SUBMISSIONS REPORT

Kurnell B Line Upgrade

June 2011

URS

CALTEX

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Introduction

1.1 Project Context

Caltex Refineries (NSW) Pty Ltd (hereafter referred to as Caltex) is in the process of upgrading the existing Kurnell Jet Fuel Pipeline (B Line) (KBL), which runs from Caltex's Kurnell Refinery, under Botany Bay, to the Caltex Banksmeadow Terminal and then on to Sydney Airport. The pipeline is used to carry jet fuel from the refinery, and other terminals, to service the airport.

This Report responds to, and addresses, the submissions received following the public exhibition of the Environmental Assessment (EA) which has been produced in response to the planned upgrade works under Part 3A of the Environmental Planning and Assessment (EP&A) Act (1979).

1.2 Project Location and Description

The Kurnell Refinery and Banksmeadow Terminal are located on opposite sides of Botany Bay in the southern part of metropolitan Sydney. The Kurnell Refinery is located on the Kurnell Peninsula within Sutherland Shire approximately 30 kilometres (km) south of Sydney's Central Business District (CBD). The refinery is bordered by Botany Bay National Park to the east, Captain Cook's Landing Place Park to the south, Bonna Point Reserve in the west and the community of Kurnell to the north.

Banksmeadow Terminal is located on the north side of Botany Bay, approximately 12km south of Sydney's CBD. The Terminal is bounded by industrial storage facilities to the north, the Patrick Stevedores Container Terminal to the south, the P&O Trans Australia Terminal to the east, and Penrhyn Road and the Penrhyn Estuary to the west. Access to the Terminal is off Penrhyn Road.

Caltex is proposing to upgrade the KBL so as to increase its available capacity and improve the reliability of delivery of jet fuel to Sydney Airport. At the Kurnell Refinery the proposed works involve installing new transfer pumps, coalescers, a new pigging[1] station and other associated plant. The length of pipeline that runs from the refinery itself up to and on the wharf to the tie in point before the pipeline enters Botany Bay will be decommissioned. A new KBL pipeline will be installed alongside the existing KBL. The works will also relocate the pigging station at the wharf to the same location as the new the transfer pumps.

At Banksmeadow Terminal the proposed works involve installing booster pumps, one coalescer, a number of valves, refurbishment of the pigging stations, installation of a variable speed drive (VSD) switchroom as well as installation of other mechanical and electrical plant.

Further details regarding the Project can be found in **Chapter 3 Project Description of the EA**.

1.3 Environmental Assessment

An Environmental Assessment (EA) was prepared under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to assess the environmental impacts of the Project. The EA was placed on public exhibition between 29 April and 3 June 2011. It was also made available on the NSW Department of Planning and Infrastructure (DoPI) website. During this period, submissions were invited from anyone with an interest in the Project.

[1] Pigging in the maintenance of pipelines refers to the practice of using pipeline inspection gauges or 'pigs' to perform various operations on a pipeline without stopping the flow of the product in the pipeline. These operations include, but are not limited to, cleaning and inspection of the pipeline. This is accomplished by inserting the pig into a 'pig launcher'. The launcher is then closed and the pressure of the product in the pipeline is used to push it along down the pipe until it reaches the receiving trap - the 'pig catcher'. Pigs are usually bullet shaped and are tailored to the size of the pipe.

1 Introduction

Appendix A provides a summary of all the submissions and **Appendix B** presents the submissions in full.

Clause 75H(6) of the EP&A Act requires the Proponent (Caltex) to prepare and submit:

- a response to the issues raised in these submissions;
- a Preferred Project Report (PPR) that outlines any proposed changes to the Project to minimise the environmental impact; and
- a revised Statement of Commitments (SOCs).

Following consideration of the submissions, no significant changes to the design described in the EA are proposed. As such, no PPR has been prepared as part of this Submissions Report.

The submissions report comprises the following:

- Section 1: Background, context and references.
- Section 2: A summary of the submissions.
- Section 3: Response to the submissions.
- Section 4: The revised SOCs for the Project.

The submissions report is supported by the following Appendices:

- Appendix A: Summary of submissions.
- Appendix B: The submissions as issued.
- Appendix C: The Preliminary Hazard Assessment (PHA) as issued with the EA in Appendix E and two subsequent addendums addressing comments by the Major Hazards Unit at DoPI and Workcover.
- Appendix D: Approvals received from WorkCover.

2

Summary of Submissions

Fourteen submissions were received in response to the public exhibition. Ten were from statutory government bodies and four were from individuals, groups or companies. **Table 2-1** groups each of the Government Agency submissions under similar environmental aspects and outlines where in **Chapter 3** each aspect is addressed.

Table 2-1 Summary of Government Agency Submissions

Issue Category	Government Agency	Submission Report Section Addressed
Consultation	NSW Office of Environment and Heritage (OEH)	Section 3.2
Water	NSW OEH City of Botany Bay	Section 3.3
Noise	NSW OEH Sutherland Shire Council City of Botany Bay	Section 3.4
Contamination	Sydney Ports Authority	Section 3.5
Safety	NSW Department of Planning and Infrastructure (DoPI) Workcover Fire and Rescue NSW	Section 3.6
Licences	NSW OEH City of Botany Bay	Section 3.7

Submissions were also received from NSW Road and Traffic Authority and NSW Office of Water. These submissions have not been considered further as they did not raise any issues with the Project (see **Appendix B** for the full submission).

Table 2-2 groups each of the submissions from individuals, groups and other non statutory bodies under similar environmental aspects and outlines where in **Chapter 3** each aspect is addressed.

Table 2-2 Summary of Private Submissions

Issue Category	Stakeholder	Submission Report Section Addressed
Consultation	Patrick Terminals Pty and Ms Rosmrie Darrietta	Section 3.2
Noise	Anonymous	Section 3.4
Contamination	Anonymous	Section 3.5
Safety	Anonymous	Section 3.6

The submission received from Sydney Airport Corporation Ltd did not raise any further issues and was strongly in favour of the Project (refer to **Appendix B**). Therefore it has not been considered further.

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Response to Submissions

3.1 Introduction

The submissions that were received fall into six categories, these are as follows:

- Consultation;
- Water Management;
- Noise;
- Contamination;
- Safety; and
- Licences.

This Chapter provides responses to each of the issues raised in the submissions. The responses have been made against the relevant environmental aspect. These aspects are explored in the following sections.

3.2 Consultation

A submission was received from **Ms Rosemrie Darrietta** that raised concerns relating to a number of issues surrounding the Caltex operation on the Kurnell Peninsular. A specific concern was the lack of public consultation relating to the Project. The **OEH** submission suggested that, specifically with regard to noise, a Community Consultation Plan (CCP) be developed in addition to the CEMP.

A submission was received from **Patrick Terminals of Port Botany** seeking a map of the proposed works and an assessment of the potential impact of the Project on their operations.

Response

Caltex is engaged in an ongoing program of community consultation to ensure that a proactive dialogue is maintained between the community in Kurnell and Caltex. As noted in **Section 5.5 of the EA**, Caltex advertise, and undertake, a quarterly consultation event with the community at Kurnell to allow any concerns to be addressed. A presentation of the Project was made at this event on 21 February 2011 and 16 May 2011. At the end of these presentations the community was asked for its views and no issues were raised. Equally, information regarding the Project has been made available through the DoPI website since the DGRs were issued on the 18 January 2011 and since the EA went on exhibition on 29 April 2011. All of this consultation effort predates the press article in the *St. George and Sutherland Shire Leader* of 26 May 2011, and accords with due process relating to advertising and publicising the EA as defined under the EP&A Act.

Caltex has recognised the importance of community consultation during construction, particularly with regards to noise, by including within **Sections 12.7 and 18.2 of the EA** the commitments:

1. Community consultation with local residents would be undertaken to assist in the alleviation of community concerns. A complaints register would be maintained.
2. Any noise complaint(s) would be investigated immediately and noise monitoring would be undertaken to ascertain the extent of any exceedance at the locations concerned. Reasonable and feasible measures would then be implemented to reduce noise impacts.

OEH have asked that a CPP be prepared. This CPP can incorporate the commitments listed above, as well as the CPP recommendations detailed within the OEH submission (refer to **Appendix B**).

Caltex commit to producing a CPP for the construction phase of the Project (refer to **Section 4.3** of this report).

Maps of the proposed works have been made available within **Chapter 3 Project Description** of the EA (refer to **Figures 3-2, 3-3** and **3-4**).

The works at the Banksmeadow Terminal are limited to the existing site boundary and will have no direct effect on the operations at Patrick Terminals. A number of impacts, such as the potential increase in traffic or the impact of noise, have the potential to affect neighbours during construction. These potential impacts have been assessed within the EA, and where appropriate measures have been put into place to mitigate any adverse impacts. Commitments to address any adverse impacts are included within the draft SOCs contained within the EA, with relevant updates contained within **Section 4.1** of this report.

3.3 Water

The **OEH** submission requested that:

- All clean stormwater be diverted away from contaminated areas at the site and beneficially reused or directed into existing stormwater drains.
- Clean areas must be maintained in a satisfactory manner to ensure pollution of waters does not occur.
- All contaminated water from the premises must be captured and stored at the premises and beneficially reused where safe and practicable to do so or removed from the site and appropriately treated and disposed of by a licenced waste disposal contractor.

The **City of Botany Bay** submission noted that the EA does not address sea level rise.

Response

As outlined within the EA in **Sections 7.3.2 and 7.3.3**, the existing stormwater management at the Kurnell Refinery and Banksmeadow Terminal provide measures to separate clean stormwater and potentially contaminated stormwater. Commitments included within **Sections 7.7 and 18.2** of the EA also address these concerns. The most relevant commitments include:

- Groundwater removed by dewatering, and any runoff that may accumulate in excavations, would be periodically tested for elevated levels of contamination. Any water removed by dewatering that was considered contaminated would be disposed of into the oily water system and treated in the Waste Water Treatment Plant (WWTP).
- Clean water removed through the dewatering process would be collected and re-used onsite where possible to minimise discharges to the stormwater drainage system.
- In the event of prolonged wet conditions creating vulnerability for water quality impacts, Caltex would direct the contractor to cease work at any location where it is considered that there is a significant risk to water quality until conditions improve.
- A Groundwater Management Plan (GWMP) would be developed to manage contaminated groundwater and prevent the infiltration of contaminated runoff. This plan would be included as part of the CEMP.

Section 7.6 of the EA states that clean water would be disposed of in the stormwater drainage system or reused on site. When reused, the clean water would be used for:

- wetting down stock piles for dust management control;
- wetting down work areas within the Right of Way for dust management control; and
- irrigation of grassed areas within the Right of Way.

As noted within the **City of Botany Bay** submission the policies relevant to sea level rise are outlined with **Section 7.3.2 of the EA**. A discussion of the impact of the Project on sea level rise is provided in **Section 7.4.1 of the EA**. As noted within the EA, *the Project represents essentially upgrade works of existing infrastructure across locations where similar activities have proceeded for some time. Aside from an overall increase in the capacity of the pipeline, climate change induced processes would not represent a significantly different level of risk or hazard to the ongoing operation of the upgraded infrastructure compared to the infrastructure as it currently exists*. Indeed the relocation of the pigging launching system from Kurnell Wharf to within the boundaries of Kurnell Refinery is likely to reduce the exposure of this infrastructure to immediate coastal risks; a measure that is in line with NSW Coastal Planning Principles and stated in **Section 7.4.1 of the EA**.

3.4 Noise

The **OEH** Submission suggested that the construction working hours should be 7am to 6pm Monday to Saturday, as per the current commitment within the EA. The submission also requested that a Construction Noise and Vibration Management Plan (CNVMP) be developed and a number of recommendations for this plan were made.

The submission from **Sutherland Shire Council** highlighted two main areas of concern regarding noise. These were:

- The hours of operation stated within the EA are outside those contained within the NSW *Interim Construction Noise Guidelines* (ICNG) (NSW DECC, 2009). The ICNG states that work on Saturdays may be carried out between 8am and 1pm. The current commitment from the Project is to limit work to between 7am and 6pm Monday to Saturday. The submission also notes that the levels of construction noise are likely to be above the recommended limits. The Council made the following suggestions within their submission.

To minimise the noise impact on the surrounding environment all building and demolition work shall be carried out only between the hours of 7.00am and 6.00pm Monday to Friday inclusive, 8.00am and 1.00pm Saturdays. No work shall be carried out on Sundays and Public Holidays.

- The second relates to the requirement to notify affected residents during peak construction.

Caltex be required to notify noise affected residents identified in the Environmental Assessment of likely peak noise construction periods prior to the commencement of the relevant construction activity.

The **City of Botany Bay** asked that the EA Noise Assessment consider the nearest residential receivers in the City of Botany Bay Council along Botany Road and Dent Street.

Noise was also raised as a concern in a submission from an **Anonymous Local Resident**. This submission related to concerns about the ability of residents to 'relax' during the weekend due to construction noise.

Response

Construction working hours were discussed by both **OEH** and **Sutherland Shire Council**. **Sutherland Shire Council** was particularly concerned about working hours on Saturday, and an **Anonymous Local Resident** was concerned about work on the weekend. Initially Caltex had proposed working from 7am to 6pm on Saturdays. However to mitigate these concerns, Caltex will commit to restricting construction work on Saturdays to between 8am and 1pm. Therefore the Project construction working hours will be in line with the recommended standard hours of construction set out in the ICNG and will be more stringent than those suggested by the **OEH**.

Sections 12.6, 12.7 and 18.2 of the EA commits Caltex to producing a CNVMP for the Project. The CNVMP will be included as part of the Construction Environmental Management Plan (CEMP). These documents would include the recommendations detailed within the **OEH** submission (refer to **Appendix B**).

In addition to the CNVMP, Caltex has committed to preparing a CCP for the construction phase of the Project. This CCP will include a number of recommendations outlined within the **OEH** submission, and would include provisions to '*notify noise affected residents identified in the Environmental Assessment of likely peak noise construction periods prior to the commencement of the relevant construction activity*'.

Chapter 4 of this report summarises any changes in commitments and presents any new commitments.

The nearest residential receiver in the **City of Botany Bay** Council along Botany Road and Dent Street is approximately 1.1km from where the construction work at Banksmeadow Terminal will take place. Using a worst case scenario of all construction plant operating concurrently, it was concluded that at a noise level of 70dB(A) would be expected at the nearest commercial receiver approximately 90m to the north of the proposed works at Banksmeadow Terminal. Given the distance between the construction work at Banksmeadow Terminal and the nearest residential receiver, and taking into account standard noise attenuation principles, it was concluded that there would be no noise impacts on the residential receivers along Botany Road and Dent Street (the attenuation of noise over this distance would be approximately 60db(A)). This conclusion is supported further given that the existing noise environment around the area is dominated by major roads, the airport and the port. Equally given the distance between Banksmeadow Terminal and the nearest residential receiver, there would not be any vibration impacts.

3.5 Contamination

The submission from **Sydney Ports Corporation** raised concern regarding the replacement of the pipeline along the wharf and the possibility of spillage occurring as a result of the works. The submission requested clarification of the nature of the works to be carried out along the wharf, specifically regarding the removal of the existing pipeline. The submission requested that a Spill Management Plan (SMP) be prepared for the works.

A submission from an **Anonymous Local Resident** also raised concerns over the danger of contamination along the pipeline easement.

Response

Sections 3.3.2 and 3.3.3 of the EA explains that the existing KBL would be cleaned, tied off and would remain in situ. The proposed KBL will be installed alongside the existing KBL within the Right of Way and on the Wharf. A decommissioned diesel pipeline would be removed from the Right of Way to make way for the proposed KBL.

Section 7.5.1 of the EA discusses the measures that would be put in place along the wharf construction to ensure that no pollution affects Botany Bay during construction. Platforms would be placed on the wharf, under the area where the pipeline would be installed. These platforms would be covered in plastic sheeting to collect any rust or other metal that may fall as a result of the pipeline installation. These platforms would be moved along the wharf as the work progressed. Any waste that collected on them would be sorted and disposed of in line with the Waste Management Plan (WMP) within the CEMP. The pipeline would be hydro-tested prior to being commissioned. As the hydro-testing occurs, spill teams will be placed along the length of the new pipeline to check for leaks and to ensure a swift response in the unlikely event of a leak occurring. Provided these measures are followed, no adverse impacts on Botany Bay are expected.

These measures are included as commitments within the EA (refer to **Sections 7.7 and 18.2**), and will be included within the CEMP. Therefore the preparation of a specific SMP is not considered necessary. However, the contact details for Sydney Ports Corporation would be included within "Stakeholders" listings within the CEMP.

All work will be subject to the measures included within the CEMP and specifically the Contamination Management Plan and the Groundwater Management Plan.

3.6 Safety

NSW DoPI Major Hazards Unit, **Workcover (General)** and **Workcover (Dangerous Goods)** made submissions regarding the Preliminary Hazards Analysis (PHA) (refer to **Appendix E of the EA**), the conditions of consent and approval for the works.

The **NSW DoPI** had two key requests:

1. *Please provide justification to ALARP for scenarios 3 and 4 in the PHA Table 6.*
2. *What measures will be in place to ensure the integrity of the tanks at higher pumping rates? The additional safeguards (if any) to prevent negative pressure in the tanks due to the higher rates should be listed.*

Workcover (General) made nine comments on the PHA and recommended two conditions of consent. **Workcover (Dangerous Goods)** asked that the pipeline be approved by the relevant regulatory body, (in this case WorkCover), prior to commencement of construction.

Fire and Rescue NSW (FRNSW) made four comments, which can be summarised as follows:

- **FRNSW** expect that any new building proposals and substantial alterations to existing buildings would comply with the current Building Code of Australia and relevant Australian Standards.
- **FRNSW** believes that the site's operators may be required to prepare and submit to the NSWFB an Emergency Plan (EP) to ensure compliance with clauses 174ZC and 175P of the Occupational Health & Safety Regulations 2001, as applicable. It is recommended that the EP follow FRNSW Policy No 1: Guidelines for Emergency Plans at Facilities Having Dangerous Goods, Explosives and Major Hazard facilities.

3 Response to Submissions

- The submitted PHA outlines possible fire scenarios in section 3 but lacks detail regarding installed fire protection, proposed mitigation methods and possible consequences relating to the worst case fire. **FRNSW** believes that a Fire Safety Study should be prepared in accordance with Hazardous Industry Planning Advisory Paper (HIPAP) No. 2 and if deemed appropriate by the consent authority, submitted to **FRNSW** for review and comment.

A submission was also received from an **Anonymous Local Resident** concerned about the risk to the properties adjoining the pipeline right of way subsiding as a result of the excavations.

Response

For completeness a full copy of the original PHA (as found within **Appendix E of the EA**) has been provided within **Appendix C1** of this report. **Appendices C2 and C3** provide two separate addendums to the PHA which address the submissions made by **NSW DoPI** and **Workcover (General)** respectively.

Workcover (General) asked that '*should the proposal be approved, the suggested conditions of approval are:*

1. *The facility is a Major Hazard Facility (MHF) under the NSW Occupational Health and Safety Regulation 2001, and therefore the proponent should consult with WorkCover prior to commencement of detailed design, and obtain requirements for updating of the site risk assessments and the Safety Report. The proponent must comply with all requirements provided by WorkCover.*
2. *The updated Safety Report must be submitted to WorkCover no later than six months prior to commissioning of the proposed project, or any other date agreed with WorkCover.*'

Caltex would consult with Workcover, and other agencies, as the Project progresses, in line with regulatory requirements. However, as per statutory requirements, Caltex together with other MHFs in NSW, is preparing Formal Safety Reports for WorkCover for the Kurnell Refinery and Banksmeadow Terminal. The legislated submission date for this first Safety Report is February 2012. Impacts from this Project would be included in the February 2012 submission. Therefore Caltex considers the requirement to provide a separate Safety Report for this Project at this stage, prior to commissioning, unnecessary, as any work would be duplicated in the Formal Safety Reports being produced for February 2012.

In line with the request made by **Workcover (Dangerous Goods)**, **Appendix D** of this report provides a copy of the letter providing Workcover approval for construction to take place.

In response to the points made by **FRNSW**:

- The Project would only result in one building at Banksmeadow Terminal being constructed. This structure would comply with the current Building Code of Australia and relevant Australian Standards.
- Caltex's Emergency Plan would be updated to ensure compliance with any regulatory procedures prior to the Project being commissioned.
- As noted in the PHA, a draft Fire Risk and Safety Assessment has been completed for the Project. This study would be finalised prior to the Project being commissioned and if required would be provided to FRNSW for review and comment.
- All proposed designs will be discussed and reviewed by the NSWFB prior to any fire related works being undertaken and prior to the Project being commissioned.

The pipeline trench is expected to be a maximum of 1.5m deep and 1.5m wide and is battered back to a distance of 1.5 m and an angle of 45º. Given the distance of the properties from the trench, it is unlikely that any subsidence issues will be encountered.

3.7 Licences

OEH requested that should the Project be approved, the proponent should ensure that the activities are carried out in accordance with the Environmental Protection Licences (EPL) for Kurnell Refinery (EPL No 837) and Banksmeadow Terminal (EPL No 6950). They also asked the proponent make a separate application to **OEH** to vary both EPLs to include the licence amendments detailed in Appendix B of the **OEH** submission (refer to **Appendix B** of this report for full submission).

The **City of Botany Bay** stated that the EA does not reference any statutory approvals that apply to the operations of the facilitates.

Response

The EPLs for the site have been considered within the EA and are specifically mentioned in **Chapter 4 Statutory Planning**, **Chapter 12 Noise and Vibration** and **Chapter 13 Air Quality**. As such the Project has been developed and assessed against the requirements of the EPLs. Nevertheless Caltex would ensure that all activities relating to the Project are carried out in accordance with the EPLs for Kurnell Refinery and Banksmeadow Terminal. Caltex would also amend the EPLs, in consultation with OEH, to be in line with the recommendations of Appendix B of the **OEH** submission. This additional commitment is provided in **Table 4-3** below.

The EA references the approvals given to both Kurnell Refinery and Banksmeadow Terminal under the Protection of the Environment Operations Act 1997 in **Section 4.3.2 of the EA**.

4

Revised Statement of Commitments

4.1 Introduction

The majority of the commitments detailed with **Section 18.2 of the EA** are still relevant to the Project. The following Chapter outlines where certain commitments have been revised and where additional commitments have been agreed following exhibition of the EA. This is in response to the above submissions and in accordance with clause 75F(6) of the EP&A Act.

4.2 Revised Commitments

The following commitments have been revised following the receipt of a number of submissions. **Table 4-1** outlines the original wording of the commitments, and **Table 4-2** provides the revised commitments. The proposed amendments in **Table 4-2** are shown in bold.

Table 4-1 Commitments to be Replaced

Mitigation Measure and Commitment	Implementation of mitigation measures		
	Design	Construction	Operation
Noise			
A Construction Noise and Vibration Management Plan (CNVMP) would be developed and included in the CEMP for the Project.	✓	✓	
Construction works would be carried out during the hours of 7.00am to 6.00pm Monday to Saturday**,** except for: • the delivery of materials which is required outside these hours as requested by the RTA or other authorities for safety reasons; • emergency work to avoid the loss of lives, property and/or prevent environmental harm; • any works which do not cause emissions to be audible at any nearby residential property; • any other work as agreed through negotiations between Caltex and potentially affected noise receivers. Work outside standard hours would require the formal written consent of Caltex.		✓	

Table 4-2 Revised Commitments

Mitigation Measure and Commitment	Implementation of mitigation measures		
	Design	Construction	Operation
Noise			
A Construction Noise and Vibration Management Plan (CNVMP) would be developed and included in the CEMP for the Project. **This plan would be incorporated into the CEMP. Together these plans would:** • **provide details of the project;** • **outlines the nature, duration and location of the works;** • **estimate construction times;** • **identify construction activities that are expected to generate offensive noise;** • **identify the location of potentially sensitive receptors;** • **provide an assessment of the construction noise levels and potential impacts on sensitive receivers;**	✓	✓	

4 Revised Statement of Commitments

Mitigation Measure and Commitment	Implementation of mitigation measures		
	Design	Construction	Operation
• **detail reasonable and feasible work practices and control measures to minimise potential noise impacts; and** • **detail performance evaluation procedures to assess the effectiveness of implemented site controls and mitigation measures.** **The CNVMP would be developed in line with the ICNG.**			
Construction works would be carried out during the hours of **7.00am to 6.00pm Monday to Friday and 8.00am to 1.00pm on Saturdays**, as is outlined in the ICNG, except for: • the delivery of materials which is required outside these hours as requested by the RTA or other authorities for safety reasons; • emergency work to avoid the loss of lives, property and/or prevent environmental harm; • any works which do not cause emissions to be audible at any nearby residential property; • any other work as agreed through negotiations between Caltex and potentially affected noise receivers. Work outside standard hours would require the formal written consent of Caltex. **Caltex would notify potentially affected neighbours at least five days in advance of such works.** **General notification of the planned works (including peak and noisy construction activities undertaken during standard working hours) would be provided to potentially affected parties.**		✓	

4.3 Additional Commitments

Three additional commitments are proposed following receipt of the submissions. These are presented in **Table 4-3** below.

Table 4-3 Additional Commitments

Mitigation Measure and Commitment	Implementation of mitigation measures		
	Design	Construction	Operation
General			
Contact details for Sydney Ports Corporation would be included within the CEMP.	✓	✓	
All works would be carried out in a manner that would comply with the existing Environmental Protection Licences (EPL) held by the Proponent for each site. Caltex would amend the EPLs in consultation with OEH, in line with the recommendations of Appendix B of the OEH Submission.		✓	✓

4 Revised Statement of Commitments

Mitigation Measure and Commitment	Implementation of mitigation measures		
	Design	Construction	Operation
Noise			
Caltex would produce a Community Consultation Plan (CCP) as part of the CEMP. Together these documents would: • provide procedures for consulting and notifying nearby residents of the commencement of the construction activities. This would include providing written notification to residents around the Kurnell ROW area.; • Provide regular updates to Kurnell Progress and Precinct Committee; • outline procedures for consulting and notifying nearby residents at appropriate stages throughout the construction activities of any specific works that may result in potential noise impacts; • provide details of a telephone complaints line (including a daytime and after hours contact phone number) for the purposes of receiving any complaints or enquiries for members of the public in relation to the construction activates; • provide contact details of relevant site persons responsible for following up complaints; • outline procedures for handling and monitoring all complaints received by the proponent; and • provide details of contingency measures to be implemented when complaints are received. The CCP would be developed in line with the ICNG.	✓	✓	

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Limitations

URS Australia Pty Ltd (URS) has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of Caltex Refineries (NSW) Pty Ltd and only those third parties who have been authorised in writing by URS to rely on the report. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the Proposal dated 10 June 2011.

The methodology adopted and sources of information used by URS are outlined in this report. URS has made no independent verification of this information beyond the agreed scope of works and URS assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to URS was false.

This report was prepared between 15 and 26 June 2011 and is based on the conditions encountered and information reviewed at the time of preparation. URS disclaims responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

A

Appendix A Summary of Submissions

Appendix A Summary of Submissions

Submission Number	Author	Summary of Issue	Section Addressed
1	Sutherland Shire Council	**Noise** It is noted in the submission that the predicted noise levels during the construction phase of the Project are likely to exceed those recommended in the NSW *Interim Construction Noise Guidelines* (ICNG). It is also noted that the proposed hours of operation are beyond those that are recommended in the ICNG.	Section 3.4
2	City of Botany Bay Council	**Licences** The submission stated that no reference is made to any statutory approvals that apply to the operation of the facility.	Section 3.7
		Noise The submission asked that an assessment of the noise and vibration impacts at the nearest residential receiver in the City of Botany Bay be completed.	Section 3.4
		Water The submission asked that the issue of sea level rise be considered and any measures to address this issue should be included in the EA.	Section 3.3
3	Sydney Ports Authority	**Contamination** The submission raises concerns about the potential for spillages within Botany Bay and suggests that a Spill Management Plan be prepared.	Section 3.5
4	NSW DoPI	**Safety** The submission raised concerns regarding the type of infrastructure that was to be installed as part of the Project and the method by which safety was to be maintained despite the increased capacity of the facility.	Section 3.6
5	WorkCover (General)	**Safety** The submission required that the correct Safety Reports be completed and before the Project is commissioned and that a number of issues be addressed within the PHA for the Project.	Section 3.6
6	WorkCover (Dangerous Goods)	**Safety** The submission requested that regulatory approval is sought prior to construction commencing.	Section 3.6
7	Anonymous	**Noise** The submission raised concern regarding the level of noise that would be occurring directly outside their house.	Section 3.4
		Contamination The submission raised concern regarding the potential for contaminants from any pipelines being removed to affect the neighbouring properties.	Section 3.5
		Safety The submission was concerned about the risk of subsidence due to the excavation of the pipeline easement.	Section 3.6
8	Patrick Terminals	**Consultation** The submission was interested in how the Project might impact on the operation of the Patrick Terminal located adjacent to the Banksmeadow Terminal.	Section 3.2

Appendix A

Submission Number	Author	Summary of Issue	Section Addressed
9	Rosemrie Darrietta	**Consultation** Amongst a number of general comments, the submission was concerned that the proponent had not engaged in adequate community consultation.	Section 3.2
10	NSW Office of Environment and Heritage (OEH)	**Noise** The submission requested that the hours of construction be limited and that a Construction Noise and Vibration Management Plan be developed as part of the CEMP.	Section 3.4
		Consultation The Submission suggest the development of a Community Consultation Plan	Section 3.2
		Water The submission requests the development of appropriate ground water management to ensure that contaminated water is properly treated. Additionally it is requested that clean water is kept separate from contamination, and that where possible water is reused.	Section 3.3
		Licences The submission asks that all work related to the Project be completed in line with the existing EPLs for the two sites. It also asks that Caltex submit and application to OEH to vary the licences in line with their suggested recommendations**.**	Section 3.7
11	Fire and Rescue NSW	**Safety** The submission requested that: • any new or altered buildings comply with the current Building Code of Australia and relevant Australian Standards; • if required Caltex prepare and submit an Emergency Plan to ensure compliance with clauses 174ZC and 175P of the Occupational Health & Safety Regulations 2001; • a Fire Safety Study should be prepared in accordance with Hazardous Industry Planning Advisory Paper (HIPAP) No. 2 and if deemed appropriate by the consent authority, submitted to FRNSW for review and comment.	Section 3.6

Submissions were also received from NSW Road and Traffic Authority, NSW Office of Water and the Sydney Airport Corporation Ltd. These submissions did not raise any further issues.

B

Appendix B Submissions

Sutherland Shire COUNCIL

Administration Centre
4-20 Eton Street, Sutherland
NSW 2232 Australia
Please reply to:
General Manager,
Locked Bag 17,
Sutherland NSW 1499
Australia
Tel 02 9710 0333
Fax 02 9710 0265
DX4511 SUTHERLAND
Email ssc@ssc.nsw.gov.au
www.sutherland.nsw.gov.au
ABN 52 018 204 808
Office Hours
8.30am to 4.30pm
Monday to Friday

Justin Sauvage - 9710 0280
File Ref: DN11/0006

2 June 2011

PCU023090

NSW Department Of Planning
GPO Box 39
SYDNEY NSW 2001

6 June 2011

Dear Sir/Madam

Development Referral No. DN11/0006
Proposal: Caltex Jet Fuel Pipeline Upgrade Project
Property: 160-166 Captain Cook Drive KURNELL NSW 2231

I refer to your referral of the above development proposal for Council's comment and input pursuant to the provisions of part 3A of the *Environmental Planning and Assessment Act 1979*.

Following a review of the proposed development and the information provided, it is Council's recommendation that the application should be supported subject to suitable conditions of development consent.

As indicated in a previous letter sent on the 9/12/2010 regarding the Preliminary Environmental Assessment the development proposal is relatively straight forward and should have minimal long term impacts. With the exception of construction noise impacts council is generally satisfied that the project will have a low impact on the community and environment if the project is carried out in accordance to the procedures outlined in the Environmental Assessment.

Chapter 12 of the Environmental Assessment outlines the noise and vibration impacts. The assessment identifies that noise impacts on residential areas adjacent to the Kurnell construction site are likely to exceed the NSW *Interim Construction Noise Guidelines (ICNG)*. It is also noted that it is proposed the hours of construction for Saturdays will be 7.00am – 6.00pm. This is outside the ICNG criteria, and Council's own standard conditions of consent for hours of construction which are 8.00am – 1.00pm on Saturdays.

The Statement of Commitments in the Environmental Assessment provides insufficient detail on how the noise impacts will be managed. It is acknowledged that in some cases it may be preferable to have extended hours of construction to minimise the total construction period and its associated noise impacts. However it is felt that the case for extended construction periods outside the usual Saturday construction times have not been sufficiently justified, particularly in locations adjacent

to residential areas in Kurnell. Council request that the following standard condition be used in any consent with regards to this project:

Permitted Hours for Building and Demolition Work:
To minimise the noise impact on the surrounding environment all building and demolition work shall be carried out only between the hours of 7.00am and 6.00pm Monday to Friday inclusive, 8.00am and 1.00pm Saturdays. No work shall be carried out on Sundays and Public Holidays.

As previously noted the Environmental Assessment indicates that it is likely the construction activities will exceed the ICNG noise impact guidelines, particularly for residential properties along the pipeline right of way between the Kurnell Refinery and the Kurnell Refinery Wharf. Caltex has in its statement of commitments indicated that its mitigation measures will include:

> "Community consultation with local residents would be undertaken to assist in the alleviation of community concerns. A complaints register would be maintained".

This commitment should be amended to require Caltex to notify affected residents of likely peak construction noise periods prior to construction so that residents can plan their activities around these impacts. The remaining noise mitigation measures proposed by Caltex are adequate.

Recommendation:
Caltex be required to notify noise affected residents identified in the Environmental Assessment of likely peak noise construction periods prior to the commencement of the relevant construction activity.

Should you need to discuss any aspect of this matter further, please do not hesitate to contact Council's Development Assessment Officer Justin Sauvage on 97100280 during normal business hours.

Yours faithfully

Justin Sauvage
for J W Rayner
General Manager

SYDNEY PORTS
FIRST PORT, FUTURE PORT

PCU022735

23 May 2011

Chris Ritchie
Major Development Assessment
Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

Our Ref: 2008/0189V2

Dear Mr Ritchie,

Caltex Jet Fuel Pipeline Upgrade: Major Project 11_0004

Thank you for providing Sydney Ports Corporation (Sydney Ports) with the oppurtunity to comment on the above Major Project Application. Sydney Ports has reviewed the Environmental Assessment (EA) and requests that the Department of Planning and Infrastructure (DP&I) considers the below matter when finalising the assessment process for this project.

Sydney Ports notes that Section 7.5.1 of the EA states that no existing pipelines on the wharf will be removed, and therefore no liquid spills in Botany Bay are expected. However, Section 1.3 of the EA states that the Kurnell Jet Fuel Pipeline is to be replaced along the wharf up to the tie in point before the pipe submerges beneath Botany Bay. As works are to be undertaken on the existing pipeline infrastructure at Kurnell, Sydney Ports requests that a Spill Management Plan be prepared for this Project to address the works.

It should also be noted that Sydney Ports is the authority for spill response on Sydney's waterways and as such, if a spill does occur in Botany Bay, Sydney Ports is to be contacted immediately on 9296 4000. The Spill Management Plan should include these details.

Please do not hesitate to contact me on 9296 4672 if you would like to discuss the above matter further.

Yours sincerely,

Greg Walls
Environmental Planner

ABN 95 784 454 833
L4, 20 Windmill Street, Walsh Bay NSW 2000 Australia
PO Box 25, Millers Point NSW 2000 Australia
+61 2 9296 4999
+61 2 9296 4742
www.sydneyports.com.au

"Karin Nilsson " <karin@planager.com.au>
05/05/2011 10:45 a.m.

To <William_Miles@URSCorp.com>
cc "'Alan Parnell'" <alanp@icdasiapacific.com.au>
bcc
Subject Additonal information requested by NSW Dept of Pla
re Caltex Pipeline PHA

History: This message has been replied to.

Hello Will,

Lilia Donkova from NSW Dept of Planning requires some additional information in the PHA.

1) Please provide justification to ALARP for scenarios 3 and 4 in the PHA Table 6.

2) What measures will be in place to ensure the integrity of the tanks at higher pumping rates. The additional safeguards (if any) to prevent negative pressure in the tanks due to the higher rates should be listed.

Lilia has already discussed her requirements with a person from Caltex who has told her all this information is available (she does not remember this person's name but believes that Greg King from Caltex asked him person to phone her).

Please could you obtain the required information for me to include in the PHA. This need to be done prior to the EIS going onto exhibition.

Kind regards,
Karin

Karin Nilsson
Director
Planager Pty Ltd
Tel. 02 9427 7851
Fax. 02 9427 7851
Mobile 0411 124 239
Email: karin@planager.com.au
Address: PO Box 1497 Lane Cove NSW 2066

WorkCover NSW – Major Hazard Facilities Team
Level 4 1 Oxford Street, Darlinghurst, NSW 2010
PO Box 429, Darlinghurst, NSW 1300
mhf@workcover.nsw.gov.au
WorkCover Assistance Service 13 10 50
workcover.nsw.gov.au

PCU022819

Date: 24 May 2011
Our Ref: 10131 / 2009/020791
Your Ref: 11_0004

Mr Chris Ritchie
Manager – Industry
Mining & Industry Projects
Department of Planning
GPO Box 39
Sydney 2001

Dear Mr Ritchie

Caltex Jet Fuel Pipeline Upgrade Project (11_0004)

Thank you for your letter, received on 5th May 2011, requesting WorkCover's recommended conditions of approval for the above project.

The Major Hazard Facilities Team reviewed the Environmental Assessment and our comments on the Preliminary Hazard Analysis are attached for your information. WorkCover will require Caltex to address any issues arising from these comments when Caltex consults WorkCover under suggested condition 1 below.

Should the proposal be approved, the suggested conditions of approval are:

1. The facility is a Major Hazard Facility under the NSW Occupational Health and Safety Regulation 2001, and therefore the proponent should consult with WorkCover prior to commencement of detailed design, and obtain requirements for updating of the site risk assessments and the Safety Report. The proponent must comply with all requirements provided by WorkCover.

2. The updated Safety Report must be submitted to WorkCover no later than six months prior to commissioning of the proposed project, or any other date agreed with WorkCover.

Should you have any queries, please contact me on telephone (02) 8281 6303 or email jan.douglas@workcover.nsw.gov.au.

Yours sincerely

Jan Douglas
Manager
Major Hazards Facilities Team
WorkCover NSW

Caltex Jet Fuel Pipeline Upgrade Project (11_0004)

WorkCover - Major Hazard Facilities Team comments on the Preliminary Hazard Analysis (PHA)

1. Table 7 Bund Design – Surface area of a pool is in itself insufficient if fire duration in the event of a blockage of the drain system is to be estimated. Suggest that a revised table in the PHA should include additional columns for bund capacity (volume), and time to fill, in the event of a blockage of the drain system, at the maximum credible leak or spill rate. The time to fill (and then overflow) should be sufficient to allow operators to intervene and isolate flow before an overflow.

2. Clause 5.1.4 Separation distances – Para 3 should include a clear statement if the proposed system and associated plant comply with the codes and standards. Any non-compliances should be detailed.

3. References to use of methodologies in standards should be complemented with confirmation that the conditions, restrictions and caveats in the standard have been met.

4. Clause 5.4.3 Knock-on effects – Jet fuel pipeline (KBL) – The minimum depth of burial appears too low for urban areas. This value should be verified.

5. Clause 5.4.3 Knock-on effects – Jet fuel pipeline (KBL) – A clear statement of compliance with applicable codes and standards should be included with any non-compliances clearly stated.

6. Table 8 Current Risk Profile, Pumping Stations and KBL Line - Dot point 2 below table 8 gives a risk reduction (scenario 5) from intermediate to low. Some detail or explanation of the before and after risks should be included here. For example, although the new location is bunded, it is in closer proximity to other plant and tanks and therefore the risk of escalation could be higher at the new location.

7. References – Items 11 and 12 refer to HIPAPs 1993. Revised HIPAPs 2011 should be used. Also see clause A2.1.2.

8. Footnote clause 2.2 – It is noted that tank 166 is to be converted from fuel oil use to jet fuel under a different project. Caltex should review the change in risk and the adequacy of the bund material for containing jet fuel. For example, is the bund material sufficiently impervious to the less viscous jet fuel?

9. General – Static and the added risk of ignition due to increased pumping rates should be considered.

"Andrew Hartcher "
<Andrew.Hartcher@planning.nsw.gov.au>
16/06/2011 09:37 a.m.

To <William_Miles@URSCorp.com>
cc
bcc
Subject Fwd: RE: Caltex Jet Fuel Pipeline Upgrade Project E
Request for Comment

>>> "Chamings, Dave" <Dave.Chamings@workcover.nsw.gov.au> 6/15/2011 8:36 am

Hi Andrew,

As indicated previously we do not comment on planning submissions other than that they must comply with the requirements to have Pipelines approved by the relevant regulatory body, either WorkCover or I&I as required, prior to commencement of construction. This is a process between the proponent and WorkCover and as such will commence once we receive an application from them.

Regards.

Dave Chamings
Acting State Coordinator
Dangerous Goods | Chemicals Team
WorkCover NSW
92-100 Donnison Street, Gosford NSW 2250
Ph: 02 4321 5196
Mob: 0402 216 046
Fax: 02 9287 5196
Email: dave.chamings@workcover.nsw.gov.au
WORK SAFE ▸ HOME SAFE

Andrew Hartcher - Caltex Upgrade

From: [redacted]
To: <plan_comment@planning.nsw.gov.au>
Date: 6/3/2011 3:26 PM
Subject: Caltex Upgrade

Dear Sir/madam,

I am writing to object to the Caltex Refineries upgrade project (11_0004). Part of the pipeline runs by the side of my property. I am concerned about the impact this may have on my house and garden and the surrounding area. Will the removal of the existing pipes cause fuel to leak into the ground? My husband and myself have spent many man hours and thousands of dollars to make a beautiful garden which we do not want contaminated by leaking fuel. What kind of impact will the removal of the pipes have on the structure of our house? Is structural damage going to occur? I understand that work will be ongoing from 7am for most of the day 6 days a week, how much noise will there be? For many people the weekend is a time to relax this will surely not be possible with construction work going on from morning till night.

I do not wish my name to be made available to the proponent or on the department's website.

Yours Sincerely,

[redacted]

Andrew Hartcher - Re: Caltex Jet Fuel Pipeline Upgrade Project

From: <W.Stuart@patrick.com.au>
To: <andrew.hartcher@planning.nsw.gov.au>
Date: 5/17/2011 2:23 PM
Subject: Re: Caltex Jet Fuel Pipeline Upgrade Project
CC: <A.Field@patrick.com.au>, <J.Mutinelli@patrick.com.au>, <Lyndall_Stoyles@asciano.com.au>, <m.anderson@patrick.com.au>, <S.Forster@patrick.com.au>

Andrew

I'm submitting this request for further information on behalf of Patrick Terminals Port Botany.

We a seeking a copy of a map (if on exists) detailing the scope of works and the possible impact on our operations during the Caltex Jet Fuel Pipeline Upgrade Project (11_0004)

Our boundary runs adjacent to the Caltex fuel farm located off Penrhyn Rd Banksmedow, and I believe that a major fuel line runs through our facility.

Your assistance on this very important matter is appreciated, and I look forward to your reply.

Regards

William Stuart | Safety & Security Manager | Patrick Terminals – Port Botany
W.stuart@patrick.com.au | Mobile 0418253702 | Tel 61 2 9394 0407 | Fax 61 2 9394 0396
Penrhyn Road, Port Botany NSW 2019

Andrew Hartcher - FW: Caltex project

From: rosemrie Darrietta <darrietta@hotmail.com>
To: <andrew.hartcher@planning.nsw.gov.au>
Date: 6/3/2011 3:47 PM
Subject: FW: Caltex project

From: darrietta@hotmail.com
To: jannik2@bigpond.com
Subject: Caltex project
Date: Fri, 3 Jun 2011 11:06:00 +0930

To Whom it may concern,
My name is Rosemrie D'Arrietta I live on the beachfront at Kurnell I have been an immediate neighbour of Caltex for the past 20 years ,with that in mind I feel I can make comment with a great degree of accuracy on the conduct of this company.

I HAVE FOUND THEM TO BE SNEAKY, DECEITFUL AND TOTALLY INCOMPETENT.
THEY HAVE HAD A COMPLETE DISREGARD FOR THE AESTHETICS OF KURNELL ,LET ALONE THE ENVIRONMENTAL ASPECT
..CALTEX THINK THEY ARE A LAW UNTO THEMSELVES,SOME YEARS BACK I AWOKE TO A BEAUTIFUL TREE BEING CUT DOWN ON MY BOUNDARY
3 OF MY PET MAGPIES DIED IN THAT EXERCISE ,THAT SAME DAY THEY STARTED BUILDING A SUBSTATION JUST OVER A METRE FROM MY PROPERTY MY COMPLETE OUTLOOK WOULD BE LOOKING INTO THIS SUBSTATION THIS WAS THE FIRST I HAD HEARD OF IT. MY MAIN CONCERN WAS THE SAFETY AND HEALTH ASPECT OF HAVING A SUBSTATION BUILT A METRE FROM MY PROPERTY.CALTEX COULD HAVE BUILT THE SUBSTATION IN SO MANY PLACES THAT WOULD NOT HAVE AFFECTED ANY RESIDENT BUT THIS WAS EASIER

I KNOW THEY WERE HERE WHEN I ACQUIRED MY PROPERTY AND FOR MANY YEARS I HAD NO PROBLEMS. BUT....tHE UGLINESS' OF THEIR PRESENCE HAS BECOME MORE AND MORE PRONOUNCED.

NO MATTER WHAT INDUSTRY YOU HAVE, YOUR BOUNDARIES CAN BE LOOKED AFTER ,CALTEX SHOULD BE TAKING A LEAF OUT TOYOTA'S MANAGEMENT .
KURNELL IS THE BIRTHPLACE OF OUR NATION IT HAS BEEN VANDALISED BY CALTEXTHROUGH INCOMPETENCE IGNORANCE AND SAVING A DOLLAR
i HAVE HAD POISONS SPRAYED INTO MY PROPERTY DESPITE OVER 20 REQUESTS TO STOP OVER 15 MONTH PERIOD it WOULD TAKE 15 MINS OF WHIPPER SNIPING TO ALLEVIATE THE PROBLEM. THEY ARE STILL SPRAYING DESPITE ME BECOMING QUITE ILL WITH THE POISON EACH TIME

THE FIRST I HEARD ABOUT THEIR NEW PROJECT DESPITE WHAT THEY HAVE TOLD THE THE DEPT OF PLANNING WAS VIA THE FRONT PAGE OF THE LEADER .THERE ARE SO MANY ISSUES THAT NEED TO BE ADDRESSED.

A DISASTER PLAN FOR KURNELL ..... YES THERE IS ONE FOR THE REFINERY BUT NOT FOR THE COMMUNITY IF THERE IS NO ONE KNOWS ABOUT IT. KURNELL HAVE HAD ENOUGH, THEY ARE DUMPED ON TIME AND TIME AGAIN. RECENTLY THERE WAS A FIRE AND PEOPLE IN KURNELL WERE TOLD TO EVACUATE WHAT A COMPLETE AND UTTER SHAMBLE IN A SERIOUS EMERGENCY THERE WOULD HAVE BEEN MANY DEATHS DUE TO SAFETY ISSUE NOT BEING ADDRESSED BEFORE HAND .
JET FUEL ,POISON GASSES ,NOISE POLLUTION ETC I NEED TO KNOW MORE ,ESPECIALLY WHEN THIS IS IN THE HANDS OF A COMPANY THAT HAS SUCH A TRACK RECORD OF DECEIT AND INCOMPETENCE.

. ONE ONLY HAS TO LOOK AT THEIR APPLICATION TO THE DEPT PLANNING ON THIS PROJECT UNDER

"CONSULTATION" CALTEX STATES THEY CONSULTED THE COMMUNITY IN NOV 2010 AND THERE WERE NO OBJECTIONS FROM THE COMMUNITY. RUBBISH I DO NOT KNOW OF ONE PERSON THAT WAS CONSULTED IN THE COMMUNITY AND THAT GOES FOR OUR COUNCIL MEMBER THE REV GEORGE CAPSIS .

LARGE COMPANIES NEED TO BE MADE MORE ACCOUNTABLE , FOR THE SAKE OF OUR CHILDREN AN FUTURE GENERATIONS THINGS MUST CHANGE.

ROSEMRIE D'ARRIETTA

NSW GOVERNMENT | Environment, Climate Change & Water

Your reference:
Our reference: LIC06/45-23:DOC11/20060:CP
Contact: Craig Patterson, (02) 4224 4100

Department of Planning and Infrastructure
(Attention: Andrew Hartcher)
GPO Box 39
SYDNEY NSW 2001

Dear Mr Hartcher

EXHIBITION OF ENVIRONMENTAL ASSESSMENT – APPLICATION NUMBER 11_0004
PROPOSED UPGRADE OF CALTEX'S JET FUEL PIPELINE (LINE B)
2 SOLANDER STREET, KURNELL

I refer to the Project Application and Environmental Assessment (EA) provided for the above proposal which was received by the Office of Environment and Heritage (OEH) on 27 April 2011.

Based on a review of the information provided, OEH has determined that it is able to provide its recommended conditions of approval for the project. To assist the Department of Planning and Infrastructure (DPI) in determining the application, OEH has included some conditions in **Attachment A** which may be regulated via the Project Approval. These conditions relate to both design elements and the development of Environmental Management Plans and are important in ensuring that the facility is constructed, operated and maintained in a proper and efficient manner. OEH recommends that the Statement of Commitments provided by the proponent in the exhibited EA are also adopted as Conditions of Approval.

The proponent currently holds two Environment Protection Licences (EPL) for activities carried out on the Kurnell Refinery site (EPL No 837) and the Banksmeadow Terminal site (EPL No 6950). Should project approval be granted, the proponent will need to ensure that the activities are carried out in accordance with the conditions of the existing Licences. In addition to the existing conditions, the proponent will also need to make a separate application to OEH to vary both the EPLs to include the intended Licence amendments as detailed in **Attachment B**.

OEH would appreciate being given an opportunity to review the draft Director General's Environmental Assessment Report and associated approval conditions to ensure the above matters have been addressed.

The attached conditions relate to the development as proposed in the documents and information currently provided to OEH. In the event that the development is modified either by the applicant prior to the granting of consent or as a result of the conditions proposed to be attached to the consent, OEH requests DoPI consult with us about the changes before consent is issued.

PO Box 513 Wollongong NSW 2520
Level 3, 84 Crown Street Wollongong NSW
Tel: (02) 4224 4100 Fax: (02) 4224 4110
ABN 30 841 387 271
www.environment.nsw.gov.au

Should you have any further enquiries, please contact the above officer.

Yours sincerely

22/6/11

PETER BLOEM
Manager Illawarra
Environment Protection and Regulation

Att

(N:\2011\PLANNING\DOC11-20060 - PART 3A - JET FUEL B LINE UPGRADE - FINAL EA DOC)

ATTACHMENT A

PROPOSED APPROVAL CONDITIONS

Office of Environment and Heritage considers that the following conditions are most appropriately regulated via the Project Approval.

Hours of Construction

All construction work at the premises must be conducted between 7am and 6pm Monday to Saturday and at no time on Sundays and public holidays, unless inaudible at any residential premises.

The above condition does not apply to the delivery of material outside the hours of operation, if that delivery is required by police or other authorities for safety reasons; and/or the operation or personnel or equipment are endangered. In such circumstances, prior notification must be provided to the Department of Planning and Infrastructure (DPI) and affected residents as soon as possible or within a reasonable period in the case of emergency.

Environmental Management Plans

Section 18.4 of the Environmental Assessment (EA) outlines the preparation and development of a Construction Environmental Management Plan for the proposed construction activities and identifies a number of sub plans that will be included in the plan. All plans should be completed prior to the commencement of construction activities with appropriate procedures for reviewing and improving the requirements of each plan where considered necessary.

In addition to the plans listed in the EA, and given the potential for noise impacts as a result of the construction activity, OEH recommends that DPI require the proponent to also prepare:

- a Construction Noise and Vibration Management Plan (CNVMP), and
- a Community Consultation Plan (CCP).

The CNVMP shall include, but not be necessarily limited to:

(a) details of the project
(b) nature, duration and location of the works
(c) estimated construction times
(d) identification of construction activities that are expected to generate offensive noise
(e) Identification of the location of potentially sensitive receivers
(f) an assessment of construction noise levels and potential impacts on sensitive receivers
(g) details of feasible and reasonable work practices and control measures to minimise potential noise impacts, and
(h) details of proposed performance evaluation procedures (including noise monitoring) to assess the effectiveness of implemented site controls and mitigation measures.

The CCP shall include, but not necessarily be limited to:

(a) procedures for consulting and notifying nearby residents of the commencement of the construction activities. This should included procedures for providing written notification to residents and include notification to the Kurnell Progress and Precinct Committee
(b) procedures for consulting and notifying nearby residents at appropriate stages throughout the construction activities of any specific works that may result in potential noise impacts
(c) details of a telephone complaints line (including a daytime and an after hours contact phone number) for the purposes of receiving any complaints or enquiries from members of the public in relation to the construction activities
(d) contact details of relevant site persons responsible for following up complaints
(e) procedures for handling and monitoring all complaints received by the proponent; and
(f) details of proposed contingency measures to be implemented where complaints are received.

The CNVMP and CCP should be developed in consultation with OEH's "Interim Construction Noise Guideline – July 2009" to ensure that appropriate noise management tools such as management plans and community engagement are considered.

Stormwater

To adequately manage stormwater at the premises, all clean stormwater must be diverted away from any contaminated areas at the site and beneficially reused or directed into the existing stormwater drains. The clean areas must also be maintained in a satisfactory manner to ensure pollution of waters does not occur. All contaminated water from the premises must be captured and stored at the premises and beneficially reused where safe and practicable to do so or removed from site and appropriately treated and disposed of by a licensed waste disposal contractor.

Water conservation

Opportunities to replace potable water with captured stormwater, or treated process water from the premises or nearby premises, should be maximised where it is safe and practicable to do so.

ATTACHMENT B

INTENDED LICENCE CONDITIONS

Office of Environment and Heritage intends to modify the existing Environment Protection Licences for both Caltex Refineries (NSW) Pty Ltd (Licence 837) and Caltex Australia Petroleum Pty Ltd (Licence 6950) in accordance with the conditions specified below.

Banksmeadow Terminal

A2 Premises to which this licence applies

A2.1 The licence applies to the following premises:

Premises Details
CALTEX SYDNEY TERMINAL PENRHYN RD BANKSMEADOW NSW 2019 ~~LOT 1 DP 452427, LOT 2 DP 636590, AND LOT 1 DP 626767.~~ LOT 1 DP1050144, LOT 1 DP874710 AND Pt LOT 6 DP1053768

L7 Potentially offensive odour

L7.1 The Licensee must not cause or permit the emission of offensive odour beyond the boundary of the premises.

Note: Section 129 of the Protection of the Environment Operations Act 1997, provides that the licensee must not cause or permit the emission of any offensive odour from the premises but provides a defence if the emission is identified in the relevant environment protection licence as a potentially offensive odour and the odour was emitted in accordance with the conditions of a licence directed at minimising odour.

L7.2 No condition of this licence identifies a potentially offensive odour for the purposes of Section 129 of the Protection of the Environment Operations Act 1997.

O5 Dust

O5.1 The premises must be maintained in a condition which minimises or prevents the emission of dust from the premises.

O5.2 Activities occurring in or on the premises must be carried out in a manner that will minimise the generation or emission from the premises, of wind-blown or traffic generated dust.

Kurnell Refinery

O8 Dust

O8.2 Activities occurring in or on the premises must be carried out in a manner that will minimise the generation or emission from the premises, of wind-blown or traffic generated dust.

