		07E235-SK-001	A

M:\E235 VOPAK ABT\SBT Work Phase 2\Drafting\XREF\MODEL APP.dwg, 1/08/2006 12:13:17 PM, wbrito

LCF
& Associates Pty Ltd
Engineering Consultants

11 Adventure Place
Caringbah NSW 2229
PO Box 2834
Taren Point NSW 2229
Tel: (02) 9531 8611
Fax: (02) 9531 8711
Email: lcf@alwaysonline.net.au

5th January 2007

Bilfinger Berger Services
7-11 Talavera Road
MACQUARIE PARK
NSW 2113

Attention: Mr Jay Shah

Spillage Contol Requirements for Bulk Storage Tanks
Re;- Department of Planning letter dated 22 Dec 2006
Vopak Site A Biodiesel Facility

Dear Jay,

This letter addresses spillage control requirements that are raised in the second paragraph under point 2 in the Department of Planning letter, ie 'the distance from the tanks to the bundwall is less than the required distance as per AS 1940.'

I understand that this comment applies to Tanks 201, 202 and 203 which will contain C2 feed oils, and also to tanks 75, 76, 77, 78 and 79 which may store either C2 feed oils or C1 biodiesel. All of the above tanks are 18 metres high,

Tanks 201, 202 and 203 are 6.3 metres from the bund wall, which is 2.65 m high.

Tanks 75, 76, 77, 78 and 79 are 3 to 4 metres from the bund wall, which is 2.8 m high.

AS 1940 requires a distance of approximately 7.7 metres from tank to bund wall, for tanks of this height.

It is noted that AS 1940 is not a mandatory code under the NSW Occupational Health and Safety Amendment (Dangerous Goods) Regulation 2005. It is listed as a relevant code. Normal practice is to implement the requirements of AS 1940 unless the intent of the code is achieved by an alternative method.

The intent of the bund to bund wall separation distance specified in AS 1940 is to reduce the risk that liquid released from penetrations in the tank might project out of the bund. Common alternative methods of controlling this risk for bulk storages in Australia include;

- Provision of tank insulation, with a substantial outer cladding.
- Provision of a splash guard; this must be adequately supported.

Provision of either of the above controls would be accepted as appropriate methods of achieving the intent of AS 1940 – 2004.

Spill containment principles are discussed in detail in section 9.7 of the WorkCover Code of Practice 2005 for the storage and handling of dangerous goods. Point (d) of Clause 9.7.3 states "*Any bund wall or barrier shall be high enough to catch all leaks*."

It is noted that other international standards control this risk by locating nozzles away from bund walls and assessment of the risk of corrosion or mechanical penetration of the tank shell.

Please contact the undersigned if further comment on this matter is required.

Yours faithfully,
LCF & Associates Pty Limited

C. E. Flannery
Member No 002- Australasian Institute of Dangerous Goods Consultants.

Appendix D

PHA Study

Pinnacle Risk Management Pty Ltd

Pinnacle
Risk Management Pty Ltd

PRELIMINARY HAZARD ANALYSIS
PROPOSED BIODIESEL PROJECT
VOPAK TERMINALS AUSTRALIA PTY LTD
PORT BOTANY, NSW

Prepared by: Dean Shewring

9 January 2007

Pinnacle Risk Management Pty Limited
ABN 83 098 666 703

PO Box 5024 Elanora Heights
NSW Australia 2101
Telephone: (02) 9913 7284
Facsimile: (02) 9913 7930

Preliminary Hazard Analysis, Proposed Biodiesel Project, Vopak Terminals Australia

Disclaimer

This report was prepared by Pinnacle Risk Management Pty Limited (Pinnacle Risk Management) as an account of work for Vopak Terminals Australia Pty Ltd (Vopak). The material in it reflects Pinnacle Risk Management's best judgement in the light of the information available to it at the time of preparation. However, as Pinnacle Risk Management cannot control the conditions under which this report may be used, Pinnacle Risk Management will not be responsible for damages of any nature resulting from use of or reliance upon this report. Pinnacle Risk Management's responsibility for advice given is subject to the terms of engagement with Vopak.

Rev	Date	Description	Reviewed By
A	2/9/06	Draft for Comment	Vopak
B	22/9/06	Initial Vopak Review Comments Included	Vopak
C	1/11/06	Response to SPC Queries Included	Vopak
D	9/1/07	Response to DoP Queries Included	Vopak

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

EXECUTIVE SUMMARY

Vopak Terminals Australia Pty Ltd (Vopak) and Natural Fuel Ltd (Natural Fuel) are proposing to construct and operate two biodiesel plants within the existing Vopak facility at 49 Friendship Road, Port Botany, NSW (i.e. Site A). The new plants are to be located on the former JORTL plot area (i.e. the LPG storage and distribution facility which has now been demolished).

The two plants will be installed in stages. This study includes both plants and the associated facilities.

To assess the risk associated with the operation of the two plants, a preliminary hazard analysis (PHA) has been performed.

The results of this PHA show that the risks associated with the proposed changes comply with the Department of Planning (DoP) guidelines for tolerable fatality, injury, irritation and societal risk. Also, transport risk, risks to biophysical environment, the risk of propagation and the impact on cumulative risk in the Port Botany area from potential hazardous events are broadly acceptable.

The primary reason for the low risk levels from proposed changes is that significant consequential impacts from potential hazardous events (mainly radiant heat from fires) do not extend far from the relevant processing areas.

It is assumed that the proposed changes will be reviewed via the HAZOP methodology, an updated fire safety study will be performed and the existing safety management systems and emergency response plans will be updated to reflect the proposed changes.

The following recommendations are made from this review:

1. Include in the updated safety management systems (including training programs) appropriate information concerning the new hazards associated with sodium methylate. Whilst this material does not contribute significantly to off-site risk, management of spills will require special attention to protect site based personnel handling the material;

2. The existing stormwater system under the biodiesel plants area has no isolation valve in the final pipe leaving site. Suitable means is to be provided to ensure spills do not leave the site via this stormwater piping system; and

3. For automated tank transfers, two independent tank level switches should be installed (or equivalent) to reduce the likelihood of tank overfilling to an acceptable level (as per current practice at Site B).

GLOSSARY

ALARP	As Low As Reasonably Practicable
API	American Petroleum Institute
AS	Australian Standard
ASME	American Society of Mechanical Engineers
BLB	Bulk Liquids Berth
CCPS	Center for Chemical Process Safety
CCTV	Closed Circuit Television
DG	Dangerous Goods
DIPNR	Department of Infrastructure, Planning and Natural Resources
DoP	Department of Planning
EIA	Environmental Impact Assessment
FSS	Fire Safety Study
HAZAN	Hazard Analysis
HAZOP	Hazard and Operability Study
HIPAP	Hazardous Industry Planning Advisory Paper
ISO	International Standards Organisation
JORTL	Joint-Owned Road Tanker Loadout
LEL	Lower Explosion Limit
LPG	Liquefied Pressurised Gas
NFAL	Natural Fuel Australia Ltd
ML	Megalitre
MSDS	Material Safety Data Sheet
PG	Packing Group
PHA	Preliminary Hazard Analysis
PPE	Personnel Protective Equipment
QRA	Quantitative Risk Analysis

SEP	Surface Emissive Power
SPC	Sydney Ports Corporation
STEL	Short Term Exposure Limit
TNO	(Netherlands Organisation for Applied Scientific Research)
TWA	Time Weighted Average
UEL	Upper Explosive Limit
wt%	Weight Percent

REPORT

1 INTRODUCTION

1.1 BACKGROUND

Vopak Terminals Australia Pty Ltd (Vopak) and Natural Fuel Ltd (Natural Fuel) are proposing to construct and operate two biodiesel plants within the existing Vopak facility at 49 Friendship Road, Port Botany, NSW (i.e. Site A). The new plants are to be located on the former JORTL plot area (i.e. the LPG storage and distribution facility which has now been demolished).

The two plants will be installed in stages. This study includes both plants and the associated facilities.

As part of the project requirements, a Preliminary Hazard Analysis (PHA) is required to be produced in accordance with the guidelines published by the Department of Planning (DoP) Hazardous Industry Planning Advisory Paper (HIPAP) No 6 (Ref 1).

Vopak has appointed Pinnacle Risk Management Pty Ltd (Pinnacle Risk Management) to produce the PHA.

1.2 OBJECTIVES

The main aims of this PHA study are to:

- Review the hazards and risks associated with the proposed new facility and the adequacy of the proposed safeguards;
- Evaluate the level of risk from the proposed new facility to surrounding land uses and compare the risk levels with the risk criteria published by the DoP in HIPAP No 4 (Ref 2); and
- Where necessary, submit recommendations to Vopak to ensure that the facility is operated and maintained at acceptable levels of safety and that effective safety management systems are used.

1.3 SCOPE

This PHA assesses the hazards and corresponding risks associated with the proposed two biodiesel plants and associated facilities at Vopak's Site A. This includes the equipment associated with the two plants, the storage requirements, the pipeline from Site A to the Vopak Site B (Port Botany), Tank 0625 at Site B (used for biodiesel storage) and transport issues (road and shipping).

1.4 METHODOLOGY

The PHA has been conducted as follows:

- The project scope was reviewed to identify potential hazardous events, their causes and consequences. Proposed safeguards were also included in this review;
- The consequences of the potential hazardous events with possible off-site impact were evaluated (as per HIPAP 4, Ref 2);
- Included in the analysis is the risk of propagation from hazardous events in nearby processing equipment;
- The likelihood and hence risk of the potential hazardous events with the possibility for off-site harm were then assessed using appropriate qualitative and/or quantitative techniques (e.g. a risk matrix) to determine if there is any possible increase to existing off-site risk levels. The risk results are compared to the criteria set in HIPAP 4, Ref 2; and
- A comparison is made to the existing Port Botany regional study (Ref 3) to determine if there is any impact on cumulative risk.

2 SITE DESCRIPTION

Vopak's Site A was established in 1979 to serve an identified need for an independent bulk liquid distribution facility in the greater Sydney Region. The facility caters for the distribution of bulk liquid chemicals to chemical manufacturers, oil companies and chemical traders who sell into the local markets.

A map of the area showing the location of Site A is shown in Figure 1. A site layout drawing showing the proposed biodiesel plants and storage facilities is shown in Figure 2.

The four hectare site is bounded to:

- The north by Friendship Road;
- The south by the Port Botany pipeline corridor and Patrick's Container Depot;
- The east by Patrick's Container Depot; and
- The west by Origin Energy (LPG Storage & Distribution).

The nearest residential area is located at Phillip Bay approximately 1 kilometre to the east of the site across Yarra Bay. Other residential areas, slightly further away, are located at Chifley to the north-east and Botany to the north-west.

The site is an established bulk chemicals storage and distribution facility. Security for the site is also established and comprises the following measures:

- Site perimeter fence installed with electronic access gates;
- The main gate is monitored by security staff based at Site B outside normal hours;
- All personnel gain access via the main gate (either by swiping their security passes or by signing in as a visitor);
- The site has lighting throughout the night to aid observation;
- The site will be permanently manned when the biodiesel plants commence operation;
- Patrols by security guards are performed; and
- The site can be observed by security personnel via a closed circuit TV.

There are approximately 30 people during normal business hours and 1 person (Security Guard) outside of normal hours on the site.

Depending on weather conditions, it may lie under the flight path to Sydney Airport. There are no known natural hazards associated with this location that pose unacceptable levels of risk.

Figure 1 – Site Location

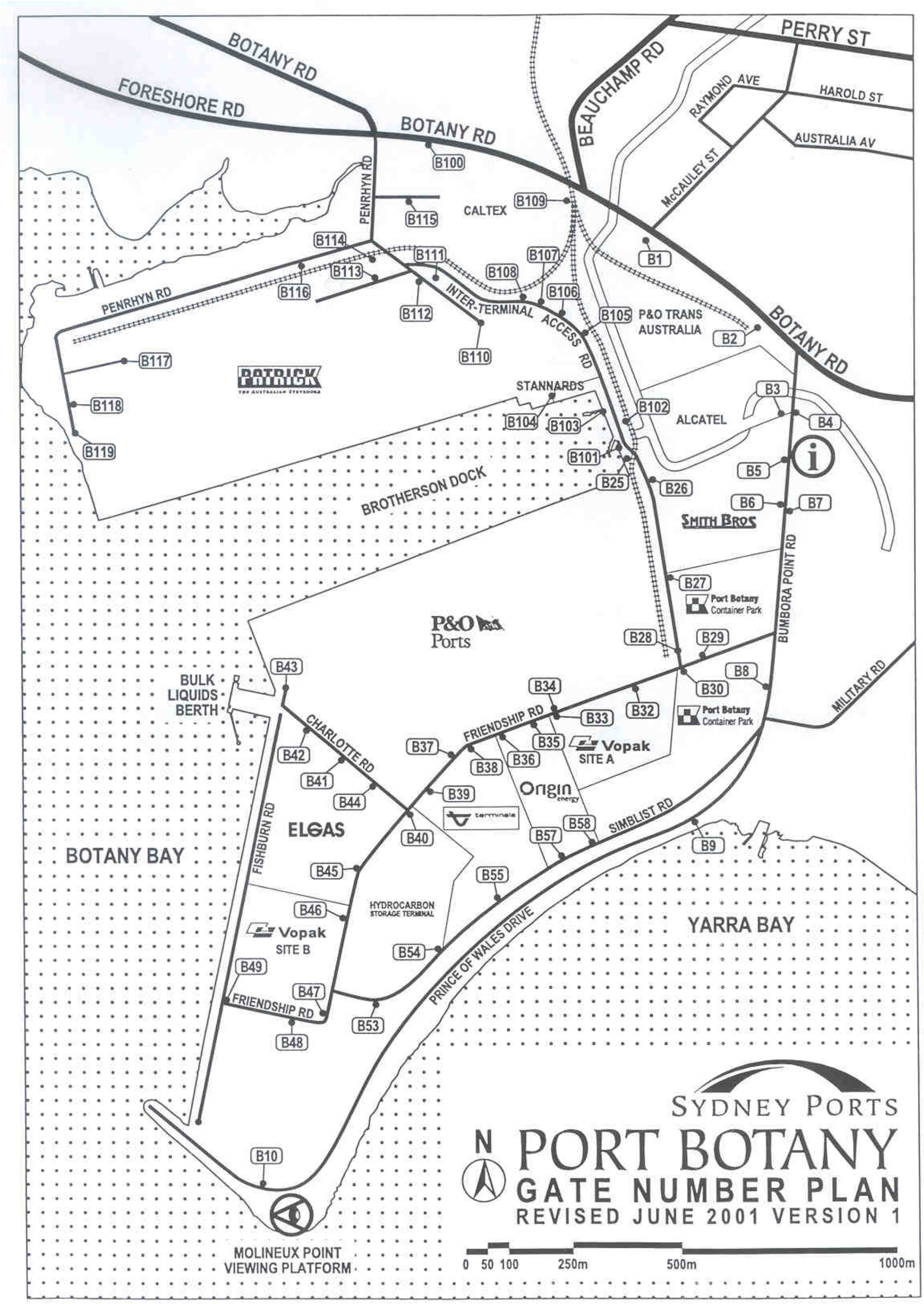
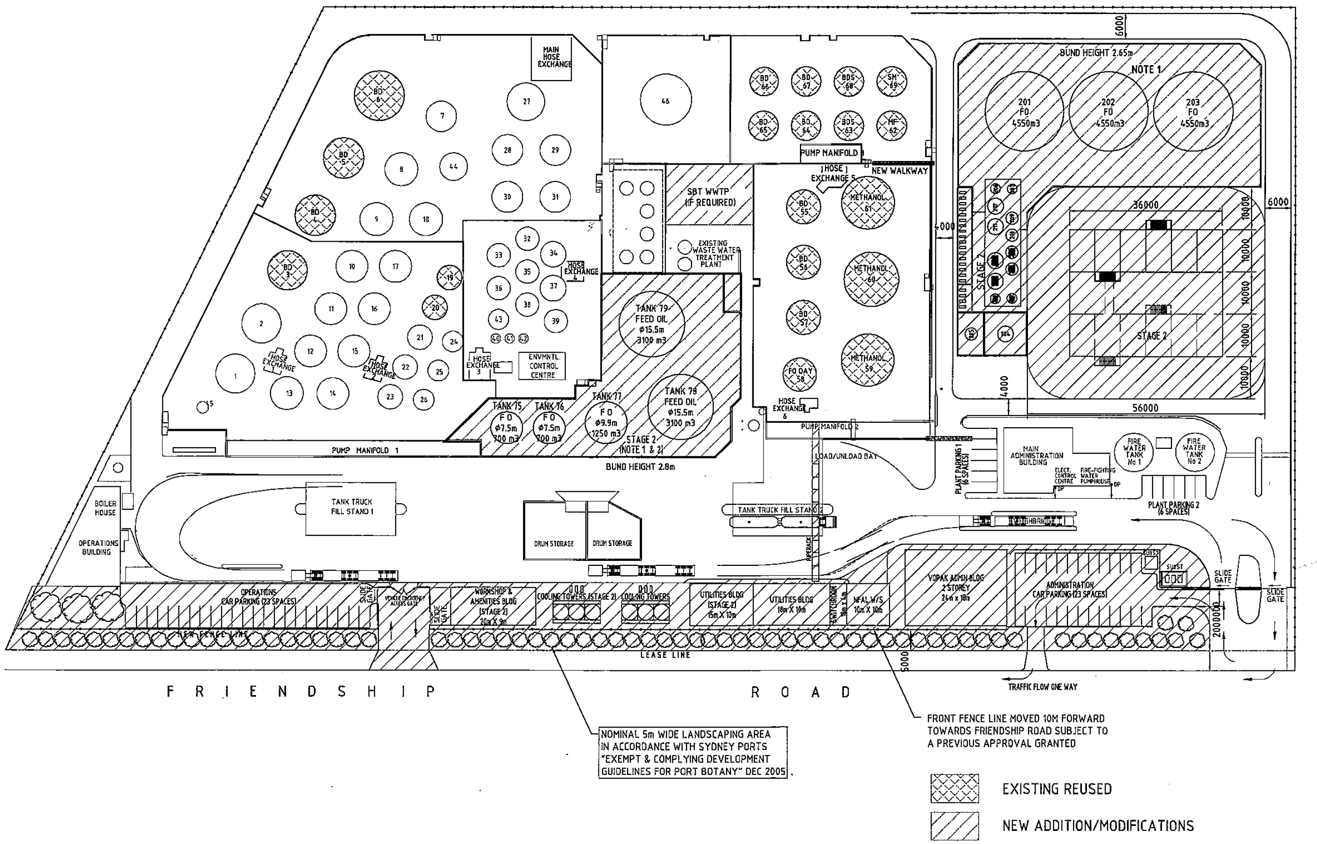


Figure 2 –Layout Drawing



Storage Details for SBT Stage 1

Item	Tank	Tank	Tank Vol	Comments
	Dia, m	Ht, m	m3	
Feed Oil Tank 1 - Tank 201	18.7	18	4550	
Feed Oil Tank 2 - Tank 202	18.7	18	4550	
Feed Oil Tank 3 - Tank 203	18.7	18	4550	
New Minor Storage Tanks (Tanks 204 to 212, No 208)			440	8 Tanks
Total New Stage 1			14090	
Existing Tanks used for Feed Oil			650	1 Tank
Existing Tanks Used for Biodiesel			8750	13 Tanks
Existing Tanks Used for Methanol			6400	4 Tanks
Existing Tanks Used for Sod Methylate			400	1 Tanks
Existing Tanks Used for Glycerine			400	1 Tanks
Total Reused			**16600**	
Total SBT			**30690**	
Total Site			**50340**	

Storage Details for SBT Stage 2

Item	Tank	Tank	Tank Vol	Comments
	Dia, m	Ht, m	m3	
Feed Oil Tank 4 - Tank 79	15.5	18	3100	
Feed Oil Tank 5 - Tank 78	15.5	18	3100	
Feed Oil Tank 6 - Tank 77	9.9	18	1250	
Feed Oil Tank 7 - Tank 76	7.5	18	700	
Feed Oil Tank 8 - Tank 75	7.5	18	700	
New Minor Storage Tanks (Tanks 231 to 236)			320	6 Tanks
Total Additional New Stage 2			9170	
Existing Tanks Used for Glycerine			400	1 Tank
Total Reused			400	
Total Additional for Stage 2			9570	
Total New Stage 2			**23260**	
Total Reused			**17000**	
Total SBT			**40260**	
Total Site			**59510**	

3 PROJECT AND PROCESS DESCRIPTION

3.1 PROJECT AND PROCESS BACKGROUND

Vopak will provide storage and distribution infrastructure, utilities and management facilities for the proposed biodiesel plants. Natural Fuel will provide the biodiesel production plants and associated equipment (Ref 4).

The proposal will require refurbishment of the Vopak Terminal and re-use of some of the existing tanks, pumps, loading / unloading facilities, fire protection systems and other miscellaneous facilities. In addition, the proposal will require construction of the new biodiesel plants in the area where the JORTL (Joint Owned Road Tanker Loading) LPG facility was previously located.

Process flow diagrams showing the proposed tanks and transfers arrangements are shown in Appendix 1.

The two plants are to be constructed in stages and will be identical in capacity. The processing plants will consist of five units integrated into the one plant structure to perform the following processes in order to create biodiesel:

- Transesterification (reaction);
- Methylester drying;
- Glycerine water pretreatment;
- Glycerine water evaporation; and
- Glycerine distillation.

The biodiesel plants will be designed for 24/7 operation. The nameplate capacity of each plant is 360 tonnes of biodiesel per day, equating to a total of approximately 120,000 tonnes per year (143 ML/year). Approximately 12,200 tonnes of pharmaceutical grade glycerine will also be produced from the process.

The processing plants are relatively compact. They occupy an area of approximately 12 m x 36 m. The majority of the equipment is constructed from stainless steel (good corrosion resistance for this coastal location).

Biodiesel is a nearly colourless liquid made from animal fats and vegetable oils. It has properties similar to petroleum based diesel.

The production of biodiesel involves a process of transesterification which is the reaction of vegetable oils with alcohol (i.e. methanol for this process) in the presence of a suitable catalyst (i.e. sodium methylate) in two reaction stages. The reaction process is at atmospheric pressure and relatively low temperatures (40 to 50^{o}C).

The following equation shows the reaction that produces the biodiesel (methylester):

$$C3H5(OOCR)3 + 3CH3OH \rightarrow 3CROOCH3 + C3H5(OH)3$$

i.e. Triglyceride + Methanol → Methylester + Glycerine

The term 'triglyceride' may be either a vegetable oil or tallow.

After the first two reaction stages, the raw biodiesel is then pumped to the final reaction stage (the maturity reactor) where diluted hydrochloric acid is used for furthering the reaction. The product biodiesel from the maturity reactor is then washed with water at similar temperatures and pressures to the initial two reaction stages.

The final operation in the transesterification section of the plant is the recovery of non-reacted methanol. This is achieved via an atmospheric pressure distillation column. Temperatures range from 65^{o}C at the top to 105^{o}C at the bottom.

The washed biodiesel (methylester) is then dried in a flash drum and steam heated drier. The drying takes place at approximately 110^{o}C and 1 barg. The dried biodiesel is then cooled (40^{o}C) and pumped to storage.

Glycerine is a byproduct from the reaction process. A mixture of glycerine and water from the bottoms of the methanol column is pumped to a pre-treatment process area. Fatty matter is removed from the glycerine-water mixture and the stream is then neutralised using sodium hydroxide (i.e. caustic soda). This process occurs at approximately 90^{o}C.

The majority of water is then removed via a three stage evaporation process (temperatures up to approximately 110^{o}C) and the crude glycerine is held in storage for further processing.

The crude glycerine is then dosed with caustic and distilled to give a two glycerine product streams. As with the majority of the plant, the distillation of glycerine is performed at close to atmospheric pressure. The bottoms waste residue product (glycerine, fats, oils, polyols, sodium chloride and water) exits the column at approximately 160^{o}C. The relatively pure glycerine exits the top of the column at approximately 105^{o}C and is pumped to storage. The second glycerine product stream exits the column below the second packed stage and is bleached with activated carbon.

The activated carbon is mixed with water so there is no fire risk with the wetted material. After bleaching, this grade of glycerine is pumped to storage.

The processing plants will produce B100 grade of biodiesel, i.e. 100% biodiesel. The biodiesel would then be:

- Stored at Site A for export via road tanker;
- Stored at Site A for export via ship; and

- Transferred to Vopak's Site B tank farm and stored in a dedicated tank (Tank 0625). From this tank, the biodiesel will be exported by ship or blended with mineral diesel via the road tanker loading rack as per customer requirements (e.g. grades B5, B10 or B20 meaning 5, 10 or 20% biodiesel in mineral / petroleum diesel).

3.2 STORAGE TANKS

A significant proportion of the existing Site A storage tankage is to be utilised for the stage one development. Stage two of the project will require the removal and replacement of several existing Site A tanks with larger ones.

Overall, the proposal includes 12 new tanks and 20 reused tanks. Tank heights range from 6 to 18 metres and tank volumes range from 20 m^3 to 4,550 m^3. Total storage capacity of the proposal is approximately 30,700 m^3. The products to be stored in the tanks are:

- Feed stock, e.g. palm oil, palm kernel oil and canola oil;
- Hydrochloric acid and liquid sodium hydroxide;
- Glycerine feed inputs;
- Biodiesel (grade B100);
- Pharmaceutical glycerine;
- Methanol; and
- Liquid sodium methylate.

3.3 PIPELINE TRANSFERS

Certified product biodiesel will be transferred to Site B on a daily basis. To facilitate efficient export of biodiesel to road tankers and/or ship, a 3,000 m^3 tank (0625) at Vopak's Site B will be allocated to biodiesel. Therefore, a new pipeline (150 mm diameter) will be required to connect the biodiesel tank farm at Site A to the main transfer manifold at Site B.

Within Site A, there will be a number of new and modified pipelines to get feedstock and product to and from the storage tanks as well as throughout the biodiesel plants.

Existing lines to and from the Sydney Ports Corporation Bulk Liquids Berth and Vopak Site A will also be utilised for import of feedstock (methanol and vegetable oils), short term (2007) import of biodiesel from the Vopak / NFAL Darwin plant for developing the Sydney market prior to the Sydney biodiesel plants coming into production and export of biodiesel.

3.4 ROAD TRANSPORT

Stage one will see a reduction in the chemicals stored on site. The main feedstocks (methanol and vegetable oils) and products (biodiesel and glycerine) will be moved by ship or road tanker. However, as stated above, the biodiesel will predominantly be blended with mineral diesel which leaves the site via road tankers. As Site B supplies an established market, there will be no net change in the number of road tankers carrying diesel (i.e. less diesel will be required to be imported via ship).

The net impact of traffic movements due to the project are summarised in the following table.

Table 1 – Traffic Movements

Per Annum Vehicle Movement	Existing Road Movements Site A	New Road Movements	Net Impact (new minus existing)
Road Vehicles	2,730	1,560	-1,170
Isocontainers In	180	454	274
Isocontainers Out	470	1,572	1,102
Total	3,380	3,586	206

That is, there will be less than one extra vehicle movement per day for the two plants (a small increase).

Economies of scale will lead to a significant amount of the pharmaceutical grade of glycerine achieving sufficient export parcel sizing by ship when the second plant is commissioned, thus reducing impact on road traffic further. With glycerine export shipping, this will again decrease the vehicles that are currently in use on the roadways.

3.5 SHIPPING

As both feedstocks and products are dedicated materials to the biodiesel plants, there will be a net increase in cross-berth movements. However, the biodiesel used to blend with mineral diesel will result in an equivalent reduction of mineral diesel oil import.

Currently, vegetable oils, methanol and diesel are currently transferred from ship-to-shore at the BLB. Therefore, the consequences of a spill at the Bulk Liquids Berth do not change as a result of this project.

Overall, the total feedstock increase (by ship-to-shore transfers) is estimated at 265,000 per year. This amount is off-set by a reduction of diesel imports of approximately 240,000 tonnes per year. Correspondingly, there is a small net increase of 25,000 tonnes per year transferred at the Bulk Liquids Berth.

3.6 UTILITIES

The main utilities required for the biodiesel plants are:

- Potable water;
- Cooling water;
- Instrument air;
- Steam and hot water. This is generated via gas fired boilers. Natural gas is currently used at the site;
- Nitrogen; and
- Stormwater.

The new utility to the site is cooling water. Vopak personnel are familiar with all other of the above utilities.

4 HAZARD IDENTIFICATION

4.1 HAZARDOUS MATERIALS

A summary of the materials associated with the two biodiesel plants is shown in Table 2. Refer to Figure 2 for material names and tank locations.

Table 2 – Materials Summary

Material	Maximum Storage Quantity, m^3	DG Class	Tank Size	Number of Tanks	Annual Throughput by sea, road or pipeline, te
Palm Oil	4,550	C2	18.7 m diameter, 18 m high	1	60,056 (sea)
Palm Kernel Oil	4,550	C2	18.7 m diameter, 18 m high	1	72,067 (sea)
Canola Oil	4,550	C2	18.7 m diameter, 18 m high	1	108,102 (sea)
Feed Buffer Tank (vegetable oil)	650	C2	7.79 m diameter, 13.7 m high	1	-
Hydrochloric Acid	60	8	3.6 m diameter, 6 m high	1	2,400 (road)
Sodium Hydroxide	25	8	2.91 m diameter, 3.7 m high	1	384 (road)
Fatty Matter	25	C2	2.3 m diameter, 6 m high	1	1,000 (road)
Industrial Glycerine	25	C2	2.3 m diameter, 6 m high	1	1,130 (road)
Shift Glycerine	80	C2	2.1 m diameter, 6 m high	2	-
Crude Glycerine	100	C2	3.76 m diameter, 9 m high	1	-
Glycerine Water	100	C2	3.76 m diameter, 9 m high	1	-
Pharmaceutical Glycerine	400	C2	6 m diameter, 14.5 m high	1	24,378 (road)

Material	Maximum Storage Quantity, m^3	DG Class	Tank Size	Number of Tanks	Annual Throughput by sea, road or pipeline, te
Biodiesel	7,862	C2	9.16 m diameter, 10.9 m high 10 m diameter, 12.2 m high 11.7 m diameter, 12.2 m high 7.64 m diameter, 16.4 m high 6.7 m diameter, 12 m high	1 2 1 3 4	240,000
Biodiesel Shift	836	C2	6.7 m diameter, 12 m high	2	-
Methanol	6,000	3 (6)	12.5 m diameter, 16.5 m high	3	24,465 (ship)
Methanol Day Tank	418	3 (6)	6.7 m diameter, 12 m high	1	-
Sodium Methylate	418	3 (8)	6.7 m diameter, 12 m high	1	4000 (road)
Activated Carbon	Note 1	4.2	Bulkibags (1 m^3)	-	45 to 60 m^3 (road)

Note 1: Storage location yet to be determined.

Information on each of these materials is shown on the following pages.

Vegetable Oils:

Palm oil, palm kernel oil and canola oil have flash points typically above 270°C, i.e. they are difficult to ignite combustible materials. The typical melting points for palm oil and palm kernel oil are at ambient temperatures, e.g. 25 to 40°C. These vegetable oils are not soluble in water. Pinnacle Risk Management has previously reviewed vegetable oils (Ref 5). This study shows that these materials pose negligible risk to the environment due to their low toxic properties.

Hydrochloric Acid:

Hydrochloric acid is a Class 8 Dangerous Good (corrosive substance); Packing Group II.

Hydrochloric acid is normally supplied as a 33wt% solution. It is a clear to slightly yellow fuming solution with a pungent odour.

Hydrochloric acid reacts violently with alkalis and sodium hypochlorite (the latter reaction evolves chlorine gas). It is highly corrosive to most metals with evolution of hydrogen gas (i.e. a highly flammable gas).

Exposure to hydrochloric acid can lead to severe burns and irritation. Prolonged exposure can lead to dermatitic effects.

Hydrochloric acid is not classifiable as a human carcinogen.

Hydrogen chloride gas can be released to the atmosphere by evaporation from spills of concentrated hydrochloric acid. It is toxic and acts as a respiratory irritant. It has a readily noticeable odour at low concentrations (around 0.3 ppm) that do not constitute an acute hazard; therefore the odour acts as a hazard warning. The Time Weighted Average (TWA) exposure limit for hydrogen chloride for an eight hour day is 5 ppm.

If involved in a fire, toxic fumes can be evolved.

Sodium Hydroxide:

Sodium Hydroxide (i.e. caustic soda) is a Class 8 Dangerous Good (corrosive substance); Packing Group II.

Caustic soda is a colourless liquid. It is highly alkaline and hence corrosive to human tissue and can cause serious injury to skin and eyes. Inhalation of any mist containing caustic soda can result in respiratory irritation and lung conditions such as pulmonary oedema.

It is typically transported as a 46 – 50 wt% solution although lower strengths are also produced.

Caustic soda is corrosive to aluminium, zinc, lead, brass and tin. A product of reaction with metals is hydrogen (i.e. a highly flammable gas). Care is therefore required when maintaining pipework etc containing caustic soda as hydrogen flash fires can occur, e.g. hot work in cutting through pipes.

It reacts vigorously with acids. When mixed with ammonium salts, ammonia gas will be evolved. Caustic soda will react exothermically with water. It will also attack many glasses and ceramic materials. When mixed with some organic matter (e.g. milk residues), carbon monoxide can be evolved.

Caustic soda will absorb carbon dioxide to form solid deposits, e.g. white solid deposits from small valve leaks.

Depending on the production method, caustic soda may contain trace impurities such as mercury. Mercury bioaccumulates and can cause nervous system damage. Therefore, any sludge should be considered for the presence of mercury.

When spilt, caustic soda is very slippery. At low ambient temperatures, higher strength caustic soda can freeze.

All carbon steel tanks containing caustic soda above 40^{o}C should be stress relieved to minimise corrosion rates.

Fatty Matter:

This is a by-product of the process and is essentially a pumpable mixture of soap derivatives. The biodiesel production process will generate approximately 990 tonnes per year of fatty matter. It is anticipated that this fatty matter has value as a potential fuel source for various industrial heating processes.

Glycerine:

Glycerine is 1,2,3-Propanetriol which is a stable material under normal operating procedures. It is not classified as dangerous and is biodegradable. It has a melting point of approximately 18^{o}C. Above 22^{o}C, it is soluble in water.

Glycerine's boiling point is above 288^{o}C and its flash point is above 199^{o}C. Therefore, it is difficult to ignite. Its autoignition temperature is approximately 400^{o}C. If it does ignite, toxic products of combustion can result, e.g. acrolein.

Biodiesel:

Biodiesel is a generic name for fuels produced by the transesterification of a vegetable oil. This process produces a diesel fuel with similar properties to diesel obtained from crude oil fractionation but with a lower viscosity.

The flash point for biodiesel is above 100^{o}C (typically 160^{o}C) and its boiling point is typically above 205^{o}C. products of combustion, if ignited, are carbon dioxide, carbon monoxide and water.

Normally, biodiesel will contain no hazardous materials such as benzene (which is present in petroleum based diesel).

It is insoluble in water and a stable material.

Methanol:

Methanol is a flammable liquid with a flash point of around 12^{o}C, a boiling point of 64^{o}C and an autoignition temperature of 464^{o}C. Methanol vapour is flammable in the range of 5.5 to 37 % in air and a saturated air-methanol mixture is flammable over a wide temperature range. As methanol is handled above its flashpoint (i.e. at ambient temperature), any loss of containment could result in formation of a flammable mixture.

Methanol vapour is heavier than air and vapours may therefore concentrate in drains or hollows.

A methanol flame is practically invisible in daylight which complicates fire fighting. The methanol flame does not produce soot, although formaldehyde and carbon monoxide form during combustion when insufficient oxygen is available for complete combustion. Water is unsuitable as an extinguishing agent for fires involving large amounts of methanol because it is miscible with the compound (mixtures containing small amounts of methanol also burn). Protein based alcohol resistant foams are suitable.

Whilst explosions involving methanol vapours can and have occurred, these have been in processing equipment or confined spaces, for example the vapour space in tanks.

Methanol liquid has no known self decomposition type reactions that could cause explosions. It reacts with oxidising agents, for example chlorine or chlorine dioxide.

Methanol is also toxic. It is a scheduled poison and is toxic through inhalation, ingestion and dermal absorption. It has a TWA of 200 ppm and an STEL of 250 ppm. It is not classified as a carcinogen.

Methanol is also mildly toxic to aquatic life.

Methanol is aggressive towards copper, zinc, magnesium, tin, lead and certain grades of aluminium. For the latter, compatibility problems exist only when the methanol is 100% pure.

Sodium Methylate:

Sodium methylate used at the biodiesel plants will be a 30% solution, i.e. 30% will be sodium methoxide and 70% will be methanol. Therefore, this material exhibits similar properties to methanol (as detailed above). It is a clear liquid which is partly miscible in water.

Sodium methylate is toxic to personnel if swallowed, if in contact with skin or if inhaled.

It is a subsidiary risk DG Class 8 as the pH is approximately 13 (i.e. alkaline).

Sodium methylate boils at approximately 92^{o}C, has a flash point of 32^{o}C and an autoignition temperature of 445^{o}C. The explosive limits are 5.5 to 44 vol%.

When in contact with various metals, e.g. aluminium, magnesium and zinc, hydrogen can be evolved (i.e. a flammable gas).

4.2 HAZARDOUS INCIDENTS REVIEW

A search of available literature and information was conducted to review the types of historical events that can occur with the proposed biodiesel plants, storage and product handling. The search included the following references:

1 Darwin Biodiesel HAZOP Report (Ref 6);

2 Natural Fuel Australia Ltd, Darwin Risk Register;

3 Frank Lees, Loss Prevention in the Process Industries (Ref 7);

4 Australian, US and UK Departments of Transport records;

5 US National Transport Safety Board statistics;

6 US Occupational Health and Safety Administration statistics;

7 US Chemical Safety and Hazard Investigation Board statistics; and

8 UK Health and Safety Executive statistics.

4.3 HAZARDOUS EVENT IDENTIFICATION WORD DIAGRAM

In accordance with the requirements of *Guidelines for Hazard Analysis*, (Ref 1), it is necessary to identify hazardous events which could be caused by the proposed operations. As recommended in HIPAP 6, the PHA focuses on "atypical and abnormal events and conditions. It is not intended to apply to continuous or normal operating emissions to air or water". The latter are discussed elsewhere in the EIA.

