TRANSPORT STUDY – ROUTE SELECTION, PORT KEMBLA ETHANOL TERMINAL, NSW

MANILDRA

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Transport Study - Route Selection, Manildra, Port Kembla Ethanol Terminal

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Rev	Date	Description	Reviewed By
A	22/9/21	Draft for Comment	Manildra
B	21/10/21	Section 6.7 Updated	Manildra
C	29/10/21	Table 6 and A-Doubles Added	Manildra

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EXECUTIVE SUMMARY

The Manildra Group is a wholly Australian owned business and the largest processor of wheat in Australia. It manufactures a wide range of wheat-based products for food and industrial markets both locally and internationally.

The Manildra Group owns the Shoalhaven Starches factory located on Bolong Road, Bomaderry, which produces a range of products for the food, beverage, confectionary, paper and motor transport industries including starch, gluten, glucose and ethanol.

Manildra propose to construct a beverage grade ethanol storage and handling facility at Port Kembla, NSW. The beverage grade ethanol will be transferred via road tankers from the Bomaderry facility to the Port Kembla facility and stored within six tanks. The beverage grade ethanol can then be transferred to a ship, or to Isotanks and road tankers for delivery to the market.

As part of the project requirements, a Transport Study is required to comply with HIPAP 11 (Hazardous Industry Planning and Advisory Paper).

The emphasis in this transportation study is on comparative risk assessment, rather than on absolute levels of risk along the route. As stated in HIPAP 11, the main purpose of a truck route network is to provide access to industrial areas and other major destinations as well as minimising the intrusion of through traffic in residential areas.

For transporting ethanol from the Shoalhaven Starches site to Shellharbour, there is only one viable route, i.e. via the A1. This is an approved route. As there are no viable alternatives then a route selection risk assessment does not need to be applied to this route.

The selection of the preferred route from Shellharbour to the Port Kembla site is based the differences between the two main options, in particular, the following types of factors:

- Mandatory factors, e.g. use of approved roads;
- Subjective factors, e.g. exposure to sensitive ecosystems;
- Road and traffic factors, e.g. traffic lights and roundabouts;
- Land use factors, e.g. exposure to residential areas; and
- Operational factors, e.g. duration and distance.

As shown in this report, the route which presents the lowest overall risk to surrounding people, property and the natural environment from Shellharbour to Port Kembla is via the A1 and Five Islands Road.

Based on the analysis in this study then no further recommendations are made.

GLOSSARY

ADG	Australian Dangerous Goods (Code)
BOD	Biological Oxygen Demand
DoP	NSW Department of Planning
EIP	Emergency Information Panels
HAZAN	Hazard Analysis
HIPAP	Hazardous Industry Planning Advisory Paper
LC	Lethal Concentration
LEL	Lower Explosive Limit
SEP	Surface Emissive Power
SEPP	State Environmental Planning Policy
SLP	Safe Load Program
SMS	Safety Management System
TERP	Transport Emergency Response Plan
US - EPA	United States of America Environmental Protection Agency

REPORT

1 INTRODUCTION

1.1 BACKGROUND

The Manildra Group is a wholly Australian owned business and the largest processor of wheat in Australia. It manufactures a wide range of wheat-based products for food and industrial markets both locally and internationally.

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Manildra propose to construct a beverage grade ethanol storage and handling facility at Port Kembla, NSW. The beverage grade ethanol will be transferred via road tankers from the Bomaderry facility to the Port Kembla facility and stored within six tanks. The beverage grade ethanol can then be transferred to a ship, or to Isotanks and road tankers for delivery to the market.

To supplement the project requirements, a Transport Study is required.

Manildra requested that Pinnacle Risk Management prepare the Transport Study for the proposed ethanol terminal and the associated road transport. This study has been prepared in accordance with the guidelines published by the Department of Planning (DoP) Hazardous Industry Planning Advisory Paper (HIPAP) No 11 (Ref 1).

1.2 SCOPE AND OBJECTIVES

As stated in HIPAP 11:

> *"Where a development involves the transport of significant volumes of dangerous goods and/or hazardous materials, there may be a need to select preferred transport routes from a number of possible alternatives.*
>
> *These guidelines provide an overall integrated framework for the assessment of road transport routes for the transportation of hazardous materials. They are based on the basic principles that land use safety planning should complement technical and operational safety management. Optimum transportation decisions can only be made when all relevant aspects of and use safety, traffic and economic elements are exposed and integrated into the decision making process."*

As the proposed ethanol terminal involves significant road transport of ethanol then this study assesses the risks associated with routes ***where alternate routes are available***.

Correspondingly, the main aim of this study is to determine if there is a preferred route, based on a risk assessment that is both qualitative and quantitative, for transporting ethanol. The methodology adopted is to initially use mostly qualitative factors in the assessment to determine if a route of least impact exists. If so, then further quantification will not be necessary.

