Vopak Site B4
Vopak Terminals Pty Ltd
18-Dec-2015

Response to Submissions Report

SSD_7000 Vopak Site B4 Tank Farm

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1.0 Introduction

1.1 Overview of the Project

Vopak Terminals Pty Ltd (Vopak) is seeking approval for the construction and operation of a liquid fuels tank farm known as Site B4 (the Project) in Port Botany NSW. The Site is located on a parcel of land managed by NSW Ports formerly occupied by the Qenos Hydrocarbon Terminal.

The Project includes the construction of seven fuel storage tanks with a total nominal capacity of 200,000 m^3 enabling Vopak to satisfy existing customer demands as well as forecast demand increases from the Sydney and surrounding markets. The Project would benefit the Sydney and NSW economy through the provision of fuels which in turn support a range of industries, in particular the transport sector. Due to the increasing divestment of major oil companies and refining capacity from Australia, it is important that fuel import terminals are developed to provide an ongoing secure supply of fuel to Sydney and NSW.

Vopak proposes to undertake the Project in two stages as follows:

- Stage 1 (Site B4A):
    - Construction of three storage tanks and bunding dedicated to Combustible Fuels (generally Automotive Diesel Oil (ADO) would have with a nominal total capacity of 105,000 m^3);
    - Construction of new pipelines/culverts to inter-connect with the Site B manifold;
    - Installation of manifold/transfer pumps and connections to utilities; and
    - Extension of the existing Site B fire protection system to cover the B4A site.
- Stage 2 (Site B4B):
    - Construction of four storage tanks (nominal total capacity of 95,000 m^3) capable of storing Class 3 Flammable or Combustible products;
    - Construction of additional transfer pipelines to Site B manifold systems; and
    - Installation of a new fire protection system complying with AS 1940 requirements.

It should be noted that Vopak has a concurrent section 75W modification application before the Department of Planning and Environment (DP&E) for modifications to its existing Site B Terminal (submitted on 19 June 2015) to which the proposed Project would be connected by pipeline. The section 75W application includes the product throughput generated by the B4 application because the associated ship imports, road tankers movements and pipelines transfers would be via the existing Site B terminal.

1.2 Overview of Approval Process and Exhibition

Approval for the Project is being sought as State Significant Development under Division 4.1, Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). In accordance with section 89F of the EP&A Act and the *Environmental Planning and Assessment Regulation 2000* (the Regulation), the Environmental Impact Statement (EIS) for the Project is required to be placed on exhibition for not less than 30 days.

Exhibition of the EIS commenced on 21 October 2015 and was completed on 20 November 2015.

The EIS was made available on the DP&E web site (http://majorprojects.planning.nsw.gov.au/). Copies were also provided to local Councils for public access as well as provided in hard and soft copy to key stakeholder agencies. Specifically, hardcopies of the EIS were supplied to the following agencies for exhibition or review purposes:

- Department of Environment and Planning;
- Randwick City Council;
- Malabar Community Library;
- Department of Primary Industry – NSW Office of Water;
- Safework Australia (formerly WorkCover);
- NSW Environment Protection Authority;

- Roads and Maritime Services; and
- Fire and Rescue NSW.

1.3 Purpose of this Report

The purpose of this report is to detail and provide responses to issues raised in the submissions received during the EIS exhibition period.

1.4 Structure of this Report

The Response to Submissions (RTS) Report has been set out to address each of the issues raised in the submissions and is structured as follows:

- **Section 1** provides an overview of the Project, the EIS process and the RTS purpose and structure.
- **Section 2** provides a summary of the submissions received and outlines the key issues raised in the submissions.
- **Section 3** provides responses to each of the issues raised in submissions received from State and local Government agencies.
- **Section 4** provides responses to each of the issues raised in submissions received from community stakeholders (individuals and community groups).
- **Section 5** presents a revised set of Project management and mitigation measures that have been reviewed following consideration of the submissions as detailed in this report.
- **Appendix A** presents the submissions received from State and local Government agencies.
- **Appendix B** presents the submissions received from community groups and individuals.
- **Appendix C** is a copy of the revised Air Quality Impact Assessment (AQIA) which addresses those matters raised in the EPA submission.
- **Appendix D** provides supplementary information in regards to the UK Vapour Cloud Assessment Method.
- **Appendix E** provides indicative drainage plans showing both internal bund drainage and external (clean water separation) drainage.

2.0 Summary of Submissions

2.1 Submissions Process

During the exhibition period, and for a short period thereafter, submissions in relation to the Project were accepted by DP&E. Submissions were provided to the proponent for response. All submissions were reviewed and issues raised have been addressed in this RTS.

2.2 Submissions Received

In total, ten submissions were received:

- Six submissions were from State and local Government agencies (refer to **Appendix A)** including:
    - Randwick Council;
    - Roads and Maritime Services;
    - SafeWork NSW;
    - Fire and Rescue NSW
    - NSW Environment Protection Authority; and
    - Department of Primary Industries – NSW Office of Water.
- Four submissions were received from the general public or community groups. A copy of these submissions is attached at **Appendix B**:

3.0 Response to Agency Submissions

This section contains a summary of all submissions received from agencies, and provides Vopak's response to each of the submissions. Refer to **Appendix A** for full submission issue details.

Table 1 Response to Agency Submissions

No.	Issue	Response	Relevant Section
Randwick Council			
1	The project approval should be conditioned to include the requirement for a detailed Construction Traffic Management Plan. The Plan should be prepared in consultation with Roads and Maritime and a copy provided to Council prior to its implementation.	A detailed Construction Traffic Management Plan would be prepared as part of the Construction Environment Management Plan (CEMP) for the Project in consultation with Roads and Maritime and Council.	Section 12.3 of the EIS.
2	The following construction hours should be conditioned for the Project: - All building, demolition and site work including Deliverables: • Monday to Friday 7am – 6pm; • Saturdays 8am – 1pm; and • No work on Sundays or public holidays. - Excavation of rock, use of jack-hammers, pile drivers or the like: • Monday to Friday 8am – 6pm; • No work on Saturdays, Sundays or public holidays. - Internal work only within a commercial or industrial development located in a commercial or industrial zone which is not audible within any residential dwelling of commercial or industrial premises: • Monday to Saturday – no time limits • No work on Sundays or public holidays. - Additional requirements for all development: • Saturdays and Sundays where the preceding Friday and/or the following Monday is a public holiday – No work permitted.	To avoid confusion that may arise as a result of multiple sets of construction hours, the following construction hours are proposed for the Project: - Monday to Friday 7am to – 6 pm; - Saturday 8am – 1pm; and - No works on Sundays and Public Holidays. Works may be undertaken outside these hours where they are not audible at sensitive receivers. These hours are consistent with the guidance provided in *Interim Construction Noise Guideline* (DEC, 2009).	Section 6.4.5 of the EIS
3	The design, construction and operation of the fuel storage areas should comply with the following requirements where applicable: a) A bund wall must be constructed around all work and liquid storage areas to prevent any spillage entering into the stormwater system. The bund area must provide for at least a volume equal to 110% of the largest containers stored and graded to a blind sump so as to facilitate	Vopak intends to design and construct the Project in accordance with the relevant regulation and standards. In regards to b) All bund areas will drain via treatment devices as indicated in (e), however clean stormwater areas will drain to onsite landscaping soak areas or direct to the	N/A

No.	Issue	Response	Relevant Section
	cleaning. b) A trafficable bund capable of preventing the escape of any pollutants into Councils Stormwater system must be provided to all access ways/exists from the development. c) Flammable and combustible liquids must be stored in accordance with AS 1940-2004- The Storage and Handling of Flammable and Combustible Liquids and relevant requirements of NSW WorkCover Authority. d) Prior to the storage of any dangerous goods on the premises a licence must be obtained from the WorkCover Authority and a copy of the licence must be forwarded to Council. e) Service and parking areas must be graded and drained to a stormwater treatment device capable of removing litter oil grease and sediment prior to discharge to the stormwater system complying with relevant EPA requirements and conditions of consent. f) A permanent record of receipts for the removal of both liquid and solid waste form the site shall be kept and maintained up to date at all times. The records are to be made available to EPA and Council Officers upon request.	NSW Ports street underground stormwater drains in accordance with NSW Ports agreements. Reference is made to **Appendix E** showing indicative drainage plans.	
4	A condition should be imposed requiring the approved landscaping to be installed prior to the issue of the final occupation certificate. Landscaping is to be maintained in accordance with the approved plans.	Vopak would install the proposed landscaping prior to the issue of the final occupation certificate. Vopak would maintain the landscaping as per the design requirements.	NA
5	The Project is located within land and adjacent to roads controlled by NSW Ports. It would be standard practice for Council to impose a requirement for lodgement of a damage deposit covering roads.	Vopak would consult directly with NSW Ports in regard to the management of potential impacts on NSW Ports assets.	NA
6	A condition should be imposed to the effect that there are to be no emissions or discharges from the B4 Project which give rise to a public nuisance or result in an offence under the *Protection of the Environment Operations Act 1997*.	The Project will require an Environment Protection Licence (EPL) under the *Protection of the Environment Operations Act 1997*. The EPL will include specific emissions limits and criteria within which the Project must be operated. The EPL would be enforced by the NSW EPA. It is not appropriate to apply emission limits other than those applied by the EPA through the EPL for the Project.	Section 7.2.5 of the EIS
7	A Construction Environmental Management Plan should be developed and implemented by a suitably qualified and experienced environmental	Vopak would engage a suitably qualified person(s) to prepare a CEMP for the Project.	Section 22.1.2 of the EIS

No.	Issue	Response	Relevant Section
	consultant.		
8	An Air Quality Management Plan should be prepared by a suitably qualified and experienced environmental consultant.	Vopak would engage a suitably qualified person(s) to prepare an Air Quality Management Plan.	Section 13.3 of the EIS
9	A Construction Noise and Vibration Management Plan should be prepared in accordance with the NSW EPA guidelines and the Project Noise and Vibration Impact Assessment. The Plan should be implemented prior to the commencement of building works.	Vopak has committed to the preparation of a Construction Noise and Vibration Management Plan as part of the CEMP for the Project.	Section 14.3 of the EIS
10	Council request that within 6 months of becoming operational an acoustic report should be prepared by a suitably qualified acoustic consultant which demonstrates and confirms that the provisions of the *Protection of the Environment Operations Act 1997* and the noise requirements and criteria contained in the Noise and Vibration Impact Assessment (AECOM, 2015) are satisfied.	The preparation of an operational noise verification report would be more appropriate following 12 months of operation, aligned with the first Annual Return required for the Project under the EPL and the *Protection of the Environment Operations Act 1997*.	N/A
11	The recommendations contained within the Preliminary Hazard Analysis (PHA) (Sherpa, 2015) should be incorporated into the consent conditions to ensure risks are appropriately managed.	Vopak will implement the recommendations contained in the PHA at the relevant stage of the project.	N/A
Road and Maritime Service			
12	The proponent should ensure that there is no queuing of heavy vehicles on Bumborah Point Road at any time during construction and operation.	Construction and operational management plans would include measures to prevent the queuing of heavy vehicle traffic on Bumborah Point Road.	N/A
13	A Road Occupancy Licence should be obtained from the Transport Management Centre for any works that may impact on traffic flows on Bumborah Point Road during construction activities.	No construction works are anticipated to impact on Bumborah Point Road.	N/A
14	A construction Traffic Management Plan detailing construction vehicle routes, numbers of trucks, hours of operation, access arrangements and traffic control should be submitted to Council for approval prior to the issue of the Construction Certificate.	Vopak would prepare a Construction Traffic Management Plan as part of the CEMP.	N/A
SafeWork NSW			
15	The EIS “should” include both on site and off site risks. However, item 1 in table 2.2 of the PHA states that on site risk is not assessed in the PHA.	For the Vopak site the methodology used to assess offsite risks is a Qualitative Risk Assessment, and onsite risk were assessed utilising a bowtie analysis. These methodologies are very different and a PHA report in the format described in	N/A