In keeping with the principles of PHAs, credible, hazardous events with the potential for off-site effects have been identified. That is, "slips, trips and falls" type events are not included nor are non credible situations such as an aircraft crash occurring at the same time as an earthquake.

The credible, significant incidents identified are summarised in the Hazard Identification Word Diagram following (Table 3). The diagram presents the causes and consequences of the events, together with major preventative and protective features that are included as part of the design. For presentation purposes, the table is divided into four processing areas, i.e.:

1 Biodiesel plants;

2 Terminal operations – tanks (including Site B – Tank 0625), road tanker loading and terminal piping;

3 Pipeline Corridor; and

4 The Bulk Liquids Berth.

Table 3 – Hazard Identification Word Diagram

Event ID No.	Hazardous Event	Causes	Possible Consequences	Proposed Prevention and Mitigation Control Measures
		Biodiesel Plants		
1.	Fires from spills	Spills of methanol and sodium methylate are more likely to be involved in fires rather than biodiesel, glycerine and vegetable oils Spills can be the result of mechanical failures, e.g. corrosion of pipes or vessels, or operational errors due to human factors or control problems (e.g. faulty high level protection) This event covers all credible causes for losses of containment within the plant bunded areas. The consequences of these releases, irrespective of the causes, are collectively assessed later in this report	Spills are contained within the bunded areas around the biodiesel plants. Fire size will depend on spill size and the time delay to ignition. Toxic products of combustion will be evolved from fires.	Plant design specifications, e.g. stainless steel for piping and minimum flanges Equipment inspection and maintenance procedures Operating procedures and training Commissioning checks on the adequacy of the control system Control of ignition sources Fire protection systems, e.g. hydrants, foam, monitors and fire extinguishers, as currently available on the site
2.	Overpressure of the methanol column	Loss of condenser, e.g. cooling water failure, or failure of the steam pressure control	Condensing in the vent condenser prior to venting to atmosphere via the exhaust air scrubber	High pressure trip on the steam flow to the reboiler Flame arrestor installed on the exhaust air scrubber discharge to prevent flashback

Event ID No.	Hazardous Event	Causes	Possible Consequences	Proposed Prevention and Mitigation Control Measures
3.	Pump fires	Pumps being deadheaded or seal failures	Localised fire at pump	Pump deadhead instrumented protection and recycle lines Preventative maintenance for pumps Fire protection systems, e.g. hydrants, foam, monitors and fire extinguishers, as currently available on the site
4.	Decomposition of sodium methylate	Mixing of sodium methylate with water to give caustic soda and methanol	Process upset and poor reaction	Controls to prevent water ingress such as nitrogen padded vessels and control on the use of hoses
5.	Explosion involving dried sodium methylate	Spills of sodium methylate drying and hence an explosion can result	The dried substance may spontaneously ignite on contact with air. Reacts violently with water producing flammable methanol and corrosive sodium hydroxide. Attacks many metals forming hydrogen. Explosions can result in damage to plant and equipment in the spill area	Containment of sodium methylate within the process piping and equipment Spill response procedures
6.	Operator exposure to sodium methylate	Losses of containment of sodium methylate	Sodium methylate can kill nerve cells before the pain is detected	Containment of sodium methylate within the process piping and equipment Operator training and knowledge Personnel protective equipment (PPE)
7.	Exhaust air washing column inefficient	Loss of reflux water flow, loss of cooling water to reflux cooler	Air / methanol stream to atmosphere	Flow measurement, water pump running status Flame arrestor installed on the exhaust air scrubber discharge to prevent flashback

Event ID No.	Hazardous Event	Causes	Possible Consequences	Proposed Prevention and Mitigation Control Measures
8.	Spills of hydrochloric acid or caustic soda	Tank overflows, losses from piping systems or vessels failures	Potential for injury to operators or damage to the environment	Containment of sodium methylate within the process piping and equipment High level protection in vessels Process area bunded PPE for the operators
9.	Overpressure in the vent system	Vent path blocked, e.g. shut valve or high level in vessel, e.g. the collecting vessel	Piping system failure resulting in a loss of containment. Fire, if ignited	Operating procedures for valves positions High level protection in tanks Process area bunded Control of ignition sources Spill response procedures Fire protection systems, e.g. hydrants, foam, monitors and fire extinguishers, as currently available on the site
10.	Corrosion of piping due to hydrochloric acid	Hydrochloric acid entering piping systems not designed for acid service due to pumps stopping and reverse flow	Corrosion of piping systems and losses of containment	Automatic isolation valves installed at the appropriate piping tees Non return valves Process flows monitored and alarmed
11.	Operators exposed to high residue temperature	Manual discharge of waste product into drums	Potential for burn injuries	Operator training and procedures PPE for the operators

Event ID No.	Hazardous Event	Causes	Possible Consequences	Proposed Prevention and Mitigation Control Measures
12.	Overpressure in evaporators	Loss of steam control	Evaporation of evaporators contents and overpressure	Pressure relief valves Steam flow and pressure measurement / alarms
13.	Corrosion (tank farm)	Process upset in the fatty matter separator	Glycerine ingress to the fatty matter collecting tower. Potential for corrosion if discharged to the tank farm	Separator design Manual operation Sight glass provided
14.	Cooling tower fire	Cooling tower shutdown and dries out. Source of ignition, e.g. maintenance work	Destruction of the tower	Control of ignition sources Fire protection systems, e.g. hydrants, foam, monitors and fire extinguishers, as currently available on the site
15.	Loss of containment of cooling tower dosing chemicals	Spills and leaks	Potential for injury to operators and to damage the environment	Chemical dosing systems are small in size and will be bunded
16.	Legionella bacteria in the cooling tower	Warm water temperature and failure of the chemical dosing program	Sickness to people who come into contact with the water / tower	Chemical dosing programme to be implemented and tests are to be regularly performed
17.	Accidents, vehicle damage resulting in spillage This event applies to all plant areas	Reckless driving, illegal driving, impact with other mobile equipment e.g. forklifts, inadequate training, inattention/distraction	Injuries to people, loss of containment of materials	Site speed limit Physical barriers, e.g. bunding and bollards Driver training Pedestrian walkways identified Drug and alcohol policy

Event ID No.	Hazardous Event	Causes	Possible Consequences	Proposed Prevention and Mitigation Control Measures
18.	Breach of security / sabotage This event applies to all plant areas	Disgruntled employee or intruder	Possible release of product with consequences as per 1. above	Security measures include fencing, CCTV, intruder beams, security patrols, operator / driver vigilance Process SCADA computer alarms monitored
19.	Contaminated fire water runoff This event applies to all plant areas	Fire which requires the application of fire water	Contaminated fire water runoff leading to environmental impact	Storage tanks and process plant bunded Emergency containment within waste water systems and other bunded areas
20.	Aircraft crash This event applies to all plant areas	Pilot error Bad weather Plane fault	Propagation to tank / bund / processing plants fires Impact to people (radiant heat and/or exposure to products), property and the environment (products of combustion)	As per aviation standards
21.	Strong winds, earthquakes This event applies to all plant areas	Strong winds cause equipment damage etc	Loss of containment leading to a fire if ignited (as above)	The tanks are designed API 650 / AS 1692 / AS 1170 to resist the combined effects on internal pressure due to contents, weight of platforms, ladders, live loads, wind loads, earthquake forces and hydrostatic test loads Operations stopped in adverse weather conditions

Event ID No.	Hazardous Event	Causes	Possible Consequences	Proposed Prevention and Mitigation Control Measures
Terminal Operations – Tanks (including Site B – Tank 0625), Road Tanker Loading and Terminal Piping				
22.	Major mechanical failure of tank	Metal fatigue Faulty fabrication Corrosion of tank base / weld Tank explosion due to lightning strike / breach of hazardous area ignition source controls Adjacent tank on fire Blocked vent	Large spillage of flammable, combustible or corrosive materials in bund. Fire if flammable or combustible materials ignited For historical tank explosions, some tanks have rocketed away from the foundations Impact to people (radiant heat and/or exposure to products), property and the environment (products of combustion and corrosive materials)	Tanks designed to API 650 Regular maintenance and inspection procedures Tank and site fire protection facilities available Explosions only occur when ullage vapour is between LEL and UEL. At steady state conditions, the combustible materials tank ullage is below LEL. Design conforms to AS1940 requirements. Methanol and biodiesel tanks are nitrogen padded (biodiesel is padded for product quality reasons) Tanks bunded PPE and safety shower / eyewash

Event ID No.	Hazardous Event	Causes	Possible Consequences	Proposed Prevention and Mitigation Control Measures
23.	Pipe failure (within the Terminal)	Corrosion	Major spillage of flammable, combustible or corrosive material. Fire if flammable or combustible materials ignited. Impact to people (radiant heat and/or exposure to products), property and the environment (products of combustion and corrosive materials)	Regular maintenance and inspection procedures Emergency isolation valves Fire fighting system (including foam) Pipes in bunded areas Pipelines surge study The piping is designed to ASME 31.3 / AS 4041 to resist the combined effects on internal pressure due to contents, wind loads, earthquake forces and hydrostatic test loads PPE and safety shower / eyewash

Event ID No.	Hazardous Event	Causes	Possible Consequences	Proposed Prevention and Mitigation Control Measures
24.	Spillage of flammable, combustible or corrosive material to the bunds	Tank overfilled during transfer Tank drain valve left open or tank sampling valve left open, e.g. human error Loss of containment at pigging stations Leak in the Main Hose Exchange during a transfer	Spill into bund Bund fire if flammable or combustible material ignited Possible tank fire and boil over Impact to people (radiant heat and/or exposure to products), property and the environment (products of combustion and corrosive materials)	Fire fighting as above Tank level device(s) installed as appropriate Emergency shutdown system Operating procedures for manual tank transfers For Site B, tank sample and dewatering valves are double valved with last valve spring-closed (deadman). Other drain valves etc are blanked off or in the manifold area have kamvalok dry-breaks Main Hose Exchange area at Site A is existing and there are established procedures for connections PPE and safety shower / eyewash

Event ID No.	Hazardous Event	Causes	Possible Consequences	Proposed Prevention and Mitigation Control Measures
25.	Leak during road tanker transfer	Failure of flexible connection / hose Leak from valves or fittings Road tanker overfill	Leak of material in road tanker bay Fire if flammable or combustible materials ignited Impact to people (radiant heat and/or exposure to products), property and the environment (products of combustion and corrosive materials)	For Site B, high level of surveillance and use of leak detection & shutdown systems (e.g. Scully overfill protection) For Site A, two man operation Drivers are well trained so as to minimise chance of operator error & ensure quick response to leaks For Site B, road tanker bays to be fitted with automatic foam deluge system For Site A, manual water deluge system with foam capabilities Ignition sources controlled PPE and safety shower / eyewash

Event ID No.	Hazardous Event	Causes	Possible Consequences	Proposed Prevention and Mitigation Control Measures
26.	Road tanker drive-away incident	Failure of procedures and hardware interlocks	Leak of material in road tanker bay Fire if flammable or combustible materials ignited Impact to people (radiant heat and/or exposure to products), property and the environment (products of combustion and corrosive materials)	Driver training Driver not in cab during filling For Site A, Vopak operator controls the loading and supervises the driver For Site B, brakes interlocked prior to connection and until disconnection Road tanker bays to be fitted with deluge system (as above) For Site B, drain to the Oily Water Tank which is level alarmed PPE and safety shower / eyewash
27.	Leak at product pumps	Pump seal, shaft or casing failures	Leak of material Fire if flammable or combustible materials ignited Impact to people (radiant heat and/or exposure to products), property and the environment (products of combustion and corrosive materials)	Condition monitoring and preventative maintenance of pumps Pumps are bunded Fire fighting as above For Site B, drain to the Oily Water Tank which is level alarmed For Site A, Vopak operator controls the loading and is present in the pump area PPE and safety shower / eyewash

Event ID No.	Hazardous Event	Causes	Possible Consequences	Proposed Prevention and Mitigation Control Measures
28.	Road accident (off-site)	Bad road or traffic conditions	Most likely outcome is no loss of load Leak of flammable or combustible material may occur, leading to fire Impact to people (radiant heat and/or exposure to products), property and the environment (products of combustion and corrosive materials)	Design of road tankers to survive accident without a loss of containment - pipes and running gear designed to shear off Driver training and choice of routes to reduce accident potential
29.	Methanol in the vegetable oil tanks	Contamination from filling, e.g. residual methanol left in piping	Methanol will layer on top of the palm oil and therefore a risk of ignition is present. Explosion / fire	Pipeline cleaning procedures as currently used at Site A Inspection and testing of tank contents
30.	Overheating of vegetable oil tanks or pharmaceutical glycerine	Failure of the hot water system to internal tank heaters	Heating of the vegetable oils or pharmaceutical glycerine, potential to approach flash points	The hot water temperature to the internal tank heaters is controlled to keep the vegetable oils / pharmaceutical glycerine below their flash points Temperature measurement and alarms for the vegetable oil tanks Control of ignition sources
31.	Mixing of hydrochloric acid with caustic soda or other non compatible material	Filling the wrong tank, mixing of spills	Reaction, heat and vapours evolved with local impact only	Design in accordance with applicable Standard AS 3780, physical separation of products, separate bunds, bunds dedicated with manual drainage valves, adequate material selection, PPE, training, monitoring programs, procedure for managing change, spill management procedures, safety shower / eyewash stations

Event ID No.	Hazardous Event	Causes	Possible Consequences	Proposed Prevention and Mitigation Control Measures
Pipeline Corridor				
32.	Pipeline failure external to the terminal, i.e. in the pipeline corridor	Corrosion	Spillage of flammable, combustible or corrosive material. Fire if flammable or combustible material ignited. Impact to people (radiant heat and/or exposure to products), property and the environment (products of combustion)	The existing pipes in the pipeline corridor at Port Botany are under the control of Sydney Ports Corporation procedures Regular maintenance and inspection procedures Emergency isolation valves Pipelines surge study Routine inspections during transfers

Event ID No.	Hazardous Event	Causes	Possible Consequences	Proposed Prevention and Mitigation Control Measures
		Bulk Liquids Berth		
33.	There is a range of shipping related hazardous events at a berth. These include: grounding, striking (a ship moored at the berth is struck by a passing ship), collision between two ships, impact with the wharf (historically the most common), ship fire and explosions, foundering / capsize, structural failure, aircraft strike, sabotage, terrorism, natural events and overfills. The accident outcomes for the above causes for a loss of containment of products could be a fire (pool fire) and/or environmental effect, including fish and bird kill. These events can also lead to injuries due to radiant heat impact and/or equipment damage. Explosion and/or fires will also release products of combustion such as carbon dioxide, carbon monoxide, water vapour, NOx, soot etc. These potential hazardous events can occur now at the BLB or immediate area for the materials either transferred from a ship (i.e. methanol and vegetable oils) or loaded to a ship (e.g. biodiesel). There are no new potential hazardous events at the BLB as a result of the proposed biodiesel plants.			
34.	Losses of containment can occur from the transfer system while a ship is being loaded / unloaded	Causes include water hammer from, for example, fast closing of valves, movement of the ship away from the wharf, line failures due to mechanical impact from a vehicle, corrosion, mechanical defect (e.g. poor weld), flange leaks and thermal expansion of trapped liquid causing overpressure, hose or hose coupling failures, and human error, e.g. leaving drain valves open	Loss of containment of flammable or combustible material. Fire if ignited. Environmental impact (products of combustion and water pollution). Injury to personnel. Damage to berth and/or ship	As per existing, the berth is controlled by Sydney Ports Corporation. Hoses are inspected and routinely tested. Any automated valves are slow closing. Vehicle movement at the berth is restricted. The berth requires access via a security gate. Procedures exist to purge lines with nitrogen to prevent liquid being trapped and causing thermal overpressure. Procedures and training. The berth transfer area has a spills drip tray and a larger containment tank underneath

4.4 SAFETY MANAGEMENT SYSTEMS

Safety management systems are intended to minimise the risk from potentially hazardous installations by a combination of hardware (i.e. design) and software factors (managements systems such as procedures, policies, plans, training etc). To ensure safe operation of the biodiesel processing plants, storage and transfer systems, both the hardware and the software systems must be of high standard.

Vopak personnel, being employed by a company specialising in the storage and distribution of Dangerous Goods, are well aware of the hazardous nature of materials associated with the project scope. However, it is acknowledged that the proposed biodiesel processing plants, storage and transfer systems will necessitate changes to the existing safety management system.

Vopak's operations and safety management systems at both Site A and Site B have been previously reviewed during hazard audits by Pinnacle Risk Management (Refs 8 and 9). These hazard audits have found that the safety management systems in use at the time of the audits are generally adequate for the nature of the hazards present.

4.4.1 Safety Software in Risk Assessment

In risk assessments, incidents are assessed in terms of consequences and frequencies, leading to a measure of risk. Where possible, frequency data comes from actual experience. However, in many cases, the frequencies used are generic, based on historical information from a variety of plants and processes with different standards and designs.

The quality of the management systems (known as "safety software") in place in these historical plants will vary. Some will have little or no software, such as work permits and modification procedures, in place. Others will have exemplary systems covering all issues of safe operation. Clearly, the generic frequencies derived from a wide sample represent the failure rates of an "average plant". This hypothetical average plant would have average hardware and software safety systems in place.

If an installation with below average safety software is assessed using generic frequencies, it is likely that risk will be underestimated. Conversely, if a plant is above average, the risk will probably be overestimated. However, it is extremely difficult to quantify the effect of software on plant safety.

Therefore, Pinnacle Risk Management adopts a policy which does not attempt to quantitatively account for the presence of and quality of software safety systems. It is assumed that the generic failure frequencies used apply to installations which have safety software corresponding to accepted industry practice. It is believed that this assumption will be conservative in that it will overstate the risk from well managed installations such as the Vopak's sites. Therefore, any quantitative approach is valid (i.e. conservative) only if safety management within the operation being assessed is of a high standard.

5 RISK ANALYSIS

The assessment of risks to both the public as well as to operating personnel around this industrial development requires the application of the basic steps outlined in Section 1. As per HIPAP 6 (Ref 1), the chosen analysis technique should be commensurate with the nature of the risks involved.

The typical risk analysis methodology attempts to take account of all credible hazardous situations that may arise from the operation of processing plants etc. For quantitative risk analysis (QRA), this is done by first taking a probabilistic approach to vessel and pipe failures for all vessels containing hazardous materials. Specific incidents, identified by a variety of techniques, are then added and the combined data used to generate composite risk contours which can be used for both the public and plant personnel.

Having assembled data on possible incidents, risk analysis requires the following general approach (for individual incidents which are then summated for all potential recognised incidents):

Risk = Likelihood x Consequence

For QRA, the consequences of an incident are calculated using standard correlations and probit-type methods which assess the effect of fire radiation, explosion overpressure and toxicity to an individual, depending on the type of hazard.

In this PHA, however, the approach adopted to assess the risk of the identified hazardous events is scenario based risk assessment. The reasons for this approach are:

1. The distance to residential and other sensitive land users is large for the Port Botany area and hence it is unlikely that any significant consequential impacts due to radiant heat from fires or overpressure from explosions (the main events of interest for the proposed development at Site A) will have any significant contribution to off-site risk; and

2. The distance between the on-site tanks and other equipment to the neighbouring industrial facilities is largely generous, hence, the consequential impacts due to radiant heat from fires or overpressure from may not have any significant contribution to off-site industrial risk.

Therefore, appropriate analysis of credible scenarios is performed in this PHA. Initially, the consequences of the potential events with off-site impact are assessed. For the events which do not contribute to off-site risk (as determined by the risk criteria in HIPAP No. 4 (Ref 2) then no further risk analysis is warranted. When the consequence of an event does contribute to off-site, the likelihood and hence risk is then analysed as required.

The scenario based risk assessment approach analyses each of the possible hazardous events individually, in this case via a risk matrix (Refs 10 and 11).

A generic risk matrix used for risk assessment by Pinnacle Risk Management is shown in Figure 3 – Risk Matrix. This matrix has been derived from a review of relevant Australian and British standards (e.g. AS 4360).

The risk matrix allows the combination of consequence and likelihood (i.e. risk – the likelihood of any defined adverse outcome) to be shown clearly and quickly on a graphical basis.

The position in the matrix of estimated risk allows an assessment of the magnitude of each risk contributor to the overall level of risk. That is, the higher the combination of likelihood and consequence, the higher the contribution to overall risk. This provides a basis for development of appropriate risk reduction strategies. Through inspection of the major risk contributors and an understanding of the cost associated with particular risk reduction strategies, cost-effective risk reduction strategies can be developed.

The generic form of the matrix allows its use for various risk categories, e.g.:

- Safety and health;
- Environment; and
- Business impact.

For the risk matrix shown in Figure 3 – Risk Matrix, there are three broad categories of risk.

The Class I area indicates a high level of risk which is intolerable and where risk reduction is required. This requires the reduction of frequency and/or consequence.

The Class II area indicates a moderate level of risk. Whilst the risk is not unacceptable, there should be practical measures taken to lower the risk if economically viable. For risks where further mitigation is not economically viable, judgement needs to be exercised as to whether the level of risk is acceptable or not. This area is the beginning of the ALARP region (i.e. as low as reasonably practicable).

The Class III area indicates a low level of risk and is broadly considered to be acceptable. Further risk mitigation may not be required / appropriate. However, low and accepted risks should be monitored and routinely reviewed to ensure that they remain acceptable. Few risks remain static. This area includes ALARP as well as what are known as trivial or negligible risks.

Consequential impact can take many forms, e.g. impacts on safety and health, environment, public relations, financial, operations, competitive nature, social well being, clients, cultural significance, security and legal issues. Consequence ratings can be determined for the selected area of interest and then applied to a risk matrix. Consequential impacts for safety and health, and environmental impact are shown in the tables following Figure 3.

Figure 3 – Risk Matrix

Frequent >1/yr	II	I	I	I	I
Probable $>10^{-1}$ to 1/yr	II	II / I	I	I	I
Possible $>10^{-2}$ to 10^{-1}/yr	III	II	II / I	I	I
Unlikely $>10^{-4}$ to 10^{-2}/yr	III	III	II	II / I	I
Very Unlikely $>10^{-6}$ to 10^{-4}/yr	III	III	III	II	II / I
Extremely Unlikely $<10^{-6}$/yr	III	III	III	III	II
Likelihood **Consequence**	Minor	Significant	Severe	Major	Catastrophic

Table 4 - Consequence Rating – Safety and Health

	Definition
Minor	Onsite: Minor injury, first-aid or medical treatment injury (MTI) Offsite: Nuisance / annoyance
Significant	Onsite: Loss time incident (LTI), multiple MTIs Offsite: Minor effect, typically of short duration
Severe	Onsite: A few serious injuries (LTIs), permanent disability Offsite: Few people requiring medical treatment. Emergency plan and services used
Major	Onsite: Single or a few fatalities (less than 5). Many injuries Offsite: Serious injuries, tens requiring medical treatment
Catastrophic	Onsite: Many fatalities (5 or more). Numerous serious injuries Offsite: One or more fatalities. Tens suffering injuries

Table 5 – Consequence Rating - Environment

	Definition
Minor	No offsite escape of material (contained within the operational areas). Onsite nuisance value only. Spill volume would typically be small, i.e. less than 50 litres
Significant	Nuisance offsite effect, typically of short duration, e.g. noise, odours, dust and/or visible plumes fro less than one day. Minor chance of prosecution. Offsite complaints received. Spill volume would typically exceed 50 litres but the majority would be contained within the operational areas
Severe	Minimal, short duration offsite effects (e.g. waterway slightly discoloured, turbid etc around the point of release with no or very few fish killed, fire or smoke affecting people near to the site). Potential prosecution. Emergency plan in action
Major	Observable but localised offsite effect, typically of medium duration (e.g. waterways discoloured 10s to 100s of metres for approximately one to two weeks with significant number of fish killed and other aquatic life adversely affected). Toxic gas emissions leading to the need for medical treatment. Flora and fauna killed. Potential prosecution and large fine. Emergency plan in action
Catastrophic	Substantial / widespread offsite effect, typically of long duration (e.g. waterways discoloured 100s to 1,000s of metres for more than one to two weeks with large numbers of fish killed and other aquatic life badly affected). Large release of toxic materials (airborne or as liquids). Serious ground or seabed contamination. Area disaster plan activated

The risk criteria applying to developments in NSW are summarised in Table 6 below (from Ref 2).

Table 6 - Risk Criteria, New Plants

Description	Risk Criteria
Fatality risk to sensitive uses, including hospitals, schools, aged care	0.5×10^{-6} per year
Fatality risk to residential and hotels	1×10^{-6} per year
Fatality risk to commercial areas, including offices, retail centres, warehouses	5×10^{-6} per year
Fatality risk to sporting complexes and active open spaces	10×10^{-6} per year
Fatality risk to contained within the boundary of an industrial site	50×10^{-6} per year
Injury risk – incident heat flux radiation at residential areas should not exceed 4.7 kW/m^2 at frequencies of more than 50 chances in a million per year or incident explosion overpressure at residential areas should not exceed 7 kPa at frequencies of more than 50 chances in a million per year	50×10^{-6} per year
Toxic exposure - Toxic concentrations in residential areas which would be seriously injurious to sensitive members of the community following a relatively short period of exposure	10×10^{-6} per year
Toxic exposure - Toxic concentrations in residential areas which should cause irritation to eyes or throat, coughing or other acute physiological responses in sensitive members of the community	50×10^{-6} per year
Propagation due to Fire and Explosion – exceed radiant heat levels of 23 kW/m^2 or explosion overpressures of 14 kPa in adjacent industrial facilities	50×10^{-6} per year

As discussed above, the consequences of the potential hazardous events are initially analysed to determine if any events have the potential to contribute to the above-listed criteria and hence worthy of further analysis.

5.1 TANK AND BUND FIRES

The credible, potential fire hazardous events associated with the proposed biodiesel plants and storages are pool fires due to losses of containment being ignited.

Whilst natural gas is to be used for a new boiler, it is already on the site, the line will be buried and is supplied by the standard natural gas mains system. Therefore, the risk associated with the new boiler is similar to the existing and is not analysed further within this study.

The potential fire events associated with the new plants and reused tanks / bunds are detailed in Table 7. This data is used in the fire modelling.

Table 7 – Fire Scenarios Calculation Data

Note that "Eq. D" is the equivalent diameter of the fire and "SEP" is the surface emissive power (i.e. the radiant heat level of the flames).

Item No.	Item Description	Width, m	Length, m	Eq. D, m	Burndown Rate, mm/min	Liquid Density, kg/m^3	SEP, kW/m^2
1	Tanks 4, 5 and 6 bund – biodiesel (this also applies to the bund holding tanks 3 and 19)	60	55	57	4	840	35
2	Tanks 62 to 69 bund – biodiesel	45	30	36	4	840	35
3	Tanks 55 to 61 bund – biodiesel	40	60	48	4	840	35
4	Tanks 201 to 203 bund – vegetable oil	69	33	45	4	880	35
5	Biodiesel plant bunded area – small spill of approximately 6 m diameter	-	-	6	4	840	60
6	Biodiesel plant bunded area – moderate spill of approximately 12 m diameter	-	-	12	4	840	35
7	Biodiesel plant bunded area – spill covering entire plant bunded area	15	40	22	4	840	35
8	Tank 0625 (Site B) bund - biodiesel	22	34	27	4	840	35
9	Tank 6 top fire – 11.7 m diameter tank and 12.2 m high biodiesel (this conservatively applies to tanks 3, 4 and 5)	-	-	11.7	4	840	35

Item No.	Item Description	Width, m	Length, m	Eq. D, m	Burndown Rate, mm/min	Liquid Density, kg/m^3	SEP, kW/m^2
10	Tanks 63 to 68 top fire – 6.7 m diameter tank and 12 m high biodiesel	-	-	6.7	4	840	60
11	Tanks 62 and 69 top fire – 6.7 m diameter tank and 12 m high methanol	-	-	6.7	3	790	35
12	Tanks 55 to 58 top fire – 7.6 m diameter tank and 16.4 m high biodiesel and palm oil	-	-	7.6	4	840	60
13	Tanks 59 to 61 top fire – 12.5 m diameter tank and 16.5 m high methanol	-	-	12.5	3	790	25
14	Tanks 201 to 203 top fire – 18.7 m diameter tank and 18 m high vegetable oil	-	-	18.7	4	880	35
15	Tank 0625 (Site B) top fire - 15 m diameter tank and 18 m high biodiesel	-	-	15	4	840	35
16	Tanks 75 to 79 bund – vegetable oil	33	43	34.6	4	880	35
17	Tanks 75 and 76 top fire – 7.5 m diameter tank and 18 m high vegetable oil	-	-	7.5	4	880	35
18	Tank 77 top fire – 9.9 m diameter tank and 18 m high vegetable oil	-	-	9.9	4	880	35
19	Tanks 78 and 79 top fire – 15.5 m diameter tank and 18 m high vegetable oil	-	-	15.5	4	880	35

Pump manifolds and tanks 206, 207, 209, 210, 211 and 212 are relatively small fire hazards and are too far from site boundary to pose any significant risk due to radiant heat. Therefore, these events are not modelled. Also, as the road tanker loading bay already exists at Site A and the materials transferred pose no new hazards to the site then fires at this location are not modelled.

Whilst it is possible to have fires associated with losses of containment from the wharf lines etc, the larger fires for these lines can only occur when product transfer is taken place. During this time, both the wharf and Terminal will be manned. Should a loss of containment occur and ignite then the transfer will be stopped. This will mitigate the size of the fire and hence the potential impact damage. As a result of this emergency response for standard wharf transfer lines and the various combinations of releases that are possible, no modelling is performed for these scenarios.

The distances to specified radiant heat levels for the above potential fire scenarios are listed in Table 8. The distances were calculated using the View Factor model for pool fires (Refs 7 and 12). This model was used as it better approximates the square / rectangular shapes of the potential bund fires.

Table 8 – Distance to Specified Levels of Radiant Heat for Potential Fire Scenarios

Pool Fire Scenario (Item No.)	**Distance to Specified Radiant Heat Level, m *(from base of flame)***					**Distance to Nearest Boundary, m**
	35 kW/m^2	**23 kW/m^2**	**12.6 kW/m^2**	**4.7 kW/m^2**	**2.1 kW/m^2**	
1	-	8	33	73	117	7
2	-	6	24	55	87	7
3	-	7	25	56	90	37
4	-	7	33	75	119	7
5	2	4	8	15	28	15
6	-	3	9	19	31	15
7	-	4	11	26	42	15
8	-	4	15	34	55	48
9	-	3	8	19	31	15
10	2	5	8	16	26	14
11	-	2	5	11	18	14
12	2	5	10	18	29	42
13	-	1	5	15	24	40
14	-	4	13	29	46	14
15	-	3	10	23	38	58
16	-	6	24	53	85	46
17	-	2	6	13	21	49
18	-	2	7	16	27	48
19	-	3	11	24	39	50

Notes: The maximum ***ground level*** radiant heat for the tank top fires are:

Scenarios:

9. 7.1 kW/m^2 at 7 metres from the tank wall
10. 8.2 kW/m^2 at 5 metres from the tank wall
11. 4.5 kW/m^2 at 5 metres from the tank wall
12. 6.8 kW/m^2 at 6 metres from the tank wall
13. 3.9 kW/m^2 at 8 metres from the tank wall
14. 7.3 kW/m^2 at 10 metres from the tank wall
15. 6.2 kW/m^2 at 10 metres from the tank wall
17. 3.7 kW/m^2 at 6 metres from the tank wall
18. 4.6 kW/m^2 at 7 metres from the tank wall
19. 6.4 kW/m^2 at 10 metres from the tank wall

The values of interest for radiant heat (DoP, HIPAP No. 4 and ICI HAZAN Course notes) are shown in Table 9.

Table 9 - Radiant Heat Impact

HEAT FLUX (kW/m^2)	EFFECT
1.2	Received from the sun at noon in summer
2.1	Minimum to cause pain after 1 minute
4.7	Will cause pain in 15-30 seconds and second degree burns after 30 seconds. Glass breaks
12.6	30% chance of fatality for continuous exposure. High chance of injury Wood can be ignited by a naked flame after long exposure
23	100% chance of fatality for continuous exposure to people and 10% chance of fatality for instantaneous exposure Spontaneous ignition of wood after long exposure Unprotected steel will reach thermal stress temperatures to cause failure
35	25% chance of fatality if people are exposed instantaneously. Storage tanks fail
60	100% chance of fatality for instantaneous exposure

For assessment of the effects of radiant heat, it is generally assumed that if a person is subjected to 4.7 kW/m^2 of radiant heat and they can take cover within approximately 20 seconds then no serious injury, and hence fatality, is expected. However, exposure to a radiant heat level of 12.6 kW/m^2 can result in fatality for some people for limited exposure durations. Therefore, for the larger spills, appropriate emergency response actions are required to minimise the potential for harm to people. This should include moving people away from such releases to a safe distance.

For information, further data on tolerable radiant heat levels is shown in Table 10.

Table 10 – Layout Considerations – Tolerable Radiant Heat Levels

Plant Item	Tolerable Radiant Heat Level, kW/m^2	Source
Drenched Storage Tanks	38	Ref 7
Special Buildings (Protected)	25	Ref 7
Cable Insulation Degrades	18-20	Ref 7
Normal Buildings	14	Ref 7
Vegetation	12	Ref 7
Plastic Melts	12	Ref 7
Escape Routes	6	Ref 7
Glass Breakage	4	Ref 13
Personnel in Emergencies	3	Ref 7
Plastic Cables	2	Ref 7
Stationary Personnel	1.5	Ref 7

Given the large distance to the nearest residential area (approximately 1 km to the east) and the estimated radiant heat levels from the potential fire events shown in Table 8 then there is no risk of injury or fatality in residential areas. Correspondingly, the risk criteria for fatality and injury (Table 6) in residential areas are satisfied for radiant heat from fires.

Whilst some of the estimated levels of radiant heat at neighbouring industrial areas exceed 12.6 kW/m^2 (events numbers 1, 2 and 4) and hence theoretically can lead to fatality, it is more probable that should a bund fire occur, people within the pipeline corridor (rare event) or in the nearest corner of the Origin Energy site will be either evacuated as per the established Port Botany emergency response procedures or escape before a fully developed bund fire occurs. Therefore, it is unlikely that fatality at these industrial neighbouring areas will result from these events.

The likelihood of these types of fire events has been previously estimated for Vopak (Ref 14) and were found to be approximately 4 x 10^{-6}/year. Given that three bunds have the potential to impose 12.6 kW/m^2 of radiant heat across the site boundary then the criterion of 50 x 10^{-6}/year for industrial fatality risk is satisfied for these fire events.

Note also that these bund fires are existing potential hazardous events associated with Site A and hence do not contribute to additional risk.

The risk of propagation to industrial areas (i.e. exceeding 23 kW/m^2) is only possible via events numbers 1 and 4. As this value of radiant heat is estimated at the boundary of Site A for these events then it is unlikely that propagation will occur as the radiant heat levels will decrease into the adjacent properties.

As above, the likelihood of these types of events has been previously estimated to be approximately 4 x 10^{-6}/year. Given that two bunds have the potential to impose 23 kW/m^2 of radiant heat at the site boundary then the criterion of 50 x 10^{-6}/year for industrial propagation risk for exceeding 23 kW/m^2 is satisfied for fire events.

Hence, propagation to neighbouring industrial facilities is unlikely due to radiant heat from pool fires.

5.2 PRODUCTS OF COMBUSTION

There is a potential risk to those attending a fire emergency (and possibly off-site) of effects from toxic products of combustion, e.g. carbon oxides and smoke, as well as vaporised product (i.e. not combusted).

Impact from toxic products of combustion will only be significant, generally, local to the fire. As stated in Lees (Ref 7):

"The hot products of combustion rising from a fire typically have a temperature in the range 800-1200^{o}C and a density a quarter that of air."

Hence, a buoyant plume is formed (as seen when smoke is emitted from a chimney) and the combustion products rise and are dispersed as per the prevailing wind / weather conditions. Several runs of the Brigg's Plume Model (Ref 15) for various combinations of weather / wind conditions and fire temperatures show that the plume rises from an 18.7 m diameter tank fire to at least 110 metres and then disperses via passive dispersion in the down wind direction. Momentum effects continue to cause the plume to rise whilst it is dispersing. The results are shown in Table 11. The results also show that plume rise is insensitive to fire temperature variations of 800^{o}C +/- 100^{o}C (not shown). An efflux velocity of 5 m/s for the products of combustion is taken for the fire event.

Table 11 – Fire Plume Rise Modelling

Wind (m/s) / Weather	Initial Height of Plume, m
5 D	110
3 E	190
2 F	280

Therefore, unless a temperature inversion exists where reverse atmospheric currents can occur (i.e. air slumps to the ground as opposed to air eddies that rise), no effect at ground level is expected. Note that dispersion models best account for temperature inversions by using F class stability (i.e. typically when the adiabatic lapse rate is positive). The models, however, do not include the provision for air slumping to ground.

5.3 Tank Explosions

An internal explosion is more credible in either the methanol or sodium methylate tanks due a failure of the nitrogen padding system, oxygen being introduced to the vapour space and a source of ignition is present.

Internal explosions have the potential to cause harm through overpressures and possibly missiles. TNO (Ref 13) has developed a methodology for estimating overpressures from internal explosions and it is used as follows.

For these scenarios, the large tanks are chosen to be two thirds full, i.e. 13,600 m^3 for tanks 59 to 61 and 278 m^3 for tanks 62 and 69. This is due to the conservative nature of the model in estimating the resultant overpressures due to ignition of the vapour in the tank's ullage.

From the explosion modelling, the distances to specified overpressure levels for the two internal tank explosion scenarios are shown in Table 12.

Table 12 – Distance to Specified Levels of Explosion Overpressure (from tank centres) for Potential Internal Tank Explosion Scenarios

	Distance to Specified Overpressure, m (from the centre of the Thermal Oxidiser)					Distance to Nearest Site Boundary, m
	70 kPa	**35 kPa**	**21 kPa**	**14 kPa**	**7 kPa**	
Tanks 59 to 61	38	59	81	109	181	45
Tanks 62 and 69	11	17	23	31	51	17

The effects from explosion overpressures (Ref 2) are summarised in Table 13.