As stated in HIPAP 11:

> *"The guidelines have been developed to help in land use safety planning. They are not intended to be used as a basis for preventing vehicles carrying hazardous materials from travelling on roads classified under the Roads Act 1993. Similarly, they should not be used as an argument for upgrading any roads classified under the Roads Act. These matters fall within the jurisdiction of the relevant NSW Government agencies.*
>
> *Essentially, the study process includes:*
>
> - *Examination of the road hierarchy and identification of routes for heavy vehicle transportation;*
> - *Elimination of those routes where there are legal or physical constraints, special/sensitive land uses or where there is inadequate emergency access;*
> - *Rating the potential routes on the basis of environment and land use risk factors, traffic factors and economic factors; and*
> - *A comparison of each of the route alternatives on the basis of their rating against each of the factors.*
>
> *Route selection is more than simply identifying "least risk routes. It requires a balancing of land use safety, road network capability and operational and economic factors."*

2 SITE DESCRIPTION

The site for the proposed terminal is on Foreshore Road, Port Kembla (see Figure 1). This is currently a greenfield site adjacent to the harbour. The site is approximately 15,000 m^2.

The site is surrounding by the following land uses:

- The harbour to the north;
- A vacant Lot to the east;
- Ixom to the south. Ixom services at this site include:
  - Sulphuric acid manufacturing, recycling and supply services to the Australian oil refining industry via a purpose-designed spent acid regeneration plant;
  - Import / export and bulk supply of concentrated sulphuric acid to industrial and power generation customers both locally and overseas;
  - Manufacture of specific grades of sulphuric acid and sulphur-based chemicals for the water treatment industry;
- A sewerage pumping station to the immediate west of the site boundary; and
- Port Kembla train station and steel equipment suppliers further to the west.

A storm water channel runs along the western boundary to the harbour. The Lot to the west of this channel is currently vacant.

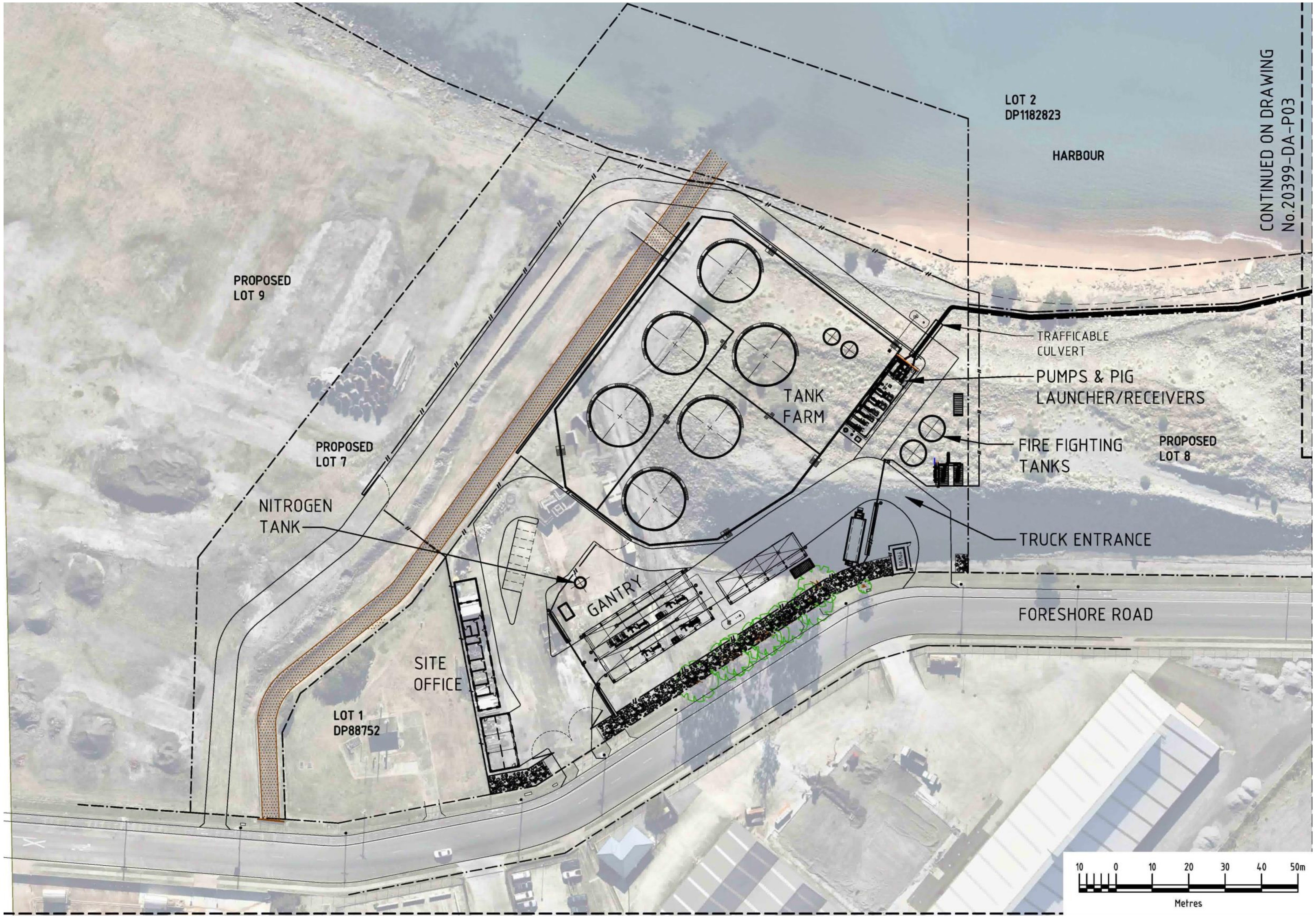
The nearest residential area is to the south-west at approximately 600 m from the terminal, i.e. the suburb of Port Kembla.