FIRE & RESCUE NSW

COMMUNITY SAFETY DIRECTORATE
STRUCTURAL FIRE SAFETY UNIT
Amarina Avenue Greenacre NSW 2190
Locked Bag 12 Greenacre NSW 2190

www.fire.nsw.gov.au info@fire.nsw.gov.au ABN 12 593 473 110

Your Reference:
File No: NFB/11046
Contact Officer: Alan Bruce

Telephone: (02) 9742 7400
Facsimile: (02) 9742 7483
Email: firesafety.nswfb@fire.nsw.gov.au

23 June 2011

NSW Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

Email: Andrew.ahrtcher@planning.nsw.gov.au

Cc: Chris.Ritchie@planning.nsw.gov.au

Attention: Chris Ritchie

Dear Sir

Re: Jet Fuel Pipeline Upgrade Project (11_0004).

I refer to your recent correspondence regarding the Caltex Jet Fuel Pipeline Upgrade Project (11_0004).

The current submission consists of a request for the Fire and Rescue NSW (FRNSW) to comment on an Environmental Assessment (EA), prepared by Michael Chilcot of URS Australia Pty Ltd and dated April 2011, conducted on the above project. The EA includes matters referred to in the Director General's Requirements under Section 75F of the Environmental Planning and Assessment Act (EP & A) 1979. FRNSW notes that a Preliminary Hazard Analysis (PHA) has also been included in the submission as appendix 8.

The project is subject to the assessment processes and requirements of Part 3A of the EP & A Act. Also, as the site deals with significant quantities of a dangerous good (jet fuel) it meets the criteria of a potentially hazardous development as defined by Part 1, Clause 3 of the State Environmental Planning Policy (SEPP) No 33 – Hazardous and Offensive Development.

FRNSW has reviewed the submitted EA and the following comments are provided:

1. FRNSW expect any new building proposals and substantial alterations to existing buildings would comply with the current Building Code of Australia and relevant Australian Standards.

2. FRNSW believes that the site's operators may be required to prepare and submit to the NSWFB an Emergency Plan (EP) to ensure compliance with clauses 174ZC and 175P of the Occupational Health & Safety Regulations 2001, as applicable. It is recommended

that the EP follow FRNSW Policy No 1: *Guidelines for Emergency Plans at Facilities Havingf Dangerous Goods, Explosivesand Major azard facilities.*

3. The submitted Preliminary Hazard Analysis outlines possible fire scenarios in section 3 but lacks detail regarding installed fire protection, proposed mitigation methods and possible consequences relating to the worst case fire. FRNSW notes that section E3 of the Executive Summary (Recommendations) states in part: "Depending on the results of the Fire Safety Study, further risk reduction may need to be considered".

4. In addition to the previous point 3 and the fact that the project could be classified as hazardous or offensive under SEPP No 33, FRNSW believes that a Fire Safety Study should be prepared in accordance with Hazardous Industry Planning Advisory Paper (HIPAP) No. 2 and if deemed appropriate by the consent authority, submitted to FRNSW for review and comment.

Should you have any further enquiries regarding any of the above matters, please do not hesitate to contact the Structural Fire Safety Unit.

Yours faithfully

Electronically approved for release

For Commissioner

NSW GOVERNMENT | Planning & Infrastructure

Contact: Andrew Hartcher
Phone: (02) 9228 6503
Fax: (02) 9228 6466
Email: andrew.hartcher@planning.nsw.gov.au

9 June 2011

File: 10/24110

Mr Greg King
Project Manager
Caltex Jet Fuel Pipeline Upgrade Project (Stage 2)
Locked Bag 2000
Taren Point NSW 2229

Cc: Mr Alan Parnell

Dear Mr King

Request for Response to Submission – Caltex Jet Fuel Pipeline Upgrade Project (MP 11_0004)

I refer to the public exhibition of the Environmental Assessment (EA) for the proposed Caltex Jet fuel Pipeline Upgrade Project which recently finished on 1 June 2011.

The Department has received a number of submissions in response to the exhibition.

Initially, please find attached an electronic copy of all agency and public submissions received to date. We are endeavouring to chase up key outstanding agency submissions from the Office of Environment and Heritage, Fire and Rescue NSW and the branch of WorkCover NSW which administers the *Dangerous Goods Act 1975*, should they wish to make comment.

Copies of the remaining public submissions will be forwarded to you over the coming days. I request that you please respond to all the issues raised in the submissions.

If you have any further enquiries, please contact Andrew Hartcher at the details above.

Yours sincerely

Felicity Greenway

Felicity Greenway
Team Leader - Industry
Mining and Industry Projects
as delegate of the Director General

Australian Government
Department of Resources, Energy and Tourism

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Mr Andrew Hartcher
Planning Officer
Department of Planning and Infrastructure
GPO Box 39
Sydney NSW 2001

Dear Mr Hartcher

Submission relating to the Part 3A assessment of the Caltex Jet Fuel Pipeline Upgrade (Application Number MP 11_0004)

I am writing in relation to the above application in the context of an identified need for investment in jet fuel supply infrastructure at Sydney Airport.

In early 2010, the Minister for Resources and Energy, the Hon Martin Ferguson AM MP, established a working group of senior industry representatives and key stakeholders. The Working Group was tasked with investigating the current and projected jet fuel supply situation at Sydney Airport and to make recommendations on actions that could be undertaken to provide for the effective future provision of jet fuel at Sydney Airport.

On 30 April 2010, the Sydney Jet Fuel Infrastructure Working Group provided its report, *Infrastructure for the Provision of Jet Fuel at Sydney Airport for the Period to 2029*, to the Minister. The report found that investment in at least 0.3 million litres (ML) to 2.4ML per day of jet fuel supply infrastructure capacity will be needed by 2014, with total investment of at least 7.4ML to 11.6ML per day of jet fuel supply infrastructure capacity required to meet projected demand in 2029.

I have attached a copy of the Working Group report for your reference. Should you have any questions regarding this matter, please contact Terry Marshman on 02 6243 7292 or at terry.marshman@ret.gov.au.

Yours sincerely

M. Sheldrick

Michael Sheldrick
General Manager, Fuels and Uranium Branch

3 June 2011

INFRASTRUCTURE FOR THE PROVISION OF JET FUEL AT SYDNEY AIRPORT FOR THE PERIOD TO 2029

SYDNEY JET FUEL INFRASTRUCTURE WORKING GROUP

30 APRIL 2010

SYDNEY JET FUEL INFRASTRUCTURE WORKING GROUP MEMBERS

Mr Paul Forward, Principal, Evans & Peck Pty Ltd (Chair)

Mr David Archibald, Supply and Logistics Manager (Asia Pacific), Air BP

Mr Warren Bennett, Executive Director, Board of Airline Representatives of Australia Inc

Mr Leo Brons, Commercial Manager, Vopak Terminals Australia

Ms Marika Calfas, General Manager Planning, Sydney Ports Corporation

Ms Jean Elverton, General Manager Procurement Services, QANTAS (as International Air Transport Association representative)

Mr Rod Gilmour, General Manager Corporate Affairs, Planning and Human Resources, Sydney Airport Corporation Limited

Mr Ralph Grimes, Manager Functional Area Coordination, NSW Department of Industry and Investment

Mr Ken James, General Manager Supply and Distribution, Caltex Australia

Ms Margaret Kennedy, Operations Manager (Asia Pacific), The Shell Company of Australia

Mr Bruce Ride, Senior Project Manager, Uhde Shedden

Mr Michael Sheldrick, General Manager, Fuels and Uranium Branch, Department of Resources, Energy and Tourism

Professor David Wood, Professorial Fellow & Emeritus Professor Dept. Chemical & Biomolecular Engineering, University of Melbourne

Secretariat - Ms Kathrine Riley, Assistant Manager, Transport Fuels Section, Department of Resources, Energy and Tourism

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1. TERMS OF REFERENCE

The Minister for Resources and Energy, the Hon Martin Ferguson, established a working group of senior industry representatives and key stakeholders to investigate the current and projected fuel supply situation at Sydney Airport and to make recommendations on actions that could be undertaken to provide for the effective provision of jet fuel at Sydney Airport in the short, medium and long term.

The Working Group was specifically requested to produce a report that will:

1) be provided to the Minister for Resources and Energy, the Hon Martin Ferguson AM MP, by 30 April 2010.

2) provide projections for Sydney Airport jet fuel demand, supply and capacity requirements of supporting infrastructure for 2014, 2019 and 2029. These projections are to include:

   a) projected jet fuel demand, including annual and peaks/troughs within a typical year.

   b) projected annual refinery production, including annual and peaks/troughs within a typical year and whilst the focus is on Sydney refineries other refineries in the country should be included.

   c) refinery storage capacity.

   d) import terminal storage capacity and facilities in the basin area surrounding Sydney airport.

   e) Joint User Hydrant Installation (JUHI) storage capacity and infrastructure.

   f) pipeline capacities and ratings connecting the facilities associated with supplying jet fuel to the Sydney JUHI.

3) identify any barriers to investment.

4) provide options that are optimally engineered, commercially viable and environmentally sustainable to meet jet fuel requirements and actions to address the identified barriers to investment.

5) recommend preferred option/s for action.

6) include diagrams or maps identifying the current jet fuel infrastructure network and for the alternatives recommended in (4)

7) provide information on jet fuel infrastructure issues at Melbourne and Brisbane airports as appendices to the main report.

2. EXECUTIVE SUMMARY

Efficient airports are an essential element of Australia's transport and tourism infrastructure, underpinning a large part of the countries economic activity.

The *2009 Sydney Airport Master Plan* indicates that Sydney Airport:

- makes a direct contribution of $8 billion in NSW Gross State Product and an economic contribution (taking flow-on impacts into account) of 6 per cent of the NSW economy and 2 per cent of the Australian economy;
- generates more than 75,000 jobs and about 131,000 jobs indirectly; and
- an estimated 100,000 additional jobs will be generated by Sydney Airport over the next ten years.

A number of forecasts indicate the number of passengers moving through Sydney airport will grow at over 4 per cent per annum over the next twenty years. With the expected increase in aircraft carrying capacity, total passenger aircraft movements will grow at a rate of about 2 per cent per annum over the period, with much of the growth in Australian movements expected to be in long-haul international flights.

Maintaining a competitive and efficient fuel supply to Sydney airport and other key Australian airports will be critical to ensure the economic value of the industry to the Australian economy is maximised.

Recognising the impacts of past and future growth in demand for jet fuel at Sydney airport on supply security, the Minister for Resources and Energy, and the Minister for Tourism, the Honourable Martin Ferguson AM MP, initiated a meeting between oil company, airline industry and government stakeholders on 11 January 2010.

Minister Ferguson subsequently established the Sydney Jet Fuel Infrastructure Working Group ("Working Group") to investigate the current and projected fuel supply situation at Sydney Airport and to make recommendations on actions that could be undertaken to provide for the effective provision of jet fuel at Sydney Airport in the short, medium and long term.

Existing jet fuel supply infrastructure

The basin area surrounding Sydney Airport contains significant infrastructure to supply jet fuel to the airport. Since 2003, investment in jet fuel supply infrastructure has doubled the amount of storage capacity in the basin area around Sydney Airport to 196 million litres (ML).

For the purposes of the report it has been assumed that locally refined jet fuel from the Sydney based refineries will not increase for the period to 2029 and that existing import levels will be no less than those for 2009. Therefore, the report assumes all growth in jet fuel demand at Sydney Airport will be met from an increase in jet fuel imports.

A common-user bulk liquids berth is available at Port Botany on the northern side of Botany Bay, approximately 9km from Sydney Airport. The berth is owned and managed by Sydney Ports Corporation and handles imports of hazardous and non-hazardous bulk liquids and gases which are transferred by pipeline to nearby storage and distribution facilities.

With the demand for bulk liquids imports through Port Botany increasing over recent years, and forecast to increase into the future, planning approval to construct a second bulk liquids berth at Port Botany was secured in 2008. Since this time Sydney Ports has been progressing with the design and development of the construction methodology for the berth. It is estimated that the earliest the second berth would be operational is in late 2012. At the present time, land is available in the Port Botany bulk liquids precinct to cater for additional tank storage.

The majority of jet fuel imports into Sydney are handled by Vopak through the bulk liquids berth at Port Botany. Currently 91ML of the total 350ML storage capacity is used for jet fuel.

The Sydney Airport Joint User Hydrant Installation (JUHI) facility is fed by two privately owned pipelines – the Shell pipeline from the Clyde refinery and the Caltex pipeline from the Kurnell refinery.

Jet fuel can be pumped through the Caltex pipeline from three separate facilities, including the Caltex Kurnell refinery, the jointly owned ExxonMobil and BP Botany terminal in Botany and the Vopak storage facilities. The Caltex and Shell pipelines can be used simultaneously to transfer jet fuel into the JUHI, however, only one of the options to pump fuel using the Caltex pipeline (i.e.: from Kurnell refinery or Vopak facility or Mobil Botany) can be utilised at any particular point in time.

Jet fuel demand projections

Jet fuel demand is met by the combination of on site storage capacity and the pipeline supply rates to replenish stock.

While annual demand projections are important for long-term planning and investment decisions, information about the daily jet fuel demand and duration of peak periods is central to enabling robust assessment of the adequacy of pipeline supply rates to maintain security of supply.

A number of publications provide projections for the number of aircraft movements and passenger numbers in the short, medium and long term. While these projections provide a useful proxy for jet fuel demand, accurately forecasting jet fuel demand requires modelling of the number and destination of aircraft movements with the actual aircraft likely to be used (taking into account the future fleet and fuel efficiency improvements will provide more accurate results)

For the purposes of this report, the Working Group developed its own model to project jet fuel demand over the period to 2029. The projections were based on certain assumptions; including:

- Aircraft type and destination ports for a typical busy day for each 5 year period, in accordance with the *2009 Sydney Airport Master Plan* projections;
- Fuel consumption efficiency improvements based on estimates for new aircraft technology (calculations based on manufacturer's base data for different aircraft types);
- QANTAS experience of tankering;
- Uplift figures for international flights to European destinations calculated using an average midpoint assumption (i.e. Bangkok/Singapore); and

- Jet fuel consumption pattern/profile (low, average, busy day ranges) for the full year in 2014, 2019, 2024 and 2029 derived by applying the 2007 actual consumption pattern/profile.

The modelling did not take account of flight path efficiency or Required Navigation Performance (RNP) and any differential in jet fuel pricing remains precisely the same.

Table A: Summary of annual and daily jet fuel demand projections for Sydney Airport

	2014	2019	2024	2029
Estimated annual demand (ML)	3472	3926	4864	5644
Estimated net additional jet fuel imports (ML)	1022	1476	2414	3194
Estimated daily demand (ML/day)	9.51	10.76	13.33	15.46
Projected 'busy' day demand (ML/day)	10.45	11.82	14.25	16.30

The Working Group's modelling shows that the annual jet fuel demand at Sydney Airport is projected to increase from 2450 million litres (ML) in 2009 to 5644ML in 2029. This represents an average 4.2% growth rate per annum year-on-year over the twenty year period with a significant period of growth of 7.22% from 2009 to 2014. This growth is largely attributable to an increase in larger, more fuel efficient aircraft entering the fleet which require more fuel to complete longer flights.

The Working Group also modelled daily jet fuel demand (including 'busy' day and intra-day jet fuel demand) to understand the maximum short-term requirements on the supply, storage and hydrant system and assess the adequacy of the infrastructure to meet projected demand.

The results of the intra-day modelling are shown graphically below. Figure A models jet fuel uplift on a typical busy day in 15 minute blocks and Figure B models jet fuel uplift on a typical busy day in hourly blocks.

Figure A: Intra-day demand for typical busy day (15 minute basis)

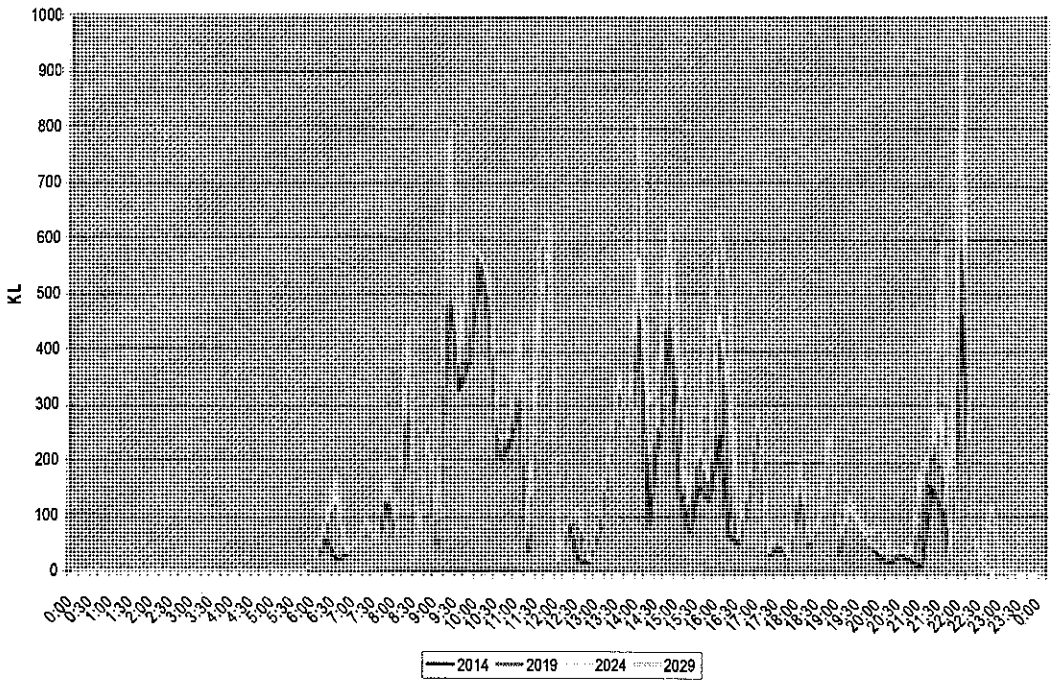
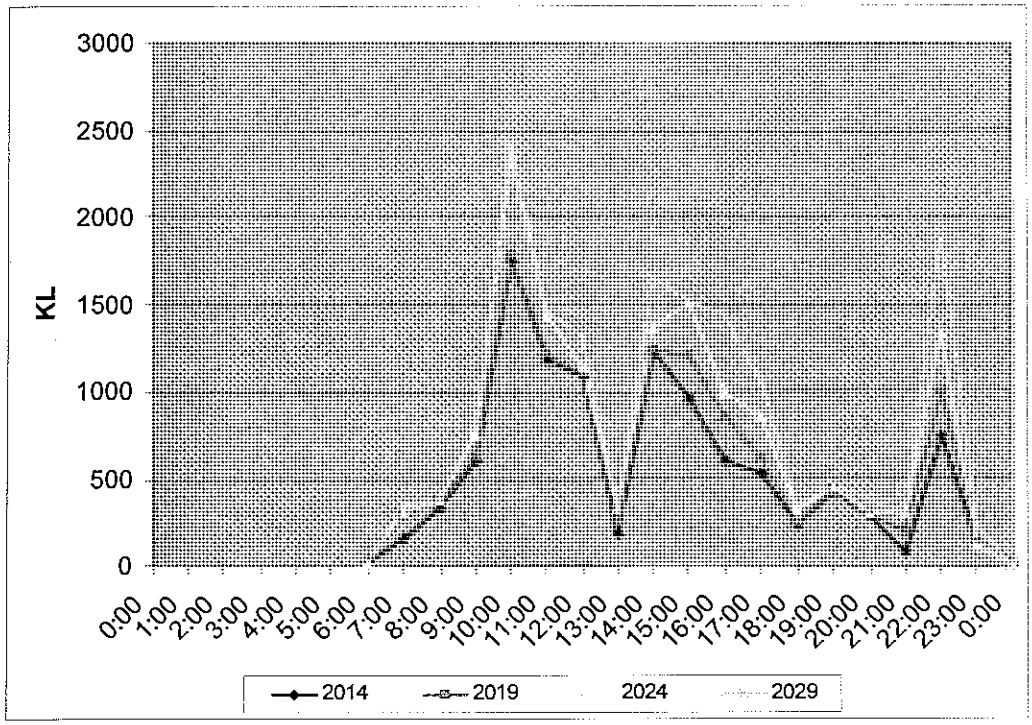
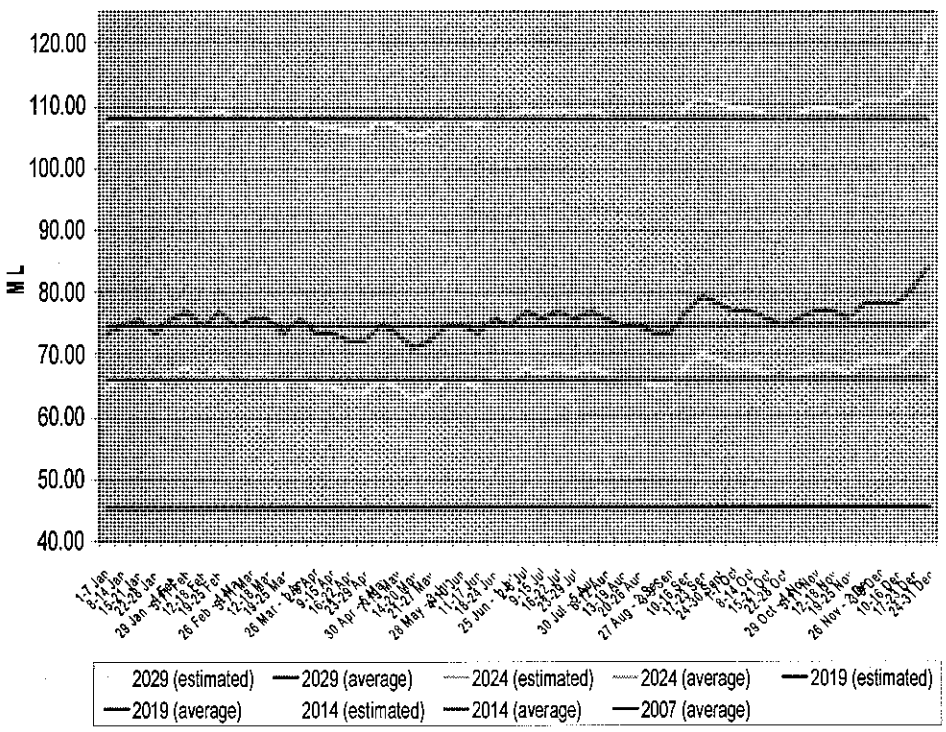


Figure B: Intra-day demand for typical busy day (hourly basis)



The peak period profiles modelled for 2014, 2019, 2024 and 2029 (Figure C) confirm that the extended peak jet fuel demand periods during Easter, school holiday and the Christmas/New Year periods places the greatest stress on the Sydney Airport jet fuel supply infrastructure.

Figure C: Weekly jet fuel demand profile for 2014, 2019, 2024 and 2029



Adequacy of existing jet fuel supply infrastructure

The adequacy of the jet fuel supply infrastructure was determined by taking into account the jet fuel demand projections and comparing the relevant infrastructure capacities with the working group's determined ideal capability criteria.

The working group's ideal multi-dimensional capability criteria relate to stock on hand in the Sydney basin, the airport and the replenishment rate of the supply infrastructure.

Capability criteria	Target level
Jet fuel stock on hand at Sydney Airport	Minimum 2 days daily demand (if on-airport storage is available)
Jet fuel stock on hand in Sydney basin area	Minimum 5 days daily demand; operational target 10 days 'typical' daily demand
Replenishment rate of supplying infrastructure	1.2 times daily demand

The Working Group's analysis determined that:

- The current jet fuel storage capacity at Sydney Airport is capable of storing the minimum two day reserve stock level until the end of 2014;
- Off-airport storage capacity in the Sydney Airport basin area is sufficient to meet the minimum (5 days) and operational (10 days) targets for off-airport storage to 2029;
- The theoretical maximum transfer ("sprint") rate of the existing supply infrastructure to Sydney Airport (11.8ML per day) is not capable of meeting the forecast high end typical daily demand replenishment rate in 2014.
- The typical transfer rate of the existing supply infrastructure to Sydney Airport (7.6ML per day) is not capable of meeting the daily demand replenishment rate in 2014.

Therefore, decisions to invest in additional jet fuel supply infrastructure to the airport will be necessary in the short term to meet the projected growth in jet fuel demand.

The Working Group's analysis of existing infrastructure suggests that investment in at least 0.3ML to 4.5ML per day of jet fuel supply infrastructure capacity will be needed by 2014, with total investment of at least 7.4ML to 11.6ML per day of jet fuel supply infrastructure capacity required to meet projected demand in 2029.

The Working Group understands that the earliest the second bulk liquids berth in Port Botany would be operational is late 2012. In the intervening period there may be certain months where berth utilisation could exceed the economic optimum and, if this occurs, there may be increased delays and costs associated with the import of jet fuel into Port Botany.

Recognising the jet fuel demand projections in this report, the Sydney Ports Corporation may need to consider the option of bringing forward investment in a third bulk liquids berth; and Caltex may need to consider whether it could facilitate increased imports via Kurnell.

Considered actions

The Working Group considered the following six potential infrastructure options to meet projected jet fuel demand at Sydney Airport in the short, medium and long term:

- **Second phase upgrade of the Caltex pipeline** – this option could result in a 9ML to 10ML per day 'sprint' transfer rate (up from a current 'sprint' transfer rate of 5ML per day) of jet fuel from the Kurnell refinery to the on-airport storage facility at the JUHI;

- **Increasing the utilisation rate of the Shell pipeline** - an existing link from the Sydney Metropolitan Pipeline could be used to divert jet fuel to the Clyde refinery to increase the current utilisation rate of the pipeline to a level much closer to the theoretical maximum of 3.9ML per day;

- **Permanent bridger facility at the on-airport storage facility** – this would allow the receipt of jet fuel via trucking on an on-going basis.

- **Additional pipeline from an off-airport storage facility to a holding facility on (or adjacent to) airport land** – This option envisages jet fuel supply provided from an off-site storage facility via a pipeline to the airport in addition to existing supply options utilising the Caltex and Shell pipelines. All supply pipelines would be connected to a holding facility at or adjacent to the airport for supply into the airport hydrant system.

- **Additional storage at on-airport storage facility** – an additional 10ML storage tank on the existing JUHI lease area;

- **Sydney jet fuel import facilities** – availability of Shell Gore Bay, Caltex Kurnell (No 1 & No 2 Berth) and the Port Botany Bulk Liquids Berth.

Conclusions

The key factors affecting the capacity and reliability of the Sydney Airport jet fuel supply system are the capacity of existing jet fuel supply infrastructure to transfer jet fuel into the on-airport storage facility and the ability of the existing bulk liquids berth to receive the projected growth in jet fuel imports.

The Working Group welcomes the recent decision of Caltex's board to proceed with the second phase upgrade to the Caltex pipeline, to be completed by late 2011 and provide for up to an additional 5ML per day increase to the total 'sprint' transfer rate to Sydney Airport. The Working Group also acknowledges the announcement by Sydney Ports to commit to the development of a second bulk liquids berth in Port Botany.

Upon completion of the second phase upgrade of the Caltex pipeline and the construction of the second bulk liquids berth in Port Botany, the Working Group considers that Sydney Airport can expect a higher level of jet fuel supply security to 2019. However, the Working Group believes that further investment in jet fuel supply infrastructure to Sydney Airport, in addition to the above planned investments, will be required to meet projected demand in the medium to long term.

Investment of up to an additional 2.4ML to 6.6ML per day jet fuel supply capacity is required to ensure transfers of jet fuel from off-airport storage facilities to the on-airport storage facility is sufficient to meet demand in 2029. Sydney Ports may also

need to consider the ability of the existing and proposed second bulk liquids berths in Port Botany to receive the projected growth in imported jet fuel.

The availability of pre-competitive data in the form of jet fuel demand projections would facilitate consideration of investment decisions by potential investors. The Working Group considers that the inclusion of jet fuel demand forecasts as part of the airport master planning process is the most appropriate mechanism to develop and publish the data. The Working Group further considers that this approach could be utilised on a national basis and would provide useful information upon which to base jet fuel infrastructure investment decisions at all of Australia's major airports.

Recommendations

In respect to Sydney Airport, the Working Group recommends that:

1. **JUHI members undertake works required to address projected demand, with a short term horizon up to 2014/15. The decision by Caltex to proceed with the second stage upgrade of the Caltex line is noted;**
2. **The Sydney Airport Corporation, as part of the *2014 Sydney Airport Master Plan* process, further review options for the airport jet fuel storage facility, including on and off-airport storage options;**
3. **Potential investors in consultation with the NSW Government undertake a review into option 7.1.5 (additional pipelines to on-airport storage facility), taking into account the potential long lead time for the construction of the infrastructure.**
4. **The JUHI operator and the SACL review options beyond the current lease term;**
5. **JUHI members immediately commence discussions with SACL regarding site requirements for future on-airport jet fuel storage options;**
6. **Jet fuel demand projections be considered as part of all future Sydney Airport Master Plans with input from appropriate industry representatives;**
7. **Consideration is given to including jet fuel demand projections in Master Plans for other key airports with input from appropriate industry representatives;**
8. **Sydney Ports Corporation consider bringing forward investment in a third bulk liquids berth if medium term jet fuel demand as projected in this report is realised; and**
9. **The Commonwealth Government monitors the actual jet fuel usage at Sydney Airport against forecast demand and the capacity of Sydney's ports to handle the increasing volumes of imported jet fuel to supplement local refinery production.**

Melbourne Airport

Since September 2009, jet fuel supply assurance at Melbourne Airport has decreased and resulted in significantly more amber and red lights being posted by the National Operating Committee for jet fuel supply (NOC).

Based on the information provided and the strong views communicated by the key stakeholders of Melbourne Airport, the Working Group considers that the existing jet fuel supply infrastructure at Melbourne Airport is sufficient to meet current demand.

However, as jet fuel demand projections were not available, the Working Group recommends that the inclusion of jet fuel demand projections in future airport master plans. The provision of this information may lower the investment risks and encourage potential investors to commit to necessary jet fuel infrastructure investments in a timely fashion.

Therefore, in respect to Melbourne Airport, the Working Group recommends that:

10. Jet fuel demand projections are determined by appropriate industry representatives as part of all future Melbourne Airport Master Plans.

Brisbane Airport

During the period September 2009 to January 2010, jet fuel supply assurance at Brisbane Airport decreased and resulted in significantly more amber and red lights being posted by the NOC. However, the jet fuel supply situation returned to 'normal' levels during February 2010

Based on the information provided by Brisbane Airport stakeholders, it is apparent that infrastructure decisions will be needed in the short, medium and long term to ensure the jet fuel supply infrastructure is adequate to meet projected demand to 2030.

However, and as with Sydney Airport, security of tenure of the on-airport storage facility is an issue that needs to be resolved in the very near term to allow potential investors with the required certainty to make decisions.

The Working Group notes that the BAC has drafted a Memorandum of Understanding that suggests longer term tenure for the Hakea storage depot post 2012. The Working Group encourages BAC and the JUHI joint venture participants to conclude negotiations in a timely fashion to allow investment decisions and necessary infrastructure build to occur with minimal negative impact on the security of jet fuel supply at Brisbane Airport.

The Working Group acknowledges that jet fuel demand projections were developed by BAC for the Working Group's consideration and provide a robust basis for assessing the adequacy of current jet fuel supply infrastructure and identifying future jet fuel supply infrastructure needs. However, the jet fuel demand projections are not included in the *2009 Brisbane Airport Master Plan*. As previously discussed, the Working Group considers that the availability of jet fuel demand projections to potential investors will reduce investment risk and encourage investment decisions.

Therefore, in respect to Brisbane Airport, the Working Group recommends that:

11. Jet fuel demand projections are determined by appropriate industry representatives as part of all future Brisbane Airport Master Plans.

3. BACKGROUND

Following a meeting with oil company, airline industry and government stakeholders on 11 January 2010, the Minister for Resources and Energy, the Honourable Martin Ferguson AM MP, endorsed the establishment of the Sydney Jet Fuel Infrastructure Working Group ("Working Group").

The Working Group was asked to provide a report to the Government containing recommendations on actions that could be undertaken to provide for the effective provision of jet fuel at Sydney Airport in the short, medium and long term by 30 April 2010.

The Working Group met on six occasions, sought submissions and undertook consultations with key stakeholders. A list of the submissions received is provided in Appendix A, and copies of the submissions are provided at appendices A1 to A9.

3.1 Recent jet fuel supply situation

Following disruptions to jet fuel supply at Sydney airport in 2003, the Australian Government established a Jet Fuel Taskforce to make recommendations on measures to reduce the risk of a jet fuel shortage recurring and handling such shortages in future.

In response to these recommendations, the National Operating Committee (NOC) was established by the four major fuel suppliers to monitor and advise on potential jet fuel supply disruptions and manage supply disruptions. The NOC is comprised of representatives from AirBP, Caltex Aviation, ExxonMobil Aviation, Shell Aviation and an Independent Person. As Qantas is a self-supplier at Sydney Airport, it participates in NOC meetings where discussion on matters of relevance to the Sydney Joint User Hydrant Installation (JUHI) occurs.

The NOC prepares and distributes to key stakeholders a weekly 'Traffic Light Report' on supply availability for the coming week based on an assessment made using a six week period forecast provided by major airports in Australia, New Zealand and Fiji. The green, amber, red and black traffic lights are defined in the traffic light reports as:

◍	OK with capacity to recover should a problem eventuate with planned production or ship arrival
◌	Some concern but expectation that we can recover should there be a temporary problem with planned production or ship arrival. "Got a bit of slack but not much".
◉	NO capacity to recover should there be a problem with planned production or ship arrival, etc. "Will just cope provided nothing goes wrong".
●	Problem identified and unable to be avoided from a Supply perspective. This issue now needs demand management and needs to be managed jointly with intimate involvement with the Aviation business.

The ideal situation for fuel supply assurance is when all supply sources are operational and delivering as normal (green light). If a situation is anticipated to reduce stocks to less than two days cover (or other critical stock level determined for a particular port); a red traffic light will be posted. Updates to Traffic Light Reports

are circulated as necessary and the NOC also undertakes an annual simulation exercise to test its communication protocols and decision-making processes. Since the establishment of the NOC, there have been three black traffic lights and 21 red traffic lights periods posted for Sydney Airport (refer Table1).

Table 1: Jet fuel disruptions – Sydney Airport

	Number of black lights	Duration	Number of red lights	Duration
2010	**0**		**1**	15 Days (Jan)
2009	**1**	26 days (Dec, 100% rationing)	**4**	6 days (Jul/Aug) 7 days (Nov) 3 days (Dec) 2 days (Dec)
2008	**1**	5 days (Oct/Nov, 100% rationing)	**5**	8 days (Feb) 7 days (Mar) 12 days (Aug) 8 days (Oct) 7 days (Nov)
2007	**0**		**2**	unknown (Aug) unknown (Oct) *[note: traffic light reports for Aug-Dec 2007 period not available]*
2006	**0**		**8**	1 day (Jan) 4 days (Mar) 1 day (Jul) 1 day (Aug) 7 days (Oct) 15 days (Oct) 5 days (Nov) 7 days (Nov)
2005	**1**	6 days (Aug/Sep)	**2**	15 days (Jul) 15 days (Sep)
2004	**0**		**0**	
Total	**3**		**22**	

During November 2009, the JUHI undertook unplanned maintenance as a result of a tank inspection which reduced tank capacity. In December 2009, a 100% allocation black light was posted for a record period of 26 days to manage the regular uplift and warn the airlines that any further events could result in deeper rationing.

Whilst sufficient supply was maintained in the basin area surrounding the airport and there was no impact on travellers, the 'normal' transfer rate of stock into the JUHI was not sufficient to meet the increase in daily demand. On days when Vopak transfers occurred JUHI jet fuel stocks partly recovered. The use of trucking marginally assisted the supply situation. However, JUHI operational requirements and risk assessments had to be satisfied to enable truck bridging to occur.

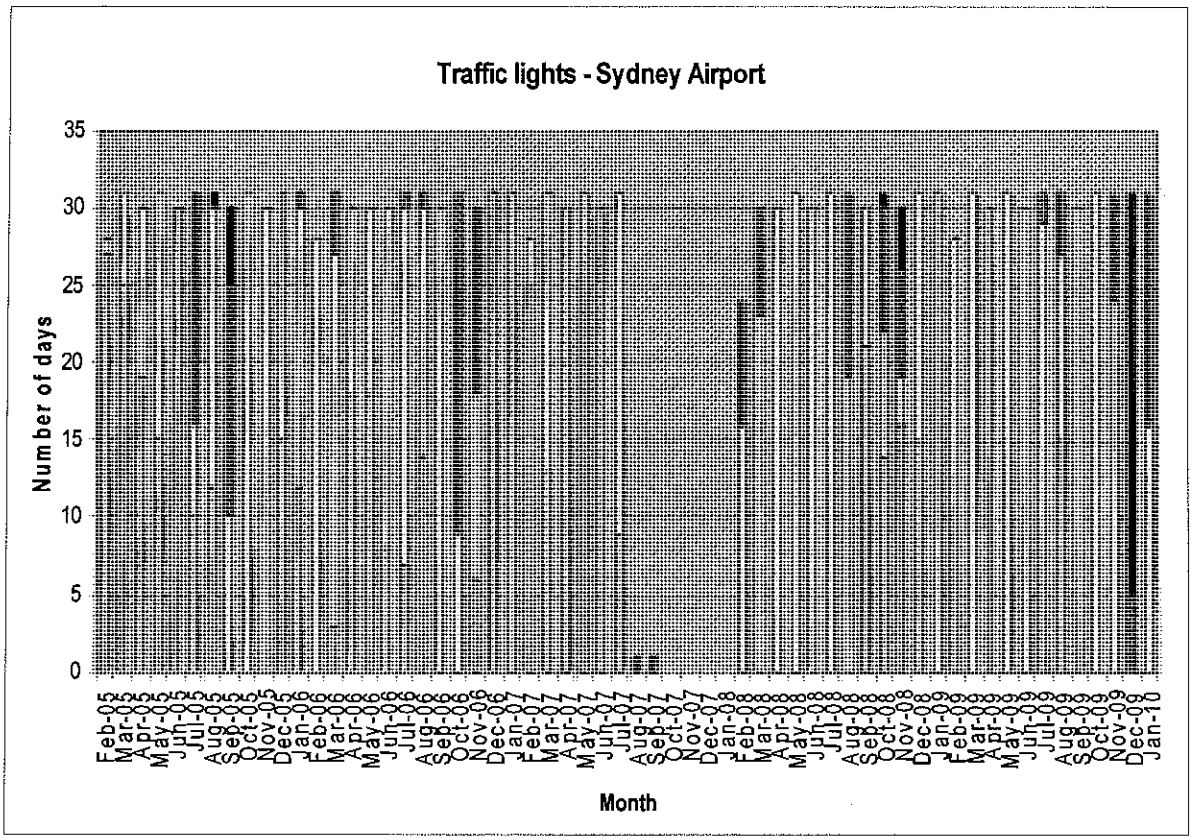
Flights were not curtailed but if uplifts of greater than 100% had been permitted, or if any malfunctions with the infrastructure or delays in importing product occurred,

deeper rationing would have been very likely. During the latter part of December 2009, when the out of service tank was commissioned, uplifts declined. JUHI stocks were rebuilt to a 2 day stock level after approximately 24 days.
The October 2008 100% allocation black light lasted for seven days as delays in pipeline maintenance work on one of the supplying pipelines resulted in JUHI stocks falling below two days cover. The black light in August/September 2005 resulted from fuel product handling issues (conductivity[1]) with imported jet fuel transferred to the JUHI.

The period of time that red lights have been posted for Sydney Airport has generally increased in recent years and, in conjunction with the black lights and more frequent amber lights, presents a concerning trend (refer Figure 1).

The most significant of the amber lights posted for Sydney was due to ongoing maintenance works at Clyde refinery throughout 2008 and its subsequent temporary shut down during November 2008 to August 2009. Whilst amber lights were posted for the majority of the latter period, jet fuel stocks at the JUHI were sufficiently maintained as Shell moved to full import mode to replace the lost local production. Amber lights were also posted during the period 1 September 2009 to 1 December 2009 whilst maintenance of two tanks occurred at the JUHI.

Figure 1: Traffic lights posted for Sydney Airport (Feb 2005 – Jan 2010)[2]



[1] Conductivity is a parameter of jet fuel specifications which refers to the fuels ability to accumulate or dissipate static charges. A Static Dissipator Additive (SDA) is used to speed up the rate at which static charge can dissipate, thereby reducing the time for which a static hazard might exist. Therefore making the fuel safer to handle. It is a well-known phenomenon for conductivity to decrease as fuel moves through the supply chain and this can require re-doping between the refinery and the airport fuelling operation.
[2] Traffic light reports for the period August 2007 to December 2007 were not available to the Secretariat.

3.2 Impact of jet fuel supply disruptions on airlines and potential flow on effects to other airports

In normal circumstances, airlines often uplift more fuel than planned to take advantage of lower fuel prices, be prepared for increased fuel use during adverse weather, or for other reasons. When the NOC posts a 100% allocation black light, suppliers restrict the amount of fuel their customers uplift in a day to the 100% contracted level and there is little impact on airlines. Generally the impact to operations is limited to airlines seeking to nominate an alternate port. The financial impact to airlines is negligible.

The declaration of deeper fuel rationing (i.e. 80 – 85% allocation) can result in the rescheduling or cancellation of flights which leads to the travelling public being inconvenienced and additional costs to airlines associated with tankering, unscheduled technical stops, reimbursement of fares and negative publicity.

When Sydney Airport faces fuel rationing, domestic airlines can uplift (tanker) extra fuel from other airports. Melbourne and Brisbane airports are generally used for flights along the Australian east coast or International flights. Tankering is very difficult and costly for airlines operating international services. The need to make a "technical stop" to secure fuel adds significantly to airline costs and is highly disruptive to airline schedules. The strategies of tankering and technical stops are discussed further in section 3.3.

3.3 Strategies used to minimise impact of jet fuel shortages at Sydney Airport

Oil suppliers and airlines have a number of strategies in place to minimise the impact of jet fuel supply shortages.

3.3.1 Additional jet fuel supply

Jet fuel suppliers have strong commercial imperatives to meet their contractual obligations, such as upholding their reputation as a reliable supplier and their ability to maintain customer relationships to retain or gain further business. However, events impacting on the ability of jet fuel suppliers to meet their commitments can occur from time to time. For example, a shipment of imported jet fuel may be delayed due to bad weather or issues at the international export port. Similarly, reduced domestic production of jet fuel may impact on supplier's capacity to meet contracts.

When a shortfall in supply eventuates suppliers will generally attempt to divert their own imports into other Australian ports, divert interstate transfers or source alternative jet fuel supply from other domestic suppliers in the first instance, as imports of jet fuel can take at least five weeks to arrive after being ordered. Suppliers with local refineries can also undertake a number of different actions to temporarily increase domestic production.

If suppliers cannot source their own product to meet their contracted sales, they can enter into a spot sale, swap or loan arrangement with another supplier. These actions are commercial matters for the supplier's supply departments and separate from the operation and management of jet fuel stocks at the JUHI facility.

3.3.2 Rationing

The NOC generally takes a conservative approach to posting traffic lights and is aware of the airlines preference for early warning of potential supply disruptions. The level of rationing will depend on the particular disruption event.

The 2003 Jet Fuel Taskforce took the view that a longer period of light rationing is to be preferred. 100% allocation can be managed for a period of time. However, just one additional problem in the supply chain can lead to deep rationing. Whilst lighter rationing over a longer period is generally preferred, there have been times where deeper rationing was encouraged by airlines to ensure the airport remained operational by maintaining sufficient reserve stock.

3.3.3 Tankering

Tankering is the practice of uplifting extra fuel on planes at an alternative airport to remove or reduce the need for uplifting fuel at the airport with fuel supply shortage. Tankering, when used, is generally only for flights that are less than about three hours duration (i.e. domestic flights), depending on the aircraft type. For example, an airline may uplift sufficient fuel at Canberra Airport for a return flight to Sydney.

Tankering is a strategy that in some circumstances can be used by Airlines to reduce fuel uplift requirements at higher fuel cost Airports (as noted in Section 3.2). Similarly, it is a strategy that in some circumstances can be safely used by Airlines to uplift less fuel at a particular airport where supply constraints apply.

3.3.4 Technical stops

In the event of a fuel supply disruption at Sydney Airport, "technical stops" are sometimes used for ultra long haul flights (>10 hours). This strategy increases total flight times and increases airline costs, such as additional landing fees, staff costs (if additional cabin or technical crew are required because of the extended flight time) and meals for passengers and crew. Wherever possible, technical stops will be made at airports along the route to the final destination. However this may not always be possible as smaller airports may not be capable of providing additional fuel over an extended period of time. In any event, technical stops result in severe disruptions to international airline schedules, and have knock on implications for other airline services.

For example, an airline reported that during one extended fuel disruption at Sydney Airport it preferred to make technical stops at Nadi for trans-Pacific flights. Whilst Nadi generally has 30 days 'normal' jet fuel demand in stock, the airline was only able to uplift from Nadi Airport for three days to supplement the up to 3 flights per day to Los Angeles. Should a Sydney Airport disruption be prolonged, the airline would have to choose a sub-optimal technical stop point to supplement its fuel requirement, for example through Brisbane, which would result in further flight time delays.

3.3.5 Type of aircraft utilised

Airlines and aircraft manufacturers have been cooperating over an extended period to ensure that each new generation of aircraft is more fuel efficient. According to the International Air Transport Association (IATA) there has been a 70% improvement in aircraft fuel efficiency in the last four decades, resulting in the fuel usage of modern aircraft averaging 3.5 litres per 100 passenger kilometres.

The A380 and the soon to be in service B787 further improve on that performance, taking the figure below 3 litres per 100 passenger kilometres. It is expected that the next generation of aircraft planned by airlines and manufacturers will result in even greater fuel efficiency. IATA expects that the planned billions of dollars of investment in new aircraft by the aviation industry worldwide will drive a 25% improvement in global fuel efficiency by 2020.

Substitution of alternate, more fuel efficient aircraft to respond to a short term jet fuel supply problem at Sydney Airport is an option that is unlikely to result in a major reduction to fuel demand. Only some airlines have sufficient aircraft to be able to re-schedule more fuel efficient aircraft on the Sydney routes and this re-scheduling could take a number of days to implement.

3.4 International jet fuel supply infrastructure models

Various models for jet fuel supply infrastructure at other international airports have developed subject to airport location, historical events and national policy. As such, no model can be referred to as "world's best practice" for jet fuel supply infrastructure ownership or third party access arrangements.

A number of models are provided below for comparison with the arrangements at Sydney Airport. Access to jet fuel infrastructure can be described as closed, limited or open:

- *Closed access* is defined as no third-party access to privately owned infrastructure.
- *Limited access* is defined as requiring participation in a joint venture owning the supply infrastructure in order to access fuel.
- *Open access* is defined as allowing all parties access to fuel through the airport fuel supply infrastructure upon payment of a throughput based fee.

Participation in jet fuel supply facility joint venture arrangements requires initial and ongoing capital investment, and acceptance of financial, maintenance, operational and environmental liabilities.

3.4.1 Hong Kong International Airport, Hong Kong

The on-airport jet fuel storage infrastructure at Hong Kong Airport is owned by the Airport authority (which is Government-owned) and is fed by the pipeline from Sha Chau Island. Product is supplied by barge into Sha Chau Island from storage at Tsing Yi (owned by oil companies) and from storage or refineries in South China. Eleven suppliers are presently in the jet fuel supply market, for which demand is estimated to be approximately 6.5 billion litres per annum.

From 30 March 2010, a new off-airport storage terminal (PAFF stage 1a 140,000 m^3) commenced operation, with supply by pipeline from PAFF to on-airport storage (via pipeline to existing pipeline at Sha Chau). During stage 1a, supply to on-airport storage will be from both PAFF and by barge via Sha Chau. Once PAFF stage 1b is completed (264,000m^3), supply via Sha Chau will be de-commissioned and all supply to on-airport storage will be from this new facility [via a new pipeline]. The PAFF storage terminal will provide open access to suppliers for bulk jet fuel imports into this terminal and for transfer via pipeline to the on-airport storage facility. The supplier must demonstrate it holds current supply contracts with airlines operating out of Hong Kong International Airport. Airlines can supply fuel for their own consumption.

3.4.2 Heathrow Airport, United Kingdom

The jet fuel supply and storage infrastructure at Heathrow Airport is owned by two separate joint venture companies. The Heathrow Hydrant Operating Company (HAPCO) owns and operates the hydrant system and the Heathrow Fuel Company (HAFCO) owns and operates the on-airport jet fuel storage terminal. The HAFCO on-airport terminal is fed by three pipelines, trucking and railway carts which originate from oil company owned refineries or storage terminals.

Both joint venture companies comprise oil companies. HAPCO includes an airline. Access to the infrastructure is available, but is dependent on participation in the joint venture (defined above as limited access). There are currently seven suppliers in the jet fuel supply market, for which demand is approximately 7.5 to 8 billion litres per annum.

3.4.3 Los Angeles Airport, United States of America

Access to on-airport jet fuel supply infrastructure is available to LAXFUEL affiliated companies through participation in the LAXFUEL consortia at agreed rates or via a (higher) published rate ('rack rate') charged to non-members. LAXFUEL members include airlines. Operation and management of the infrastructure is outsourced to experienced contractors, usually third party infrastructure companies such as in this case, Aircraft Service International Group (ASIG) [3], who own and operate the mobile equipment and provide service for a fee.

The on-airport jet fuel storage terminal is fed by four pipelines, three from oil company refineries and one from a common user storage terminal. Up to 25 suppliers use the system for which annual demand is approximately 5.5 to 6 billion litres.

3.4.4 Sydney Airport, Australia

The jet fuel infrastructure at Sydney Airport comprises an unincorporated joint venture managed on-airport storage facility and hydrant system. The on-airport storage facility is fed by two privately (oil company) owned pipelines. Trucking of limited amounts can also occur from time to time to supplement on-airport stocks.

The Caltex owned pipeline supplying the on-airport storage facility is connected to the Kurnell refinery, a major common-user import terminal (Vopak) and a small private terminal (ExxonMobil). Third party access to this pipeline is allowed for a contracted number of days per month.

The Shell pipeline to the on-airport storage facility is connected to the Clyde refinery and is predominantly used to transfer Clyde jet fuel production to the on-airport storage facility.

Five suppliers are presently in the Sydney Airport jet fuel supply market, for which demand is approximately 2.4 billion litres per annum. Further detail on the current arrangements to supply jet fuel to customers at Sydney Airport is provided in Chapter 4 (*Existing jet fuel supply infrastructure and logistics arrangements in Sydney*).

[3] Information on ASIG is available at: http://www.asig.com/index.shtml.

3.5 Capability criteria for Sydney Airport

To assess the current level of jet fuel supply assurance at Sydney Airport and to consider the adequacy of proposed options for action, the working group has developed ideal multi-dimensional capability criteria (table 2 refers).

Table 2: Capability criteria

Capability criteria	Target level
Jet fuel stock on hand at Sydney Airport	Minimum 2 days daily demand (if on-airport storage is available)
Jet fuel stock on hand in Sydney basin area	Minimum 5 days daily demand; operational target 10 days 'typical' daily demand
Replenishment rate of supplying infrastructure	1.2 times daily demand

Whilst the capability criteria provide target levels, the criteria itself does not represent a guarantee that sufficient jet fuel will be available all the time.

4. EXISTING JET FUEL SUPPLY INFRASTRUCTURE AND LOGISTICS ARRANGEMENTS IN SYDNEY

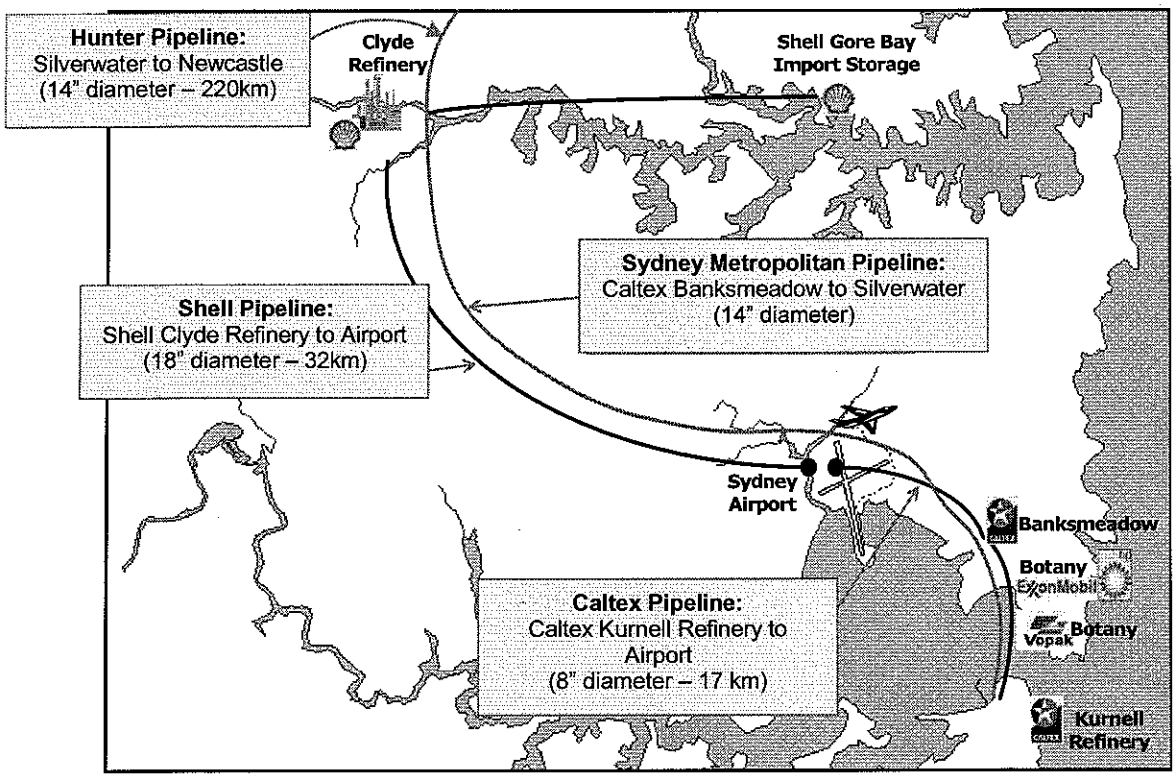
4.1 Jet fuel infrastructure to Sydney Airport

The basin area surrounding Sydney Airport contains significant infrastructure to supply jet fuel to the airport. Since 2003, investment in jet fuel supply infrastructure has doubled the amount of storage capacity in the basin area around Sydney Airport to 196ML.

The Sydney Airport Joint User Hydrant Installation (JUHI) facility is fed by two privately owned pipelines – the Shell pipeline from the Clyde refinery and the Caltex pipeline from the Kurnell refinery.

Figure 2 shows the location and jet fuel storage capacity at each supply point in the basin area.

Figure 2 – Jet fuel supply infrastructure in Sydney basin area[4]



4.1.1 Refineries

Caltex's Kurnell refinery is located on Kurnell Peninsula, approximately 17 kilometres south east of Sydney Airport. The refinery receives crude oil feedstock through the Kurnell No 3 crude berth. Crude oil is processed at the refinery to produce a range of petroleum products including jet fuel. The refinery can also receive imported finished product including jet fuel through the No 1 and No 2 product berths located on the Kurnell Wharf. Jet fuel produced at Kurnell refinery or imported jet fuel is stored on-site at Kurnell prior to being transferred via the Caltex pipeline to the Sydney JUHI for

[4] Diagram provided by The Shell Company of Australia (as Sydney Airport JUHI operator).