The results presented in Table 12 have been checked against the methodology used by CCPS (Center for Chemical Process Safety) (Ref 16) and are were found to be consistent. Both the TNO and CCPS methodologies are conservative for these types of internal explosion events as it is assumed that the tank will fail at an elevated pressure. This is not true for all tanks, in particular, those built to API 650 where a frangible roof is installed. This 'weak' roof seam is designed to fail at low pressures to restrict the pressure build-up and hence overpressure and missile generation. Historical evidence of fixed roofed tanks explosions also supports the conservative nature of the above results, e.g. the tank explosion at the former CSRC site at Rhodes, Sydney, did not result in critical injuries to the contractors who initiated the explosion from explosion overpressures.

Therefore, the results presented in Table 12 will be valid for only a small percentage of all tank explosions. Historical evidence shows that lower overpressures are expected. The results in Table 12 are included as a 'worst case' data set only. It is expected that the designed weak roof-to-wall joint will fail below the theoretical maximum internal pressures and hence there will be a vented explosion. The effect is lower than estimated overpressures.

With regard to risk in residential and other sensitive areas, the results presented in presented in Table 12 show that no unacceptable risks (fatality or injury) exist. This is due to the distance between the site and these areas of interest, i.e. approximately 1 km.

Table 13 – Effects of Explosion Overpressure

OVERPRESSURE, kPa	PHYSICAL EFFECT
3.5	90% glass breakage No fatality, very low probability of injury
7	Damage to internal partitions and joinery 10% probability of injury, no fatality
14	Houses uninhabitable and badly cracked
21	Reinforced structures distort, storage tanks fail 20% chance of fatality to person in building
35	Houses uninhabitable, rail wagons & plant items overturned. Threshold of eardrum damage, 50% chance of fatality for a person in a building, 15% in the open
70	Complete demolition of houses Threshold of lung damage, 100% chance of fatality for a person in a building or in the open

With regard to the likelihood of internal tank explosions, Table 14 summarises the range some atmospheric storage vessel failure data.

Table 14 – Failure Rates of Atmospheric Storage Tanks

SOURCE OF DATA	FREQUENCY VALUE
Department of Planning (1985), Risk Assessment Study for the Botany/Randwick Industrial Complex and Port Botany (Ref 17)	Storage tank failure frequency of 6 x 10^{-4}/year
Cremer and Warner, in its risk analysis of the Rijnmond area (Holland) (Ref 18)	Failure rates for specified failure modes of atmospheric storage tanks: 1 x 10^{-4}/yr for leak 6 x 10^{-6}/yr for catastrophic failure
Bureau Veritas, Risk Analysis of Petrochemical Industries Company Ltd Proposed Integrated Petrochemical Complex at Kwinana (Ref 19)	Adopted the following failure rates for atmospheric storage tanks: 1 x 10^{-4}/yr for storage 6 x 10^{-6}/yr for severe leaks
Kletz, ICI (fixed roofed tanks containing volatile hydrocarbons; includes small and large fires; most dominant causes are overfill, lightning strike and pump failures; comparable data for floating roofed tanks not available)	Frequency of fires / explosions: 1.2 x 10^{-3}/yr (1.2 x 10^{-4}/yr for inerted tanks)
Batstone and Tomi (Ref 20)	3 x 10^{-5}/yr for catastrophic failure
Covo Study (Ref 21)	6 x 10^{-6}/yr for catastrophic failure
Taylor (Ref 22)	1 x 10^{-5}/yr for catastrophic failure
Davies (Prokop) (Ref 23)	2 x 10^{-7}/yr for catastrophic failure
Christiansen and Eilbert (Ref 24)	9.2 x 10^{-6}/yr for catastrophic failure for all tanks

The above tank catastrophic failure rates are for all causes, e.g. earthquake. An internal explosion is one of these causes. In this study, a likelihood of an internal tank explosion is conservatively taken to be 6.6 x 10^{-6} per year. This value is generally similar to the COVO (Rijnmond) study for all causes.

Overpressures from the potential internal tank explosions for five tanks (methanol and sodium methylate) have the potential to cause propagation at neighbouring (i.e. above 14kPa). However, the combined likelihood for five tanks is approximated to be 33 x10^{-6} per year. This is below the criterion shown in Table 6 (50 x 10^{-6} per year) and is therefore broadly considered acceptable. This is illustrated in the risk matrix (Figure 3) as an acceptable level of risk up to a major consequence rating. As the combined likelihood for five internal tank explosions is also below 50 pmpy (Table 6), then the risk of fatality due to overpressures at neighbouring industrial areas is also acceptable.

5.4 VAPOUR CLOUD EXPLOSIONS AND FLASH FIRES

The possibility of vapour cloud explosions and flash fires have been included in this assessment. These events are not deemed credible as:

1. The process involves flammable and combustible liquids;
2. The process is operated at atmospheric pressure or vacuum conditions, therefore, releases are not likely to create flashing liquid / vapours;
3. The process temperatures are generally close to ambient except where vacuum conditions exist (again, releases are not likely to create flashing liquid / vapours); and
4. The plant equipment and piping sizing is relatively small (e.g. 50 mm piping is common throughout the plant). Therefore, relatively small amounts of inventory exist within the equipment and piping. The probability of vapour cloud ignition only becomes significant above 5 tonnes of vaporised product.

Therefore, vapour cloud explosions and flash fires have not been analysed in this assessment.

5.5 PIPELINE CORRIDOR

As discussed in Section 3.3, certified product biodiesel will be transferred to Site B on a daily basis. Therefore, a new pipeline (150 mm diameter) will be required to connect the biodiesel tank farm at Site A to the main transfer manifold at Site B.

From the review of historical incidents associated with pipelines, the main cause for losses of containment is third party activities (corrosion and mechanical failures are the other main contributors). Third party activities typically account for 20 to 60% of recorded losses of containment for piping systems outside of site boundaries.

A summary of the likelihood of failure of pipelines is given Table 15 (Refs 7, 25 and 26).

Table 15 – Pipelines Failure Data

Source of Data:	Failure Frequency (per km per year)
US Dept of Transport, Natural Gas Pipelines, 1970 - 74	7.8×10^{-4}
CONCAWE, Oil Industry Pipelines, 1972 - 76	1.05×10^{-3}
CONCAWE, Oil Industry Pipelines, 1987 - 91	0.5×10^{-3}
CONCAWE, Oil Industry Pipelines in Western Europe, 1975 – 80 (6” lines)	1.2×10^{-3}
CONCAWE, Oil Industry Pipelines in Western Europe, 1966 – 76	0.7×10^{-3}
Full bore rupture of underground piping (TNO)	4.3×10^{-4}
ICI Mond UK, Processing Plant Pipelines, Catastrophic Failure of Lines Greater Than 100 mm diameter	1×10^{-4}
ICI Mond UK, Processing Plant Pipelines, 50 mm Holes in Piping	3×10^{-4}
Canvey Report, Failure of Jetty Pipework	10^{-4} to 10^{-3} (per year)

Note: CONCAWE is an organisation of oil companies.

Work by De La Mare and Andersen (1981) (Ref 7) concluded that the failure rates of pipelines appear similar even where the fluid handled and the environment are different; that the failure rates of oil pipelines depend on the diameter (inversely proportional), that about half of the failures can be attributed to external factors; and that pipelines tend to exhibit wearout failure. The consistency of the data presented above supports these conclusions.

From the data shown in Table 15, an approximate value of 1×10^{-3} per km per year for losses of containment for pipelines external to a site boundary can be assumed. However, for the pipelines at Port Botany, the pipes run in well-defined corridors and the transfer operations are closely supervised. Therefore, an approximate reduction in the loss of containment likelihood of at least one order of magnitude is expected for these lines (i.e. less than 1×10^{-4} per km per year).

The new pipeline of interest will be used to transport biodiesel, i.e. a combustible liquid. The other pipelines used for the two biodiesel plants are existing, they already convey both flammable and combustible materials and hence the risk associated with these lines does not significantly change.

From Lees (Ref 7), the following data shows the difficulty of ignition for higher boiling point materials, i.e. combustible liquids:

Event:	**Ignition Probability**
Massive LPG leak	0.1
Flammable liquid, flash point < 43^{o}C or operated above its flash point	0.01
Flammable liquid, flash point 43 to 93^{o}C	0.001

Therefore, given an ignition probability of approximately 0.1% for biodiesel, then the risk of pipeline fires in the Port Botany pipeline corridor associated with the new line is estimated as follows and is acceptably low. This is illustrated in the risk matrix (Figure 3) as an acceptable level of risk for all consequence ratings.

Fire in the pipeline corridor due to failure of the new biodiesel line:

1 x 10^{-4} per km per year x 1 km (approximate length) x 0.001 = 1 x 10^{-7} per year

5.6 BULK LIQUIDS BERTH

Existing lines to and from the Sydney Ports Corporation Bulk Liquids Berth and Vopak Site A will also be utilised for import of feedstock (methanol and vegetable oils) and export of biodiesel.

From Section 3.5, as both feedstocks and products are dedicated materials to the biodiesel plants, there will be a net increase in cross-berth movements. However, the biodiesel used to blend with mineral diesel will result in an equivalent reduction of mineral diesel oil import.

Currently, vegetable oils, methanol and diesel are currently transferred from ship-to-shore at the BLB. Therefore, the consequences of a spill at the Bulk Liquids Berth do not change as a result of this project.

Overall, the total feedstock increase (by ship-to-shore transfers) is estimated at 265,000 per year. This amount is off-set by a reduction of diesel imports of approximately 240,000 tonnes per year. Correspondingly, there is a small net increase of 25,000 tonnes per year transferred at the Bulk Liquids Berth.

Given this relatively small increase in tonnage transferred at the Bulk Liquids Berth and that no new materials (and hence consequential impacts) are involved then there is correspondingly only minor changes to risk here. The fire protection and emergency response are currently designed for these types of materials and hence the existing systems will remain appropriate.

5.7 AIRCRAFT IMPACT

The site is an established site which does lie under one of the main approaches to Sydney airport. However, as the facility will lie on the plot formerly occupied by the LPG JORTL facility, the incremental risk due to an aircraft crash is unlikely to be increased. The outcomes of any aircraft crash on this site will be dominated by larger hazardous events in other processing and storage areas as well as the ensuing fire from the plane wreckage. This is an existing risk for the site and the proposed changes to the site have negligible effect. As shown in other risk assessments for the Port Botany area (e.g. Ref 14), the likelihood of this type of event is acceptably low, i.e.:

- Scheduled aircraft $1x10^{-8}$/year; and
- Unscheduled aircraft $4x10^{-7}$/year.

Other external events that may lead to propagation of incidents on any site include:

Subsidence	Landslide
Burst Dam	Vermin/insect infestation
Storm and high winds	Forest fire
Storm surge	Rising water courses
Flood	Storm water runoff
Breach of security	Lightning
Tidal waves	Earthquake

These events were reviewed and none of them were found to pose any significant risk to the container storage area given the proposed safeguards.

5.8 ROAD TRANSPORT

As discussed in Section 3.4, there will be less than one extra vehicle movement per day for the two plants (a small increase). On further analysis, the change in the products stored and transported from Site A will result in a reduction in road tankers and an increase in the use of Isocontainers (the latter being of higher integrity design). From the data shown in Table 2, the bulk of the road transport is associated with glycerine, a non Dangerous Good. Therefore, given the net small increase in road vehicle movements (the bulk of which is glycerine) and the increased use of higher integrity Isocontainers, there will be minimal change to transport risk associated with the site.

5.9 CUMULATIVE RISK

Cumulative risk for the Port Botany area was considered by the Department of Urban Affairs and Planning (now DIPNR) in 1996 (Ref 27). As shown in this PHA, the proposed changes to the Vopak site will have negligible impact on the cumulative risk results for the Port Botany area. The recommendations from this 1996 study have been reviewed to determine if the proposed changes are consistent with the intent of these recommendations. In summary, all current proposed changes to the Vopak site have been found to be consistent with the intent of the recommendations and do not contribute to unacceptable cumulative risk in the Port Botany area.

With respect to the impact on cumulative off-site risk from Site A, the results show that there is negligible off-site risk from the proposed biodiesel plants. In particular, the site cumulative risk is expected to have decreased when compared to the risk levels imposed during the period when JORTL was operational.

5.10 ON-SITE PROPAGATION OF INCIDENTS

The risk of off-site propagation due to fires and internal tank explosions was discussed in Sections 5.1 and 5.3, respectively, and found to be acceptable. Propagation of an incident could also occur within the Vopak site. The event likelihoods remain the same and, as shown previously, are acceptably low.

Propagation due to radiant heat from a potential fire to metallic structures can occur if the impacted area is subjected to 23 kW/m^2 or higher without any emergency response action, e.g. the application of cooling water. From the results shown in Table 8, propagation to cause damage to nearby metallic structures is predicted to occur for scenarios:

- 1 (tanks 4, 5 and 6 bund – biodiesel);
- 2 (tanks 62 to 69 bund – biodiesel);
- 3 (tanks 55 to 61 bund – biodiesel);
- 10 (tank top fires 63 to 68 – biodiesel);
- 12 (tank top fires 55 to 58 – biodiesel and palm oil);
- 14 (tank top fires 201 to 203 – vegetable oil); and
- 16 (tanks 75 to 79 bund – vegetable oil).

Whilst the event likelihoods are acceptably low, the following control measures are employed at the site to either prevent or mitigate the risk of propagation.

Prevention Control Measures:

- Equipment inspection and maintenance procedures;
- Operating procedures, e.g. manual tank transfers, and training;
- Commissioning checks on the adequacy of the control system;
- Control of ignition sources, e.g. no smoking on site and hot work permit system;
- Site speed limit (reduces risk of impact events);

- Physical barriers, e.g. bunding and bollards;
- Security measures include fencing, CCTV, intruder beams, security patrols, operator / driver vigilance;
- Process SCADA computer alarms monitored;
- The tanks are designed API 650 / AS 1692 / AS 1170 to resist the combined effects on internal pressure due to contents, weight of platforms, ladders, live loads, wind loads, earthquake forces and hydrostatic test loads;
- Operations stopped in adverse weather conditions;
- Explosions only occur when ullage vapour is between LEL and UEL. At steady state conditions, the combustible materials tank ullage is below LEL. Design conforms to AS1940 requirements. Methanol and biodiesel tanks are nitrogen padded (biodiesel is padded for product quality reasons);
- Tank level device(s) installed as appropriate;
- Instrumentation and electrical systems designed to AS2430 for hazardous areas; and
- Tanks are earthed.

Mitigation Control Measures:

- Site emergency response plan;
- Fire protection systems, e.g. hydrants, foam, monitors, tank spray systems and fire extinguishers, as currently available on the site;
- Spill response procedures; and
- Emergency isolation valves and shutdown system.

Incident propagation can also occur due to overpressures or missiles from a potential internal tank explosion (i.e. the methanol or sodium methylate tanks 59 to 62 and 69). For overpressures, propagation is considered possible if the impacted area is subjected to 21 kPa or higher. Under worst case conditions, propagation is possible for all methanol and sodium methylate tanks.

Whilst the event likelihoods are acceptably low, the above fire preventative control measures are generally applicable at the site to prevent the risk of propagation. Mitigation control measures are also as shown above but others may be required, e.g. medical response, depending on the consequences of the potential explosions (as detailed in the existing emergency response plan).

5.11 RISK TO THE BIOPHYSICAL ENVIRONMENT

The main concern for risk to the biophysical environment is generally with effects on whole systems or populations. For the proposed changes at Port Botany, it is suitably located away from residential areas. However, due to the nature of the activities, there are operations, e.g. shipping, where losses of containment can adversely impact the marine environment. Major fires can also effect the environment (combustion products). Spills within the Terminal are contained within bunding and the effluent system.

Whereas any adverse effect on the environment is obviously undesirable, the results of this study show that the risk of losses of containment is broadly acceptable.

For completeness, risks to the biophysical environment due to loss of containment events are summarised below.

5.11.1 Liquid Wastes:

There are four main liquid wastes from the proposed biodiesel plants. These are as follows:

1. Waste Water

This will be disposed of to sewer via a Trade Waste Agreement with Sydney Water. The Trade Waste Agreement will apply Sydney Water's latest Acceptance Criteria and the total volume for the two plants is 65,200 tonnes per year.

2. Fatty Matter

This is a by-product of the process and is essentially a pumpable mixture of soap derivatives. The biodiesel production process will generate approximately 990 tonnes per year of fatty matter. It is anticipated that this fatty matter has value as a potential fuel source for various industrial heating processes or used in animal feed pellets.

3. Glycerine Type II (Industrial Glycerine)

Another by-product of the process is Glycerine Type II or industrial grade glycerine that has minor impurities. Approximately 1,130 tonnes per year of this material will be generated. This material also has potential for a fuel source for various industrial heating processes or used in animal feed pellets.

4. Glycerine Residue

The final by-product is a residue of glycerine, fats, oils, polyols, sodium chloride and water. Approximately 2,990 tonnes per year of this material will be generated. This material also has value and can be used in animal feed pellets.

Products Stored in Bunded Areas

Spillages of products from the tanks and adjacent piping are contained in the bunds. The bunded areas are sized to contain the entire contents of the single tank so that a total loss of contents does not spill over the bund, plus an allowance for rainwater, fire water, hosing down etc. The two biodiesel plants are also similarly bunded.

Non compatible materials, e.g. hydrochloric acid and caustic, are separately bunded.

Bund water will be analysed prior to determining further treatment options, e.g. trade waste, treatment in the existing dissolved flotation plant or to be recovered into existing waste storage tanks for subsequent removal by licensed waste contractors.

Drainage Systems and Site Grades

These have been designed so that in the event of fire, fire water run off containing any materials is held on site, away from plant equipment and buildings. All open areas are paved.

Small spills will be contained using the existing spill response kits which include absorbent material.

Other spills can occur as a result of road tanker operations, failures of the pipes in the pipeline corridor and at the Bulk Liquids Berth. As discussed in this report, the materials involved and the net change in transport frequency does not impose additional significant risks to the Port Botany area.

5.11.2 Gaseous Emissions

Combustion of the stored products, caused by ignition following a spillage or leak, will release products of combustion (e.g. carbon dioxide, carbon monoxide, soot, vaporised product [unburnt] and water vapour). As shown in Section 5.2, for typical wind / weather conditions, the products of combustion from a fire will rise due to momentum and buoyancy. Local impact can be expected for very still conditions only (in which case, emergency response is required for evacuation). The products of combustion are unlikely to include any materials which present a long-term risk to the biosphere.

Hydrocarbons vapour emissions whilst tanker filling are as per existing site practices and no new significant changes are expected here.

The plant has a number of vents included in the design. The design rates from these vents are small. The impact from these releases is being separately analysed in the environmental impact assessment.

5.11.3 Solid Wastes

Spent activated carbon is flushed with water and dumped into a waste skip. This material is the disposed to landfill in a wet state.

Other solid wastes are non-hazardous, office and plant waste products to landfill.

From the analysis in this report, no incident scenarios were identified where whole systems or populations could be affected by a release to the atmosphere, waterways or soil.

6 CONCLUSION AND RECOMMENDATIONS

The risks associated with the proposed biodiesel plants and their associated operations at Port Botany have been assessed and compared against the DoP risk criteria.

In summary:

1. Fires:

- No risk of injury or fatality at residential areas or other sensitive land uses as the separation distance is large, i.e. 1 km or larger;
- Three fire events have the potential to cause fatality in neighbouring industrial areas, however, their likelihood is acceptably low and there exists a high probability of escape; and
- Two fire events have the potential to cause propagation at neighbouring industrial facilities, however, the combined likelihood (approximately 8 pmpy) is less than the acceptable criterion of 50 pmpy.

2. Internal tank explosions:

- No risk of injury or fatality at residential areas or other sensitive land uses as the separation distance is large, i.e. 1 km or larger; and
- Five internal tank explosion events have (conservatively) the potential to cause fatality or propagation damage in neighbouring industrial areas, however, however, the combined likelihood (approximately 33 pmpy) is less than the acceptable criterion of 50 pmpy.

3. The likelihood of a fire associated with the new biodiesel pipeline in the pipeline corridor is acceptably low (approximately $1x10^{-7}$ per year).

4. There are no significant risk impacts at the Bulk Liquids Berth associated with this project.

5. Societal risk is qualitatively concluded to be acceptable given:

- Few events analysed in the study have the potential for off-site impact and, for the ones that do, their likelihood is acceptably low;
- The risk of off-site individual fatality is low and acceptable, and;
- The population density in the Port Botany area is relatively low.

6. There are no significant risk impacts on road transport associated with this project as there will be less than one extra vehicle per day and greater use will be made of the higher integrity Isocontainers.

Therefore, the results of this PHA show that the risks associated with the proposed changes comply with the DoP guidelines for tolerable fatality, injury, irritation and societal risk. Also, transport risk, risks to biophysical environment, the risk of propagation and the impact on cumulative risk in the Port Botany area from potential hazardous events are broadly acceptable.

The primary reason for the low risk levels from proposed changes is that significant consequential impacts from potential hazardous events (mainly radiant heat from fires) do not extend far from the relevant processing areas.

It is assumed that the proposed changes will be reviewed via the HAZOP methodology, an updated fire safety study will be performed and the existing safety management systems and emergency response plans will be updated to reflect the proposed changes.

The following recommendations are made from this review:

1. Include in the updated safety management systems (including training programs) appropriate information concerning the new hazards associated with sodium methylate. Whilst this material does not contribute significantly to off-site risk, management of spills will require special attention to protect site based personnel handling the material;

2. The existing stormwater system under the biodiesel plants area has no isolation valve in the final pipe leaving site. Suitable means is to be provided to ensure spills do not leave the site via this stormwater piping system; and

3. For automated tank transfers, two independent tank level switches should be installed (or equivalent) to reduce the likelihood of tank overfilling to an acceptable level (as per current practice at Site B).

Appendix 1

Process Flow Diagrams

Preliminary Hazard Analysis, Proposed Biodiesel Project, Vopak Terminals Australia

REV	DATE		BY	CHK	CIV/STR	MECH	E/I	PROCESS
B	07-08-06	ISSUED FOR EIS	W.B.	JS				JS
A	22-05-06	PRELIMINARY ISSUE	CB	JS				JS

APPROVED

REFERENCE

DRAWING NUMBER	TITLE

NOTES:

- - - - - - - EXISTING AT SITE 'A'

——— STAGE 1 NEW

STAGE 1 FLOW / STAGE 2 FLOW

TPD - TONNES PER DAY
TPA - TONNES PER ANNUM
WW - WASTE WATER

CONTRACT No.	07E235	
ENG. DESIGN BY	J. SHAH	
DRAWN	C. BINNING	22-05-06
CHECKED		
CIV & STRUCT DESIGN APPR.		
MECHANICAL DESIGN APPR.		
ELECT. & INSTR. DESIGN APPR.		
PROCESS DESIGN APPR.		
WEIGHTS CHECKED		

BILFINGER BERGER Services

VOPAK TERMINALS PTY. LTD.

SYDNEY BIODIESEL TERMINAL
OVERALL
PROCESS FLOW DIAGRAM

Scale NONE | A1 | BBSA DRG No 07-E235-86-006 | REV. B

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Appendix E

Traffic study

GHD Pty Ltd

CLIENTS | PEOPLE | PERFORMANCE

Vopak Terminals Sydney Pty Ltd and Natural Fuels Australian Ltd

Sydney Biodiesel Project

Traffic Report

January 2007

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

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Appendices

1. Introduction

Vopak Terminals Sydney Pty Ltd (Vopak) and Natural Fuels Australia Ltd (NFAL) are proposing to construct and operate a biodiesel facility within an existing chemical and petroleum handling facility at Port Botany NSW. The existing facility is owned and operated by Vopak. The proposal would utilise existing infrastructure and expand the Vopak site for the purpose of producing, storing and distributing biodiesel.

Vopak is a company that provides bulk liquid services (storage, transport, bulk handling, packaging and distribution) and access from distribution facilities to independent operators and large corporations. These bulk liquids include fuel-based products used for energy and transport functions throughout NSW.

NFAL was incorporated in February 2005. The company was formed to build a sustainable and renewable energy business in emerging yet strong alternative energy growth markets.

Vopak operates two bulk liquid storage terminals in Port Botany. The first is known as the Site A Terminal and is located at 49 Friendship Road. The second facility, known, as Site B Terminal is located at 20 Friendship Road. Both sites currently store petroleum products.

This Traffic Impact Assessment has been prepared to assess the impacts of the proposed biodiesel project at Site A and is in accordance with the Roads and Traffic Authority (RTA) *Guide to Traffic Generating Developments* procedure manual where applicable.

This report discusses the following:

- Existing Conditions – a review of existing road characteristics, adjacent development, traffic volumes, intersections performance, public transport accessibility and pedestrian and cyclist facilities;
- Future Conditions – calculates additional traffic generated during the construction stages and future operation of the proposed facility, assesses the adequacy of the network to support the proposed activity and the performance of the network under these proposed conditions.

2. Existing Conditions

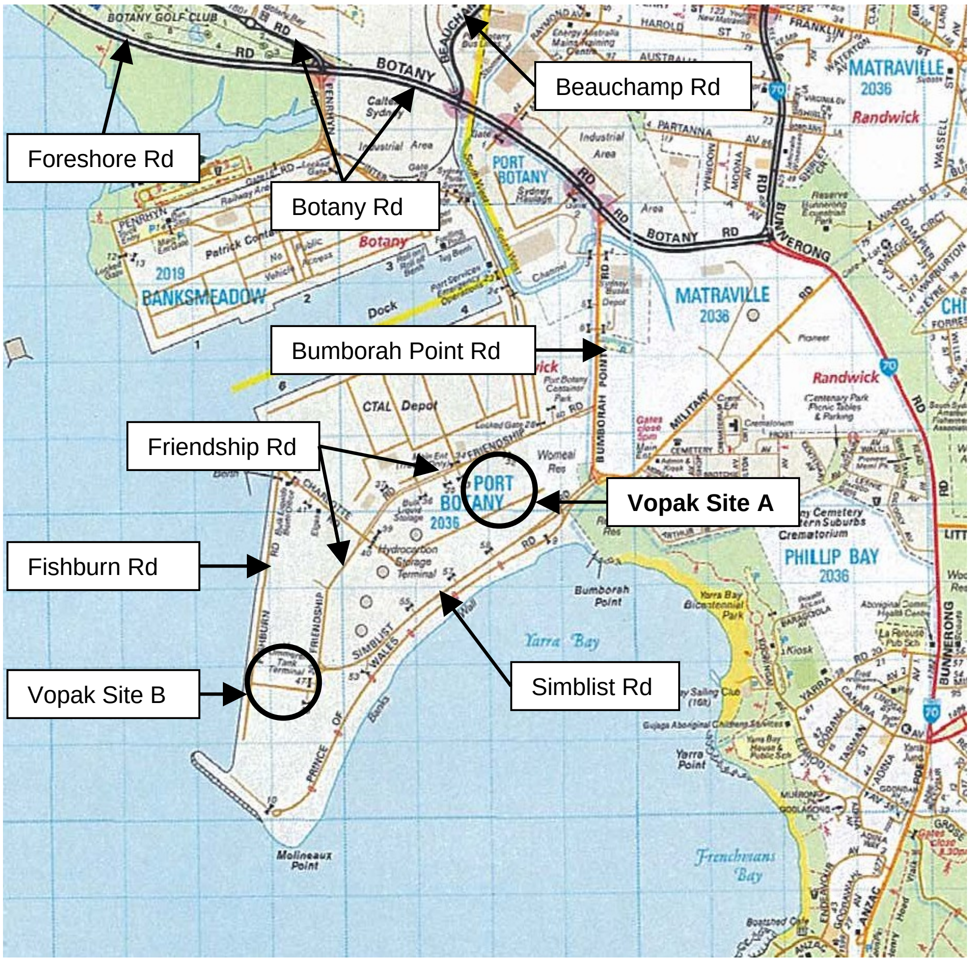
2.1 Site Description

The proposed development is situated on a 0.8-hectare parcel of land within the boundaries of the Site A Terminal and is known as Lot 5 in Deposited Plan 635791. The Site A Terminal is a four-hectare site located at 49 Friendship Road, Port Botany and comprises of:

- Lot 3 DP 635791 (2.477 hectares);
- Lot 4 DP 635791 (0.7580 hectares); and
- Lot 5 DP 635791 (0.7792 hectares).

Vopak is currently negotiating the extension of its lease with the Sydney Ports Corporation for a 20-year option over the site.

Figure 1 Locality Plan



This area is relatively flat, stable land with few undisturbed natural features. Areas that surround the road network into this section of Port Botany include Banksmeadow, Botany and Matraville which are situated to the north of Botany Road. These suburbs are characterised by a mix of port related and industrial uses, residential and commercial services. Kingsford Smith Airport is located nearby, making the area an important gateway transfer point for Sydney, NSW and Australia to the global economy.

Access to the site is from Friendship Road.

2.2 Existing Operations

The existing Site A Terminal was established in 1979 to serve an identified need for an independent bulk liquid chemical distribution facility in the greater Sydney Region. The facility caters for the distribution of bulk liquid chemicals to chemical manufacturers, oil companies, and chemical traders who sell into the local markets.

The current facility is also integrated into a wider network of petroleum and liquid fuels transport infrastructure with other Vopak facilities (Vopak Site B), oil industry corporations including Caltex Banksmeadow and Caltex Kurnell, Terminals Pty Ltd and the Sydney Ports Corporation. Consequently Vopak infrastructure is a critical part of the network to ensure other bulk liquid and cargo distribution facilities in the immediate area operate in an efficient, safe and environmentally sensitive manner.

2.3 Existing Road Network Characteristics

The information below on the existing road network has been provided from a study prepared by Masson Wilson Twiney – February 2004[1]

2.3.1 Access Roads

Friendship Road and Simblist Road currently provide a one-way traffic system along Simblist Road and Friendship Road, which was implemented at the end of October 2006. The one-way system operates in a clockwise manner along Simblist Road (from Prince of Wales Drive to Friendship Road) and Friendship Road (from Simblist Road to Bumborah Point Road).

Simblist Road is a wide two-lane road, with each traffic lane accommodating through traffic as well as truck queuing. The main function is to provide access to the sites along it. It also has a strategic function as a possible relief road to Friendship Road, and as an emergency access in the event of a situation, which would require the closure of Friendship Road to traffic.

Foreshore Road provides arterial road access to Vopak Site A from General Holmes Drive and Beauchamp Road.

Foreshore Road and Botany Road west of Bumborah Point Road are divided roads, which were purpose built or upgraded to serve truck traffic to Port Botany.

[1] Existing Conditions Information provided from the Port Botany South Precinct Transport Management Study prepared by Masson Wilson Twiney – February 2004

Beauchamp Road together with Denison Street provides principal access routes to the Port Botany area from the north (via Wentworth Road, Southern Cross Drive, Eastern Distributor). These are both four lane undivided roads.

Bumborah Point Road is a four lane undivided road. Apart from providing access to the State Transit Authority bus depot and the Alcatel cable factory, its principal purpose is to serve the Port Botany area. Its intersection with Botany Road is controlled with traffic signals, whereas the intersection with Friendship Road is priority controlled, with Bumborah Point Road traffic having priority.

In summary, all roads to and from the Vopak Site A are of industrial standard and have been built to accommodate heavy vehicles.

Photo 1 –Vopak Site A Entrance off Friendship Road

2.3.2 On site parking

There are currently 39 parking spaces on site. Access is provided through the entrance on Friendship Road.

2.4 Existing Traffic Generation at Vopak - Site A

2.4.1 Staff Vehicle Traffic Generation

The number of staff on the existing site is in the order of 31 employees. Based on information provided by Vopak, the existing traffic generation characteristics of the site revealed a typical car driver rate of 100% (i.e. each employee travel to work by a car). Application of that car driver rate to the existing staff numbers yields a traffic generation in the order of 62 vehicle trips per day (two-way).

Vopak Site A currently operates Monday to Friday from 6:00am to 5:30pm for Vopak Staff and Operators. It also provides access for Road Tankers 24 hours a day, 7 days per week. This service is operated on an as need basis as overtime by the Vopak Operators.

Vopak Employees

- Staff (8:00 am to 5:30 pm) – 15 personnel; and
- Operators (6:00 am to 2 pm) – 16 personnel.

Operators arrive prior to 6:00 am and depart at 2pm. Staff however arrive prior to 8:00am and depart at 5:30pm.

It is important to note that the peak hour traffic flows on the surrounding road network under the existing situation occur between 7:00 am – 8:00 am and 4:00 pm – 5:00 pm for the morning and evening peak periods respectively [1.] Further information on peak period traffic movement is also provided in Section 2.5 of this report. The staff traffic movements are likely to be distributed based on a 100/0 split between arrivals and departures. It is noted from the above information that operator arrivals will occur before the morning peak period, and that both the operator and staff departures will occur outside of the evening peak period.

Using these assumptions, the traffic generation during the weekday peak periods is as follows:

- 16 vehicle trips per hour (vtph), comprising 16 In/ 0 Out prior to the morning peak period;
- 15 vehicle trips per hour (vtph) comprising of 15 In / 0 Out during the morning peak period;
- 16 vehicle trips per hour (vtph) comprising of 0 In/ 16 Out prior to the evening peak period; and
- 15 vehicle trips per hour (vtph) comprising of 0 In/ 15 Out after the evening peak period.

In summary the traffic generation in the morning and evening peak periods is in the order of 15 vtph.

2.4.2 Heavy Vehicle Traffic Generation

Vopak have provided information of the likely heavy vehicle traffic that is generated by the existing operations. Heavy vehicle movements currently consist of road tankers to the site and the transportation of bulk liquids. Based on the information provided, there are an average of 24 truck movements per day with an estimated daily peak of 48 truck movements.

Under a worse case scenario, it can be assumed that approximately 10% of all daily truck movements occur during the morning and evening peak periods. It has also been assumed that the majority of existing heavy vehicle traffic will have an arrival/ departure split of 50/ 50 in the morning peak periods and evening peak periods. Application of these assumptions yields a traffic generation during the weekday peak period of 5 vehicles per hour, comprised of 2.5 In / 2.5 Out during the morning and evening peak periods.

In summary 5 heavy vehicles per hour are generated during the morning and evening peak periods.

2.4.3 Visitors / Contractors

Under the existing operation of Site A, Vopak has provided information that there is an average of eight (8) visitors/contractors accessing the site on a daily basis.

2.4.4 Total Existing Traffic Generation

Table 1 Existing Traffic Generation

Road Tankers	24 vpd
Staff	31 vpd
Visitors / Contractors	8 vpd

The daily and peak hour traffic generation of the existing operation is set out in Table 2 The traffic generation due to the existing operations is in the order of:

- 22 vehicle trips per hour during AM peak period, comprising, 2 visitor/contractor trips (1 In and 1 Out), 15 employee trips (15 In) and 5 heavy vehicle movements (2.5 In and 2.5 Out).
- 7 vehicle trips per hour during PM peak period, comprising 2 visitor/contractor trips (1 In and 1 Out) and 5 heavy vehicle movements (2.5 In and 2.5 Out).
- The total daily weekday traffic generation of the existing site is in the order of 126 (63 In/ 63 Out) vehicle trips per day (vtpd).

Table 2 Total Existing Traffic Generation

Component	Morning Peak (vtph)*	Evening Peak (vtph)*	Daily Trips (vtpd)**
Visitors/Contractors Traffic	2	2	16

Component	Morning Peak (vtph)*	Evening Peak (vtph)*	Daily Trips (vtpd)**
Employee Traffic	15	-	62
Heavy Vehicle Traffic	5	5	48
Total	**22**	**7**	**126**

***vtph = Vehicle trips per hour**

**** vtpd = Vehicle trips per day**

2.5 Existing Traffic Volumes

Traffic count data was obtained from automatic counters that were installed for the Port Botany South Precinct Transport Management Study 2004, which is assumed to still represent the current situation [1]. The following are the locations that automatic counters were placed:

- Military Road – east of Bumborah Point Road;
- Simblist Road – west of Prince Wales Drive;
- Friendship Road – north of Simblist Road;
- Friendship Road – west of Bumborah Point Road;
- Bumborah Point Road – south of Friendship Road;
- Bumborah Point Road – south of Botany Road; and
- Botany Road – east and west of Bumborah Point Road.

Table 3 below summarises the results of the average weekday traffic volumes.

Table 3 Average Weekday Traffic Volumes (veh/day)

Road	Location	Total Vehicles (two-way)	Rigid trucks or Buses (two-way)	Articulated Trucks (two-way)
Military Road	East of Bumborah Point Road	1293	371	98
Simblist Road	West of Prince Wales Drive	794	64	557
Friendship Road	North of Simblist Road	1065	82	693
Friendship Road	West of Bumborah Point Road	1503	239	605
Bumborah Point Road	South of Friendship Road	2272	547	696

Road	Location	Total Vehicles (two-way)	Rigid trucks or Buses (two-way)	Articulated Trucks (two-way)
Bumborah Point Road	South of Botany Road	8349	1842	2465

The results of the automatic counts indicate that the access roads for Port Botany, Bumborah Point Road and Military Road combined carry around 9,650 vehicles per day, with a peak of around 900 vehicles per hour. Over the average weekday, 27% of this traffic is articulated trucks and 23% is rigid trucks. The remaining 50% of daily traffic is light vehicles. Traffic travelling to the Vopak site are unlikely to use Military Road as this is considered more a local access route. Therefore heavy vehicles can be assumed to travel to the Vopak site from Bumborah Point Road.

Tables in Appendix A summarise the results of the automatic counts for the average weekday, morning and evening commuter peak hours. This information identifies peak periods of the day as well as the average weekend and was obtained from the Port Botany South Precinct Transport Study. The morning commuter peak hour was determined as 7:00 am to 8:00 am and the evening peak as 4:00 pm to 5:00 pm. The overall busiest hour of the day was 2:00 pm to 3:00 pm.