No.	Issue	Response	Relevant Section
		HIPAP6 and included in an EIS is not an appropriate format to address onsite risk. Onsite risk will be assessed in the updated Safety Case for the site.	
16	Please provide clarification in regards to the assessment undertaken for vapour cloud explosions as the report is currently unclear about how this was modelled and the resulting assessment outcomes.	As section PHA Section 5.3.4 overpressures were not modelled explicitly as fatality effects are generally found to be within the flashfire (i.e. LFL) envelope. Supplementary information regarding the UK HSE Vapour Cloud Assessment (VCA) method used to assess tank overfills has been previously provided to DP&E and is attached in PHA Appendix D.	Section 5.3.4 of the PHA
17	The PHA refers to an assumption that a tank rim seal fire progresses to a full tank surface roof fire at a factor of 0.1, but states that it will be verified as part of the design phase. Vopak to provide this evaluation at design phase and revise the risk assessment if the 0.1 assumption cannot be substantiated by analysis and comparison with published data.	Noted: Rim seal fire detection will be provided for floating roof flammable storage tanks with alarm to the Fire Indicator Panel. Detailed design phase will assess effectiveness and reliability and the Final Hazard Analysis (FHA) updated accordingly.	N/A
18	PHA Appendix A, items 14 & 16 indicate that this Buncefield recommendation will not be implemented. Although offsite risk criteria may be satisfied, Vopak will be required via the Safety Case update, to justify not implementing this measure, since risks need to be reduced to So Far As Reasonably Practical (SFARP).	Noted. The SFARP demonstration will be contained in the updated Safety Case and include the basis for accepting or rejecting specific control measures, including those identified in the Buncefield recommendations	N/A
19	PHA Appendix A, item 14 is the (Buncefield) recommendation to reroute overflows. The Buncefield inflow rate was 890m3/hr at the time of the incident. The site B inflow rate at safety case preparation time was 820m3/hr. The B4 rate is stated as 3500m3/hr but unclear if this is tank fill rate. Anyhow, minimizing overflow quantity and hence the size of a potential vapour cloud is considered critical. Vopak to demonstrate that high reliability post overflow shutdown and control measures will be implemented. These need to be addressed in the Hazard and Operability Study (HAZOP). The HAZOP must also verify if the ullage between overflow levels and High and High High levels are adequate in comparison with available response times. E.g. if the ESD valve closure time is 45 sec, is the ullage above HH alarm sufficient at the increased fill rate to prevent overflow? Vopak to clarify.	The B4 tanks can be filled at a rate of up to 3500m3/hr. This has been accounted for in the estimated size of the flammable cloud developed in an overfill as per Appendix D, table D.7 of the PHA. Also refer to the supplementary info provide in response to Item 16. The HAZOP will consider the overfill case and post overfill detection and recovery measures. Tank safe fill level, high level alarm and trip settings are specified in Tank Safe Fill Determination calculation sheets (compliant with API2350) for each individual tank based on tank dimensions and maximum tank fill rates. These are prepared as part of the design process and will be available in the HAZOP. These sheets will also be used as part of the adequacy of control demonstration for high level protection that will part of the	N/A

No.	Issue	Response	Relevant Section
		Safety Case update.	
20	Table D7 shows 75W operation as 1750 m3/hr and B4 as 3500 m3/hr. It is unclear if this is ship to shore pumping rate over one pipeline or multiple pipelines. How are the velocity limits re static issues maintained. The previous draft surge study probably used the pre 75W flow rate of 820m3/hr. At least the following three scenarios need to be addressed in the new surge study to be carried out under the current MHF licence conditions. (a) Emergency shutdown valves are presently set at 45 sec closing time. This will need to be reviewed in the surge study if flow rates are increased. (b) Surge conditions likely to be generated due to sudden failure of ship's pumps. (c) surge conditions likely to be generated if the dry break coupling on an MLA is activated during pumping.	Velocity limits: Bulk Liquid Berth (BLB) 1 can provide a maximum loadout rate of 2400 m3/hr via simultaneous use of two loading arms each at 1200m3/hr. BLB2 can provide a maximum loadout rate of 3500 m3/hr via simultaneous use of two loading arms each at 1750m3/hr. Each BLB flow can combine into a single line within the terminal for feeding B4 Tanks with a maximum tank infill of 3,500m3/hr. Velocity limits are maintained in all piping to below 7m/s via pipe sizing and as per current operations, operations parameters will be agreed with the ship and monitored throughout the transfer. Surge: As part of the design phase, the pipeline surge study will be updated to reflect the increase in filling rates, the additional piping lengths to the B4 area and to account for sudden shutoffs, for example in cases a)- c). The surge study results may affect valve closure times.	N/A
21	SafeWork make the following suggested conditions: 1) Prior to finalising of detail design related to safety and risk control aspects of the B4 Project, Vopak shall consult with SafeWork NSW with regard to matters to be addressed in updating the site B Safety Case, on site risk assessment, surge issues due to increase in pumping rates and SFARP demonstration in particular, and comply with the requirements of the Work Health and Safety Act and Regulation 2011. The updated Safety Case shall be submitted to SafeWork at least one month prior to commencement of commissioning of the B4 Project. 2) The safety Management system to be prepared or updated for the whole of site B under consent condition No. XXXX shall comply with the requirements of the Work Health and Safety Regulation 2011. In particular, the requirements in clause 558, clause 568 and schedule 17. 3) A copy of the report of the Hazard Audit to be carried out under consent condition YYYYY shall be submitted to SafeWork together with a program to action the recommendations. The report and action plan must be submitted at the same time as the submission of the report to	- Response to 1-3) and 5): Vopak believes that the EIS (including the PHA) demonstrates that overall envelope of effects for the complete development will be within acceptable limits and has no general concern with the suggested conditions. However as the B4 project will be staged, Vopak suggest that the conditions of consent allow a staged approach to delivery of the required studies as the B4A (diesel / combustible only storage) will be developed several years prior to B4B (gasoline / flammable storage). - Response to 4): Due to the differences in methodology between on and offsite risk assessment and also overlap with demonstration of adequacy required in the Safety Case, Vopak would prefer to cover offsite risk (ie QRA approach) in the FHA, and onsite risk and SFARP	N/A

No.	Issue	Response	Relevant Section
	the Department of Planning and Infrastructure. 4) The FHA to be done under consent condition ZZZZZ to include both on site and off site risks. 5) 5. The HAZOP to be done under condition of consent shall address the concerns raised under item 5 above.	demonstration in an updated Safety Case.	
Fire and Rescue NSW			
22	The proponent would be required to prepare a Project specific Fire Safety Study (FSS) in accordance with the requirements of HIPAP No. 2. The Fire Safety Study is to be prepared in consultation with and approved by FRNSW.	Vopak would prepare a Project-specific FSS in consultation with FRNSW.	N/A
23	The FSS should include consideration of the associated Site B3 expansion (subject to separate modification application), associated road tanker movement increases increased fuel import rates through Bulk Liquid Berths (LBL) 1 and 2 and any interfacing services between the Project and adjoining site.	The FSS will include consideration of the interactions of the Project with linked infrastructure and adjoining Vopak terminal elements. As per item 21 above, Vopak would prefer to adopt a staged approach to delivery of the FSS as the B4A (diesel / combustible only storage) will be developed several years prior to B4B (flammable storage). The B4A FSS could provide details of the proposed approach for the B4A as well as the concept design for fire protection of the B3B area, but Vopak anticipate that the overall B4 FSS may require updating at the design stage of the B4B project.	N/A
24	Fire protection control recommendation included in the FSS should be developed from first principle evaluation rather than reliance on Australian Standard 1940 as specified in HIPAP No. 2	The FSS would be developed based on a first principle evaluation of the minimum requirements set by relevant standards and having regard to site-specific considerations.	N/A
25	The FSS should be undertaken to incorporate both stages of the Project, Site B4A and B4B. Where common infrastructure is identified for both stages it should be implemented for the initial stage.	The FSS would be prepared for both stages of the Project and would take into account the installation of required fire safety elements and their required timing or staging to ensure an appropriate level of fire protection is provided. As per item 21 above, Vopak would prefer to adopt a staged approach to delivery of the FSS as the B4A (diesel / combustible only storage) will be developed several years prior to B4B (gasoline / flammable storage). The B4A FSS could provide details of the proposed approach for the B4A	N/A

No.	Issue	Response	Relevant Section
		as well as the concept design for fire protection of the B3B area, but Vopak anticipate that the overall B4 FSS may require updating at the design stage of the B4B project.	
26	As 24/7 operation is proposed there may be reduced staffing outside of normal business hours. The FSS should demonstrate that fire systems can be appropriately initiated or activated even during times of low staffing.	The FSS would confirm the ability of the terminal systems and staff to appropriately activate the required fire safety systems, even during times of reduced staffing. As per the existing site, the B4 fire system will be designed with remote detection and actuation for minimum staffing levels.	N/A
NSW Environment and Protection Authority			
27	Environment Protection Licence The EIS identifies that the proposed Project will require issuing of a new Environment Protection Licence (EPL) under the POEO Act and that an application would be made to obtain a new stand-alone EPL prior to construction works for the scheduled activity commencing. The EIS does not, however, specify the scheduled activity or activities that would apply to the Project. Vopak has expressed to the EPA an interest in incorporating the Project on the current EPL for Site B (EPL 6007). The EPA has no objection in varying the current licence to incorporate the activities at Site B4 should the Project be approved	Vopak would submit an application to vary the existing EPL, subject to approval of the Project, for the scheduled activity of chemical storage in quantities that reflect the combined capacity of the existing and proposed Vopak site stages.	Section 7.2.5 of the EIS.
28	Dust Dust emissions from the construction phase of the Project have the potential to cause environmental impact. It is therefore important that dust mitigation measures are incorporated into the proposed Construction Environmental Management plan (CEMP) and that the measures are implemented during all construction activities.	A CEMP would be prepared that details measures to be implemented during the construction phase to management potential dust generation and impacts. CEMPs would be staged for each of the B4A and B4B developments as the works are expected to be several years apart.	Section 22.1.2 of the EIS.
29	Assessment of additional emission sources The AQIA estimates VOC emissions from tank standing losses at the B4 site. The AQIA does not consider working losses from fuel distribution or any other ancillary plant and equipment operated by Vopak or other external operations undertaking activities emitting similar substances in close proximity to the Project. The AQIA states that “assessments are to consider Project	The AQIA for the Project considered all direct storage tank losses as calculated from the TANKS model, including standing storage loss, working loss, withdrawal loss, rim seal loss, fitting loss and deck seam loss, as shown in Appendix C of the AQIA.	**Appendix C**.

No.	Issue	Response	Relevant Section
	contributions only; that is, cumulative assessment, which requires the consideration of background pollutant concentrations, is not required". The EPA advises that incremental assessment (Project contributions only) are applicable where it can be reasonably demonstrated that existing ambient levels are low and there are no other significant emission sources in close proximity to the Project which emit the same substances. Based on other sites and activities undertaken between the Project and nearby receptors, there is likely to be other emission sources that contribute, collectively to potential localised air quality impacts. No comprehensive assessment characterising the potential impacts from all emissions associated with all chemical/fuel storage and distribution activities in the locality of the Project is available for EPA review.	As detailed in **Appendix C,** assessment of the Project indicated that the highest impacting VOC, cumene would only reach 15% of EPAs boundary criteria. Offsite impacts would be further reduced again at distance from the terminal due to dispersion. The assessment found that cumene would only be 2% of the criteria at the nearest residential receiver. Other potential sources of VOCs in Port Botany include Vopaks Site B3. Its primary emissions source the truck gantry is managed through a Vapour Recovery Unit (VRU). Due to the incremental nature of emissions impacts off site there is unlikely to be significant cumulative impacts.	
30	**Assessment of peak impacts** **Emissions smoothed annually may under predict peak impacts** Section 5.3 of the assessment states that "The assessment was conducted for continuous operation of the facility, assuming constant emissions occurring 24 hours per day, 7 days per week, 365 days per year". Appendix C of the assessment provides a summary output of the emissions model (TANKS), which indicates emissions were estimated on an annual basis. Emissions rates applied to the dispersion model were grams per second. The method for assigning grams per second emission rates is not detailed in the assessment report. However, based on the above scenario, it is likely that annual emissions were smoothed evenly across the model year. The EPA advises that smoothing emissions throughout the model year is not an appropriate assessment methodology when assessing peak 1-hour impacts from emissions that will vary temporally.	The TANKS model, which is the model approved by the NSW EPA for the modelling of storage tank emissions, reports only as annually or monthly values. In order to determine monthly values for the Project, the TANKS model prepared for Project has been rerun to determine potential peaks across the previous annual modelling period. The monthly values have then been scaled back to hourly averages to gain a more representative 1 hour peak than the previous annual averaging method. The outcome of the additional TANKS modelling indicates that all relevant air quality criteria would continue to be met for the Project. A copy of the revised AQIA is attached at **Appendix C**.	**Appendix C**
31	**Assessment does not adequately justify the adoption of 99.9th percentile model predictions** Table 6 of the air assessment provides a summary of generalised product liquid composition for diesel and unleaded petrol. The composition was sourced from the NPI generic database. The assessment does not justify the	Site-specific liquid / vapour data are not available for the site. The values used in the modelling were based on the Australian Governments National Pollutant Inventory (NPI) default values. In AECOMs recent project experience these values have been found to be highly conservative and would	N/A