A layout drawing showing the proposed terminal layout is shown in Figure 2.

Figure 1 - Site Location

Reference: Google Maps

Figure 2 - Site Layout



3 Road Transport Description

3.1 Overview

Ethanol is a Dangerous Good Class 3, Packing Group 2, flammable liquid.

The facility is to include the following road transport requirements:

- In-loading of beverage grade ethanol into the storage tanks from road tankers (singles and doubles, e.g. A-Doubles) from Shoalhaven Starches. The doubles can hold approximately 74,000 L; and
- Outloading to Isotanks (up to 26,000 L) and road tankers for delivery to customers.

Ethanol transported by road will be transported in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (Ref 2). Correspondingly, the proposed ethanol transport will be compliant with the Australian road standards and guidelines

If a road tanker or Isotank carrying ethanol is involved in an accident and the vessel integrity is lost then there is the potential for serious injury and fatality for people involved in the accident or those nearby if the ethanol ignites. There is also potential for environmental impact if the ethanol flows into sensitive environments, e.g. waterways.

The expected frequency and vehicle movements to/from the site is given in Table 1.

Table 1 – Ethanol Road Transport Frequencies

Material Transported	Nominal Site Delivery Frequency	Nominal Annual Volume
Road Tankers Delivering Ethanol to the Site	65 Loads per Week (74,000 L each) or 13 per Day	250,000,000 L
Road Tankers and Isotanks Supplying the Market, i.e. leaving the site	20 Loads per Week (average of 50,000 L each) or 4 per Day	50,000,000 L

Note: The remainder of the ethanol will be transferred to ships for overseas delivery.

Given the expected approximate transport frequencies in Table 1 then there will be an additional 65 loads carrying ethanol to the site per week. As this is above the SEPP 33 (State Environmental Planning Policy) (Ref 3) criterion of 45 loads per week for a Dangerous Good 3, Packing Group II, flammable liquid such as ethanol then this assessment of the anticipated roads is performed. As per HIPAP 11 (Ref 1), the assessment reviews the potential risks associated with the proposed roads to determine the preferred route to use (if any).

3.2 PROPOSED TRANSPORT ROUTES

For transporting ethanol from the Shoalhaven Starches site to Shellharbour, there is only one viable approved route, i.e.:

- The vehicles (mostly A-Doubles) will turn left when leaving the Shoalhaven Starches site and travel west along Bolong Road to the A1; and
- Turn right at the A1 and follow this road north to Shellharbour.

This approved route is shown in Figure 3. As there are no viable alternatives then a route selection risk assessment does not need to be applied to this route.

There are two options for transporting the ethanol to the terminal at Foreshore Road, Port Kembla, from Shellharbour, i.e.:

Option 1:

- Continue travelling north along the A1 and turn right at Five Islands Road (via the A1 off-ramp). This will involve a right-hand turn at a set of traffic lights at Five Islands Road;
- Follow Five Islands Road and turn left onto Darcy Road; and
- Travel north along Darcy Road for approximately 300 m and then turn right into Foreshore Road to arrive at the site.

Option 2:

- Leave the A1 at Shell Cove and turn right (via the A1 off-ramp) onto the B65, i.e. Shellharbour Road. This will involve a right-hand turn at a roundabout at Shellharbour Road;
- Follow the B65 north and turn right (at a set of traffic lights) into Five Islands Road;
- Follow Five Islands Road and turn left onto Darcy Road; and
- Travel north along Darcy Road for approximately 300 m and then turn right into Foreshore Road to arrive at the site.

These options are shown on Figure 4. As there are two options then a route selection risk assessment is performed to determine if one route is preferred.

For transporting ethanol from the terminal to the customers, the most likely route is west along Five Islands Road and then north, i.e. to Sydney. As the customers and therefore routes are not known then route selection risk assessments are not performed. Importantly, all road used will be compliant with the NSW approvals.