2.6 Planned Expansion of Port Botany

It is noted that the current arterial road system that provides access into the Port Botany and Kingsford Smith Airport precinct, and in particular General Holmes Drive and the M5 East is currently operating close to capacity during commuter peak periods. Information obtained from the Sydney Ports Corporation documentation indicates that the planned expansion of Port Botany will double daily traffic even with a higher rail (40%) split in the future. The planned increase in traffic will be managed through expanding the vehicle operating times for road haulage over 7 days a week and 24 hours a day, instead of concentrating around the working week and typical normal working day. The arrival of heavy vehicles is proposed to be managed through providing time slots for specified vehicles at container sites and terminals situated in the area.

2.7 Existing Internal Site operation

Photo 2 – Existing Vopak Site A – Internal Operation

The existing operation of the site is illustrated in Figure 2 and operates as follows:

- Single lane entry;
- Weigh in and collect paper work from office;
- Trucks proceed to east end of the site;
- Trucks circulate and proceed into loading areas; and
- Trucks then proceed out of loading area and park at the weigh area to submit the required paperwork and then exit the site.

Figure 2 outlines the existing internal operation of truck movements at Vopak Site A.

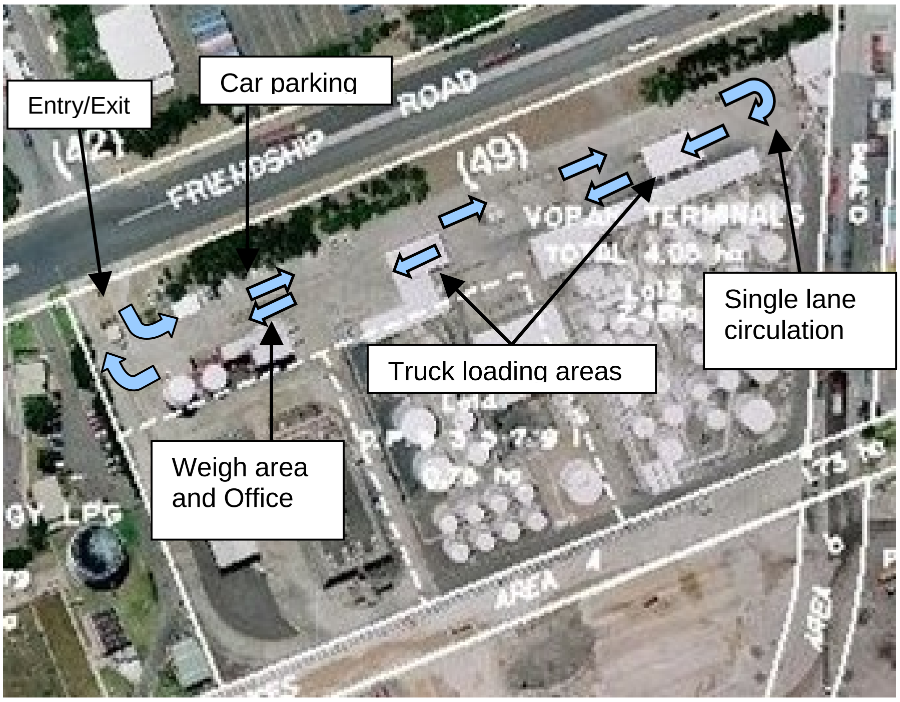


Figure 2 Aerial view of the existing internal operation

2.8 Intersection Operation

The performance of the existing road network is largely dependent on the operating performance of key intersections that are critical capacity control points on the road network. The capacity of a road network is generally governed by the operation of its intersections. It is therefore appropriate to consider intersection operation as a measure of capacity of the road network.

The criteria for evaluating the operational performance of intersections is provided by the RTA Guidelines to Traffic Generating Developments and reproduced in Table 4. The criteria for evaluating the operational performance of intersections is based on a qualitative measure (i.e. level of service), which is applied to each average vehicle delay band.

Table 4 Level of Service Criteria

Level of Service	Average delay per vehicle (secs/veh)	Traffic Signals, Roundabouts	Give Way and Stop Signs
A	Less than 14	Good Operation	Good Operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays and spare capacity

Level of Service	Average delay per vehicle (secs/veh)	Traffic Signals, Roundabouts	Give Way and Stop Signs
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity; at signals incidents will cause excessive delays Roundabouts require other control mode	At capacity requires other control mode
F	> 70	Extra capacity required	Extreme delay, traffic signals or other major treatment required

Adapted from RTA Guide to Traffic Generating Developments, 1993

The Port Botany South Precinct Transport Management Study surveyed and analysed a number of key intersections. Current levels and performance measures are outlined in Table 5.

Table 5 Existing Peak Hour Intersection Operation

Intersection	Control	Morning Peak Hour		Evening Peak Hour	
		Average Delay	LOS	Average Delay	LOS
Bumborah Pt/Simblist/Military	Priority	5.6	A	5.7	A
Bumborah Pt/Friendship	Priority	6.4	A	6.3	A
Bumborah Pt/Botany	Signals	16.8	B	17.4	B
Botany/Beauchamp	Signals	20.4	B	18.0	B

Note: Average delay = Average delay in seconds per vehicle; for all movements signalised intersections, for most delayed movement at unsignalised intersections

LOS = Level of Service

Table 5 indicates that all intersections operate satisfactorily with some spare capacity.

It is noted that stakeholder consultation has indicated that although the intersection of Botany Road/Bumborah Point Road has spare capacity, the observations indicated that signal phasing and a short eastbound right turn bay in Botany Road sometimes causes delays to right turning traffic and the right turn queue to extend back to and through the previous intersection. This is probably resulting from the peak arrival of trucks, which is expected to be managed more efficiently with new systems being introduced by stevedores and freight forwarders in Port Botany.

2.9 Truck Queuing

The Masson Wilson Twiney report noted that in the morning a rolling queue forms on Simblist Road as container trucks wait to move to the P&O Container Terminal for processing. This queue moves for periods up to 15 minutes and impacts on the operation of the Simblist Road/Friendship Road intersection and on property accesses along the route.

Truck queuing issues were also identified at the following locations:

- Simblist Road – irregular queuing in two lanes with apprehended adverse impacts on the new access to/from the Patrick Container yards and warehouse development on the northern side of Simblist Road;
- Friendship Road – on the northern side opposite Terminals. This prevents terminals trucks from parking opposite the site to complete paperwork prior to departure; and
- Friendship Road – access to Vopak Site A is affected in the early morning hours by trucks queuing to enter the Patrick warehouse development on the northern side of Friendship Road.

Photo 3 – Simblist Road – Truck Queuing

2.10 Crash Statistics

A search of the Roads and Traffic Authority crash database has been undertaken for the five-year period September 2000 – June 2005. Details of the crash database records are shown in Appendix C.

The data shows that there were no crashes recorded by the RTA in the vicinity of the proposed development. The data indicates that in total three (3) crashes occurred on Friendship Road, two (2) were in the vicinity of Charlotte Road and the third near the intersection of Bumborah Point Road. Two of these crashes resulted in injuries.

The crash data was identified to be unrelated to the operation or activities in the vicinity of the proposed development.

3. Proposed Development

The proposal is the construction and operation of a biodiesel processing plant, storage tanks and associated infrastructure. Vopak would provide storage and distribution infrastructure, utilities and infrastructure management facilities. Natural Fuels Australia Ltd (NFAL) would provide the biodiesel processing plant and associated infrastructure.

The proposal will require refurbishment of the Vopak Site A Terminal (Lots 3 and 4) and to re-use some of the existing tanks, pumps, loading/unloading facilities, fire protection system and other miscellaneous facilities. In addition, the proposal will require construction of a biodiesel processing plant and associated facilities on a cleared portion of the Vopak Site A Terminal (Lot 5).

The development is to be achieved in two stages. During the first stage, a one train biodiesel plant and associated infrastructure, storage and utilities would be provided. The second train biodiesel plant of the same capacity and necessary additional facilities will be provided during stage two.

3.1 Access Routes

The entry and exit to/from the site will remain at the existing location. An emergency access is proposed from the site onto Friendship Road approximately 120m east of the existing access, which would be designed in accordance with RTA's Road Design Guide (February 2006).

3.2 Internal Road System

The internal road arrangement for the pick up and delivery of bulk liquids will not change from the existing. The only traffic related changes would be to the car parking areas and the provision of an emergency vehicle access.

3.3 Parking and Access

The proposed development at the site would incorporate the provision of an additional 19 spaces to accommodate the additional employees; this will increase the number of parking spaces on site to a total of 58.

The car park adjacent to the main entry/exit will be accessed from the main entrance with an exit directly onto Friendship Road as shown on the Proposed Plant Layout Plan in Appendix B.

Figure 3 outlines the proposed internal operation of Vopak Site A.

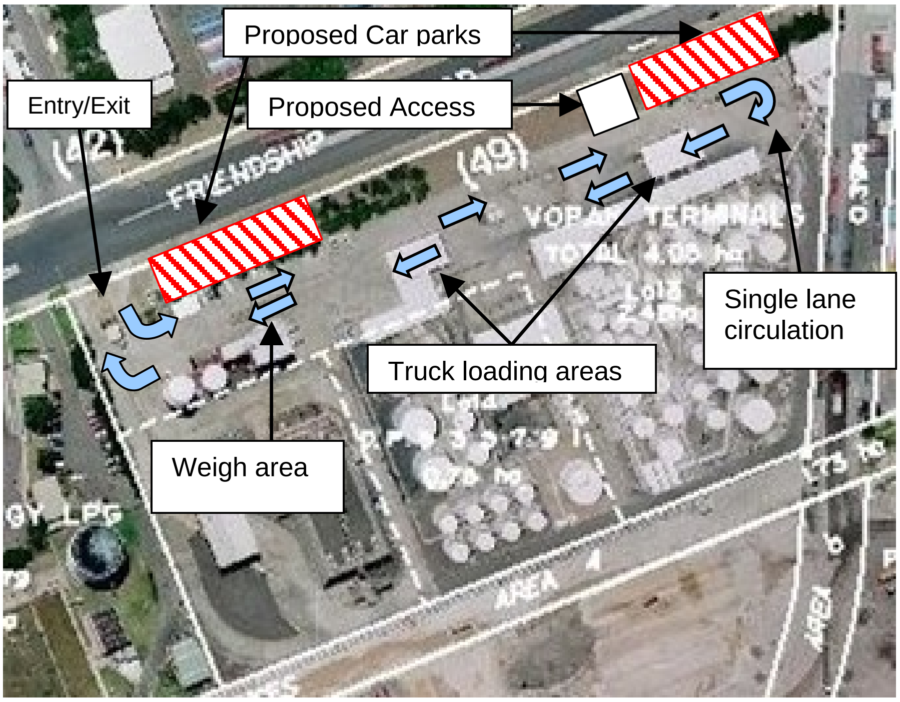


Figure 3 Aerial view of the proposed internal operation

4. Traffic Impacts During Construction

During the construction period, traffic movements will predominantly be related to the arrival and departure of construction workers and the delivery of material and equipment.

The main traffic impact will essentially be vehicles entering and exiting the proposed site on Friendship Road.

During the construction period the existing site will continue to operate normally, and the construction traffic generation described in the following sections is additional to the existing traffic generation of the site.

4.1 Traffic Generation During Construction

4.1.1 Construction Activities

The proposed development will require a range of activities including:

- Construction of biodiesel plant process train;
- Construction of 12 new tanks;
- Installation of nine new pumps and relocation of three pumps;
- A new 150mm pipeline connecting Site A to Site B;
- Integration and relocation of pipelines within Site A;
- Construction of two car parking areas, in accordance with AS 2890.1 2004; and
- Construction of an emergency access point, in accordance with the RTA's Road Design Guide, 2006.

4.1.2 Proposed Work Hours

The construction period is likely to be 40 weeks in duration. The working hours proposed for the construction period will be as follows:

- Monday to Friday (7:00 am – 6:00 pm); and
- Saturday, Sunday and public holidays (no work).

4.1.3 Traffic Generation

Traffic generation information has been provided by Vopak and indicates that a minimum of 25 and a maximum of 75 construction vehicles (heavy and light) will access the site on a daily basis, of those construction vehicles a minimum of 20 and a maximum of 60 workers will arrive in light vehicles. Therefore based on the maximum scenario it is assumed that the worse case would be 75 construction vehicles per day consisting of 15 heavy and 60 light vehicles per day during construction.

4.1.4 Heavy Vehicle Traffic Generation

The development is to be achieved in two stages. During the first stage, a one biodiesel plant and associated infrastructure, storage and utilities would be provided. The second plant of the same capacity and the necessary additional facilities will be provided during stage two.

Based on the worse case that the heavy vehicle traffic generation during the weekday peak periods is in the order of 15 trucks per day, comprising 15 In/ 15 Out. The proportion of these movements occurring during the AM and PM peak periods is conservatively estimated at approximately 25%, with a split between arrivals and departures of 50/ 50. Therefore, the worse case scenario that truck movements occur during the peak periods, heavy vehicle generation during the AM and PM peak periods is four (4) vehicles per hour, comprising 2 In and 2 Out.

4.1.5 Light Vehicle Traffic Generation

During the construction period it is estimated that there will be a minimum of 20 and a maximum of 60 workers accessing the site daily. Based on the characteristics of the site it has been assumed there will be a typical car driver rate of 100% (i.e. each employee driving a car). Application of this car driver rate to an assumed worse case scenario workforce yields a traffic generation of the order of 60 light vehicles per day.

It is likely that the arrival of workers will occur before the AM peak hour and depart before the PM peak hour. Therefore the proportion of these movements occurring during the AM and PM peak periods is conservatively estimated at approximately 20%, with the total daily arrivals being 60 In and departures of 60 out. Based on this assumption the weekday peak period traffic generation is in the order of 12 additional vehicle trips per hour. This is unlikely to impact on internal Port Botany road network operations, which as shown in Table 5 of Section 2.8 is known to have space capacity above this additional volume.

4.1.6 Total Construction Traffic Generation

A summary of the additional traffic movements during the construction period is shown in Table 6 below:

Table 6 Construction Period Traffic Movements – Worse Case

Activity	Additional Daily traffic (vpd)	Additional AM Peak construction traffic (vph)	Additional PM Peak construction traffic movements (vph)
Heavy Vehicles	15	4	4
Workers	60	12	12
Total	**75**	**16**	**16**

4.1.7 Traffic Assignment during Construction

Due to the site proximity the options for accessing the site under the one-way traffic system along Simblist and Friendship Roads (implementation October 2006), the routes are as follows:

- Via Botany Road – Bumborah Point Road and Simblist Road; and
- Via Bunnerong Road – Military Road and Simblist Road.

Under the one-way traffic system all traffic would approach the site from Simblist Road, however Military Road is only likely to be used by traffic from the southern section of the eastern suburbs therefore the following traffic assignment has been adopted:

- 90% of vehicles approach/ depart the site via Bumborah Point Road, and
- 10% of vehicles approach/ depart the site via Military Road.

Given the above assumptions, during the AM and PM construction traffic peak periods the estimated additional traffic demand on the road network serving the site is minor, with the following expected traffic increases:

AM and PM Construction Traffic Peak Periods

- Additional two-way traffic flows on Bumborah Point Road during the morning and evening peak periods is in the order 14 vehicle trips per hour;
- Additional two-way traffic flows on Military Road during the morning and evening peak periods is in the order 2 vehicle trip per hour;
- Additional one-way traffic flows on Simblist Road during the morning and evening peak periods is in the order 8 vehicle trips per hour; and
- Additional one-way traffic flows on Friendship Road during the morning and evening peak periods is in the order 16 vehicle trips per hour.

4.2 Construction Period Road Network and Intersection Performance

Based on the above traffic generation predictions, the surrounding network and intersections would need to accommodate an additional 16 vph from the construction of the proposed development. Referencing to Austroads – Part 5 Intersections at Grade Fig 4.2 Practical Absorption Capacity this increase can easily be accommodated.

4.3 Local Transport and Other Transport Issues

4.3.1 Pedestrian and Cyclists

The increase in truck movements generated by the construction at the site is not likely to impact on or change the paths used by the pedestrian and cyclists in the vicinity of the site. Friendship Road and Simblist Road do not have footpaths; this is a port related area with industrial uses where the number of pedestrians and cyclists are expected to be low.

4.3.2 Public Transport

The nearest bus service is located on Bumborah Point Road near Friendship Road. The level of public transport servicing the site is considered adequate and will not be adversely affected by the construction at the site.

5. Traffic Impacts Post Development

The projected traffic generation of the proposed development is determined by the car usage rate of employees and the number of heavy vehicles likely to access the site. This section assesses the traffic generation for the proposed development, under a worse case scenario with the maximum of additional employees and heavy vehicles accessing the site.

5.1 Future Traffic Generation of the Site

5.1.1 Future Employee Traffic Generation

Under post development conditions, the number of personnel on site at any one time is likely to be 40.

Vopak Employees

- Staff (8:00 am to 5:30 pm) – 15 personnel; and
- Operators (6:00 am to 2 pm) – 16 personnel.

NFAL Employees

- 14 personnel (operating in shifts)

NFAL will operate 24 hours 7 days a week consisting of three (3) shifts that start and finish at 6 am, 2 pm and 12 am each shift will consist of 3 personnel per shift.

A typical car driver rate of 100% (i.e. each employee driving a car) has been assumed for these additional movements.

Based on the above information it is likely that the arrival of Vopak operators and NFAL employees will occur before the existing road network AM peak hour, and the arrival of Vopak staff will occur during the existing road network AM peak hour.

The departure of Vopak operators and NFAL employees will occur before the existing PM peak hour and the departure of Vopak staff will occur after the PM peak period. Therefore, during the weekday AM peak period the traffic generation is in the order of 15 vehicle trips per hour comprising of 15 arrival movements based on a 100 / 0 split. This is the existing situation and the proposal does not result in any additional traffic generated within the AM and PM commuter peak periods.

Table 7 Existing and Future Daily Employee Traffic Generation

	Existing	Future	Difference
Vopak Personnel	31 vpd	31 vpd	NIL
NFAL Personnel	NIL	14 vpd	14 vpd
Visitors / Contractors	8 vpd	8 vpd	NIL
	39 vpd	**53 vpd**	**14 vpd**

5.1.2 Future Heavy Vehicle Traffic Generation of the Site

The existing road network servicing the Port Botany area has been specifically designed to service port and port related industries. This includes the use of heavy vehicles and Double-B trucks. Road geometry, layout, site access and pavement are of excellent standard and have been designed to minimise conflict and accommodate these types of commercial vehicles.

One of the fundamental concepts behind the proposal is that it would utilise existing storage tanks for a large part of the process. Stage one would see a reduction in the chemicals stored on site, complemented by the storage of feed and finished goods stocks largely brought in by ships. A comparison of the existing annual versus proposed annual truck generation is shown in Table 8.

Table 8 Existing and Future Annual Heavy Traffic Generation

	Site A - Existing (annual)	Site A - After Completion of Stage 1 (annual)	Site A - After Completion of Stage 2 (annual)	Site A Difference (annual)
Road Tankers	2730	780	1560	-1170
ISO Containers IN	180	227	454	274
ISO Containers OUT	470	786	1572	1102
	3380	**1793**	**3586**	**206**

The annual difference between the existing and proposed heavy traffic generation results in an increase of approximately 1vpd.

A comparison of daily and peak hour traffic generation for Site A incorporating both staff vehicles and trucks at the existing and proposed development site is set out in Table 9.

Table 9 Existing and Proposed Total Traffic Generation

Component	Existing			Proposed		
	Morning Peak (vtph)	Evening Peak (vtph)	Daily Trips (vtpd)	Morning Peak (vtph)	Evening Peak (vtph)	Daily Trips (vtpd)
Visitors/Contractors Traffic	2	2	16	2	2	16
Employee Traffic	15	0	62	15	0	90
Heavy Vehicle Traffic	5	5	48	5	5	50
Total	22	7	126	22	7	156

Therefore after the completion of Stages 1 and 2 the actual increase in heavy vehicles to and from the site is 2 vtpd, resulting in an overall increase in vehicles of 30 vtpd.

5.2 Future Road Network and Intersection Performance

Based on the above traffic generation predictions in Table 9, the surrounding network will need to accommodate an additional 2 vph from this proposed development.

Referencing to Austroads – Part 5 Intersections at Grade Fig 4.2 Practical Absorption Capacity this increase can easily be accommodated.

5.2.1 Intersection Performance

The additional staff vehicle and truck movements generated from the operation of the proposed development are considered to be minimal and unlikely to have a significant affect on the performance of intersections in the vicinity of the proposed site.

5.2.2 Pedestrian and Cyclists

The increase in truck movements generated by the operation of the site is not likely to impact on the pedestrian and cyclists in the vicinity of the site. Friendship Road and Simblist Road do not have footpaths; this is a port related area with industrial uses where the number of pedestrians and cyclists are expected to be low.

5.2.3 Public Transport

The nearest bus service is located on Bumborah Road near Friendship Road. The level of public transport servicing the site is considered adequate and will not be adversely affected by the operation of the site post development.

5.3 Pipeline Transportation

To facilitate efficient export of biodiesel to road tankers and/or ship, a 3,000 m^3 capacity tank at Vopak Site B would be allocated to biodiesel. A new pipeline will be required to connect Site A (finished biodiesel tank farm area) to the main transfer manifold in Vopak Site B.

Finished (certified) biodiesel would be transferred to the Site B tank on a daily basis. The proposal would therefore require pipelines to integrate with the biodiesel processing plant and the Vopak Site B facility for ultimate distribution to the market. This includes the following lines:

- A new 150 mm pipeline connecting Site A to Site B dedicated biodiesel tank farm area; and
- Integrated pipelines to transport feedstock and processed materials to the storage tanks, processing plant and output lines within the Vopak Site A Terminal.

Existing lines to and from the Sydney Ports Corporation Bulk Liquids Berth and Vopak Site A would also be utilised for import product feed and export of biodiesel.

5.4 Future Development in Port Botany

Council has commented that although the proposal would reduce the number of road tankers accessing the site, that there will be no reduction in road movement. Council's Traffic Engineer indicates that the reduction in chemical storage on Site A will simply be generated elsewhere in Port Botany and therefore this development in the long term will potentially result in an increase in traffic generation. The traffic management of the anticipated relocation of chemical storage to another location within Port Botany does not form part of this application and therefore it is not possible to address by the proponent. However, it is expected that this need will fall under the Planned Expansion of Port Botany, which can be expected to be managed through expanding the vehicle operating times for road haulage over 7 days a week and 24 hours a day instead of concentrating around the working week and typical normal working day. The arrival of heavy vehicles would be proposed to be managed through providing time slots for specified vehicles at container sites and terminals situated in the area.

5.5 Traffic Assignment during operation

Vopak is aware of local traffic issues, including the need to avoid the use of local roads (for example Stephen Road and Botany Road west of their intersection with Foreshore Road) for non-local bulk liquid deliveries. It is considered that Vopak has demonstrated compliance with external road network conditions for existing operations and that this would not be altered for the proposal.

A mitigation measure would be to that during the life of the project, the proponent shall ensure that vehicles associated with the project do not transport hazardous goods along Stephen Road and Botany Road west of their intersection with Foreshore Road, unless for local deliveries only. This would be incorporated into conditions of contract for the trucking companies.

6. Conclusion

The following conclusions are made based on the investigations contained in this report.

6.1 Crash History

No recorded crash data was identified to be related to the operation or activities in the vicinity of the proposed development.

6.2 Existing Conditions

The existing road conditions along Friendship Road, Simblist Road and Bumborah Point Road are of industrial standard and have been built to accommodate heavy vehicle operation and therefore are generally considered satisfactory to accommodate the additional number and type of vehicles likely to be generated by the construction and operation of proposed development.

The existing level of service indicates that all intersections operate satisfactorily with some spare capacity at present.

6.3 Construction Impact and Mitigation

During the construction of biodiesel plant the existing Site A will continue to operate normally, access to construction activities in Site A will be through the existing access to Site A.

Traffic generation by the proposed construction activity will impact on the road network surrounding the site.

The worse case scenario for the construction period would be that approximately 75 vehicles per day would be generated.

Construction traffic will be contained to the site.

A Construction Traffic Management Plan (CTMP) would be developed and submitted to SPC for review and approval prior to construction. A copy of the CTMP would be sent to the RTA and Randwick City Council prior to construction.

This increase in traffic will impact on Friendship Road, Simblist Road and Bumborah Point Road; these roads have been identified to have some spare capacity and therefore able to accommodate this traffic.

The majority of traffic movement has been identified to occur outside of peak commuter periods and thus the impact on the operation performance of the surrounding road network will be minimal.

6.4 Post Development

The actual increase in heavy vehicles to and from the site is 1 vpd, resulting in an overall vehicle increase of 15 vpd. Council has commented that though the proposal has a reduction in the number of road tankers accessing the site under the proposal, that there will be no reduction in the overall road movement in the wider area as the reduction in chemical storage on Site A will simply be generated elsewhere in Port Botany and therefore this development in the long term will potentially result in an increase in traffic generation. The traffic management of the anticipated relocation of chemical storage to elsewhere within Port Botany cannot be addressed by the proponent, however it is expected that it will fall under the Planned Expansion of Port Botany, which can be expected to be managed through expanding the vehicle operating times for road haulage over 7 days a week and 24 hours a day instead of concentrating around the working week and typical normal working day. The arrival of heavy vehicles would be proposed to be managed through providing time slots for specified vehicles at container sites and terminals situated in the area.

The additional staff vehicle and truck movements generated from the operation of the proposed development are considered to be minimal and unlikely to have a significant affect on the performance of intersections in the vicinity of the proposed site.

6.5 On site Parking

The site will incorporate an additional nineteen (19) spaces to accommodate the likely number of additional employees; this will increase the number of on site parking spaces to a total of 58.

The number of staff is expected to increase by fourteen (14), totalling 45, with the expected number of staff on site at one time being 40.

Therefore in the worse case scenario that all staff where on the site at the same time being a total of forty-five (45) which occurs at the same time as eight (8) visitor or contractor vehicles, totalling 53; the proposed parking increase in parking capacity to 58 is considered appropriate for this site.

The existing access point to the site will be modified to accommodate a two-way entry/exit to a proposed car parking area designated for administration staff and visitors.

6.6 Intersection Performance

The additional movements generated from the construction of the proposed development are considered minimal and unlikely to have a significant effect on the performance of the following intersections in the vicinity of the site:

- Friendship/Simblist;
- Bumborah/Friendship;
- Bumborah/Military/Simblist; and
- Bumborah/Botany.

The additional staff vehicle and truck movements generated from the operation of the proposed development are considered to be minimal and unlikely to have a significant affect on the performance of the following intersections in the vicinity of the site:

- Friendship/Simblist;
- Bumborah/Friendship;
- Bumborah/Military/Simblist; and
- Bumborah/Botany.

The above intersection performance conclusions are based on the implications of traffic growth predicted in the Port Botany area as determined by the Masson Wilson Twiney Port Botany South Precinct Transport Management Study.

6.7 Public Transport, Pedestrians and Cyclists

The increase in truck movements generated by firstly the construction and secondly the operation of the site is not likely to impact on or change the paths used by the pedestrian and cyclists in the vicinity of the site.

The level of public transport servicing the site is considered adequate and will not be adversely affected by the construction or proposed operation of the site.

6.8 Pipeline Transportation

Pipeline movement of biodiesel will occur for the finished product via a new dedicated pipeline between Site A and Site B where it will be stored and blended for distribution to the market via shipping or road tankers.

6.9 Traffic assignment during operation

During the life of the project, the proponent shall ensure that vehicles associated with the project do not transport hazardous goods along Stephen Road and Botany Road west of their intersection with Foreshore Road, unless for local deliveries only. This would be incorporated into conditions of contract for the trucking companies.

Appendix A

Traffic Volumes

Table 2-1– Average Weekday Traffic Volumes (veh/day)

Road	Location	Total Vehicles			Rigid Trucks or Buses			Articulated Trucks		
		North or Eastbound	South or Westbound	Two Way	North or Eastbound	South or Westbound	Two Way	North or Eastbound	South or Westbound	Two Way
Military	E of Bumborah Pt	647	646	1,293	219	152	371	43	55	98
Simblist	W of Prince of Wales	109	685	794	18	47	64	41	516	557
Friendship	N of Simblist	817	248	1,065	56	27	82	585	108	693
Charlotte	N of Friendship	15	166	181	2	15	17	0	41	41
Friendship	W of Bumborah Pt	988	515	1,503	97	142	239	464	141	605
Bumborah Pt	S of Friendship	864	1,409	2,272	278	268	547	71	626	696
Bumborah Pt	S of Botany	4,376	3,974	8,349	946	895	1,842	1,334	1,131	2,465
Botany	E of Bumborah Pt	5,238	5,779	11,017	789	1,007	1,795	289	88	377
Botany	W of Bumborah Pt	8,380	8,849	17,229	1,419	1,505	2,924	1,176	1,143	2,319

Table 2-2 – Average Weekday Morning Commuter Peak Hour Traffic Volumes 7:00-8:00am (veh/hour)

Road	Location	Total Vehicles			Rigid Trucks or Buses			Articulated Trucks		
		North or Eastbound	South or Westbound	Two Way	North or Eastbound	South or Westbound	Two Way	North or Eastbound	South or Westbound	Two Way
Military	E of Bumborah Pt	48	25	73	17	9	26	3	3	6
Simblist	W of Prince of Wales	8	55	63	2	4	6	4	45	48
Friendship	N of Simblist	54	18	72	5	2	7	44	6	50
Charlotte	N of Friendship	2	12	14	0	1	1	0	2	2
Friendship	W of Bumborah Pt	54	42	95	8	13	21	31	9	40
Bumborah Pt	S of Friendship	47	122	168	22	22	44	5	55	59
Bumborah Pt	S of Botany	265	315	580	107	44	151	105	89	194
Botany	E of Bumborah Pt	476	330	805	58	31	89	31	8	38
Botany	W of Bumborah Pt	731	513	1,244	94	114	208	89	85	174

Table 2-3 – Average Weekday Evening Commuter Peak Hour Traffic Volumes 4:00-5:00pm (veh/hour)

Road	Location	Total Vehicles			Rigid Trucks or Buses			Articulated Trucks		
		North or Eastbound	South or Westbound	Two Way	North or Eastbound	South or Westbound	Two Way	North or Eastbound	South or Westbound	Two Way
Military	E of Bumborah Pt	44	49	93	16	10	26	2	4	6
Simblist	W of Prince of Wales	6	41	47	1	2	2	2	36	38
Friendship	N of Simblist	55	9	64	3	1	4	41	6	47
Charlotte	N of Friendship	1	8	10	0	0	0	0	2	2
Friendship	W of Bumborah Pt	60	17	77	5	2	7	31	7	38
Bumborah Pt	S of Friendship	60	91	151	13	16	30	4	42	46
Bumborah Pt	S of Botany	314	178	491	49	36	85	81	67	148
Botany	E of Bumborah Pt	317	474	791	29	51	80	10	3	13
Botany	W of Bumborah Pt	448	725	1,173	38	82	119	44	75	118

Table 2-4 – Average Weekday Busiest Hour Traffic Volumes 2:00-3:00pm (veh/hour)

Road	Location	Total Vehicles			Rigid Trucks or Buses			Articulated Trucks		
		North or Eastbound	South or Westbound	Two Way	North or Eastbound	South or Westbound	Two Way	North or Eastbound	South or Westbound	Two Way
Military	E of Bumborah Pt	54	59	114	18	14	32	3	4	7
Simblist	W of Prince of Wales	9	51	60	2	4	6	3	39	43
Friendship	N of Simblist	60	18	79	6	2	8	37	8	45
Charlotte	N of Friendship	1	11	11	0	1	1	0	2	2
Friendship	W of Bumborah Pt	95	41	136	9	12	20	32	8	40
Bumborah Pt	S of Friendship	92	107	199	29	22	51	5	44	50
Bumborah Pt	S of Botany	461	333	793	96	66	162	101	89	190
Botany	E of Bumborah Pt	361	476	837	57	85	142	19	7	26
Botany	W of Bumborah Pt	620	809	1,429	97	144	241	79	94	173

Table 2-5 – Average Weekend Day Traffic Volumes (veh/day)

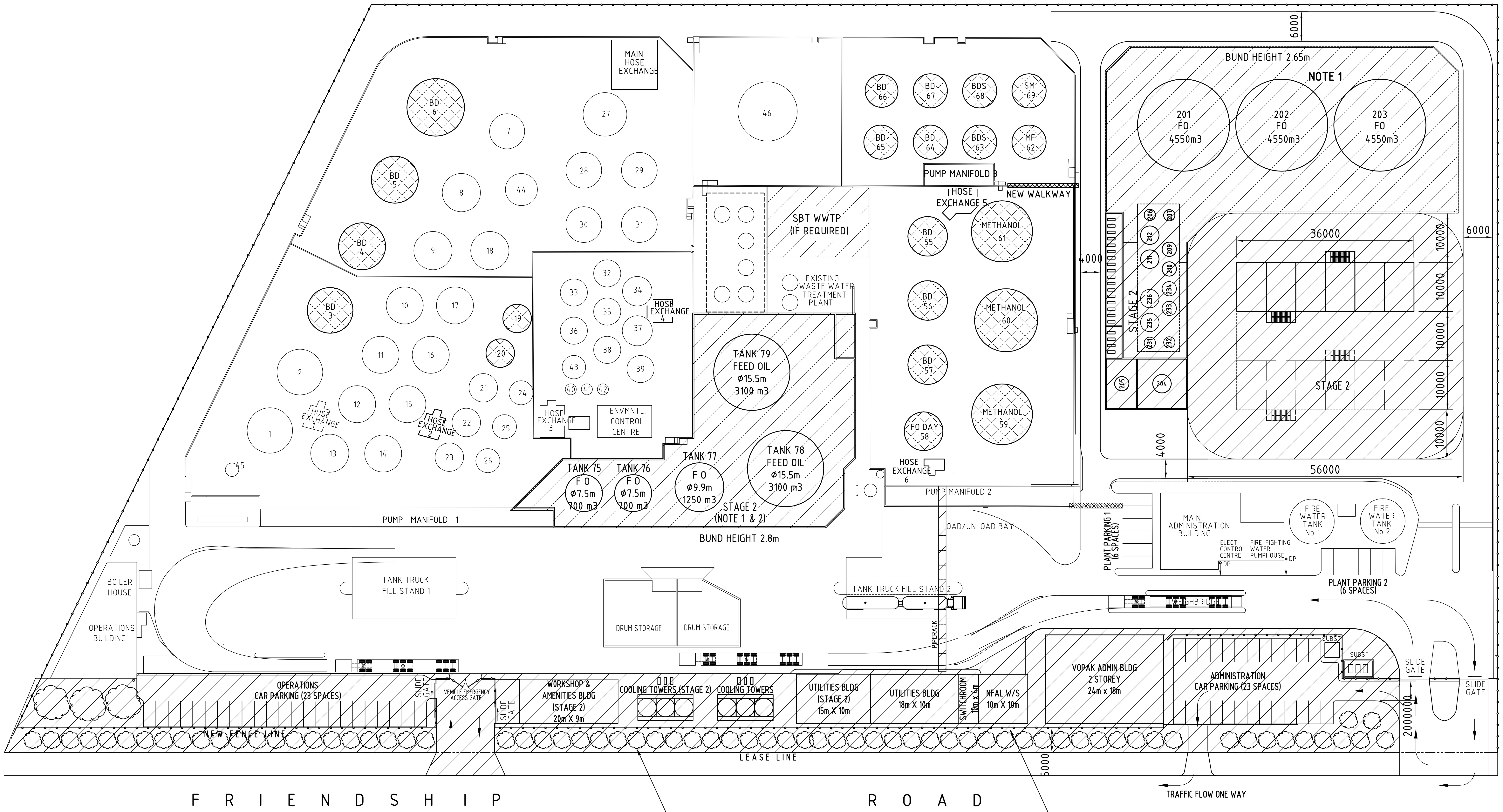
Road	Location	Total Vehicles			Rigid Trucks or Buses			Articulated Trucks		
		North or Eastbound	South or Westbound	Two Way	North or Eastbound	South or Westbound	Two Way	North or Eastbound	South or Westbound	Two Way
Military	E of Bumborah Pt	521	465	986	62	36	97	3	2	5
Simblist	W of Prince of Wales	56	115	171	3	7	10	4	13	17
Friendship	N of Simblist	130	79	209	6	2	8	25	15	39
Charlotte	N of Friendship	2	75	77	1	5	6	1	19	20
Friendship	W of Bumborah Pt	244	110	353	13	8	21	29	18	47
Bumborah Pt	S of Friendship	498	625	1,123	37	74	111	5	13	17
Bumborah Pt	S of Botany	1,311	1,378	2,689	296	328	624	86	79	165

Table 2-6 – Percentage Heavy Vehicles

		Average Weekday	Morning Commuter 7:00-8:00am	Evening Commuter 4:00-5:00pm	Weekday Busiest Hr 2:00-3:00pm	Average Weekend Day
Military	E of Bumborah Pt	36	43	34	34	10
Simblist	W of Prince of Wales	78	87	87	81	16
Friendship	N of Simblist	73	79	79	68	22
Charlotte	N of Friendship	32	22	20	25	33
Friendship	W of Bumborah Pt	56	65	59	45	19
Bumborah Pt	S of Friendship	55	62	50	51	11
Bumborah Pt	S of Botany	52	59	47	44	29
Botany	E of Bumborah Pt	20	16	12	20	
Botany	W of Bumborah Pt	41	41	29	39	

Appendix B

Development Plan



NOMINAL 5m WIDE LANDSCAPING AREA IN ACCORDANCE WITH SYDNEY PORTS "EXEMPT & COMPLYING DEVELOPMENT GUIDELINES FOR PORT BOTANY" DEC 2005

FRONT FENCE LINE MOVED 10M FORWARD TOWARDS FRIENDSHIP ROAD SUBJECT TO A PREVIOUS APPROVAL GRANTED

Storage Details for SBT Stage 1

Item	Tank	Tank	Tank Vol	Comments
	Dia, m	Ht, m	m3	
Feed Oil Tank 1 - Tank 201	18.7	18	4550	
Feed Oil Tank 2 - Tank 202	18.7	18	4550	
Feed Oil Tank 3 - Tank 203	18.7	18	4550	
New Minor Storage Tanks (Tanks 204 to 212, No 208)			440	8 Tanks
Total New Stage 1			14090	
Existing Tanks used for Feed Oil			650	1 Tank
Existing Tanks Used for Biodiesel			8750	13 Tanks
Existing Tanks Used for Methanol			6400	4 Tanks
Existing Tanks Used for Sod Methylate			400	1 Tanks
Existing Tanks Used for Glycerine			400	1 Tanks
Total Reused			**16600**	
Total SBT			**30690**	
Total Site			**50340**	

Storage Details for SBT Stage 2

Item	Tank	Tank	Tank Vol	Comments
	Dia, m	Ht, m	m3	
Feed Oil Tank 4 - Tank 79	15.5	18	3100	
Feed Oil Tank 5 - Tank 78	15.5	18	3100	
Feed Oil Tank 6 - Tank 77	9.9	18	1250	
Feed Oil Tank 7 - Tank 76	7.5	18	700	
Feed Oil Tank 8 - Tank 75	7.5	18	700	
New Minor Storage Tanks (Tanks 231 to 236)			320	6 Tanks
Total Additional New Stage 2			9170	
Existing Tanks Used for Glycerine			400	1 Tank
Total Reused			400	
Total Additional for Stage 2			9570	
Total New Stage 2			**23260**	
Total Reused			**17000**	
Total SBT			**40260**	
Total Site			**59510**	

EXISTING REUSED

NEW ADDITION/MODIFICATIONS

REV	DATE		BY	CHK	CIV/STR	MECH	E/I	PROCESS
G	11/12/06	STAGE TWO TANKS NUMBERED	W.B.	JS				
F	14/11/06	NOTES ADDED FOR LANDSCAPING	A.A.	JS				
E	2/11/06	REVISED FOR ONE WAY TRAFFIC FLOW ON FRIENDSHIP ROAD	W.B.	JS				
D	9/8/06	CAR PARK ENTRY & EXIT SHOWN	AFF	JS				JS
C	3/8/06	NEW STORAGE AREA NEAR WWTP REVISED	AFF	JS				JS
B	30-6-06	ISSUED FOR SUBMISSION	CB	AFF				JS

APPROVED

REFERENCE

DRAWING NUMBER | TITLE

NOTE:

1. DISTANCE FROM FEED OIL TANK TO BUNDWALL IS LESS THAN REQUIRED PER AS 1940. HOWEVER AS FEED OIL TANKS WILL BE INSULATED, SPLASH SHIELDS ARE NOT REQUIRED.