No.	Issue	Response	Relevant Section
	selection of chemicals as representative of proposed chemical storage at the site. The assessment does not reference site/terminal specific liquid or vapour phase data as being used to estimate VOC emissions for the Project. The assessment compares 99.9th percentile 1-hour model predictions to impact assessment criteria for toxic air pollutants, in accordance with Approved Methods guidance for conducting a Level 2 assessment. However, the Approved Methods defines a Level 2 assessment as a refined dispersion modelling technique using site-specific input data. Given site specific emission data was not used, the assessment should justify the selected 99.9th percentile prediction adopted.	likely result in an overestimation of actual emissions. Recent work on a similar tank farm showed a diesel liquid benzene percentage composition of approximately 0.004% rather than the default NPI value of 0.03%, and a cumene value of 0.02% compared to the default 0.96%. Utilising the NPI figures would therefore result in a conservative assessment of potential emissions. The tank fuel throughputs and design are site specific, while the meteorological data was created specifically for the Project site. Given the above information, the use of conservative default composition values that are likely to result in overestimates is a reasonable approach for a level 2 assessment and should be maintained for the assessment.	
32	**Assessment of ozone impacts** The air quality assessment states that: “The pollutants of prime interest in NSW are ozone and particulates, with levels of these pollutants approaching or exceeding the national standards prescribed in the National Environment Protection Measure for Ambient Air Quality (NEPM) on occasion. The Vopak facility is not expected to generate significant levels of ozone or particulates”. The assessment correctly identifies ozone as a priority air pollutant in NSW. However, the assessment provides no justification to support the assertion that the Vopak facility is not expected to generate significant levels of ozone. Vopak’s activities in the vicinity of the Project have the potential to emit significant quantities of ozone precursors, NOx and VOCs. The potential for these precursor emissions to contribute to increased ground level ozone impacts warrants further investigation.	Relative to other known sources of ozone, such as transport emissions, it is expected that the Project would have a relatively small contribution to total ozone in the airshed. Ozone has not been an assessed pollutant in similar recent terminal Project assessments undertaken in NSW, and was not considered for the Vopak Berth No.2, the Vopak Bitumen storage facility. Further consideration of ozone is therefore not considered warranted in regards to the Project.	N/A
33	**Justification of model meteorology** **Model meteorology not demonstrated as representative.** The meteorological data used in dispersion modelling is of fundamental importance as it drives the transport and dispersion of the air pollutants in the atmosphere. The dispersion modelling was undertaken for the year 2014.	A review of the meteorological data was undertaken as provided in the updated AQIA attached at **Appendix C.** This shows that for the year 2014 the CALMET data shows a very close correlation with the Sydney Airport data, validating the accuracy of the CALMET settings and outputs.	Refer to revised AQIA at **Appendix C**

No.	Issue	Response	Relevant Section
	The assessment does not provide adequate justification for the selection of 2014 as a representative year. The Approved Methods requires that for a detailed assessment, site representative data should be correlated against a longer duration meteorological dataset. The AQIA provides long term climate statistics for Sydney Airport. These statistics, as presented, do not confirm 2014 as a representative year for dispersion modelling.	A review of the wind rose data utilised to create 9am and 3pm wind roses from the CALMET data was undertaken. It was found that the internal CALPUFF View program used to create the data had an error that incorrectly repeated the wind parameters after July 2015, skewing the graphed data. A newer version of the wind rose data creation program that has the error corrected was sourced and the data recreated. Refer to **Appendix C.** The data shows a strong correlation between the CALMET airport 2014 data and the BoM long-term trends for the 9am and 3pm data. Specifically, the underestimate of winds from the north-west 9am data is now present. The comparable wind roses showing this correlation are provided at the end of this document. The data confirms the appropriateness of the CALMET data for the assessment. The corrected wind rose data is included in **Appendix C.**	
34	**CALMET model evaluation not adequate** It is important to undertake an evaluation of the CALMET modelling results as the CALMET module requires careful consideration of input data, modelling domain, grid resolution and the seven critical parameters. The AQIA presents a summary of the 2014 CALMET data. It is unclear if the CALMET data was extracted for the Project site or Sydney Airport. A comparison of predicted and observed wind fields is provided in the AQIA as Appendix B. Appendix B shows some potentially significant differences between modelled and observed wind fields. The AQIA does not demonstrate the suitability of the CALMET generated data. An adequate evaluation of the CALMET generated data is always important but particularly necessary where observational data assimilation requires the user to make 'several critical choices which can significantly affect the final outcome of the model runs' 1. These are: TERRAD, RMAX1, RMAX2, R1, R2, IEXTRP and BIAS. The AQIA does not present or justify the assumed value of these seven critical parameters.	Refer to response above. The meteorological data used in the assessment has been demonstrated to be justified.	Refer to revised AQIA at **Appendix C**

No.	Issue	Response	Relevant Section
	Recommendation: The proponent provide an evaluation of the CALMET generated meteorology data to demonstrate it is suitable for use in CALPUFF. Additionally, the EPA recommends the proponent provide and justify the values assumed for these seven critical parameters		
Department of Primary Industries – NSW Office of Water			
35	Groundwater Monitoring Bores – Table 9 of the EIS indicates that existing Port Botany and Vopak groundwater monitoring bores would be used for the Project and additional perimeter bores are also likely to be required. While monitoring bores associated with SSD projects do not require a licence under the *Water Act 1912*, it is requested the Project includes a management measure which requires: - Construction details for the monitoring bores to be submitted to DPI Water and all monitoring records are made available for review.	The details of any proposed monitoring bores would be provided to DPI prior to undertaking any works associated with the establishment of the bores.	NA
Department of Planning and Environment			
36	<u>Consultation</u> - Provide details on consultation required with the Civil Aviation Safety Authority (CASA) regarding use of cranes during construction, provide details of consultation undertaken to date and the approvals required. - Provide a summary of the outcomes following the community presentation on 24 November.	- Prior to undertaking construction activities CASA would be consulted regarding the crane height proposed by the construction contractor. Until such time as a contractor is confirmed these heights cannot be confirmed. The approval should be conditioned such that no construction can take place until CASA and Sydney Airports have approved the crane height and evidence of such of provided to DP&E. This is consistent with the approach taken for the previous Site B3 approval. - The minutes of the community meeting at which Vopak provided a presentation about the Project have previously been provided directly to DP&E.	N/A
37	<u>Hazard</u> For the event of a flash fire, please confirm whether all wind conditions have been considered for releases from manifold, pumps and other releases from pipes/hoses/valves/road tanker gantry (where applicable).	For all flashfire events due to releases in pump, manifolds and equipment in the gantry area, all wind directions (as identified in Appendix F of the B4 PHA report) have been considered in the QRA model.	See Appendix F of the EIS.

No.	Issue	Response	Relevant Section
38	Traffic The Construction Traffic Impact Assessment refers to daily traffic volumes using old figures. Please revise using actual traffic counts or provide justification why the figures used are acceptable.	The volumes DP&E refer to (baseline 2005 volumes projected out to 2013 volumes) was used to detail background traffic levels. The construction traffic impact assessment that was undertaken to assess potential impact on AM and PM peak periods utilised survey data that was collected in 2014. This data is considered and appropriate for the assessment of potential construction traffic impacts associated with the Project.	See Appendix G of the EIS.
39	Air Quality The cumulative impacts between Site B4 and surrounding development as per the EPA submission.	- Refer to response to EPA comment No. 29 in regards to cumulative impact assessment.	Response to comment No. 29

4.0 Response to Community Submissions

This section contains a summary of all submissions received from the general public and Vopak's response to each of the submissions. Refer to **Appendix B** for full submission issue details.

Table 2 Response to Individual Submissions

No.	Issue	Response	Relevant Section
Submission 1			
36	- The Project is opposed as it will add to an already dangerously volatile and over loaded situation in the Port Botany/ Botany / Matraville areas, a time bomb waiting to explode. - The traffic congestion caused by the construction will cause major difficulties to our already seriously congested road network. - The State Government is already forcing changes upon the people of the this area by dismantling our democratically elected local councils and amalgamating with other democratically elected local councils.	- The B4 Project would not generate significant heavy vehicle traffic. Transport of fuels stored on the Site B4 would be trucked from Site B3 which is subject to a separate S75W application currently being assessed by DP&E. - The Project has no bearing or impact on Government processes.	N/A
Submission 2			
37	- There is concern of a terrorist attack on the terminal and this should be addressed together with the cumulative impact of an explosion in the area and how many other industries in the area would add to the explosive effect if triggered. - What gasses can be released into the atmosphere and their health effects on residents.	- The PHA examined the potential impacts of fire or flammable vapour cloud scenarios and the potential for escalation to other MHFs. A terrorist attack would result in very similar scenarios as these are dependent on the inventories at the site. However it is extremely difficult to quantify the likelihood of this type of event. With regard to a potential terrorist attack the site would be subject to strict security and safety systems designed to prevent those seeking to undertake such acts from accessing the site and a security plan is required as part of the MHF Safety Case update. - A Project specific Air Quality Impact Assessment (AECOM, 2015) was prepared as part of the EIS which identified the key air pollutants as being volatile organic compounds (VOCs). VOCs refer to a range of chemical compounds which in regards to the Project relate to vapour compounds that may be generated by petroleum products. The VOCs assessed as part of the AQIA were	NA

No.	Issue	Response	Relevant Section
	- A Traffic impact study should assess the affects on local residents and traffic on the surrounding areas	benzene, cumene, cyclohexane, ethylbenzene, n-hexane, toluene and xylenes. The outcomes of the AQIA indicated that the Project is unlikely to have an impact on the health of residents. - The Project is for a tank farm that would connect to the existing Vopak terminal and truck outloading gantry. The Project itself does not include a truck loading gantry or similar infrastructure that could facilitate additional traffic generation. As part of a concurrent modification application (06_0089 Mod 2) Vopak has submitted to DP&E, additional traffic from total Vopak operations is being assessed.	
Submission 3			
38	- The increase in usage of the Port Botany region for the transfer of Dangerous Goods from See to other modes of transport logically leads to an increase in risk in the region. - The increased facility will lead to an increase in the number of truck movements carrying DG's through street in the vicinity of the facility. Some of the designated dangerous goods routes have residences fronting them. What risk will the final approved facility impose on neighbouring streets through the road transport of dangerous goods?	- There is no increase in DG traffic associated with the B4 Project hence a DG transport risk assessment has not been carried out. The Project does not seek approval for increased road traffic. Vopak is currently seeking approval for 06_0089 Mod 2 (S75W) which includes a Traffic Impact Assessment and an assessment of the risks associated with increased transport of dangerous good.	N/A
Submission 4			
39	The Project neglects to consider long term planning and the need to decentralise.	The EIS included an assessment of the Project having consideration of the aims and objectives of relevant strategic planning documents including the State Plan, Sydney Metropolitan Plan and the Eastern Sydney and Inner West Regional Action Plan. The Project was found to be consistent with the long term planning objectives of these strategies.	Section 7.3 of the EIS
40	Consultation with the community was inadequate. The community have not been involved in the preparation of emergency plans.	It is envisaged that the requirement for a Project specific emergency management plan, or similar would be conditioned on the consent should the Project be approved. An appropriate level of community consultation would be entered into during the preparation of this plan and this is	N/A

No.	Issue	Response	Relevant Section
		also required as part of the MHF Safety Case update.	
41	The hazard analysis needs to be updated to include 30 year projection as part of the NSW Ports 30 Year Plan.	The NSW Ports 30 Year Plan is a strategic guidance document that identifies likely land use and infrastructure requirements based on anticipated trade forecasts over a 30 year outlook. As the specific details of how port requirements will develop there would be a lack of accuracy in undertaking a hazard analysis based on possible development scenarios. It is more appropriate to undertake as detailed hazard assessment of projects as they are proposed so that the most appropriate management and risk mitigation measures can be implemented leading to improved risk reduction outcomes. It should also be noted that the Project specific hazard analysis included consideration of the Port Botany Land Use safety Study (DP&E, 2001). As this study predates the NSW Ports 30 Year Plan its recommendations have been included in the 30 Year Plan as appropriate. The Project is therefore considered to have appropriately considered the requirements of the relevant strategic planning documents particularly in relation to hazards and risk.	N/A
42	The submission made the following recommendations in relation to transport: - Transport plan should include detailed active transport strategy. - Community Consultation should include a public forum facilitated by Department of Planning with regulators Workcover and EPA as well as Fire and Rescue to communicate cumulative risk and emergency management as well as projections. All to be recorded for future reference on NSW Planning webpage	- The Project would include the preparation of a detailed Construction Transport Management Plan to manage transport and traffic during the construction phase. During operation traffic generated by Vopak will be from the adjoining Site B3. The Project site will not generate heavy vehicle traffic for the purposes of fuel delivery. Detailed transport planning has been undertaken for the adjoining Site B3 as currently being assessed by DP&E as part of 06_0089 Mod 2. - An appropriate level of community consultation was undertaken for the Project including through a community meeting, briefing the Port Botany Community Consultative Committee and the EIS public exhibition process. Vopak also undertook consultation	Section 9.7 of the PHA (Sherpa, 2015)

No.	Issue	Response	Relevant Section
		with both FRNSW and WorkCover. In addition further consultation would be undertaken with these agencies as part of the development or update of emergency management plans. As required by conditions of consent appropriate consultation and approval from such agencies would be required by DP&E.	
	- The Port Botany Land Use Study and the Randwick/Botany Industrial risk study need to be updated and the process include genuine community consultation and full disclosure.	- As part of the Project specific PHA (Sherpa, 2015) a comparison was undertaken of the Project against the Port Botany Land use Safety Study. The assessment against the Port Botany Land Use Safety Study concluded that there would be no significant impact on cumulative risk as a result of the Project. The Project site is outside the study area for the Randwick/Botany Industrial Land Use Safety Study.	
	- The EIS does not mention cycling.	- The Project would not generate cyclist traffic nor is cyclist traffic encouraged on the industrial roads through Port Botany due to the safety risks of combining cycle and heavy vehicle traffic. No further consideration of cycling is warranted.	