Figure 3 – Route from Shoalhaven Starches to Shellharbour

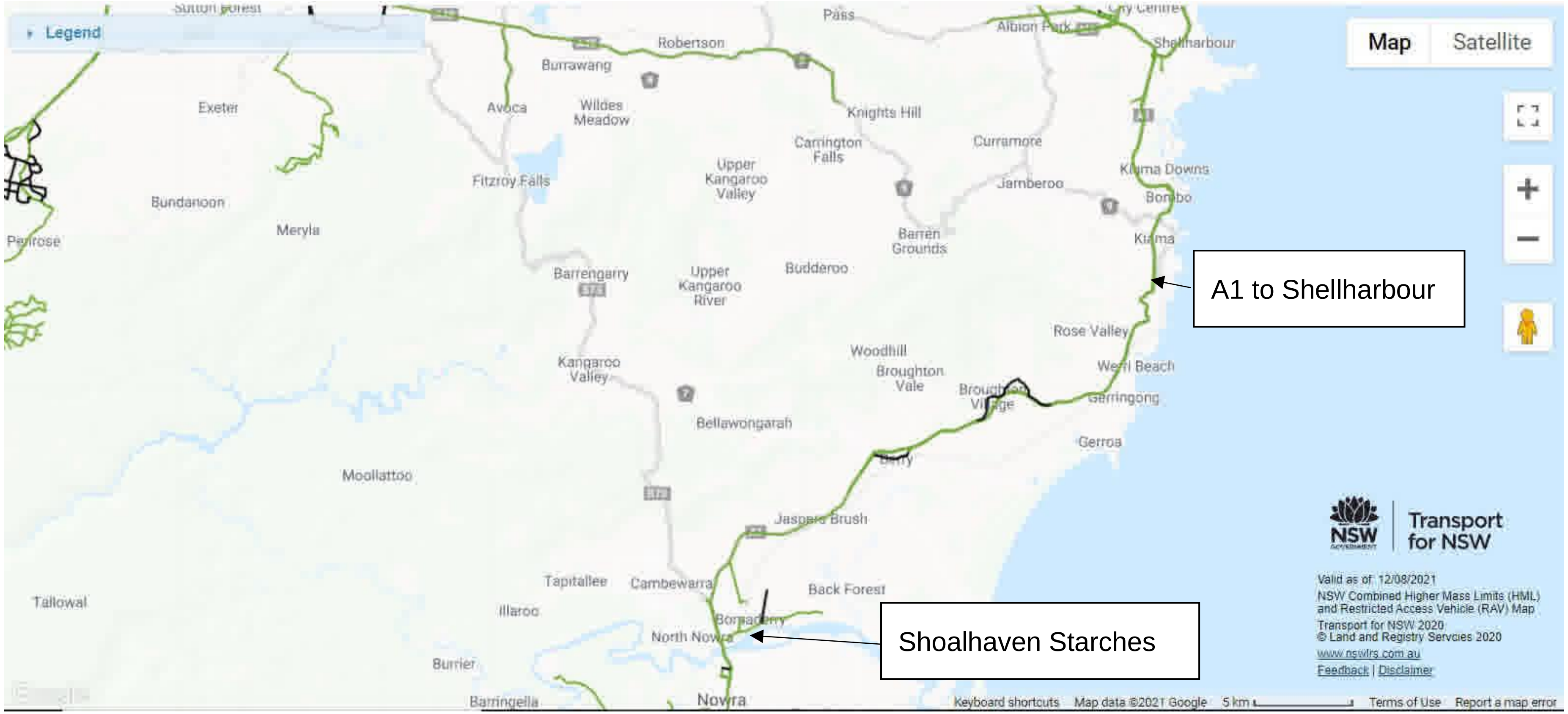
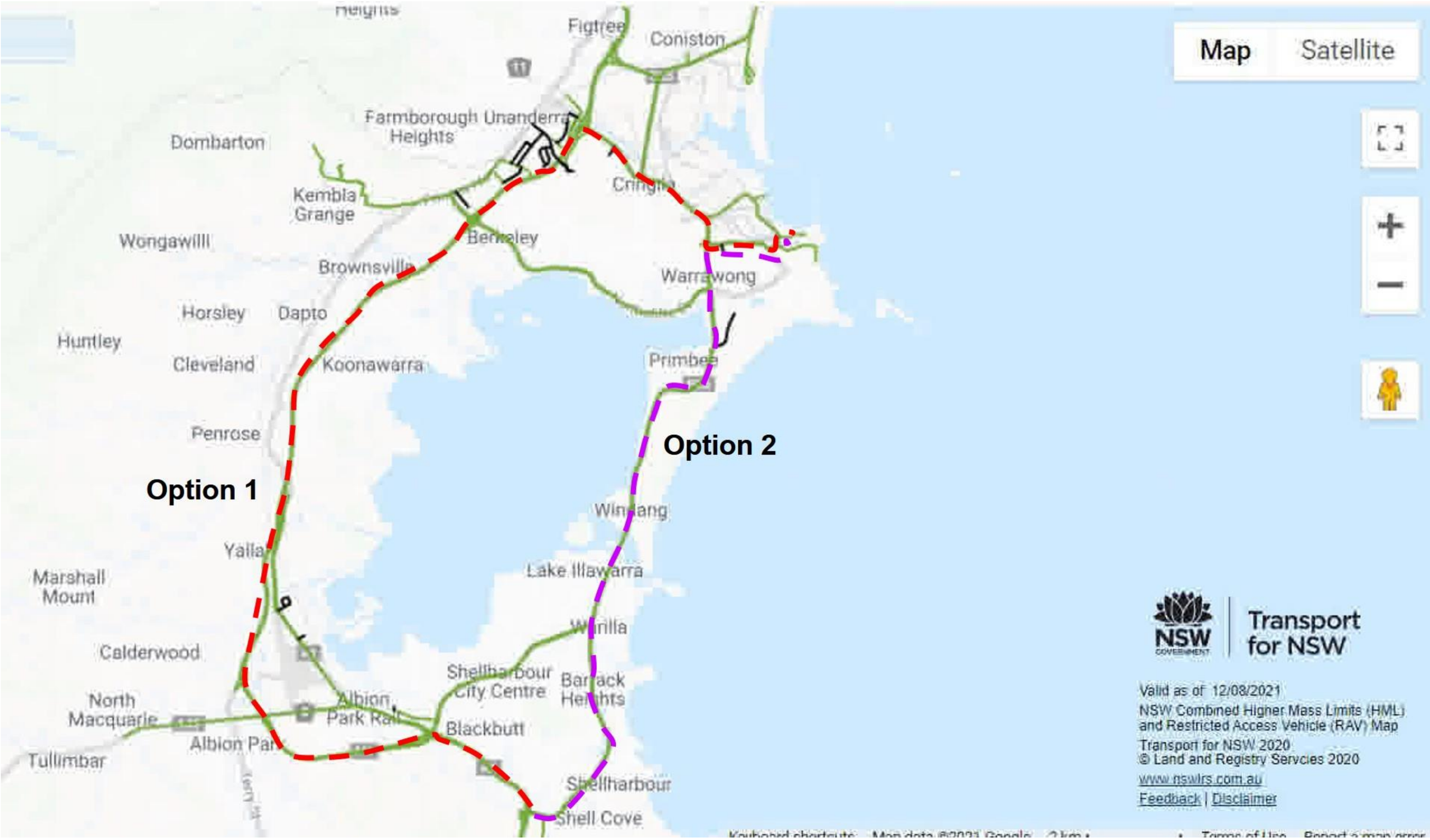