2 STORAGE CAPACITY MAY BE USED FOR BIODIESEL FOR STAGE 1

CONTRACT No.	07E235	
ENG. DESIGN BY	J. SHAH	
DRAWN	W. BRITO	19-05-06
CHECKED		
CIV & STRUCT DESIGN APPR.		
MECHANICAL DESIGN APPR.		
ELECT. & INSTR. DESIGN APPR.		
PROCESS DESIGN APPR.		
WEIGHTS CHECKED		

BILFINGER BERGER Services

VOPAK TERMINALS PTY. LTD.

SYDNEY - BIODIESEL TERMINAL (SBT)
PROPOSED PLANT LAYOUT
(FOR AUTHORITY APPROVALS)

Scale NONE | A1 | BBSA DRG No 07E235-81-003 | REV. G

Appendix C

Crash Statistics

LOCAL GOVERNMENT AREA : Botany Bay

NB: All records for 2005 and beyond are Provisional, incomplete and subject to change. AccNo = YYQxxxxxx

BEAUCHAMP RD

AccNo	Date	Day	Time	Dist	Feature	Loc	Lgt	Sfc	Spd	Aln	DCA	TU	K	I	TU1	S	D	Manoeuvr1	TU2	S	D	Manoeuvr2	Tmp/Haz/Perm Feature	DEGREE
004590581	27-10-2000	Fri	9:45	6m N	**BOTANY RD**	TJN	Off	Dry	60	STR	**301**	3	0	1	**LOR**	1	S	GOING STRT	**TRK**	1	S	STATNARY		Injury
041873444	07-03-2004	Sun	1:25	9m N	**BOTANY RD**	YJN	On	Wet	70	STR	**704**	1	0	0	**WAG**	1	N	GOING STRT	**TRAFFIC SIGNAL POLE**				Other bridge	Non-casualty

Street Crashes *2* **(K) KILLED** *0* **(I) INJURED** *1* **(TU) Traffic Units** *4* **Fatal Crash** *0* **Injury Crash** *1* **Non-casualty Crash** *1*

BOTANY RD

AccNo	Date	Day	Time	Dist	Feature	Loc	Lgt	Sfc	Spd	Aln	DCA	TU	K	I	TU1	S	D	Manoeuvr1	TU2	S	D	Manoeuvr2	Tmp/Haz/Perm Feature	DEGREE
014672251	01-10-2001	Mon	20:49	at	**BEAUCHAMP RD**	TJN	On	Dry	60	STR	**202**	2	0	0	**CAR**	1	W	TURNG RITE	**CAR**	1	E	GOING STRT		Non-casualty
031774888	04-01-2003	Sat	9:45	at	**BEAUCHAMP RD**	TJN	Off	Dry	70	STR	**104**	2	0	0	**VAN**	2	S	TURNG RITE	**CAR**	1	E	GOING STRT	Other bridge	Non-casualty
031780676	04-02-2003	Tue	22:30	at	**BEAUCHAMP RD**	TJN	On	Dry	70	STR	**202**	2	0	0	**CAR**	1	W	TURNG RITE	**CAR**	1	E	GOING STRT		Non-casualty
034856851	20-12-2003	Sat	5:00	at	**BEAUCHAMP RD**	TJN	On	Dry	60	STR	**703**	1	0	0	**CAR**	1	W	GOING STRT	**GUARDRAIL OR FENCE**					Non-casualty
042892374	04-06-2004	Fri	9:40	at	**BEAUCHAMP RD**	TJN	Off	Dry	60	STR	**301**	2	0	1	**CAR**	1	W	GOING STRT	**CAR**	1	W	STATNARY		Injury
043905123	29-07-2004	Thu	18:00	at	**BEAUCHAMP RD**	TJN	On	Dry	70	STR	**104**	2	0	2	**CAR**	2	S	TURNG RITE	**CAR**	1	E	GOING STRT	Crest	Injury
052971235	08-06-2005	Wed	9:00	at	**BEAUCHAMP RD**	TJN	Off	Dry	60	CRV	**309**	2	0	0	**OMV**	1	E	TURNG LEFT	**CAR**	1	E	TURNG LEFT	Steep Grade	Non-casualty
052978725	25-06-2005	Sat	3:20	at	**BEAUCHAMP RD**	TJN	On	Wet	70	STR	**301**	2	0	1	**UTE**	1	E	GOING STRT	**P/C**	1	E	GOING STRT		Injury
042906031	21-04-2004	Wed	15:45	10m W	**BEAUCHAMP RD**	TJN	Off	Dry	70	STR	**301**	2	0	0	**CAR**	1	E	GOING STRT	**CAR**	1	E	STATNARY	Other bridge	Non-casualty
051956099	30-03-2005	Wed	16:35	5m W	**BEAUCHAMP RD**	TJN	Off	Wet	70	CRV	**301**	2	0	0	**CAR**	1	E	GOING STRT	**TAX**	1	E	STATNARY		Non-casualty

Street Crashes *10* **(K) KILLED** *0* **(I) INJURED** *4* **(TU) Traffic Units** *19* **Fatal Crash** *0* **Injury Crash** *3* **Non-casualty Crash** *7*

LGA Crashes *12* **(K) KILLED** *0* **(I) INJURED** *5* **(TU) Traffic Units** *23* **Fatal Crash** *0* **Injury Crash** *4* **Non-casualty Crash** *8*

LOCAL GOVERNMENT AREA : Randwick

NB: All records for 2005 and beyond are Provisional, incomplete and subject to change. AccNo = YYQxxxxxx

BOTANY RD

AccNo	Date	Day	Time	Dist	Feature	Loc	Lgt	Sfc	Spd	Aln	DCA	TU	K	I	TU1	S	D	Manoeuvr1	TU2	S	D	Manoeuvr2	Tmp/Haz/Perm Feature	DEGREE
004597043	15-11-2000	Wed	10:23	25m E	**BEAUCHAMP RD**	DIV	Off	Wet	60	STR	**301**	2	0	0	**LOR**	1	E	GOING STRT	**WAG**	1	E	GOING STRT	Crest	Non-casualty
013668887	02-09-2001	Sun	7:00	50m E	**BEAUCHAMP RD**	DIV	Nil	Dry	50	STR	**301**	2	0	0	**PAN**	1	E	GOING STRT	**4WD**	1	E	GOING STRT		Non-casualty
003576331	28-08-2000	Mon	9:51	at	**BUMBORAH PT RD**	TJN	Off	Dry	60	STR	**202**	2	0	4	**CAR**	1	S	TURNG RITE	**CAR**	1	W	GOING STRT		Injury
004589844	31-10-2000	Tue	7:50	at	**BUMBORAH PT RD**	TJN	Off	Dry	60	STR	**202**	2	0	2	**CAR**	1	E	TURNG RITE	**4WD**	1	W	GOING STRT		Injury
004599782	12-12-2000	Tue	11:30	at	**BUMBORAH PT RD**	TJN	Off	Dry	70	STR	**200**	2	0	0	**TOW**	1	W	GOING STRT	**TRK**	1	E	WAIT TRN R		Non-casualty
004602329	18-12-2000	Mon	14:00	at	**BUMBORAH PT RD**	TJN	Off	Dry	90	STR	**202**	2	0	0	**CAR**	1	E	TURNG RITE	**CAR**	1	W	GOING STRT		Non-casualty
011610582	31-01-2001	Wed	8:10	at	**BUMBORAH PT RD**	TJN	Off	Wet	60	STR	**202**	2	0	0	**SEM**	1	N	TURNG RITE	**CAR**	1	S	GOING STRT		Non-casualty
011621011	06-03-2001	Tue	13:30	at	**BUMBORAH PT RD**	TJN	Off	Dry	60	STR	**202**	2	0	0	**LOR**	1	S	TURNG RITE	**CAR**	1	N	GOING STRT		Non-casualty
012642144	06-04-2001	Fri	13:10	at	**BUMBORAH PT RD**	TJN	Off	Dry	70	CRV	**202**	2	0	0	**CAR**	1	E	TURNG RITE	**LOR**	1	W	GOING STRT		Non-casualty
012634092	27-04-2001	Fri	14:20	at	**BUMBORAH PT RD**	TJN	Off	Dry	70	STR	**202**	2	0	1	**LOR**	1	E	TURNG RITE	**TRK**	1	W	GOING STRT		Injury
013668673	15-06-2001	Fri	6:40	at	**BUMBORAH PT RD**	TJN	On	Dry	60	STR	**202**	2	0	1	**SEM**	1	E	TURNG RITE	**CAR**	1	W	GOING STRT		Injury
024767562	29-10-2002	Tue	16:10	at	**BUMBORAH PT RD**	TJN	Off	Dry	70	STR	**202**	2	0	0	**LOR**	1	E	TURNG RITE	**CAR**	1	W	GOING STRT		Non-casualty
033826382	19-08-2003	Tue	7:00	at	**BUMBORAH PT RD**	TJN	Off	Dry	70	STR	**202**	2	0	0	**CAR**	1	E	TURNG RITE	**CAR**	1	W	GOING STRT		Non-casualty
051951964	17-03-2005	Thu	14:10	at	**BUMBORAH PT RD**	TJN	Off	Wet	70	STR	**202**	2	0	0	**SEM**	1	E	TURNG RITE	**TRK**	1	W	GOING STRT		Non-casualty
024770531	14-12-2002	Sat	16:15	500m E	**BUMBORAH PT RD**	DIV	Off	Dry	60	CRV	**804L**	1	0	1	**CAR**	1	W	GOING STRT	**SIGNPOST & UTILITY POLE**					Injury
024769891	04-12-2002	Wed	8:50	30m W	**BUMBORAH PT RD**	DIV	Off	Dry	70	STR	**202**	2	0	0	**SEM**	1	E	TURNG RITE	**SEM**	1	W	GOING STRT	Driveway or entrance	Non-casualty
011604523	02-01-2001	Tue	18:15	50m W	**BUMBORAH PT RD**	DIV	Off	Dry	70	STR	**0**	2	0	1	**CAR**	1	W	GOING STRT	**PED**	1	S	UNSPEC PED		Injury
042887559	17-05-2004	Mon	7:20	5m W	**BUMBORAH PT RD**	TJN	Nil	Dry	70	STR	**301**	2	0	0	**SEM**	1	E	GOING STRT	**CAR**	1	E	STATNARY		Non-casualty
023745009	26-08-2002	Mon	16:05	30m W	**BUNNERONG RD**	DIV	Off	Wet	60	STR	**703**	1	0	0	**CAR**	1	E	GOING STRT	**SIGNPOST & UTILITY POLE**					Non-casualty
014697661	09-11-2001	Fri	15:00	3m W	**BUNNERONG RD**	TJN	Off	Dry	60	STR	**303**	2	0	1	**CAR**	1	E	GOING STRT	**CAR**	1	E	WAIT TRN R		Injury
024763679	16-11-2002	Sat	21:30	50m W	**BUNNERONG RD**	DIV	On	Dry	60	STR	**701**	1	0	0	**UTE**	1	E	GOING STRT	**NO OBJECT HIT**					Non-casualty
052961516	01-04-2005	Fri	21:49	96m W	**BUNNERONG RD**	OTH	On	Dry	60	CRV	**301**	3	0	1	**CAR**	1	W	GOING STRT	**CAR**	1	W	GOING STRT	Steep Grade	Injury
004593916	08-11-2000	Wed	15:55	3m E	**GATE 2 EN**	DIV	Off	Dry	70	STR	**301**	2	0	1	**SEM**	1	W	GOING STRT	**CAR**	1	W	STATNARY		Injury
043901131	21-07-2004	Wed	13:20	at	**MCCAULEY ST**	TJN	Off	Dry	70	STR	**202**	2	0	0	**LOR**	1	E	TURNG RITE	**CAR**	1	W	GOING STRT	Driveway or entrance	Non-casualty
052976699	21-02-2005	Mon	10:30	at	**MCCAULEY ST**	TJN	Off	Dry	70	STR	**302**	2	0	1	**4WD**	1	E	GOING STRT	**TAX**	1	E	TURNG LEFT		Injury
051946112	08-01-2005	Sat	8:55	40m E	**MCCAULEY ST**	DIV	Off	Wet	70	STR	**202**	2	0	0	**LOR**	1	E	TURNG RITE	**SEM**	1	W	GOING STRT	Driveway or entrance	Non-casualty
043920801	20-05-2004	Thu	13:20	at	**NUMBER 2 GT**	DIV	Off	Dry	70	STR	**406**	2	0	1	**SEM**	1	N	DRWY FRWRD	**4WD**	1	E	GOING STRT	Driveway or entrance	Injury

Street Crashes *27* **(K) KILLED** *0* **(I) INJURED** *15* **(TU) Traffic Units** *52* **Fatal Crash** *0* **Injury Crash** *11* **Non-casualty Crash** *16*

BUMBORAH PT RD

AccNo	Date	Day	Time	Dist	Feature	Loc	Lgt	Sfc	Spd	Aln	DCA	TU	K	I	TU1	S	D	Manoeuvr1	TU2	S	D	Manoeuvr2	Tmp/Haz/Perm Feature	DEGREE
034855164	05-12-2003	Fri	14:30	10m S	**BOTANY RD**	TJN	Off	Wet	60	STR	**301**	2	0	0	**LOR**	1	N	GOING STRT	**CAR**	1	N	GOING STRT		Non-casualty
044943231	06-08-2004	Fri	15:15	200m S	**BOTANY RD**	DIV	Off	Dry	60	STR	**301**	2	0	1	**STA**	1	N	GOING STRT	**SEM**	1	N	STATNARY		Injury
022713258	11-04-2002	Thu	15:50	400m S	**BOTANY RD**	2WY	Off	Dry	40	STR	**406**	2	0	1	**CAR**	1	W	DRWY FRWRD	**SEM**	1	S	GOING STRT	Roadworks / detour /	Injury
042888543	28-04-2004	Wed	5:50	100m N	**FRIENDSHIP RD**	DIV	Nil	Wet	60	STR	**301**	2	0	1	**M/C**	1	S	GOING STRT	**CAR**	1	S	GOING STRT		Injury
021704424	06-01-2002	Sun	14:00	10m N	**MILITARY RD**	TJN	Off	Dry	50	STR	**705**	1	0	1	**M/C**	1	S	GOING STRT	**NO OBJECT HIT**				Roadworks / detour /	Injury

Street Crashes *5* **(K) KILLED** *0* **(I) INJURED** *4* **(TU) Traffic Units** *9* **Fatal Crash** *0* **Injury Crash** *4* **Non-casualty Crash** *1*

BUNNERONG RD

AccNo	Date	Day	Time	Dist	Feature	Loc	Lgt	Sfc	Spd	Aln	DCA	TU	K	I	TU1	S	D	Manoeuvr1	TU2	S	D	Manoeuvr2	Tmp/Haz/Perm Feature	DEGREE
003567144	07-07-2000	Fri	21:30	at	**BOTANY RD**	TJN	On	Wet	70	CRV	**104**	2	0	0	**CAR**	2	E	TURNG RITE	**VAN**	1	N	GOING STRT		Non-casualty
003593543	02-08-2000	Wed	17:50	at	**BOTANY RD**	TJN	On	Dry	60	STR	**706R**	1	0	0	**CAR**	2	E	TURNG LEFT	**GUARDRAIL OR FENCE**					Non-casualty
004606316	15-11-2000	Wed	13:17	at	**BOTANY RD**	TJN	Off	Wet	60	STR	**104**	2	0	0	**CAR**	2	E	TURNG RITE	**WAG**	1	N	GOING STRT		Non-casualty
021721074	31-03-2002	Sun	13:15	at	**BOTANY RD**	TJN	Off	Dry	60	STR	**104**	2	0	2	**CAR**	2	E	TURNG RITE	**CAR**	1	N	GOING STRT		Injury
022721376	04-05-2002	Sat	10:30	at	**BOTANY RD**	TJN	Off	Dry	60	STR	**104**	2	0	0	**TRK**	2	E	TURNG RITE	**UTE**	1	N	GOING STRT		Non-casualty
023737048	24-07-2002	Wed	20:20	at	**BOTANY RD**	TJN	On	Wet	60	CRV	**104**	2	0	0	**CAR**	2	E	TURNG RITE	**CAR**	1	N	GOING STRT		Non-casualty
033833409	13-09-2003	Sat	15:00	at	**BOTANY RD**	TJN	Off	Dry	60	STR	**104**	2	0	0	**CAR**	2	E	TURNG RITE	**CAR**	1	N	GOING STRT		Non-casualty
034856492	21-11-2003	Fri	11:40	at	**BOTANY RD**	TJN	Off	Dry	60	CRV	**101**	3	0	1	**CAR**	2	E	GOING STRT	**CAR**	1	N	GOING STRT		Injury
034859207	21-11-2003	Fri	0:40	at	**BOTANY RD**	TJN	On	Wet	60	CRV	**803L**	1	0	2	**CAR**	1	S	GOING STRT	**SIGNPOST OR PARKING METER**				Steep Grade	Injury
034855121	03-12-2003	Wed	11:00	at	**BOTANY RD**	TJN	Off	Dry	60	STR	**104**	2	0	0	**CAR**	2	S	TURNG RITE	**LOR**	1	E	GOING STRT		Non-casualty
041868675	21-02-2004	Sat	22:00	at	**BOTANY RD**	TJN	On	Dry	60	STR	**101**	2	0	1	**4WD**	2	E	GOING STRT	**CAR**	1	N	GOING STRT		Injury
041871174	09-03-2004	Tue	11:45	at	**BOTANY RD**	TJN	Off	Dry	60	STR	**104**	2	0	1	**CAR**	2	E	TURNG RITE	**CAR**	1	N	GOING STRT		Injury
042884907	10-05-2004	Mon	9:00	at	**BOTANY RD**	TJN	Off	Dry	60	STR	**104**	2	0	0	**CAR**	2	E	TURNG RITE	**CAR**	1	N	GOING STRT		Non-casualty
043901597	04-07-2004	Sun	12:35	at	**BOTANY RD**	TJN	Off	Dry	60	CRV	**104**	2	0	0	**CAR**	2	E	TURNG RITE	**CAR**	1	N	GOING STRT		Non-casualty
044929169	14-11-2004	Sun	12:30	at	**BOTANY RD**	TJN	Off	Dry	60	CRV	**104**	2	0	4	**CAR**	2	E	TURNG RITE	**CAR**	1	N	GOING STRT		Injury
044934387	12-12-2004	Sun	11:50	at	**BOTANY RD**	TJN	Off	Dry	60	CRV	**101**	2	0	0	**CAR**	2	E	GOING STRT	**CAR**	1	N	GOING STRT		Non-casualty
013666585	22-09-2001	Sat	18:50	100m S	**BOTANY RD**	DIV	On	Dry	60	CRV	**804R**	1	0	0	**CAR**	1	S	GOING STRT	**EMBANKMENT & UTILITY POLE**					Non-casualty
004587237	10-10-2000	Tue	10:00	at	**MILITARY RD**	TJN	Nil	Dry	60	CRV	**107**	2	0	0	**SEM**	2	E	TURNG LEFT	**CAR**	1	N	GOING STRT		Non-casualty
041876847	28-03-2004	Sun	15:00	at	**MILITARY RD**	TJN	Nil	Dry	60	CRV	**202**	2	0	3	**CAR**	1	S	TURNG RITE	**CAR**	1	N	GOING STRT		Injury
043919592	27-09-2004	Mon	6:30	at	**MILITARY RD**	XJN	Off	Dry	60	STR	**202**	2	0	0	**WAG**	1	S	TURNG RITE	**TRK**	1	N	GOING STRT	Steep Grade	Non-casualty

Street Crashes ***20*** **(K) KILLED** ***0*** **(I) INJURED** ***14*** **(TU) Traffic Units** ***38*** **Fatal Crash** ***0*** **Injury Crash** ***7*** **Non-casualty Crash** ***13***

FRIENDSHIP RD

AccNo	Date	Day	Time	Dist	Feature	Loc	Lgt	Sfc	Spd	Aln	DCA	TU	K	I	TU1	S	D	Manoeuvr1	TU2	S	D	Manoeuvr2	Tmp/Haz/Perm Feature	DEGREE
044921421	11-10-2004	Mon	11:30	100m W	**BUMBORAH PT RD**	2WY	Off	Dry	60	STR	**202**	2	0	0	**LOR**	1	E	TURNG RITE	**WAG**	1	W	GOING STRT	Driveway or entrance	Non-casualty
022727889	13-05-2002	Mon	19:20	50m N	**CHARLOTTE RD**	2WY	On	Dry	60	CRV	**801L**	1	0	1	**M/C**	1	N	GOING STRT	**NO OBJECT HIT**					Injury
033831952	07-09-2003	Sun	8:40	150m S	**CHARLOTTE RD**	2WY	Off	Dry	60	CRV	**805**	1	0	1	**P/C**	1	N	GOING STRT	**NO OBJECT HIT**					Injury

Street Crashes ***3*** **(K) KILLED** ***0*** **(I) INJURED** ***2*** **(TU) Traffic Units** ***4*** **Fatal Crash** ***0*** **Injury Crash** ***2*** **Non-casualty Crash** ***1***

MILITARY RD

AccNo	Date	Day	Time	Dist	Feature	Loc	Lgt	Sfc	Spd	Aln	DCA	TU	K	I	TU1	S	D	Manoeuvr1	TU2	S	D	Manoeuvr2	Tmp/Haz/Perm Feature	DEGREE
014672807	18-10-2001	Thu	16:00	1m E	**BUMBORAH PT RD**	TJN	Nil	Dry	60	STR	**301**	2	0	1	**CAR**	1	S	GOING STRT	**M/C**	1	S	GOING STRT		Injury
012632327	20-04-2001	Fri	20:10	50m E	**BUMBORAH PT RD**	2WY	Nil	Wet	60	CRV	**405**	1	0	0	**CAR**	1	W	OTHR REVRS	**UTILITY POLE**					Non-casualty
014677049	17-10-2001	Wed	15:40	at	**NUMBER 2 HN**	2WY	Off	Dry	60	STR	**202**	2	0	0	**CAR**	1	W	TURNG RITE	**4WD**	1	E	GOING STRT	Driveway or entrance	Non-casualty

Street Crashes ***3*** **(K) KILLED** ***0*** **(I) INJURED** ***1*** **(TU) Traffic Units** ***5*** **Fatal Crash** ***0*** **Injury Crash** ***1*** **Non-casualty Crash** ***2***

LGA Crashes ***58*** **(K) KILLED** ***0*** **(I) INJURED** ***36*** **(TU) Traffic Units** ***108*** **Fatal Crash** ***0*** **Injury Crash** ***25*** **Non-casualty Crash** ***33***

SUMMARY OF ACCIDENT FACTORS

Type Of Accident

Car Accident	60	85.7%
Light Truck Accident	7	10.0%
Rigid Truck Accident	11	15.7%
Articulated Truck Acc	11	15.7%
'Heavy Truck Accident	(21)	(30.0%)
Bus Accident	1	1.4%
"Heavy Vehicle Accident	(21)	(30.0%)
Emergency Vehicle Acc	1	1.4%
Motorcycle Accident	4	5.7%
Pedal Cycle Accident	2	2.9%
Pedestrian Accident	1	1.4%

' Rigid or Artic. Truck, " Heavy Truck or Bus

 # These categories are NOT mutually exclusive

Location Type:

*Intersection Crash	50	71.4%
Non-intersection Crash	20	28.6%

** Up to 10 metres from an Intersection*

~ 0730-0930 or 1430-1700 on school days

Collision Type:

Single Vehicle Accident:	12	17.1%
Multi-Vehicle Accident:	58	82.9%

Road Classification:

Freeways/Motorways	0	0.0%
State Highways	0	0.0%
Other Classified Roads	63	90.0%
Unclassified Roads	7	10.0%

Contributing Factors:

Speed involved	11	15.7%
Fatigue involved	4	5.7%
^Alcohol involved	2	2.9%

Weather:

Fine	52	74.3%
Rain	14	20.0%
Overcast	4	5.7%
Fog or Mist	0	0.0%
Other	0	0.0%

Road Surface Condition:

Wet	15	21.4%
Dry	55	78.6%
Snow or Ice	0	0.0%

Natural Lighting:

Dawn	2	2.9%
Daylight	52	74.3%
Dusk	1	1.4%
Darkness	15	21.4%

Accident BCA Group:

Intersection, adjacent approaches	17	24.3%
Head on (not overtaking)	0	0.0%
Opposing vehicles; turning	20	28.6%
U-turn	0	0.0%
Rear-end	16	22.9%
Lane change	0	0.0%
Parallel lanes; turning	1	1.4%
Vehicle leaving driveway	2	2.9%
Overtaking; same direction	0	0.0%
Hit parked vehicle	0	0.0%
Hit railway train	0	0.0%
Pedestrian crossing road	0	0.0%
Permanent obstruction on road	0	0.0%
Hit animal	0	0.0%
Off road on straight	1	1.4%
Off road on straight, hit object	3	4.3%
Out of control on straight	1	1.4%
Off road on curve	1	1.4%
Off road on curve, hit object	3	4.3%
Out of control on curve	1	1.4%
Other accident type	4	5.7%

^ This data is Incomplete and Subject to Change

` Partial year

Speed Limit:

40 km/h or less	1	1.4%
50 km/h zone	2	2.9%
60 km/h zone	44	62.9%
70 km/h zone	22	31.4%
80 km/h zone	0	0.0%
90 km/h zone	1	1.4%
100 km/h zone	0	0.0%
110 km/h zone	0	0.0%

ACCIDENTS 70

Fatal accident	0	0.0%
Injury accident	29	41.4%
Non-casualty crash	41	58.6%

Time Groups:

			% of Day
00:01 - 02:59	2	2.9%	12.5%
03:00 - 04:59	1	1.4%	8.3%
05:00 - 05:59	2	2.9%	4.2%
06:00 - 06:59	2	2.9%	4.2%
07:00 - 07:59	4	5.7%	4.2%
08:00 - 08:59	4	5.7%	4.2%
09:00 - 09:59	6	8.6%	4.2%
10:00 - 10:59	4	5.7%	4.2%
11:00 - 11:59	6	8.6%	4.2%
12:00 - 12:59	2	2.9%	4.2%
13:00 - 13:59	6	8.6%	4.2%
14:00 - 14:59	5	7.1%	4.2%
15:00 - 15:59	8	11.4%	4.2%
16:00 - 16:59	5	7.1%	4.2%
17:00 - 17:59	1	1.4%	4.2%
18:00 - 18:59	3	4.3%	4.2%
19:00 - 19:59	1	1.4%	4.2%
20:00 - 21:59	6	8.6%	8.3%
22:00 - 24:00	2	2.9%	8.3%

Street Lighting Off/Nil: % of Dark
1 of 15 in Darkness (6.7%)

CASUALTIES 41

Killed	0	0.0%
Injured	41	100.0%

Casualties		Accident
3	^2005	7
15	2004	18
4	2003	10
6	2002	11
5	2001	13
8	`2000	11

~ School Travel Time

Involvement: 15 21.4%

incl 1 in 40k or (6.7%)

McLean Period:

			%Week
A	8	11.4%	17.9%
B	5	7.1%	7.1%
C	22	31.4%	17.9%
D	2	2.9%	3.6%
E	5	7.1%	3.6%
F	11	15.7%	10.7%
G	6	8.6%	7.1%
H	4	5.7%	7.1%
I	1	1.4%	12.5%
J	6	8.6%	10.7%

Day of the Week :

Monday	10	14.3%
Tuesday	9	12.9%
Wednesday	14	20.0%
Thursday	5	7.1%
Friday	13	18.6%
Saturday	10	14.3%
Sunday	9	12.9%
WEEKDAY	51	72.9%
WEEKEND	19	27.1%

Holiday Periods

New Year	0	0.0%
Aust. Day	0	0.0%
Easter	1	1.4%
Anzac Day	0	0.0%
Queen's BD	0	0.0%
Labour Day	1	1.4%
Christmas	0	0.0%
January SH	4	5.7%
Easter SH	4	5.7%
June/July SH	2	2.9%
Sept./Oct. SH	2	2.9%
December SH	1	1.4%

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	K McNatty	G Hughes		G Hughes		08/06
1	K McNatty	G Hughes		G Hughes		11/06/07

Appendix F

Air study

GHD Pty Ltd

Vopak Terminals Sydney Pty Ltd and Natural Fuels Australia Ltd

Report for EA - Sydney Biodiesel Terminal

Air Assessment

January 2007

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

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Executive Summary

GHD Pty Ltd (GHD) was commissioned by Vopak Terminals Sydney Pty Ltd (Vopak) and Natural Fuels Australia Limited (NFAL), as part of an environmental impact assessment (EIA) to assess the air quality impact of a proposed processing plant to manufacture biodiesel. The basis of the assessment was to determine emissions to air from the proposed development during construction and once operational, and ascertain whether these emissions would have an adverse affect on local air quality.

The proposal is the construction and operation of a biodiesel processing plant, storage tanks and associated infrastructure. Vopak would provide storage and distribution infrastructure, utilities and infrastructure management facilities. NFAL will provide the biodiesel processing plant and associated infrastructure.

The development is to be achieved in two stages. During the first stage, a single train biodiesel plant and associated infrastructure, storage and utilities would be provided. A second train of the same capacity and the necessary additional facilities will be provided during stage two. This air quality assessment is based on the operation of a two-train biodiesel plant.

Meteorological data from Sydney Mascot Airport for 1997 (8 520 hours) has been obtained and utilised within this assessment. Mascot Airport is located approximately 5 km northwest of the facility and is therefore considered to show site-representative meteorology for the Port Botany site.

The dominant source of air emissions during the construction phase of the project will be dust generated from surface operational activity during construction; however, with proper construction management, these emissions are expected to be negligible, especially because roads are sealed, the site is located in an existing industrial zone and the nearest residential premises is located over 1 km away.

During operation, odorous emissions from the tank storage of biodiesel and feedstock (vegetative oils) are expected to be negligible due to the low vapour pressures (<2mm Hg) of these substances. The anticipated odour emission from the proposed facility, with the highest potential to cause off-site odour impact, is expected to be the discharge of methanol vapour because methanol has a relatively high vapour pressure and is highly odorous. Results of the air dispersion modelling indicate that compliance to the air quality impact assessment criterion for methanol is readily achieved with the air quality impact assessment criterion for methanol.

Based on the results of this assessment and the fact that the nearest sensitive receptor is greater than one km away, it can be concluded that odorous emissions from the proposed facility will not have a significant incremental affect on local air quality.

These conclusions are based on the limitations of this assessment presented in Section 7 of this report.

1. Introduction

GHD Pty Ltd (GHD) was commissioned by Vopak Terminals Sydney Pty Ltd (Vopak) and Natural Fuels Australia Limited (NFAL), as part of an environmental impact assessment (EIA) to assess the air quality impact of a proposed processing plant to manufacture biodiesel. The basis of the assessment was to determine emissions to air from the proposed development during construction and once operational, and ascertain whether these emissions would have an adverse affect on local air quality.

1.1 Background

Vopak Terminals Sydney Pty Ltd and Natural Fuels Australia Ltd (NFAL) (together known as 'the proponent') are proposing to construct and operate a biodiesel facility within an existing chemical and petroleum handling facility at Port Botany NSW. The existing facility is owned and operated by Vopak Terminals Sydney Pty Ltd. The proposal would utilise existing infrastructure and expand the Vopak site for the purpose of producing, storing and distributing biodiesel.

Vopak Terminals Sydney Pty Ltd is a company that provides bulk liquid services (storage, transport, bulk handling, packaging and distribution) and access to distribution facilities to independent operators and large corporations. These bulk liquids include fuel-based products used for energy and transport functions throughout NSW.

NFAL was incorporated in February 2005. The company was formed to build a sustainable and renewable energy business in emerging yet strong alternative energy growth markets.

The proponent operates two bulk liquid storage terminals in Port Botany, approximately 13 km south of the Sydney CBD. The first is known as the Site A Terminal and is located at 49 Friendship Road. The second facility, known as the Site B Terminal, is located at 20 Friendship Road. Both sites store petroleum products. The proposal would take place upon land at the Site A Terminal but would integrate with other existing facilities, including the Site B Terminal.

The proposed biodiesel facility would be located on a 0.8 hectare parcel of land within the boundaries of the Site A Terminal on land described as Lot 5 DP 635791 at 49 Friendship Road Port Botany. The proposal also includes utilisation of existing Vopak Site A infrastructure and integration into the wider regional fuel distribution network, including Vopak Site B, via the use of pipeline transfers.

1.2 Scope of Work

This assessment for air pollutant emissions from the operation of the proposed biodiesel plant comprises the following components of work:

- Description of the site and operation process;
- Compilation of an emissions inventory from sources associated with the construction and operation of the proposed Biodiesel facility;
- Analysis of the local meteorology;
- Dispersion modelling using AUSPLUME to produce contours of predicted ground level concentrations of air pollutants identified in the emissions inventory; and
- Discussion of air quality impacts for all relevant pollutants.

2. Description of Site and Operation

2.1 Site Description

2.1.1 Site History

The existing Site A Terminal was established in 1979 to serve an identified need for an independent bulk liquid chemical distribution facility in the greater Sydney Region. The facility caters for the distribution of bulk liquid chemicals to chemical manufacturers, oil companies, and chemical traders who sell into the local markets.

The current facility is also integrated into a wider network of petroleum and liquid fuels transport infrastructure with other Vopak facilities (Vopak Site B), oil industry corporations including Caltex Banksmeadow and Caltex Kurnell, Terminals Pty Ltd, and the Sydney Ports Corporation. Consequently, Vopak infrastructure is a critical part of the network to ensure other bulk liquid and cargo distribution facilities in the immediate area operate in an efficient and environmentally safe manner.

2.1.2 Site location

The Site A Terminal is a four hectare site located at 49 Friendship Road, Port Botany and comprises:

- Lot 3 DP 635791 (2.477 hectares);
- Lot 4 DP 635791 (0.7580 hectares); and
- Lot 5 DP 635791 (0.7792 hectares).

Vopak is currently negotiating the extension of its lease with the Sydney Ports Corporation for a 20 year option over the site.

Figure 1 Location of the proposal

The Vopak Site A Terminal is located on relatively flat, stable land with few undisturbed natural features and to the south of Brotherson Dock, a container dock facility (where Patrick Stevedores, Port Botany Container Park and Port Botany Transfer Station, amongst others, are located), refer to Figure 1.

Nearby suburbs include Banksmeadow, Botany, Matraville, Phillip Bay, La Perouse, Little Bay and Chifley. These suburbs are characterised by a mix of port related and industrial uses, residential and commercial services. Kingsford Smith Airport is located nearby, making the area an important gateway transfer point for Sydney, NSW and Australia to the global economy.

2.2 Biodiesel Facility Operation - Overview

2.2.1 Biodiesel

Biodiesel is a form of biofuel – a fuel that is derived from a renewable source of organic material that can be beneficially used for energy purposes. Biodiesel is a liquid made from animal fats and/or vegetable oils, however in this case, the biodiesel will only be made from vegetable oils. The production of biodiesel involves a process of transesterification, which includes mixing of vegetable oils with alcohol (e.g. methanol) in the presence of a suitable alkaline catalyst (such as sodium methylate).

After the chemical reaction takes place within the mixing trains, the product is separated within a settler tank and allowed to separate into an ester-rich phase (which is upgraded to biodiesel by washing with water) and a denser glycerine (which is vacuumed dried, distilled and refined to pharmaceutical grade glycerine).

The proposed Biodiesel plant is only applicable to the vegetable oils (e.g. palm oil / palmolein). The process is not designed for, nor can it accommodate, waste fats/oils from recovery operations of food outlets, sewage treatment plants etc.

2.2.2 General Description

The proposal is the construction and operation of a biodiesel processing plant, storage tanks and associated infrastructure. Vopak would provide storage and distribution infrastructure, utilities and infrastructure management facilities. NFAL will provide the biodiesel processing plant and associated infrastructure.

The proposal will require refurbishment of the Vopak Site A Terminal (Lots 3 and 4) and the re-use of some of the existing tanks, pumps, loading/unloading facilities, fire protection system and other miscellaneous facilities. In addition, the proposal will require construction of a biodiesel processing plant and associated facilities on a cleared portion of the Vopak Site A Terminal (Lot 5).