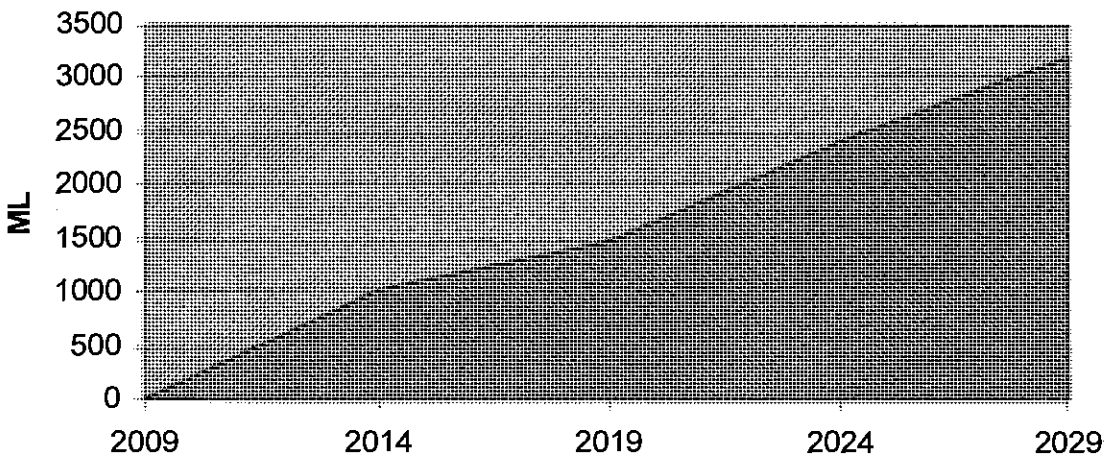
use at Sydney Airport or to the Caltex Banksmeadow terminal where it can be transferred (via trucks) for use at Canberra Airport. Jet fuel is also transferred via the Sydney Metropolitan Pipeline (SMP) and the Hunter and Newcastle Pipelines to the Caltex storage facility in Newcastle for use at Williamtown Airport. The Newcastle facility was recently used to supply Canberra in order to free up time on the Caltex pipeline for deliveries to Sydney Airport.

Shell's Clyde refinery is located where the Parramatta and Duck Rivers join, 16km west of Sydney's CBD and 32 km north-west of Sydney Airport. The refinery receives its feedstock via its twin-berth Gore Bay terminal, which is also capable of receiving imports of finished products. Jet fuel produced at Clyde refinery, and imported via Gore Bay, is transferred to the Sydney JUHI via Shell's pipeline for use at Sydney Airport.

Current and future production from the Shell and Caltex refineries in Sydney is commercial-in-confidence, therefore the Working Group is unable to address Terms of Reference 2(b) and 2(c). However, it is reasonable to assume that local refinery production is unlikely to increase materially and that all growth in airport jet fuel demand will be met by imports.

Therefore, this report assumes no material changes to Sydney area refinery production in the period to 2029. On this basis and with the assumption that existing import levels will be no less than those for 2009, Figure 3 illustrates the amount of additional jet fuel imports required to meet projected annual jet fuel demand at Sydney Airport.

Figure 3: Projected net additional jet fuel imports



4.1.2 Import terminals

The only common-user bulk liquids berth in NSW is available at Port Botany on the northern side of Botany Bay, approximately 9km from Sydney Airport (refer map, Appendix B). The berth is owned and managed by Sydney Ports Corporation and handles imports of hazardous and non-hazardous bulk liquids and gases which are transferred by pipeline to nearby storage and distribution facilities. Some export of bulk liquids products also occurs through the berth.

The main product groups handled at the bulk liquids berth are petroleum products (petroleum, diesel, naphtha and jet fuel), hydrocarbons (LPG) and chemical products (organic chemicals, solvents and caustic soda). The land in the immediate vicinity of

the bulk liquids berth is also owned by Sydney Ports and is leased to a number of parties for use as bulk liquids storage facilities.

Capacity for bulk liquids servicing at Port Botany is affected by berth utilisation at the bulk liquids berth and land supply for tank storage. As at March 2010, average berth utilisation for the preceding 12 months was 60%, fluctuating between monthly utilisations of 43% and 80%. Sydney Ports Corporation has advised that an average berth utilisation of 65% is a practical and economic working limit for a bulk liquids berth. Higher utilisation creates the potential for increasing demurrage costs (i.e. costs associated with ships waiting for berth access).

With the demand for bulk liquids imports through Port Botany increasing over recent years, and forecast to increase into the future, planning approval to construct a second bulk liquids berth at Port Botany to the south of the existing bulk liquids berth was secured in 2008. Since this time Sydney Ports has been progressing with the design and development of the construction methodology for the second bulk liquids berth. It is estimated that the earliest the second berth would be operational is in late 2012. At the present time, land is available in the Port Botany bulk liquids precinct to cater for additional tank storage.

The majority of jet fuel imports into Sydney are handled by Vopak through the bulk liquids berth at Port Botany. Vopak owns and operates a petroleum product storage facility in Port Botany on land leased from Sydney Ports. Currently 91ML of the total 350ML storage capacity is used for jet fuel. Jet fuel from Vopak is transferred to the Sydney JUHI facility via the Caltex-owned pipeline from Kurnell peninsula in accordance with the supplier's pipeline access agreements with Caltex. Vopak recently increased the pumping capacity from 5.7ML per day to 7.9ML per day. Vopak advised the Working Group that its storage facility has sufficient space to install additional pipelines and sufficient storage tanks to cater for increased imports from the second bulk liquid berth.

The ExxonMobil terminal in Botany, which is jointly owned by ExxonMobil and BP, has import access via the Sydney Port Corporation's bulk liquids berth. Jet fuel storage capacity at the ExxonMobil terminal totals 18ML.

4.1.3 Pipelines

There are four supply points which utilise the two privately owned pipelines to the Sydney JUHI facility. Table 3 provides a summary of the pipeline throughput rates for each supply point.

Table 3: Sydney basin jet fuel supply pipelines - throughput rates

Pipeline to Sydney JUHI	Maximum daily throughput
Shell (ex Clyde refinery)	3.9 ML
Caltex (ex Kurnell refinery) *	5.0 ML
Caltex (ex Vopak) *	7.9 ML
Caltex (ex Mobil Botany *	4.8 ML

* Caltex pipeline throughput rates are not cumulative

The Shell pipeline is approximately 200mm (8 inches) in diameter and 32 km long with a capability of transferring a maximum of 3.9ML per day into the JUHI. The Shell pipeline is currently utilised at a rate of 56%.

The Caltex pipeline is 17 km long and capable of transferring 5.0ML per day from Kurnell to the JUHI. The pipeline is predominately 254mm (10 inch) diameter between Kurnell to Botany and 200mm (8 inch) from Botany to the JUHI. Caltex has recently completed stage one of an upgrade program to raise the pressure rating of the line and installation of high capacity line filters at the JUHI. This resulted in the maximum transfer rate of jet fuel from the Kurnell refinery increasing to 5.0ML per day. At the same time as the Caltex stage one upgrade, Vopak upgraded its six pumps at the Vopak facility.

The Caltex pipeline also incorporates links from the Vopak and ExxonMobil terminals at Port Botany. Following the recent upgrade the Caltex pipeline is capable of transferring up to 7.9ML per day but only from the Vopak facility. The ExxonMobil terminal is capable of transferring 4.8ML per day to the JUHI via the Caltex pipeline.[5]

A second upgrade to the Caltex pipeline, which will result in an increased pumping rate from the Kurnell refinery of up to 9ML to 10ML per day, is planned for completion in late 2011. To maximise throughput over the entire pipeline, an upgrade to the Vopak pumps would need to be considered by Vopak. The Working Group has been advised that Caltex's Board recently approved the second phase upgrade, which could be completed by late 2011. Vopak advised the Working Group that it is in a position to further upgrade its pipeline subject to customer approval. The Vopak upgrade could result in an increased pumping capacity of 10ML per day from the Vopak storage facility to Sydney Airport, within the next six to twelve months.

The Caltex and Shell pipelines can be used simultaneously to transfer jet fuel into the JUHI. However, only one of the options to pump fuel using the Caltex pipeline (ie: from Kurnell refinery or Vopak or Mobil Botany) can be utilised at any particular point in time. The scheduling of jet fuel transfers within the Caltex pipeline is Caltex's responsibility and is done in accordance with its pipeline access agreements with the parties involved. The agreements currently allow third parties to utilise the pipeline for approximately a total of five days per month. Negotiations to renew arrangements following the increased pumping capacity from Vopak facility are underway. The net effect for the Vopak jet fuel customers will be a function of flow rates and access agreements.

4.1.4 Other supply infrastructure

Trucking of fuel into the Sydney Airport JUHI is possible, but not normally undertaken. The critical supply situation in December 2009 warranted this additional supply method and was successfully utilised to supplement the flow of jet fuel into the JUHI by approximately 200,000 L (0.2ML) per day.

Trucking significantly increases traffic congestion around the immediate JUHI area. It also increases safety risks at JUHI. Trucking is not a total solution to the bottleneck in transporting fuel from off-airport storage facilities to Sydney Airport, but can provide incremental supply in the short to medium term or under special or emergency supply conditions.

[5] NOC Chair presentation to Minister Ferguson, 11 January 2010.

4.2 Jet fuel infrastructure at Sydney Airport

4.2.1 Joint User Hydrant Installation (JUHI) facility

The Sydney Airport JUHI is an unincorporated joint venture, with one joint venture agreement covering the storage facilities and international and domestic hydrants. The JUHI is located at the northern end of the International Precinct and contains five jet fuel storage tanks with a maximum capacity of 30ML. A map showing the location of the JUHI facility on the Sydney Airport site is provided at Appendix C.

Shell Australia operates and manages developments of the facility on behalf of the joint venture participants. Component A (Storage + International Hydrant) of the joint venture comprises BP, Caltex, Chevron, ExxonMobil, Shell and Qantas. Component A, B and C comprises BP, Caltex, Exxon, Shell and Qantas (component B and C refers to the Domestic Hydrant).

The maximum operational (useable) capacity is approximately 21.2ML, with optimal operating capacity between 18ML and 19ML. Tankage is reserved to provide separation of fuel receipt and dispatch to the hydrant system as part of the fuel quality control procedures The JUHI storage facilities began operating 24 hours, seven days a week in August 2006. The JUHI storage facility is not intended for blending additives or other components into jet fuel or receiving frequent large volumes of road delivery of jet fuel.

4.2.2 Sydney Airport hydrant system

Jet fuel is distributed across the Airport from the JUHI storage facility, via a number of underground pipelines, to apron hydrant outlets located adjacent to aircraft gates. A number of the General Aviation[6] (GA) and helicopter operators have small refuelling storage facilities and equipment located in close proximity to their main facilities, either operated by the oil companies or by the operators themselves. Qantas also has onsite storage at the Jet Base which currently has one 170KL tank operational.[7]

The hydrant system feeds into the international terminal, domestic terminals and freight bays, and consists of 10 hydrant pumps with each having a maximum throughput capacity of 3800 litres per minute. The hydrant pipelines vary in size from 600mm to 100mm (refer Appendix D).

The hydrant system has expanded in accordance with the number of new bays installed at the airport and the joint venture participants believe that infrastructure is adequate to meet current customer demand. In the short term, Sydney Airport proposes to develop a number of apron expansions adjacent to and remote from the International and Domestic terminals. Traditionally, remote apron sites have not been equipped with hydrant fuel as the positions are mainly used to overlay aircraft. With increasing aircraft parking demand and the need to maximise flexibility, this situation is changing with a number of the proposed remote apron positions now requiring the provision of hydrant fuel so as to enable aircraft to be turned around during the peak hour periods. With the expansion of aircraft aprons in areas currently not serviced by hydrant fuel, the capacity of the hydrant system and solutions which deliver a cost effective expansion of such infrastructure will continue

[6] "General Aviation" refers to premium corporate business jets, RAAF VIP aircraft and other private aircraft.
[7] Sydney Airport Corporation Limited (SACL), *2009 Sydney Airport Master Plan*, p79.

to receive focus. The issue of hydrant extensions is a matter for SACL and the JUHI joint venture participants to negotiate suitable arrangements as has occurred in the past.
'Into-plane' dispensing is undertaken directly by the fuel companies or by other entities established by the oil companies and other providers. Specialist hydrant refuelling vehicles are used for this task and administrative and maintenance support for refuelling vehicles is accommodated as part of the JUHI facility.[8]

Bulk tanker vehicles are used for the fuelling of regional and GA aircraft and helicopters where hydrant access is not available. These mobile tankers and dispensers are parked at a number of locations on the airport in close proximity to aircraft aprons and receive maintenance and servicing at the JUHI facility.[9]

4.3 Market arrangements for jet fuel supply

4.3.1 Key suppliers and third party access arrangements for privately owned infrastructure

As previously discussed in chapter 3, the current jet fuel suppliers for Sydney Airport are Caltex, Shell, BP, ExxonMobil and Qantas. The two pipelines to the Sydney JUHI are privately owned by Caltex and Shell, and third party suppliers must negotiate pipeline access arrangements with the relevant infrastructure owners.

Currently only the JUHI members supply jet fuel to customers at Sydney Airport. However, new participants can apply to the JUHI joint venture participants to negotiate access to the JUHI infrastructure and negotiate access to the privately owned pipeline infrastructure (e.g: on a throughput basis).

Shell and Qantas/Q8 Aviation have negotiated storage and pipeline access arrangements with Vopak to enable them to import jet fuel via Port Botany, in addition to negotiating pipeline access agreements with Caltex. BP and ExxonMobil also have pipeline access agreements with Caltex to allow them to transfer product from the ExxonMobil Botany storage terminal to JUHI. In total, third party access to the Caltex pipeline is currently allowed for approximately five days per month. It has been difficult for the third party users to maintain or increase their volume on the Caltex pipeline, due to Caltex's increasing use of their pipeline capacity for their own jet fuel transfers to the JUHI.

The Shell pipeline is currently primarily used to transfer Shell's jet fuel production from the Clyde refinery, supplemented with imports, to the Sydney JUHI facility. Shell can direct imports of jet fuel via its Gore Bay terminal, which is connected via a multi product pipeline to the Clyde refinery. However, this supply route is only used to supplement local jet fuel production and on a scheduled basis due to costs, potential impacts to the refinery operations and additional risks associated with maintaining jet fuel specification when the product is transported through the multi-product pipeline and transferred into, and through, the Clyde-JUHI pipeline.

[8] SACL, ibid.
[9] SACL, ibid.

4.3.2 Inventory ownership management arrangements for JUHI stock levels

Shell, as the JUHI operator, manages the Sydney JUHI facility on behalf of the joint venture parties and is responsible for oversight and management of the inventory ownership management arrangements. The joint venture principle is that each supplier's fuel off-take is balanced against its supply transfers.

Each supplier is allocated a percentage of the total storage capacity and each supplier is required to nominate a target level for its end-of-month stockholding. Suppliers must advise the JUHI manager on a monthly basis of the amount of jet fuel it intends to transfer into JUHI to meet its own demand. Suppliers also provide the JUHI manager with weekly updates to the transfer schedule.

The JUHI manager uses the monthly and weekly updates to forecast the end of month stock level for each supplier and provides feedback to suppliers on the impact of changes to its transfer schedule. The JUHI manager can make recommendations to the suppliers in relation to increasing or decreasing the amount of transfers during the month to assist them to meet their end-of-month target but does not have authority to enforce the recommended action. Should escalation of an issue be required this would be taken to a JUHI OPCOM (Operating Committee) for review and decision. At the end of the month, the JUHI manager transfers the balance of stocks to the start of the next month.

The joint venture participants are independently responsible for supply, sales and deliveries of jet fuel. If suppliers cannot meet their projected transfer schedule and end of month balance, it is the responsibility of the individual supplier to source additional jet fuel from other suppliers. Suppliers buy and sell jet fuel from each other from time to time to ensure they satisfy their contractual commitments.

5. PROJECTED JET FUEL DEMAND AT SYDNEY AIRPORT IN 2014, 2019, 2024 AND 2029

A number of publications[10] provide projections for the number of aircraft movements and passenger numbers in the short, medium and long term. The annual and representative busy day forecasts were compiled by an independent consultant for the Sydney Airport Master Plan 2009 with the plan including a projection for aircraft departures for a typical busy day in 2014, 2019, 2024 and 2029.

In addition, an independent peer review of the forecast methodology was undertaken as part of the master planning process. These forecasts represent the best available information on forecast aircraft movements and provide a firm basis to calculate future jet fuel demand.

For the purposes of this report the Working Group developed its own model to project jet fuel demand over the period to 2029 based on the Sydney Airport Master Plan data. The methodology and key assumptions for the projection model are described in section 5.1 below.

The Working Group projections have an accuracy of +/- 10%, which is sufficient to identify critical limits in regard to jet fuel supply to Sydney Airport using existing and potential future infrastructure and required onsite storage. The 2014 average jet fuel consumption projections have a higher degree of certainty compared with the projections for 2019, 2024 and 2029. As the projections for these out-years have a higher degree of uncertainty because of possible variations in the key assumptions upon which the forecasts were based, it is recommended that these projections are updated on a five-yearly basis, following the approval of future Sydney Airport Master Plans.

5.1 Methodology and key assumptions

The jet fuel demand projections are based upon the following assumptions:

- Aircraft type and destination ports for a typical busy day in 2014, 2019, 2024 and 2029 and the busy day to average day ratios for each 5 year period, in accordance with the *2009 Sydney Airport Master Plan* projections;
- Fuel consumption efficiency improvements based on estimates for new aircraft technology (calculations based on manufacturer's base data for different aircraft types);
- QANTAS experience of tankering;
- Uplift figures for international flights to European destinations calculated using an average midpoint assumption (i.e. Bangkok/Singapore); and
- The jet fuel consumption pattern (low, average, busy day ranges) for the full year in 2014, 2019, 2024 and 2029 derived by applying the 2007 actual consumption pattern/profile (the 2007 travel pattern/profile is believed to be more typical than that in 2009 which was affected by the global financial crisis (GFC)).

[10] 2009 *Sydney Airport Master Plan*; 2009 *Aviation White Paper;* 2008 Bureau of Infrastructure, Transport and Regional Economics Working Paper 72, *Air passenger movements through capital city airports to 2025–26.*

The modelling did not take account of flight path efficiency or Required Navigation Performance (RNP) and differential in jet fuel pricing remains precisely the same.

The *2009 Sydney Airport Master Plan* projections were published prior to the GFC and, therefore, potentially have a higher base compared to a forecast that may take the GFC into account. The Working Group noted that over the longer term travel levels are likely to return to the average growth levels projected by the Sydney Airport Master Plan. Further detail on the assumptions used to estimate the peak and trough pattern within the out-years is provided in section 5.3.

5.2 Projected annual and daily demand for 2014, 2019, 2024 and 2029

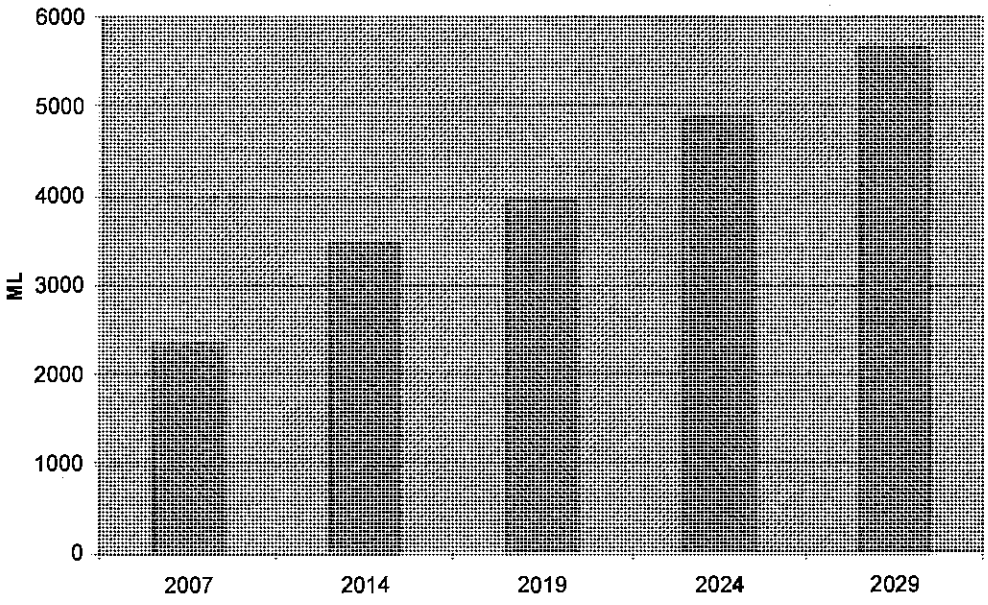
The annual jet fuel demand at Sydney Airport is projected to increase from 2450 million litres (ML) in 2009 to 5644ML in 2029 (refer Table 4). This represents an average 4.2% growth rate per annum year-on-year over the twenty year period.

The 7.22% growth from 2009 to 2014 is significant and attributable to the assumption that larger capacity aircraft (such as A380s) are increasingly used for international flights. From 2014, the 5-year growth rate moderates to between 2.49% – 4.38% over the next three 5-year periods.

Table 4: Jet fuel demand projections – annual (ML)

	Estimated annual demand	% increase over prior 5 years	Year-on-year % increase 2009 - 2029	Year-on-year % increase 2014 - 2029
2007	2357			
2009	2450		4.26	
2014	3472	7.22		3.29
2019	3926	2.49		
2024	4864	4.38		
2029	5644	3.02		

Figure 4: Annual jet fuel demand projections



The daily jet fuel demand and duration of busy day periods is critical to assessing the adequacy of pipeline supply rates to Sydney Airport and the on-airport fuel storage. Jet fuel demand is met by the combination of on site storage capacity and the pipeline supply rates to replenish stock.

The growth rate for daily demand is similarly projected to be, on average, 4.2% per annum over the twenty year period to 2029 (refer Table 5), with the growth rate in 2014 peaking at 7.23% before moderating to 2.49% – 4.38% for each forward 5-year period. Figure 5 shows the projected busy day and estimated daily demand figures, which have been calculated from the total annual demand figure for each year.

Table 5: Jet fuel demand projections – daily (ML)

	Projected 'busy' day demand	Estimated daily demand	% increase over prior 5 years	Year-on-year % increase 2009 - 2029	Year-on-year % increase 2014 - 2029
2007	6.46	**6.46**			
2009	6.71	**6.71**		4.26	
2014	10.45	**9.51**	7.23		3.29
2019	11.82	**10.76**	2.49		
2024	14.25	**13.33**	4.38		
2029	16.30	**15.46**	3.02		

Figure 5: Daily jet fuel demand projections

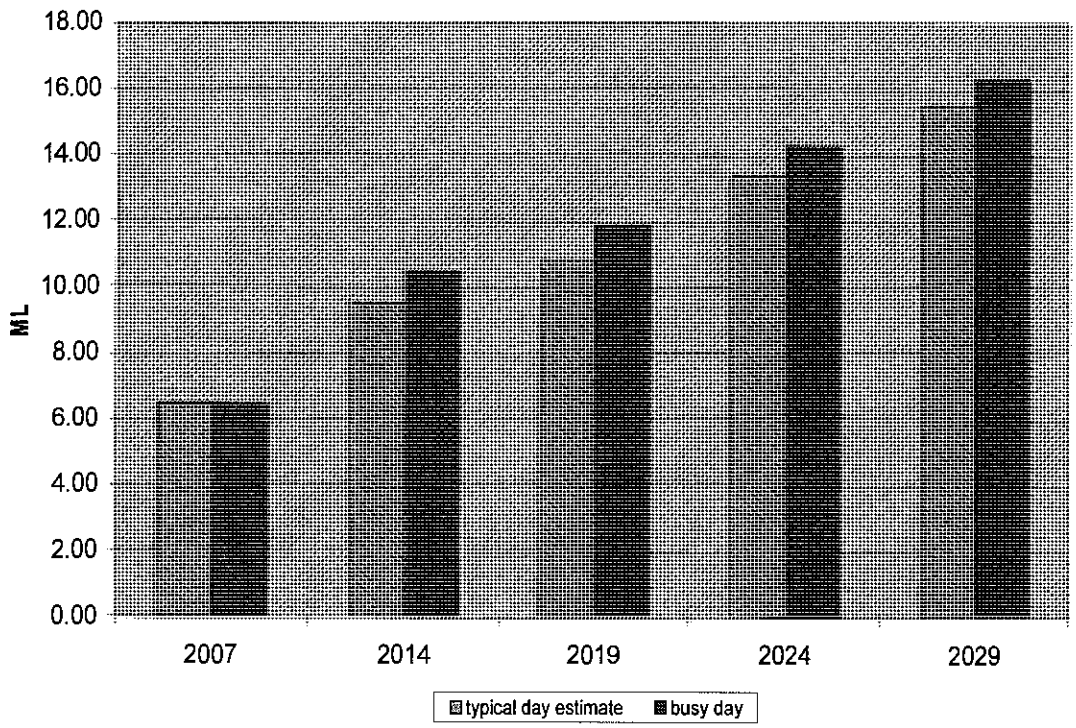


Figure 6 models the jet fuel requirement in 15 minute blocks throughout the typical busy days in 2014, 2019, 2024 and 2029. Figure 7 models the jet fuel requirements in hourly blocks throughout the typical busy days in 2014, 2019, 2024 and 2029.

An assessment of the adequacy of the existing hydrant system at Sydney Airport to meet the projected intra-day demand for jet fuel is discussed in chapter 6.

Figure 6: Intra-day demand for typical busy day (15 minute basis)

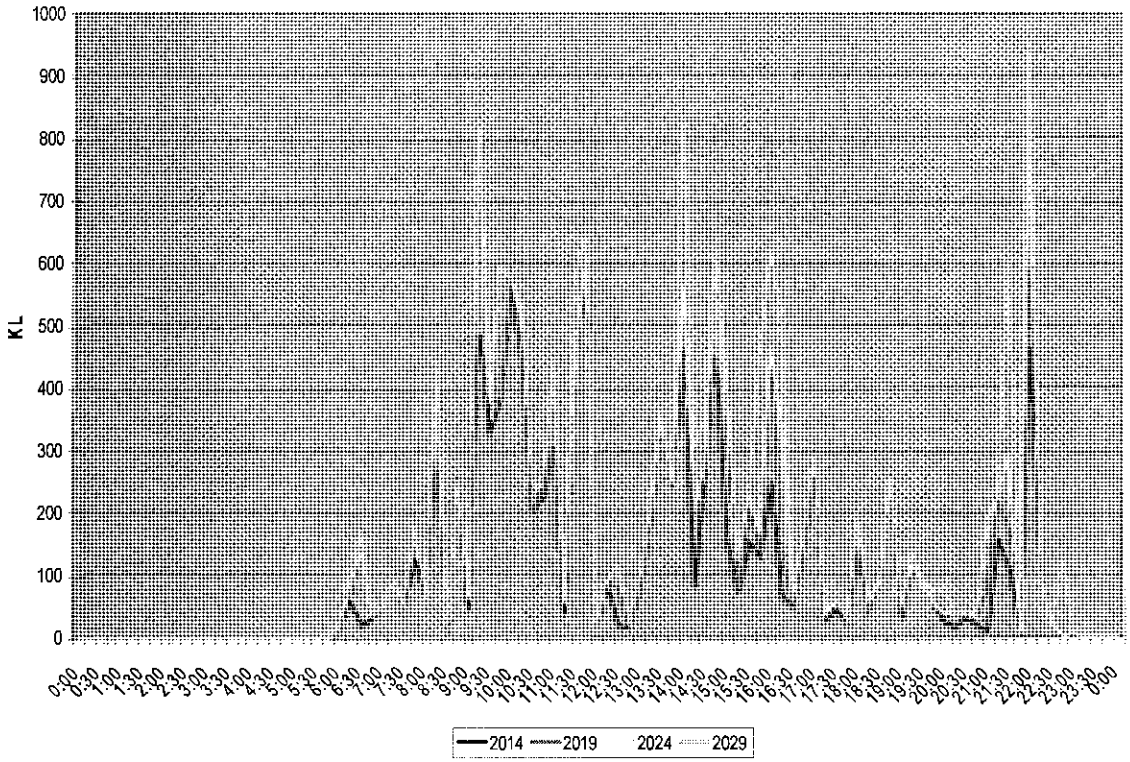
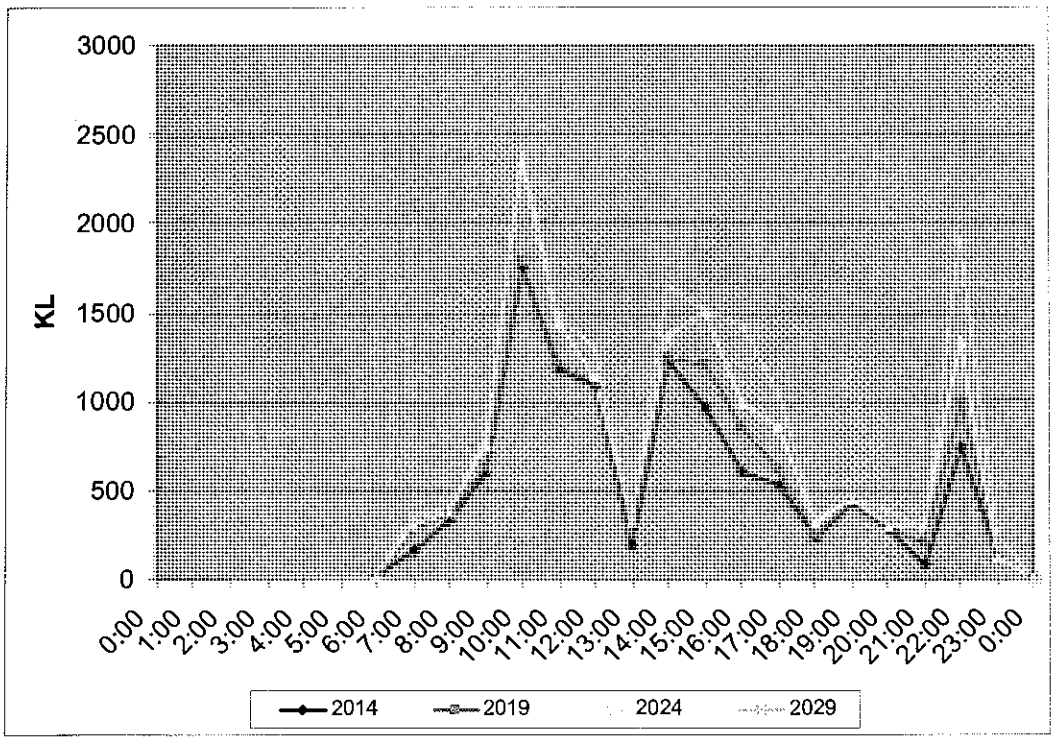


Figure 7: Intra-day demand for typical busy day (hourly basis)



5.3 Peak period profiles for 2014, 2019, 2024 and 2029

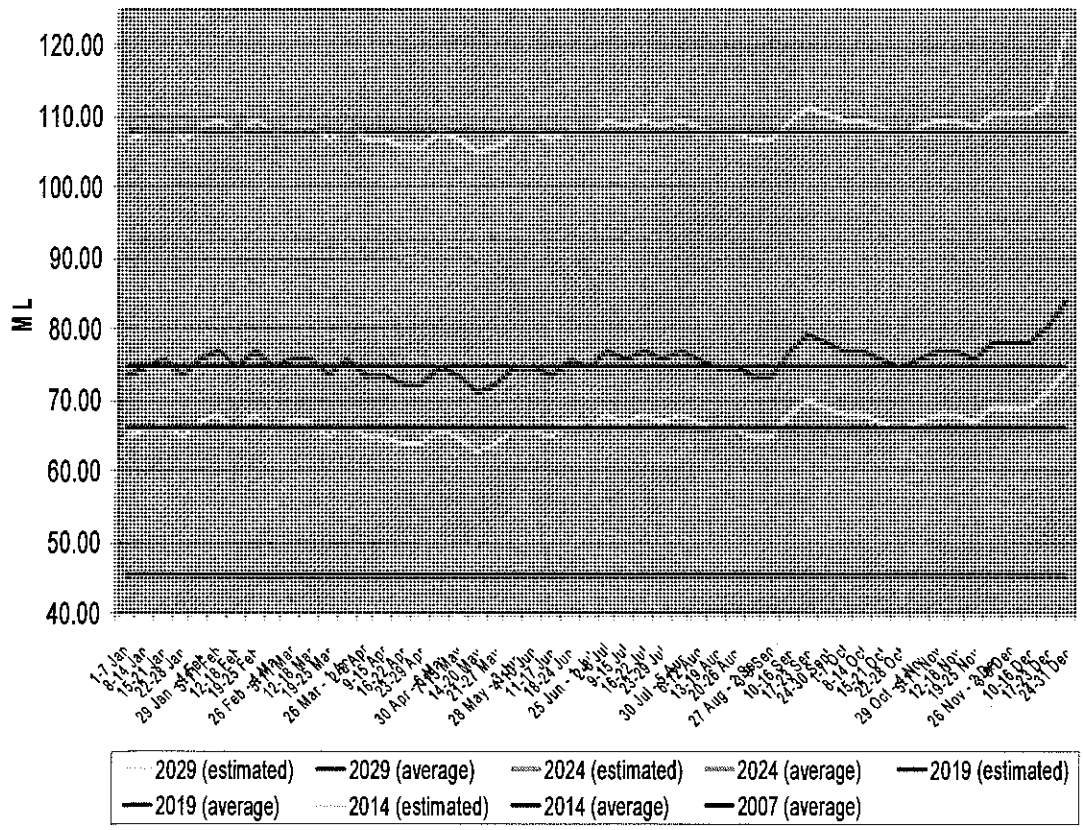
The peak period profiles for prolonged busy periods in future years were determined by applying the derived 'low', 'average' and 'busy' demand day profile in 2007 directly to 2014, 2019, 2024 and 2029.

Figure 8 shows the projected weekly demand for jet fuel in comparison with the average weekly demand for each year. The above average demand weeks cluster around February/March, July, September, and November/December, which respectively reflect the Easter long weekend period; the coinciding NSW, Victoria and Queensland school holiday periods; and the Christmas and New Year season.

As 2024 is a leap year, the week commencing 28 February is an eight day week for the purposes of the modelling and therefore shows an extraordinary spike in demand.

Extended peak jet fuel demand periods place the greatest stress on the Sydney Airport jet fuel supply infrastructure. The adequacy of the existing infrastructure at Sydney Airport to meet the projected demand for jet fuel is discussed in chapter 6.

Figure 8: Weekly jet fuel demand profile for 2014, 2019, 2024 and 2029



6. ADEQUACY OF EXISTING INFRASTRUCTURE AND ARRANGEMENTS TO MEET PROJECTED JET FUEL DEMAND

This chapter provides an assessment of the adequacy of the existing infrastructure to meet the projected demand for jet fuel at Sydney Airport in the short, medium and long term.

For the purposes of this chapter, the 'typical' daily demand figures for the out-years were calculated by using the full year average of the estimated daily jet fuel demand data in Chapter 5 and adding one standard deviation (based on full year data). The results are shown in Table 6.

Table 6: Typical daily demand figures

	2014	2019	2024	2029
'Normal' daily demand (ML/day)	9.51	10.76	13.29	15.46
Standard Deviation (ML/day)	0.57	0.64	0.58	0.50
Typical Daily Demand (ML/day)	**10.08**	**11.40**	**13.87**	**15.97**

The adequacy of the infrastructure was then compared with the capability criteria outlined in section 3.5, which includes targets for preferred on-airport stock holding (a minimum of 2 days typical demand), off-airport storage capacity (minimum 5 days typical demand) and replenishment rate to re-stock on-airport storage (1.2 times typical demand).[11]

6.1 Physical capacity constraints

6.1.1 On-airport storage

As noted in chapter 4, the maximum operational (useable) storage capacity of the on-site JUHI is 21.2ML and the optimal operational storage level is approximately 19ML. The JUHI stock levels at a given time depend on the supplier's transfer schedules and the uplift rate.

Whilst fluctuations occur throughout the day, the JUHI aims to have a minimum of two days demand stock level each day prior to commencement of fuelling hours, with the preferred level being stock holding above two days demand. Table 7 illustrates the future storage capacity requirements to meet the operational minimum and preferred stock levels.

Table 7: Adequacy of existing on-airport storage capacity

		2014	2019	2024	2029
Normal	Minimum Stock Holding (2 days)	19.02	21.51	26.58	30.92
Typical	Minimum Stock Holding (2 days)	20.15	22.79	27.73	31.93

Legend

Daily demand is between JUHI optimal operational stock on hand and maximum (useable) storage capacity.

Daily demand exceeds JUHI maximum (useable) capacity.

[11] Note, the stock holding figures above are expressed as minimum stock holding figures, in this instance the 2 days on airport minimum represents the typical trigger point (at Sydney) for posting a Red traffic light. Hence the average stock holding will be maintained well above these "minimum" figures, particularly the "stock off airport" figure.

The above figures indicate that the current storage capacity is capable of storing the minimum stock holding of two day's demand only until the end of 2014, based upon the predicted demand.

6.1.2 Off-airport storage

As discussed in chapter 4, total off-airport storage for jet fuel at the Clyde refinery, Kurnell refinery, Vopak facility and ExxonMobil terminal currently totals 196ML. Table 8 shows the storage capacity as equivalent number of days stock holding.

Table 8: Adequacy of existing off-airport storage capacity

	2014	2019	2024	2029
Typical Daily Demand (ML/day)	10.08	11.40	13.87	15.97
Stock holding (number of days)	19.4	17.2	14.1	12.3

Based on the theoretical maximum off-airport storage of 196ML, the above figures indicate that there will be sufficient off-airport storage capacity in the Sydney Airport basin area to meet the minimum (5 days) and operational (10 days) targets for off-airport storage in the long term.

The Working Group acknowledges that each of the current suppliers has their own internal targets for minimum and average stock days and will manage their delivery schedules within these guidelines. Therefore, stock holding within refineries and import facilities will oscillate between maximum and minimum levels as product is drawn down to make room for the next import or batch of refinery production. As demand increases, individual suppliers will need to consider investment in more storage to maintain their target minimum and average stock days.

6.1.3 Replenishment rate of existing supply infrastructure

Using the optimal configuration of the Shell pipeline and transfers from Vopak via the Caltex pipeline, the theoretical maximum capability ('sprint rate') of the current infrastructure to transfer jet fuel to Sydney Airport is approximately 11.8ML per day.

The sprint rate assumes that the maximum capacity can be utilised without any disruption for any required period. However, the length of time the maximum transfer rate can be utilised is limited by the volume of stock on hand at each supply location and third party access arrangements from Vopak to the Caltex pipeline which is currently 5 days per month.

Table 9 shows the adequacy of the replenishment rates for the existing jet fuel supply infrastructure to the airport to meet a high demand period that consists of 10 consecutive days of 'busy' jet fuel demand. The analysis assumes that one day of stock will be maintained at the JUHI throughout the period and no further supply disruptions occur.

Table 9: Replenishment rates of existing jet fuel supply infrastructure to Sydney Airport

		2014	2019	2024	2029
High Period	Total 'busy' day withdrawals for 10 days	104.5	118.2	142.5	163.0
	Minimum JUHI stock holding during high demand period (one day 'normal' demand)	9.51	10.76	13.29	15.46
	Min. supply required for period	94.99	107.44	129.21	147.24
Minimum 'High' Supply Transfer Rate (ML/day)		9.50	10.74	12.92	14.72

Legend

Normal and Typical daily demand is between 'Typical' and 'Sprint Maximum' supply transfer rate

Normal and Typical daily demand exceeds 'Sprint Maximum' supply transfer rate

The above figures indicate that the current jet fuel supply infrastructure could theoretically be capable of meeting a high demand period until at least 2019. However, the current 'typical' transfer rate of the existing infrastructure is approximately 7.6ML per day and could be improved by increasing either the frequency of higher flow rate transfer days from the Vopak facility or increasing the utilisation of the Shell Clyde pipeline.

The capability criterion for the replenishment rate of on-airport stocks uses a target level of 1.2 times daily demand. In other words, one day of "typical" demand should be replenished within five days. Table 10 shows the minimum required replenishment rates to satisfy the capability criteria in future years.

Table 10: Required minimum replenishment rates

	2014	2019	2024	2029
Required minimum replenishment rate (ML/day)	12.10	13.68	16.64	19.16

The theoretical maximum transfer (sprint) rate of the existing infrastructure (11.8ML per day) is not capable of meeting the forecast high end typical daily demand replenishment rate in 2014 (if standard positive deviation is applied). Therefore, investment in at least 0.3ML of capacity per day will be required in the short term and at least 7.4ML per day to supply the projected long term jet fuel demand.

As the current typical transfer rate of the supply infrastructure is approximately 7.6ML per day, the minimum required level of investment in supply infrastructure is more likely to be in the order of 4.5ML per day in the short term (i.e. before 2014) and at least 11.6ML per day to supply the projected long term jet fuel demand.

6.1.4 On-airport hydrant system

The intra-day demand profile in section 5.2 indicates that the maximum uplift of jet fuel on a typical busy day in 2029 reaches approximately 950,000 litres within the peak 15 minute period and up to 2,400,000 litres within the peak hour period.

The existing hydrant piping system has a maximum flow rate of 38,000 litres per minute, which equates to 570,000 litres per 15 minutes or 2,280,000 litres per hour. The current flow rate through the hydrant system is dependent upon the mix of aircraft type and level of concurrent refuelling activity. JUHI has provision for installation of two further pump units, which given projected demand peaks, may be required to provide sufficient pumps to transfer fuel at the required rates.

6.1.5 Import capacity

As noted in Chapter 4.1.1, the report assumes no material changes to refinery production and imports will be no less than those in 2009. Therefore, the net additional jet fuel imports required to meet projected demand totals 1022ML in 2014; 1476ML in 2019; 2414ML in 2024; and 3194ML in 2029.

Sydney Ports Corporation have announced that a second bulk liquids berth is to be constructed at Port Botany to cater for the predicted future growth of bulk liquids products, including jet fuel. It is understood that the earliest the second berth would be operational is late 2012. In the intervening period there may be certain months where berth utilisation could exceed the average economic optimum.

Based on future trade growth predictions by Sydney Ports prior to the preparation of the demand figures presented in this report, it was assessed that the existing bulk liquids berth would reach the 65% economic utilisation by about 2011 and a third bulk liquids berth would be required by about 2025. Sydney Ports has designed the second bulk liquids berth to allow for a third berth to be constructed adjacent to it. The jet fuel predictions presented as part of this report are higher than those predicted by Sydney Ports and could result in the need for the third bulk liquids berth earlier than previously forecast.

6.2 Infrastructure deficiencies in the short, medium and long term

Decisions to invest in additional jet fuel supply infrastructure to the airport will be necessary in the short term to meet the projected growth in jet fuel demand. The above analysis suggests that investment in at least 0.3ML to 4.5ML per day of jet fuel supply infrastructure capacity will be needed by 2014, with total investment of at least 7.4ML to 11.6ML per day of jet fuel supply infrastructure capacity required to meet projected demand in 2029.

If the utilisation of the bulk liquids berth increases prior to the second berth being operational, there may be increased delays and costs associated with the import of jet fuel into Port Botany. Recognising the jet fuel demand projections in this report, the Sydney Ports Corporation may need to consider the option of bringing forward investment in a third bulk liquids berth; and Caltex may need to consider whether it could facilitate increased imports via Kurnell.

Therefore, investment in jet fuel infrastructure will need to occur in the short and medium term to meet the forecast growth projections included in the *2009 Sydney Airport Master Plan*.

Potential investment options to meet the identified minimum replenishment rates for jet fuel supply infrastructure to Sydney Airport are discussed in chapter 7.

7. OPTIONS FOR ACTION TO MEET PROJECTED JET FUEL DEMAND AT SYDNEY AIRPORT

7.1 Options, including risk analysis

The previous chapters provide a foundation for, and an assessment of, the adequacy of the existing jet fuel supply infrastructure at Sydney Airport. This chapter provides consideration of a number of potential infrastructure options to meet projected jet fuel demand at Sydney Airport in the short, medium and long term.

Apart from demand projections, a key factor in selecting any option is the life of the existing lease and long term intention of Sydney Airport Corporation to require the JUHI to move from its current location.

7.1.1 Second phase upgrade of the Caltex pipeline

Caltex has advised that its Board has approved funding for the second stage upgrade of its pipeline. Work to complete detailed design and engineering has commenced and subject to receiving relevant statutory approvals the upgrade is expected to be completed in the second half of 2011.

This option will cost approximately $20m to $25m and result in a 9ML to 10ML per day 'sprint' transfer rate (up from a current 'sprint' transfer rate of 5ML per day) of jet fuel from the Kurnell refinery to the on-airport storage facility at the JUHI.

Caltex have indicated that the second stage upgrade will take the existing pipeline to its operational maximum capacity with no technical capacity for any material additional upgrades.

To maximise throughput over the entire pipeline, an upgrade to the Vopak pumps would need to be considered by Vopak. Vopak have indicated that investment (subject to its customer's consent) to upgrade its pumping capacity to 10ML per day could be the quickest and cheapest option to help meet short to medium term demand. However, at the time of writing, no decision to proceed has been made by Vopak.

Potential positives

Based on the jet fuel demand projections in Chapter 5 and the theoretical maximum transfer rate of the Shell pipeline (3.9ML) and an upgraded Caltex pipeline (10ML), this option (which includes an upgrade of Vopak pumping capacity), has the potential to meet the peak daily demand in 2019 (11.82ML) and the average daily demand in 2024 (13.33ML). Taking into account the normal total transfer rate of 7.6ML per day, the additional sprint capacity rate that this option provides (up to 5ML per day) has the potential to meet the peak and average daily demand in 2019.

This option presents an opportunity for new or existing access agreements to be negotiated by third parties with Caltex, with the view to increasing the amount of fuel third parties can transfer via the privately owned pipeline.

Increased pumping from Caltex refinery to the JUHI allows the two Caltex refinery product berths to be used for jet imports which may be useful during times of congestion at the Port Botany Bulk Liquids Berth.

Issues to consider

This option assumes that pipeline connection to an on-site storage facility will continue to be available. The decision about whether the on-airport storage facility will remain on airport land post 2024 may impact on the consideration of this option.

If this option proceeds there may be a delay in, or reduced incentive for, investment decisions regarding longer term jet fuel supply solutions for Sydney Airport to be made. Even if a decision is made to proceed with this option, the jet fuel demand projections in chapter 5 and assessment of the adequacy of existing infrastructure in chapter 6 indicates that investment in up to 7.1ML per day of jet fuel supply infrastructure to the Sydney Airport will be required to meet jet fuel demand in 2029,.

The capacity of import facilities to facilitate the projected increase in imports will need to be considered. As noted in chapter 6, the earliest that the second berth will be operational is projected to be late 2012 and in the intervening period average berth utilisation may exceed the economic maximum.

7.1.2 Increase the utilisation rate of the Shell pipeline

An existing link from the Sydney Metropolitan Pipeline could be used to divert jet fuel to the Clyde refinery.

Potential positives

The current average transfer rate of 2.2ML per day could be increased to a rate much closer to the theoretical maximum of 3.9ML per day.

Issues to consider

Access arrangements to the SMP would need to be negotiated with the pipeline owners on a commercial basis. Product would need to be sourced from Kurnell unless facilities were installed at Port Botany which allowed the transfer to take place while maintaining jet fuel product integrity. Any jet fuel scheduled to Clyde via the SMP will displace the carriage of other products and, be subject to pipeline availability. As pumping of petrol and other ground fuels is faster on the SMP than jet this option will require the trucking of approximately 1.5 litres of ground fuels from the Port Botany area to Sydney west for every litre of jet fuel pumped to Clyde.

This option is likely to be considered for the short and medium term and is an additional way to supplement supply to the existing on-airport storage facility via the Shell Clyde pipeline during periods of required "sprint" stock builds.

The capacity of import facilities to facilitate the projected increase in imports will need to be considered. As noted in chapter 6, the earliest that the second berth will be operational is projected to be late 2012 and in the intervening period average berth utilisation may exceed the economic optimum.

7.1.3 Permanent bridger facility at on-airport storage facility

A permanent installation of a bridger facility at the on-airport storage facility would allow the receipt of jet fuel via trucking. This option was considered by the JUHI joint venture participants in 2007 and was estimated to cost approximately $460,000.

Potential positives

The bridger facility is a relatively low cost option that could be implemented in the short term to supplement the amount of jet fuel transferred into the on-airport storage facility by approximately 0.5ML per day. Permanent road bridging infrastructure would provide additional supply security, particularly in special/emergency situations.

Issues to consider

The continual use of jet fuel supply trucks would significantly increase traffic congestion around the immediate JUHI storage area at Sydney Airport and cause disruptions to the operations at the JUHI, with fuel trucks competing with airport freight vehicles for road space. Regulatory and safety considerations would need to be considered to ensure there was minimal increase in safety risks and to minimise traffic congestion.

Due to the above concerns, this option is considered a secondary solution that is ideally suited for use in shorter term emergency situations.

The capacity of import facilities to facilitate the projected increase in imports will need to be considered. As noted in chapter 6, the earliest that the second berth will be operational is projected to be late 2012 and in the intervening period average berth utilisation may exceed the economic maximum.

7.1.4 Additional storage at on-airport storage facility

The Working Group was advised that there is sufficient space to build a new 10ML storage tank on the existing JUHI lease area. However, the initial hazard risk assessment completed by the JUHI joint venture participants raised concerns about the construction of a new tank and its potential impact on adjacent buildings and air traffic. Investment could be undertaken by all, or some, of the current JUHI joint venture participants.

The Working Group acknowledges that the building of additional on-airport storage is not in itself a solution to the current infrastructure constraints. An increase in replenishment rate capacity from off-airport storage facilities to on-airport storage facility will be needed, however the construction of more on-airport storage could reduce the extent to which replenishment rates will need to be increased.

Potential positives

The increase of tank storage capacity to approximately 38ML would equate to approximately 3.6 days of peak demand in 2014. This option could be part of a medium term solution as the planning and construction process would take approximately two years to complete.

Issues to consider

The construction of a new tank would require the relocation of into-plane servicing equipment. The present JUHI lease term expires in 2015, with SACL required to provide three years notice to 2018. The Working Group notes there are two options to extend the lease period to 2024. If renegotiations do not result in an extended lease period, investors would need to consider whether a six year payback period is sufficient. The JUHI manager has advised that future investment by the JUHI

participants in additional storage stands a greater chance of approval subject to the confirmation of lease tenure at the existing JUHI location until 2024 or longer. The capacity of import facilities to facilitate the projected increase in imports will need to be considered. As noted in chapter 6, the earliest that the second berth will be operational is projected to be late 2012 and in the intervening period average berth utilisation may exceed the economic maximum.

7.1.5 Additional pipeline from an off-airport storage facility to a holding facility on (or adjacent to) airport land

This option recognises that the capacity of the existing supply pipelines and on-airport storage facility will need to be supplemented in the longer term to meet projected jet fuel demand.

This option could accommodate the potential closure of the existing JUHI facility at Sydney Airport from 2024, with fuel supply provided from an off-site storage facility via a pipeline to the airport in addition to existing supply options utilising the Caltex and Shell pipelines. All supply pipelines would be connected to a holding facility at or adjacent to the airport for supply into the airport hydrant system.

The off-site storage and pipeline facility would allow open access to any party wishing to supply jet fuel to customers at Sydney Airport and envisages the use of the existing off-airport storage facilities. Under this option additional pipeline investment would be necessary.

As noted above, additional pipelines to the airport have been considered by stakeholders in the past, at an estimated cost in 2008 of $50 million to $60 million. This option also recognises that its commercial underpinnings would depend on the facility operator entering into a prices and services agreement with stakeholders.

Potential positives

The replenishment rate of the supplying infrastructure to Sydney Airport would increase significantly upon the completion of the additional pipeline from the off-airport storage facility and would eliminate the need to consider additional storage tanks at the existing on-airport storage facility.

The additional pipeline would increase the security of supply of jet fuel to Sydney Airport on an ongoing basis, reduce the risk of supply shortages as a result of breakdowns and increase supply flexibility.

BARA considers that this option would resolve some airline stakeholders' concerns with third party access.

Issues to consider

The point where the pipeline connects to the airport would need to be carefully considered. The matters of securing land close to Sydney Airport (or on the airport) for the holding tank and leasing tank storage capacity for the off-airport storage facility would need to be addressed in the short term.

Even if a decision to expedite the development of the pipeline under this option was taken before the end of 2010 it is unlikely the pipeline would be operational before 2015. This is on the basis that the time required to complete an environmental

impact assessment process could be of the order of 12 to 18 months with a likely 30 months required for approvals and construction.

The capacity of import facilities to facilitate the projected increase in imports will need to be considered. As noted in chapter 6, the earliest that the second berth will be operational is projected to be late 2012 and in the intervening period average berth utilisation may exceed the economic maximum.

7.1.6 Sydney jet fuel import facilities

All options noted above assume adequate supplies of jet fuel can be delivered into Sydney. While neither Shell or Caltex are prepared to make comment regarding the longer term production of jet fuel from their refineries it is reasonable to assume that local refinery production is unlikely to increase materially and that all growth in airport jet demand will be met by imports.

Available import berths include Shell Gore Bay, Caltex Kurnell (No 1 & No 2 Berth) and the Port Botany Bulk Liquids Berth. Shell Gore Bay has limitations when used in an ad-hoc manner for jet fuel imports. Caltex product berths have import capacity available.

Issues to consider

As noted in Chapter 6.1.5, the net additional jet fuel imports required to meet projected demand totals 1022ML in 2014; 1476ML in 2019; 2414ML in 2024; and 3194ML in 2029.

Port Botany bulk liquids berth is operating close to its economic optimum utilisation level and will be supplemented with a second berth in approximately 2012. There is room for a third berth if required at a later date. It is not expected that product berth capacity will normally be an impediment to jet supply although some periods of congestion may be experienced before the second bulk liquids berth is commissioned.

7.2 Barriers to investment

The current suppliers of jet fuel at Sydney Airport face a number of issues that need to be addressed when considering future investment decisions for jet fuel infrastructure. These include: selecting the most economical investment option within an uncertain market for future jet fuel demand, the location of the JUHI facility post-2024 and competition for land for expansion of the facilities on-airport; the performance of the existing infrastructure and options to prolong the life of this infrastructure; and, the existing jet fuel market arrangements and the likely investment decisions of competitors.

Potential new entrants into the market face similar issues. Moreover, they are faced with a complex array of commercial arrangements between suppliers and users of jet fuel, together with the need for commercial considerations over access to the jet fuel infrastructure that supplies Sydney Airport (including the JUHI storage system), pipelines servicing the airport and the airport hydrant system), with the incumbent suppliers, and their competitors. It is likely that a new entrant will require a sizeable portion of the Sydney Airport jet fuel volume to justify its new investment. Negotiating such a deal in the existing commercial environment would be a challenging task.

These barriers to investment essentially relate to commercial decision making issues involving the commercial parties associated with jet fuel supply and the Sydney Airport. The Working Group notes that existing regulatory regimes do not preclude the creation of open access infrastructure to supply jet fuel to Sydney Airport.

The Board of Airline Representatives of Australia (BARA) expressed the view that the barriers to investment in jet fuel supply infrastructure are sufficient to warrant an inquiry by the Productivity Commission. This view is not supported by the other members of the Working Group.

7.2.1 Lease period for existing on-airport storage facility location

The current lease term for the JUHI on-airport storage facility expires in 2015 and there are two options to renew the lease until 2020 and 2024. SACL is required to provide three years notice if it wishes to terminate the lease and can do so from 2015. Therefore, the earliest the JUHI site could be vacated is in 2018.

In its submission, Shell (the operator of the JUHI on behalf of the joint venture participants) believes the joint venture participants would have a greater willingness to invest in capital works, including the construction of an additional storage tank, if the JUHI lease is extended until 2024. Shell noted its willingness to recommence negotiations with SACL for a firm lease period to 2024 and advised that this was supported by the joint venture participants at the recent Operating Committee meeting. SACL has indicated its willingness to enter discussions concerning the current lease term.