5.0 Management Measures

The Project EIS included a summary of the management measures that would be incorporated into the construction and operation of the Project. Following the receipt and consideration of submissions these management measures were reviewed and no additions or amendments were considered necessary. The final summary of Project management measures is provided in **Table 3**.

Table 3 Summary of Management Measures

Environmental Aspect	Commitments and Mitigations
Management Plan	- Construction Environmental Management Plan will be prepared for the construction of the Project. The CEMP will be prepared in consultation with DP&E; and - Vopak will undertake a review and update their existing OEMP in consultation with DP&E as required by the Project.
Hazards and Risks	- The effectiveness of the safeguards assumed to be in place and accounted for in the QRA should be verified as part of the design process; - Vopak undertake a review of emerging engineering measures (for example modification to tank top design) that may be able to be implemented to eliminate formation of large flammable clouds due to tank overfill scenarios; - As part of the review of the emergency response plan (ERP) that will be required for the Project, Vopak with input from Australian Container Freight Services undertake a review of access/egress from the Australian Container Freight Services site to determine if any additional emergency access or exit provisions are required in the event of an incident at the B4 site; and - As part of the Final Hazard Analysis (which will be prepared prior to operations commencing), checklists identifying the key assumptions and constraints in the QRA at the final design stage of the Project will be developed. These will be an update to the checklists prepared for Site B as part of the current Section 75W QRA, and will simplify the hazard analysis update requirements for future changes should they arise.
Traffic and Transport	- A Construction Traffic Management Plan will be prepared for the construction of the Project to manage construction traffic impacts. This will be incorporated into the Project CEMP; - A Traffic Management Plan was prepared for the existing Site B Facility, in accordance with the Site B project approval, and was prepared in consultation with the now DP&E. this will be reviewed and updated to include the Project; - Measures identified to manage potential traffic impacts include: • An induction process for drivers; • Entry and exit conditions and requirements; • Site traffic movements; and • Approved operational access and egress routes.
Air Quality	- A Construction Air Quality Management Plan will be prepared for the construction of the Project to manage construction air quality impacts (notably dust). This will be incorporated into the Project CEMP. - The existing OEMP currently in place for the operating Site B Facility will be reviewed and updated to ensure all reasonable and feasible air quality management measures have been incorporated into the operation of the Project. - All vehicles and plant/equipment should be fitted with appropriate emission control equipment and be serviced and maintained in accordance with the manufacturers' specifications. Smoke from vehicles/plant should not be visible for more than ten seconds; - Trucks entering and leaving the premises that are carrying loads of dust-generating materials must have their loads covered at all times, except during loading and unloading; - Hard surfaces or paving should be used where possible, as unpaved routes can account for a significant proportion of fugitive dust emissions, particularly during dry/windy conditions. Routes should be inspected regularly and repaired when

Environmental Aspect	Commitments and Mitigations
	necessary, and roads should be swept and watered as required to limit dirt/dust build up and potential dust generation during windy conditions; - Any areas on site that are not covered with hard surfaces should be vegetated wherever possible to minimise wind erosion and associated dust generation; - All vehicles should be switched off when not in use for extended periods; - Water carts and/or road sweeping will be used to minimise dust generation. The frequency of these management measures will be increased during dry windy conditions; - Stockpiles where hazardous material has been encountered will be wetted and covered; - Active excavation area works will be wetted down with hoses; and - Housekeeping will be maintained to keep exposed areas to a minimum.
Noise and Vibration	- A Construction Noise Management Plan will be prepared for the construction of the Project to manage construction noise impacts. This will be incorporated into the Project CEMP; and - The existing OEMP currently in place for the operating Site B Facility will be reviewed and updated to ensure all reasonable and feasible noise and vibration management measures have been incorporated into the operation of the Project.
Soil and Water	- A Sediment and Erosion Control Plan and a Soil and Water Management Plan will be prepared for the construction phase of the Project. Both these plans will form part of the CEPM for the Project; - The existing Water – stormwater/surface water management and control measures prepared for the Site B Facility as detailed in the existing OEMP, will be updated to incorporate the Project; and - The existing soil and groundwater management and control measures prepared for the Site B Facility as detailed in the existing OEMP, will be updated to incorporate the Project.
Waste	- The waste strategies developed for the existing Site B Facility will be updated to incorporate the Project. This can be summarised as the application of the waste hierarchy where the following will be employed, in order of preference: • *Avoidance* – The generation of wastes from the Facility will be avoided where possible; • *Reduce* – Reduce resource consumption, procure materials with less packaging and implement practices to reduce waste; • *Reuse* – Where feasible, materials will be reused onsite. However, due to the limited waste streams generated onsite, reuse options may be limited; • *Recycling* – Paper, cardboard, glass and plastics will be available for recycling. A bin will be placed adjacent to the office which will be collected by a waste management contractor on a regular basis; and • *Disposal* – Disposal of wastes will be minimised where possible. Putrescibles wastes from the office will be sent to landfill, with other wastes generally diverted for recycling; and - Waste strategies will be met through the extension of the existing Site B Waste management and control measures as detailed in the existing OEMP for operations at Site B and as part of the CEMP for waste generated during construction.
Visual Amenity	- A Landscape Plan will be prepared to manage the visual amenity of the Project.
Greenhouse Gas	- An Energy Efficiency Plan will be prepared as part of the existing Site B OEMP to include key elements of the Project and to describe how the plan will be applied across the entire terminal and a timeframe for this to occur.

Appendix A

Agency Submissions

Appendix A Agency Submissions

NSW GOVERNMENT | Department of Primary Industries

OUT15/33476

Ms Pamela Morales
Industry Assessments
NSW Department of Planning and Environment
GPO Box 39
SYDNEY NSW 2001

Pamela.Morales@planning.nsw.gov.au

Dear Ms Morales,

Vopak Terminals Site B4 Expansion, Port Botany [SSD_7000]
Response to exhibition of Environmental Impact Statement

I refer to your email dated 20 October 2015 requesting advice from the Department of Primary Industries (DPI) in respect to the above matter.

Comment by DPI Water
DPI Water has reviewed the Environmental Impact Statement (EIS) and provides the following comments, and detailed comments in Attachment A.

- DPI Water must to be consulted prior to construction activities commencing if construction is beneath the watertable, or dewatering is required.

- Construction details for the monitoring bores are submitted to DPI Water and all monitoring records made available for review.

For further information please contact Janne Grose, Water Regulation Officer (Parramatta Office) on 8838 7505 or at janne.grose@dpi.nsw.gov.au.

Yours sincerely

Mitchell Isaacs
Director, Planning Policy & Assessment Advice
27/11/2015

Attachment A

Vopak Terminals Site B4 Expansion, Port Botany [SSD_7000]
Response to exhibition of EIS
DPI Water - Detailed comments

The DPI Water has reviewed the Environmental Impact Statement (EIS) and provides the following comments:

Groundwater

The EIS notes the site is located above two aquifer systems - the Botany Sands Aquifer and an underlying confined aquifer lies within the Hawkesbury Sandstone (page 85). It indicates impacts to groundwater are unlikely during construction due to the shallow (approximately 1m) depth to which excavations are required compared to local groundwater levels which are typically 3 - 4 metres below ground level (Section 15.2, page 87).

It is noted excavation for the Friendship Road Culvert will be approximately 3m deep (Appendix D - Port Botany Development Code 2013 Checklist, page 21). Should construction associated with the project be beneath the watertable, or dewatering is required, DPI Water needs to be consulted prior to construction activities commencing.

The EIS indicates that prior to any construction works Vopak would undertake a geotechnical site investigation (Section 6.3, page 20). It also notes a Construction Environmental Management Plan (CEMP) would be prepared to address the management of potential environmental impacts associated with construction and it would include management measures to address soils and groundwater (Section 6.4.6, page 23). It also indicates existing soil and groundwater management and control measures in the existing OEMP will be updated to incorporate the project.

Groundwater Monitoring Bores

Table 9 of the EIS indicates that existing Port Botany and Vopak groundwater monitoring bores would be used for the project and additional perimeter bores are also likely to be required (page 40-41). It notes Vopak will consult with DPI Water to confirm if approvals are required under the Water Management Act 2000 (page 41). Please note, monitoring bores associated with SSD projects do not require a licence under the *Water Act 1912*. While the monitoring bores do not require a license, it is requested the project includes a management measure which requires:

- construction details for the monitoring bores to be submitted to DPI Water and all monitoring records are made available for review.

End Attachment A

Your reference SSD-7000
Our reference: DOC15/470064
Our contact: Larissa Borysko; 02 9995 6843

Ms Joanna Bakopanos
Team Leader – Industry Assessments
Department of Planning and Environment
GPO Box 39
SYDNEY NSW 2001

Attention: Pamela Morales

Dear Ms Bakopanos

Vopak Site B4 Project (SSD 7000) – EPA review of Environmental Impact Statement

I refer to a letter received by the Environment Protection Authority (EPA) on 20 October 2015, from the Department of Planning and Environment (DP&E) inviting comment on the publicly exhibited Vopak Site B4 Project Environmental Impact Statement (EIS). The EIS was prepared by AECOM Australia Pty Ltd (AECOM) on behalf of the proponent, Vopak Terminals Sydney Pty Ltd (Vopak). The EPA subsequently accessed a copy of the EIS from the DP&E website on 21 October 2015.

The EPA notes the proposal is being assessed as State Significant Development under Part 4 of the *Environmental Planning & Assessment Act 1979* (EP&A Act). The EPA understands the proposed B4 Project would involve the construction and operation of a liquid fuels storage terminal with construction of seven petroleum storage tanks of a total nominal capacity of 200 ML. The EPA further understands the proposed fuels storage terminal would be connected to Vopak's existing Site B Terminal and that Vopak has a concurrent Section 75W modification application for the Site B Terminal before the DP&E.

To assist the DP&E with its assessment of the proposal, the EPA has conducted a review of the EIS. The EPA's comments and recommendations are set out in Attachment A. The EPA also recommends conditions be incorporated as part of any project approval that is issued for the Project as set out in Attachment B.

If the project is approved, Vopak will require a variation to the current Site B Environment Protection Licence No. 6007 issued under the POEO Act for both the construction and operational phases. Vopak will need to make a separate application to the EPA to obtain a Licence Variation.

If you have any queries regarding this matter please contact Larissa Borysko on 9995 6843.

Yours sincerely

20/11/2015

STUART CLARK
A/Unit Head – Sydney Industry
Environment Protection Authority

PO Box 668 Parramatta NSW 2124
Level 13, 10 Valentine Avenue, Parramatta NSW 2150
Tel: (02) 9995 5000 Fax: (02) 9995 6900
ABN 43 692 285 758
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Attachment A: EPA comments on the EIS for Vopak's Site B4 project (SSD-7000)

The EPA has reviewed the above EIS and provides comments on the following aspects of the proposal:

Environment Protection Licence

The EIS identifies that the proposed Project will require issuing of a new Environment Protection Licence (EPL) under the POEO Act and that an application would be made to obtain a new stand-alone EPL prior to construction works for the scheduled activity commencing. The EIS does not, however, specify the scheduled activity or activities that would apply to the Project.

Vopak has expressed to the EPA an interest in incorporating the Project on the current EPL for Site B (EPL 6007). The EPA has no objection in varying the current licence to incorporate the activities at Site B4 should the Project be approved.

Dust

Dust emissions from the construction phase of the project have the potential to cause environmental impact. It is therefore important that dust mitigation measures are incorporated into the proposed Construction Environmental Management plan (CEMP) and that the measures are implemented during all construction activities.

Air Quality and Odour

The EPA has reviewed the document titled "*Air Quality Impact Assessment, Vopak Terminal B4 - State Significant Development*" Revision D (AECOM, October 2015).

The EIS advises that Vopak has a concurrent Section 75W modification application before the DP&E for modifications to the existing Site B Terminal (submitted on 19 June 2015) to which the proposed Project would be connected by pipe. The Section 75W application includes the product throughput of this B4 application as the flow to/from the ships and road tankers and pipelines is via the existing Site B distribution facilities.

The EPA has not reviewed the s75W assessment as the assessment documentation has not been provided. On this basis, the comments provided refer to potential cumulative impacts from chemical/fuel storage and distribution in the vicinity of the Project.

<u>Assessment of additional emission sources</u>

The AQIA estimates VOC emissions from tank standing losses at the B4 site. The AQIA does not consider working losses from fuel distribution or any other ancillary plant and equipment operated by Vopak or other external operations undertaking activities emitting similar substances in close proximity to the Project.

The AQIA states that "*assessments are to consider project contributions only; that is, cumulative assessment, which requires the consideration of background pollutant concentrations, is not required*".

The EPA advises that incremental assessment (project contributions only) are applicable where it can be reasonably demonstrated that existing ambient levels are low and there are no other significant emission sources in close proximity to the Project which emit the same substances. Based on other sites and activities undertaken between the Project and nearby receptors, there is likely to be other emission sources that contribute, collectively to potential localised air quality impacts.