The development is to be achieved in two stages. During the first stage, a single train biodiesel plant and associated infrastructure, storage and utilities would be provided. A second train of the same capacity and the necessary additional facilities will be provided during stage two.

This air quality assessment is based on the operation of a two-train biodiesel plant.

2.3 Biodiesel Facility - Unit Operations

2.3.1 Biodiesel Processing Plant Train

The processing plant would consist of five units integrated into one plant structure to perform the following processes in order to create biodiesel:

- Transesterification;
- Methylester drying;
- Glycerin water treatment;
- Glycerin water evaporation; and
- Glycerin distillation.

The processing plant would occupy an area of 17 m x 36.5 m. The majority of equipment, fittings and pipes would be stainless steel and operate under low temperatures and pressures. An example of an existing biodiesel plant process train in Darwin, NT is depicted in Figure 2.

The Lurgi (Biodiesel) Plant Module is of the order of 15m in height but the design includes distillation columns, which will be of the order of 30m in height.

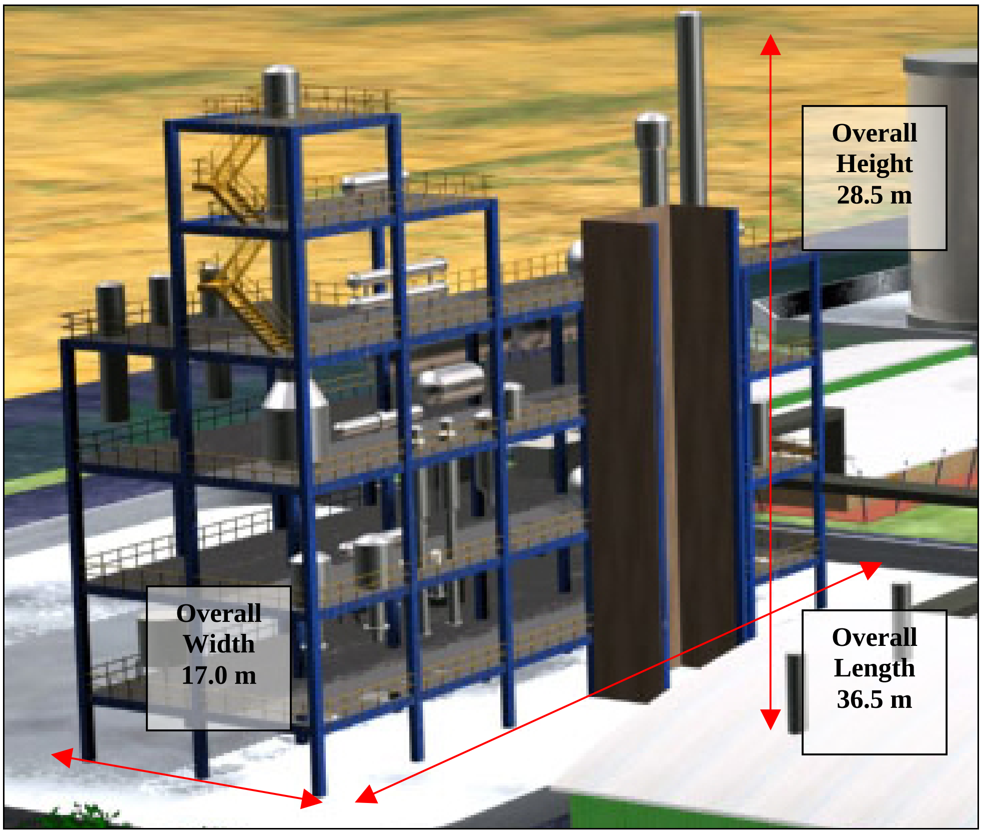


Figure 2 Lurgi Pacific designed biodiesel plant process train in Darwin, NT

2.3.2 Storage Tanks

A significant proportion of the existing Site A storage tankage is to be utilised for the stage one development. Stage two of the project would require the removal and replacement of several existing Site A tanks with larger tanks.

Overall, the proposal includes 12 new tanks and 20 reused tanks. Tank height ranges from 6m to 18m and tank volumes range from 20m^3 to of 4,550 m^3. Total storage capacity of the proposal is approximately 30,700 m^3. The products to be stored in tanks include:

- Feed stock (e.g. palm oil, palm kernel oil and canola oil);
- Hydrochloric acid and liquid caustic (e.g. HCI Acid);
- Glycerine feed inputs;
- Biodiesel (B100);
- Pharmaceutical glycerine;
- Methanol; and
- Sodium methylate.

2.4 Production Rate

The single plant train will be designed for a continuous 24-hour production of 360 tonnes of biodiesel per day, equating to a total of approximately 120,000 tonnes per year (143 ML/year). Approximately 12,200 tonnes per year of pharmaceutical grade glycerine will also be produced from the process. A similar plant train (stage two) would be installed in future.

The processing plant would produce B100 (indicating 100% biodiesel) grade of biodiesel. The biodiesel would then be transferred to Vopak Site B tank farm area and stored in a dedicated storage tank. From this tank, the biodiesel would be exported by ship or electronically blended with mineral diesel as per customer requirements via the loading rack at the Site B road tanker loading gantry.

2.5 Air Emission Control Systems

The proposed biodiesel plant design incorporates a wet scrubber system to abate methanol emissions to air. The management of potential emissions to air from the associated storage tank farm will utilise a pre-existing vapour emission control system (VECS) situated on Vopak Site A.

2.5.1 Vapour Emission Control System

The VECS was designed to effectively capture and process vapour emissions of volatile organic compounds (VOC) from the normal operations of the Vopak terminal, with a view to reducing overall chemical vapour emissions to atmosphere and providing a safer work environment for the operators of the facility. The VECS is located in the Environmental Control Centre (near tank No. 39) on Site A and is designated as discharge point to air No. 1 in the Environment Protection Licence No. 6581.

The sources of VOC emission that are captured and ducted to the VECS include the normal thermal breathing of storage tanks and displaced vapour emissions through the primary pressure vent of the storage tank caused by filling the tank, usually in ship to shore transfer operations; displaced vapours from truck filling operations; residual vapours from storage tanks purged out during tank cleaning operations, via the tank purging facility of the VECS.

The VECS is in principle a twin-bed activated carbon adsorber unit used primarily for the removal of solvents, including methanol, from the captured gas stream. When one of the activated carbon beds has been loaded to the extent that it is approaching saturation (i.e. 'break-through'), it is taken off-line and regenerated using steam, and the other activated carbon bed is brought on-line.

The existing VECS system is documented by the manufacturer as being compatible with Methanol vapours and is also approved by DEC since 1979. The proponent would utilise the VECS system for the Methanol /Sodium Methylate storage tanks. The VECS system is designed to handle both ship discharge situations and normal storage tank breathing.

GHD was advised that the VECS is capable of reducing vapour emissions, in particular methanol emissions, to atmosphere by 90%.

Note that because of the projected change in product storage profile on this site as a result of the proposal, the 'vapour loading' on the VECS is anticipated to be smaller/more consistent than the present case.

A schematic flow diagram typical of the VECS is shown in Figure 3.

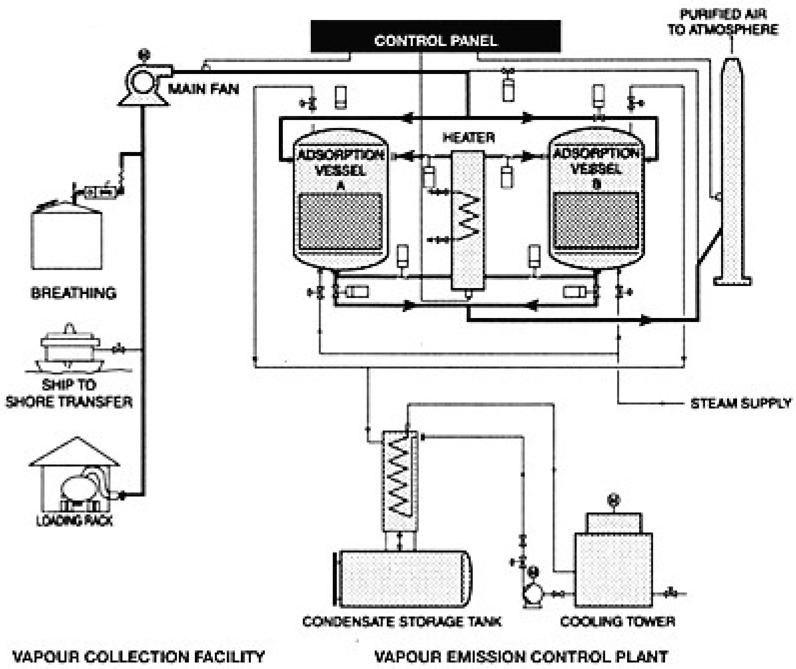


Figure 3 VECS Schematic Diagram

Methanol Storage Tanks and Transfer Points

As methanol would be imported by ship, a 5,000-6,000m^3 storage facility would be required. Three existing 2,000m^3 tanks have been allocated. Methanol is a flammable substance, and the allocated existing tanks are designed for storage of flammable liquids with suitable fire protection facilities and nitrogen blanketing provision. The existing 400m^3 tank 62 would be used as a day tank for methanol. The methanol day tank has suitable fire protection facilities and nitrogen blanketing.

Hence methanol tanks will be fitted with nitrogen blanketing systems and the existing/new tanks for methanol allows for a design pressure of 7kPa (working pressure of 5 kPa) which is generally higher than most API 650 type tanks used in the terminal industry. Hence, the vapour emissions during storage are minimised. Vapours are ducted to the VECS for treatment.

The transfers from the methanol storage tanks to the biodiesel plant are all hard piped (i.e. no hose or make/break connections) and therefore there will be no vapour emissions as a result of these transfers.

Biodiesel Storage Tanks and Transfer Points

Biodiesel and raw vegetable oil transfer points and storage tanks will not be connected to the VECS because the long-chain compounds associated with these substances are not compatible with the VECS, these tanks will breathe directly to atmosphere via pressure/vacuum vents. However, given that these types of liquids are not volatile (vapour pressure <2 mm Hg at 25°C) under the conditions at which they are stored, volatile emissions from these storage tanks will be minimal. Furthermore, biodiesel, vegetable oils, hydrochloric acid, fatty matter and caustic Soda are not VOCs by definition and therefore do not require vapour emission controls.

Road Tankers

Products delivered by tanker truck include:

- Sodium Methylate @ 4,000 tonnes per year (18 ISO containers per month);
- Caustic Soda @ 400 tonnes per year (1 ISO container every 3 weeks); and
- Hydrochloric Acid @ 2,400 tonnes per year (10 ISO containers per week).

Only biodiesel would be loaded from the Site B road tanker area once transferred from Site A via pipeline. The air quality impacts of the Site B operations have been previously assessed, this included the use of biodiesel as part of the Site B B3 expansion.

Road tanker equipment at Site B includes a vapour recovery unit, suitable for gasoline, which has been installed close to the loading gantry. The unit has been sized for a five bay simultaneous gasoline loading operation.

Hydrocarbon vapours from the road tanker compartments are ducted to an underground condensate knock out tank and then to the vapour recover unit for recovery. Recovered product is pumped to a day tank or bulk tank. Also product from the day tank or bulk tank is cycled through the vapour recover unit as an absorbing medium for any hydrocarbon vapours. A minimum level is kept in the day or bulk tank to provide supply to the vapour recover unit.

The capacity of the vapour recovery unit is based on the number of road tankers loading simultaneously. The maximum instantaneous flowrate is 32 m^3 / min.

Product is recovered by carbon absorption in either of two absorption vessels. Regeneration of these vessels is achieved by vacuum regeneration followed by vacuum air purge. While one vessel is on line the other is undergoing regeneration.

Hydrocarbon vapours from the vacuum pump are passed to a product flushed packed absorber column where they are absorbed by the product and the discharge is pumped back to storage. The small amount of vapour that is not absorbed is recycled to the carbon absorber that is on-line.

Liquid hydrocarbon from the vacuum pump is discharged to a condenser where it is cooled by the product circulating from the product storage tank.

2.5.2 Biodiesel Plant - Methanol Scrubber

A two-stage wet scrubber system is incorporated into the design of each biodiesel plant train, which will be used to ensure that air emissions generated during the operation of the biodiesel plant will be minimal. All head spaces in the reaction vessels, the catalyst pump tank and the methanol pump tank will be connected to a process ventilation system and purged with nitrogen gas. The purged gases will be directed to a dedicated water scrubbing system. Any methanol vapours that are remaining from the glycerine evaporation and distillation process will be drawn through steam injectors, condensers and a final water-ring seal pump which itself is an effective scrubbing system.

GHD was advised that the methanol scrubber, associated with each biodiesel processing plant train, is capable of reducing methanol emissions to atmosphere by >95%.

2.6 Plant layout

The general layout includes defined areas and boundaries for storage tanks, pumps, transfer points and the biodiesel processing unit. The processing plant would be located on a cleared plot of land on the southwestern end of the Site A Terminal.

The site layout plan is provided in Appendix A.

3. Emissions Inventory

The initial steps for assessing the potential impacts from the proposed biodiesel facility were to develop an emissions inventory for both the construction and operational phases of the proposed development, and to gain an understanding of the existing ambient air quality in the vicinity.

3.1 Construction Phase

The dominant source of air emissions during the construction phase of the project will be dust generated from surface operational activity during construction; however, with proper construction management, the impact of these emissions is expected to be negligible, especially because roads are sealed, the site is located in an existing industrial zone and the nearest residential premises is located over 1 km away.

3.2 Operational Phase

The primary air quality impact associated with the operation of the proposed biodiesel plant will be emissions of odorous volatile organic compounds (VOC). Other air emissions such as combustion products emitted from the natural gas fired boilers will be minimal.

3.2.1 Odour

Odorous emissions from the tank storage of biodiesel and feedstock (vegetative oils) are expected to be negligible due to the low vapour pressures (<2mm Hg) of these substances. Tanks used to store these substances will have a pressure relief valve on the vent and will breathe directly to atmosphere when the pressure inside exceeds the design value within the storage tank. Theses tanks are only expected, if at all, to vent during the hotter months of the year when thermal expansion of air in the tank headspace occurs, and during tank filling, both of which will only occur intermittently. The emitted odour, if detectable, is expected to be low in strength and inoffensive because only vegetative oils, as opposed to animal fat, will be used as feedstock.

Additionally, all emissions from the biodiesel process operations will be conducted in a closed system, serviced by a ventilation system that discharges to a two-stage wet scrubber.

Emissions from the above sources are therefore not considered further in this assessment.

The anticipated odour emission from the proposed facility, with the highest potential to cause off-site odour impact, is expected to be the discharge of methanol vapour because methanol has a relatively high vapour pressure and is odorous.

Therefore, there are two potential odour sources that will be included in this assessment, namely, (i) the methanol scrubber exhaust, and (ii) the methanol storage tanks (via the VECS). The potential emissions from these sources are detailed below.

Wet (Methanol) Scrubber

Nitrogen, air and water vapour are the pollutants expected to be emitted from the scrubber vent. The use of demineralised water or condensate as the final wash stream should minimise any methanol in this stream. The methanol emissions will be low because the bulk of the methanol is recovered via the methanol recovery column and recycled in the process. All process equipment vents are discharged via the vent scrubber.

GHD was advised that the maximum methanol load on each methanol scrubber is estimated to be one kg per hour. This is considered by the proponent to be a conservative estimate, as it does not represent a continuous value for long-term plant operation. The methanol removal efficiency of the scrubber is expected to be in excess of 95% due to methanol's high solubility in water, thus the methanol emission rate from each methanol scrubber exhaust stack is estimated to be 0.05 kg per hour (438 kg per year). Table 1 shows the source release parameters and emission rates of the methanol scrubber.

Table 1 Source Release Parameters and Emission Rates – Methanol Scrubber

Source	Stack Height (m)	Stack Diameter (m)	Exit Velocity (m/s)	Exit Temp. (°C)	Emission Rate (kg/hr)
Train 1 - Methanol Scrubber	18	0.05	2.4	25 [1]	0.05
Train 2 - Methanol Scrubber	18	0.05	2.4	25 [1]	0.05

(1) Ambient temperature

VECS - Methanol Storage Tanks

GHD was advised that the total methanol load sent to the VECS for treatment from the required methanol storage tanks would be approximately 5600 kg per year. This estimate is based on tank emission modelling undertaken by Vopak using the computer software TANKS[1], which is a model developed by the US EPA and is designed for use by local, state, and federal agencies, environmental consultants, and others who need to calculate air pollutant emissions from organic liquid storage tanks.

The methanol removal efficiency of the activated carbon bed is estimated to be in excess of 90%, thus the methanol emission rate from the VECS exhaust stack is estimated to be approximately 560 kg per year or 0.064 kg per hour.

The release parameters and source emission rates for the VECS are summarised in Table 2.

Table 2 Source Release Parameters and Emission Rates

Source	Stack Height (m)	Stack Diameter (m)	Exit Velocity (m/s)	Exit Temp. (°C)	Emission Rate (kg/hr)
VECS	18	0.25	20 [2]	25 [1]	0.064

(1) Ambient temperature

(2) Conservative estimate based on main fan operating at half fan capacity (maximum fan capacity = 6,800m^3/hr).

[1]Available: http://www.epa.gov/ttn/chief/software/tanks/index.html

3.2.2 Combustion Gases

Combustion products emitted from the natural gas fired (8.5 MW) boilers (2 units) during the production of process steam will be negligible.

These boilers will be designed to be compliant with the general standards of concentration prescribed in Schedule 4 of the *Protection of the Environment Operations (Clean Air) Regulation 2002.*

Emissions from these sources are therefore not considered further in this assessment.

3.3 Other Sources of Methanol in the Vicinity

Existing background levels of odour, and in particular methanol odour, are not readily available for the area surrounding the proposed facility.

The National Pollutant Inventory (NPI) database was searched for all facilities located within the general area as the Vopak site (postcodes 2036 and 2019), which reported methanol emission rates for 2004 – 2005. The search results are compared against the anticipated methanol emissions from the proposed development in Table 3 below.

Table 3 NPI - Methanol Emissions to Air

Industry	Methanol Emissions to Air (kg/year) [1]
Huntsman Corporation Australia Pty Ltd (2019)	330
Qenos Pty Ltd – Qenos Alkathene and Alkatuff Plants (2019)	160
Qenos Pty Ltd – Qenos Olefines and Site Ultilities Plant (2019)	3,800
Orica Australia Pty Ltd (2036)	31
TOTAL	**4,322**

(1) NPI database search accessed 17 August 2006. Excludes undefined diffuse emission sources in the category of domestic/commercial solvents/aerosol

The estimated total methanol emissions from the proposed biodiesel facility is approximately 1000 kg per year. When compared against the total existing methanol emissions in the area it suggests that the proposed development will result in approximately a 25% increase in methanol emissions to the local air shed.

The implications of this increase will be examined as part of the air quality impact assessment described in Section 5.4 of this report.

4. Meteorology

The complex interaction between synoptic scale and mesoscale meteorology determines the general weather conditions in the NSW coastal region.

Westerly high-pressure regions are the primary synoptic scale influence in NSW, however variation is apparent on a seasonal basis. These aforementioned high-pressure cells move north during autumn and winter, from a typical location across southern NSW during summer, resulting in predominantly westerly winds. These autumn and winter prevailing conditions differing greatly to the easterlies experienced in the summer months; spring shows similar atmospheric attributes to autumn and winter.

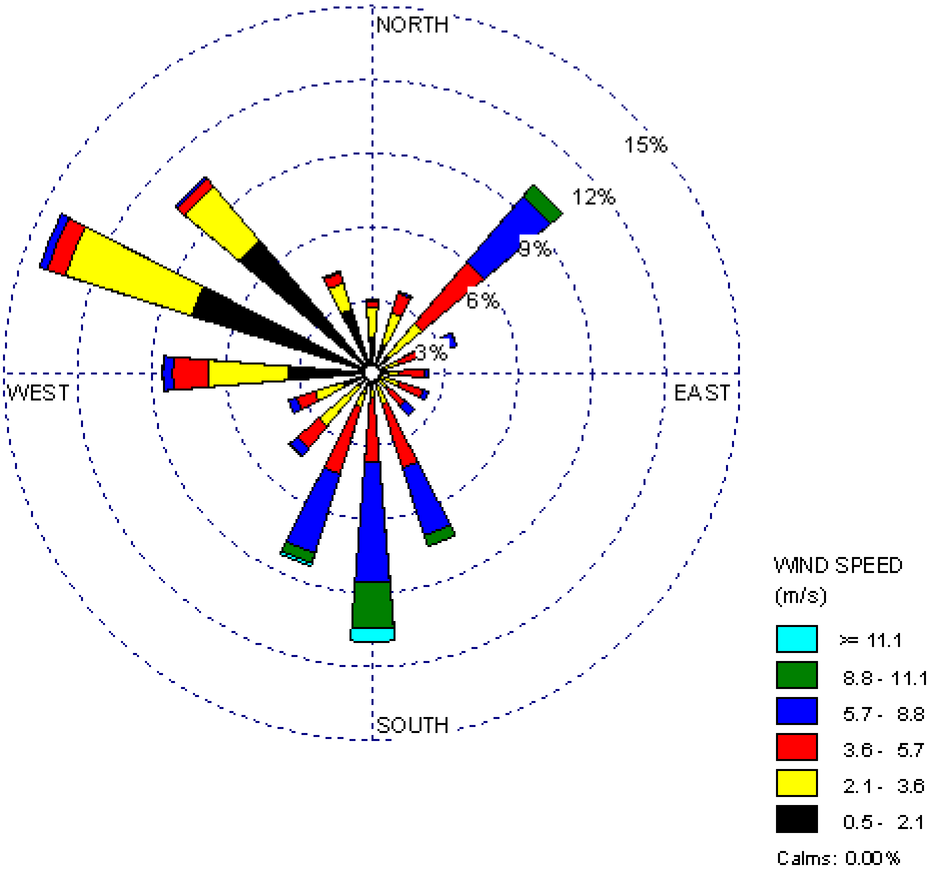
Mesoscale land-sea contrasts result in the generation of the afternoon sea breeze particularly during the summer months, and nocturnal katabatic drainage flows are also apparent from areas of higher topography particularly during cold and clear winter months (from the west in the Botany Bay region); other terrain-induced flows and land breeze events are also evident dependent upon location, onset timing and overarching meteorological conditions.

Meteorological data from Sydney Mascot Airport for 1997 (8 520 hours) has been obtained and utilised within this assessment. Mascot Airport is located approximately 5 km northwest of the facility and is therefore considered to show site-representative meteorology for the Port Botany site.

Wind speed and atmospheric stability are examined with respect to flow direction to investigate typical flow regimes and directions of poor dispersion.

The P/G stability category scheme is a six level categorisation of atmospheric stability, with three unstable levels (A, B and C), one neutral level (D) and two stable levels (E and F). Atmospheric stability is an important factor in the dispersion of emissions to air, and the incidence of stable conditions (when dispersion is poor) will define the directions of maximum toxicity impact.

Accordingly, the all hours wind and stability roses for the data set are illustrated below in Figure 4 and Figure 5.



Average wind speed = 3.87 m/s

Figure 4 All Hours Windrose – Mascot Airport

The pattern of wind climate is readily shown by means of a wind rose. The annual average wind rose formed from the Mascot Airport meteorological data is illustrated in Figure 4 and this is considered representative of the site.

Three dominant wind regimes are evident: northwesterly, northeasterly and southerly. Wind speeds are significantly higher in the northeasterly and southerly flows when compared to northwesterly conditions. It is apparent that northwesterly wind speeds are predominantly 0.5 – 3.6 m/s whereas the remaining dominant flow regimes display values of predominantly 3.6 – 11.1 m/s.

As discussed earlier southerly and easterly component winds are dominant during the summer months whereas the westerly flow components are more typical of winter conditions.

4.1 All Hours Stability Rose

The pattern of atmospheric stability at the site is readily shown by means of a stability rose. The annual average stability rose formed from the Mascot Airport meteorological data is illustrated in Figure 5.

It is apparent that the dominant directions of poor dispersion (stability categories E and F) are from the west and northwest. These directions reflect the nocturnal cool air drainage flows in the Sydney basin. This directional dominance is similar to the wind rose whereby these westerly azimuths were identified as the dominant wind flow regime during winter months.

It is therefore evident that stable westerly flows are the meteorological conditions representing worst-case atmospheric (poor) dispersal. However, the quantity of sensitive receptors to the east of the facility is reduced due to the proximity of the South Pacific Ocean and as such potential large-scale impact in the region is tempered.

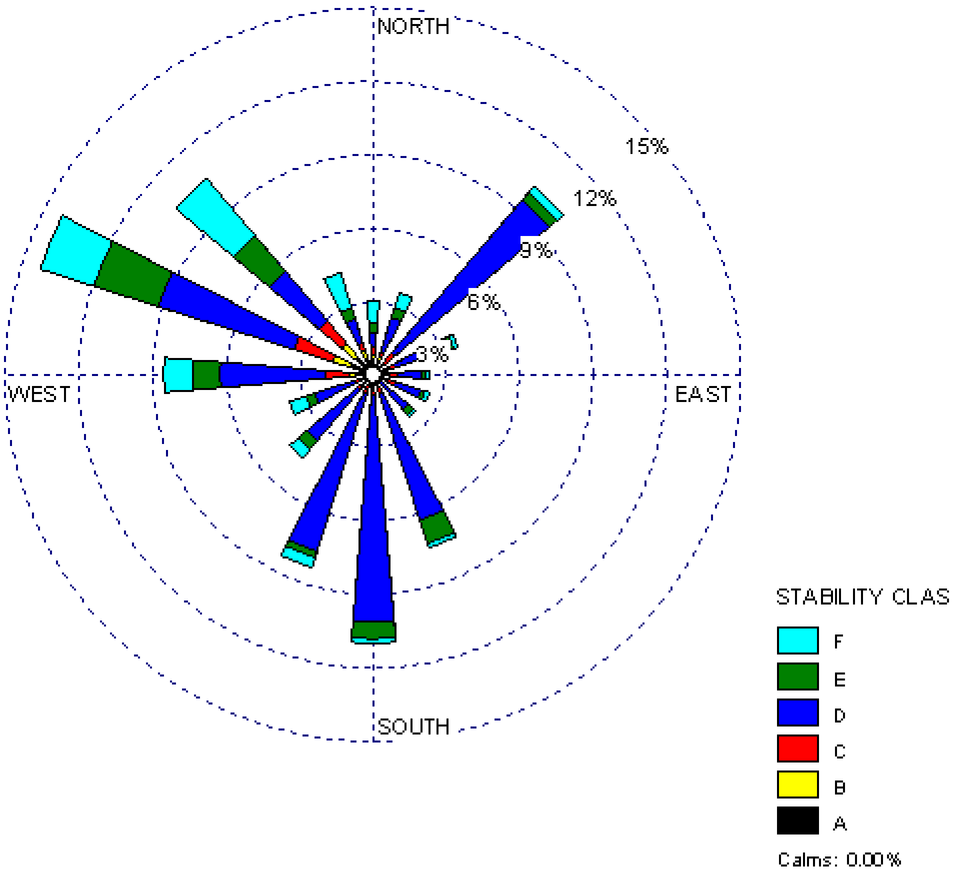


Figure 5 All Hours Stability Rose – Mascot Airport

4.2 Seasonal Meteorology

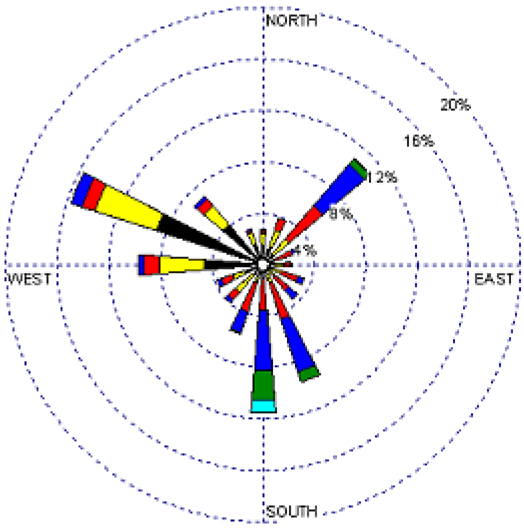
Figures 6 shows seasonal wind roses.

It is apparent from Figure 6 that spring, autumn and winter show distinctive westerly flows; with reduced frequency northeasterly and southerly winds in the case of spring and autumn.

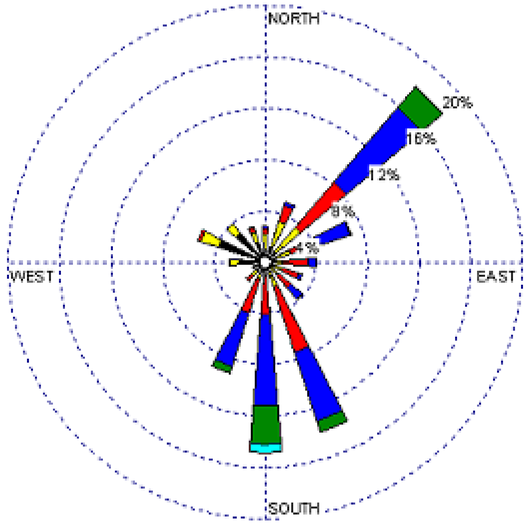
This contrasts with summer where the westerlies present in the other three seasons are reduced markedly in frequency together with an increase in frequency of the southerly and northeasterly components.

Summer shows the highest mean wind speed (4.82 m/s) whereas the remaining seasons show a value considerably lower (3.11 to 3.99 m/s).

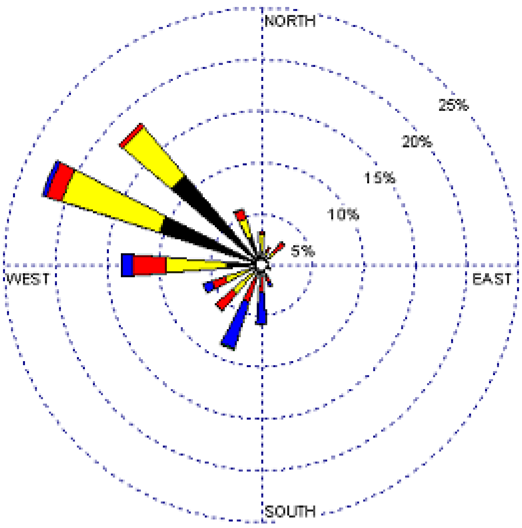
Spring (average wind speed = 3.99m/s)



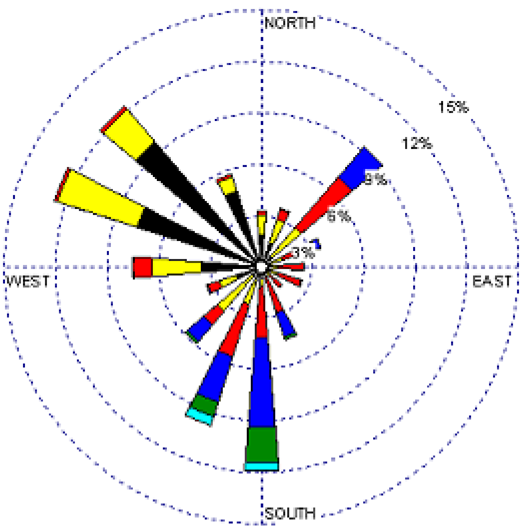
Summer (average wind speed = 4.82m/s)



Winter (average wind speed = 3.1m/s)



Autumn (average wind speed = 3.6m/s)



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22/12905

Figure 6 Seasonal Wind Roses

4.3 Meteorological Data Quality Assurance

The meteorological data to be used in dispersion modelling was analysed using the DEC guidelines set out in Approved Methods for the Modelling and Assessment of Air Pollutants in NSW and was found to demonstrate the expected trends.

Table 4 below indicates the relationship between stability class and wind speed and it can be seen that the distribution is approximately as expected e.g. stable conditions E and F show low wind speeds.

Table 5 below illustrates the relationship between stability class and time of day, and again displays the expected characteristics e.g. unstable A to C conditions are not present during nocturnal hours and stable conditions E and F are similarly not present during the majority of daytime hours.

Table 4 Stability class - wind speed relationship

Wind Speed (m/s)	Stability					
	A	B	C	D	E	F
<1	46	6	2	28	42	325
<2	245	73	86	311	376	584
<3	193	104	188	780	314	174
<4	68	120	160	700	104	0
<5	34	53	203	577	80	0
<6	6	23	143	623	7	0
<7	0	0	0	682	0	0
<8	0	0	0	463	0	0
<9	0	0	0	284	0	0
<10	0	0	0	164	0	0
<11	0	0	0	81	0	0
<12	0	0	0	43	0	0
<13	0	0	0	14	0	0
<14	0	0	0	9	0	0
<15	0	0	0	2	0	0
SUM	592	379	782	4761	923	1083

Table 5 Stability class – hour relationship

Hour	Stability						Hours
	A	B	C	D	E	F	
1	0	0	0	172	91	92	355
2	0	0	0	183	64	108	355
3	0	0	0	175	70	110	355
4	0	0	0	175	78	102	355
5	0	0	0	174	91	90	355
6	11	4	20	171	75	74	355
7	31	21	42	183	36	42	355
8	57	44	84	155	6	9	355
9	62	61	91	141	0	0	355
10	79	44	104	128	0	0	355
11	90	47	93	125	0	0	355
12	83	51	72	149	0	0	355
13	59	40	78	178	0	0	355
14	53	27	64	211	0	0	355
15	45	19	55	236	0	0	355
16	20	15	52	254	6	8	355
17	1	3	23	294	17	17	355
18	1	3	4	307	16	24	355
19	0	0	0	277	36	42	355
20	0	0	0	262	44	49	355
21	0	0	0	225	55	75	355
22	0	0	0	225	55	75	355
23	0	0	0	194	78	83	355
24	0	0	0	180	85	90	355
SUM	592	379	782	4774	903	1090	8520

5. Dispersion Modelling

Dispersion modelling using AUSPLUME was conducted to predict the maximum ground level concentrations resulting from emissions of methanol to air from the biodiesel facility. The predicted ground level concentrations (GLC) of methanol were assessed against the NSW DEC air quality design criteria prescribed in the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*.

AUSPLUME version 6.0 is a Gaussian plume dispersion model developed by Victorian EPA in order to assess the impact of airborne pollutants and it has been used to predict ground level concentrations for the model inputs specified below.

GHD note that the Civil Aviation Safety Authority (CASA) requires the proponent of a facility to be located within 15 km of an aerodrome, as is the case here, are to consult the aerodrome operator if the facility includes a combustion source which generates an exhaust plume which has a vertical velocity greater than 4.3 m/s at the height of the Obstacle Limitation Surface (OLS)[2]. The plume exhaust stacks associated with the proposed biodiesel facility (Methanol Scrubber stacks) are not combustion sources and have a vertical exit velocity of about 2.5m/s, which means that they readily comply with the maximum vertical velocity of 4.3m/s at the OLS. No further consideration will be given to this issue.

5.1 Model Configuration

AUSPLUME was configured to adapt the model to the facility and make best use of the measured emissions and meteorological data.

Emissions from the VECS and methanol scrubber exhaust stacks were modelled as point sources.

Key components of the model configurations are summarised below:

- Ground level concentrations were predicted over a 3 by 3 km square Cartesian receptor grid, centred over the site with a grid resolution of 50 m;
- Averaging period of 1-hour was selected;
- Building wake effects were included, with characteristic building/tank dimensions determined by inspection of a plan of the site. The Building Profile Input Program (BPIP) module within the AUSPLUME model was used to generate the characteristic dimensions for each 10-degree wind-directional arc. For wind directions where the potential for building wake influences was considered significant by AUSPLUME, the PRIME building wake algorithm was used to provide a conservative estimate of ground level concentrations;
- Given that Port Botany region is relatively flat and the model domain of interest is confined to the near-field (e.g. site boundary and nearest receptors to the east), the effects of terrain on dispersion were considered negligible and were not included in this assessment;
- Irwin’s “Urban” wind profile exponents were used;
- Horizontal dispersion was parameterised according to equations for the Pasquill-Gifford curves; and
- A surface roughness height of 0.8 m was used to represent the site.

[2] Guidelines for conducting plume rise assessments, CASA, AC 139-05(0), June 2004.

Further information on the options selected and the model configuration are given within the AUSPLUME output files provided in Appendix B.

5.2 Compliance Criteria

The NSW DEC criterion for scheduled sources is that the predicted maximum ground level concentration must not exceed the design criterion for the relevant pollutant listed in the DEC (2005) *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*. The predicted maximum concentration for this level 2 assessment is taken to be the 99.9th percentile concentration for simulations using an averaging time of 1-hour.

The air quality impact criterion for methanol is 3.0 mg/m^3 (1-hour average), which must be met at the nearest or likely future off-site receptor.

The nearest sensitive receptors are residential premises in the nearby suburbs include Banksmeadow, Botany, Matraville, Phillip Bay, La Perouse, Little Bay and Chifley.

Although not strictly classified as sensitive receptors, to determine the sensitivity of off-site impact on elevated receptors, such as the straddle car operators on the adjacent P&O site, an additional model simulation was conducted for the worst-case odour concentration with all receptors set at a height of 12 metres above ground level (i.e. approximate height of straddle car operators).

5.3 Release Parameters and Mass Emission Rates

The emission sources described in Section 3.2 were included in the model input as point (stack) sources.

5.4 Predicted Impacts of Methanol Emissions

The predicted ground level concentrations (1-hour, 99.9th percentile) of methanol vapours are displayed on Figure 7.

In addition to the concentration contour plots, four sensitive receptor sites have been selected encompassing the facility to the north, east and southeast to adequately describe the local amenities:

1. Yarra Point;
2. La Perouse Point Monument;
3. Banksmeadow Golf Course; and
4. Partanna Avenue, Matraville.

Predicted maximum (99.9 %ile, 1-hour) ground level concentrations of methanol at these sensitive receptors are shown in Table 6.