Figure 4 – Routes from Shellharbour to the Terminal



4 HAZARD IDENTIFICATION

4.1 ETHANOL HAZARDS

Ethanol is a Dangerous Good Class 3 flammable liquid. It is soluble in water.

Ethanol's flammability limits are LEL (lower explosive limit) 3.5% and UEL (upper explosive limit) 19%. It burns with a near colourless flame. The vapour is heavier than air and can accumulate in low points. Explosions of confined vapours are possible. Ethanol combustion produces carbon dioxide and carbon monoxide. Fires involving ethanol are normally extinguished with alcohol resistant foam.

The following potential environmental impacts are summarised from Ref 4:

- LC50 (lethal concentration to 50% of the test population - fathead minnow fish) is 15,300 mg/L for a 96 hour exposure (US-EPA);
- Ethanol is readily biodegradable in the environment, e.g. by bacteria;
- The Biochemical Oxygen Demand (BOD) is 1 to 1.7 mg/L, i.e. a minor to moderate value. BOD is the amount of dissolved oxygen needed (i.e. demanded) by aerobic biological organisms to break down organic material present in a given water sample at certain temperature over a specific time period; and
- Ethanol does not accumulate in organisms.

4.2 HAZARDOUS EVENT IDENTIFICATION

Causes for road tanker accidents are summarised in Table 2 (Ref 5). These are typical for most roads throughout Australia.

The significant consequential impacts of a road tanker accident are as follows:

- Injury and possible fatality to the driver and others involved in the accident;
- Injury, and property and environmental impact if a loss of containment occurs and is ignited, i.e. due to radiant heat impact from a pool fire; and
- Environmental impact if a loss of containment occurs and the ethanol flows into an environmentally sensitive area.

The main safeguards are as follows:

- Road tankers and Isotanks compliant with the Australian Standards;
- Licenced drivers;
- All roads to be used are approved by the NSW government; and

- Ethanol is transported in compliance with the Australian Dangerous Goods Code which includes the mandatory the requirements for emergency response to incidents.

Further safeguards are discussed throughout this report.

Table 2 – Causes for Road Tanker Accidents

Human Error	Equipment Failures	System or Procedural Failures	External Events
• driver impairment, e.g. alcohol or drugs • speeding • driver overtired • driver exceeding safe working hours • en-route inspection • contamination • overfilling • other vehicle's driver • taking tight turns/ramps too quickly (overturns) • unsecured loads	• non-dedicated trailer • rail road crossing guard failure • leaking valve • leaking fitting • brake failure • relief device failure • tyre failure • soft shoulder • overpressure • material defect • steering failure • sloshing • high centre of gravity • corrosion • bad weld • excessive grade • poor intersection design • road chamber/width • suspension system • tyre fire caused by friction, brakes overheating or exploding tyres give sparks due to metal in the rubber) • fuel tank fire (diesel)	• driver incentives to work longer hours • driver training • carrier selection • container specification • route selection • emergency response training • speed enforcement • driver rest periods • maintenance • inspection • time of the day restrictions	• vandalism/sabotage • rain • fog/visibility • wind • flood/washout • fire at rest area/parking areas • earthquake • existing accident • animals on road

5 CONSEQUENCE ANALYSIS - POOL FIRE MODELLING

The potential pool fire events associated with accidents involving and ethanol road tanker are detailed in Table 3. This data is used in the fire modelling. A discussion on burndown rates and surface emissive powers (SEP) is given below.

Burndown Rates:

For burning liquid pools (Ref 6), heat is transferred to the liquid via conduction, radiation and from the pool rim.

Wind can also affect the burning rate (experiments have shown both an increase and decrease in burning rates due to the effects of wind) but also can affect flame stability (and hence average flame emissive power) (Ref 7). Therefore, average reported values for burndown rates are used in this study.

For very large pool fires with diameters greater than 5 to 10 m, there is some evidence of a decrease in burning rate.

Experimental data for the ethanol burndown rate is 1 mm/min (Refs 7 and 8).

The burning rate is used in the determination of flame height. Normally, the higher the burning rate, the higher the estimated flame height.

Surface Emissive Power:

Surface emissive power can be either derived by calculation or by experimentation. Unfortunately, experimental values for surface emissive powers are limited.

When calculated, the results can be overly conservative, particularly for large diameter fires, as it is assumed that the entire flame is at the same surface emissive power. This is not the case for large diameter fires as air entrainment to the centre of the flame is limited and hence inefficient combustion occurs.