No comprehensive assessment characterising the potential impacts from all emissions associated with all chemical/fuel storage and distribution activities in the locality of the Project is available for EPA review.

Potentially significant emission sources not included in the AQIA include, but may not be limited to:

- Ships – including ship emissions and product loading and unloading;
- Load and unloading fuel - including Vopak's Site B loading gantry;
- Tanks – including existing tanks from Vopak's adjacent sites and other operators in the vicinity of the Project; and
- Bitumen storage.

Recommendation: **The EPA recommends that the AQIA be revised to comprehensively characterise and assess emissions associated with the Project, in conjunction with other emission sources located in close proximity to the Project. Where toxic air pollutants are emitted from other sites, in significant quantities and in close proximity to the Project, these additional emissions should be assessed on a cumulative basis.**

Assessment of peak impacts

Emissions smoothed annually may under predict peak impacts

Section 5.3 of the assessment states that "*The assessment was conducted for continuous operation of the facility, assuming constant emissions occurring 24 hours per day, 7 days per week, 365 days per year*".

Appendix C of the assessment provides a summary output of the emissions model (TANKS), which indicates emissions were estimated on an annual basis. Emissions rates applied to the dispersion model were grams per second. The method for assigning grams per second emission rates is not detailed in the assessment report. However, based on the above scenario, it is likely that annual emissions were smoothed evenly across the model year.

The EPA advises that smoothing emissions throughout the model year is not an appropriate assessment methodology when assessing peak 1-hour impacts from emissions that will vary temporally.

Recommendation: **The assessment should be revised to ensure that peak emissions are assessed for the Project and neighbouring emission sources, without smoothing based on annualised variables.**

Assessment does not adequately justify the adoption of 99.9th percentile model predictions

Table 6 of the air assessment provides a summary of generalised product liquid composition for diesel and unleaded petrol. The composition was sourced from the NPI generic database. The assessment does not justify the selection of chemicals as representative of proposed chemical storage at the site. The assessment does not reference site/terminal specific liquid or vapour phase data as being used to estimate VOC emissions for the Project.

The assessment compares 99.9th percentile 1-hour model predictions to impact assessment criteria for toxic air pollutants, in accordance with Approved Methods guidance for conducting a Level 2 assessment. However, the Approved Methods defines a Level 2 assessment as a refined dispersion modelling technique using *site-specific input data.* Given site specific emission data was not used, the assessment should justify the selected 99.9th percentile prediction adopted.

Recommendation: **The AQIA should be revised to adequately justify the adoption of 99.9th percentile rather that 100th percentile criteria. The justification must specifically address the adoption of generic emissions data. Where necessary, the assessment should be revised to consider 100th percentile criteria.**

Assessment of ozone impacts

The air quality assessment (section 3) states that: "*The pollutants of prime interest in NSW are ozone and particulates, with levels of these pollutants approaching or exceeding the national standards prescribed in the National Environment Protection Measure for Ambient Air Quality (NEPM) on occasion. The Vopak facility is not expected to generate significant levels of ozone or particulates*".

The assessment correctly identifies ozone as a priority air pollutant in NSW. However, the assessment provides no justification to support the assertion that the Vopak facility is not expected to generate significant levels of ozone.

Vopak's activities in the vicinity of the Project have the potential to emit significant quantities of ozone precursors, NOx and VOCs. The potential for these precursor emissions to contribute to increased ground level ozone impacts warrants further investigation.

Recommendation: **The assessment should be revised to assess potential ozone impacts in accordance with the EPA's guidance *Tiered Procedure for Estimating Ground-Level Ozone Impacts from Stationary Sources (http://www.epa.nsw.gov.au/resources/air/estimating-ground-level-ozone-report.pdf).***

Justification of model meteorology

Model meteorology not demonstrated as representative

The meteorological data used in dispersion modelling is of fundamental importance as it drives the transport and dispersion of the air pollutants in the atmosphere. The dispersion modelling was undertaken for the year 2014. The assessment does not provide adequate justification for the selection of 2014 as a representative year. The Approved Methods requires that for a detailed assessment, site representative data should be correlated against a longer duration meteorological dataset.

The AQIA provides long term climate statistics for Sydney Airport. These statistics, as presented, do not confirm 2014 as a representative year for dispersion modelling.

Recommendation: **The proponent provide the results of the analysis demonstrating year 2014 is a representative year.**

CALMET model evaluation not adequate

It is important to undertake an evaluation of the CALMET modelling results as the CALMET module requires careful consideration of input data, modelling domain, grid resolution and the seven critical parameters.

The AQIA presents a summary of the 2014 CALMET data. It is unclear if the CALMET data was extracted for the Project site or Sydney Airport.

A comparison of predicted and observed wind fields is provided in the AQIA as Appendix B. Appendix B shows some potentially significant differences between modelled and observed wind fields. The AQIA does not demonstrate the suitability of the CALMET generated data.

An adequate evaluation of the CALMET generated data is always important but particularly necessary where observational data assimilation requires the user to make '*several critical choices which can significantly affect the final outcome of the model runs'* [1]. These are: TERRAD, RMAX1, RMAX2, R1, R2, IEXTRP and BIAS. The AQIA does not present or justify the assumed value of these seven critical parameters.

Recommendation: **The proponent provide an evaluation of the CALMET generated meteorology data to demonstrate it is suitable for use in CALPUFF. Additionally, the EPA recommends the proponent provide and justify the values assumed for these seven critical parameters**.

Soil and Water

The proposed Project has the potential to impact surface water, groundwater and soils during the construction and operational stages.

The EIS states that soil and water management will be addressed and incorporated into the proponent's CEMP through the development of a Sediment and Erosion Control Plan and a Soil and Water Management Plan. The plans should address, but need not be limited to, measures to mitigate/control sediment laden stormwater run-off, run-off from potentially contaminated fill material, spills, potential Acid Sulfate Soils and contaminated soils, including those contaminated with asbestos.

The proponent should ensure that any sediment and erosion control measures to be implemented are designed, constructed and maintained in accordance with guideline document *Managing Urban Stormwater – Soils and Construction* (Landcom, 2004).

Vopak's existing Operational Environmental Management Plan (OEMP) should also be updated to incorporate soil and water management at the project site.

The EPA understands that the B4 site will have an interceptor pit and off-site discharge point. Vopak will be required to apply to have a discharge point added to the Environment Protection Licence. Similarly, the EPA consider the requirement for the addition of groundwater monitoring wells.

Noise and vibration

The EPA has reviewed the document titled "*Noise and Vibration Impact Assessment, Vopak Terminal B4 - State Significant Development*" Revision E (AECOM, October 2015).

The EPA notes that the impacts of noise and vibration on residential receivers during the construction and operational stages of the Project are predicted to be low. In general, most construction activities will be undertaken during standard construction hours. Mitigation measures should be developed and incorporated into the proponent's Construction Noise Management Plan, CEMP and OEMP.

<u>Recommended Construction Hours</u>

[1] OEH (2011) Generic guidance and Optimum Model Settings for the CALPUFF Modelling System for Inclusion into the 'Approved Methods for the Modelling and Assessment of Air Pollutants in NSW, Australia' March 2011, Prepared for NSW Office of Environment and Heritage, Prepared by Jennifer Barclay and Joe Scire, TRC Environmental Corporation

It is proposed the construction will occur, in general, during normal construction hours ie. 7:00am to 6:00pm Monday to Friday and 8:00am to 1:00pm Saturday with no construction works on Sundays or Public Holidays. The EPA supports this approach.

Recommended inclusions in a Construction Noise Management Plan

The Construction Noise Management Plan should be developed prior to commencement of construction activities, and include, but need not be limited to:

a) Identification of each work area, site compound and access route (both private and public)
b) Identification of the specific activities that will be carried out, and the associated noise sources at the premises and access routes,
c) Identification of all potentially affected sensitive receivers,
d) The construction noise and vibration objectives identified in accordance with the *NSW Interim Construction Noise Guideline* and *Assessing Vibration: A Technical Guideline*,
e) Assessment of potential noise and vibration from the proposed construction methods (including noise from construction traffic) against the objectives identified in (d),
f) Where the objectives are predicted to be exceeded an analysis of feasible and reasonable noise mitigation measures that can be implemented to reduce construction noise impacts, and
g) Description of management methods and procedures and specific noise mitigation measures that will be implemented to control noise and vibration during construction.

Waste Management

The proponent should identify, characterise and classify all waste that will be generated onsite through excavation or construction activities and document procedures and protocols to ensure that any waste leaving the site is transported and disposed of lawfully.

The Proponent must ensure that any waste generated and/or stored at the premises through the construction and operational stages of the Project is assessed and classified in accordance with the EPA's *Waste Classification Guidelines*. The Proponent must retain all sampling and classification results for the life of the Project to demonstrate compliance with EPA's *Waste Classification Guidelines.*

Attachment B: EPA recommended conditions of consent for Vopak's Site B4 project (SSD-7000)

Environment Protection Licence

1. An application to the EPA for an Environment Protection Licence, or a variation of licence, under the *Protection of the Environment Operations Act* 1997 for the facility must be submitted prior to the commencement of any scheduled activity being undertaken at the site. Additional information on licensing is available in the EPA *Guide to Licensing* documents (www.epa.nsw.gov.au/licensing/licenceguide.htm).

Dust

2. All operations and activities occurring at the premises must be carried out in a manner that will minimise or prevent the emission of dust from the premises.
3. The premises must be maintained in a condition which minimises or prevents the emissions of dust from the premises.

Air Quality and Odour

4. Vopak must update the Air Quality Impact Assessment to address the recommendations provided in Attachment A of this document and provide to the EPA for its review.

5. The proponent 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 applicant 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.

Soil and Water

6. The proponent must prepare and incorporate a Sediment and Erosion Control Plan and a Soil and Water Management Plan to the CEMP, to be approved by the Director General, before commencement of works. The Plans should be prepared in consultation with relevant stakeholders.

7. The proponent must amend its Operational Environmental management Plan (OEMP) to accommodate soil and water management at the project site. The Plan should be prepared in consultation with relevant stakeholders.

Noise and Vibration

8. The proponent should prepare and implement a detailed Construction Noise and Vibration Management Plan (CNVMP), to be approved by the Director General, before commencement of works.

9. All construction work/activities at the premises must be conducted between 7am and 6pm Monday to Friday and between 8am and 1pm Saturdays and at no time on Sundays and Public Holidays. Work outside these hours is not permitted except as explicitly specified below or in other conditions and include:

a) the delivery of materials which is required outside these hours as requested by Police or other authorities for safety reasons;

b) emergency work to avoid the loss of lives, damage to property and/or to prevent environmental harm;

c) other works expressly approved by the Director General; and

d) out of standard hours works identified in a CNVMP approved by the Director General.

10. The proponent should make amendments to the current OEMP to incorporate noise management measures. The OEMP is to be approved by the Director General prior to commencing operations at the premises.

Waste Management

11. The proponent must assess, classify and manage any waste generated at the premises in accordance with the NSW Environment Protection Authority (EPA) *Waste Classification Guidelines Part 1: Classifying Waste, November 2014*.

Fire & Rescue NSW

File Ref. No: BFS15/1786 (9105)
TRIM Doc. No: D15/86944
Contact: Station Officer Mark Castelli

11 November 2015

Attention: Pamela Morales

Dept. of Planning & Environment
GPO Box 39
SYDNEY NSW 2001

E: Pamela.Morales@planning.nsw.gov.au

Dear Madam,

RE: STATE SIGNIFICANT DEVELOPMENT APPLICATION
VOPAK SITE, B4 PROJECT (SSD 7000)

I refer to your correspondence dated 15 October 2015 in regards to the above project. Fire and Rescue NSW (FRNSW) note that we have been invited by the Department of Planning & Environment (DPE) to comment upon the above proposal (including advice on recommended conditions of consent).

The relevant details of the Environmental Impact Statement (EIS) FRNSW assessed are:

- EIS prepared by Simon Murphy of AECOM;
- EIS dated 9 October 2015; and
- EIS reviewed by Mr Scott Jeffries.

FRNSW has reviewed the EIS and within the context of participating in an integrated assessment process for safety assurance of the development the following recommendations are submitted for consideration.

Recommendations

1. That the project proponents be required to undertake a fire safety study (FSS) of the proposed development and that the study is developed in accordance with the requirements of Hazardous Industry Planning Advisory Paper Number 2 (HIPAP No.2).

2. That the FSS is required to be approved by FRNSW.

3. To ensure efficient assessment and cost effective project management efficiencies it is important that the FSS be developed in consultation with FRNSW prior to the FSS being finalised. Therefore it is recommended that the proponent consultants be required to liaise with FRNSW prior to the FSS being commenced.

4. That the scope of the FSS be widened to not only include the analysis of hazards associated with the B4 Project but also expansion works associated with the provision of extra road tanker bays at Site B, the proposed increased discharge rates from berths BLB 1 & BLB 2 and interfacing of services with the existing Site B arising as a consequence of the development.

5. That the recommended fire protection control measures arising from the FSS analysis be developed from first principle evaluation rather than reliance on Australian Standard (AS) 1940, (i.e. as required by Section 2.1 of HIPAP No.2).