Table 6 Predicted 1-hour ground level methanol concentrations (99.9%ile, 1-hour average)

Pollutant	Receptor

	Receptor				
	DEC Criterion[1]	1	2	3	4
Methanol (mg/m^3)	3.0	0.0033	0.0021	0.00051	0.0011

(1) Approved Methods for Modelling and Assessment of Air Pollutants in NSW – Table: 7.4a Impact assessment criteria for individual odorous air pollutants

The model results presented in Table 6 show that compliance to the DEC criterion for methanol is readily achieved.

Given that the incremental impact assessment criterion is achieved by almost three orders of magnitude, it is very unlikely that the cumulative impact (incremental plus existing background levels) will exceed air quality goals.

DATA SOURCE				
Prepared.	EM	18/8/06	Workspace	version2
Checked.	SA	03/03/2006	Location	G:\22\12905\mapinfo
Approved.	GC	03/03/2006	Map Grid	MGA 94 (zone 56)

GHD

180 Lonsdale Steet
Melbourne Vic 3000

Tel: 61 3 8687 8000
Fax: 61 3 8687 8111

Project: **Sydney Biodiesel Terminal**

Title: **Figure 7: Predicted ground level methnaol concentrations (mg/m**3 , 1-hr ave, 99.9th percentile)**

Project No:	22 / 12905	Date:	18/08/2006	A4	Scale:	1:30,000	Sh 1 of 1	Rev. 0

5.4.1 Additional Scenario

To determine the sensitivity of off-site impact on elevated receptors, such as the straddle car operators on the adjacent P&O site, an additional model simulation was conducted for the worst-case odour concentration with all receptors set at a height of 12 metres above ground level (i.e. approximate height of straddle car operators). For this simulation the PRIME algorithm was turned off to ensure that the model predictions represent worst-case concentrations that can be expected at the elevated receptors

The maximum predicted methanol concentration at 12 metres above ground is well below the methanol criterion over the adjacent P&O site, with peak levels not exceeding 0.02 mg/m^3. Hence at a height of 12m there is still compliance with the DEC criterion.

6. Summary and Conclusions

GHD Pty Ltd (GHD) was commissioned by the proponent, as part of an environmental assessment to assess the air quality impact of a proposed processing plant to manufacture biodiesel. The basis of the assessment was to inventory emissions to air from the proposed development during construction and once operational, and ascertain whether these emissions would have an adverse effect on local air quality.

The dominant source of air emissions during the construction phase of the project will be dust generated from surface operational activity during construction; however, with proper construction management, these emissions are expected to be negligible, especially because roads are sealed, the site is located in an existing industrial zone and the nearest residential premises is located over 1 km away.

Odorous emissions from the tank storage of biodiesel and feedstock (vegetative oils) are expected to be negligible due to the low vapour pressures (<2mm Hg) of these substances. Tanks used to store these substances will have a pressure relief valve on the vent and will breathe directly to atmosphere when the pressure inside exceeds the design value within the storage tank. These tanks are only expected, if at all, to vent during the hotter months of the year when thermal expansion of air in the tank headspace occurs and during tank filling, both of which will only occur intermittently. The emitted odour, if detectable, is expected to be low in strength and inoffensive because only vegetative oils, as opposed to animal fat, will be used as feedstock.

The anticipated odour emission from the proposed facility, with the highest potential to cause off-site odour impact, is expected to be the discharge of methanol vapour because methanol has a relatively high vapour pressure and is highly odorous. Results of the air dispersion modelling indicate that compliance to the air quality impact assessment criterion for methanol is readily achieved with the air quality impact assessment criterion for methanol.

Based on the results of this assessment and the fact that the nearest sensitive receptor is greater than one km away, it can be concluded that odorous emissions from the proposed facility will not have a significant incremental affect on local air quality.

These conclusions are based on the limitations of this assessment presented in Section 7 of this report.

7. Limitations

This Air Quality Assessment report:

a) Has been prepared pursuant to a contract with Vopak/NFAL;

b) Has been prepared on the basis of information provided to GHD up to 18/08/2006;

c) Is for the sole use of Vopak/NFAL for the sole purpose outlined in the GHD proposal dated 21 April 2006;

d) Must not be used (1) by any person other than Vopak/NFAL or (2) for a purpose other than that outlined in the GHD Proposal dated 21 April 2006; and

e) Must not be copied without the prior written permission of GHD.

Neither GHD, its servants, employees or officers accepts responsibility to any person other than Vopak/NFAL in connection with the document.

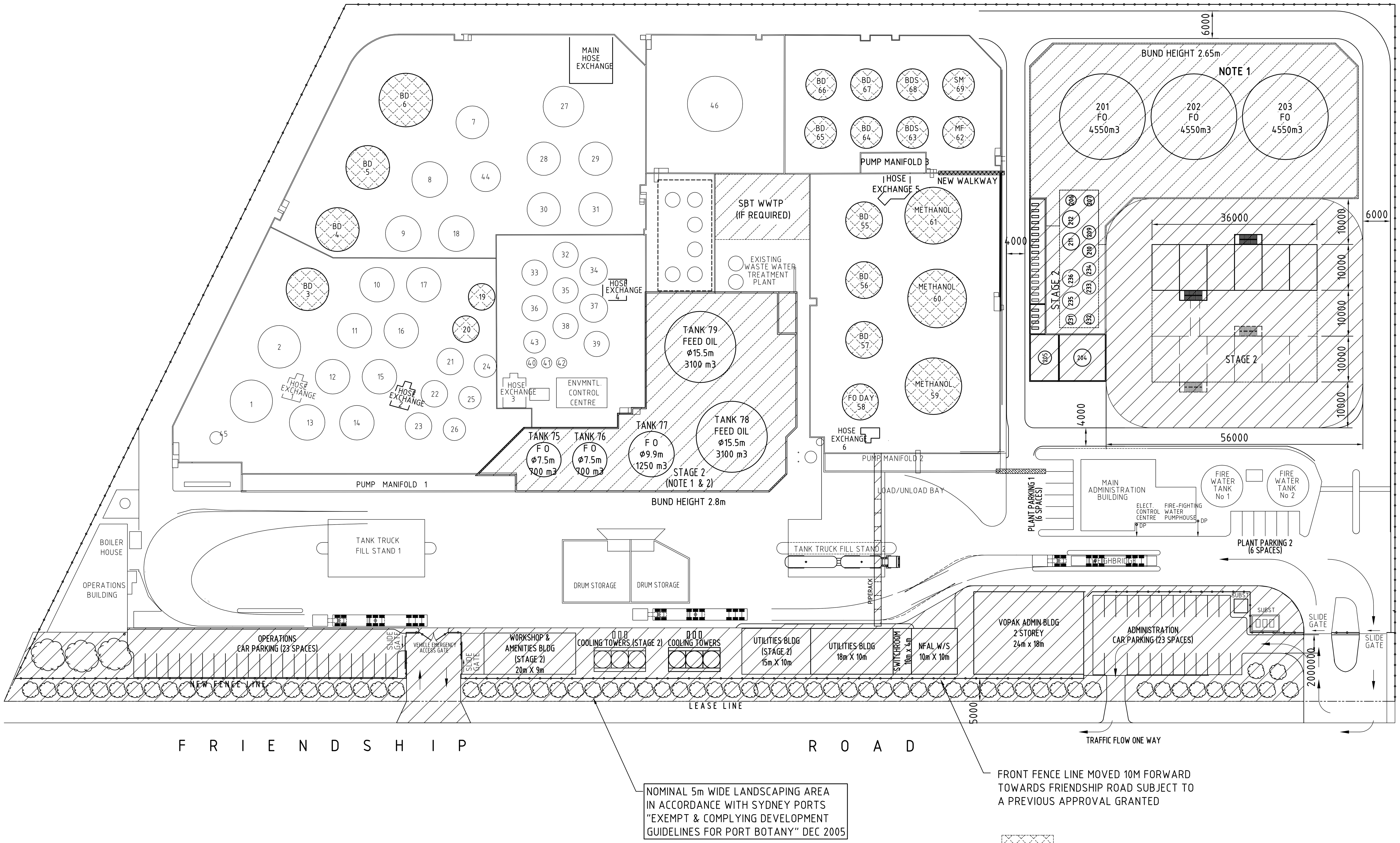
GHD has prepared the Air Quality Assessment report on the basis of information provided by Vopak/NFAL, which GHD has not independently verified or checked.

The work conducted by GHD under this commission has been to the standard that would normally be expected of professional environmental consulting firm practising in this field in the State of NSW. However, although strenuous effort has been made to identify and assess all significant environmental issues required by this brief we cannot guarantee that other issues outside of the scope of work undertaken by GHD do not remain.

This report should not be altered, amended or abbreviated, issued in part and issued incomplete in any way without prior checking and approval by GHD. GHD accepts no responsibility for any circumstances that arise from the issue of the report that has been modified other than by GHD.

Appendix A

Site Plan



EXISTING REUSED

NEW ADDITION/MODIFICATIONS

Storage Details for SBT Stage 1

Item	Tank Dia, m	Tank Ht, m	Tank Vol m3	Comments
Feed Oil Tank 1 - Tank 201	18.7	18	4550	
Feed Oil Tank 2 - Tank 202	18.7	18	4550	
Feed Oil Tank 3 - Tank 203	18.7	18	4550	
New Minor Storage Tanks (Tanks 204 to 212, No 208)			440	8 Tanks
Total New Stage 1			14090	
Existing Tanks used for Feed Oil			650	1 Tank
Existing Tanks Used for Biodiesel			8750	13 Tanks
Existing Tanks Used for Methanol			6400	4 Tanks
Existing Tanks Used for Sod Methylate			400	1 Tanks
Existing Tanks Used for Glycerine			400	1 Tanks
Total Reused			**16600**	
Total SBT			**30690**	
Total Site			**50340**	

Storage Details for SBT Stage 2

Item	Tank Dia, m	Tank Ht, m	Tank Vol m3	Comments
Feed Oil Tank 4 - Tank 79	15.5	18	3100	
Feed Oil Tank 5 - Tank 78	15.5	18	3100	
Feed Oil Tank 6 - Tank 77	9.9	18	1250	
Feed Oil Tank 7 - Tank 76	7.5	18	700	
Feed Oil Tank 8 - Tank 75	7.5	18	700	
New Minor Storage Tanks (Tanks 231 to 236)			320	6 Tanks
Total Additional New Stage 2			9170	
Existing Tanks Used for Glycerine			400	1 Tank
Total Reused			400	
Total Additional for Stage 2			9570	
Total New Stage 2			**23260**	
Total Reused			**17000**	
Total SBT			**40260**	
Total Site			**59510**	

REV	DATE		BY	CHK	CIV/STR	MECH	E/I	PROCESS
G	11/12/06	STAGE TWO TANKS NUMBERED	W.B.	JS				
F	14/11/06	NOTES ADDED FOR LANDSCAPING	A.A.	JS				
E	2/11/06	REVISED FOR ONE WAY TRAFFIC FLOW ON FRIENDSHIP ROAD	W.B.	JS				
D	9/8/06	CAR PARK ENTRY & EXIT SHOWN	AFF	JS				JS
C	3/8/06	NEW STORAGE AREA NEAR WWTP REVISED	AFF	JS				JS
B	30-6-06	ISSUED FOR SUBMISSION	CB	AFF				JS

APPROVED

REFERENCE

DRAWING NUMBER	TITLE

NOTE:

1. DISTANCE FROM FEED OIL TANK TO BUNDWALL IS LESS THAN REQUIRED PER AS 1940. HOWEVER AS FEED OIL TANKS WILL BE INSULATED, SPLASH SHIELDS ARE NOT REQUIRED.

2. STORAGE CAPACITY MAY BE USED FOR BIODIESEL FOR STAGE 1

CONTRACT No.	07E235	
ENG. DESIGN BY	J. SHAH	
DRAWN	W. BRITO	19-05-06
CHECKED		
CIV & STRUCT DESIGN APPR.		
MECHANICAL DESIGN APPR.		
ELECT. & INSTR. DESIGN APPR.		
PROCESS DESIGN APPR.		
WEIGHTS CHECKED		

BILFINGER BERGER Services

VOPAK TERMINALS PTY. LTD.

SYDNEY - BIODIESEL TERMINAL (SBT)
PROPOSED PLANT LAYOUT
(FOR AUTHORITY APPROVALS)

Scale: NONE | A1 | BBSA DRG No: 07E235-81-003 | REV. G

Appendix B

Ausplume Output Files

1

Vopak Site A - Methanol

Concentration or deposition	Concentration
Emission rate units	kg/hour
Concentration units	milligrams/m3
Units conversion factor	2.78E+02
Constant background concentration	0.00E+00
Terrain effects	None
Smooth stability class changes?	No
Other stability class adjustments ("urban modes")	None
Ignore building wake effects?	No
Decay coefficient (unless overridden by met. file)	0.000
Anemometer height	10 m
Roughness height at the wind vane site	0.300 m
Use the convective PDF algorithm?	No

DISPERSION CURVES

Horizontal dispersion curves for sources <100m high	Pasquill-Gifford
Vertical dispersion curves for sources <100m high	Pasquill-Gifford
Horizontal dispersion curves for sources >100m high	Briggs Rural
Vertical dispersion curves for sources >100m high	Briggs Rural
Enhance horizontal plume spreads for buoyancy?	Yes
Enhance vertical plume spreads for buoyancy?	Yes
Adjust horizontal P-G formulae for roughness height?	Yes
Adjust vertical P-G formulae for roughness height?	Yes
Roughness height	0.800m
Adjustment for wind directional shear	None

PLUME RISE OPTIONS

Gradual plume rise?	Yes
Stack-tip downwash included?	Yes
Building downwash algorithm:	PRIME method.
Entrainment coeff. for neutral & stable lapse rates	0.60,0.60
Partial penetration of elevated inversions?	No
Disregard temp. gradients in the hourly met. file?	No

and in the absence of boundary-layer potential temperature gradients given by the hourly met. file, a value from the following table (in K/m) is used:

Wind Speed Category	Stability Class A	B	C	D	E	F
1	0.000	0.000	0.000	0.000	0.020	0.035
2	0.000	0.000	0.000	0.000	0.020	0.035
3	0.000	0.000	0.000	0.000	0.020	0.035
4	0.000	0.000	0.000	0.000	0.020	0.035
5	0.000	0.000	0.000	0.000	0.020	0.035
6	0.000	0.000	0.000	0.000	0.020	0.035

WIND SPEED CATEGORIES
Boundaries between categories (in m/s) are: 1.54, 3.09, 5.14, 8.23, 10.80

WIND PROFILE EXPONENTS: "Irwin Urban" values (unless overridden by met. file)

AVERAGING TIMES
1 hour

1

Vopak Site A - Methanol

SOURCE CHARACTERISTICS

STACK SOURCE: VECS

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
335649	6239282	0m	18m	0.25m	25C	20.0m/s

______ Effective building dimensions (in metres) ______

Flow direction	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°
Effective building width	27	25	23	20	38	40	39	38	21	25	27	28
Effective building height	18	18	18	18	18	18	18	18	18	18	18	18
Along-flow building length	24	27	28	29	24	29	33	37	28	27	40	23
Along-flow distance from stack	-3	-7	-10	-13	-41	-44	-47	-48	-24	-25	-42	-26
Across-flow distance from stack	12	13	15	15	10	5	-1	-5	11	9	-19	5

Flow direction	130°	140°	150°	160°	170°	180°	190°	200°	210°	220°	230°	240°
Effective building width	29	29	28	28	28	28	27	25	23	20	39	40
Effective building height	18	18	18	18	18	18	18	18	18	18	18	18
Along-flow building length	20	16	12	13	17	21	25	27	28	29	24	29
Along-flow distance from stack	-25	-23	-21	-20	-21	-21	-21	-20	-19	-17	17	16
Across-flow distance from stack	2	0	-3	-6	-8	-10	-12	-13	-14	-15	-10	-5

Flow direction	250°	260°	270°	280°	290°	300°	310°	320°	330°	340°	350°	360°
Effective building width	39	38	21	24	27	29	29	29	28	27	28	28
Effective building height	18	18	18	18	18	18	18	18	18	18	18	18
Along-flow building length	33	37	28	27	40	23	20	16	12	13	18	21
Along-flow distance from stack	13	11	-4	-2	2	3	6	8	9	7	3	0
Across-flow distance from stack	1	5	-11	-9	19	-5	-2	0	2	5	8	10

(Constant) emission rate = 6.40E-02 kg/hour
No gravitational settling or scavenging.

STACK SOURCE: MS1

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
335513	6239190	0m	18m	0.05m	25C	2.4m/s

______ Effective building dimensions (in metres) ______

Flow direction	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°
Effective building width	44	45	43	41	37	32	33	38	42	45	47	47
Effective building height	15	15	15	15	15	15	15	15	15	15	15	15
Along-flow building length	45	47	47	46	44	39	36	40	43	44	45	43
Along-flow distance from stack	-3	-2	-1	1	1	2	2	-3	-7	-11	-15	-18
Across-flow distance from stack	-11	-8	-4	0	5	9	12	16	18	20	22	23

Flow direction	130°	140°	150°	160°	170°	180°	190°	200°	210°	220°	230°	240°
Effective building width	46	43	39	37	40	43	44	45	43	41	37	32
Effective building height	15	15	15	15	15	15	15	15	15	15	15	15
Along-flow building length	41	37	32	32	38	42	45	47	47	46	43	39
Along-flow distance from stack	-21	-23	-25	-28	-34	-39	-43	-45	-47	-46	-44	-41
Across-flow distance from stack	23	23	22	20	17	15	11	8	4	-1	-5	-9

Flow direction	250°	260°	270°	280°	290°	300°	310°	320°	330°	340°	350°	360°
Effective building width	32	38	42	45	47	47	46	43	39	36	40	43
Effective building height	15	15	15	15	15	15	15	15	15	15	15	15
Along-flow building length	36	40	43	44	45	43	41	37	32	33	38	42
Along-flow distance from stack	-38	-38	-36	-33	-30	-25	-20	-14	-8	-5	-4	-3
Across-flow distance from stack	-12	-16	-18	-21	-22	-23	-23	-23	-22	-20	-17	-15

(Constant) emission rate = 5.00E-02 kg/hour
No gravitational settling or scavenging.

STACK SOURCE: MS2

X(m)	Y(m)	Ground Elev.	Stack Height	Diameter	Temperature	Speed
335507	6239210	0m	18m	0.05m	25C	2.4m/s

______ Effective building dimensions (in metres) ______

Flow direction	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°

Effective building width	44	45	43	41	37	32	33	38	42	45	47	47
Effective building height	15	15	15	15	15	15	15	15	15	15	15	15
Along-flow building length	45	47	47	46	44	39	36	40	43	44	45	43
Along-flow distance from stack	-21	-18	-15	-11	-8	-3	1	0	-1	-2	-2	-3
Across-flow distance from stack	-21	-20	-19	-17	-15	-12	-9	-6	-2	2	5	9

Flow direction	130°	140°	150°	160°	170°	180°	190°	200°	210°	220°	230°	240°
Effective building width	46	43	39	37	40	43	44	45	43	41	37	32
Effective building height	15	15	15	15	15	15	15	15	15	15	15	15
Along-flow building length	41	37	32	32	38	42	45	47	47	46	43	39
Along-flow distance from stack	-3	-4	-4	-7	-14	-19	-24	-28	-32	-35	-36	-36
Across-flow distance from stack	12	15	17	19	20	21	21	20	19	17	15	12

Flow direction	250°	260°	270°	280°	290°	300°	310°	320°	330°	340°	350°	360°
Effective building width	32	38	42	45	47	47	46	43	39	36	40	43
Effective building height	15	15	15	15	15	15	15	15	15	15	15	15
Along-flow building length	36	40	43	44	45	43	41	37	32	33	38	42
Along-flow distance from stack	-37	-40	-42	-43	-42	-40	-37	-34	-28	-25	-24	-23
Across-flow distance from stack	9	6	2	-2	-5	-8	-12	-15	-17	-19	-20	-21

(Constant) emission rate = 5.00E-02 kg/hour
No gravitational settling or scavenging.

1

Vopak Site A - Methanol

RECEPTOR LOCATIONS

The Cartesian receptor grid has the following x-values (or eastings):

```
 334116.m  334166.m  334216.m  334266.m  334316.m  334366.m  334416.m
 334466.m  334516.m  334566.m  334616.m  334666.m  334716.m  334766.m
 334816.m  334866.m  334916.m  334966.m  335016.m  335066.m  335116.m
 335166.m  335216.m  335266.m  335316.m  335366.m  335416.m  335466.m
 335516.m  335566.m  335616.m  335666.m  335716.m  335766.m  335816.m
 335866.m  335916.m  335966.m  336016.m  336066.m  336116.m  336166.m
 336216.m  336266.m  336316.m  336366.m  336416.m  336466.m  336516.m
 336566.m  336616.m  336666.m  336716.m  336766.m  336816.m  336866.m
 336916.m  336966.m  337016.m  337066.m  337116.m
```

and these y-values (or northings):

```
6237745.m 6237795.m 6237845.m 6237895.m 6237945.m 6237995.m 6238045.m
6238095.m 6238145.m 6238195.m 6238245.m 6238295.m 6238345.m 6238395.m
6238445.m 6238495.m 6238545.m 6238595.m 6238645.m 6238695.m 6238745.m
6238795.m 6238845.m 6238895.m 6238945.m 6238995.m 6239045.m 6239095.m
6239145.m 6239195.m 6239245.m 6239295.m 6239345.m 6239395.m 6239445.m
6239495.m 6239545.m 6239595.m 6239645.m 6239695.m 6239745.m 6239795.m
6239845.m 6239895.m 6239945.m 6239995.m 6240045.m 6240095.m 6240145.m
6240195.m 6240245.m 6240295.m 6240345.m 6240395.m 6240445.m 6240495.m
6240545.m 6240595.m 6240645.m 6240695.m 6240745.m
```

DISCRETE RECEPTOR LOCATIONS (in metres)

No.	X	Y	ELEVN	HEIGHT	No.	X	Y	ELEVN	HEIGHT
1	336325	6238415	0.0	0.0	3	334783	6240731	0.0	0.0
2	336583	6237749	0.0	0.0	4	336183	6240432	0.0	0.0

METEOROLOGICAL DATA : Mascot Airport 1997. Data collected by SACL and syn
t

---

1 Peak values for the 100 worst cases (in milligrams/m3)

Averaging time = 1 hour

Rank	Value	Time Recorded hour,date	Coordinates (* denotes polar)
1	6.57E-02	07,16/09/97	(335566, 6239195, 0.0)
2	6.42E-02	03,04/01/97	(335566, 6239195, 0.0)
3	6.20E-02	03,12/12/97	(335566, 6239195, 0.0)
4	6.04E-02	04,12/12/97	(335566, 6239195, 0.0)
5	6.03E-02	03,22/02/97	(335566, 6239195, 0.0)
6	5.87E-02	04,13/09/97	(335566, 6239195, 0.0)
7	5.82E-02	06,29/12/97	(335566, 6239195, 0.0)
8	5.74E-02	01,04/01/97	(335566, 6239195, 0.0)
9	5.64E-02	03,31/08/97	(335566, 6239195, 0.0)
10	5.58E-02	02,26/10/97	(335566, 6239195, 0.0)
11	5.54E-02	03,13/09/97	(335566, 6239195, 0.0)
12	5.53E-02	18,07/05/97	(335566, 6239195, 0.0)
13	5.53E-02	02,15/09/97	(335566, 6239195, 0.0)
14	5.53E-02	02,29/10/97	(335566, 6239195, 0.0)
15	5.53E-02	23,16/11/97	(335566, 6239195, 0.0)
16	5.51E-02	19,28/05/97	(335566, 6239195, 0.0)
17	5.51E-02	02,02/10/97	(335566, 6239195, 0.0)
18	5.42E-02	12,21/05/97	(335566, 6239195, 0.0)
19	5.41E-02	05,11/04/97	(335566, 6239195, 0.0)
20	5.40E-02	19,10/06/97	(335566, 6239195, 0.0)
21	5.40E-02	03,26/10/97	(335566, 6239195, 0.0)
22	5.35E-02	01,27/04/97	(335566, 6239195, 0.0)
23	5.32E-02	02,04/01/97	(335566, 6239195, 0.0)
24	5.31E-02	14,09/04/97	(335566, 6239195, 0.0)
25	5.26E-02	05,24/10/97	(335566, 6239195, 0.0)
26	5.23E-02	01,13/09/97	(335566, 6239195, 0.0)
27	5.21E-02	19,22/06/97	(335566, 6239195, 0.0)
28	5.19E-02	09,30/10/97	(335566, 6239195, 0.0)
29	5.18E-02	23,15/09/97	(335566, 6239245, 0.0)
30	5.14E-02	13,29/04/97	(335566, 6239195, 0.0)
31	5.13E-02	15,24/06/97	(335516, 6239245, 0.0)
32	5.12E-02	06,03/01/97	(335566, 6239195, 0.0)
33	5.12E-02	04,04/01/97	(335566, 6239195, 0.0)
34	5.11E-02	10,06/05/97	(335516, 6239245, 0.0)
35	5.04E-02	06,23/10/97	(335566, 6239195, 0.0)
36	4.94E-02	02,01/05/97	(335566, 6239195, 0.0)
37	4.94E-02	21,03/06/97	(335566, 6239195, 0.0)
38	4.83E-02	24,01/10/97	(335566, 6239195, 0.0)
39	4.83E-02	07,29/12/97	(335566, 6239195, 0.0)
40	4.82E-02	05,26/10/97	(335566, 6239195, 0.0)
41	4.80E-02	18,14/06/97	(335566, 6239195, 0.0)
42	4.72E-02	21,21/06/97	(335566, 6239195, 0.0)
43	4.72E-02	01,28/08/97	(335566, 6239195, 0.0)
44	4.70E-02	23,13/09/97	(335566, 6239245, 0.0)
45	4.68E-02	19,02/09/97	(335566, 6239195, 0.0)
46	4.65E-02	24,30/08/97	(335566, 6239195, 0.0)
47	4.65E-02	01,02/12/97	(335566, 6239195, 0.0)
48	4.64E-02	07,27/01/97	(335566, 6239195, 0.0)
49	4.63E-02	19,03/06/97	(335566, 6239195, 0.0)
50	4.62E-02	09,28/05/97	(335566, 6239195, 0.0)
51	4.60E-02	24,19/11/97	(335566, 6239195, 0.0)
52	4.60E-02	06,05/06/97	(335566, 6239195, 0.0)
53	4.60E-02	02,30/08/97	(335566, 6239195, 0.0)
54	4.59E-02	03,21/12/97	(335566, 6239195, 0.0)
55	4.53E-02	01,26/10/97	(335566, 6239245, 0.0)
56	4.49E-02	05,05/10/97	(335566, 6239195, 0.0)
57	4.47E-02	04,11/04/97	(335566, 6239195, 0.0)
58	4.46E-02	23,31/01/97	(335416, 6239145, 0.0)
59	4.44E-02	01,24/02/97	(335516, 6239245, 0.0)
60	4.44E-02	22,06/03/97	(335566, 6239195, 0.0)
61	4.37E-02	06,06/02/97	(335566, 6239195, 0.0)
62	4.33E-02	20,01/06/97	(335566, 6239195, 0.0)
63	4.33E-02	04,24/10/97	(335566, 6239195, 0.0)
64	4.31E-02	02,19/03/97	(335566, 6239195, 0.0)
65	4.29E-02	05,12/04/97	(335566, 6239195, 0.0)
66	4.25E-02	03,11/10/97	(335566, 6239195, 0.0)

67	4.21E-02	02,27/01/97	(335566,	6239245,	0.0)
68	4.20E-02	12,01/09/97	(335566,	6239195,	0.0)
69	4.20E-02	06,18/01/97	(335566,	6239195,	0.0)
70	4.19E-02	03,11/03/97	(335566,	6239195,	0.0)
71	4.19E-02	20,24/06/97	(335566,	6239195,	0.0)
72	4.17E-02	02,09/02/97	(335366,	6239095,	0.0)
73	4.16E-02	08,08/09/97	(335566,	6239195,	0.0)
74	4.15E-02	24,28/08/97	(335566,	6239195,	0.0)
75	4.13E-02	05,03/01/97	(335566,	6239195,	0.0)
76	4.12E-02	05,23/01/97	(335416,	6239145,	0.0)
77	4.11E-02	07,21/09/97	(335566,	6239195,	0.0)
78	4.08E-02	24,25/02/97	(335566,	6239195,	0.0)
79	4.06E-02	03,02/05/97	(335566,	6239195,	0.0)
80	4.05E-02	06,24/04/97	(335566,	6239195,	0.0)
81	4.05E-02	23,09/06/97	(335566,	6239195,	0.0)
82	4.02E-02	24,09/06/97	(335566,	6239195,	0.0)
83	4.02E-02	02,02/12/97	(335566,	6239195,	0.0)
84	4.01E-02	02,22/02/97	(335566,	6239195,	0.0)
85	3.99E-02	24,15/05/97	(335566,	6239195,	0.0)
86	3.99E-02	05,30/09/97	(335566,	6239195,	0.0)
87	3.98E-02	03,11/04/97	(335566,	6239195,	0.0)
88	3.98E-02	04,02/05/97	(335566,	6239195,	0.0)
89	3.98E-02	02,28/11/97	(335566,	6239195,	0.0)
90	3.97E-02	22,29/08/97	(335566,	6239195,	0.0)
91	3.97E-02	21,09/06/97	(335566,	6239195,	0.0)
92	3.97E-02	05,16/10/97	(335566,	6239195,	0.0)
93	3.96E-02	05,18/01/97	(335566,	6239195,	0.0)
94	3.96E-02	01,23/06/97	(335566,	6239195,	0.0)
95	3.96E-02	06,18/02/97	(335566,	6239245,	0.0)
96	3.94E-02	24,15/12/97	(335516,	6239245,	0.0)
97	3.91E-02	23,19/11/97	(335566,	6239195,	0.0)
98	3.88E-02	01,18/12/97	(335566,	6239195,	0.0)
99	3.88E-02	24,30/07/97	(335566,	6239195,	0.0)
100	3.85E-02	03,10/09/97	(335566,	6239195,	0.0)

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
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Draft B	S. Anderson	T. Pollock	*T. Pollock	J. Ardas	*J Ardas	25/8/06
0	S. Anderson			J. Ardas	J. Ardas	11/1/07

Appendix G

Noise study

GHD Pty Ltd

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Vopak Terminals Sydney and Natural Fuels Australia

Report for Vopak SBT Project

Noise Report

November 2006

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

Contents

Table Index

Figure Index

Glossary

dB	Decibel, which is 10 times the logarithm (base 10) of the ratio of a given sound pressure to a reference pressure; used as a unit of sound.
dB(A)	Unit used to measure 'A-weighted' sound pressure levels.
L_N	Statistical sound measurement recorded on the linear scale.
L_{AN}	Statistical sound measurement recorded on the "A" weighted scale.
$L_{A10\ (Time)}$	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
$L_{A10\ (1\ hour)}$	The L_{A10} level measured over a 1-hour period.
$L_{A10\ (18\ hour)}$	The arithmetic average of the L_{A10} levels for the 18-hour period between 0600 and 2400 hours on a normal working day. It is a common traffic noise descriptor.
$L_{Aeq\ (Time)}$	Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
$L_{Aeq\ (15\ hr)}$	The L_{Aeq} noise level for the period 7 am to 10 pm. (Day and Evening)
$L_{Aeq\ (9\ hr)}$	The L_{Aeq} noise level for the period 10 pm to 7 am. (Night)
$L_{Aeq\ (1\ hr)}$	The L_{Aeq} noise level for a one-hour period. It represents the highest tenth percentile hourly A-weighted L_{eq} during the period 7 am to 10 pm, or 10 pm to 7 am, (whichever is relevant).
$L_{A90\ (Time)}$	The A-weighted sound pressure level that is exceeded for 90 per cent of the time over which a given sound is measured. This is considered to represent the background noise e.g. $L_{A90\ (15\ min)}$
$L_{AMax\ (Time)}$	The maximum sound level recorded during a specified time interval
$L_{AMin\ (Time)}$	The minimum sound level recorded during a specified time interval

Executive Summary

GHD Pty Ltd (GHD) was commissioned by Vopak Terminals Sydney Pty Ltd (Vopak) and Natural Fuels Australia Ltd (NFAL), as part of an Environmental Assessment (EA) to assess the acoustic impact of a proposed processing plant to manufacture bio-diesel. The basis of the assessment was to determine noise levels emanating from the proposed development once operational and ascertain whether noise levels would have an adverse acoustic effect on the amenity of residences within close proximity of the site during both construction and operation of the development.

Sound power levels for proposed noise generating equipment to be used at the site were sourced from information provided by the client. Detailed noise modelling was undertaken based on the provided sound power levels of primary noise sources for the proposed facility.

A worst case operational scenario was modelled with all items listed in Table 5.2 operating simultaneously.

Results of the modelling suggest noise associated with activities of the operating biodiesel plant is unlikely to exceed project specific noise goals at the modelled receiver location at 36 Yarra Road. Additionally, noise contours suggest operational noise goals may be met within the built-up residential areas of Matraville, Malabar Junction and Chifley as defined on the noise contour map during day, evening and night time operations.

As the nearest residential noise receivers are located at a distance of approximately 1 km from the proposed site location, it is unlikely that construction noise will adversely impact the noise environment of the residential/built up areas surrounding the site to the north east, east and south east.

Therefore based on the findings of this noise assessment with consideration to the scope and the information provided, it is believed that relevant construction and operational noise guidelines can be met.

1. Introduction

GHD Pty Ltd (GHD) was commissioned by Vopak Terminals Sydney Pty Ltd (Vopak) and Natural Fuels Australia Ltd (NFAL), as part of an Environmental Assessment (EA) to assess the acoustic impact of a proposed processing plant to manufacture bio-diesel. The basis of the assessment was to determine noise levels emanating from the proposed development once operational and ascertain whether noise levels would have an adverse acoustic effect on the amenity of residences within close proximity of the site during both construction and operation of the development.

1.1 Scope of Works

The scope of works undertaken included:

- Undertake a desktop review of specific noise levels based on available information detailing manufacturers specifications and proposed construction information;
- Based on manufacturers information, undertake limited distance attenuation modelling for construction and detailed CadnaA noise modelling to predict noise levels emanating from the proposed operational development;
- Review of previous background noise monitoring reports and established background noise criteria;
- Review of manufacturers design specifications for proposed plant/machinery to be used on the operational site;
- Comparison of predicted noise levels with the specified EPA amenity guidelines and intrusive guidelines;
- Based on noise results, recommendations for in principle noise attenuation measures if predicted noise levels indicate specified noise criteria would be exceeded at the proposed development;
- Provision of a report with consideration to the NSW DEC publications Industrial Noise Policy (INP), Environmental Criteria for Road Traffic Noise (ECRTN) and Environmental Noise Control Manual (ENCM), detailing the results of the noise monitoring and the noise impact assessment including:
  - A brief description of the project;
  - A brief description of the ambient noise environment;
  - Location of the noise monitoring with respect to the proposed development works;
  - Discussion of the modelling results with relation to project specific noise goals and guidelines; and
  - Outlining possible in principle noise mitigation measures where the noise assessment suggests that project specific noise goals may be exceeded.

1.2 Assessment Methodology

The following steps for the noise assessment were undertaken:

1. Compliance criteria determined;
2. Review of existing background and attended noise measurements;
3. Projection of new noises to the residential area;
4. Summation of existing and projected noise;
5. Assessment of compliance; and
6. Comment on noise control requirements.

1.3 Limitations

This report has been prepared for Vopak Terminals. The purpose of the report is to provide an independent review of the acoustic output of the proposed biodiesel facility located at the Vopak Site A Terminal, Sydney NSW.

It is not the intention of the assessment to cover every element of the acoustic environment, but rather to conduct the assessment with consideration to the prescribed work scope.

The findings of the noise assessment represent the findings based on provided information. It is the nature of environmental monitoring that all variations in environmental conditions cannot be accessed and all uncertainty concerning the conditions of the ambient noise environment cannot be eliminated. Professional judgement must be exercised in the investigation and interpretation of observations.

In conducting this assessment and preparing the report, current guidelines for noise were referred to. This work has been conducted in good faith with GHD's understanding of the client's brief and the generally accepted consulting practice.

No other warranty, expressed or implied, is made as to the information and professional advice included in this report. It is not intended for other parties or other uses.

2. Project Description

Vopak and NFAL are proposing to construct and operate a biodiesel facility within an existing chemical and petroleum handling facility at Port Botany, NSW. The existing facility is owned and operated by Vopak and is known as the ‘Site A terminal’. The proposal would utilise existing infrastructure and expand the Vopak site for the purpose of producing, storing and distributing biodiesel.

The expansion area would take place on a 0.8 hectare parcel of land within the boundaries of the Site A terminal of land described as Lot 5 DP 635791 at 49 Friendship Road, Port Botany. The proposal also includes utilisation of existing Vopak Site A infrastructure and integration into the wider regional fuel distribution network, including Vopak Site B, via the use of pipeline transfer.

The site location is shown in Figure 1.

Source: Botany Bay Topographic Map 9130-3-S 2nd ed., CMA of NSW.

0 1 2Km

Scale

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Proposed Sydney Biodiesel Terminal
Vopak Site A Terminal Noise Assessment

Site Location

scale | as shown | date | 15 August 2006

job no 21-14828
file ref 2114828_LTN_01.cdr

Figure 1

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3. Existing Environment

3.1 Previous Assessments

Environmental Monitoring Services (EMS), Noise Assessment of the Van Ommeren Bulk Liquid Terminal, September 1996

A background noise study for the operational Bulk Liquids Terminal Site B which is located along Friendship Road further south of the current project site, was undertaken by EMS in September 1996.

It was considered that the previous noise monitoring location used to determine background noise levels was likely to represent ambient received noise levels from industry located along Friendship Road. In addition, as the local environment is viewed as similar to 1996, the previous monitoring results were considered valid and appropriate for use for this assessment[1].

Seven days worth of monitoring is typically undertaken for many noise assessments. However, the INP also states that where background noise levels may be considered relatively consistent day to day, as would be the situation for the Port area (trucks entering/exiting sites, loading and unloading activities), three days worth of monitoring is considered sufficient. Therefore the five days worth of data used to determine background noise levels is considered sufficient for this particular project.

As the local environment is viewed as similar to 1996, the previous monitoring results are considered valid and appropriate to use for this assessment.