For ethanol, a literature search (Refs 9 and 10) indicates the following data:

SEP's of 50kW/m^2 for large fires (pool diameter => 25 m) and 60 kW/m^2 for pool fires less than 25 m in diameter appear reasonable.

For road tankers, the typical fire diameter is up to 8 m (Ref 11). This is supported by anecdotal evidence of fuel tanker fires in Australia. Therefore, a pool diameter of 8 m is used in this assessment.

The distances to specified radiant heat levels for the potential pool fire scenario involving an ethanol road tanker are shown in Table 3. The distances were calculated using the View Factor model for pool fires (Refs 7 and 8).

Table 3 – Fire Scenarios Calculation Data and Results

Item Description	Diameter, m	Liquid Density, kg/m^3	SEP, kW/m^2	Distance to Specified Radiant Heat Level, m (from the edge of the flames)		
				23 kW/m^2	12.6 kW/m^2	4.7 kW/m^2
Road tanker fire	8	790	60	2	5	11

Notes for Table 3:
1. Modelling performed at low wind speed.

The values of interest for radiant heat (DoP, HIPAP No. 4 and ICI HAZAN Course notes) are shown in Table 4.

Table 4 - 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 information, further data on tolerable radiant heat levels is shown in Table 5.

Table 5 – Layout Considerations – Tolerable Radiant Heat Levels

Plant Item	Tolerable Radiant Heat Level, kW/m^2	Source
Drenched Storage Tanks	38	Ref 8
Special Buildings (Protected)	25	Ref 8
Cable Insulation Degrades	18-20	Ref 8
Normal Buildings	14	Ref 8
Vegetation	12	Ref 8
Plastic Melts	12	Ref 8
Escape Routes	6	Ref 8

Plant Item	Tolerable Radiant Heat Level, kW/m^2	Source
Glass Breakage	4	Ref 12
Personnel in Emergencies	3	Ref 8
Plastic Cables	2	Ref 8
Stationary Personnel	1.5	Ref 8

Given the modelling results in Table 3 then adverse impact to people is expected from a potential fire at 11 m from the edge of the flames (typically the side of the road, e.g. guttering can limit the fire spread).

Adverse impact to property and vegetation is expected to be at approximately 5 m from the edge of the flames.

As ethanol is a flammable liquid then the vapour cloud to the lower explosion limit will not travel very far, i.e. typically up to one pool diameter or 8 m in this case (based on experimental data, Ref 13, for evaporation from flammable liquids pools).

Therefore, this assessment is based on potential sensitive receptors (people) up to 11 m from the potential collision locations with subsequent pool fires. Impact to property and/or the natural environment is assessed up to 5 m from the potential fires.

Note that if ignition does not occur then the maximum quantity of ethanol is assumed to be lost and then enters the environment, i.e. environmental impact occurs.

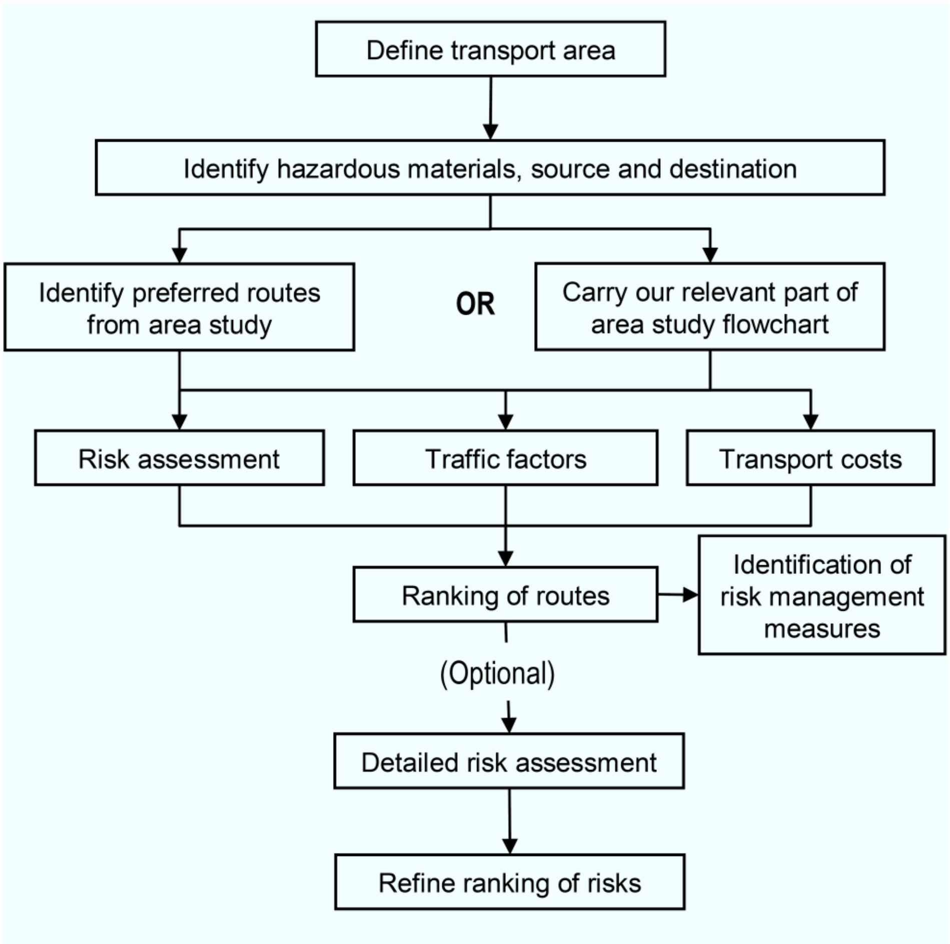
6 HIPAP 11 ROUTE SELECTION ASSESSMENT

The process for evaluating road transport routes in HIPAP 11 takes into account the following factors:

- Relevant codes and standards, and mandatory considerations that must be observed, such as load limits and prohibited routes;
- Subjective factors, which reflect community priorities and values;
- Road and traffic factors, including the physical adequacy of the roads and carriageway levels of service;
- Hazards and risks to people, property and the environment arising out of accidents involving hazardous materials;
- Transport economics of the various route alternatives; and
- Emergency response capability.

These are summarised in the following figure from HIPAP 11.

Figure 5 – HIPAP 11 Assessment Process for Specific Developments



Each of the above listed factors are considered for the two route options from Shellharbour to Port Kembla, i.e. via the A1 and B65.

6.1 Mandatory Factors Assessment

It is possible that physical considerations could preclude a routing alternative because of weight limitations on bridges, height restrictions on underpasses, inadequate shoulders for breakdowns, extensive construction activities or inadequate parking and turning spaces.

For the two options being assessed in this study, both are approved routes for A-Doubles. Therefore, both options are deemed "Acceptable Routes".

6.2 Subjective Factors Assessment

Subjective factors included in the consideration of transport routes for hazardous materials typically include those shown in the following table. The numbers of potential receptors are shown for both route options, i.e. via the A1 and the B65.

As determined in Section 5, this assessment is based on potential sensitive receptors (people) up to 11 m from the potential collision locations with subsequent pool fires. Radiant heat impact to property and/or the natural environment is assessed up to 5 m from the potential fires. Impact to the biophysical environment, i.e. an accident with a release (up to 74,000 L) and no ignition, can occur at significantly larger distances. This is taken into consideration in determining the potential sensitive ecosystems.

The receptors on both sides of the roads are taken into consideration, e.g. a vehicle could travel onto the wrong side of the road and therefore be involved in an accident.

Table 6 – Subjective Factors Assessment

Factor:	Option 1 – A1	Option 2 – B65
Hospitals	0	1 (Note 1)
Schools	0	1 (Note 2)
Aged person housing	0	0
Churches	0 (Note 3)	0 (Note 3)
Items of heritage or cultural significance	0	1 (Note 4)
Sensitive ecosystems, e.g. creeks, rivers and wetlands	10	6
Sensitive ecosystems, i.e. lake	0	1 (Note 5)
Ranking:	Most Preferred	Least Preferred

Notes (see next page):

1. Illawarra Rehabilitation Clinic.
2. Amity College, Illawarra Campus
3. The Shellharbour Community Church, including the carpark, and the Dapto Jehovah Witnesses Hall are beyond the distance for adverse impact from radiant heat.
4. Shellharbour Cemetery.
5. Lake Illawarra has a relatively large exposure to spills as the B65 runs adjacent to this lake (approximately 2 km).

Whilst the absolute number of receptors are similar, Option 2, i.e. via the B65, is deemed the Least Preferred route given the large exposure to spills potentially entering Lake Illawarra.

6.3 Road and Traffic Factors Assessment

Road and traffic factors include the capability and level of service of the road system as measured by its physical characteristics, the volume of traffic and its composition, and congestion levels of existing and potential routes as shown in the following table.

Table 7 – Road and Traffic Factors Assessment

Factor:	Option 1 – A1	Option 2 – B65
Structural and geometric adequacy of roads	Four lanes, divided	Six lanes
Traffic volume and composition	Most Preferred	Least Preferred (Note 1)
Level of service – number of turns without traffic signals or roundabouts	1	1
Level of service – number of traffic lights	6	18
Level of service – number of roundabouts	2	5
Road width	Acceptable	Acceptable
Horizontal and vertical curves	Acceptable	Acceptable
Availability of alternative routes	Acceptable (Note 2)	Acceptable (Note 2)
Emergency and evacuation planning, infrastructure and response	Acceptable (Note 3)	Acceptable (Note 3)
Vehicle crashes	4 (Note 4)	1 (Note 4)
Ranking:	Most Preferred	Least Preferred

Notes:

1. Qualitatively, the B65 has a higher residential traffic flow and therefore having approximately 13 road tankers per day is deemed significant.
2. As both options are approved for A-Doubles then they could be used as alternate routes for each other, e.g. in the event of an accident and delay.
3. Emergency response capability available for the routes includes such considerations as the speed of response of the emergency services, ease of access to the potential accident site and availability of emergency combat equipment.

4. Source (total number of accidents involving B-Doubles from 2011 to 2020): https://roadsafety.transport.nsw.gov.au/statistics/interactivecrashstats. There are no reported crashes for A-Doubles as these are relatively new vehicles in this area.

Whilst the historical vehicle crash rate is higher for Option 1 (via the A1), there are fewer sensitive receptors (see Section 6.4). Option 2 (B65) is Least Preferred given the higher number of traffic lights and roundabouts as well as the larger residential road use.