7.2.2 Availability of land for on-airport storage

The *2009 Sydney Airport Master Plan* notes that the planned expansion of the International Terminal aircraft parking stands will not require the re-location of the on-airport storage facility until at least 2024. Future sites off airport also need to be considered.

As mentioned in section 7.1 and section 7.2.1, it is unlikely that investment decisions about new jet fuel supply infrastructure that requires connection to the on-airport storage facility will be made whilst the location of the storage facility post-2024 is not known.

Stakeholders would welcome a further review of this matter as part of the *2014 Sydney Airport Master Plan*, as all future investment options require the supply point of the pipelines (existing and new) to be identified. SACL have advised that an update and consideration of further storage options will be reviewed as part of the *2014 Sydney Airport Master Plan.*

7.2.3 Current ownership arrangements of the jet fuel supply infrastructure

Presently the ownership of jet fuel supply infrastructure includes oil companies, airlines and third party terminal owners. Some airline stakeholders maintain the commercial interests of the different parties are in conflict and not aligned with promoting the long term efficient provision of jet fuel at Sydney Airport.

It should be noted that the owners of the infrastructure do not support that view, noting that the creation of the existing jet fuel infrastructure relevant to Sydney airport

is entirely due to the investment and other commercial decisions of the JUHI participants.

Only two companies, Caltex and Shell own infrastructure across the entire supply chain from refineries and import berths through supply pipelines to the JUHI and into plane services. Two other oil companies BP and ExxonMobil, together with Qantas, also have ownership in the JUHI and into plane services.

This ownership has been the basis of investment in the supply infrastructure that has supplied Sydney airport for most of its history. The other and more recent development has been investment in third party import and terminal infrastructure at Port Botany. This investment in jet storage at Port Botany has been on the back of commitments to use that storage capacity by JUHI participants or their suppliers and the willingness of Caltex to create spare capacity in its pipeline and make it available to these participants.

Airline stakeholders have also expressed a concern regarding future access by competitively priced third parties as the import, pipeline and JUHI facilities remain privately owned and short and long term access agreement negotiations may not result in increased throughput by third parties. The Working Group notes that infrastructure owners have an economic interest in maximising the utilisation of that infrastructure by making it available to other users.

The Caltex second stage upgrade was made recognising that airport development plans could mean an operating life for that line of as little as 7 years (i.e. 2011 to 2018) with a probable life of 13 years (i.e. 2011-2024).

The importance of clarity regarding future airport developments and demand projections cannot be overstated when considering major long term investment in fuel supply infrastructure. For this reason the *2014 Sydney Airport Master Plan* will be a critical document supporting infrastructure decisions for the 2019-2024 period.

Given the very significant investment required, particularly if post 2024 the JUHI is relocated and no on-airport jet fuel storage is possible, it is unlikely that multiple independently owned jet fuel supply chains can be economically supported. In this high investment case there may well be an opportunity or even a need to bring new major investors into the overall jet fuel supply infrastructure ownership mix with a possible change to the operating and access model. However, the ownership arrangements of the existing infrastructure, and the commercial arrangements between the jet fuel suppliers and the airlines may prevent this occurring in the short to medium term.

Those airline stakeholders that consider barriers to investment arise from the current ownership arrangements of the jet fuel supply infrastructure, believe this is due to the following reasons:

The existing ownership arrangements encourage vertical integration

Some oil companies (e.g. Caltex) are vertically integrated, providing jet fuel, the supply infrastructure and 'into-plane' services. Vertical integration by existing suppliers discourages investment by other non-vertically integrated existing suppliers and potential new entrants. In this regard, structural reform of Australia's public utilities across a range of industries (e.g.: gas, electricity and telecommunications) has been necessary to address the problem of a vertically integrated provider of both monopoly and contestable services.

Lack of end-to-end planning and provision of jet fuel supply infrastructure

The current ownership arrangements mean that no one entity is responsible for the end-to-end planning and provision of jet fuel supply infrastructure. There is also no overarching framework for the cost recovery of investment. As the various parties (e.g. pipeline, JUHI and off-site storage owners) pursue their own commercial objectives there is a tendency for investment to be focussed on the next infrastructure upgrade necessary to meet demand in the short term. Investment is constrained because to look beyond the immediate future requires responsibility for overall outcomes and a stable and known commercial environment. Also, any new investment devalues current infrastructure.

The current ownership arrangements have delivered storage facilities both on- and off-site of Sydney Airport; has confused investment planning; and constrains new investment by creating high transaction costs. By controlling at least one part of the supply chain, existing suppliers have made it difficult for new fuel suppliers to enter the jet fuel market at Sydney Airport. The establishment of a competitive market for jet fuel supply at Sydney Airport will require as a pre-condition the ability for existing and new entrants to enter and exit the market at reasonable transaction costs.

Generally, the lack of a stable and certain planning and investment environment limits the ability of users and the provider of infrastructure to negotiate delivery and pricing of that infrastructure. The replacement of the existing arrangements with market based outcomes would encourage investment in adequate infrastructure with non-discriminatory access.

7.3 Considered actions

7.3.1 Potential impact of infrastructure investment decisions

The analysis indicates there are two critical time periods for Sydney Airport's jet fuel supply infrastructure. Decisions are needed by approximately 2012 and 2018 to enable the market to provide sufficient jet fuel to meet the projected demand at Sydney Airport. The potential impact of various decisions is discussed below.

Short term – present to approximately 2019

The decision taken by Caltex to upgrade the Caltex supply pipeline capability will ensure jet fuel supply to Sydney Airport will be adequate to meet projected jet fuel demand requirements. Vopak has indicated it would, pending customer approval, also increase pumping rates to those to be achieved by Caltex (assuming availability of the Caltex pipeline).

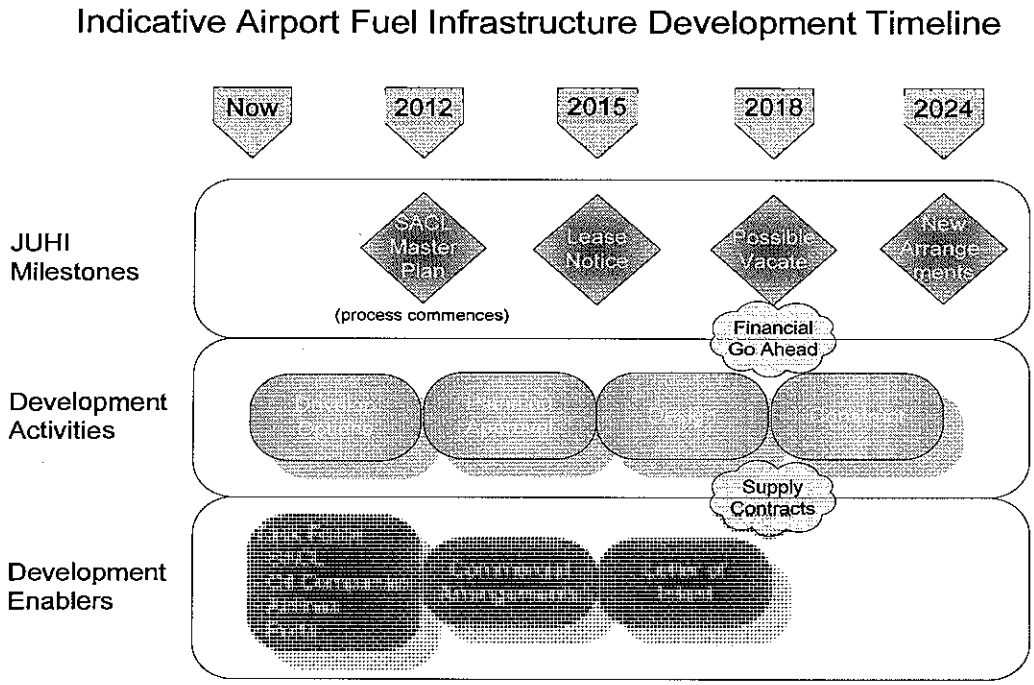
Port Botany bulk liquids berth is operating close to its economic optimum utilisation level and will be supplemented with a second berth in approximately 2012. Whilst it is not expected that product berth capacity will normally be an impediment to jet supply, some periods of congestion may be experienced before the second bulk liquids berth is commissioned.

Medium to long term - approximately 2018 and beyond

Irrespective of the upgrading of the Caltex supply line capability and utilisation of the Shell link to the SMP, if one or more of the options detailed by the Working Group in Chapter 7 are implemented, jet fuel supply will meet projected jet fuel demand requirements.

Sydney Ports Corporation will need to consider bringing forward investment in a third bulk liquids berth if medium term jet fuel demand as projected in this report is realised; and Caltex may need to consider whether it could facilitate increased imports via Kurnell.

Figure 9: Airport Fuel Infrastructure Development timeline



An indicative development timeframe is illustrated in Figure 9 and envisages the following steps:

- A taskforce develops physical scopes (layouts, pipeline sizing etc) for the various jet fuel supply options to Sydney Airport and indicative capital costs, namely:
  a. a new pipeline (ex Vopak) supplying the existing or re-located JUHI facility on Airport or adjacent land; pressure boosted by JUHI into the distribution system; and
  b. Caltex, Shell and new (Vopak) pipelines supplying directly into the Airport distribution system at required distribution pressure *(Allow 12 months; completion by mid 2011)*
- The taskforce proposes a "preferred option", taking into account future jet fuel consumption at Sydney Airport, new investment capital costs, SACL land issues, existing Sydney Airport/JUHI contract and preparedness of JUHI participants to accept a new commercial arrangement for fuel supply to Airport fuel users, airlines acceptance of proposed commercial structures for new jet fuel supply infrastructure and practicalities for potential investors in the new supply infrastructure. *(Allow 12 months: completion by mid 2012)*
- A "Project Sponsor" is appointed to call for Expressions of Interest for provision of /capital investment in the proposed new jet fuel supply infrastructure and commences Planning Approval processes *(Commences mid 2012/late 2012; EOI review completed year end 2012 - mid 2013)*

- Commercial arrangements with preferred EOI candidate and jet fuel suppliers and users negotiated to Letter of Intent stage *(Allow 12 months to year end 2013)*
- Completion of EIS and Planning Approvals *(by year end 2014)*
- Completion of Jet Fuel commercial arrangements *(by year end 2014)*
- Design and Construction phase (allow 30 months, completion by mid 2017).

7.3.2 Increasing certainty to encourage investment decisions

Greater certainty on key issues is required to encourage investment in jet fuel supply infrastructure to, and at, Sydney Airport.

SACL has indicated its willingness to enter into discussions concerning the current lease term of the existing JUHI facilities. Consideration should be given to the future options for on and off airport storage facilities as part of the 2014 Sydney Airport Master. Similarly, the potential costs and benefits associated with the removal of on-airport storage facilities and the use of an off-airport storage facility with associated pipeline development needs to be considered.

The development of jet fuel demand projections has underpinned the Working Group's consideration of the adequacy of existing jet fuel supply infrastructure and potential infrastructure expansion options. The availability of this data to potential investors will assist them when making their investment decisions.

The Working Group recommends that:

1. **JUHI members undertake works required to address projected demand, with a short term horizon up to 2014/15. The decision by Caltex to proceed with the second stage upgrade of the Caltex line is noted;**
2. **The Sydney Airport Corporation, as part of the *2014 Sydney Airport Master Plan* process, further review options for the airport jet fuel storage facility, including on and off-airport storage options;**
3. **Potential investors in consultation with the NSW Government undertake a review into option 7.1.5 (additional pipelines to on-airport storage facility), taking into account the potential long lead time for the construction of the infrastructure.**
4. **The JUHI operator and the SACL review options beyond the current lease term;**
5. **JUHI members immediately commence discussions with SACL regarding site requirements for future on-airport jet fuel storage options;**
6. **Jet fuel demand projections be considered as part of all future Sydney Airport Master Plans with input from appropriate industry representatives;**
7. **Consideration is given to including jet fuel demand projections in Master Plans for other key airports with input from appropriate industry representatives;**

8. **Sydney Ports Corporation consider bringing forward investment in a third bulk liquids berth if medium term jet fuel demand as projected in this report is realised; and**

9. **The Commonwealth Government monitors the actual jet fuel usage at Sydney Airport against forecast demand and the capacity of Sydney's ports to handle the increasing volumes of imported jet fuel to supplement local refinery production.**

7.4 Conclusions

The key factors affecting the capacity and reliability of the Sydney Airport jet fuel supply system are the capacity of existing jet fuel supply infrastructure to transfer jet fuel into the on-airport storage facility and the ability of the existing bulk liquids berth to receive the projected growth in jet fuel imports.

The Working Group considers that the identified barriers to investment relate to commercial decision making issues involving the commercial parties and that the existing regulatory regimes do not preclude the creation of open access infrastructure to supply jet fuel to Sydney Airport.

The Working Group welcomes the recent decision of Caltex's board to proceed with the second phase upgrade to the Caltex pipeline, to be completed by late 2011 and provide for up to an additional 5ML per day increase to the total 'sprint' transfer rate to Sydney Airport. The Working Group also acknowledges the announcement by Sydney Ports to commit to the development of a second bulk liquids berth in Port Botany.

Upon completion of the second phase upgrade of the Caltex pipeline and the construction of the second bulk liquids berth in Port Botany, the Working Group considers that Sydney Airport can expect a higher level of jet fuel supply security to 2019.

However, the Working Group believes that further investment in jet fuel supply infrastructure to Sydney Airport, in addition to the above planned investment, will be required to meet projected demand in the medium to long term.

Investment of up to an additional 2.4ML to 6.6ML per day jet fuel supply capacity is required to ensure transfers of jet fuel from off-airport storage facilities to the on-airport storage facility are sufficient to meet demand in 2029. Sydney Ports may also need to consider the ability of the existing and proposed second bulk liquids berths in Port Botany to receive the projected growth in imported jet fuel.

The availability of pre-competitive data in the form of jet fuel demand projections would facilitate consideration of investment decisions by potential investors. The Working Group considers that the inclusion of jet fuel demand forecasts as part of the airport master planning process is the most appropriate mechanism to develop and publish the data. The Working Group further considers that this approach could be utilised on a national basis and would provide useful information upon which to base jet fuel infrastructure investment decisions at all of Australia's major airports.

APPENDIX A

STAKEHOLDER CONSULTATION

Submissions received

A1 Australia Pacific Airports (Melbourne) Pty Ltd

A2 Board of Airline Representatives Australia

A3 Brisbane Airport Corporation

A4 Brisbane Airport Joint User Hydrant Installation (unincorporated joint venture)

A5 Melbourne Airport Joint User Hydrant Installation (unincorporated joint venture)

A6 Mobil Oil Australia Pty Ltd

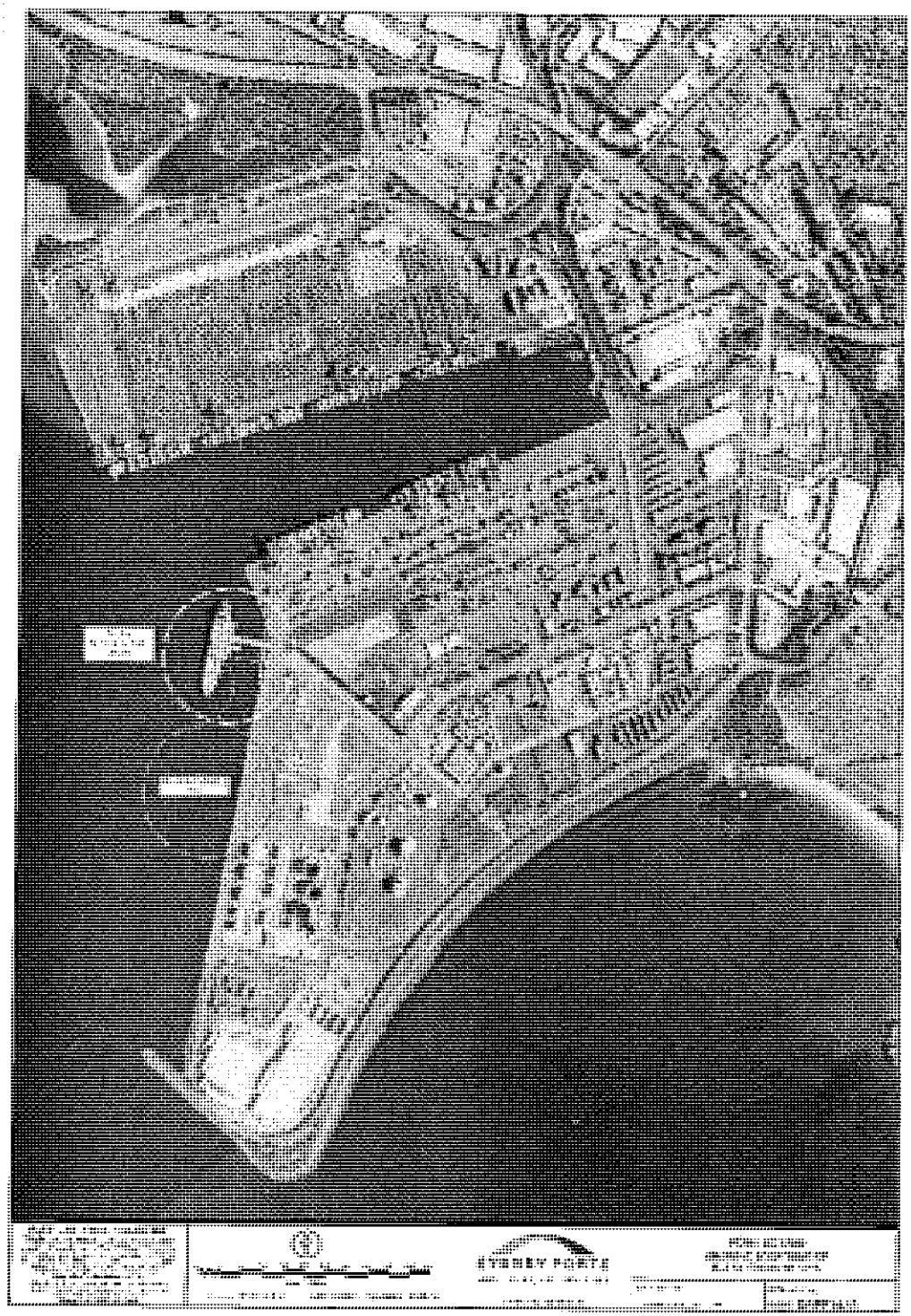
A7 QANTAS Airways Limited

A8 The Shell Company of Australia

A9 Virgin Blue Airlines

APPENDIX B

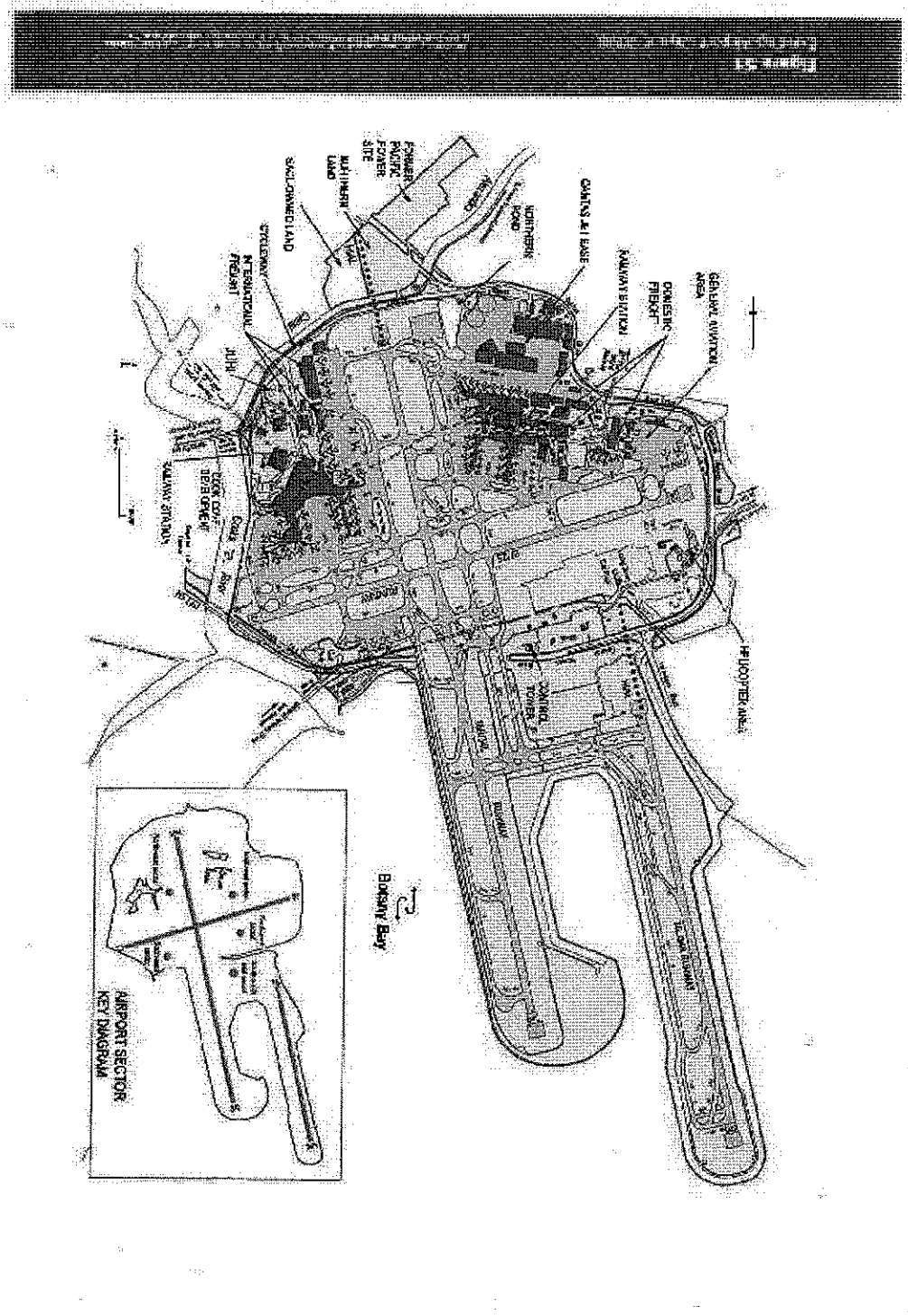
Map showing location of Sydney Ports bulk liquids berths[12]



[12] Diagram provided by Sydney Ports Corporation

APPENDIX C

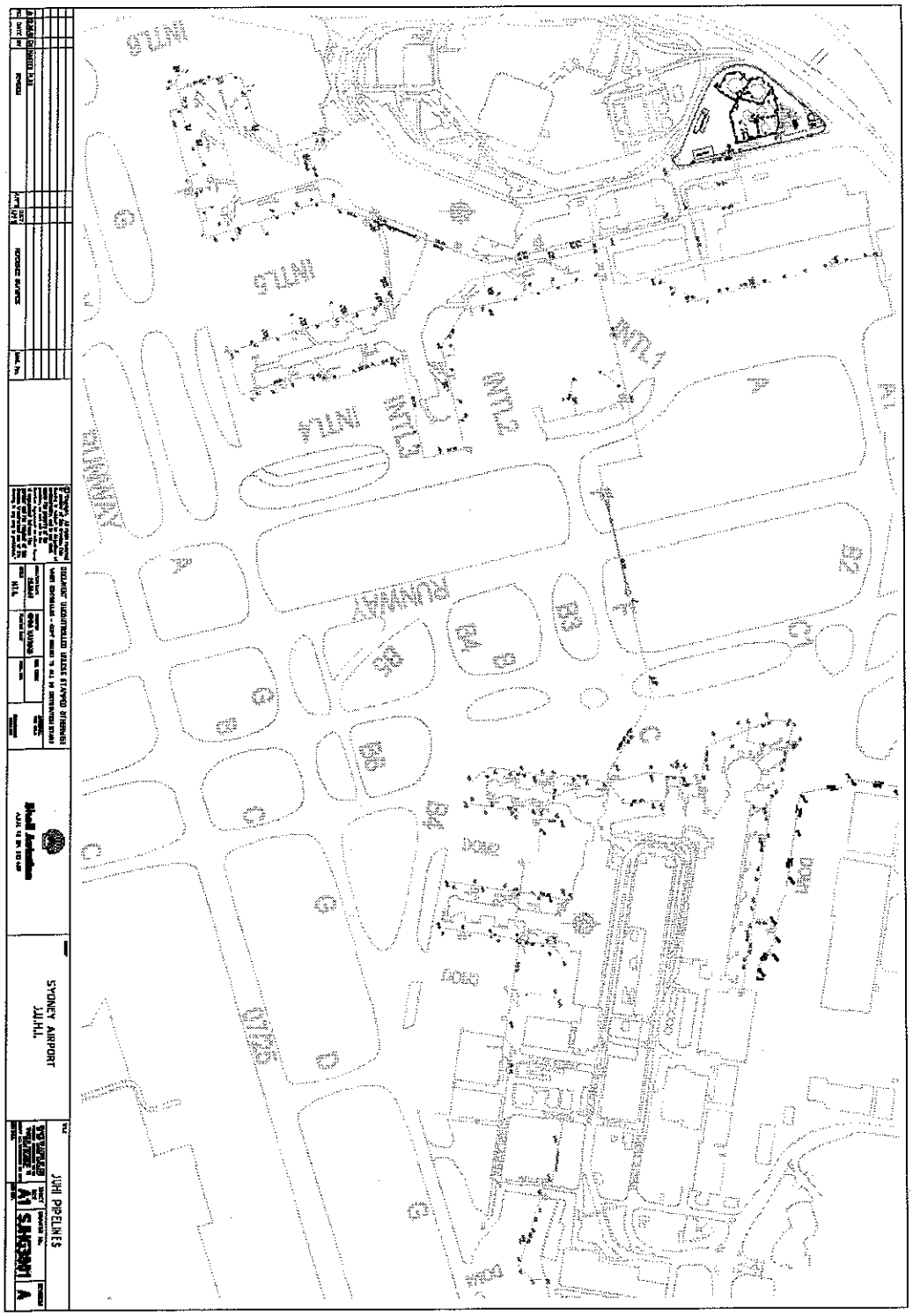
MAP SHOWING JUHI LOCATION ON SYDNEY AIRPORT LAND[13]



[13] 2009 Sydney Airport Master Plan, SACL

APPENDIX D

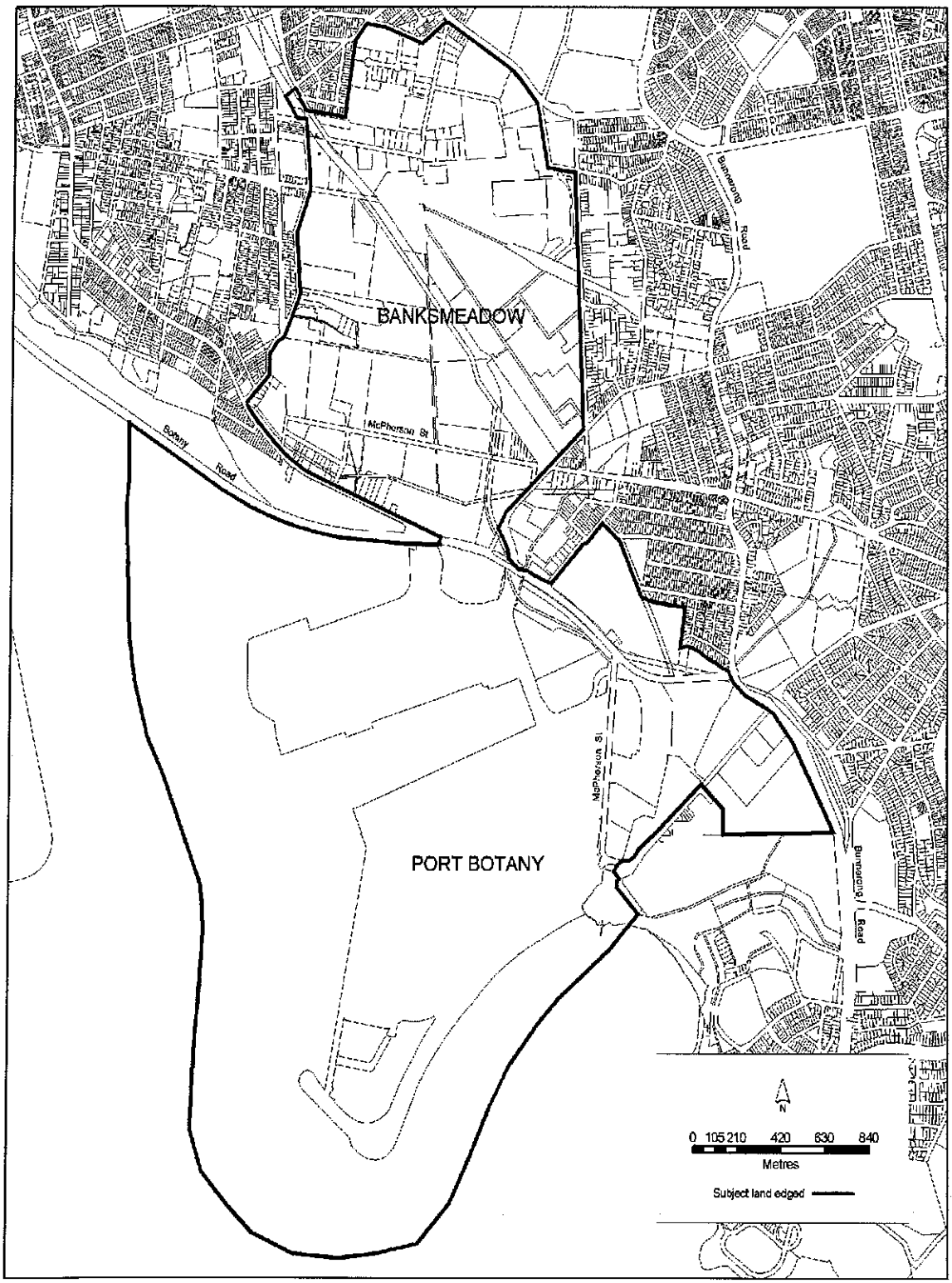
MAP SHOWING SYDNEY AIRPORT HYDRANT PIPELINE NETWORK[14]



[14] Diagram provided by The Shell Company of Australia (as Sydney Airport JUHI operator)

APPENDIX E

MAP OF STATE SIGNIFICANT DEVELOPMENT SEPP - PORT BOTANY[15]



[15] Diagram provided by Industry and Investment NSW

APPENDIX F

OVERVIEW OF RELEVANT LEGISLATION

In 1992, the Commonwealth Government entered into the *Intergovernmental Agreement on the Environment* (the agreement) with Australian States and Territories (States). The agreement sets out roles and responsibilities for the Commonwealth and States regarding the operation of Environmental Law in Australia.

The agreement acknowledges the Commonwealth has legislative powers and responsibilities for among other things, International Treaties, to establish national environmental protection standards, guidelines goals and associated protocols (referred to as measures).

The measures are aimed primarily at pollution control and waste management, protection of native species and marine environments. Principal legislation includes the *Environment Protection and Biodiversity Conservation Act 1999.*

The sections below outline the key State and Commonwealth approval processes and legislation which may apply to future investments in jet fuel supply infrastructure to, or at, Sydney Airport.

NSW Government approval processes

Land use planning and policy are the responsibility of the individual States.

It is likely that a major development of a JUHI facility *off*-site would occur under Part 3A of the *Environmental Planning and Assessment Act 1979* (*NSW*) ("the EP&A Act"). On-site development would likely be in accordance with the provisions of the *Airports Act 1996 (C'th), with reference to* the EP&A Act and respective *State Environmental Planning Policy*.

The following key legislative requirements are currently in effect in NSW for land use planning and control of development. In context of this report, this includes the systems for approval of petroleum handling facilities and pipelines. The main application and requirements of the legislation are summarised below with greater detail noted in Appendix E.

Environmental Planning and Assessment Act 1979[16]

The *Environmental Planning and Assessment Act 1979* ("the EP&A Act") is the principal legislative instrument for the environmental assessment and approval of activities associated with the construction of pipelines and related petroleum facilities.

The EP&A Act spells out which undertakings are to be covered by each respective part. Parts 3, 3A, 4 and 5 are relevant in this context and are described below:

- **Part 3** of the Act specifies environmental planning instruments governing the type of development that may be carried out on land subject to those instruments. Their provisions are legally binding on councils and developers. Examples include: *State Environmental Planning Policy* ("SEPP") *and Local Environment Plan* ("LEP").

[16] A copy of the EP&A Act is available for download from: http://www.legislation.nsw.gov.au/maintop/view/inforce/epi%2B641%2B2007%2BFIRST%2B0%2BN/

- **Part 3A** of the Act relates to major infrastructure and other projects such as roads, electricity and gas transmission or distribution, dams water reticulation works, and more recently pipelines. The test is whether in the opinion of the Minister, the infrastructure or development is of State or regional environmental (or economic) planning significance. If only part of any development is a project to which this part applies, the other parts of the development are (subject to conditions) considered included in this part.

- **Part 4** of the Act provides for development assessment and contains a system whereby development proposals are assessed according to their particular nature. For example, local council approval for some developments is defined in this part.

- **Part 5** of the Act provides for environmental assessment. This Part also contains provisions for environmental impact assessment (EIA) and impact statement (EIS). Under this Part and the *State Environmental Planning Policy (Infrastructure) 2007* (SEPP), development for the purpose of an electricity transmission or distribution network may be carried out by or on behalf of an electricity supply authority or public authority without consent on any land. Other authorities such as the National Parks & Wildlife Service may need to give concurrent approval or be consulted on specific matters.

Under Part 3A of the Act and the *State Environmental Planning Policy (Major Development) 2005*[17], a pipeline development under the *Pipelines Act 1967*, will be considered a Major Project by NSW Department of Planning with prescribed level of environmental assessment and development control. Features of Part 3A project assessments include "Concept approval" and a staged assessment process including revised approval authority provisions. The criteria is also further defined in the *State Environmental Planning Policy (State Significant Development) 2005*.

Petroleum handling installations are generally regarded as Major Hazards Facilities and as such are dealt with under the *SEPP 33 (Hazardous and Offensive Development)*. For an area such as Port Botany, this type of development may be declared major infrastructure or State Significant Development and also covered under Part 3A.

Proponents need to ensure that the requirements for each of the respective legal instruments, both Commonwealth and NSW are met in any application for development approval.

Pipelines Act 1967

The *Pipelines Act 1967* ("Pipelines Act") sets out the principal requirements for pipeline licensees and operators with regard to the planning, construction, operation and maintenance of licensed pipelines and associated activities in NSW.

The principal objectives of the Pipelines Act are to define:

- Which pipelines require licensing;
- Licence approval processes;
- Environmental assessment and land access processes;

[17] The Major Development SEPP is available for download from : http://www.legislation.nsw.gov.au/fullhtml/inforce/epi%2B194%2B2005%2BFIRST%2B0%2BN/#pt.1-cl.1

- Licence holders responsibilities; and
- Regulations for pipeline system design, risk assessment criteria, construction, operation and maintenance.

Pipelines may be also be licensed or regulated under other legislation. Potential investors will need to consider whether the following four Acts, which apply to the construction of petroleum pipelines in NSW, applies to their proposal:

- *Petroleum (Onshore) Act 1991 (NSW)* – Onshore petroleum mining (extraction) plant gathering (wellhead to plant) pipelines;
- *Petroleum (Submerged Lands) Act 1982 (Cwth)* – Offshore petroleum plant gathering pipelines;
- *Dangerous Goods Act 1975*[18] – Processing and storage plant pipelines and short (usually less than 10km) inter-plant pipelines; and
- *Gas Supply Act 1996* – Natural Gas, LPG and other gas distribution pipelines.

State Environmental Planning Policy (Infrastructure) 2007 (NSW)[19]

This SEPP repeals the *State Environmental Planning Policy No 31—Sydney (Kingsford Smith) Airport.*

This SEPP provides for development on Sydney Kingsford Smith Airport without (NSW) consent. The SEPP lists the specific activities or classes of development for which this instrument applies. This instrument needs to be considered in conjunction with the *Airports Act 1996 (C'th) and particularly Part 5—Land use, planning and building controls.*

NSW Department of Planning decides whether an environmental impact statement (EIS) is necessary. The test laid down in s112 of the EP&A Act is whether the proposed activity "is likely to significantly affect the environment (including critical habitat) of threatened species, populations or ecological communities, or their habitats".

Furthermore, the proposer must not carry out an activity in respect of land that is critical habitat, or is likely to significantly affect threatened species, populations or ecological communities, or their habitats, unless a species impact statement (SIS) has been prepared in accordance with the *Threatened Species Conservation Act 1995.*

Where an EIS has been prepared, the public must be notified and given an opportunity to comment on the proposed activity. An SIS is subject to the similar public exhibition requirements. The proposers' must ensure that alternate routes for the pipelines are explored and details are made available for comment during the proposal development / consultation process.

Concurrently, the proponent, through the NSW Planning process, must ensure that the requirements in the Environment Protection and Biodiversity Conservation Act 1999 (C'th) are considered.

---

[18] *The Dangerous Goods Act 1975* and the *Dangerous Goods (General) Regulation 1999* were repealed in 2000. The requirements which relate to pipelines were included in the Savings and Transitional provisions of the Occupation Health and Safety Act (2001) and *Occupational Health and Safety Regulations 2001* - Schedule 3. Those provisions continue to have effect.

[19] A copy of the SEPP is available for download from:
http://www.legislation.nsw.gov.au/viewtop/inforce/act%2B203%2B1979%2BFIRST%2B0%2BN/

Occupational Health and Safety Regulation 2001- Schedule 3

The *Dangerous Goods Act 1975* and the *Dangerous Goods (General) Regulation 1999* were repealed in 2000. The requirements which relate to pipelines were included in the *Savings and Transitional provisions of the Occupation Health and Safety Act (2001)* and *Occupational Health and Safety Regulations 2001 - Schedule 3.* Those provisions continue to have effect.

Schedule 3 of the *Occupational Health and Safety Regulations 2001* is provided below:

> **3 Saving of certain Dangerous Goods Regulation provisions relating to pipelines**
>
> (1) Despite the repeal of the *Dangerous Goods Act 1975* and the *Dangerous Goods (General) Regulation 1999*, the following provisions (which relate to pipelines) continue to have effect:
>
> (a) clauses 192, 193 and 198 of that Regulation,
>
> (b) for the purpose of those clauses, the definition of "pipeline" in section 4 of that Act.
>
> (2) Contravention of a provision referred to in subclause (1) is an offence against this clause.
>
> Maximum penalty: Level 4.
>
> (3) The provisions referred to in subclause (1) do not apply to:
>
> (a) the transport of any dangerous goods by road or rail, or
>
> (b) any associated activity or matter,
>
> to the extent to which the transport, activity or matter is regulated by the *Road and Rail Transport (Dangerous Goods) Act 1997* or any regulations under that Act.

Commonwealth Government approval processes

Airports Act 1996 (Cwth)[20]

Planning control on leased federal airports is vested in the Commonwealth under the *Airports Act 1996* (the Act), as these airports are essential elements of national economic infrastructure, and they are on Commonwealth land.

As part of the planning framework, airports are required to prepare the following:

- **Master Plan:** This is a 20 year strategic vision for the airport site which is renewed every five years. The Master Plan includes future land uses, types of permitted development, and noise and environmental impacts.
- **Airport Environment Strategy:** This sets out the airport's strategy to manage environmental issues within a 5 year period and beyond. It is the basis on

[20] A copy of the Airports Act 1996 is available for download from: http://www.comlaw.gov.au/ComLaw/Legislation/ActCompilation1.nsf/all/search/48E3461CE3A65473CA256F7100502D69

which the Commonwealth measures the environmental performance of airports and the document by which airport tenants will determine their environmental responsibilities.

- **Major Development Plan:** There is a requirement under the Airports Act for a MDP for any major airport development as defined under section 89 of the Act. This section captures developments with a significant environmental impact and provisions of the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The purpose of a Major Development Plan is to establish the detail of a major development at the airport and to establish whether it is in line with the airport lease, and the final master plan for the airport.

The Australian Government's National Aviation Policy White Paper provides a coherent and strategic policy and planning framework for the aviation industry. The White Paper recognises improved planning at Australia's airports is necessary for better integration and coordination with off-airport planning and continued investment in Australia's airport infrastructure and land transport links.

As part of the White Paper, the Australian Government is initiating amendments to the Airports Act to support more effective public consultation and better alignment with other planning jurisdictions.

Environment Protection and Biodiversity Conservation Act 1999 (Cwth)[21]

Under the *Environment Protection and Biodiversity Conservation Act 1999 (Cwth)* ("the EPBC Act"), actions that have, or are likely to have, a significant impact on a matter of national environmental significance require approval from the Australian Minister for the Environment, Heritage and the Arts.

The eight matters of national environmental significance protected under the EPBC Act are:

- world heritage properties;
- national heritage places;
- wetlands of international importance (listed under the RAMSAR convention);
- listed threatened species and ecological communities;
- migratory species;
- the Great Barrier Reef Marine Park; and
- nuclear actions (including uranium mines).

[21] A copy of the EPBC Act is available for download from:
http://www.legislation.nsw.gov.au/maintop/view/inforce/epi%2B641%2B2007%2BFIRST%2B0%2BN/

APPENDIX G

MELBOURNE AIRPORT

Melbourne Airport is located 22km north west of Melbourne and is owned and operated by Australia Pacific Airports Melbourne Pty Limited (APAM). QANTAS indicates that Melbourne is the most economic alternative fuel supply point to Sydney in the event of a disruption[22].

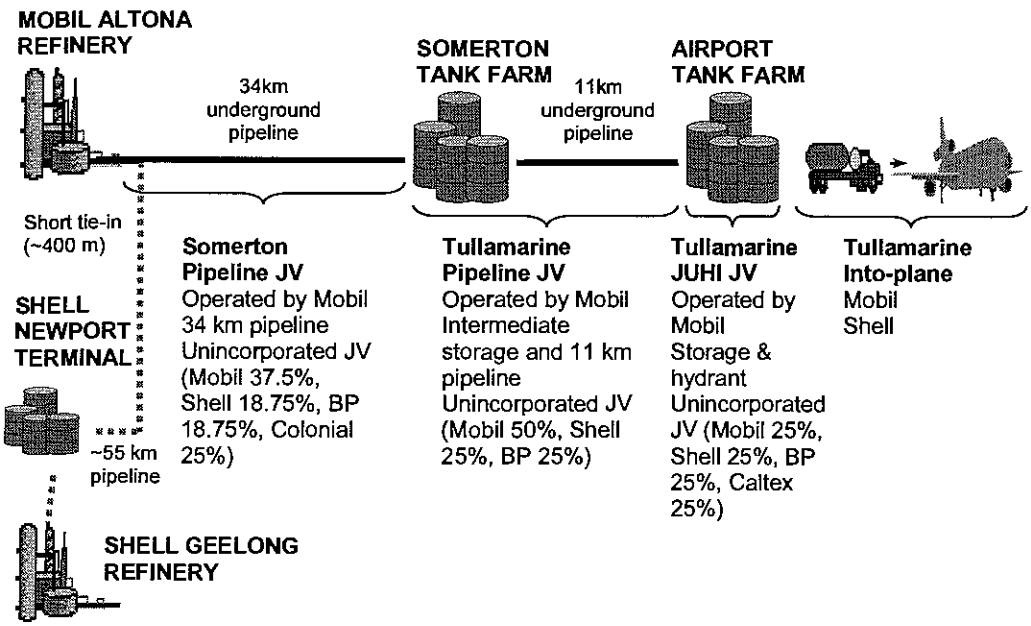
In 2008/09, Melbourne Airport experienced overall passenger growth of 2.1%[23]. The *2008 Melbourne Airport Master Plan* projects that total aircraft movements will grow from 180,200 in 2006/07 to between 263,200 and 316,500 movements annually in 2027/28, which indicates year-on-year growth of between 1.8% and 2.6%.

Average daily jet fuel demand at Melbourne Airport is 3.5ML (3.0ML to 4.0ML per day) and over 250 refuellings (via the hydrant system) take place each day. Jet fuel demand projections are not available from Melbourne Airport or Tullamarine JUHI operators.

1. Existing jet fuel infrastructure and logistics arrangements

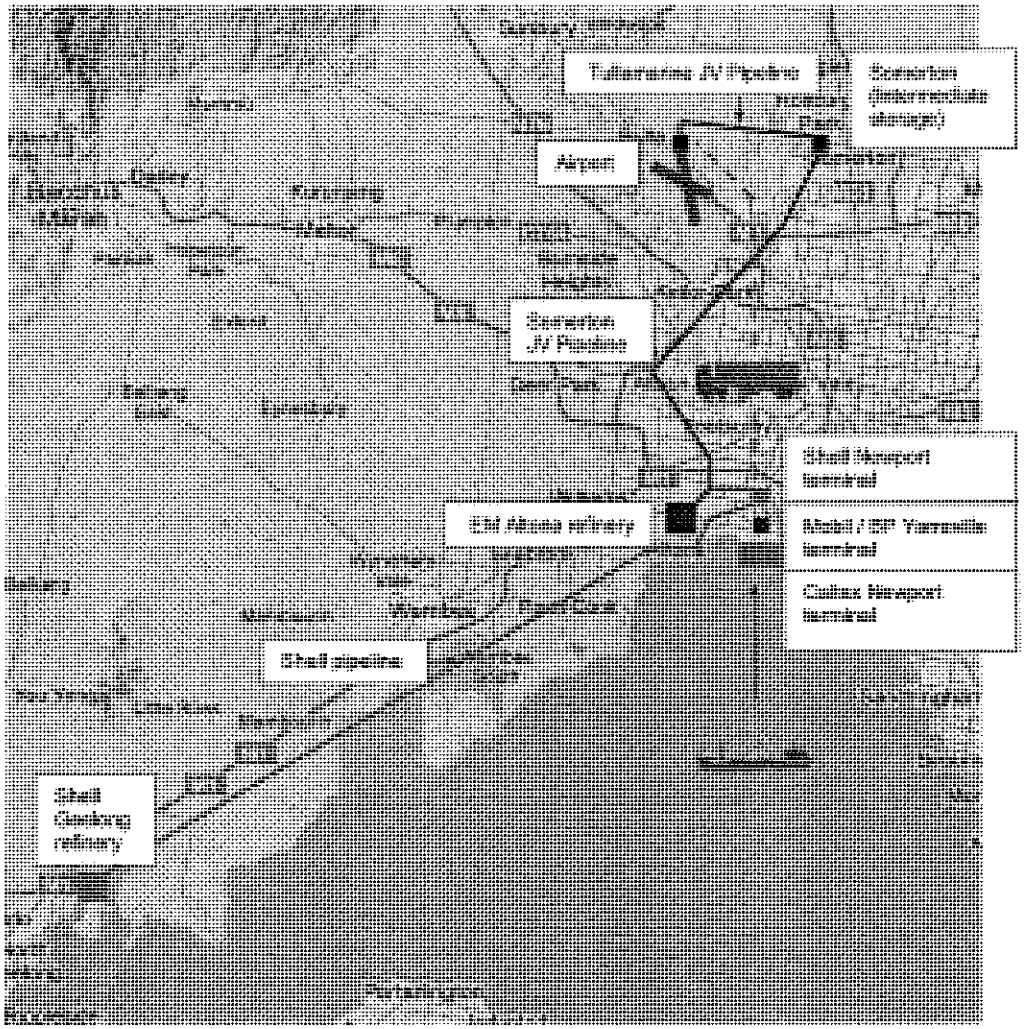
The jet fuel supply infrastructure to Melbourne Airport is shown schematically in Figures G1 and G2.

Figure G1: Jet fuel pipeline supply infrastructure network to Melbourne Airport[24]



[22] QANTAS submission, refer Appendix A7.
[23] Australia Pacific Airports Corporation Ltd, *Annual Report 2009*.
[24] Melbourne Airport, presentation slide provided to the working group on 7 April 2010.

Figure G2: Jet fuel supply chain to Melbourne Airport[25]



Notes:
(1) Competitor facilities and infrastructure based on public domain information
(2) Pipeline & terminal locations indicative

Mobil Oil Australia Pty Ltd (Mobil) operates the Tullamarine JUHI on behalf of the joint venture participants, consisting of Mobil, Shell, BP and Caltex. Mobil also operates the Somerton Pipeline Joint Venture, the 34km underground pipeline from Mobil's Altona refinery to Somerton; and the Tullamarine Pipeline Joint Venture which includes the Somerton tank farm and the 11km underground pipeline from Somerton to the Tullamarine JUHI.

The Somerton pipeline has a theoretical maximum pumping rate of 8.4ML per day. The submission lodged on behalf of the joint venture participants indicates that the utilisation and current pumping rates are well below design limits as it was originally designed for the carriage of multiple products.

The Tullamarine Pipeline is currently operating close to its maximum capacity of 3.2ML per day. The submission on behalf of Tullamarine Pipeline JV advises that the joint venture participants recently approved a pumping upgrade that will allow an increase in throughput rate of approximately 35% (i.e. to 4.5ML per day).

[25] Melbourne Airport presentation slide provided to the working group on 7 April 2010.

The Somerton tank farm contains two 12ML tanks and the Tullamarine JUHI storage depot contains 7ML of storage capacity. The JUHI operator advised that jet fuel transferred through the pipeline from the Somerton tank farm to the Tullamarine JUHI storage does not require recertification.

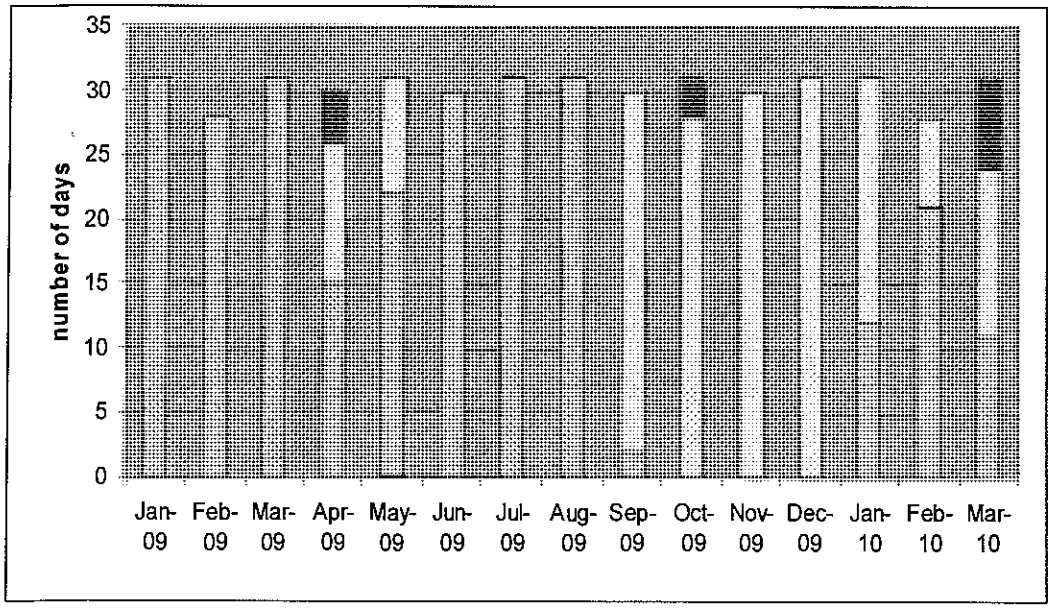
Pipeline supply is supplemented by product trucked to Melbourne Airport from the Mobil/BP Yarraville terminal and Caltex Newport terminal, located in Melbourne's inner-west. Fuel supply within the airport is dependent on hydrant infrastructure and the operators of Melbourne Airport view that tankering is not a viable option, except to supply a very limited supply of fuel into aircraft.

A stakeholder advised that imports of refined petroleum products via the Port of Melbourne currently occur at the rate of one shipment every three days and, given a number of these vessels do not currently carry jet fuel, the volume of jet fuel imported could be increased.

2. Status of jet fuel supply assurance at Melbourne Airport

Jet fuel supply assurance at Melbourne Airport has generally been stable; however there has been a significant increase in amber and red traffic lights since September 2009 (refer Figure G3).

Figure G3: Traffic light colours posted for Melbourne Airport – January 2009 to March 2010



The primary reasons for these amber and red lights include:

- a planned refinery turnaround taking place in September 2009;
- inability of one of the two Victorian refineries maintaining full production of jet fuel during October 2009 and December 2009;
- planned shut down of one refinery during the period October to November 2009;
- planned, non discretionary repair of two storage tanks at the Tullamarine JUHI Storage facility during November and December 2009; and

- delay in production and transfers following severe weather event in early March 2010.

Throughout the period the strategies of increasing imports, trucking and throughput of supplying pipelines were utilised to supplement and maintain sufficient jet fuel stocks at the Tullamarine JUHI storage facility.

3. Adequacy of jet fuel supply infrastructure

In its submission, APAM comments that the current jet fuel supply infrastructure is *"adequate to support current needs"*, and notes the following risks to the jet fuel supply chain:

- Low redundancy - Fuel supply to the airport could be compromised by any number of single point failures. For example, there is a single pipeline from the Somerton Depot to the JUHI depot and the JUHI depot holds only two days fuel supply.

- Reliance on one option for refuelling - Fuel supply within the airport is dependent on hydrant infrastructure as tankering is not a viable option.

- Future investment decisions - The longer term growth of Melbourne Airport is conditional on JUHI making investment decisions in line with APAM, and being given the appropriate investment signals.

APAM notes that substantial disruption to both domestic and international operators would be experienced if a single point failure or if an event disrupting the hydrant supply lines occurred. For example, refuelling of aircraft would need to be severely rationed and airline operators would need to refuel many of their aircraft at alternate ports.

The submission lodged on behalf of the joint venture participants advises that the utilisation and current pumping rates of the Altona to Somerton pipeline are well below design limits. The joint venture participants note that this underutilisation is due to the pipeline having been originally designed for carrying multiple products, rather than just jet fuel. Based on current infrastructure, future investment plans and Melbourne Airport Authority's projections in passenger and aircraft numbers, the joint venture participants consider there are no significant, unmanageable issues with current or future supply of jet fuel to Melbourne Airport.

QANTAS indicated they would support the expansion of the Somerton to JUHI pipeline and the directional change of the Altona pipeline to the Yarraville terminal to allow direct transfers of imports. QANTAS recommends that in the long term there should be increased or open access to the Somerton terminal and the Somerton to JUHI pipeline.

4. Emerging supply chain issues

The NOC commentary during October 2009 noted that the only strategy used to meet the increase in demand was an increase in trucking from the nearby storage terminals to the Tullamarine JUHI storage facility. This indicates that there may be an emerging constraint with the Somerton to Tullamarine pipeline capacity.

The above comment supports the 2009 ACIL Tasman finding that the pipeline capacity to the Tullamarine JUHI *"is somewhat constrained and may require augmentation to its capacity in the near future"*[26].

The Working Group notes that an expansion of Tullamarine Pipeline's capacity has already been approved by Tullamarine Pipeline JV participants.

5. Concluding remarks

Based on the information provided and the strong views communicated by the key stakeholders of Melbourne Airport, the Working Group considers that the existing jet fuel supply infrastructure is sufficient to meet current demand.

As jet fuel demand projections and information on the adequacy of the existing infrastructure to meet longer term demand is not available at this time to enable a full assessment, the working group can only comment with limited confidence about potential action required to reduce the risk of supply shortages in the longer term.

Stakeholders with an interest in jet fuel supply to Melbourne Airport may wish to consider:

- increasing capacity (or duplication) of the Somerton to Tullamarine pipeline (Tullamarine Pipeline pumping upgrade investment has already been approved by Tullamarine Pipeline JV participants);
- reviewing available options to make better use of currently under utilised pipeline capacity to Somerton and reduce dependence on trucking fuel to the airport in the future.