Works were undertaken to ensure compliance with the acoustical design goals of the local regulatory authority and the NSW DEC. The following scope of works were undertaken:

- Measurement of the ambient and background noise near the boundary of the nearest residential occupancy;
- Predictions of the noise levels generated by operations of the proposed development to the nearest residential premises; and
- Comparison of the predicted noise levels with the acoustical design goals of the relevant regulatory authority and the NSW DEC to assess compliance.

EMS concluded that the nearest resident to the proposed operating site B was located at Phillip Bay at 36 Yarra Road, approximately 1.8 km from the eastern boundary of Site B. Yarra Bay is located between the site and the receiver.

Background monitoring was undertaken at one location for a period of 5 days.

The existing background noise levels at 36 Yarra Road, as measured by EMS for both day and evening periods is detailed in Table 3.1 below.

[1] Note – any changes to the local ambient noise environment since background monitoring was undertaken is likely to result in an increase in background noise, therefore the data used in this assessment is considered conservative.

Table 3.1 Background Noise Levels – 36 Yarra Road

Period	Background Noise Levels (L_{90})
Day	45 dB (A)
Evening	25* dB (A)

Note - *Based on EPA's Environmental Noise Control Manual (ENCM), more stringent guidelines apply for night time periods where the existing background noise level is above the relevant acceptable limits as specified by the ENCM.

4. Environmental Noise Criteria

4.1 Construction Noise Criteria

Criteria for the construction phase applied to the assessment were sourced from Section 171 of the DEC's Environmental Noise Control Manual. The criteria was established using the provided background noise levels and applying a conversion factor based on the expected construction period. Construction noise criteria are shown in Table 4.1.

Table 4.1. Construction Noise Criteria

Construction Period	**Level Restrictions (L_{10})**	**36 Yarra Road**
Less than 4 weeks	Background + 20 dB	65
Less than 26 weeks	Background + 10 dB	55
More than 26 weeks	Background + 5 dB	50

Normal construction hours are between 7 am to 6 pm Monday to Friday, and 8 am to 1 pm Saturday and at no time on Sundays and public holidays. Construction activity outside those hours is not preferred but can usually occur provided the normal operational noise criteria are met and construction noise is not substantially audible or intrusive inside a dwelling.

4.2 Operational Noise Criteria

The Industrial Noise Policy (INP) provides guidance on the assessment of operational noise impacts. The guidelines include both intrusive and amenity criteria that are designed to protect receivers from noise significantly louder than the background level and to limit the total noise level from all sources near a receiver.

Intrusive noise limits set by the INP control the relative audibility of operational noise compared to the background level. Amenity criteria limit the total level of extraneous noise. Both sets of criteria are calculated and the lowest of the two in each time period normally apply. Table 2.2 in the INP provides modifications to the amenity criteria for existing levels of industrial noise.

Information provided in the previous noise assessment reports indicated a noise environment with existing industrial noise sources. Based on the total of existing L_{Aeq} noise levels from the previous reports, modifications to the acceptable noise levels were undertaken to account for the existing industrial noise, as per Table 2.2 in the INP.

The rating background level is the level used for assessment purposes. Where the rating background level is found to be less than 30 dB(A), then it is set to 30 dB(A).

Amenity criteria are determined based on the overall acoustic characteristics of the receiver area and the existing level of noise excluding other noises that are uncharacteristic of the usual noise environment. Residential receiver areas are characterised into ‘urban’, ‘suburban’, ‘rural’ or other categories based on land uses, the existing level of noise from industry, commerce, and road traffic.

Background noise data has been used from the previous noise assessment undertaken by EMS for location 36 Yarra Road. This residential receiver is considered representative of the local ambient noise environment for the nearest sensitive noise receivers to the Site A project and has therefore been used to determine appropriate noise criteria.

Project specific noise levels were determined based on Tables 2.1 and 2.2 of the NSW INP and measured background noise levels. Modifications to noise levels during the daytime period was undertaken based on Table 2.2 of the INP due to the influence of existing industrial noise.

Although the monitoring location at 36 Yarra Road is surrounded by commercial and light industry, the area is zoned residential and is therefore considered to be an ‘urban’ setting for assessment purposes.

The INP specifies that an urban area may be located in either a rural, rural-residential or residential zone, as defined by an LEP or other planning instrument.

The project specific noise levels are provided in Table 4.2.

Table 4.2 Project Specific Noise Levels

Location - 36 Yarra Road			
Criterion	**Day 7 am to 6 pm[1]**	**Evening[2] 6 pm to 10 pm**	**Night 10 pm to 7 am***
A: Rating Background Level	45 $L_{A90(day)}$	25[3] $L_{A90(evening)}$	25[3] $L_{A90(night)}$
B: Intrusiveness Criteria (A + 5dB)	50 $L_{Aeq(15\ min)}$	35 $L_{Aeq(15\ min)}$	35 $L_{Aeq(15\ min)}$
C: Urban Amenity Criteria (Table 2.1 INP)	60 $L_{Aeq(day)}$	45 $L_{Aeq(evening)}$	45 $L_{Aeq(night)}$
D: Amenity Criteria: (INP Table 2.2 Adjusted)	50[4] $L_{Aeq(day)}$	45 $L_{Aeq(evening)}$	45 $L_{Aeq(night)}$
E: Project Specific Noise Level (Pg 21 INP)	**50 $L_{Aeq(15\ min)}$**	**35 $L_{Aeq(15\ min)}$**	**35 $L_{Aeq(15\ min)}$**

[1] Note – Day and night time periods as specified in EMS report, September 1996.

[2] – Note that the EMS report provided day and night time noise levels only. Therefore the night time noise levels were applied to evening which is considered conservative for this assessment.

[3] - The INP states that where the rating background level is found to be less than 30 dB(A), then it is set at a minimum of 30 dB(A), therefore these values have been adjusted to 30 dB for further calculations.

[4] – Modification to acceptable noise level undertaken to account for existing level of industrial noise as per Table 2.2 of the INP.

5. Assessment of Potential Impacts

5.1 Construction Noise Assessment

The construction noise criteria are set for noise levels determined as $L_{10(15min)}$. During a full 15-minute period the machinery items to be used on site will operate at maximum sound power levels for only brief stages. At other times the machinery may produce lower sound levels while carrying out activities not requiring full power.

In addition, mobile machinery will likely move about during the 15 minutes, variously altering the directivity of the noise source with respect to individual receivers.

As it is likely construction activities would be undertaken over 26 consecutive weeks, the construction noise criterion should be considered as being Background + 5 dB(A). Therefore the construction criteria at the nearest residential receivers[2] would be 50 dB(A).

As exact construction equipment is unknown, typical noise levels produced by construction plant anticipated to be used on site were sourced from AS 2436 – 1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites and from GHD's internal database. The sound power levels were then distance attenuated from the proposed construction site. Propagation calculations take into account sound intensity losses due to spherical spreading, with additional minor losses such as atmospheric absorption, directivity and ground absorption ignored in the calculations. As a result, predicted received noise levels are expected to slightly overstate actual received levels and thus provide a measure of conservatism.

Received noise at each assessed distance from each item of plant on site is added, where appropriate, to determine the total received noise at that distance from construction activities and compared to the criteria.

Received noise produced by anticipated activities, during construction of the proposed facility is shown in Table 5.1 for a variety of distances to a typical receiver, with no noise barriers or acoustic shielding in place and with each plant item operating at full power.

[2] Residence located at 36 Yarra Road and the built up areas of Matraville, Malabar Junction and Chifley has been assumed as the nearest residential receiver for the purpose of this assessment. Received sound pressure levels are assumed to be representative of the local ambient noise environment at this location.

Table 5.1 Predicted Plant Item Noise Levels, dB(A)

Plant Activity SWL dB(A)	40 m	80 m	160 m	320 m	640 m	1280 m
Crane 110	70	64	58	52	46	40
Backhoe 108	68	62	56	50	44	38
Compressor 100	60	54	48	42	36	30
Concrete Pump 109	69	63	57	41	35	29
Dump Truck 108	68	62	56	50	44	38
Water Tanker 109	69	63	57	51	45	39
Compactor 110	70	64	58	52	46	40
Concrete Saw 118	78	72	66	60	54	48
Paver 113	73	67	61	55	49	43

The sound power levels shown in Table 5.1 are maximum levels produced when machinery is operated under full load.

The cumulative sound power level of all items listed at the greatest distance (1,280 m) shown in Table 5.1 is calculated at 48 dB(A), which is still below the construction noise criteria (50 dB(A)) at the residential location across Yarra Bay.

As the nearest residential noise receivers are located at a distance of approximately 1 km from the proposed site location, it is unlikely that construction noise will adversely impact the noise environment of the residential area to the east, across Yarra Bay.

5.2 Operational Noise Assessment

5.2.1 Operational Noise Model Set-up

The closest direct residential receptor to the proposed development site is located approximately 1 km to the east across Yarra Bay.

Acoustic modelling was undertaken using Computer Aided Noise Abatement (CadnaA) to predict the effects of industrial noise generated by the proposed facility. It should be noted that modelling was undertaken in the absence of any noise attenuation parameters.

CadnaA is a computer program for the calculation, assessment and prognosis of noise exposure. CadnaA calculates environmental noise propagation according to ISO 9613-2 and road traffic noise according to CRTN, which was developed by the UK Department of Transport. Modelling results are based on available information provided and should only be used as a guide for comparative purposes.

Modelling was based on raw noise data provided by the client for the respective equipment. Plant layout and building structures were based on information provided at the time of the assessment.

The following outlines the modelling assumptions both models were based on:

- Ground temperature 10 ^{o}C and relative humidity of 70%;
- No ground absorption properties for the concrete areas and ground absorption of one for other areas;
- Heights and diameters of the proposed and existing storage tanks as per the information provided by the client;
- Yarra Bay was modelled as a reflective source (i.e. no absorption properties);
- The model did not take into account intervening buildings existing between the project site and outlying noise receivers; and
- Reflection and shielding of site buildings and existing storage tanks were taken into account.

Table 5.2 lists the modelled operating machinery, equipment and/or activities and their respective sound power levels, as sourced from information provided by the client and the source heights of these noise generating equipment.

Table 5.2 Noise Generating Equipment

Equipment	Number Modelled	Modelled SWL dB(A)	Frequency* (Hz)	Height (m)
Tanker trucks	4	103	Spectral	1.5
Boiler	2	85	500	1
Cooling Water Pumps	5	96	500	1
Booster Pumps	3	99	Spectral	1

Note* - Frequency levels used based on ISO 9613.2 which states that if only A-weighted sound power levels of the sources are known (only A-weighted SWL provided in previous report), the attenuation terms for 500 Hz may be used to estimate the resulting attenuation.

Processing operations were modelled to represent a worst case scenario. Modelling was undertaken based on the following differing meteorological and operational conditions:

- Scenario 1 - Calm weather conditions, with no wind during day time periods;
- Scenario 2 - wind vector modelled with consideration to ISO 9613-2, which takes into account the excess attenuation from downwind propagation. A coefficient of 2 dB, which is likely to be conservative, has been used as the ISO 9613-2 deems values in excess of this exceptional;
- Scenario 3 – Class F concawe weather conditions, wind speed 2 m/s towards north east (residences adjacent to existing oil refinery opposite Bunnerong Road) during night time and early morning periods; and

- Scenario 4 – Class F[3] concawe weather conditions, wind speed 2 m/s towards south east (residences across Yarra Bay) during night time and early morning periods.

5.3 Operational Noise Results

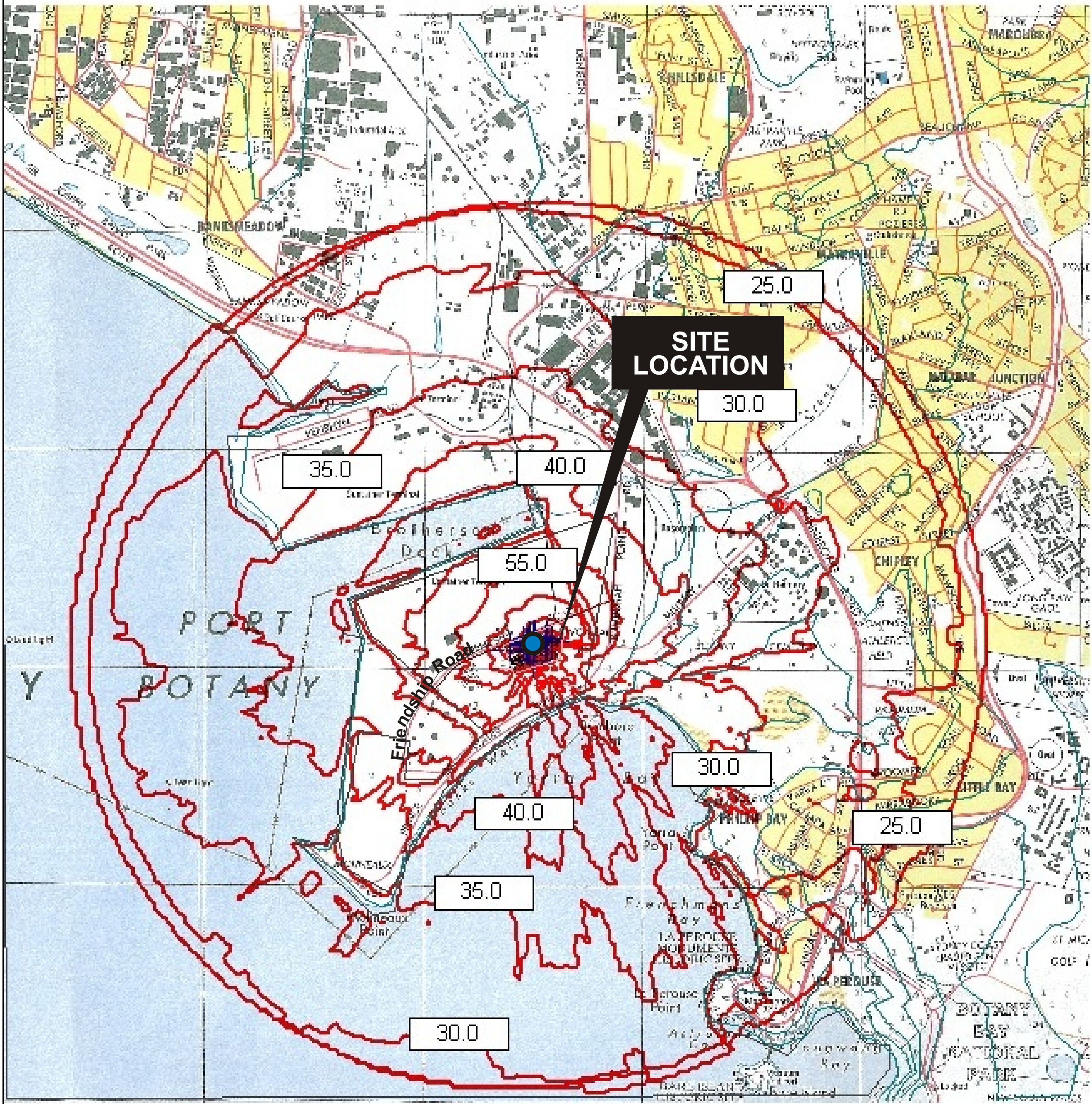
A worst case scenario was modelled where all items listed in Table 5.2 are modelled operating simultaneously.

Results of the modelling suggest project specific noise goals are likely to be met within the built up residential areas of Phillip Bay and Chifley as defined on the contour map during day, evening and night time plant operations (as shown in Figures 2 – 5 below).

Under prevailing wind conditions with an F-class inversion towards the residential receivers located to the north east of the site (within Matraville), modelling suggests residential dwellings located adjacent to Bunnerong Creek (along the southern portion of the suburb of Matraville) has the potential to reach a maximum 38 dB(A) during operation of the facility. This would result in a maximum 3 dB(A) increase over the recommended operational noise level.

However, a noise increase of 2 – 3 decibels is unlikely to be perceptible to the human ear.

[3] The default inversion parameter Class F has been used based on the area classified as a non-arid area.



Source: Botany Bay Topographic Map 9130-3-S 2nd ed., CMA of NSW.

0 1 2Km

Scale

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Proposed Sydney Biodiesel Terminal
Vopak Site A Terminal Noise Assessment

Modelled Results, Scenario 1 - Neutral Weather Conditions

scale as shown | date 15 August 2006

job no 21-14828
file ref 2114828_LTN_02.cdr

Figure 2

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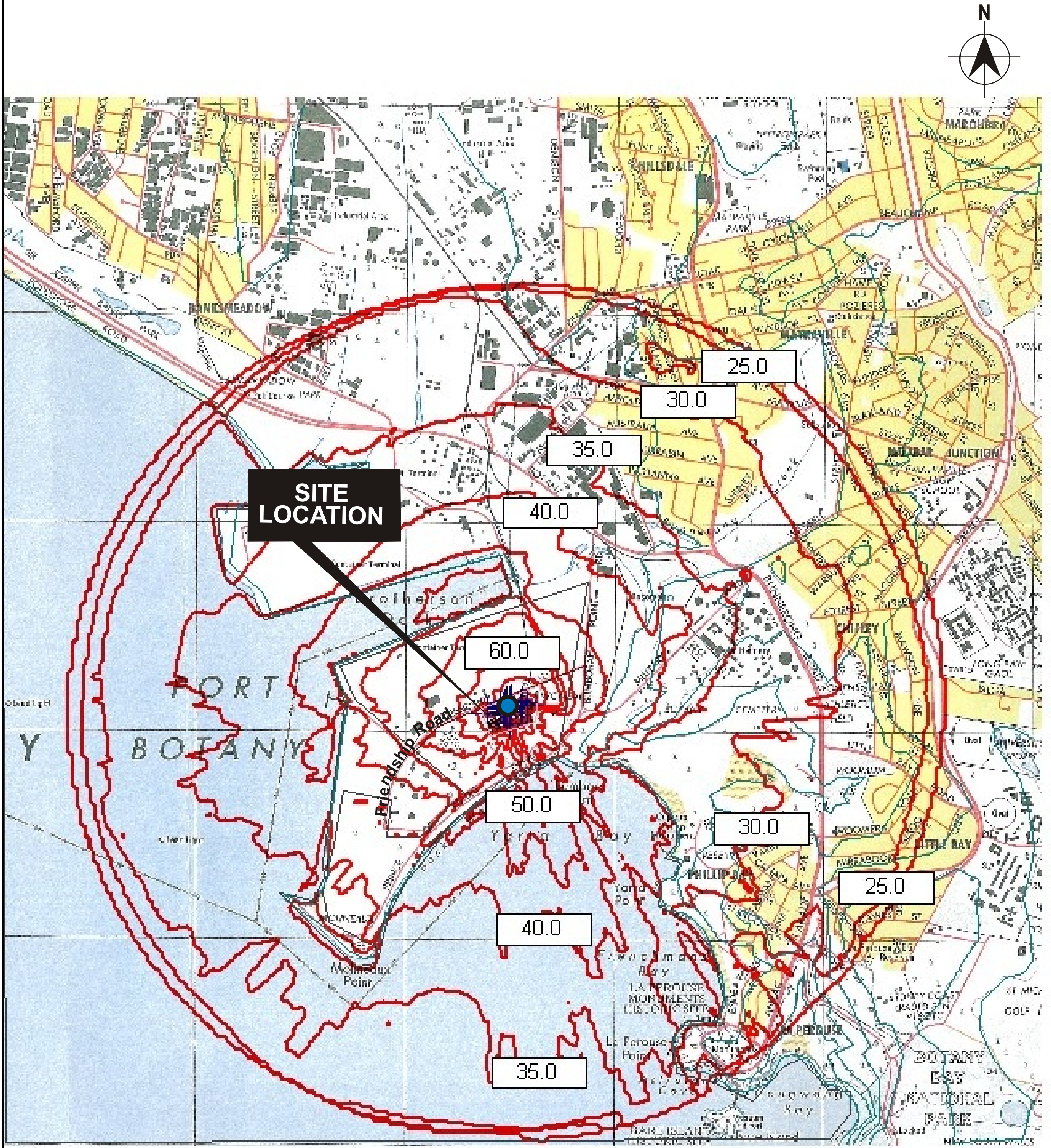

Source: Botany Bay Topographic Map 9130-3-S 2nd ed., CMA of NSW.

0 1 2Km
Scale

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Proposed Sydney Biodiesel Terminal
Vopak Site A Terminal Noise Assessment

Modelled Results, Scenario 2 - Wind Vector

scale | as shown | date | 15 August 2006

job no | 21-14828
file ref | 2114828_LTN_03.cdr

Figure 3

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Source: Botany Bay Topographic Map 9130-3-S 2nd ed., CMA of NSW.

0 1 2Km
Scale

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Proposed Sydney Biodiesel Terminal
Vopak Site A Terminal Noise Assessment

Modelled Results, Scenario 3 - F-Class Winds towards North East

scale as shown date 15 August 2006

job no 21-14828
file ref 2114828_LTN_04.cdr

Figure 4

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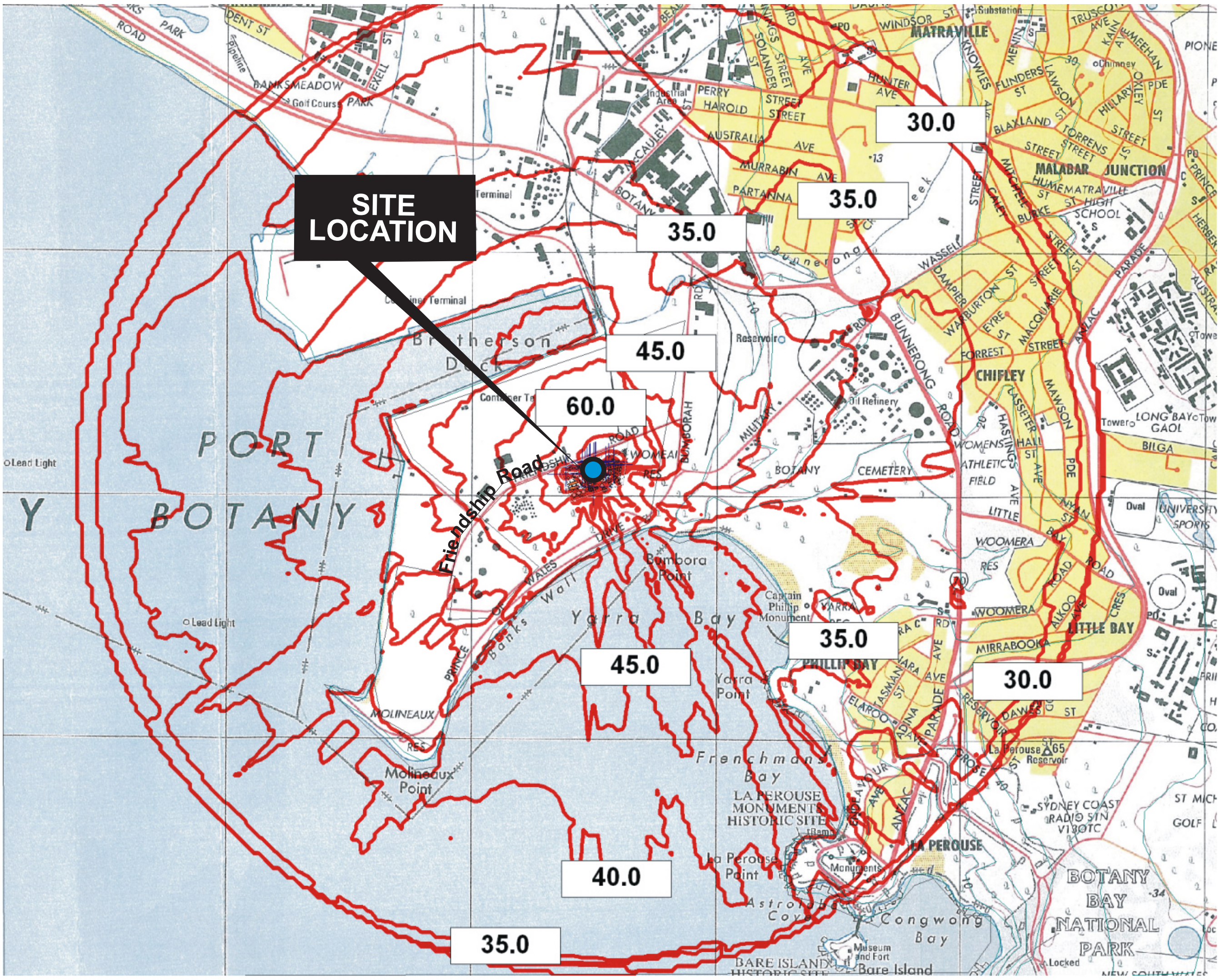
N



Source: Botany Bay Topographic Map 9130-3-S 2nd ed., CMA of NSW.

0 1 2Km
Scale

Proposed Sydney Biodiesel Terminal
Vopak Site A Terminal Noise Assessment

Modelled Results, Scenario 4 - F-Class Winds towards South East

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Figure 5

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5.4 Operational Road Traffic Noise Assessment

Operational traffic movements are primarily attributed to freight transport, including distribution of goods and products.

Both current and predicted road vehicle movements as indicated in GHD's traffic assessment report (August 2006) are presented in Table 5.3 below.

Table 5.3 Existing and Proposed Traffic Generation

	Approximate Maximum Number of Vehicles Per Day
Existing Operations	55 VPD
Proposed Operations	60 VPD

Note VPD = vehicles per day

As the number of proposed vehicles, including heavy vehicle traffic and commercial vehicles is not expected to increase considerably during operation of the terminal facility, the noise environment is not considered to be affected by future operational road traffic movements.

Generally, in order to increase traffic noise levels by 3 dB(A) the amount of traffic would need to double. Given the negligible increase in vehicle movements, it is considered that the proposed development will comply with the ECRTN and vehicle noise will increase by less than 2 dB(A).

6. Mitigation Measures

From the identification of potential noise sources, there are appropriate management and mitigation measures available to ameliorate likely noise impacts. The measures proposed to manage and mitigate the noise impacts are:

- An Environmental Management Plan (EMP) for the project works should be developed for both construction and operational phases;
- During construction and operation, combustion engine plants, such as generators, compressors and welders should be checked to ensure they produce minimal noise with particular attention to residential grade exhaust silencers;
- Construction vehicles to be kept properly serviced and fitted with appropriate mufflers. The use of exhaust brakes should be eliminated, where practicable;
- Where practical, all construction vehicle access to and from the construction site should be made only during normal working hours;
- Where practical, construction and operational machines to be operated at low speed or power and should be switched off when not being used rather than left idling for prolonged periods;
- Construction and operational machines found to produce excessive noise compared to industry best practice should be removed from the site or stood down until repairs or modifications can be made;
- Where practical, impact wrenches should be used sparingly with hand tools or quiet hydraulic torque units preferred during construction;
- Where practical, construction vehicles should be operated at low speed or power and should be switched off when not being used rather than left idling for prolonged periods; and
- Noise modelling suggests that vehicular movements to and from the site and idling transport vehicles are most likely to influence the noise output from the operational site. Where practical, vehicles should be operated at low speed or power and should be switched off when not being used rather than left idling for prolonged periods.

7. Conclusion

GHD Pty Ltd (GHD) was commissioned by Vopak Terminals Sydney Pty Ltd (Vopak) and Natural Fuels Australia Ltd (NFAL), as part of an Environmental Assessment (EA) to assess the acoustic impact of a proposed processing plant to manufacture bio-diesel. The basis of the assessment was to determine noise levels emanating from the proposed development once operational and ascertain whether noise levels would have an adverse acoustic effect on the amenity of residences within close proximity of the site during both construction and operation of the development.

As the nearest residential noise receivers are located at a distance of approximately 1 km from the proposed site location, it is unlikely that construction noise will adversely impact the noise environment of the residential/built up areas surrounding the site to the north east, east and south east.

Sound power levels for proposed noise generating equipment to be used at the site were sourced from information provided by the client. Detailed noise modelling was undertaken based on the provided sound power levels of primary noise sources for the proposed facility.

A worst case operational scenario was modelled where all identified noise generating equipment was modelled operating simultaneously.

Results of the modelling suggest noise associated with activities of the operating biodiesel plant is unlikely to exceed project specific noise goals at the modelled receiver location at 36 Yarra Road. Additionally, noise contours suggest operational noise goals may be met within the built-up residential areas of Malabar Junction and Chifley as defined on the noise contour map during day, evening and night time operations.

Under prevailing wind conditions with an F-class inversion towards the residential receivers located to the north east of the site (within Matraville), modelling suggests residential dwellings located adjacent to Bunnerong Creek (along the southern portion of the suburb of Matraville) has the potential to reach a maximum 38 dB(A) during operation of the facility. This would result in a maximum 3 dB(A) increase over the recommended operational noise level.

However, a noise increase of 2 – 3 decibels is unlikely to be perceptible to the human ear.

Therefore based on the findings of this assessment with consideration to the information provided and work scope undertaken, it is anticipated relevant construction and operational noise levels should comply with the relevant site specific noise goals.

8. References

Australian Standards (AS 2436), 1981, Guide to Noise Control on Construction, Maintenance and Demolition Sites.

Environmental Monitoring Services, *Noise Assessment of the Van Ommeren Bulk Liquid Terminal,* September 1996.

NSW DEC, Environmental Criteria for Road Traffic Noise, May, 1999.

NSW DEC, Environmental Criteria for Industrial Noise Policy (INP), January 2000.

NSW DEC, Environmental Noise Control Manual, June 1994.

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Appendix H

SPC Green Ports Guidelines

Applicant Details

Name	Neil Trillo
Address	PO Box 191, Matraville NSW 2036
Phone number/Email	(02) 9666 4455
Project Details	Sydney Biodiesel Terminal
Location of proposed development	49 Friendship Road, Port Botany
Description of proposed development	Refer to EA
The details on this form are the provisions and intentions for maximising the environmental sustainability of this development.	
Name	Neil Trillo
Signature	
Date	

Item No	**Purpose/ Criterion**	**Has this been addressed? (Yes/ No/ N/A)**	**How has it been addressed? Or why has it not been addressed?**	**Provide details of supporting documentation/ reference material**
MATERIALS SELECTION				
R1	Reduce the quantity of new materials being used by reducing or reusing materials or by utilising recycled materials.	Yes	Re-use of facilities such as Tanks, pumps and fire infrastructure	Refer to Environmental Assessment
R2	Encourage environmentally friendly production of materials.	Yes	Biodiesel is environmental friendly. Early stage of proposal –detailed engineering stage to consider use of environmentally friendly products where practicable.	Refer to Environmental Assessment

Item No	Purpose/ Criterion	Has this been addressed? (Yes/ No/ N/A)	How has it been addressed? Or why has it not been addressed?	Provide details of supporting documentation/ reference material
R3	Specify materials that have minimal embodied energy and environmental impact.	Yes	Due to nature of operations, materials used would be chosen for durability, strength and low maintenance requirements.	
R4	Consider the end of life of materials and the whole building, design for deconstruction**.**	Yes	Early stage of proposal –detailed engineering stage to consider use of potential for end-use recyclable products where practicable.	
WASTE MANAGEMENT				
W1	Minimise the generation of wastes.	Yes	The proposal will incorporate a Waste Management Plan within a CEMP based on hierarchy of waste management principles.	Refer to Environmental Assessment
W2	Facilitate recycling to reduce the amount of waste going to landfill.	Yes	The proposal will incorporate a Waste Management Plan within a CEMP based on hierarchy of waste management principles	Refer to Environmental Assessment
W3	Ensure the safe storage and handling of hazardous wastes.	Yes	Proposal designed to provide for a market involving petroleum products. Strong focus on safety and handling procedures for hazardous substances.	Refer to Environmental Assessment
WATER CONSUMPTION				
H1	Reduce consumption of potable water internally.	No	Early stage of proposal –detailed engineering stage to consider use of water efficient appliances.	

Item No	Purpose/ Criterion	Has this been addressed? (Yes/ No/ N/A)	How has it been addressed? Or why has it not been addressed?	Provide details of supporting documentation/ reference material
H2	Manage and monitor water usage and any leaks.	No	Early stage of proposal – Operational management plan to monitor water consumption and install devices to limit instances of leakage.	
H3	Reduce the quantity of potable water used for landscape irrigation.	No	Early stage of proposal – landscape plan to consider use of native plants, mulch and drip-feed irrigation.	
H4	Treat water onsite and reuse the treated water to reduce demand on the local potable water supply and the demand on the local infrastructure.	No	Limited numbers of staff discount this option. Reuse of trade wastewater used during processing requires additional treatment and stringent monitoring and is not practicable in the current circumstance due to small onsite demand for irrigation etc.	Refer to Environmental Assessment
ENERGY USE				
E1	Reduce energy consumption and hence greenhouse gas emissions.	No	Early stage of proposal – Detailed engineering phase to consider use of low energy fittings, micro-climate requirements and use of energy efficient appliances where practicable.	
E2	Manage the use of energy to minimise consumption.	Yes	Proposal includes a logistical approach to operations that results in minimum manpower, use of specialised technology and aims for efficiency to remain competitive. Such approaches all contribute to a minimum use of energy consumption for the intended operations.	Refer to Environmental Assessment

Item No	Purpose/ Criterion	Has this been addressed? (Yes/ No/ N/A)	How has it been addressed? Or why has it not been addressed?	Provide details of supporting documentation/ reference material
E3	Source energy from renewable sources.	Yes	The biodiesel facility would not result in a net increase of C02.	Refer to Environmental Assessment
E4	Source energy from alternate energy sources and use less greenhouse intensive fuels (in particular limit diesel use).	Yes	The biodiesel facility would not result in a net increase of C02.	Refer to Environmental Assessment
TRANSPORTATION				
T1	Encourage the use of alternative modes of transport by employees, in order to reduce the amount of inefficient/individual car travel and therefore greenhouse gas emissions.	Yes	The proposal seeks to utilise shipping and pipeline as the means of product transfer where possible. Business transactions and operations centralised, avoiding the need to travel to meetings etc.	Refer to Environmental Assessment
T1	Reduce greenhouse gas emissions from operational vehicles and equipment.	Yes	Distribution of fuels by pipe to increase, therefore reducing potential distribution by road tanker.	Refer to Environmental Assessment
INDOOR ENVIRONMENT				
IE1	Improve the quality of indoor air to protect the health of employees and enhance productivity.	Yes	Use of Reverse Cycle A/C for staff comfort	Refer to Environmental Assessment

Item No	Purpose/ Criterion	Has this been addressed? (Yes/ No/ N/A)	How has it been addressed? Or why has it not been addressed?	Provide details of supporting documentation/ reference material
IE2	Optimise daylighting and make best use of artificial lighting to assist eye health and productivity.	No	Early stage of proposal – Detailed engineering phase to consider design of indoor work spaces to control daylight infiltration through window sighting and use of louvres as far as practicable.	
IE3	Provide optimum acoustical environment for productivity and to prevent ear damage.	No	Early stage of proposal – Detailed engineering phase to consider design of indoor work spaces to control acoustical environment through the use of materials as far as practicable.	
EMISSIONS				
EM1	Protect the ozone layer and reduce the potential for global warming.	Yes	The use of ozone depleting substances minimised as far as practicable. The biodiesel facility would not result in a net increase of C02.	Refer to Environmental Assessment
EM2	Limit the generation of air pollutants and ensure that they are emitted away from sensitive receptors.	Yes	Vapour recovery unit installed and mitigation and management measures identified to minimise particulate matter disturbance	Refer to Environmental Assessment
EM3	Minimise odours.	Yes	Vapour recovery unit installed and siting of site away from sensitive receivers.	Refer to Environmental Assessment
EM4	Minimise noise nuisance.	Yes	Situated away from sensitive receivers.	Refer to Environmental Assessment
EM5	Avoid light spill into night sky or neighbouring properties/areas.	Yes	Lighting to be designed and installed to minimise light overspill.	Refer to Environmental Assessment

Item No	Purpose/ Criterion	Has this been addressed? (Yes/ No/ N/A)	How has it been addressed? Or why has it not been addressed?	Provide details of supporting documentation/ reference material
EM6	Avoid accidental contact with hazardous or poisonous goods.	Yes	Proposal designed to provide for a market involving petroleum products. Strong focus on safety and handling procedures for hazardous substances.	Refer to Environmental Assessment
WATER QUALITY				
HQ1	Manage stormwater to reduce peak stormwater flows and protect water quality.	Yes	Installation of bunded areas, WWTP and stormwater inceptor pit	Refer to Environmental Assessment
HQ2	Manage water quality to protect the harbour and other waterbodies.	Yes	Installation of bunded areas, WWTP and stormwater inceptor pit	Refer to Environmental Assessment
HQ3	Prevent damage from potential flood events and water table changes.	N/A	No significant changes to topography or groundwater levels would result from the proposal	Refer to Environmental Assessment
LAND USE				
L1	Encourage the redevelopment of sites that have previously been developed and remediate contaminated land.	Yes	Situated on cleared and disturbed land. Unlikely to be any contaminated soils.	Refer to Environmental Assessment
L2	Use landscaping to enhance biodiversity and conserve and create habitat for flora and fauna.	No	Early stage of proposal – Detailed landscape plan to consider use of native plants where practicable according to safety and operational requirements.	
L3	Enhance visual amenity.	Yes	Visual environment consistent with existing context and character and would not significantly affect visual amenity.	Refer to Environmental Assessment

Item No	Purpose/ Criterion	Has this been addressed? (Yes/ No/ N/A)	How has it been addressed? Or why has it not been addressed?	Provide details of supporting documentation/ reference material
L4	Avoid impact on identified heritage items.	N/A	No identified heritage items in vicinity of site	Refer to Environmental Assessment
ENVIRONMENTAL MANAGEMENT				
M1	Maintain good relationships with stakeholders and respond to any complaints.	Yes	Community consultation and agency stakeholder discussions undertaken.	Refer to Environmental Assessment
M2	Provide a framework for identifying, managing and minimising environmental impacts, and maximising environmental benefits.	Yes	Environmental Assessment identified use of a construction environment management plan and operational environment management plan to minimise potential environmental impacts.	Refer to Environmental Assessment
M3	Educate developers, tenants and employees about ESD and how to improve sustainability.	Yes	Construction environment management plan and operational environment management plan to include ESD principles and awareness of environmental responsibility.	Refer to Environmental Assessment

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