6. That the FSS assessment be undertaken concurrently to assess hazards and risks associated with both stages of the project, (i.e. a holistic analysis of Stage 1 [B4A] and Stage 2 [B4B] rather than two separate FSS being developed for each stage).

7. That fire detection/protection systems requirements arising from the FSS analysis for Stage 1 [B4A] of the development and which will be common to Stage 2 [B4B] are implemented as part of Stage 1 works, (e.g. the hydraulic performance of on-site fire service pumps).

8. It is noted that the site will be a 24/7 operation, it is FRNSW experience that on-site staff numbers for similar sites reduce significantly outside of normal business hours. FRNSW therefore recommends that the analysis of required fire protection systems includes substantiation of effective and timely system initiation/activation with regard to the number of on-site personnel available at all hours of business operations.

FRNSW notes that Section 9.2 and Table 14 of the EIS states that FRNSW did not provide a response during the agency consultation process undertaken as required by the SEARs. FRNSW highlights that we do not have a record of any such request being received. For future reference FRNSW advises that all requests for similar consultation should be made through FRNSW Fire Safety Assessment Unit (bfs@fire.nsw.gov.au).

FRNSW thanks the DPE for the opportunity to comment upon the EIS. For further information please contact Mark Castelli of the Fire Safety Assessment Unit, referencing FRNSW file number BFS15/1786 (9105). Please ensure that all correspondence in relation to this matter is submitted electronically to bfs@fire.nsw.gov.au.

Yours sincerely

Superintendent Mark Reilly AFSM CMIFireE
Manager
Fire Safety Assessment Unit

Copies to:

Superintendent Darryl Dunbar
Zone Commander MS2
CC: Darryl.Dunbar@fire.nsw.gov.au

Station Officer Kathryn Barnes
FRNSW Major Hazard Officer
SafeWork NSW
CC: Kathryn.Barnes@safework.nsw.gov.au

Randwick City Council
a sense of community

Randwick City Council
30 Frances Street
Randwick NSW 2031
ABN: 77 362 844 121

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Find us on:

Our Ref: D02524702-D02494578-F2015/00244 (D02494387/D02337379)
Your Ref: SSD 7000
Contact Officer: Elias Coorey

1 December 2015

Industry Assessments - Department of Planning & Environment
23-33 Bridge Street
SYDNEY NSW 2000
GPO Box 39 SYDNEY NSW 2001

Attention: Pamela Morales/Joanna Bakopanos

Dear Pamela,

Re: Vopak Site B4 Project (SSD 7000)

Council refers to your correspondence dated 16 October 2015 and received by Council on 22 October 2015 requesting Council's input into the subject Development Application (DA) and Environmental Impact Statement (EIS) relating to Vopak B4 project (SSD 7000).

Council would like to provide the following comments and or recommendations for consideration:

Introduction:

This state significant development seeks approval for the construction and operation of Petroleum Tank Farm B4 in two stages. This would involve the construction of seven storage tanks with a total nominal capacity of 200,000 m^3.

The EIS and subsequent assessment relates only to the construction and operation of the Site B4 tank farm. The proponent has a concurrent Section 75W modification application before the Department of Planning and Environment (DPE) for modifications to the operation of the existing Site B Terminal to which the proposed B4 project would be connected by pipe. The Section 75W application includes the product throughput of this B4 application as the flow to/from the ships, road tankers and pipelines via the existing Site B4 distribution facilities.

The submitted EIS is generally considered to be comprehensive in terms of the matters identified to be addressed by VOPAK in their Environmental Impact Statement (EIS). Council proposes consideration of key issues and recommended conditions for your consideration.

Key Issues and recommendation for conditions

The EIS states that traffic generation associated with this project is only construction traffic and minor operational traffic (for ongoing maintenance of the completed facility). The traffic associated with the throughput from the development is to be considered as part of the concurrent Section 75W for modifications of the existing Site B Terminal to

which the proposed project would be connected by pipe. Council does not consider it is reasonable to neglect operational traffic associated with the throughput of this project given that this project will directly lead to additional traffic generation. Therefore, it is recommended that the assessment of this application be carried out simultaneous to the assessment of the Section 75W application.

It is recommended that a detailed Construction Traffic Management Plan (CTMP) be prepared for the proposed development. The CTMP must provide travel routes for all construction vehicles and a parking strategy for construction worker's vehicles. The travel routes must generally involve the use of NSW Ports' roads, Bumborah Point Road and Botany Road. There must be no use of local residential roads for construction related activities. The CTMP must be reviewed and approved by NSW Ports prior to implementation.

Recommended condition:

- A detailed Construction Site Traffic Management Plan (CTMP) must be submitted to and approved by Roads and Maritime Services (RMS), prior to the commencement of any site work.

  The CTMP must be prepared by a suitably qualified person and must include the following details, to the satisfaction of RMS:

  - A description of the demolition, excavation and construction works
  - A site plan/s showing the site, roads, footpaths, site access points and vehicular movements
  - Any proposed road and/or footpath closures
  - Proposed site access locations for personnel, deliveries and materials
  - Size, type and estimated number of vehicular movements (including removal of excavated materials, delivery of materials and concrete to the site)
  - Provision for loading and unloading of goods and materials
  - Impacts of the work and vehicular movements on the road network, traffic and pedestrians
  - Proposed hours of construction related activities and vehicular movements to and from the site
  - Current/proposed approvals from other Agencies and Authorities (including NSW Roads & Maritime Services, Police and State Transit Authority)
  - Any activities proposed to be located or impact upon Council's road, footways or any public place
  - Measures to maintain public safety and convenience
  - Details of the shuttle bus service transporting workers between the site and pick up point during the final 4th tank construction works shall be provided to the department, Council and RMS.

  The approved CTMP must be complied with at all times, and any proposed amendments to the approved CTMP must be submitted to and be approved by RMS in writing, prior to the implementation of any variations to the Plan. A copy of the approved CTMP shall be provided to Council.

Hours of building and associated site works

Recommended condition:

- Building, and associated site works must be carried out in accordance with the following requirements:

Activity	Permitted working hours
All building, demolition and site work, including site deliveries (except as detailed below)	• Monday to Friday - 7.00am to 6.00pm • Saturday - 8.00am to 1.00pm • Sunday & public holidays - No work permitted
Excavating of rock, use of jack-hammers, pile-drivers or the like	• Monday to Friday - 8.00am to 6.00pm • Saturday - No work permitted • Sunday & public holidays - No work permitted
Internal work only within a commercial or industrial development, located in a commercial or industrial zone, which is not audible within any residential dwelling or commercial or industrial premises	• Monday to Saturday - No time limits • Sunday & public holidays - No work permitted
Additional requirements for all development	• Saturdays and Sundays where the preceding Friday and/or the following Monday is a public holiday - No work permitted

An application to vary the abovementioned hours may be submitted for approval to vary the specified hours in exceptional circumstances and for limited occasions (e.g. for public safety, traffic management or road safety reasons). Any applications are to include supporting information. Applications must be made at least 10 days prior to the date of the proposed work.

Drainage

The subject development site is located within the area controlled by NSW Ports and the determining authority must ensure that all requirements of NSW Ports are addressed within any development consent for this application. All site stormwater drainage must be to NSW Ports' approval given that all land the subject of this development and the surrounding roads and infrastructure are under the care and control of NSW Ports.

Prior to site stormwater being discharged from the site it should be taken through pollutant traps, interceptors or treatment processes that are capable of removing gross pollutants, oil, grease, sediments and silts. Appropriate bunding must be positioned around the proposed tanks to ensure that that all paved areas on which a spillage of polluting materials may occur is designed to prevent entry of the pollutants into the stormwater system external to the site.

Recommended condition:

➢ The design, construction and operation of fuel storage areas must comply with the following requirements (as applicable):

(Pollution control & stormwater protection- liquid storage areas - Bunding)

a) A bund wall must be constructed around all work and liquid storage areas to prevent any spillage entering into the stormwater system. The bund area must provide for at least a volume equal to 110% of the largest containers stored and graded to a blind sump so as to facilitate cleansing.

(Pollution control & stormwater protection - Trafficable bund)

b) A trafficable bund, capable of preventing the escape of any pollutant into Council's stormwater drainage system, must be provided to all access ways/exits from the development.

(Public Health & safety - Storage of flammable and combustible liquids)

c) Flammable and combustible liquids must be stored in accordance with AS 1940-2004 - The Storage and Handling of Flammable and Combustible Liquids and relevant requirements of NSW WorkCover Authority.

(Public Health & safety - Storage of Dangerous Goods)

d) Prior to the storage of any 'dangerous goods' on the premises, a licence must be obtained from the WorkCover Authority (Chemical Safety Branch) and a copy of the licence must be forwarded to Council.

e) Service and parking areas must be graded and drained to a stormwater treatment device capable of removing litter, oil, grease and sediment prior to discharge to the stormwater system complying with relevant EPA requirements & guidelines and conditions of consent.

(General requirement - Waste Receipts)

f) A permanent record of receipts for the removal of both liquid and solid waste from the site shall be kept and maintained up to date at all times. The records are to be made available to EPA & Council Officers, upon request.

Visual Amenity - Landscaping

There are several existing trees, (covered by Council's Tree Preservation Order), that will be affected by this proposal. The level of detail on the proposed landscape treatment of the development site is limited to a reference to the Port Botany Development Code. The EIS states that a Landscape Plan would be prepared to manage the visual amenity of the Project. A condition to this effect should be included within any development consent. The port botany development code does not appear to require planting on site.

Recommended condition:

- The landscaping shall be installed in accordance with the approved documentation prior to the issue of a final occupation certificate and landscaping is to be maintained in accordance with the approved plans and specifications. To minimise the potential for bird habitation and roosting, the proponent must ensure that non-bird attracting plant species are used in any landscaping design. Any landscaping design must minimise the attractiveness for foraging birds, i.e. site is kept clean regularly, refuse bins are covered, and detention ponds are netted. Landscaping must not rise to a height greater than that of building height supported by the Sydney Airport Corporation.

Other Consideration

The Project is located within land and adjacent to roads controlled by NSW Ports it would be standard practice for Council to impose a requirement for lodgement of a damage deposit covering roads.

Air quality

The assessment, under Appendix H "Air Quality Impact Assessment" prepared by AECOM dated 8/10/15, has been undertaken in accordance with the NSW EPA approved methods for the modelling and assessment of Air Pollutants in NSW (Dec 2005). This assessment included the relevant pollutants and compared these against the set criteria. Sensitive

receivers have been identified and in order to provide a thorough assessment of pollutant concentrations surrounding the facility, a grid 4 km x 4 km with a 49m spacing approximately centred on the site was assessed.

Vopak proposes as part of its operations the import of approximately 2,520 ML of diesel and 2,266 ML of gasoline per annum by ship, which would be stored in tanks prior to dispatch via truck.

The assessment investigated the effects of the proposed operations on the air quality of the surrounding environment. The assessment of air emissions was limited to Volatile Organic Compounds (VOCs) during operation of the proposed facility. VOC concentrations at sensitive receptor locations were estimated through dispersion modelling using the CALPUFF Program.

The results of the modelling predicted that all assessed VOC concentrations would be less than the relevant EPA guideline criteria at all sensitive receptor locations assessed. With regards to Green House Gas emissions, the greatest contributor to emissions is the consumption of the fuel supplied by Vopak.

Construction mitigation measures have been outlined in section 8 of the report. These should be incorporated in any consent to be issued.

Consideration should be given to a condition being imposed requiring an air quality management plan (AQMP) to be prepared in accordance with section 8.2 appendix H.

The project is not expected to adversely affect the air environment or the amenity of sensitive receptors.

Recommended conditions:

- There are to be no emissions and discharges from the B4 project which give rise to a public nuisance or result in an offence under the Protection of the Environment Operations Act 1997 and Regulations.
- A Construction Environmental Management Plan (CEMP) is to be developed and implemented by a suitably qualified and experienced environmental consultant in accordance with the recommendations as outlined in Section 8.1 of the Air Quality Impact Assessment (Appendix H) pages 23.
- An Air Quality Management Plan (AQMP) should be prepared by a suitably qualified and experienced environmental consultant in accordance with section 8.2 of the Air Quality Impact Assessment (Appendix H) pages 24.

Noise and vibration

An assessment of Construction, Operation and Traffic (Appendix I – Noise and Vibration Impact Assessment prepared by AECOM dated 8/10/15)

Construction noise and vibration:

Noise producing construction activities from the typical worst case construction stages as part of this project have been modelled to provide an indication of the noise impacts at the nearest noise sensitive and industrial receivers. It has been noted that the assessment has been conducted in accordance with the NSW EPA Interim Construction Noise Guideline (INCG, 2009). The construction noise assessment indicates compliance with EPA's ICNG acoustic requirements at all assessment locations during the standard hours of construction. Construction traffic numbers have been stated as being minor compared with the existing traffic numbers and noise impacts from the increased

construction traffic on the nearby road network are stated as being considered negligible and inconsequential.