The Working Group considers that the application of Recommendation 5 should be extended to Melbourne Airport to enable the assessment of potential future infrastructure needs. As noted in chapter 7, the availability of jet fuel demand projections may lower the investment risks and encourage potential investors to commit to necessary jet fuel infrastructure investments in a timely fashion.

Therefore, the Working Group recommends that:

10. Jet fuel demand projections be determined by appropriate industry representatives as part of all future Melbourne Airport Master Plans.

[26] ACIL Tasman, *Petroleum Import Infrastructure in Australia*, 2009.

APPENDIX H

BRISBANE AIRPORT

Brisbane Airport is located approximately 13km from the central business district and is owned and operated by the Brisbane Airport Corporation Pty Limited (BAC). QANTAS views Brisbane as the second most important alternative fuel supply point (following Melbourne) in the event that fuel disruption events at Sydney Airport result in support being required.

In 2009, Brisbane Airport experienced overall passenger growth of around 2% to just over 19 million passengers[27]. The *2009 Brisbane Airport Master Plan* projects international movements will grow at an average of 3.9% annually over the next 20 years, with domestic movements growing at 4% annually over the same period. By 2029, Brisbane Airport is forecast to be handling approximately 358,000 annual aircraft movements.

Table H1 contains the jet fuel demand projections to 2029/30 provided by BAC in its submission.

Table H1: Average daily jet fuel demand projections – Brisbane Airport

	2008/09	2014/15	2019/20	2029/30
Average daily International demand (ML per day)	1.35	1.75	2.0	2.55
Average daily Domestic demand (ML per day)	1.35	1.74	2.44	2.84
Total jet fuel demand (ML per day)	**2.7**	**3.49**	**4.44**	**5.39**

1. Existing jet fuel infrastructure and logistics arrangements

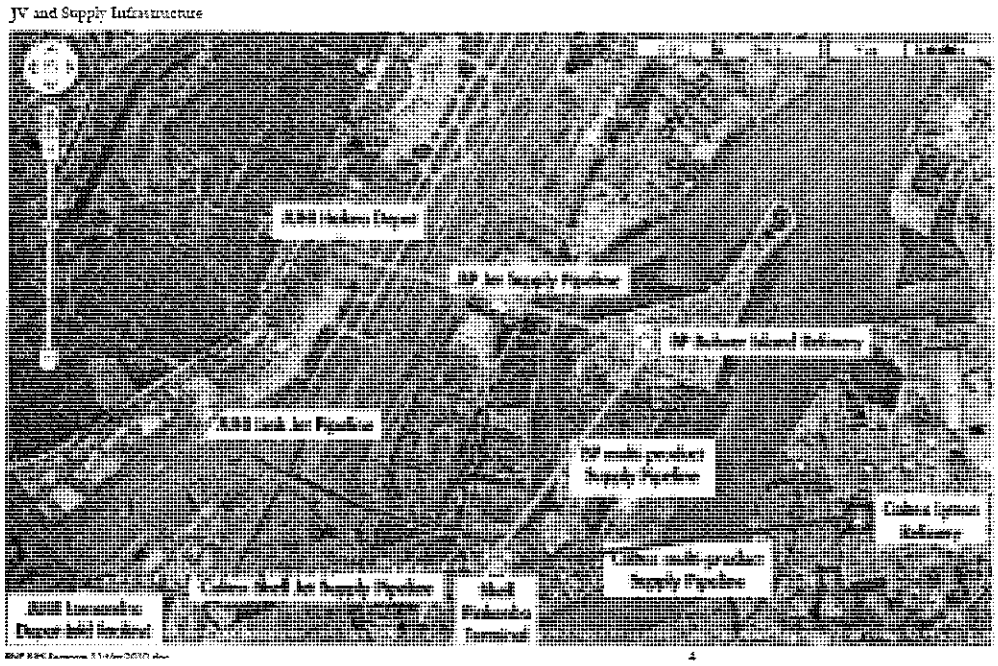
Brisbane Airport currently has two major jet-A1 fuel installations. The primary storage facility is on Hakea Street between the domestic and international terminals and includes three above ground tanks with total 6ML storage capacity. The secondary storage facility is located on the corner of Lomandra Drive and Viola Place and contains one storage tank of 2.5ML storage capacity.

The secondary facility is due for decommissioning following the expiry of the current lease in April 2012. It is proposed that the 2.5ML storage capacity will be removed and a new 4ML storage tank will be constructed at the primary JUHI, which will result in an effective total increase in storage capacity of 1.5ML at Brisbane Airport.

BP and Caltex produce jet fuel at their respective refineries, Bulwer Island and Lytton. Shell and ExxonMobil have terminals that provide for the receipt of jet fuel from local or overseas refineries. Jet fuel is transferred from these facilities via pipeline to the on-airport storage facilities (refer Figure H1). All facilities and assets associated with the on-airport storage and hydrant system is owned and operated by an unincorporated joint venture, in which BP, Caltex, ExxonMobil and Shell participate. Shell is the joint venture operator and the assets are operated under operating lease and license arrangements with the Airport and the joint venture's working protocols.

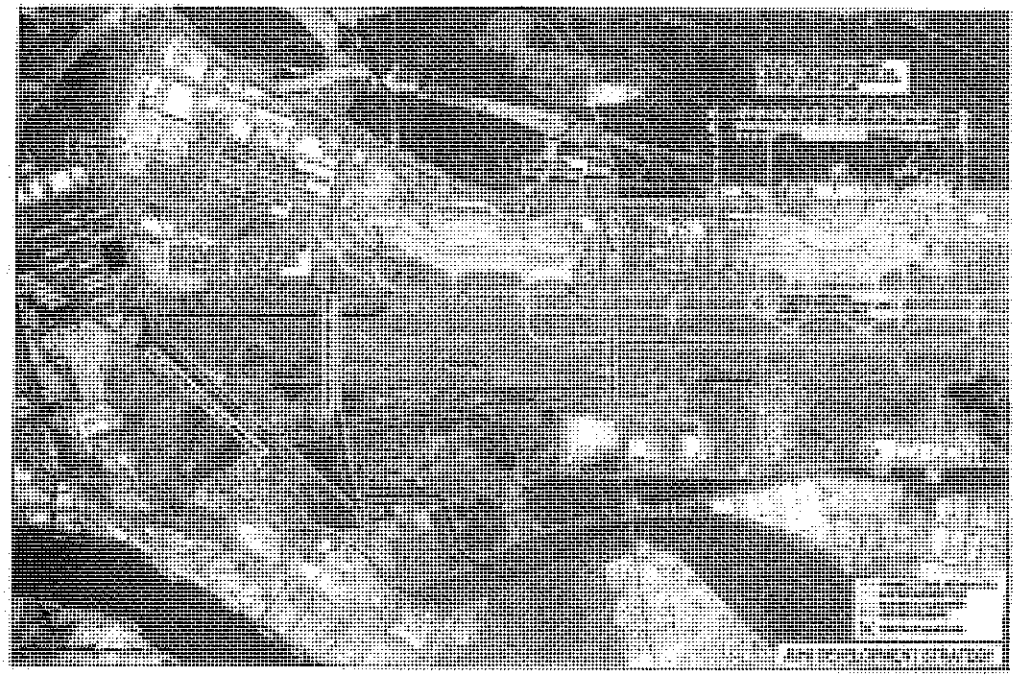
[27] BAC Holdings Limited 2009 Annual Report

Figure H1: Jet fuel supply infrastructure to Brisbane Airport



The International and Domestic aprons are serviced by pipelines from the Hakea Street JUHI (refer Figure H2). There are seven hydrant pumps at Hakea Depot, each with capacity of 3800 litres/minute, the pipeline to the International apron is a high capacity 600mm pipeline, and the pipeline to the Domestic apron is a medium capacity 450mm pipeline. The Logistics apron and the regional aircraft and remote stands on the Domestic apron are serviced by tanker fuelling.

Figure H2: Hydrant pipeline system at Brisbane Airport



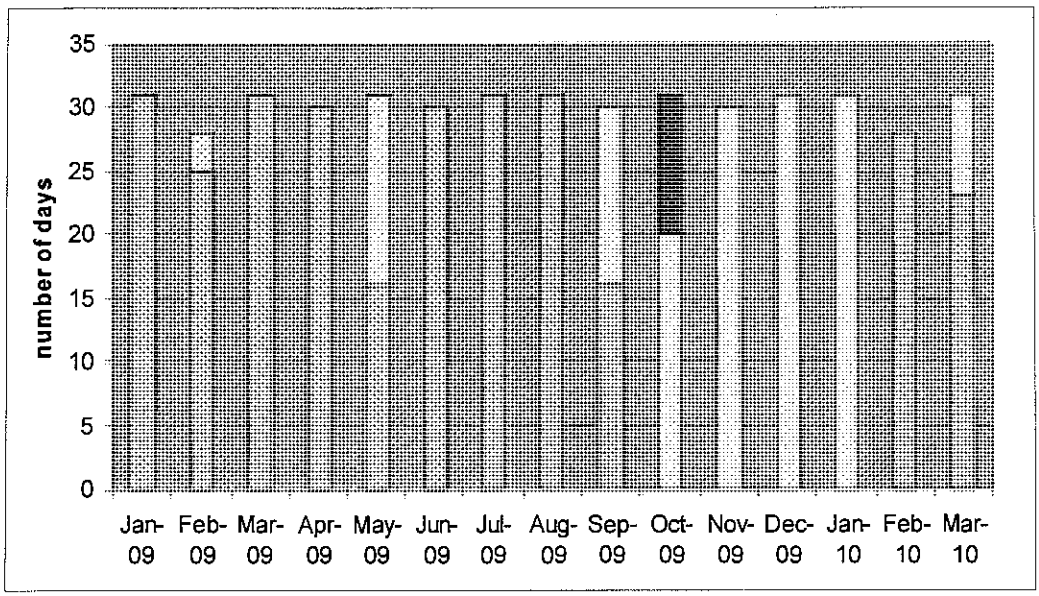
Submission to the Sydney Jet Fuel Infrastructure Working Group
Brisbane Airport Corporation Pty Limited, March 2013

The Ground Service Equipment (GSE) and airside vehicles refuelling requirements (diesel and unleaded fuel) are addressed by several facilities with airline leased and licensed areas. Due to the Domestic apron works, the QANTAS GSE fuelling facility has been removed and road tanker based servicing introduced for a select area of the apron to temporarily fulfil aviation equipment needs.

2. Status of jet fuel supply assurance at Brisbane Airport

Jet fuel supply assurance at Brisbane Airport has generally been stable. However, amber lights have been posted on an on-going basis during the period September 2009 to January 2010 and red lights were posted in October 2009 (refer Figure H3).

Figure H3: Traffic light colours posted for Brisbane Airport – January 2009 to March 2010



The primary reasons for the amber and red lights include:

- low stocks at supplying terminals in anticipation of imports and a supplying terminal having a conductivity issue with a jet fuel batch in September 2009;
- one of the local refineries being unable to maintain full production due to ongoing maintenance during October 2009;
- one of the local refineries being unable to maintain full production due to a quality issue during the period October 2009 to December 2009;
- scheduled tank cleaning at one refinery during November 2009;
- one rundown tank being out of service at a supplying refinery during the period November 2009 to January 2010;
- potential crude-related quality issues (requiring optimisation of crude slate to minimise impacts on production) and production problems flagged at one refinery during the period December 2009 to end of January 2010; and
- both refineries flagging potential production problems during January 2010.

Throughout the period the strategies of sourcing alternate supply from interstate and international sources was utilised to supplement and maintain sufficient jet fuel

stocks at the on-airport storage facilities at Brisbane Airport. The NOC traffic light reports indicated to stakeholders that the above issues were not expected to impact on the level of jet fuel stocks at Brisbane Airport.

3. Adequacy of jet fuel supply infrastructure

Storage capacity

The BAC submission infers that the current on-airport storage capacity is equivalent to approximately 3.5 days of current average demand and would equate to 1.5 days of average demand in 2029/30.

BAC further note in its submission that, once the planned additional storage capacity is constructed following the decommissioning of the Lomandra storage depot, on-airport storage capacity will be sufficient until 2015.

Based on current joint venture infrastructure and projected demand growth for Brisbane Airport, the JUHI joint venture participants consider there is an urgent need for additional and centralised jet fuel storage at Hakea Depot to maintain future operational and supply integrity.

Jet fuel supply infrastructure (pipelines) to Brisbane Airport

BAC understand that the throughput rate of the supplying pipeline to the Hakea storage depot needs to be increased in the medium term to align with future jet fuel demand.

Whilst QANTAS does not view any logistical or infrastructure issues for aviation supply in Brisbane, QANTAS indicated that the recent production issues and reliability incidents in Brisbane have lowered production and highlighted the reliance of the Sydney aviation market on Brisbane production levels.

Hydrant system

The submission on behalf of the JUHI joint venture participants indicates there is space in the current location for the installation of three further pumps in the future.

4. Emerging supply chain issues

In its submission, BAC indicates that the following investments will be required in the short to medium term (i.e. next 10 years) to align with projected jet fuel demand growth:

- modified and new facilities at the Common User Domestic Terminal;
- an additional primary apron hydrant feeder route to the apron expansion areas to the northern apron of the Domestic apron;
- new facilities at the International Terminal;
- the installation of additional storage tanks at the Hakea storage depot and at locations that do not encroach further towards the 01/19 parallel taxiway system;

- additional larger capacity aircraft refuelling vehicles or preferably the reinstatement of an in-ground fuel hydrant system at the logistics apron over the next 5 years;
- the possible medium-term installation of a replacement higher capacity feed line from the Shell Pinkenba facility to the Hakea storage depot in a long-term secure alignment airside; and
- for ground fuels, the establishment of suitable common user GSE and airside refuelling facilities within a functional operating distance of the major apron areas.

In the longer term (10+ years), BAC anticipates that the Hakea storage depot will be retained and a long-term reservation within the *Future Aviation Facilities Area* of sufficient size for an additional or consolidated storage depot will be allocated. BAC views it is appropriate that investment costs for future jet fuel facilities are borne by the JUHI joint venture participants.

The JUHI joint venture participants indicated that they cannot remediate the Lomandra facility or surrender the Lomandra depot lease, and maintain reliable supply without the proposed new storage tank at Hakea Depot. The JUHI joint venture participants further advised that investment in new joint venture facilities is contingent upon the joint venture securing a long term lease for the Hakea Depot.

BAC additionally noted that implications of development of the International Terminal in the vicinity of the Hakea storage depot might become more critical in the medium term. BAC believe that the JUHI joint venture participants should demonstrate that it has adequately and carefully considered all safety and security hazards and factors relevant to retaining existing and proposed new jet fuel storage facilities at the Hakea depot.

BAC suggested that an independent report on safety and security matters (including any required exclusion zone around the Hakea depot) should be provided. BAC alternatively suggested that the aviation industry should consider providing safety and security standards or recommendations for fuel facilities on Airports.

5. Concluding remarks

The Working Group acknowledges that jet fuel demand projections have been developed by BAC and provide a robust basis for assessing the adequacy of current jet fuel supply infrastructure and identifying future jet fuel supply infrastructure needs. However, the jet fuel demand projections are not included in the *2009 Brisbane Airport Master Plan.*

As discussed in the report in respect to Sydney and Melbourne Airport, the Working Group considers that the availability of jet fuel demand projections to potential investors will reduce investment risk and encourage investment decisions.

Therefore, the Working Group recommends that:

11. Jet fuel demand projections be determined by appropriate industry representatives as part of all future Brisbane Airport Master Plans.

Based on the information provided by Brisbane Airport stakeholders, it is apparent that infrastructure decisions will be needed in the short, medium and long term to ensure the jet fuel supply infrastructure is adequate to meet projected demand to 2030.

However, and as with Sydney Airport, security of tenure of the on-airport storage facility is an issue that needs to be resolved in the very near term to allow potential investors with the required certainty to make decisions.

The Working Group notes that the BAC has drafted a Memorandum of Understanding that suggests longer term tenure for the Hakea storage depot post 2012. The Working Group encourages BAC and the JUHI joint venture participants to conclude negotiations in a timely fashion to allow investment decisions and necessary infrastructure build to occur with minimal negative impact on the security of jet fuel supply at Brisbane Airport.

1 June 2011

City of Botany Bay

Our Ref: PPTY/228-4

Your Ref: 11_0004

31 May 2011

Mr Chris Ritchie
Manager – Industry
Mining and Industry Projects
NSW Department of Planning & Infrastructure
GPO Box 39
Sydney NSW 2001

Dear Mr Ritchie

Re: Caltex Jet Fuel Pipeline Upgrade Project (11_0004)

I refer to your letter received by Council on 28 April 2011 in respect of the public exhibition of the Environmental Assessment for the above-mentioned Major Project Application.

Council has reviewed the Director-General's Requirements for the application and the Environmental Assessment ("EA") prepared by URS Australia Pty Ltd dated April 2011.

Council notes that no works are proposed to the jet fuel pipeline that runs along Foreshore Road from Banksmeadow Terminal to Sydney Airport. Council is of the understanding that any further works to this section of the pipeline would be subject to a separate application.

Council's response to the EA is as follows:

Director General's Requirements
Most of Council's comments detailed in the email of 8 April regarding the assessment of the DGR's in the draft EA have been adequately addressed in the final EA.

- ***General Requirements:*** The EA does not include reference to any statutory approvals that apply to the operations and facilities.

- ***Noise and Vibration:*** The EA includes an assessment of the impact of Construction Noise and Vibration on an Industrial/Commercial Premises to the north of the Banksmeadow Terminal. The EA should also include an assessment of Noise and Vibration impacts on a residential receiver in the Botany Bay LGA. Council has a concern for the amenity of nearby residents in Botany Road and Dent Street, Botany who have experienced noise and vibration impacts from Port related activities in the past.

Administration Centre, 141 Coward Street, Mascot NSW 2020. (PO Box 331 Mascot NSW 1460)
Telephone: (02) 9366 3666 Facsimile: (02) 9366 3777
E-mail: council@botanybay.nsw.gov.au Internet: http://www.botanybay.nsw.gov.au

- ***Key Issues – Soil and Water – Sea Level Rise***: The EA does not address consideration of sea level rise and its potential impact on the site including proposed management practices. Part 7.2.3 of the EA gives an outline of relevant sea level rise policies but does not give a specific analysis and proposed protection measures for the subject sites at Banksmeadow and Kurnell. Given the location of the both of the Caltex sites on either side of Botany Bay, sea level rise should be of key consideration.

Should you have any queries please contact Ms Suzanne Wren, Council's Strategic Planner on (02) 9366 3556.

Yours faithfully

R J DOWSETT
DIRECTOR – PLANNING & DEVELOPMENT

NSW GOVERNMENT | Office of Water

Major Development Assessments
Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

26 May 2011

c: Jodie Dabovic
t: 02 4904 2571
f: 02 4904 2503
e: jodie.dabovic@water.nsw.gov.au

Our ref : ER21503
Your ref: MP 11_0004

Attention: Chris Ritchie

Dear Chris

SUBJECT: CALTEX JET FUEL PIPELINE UPGRADE PROJECT (11_0004)
NOFICIATION OF EXHIBITION

I refer to your letter dated 28 April 2011 regarding notification of exhibition of the environmental assessment for the Caltex Jet Fuel Pipeline Upgrade.

The NSW Office of Water (NOW) provides the following advice on the basis that the existing legislative provisions under Part 3A of the *Environmental Planning and Assessment Act 1979* apply to this proposal.

NOW has reviewed the environmental assessment and is satisfied with the statement of commitments for surface and groundwater and recommends that the statement of commitments is included as conditions of approval.

If you require further information please contact Jodie Dabovic, Planning and Assessment Coordinator on (02) 4904 2571.

Yours sincerely

Mark Mignanelli
Manager Major Projects and Assessment

Our Reference: 11M1255Vol.2 - SYD11/00255/02
Your Reference: MP11_0004
Contact: Stella Qu (DC)
Telephone 8849 2520

NSW GOVERNMENT | Transport Roads & Traffic Authority

Manager-Industry
Mining & Industry Projects
NSW Department of Planning & Infrastructure
GPO Box 39
Sydney NSW 2001

Attention: Andrew Hartcher

MAJOR PROJECT APPLICATION (MP 11_0004) – CALTEX JET FUEL PIPELINE UPGRADE PROJECT

Dear Sir,

I refer to your correspondence received on 27 April 2011 (Ref: MP11_0004) with regard to the proposed Caltex Jet fuel pipeline upgrade project, which was referred to the Roads and Traffic Authority (RTA) for comment under Part 3A of the *Environmental Planning and Assessment Act 1979*.

The RTA has reviewed the submitted application and advises that the RTA, Council and Caltex were co-signatories to a Deed of Agreement (effectively a pipeline licence) dated 29th January 2003(Copy attached). This Deed permits Caltex to lay, construct and operate a steel pipeline for the carriage of liquid jet fuel in, under and across parts of the Sydney road network including passing under General Holmes Drive.

Therefore, the RTA raises no objections to the proposed development provided any upgrade works are undertaken in accordance with the abovementioned Deed.

Further enquiries on this matter can be directed to the nominated Land Use & Transport Planner, Stella Qu on phone 8849 2520 or facsimile (02) 8849 2918.

Yours sincerely

James Hall
Senior Land Use Planner
Transport Planning, Sydney Region

6 June 2011

DATED 29TH JANUARY 2003

BETWEEN:

THE COUNCIL OF BOTANY

AND:

THE ROADS AND TRAFFIC AUTHORITY

AND:

CALTEX AUSTRALIA PETROLEUM PTY LIMITED

DEED OF AGREEMENT

Messrs Houston Dearn O'Connor
Solicitors
Suites 3 & 4, 1st Floor
Murray Arcade
127 Burwood Road
BURWOOD 2134
DX 8565 BURWOOD
TEL: 9744 9247
FAX: 9744 6739

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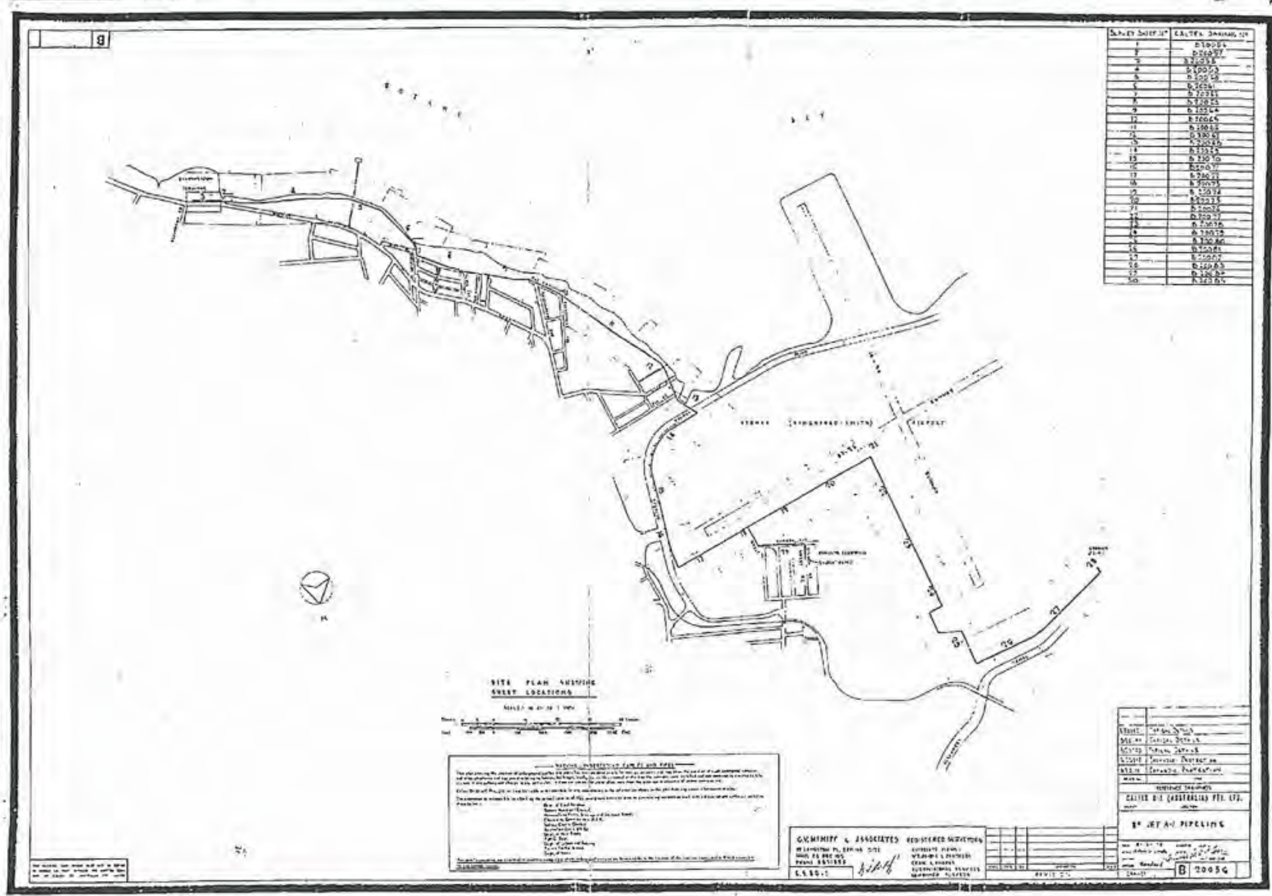


BOTANY
BAY
SYDNEY (KINGSFORD-SMITH) AIRPORT
SITE PLAN SHOWING
SHEET LOCATIONS
& ASSOCIATES
REGISTERED SURVEYORS
CALTEX OIL (AUSTRALIA) PTY. LTD.
JET A-1 PIPELINE
B 20056

DATED 21 May 1974.

BETWEEN

CALTEX OIL (AUSTRALIA) PTY. LIMITED

of the first part

AND

THE COUNCIL OF THE MUNICIPALITY OF BOTANY

of the second part

AND

THE COMMISSIONER FOR MAIN ROADS

of the third part

DEED "A"

MESSRS. PIKE PIKE & FENWICK,
Solicitors,
64 Castlereagh Street,
SYDNEY, 2000.
Telephone: 233-4355

I, ANDREW FREDERICK SCHMIDT The Commissioner for Main Roads have hereunto affixed the official seal of The Commissioner for Main Roads in the presence of:

A F Schmidt

Secretary.

14. THE COMPANY agrees that the crossings of the various Main, Secondary and County Roads will be made by under-road boring techniques unless otherwise approved by the Commissioner and the Council.

15. ANY notice required to be given to or served upon any of the parties hereto shall be in writing and either delivered to or sent by prepaid post to the party concerned at the address hereinafter mentioned and if sent by post shall be deemed to have been delivered on the day following the posting thereof. In the case of the Council the address shall be its Council Chambers or place of business for the time being. In the case of the Commissioner for Main Roads the address shall be at his office 309 Castlereagh Street, Sydney and in the case of the Company the address shall be its registered office.

16. THIS agreement shall run concurrently with two agreements of even date made between the Company of the one part and the Council of the other part in respect of the laying construction and maintenance of the pipeline hereinbefore referred to.

17. THE COMPANY shall pay the Council's legal costs and incidental to the preparation of this Deed.

IN WITNESS WHEREOF the parties hereto have hereunto set their hands and affixed their seals on the day and year first hereinbefore written.

Signed and Sealed and Delivered by CLARENCE JOHN SUTTON as the attorney of CALTEX OIL (AUSTRALIA) PTY. LIMITED and I hereby declare that at the time of the execution by me of this instrument I have no notice of the revocation of the Power of Attorney dated 5 SEP 1969 to me registered in the Miscellaneous Register in the Registrar-General's Department No. 164152 (Land Titles Office No. ...), under the authority of which I have executed the said instrument in the presence of:

.....

as the attorney of CALTEX OIL (AUSTRALIA) PTY. LIMIT

THE COMMON SEAL of CALTEX OIL (AUSTRALIA) PTY. LIMITED was hereunto affixed

THE COMMON SEAL of THE COUNCIL OF THE MUNICIPALITY OF BOTANY was hereunto affixed in pursuance of a Resolution made the 9th day of October 1974 in the presence of:

.....
Mayor

.....
Town Clerk

~~SIGNED SEALED AND DELIVERED~~

or by reason of the Council and the Commissioner having entered into this Deed or having approved or directed or assented to anything done or purported to be done by the Company under this Deed AND that in respect of any matter covered by this indemnity the Council and the Commissioner shall be at liberty to pay satisfy defend compromise or settle any claim action or other proceedings which may be made threatened instituted commenced or prosecuted against the Council of the Commissioner and any amount paid by the Council of the Commissioner in accordance with this clause shall be repaid to it or him by the Company PROVIDED ALWAYS that immediately any claim is received by the Council or the Commissioner and before it or her shall take any action in regard thereto the Council of the Commissioner as the case may be receiving such claim shall advise the Company of full details of such claim and not settle or compromise the same without the consent of the Company and if the Company shall so design the Council and the Commissioner will upon being required so to do and at the expense of the Company reject oppose and defend any such claim action or proceeding AND THE COMPANY hereby waives any claim or redress of any kind which it may have by virtue of damage to the pipeline by the Council's servants or agents in the performance of work in or upon the Council's drains pipelines channels and roads AND THE COMPANY further waives any claims or redress or any kind which it may have against the Commissioner or the Department of Main Roads by virtue of damage to the pipeline by persons or vehicles using General Holmes Drive and acknowledges that the Commissioner and the Department of Main Roads are absolved from any responsibility in respect thereof PROVIDED ALWAYS that nothing in the foregoing shall exclude the Company from claiming or seeking redress in respect of damage to the pipeline caused by the negligent acts of the Council's servants the Commissioner or the Department of Main Roads (as the case may be.

to the Company in writing specifying a reasonable time within which to comply with such requirements;

(b) obtain from its contractors the names and telephone numbers of two persons who shall be available outside normal hours of business to attend to any direction of Council's Chief Engineer in respect of matters arising from the construction work provision of safety devices or other matters and shall make the names and telephone numbers available to the Council's Engineering Department and to the Mascot Police prior to the commencement of the work;

(c) comply with the provisions of the Main Roads Act, 1924 (as amended), the Local Government Act, 1919 (as amended and Ordinances thereunder and all relevant legislation and any conditions or requirements thereby imposed or made.

11. WHENEVER the Council or the Commissioner does any work under this Deed the costs whereof are payable by the Company, a Certificate of the Town Clerk for the Council or the Secretary for the time being of the Department for Main Roads shall be final and conclusive as to the cost of any such work and the Council or the Commissioner will provide the Company with full details of any such costs with such Certificate.

12. IF the Company shall commit any breach of the covenants or conditions contained in this deed and on its part to be observed and performed it shall be lawful for the Council or the Commissione immediately thereupon to determine the permission hereby granted by notice in writing to the Company.

13. THE COMPANY will at all times indemnify and keep indemnified the Council and the Commissioner against all actions suits proceedings losses costs damages charges claims and demands in any way arising out of or by reason of anything done or omitted to be done by the Company in respect of the construction renewal repair and maintenance ofthe pipeline or of the existence or use thereof or

THE COMPANY AGREES that the Commissioner or the Council may carry out the work of renewal and reinstatement and make good all damage done to the roads hereinbefore mentioned at the expense of the company.

8. THE COMPANY shall during the construction of the pipeline chart all services encountered in their correct position and on completion of the work shall furnish to the Council a survey work-as-executed plan showing:

(a) the location of the pipeline stops valves and other relevant items by offsets from permanent marks such as bolts set in the kerb or other approved means;

(b) the reduced levels of the pipeline and its relationship to the surface at each boundary and on the centreline of the road and at any change in conver; and

(c) the location of all services adjacent to or crossed by the pipeline.

9. THE COMPANY shall notify the Police Traffic Branch, the Department of Main Roads and the Council in respect of all road openings necessary to permit the replacements or repairs to the pipeline and shall pay the requisite road opening fees and restoration charges provided that in the case of an emergency the Company shall comply with the provisions of this Clause at the earliest possible time thereafter but shall advise the Police Traffic Branch immediately ofany works which may interfere with traffic.

10. THE COMPANY shall:

(a) maintain and at all times keep the work in a proper state of repair to the satisfaction of the Council and the Commissioner and to observe and carry out all reasonable requirements of the Council and of the Commissioner in connection with the location construction renewal or repair of the work which requirements shall be communicated

dollars ($50.00) for the services rendered by the Council's Engineering staff in supervising the construction of that section of the pipeline which is the subject of the present agreement to ensure that it complies with the terms of the within agreement AND the Company HEREBY ACKNOWLEDGES THAT the said supervision relates to its performance of the terms of the within agreement and the protection of the Council's work and does not extend to the supervision of labour or materials used in the construction of the said pipeline which are the responsibility of the Company its agents and servants AND THAT the said supervision in no way relieves it of any of its obligations under the within agreement.

5. THE COMPANY shall alter the levels of the pipeline and modify and shift the same at its own expense should the Council and the Commissioner at any time require the pipeline in their roads or adjacent to their works to be so altered modified or shifted.

6. IF by reason of any work which the Council or the Commissioner desires to carry out it shall be necessary in the opinion of the Council or of the Commissioner to relocate any portion of the work or carry out any additional work for the safety and protection of the public the Company shall at its own expense relocate or carry out such additional work as shall be necessary and shall pay to the Council or the Commissioner as the case may be any additional cost or expenditure caused to the Council or the Commissioner by reason of the existence of the pipeline.

7. THE COMPANY shall remove or relocate the pipes and reinstate the surface to the satisfaction of the Commissioner his servants or agents and the Council within six (6) months from the receipt of a notification in writing from the Commissioner or the Council requiring the removal and reinstatement to be effected or within three (3) months from the expiration of the term of the within agreement including any renewed term PROVIDED THAT in the event of failure by the Company to effect the said removal and reinstatement after being so required by the Commissioner or the Council

liquid fuel for jet aircraft from the existing terminal of the Company at Botany Road, Banksmeadow within the Municipality of Botany to the Joint User Hydrant Installation and other installations at Sydney Airport AND for the purpose to pass under General Holmes Drive AND to retain maintain and operate the same for a period of twenty (20) years from the first day of July One thousand nine hundred and seventy four.

2. THE COUNCIL shall make an annual charge in respect of that portion of the pipeline which passes under General Holmes Drive in accordance with the provisions of Section 171 of the Local Government Act, 1919 (as amended) and any other statutory power it thereunto enabling in respect of all pipelines laid in or under a public road the said charge at the date hereof being fixed at fifteen cents (15¢) per lineal foot with a minimum charge of Twenty five dollars ($25.00).

3. THE COMPANY shall pay to the Council prior to the commencement of the work a deposit of seven thousand five hundred dollars ($7,500.00) being a sum determined jointly by the Council and the Department of Main Roads which sum shall be held by the Council in trust as security for damage to pavements surfaces pipelines channels drains and any services of the Council resulting from the construction of the pipeline and which sum is the same amount provided for in two deeds of even date made between the parties hereto and not an amount in addition thereto AND the Council shall be at liberty to apply the whole or part of the said deposit to the cost of restoration and reinstatement of any of the said pavements surfaces pipelines channels drains and services damaged during the construction and shall return the unexpended moneys to the Company on completion of the work BUT in the event that the cost of restoration and reinstatement shall exceed the deposit held by the Council the Company HEREBY UNDERTAKES to reimburse the Council for the deficiency.

4. THE COMPANY shall pay to the Council in pursuance of Section 167 of the Local Government Act, 1919 (as amended) a fee of fifty

L.O 667.6 "A"

3

THIS DEED made the [illegible] day of May One thousand nine hundred and seventy four BETWEEN CALTEX OIL (AUSTRALIA) PTY LIMITED a Company incorporated in the State of New South Wales and having its registered office at Caltex House 167-187 Kent Street, Sydney in the said State (herein called "the Company") of the first part THE COUNCIL OF THE MUNICIPALITY OF BOTANY of Council Chambers, Mascot in the said State (herein called "the Council") of the second part AND THE COMMISSIONER FOR MAIN ROADS (herein called "the Commissioner") of the third part WHEREAS the Company has applied to the Council for permissio to lay construct and operate an eight inch (8") steel pipeline for the conveyance of liquid fuel for jet aircraft from the existing terminal of the Company at Botany Road, Banksmeadow within the Municipality of Botany to the Joint User Hydrant Installation and other installations at Sydney Airport and for this purpose to pass under General Holmes Drive AND WHEREAS General Holmes Drive is a Proclaimed Main Road vested in the Council and controlled by the Department of Main Roads AND WHEREAS the Company has produced to the Council letters from the Postmaster-General's Department, the New South Wales Department of Labour and Industry, the New South Wales Department of Mines, the Electricity Commission of New South Wales, the Electricity Authority of New South Wales (Sydney Electrolysis Technical Sub-Committee), the Police Traffic Branch, the Metropolitan Water Sewerage and Drainage Board, the Sydney County Council and the Australian Gas Light Company indicating the concurrence of those bodies and giving details of their conditions of approval (if any) AND WHEREAS the Company has further produced to the Council evidence of the approval of the Department of Main Roads in respect of the crossing of General Holmes Drive NOW THIS DEED WITNESSETH THAT:

1. THE COUNCIL with the consent of the Commissioner in pursuance of its powers under Section 421 of the Local Government Act, 1919 (as amended) and all other powers it thereunto lawfully enabling GRANTS to the Company and its successors permission to lay constr and operate an eight inch (8") steel pipeline for the conveyanc

NEW SOUTH WALES $ 06.00 STAMP DUTY

366354

THE COMMON SEAL of **CALTEX** AUSTRALIA ↑)
PETROLEUM PTY LIMITED (ACN)
000 032 128) was hereunto affixed)
by authority of the Board in the)
presence of:)

S. Hegarty
.....
Director

.....
Secretary

18. The pipeline and all apparatus or works (as defined under the Pipelines Act, 1967) shall at all times remain the property of the Company notwithstanding that they may be built in or otherwise affixed to the soil.

IN WITNESS WHEREOF the parties have hereunto set their hands and affixed their seals the day and year first hereinbefore written.

THE COMMON SEAL of **THE CITY OF BOTANY BAY COUNCIL** was hereunto duly affixed pursuant to a resolution of Council passed on the 27th day of April, 1994 before me:)

.....
Mayor

.....
General Manager

THE COMMON SEAL of **THE ROADS AND TRAFFIC AUTHORITY** was hereunto affixed by authority of the Board in the presence of:)

.....
Director

.....
Secretary

MANAGER PROPERTY SERVICES
Executed pursuant to
Delegation Book 4238 No 360

WITNESS:
ROAD CORRIDORS MANAGER

Company from any Council, from the Roads and Traffic Authority or from the Minister for the time being administering the Crown Lands Acts, or from the owner or trustee of any other lands through which the Company's pipeline between the Company's terminal at Banksmeadow and the Joint User Hydrant Installation within Sydney Airport is laid, is terminated or ceases for any reason, or if the provisions of the Pipelines Act, 1967 as amended from time to time apply to the Company's pipeline.

16. The Council may determine this agreement by notice to the Company in the event that the Company commits any breach of the provisions herein to be performed by it and if such breach is capable of remedy the Company has failed to remedy such breach within a reasonable time after the Council has served a notice on the Company specifying the breach and the action to be taken by the Company to remedy the breach.

17. The Company shall not carry out any work on the pipeline which may affect General Holmes Drive or Foreshore Road without first obtaining the written approval of the Authority, such approval not to be unreasonably withheld, and shall during the carrying out of work comply with all appropriate statutory provisions and any direction of the Authority its servants or agents with respect to the management of traffic **PROVIDED THAT** in the event of an emergency which necessitates the immediate carrying out of work on the pipeline then the Company may execute such work without having previously obtained the approval of the Authority and in such case shall as soon as possible notify the Authority's Sydney Traffic Control Centre of the occurrence of such emergency and of any work done on a pipeline and/or General Holmes Drive and Foreshore Road as a result of such emergency. The address for the Sydney Traffic Control Centre is:

Level 1, 1 Oxford Street, Darlinghurst NSW 2010
Telephone: 9211 3000
Fax: 9283 4262.

negligent acts, omissions or default of the Council or the Authority or any officer, servant or agent of the Council or the Authority) in any way arising out of or by reason of anything done or omitted to be done by the Company in respect of the retention, renewal, repair and maintenance of the pipeline or of the existence or use thereof or by reason of the Council or the Authority having entered into this Deed or having approved or directed or assented to anything done or purported to be done by the Company under this Deed such Policy to be in the sum of not less than $10,000,000.00 and the Company shall produce at any time when required by the Council or the Authority the last renewal receipt for payment of the premiums thereon.

12. Any notice required to be given to or served upon any of the parties hereto shall be in writing and either delivered to or sent by prepaid post to the party concerned at the address hereinafter mentioned and if sent by post shall be deemed to have been delivered on the day following the posting thereof. In the case of the Council the address shall be its Council Chambers or place of business for the time being, in the case of the Company the address shall be its principal office in New South Wales and in the case of the Authority the address shall be its place of head office for the time being.

13. The Company shall comply with the provisions of the Roads Act, 1993 and the Local Government Act, 1993 and Regulations thereunder and all relevant legislation and any conditions or requirements thereby imposed or made as they apply to the pipeline and to the extent that they are not modified by this Deed. The Company acknowledges that the consent given in accordance with Division 3 of the Roads Act, 1993 may be revoked in accordance with the provisions of Section 140 of the Roads Act, 1993.

14. The Company shall pay the Council's and the Authority's reasonable legal costs of and incidental to the preparation of this Deed.

15. The Company may by notice to the Council terminate this Agreement if any permission, easement, licence or authority which may have been obtained by the

10. The Company will at all times indemnify and keep indemnified the Council and the Authority against all action, suits, proceedings, losses, costs, damages, charges, claims and demands (excluding those arising out of the negligent acts, omissions or default of the Council or the Authority or any officer, servant or agent of the Council or the Authority) in any way arising out of or by reason of anything done or omitted to be done by the Company in respect of the retention, renewal, repair and maintenance of the pipeline or of the existence or use thereof or by reason of the Council or the Authority having entered into this Deed or having approved or directed or assented to anything done or purported to be done by the Company under this Deed **AND** that in respect of any matter covered by this indemnity the Council and the Authority shall be at liberty to pay, satisfy, defend, compromise or settle any claim, action or other proceedings which may be made, threatened, instituted, commenced or prosecuted against the Council or the Authority and any amount paid by the Council or the Authority in accordance with this clause shall be repaid to them by the Company **PROVIDED ALWAYS** that immediately any claim is received by the Council or the Authority and before they shall take any action in regard thereto they shall advise the Company of full details of such claim and not settle or compromise the same without the consent of the Company and if the Company shall so desire the Council and the Authority will upon being requested so to do and at the expense of the Company reject, oppose and defend any such claim, action or proceeding **AND THE COMPANY** hereby waives any claim or redress of any kind which it may have by virtue of damage to the pipeline by the Council's servants or agents in the performance of work in or upon the Council's drains, pipelines, channels and roads **PROVIDED ALWAYS** that nothing in the foregoing shall exclude the Company from claiming or seeking redress in respect of damage to the pipeline caused by the negligence of the Council's servants.

11. The Company shall take out a public risk insurance policy with a reputable insurance office approved by the Council and the Authority in the names of the Company, the Council and the Authority insuring them against all actions, suits, proceedings, losses, costs, damages, charges, claims and demands (excluding those arising out of the

5. The Company shall ensure that any trench dug in connection with repair or replacement of the pipeline shall be back filled to the complete satisfaction of the Authority and of the Council and in this respect all trenches shall be back filled with clean sand and compacted at optimum moisture content with a mechanical rammer or similar.

6. The Company shall at its own expense alter the levels of the pipeline and modify and shift the same should the Council or the Authority at any time so require for the purpose of executing works within General Holmes Drive or Foreshore Road.

7. The Company shall remove or relocate the pipes and reinstate the surfaces to the satisfaction of Council's Director of Engineering and the Authority within 6 months from the expiration of the term of the within agreement including any renewed term **PROVIDED THAT** in the event of failure by the Company to effect the said removal and reinstatement after be so required by the Council or the Authority **THE COMPANY AGREES** that the Council or the Authority may carry out the work of renewal and reinstatement and make good all damage done to the roads hereinbefore mentioned at the expense of the Company.

8. This Agreement shall run concurrently with two Agreements each made on 7th October, 1998 between Ampol Petroleum Pty Limited (ACN 000 007 876) (now Caltex Petroleum Pty Limited (ACN 000 007 876)) of the one part and the Council of the other part in respect of the retention, maintenance and operation of the pipeline hereinbefore referred to.

9. The Company shall provide to Council and the Authority forthwith upon the execution of this Agreement the names and telephone numbers of two persons who shall be available outside normal hours of business to attend to any direction of the Council's Director of Engineering or of the Authority in respect of matters arising from the use, repair, replacement or operation of the pipeline.

granting of such permission.

NOW THIS DEED WITNESSETH THAT:

1. The Council with the consent of the Authority as evidenced by its execution of this Deed and in pursuance of its powers under Section 138 of the Roads Act, 1993 and all other powers it thereunto lawfully enabling hereby grants to the Company and its successors permission to retain, maintain and operate the pipeline beneath General Holmes Drive and Foreshore Road for a period of twenty (20) years from the 1st July, 1994 and at any time to remove the whole or any part of it and if the Company so requires to replace the whole or any part of it.

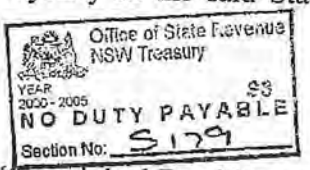
2. The Company shall pay to the Council an annual charge to be levied by the Council in respect of that portion of the pipeline which passes under General Holmes Drive and Foreshore Road in accordance with the provisions of Section 611 of the Local Government Act, 1993 and any other statutory power it thereunto enabling in respect of all pipelines laid in or under a public road the said Charge being fixed for the first year commencing 1 July, 1994 at $8.20 per lineal metre.

3. The Company shall be responsible for maintaining the pipeline in good and sufficient repair and the Company shall notify the Council and the Authority in advance and pay the requisite road opening fees and restoration charges in respect of all road openings required to permit replacements or repairs to the pipeline provided that in the case of an emergency the Company shall comply with the provisions of this Clause at the earliest possible time thereafter.

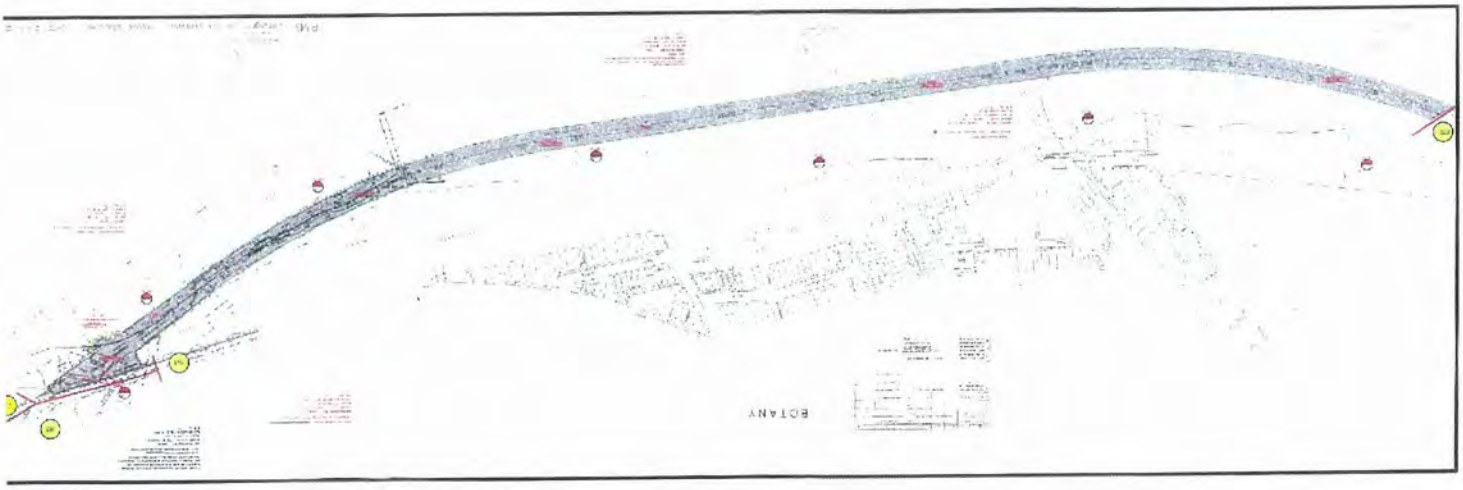
4. The Company shall supply adequate warning devices, barriers and signs to protect the public in accordance with the provisions of Australian Standard 1742.3 - 1985 (or any Standard replacing same from time to time) when undertaking any repair or replacement works in connection with the pipeline and shall ensure that provision shall be made for the safe passage of pedestrians over any trench.

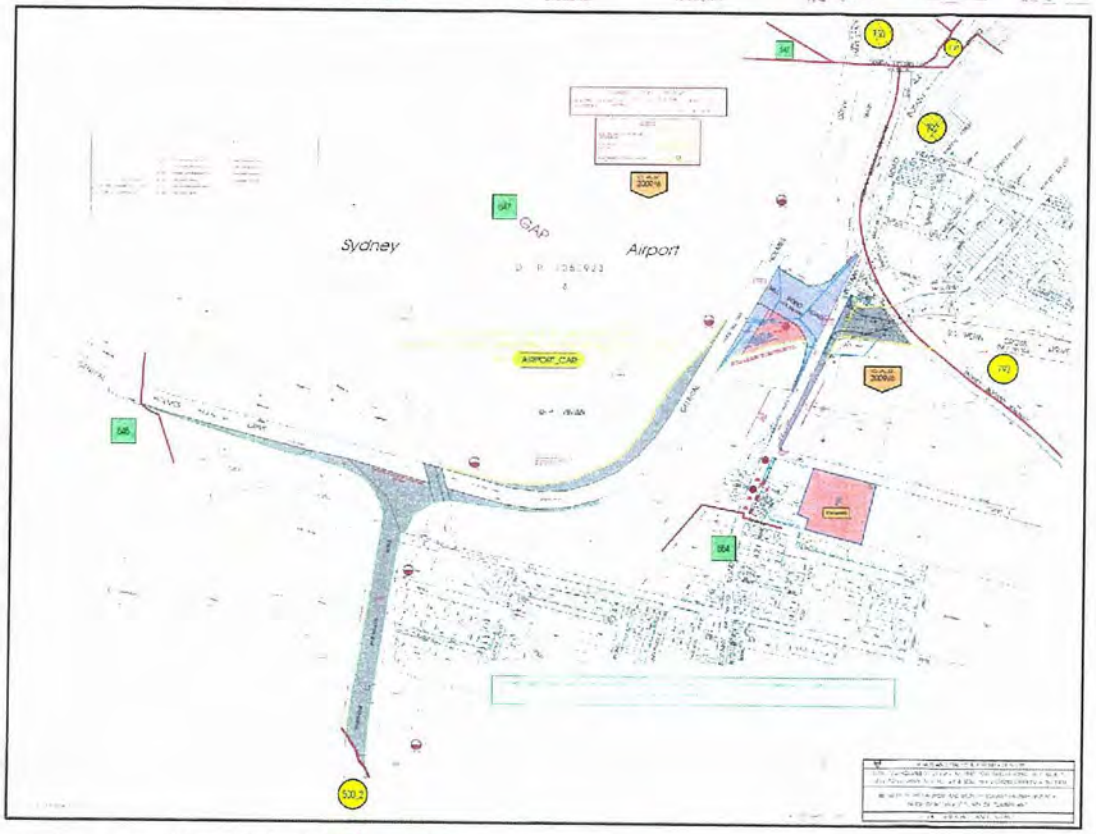
THIS DEED made the 29th day of JANUARY, 2003

BETWEEN THE CITY OF BOTANY BAY COUNCIL of Council Chambers, Coward Street, Mascot in the State of New South Wales (hereinafter called "the Council") of the first part **AND THE ROADS AND TRAFFIC AUTHORITY** (hereinafter called "the Authority") of the second part **AND CALTEX AUSTRALIA PETROLEUM PTY LIMITED** (ACN 000 032 128) a Company incorporated in the State of New South Wales and having its principal office in Sydney at Level 12, MLC Centre, 19-29 Martin Place, Sydney in the said State (hereinafter called "the Company") of the third part.



WHEREAS by Deed dated the 23rd May, 1975 (hereinafter called "the original Deed") a true copy of which is annexed hereto and marked "A" the Council with the approval and concurrence of the Commissioner of Main Roads granted permission to Caltex Oil (Australia) Pty Limited ("Caltex Oil") to lay, construct and operate a 203 millimetre steel pipeline for the conveyance of liquid fuel for jet aircraft from the existing terminal of Caltex Oil at Botany Road, Banksmeadow within the Botany Council area to the Joint User Hydrant Installation and other installations at Sydney Airport and for this purpose to pass, inter alia, under General Holmes Drive as more particularly shown on the copy of Reference Drawing B20056 which is annexed and marked "B" and the drawings then produced to the Council by Caltex Oil **AND** to retain, maintain and operate the same for a period of twenty (20) years from the 1st July, 1974 **AND WHEREAS** General Holmes Drive is a classified main road vested in Fee Simple in the Council and controlled by the Authority **AND WHEREAS** the permission granted to Caltex Oil pursuant to the original Deed expired on the 30th of June, 1994 **AND WHEREAS** the pipeline passes under Foreshore Road, a classified main road vested in Fee Simple in the Council and controlled by the Authority, which was constructed after execution of the original Deed **AND WHEREAS** Caltex Oil (Australia) Pty Limited (ACN 000 007 876) changed its name to Ampol Petroleum Pty Limited (ACN 000 007 876) a wholly owned subsidiary of the Company and Ampol Petroleum Pty Limited (ACN 000 007 876) changed its name to Caltex Petroleum Pty Limited (ACN 000 007 876) **AND WHEREAS** the Company has applied to the Council for permission to retain, maintain and operate the said pipeline for a further period of twenty (20) years from the 1st July, 1994 **AND WHEREAS** the Council has agreed to grant such permission and the Authority has concurred in the


BOTANY



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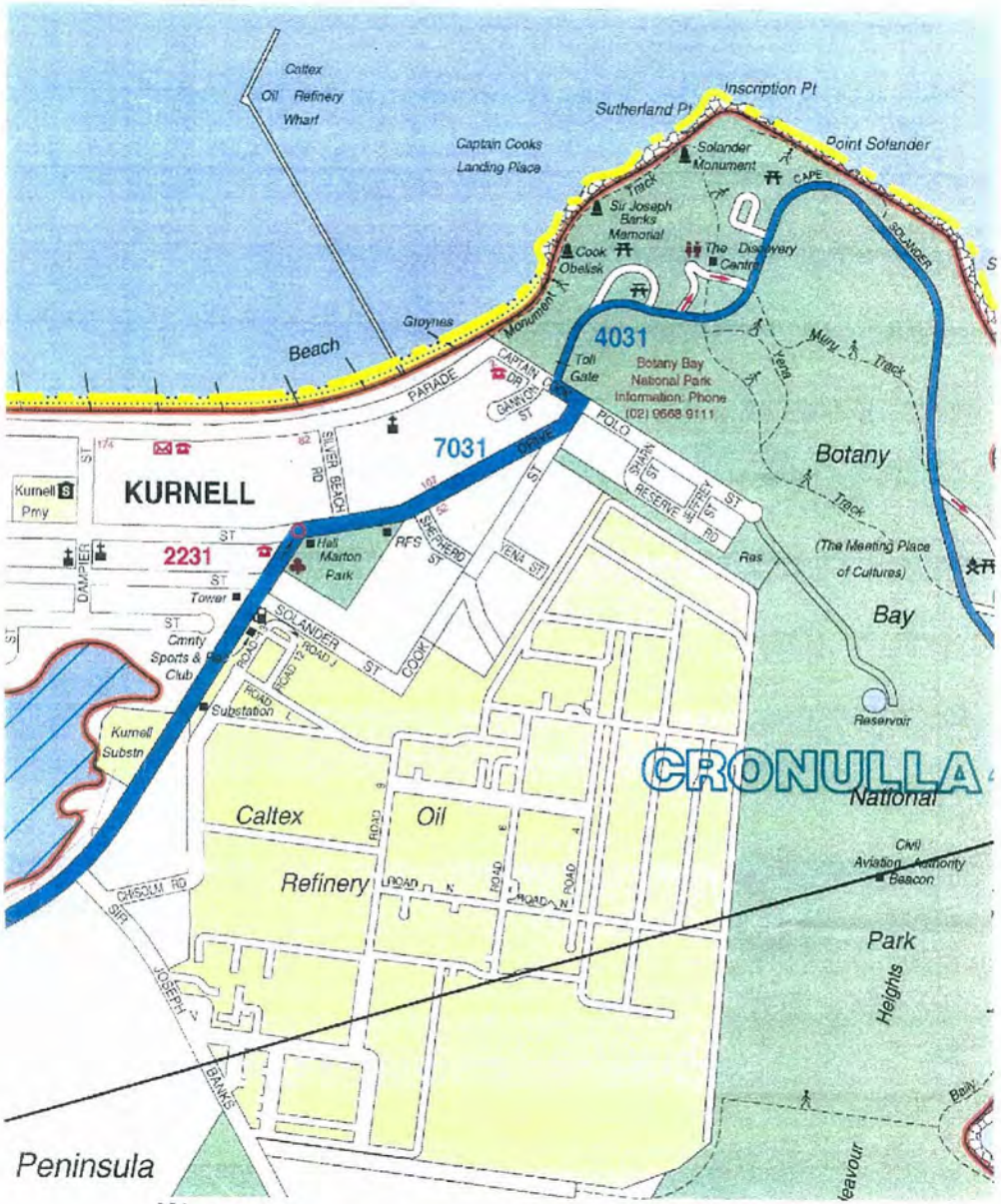

2 June 2011

Director General
Department of Planning and Infrastructure
GPO Box 39
Sydney NSW 2001

Dear Sir

Caltex Jet Fuel Pipeline Upgrade Project

Sydney Airport Corporation Limited
ABN 62 082 578 809

Locked Bag 5000
Sydney International
Airport NSW 2020

The Ulm Building
1 Link Road
Sydney International
Airport NSW 2020
Australia

Telephone:
61 2 9667 9111
www.sydneyairport.com

Sydney Airport Corporation Limited (SACL) is the airport-lessee company for Sydney Airport and, as such, is primarily responsible for managing operations at the airport as a whole, and ensuring the effective delivery and coordination of airport-related services and facilities and on-site utilities.