6.4 LAND USE RISK ASSESSMENT

In addition to the subjective factors shown in Section 6.2 and the road and traffic factors shown in Section 6.3, the following land use factors are taken into consideration for the transport of hazardous materials.

Table 8 – Land Use Factors Assessment

Factor:	Option 1 – A1	Option 2 – B65
Adjacent land use – approximate length of residential and commercial land use that could be impacted (Note 1)	5.6 km	8.8 km
Adjacent land use – approximate length of heavy industries land use that could be impacted	1.8 km	0.4 km
Adjacent land use – approximate length of open space, e.g. playing fields, that could be impacted	0	1.5 km
Ranking:	Most Preferred	Least Preferred

Notes:

1. This assessment is based on potential sensitive receptors (people) up to 11 m from the potential collision locations with subsequent pool fires.
2. Option 1 is through rural land use, in particular, at the southern end.

Whilst the distances in Table 8 are approximate, there is the potential to impact more receptors close to the B65 rather than the A1. Therefore, Option 2 is the Least Preferred for land use receptors.

6.5 Operational Factors Assessment

Operational factors in the consideration of routes for the transport of hazardous materials usually include those shown in the following table.

The main cost criterion when comparing alternative routes is the expected increase or decrease in distance and travel time if another route is used. An increase or decrease in operating costs exceeding 10 percent may have an effect on the overall transport economics and as such, may be used as a general guide for comparison purposes (Ref 1).

Table 9 – Operational Factors Assessment

Factor:	Option 1 – A1	Option 2 – B65
Distance	30 km	17 km
Travel Time	23 minutes	20 minutes
Ranking:	Least Preferred	Most Preferred

6.6 Assessment Summary

The following table contains the results of the assessment rankings.

Table 10 – Assessment Summary

	Option 1 – A1	Option 2 – B65
Mandatory Factors	Acceptable	Acceptable
Subjective Factors	Most Preferred	Least Preferred
Road and Traffic Factors	Most Preferred	Least Preferred
Land Use Factors	Most Preferred	Least Preferred
Operational Factors	Least Preferred	Most Preferred

Given the above summary in Table 10, Option 1, i.e. via the A1 and Five Islands Road, is recommended. Further quantitative analysis (e.g. traffic counts) is not recommended as the risk to sensitive receptors, i.e. people, the environment and property, is clearly lower for Option 1.

6.7 CARRIER'S SAFETY MANAGEMENT SYSTEM

Manildra Group works towards effectively meeting the safety needs of the business. A systematic process of evaluation is in place to provide information on which to base plans for improvement, by reducing the risk factors for incidents. It is Manildra Group's intention to raise the level of consciousness and sensitivity of all involved to actively reduce potential workplace injuries and incidents.

To achieve this, Manildra Group has established a robust Risk Based Safety Management System (SMS) which includes Work Health and Safety Policies and Procedures, Drug and Alcohol Policy, Incident Management, Change Management and Fatigue Management. System reviews are conducted to ensure currency and effectiveness of all procedures within the SMS.

Emergency Response:

The core objectives of the Transport Emergency Response Plan (TERP) are to:

- Minimise adverse effects on employees and the general public, damage to property, or harm to the environment during an emergency;
- Facilitate a rapid and effective response, and recovery from an incident;
- Provide assistance to emergency services; and
- Communicate vital information to relevant personnel; both internal and external to the Manildra Group.

This TERP is produced in line with Regulation 14.5 of the Road Transport Reform (Dangerous Goods) Regulations 1997, and the Australian Dangerous Goods (ADG) code.

Driver Selection:

All drivers undergo rigorous assessments before and during employment which consists of driving assessments, and loading and unloading assessments. To maintain employment within the Manildra Group, drivers are responsible to maintain currency of the necessary class of Heavy Vehicle licence and any other necessary qualifications, e.g. Dangerous Goods Licence and Safe Load Program (SLP) Loading Pass.

Placarding:

The vehicles carrying ethanol are designed for the sole purpose of transporting Class 3 Dangerous Goods. Vehicle placarding is positioned as per the ADG Code requirements in the form of Emergency Information Panels (EIP's).

Vehicle Maintenance:

Vehicles are to be purchased new and maintained under a service agreement with the vehicle manufacturer.

The Manildra Group ethanol loading facility and vehicles are fitted with an automated Scully system which eliminates the possibility of overfilling vehicles and therefore overloaded vehicles leaving the site and travelling on Public roads.

7 CONCLUSION AND RECOMMENDATIONS

The emphasis in this transportation study is on comparative risk assessment, rather than on absolute levels of risk along the route. As stated in HIPAP 11, the main purpose of a truck route network is to provide access to industrial areas and other major destinations as well as minimising the intrusion of through traffic in residential areas.

The selection of the preferred route from Shellharbour to Port Kembla is based the differences between the two options, in particular, the following types of factors:

- Mandatory factors, e.g. use of approved roads;
- Subjective factors, e.g. exposure to sensitive ecosystems;
- Road and traffic factors, e.g. traffic lights and roundabouts;
- Land use factors, e.g. exposure to residential areas; and
- Operational factors, e.g. duration and distance.

As shown in this report, the route which presents the lowest overall risk to surrounding people, property and the natural environment from Shellharbour to Port Kembla is via the A1 and Five Islands Road.

Based on the analysis in this study then no further recommendations are made.

8 REFERENCES

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