Operational noise and vibration:

The report identifies that the only significant noise producing items that are proposed as part of the B4 project are the addition of six fuel pumps. The assessment indicates that for all meteorological conditions and time periods, the predicted noise levels from the B4 Project are significantly below the existing approved Site B noise levels. Additionally, the predicted noise levels at all nominated representative receiver locations are significantly below the existing ambient noise levels at all non-industrial receiver locations. As such the report states that the noise impacts from B4 Project operations are not predicted to increase at any of the non-industrial receiver locations as a result of the B4 project. Further, it is stated that no items of plant and equipment used in operation of the B4 project site are expected to generate significant levels of vibration and the nearest residential (vibration sensitive) receivers are nominated as being located approximately 1400m from the facility, therefore operational vibration impacts are consequentially expected to be negligible.

However, over recent years Council has received a considerable number of complaints from the residents along McCauley Street; Australia Avenue; Marrabin Avenue; Partanna Avenue; Moorina Avenue; Wassell Street and Perry Street about the increasing noise levels from port related activities creating a noise disturbance particularly during the evening and night time periods. These locations have not all been identified as potentially affected or sensitive receivers however Council's complaint management system indicates that they are potentially affected by Port related activities and as such should be included in any future assessments and compliance monitoring.

Road Traffic Noise:

The assessment indicates that there is no increase in road traffic movements proposed as a result of this upgrade works.

Recommended conditions:

- A Construction noise and vibration management plan (CNVMP) is to be prepared by a suitably qualified and experienced consultant in accordance with the NSW EPA guidelines and the Noise and Vibration Impact Assessment dated 8 October 2015 prepared by Aecom. The CNVMP is to be implemented prior to building works commencing.

- An additional acoustic report, prepared by a suitably qualified and experienced consultant in acoustics, must be prepared and provided to the Council **within 6 months of B4 becoming operational (or at any other time as may be deemed reasonable and necessary by the appropriate regulatory authority or Council)**, which demonstrates and confirms that the relevant provisions of the *Protection of the Environment Operations Act 1997* and the noise criteria and requirements contained in the Noise and Vibration Impact Assessment prepared by AECOM dated 8 October 2015 has been satisfied (including any other relevant approved acoustic report and recommendations). The assessment and report must consider and incorporate the following sensitive receivers as potentially affected locations: McCauley Street Matraville; Australia Ave Matraville; Murrabin Ave Matraville; Partanna Ave Matraville; Moorina Ave Matraville; Wassell Street Matraville; Perry Street Matraville. .

Soil and Water - Land contamination

A statutory site audit statement, issued by Melissa Porter dated 29/04/15 and contained in Appendix L of the EIS, was produced in accordance with the NSW Contaminated Land Management Act 1997. The audit was commissioned by the previous occupiers Qenos. The audit was requested to assess the suitability of the site for its intended commercial/industrial use as per DA 6329, issued on 20 June 2014 by the Planning Assessment Commission.

The site has been detailed as 39 Friendship Rd Port Botany (Lot 27 DP 1126332) and the auditor has certified that the site is suitable for the commercial / Industrial uses. No further requirements have been identified. Acid Sulphate Soils (ASS) has not been identified as an issue requiring an ASS Management Plan.

Hazard and Risk: State Environmental Planning Policy 33 - Hazardous and Offensive Development (SEPP 33)

The subject site is currently a Major Hazard facility (MHF) defined under SEPP 33. Vopak is proposing to expand the storage capacity available by utilising the recently vacated area of the nearby Qenos site to provide satellite storage for their Site B operations.

It is noted that the applicant has submitted with their application under Appendix F a Preliminary Hazard Analysis (PHA) prepared by SHERPA Consulting dated 31/08/15, for the B4 Project in order to show that the development will meet the relevant land use planning risk criteria. The PHA covers the risk from the B4 Project, as well as the cumulative risk of the projected future operation as well as the complete B4 Project (i.e. both Stages B4A and B4B).

Recommended condition:

- The recommendations outlined in section 1.4 of the Preliminary Hazard Analysis prepared by Sherpa Consulting dated 31 August 2015 (reference 20945-RP-001; Revision 2) are to be incorporated into the consent conditions to ensure risks are appropriately managed.

Council appreciates the opportunity to comment and recommend conditions on the proposed development and should you have any further enquiries on this matter, please contact the Environmental Planning Officer, Mr Elias Coorey, on 9399 0524.

Yours faithfully,

Kerry Kyriacou
Manager Development Assessment

Transport
Roads & Maritime
Services

18 November 2015

Our Reference: SYD15/00445/02 (A10647081)
Department Ref: SSD 7000

Team Leader Industry Assessments
Department of Planning & Environment
GPO Box 39
Sydney NSW 2001

Attention: Pamela Morales

Dear Sir/Madam,

PROPOSED CONSTRUCTION AND OPERATION OF THE B4 SITE IN PORT BOTANY BY VOPAK TERMINALS SYDNEY PTY LTD.

Reference is made to the Department of Planning and Environment (DP&E) letter dated 16 October 2015, regarding the abovementioned Application which was referred to Roads and Maritime Services (Roads and Maritime) for comment in accordance with Schedule 3 of the *State Environmental Planning Policy (Infrastructure) 2007.*

Roads and Maritime has reviewed the submitted application and raise no objection to the State Significant Development provided the following conditions are incorporated into the Consent:

1. The developer shall ensure that there is no queuing of heavy vehicles on Bumborah Point Road at any time during construction and operation.

2. A Road Occupancy Licence should be obtained from Transport Management Centre for any works that may impact on traffic flows on Bumborah Point Road during construction activities.

3. A Construction Traffic Management Plan detailing construction vehicle routes, number of trucks, hours of operation, access arrangements and traffic control should be submitted to Council for approval prior to the issue of a Construction Certificate.

Any inquiries in relation to this Application can be directed to Ahsanul Amin on 8849 2413 or development.sydney@rms.nsw.gov.au.

Yours sincerely,

Rachel Nicholson
A/Senior Land Use Planner
Network and Safety Section

SafeWork NSW reviewed the EIS in general and the PHA in particular, and our comments are:

1. The requirements given by SafeWork for the SEARS are on Page 50 of the EIS. The first dot point stated that the EIS "should" include both on site and off site risks. However, item 1 in table 2.2 of the PHA states that *on site risk is not assessed in the PHA*. Clause 1.4 and item 6 in table 2.3 states that *SFARP demonstration was not addressed in the PHA.* Given that only off site risk is considered from a land use safety point of view, SafeWork has included in the suggested conditions below, that Vopak consult with SafeWork, prior to completion of detail design. Issues include, but are not limited to:.
    - Including both on and off site risk in the FHA.
    - SFARP demonstration with regard to both on and off site risk.
    - Updating the Safety Case under the WHS Regulation.
    - Matters to be addressed in the HAZOP study

2. Clause 5.3.4 of the PHA states that *vapour cloud explosion …… was not modelled in this study.* An explanation is given that overpressures are within the flashfire (LEL) envelope. Clause 7.1 in the PHA states that the maximum extent of the worst case vapour cloud (flash fire and explosion)scenario from a gasoline tank overfill is approximately 620m. Section D6 discusses vapour cloud/flash fire scenarios for tank overfill. Table D7 shows flash fire consequence distances. Section D3 discusses other flash fires and states that modelling results are reported in terms of width and length to 50% LFL and 100% LFL. However, the consequence results in tables D3 and D4 appear to show only distances to LFL. Results for 50% LFL do not appear to be included. Vopak to clarify.

3. Clause 8.2, dot point 4 of the PHA refers to an assumption that a tank rim seal fire progresses to a full tank surface roof fire at a factor of 0.1, but states that it will be verified as part of the design phase. Vopak to provide this evaluation at design phase and revise the risk assessment if the 0.1 assumption cannot be substantiated by analysis and comparison with published data.

4. PHA Appendix A, items 14 & 16 indicate that this Buncefield recommendation will not be implemented. Although offsite risk criteria may be satisfied, Vopak will be required via the Safety Case update, to justify not implementing this measure, since risks need to be reduced to SFARP.

5. PHA Appendix A, item 14 is the (Buncefield)recommendation to reroute overflows. The Buncefield inflow rate was 890m3/hr at the time of the incident. The site B inflow rate at safety case preparation time was 820m3/hr. The B4 rate is stated as 3500m3/hr but unclear if this is tank fill rate. Anyhow, minimizing overflow quantity and hence the size of a potential vapour cloud is considered critical. Vopak to demonstrate that high reliability post overflow shutdown and control measures will be implemented. These need to be addressed in the HAZOP. The HAZOP must also verify if the ullage between overflow levels and High and High High levels are adequate in comparison with available response times. E.g. if the ESD valve closure time is 45 sec, is the ullage above HH alarm sufficient at the increased fill rate to prevent overflow? Vopak to clarify.

6. Table D7 shows 75W operation as 1750 m3/hr and B4 as 3500 m3/hr. It is unclear if this is ship to shore pumping rate over one pipeline or multiple pipelines. How are the velocity limits re static issues maintained. The previous draft surge study probably used the pre 75W flow rate of 820m3/hr. At least the following three scenarios need to be addressed in the

new surge study to be carried out under the current MHF licence conditions. (a) Emergency shutdown valves are presently set at 45 sec closing time. This will need to be reviewed in the surge study if flow rates are increased. (b) Surge conditions likely to be generated due to sudden failure of ship's pumps. (c) surge conditions likely to be generated if the dry break coupling on an MLA is activated during pumping.

Suggested conditions

1. Prior to finalising of detail design related to safety and risk control aspects of the B4 project, Vopak shall consult with SafeWork NSW with regard to matters to be addressed in updating the site B Safety Case, on site risk assessment, surge issues due to increase in pumping rates and SFARP demonstration in particular, and comply with the requirements of the Work Health and Safety Act and Regulation 2011. The updated Safety Case shall be submitted to SafeWork at least one month prior to commencement of commissioning of the B4 project.
2. The safety Management system to be prepared or updated for the whole of site B under consent condition No. XXXX shall comply with the requirements of the Work Health and Safety Regulation 2011. In particular, the requirements in clause 558, clause 568 and schedule 17.
3. A copy of the report of the Hazard Audit to be carried out under consent condition YYYYY shall be submitted to SafeWork together with a program to action the recommendations. The report and action plan must be submitted at the same time as the submission of the report to the Department of Planning and Infrastructure.
4. The FHA to be done under consent condition ZZZZZ to include both on site and off site risks.
5. The HAZOP to be done under condition of consent WWWW. shall address theconcerns raised under item 5 above.

Appendix B

Community Submissions

Appendix B Community Submissions

Pamela Morales

From: system@affinitylive.com [mailto:system@affinitylive.com]
Sent: Wednesday, 28 October 2015 4:56 PM
To: Pamela Morales

Confidentiality Requested: yes

Submitted by a Planner: no

Disclosable Political Donation: no

Content:
I oppose the construction of seven liquid-fuel storage tanks holding up to 200 mega-litres of flammable and combustible fuels and the building of new pipelines under Friendship Rd to an existing Vopak terminal on the grounds that it will add to an already dangerously volatile and over loaded situation in the Port Botany/ Botany / Matraville areas, a time bomb waiting to explode. The traffic congestion caused by the construction will cause major difficulties to our already seriously congested road network. The State Government is already forcing changes upon the people of the this area by dismantleing our democraticly elected local councils and amalgamating with other democratlcly elected local councils.

Submission for Job: #7000 Vopak Site B4 Project
https://majorprojects.affinitylive.com/?action=view_job&id=7000

Site: #3078 Vopak Bulk Liquids Facility
https://majorprojects.affinitylive.com/?action=view_site&id=3078

Pamela Morales

From: system@affinitylive.com [mailto:system@affinitylive.com]
Sent: Wednesday, 18 November 2015 6:38 PM
To: Pamela Morales
Subject:

Confidentiality Requested: yes

Submitted by a Planner: no

Disclosable Political Donation: no

Matraville, NSW
2036

Content:
* I would like the serious concern of a terrorist attack on the terminal addressed together with the cumulative impact of an explosion in the south eastern area (that is -an explosion at this facility and how many other industries in the area would add to the explosive effect if triggered)
* What gasses can be released into the atmosphere and their health effects on residents
* Traffic impact study and how this affects local residents and traffic on the surrounding areas
* Please keep me updated with any progress and responses

Pamela Morales

From: system@affinitylive.com on behalf of ross salter <ross@kingsfordtimber.com.au>
Sent: Friday, 20 November 2015 3:06 AM
To: Pamela Morales
Subject: Submission Details for ross salter (object)

Confidentiality Requested: no

Submitted by a Planner: no

Disclosable Political Donation: no

Name: ross salter
Email: ross@kingsfordtimber.com.au

Address:
81 beauchamp rd

matraville, NSW
2036

Content:
The increase in usage of the Port Botany region for the transfer of Dangerous Goods from See to other modes of transport logically leads to an increase in risk in the region.

The increased facility will lead to an increase in the number of truck movements carrying DG's through street in the vicinity of the facility. Some of the designated dangerous goods routes have residences fronting them.

the EIS does not address this.

what risk will the final approved facility impose on neighbouring streets through the road transport of dangerous goods?