Caltex Refineries (NSW) Pty Ltd is seeking approval to undertake some upgrade works to their existing infrastructure associated with the supply of jet fuel to Sydney Airport. The proposal includes:

- the installation of new pumps on the Caltex Refinery site at Kurnell;
- replacement of around 1.5km of existing piping from the refinery boundary to the Caltex wharf on the southern side of Botany Bay; and
- the installation of new booster pumps, piping modifications and electrical switch room within Caltex's Banksmeadow terminal.

SACL supports the Caltex proposal because it is essential to upgrade the reliability and supply of jet fuel to Sydney Airport.

Aviation activity at Sydney Airport

Sydney Airport is Australia's major gateway to the world. Servicing 44 airlines and with 43% of all Australia's international airline passengers arriving in Sydney, it is our nation's busiest airport. In 2010, Sydney Airport saw 35.6 million passengers pass through its terminals (an average of nearly 100,000 per day), accommodated 309,000 aircraft movements and handled 656,000 tonnes of air freight. As outlined in the approved Sydney Airport Master Plan 2009, this level of aviation activity is forecast to grow as follows:

- passengers by 4.2% per year to 78.9 million in 2029;
- aircraft movements by 2% per year to 427,400 in 2029; and
- air freight by 3.8% per year to 1,077,000 tonnes in 2029.[1]

[1] *Sydney Airport Master Plan 2009*, Chapter 5.

The economic significance of Sydney Airport

The significant and growing level of aviation activity underpins Sydney Airport's role as an employer and economic driver of state and national importance. Sydney Airport today makes a direct contribution of $8 billion to NSW Gross State Product. With flow–on impacts taken into account, the airport's economic contribution increases to $16.5 billion and is forecast to rise to more than $27 billion by 2015/16. This is equivalent to 6% of the NSW economy and 2% of the Australian economy.

This substantial economic contribution translates into well paid jobs. It is estimated that Sydney Airport provides or generates more than 75,000 jobs directly and about 131,000 jobs indirectly, making a total of around 206,000 jobs. As a result of the forecast growth in the airport's economic contribution outlined above, the total number of jobs provided or generated by Sydney Airport is expected to rise to more than 338,000 by 2015/16.

The importance of maintaining an efficient jet fuel supply

Maintaining a competitive and efficient fuel supply to Sydney Airport will be critical to ensure the abovementioned economic value of the airport to the Australian economy is maximised.

The Sydney Jet Fuel Infrastructure Working Group was established by the Minister for Tourism, the Hon Martin Ferguson AM MP, to investigate the current and projected fuel supply situation at Sydney Airport and to make recommendations on actions that could be undertaken to provide for the effective provision of jet fuel at Sydney Airport in the short, medium and long term. The Working Group's final report was released by Minister Ferguson on 8 June 2010. It can be downloaded from the Department of Energy, Resources and Tourism website at:
http://www.ret.gov.au/resources/fuels/petroleum_refining_and_retail/jetfuel/Pages/JetFuelInfrastructure.aspx

As shown in the table below, the Working Group found that the annual jet fuel demand at Sydney Airport is projected to increase from 2,450 million litres (ML) to 5,644 ML in 2029. While the average annual growth rate to 2029 was projected to be 4.2% per annum, it should be noted that a much sharper growth rate of 7.2% was projected over the five year period to 2014.

	2014	2019	2024	2029
Estimated annual demand (ML)	3472	3926	4864	5644
Estimated net additional jet fuel imports (ML)	1022	1476	2414	3194
Estimated daily demand (ML/day)	9.51	10.76	13.33	15.46
Projected 'busy' day demand (ML/day)	10.45	11.82	14.25	16.30

This growth is largely attributable to an increase in larger, more fuel efficient aircraft (such as the A380) entering the fleet which require more fuel to complete longer flights. To secure the benefits of the A380, Sydney Airport invested $128 million in new and upgraded infrastructure. In just three years, Sydney Airport has become one of the most A380 intensive airports in the world. By 2029, there are forecast to be 93 X A380 movements per day – more than a third of all daily movements by major aircraft types.

The Working Group also modelled daily jet fuel demand (including 'busy' day and intra-day jet fuel demand) to understand the maximum short-term requirements on the supply, storage and hydrant system and assess the adequacy of the existing infrastructure to meet projected demand.

The Working Group considered a number of potential infrastructure options to meet projected fuel demand at Sydney Airport in the short, medium and long term, one of which was the second phase upgrade of the Caltex pipeline, the subject of this application. In fact, in its Report, the Working Group welcomed the decision of Caltex's board to proceed with this project which, at the time, was expected to be completed by late 2011.

SACL commends this important project to the Department of Planning and Infrastructure.

Yours sincerely

Rod Gilmour
General Manager
Corporate Affairs, Planning & HR

Political Donations Disclosure Statement to Minister or the Director-General

If you are required under section 147(3) of the Environmental Planning and Assessment Act 1979 *to disclose any political donations (see Page 1 for details), please fill in this form and sign below.*

Disclosure statement details

Name of person making this disclosure: EDWIN ROY PLUMMER / SYDNEY AIRPORT CORPORATION

Planning application reference (e.g. DA number, planning application title or reference, property address or other description): MP 11_0004

Your interest in the planning application (circle relevant option below)

You are the APPLICANT YES / NO OR You are a PERSON MAKING A SUBMISSION IN RELATION TO AN APPLICATION (YES) / NO

Reportable political donations made by person making this declaration or by other relevant persons

* *State below any reportable political donations* ***you have made*** *over the 'relevant period' (see glossary on page 2). If the donation was made by an entity (and not by you as an individual) include the Australian Business Number (ABN).*

* *If you are the* ***applicant*** *of a relevant planning application state below any reportable political donations that you know, or ought reasonably to know, were made by any persons with a financial interest in the planning application, OR*

* *If you are a* ***person making a submission*** *in relation to an application, state below any reportable political donations that you know, or ought reasonably to know, were made by an associate.*

Name of donor (or ABN if an entity)	Donor's residential address or entity's registered address or other official office of the donor	Name of party or person for whose benefit the donation was made	Date donation made	Amount/ value of donation
SYDNEY AIRPORT CORPORATION LTD	1 LINK RD, SYDNEY INTER-NATIONAL AIRPORT NSW 2020	LIBERAL PARTY (NSW DIVISION)	13/5/11	3000.00
"	"	"	7/3/11	$120.00
"	"	MEMBER FOR MARRICKVILLE	29/11/10	$500.00
"	"	MILLENNIUM FORUM	22/12/10	$550.00

Please list all reportable political donations—additional space is provided overleaf if required.

By signing below, I/~~we~~ hereby declare that all information contained within this statement is accurate at the time of signing.

Signature(s) and Date: Ted Plummer 3/6/11

Name(s): TED PLUMMER

Cont...

Political Donations Disclosure Statement to Minister or the Director-General

Name of donor (or ABN if an entity)	Donor's residential address or entity's registered address or other official office of the donor	Name of party or person for whose benefit the donation was made	Date donation made	Amount/ value of donation
SYDNEY AIRPORT CORPORATION LTD	1 LINK RD, SYDNEY INTER-NATIONAL AIRPORT NSW 2020	MILLENIUM FORUM	23/12/10	$6000.00
"	"	"	20/12/10	$17,600.00
"	"	MEMBER FOR WILLOUGHBY	7/7/10	$1,000.00
"	"	MEMBER FOR COOK	5/7/10	$1,100.00
"	"	LIBERAL PARTY (NSW DIVISION)	5/7/10	$1000.00
"	"	MEMBER FOR WILLOUGHBY	9/7/10	$1,000.00
"	"	MILLENIUM FORUM	12/7/10	$1,000.00
"	"	LIBERAL PARTY (NSW DIVISION)	28/8/09	$4,000.00
"	"	"	11/8/10	$1,000.00
"	"	ALP (NSW) ROBERTSON FEZ	11/8/10	$1,000.00

Cont...

Political Donations Disclosure Statement to Minister or the Director-General

Name of donor (or ABN if an entity)	Donor's residential address or entity's registered address or other official office of the donor	Name of party or person for whose benefit the donation was made	Date donation made	Amount/ value of donation
SYDNEY AIRPORT CORPORATION LTD.	1 LINK RD, SYDNEY INTERNATIONAL AIRPORT NSW 2020	MEMBER FOR GRAYNDLER	16/8/10	$1700.00
"	"	LIBERAL PARTY (NSW DIVISION)	9/9/10	$5,000.00
"	"	"	26/10/10	$1,000.00
"	"	"	22/11/10	$450.00
"	"	MILLENIUM FORUM	24/11/10	$17,600.00
"	"	MARRICKVILLE ALP CAMPAIGN	2/12/10	$500.00
"	"	LIBERAL PARTY (NSW DIVISION)	2/12/10	$750.00
"	"	MILLENIUM FORUM	6/12/10	$550.00
"	"	LIBERAL PARTY (NSW DIVISION)	17/12/10	$5000.00

Cont...

Political Donations Disclosure Statement to Minister or the Director-General

Name of donor (or ABN if an entity)	Donor's residential address or entity's registered address or other official office of the donor	Name of party or person for whose benefit the donation was made	Date donation made	Amount/ value of donation
SYDNEY AIRPORT CORPORATION LTD.	1 LINK RD, SYDNEY INTERNATIONAL AIRPORT NSW 2020	ALP (NSW)	15/6/09	$1,200.00
"	"	"	"	$400.00
"	"	"	"	$1090.91
"	"	MEMBER FOR GRAYNDLER	2/11/09	$2100.00
"	"	ALP (NSW)	23/7/09	$2,500.00
"	"	"	3/9/09	$400.00
"	"	"	27/10/09	$650.00
"	"	Liberal (NSW Division)	28/8/09	$4000.00
"	"	"	11/1/10	$550.00
"	"	"	15/1/10	$360.00

Cont...

Political Donations Disclosure Statement to Minister or the Director-General

Name of donor (or ABN if an entity)	Donor's residential address or entity's registered address or other official office of the donor	Name of party or person for whose benefit the donation was made	Date donation made	Amount/ value of donation
SYDNEY AIRPORT CORPORATION LTD	1 LINK RD, SYDNEY INTERNATIONAL AIRPORT NSW 2020	LIBERAL (NSW Division)	9/3/10	$1000.00
"	"	"	3/2/10	$3,000.00
"	"	"	26/3/10	$1,000.00
"	"	"	27/3/10	$1,500.00
"	"	"	20/5/10	$11,000.00
"	"	ALP (NSW Branch)	14/1/10	$100.00
"	"	"	6/5/10	$250.00
"	"	"	7/5/10	$22,000.00
"	"	"	17/5/10	$1,100.00
"	"	LIBERAL (NSW)	10/6/10	$1,300.00

C

Appendix C Hazards and Risk Assessment (PHA and Addendums)

C.1 Preliminary Hazards Analysis (PHA)

PRELIMINARY HAZARD ANALYSIS OF THE PROPOSED CALTEX JET FUEL UPGRADE PROJECT

Prepared for: URS Australia Limited

Document Number: URS\19-B273

Revision C2

Prepared by: Karin Nilsson

7 March 2011

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Preliminary Hazard Analysis of the Proposed Caltex Jet Fuel Upgrade Project

Acknowledgment

The author would like to thank Helen Bachas and Alan Parnell (ICD Asia Pacific) and Will Miles (URS Australia) for their assistance in preparing this report.

Disclaimer

Rev	Date	Description	Prepared By	Reviewed By	Authorised By
A	28/02/2011	Draft for Comment	Karin Nilsson	Maarten Tentij	Karin Nilsson
B	01/03/2011	2nd Draft for Comment	Karin Nilsson	Maarten Tentij	Karin Nilsson
C	04/03/2011	Final Report	Karin Nilsson	Maarten Tentij	Will Miles
C2	07/03/2011	Final Report with minor typos corrected	Karin Nilsson	Maarten Tentij	Will Miles

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EXECUTIVE SUMMARY

E1 Introduction

In order to increase the available capacity of the pipeline providing jet fuel from Kurnell Refinery to the Joint User Hydrant Installation Facility at Sydney Airport, it is proposed to install new pumps at the refinery and at Banksmeadow Terminal.

A Preliminary Hazard Analysis (PHA), in accordance with the NSW Department of Planning Director-General's Requirements (DGRs) for the proposed upgrade project, has been prepared by Planager Pty Ltd for inclusion in the Environment Assessment. The results are summarised in this report.

The following risks are assessed as part of the PHA:

- Risk from flammable material.
- Environmental risk from spills.

The main features of the proposed upgrade project include:

- Caltex Kurnell Refinery:
  - Installation of new transfer pumps and coalescers.
  - Installation of a new pigging station (to replace the one at the wharf);
- Banksmeadow terminal: Installation of new booster pumps and valves, upgrade and modification of the existing pigging stations and the installation of power supply equipment;
- KBL Pipeline: Installation of new pipeline from Kurnell Refinery to halfway along the Kurnell wharf, located within the existing easement. The old pipeline would be decommissioned but not removed. Installation of a new pigging station installed within the refinery to more effectively monitor the KBL and reduce environmental risks.

The aim of the PHA is to:

- Provide an assessment of the hazards and risks associated with the proposed upgrade project;
- Determine the incremental change (increase or decrease) in the risk levels associated with the transfer of petroleum products in the pipeline;
- Compare the resulting risk levels with the NSW Department of Planning's risk criteria for maximum tolerable risk of fatality, injury and propagation.

E2 Results

The main hazard associated with the proposed project is associated with the handling of jet fuel which is a flammable liquid at atmospheric conditions.

The predominant mode in which a hazardous incident may be generated is associated with a leak. This would generally only have the potential to cause injury or damage if there was ignition, which resulted in a fire or explosion incident. If the leak was not adequately contained and the jet fuel was allowed to enter the natural environment, an unignited release would be a threat to the biophysical environment

The risk assessment showed that the net result of the proposed upgrade project is an overall reduction in the risk associated with the KBL. This is due to:

- An increased ability to check the pipeline for any small reduction in it's integrity before it becomes an issue; and
- The relocation of the pigging station from the wharf to the refinery, a location which can be contained in case of any spills or leaks.

The slight increase in risk associated with the more complex operational procedures required to transfer jet fuel at different rates to different customers is managed through the installation of hardware and software features.

The increase in maximum operational pressure in the KBL is not believed to substantially increasing the risk associated with this pipeline. This is because the design pressure and Maximum Allowable Operational Pressure (MAOP) for the KBL exceeds the proposed operating pressure. Further, the pressure trips and alarms would also contribute to the management of this risk.

The risk associated with the Kurnell Refinery and the Banksmeadow Terminal is not expected to substantially change as a result of the installation of the new pumping stations. The quantitative risk assessment showed that all landuse criteria, as defined by the NSW Department of Planning are met for the two new pumping stations. The risk of fatality at any nearby residential areas, open spaces and sensitive development is well below the maximum tolerable risk criteria. The risk of propagation from the pumping stations to neighbouring facilities or to infrastructure on the same site (such as the neighbouring storage tanks), is also below the NSW Department of Planning risk criteria. The most stringent risk criteria, as set by the NSW Department of Planning for acceptable risks in industrial installations, are adhered to for the two pumping stations.

E3 Recommendations

Recommendation 1: As far as practicable, ensure pipes outside of contained areas are fully welded (not flanged).

Recommendation 2: Review existing Emergency Response Plans at both the Kurnell Refinery and at Banksmeadow Terminal as well as for the KBL for any changes required following implementation of the proposed upgrade.

Recommendation 3: Depending on the results of the Fire Safety Study, further risk reduction may need to be considered for the risk associated with a knock-on at the neighbouring foam pump house at Banksmeadow Terminal in case of a major fire at the booster pump station.

GLOSSARY

ADG	Australian Dangerous Goods
ALARP	As Low As Reasonably Practicable
AS	Australian Standard
CBD	Central Business District
CCTV	Closed Circuit Television
CP	Cathodic Protection
DCVG	Direct Current Voltage Gradient
DoP	Department of Planning
ESD	Emergency Shutdown
HAZID	Hazard Identification
HIPAP	Hazardous Industry Planning Advisory Paper
ILI	Inline Inspection
JUHI	Joint User Hydrant Installation Facility
JSA	Job Safety Analysis
KBL	Kurnell B Line
MAOP	Maximum Allowable Operational Pressure
NDT	Non Destructive Testing
OH&S	Occupational Health and Safety
PHA	Preliminary Hazard Analysis
PLC	Programmable Logic Control
QRA	Quantitative Risk Assessment
SCADA	Supervisory Control and Data Acquisition
TNO	The Netherlands Organisation for Applied Scientific Research

REPORT

1 INTRODUCTION

1.1 BACKGROUND

Jet fuel is currently being transferred from the Caltex Kurnell Refinery (*the refinery*) via the jet fuel pipeline known as the *Kurnell B Line* (the *KBL*) to the Joint User Hydrant Installation Facility (JUHI) facility at Sydney Kingsford Smith airport (*the JUHI*) and to Caltex terminal at Banksmeadow.

In order to increase the available capacity of the jet fuel pipeline it is proposed to increase jet fuel transfer rate from the refinery to the JUHI by installing new pumps at the refinery and at Banksmeadow Terminal.

A Preliminary Hazard Analysis (PHA), in accordance with the NSW Department of Planning (NSW DoP) Director-General's Requirements (DGRs) for the Development, has been prepared by Planager Pty Ltd for inclusion in the Environment Assessment. The results are summarised in this report.

The Director-General's requirements for the PHA are as follows:

> **Hazards and Risk** – *The PHA should consider changes proposed within the Kurnell Refinery boundary, the upgraded pipeline arrangements between the refinery and wharf, increase in pipeline operating pressures and the modifications within the Caltex Banksmeadow terminal. The analysis should include:*
>
> - *identification of potential hazards associated with the project, to determine the potential for offsite impacts;*
> - *an estimate of the consequences and likelihood of significant events;*
> - *comparison of the estimated overall risks against the Department's risk criteria; and*
> - *proposed safeguards to ensure risks are minimised.*

This PHA has been prepared with reference to the State Environment Planning Policy No 33 (Hazardous and Offensive Development), and in accordance with the NSW DoP's Hazardous Industry Planning Advisory Papers (HIPAPs) Numbers 4 (*Risk Criteria*) and 6 (*Hazard Analysis*), References 1, 2 and 3.

Further, references to the Australian Standard AS2885 (*Pipelines - Gas and Petroleum Liquids*, Ref 4) are also made with respect to the pipeline component of the upgrade project.

1.2 SCOPE AND AIM OF STUDY

1.2.1 Scope

The following risks are assessed as part of the PHA:

- Risk from flammable material.
- Environmental risk from spills.

The main features of the proposed upgrade project include:

- Caltex Kurnell Refinery:
    - Installation of new transfer pumps and coalescers.
    - Installation of a new pigging station (to replace the one at the wharf);
- Banksmeadow Terminal: Installation of new booster pumps and valves and upgrade and modification of the existing pigging stations and the installation of power supply equipment;
- Kurnell B Pipeline: Installation of new pipeline from Kurnell Refinery to halfway along the Kurnell wharf, within the existing easement. The old pipeline would be decommissioned. Installation of a new pigging station installed within the refinery to enable pigging of more of the pipeline than what was previously possible.

The existing pigging station at Bumborah Point (North of Botany Bay) will remain unaltered.

1.2.2 Aim

The aim of the PHA is to:

- Provide an assessment of the hazards and risks associated with the proposed upgrade project;
- Determine the incremental change (increase or decrease) in the risk levels associated with the transfer of petroleum products from Caltex Kurnell Refinery to the JUHI (Sydney Airport) via Bumborah Point and the Banksmeadow Terminal;
- Compare the resulting risk levels with the NSW DoP's risk criteria for maximum tolerable risk of fatality, injury and propagation.

The aim is in line with the requirements by the NSW DoP for the proposed upgrade project.

The risk associated with the modifications to the Caltex Kurnell Refinery and to Banksmeadow Terminal is assessed both qualitatively and quantitatively and the results are reported in Sections 6 and 7 below.

The risk associated with the Kurnell B Pipeline is assessed more appropriately using the methodology described in the AS2885.1 *Pipelines - Gas and Petroleum Liquids* (Ref 4) using a multidisciplinary team (as reported in Ref 5) and summarised in this PHA in the Hazard Identification Word Diagram in Table 6 and under Section 6 (below).

2 SITE AND PROJECT DESCRIPTION

2.1 PROJECT LOCATION

The Kurnell Refinery and Banksmeadow Terminal are located on opposite sides of Botany Bay in the southern part of metropolitan Sydney, as shown in Figure 1 below.

The Kurnell Refinery is located on the Kurnell Peninsula within Sutherland Shire, approximately 30km south of Sydney's CBD. The site is bordered by Botany Bay National Park to the east, Captain Cook's Landing Place Park to the south, Bonna Point Reserve in the west and the community of Kurnell to the north. The refinery mainly produces petrol (49%), diesel (22%) and jet fuel (15%).

A Kurnell B Pipeline (KBL) *right of way* runs north west from the refinery to a wharf located at the southern side of Botany Bay. The existing jet pipeline (the KBL) runs through this right of way, underground from the refinery, resurfacing after Prince Charles Parade and continuing along the wharf, before diving below Botany Bay. From here the KBL travels north until it reaches land at Bumborah Point. It is still underground at this point and remains so continuing north, before turning west and eventually surfacing at Banksmeadow Terminal.

Banksmeadow Terminal is located on the north side of Botany Bay, approximately 12km south of Sydney's CBD. The Terminal is bounded by industrial storage facilities to the north, the Patrick Stevedores Container Terminal to the south, the P&O Trans Australia Terminal to the east, and Penrhyn Road and the Penrhyn Estuary to the west. Access to the Terminal is off Penrhyn Road.

Banksmeadow is Caltex's main storage terminal in NSW and has a maximum storage capacity of 50 million litres. The facility stores products from the Kurnell Refinery which reach the terminal via pipelines under Botany Bay. The main products stored are petrol, diesel, heating oil, aviation fuel and fuel oils.

KBL heads west underground from Banksmeadow Terminal and eventually reaches the JUHI at Sydney Airport.

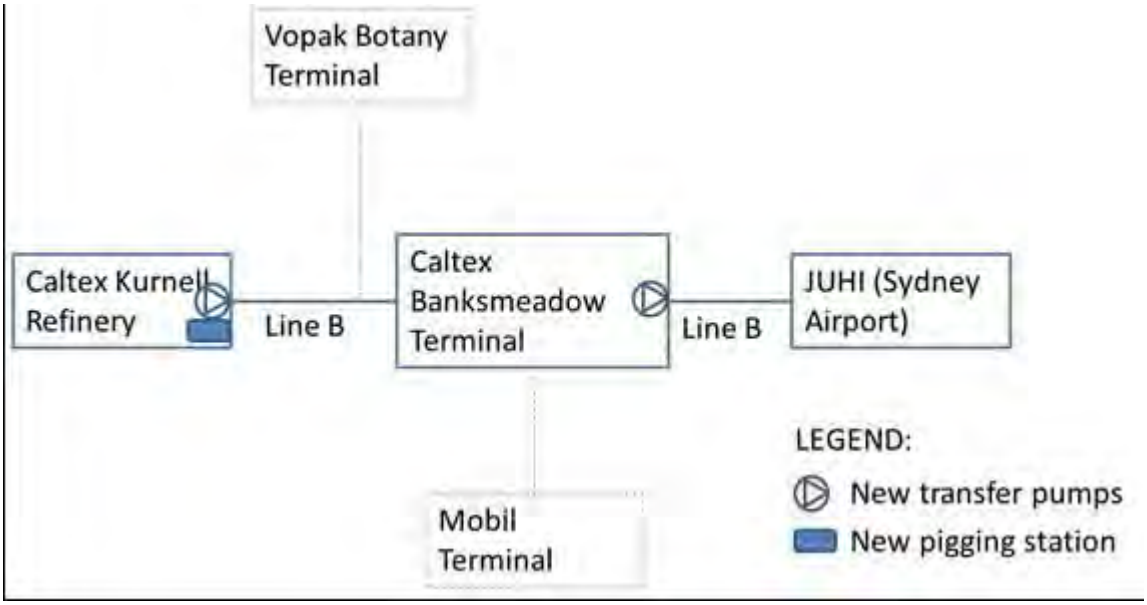
The KBL is approximately 12km long.

A block diagram of the KBL is provided in Figure 2 below.

The Vopak and Mobile terminals and their associated transfer facilities, also connecting into the KBL, do not form part of the present upgrade project and are hence not included in this PHA.

Figure 1 – Project Location

Figure 2 – KBL Block Diagram



2.2 MODIFICATIONS TO CALTEX KURNELL REFINERY

An overview of the modifications at the refinery is presented in Figure 3 below.

The proposed upgrade works at Kurnell Refinery would be limited to the north eastern part of the refinery where two new pumps (one duty and one standby), and a new pigging facility would be located close to tank 166 and 157, just off Road 7. Two new filter/coalescer and associated instrumentation would also be installed in this area.

The discharge pipes at the new pumps will allow for an increase in maximum operating pressure from the current 1,650kPa to 2,200kPa (refer Table 2 below). The design pressure will be increased from the current 1,950kPa (*Class 150 pound rating*) to 5,100kPa (*Class 300 pound rating*).

New suction pipes (300mm diameter), from the existing tanks (127, 166[1], 168, & 169) into the new pumps, will also fitted.

Modifications to existing instrumentation and control would be required, in the form of a new flow control loop and a new flow meter, as well as modifications to the existing SCADA and PLC.

[1] Tank 166 to be converted from fuel oil to Jet service as part of another proposed project.

This new equipment would be installed on a new concrete pad, in the area between an existing earth bund and the primary containment bund for tank 166 (refer to Figure 3 below).

Figure 3 – Overview of Modifications at Kurnell Refinery

The existing pigging station, which is currently located at the wharf, will be decommissioned, removed, and replaced with the new pigging station installed in proximity to the new pumps.

2.3 MODIFICATIONS FOR THE JET FUEL PIPELINE (KBL)

An overview of the modifications to the KBL is presented in Figure 3 above.

The KBL operates in different *modes* depending on the destination of the jet fuel, as follows:

- Deliver to JUHI with stripping to Banksmeadow Terminal
- Direct to JUHI
- Pigging

There will be no change in the flow rates for the mode where jet fuel is transferred from the refinery to the Banksmeadow terminal.

Flow rates will increase from a maximum of 205 kL/hour to a maximum of 400 kL/hour in the modes where jet fuel is transferred from the refinery into the JUHI.

To allow for the pressure increase achieved by the required increase in flow rates, a new 250 mm diameter (10 inch) pipeline would be installed from the new Kurnell Refinery pumping station to half way along the wharf. This pipeline would be rated for 5,100kPa design pressure (compared with the existing 1,950kPa design pressure).

This new, upgraded part of the KBL, would run approximately 1,200m north east alongside Road 7, (refer to Figure 5) from the new pumping station through Gate 5 and out to the wharf buried underground before running along part of the wharf itself (as shown on Figure 5 below). The new pipeline would tie into the existing 250 mm diameter submarine KBL at the wharf. The new pipeline would be buried as per AS2885 requirements (up to 1.5m in depth). This is a common easement with other product transfer lines.

There will be no change to the design pressure of the underwater pipeline, which will remain at 5,100 kPa (Class 300 pound rating), limited by the flanges at either end of the underwater section.

Figure 4 – Replacement KBL Pipeline Section at Kurnell

2.4 MODIFICATIONS TO CALTEX BANKSMEADOW TERMINAL

An overview of the modifications at Banksmeadow Terminal is presented in Figure 5 below.

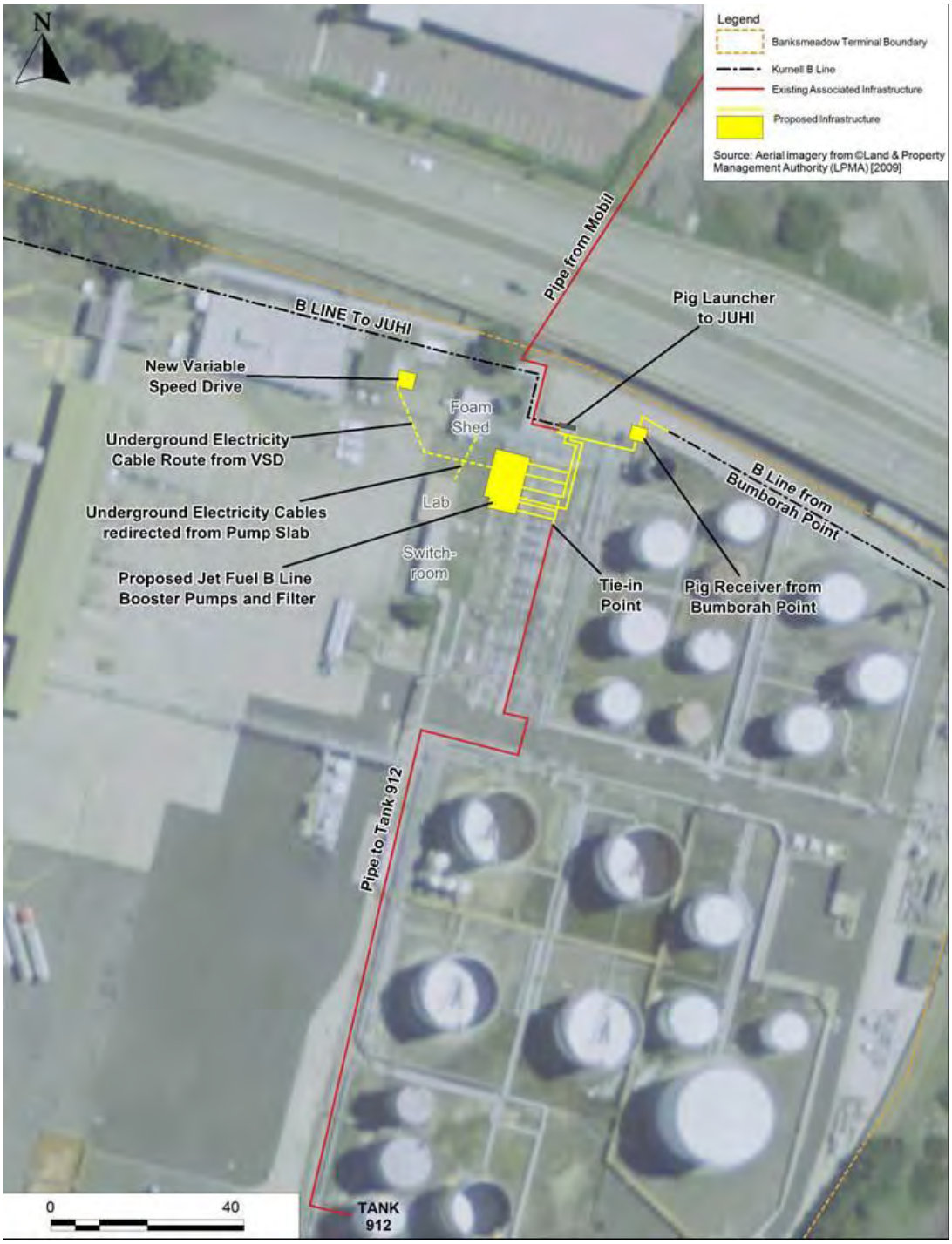
Two new booster pumps (variable speed, one duty and one stand-by) will be installed. Each pump will also be fitted with associated instrumentation. The inlet and outlet piping and valving associated with the new pumps will be modified.

. A new filter/coalescer will be installed to filter the fuel into Banksmeadow terminal.

Modifications to existing instrumentation and control valves would be required, as well as modifications to the existing SCADA and PLC control systems.

The existing pigging station will also be upgraded.

Figure 5 – Modifications at Banksmeadow Terminal



2.5 OPERATING CONDITIONS

The following table details the transfer rates before and after the upgrade.

Table 1 – Flow Rates Before and After Upgrade

	Current Flowrate	Flowrate After Upgrade	Change
Refinery to Banksmeadow Terminal	145-150 kL/hr (direct)	0-150 kL/hr (stripping)	Direct transfer is not proposed. New mode.
Refinery to JUHI	200-205 kL/hr (direct) 150 kL/hr (pigging) Stripping not currently applicable	400 kL/hr (direct) 150 kL/hr (pigging) 250-400 kL/hr (stripping)	Increase No change New mode.

The following table details the maximum operating pressures before and after the upgrade.

Table 2 – Max Operating Pressures Before and After Upgrade

Location	Current Max Operating Pressure	After Upgrade Max Operating Pressure	Change
Discharge at the refinery	1,650 kPag	2,200 kPag	Increase
At Banksmeadow Terminal	1,100 kPag (currently no booster pumps)	- 300 kPag (suction) - 3,845 kPag (discharge)	Decrease Increase
At JUHI	300 kPag (at JUHI)	390 kPag (at JUHI)	Slight increase

2.6 SECURITY

Both pump stations, as installed within the Kurnell Refinery and the within Banksmeadow Terminal, are surrounded by security fencing and are provided with security gates and close circuit television (CCTV) cameras. The sites are also patrolled and access to both facilities is strictly controlled.

The KBL runs underground for most of the way except for where it resurfaces after Prince Charles Parade to continue along the wharf, before diving below Botany Bay, and where it enters and leaves the Banksmeadow Terminal and the JUHI. There are no above ground valve stations or other facilities associated with the pipeline along this route except for one small section where the pipeline crosses a storm water channel beside Bumborah Point Road. No changes are being undertaken here.

3 STUDY METHODOLOGY

3.1 INTRODUCTION

The methodology for the PHA is well established in Australia. The assessment has been carried as per the Department of Planning's HIPAP No 4 (*Risk Criteria for Land Use Planning*, Ref 2) and HIPAP No 6 (*Guidelines for Hazard Analysis*, Ref 3). These documents describe the methodology and the criteria to be used in PHAs, as required by the NSW Department of Planning for major "potentially hazardous" development.

There are five stages in risk assessment (as per Ref 3):

3.1.1 Hazard Identification

The hazard identification includes a review of potential hazards associated with all dangerous and hazardous goods to be processed, used and handled as part of the upgrade project. The hazard identification includes a comprehensive identification of possible causes of potential incidents and their consequences to public safety and the environment, as well as an outline of the proposed operational and organisational safety controls required to mitigate the likelihood of the hazardous events from occurring.

The tasks involved in the hazard identification of the proposed upgrade project included a review of all relevant data and information to highlight specific areas of potential concern and points of discussion, including drafting up of preliminary hazard identification (HAZID) word diagram. For this particular study, a Hazard and Operability (HAZOP) study had already been completed by a multidisciplinary team comprised of people with operational / engineering / risk assessment expertise. The HAZID word diagram was prepared party based on the output from this study and partly based on Planager's knowledge of similar installations and facilities.

The review takes into account both random and systematic errors, and gives emphasis not only to technical requirements, but also to the management of the safety activities and the competence of people involved in them.

The final HAZID word diagram is presented in Table 6 in Section 4 below.

3.1.2 Consequence and Effect Analysis

The consequences of identified hazards are assessed using current techniques for risk assessment. Well established and recognised correlations between exposure and effect on people are used to calculate impacts. Estimations on the effects on the biophysical environment are also made.

A set of representative fire and explosion scenarios were identified in the Fire Safety Study in Ref 6. These scenarios include a range of the hazardous events that have some potential to occur.

For the present PHA, these scenarios have been further expanded on, based on the current design of the equipment which forms part of the Project and knowledge of similar facilities, applicable codes and standards, and good engineering practice. The scenarios can be divided into the following categories:

- Moderate releases, characterised by a hole equivalent to that of a flange failure (representing a potential flange or a pump seal). If ignited, such a leak may result in:
  - A jet fire (from an aerosol formed),
  - A sump fire and/or,
  - A flash fire.
- Large releases (ruptures), characterised by a hole with a diameter equal to the pipe diameter. If ignited, this leak may result in:
  - A pool fire,
  - A flash fire, or
  - A vapour cloud explosion.

For further details, please refer to Appendices 1 and 2.

Quantitative consequence analysis was undertaken using the TNO Quantitative Risk Assessment program *Riskcurves* (version 7.6) and consequence modelling software program *Effects* (version 8.0). The TNO tools are internationally recognised by industry and government authorities. The consequence models used within Effects Riskcurves are well known and are fully documented in the TNO Yellow Book (Ref 7).

3.1.3 Frequency Analysis

For incidents with significant effects, whether on people, property or the biophysical environment, the incident frequencies are estimated based on historical data. A probabilistic approach to the failure of vessels and pipes is used to develop frequency data on potentially hazardous incidents.

Details as to the likelihood analysis are provided in Appendix 1 and in Appendix 2.

3.1.4 Risk Analysis

The combination of the probability of an outcome, such as injury, propagation or death, combined with the frequency of an event, gives the risk from the event. In order to assess the merit of the proposal, it is necessary to estimate the risk

at a number of locations so that the overall impact can be assessed. The risk for each incident is defined according to:

Risk = Consequence x Frequency

The risk associated with the proposed upgrade project is determined both *qualitatively*, using a risk matrix approach, and *quantitatively* using risk assessment software.

Qualitative risk: The result of the qualitative risk analysis is presented in table form in the Hazard Identification Word Diagram in Table 6 and in Section 6. Details on the qualitative risk assessment are presented in Appendix 1.

Quantitative risk: In quantitative risk analysis, risk levels from each scenario are calculated by considering each modelled scenario, and combining its frequency with the extent of its *harm footprints*. Total risk is obtained by adding together the results from the risk calculations for each incident, i.e. the total risk is the sum of the risk calculated for each scenario. The results of the quantitative risk analysis are presented in Section 7 in three forms:

- Fatality Risk:
    - *Individual Risk of Fatality*: The likelihood (or frequency) of fatality to notional individuals at locations around the site, as a result of any of the postulated fire and explosion events. The units for individual risk are probability (of fatality) per million per year. Typically, the result of individual risk calculations is shown in the form of risk contours overlaid on a map of the development area.
    - *Societal Risk of Fatality*: Societal risk takes into account the number of people exposed to risk. Whereas individual risk is concerned with the risk of fatality to a (notional) person at a particular location (person 'most at risk', i.e. outdoors), societal risk considers the likelihood of actual fatalities among any of the people exposed to the hazard. Societal risk is presented as so called *f-N curves*, showing the frequency of events (f) resulting in N or more fatalities. To determine societal risk, it is necessary to quantify the population within each zone of risk surrounding a facility. By combining the risk results with the population data, a societal risk curve can be produced
- Injury risk, i.e. the likelihood of injury to individuals at locations around the site as a result of the same scenarios used to calculate individual fatality risk.
- Propagation risk, i.e. the risk of propagation from one incident at the proposed upgrade to neighbouring installation and infrastructure.

The event frequency and hazard consequence data has been combined to produce estimates of risk using TNO's risk calculation and contour plotting program entitled *Riskcurves*.

Having determined the risk from a development, it must then be compared with accepted criteria in order to assess whether or not the risk level is tolerable. If not, specific measures must be taken to reduce the risk to a tolerable level. Where this is not possible, it must then be concluded that the proposed development is not compatible with the existing surrounding land uses.

The risk criteria, applicable for the proposed development, are detailed in Appendix 2 together with further details of the input and the results of the quantitative risk assessment (incident scenarios, likelihoods, consequence etc.).

3.1.5 Risk reduction

Where possible, risk reduction measures are identified throughout the course of the study in the form of recommendations.

3.2 SAFETY MANAGEMENT SYSTEMS

3.2.1 Safety Management in General

In quantitative risk assessments, incidents are assessed in terms of consequences and frequencies, leading to a measure of risk. Where possible, frequency data used in the analysis comes from actual experience, e.g. near misses or actual incidents. 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.

As with any sample of a population, the quality of the management systems (referred to here as "safety software") in place in these historical plants will vary. Some will have little or no software, such as work permits, planned maintenance 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 which has significantly below average safety software in place is assessed using the generic frequencies, it is likely that the risk will be underestimated. Conversely, if a plant is significantly above average, the risk will probably be overestimated. However, it is extremely difficult to quantify the effect of software on plant safety. Incorporating safety software as a means of mitigation has the potential to significantly reduce the frequency of incidents and also their consequences if rigorously developed and applied. The risk could also be underestimated if safety software is factored into the risk assessment but is not properly implemented in practice. Practical issues also arise when

attempting to factor safety software into the risk assessment – applying a factor to the overall risk results could easily be misleading as in practice it may be the failure of one aspect of the safety software that causes the accident, while all other aspects are managed exemplarily.

In this study it is assumed that the generic failure frequencies used apply to installations which have safety software corresponding to accepted industry practice and that this site has similar management practices and systems. This assumption, it is believed, will be conservative in that it will overstate the risk from well-managed installations.

3.2.2 Safety Management System Implemented

Caltex have a commitment to Occupational Health and Safety (OH&S) and have numerous policies and procedures to achieve a safe workplace. Procedures specific to the upgraded plant and its environment will be developed and incorporated into the safety management system.

The upgraded plant equipment will comply with all current, relevant codes and statutory requirements with respect to work conditions. There will be no changes to existing precautions observed on site, in particular, standards and requirements for the handling of flammable liquids. All personnel required to work with these substances are trained in their safe use and handling, and are provided with all the relevant safety equipment.

Emergency procedures have been developed and will be reviewed in the light of the proposed changes. The emergency procedures include responses to emergency evacuation, injury, major asset damage or failure, critical failures, spillages, major fire, and threats.

The refinery and the Banksmeadow Terminal sites each have a manager with overall responsibility for safety, who is supported by experienced personnel trained in the operation and support of the plant.

A Permit to Work system (including Hot Work Permit) and a Management of Change system are in use on site to control work on existing plant and to protect existing plant and structure from substandard and potentially hazardous modifications.

Injury and incident management is proceduralised and people are trained in how to report incidents. An established incident reporting and response mechanism has been established, providing 24 hour coverage.

Protective Systems will be tested to ensure they are in a good state of repair and function reliably when required to do so. This will include scheduled testing of trips, alarms, detectors, relief devices and other protection systems.

All persons on the premises are provided with appropriate personal protective equipment suitable for use with the specific hazardous substances.

At least one person on the premises is trained in first aid; and a list of persons trained in, and designated as being responsible for the administering of, first aid is shown on the noticeboards on the premises.

3.3 MAIN CODES AND STANDARDS

The following table shows some of the main codes and standards which are applicable for the proposed upgrade project.

Table 3 – Codes and Standards for the Design of Proposed Upgrade Project

Area of Concern	Standard / Code
Plant layout and design philosophy	Chevron Global Aviation Specs • GPS A5 – Refinery layout and spacing • GPS A6 – Design philosophy
Bunding arrangement and design	• AS1940 *The storage and handling of flammable and combustible liquids* (Ref 8)
Pump and piping design	• STD 40.06.CES.PIM-LA-5112-B Piping Materials • STD 40.06.CES.PIM-LA-5138-A Piping Design • STD 40.06.CES.PVM-LA-4750-E Carbon Steel Pressure Vessels for General Refinery Service • STD 40.06.CES.PMP-983 Centrifugal Pumps for General Refinery Services • API 1581 – Aviation Jet Fuel Filter/Separators 5th Edition • API 610 – Refinery Pumps • ASME B31.3 - Process Piping • AS 1200:2000 - Pressure equipment • AS1200:2000 – Pressure equipment
Pipeline (design, operation and maintenance)	• AS2885 Pipelines - gas and liquid petroleum (Ref 4).
Electrical design	• GPS P1 – Electric Power and Lighting • STD 40.06.SPEC-P12 High Voltage Electric Motors • AS/NZS 2381 Electrical Equipment for Explosive Atmospheres – Selection, Installation and Maintenance • AS/NZS 3000 Australian / New Zealand Wiring Rules • AS/NZS 60079 Explosive Atmospheres - Explosion Protection Techniques • AS/NZS 60079.10.1:2009 Explosive Atmospheres Part 10.1: Classification of areas – Explosive gas atmospheres.
Emergency response and fire safety	• Control Of Major Hazard Facilities - National Standard (Ref 9) • National Code of Practice (Ref 10); • Hazardous Industry Planning Advisory Papers No 1 and No 2: *Emergency Planning Guidelines* and *Fire Safety Study* (Refs 11 and 12); • Building Code of Australia for any buildings and protected works (Ref 13).
Dangerous goods storage and transport	*Australian Code for Transport of Dangerous Goods by Road and Rail* (ADG Code), 7th Ed (Ref 14).
Occupational health and safety	(NSW) Occupational Health and Safety Act 2000. (NSW) Occupational Health and Safety Regulations 2001.

4 HAZARD IDENTIFICATION

The main risk associated with the proposed upgrade involves the transfer and storage of jet fuel, which is a flammable material at atmospheric conditions.

Other, less prominent hazards associated with the proposed upgrade, involve the use of high voltage electricity and the rotating machinery. Such hazards are predominantly limited to the local area and experienced by operators or maintenance personnel. They are unlikely to give rise to off-site hazards. As such, these potential hazards are generally dealt with using training, procedures, Job Safety Analysis (JSA), permit to work etc., and are not discussed further in this PHA.

4.1 HAZARDOUS MATERIALS

4.1.1 Storage Inventory

There will be no change to storage inventories of dangerous goods (i.e. flammable liquids) on either of the sites affected by the upgrade project.

4.1.2 Properties of Potentially Hazardous Material

Fire and explosion hazards were identified by considering the physical and chemical properties of the jet fuel being considered, and the potential for releases and loss of containment. The table below summarises the main properties of jet fuel.

Table 4 – Main Properties of Jet Fuel

Material	Property / Characteristics
Dangerous Goods Classification	Class 3 PG III, flammable liquid
Physical state at atmospheric conditions	Liquid
Appearance	Clear
Molecular weight	175
Boiling point	216^{o}C
Flash point	38^{o}C
Heat of combustion	36644 kJ/kg
Heat of vaporisation	341.2 kJ/kg
Heat capacity	1.9 kJ/kg K
Density	@ 10 ^{o}C - 797 kg/m^{3} @ 15^{o}C – 794 kg/m^{3} @ 25 ^{o}C - 787 kg/m^{3}
Vapour pressure	@ 10 ^{o}C – 0.14 kPa(a) @ 25 ^{o}C – 0.34 kPa(a)
Flammable range (vapour in air)	Between 0.7 and 6 vol%

4.2 HAZARDOUS INCIDENT SCENARIOS

In case of a loss of containment outside of bunded / contained areas, jet fuel may pose a threat to the biophysical environment or it may ignite and pose a threat to people and property.

Jet fuel can be ignited and burn provided the flammable vapour concentrations are within the flammable range and a source of ignition is present. For an explosion with any significant overpressure to occur however, sufficient quantities of vapour will need to be present in a dispersing or stagnant vapour cloud.

If jet fuel is released under high pressure, for example at the discharge of the pump, an aerosol or mist may form that is significantly more flammable than when stored under normal conditions, and lower ignition energy may cause a fire or explosion.

An important part of fire prevention is to avoid situations where fuels may be released as aerosols (Ref 6), which may form an explosive vapour.

Several variables must be addressed in developing an assessment of a release and its general dispersion, including potential for ignition sources. The factors, as presented in Appendix 3, determine the possible outcomes of an uncontrolled release, i.e. whether it:

- Disperses without a fire, leading to an environmental pollution issue,
- Burns as a pool fire,
- Burns as a flash fire, or
- Explodes in a vapour cloud.

A hazard identification exercise was undertaken by a multidisciplinary team (composed of personnel from design operations and engineering), addressing the nature of hazards that might occur during operation of the facility after implementation of the proposed upgrade (Ref 15). Further, a safety management assessment in accordance with AS2885 requirements was conducted for the project (Ref 5), using a multidisciplinary team from design, process, inspection, operation and project management.

A Hazard Identification Word Diagram has been prepared for this project and presented in Table 6. This table draws from the potential incident scenarios identified during the hazard identification exercises above and elsewhere, including initiating causes, consequences and proposed / existing safeguards to minimise consequences of likelihood of an incident.

A total of 10 hazards were identified in terms of their potential consequences and likelihoods, as listed in Table 5 below.

Table 5 - Summary of Identified Hazards

Hazardous Event Potential
Loss of Containment Events (Jet Fuel or Energy)
Leak of jet fuel from pipes or pumps on-site or off-site due to generic faults or impact leads to fire event
Leak of jet fuel from pipes or pumps on-site or off-site due to generic faults or impact leads to threat to the biophysical environment
Natural Hazards
Earthquake / Seismic hazard
Land subsidence hazard
Bush /brush fire
Flooding
Lightning strike
Other types of hazards
Aircraft crash
Intentional acts
Knock-on Effects / Cumulative Effects

The risk associated with each incident scenario has been evaluated in turn for the situation before and after the upgrade project. The risk matrix from AS2885 (Ref 4) was used in this exercise. The following terminology is used in the table:

- C: Consequence
- L: Likelihood
- R: Risk

Refer to Appendix 1 for details on the methods used for the qualitative assessment.

Refer to Appendix 2 for the calculations carried out for those scenarios with serious effects which were transferred to the quantitative risk assessment.

Table 6 – Hazard Identification Word Diagram

No	Hazard	Possible Causes and Threats	Possible Consequences	Preventative and Protective Safeguards	Risk Prior to Upgrade	Risk After Upgrade	Carried forward to QRA
Kurnell KBL							
1	Loss of containment event: Uncontrolled release from the pipeline due to generic faults.	- Construction damage, - Weld fault, - Coating flaw, - Faulty materials. - Design defects.	Damage to the pipeline and release of jet fuel. Environmental pollution if the spill is not contained. If ignition then possibility of flash or jet fire. If confinement then possibility of a vapour cloud explosion. Injury and property damage.	**Prevention:** Coating on external surfaces of underground pipelines; Cathodic Protection (CP); internal corrosion virtually absent with clean hydrocarbon; Pressure testing Radiography &/or ultrasonic testing of welds; design to limit crack propagation; Pipeline Integrity Management Plan. Welding procedures and welds radiographed; material certificates; hydrostatic testing and QA/QC. **Detection:** Routine inspection (incl. patrol, pigging, CP monitoring. **Protection:** Pipe thickness and design factor to AS2885 requirements. Below ground pipeline is buried and signposted as per AS2885 requirements. **Emergency response:** Emergency response plan, including emergency isolation of pipeline and links to external authorities.	**C: Severe** **L: Remote** **R: Low**	**C: Severe** **L: Remote** **R: Low** **Negligible change compare with situation prior to upgrade**	**No - AS2885-methodology used for the KBL**

No	Hazard	Possible Causes and Threats	Possible Consequences	Preventative and Protective Safeguards	Risk Prior to Upgrade	Risk After Upgrade	Carried forward to QRA
2	Loss of containment event: Loss of containment due to aging pipeline	Long term effects on old pipeline: - Damage to pipeline with no immediate effect but possible long term effect. - Wear and tear. - Maintenance failure with no immediate effect. - Stress corrosion cracking.	Damage to pipeline over a long period of time, usually starting with a small issue but could develop to an incident of more serious nature. Eventually leading to a release of jet fuel. The rest as above.	Entire existing pipeline (with the exception of the length of pipe between Gate 5 at the refinery to the pigging station at the wharf) can be pigged (Non Destructive Testing). Pigging is carried out at periodic and regular intervals. Both stress and temperature are below that required for external stress corrosion cracking After upgrade project: New pipeline in section of Gate 5 to the wharf which can be pigged. Detection, protection and emergency response as per No 1 above.	**C: Severe** **L: Unlikely** **R: Inter-mediate**	**C: Severe** **L: Remote** **R: Low**	**No - AS2885-methodology used for the KBL**
3	Loss of containment event: Uncontrolled release of jet fuel due to impact or damage to the pipeline.	3rd party involvement e.g. digging or trenching, or other earth work. Anchor damage. 1st party involvement (excavation inspection damages coating and corrosion). Destructive vibration near the pipeline.	As above	**Prevention:** Underground pipeline within a right-of-way. Pipeline along wharf is well away from the roadway and is protected by the road kerb. There are no changes to this compared with the existing pipeline. No 3rd party assets in right-of-way minimises activities near the pipeline. Signage. **Detection:** Pressure sensors and alarms transmitted to the control room (24hr/7d monitoring). Routine inspection and patrol. **Protection:** Resistance of pipelines to penetration through use of pipe thickness and adequate design factor and burial depth. Repair of any coating damage as required. **Emergency response:** Manual shut down at detection of pressure drop. Emergency response plan.	**C: Major** **L: Remote** **R: Inter-mediate**	**C: Major** **L: Remote** **R: Inter-mediate** **Negligible change compare with situation prior to upgrade.**	**No - AS2885-methodology used for the KBL**

No	Hazard	Possible Causes and Threats	Possible Consequences	Preventative and Protective Safeguards	Risk Prior to Upgrade	Risk After Upgrade	Carried forward to QRA
4	Loss of containment event: Maloperation	Operational error upstream or downstream facility.	As above	Use of mechanical over pressure and temperature protection at Kurnell Refinery new pumping station. Procedure to be written detailing risks and controls during manual operation (Ref 5). Detection, protection and emergency response – as above.	**C: Major** **L: Remote** **R: Inter-mediate**	**C: Major** **L: Remote** **R: Inter-mediate** **Some increase in risk due to increased pressures on the system and some increase in control comple-xity**	**No - AS2885-methodol ogy used for the KBL**
5	Loss of containment event: During maintenance	Failure during pigging causes loss of containment	As above	Procedures for maintenance and pigging. After upgrade project: Pigging station at the wharf no longer used. New pigging station at the refinery, which is contained.	**C: Severe** **L: Unlikely** **R: Inter-mediate**	**C: Severe** **L: Remote** **R: Low**	**No - AS2885-methodol ogy used for the KBL**

No	Hazard	Possible Causes and Threats	Possible Consequences	Preventative and Protective Safeguards	Risk Prior to Upgrade	Risk After Upgrade	Carried forward to QRA
6	Natural Event	- Flooding, - Earthquake, land subsidence, - Bush/brush fire, - Lightning strike.	As above	No change from existing situation. Regular inspections and patrol for any erosion. Structures and plant are designed to withstand earthquake effects using well-established procedures in accordance with relevant Australian or International standards. The pipeline route does not cross any known areas of mine subsidence. Bush fire risk minimised through maintenance of a buffer zone between buried pipeline and natural vegetation. Buried pipeline unlikely to be affected by above ground bush / brush fire. Lightning strike unlikely to damage buried pipeline and pipeline under water (but not impossible). Detection, protection and emergency response – as above.	**C: Minor** **L: Remote** **R: Negli-gible**	**C: Minor** **L: Remote** **R: Negli-gible** **Negligible change compare with situation prior to upgrade**	**No - AS2885-methodol ogy used for the KBL**
7	Other types of hazards	- Aircraft crash - Intentional acts - Knock-on effects / Cumulative hazards	As above	An incident at a nearby facility or an aircraft crash is highly unlikely to expose a pipeline and, provided that the pipeline is not exposed, damage to the pipeline is highly unlikely. Negligible impact of proposed project on the risk of intentional acts on the pipeline such as terrorism, vandalism. Above ground sections not changed from existing layout. Detection, protection and emergency response – as above.	**C: Severe** **L: Hypo-thetical** **R: Negli-gible**	**C: Severe** **L: Hypo-thetical** **R: Negli-gible** **Negligible change compare with situation prior to upgrade**	**No - AS2885-methodol ogy used for the KBL**

No	Hazard	Possible Causes and Threats	Possible Consequences	Preventative and Protective Safeguards	Risk Prior to Upgrade	Risk After Upgrade	Carried forward to QRA
Pump Stations at the Refinery and at the Banksmeadow Terminal							
8	Loss of containment event: Uncontrolled release of jet fuel due to generic faults.	Construction damage, weld fault, coating flaw or faulty materials. Corrosion (internal or external) Gasket leak. Seal failure Weld failure Vibration. Valve leak	Damage to the pump, pipes and equipment and subsequent release of jet fuel. If liquid release then formation of pool which would drain away into the sump and bund. If the spill is not contained then possible environmental pollution. If ignition of a liquid release then formation of a pool fire. Possibility of flash or jet fire and vapour cloud explosion. Injury and property damage. Propagation to neighbouring bushland at Kurnell Refinery.	**Prevention:** Painting of aboveground pipework in pump station to prevent external corrosion; internal corrosion virtually absent with clean hydrocarbon. Hydrotesting; radiography and / or ultrasonic testing of welds; welding procedure. On stream monitoring of pump vibration Draining of pump station away from potential sensitive infrastructure. **Detection:** Hydrocarbon detector alarms to be fitted at Kurnell and Banksmeadow. Seal leak detection system to be installed. Routine maintenance and inspection (including regular inspections and patrols). **Protection:** Resistance of pipes to metal loss through use of pipe thickness and adequate design factor. Location of pumps and associated infrastructure within bunded areas. **Emergency response:** Emergency response plan, including emergency isolation of pipeline and links to external authorities.	**C: Minor** **L: Remote** **R: Negli-gible**	**C: Minor** **L: Remote** **R: Negli-gible** **Negligible change compare with situation prior to upgrade**	**YES** **(generic likelihood data used)**

No	Hazard	Possible Causes and Threats	Possible Consequences	Preventative and Protective Safeguards	Risk Prior to Upgrade	Risk After Upgrade	Carried forward to QRA
9	<u>Loss of containment event:</u> Uncontrolled release of jet fuel due to mechanical impact or damage at one of the pump stations.	Mechanical impact e.g. motor vehicle impact. Failure of maintenance.	Damage to the pump, pipes and equipment and subsequent release of jet fuel. If liquid release then formation of pool which would drain away into the sump and bund. If the spill is not contained then possible environmental pollution. If ignition of a liquid release then formation of a pool fire. If ignition of an aerosol then possibility of flash or jet fire. If confinement then possibility of a vapour cloud explosion. Injury and property damage.	**Prevention:** Thickness and grade of equipment and pipes. Any major work within the facilities requires permit to work, including job safety analysis. Remote operated isolation valves available for Emergency Shut Down. Robust nature of valve body – tight shut-off feature. Regular inspection of facilities and routine maintenance. Electrical design for equipment in hazardous areas. Draining of pump station away from potential sensitive infrastructure. **Detection:** Pressure sensors and alarm transmitted to the control room (24hr/7d monitoring). Continuous detection system. Periodic leak surveys. Hydrocarbon alarms at pumps at Kurnell & Banksmeadow. **Protection:** Resistance of pipes and equipment to damage from mechanical impact through use of pipe thickness and adequate design factor. Pump stations are graded away from pumps. Spills will drain to oil sump system. Spills outside of bunded and contained areas would drain to the site drainage systems which is segregated so that any potentially contaminated surface water runoff are kept separate from clean rainwater runoff. **Emergency response:** Remote operated emergency shut-down valves.	**C: Minor** **L: Remote** **R: Negli-gible**	**C: Minor** **L: Remote** **R: Negli-gible** **Negligible change compare with situation prior to upgrade**	**YES** **(generic likelihood data used)**

No	Hazard	Possible Causes and Threats	Possible Consequences	Preventative and Protective Safeguards	Risk Prior to Upgrade	Risk After Upgrade	Carried forward to QRA
10	Natural Hazards	- Flooding, - Earthquake, land subsidence, - Bush/brush fire, - Lightning strike.	As above	Negligible incremental change in flood risk associated with the proposed upgrade project. Possible decrease due to newer installation and equipment located above grade. Protecting against lightning strike in accordance with Australian Standard AS 1768 Lightning Protection. Control of vegetation around facilities. The Council owned bushland to the west of the refinery pumping station (Marton Park Wetland) which is located relatively close to the proposed site of the new pumps may be an issue, refer Recommendations 1 and 2 below.	**C: Minor** **L: Hyo-thetical** **R: Negli-gible**	**C: Minor** **L: Hyo-thetical** **R: Negli-gible** **Negligible change in risk from flood, earthquake and lightning. Some increase in risk to wetland near refinery pumps.**	**YES** **(generic likelihood data used)**

No	Hazard	Possible Causes and Threats	Possible Consequences	Preventative and Protective Safeguards	Risk Prior to Upgrade	Risk After Upgrade	Carried forward to QRA
11	Other Hazards	- Aircraft or heavy vehicle crash resulting in damage to the pump station and potentially in hazardous releases. - Damages station through terrorism or vandalism. - Knock-on effects / Cumulative hazards (incident at the neighbouring storage tank)	As above	Negligible change in risk profile from aircraft crash due to proposed upgrade project. Vehicle crash into pumping stations extremely unlikely in current situation. Security measures at pumping stations include fencing, patrols, etc. Receipt station at Banksmeadow Terminal is located inside a fenced area. Knock-on effects prevented through effective emergency response, refer recommendation 2 below.	**C: Severe** **L: hypo-thetical** **R: Negli-gible**	**C: Severe** **L: hypo-thetical** **R: Negli-gible** **Negligible change compare with situation prior to upgrade**	**YES** **(generic likelihood data used)**

5 DETAILED CONSIDERATION OF ALL HAZARDS AND ASSOCIATED CONTROLS

The Hazard Identification Word Diagram in Table 6 details the control mechanisms for each identified hazard associated with the proposed upgrade project. Further details on these controls are provided below.

5.1 CONTROL OF A LOSS OF CONTAINMENT EVENT

Safety associated with a loss of containment is ensured by the following four elements that provide multiple layers of protection both for the safety of workers and the safety of communities that surround the facilities:

- Primary containment;
- Secondary containment;
- Safeguard systems; and
- Separation distances.

Generally, these multiple layers of protection create four critical safety conditions, all of which are integrated with a combination of industry standards and regulatory compliance.

The following section summarises how the design and construction of the proposed upgrade will comply with these essential elements of safety.

5.1.1 Primary Containment

The first and most important requirement for containing the jet fuel is based on the integrity of containment, including the use of appropriate materials for the facilities, proper engineering design and construction practices and minimising the risk of damage and fatigue of pipelines, pumps and other plant and equipment. The measures to be used at the proposed upgrade include:

- The use of recognised and experienced plant designers.
- The design of pipeline and other piping in accordance with the most widely recognised and used codes for its type (refer Table 3 for a short summary of those standards and codes in particular applicable to hazards and risk management for this development);
- Material selection, robust and secured pipework to code requirements, welds radiographed, hydrostatic testing, design pressure and relief valves, and thermal reliefs.
- Minimising the risk of mechanical damage caused by malicious damage through burial of the KBL pipeline as far as practicable, through on-site security measures (to prevent sabotage), and through vehicular assess to the area, protection of plant and equipment and speed restrictions;
- Quality control during the construction of the piping, including radiography of welds, testing of weld and heat affected zones, pressure test and/or vacuum

tests as appropriate, production weld testing and other recognised Non Destructive Testing (NDT) requirements;
- Minimising lengths of piping and number of flanges (use welded connections wherever possible);
- Proper securing of piping;
- No use of flexible connection and hoses required as part of this project; and
- Regular and periodic inspection and maintenance.

5.1.2 Secondary Containment

The second layer of protection ensures that, if a leak or spill did occur, the jet fuel can be contained and isolated from the public. The Kurnell Refinery and the Banksmeadow Terminal includes a system of containment areas (or *bunds*), capable of containing the quantity of jet fuel that could be released by a credible incident involving the component served by each particular containment system.

Table 7 summarises the design of the sumps and bunds relevant to the present project. Note that both bunds are draining freely through an underground drainage system to the oily sewer where the spill would be captured. The bund has flammable gas detectors that alarm in the control room in case of a spill. The oily sewer is designed with gas seal catch basis to prevent the spread of fire through the oily sewer system.

Table 7 – Bund Design

Bund configurations	Surface Area (m^2) Maximum	Design Basis
Kurnell Refinery pump bund	264	Capable of restraining a massive release and directing it to the underground drain system and oily sewer. Maximum surface area of pool in case of completely blocked drainage system (refer Appendix 2 for discussion on the probability of this occurring).
	104	Total area covered by the catch basin closest to the pumps. Maximum surface area of pool in case of free drain to oily sump.
Banksmeadow Terminal pump bund	114	Capable of restraining a massive release and directing it to the underground drain system and oily sewer
	40	Total area covered by the catch basin closest to the pumps. Maximum surface area of pool in case of free drain to oily sump.

Should a spill occur, the chances of ignition will be minimised through the use of a combination of hardware plant design features (such as control of static electricity through earthing and electrical continuity and the installation of suitable electrical equipment to comply with hazardous area classification requirements) and through procedural requirements (through use of maintenance systems such as permit to work systems and preventative maintenance programs for electrical equipment in hazardous area).

A loss of containment may ignite at the source, for example due to the static electricity created at the point of release or by a mechanical impact causing the release in the first place. In the case of an ignition at the source, the jet fuel would burn as a jet fire (in the case of an aerosol release) or as a pool fire.

Some potential ignition sources are located within the refinery and Banksmeadow Terminal sites and are integral to the operation of these facilities. These sources are located well outside of the Hazardous Zones. However, in case of a large release of jet fuel it is conceivable that concentrations within the flammable range may reach such an ignition source, resulting in a flash back and a pool fire or possibly a flash fire or vapour cloud explosion (if the vapours were allowed to accumulate).

5.1.3 Safeguard Systems

The goal of the third layer of protection is to minimize the frequency and size of a release and prevent harm from potential associated hazards, such as fire.

For this level of safety protection, the refinery pumps and the Banksmeadow Terminal as well as the KBL are fitted with a number of sensors, detectors and alarms and back-up safety systems, which include an emergency shutdown (ESD) system.

Flammable vapour (hydrocarbon) sensors with alarms as well as detection of upset operating conditions (e.g. pressure, flow) with subsequent plant shut down will be provided.

The ESD system can identify problems and initiate shut off operations in the event certain specified fault conditions or equipment failures occur. The ESD is designed to prevent or limit significantly the amount of jet fuel that could be released in the event of a hazardous incident.

The ESD system is *fail safe*, i.e. the equipment associated with the ESD system are capable of compensating automatically and safely for a failure (e.g. failure of a mechanism or power source). The ESD system includes emergency shutdown buttons which are located in strategic locations within the refinery and the Banksmeadow Terminal, including at the control room. Automatic initiation of the ESD system has been designed into the system for critical trip events.

Hydrocarbon vapour detection (at the pumping stations) and fire fighting systems combine to limit effects if there is a release.

Necessary operating procedures, training, emergency response systems and regular maintenance to protect people, property and the environment from any release will also be established**.**

The details of this layer of protection will be defined during the detailed design process.

5.1.4 Separation Distances

The fourth layer of protection employed for facility design is required by regulation to maintain separation distances from communities and other public areas.

The separation distances are based on requirements code and on the maximum tolerable risk principles (as per the present hazard and risk assessment).

With respect to the code-based requirements, the Australian Standards (Ref 8) specify separation distances between storages and boundaries, ignition sources, protected places and accumulations of combustible materials. These separation distances must be large enough to safeguard people and property in case of a loss of containment incident.

In case of a spill at the pump platform, the jet fuel drains to sump further through an underground drainage system to an oily sump, minimising the surface area for evaporation and possible heat radiation (if ignition occurs) from neighbouring structures, tanks etc.

5.2 Control Risks to the Biophysical Environment

A failure to contain a loss of containment of jet fuel could cause environmental pollution to surface and groundwater. Prevention includes:

- Adequately designed piping, vessels, and storage tanks used for liquids;
- Most of the new, above-ground pipework is located inside bunded areas;
- Pipeline manifolds and pumps (both at the refinery and the Banksmeadow Terminal) are located on concrete slabs which drain away to the oily water sewer system;
- Oily sumps are fitted with hydrocarbon detectors which initiate alarm, informing pipeline operator of loss of containment.

Recommendation 1: As far as practicable, ensure pipes outside of contained area are fully welded (not flanged).

5.3 Control of Natural Hazards

While the safety systems listed in Section 5.1 are in general also partly for the control of the risk associated with natural hazards (such as design to codes and standards, robust design, bunds etc.), specific controls associated with these hazards have been listed below.

5.3.1 Earthquake / Seismic Hazard and Hazards from Land Subsidence

Structures and plant are designed to withstand earthquake effects using well-established procedures in accordance with relevant Australian or International standards. The pipeline route does not cross any known areas of mine subsidence.

Note that the main part of the KBL will remain unaltered with regards to risk from seismic hazards and from hazards relating to mine subsidence.

5.3.2 Brush and Bushfires

The risk associated with an incident associated with the new pumping stations initiating a brush or bushfire is minimised through passive protection in the form of plant layout, equipment spacing and drainage of possible liquid spillages away from critical equipment to containment sumps. Further, active measures such as fire and/or hydrocarbon (flammable vapour) detection, a firewater system and overpressure protection will also be included in the detailed design, minimising the effect of an incident.

Further, emergency response plans and procedures have been developed for the facility in conjunction with NSW Fire Brigades. These plans and procedures will detail the steps to be taken in case of a bushfire in the vicinity of the facilities.

The Council owned bushland to the west of the refinery pumping station (Marton Park Wetland) is located relatively close to the proposed site of the new pumps and may be at threat from a fire in the vicinity of the station. This was also highlighted in the Fire Safety Study conducted for the upgrade project (Ref 6). It is noted that the existence of fire hydrants in close proximity to the pump area provides fire protection cover to the wetland area.

Recommendation 2: Review existing Emergency Response Plans at both the Kurnell Refinery and at Banksmeadow Terminal as well as for the KBL for any changes required following implementation of the proposed upgrade.

5.3.3 Flooding / Erosion Hazard

Floods are unlikely to cause erosion of the ground cover of the KBL pipeline or floatation of the pipeline. The current regime of regular inspections and patrols of the pipeline would be maintained in order to identify any erosion problems and initiate repair of the ground cover. The proposed upgrade project does not introduce any increase in the risk associated with flooding / erosion.

The level of the pumping stations at the Kurnell Refinery and Banksmeadow Terminal are typically above grade.

5.3.4 Lightning Strike

Lightning strike is unlikely (but not impossible) to affect a buried pipeline or a pipeline below the Bay.

The refinery and the Banksmeadow Terminal are protected against lightning strike in accordance with Australian Standard AS 1768 Lightning Protection (Ref 16) requirements.

5.4 CONTROL OF OTHER TYPES OF HAZARDS

5.4.1 Aircraft Crash

The risk of an aircraft crashing into any given facility is based upon the following:

- The location of the airways relative to the facility;
- The location of the airport relative to the facility;
- The relative consequences should an aircraft crash into the facility.

The proposed location of the pumps at the refinery and at Banksmeadow Terminal site and the location of the KBL is within a few kilometers from Sydney Kingston Smith airport runways and hence in proximity of the arrival and departure flight paths. While airplane crashes are highly unlikely in Australia due to the stringent Civil Aviation Safety Authority requirements, they are possible and should the crash occur at one of the pump stations it is likely to result in massive releases of flammable liquids with subsequent fire and even possibly explosion.

While the consequences of airplane crash are serious, the likelihood of such an incident is extremely low. The incremental increase in risk resulting from the upgrade project, compared with the current risk of an airplane crash at the refinery or the Banksmeadow Terminal, is negligible.

The majority of the pipeline, being buried underground or well under the harbour, is unlikely to be seriously damaged even in the event of an aircraft crash.

5.4.2 Intentional Acts

Intentional acts include terrorism and vandalism. The incremental increase in risk resulting from the upgrade project, compared with the current risk of an intentional act at the refinery, the KBL or the Banksmeadow Terminal, is negligible.

Security at the refinery and at Banksmeadow Terminal is discussed in Section 2.6 above.

5.4.3 Knock-on Effects / Cumulative Effects

Consequence calculations carried out as part of the Fire Safety Study (Ref 6) shows that separation distances from the pumping stations at both the refinery and Banksmeadow Terminal to neighbouring facilities outside of the site boundaries ensures that the heat radiation or overpressure from credible scenarios are highly unlikely to cause major structural damage at neighbouring facilities.

The possibility of on-site knock-on effects from incidents at the new pumping stations was assessed in the Fire Safety Study for the proposed upgrade (Ref 6). This study showed that:

Kurnell Refinery

- In case of a major pool fire at the refinery, neighbouring tanks (T166 and T157) could be exposed to short time (1-2 minutes) intense heat radiation which was unlikely to pose any major threat to either of these tanks due to the short duration of the fire near the tanks with the pool draining away from the pumps (and hence the tanks) into the oily water sewer.

- Further, a major jet fire at the refinery was unlikely to pose a threat to nearby infrastructure (tanks) due to the bund wall which separates the pumps from the tanks.

- Hence, knock-on effects (or propagation) from a major incident at the Kurnell Refinery pumping station is unlikely to occur.

Banksmeadow Terminal

- In case of a major pool or jet fire at the new booster pump station at the Terminal, neighbouring foam pump house, laboratory and switchroom building could be exposed to intense heat radiation.

- A major jet fire at the new booster pump station at the Banksmeadow Terminal could pose a threat to nearby (existing) products pump.

- Hence, knock-on effects (or propagation) from a major incident at the Banksmeadow Terminal new booster pump station may occur without effective emergency response. This knock-on may cause damage to the Banksmeadow Terminal fire response equipment (foam house) which may lead to diminished emergency response and further damage to the Terminal.

Recommendation 3: Depending on the results of the Fire Safety Study, further risk reduction may need to be considered for the risk associated with a knock-on at the neighbouring foam pump house at

Banksmeadow Terminal in case of a major fire at the booster pump station.

Jet Fuel Pipeline (KBL)

The pipeline is buried from Bumborah Point to Banksmeadow Terminal and from Banksmeadow Terminal to JUHI.

An incident at a nearby facility is highly unlikely to expose the buried KBL (at a depth of a minimum of 750 mm) and, provided that the pipeline is not exposed, research has shown that a pipeline cannot be damaged by the radiated heat or explosion overpressure from a nearby incident (as discussed in the recent risk assessment of the Young to Bomen pipeline which will be installed alongside an existing high pressure pipeline (Ref 17)).

The pipeline is located underground from the Kurnell Refinery down to the wharf. Leak prevention is achieved through design, operation and maintenance to the requirements of applicable codes and standards (notably AS2885).

6 QUALITATIVE RISK ANALYSIS

As discussed above, the qualitative risk assessment has been prepared on the basis of the risk matrix and associated consequence and likelihood scoring tables in AS2885.1 (Ref 5), as presented in Appendix 1, and based on the hazardous incident identification exercise summarised in Table 6 above.

The risk profile of the current pumping stations (at Kurnell Refinery and at Banksmeadow Terminal) and the KBL line itself is presented in Table 8 below.

This risk profile can be compared with the risk profile for the pumping stations and the KBL line after completion of the proposed upgrade project, as presented in Table 9 below.

The scenarios refer to those identified in Table 6, as follows:

Scenario 1. KBL loss of containment event: Uncontrolled release from the pipeline due to generic faults.

Scenario 2. KBL loss of containment event: Loss of containment due to aging pipeline

Scenario 3. KBL loss of containment event: Uncontrolled release of jet fuel due to impact or damage to the pipeline.

Scenario 4. KBL loss of containment event: Maloperation

Scenario 5. KBL loss of containment event: During maintenance

Scenario 6. KBL loss of containment due to natural event

Scenario 7. KBL loss of containment due to other types of hazards (terrorism, aircraft crash, knock-on event)

Scenario 8. Pumping station loss of containment event: Uncontrolled release of jet fuel due to generic faults.

Scenario 9. Pumping station loss of containment event: Uncontrolled release of jet fuel due to mechanical impact or damage at one of the pump stations.

Scenario 10. Pumping station loss of containment due to natural hazards

Scenario 11. Pumping station due to other types of hazards (terrorism, aircraft crash, knock-on event)

Table 8 – Current Risk Profile, Pumping Stations and KBL Line

	Catastrophic	Major	Severe	Minor	Trivial
Frequent	EXTREME	EXTREME	HIGH	INTERMEDIATE	LOW
Occasional	EXTREME	HIGH	INTERMEDIATE	LOW	LOW
Unlikely	HIGH	HIGH	INTERMEDIATE SCENARIO 2 SCENARIO 3 SCENARIO 4 SCENARIO 5	LOW	NEGLIGIBLE
Remote	HIGH	INTERMEDIATE	LOW SCENARIO 1	NEGLIGIBLE SCENARIO 6 SCENARIO 8 SCENARIO 9	NEGLIGIBLE
Hypothetical	INTERMEDIATE	LOW	NEGLIGIBLE SCENARIO 7 SCENARIO 11	NEGLIGIBLE SCENARIO 10	NEGLIGIBLE

Table 9 – Risk Profile After Upgrade Project, Pumping Stations and KBL Line

	Catastrophic	Major	Severe	Minor	Trivial
Frequent	EXTREME	EXTREME	HIGH	INTERMEDIATE	LOW
Occasional	EXTREME	HIGH	INTERMEDIATE	LOW	LOW
Unlikely	HIGH	HIGH	INTERMEDIATE SCENARIO 3 SCENARIO 4	LOW	NEGLIGIBLE
Remote	HIGH	INTERMEDIATE	LOW SCENARIO 1 SCENARIO 2 SCENARIO 5	NEGLIGIBLE SCENARIO 6 SCENARIO 8 SCENARIO 9	NEGLIGIBLE
Hypothetical	INTERMEDIATE	LOW	NEGLIGIBLE SCENARIO 7 SCENARIO 11	NEGLIGIBLE SCENARIO 10	NEGLIGIBLE

It is evident from the above that a net risk reduction would be expected following the proposed upgrade project, as follows:

Risk Reduction: The risk associated with the following incident scenarios will be reduced (by approximately one order of magnitude):

- Loss of containment event: Scenario 1 - Loss of containment due to aging pipeline. Risk reduced from *Intermediate* to *Low.*
- Loss of containment event: Scenario 5 - During maintenance (failure during pigging causes loss of containment from the pigging station). Risk reduced from *Intermediate* to *Low.*

There will be some increased complexity in the operation of the pipeline which may somewhat increase the risk of operational error, as follows:

Increase in Risk: The risk associated with the following incident scenario will be somewhat increased:

- Loss of containment event: Scenario 4 - Operational error upstream or downstream facility.

The increase in risk is not expected to be a whole order of magnitude and cannot therefore be represented as such on the AS2885.1 Risk Matrix above. Further, safety features (including leak detection, pressure trips and alarm functions and procedures will come together to manage this risk.

The increase in pressure and flowrate may increase the rate of release if a pipeline leak was to occur and it may increase the stress on the pipeline. However, this increase is only relevant for certain operational modes (refer Table 1 and Table 2) and the pipeline and pumps have been designed to withstand higher operational pressure. Therefore the increase in pressure and flowrate is not expected to substantially affect the risk levels of the KBL.

7 QUANTITATIVE RISK ANALYSIS

The results of the quantitative risk assessment are presented below, as follows:

- Risk associated with the new pumping station at Kurnell Refinery
  - Individual fatality risk
  - Societal fatality risk
  - Propagation risk
  - Injury risk
- Risk associated with the new booster pump station at Banksmeadow Terminal
  - Individual fatality risk
  - Societal fatality risk
  - Propagation risk
  - Injury risk

7.1 NEW PUMPING STATION AT KURNELL REFINERY

7.1.1 Individual fatality risk

Individual risk contours are shown in Figure 6 for the Kurnell pumping station. The results show the following:

Maximum risk at site boundary: The maximum risk level at the site boundary is 0.08 x 10^{-6} per year.

Risk criterion for residential areas: The 1x10^{-6} per year risk contour, which is applicable for residential areas, is fully contained within the site boundary. The risk contours centre at the new pumping station and the lowest part of the bund where the pump and the catch basin leading to the underground drain system are located.

The risk of fatality at the nearest residential area from the new pumping station is less than 1 x 10^{-11} per year. This is less than the risk of dying from a meteorite (Refer 2) as well as being well below the maximum tolerable limit of one chance in a million per year (1 x 10^{-6} per year).

Risk criterion for active open space: The 10 x 10^{-6} per year risk contour for active open space is fully contained within the site boundary. The risk of fatality at the nearest active open space (i.e. at the wetland to the west of the new pump station) is 0.08 x 10^{-6} per year which is well below the criterion of ten chances per million years (10 x 10^{-6} per year) for open space.

Figure 6 - Individual Fatality Risk Contours, Kurnell After Upgrade

Legend:
---------- 10 x 10^{-6} per year (active open space buffer)
---------- 1 x 10^{-6} per year (residential buffer)

Risk criterion for industrial areas: The 50 x 10^{-6} per year risk contour for industrial buffer is never reached.

Risk criterion for sensitive development: The risk criterion for any sensitive development (0.1 x 10^{-6} per year) is contained in most directions except for a small excursion (of one to two meters) into the wetlands at the west of the new pump station. This risk contour does not however extend anywhere near any neighbouring sensitive developments such as nursing homes or schools etc.

Major Risk Contributors: The major risk contributors to the 1x10^{-6} per year and the 10x^{-6} per year risk contours are listed in Table 10 below.

Table 10 – Major Risk Contributors, Kurnell Pumping Station After Upgrade

Scenario	Contribution to the 10x10^{-6} per year contour	Contribution to the 1x10^{-6} per year contour
Pump leak at subsequent pool fire	99%	99%
Hole in one of the coalescers	1%	1%

7.1.2 Societal fatality risk

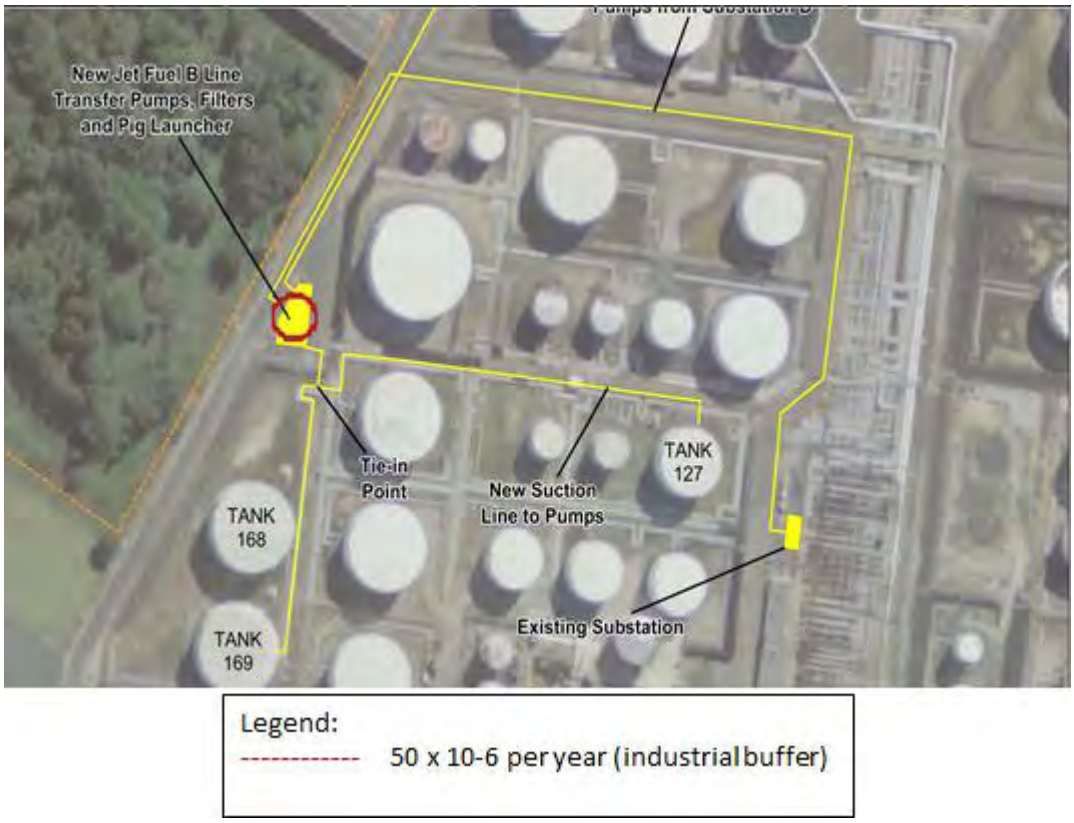
The risk of fatality at the nearest residential area from the new pumping station is less than 1 x 10^{-11} per year. With such low fatality risks at locations where residents and the public may reside, societal risk of fatality does not apply.

7.1.3 Propagation risk

The risk contour for levels of heat radiation and overpressures which may be damaging to process equipment (23 kW/m^2 and 14 kPa as per the NSW DoP risk criteria - Ref 2) is presented in Figure 7 below. The 50 x 10^{-6} per year risk contour, representing the maximum risk of propagation to neighbouring industrial facilities as per the DoP risk criteria, is contained within the site boundary. Further, it does not extend into any major infrastructure on the refinery site (such as neighbouring storage tanks).

The risk of propagation associated with the proposed pumping station is well below tolerable risk levels as per the DoP risk criteria.

Figure 7 – Propagation Risk, Kurnell After Upgrade

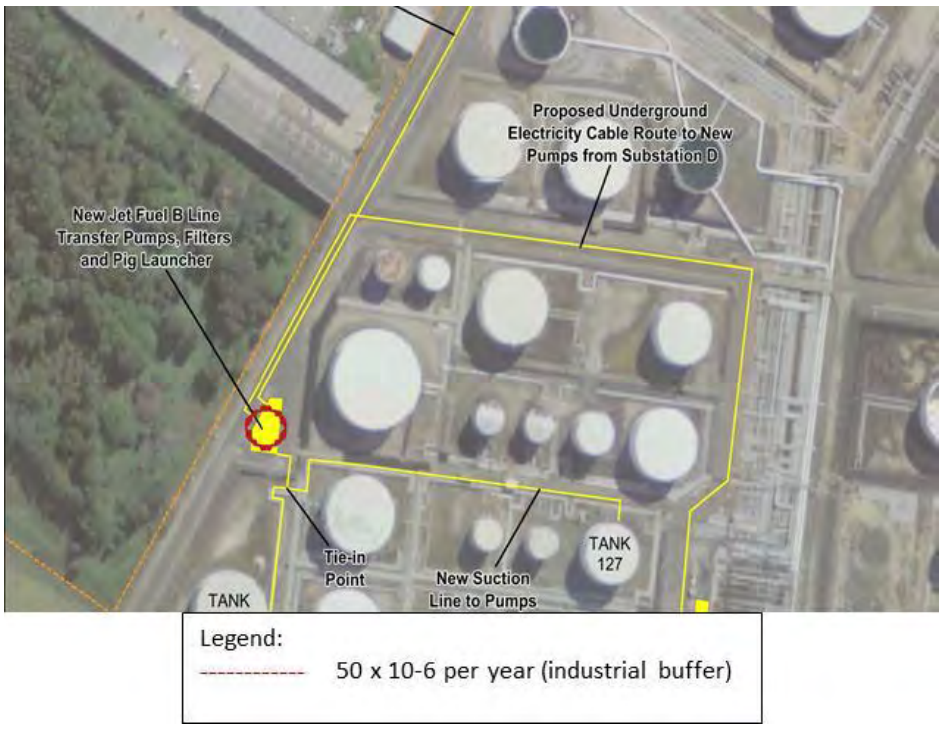


7.1.4 Injury risk

The risk contour for levels of heat radiation and overpressures which may be injurious (4.7 kW/m^2 and 7 kPa as per the NSW DoP risk criteria - Ref 2) is presented in Figure 8 below. The 50 x 10^{-6} per year risk contour, representing the maximum risk of injury outside of the site boundary, as per the DoP risk criteria, is contained within the site boundary.

The risk of injury associated with the proposed pumping station is below tolerable risk levels as per the DoP risk criteria.

Figure 8 – Injury Risk, Kurnell After Upgrade



7.2 NEW BOOSTER PUMP STATION AT BANKSMEADOW TERMINAL

7.2.1 Individual fatality risk

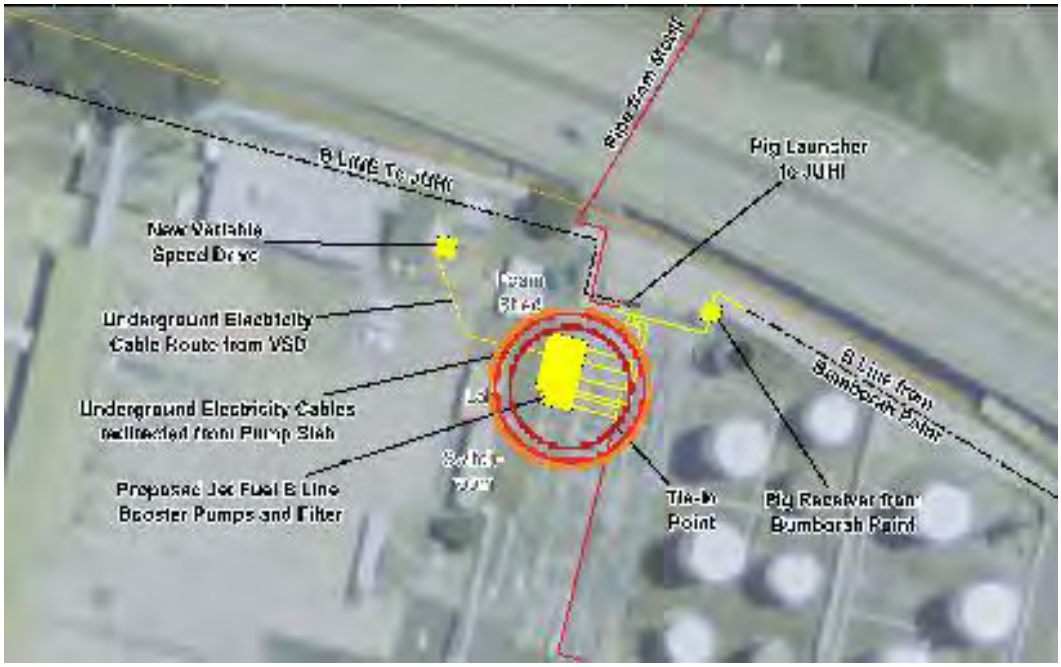
Individual risk contours are shown in Figure 9 for the Banksmeadow Terminal booster pumping station. The results show the following:

Maximum risk at the site boundary: The maximum risk level at the site boundary is less than 1 x 10^{-11} per year.

Risk criterion for residential areas: The 1x10^{-6} per year risk contour, which is applicable for residential areas, is fully contained within the site boundary. The risk contours centre around the new booster pumping station and the lowest part of the bund where the pump is located.

The risk of fatality at the nearest residential area from the new booster pumping station is less than 1 x 10^{-11} per year. This is less than the risk of dying from a meteorite (Refer 2). It is well below the maximum tolerable limit of one chance in a million per year (1 x 10^{-6} per year) set by the NSW DoP.

Figure 9 – Individual Fatality Risk Contours, Banksmeadow Terminal, After Upgrade



Legend:
---------- 10 x 10^{-6} per year (active open space buffer)
---------- 1 x 10^{-6} per year (residential buffer)

Risk criterion for active open space: The 10 x 10^{-6} per year risk contour for active open space is fully contained within the site boundary. The risk of fatality at the nearest active open space or the nearby public road, is well below the criterion of ten chances per million years (10 x 10^{-6} per year).

Risk criterion for industrial areas: The 50 x 10^{-6} per year risk contour for industrial buffer is fully contained within the site boundary in all other directions.

Risk criterion for sensitive development: The risk criterion for any sensitive development (0.1 x 10^{-6} per year) is fully contained within the site boundary.

Major Risk Contributors: The major risk contributors to the 1x10^{-6} per year and the 0.1x10^{-6} per year risk contours are listed in the table below.

Table 11 – Major Risk Contributors, Banksmeadow Terminal Booster Pumps After Upgrade

Scenario	Contribution to the $10x10^{-6}$ per year contour	Contribution to the $1x10^{-6}$ per year contour
Pump leak leading to a pool fire	99%	99%
Hole in one of the coalescers leading to a pool fire	1%	1%

7.2.2 Societal fatality risk

The risk of fatality at the nearest residential area from the new booster pumping station is less than 1×10^{-11} per year. With such low fatality risks at locations where residents and the public may reside, societal risk of fatality does not apply.

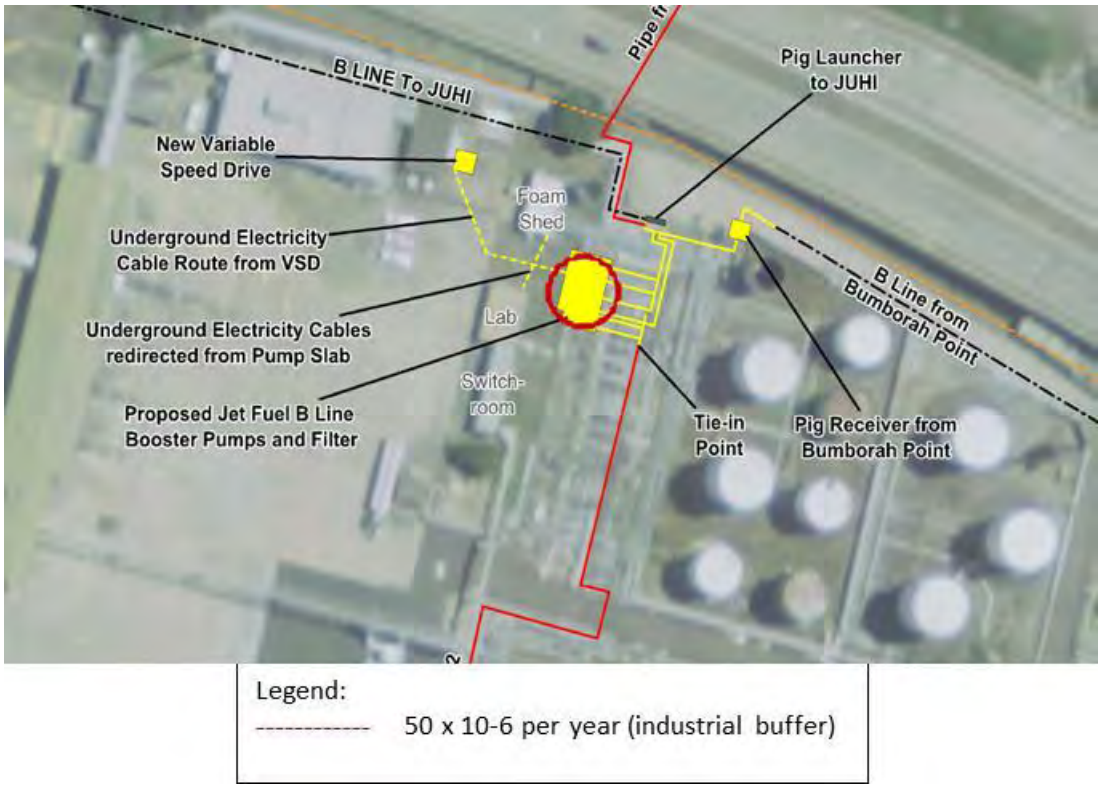
7.2.3 Propagation risk

The risk contour for levels of heat radiation and overpressures which may be damaging to process equipment (23 kW/m^2 and 14 kPa as per the NSW DoP risk criteria - Ref 2) is presented in Figure 10 below. The 50×10^{-6} per year risk contour, representing the maximum risk of propagation to neighbouring industrial facilities as per the DoP risk criteria, is contained within the site boundary.

Further, it does not extend into any major infrastructure on the site such as neighbouring storage tanks. However, the foam shed is located close to the new booster pump station and may be affected in a major fire at the station (also refer to the Fire Safety Study, Ref 6).

The risk of propagation associated with the proposed booster pumping station is below tolerable risk levels, as per the NSW DoP criteria.

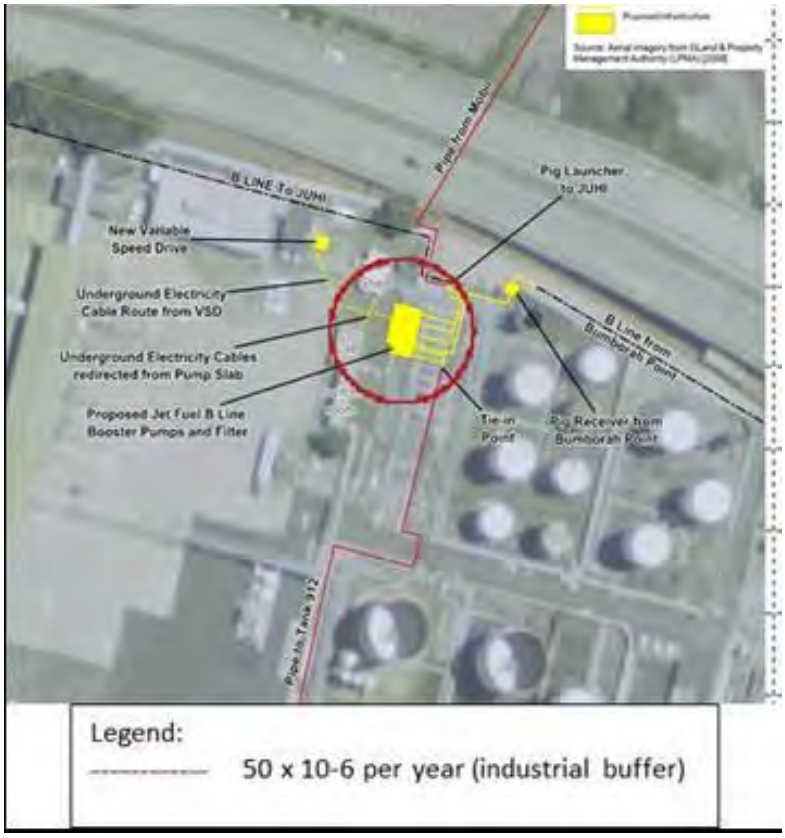
Figure 10 – Propagation Risk, Banksmeadow Terminal After Upgrade



7.2.4 Injury risk

The risk contour for levels of heat radiation and overpressures which may be injurious (4.7 kW/m^2 and 74 kPa as per the NSW DoP risk criteria - Ref 2) is presented in Figure 11 below. The 50 x 10^{-6} per year risk contour, representing the maximum risk of injury outside of the site boundary, as per the DoP risk criteria, is contained within the site boundary. The risk of injury associated with the proposed booster pumping station is below tolerable risk levels.

Figure 11 – Injury Risk, Banksmeadow Terminal After Upgrade



8 DISCUSSIONS AND CONCLUSION

8.1 OVERVIEW OF RISK

The main hazard associated with the proposed project is associated with the handling of jet fuel which is a flammable liquid at atmospheric conditions.

The predominant mode in which a hazardous incident may be generated is associated with a leak. This would generally only have the potential to cause injury or damage if there was ignition, which resulted in a fire or explosion incident. If the leak was not adequately contained and the jet fuel was allowed to enter the natural environment, an unignited release would be a threat to the biophysical environment

The factors involved are:

- Failure must occur causing a release. There are several possible causes of failure, with the main ones being corrosion and damage to the equipment by external agencies;

- For a pollution incident to occur, the release must either occur outside of contained areas (such as bunds) or containment must fail. The level of pollution will depend on the quantities of material released, the ease in which it can be removed and the area cleaned up, and the sensitivity of the environment in which the material was released;

- For a fire to occur, the released material must come into contact with a source of ignition. In some cases this may be heat or sparks generated by mechanical damage while in others, the possible ignition source could include non-flame proof equipment, vehicles, or a heat-source some distance from the release;

- Depending on the release conditions, including the mass of material involved and how rapidly it is ignited, the results of an ignition may be a localised fire (for example a so called jet fire or a pool fire) or a flash fire. If there is confinement a vapour cloud explosion is possible;

- Finally, for there to be a risk, people must be present within the harmful range (consequence distance) of the fire or explosion or the released jet fuel must enter the biophysical environment.

8.2 ADHERENCE TO QUANTITATIVE RISK CRITERIA – PUMPING STATIONS

The detailed design has not been completed as yet for this upgrade project. Despite the fact that many of the assumptions in this hazard and risk assessment are conservative, the results show that the risk associated with this

the Kurnell Refinery and the Banksmeadow Terminal pumping stations falls within acceptable limits.

The quantitative risk assessment (QRA) showed that all landuse criteria, as defined by the NSW DoP (Ref 2) are met for the two pumping stations. The risk at any nearby residential areas, open spaces and sensitive development is well below the maximum tolerable risk criteria. The risk associated with the new pumping stations does not preclude further industrial development in the vicinity of the sites.

The risk of propagation from the pumping stations to neighbouring facilities on the same site, such as the neighbouring storage tanks at the refinery and the Terminal, is also below the NSW Department of Planning risk criteria.

The most stringent risk criteria, as set by the NSW DoP for acceptable risks in industrial installations, are adhered to for the two pumping stations.

8.3 ACCEPTABILITY OF OTHER RISKS AND HAZARDS

8.3.1 Qualitative Evaluation of Risk

The net result of the proposed upgrade project is an overall reduction in the risk associated with the KBL. This is due to:

- The upgrade project ensures that the entire pipeline can be subjected to a Non Destructive Testing method (called *intelligent pigging*) where possible reduction in the integrity of the pipeline can be identified through measurement of loss of wall thickness or coating damage on the pipeline, before it becomes an issue. This process, while performed at typically every 7 years for the rest of the pipeline, cannot currently be completed for a length of pipeline between the Kurnell refinery and the wharf. After the upgrade project the entire pipeline will be able to be intelligently pigged.

- The removal of the pigging station from the wharf and installing it instead at the refinery, in a location which can be contained in case of a loss of containment of jet fuel during pigging activities, is also seen as a clear risk reduction measure.

The slight increase in risk associated with the more complex operational procedures required to transfer jet fuel at different rates to different customers (which may lead to operational error at the upstream or downstream facilities) is managed through the installation of hardware features such as valve position pumping permissives, pressure trips and alarm functions as well as procedures and training.

The increase in maximum operational pressure in the KBL is not believed to substantially increase the risk associated with this pipeline, seeing that the

design pressure and Maximum Allowable Operational Pressure (MAOP) exceeds this value. Further, the pressure trips and alarms would also contribute in the management of this risk.

The risk associated with the Kurnell Refinery and the Banksmeadow Terminal is not substantially changed as a result of the installation of the new pumping stations.

8.3.2 Risk to the Biophysical Environment

Risk to the biophysical environment from accidental releases of hazardous material at the new pumping stations will be minimised throughout the design, operation and maintenance process of plant and equipment. Further, spills outside of bunded areas will drain to the site drainage systems.

Risk to the biophysical environment from the KBL will be reduced as a result of the upgrade project, as discussed in Section 8.3.1 above.

8.3.3 Natural Hazards

A. Earthquake / Seismic Hazard and Hazards from Land Subsidence

The risk of earthquake, seismic hazards or land subsidence is minimal and is not altered as a result of the upgrade project.

B. Bushfire / Brush Fire

The risk associated with an incident associated with the new pumping stations initiating a brush or bushfire is minimised through a combination of active and passive protection (in the form of plant layout, equipment spacing, drainage, fire and/or hydrocarbon (flammable vapour) detection, a firewater system and overpressure protection).

The risk of a bush fire initiating an event at the KBL is not altered as a result of the upgrade project.

C. Flooding / Erosion

The risk associated with flooding or erosion is considered negligible in accordance with the risk ranking methodology in AS2885.1 (refer Appendix 1). It is not altered as a result of the upgrade project.

D. Lightning

The risk from lightning strike will be minimised through the use of relevant Australian or International standards.

8.3.4 External Hazards

A. Aircraft Crash

The risk associated with an aircraft crash is considered negligible in accordance with the risk ranking methodology in AS2885.1 (refer Appendix 1). It is not altered as a result of the upgrade project.

B. Incident Causes Knock-on Effect at Neighbouring Facility

The propagation risk calculations show that the current criteria for maximum acceptable risk at neighbouring industrial facilities is met at the boundary of the Kurnell Refinery pumping station and at Banksmeadow Terminal booster pump station.

Further, the said risk contour does not enter into major infrastructure at the two sites (such as storage tank areas).

The risk of knock-on effects at neighbouring installations is considered negligible in accordance with the risk ranking methodology in AS2885.1 (refer Appendix 1) for the KBL. It is not altered as a result of the upgrade project.

C. Intentional Acts

The risk of intentional acts (such as vandalism, terrorism) is considered negligible in accordance with the risk ranking methodology in AS2885.1 (refer Appendix 1). It is not significantly altered as a result of the upgrade project.

8.3.5 Cumulative Risk

Examination of the risk contours presented in Section 8.2 above shows that the risk associated with the new pumping stations at Kurnell Refinery and at Banksmeadow Terminal is low. It is expected to have low impact on the overall risk from the sites.

8.4 OVERALL CONCLUSION

The construction, commissioning and operation of the proposed upgrade project will be subject to rigorous scrutiny by Caltex and by the designing company, safeguarding delivery and operation of the project in a manner that minimises the risk to workers, contractors and the community.

The potential for incidents is well understood and the design of the plant and equipment will minimise the probability of an incident happening and mitigating an incident if it did occur.

The preliminary hazard and risk assessment of the proposed upgrade has found that the levels of risks to public safety from the two pumping stations are within generally accepted safety and risk guidelines.

Further, the upgrade project is expected to result in a net reduction in the overall risk from the KBL.

The present risk assessment has shown that the overall risk associated with the proposed upgrade project is low and does not introduce an excessive additional risk to the surrounding area.

9 RECOMMENDATIONS

Where possible, risk reduction measures have been identified throughout the course of the study in the form of recommendations. These are as follows:

- Recommendation 1: As far as practicable, ensure pipes outside of contained areas are fully welded (not flanged).
- Recommendation 2: Review existing Emergency Response Plans at both the Kurnell Refinery and at Banksmeadow Terminal as well as for the KBL for any changes required following implementation of the proposed upgrade.
- Recommendation 3: Depending on the results of the Fire Safety Study, further risk reduction may need to be considered for the risk associated with a knock-on at the neighbouring foam pump house at Banksmeadow Terminal in case of a major fire at the booster pump station.

10 REFERENCES

1 State Environment Planning Policy No 33 - *Hazardous and Offensive Development*, NSW Department of Planning

2 Hazardous Industry Planning Advisory Paper No. 4 (HIPAP No. 4): *Risk Criteria for Landuse Planning*, NSW Department of Planning

3 Hazardous Industry Planning Advisory Paper No. 6 (HIPAP No. 6): *Guidelines for Hazard Analysis*, NSW Department of Planning

4 Australian Standard AS2885 for Pipelines - Gas and Petroleum Liquids, 2007

5 *AS2885 Risk Assessment Workshop for the Caltex Jet Fuel B Line Stage 2 Upgrade*, ICD Asia Pacific, February 2011

6 *Caltex Jet Fuel Pipeline Upgrade Project, Fire Risk And Safety Assessment*, MATRIX RISK Pty Ltd, DRAFT November 2010

7 Yellow Book, *Methods for the Calculation of the Physical Effects of the Escape of Dangerous Material*, *CPR 14E, Parts 1& 2*, Committee for the Prevention of Disasters, TNO, 3rd edition 1997

8 AS1940 *The storage and handling of flammable and combustible liquids*

9 *Control Of Major Hazard Facilities* - National Standard, National Occupational Health and Safety Commission (NOHSC:1014), 2002

10 National Code of Practice National Occupational Health and Safety Commission (NOHSC:2016), 1996

11 Hazardous Industry Planning Advisory Paper No 1: *Industrial Emergency Planning Guidelines*, NSW Department of Planning 1993

12 Hazardous Industry Planning Advisory Paper No 2: *Fire Safety Study*, NSW Department of Planning 1993.

13 Building Code of Australia

14 *Australian Code for Transport of Dangerous Goods by Road and Rail* (ADG Code), 7th Ed, 2007

15 *Jet Fuel Upgrade Project A10027 - HAZOP Worksheets*, Caltex Refineries NSW, Kurnell, Printed 20 September 2010

16 AS 1768 Lightning Protection

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18 Dangerous Substances (PGS 3), Guidelines for quantitative risk assessment, Ministerie van VROM Ministerie van Verkeer en Waterstaat, December 2005

19 Cox A. W. Lees F. P, Ang M. L. Classification of Hazardous Locations, IChemE, 1990

20 Orica HAZAN Course, SHE Pacific, 1998

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Appendix 1

Qualitative Risk Assessment

Preliminary Hazard Analysis of the Proposed Caltex Jet Fuel Upgrade Project

Appendix 1 – Qualitative Risk Assessment

A1.1 – Risk Matrix

The risk matrix from AS2885.1 (2007) was used to qualitatively assess the risks associated with the proposed upgrade.

A1.1 – Risk Matrix

	Catastrophic	Major	Severe	Minor	Trivial
Frequent	EXTREME	EXTREME	HIGH	INTERMEDIATE	LOW
Occasional	EXTREME	HIGH	INTERMEDIATE	LOW	LOW
Unlikely	HIGH	HIGH	INTERMEDIATE	LOW	NEGLIGIBLE
Remote	HIGH	INTERMEDIATE	LOW	NEGLIGIBLE	NEGLIGIBLE
Hypothetical	INTERMEDIATE	LOW	NEGLIGIBLE	NEGLIGIBLE	NEGLIGIBLE

A1.2 – Consequence Scoring Table

Dimension	Catastrophic	Major	Severe	Minor	Trivial
People	Multiple fatalities result	Few fatalities; several people with lifethreatening injuries	Injury or illness requiring hospital treatment	Injuries requiring first aid treatment	Minimal impact on health and safety
Environment	Effects widespread; viability of ecosystems or species affected; permanent major changes	Major off-site impact; longterm severe effects; rectification difficult	Localized (<1 ha) and short-term (<2 y) effects, easily rectified	Effect very localized (<0.1 ha) and very short-term (weeks), minimal rectification	No effect; minor on-site effects rectified rapidly with negligible residual effect

A1.3 – Likelihood Scoring Table

Frequency class	Frequency description
Frequent	Expected to occur once per year or more
Occasional	May occur occasionally in the life of the pipeline
Unlikely	Unlikely to occur within the life of the pipeline, but possible
Remote	Not anticipated for this pipeline at this location
Hypothetical	Theoretically possible but has never occurred on a similar pipeline

Appendix 2

Quantitative Risk Assessment

Preliminary Hazard Analysis of the Proposed Caltex Jet Fuel Upgrade Project

Appendix 2 – Quantitative Risk Assessment

A2.1 – Risk Criteria

A2.1.1 - Individual Risk Criteria

The individual fatality risk is the probability of fatality to a person or a facility at a particular point. It is usually expressed as chances per million per year. It is assumed that the person will be at the point of interest 24 hours per day for the whole year. By convention in NSW, no mitigation is allowed, i.e. any possible evasive action that could be taken by a person exposed to a hazardous event, e.g. by walking out of a toxic cloud or a heat radiation. The assessment of fatality, incident propagation and injury risk should include all components contributing to the total risk, i.e. fire and explosion.

The NSW DoP uses a set of guidelines on acceptable levels or individual risk which are in line with the criteria used elsewhere in the world. These guidelines are published in the HIPAP No. 4: *Risk Criteria for Land Use Safety Planning* (Ref 2). The criteria for maximum tolerable individual risk from a new development are shown in Table A2.1 below. The criteria have been chosen so as not to impose a risk which is significant when compared to the background risk we are already exposed to. This table shows the criteria for individual risk of fatality, injury and propagation of an incident.

Table A2.1 - Criteria for Tolerable Individual Risk From New Development

Land Use		Max Tolerable Risk (per million per year)
Fatality risk criteria:		
Hospitals, Schools, etc		0.5
Residential areas, hotels, etc		1
Offices, retail centres, etc		5
Open space, recreation areas etc		10
Neighbouring industrial areas		50
Overpressure for Safety Distances:		
Property damage and accident propagation	14 kPa	50 Adjacent potentially hazardous installation, land zoned to accommodate such installations, or nearest public building
Injury risk levels	7 kPa	50 At residential areas
Maximum Heat Radiation:		
Injury risk levels	4.7 kW/m^2	50 At residential areas
Property damage and accident propagation	23 kW/m^2	50 Adjacent potentially hazardous installation or land zoned to accommodate such installations

In order to put these risks into perspective, published information on the level of risk to which each of us may be exposed from day to day due to a variety of activities has been shown in Table A2.2 below. Some of these are voluntary,

for which we may accept a higher level of risk due to a perceived benefit, while some are involuntary. Generally, we tend to expect a lower level of imposed or involuntary risk especially if we do not perceive a direct benefit.

Table A2.2 - Risk to Individuals

Activity / Type of Risk	Published levels of risk (per million per year)
VOLUNTARY RISKS (AVERAGED OVER ACTIVE PARTICIPANTS)	
Smoking	5,000
Drinking alcohol	380
Swimming	50
Playing rugby	30
Travelling by car	145
Travelling by train	30
Travelling by aeroplane	10
INVOLUNTARY RISKS (AVERAGED OVER WHOLE POPULATION)	
Cancer	1,800
Accidents at home	110
Struck by motor vehicle	35
Fires	10
Electrocution (non industrial)	3
Falling objects	3
Storms and floods	0.2
Lightning strikes	0.1

A2.1.2 - Societal Risk Criteria

Societal risk is concerned with the potential for an incident to coincide in time and space with a human population. Societal risk takes into account the potential for an incident to cause multiple fatalities. Therefore, two components are relevant, namely:

- The number of people exposed in an incident, and
- The frequency of exposing a particular number of people.

In the absence of published criteria in HIPAP 4 (Ref 2), the criteria in the 1996 regional study of Port Botany by the NSW DoP[2] have been used for indicative purposes, as presented in Table A2.3 below.

Table A2.3 - Criteria for Tolerable Societal Risk

Number of fatalities (N) [-]	Acceptable limit of N or more fatalities per year	Unacceptable limit of N or more fatalities per year
1	3×10^{-5}	3×10^{-3}
10	1×10^{-6}	1×10^{-4}
100	3×10^{-8}	3×10^{-6}
1000	1×10^{-9}	1×10^{-7}

[2] then the Department of Urban Affairs and Planning

The societal risk criteria specify levels of societal risk which must not be exceeded by a particular activity. The same criteria are currently used for existing and new developments. Two societal risk criteria are used, defining acceptable and unacceptable levels of risk due to a particular activity. The criteria in Table A2.3 above are represented on the societal risk (f-N) curve as two parallel lines. Three zones are thus defined:

- Above the unacceptable/intolerable limit the societal risk is not acceptable whatever the perceived benefits of the development.

- The area between the unacceptable and the acceptable limits is known as the ALARP (as low as reasonably possible) region. Risk reduction may be required for potential incidents in this area.

Below the acceptable limit, the societal risk level is negligible regardless of the perceived value of the activity.

A2.2 - Consequence Analysis

A2.2.1- Modelling Software

Consequence analysis was undertaken using the TNO Quantitative Risk Assessment program *Riskcurves* (version 7.6) and consequence modelling software program *Effects* (version 8.0). The TNO tools are internationally recognised by industry and government authorities.

The consequence models used within Effects Riskcurves are well known and are fully documented in the TNO Yellow Book (Ref 7).

Essentially, an appropriate release rate equation is selected based on the release situation and initial state of the material. The atmospheric dispersion model for denser-than-air releases - SLAB - is used to model dispersion behaviour for heavier than air vapours such as those formed from a jet fuel released into the atmosphere. The software tool is able to predict when the dispersed gas becomes neutral through incorporation of air and switches model automatically.

A2.2.2- Evaluation Techniques

Leak Rates

Riskcurves and Effects model release behaviour for compressed gas, liquid or 2-phase releases from vessels, pipelines or total vessel rupture. Input data includes the type of release, location of release with respect to vessel geometry, pipe lengths etc. and initial conditions of the fluid (i.e. before release).

The release rate is assumed to remain constant until isolation can be achieved - this is a conservative approach as in reality there will be pressure reduction and hence reduction in leak rate.

Duration

The duration of a leak will depend on the hardware systems available to isolate the source of the leak, the nature of the leak itself and the training, procedures and management of the facility. While in some cases it may be argued that a leak will be isolated within one minute, the same leak under different circumstances may take 10 minutes to isolate. Under worst case conditions, such as where there are large quantities of materials between two isolating valves, the release may last even longer. In such cases, the release pressure and hence the release rate will decrease.

The approach used in this study for the failure scenarios identified is to assume the release continues until the inventory has been released, up to a maximum duration of one hour. This is a conservative assumption as the operators have the ability to isolate the leak using remote operated valves.

Where automatic response has been designed into the plant (e.g. in the form of process trips), such response has been taken into account, with the relevant probability of failure of the trip.

Pool Dimensions

The Riskcurves model calculates the rate of evaporation and spreading of a pool of liquid. There are three release options which have the following implications on the spreading of a pool of liquid:

1. Instantaneous release: the inventory is released instantaneously, with the associated speed of the pool being very rapid;

2. Continuous release: the inventory is released at a constant rate for a given time period; and,

3. Transient release: the inventory is released at a variable rate for a given time period.

The rate of evaporation will depend on many factors, including climatic and weather, as well as the surface area over which evaporation takes place. A large surface area means a higher degree of evaporation if all other variables remain constant. Table A2.4 below summarizes the main assumptions made in the calculation of pool spreading and evaporation rates.

Table A2.4 - Input factors used to model Jet Fuel Spreading and Evaporation Rate

Substrate:	Land, average soil
Roughness Parameter:	Low crops, occasional large object
Release Duration	Duration derived from release rate calculation.

Dispersion Distances

A gas released will disperse in the atmosphere. At concentrations between the upper flammable limit and the lower flammable limit, jet fuel can ignite and burn.

The Riskcurves model is used to estimate the distance to which a release of flammable vapours will disperse to half the LFL for momentum driven (high pressure, high velocity releases) and dense gas scenarios respectively. Feed rates for gas dispersion models are taken from vapour release rates calculated by the Effects model.

Weather Data

Weather conditions are described as a combination stability category and wind speed. This is usually denoted as a combination of a letter with a number, such as *D4* or *F2*. The letter denotes the Pasquil stability class and the number gives the wind speed in metres per second.

Wind speeds range from light (1-2 m/s) through moderate (around 5 m/s) to strong (10 m/s or more). The probability of the wind blowing from a particular direction is displayed graphically as a *wind rose*.

The Pasquil stability classes describe the amount of turbulence present in the atmosphere ranging from *unstable* weather (class *A*), with a high degree of atmospheric turbulence to *stable* conditions (class *F*). Class A would normally be found on a bright sunny day; class D (*neutral* conditions), corresponding to an overcast sky with moderate wind; and class F corresponds to a clear night with little wind.

The approach used in this study is to define one wind weather category to represent day time (D4) and one to represent nighttime (F2).

A2.2.3- Heat Radiation and Explosion Overpressures

Modelling Techniques - Theory

Heat Radiation

The effect or impact of heat radiation on people is shown in the table below.

Table A2.5 - Effects of Heat Radiation

Radiant Heat Level (kW/m^2)	Physical Effect (effect depends on exposure duration)
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 15-20 seconds and injury after 30 seconds' exposure
12.6	Significant chance of fatality for extended exposure High chance of injury

Radiant Heat Level (kW/m^2)	Physical Effect (effect depends on exposure duration)
23	Likely fatality for extended exposure and chance of fatality for instantaneous (short) exposure
35	Significant chance of fatality for people exposed instantaneously

In Riskcurves, heat radiation effects are calculated based on flame surface emissive power (which is dependent on the quantity of material, its heat of combustion, flame dimensions and the fraction of heat radiated), as per the Yellow Book by TNO (in Ref 7). The heat flux at a particular distance from a fire is calculated using the view factor method. The view factor takes into account the distance from the flame to the target, the flame dimensions and the orientation angle between the flame and the target.

The effect of heat radiation on a person is calculated from the probit equation which relates to the probability of fatality to the thermal *dose* received (i.e. the combined heat and exposure time) though the following equations.

$$\text{Probit Pr} = -36.38 + 2.56 \ln(tQ^{1.33})$$

With t = exposure time (sec) and Q = heat flux (W/m^2).

And with the relationship between the probit value and the probability of fatality is calculated as follows:

$$\text{Probability of fatality} = \frac{1}{2}\left(1 + \text{erf}\left(\frac{\text{Pr}-5}{2^{0.5}}\right)\right)$$

Overpressure

The effect or impact of overpressure is shown in the table below.

Table A2.6 - – Effect of Explosion Overpressure

Overpressure (kPa)	Physical Effect
3.5	90% glass breakage. No fatality, very low probability of injury
7	Damage to internal partitions & 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

In Riskcurves, the Multi Energy method is used to predict the overpressures from flammable gas explosions, as per the Yellow Book in Ref 7. The key

feature of the Multi-Energy method is that the explosion is not primarily defined by the fuel air mixture but by the environment in which the vapour disperses.

Partial confinement is regarded as a major cause of blast in vapour cloud deflagrations. Blast of substantial strength is not expected to occur in open areas. Strong blast is generated only in places characterized by partial confinement while other large parts of the cloud burn out without contributing to the blast effects. The vapour cloud explosion is not regarded as an entity but is defined as a number of sub-explosions corresponding to various sources of blast in the vapour cloud, i.e. each confined part of the cloud is calculated as a separate vapour cloud explosion.

The initial strength of the blast is variable, depending on the degree of confinement and on the reactivity of the gas. The initial strength is represented as a scale of 1 to 10 where 1 means slow deflagration and 10 means detonation. For explosions in process plant environments the initial strength is thought to lie between 4 to 7 on the scale.

Calculated Fire Dimensions

Flame dimensions will vary depending on the wind weather conditions. Riskcurves calculates the flame dimensions for each wind weather category and incorporates these into the risk assessment together with their respective probability of occurrence.

Pool fire evaporation and burning rates will also vary depending on the wind weather conditions. Riskcurves calculates the heat radiation from a fire for each wind weather category and incorporates these into the risk assessment together with their respective probability of occurrence.

Calculated Blast Overpressure Dimensions

For a release of flammable gas into an unconfined environment the chances of an explosion is small.

A vapour cloud explosion is possible however if some degree of confinement is present, for example in a cramped plant area.

For concentrations within the flammable range from a release of jet fuel to be able to reach a confined area the release must be relatively large. Hence, vapour cloud explosions were only considered for the pipe rupture cases.

A2.3 - Likelihood Analysis

A2.3.1 - Failure Rates

The frequency of each postulated equipment failure incident scenario listed above was determined using the data in the table below.

These frequencies for pipelines and vessel leaks are those that have been in use by Orica Engineering for over 15 years of risk assessments in Australia. These frequencies are based on Orica Engineering's interpretation of published and unpublished (internal ICI and Orica) data.

The frequencies for pump leaks are those from Dutch TNO *Purple Book* (Ref 18).

Table A2.7 - Equipment Failures and Associated Frequencies

Type of Failure	Failure Rate (pmpy)
PIPELINES WITHIN FIXED PLANT	
3 mm hole	9 / m
13 mm hole	3 / m
50 mm hole	0.3 / m
3 mm gasket (13 mm hole equivalent)	5 / joint
Guillotine fracture (full bore):	
< 50 mm	0.6 / m
> 50 mm but < 100 mm	0.3 / m
> 100 mm	0.1 / m
PRESSURE VESSEL	
6 mm hole	24 pmpy
13 mm hole	6 pmpy
25 mm hole	3 pmpy
50 mm hole	3 pmpy
Catastrophic rupture	1 pmpy
PUMP LEAK (FOR PUMPS WITHOUT ADDITIONAL PROVISIONS)	
Catastrophic failure (full bore rupture of the largest connecting pipeline)	100
Leak (leak with an effective diameter of 10% of the nominal diameter of the largest connecting pipeline)	500

A2.3.2- Ignition Probability

Cox, Lees and Ang (Ref 19) gives the probabilities for ignition, as presented in the table below. The probability increases as a function of the size of the release. For the smallest releases the ignition probability may be as low as 1%. Vapours, such as those evaporating from a jet fuel release, are considered to be of *medium* reactivity, with correspondingly medium ignition probability.

Table A2.8 – Probability of Ignition

Size Release	Ignition probability
Small	1%
Medium	3%
Large	8%

The probability of delayed ignition for pipeline incidents are takes as per the Orica Hazard Analysis (HAZAN) Course (Ref 20).

Table A2.9 - Probability of Delayed Ignition

Size Release (kg/s)	Probability of Delayed Ignition
Small to medium vapour cloud	0.1
Medium vapour cloud	0.22
Major vapour cloud	0.43

The probability of an explosion for the fixed plant (where there may be some confinement) is taken as 40% of the total delayed ignition case, with flash fires accounting for the other 60% of cases. This is as per the methodology in the TNO Purple Book (Ref 18) and more conservative than observations of actual incidents in process industry.

The frequency of outcome of each individual incident scenario is listed in the spread sheet below. The Event Tree in Figure A2.1 below shows the flammable even logic used in this assessment.

Blockage in the Bund Drainage System

In the case of a loss of containment at the pumps at Kurnell Refinery or at the booster pumps at Banksmeadow Terminal, the jet fuel would gravity drain through the underground drainage system to the oily water sewer located at either site.

There are three catch basins within the Kurnell pump bund where the spill could enter the underground oily water sewer system.

If there was a blockage in one of these catch basins it is assumed that the spill would be transferred through the slope in the bund floor to the next catch basins and so forth.

If there was a blockage in the common underground drain system then a spill would pool on the pump bund floor.

The absence of blockages is checked every time there is rain and procedures exist to ensure that the pump bunds are free of water. There are no common mode incidents identified where the blockage in the drain system is initiated through a leak at the pumps. Hence the blockage in the drain system is assumed to be fairly unlikely to coincide with a loss of containment at the pumps.

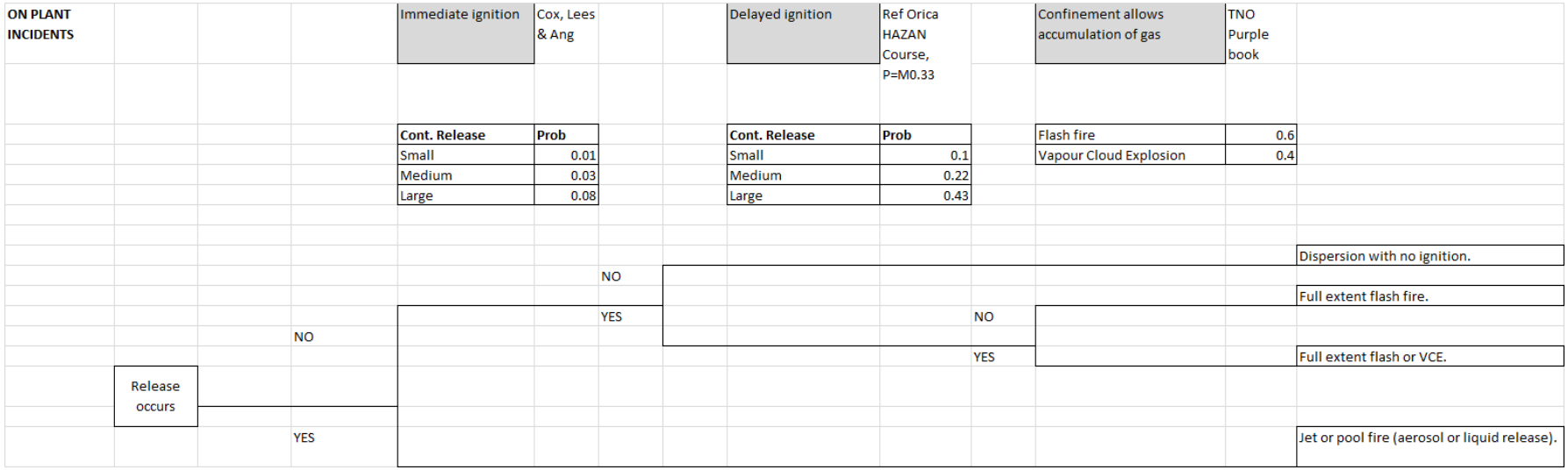
The following probability of failing to correct a blocked drain in either pump station bund is used in the present PHA, following the methodology suggested in the AIChE publication in Ref 21:

- General errors of omission for items imbedded in a procedure: 1×10^{-3} per demand

In the case of a totally blocked drainage system the maximum surface area of a loss of containment is that covering the total bund area.

If the drain is not blocked, the loss of containment scenario is evaluated buy fixing the maximum surface of the pool at that which is covered by the closest catch basin.

Figure A2.1 - Event Tree for Ignition of Jet Fuel Releases



Input data for RiskCurves			
Abbreviation	**Leak scenario**	**Material**	**State**
REFSMALL	3mm hole in pipe or flange (pinhole)	JET FUEL	AEROSOL
REFFLANGE	13mm hole in seal or flange	JET FUEL	AEROSOL
REFMAJOR	10% hole in pipeline	JET FUEL	LIQUID
REFRUPTURE	Rupture of pipeline	JET FUEL	LIQUID
BMTSMALL	3mm hole in pipe or flange (pinhole)	JET FUEL	AEROSOL
BMTFLANGE	13mm hole in seal or flange	JET FUEL	AEROSOL
BMTMAJOR	10% hole in pipeline	JET FUEL	LIQUID
BMTRUPTURE	Rupture of pipeline	JET FUEL	LIQUID
PV6	6mm leak in coalescer	JET FUEL	LIQUID
PV13	13mm leak in coalescer	JET FUEL	LIQUID
PV25	25mm leak in coalescer	JET FUEL	LIQUID
PV50	50mm leak in coalescer	JET FUEL	LIQUID
PVCAT	Catastrophic rupture of coalescer	JET FUEL	LIQUID
PUMPLEAK	10% leak in pump	JET FUEL	LIQUID
PUMPCAT	Rupture of connection to pump	JET FUEL	LIQUID

KURNELL REFINERY										
EQUIPMENT	LENGTH metres	#JOINTS	TRIP	LEAK FREQ. /yr	IGNITION FREQ/ /yr	IMMEDIATE IGNITION JET FIRE FROM AEROSOL FREQ. /yr	IMMEDIATE IGNITION POOL FIRE FREQ. /yr	IMMEDIATE IGNITION WITH BLOCKED DRAIN /yr	IMMEDIATE IGNITION POOL FIRE FREQ. /km yr	DELAYED IGNITION FLASH FREQ. /yr
REFSMALL	20	20	NO	1.80E-04	1.80E-06	9.00E-07	9.00E-07	9.00E-10	4.50E-05	1.08E-07
REFFLANGE	20	20	NO	6.00E-05	6.00E-07	3.00E-07	3.00E-07	3.00E-10	1.50E-05	3.60E-08
REFMAJOR	20	20	NO	6.00E-06	1.80E-07		1.62E-07	1.62E-10	8.10E-06	1.08E-08
REFRUPTURE	20	20	NO	2.00E-06	1.60E-07		1.60E-07	1.60E-10	8.00E-06	2.11E-08
REFSMALL DOWNSTREAM	20	20	NO	1.80E-04	1.80E-06	9.00E-07	9.00E-07	9.00E-10	4.50E-05	1.08E-07
REFFLANGE DOWNSTREAM	20	20	NO	6.00E-05	6.00E-07	3.00E-07	3.00E-07	3.00E-10	1.50E-05	3.60E-08
REFMAJOR DOWNSTREAM	20	20	NO	6.00E-06	1.80E-07		1.80E-07	1.80E-10	9.00E-06	1.08E-08
REFRUPTURE DOWNSTREAM	20	20	NO	2.00E-06	1.60E-07		1.60E-07	1.60E-10	8.00E-06	2.11E-08
PV6	N/A	N/A	NO	4.80E-05	4.80E-07	2.40E-07	2.40E-07	2.40E-10	N/A	2.88E-08
PV13	N/A	N/A	NO	1.20E-05	1.20E-07	6.00E-08	6.00E-08	6.00E-11	N/A	7.20E-09
PV25	N/A	N/A	NO	6.00E-06	1.80E-07		1.62E-07	1.62E-10	N/A	1.08E-08
PV50	N/A	N/A	NO	6.00E-06	1.80E-07		1.40E-07	1.40E-10	N/A	2.38E-08
PVCAT	N/A	N/A	NO	2.00E-06	1.60E-07		1.25E-07	1.25E-10	N/A	2.11E-08
PUMPLEAK	N/A	N/A	NO	1.00E-03	3.00E-05	1.30E-05	1.30E-05	1.30E-08	N/A	3.96E-06
PUMPCAT	N/A	N/A	NO	2.00E-04	1.60E-05	8.00E-06	8.00E-06	8.00E-09	N/A	4.13E-06

BANKSMEADOW TERMINAL										
EQUIPMENT	LENGTH metres	#JOINTS	TRIP	LEAK FREQ. /yr	IGNITION FREQ/ /yr	IMMEDIATE IGNITION JET FIRE FRO AEROSOL FREQ. /yr	IMMEDIATE IGNITION POOL FIRE FREQ. /yr	IMMEDIATE IGNITION WITH BLOCKED DRAIN /yr	IMMEDIATE IGNITION POOL FIRE FREQ. /km yr	DELAYED IGNITION FLASH FREQ. /yr
BMTSMALL	20	20	NO	1.80E-04	1.80E-06	9.00E-07	9.00E-07	9.00E-10	4.50E-05	1.08E-07
BMTFLANGE	20	20	NO	6.00E-05	6.00E-07	3.00E-07	3.00E-07	3.00E-10	1.50E-05	3.60E-08
BMTMAJOR	20	20	NO	6.00E-06	1.80E-07		1.80E-07	1.80E-10	9.00E-06	1.08E-08
BMTRUPTURE	20	20	NO	2.00E-06	1.60E-07		1.60E-07	1.60E-10	8.00E-06	2.11E-08
PV6	N/A	N/A	NO	4.80E-05	4.80E-07	2.40E-07	2.40E-07	2.40E-10	N/A	2.88E-08
PV13	N/A	N/A	NO	1.20E-05	1.20E-07	6.00E-08	6.00E-08	6.00E-11	N/A	7.20E-09
PV25	N/A	N/A	NO	6.00E-06	1.80E-07		1.80E-07	1.80E-10	N/A	1.08E-08
PV50	N/A	N/A	NO	6.00E-06	1.80E-07		1.80E-07	1.80E-10	N/A	2.38E-08
PVCAT	N/A	N/A	NO	2.00E-06	1.60E-07		1.25E-07	1.25E-10	N/A	2.11E-08
PUMPLEAK	N/A	N/A	NO	1.00E-03	3.00E-05	1.50E-05	1.50E-05	1.50E-08	N/A	3.96E-06
PUMPCAT	N/A	N/A	NO	2.00E-04	1.60E-05	8.00E-06	8.00E-06	8.00E-09	N/A	2.11E-06

KURNELL REFINERY						BEFORE UPGRADE					AFTER UPGRADE				
EQUIPMENT	DIAM ORIF. Metres	CROSS AREA m2	REL. HEIGHT m	MAX POOL SURFACE (M2)	MAX POOL SURFACE IF DRAIN SYSTEM NOT BLOCKED (M2)	LEAK RATE BEFORE UPGRADE kg/s (Effects)	EVAPORATION RATE (kg/s) (Effects)	DISTANCE TO LEL (m) (Effects)	CLOUD (KG) F2 (Effects)	CLOUD (KG) D4 (Effects)	LEAK RATE AFTER UPGRADE kg/s (Effects)	EVAPORATION RATE (kg/s) (Effects)	DISTANCE TO LEL (m) (Effects)	CLOUD (KG) F2 (Effects)	CLOUD (KG) D4 (Effects)
REFSMALL	3.00E-03	7.07E-06	0.00E+00	8.00E-01	8.00E-01	2.38E-01	0.021959	<1	0.00E+00	0.00E+00	2.58E-01	0.022612	<1	0.00E+00	0.00E+00
REFFLANGE	1.30E-02	1.33E-04	0.00E+00	2.64E+02	1.04E+02	4.48E+00	2.1986	<1	0.00E+00	0.00E+00	4.85E+00	2.1978	<1	0.00E+00	0.00E+00
REFMAJOR	5.00E-02	1.96E-03	0.00E+00	2.64E+02	1.04E+02	6.61E+01	5.5899	22.6	3.16E+01	0.00E+00	7.16E+01	5.7422	23	3.21E+01	0.00E+00
REFRUPTURE	2.00E-01	3.14E-02	0.00E+00	2.64E+02	1.04E+02	7.30E+02	8.6368	22	1.03E+02	0.00E+00	7.91E+02	8.68	24	1.05E+02	0.00E+00
REFSMALL DOWNSTREAM	3.00E-03	7.07E-06	0.00E+00	8.00E-01	8.00E-01	2.04E-01	0.020711	<1	0.00E+00	0.00E+00	3.44E-01	0.022612	<1	0.00E+00	0.00E+00
REFFLANGE DOWNSTREAM	1.30E-02	1.33E-04	0.00E+00	1.14E+02	1.04E+02	3.82E+00	1.0735	<1	0.00E+00	0.00E+00	6.46E+00	1.3353	<1	0.00E+00	0.00E+00
REFMAJOR DOWNSTREAM	5.00E-02	1.96E-03	0.00E+00	1.14E+02	1.04E+02	5.64E+01	3.0456	18.6	1.00E+00	0.00E+00	9.54E+01	3.4001	18.6	1.10E+00	0.00E+00
REFRUPTURE DOWNSTREAM	2.00E-01	3.14E-02	0.00E+00	1.14E+02	1.04E+02	6.24E+02	4.0278	23.8	3.00E+00	0.00E+00	1.05E+03	4.15	23.8	3.20E+00	0.00E+00
PV6	6.00E-03	2.83E-05	0.00E+00	8.00E-01	8.00E-01	3.80E+00	0.6	<1	0.00E+00	0.00E+00	600	0	<	0.00E+00	0.00E+00
PV13	1.30E-02	1.33E-04	0.00E+00	2.64E+02	1.04E+02	4.48E+00	2.1986	<1	0.00E+00	0.00E+00	4.85E+00	2.1978	<1	0.00E+00	0.00E+00
PV25	2.50E-02	4.91E-04	0.00E+00	2.64E+02	1.04E+02	3.20E+01	3.4	<1	0.00E+00	0.00E+00	3.20E+01	3.4	<1	0.00E+00	0.00E+00
PV50	5.00E-02	1.96E-03	0.00E+00	2.64E+02	1.04E+02	6.61E+01	5.5899	22.6	3.16E+01	0.00E+00	7.16E+01	5.7422	23	3.21E+01	0.00E+00
PVCAT	RUPTURE	RUPTURE	0.00E+00	2.64E+02	1.04E+02	INSTANT.	6.1	26	1.20E+02	0.00E+00	INSTANT.	6.1	26	1.20E+02	0.00E+00
PUMPLEAK	2.50E-03	4.91E-06	0.00E+00	2.64E+02	1.04E+02	6.61E+01	5.5899	22.6	3.16E+01	0.00E+00	7.16E+01	5.7422	23	3.21E+01	0.00E+00
PUMPCAT	2.00E-01	3.14E-02	0.00E+00	2.64E+02	1.04E+02	7.30E+02	8.6368	22	1.03E+02	0.00E+00	7.91E+02	8.68	24	1.05E+02	0.00E+00

BANKSMEADOW TERMINAL						BEFORE UPGRADE					AFTER UPGRADE				
EQUIPMENT	DIAM ORIF. Metres	CROSS AREA m2	REL. HEIGHT m	POOL SURFACE (M2)	MAX POOL SURFACE IF DRAIN SYSTEM NOT BLOCKED (M2)	LEAK RATE BEFORE UPGRADE kg/s (Effects)	EVAPORATION RATE (kg/s) (Effects)	DISTANCE TO LEL (m) (Effects)	CLOUD (KG) F2 (Effects)	CLOUD (KG) D4 (Effects)	LEAK RATE AFTER UPGRADE kg/s (Effects)	EVAPORATION RATE (kg/s) (Effects)	DISTANCE TO LEL (m) (Effects)	CLOUD (KG) F2 (Effects)	CLOUD (KG) D4 (Effects)
BMTSMALL	3.00E-03	7.07E-06	0.00E+00	8.00E-01	8.00E-01	2.04E-01	0.020711	<1	0.00E+00	0.00E+00	3.44E-01	0.022612	<1	0.00E+00	0.00E+00
BMTFLANGE	1.30E-02	1.33E-04	0.00E+00	4.00E+01	1.04E+02	3.82E+00	1.0735	<1	0.00E+00	0.00E+00	6.46E+00	1.3353	<1	0.00E+00	0.00E+00
BMTMAJOR	5.00E-02	1.96E-03	0.00E+00	4.00E+01	1.04E+02	5.64E+01	3.0456	18.6	1.00E+00	0.00E+00	9.54E+01	3.4001	18.6	1.10E+00	0.00E+00
BMTRUPTURE	2.00E-01	3.14E-02	0.00E+00	4.00E+01	1.04E+02	6.24E+02	4.0278	23.8	3.00E+00	0.00E+00	1.05E+03	4.15	23.8	3.20E+00	0.00E+00
PV6	3.00E-03	7.07E-06	0.00E+00	8.00E-01	8.00E-01	2.04E-01	0.020711	<1	0.00E+00	0.00E+00	3.44E-01	0.022612	<1	0.00E+00	0.00E+00
PV13	1.30E-02	1.33E-04	0.00E+00	4.00E+01	1.04E+02	3.82E+00	1.0735	<1	0.00E+00	0.00E+00	6.46E+00	1.3353	<1	0.00E+00	0.00E+00
PV25	5.00E-02	1.96E-03	0.00E+00	4.00E+01	1.04E+02	5.64E+01	3.0456	18.6	1.00E+00	0.00E+00	9.54E+01	3.4001	18.6	1.10E+00	0.00E+00
PV50	2.00E-01	3.14E-02	0.00E+00	4.00E+01	1.04E+02	6.24E+02	4.0278	23.8	3.00E+00	0.00E+00	1.05E+03	4.15	23.8	3.20E+00	0.00E+00
PVCAT	RUPTURE	RUPTURE	0.00E+00	4.00E+01	1.04E+02	INSTANT.	3.22	22	1.00E+02	0.00E+00	INSTANT.	3.22	22	1.00E+02	0.00E+00
PUMPLEAK	2.50E-03	4.91E-06	0.00E+00	4.00E+01	1.04E+02	6.61E+01	5.5899	22.6	3.16E+01	0.00E+00	7.16E+01	5.7422	23	3.21E+01	0.00E+00
PUMPCAT	2.00E-01	3.14E-02	0.00E+00	4.00E+01	1.04E+02	7.30E+02	8.6368	22	1.03E+02	0.00E+00	7.91E+02	8.68	24	1.05E+02	0.00E+00

KURNELL REFINERY	DISTANCE TO HEAT RADIATION (m) (Effects)		
EQUIPMENT	4.7kW/m2	12.5kW/m2	23kW/m2
REFSMALL	25	11	9
REFFLANGE	25	11	9
REFMAJOR	25	11	9
REFRUPTURE	25	11	9
REFSMALL DOWNSTREAM	18	8	6
REFFLANGE DOWNSTREAM	18	8	6
REFMAJOR DOWNSTREAM	18	8	6
REFRUPTURE DOWNSTREAM	18	8	6
PV6	25	11	9
PV13	25	11	9
PV25	25	11	9
PV50	25	11	9
PVCAT	25	11	9
PUMPLEAK	25	11	9
PUMPCAT	25	11	9

BANKSMEADOW TERMINAL	DISTANCE TO HEAT RADIATION (m) (Effects)		
EQUIPMENT	4.7kW/m2	12.5kW/m2	23kW/m2
BMTSMALL	18	8	6
BMTFLANGE	18	8	6
BMTMAJOR	18	8	6
BMTRUPTURE	18	8	6
PV6	18	8	6
PV13	18	8	6
PV25	18	8	6
PV50	18	8	6
PVCAT	18	8	6
PUMPLEAK	25	11	9
PUMPCAT	25	11	9

C.2 PHA Addendum addressing comments by the Major Hazards Unit at the Department of Planning and Infrastructure

Addendum to PHA
Caltex Jet Fuel Upgrade Project
Response to Comments from Department of Planning and Infrastructure

1. Introduction

This addendum has been compiled to respond to a request by the NSW Department of Planning and Infrastructure (DoPI) relating to additional information on the Preliminary Hazard Analysis (PHA) of the Proposed Caltex Jet Fuel Upgrade Project (Ref [1]), which is proposed by Caltex in NSW. The addendum and the PHA were compiled by Planager Pty Ltd (Planager) in accordance with the requirements for risk assessment of potentially hazardous development by NSW DoPI.

To assist in the reading of this addendum, the questions/requests for information posed by the DoPI have been included in the text below.

Ref [1]. Nilsson K, *Preliminary Hazard Analysis of the Proposed Caltex Jet Fuel Upgrade Project*, Planager Pty Ltd, 7 March 2011

2. Response to Requests by NSW DoPI

Question 1: *The risks are estimated qualitatively in the table and for items 3 and 4 are found Intermediate. It should be noted, that AS 2885 requires risk ranked as Intermediate, to be treated. If the risk cannot be reduced, then ALARP should be demonstrated. The Proponent should provide additional information to demonstrate that the Qualitative Risk Assessment (QRA) performed for the pipeline complies with the methodology outlined in AS 2885.*

Answer 1: The justification as to ALARP is provided in the tables attached.

.

Question 2: *What measures will be in place to ensure the integrity of the tanks at higher pumping rates? The additional safeguards (if any) to prevent negative pressure in the tanks due to the higher rates should be listed.*

Answer 2: The jet storage tanks at Kurnell are cone roof in construction with internal floating pans and are fitted with numerous air scoop vents around the perimeter of the roof. As such, the tank has several open air slots at the roof. Therefore, there is no risk of a vacuum being created, even during the highest pumping rate.

Question 3: *Information on the failure rates used for the valves in the frequency analysis should be provided.*

Answer 3: Failure rate data used in the QRA are from the Netherlands Organisation for Applied Scientific Research - TNO's - *Purple Book*. As per the TNO methodology, the valves were not treated as separate equipment types within a QRA; simply because the small amount of material typically released during a leak does not provide substantial risk. However, gasket failures can contribute to risk and are included in the TNO failure frequencies for pipelines (refer Section 3.2.3(5) in the Purple Book).

AS 2885 ALARP Assessment For Intermediate Risk Ranked Scenarios ref AS 2885 AppD:

Threat ID	Threat Description	Location	Safeguards/Prevention Summary
3	**Loss of containment event:** Uncontrolled release of Jet fuel due to 1st or 3rd party interference by excavation or by anchor damage under Botany Bay.	Whole of pipeline from Kurnell Refinery to JUHI facility within Sydney Airport complex.	**Prevention:** Pipelines within a pipeline corridor with administrative controls preventing 3rd parties from carrying out work without CALTEX approval. Signage at road crossings indicating presence of pipelines. **Detection:** SCADA system and pressure sensors and independent alarms monitored 24/7. Routine inspection and patrol in accordance with pipeline inspection/integrity plan. Automatic leak detection system which triggers emergency shutdown of pipeline. **Protection:** Resistance to penetration by pipe wall thickness and burial depth. Integrity program to ensure any deterioration is detected and repaired. **Emergency Response:** Manual and automated shutdown of pipeline on detection of pressure drop. Developed emergency response and oil spill response plan.

ALARP Analysis

Possible Alternative Mitigation:	Reason Not adopted:	ALARP Satisfied (Y/N)
Shut down pipeline permanently.	Possibility of 3rd party interference cannot be fully mitigated while the line exists so removal is the only effective way to eliminate the risk. However the airport would not be able to function effectively. Any viable alternative supply would likely involve a pipeline and threat would remain.	Y
Flexible concrete mat over pipeline under botany Bay	This would not be fully effective if a large ship's anchor made contact with the pipeline (which is the main threat). Cost would be disproportionate to minor risk reduction achieved and potential environmental impact considerable with the solution not fully effective.	Y

AS 2885 ALARP Assessment for intermediate Risk ranked Scenarios ref AS 2885 AppD:			
Threat ID	**Threat Description**	**Location**	**Safeguards/Prevention**
4	Loss of containment due to mal operation	Whole of pipeline from Kurnell Refinery to JUHI facility within Sydney Airport complex.	Prevention, detection and emergency response as per scenario 3. **Protection**: Additional safeguards are mechanical over pressure device in the form of a pressure safety valve. This means that if other safeguards are manually overridden, the pipeline cannot be subjected to pressures over design maximum allowable operating pressure. Operating procedures and training to be developed. Pipeline technicians would require to be trained and certified in the correct operation of the pipeline.

ALARP Analysis		
Possible Alternative mitigation:	**Reason Not adopted:**	**ALARP Satisfied (Y/N)**
Shut down pipeline permanently. No other mitigations available if project current design is fully adopted.	Refer Threat 3 complete shutdown of the B line would mean airport requiring a new pipeline which would have similar risk. Transport of jet fuel from refinery to JUHI by road would incur greater risk to airport operation. It would also increase the quantity of dangerous goods being tankered on congested road system. JUHI facility limited delivery options and largely beyond Caltex control given control of the site is by SACL and Shell.	Y

C.3 PHA Addendum addressing comments by Workcover (General)

Addendum to PHA
Caltex Jet Fuel Upgrade Project
Response to Comments from WorkCover MHF Branch 24 May 2011

1. Introduction

This addendum has been compiled to respond to a request by WorkCover's Major Hazard Facilities (MHF) Team relating to additional information on the Preliminary Hazard Analysis (PHA) of the Proposed Caltex Jet Fuel Upgrade Project (Ref [1]), which is proposed by Caltex in NSW. The addendum and the PHA were compiled by Planager Pty Ltd (Planager) in accordance with the requirements for risk assessment of potentially hazardous development by NSW DoPI.

To assist in the reading of this addendum, the questions/requests for information posed by the MHF Team have been included in the text below.

2. MHF Team Suggested Conditions of Approval

As per statutory requirements, Caltex together with other MHFs in NSW, is preparing a Formal Safety Report for WorkCover. The legislated submission date for this first Safety Report is February 2012. Impacts from this project (site QRA, AQR and potential effects on existing or new MAHs) will be included in the February 2012 submission.

Ref [1]. Nilsson K, *Preliminary Hazard Analysis of the Proposed Caltex Jet Fuel Upgrade Project*, Planager Pty Ltd, 7 March 2011

3. Response to Requests by MHF Team 24 May 2011

Question 1:

1. Table 7 Bund Design – Surface area of a pool is in itself insufficient if fire duration in the event of a blockage of the drain system is to be estimated. Suggest that a revised table in the PHA should include additional columns for bund capacity (volume), and time to fill, in the event of a blockage of the drain system, at the maximum credible leak or spill rate. The time to fill (and then overflow) should be sufficient to allow operators to intervene and isolate flow before an overflow.

Answer 1:

Please note that the risk scenarios for pool fire associated with a blocked drain was included for completeness but only contribute less than 0.1% to the total risk at the site boundary and at the edge of the pump bund.

The PHA has assumed that the catchment basin closest to the pump area will catch the spill in all cases provided that the free drain to the oily sump is not blocked, and that the surface area of the burning pool equals the surface area of the catchment basin (a maximum 104m^2). In reality, the surface area of the burning pool will be much smaller as the release would be free draining through the underground drainage system to the oily water sewer.

If the drain was to block, the risk assessment has assumed that the spill would keep on filling up the bund floor, from one catchment basin to the other and eventually filling the whole pump bund floor.

The PHA assumed two cases:

- Firstly the case where the drain is not blocked and where the pool covers the entire catchment basin: 104m^2.
- Secondly, where there was a blockage in the free drain and where the pool covers the entire pump bund floor: 264m^2. The likelihood of this event was reduced by the probability of the free drain being blocked, resulting in a very low likelihood and hence to very low contribution to the overall risk. This would not change even if the PHA had assumed that a much larger area was covered by the pool.

The leak would initiate an automatic pipeline emergency shutdown on hydrocarbon detection. The hydrocarbon detectors are located locally and within the oily water system.

Should the SCADA fail to react, an alarm in the control room (which is manned 24hr/7d) would prompt operators to shut down the pump and close the isolation valves to stop the leak using remote activated commands from the control room.

The spilled maximum volume of flammable liquid would be the contents of the line between the ESD block valve and the pump seal. Caltex experience shows that leak detections have resulted in < 300L product released into the bund.

The bund volume is 40m^3. The approximate time for the bund to fill up, in case of a major leak which did not drain to the sump, is 7 minutes.

Caltex experience shows that this timeframe is adequate to allow for safe shutdown of pump and closure of isolation valves, even if the drain was blocked.

Question 2:

2. Clause 5.1.4 Separation distances – Para 3 should include a clear statement if the proposed system and associated plant comply with the codes and standards. Any non-compliances should be detailed.

Answer 2:

The main codes and standard applicable for the present development are AS1940 (for flammable and combustible liquids) and AS2885.1 (pipelines code).

All new equipment (pipeline, pumps etc.) forming part of the present upgrade project will comply will all aspects of AS1940 and AS2885.1, as follows:

- The New Jet Fuel B Line at the Kurnell Right of Way complies with AS2885 part 1;
- The New Pump plot location complies AS1940 separation distances (see attached sketch) ;
- Structures and plant are designed to withstand earthquake loads as per AS1170 part 4;
- The design complies with the Lightning Protection AS1768 section 7.

Further, while outside the scope of the PHA, a Fire Safety Study and an Environmental Study was carried out for the Tank 166 conversion project. The fire safety study included ensuring Tank 166 compliance with AS1940. Tank 166 will comply with AS1768 for lightning protection

No non-compliance issues with respect to the new equipment and Tank 166 have been identified.

Question 3:

3. References to use of methodologies in standards should be complemented with confirmation that the conditions, restrictions and caveats in the standard have been met.

Answer 3:

Table 3 in Section 3 refers to the main codes and standards applicable for the present development. The designers are contractually responsible for ensuring that the conditions, restrictions and caveats in these standards, as relevant for the

upgrade project, are met. Caltex review and approval of the designs confirms Caltex satisfaction that these responsibilities have been met. (Refer Caltex Schedule of design approvals for major projects).

Question 4:

4. Clause 5.4.3 Knock-on effects – Jet fuel pipeline (KBL) – The minimum depth of burial appears too low for urban areas. This value should be verified.

Answer 4:

Caltex has chosen to use the T1 definition in AS2885.1 to describe the area around the pipeline and will hence adopt a minimum depth of burial of 900mm and 1200mm at road crossings (the latter exceeding AS2885.1 requirements).

Question 5:

5. Clause 5.4.3 Knock-on effects – Jet fuel pipeline (KBL) – A clear statement of compliance with applicable codes and standards should be included with any non-compliances clearly stated.

Answer 5:

As described above,

- The New Jet Fuel B Line at the Kurnell Right of Way complies with AS2885 part 1;
- The New Pump plot location complies AS1940 separation distances (see attached sketch);
- Structures and plant are designed to withstand earthquake loads as per AS1170 part 4;
- The design complies with the Lightning Protection AS1768 section 7.

Signage and dial before you dig requirements also serve to limit risk exposure. With these controls there is no mandated requirement to bring the existing pipelines to full compliance.

Caltex meet the requirements of AS 2885.3 for the KBL.

Question 6:

6. Table 8 Current Risk Profile, Pumping Stations and KBL Line - Dot point 2 below table 8 gives a risk reduction (scenario 5) from intermediate to low. Some detail or explanation of the before and after risks should be included here. For example, although the new location is bunded, it is in closer proximity to other plant and tanks and therefore the risk of escalation could be higher at the new location.

Answer 6:

The intermediate risk level in the current set-up is due to:

- The inability to pig a section of the line leading to possible small leaks.
- The location of the pigging station near Botany Bay and the difficulties in containing and cleaning up should a spill occur.

The main reduction identified is achieved through the improved ability to pig the system and hence identify and rectify potential for leakage before it occurs.

Further, loss of containment may occur during pigging, which could cause environmental damage or, if ignited, a fire.

After the upgrade project the pigging station at the wharf will no longer be used.

The new pigging station at the refinery will be contained. In case of a loss of containment during pigging activity, the spill would be contained and hence, the risk is assumed to be reduced to a *low* risk. Please note that since pigging activities are well understood and heavily proceduralised activities, the risk of ignition of a contained spill during pigging activities is very low, in particular in cases where the spill is contained.

While the location of the Kurnell booster pumps is closer to tanks it is further away from other equipment/pumps and the occupied control room. Overall safety risk associated with exposure issues at the new location should be similar to the existing pump location.

Question 7:

7. References – Items 11 and 12 refer to HIPAPs 1993. Revised HIPAPs 2011 should be used. Also see clause A2.1.2.

Answer 7:

Revised references are:

11) Hazardous Industry Planning Advisory Paper No 1: Industrial Emergency Planning Guidelines, NSW Department of Planning 2011
12) Hazardous Industry Planning Advisory Paper No 2: Fire Safety Study, NSW Department of Planning 2011.

Further, clause A2.1.2 refers to the criteria for societal risk as described in the Port Botany regional study. In 2011 the NSW Department of Planning published the *Indicative Societal Risk Criteria* in reference 2) in the PHA, as follows:

2) Hazardous Industry Planning Advisory Paper No. 4 (HIPAP No. 4): Risk Criteria for Landuse Planning, NSW Department of Planning, 2011

Please note that the criteria used in the PHA for the KBL upgrade is as per the 2011 *Indicative Societal Risk Criteria*.

Question 8:

8. Footnote clause 2.2 – It is noted that tank 166 is to be converted from fuel oil use to jet fuel under a different project. Caltex should review the change in risk and the adequacy of the bund material for containing jet fuel. For example, is the bund material sufficiently impervious to the less viscous jet fuel?

Answer 8:

A number of risk assessments have been conducted for the proposed upgrade and Tank 166 conversion, including: HAZOP, Fire Safety Study, Fire equipment and foam design assessment, Quantitative Risk Assessment (as part of the Preliminary Hazard Analysis), and a Refinery Health and Safety Evaluation.

All design actions raised in these reviews have been addressed by the designers and reviewed using Caltex's internal review and approval process.

There is a (small) number of pre-commissioning and post commissioning actions. These are being managed as part of the project and will be completed when work has proceeded far enough to allow the items to be addressed (most are procedural updates).

Tank 166 bund and tank compound has been modified as part of the Tank 166 conversion process, to install an impervious clay liner.

Question 9:

9. General – Static and the added risk of ignition due to increased pumping rates should be considered.

Answer 9:

The following potential risk issues have been identified and addressed:

Risk of vacuum: The jet storage tanks at Kurnell are cone roof in construction with internal floating pans and are fitted with numerous air scoop vents around the perimeter of the roof. As such, the tank has several open air slots at the roof.

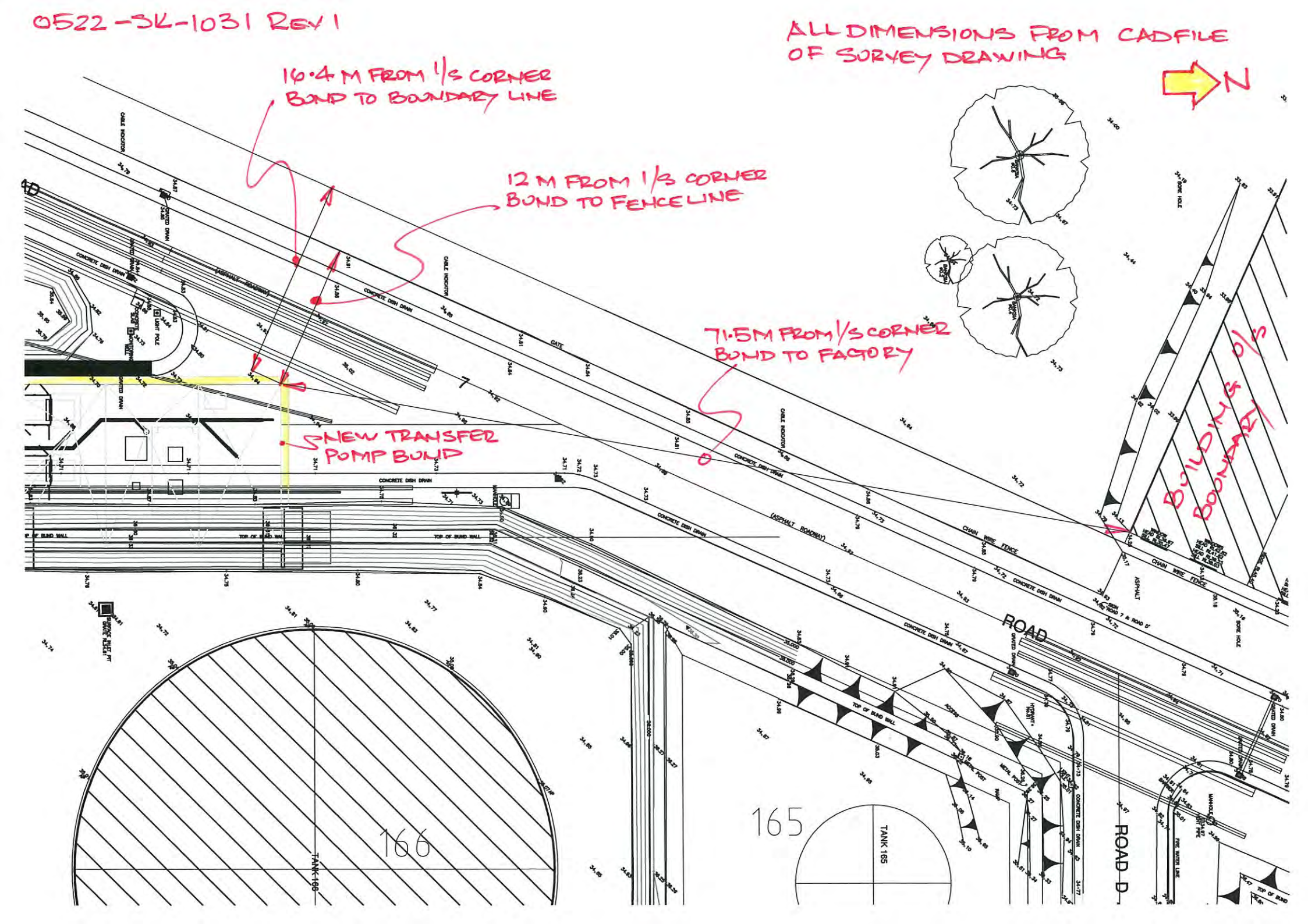
Therefore, there is no risk of a vacuum being created, even during the highest pumping rate.

Static build-up risk: The pipework has also been sized with a flow velocity of less than 4m/sec to reduce the build-up of static. This meets Caltex's requirement for maximum velocity in jet fuel systems to reduced risk of static build-up and is less than the maximum velocity that is common safe practice in industry.

The maximum jet fuel tank inlet and outlet velocities have also been reviewed and are below the maximum acceptable limits.

Please note that rates are only increasing on the Kurnell side to Bumborah point road tie in by VOPAK pipeline. Current rates when Vopak are pumping are the same as the new design for Kurnell.

Additionally, the injection of a static dissipation chemical agent (STADIS) is employed to reduce the likelihood of static build up. Pumping at 4m/s is considered safe even without STADIS and the 4m/s limitation is to cater for the possibility of STADIS failure.


0522-SK-1031 REV 1
ALL DIMENSIONS FROM CADFILE OF SURVEY DRAWING
N
16.4 M FROM 1/S CORNER BUND TO BOUNDARY LINE
12 M FROM 1/S CORNER BUND TO FENCELINE
71.5M FROM 1/S CORNER BUND TO FACTORY
NEW TRANSFER PUMP BUND
BUILDING O/S BOUNDARY
ROAD
ROAD D
TANK 166
TANK 165
CONCRETE DISH DRAIN
(ASPHALT ROADWAY)
CHAIN WIRE FENCE
TOP OF BUND WALL
CABLE INDICATOR
GATE
ASPHALT

D

Appendix D WorkCover Approval Letter

WorkCover NSW
92-100 Donnison Street, Gosford, NSW 2250
Locked Bag 2906, Lisarow, NSW 2252
t 02 4321 5000 f 02 4325 4145
WorkCover Assistance Service 13 10 50
DX 731 Sydney workcover.nsw.gov.au

Date: 22 June 2011
Our Ref: 2011/010456
Email: dave.chamings@workcover.nsw.gov.au
Your Ref: Jet Fuel Pipeline Upgrade project (11_0004)

Mr James Farhart
Caltex Refineries
2 Solander Street
Kurnell NSW 2231

Dear Mr Farhart,

I refer to your correspondence received by WorkCover NSW 22 June 2011 that detailed an application for approval to upgrade the following identified Petroleum Fuel Pipeline:

Caltex Jet Fuel Pipeline (11_0004)

- *From The Caltex Refinery to Refinery end to the Wharf Tie in Point*
- *Relocation of the pigging station to the wharf on the refinery side*
- *Installation of a ne pigging station at the transfer pumps*

Based on the information supplied in your submission June 2011 and pursuant to the Occupational Health and Safety Regulation 2001 Schedule 3 Clause 3 approval has been granted for the abovemented upgrade at the locations listed.

Approval No. 2011/00001

Yours sincerely,

Dave Chamings

Acting State Coordinator

Dangerous Goods

WorkCover NSW


URS


CALTEX