This information is required in order to provide a submission to the DoPE.

can you please advise when the QRA for transport of dangerous goods will be available.

thanks

IP Address: - 197.157.128.134
Submission: Online Submission from ross salter (object)
https://majorprojects.affinitylive.com/?action=view_activity&id=131978

Submission for Job: #7000 Vopak Site B4 Project
https://majorprojects.affinitylive.com/?action=view_job&id=7000

Site: #3078 Vopak Bulk Liquids Facility
https://majorprojects.affinitylive.com/?action=view_site&id=3078

ross salter

E : ross@kingsfordtimber.com.au

Submission VOPAK

Close: 20th November 2016

Lynda Newnam 0409698321 laperouse@bigpond.com www.portbotany.org

Note in the EIS prepared by Simon Murphy with review by Scott Jeffries, Aecom, the following Objective and Need:

4.1 Project Objective

The primary objective of the Project is to: - Provide additional storage to expand Vopak's existing Site B fuel terminal in Botany Bay to meet the forecasted increase in terminal throughput demand as a result of increased fuel consumption in Sydney and NSW.

4.2 Project Need

The Project is of economic significance to the regional, State and national economies due to the changes in the Australian fuel supplies market, and the need to provide secure fuel supplies for the ongoing operation of Australian businesses and industry.

Once again neighbouring residents and businesses are being asked to make submissions on complex state significant hazardous industry proposals without the benefit of input from the Department of Planning, Workcover and relevant combat agencies such as Fire and Rescue, Police and EPA.

The Vopak site is licenced by the EPA, it is a Major Hazard Facility(MHF) in a region with the greatest concentration of MHFs in NSW and located within the 3 Ports SEPP boundary.

It deserves greater scrutiny.

1 June 2013
Meadow Way Banksmeadow

12 July 2013
Caltex Banksmeadow

19 December 2013
Orora Matraville

Caltex faces $2 million fine for petrol leak: October 16, 2014

"It is alleged that the discharge continued for around 80 minutes before a NSW Fire and Rescue officer waded through a pool of petrol to turn off the valve," the EPA said.

"There was a real possibility of an explosion if the leaking valve was not shut off," FRNSW Commissioner Greg Mullins said at the time of the award ceremony.

Above is a snapshot of major industrial 'incidents' that occurred over a 6 month period in 2013. A community meeting took place after the Meadow Way 'event' however this did not

result in improved engagement during and after the July and December events, nor the following years. Requests for a cumulative impact assessment have been rejected.

5.1.1 Alternative Locations in the Sydney Region While there is potential for other locations to be considered for fuel import terminals in the Sydney Region, no other location provides direct connection to an existing fuel terminal, connection to fuel pipelines, direct access to existing bulk liquids berths and connection to key transport routes. Other locations would require the establishment of significant additional infrastructure, which would result in potentially significant disruption to the community, other businesses and the environment.

Neglects to consider long term planning and the need to decentralise.

Consultation

9.2 Agency Consultation

As required by the SEARs consultation with a number of agencies was undertaken during the preparation of the EIS. A number of these agencies, notably NSW Ports, the EPA and WorkCover NSW have been in ongoing discussions with Vopak regarding the Project. The outcomes of this consultation are detailed in Table 14. Table 14

Agency Consultation Summary

Agency / Comment Response / Section of EIS

Randwick City Council No response received NA

Environment Protection Authority No response received NA

Roads and Maritime Services No response received NA

Office of Environment and Heritage No response received NA

NSW Fire and Rescue No response received NA

9.3 Community Consultation

As described in Section 1.6.3, this EIS would be placed on public exhibition during which time the community would have the opportunity to review the Project documentation and make formal submission to DP&E regarding the Project.

At the August meeting of NSWPorts CCC agreed action: "Vopak to issue community invitation to information session on their development."

Note: The invitation was sent 18th November for a meeting to be held 24th November**, after submissions close.**

Another indication that this region has a low priority and resident concerns not taken seriously.

Notwithstanding, residents face the cumulative impact and therefore need those who grant consent and regulate industry to facilitate engagement not individual proponents/operators.

August NSWPorts CCC discussion on recent fire at Vopak:
http://www.nswportsbotany.com.au/assets/Community-Downloads/Port-Botany-CCC-Final-Minutes-August-2015.pdf

CA noted that beside routine alarms we are getting more non-routine alarms for events. These create concern in the community. Is there a way for people to ring up and see if they should be getting into their cars and leaving? Who do people ring? SH noted this is a challenge. Police are the authority to coordinate an evacuation of residents. They will advise residents if there is a need to evacuate. Police are on the NSW Ports emergency radio frequency. In the recent Vopak incident the Port Botany Emergency Alarm Radio System (PBEAR) was used to alert other port tenants and provide updates on the situation. There was also an emergency services exercise at the BLB 1 a couple of weeks ago where the PBEAR system was used. He suggested the evacuation of surrounding residents is a police matter rather than NSW Ports. RS speaking to questions tabled by LN said residents don't know what the siren means but are concerned. If concerned, can residents ring police? SH said NSW Ports received SMSs from local residents regarding the Vopak incident. He explained it was a small fire at the Vopak site. He understands that information provided by NSW Ports on the night of the incident may have been put on community websites by those residents. RS sought confirmation that it is alright to release this information. Can it go on a twitter feed? SH confirmed NSW Ports are happy for information that they are aware of to go out. He will talk to Karen McCarthy, Local Area Commander, to see how information is best communicated during an incident at the Port. CA asked whether SH can find out if it is okay for residents to ring police. (CA, Charles Abela (Community), SH Shane Hobday (NSW Ports) RS Ross Salter (Community) LN Lynda Newnam (Community).

One of the 4 objectives of the State Emergency Plan, issued December 2012, emphasises "community engagement in the development and exercise of plans as well as in their operational employment "

and on the Emergency NSW Website:

"You should think about what sort of emergency you might be likely to face in your home, local community, workplace and the areas you regularly visit. This will help you best plan what you need to do, depending on the circumstances ".

Polices on the management of major hazards very clearly outline the importance of community engagement.

The Hazardous Materials Plan makes specific reference to developing relationships with community in Section 3, under Prevention 48: Measures to prevent these types of

emergencies or the escalation of an incident are a State priority requiring effective partnerships between agencies, governments, business, industry **and the community**.

The State Emergency Plan clearly articulates the need for education and training.

602 **Disaster preparation is the responsibility of the whole community**..... Preparation activities delivered in partnership between all agencies, organisations **and communities help build engaged and resilient communities.**

603 Key elements of preparation include: planning; capability development; training exercises; building community resilience; risk communication. Community education and awareness campaigns aim to: develop awareness of the nature and potential impacts of hazards; promote personal responsibility for managing risks and preparation for emergencies; develop awareness of emergency management arrangements and assistance measures; encourage community participation in volunteering and infrastructure protection activities.

This has not been addressed in the EIS.

It is also notable that agencies such as the EPA, Fire and Rescue, and Randwick Council have not responded particularly given the recent incident and community concern around the management of MHFs, dangerous goods and heavy industry. Note also that in the case of dangerous goods residents in Dennison Street are now facing **'unacceptable risk' see** **https://portbotany.files.wordpress.com/2015/06/2015-05-19-undated-addendum_qra_report_2012sye009.pdf**

Australian Government's WHS Guide for Major Hazard Facilities
http://www.safeworkaustralia.gov.au/sites/SWA/about/Publications/Documents/672/Preparation%20of%20a%20Safety%20Case.pdf

with regard to obligations to community recommend the following:

graphically presented demographic information for the local community, including surrounding land uses permitted by the local planning authority (Schedule 18, (2.2))

information provision to the local community after a major incident

exercises and drills carried out to test the emergency arrangements at all levels, including the MHF's interface with emergency services ***and the local community***

Regulation 572 requires operators of licensed MHFs to provide certain information to the local authority and the local community. ***Two-way discussions with the local authority and the local community****, in addition to the required provision of information, give MHF operators an opportunity to improve the quality of hazard identification and safety assessment at MHFs. The safety case may include information about how the MHF operator provides information to the local community and the local authority as required by regulation 572.*

The safety case may also describe any mechanisms for ***seeking information from the local council, the community and other stakeholders in relation to major incident prevention and control, and the results of any discussions.***

Hazard Risk Analysis

Needs to be updated with 30 year projections as part of NSW Ports 30 Year Plan

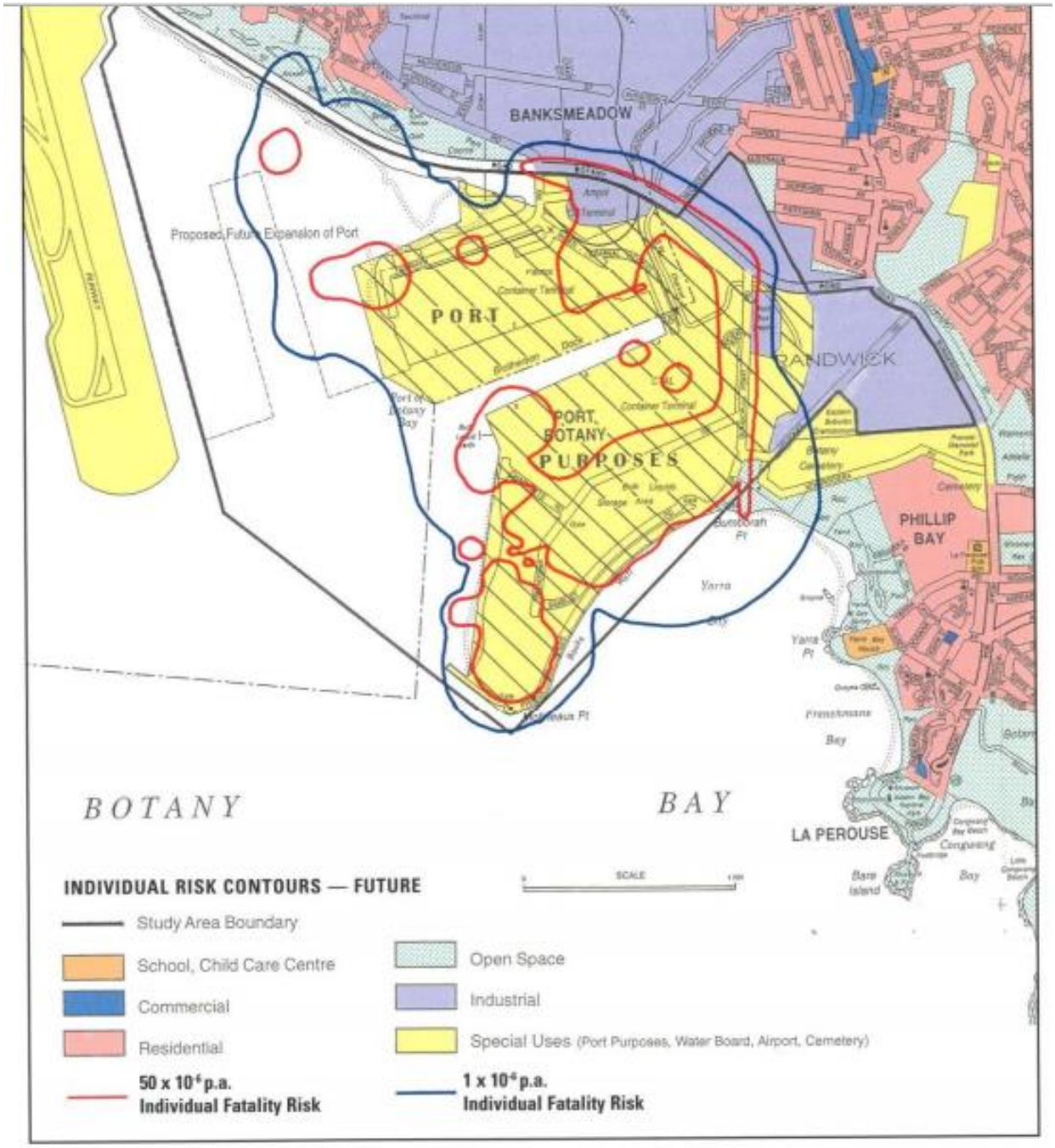


Figure 11 **Port Botany Land Use Study – Cumulative Individual Risk Contours including postulated Future Development (1996)**

I refer to the Planning NSW Guidelines on Risk http://www.planning.nsw.gov.au/en/Policy-and-Legislation/~/media/0D39F08E7889409BBA1FA88D5FB859FD.ashx

Table 2: Individual Fatality Risk Criteria Land Use Suggested Criteria (risk in a million per year)

Hospitals, schools, child-care facilities, old age housing 0.5

Residential, hotels, motels, tourist resorts 1

Commercial developments including retail centres, offices and entertainment centres 5

Sporting complexes and active open space 10

Industrial 50

Figure 10 Individual risk contour (cumulative site B terminal including B4 project)

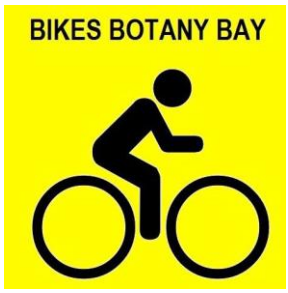
The Tourist viewing and recreation area at Molineux Point falls outside the acceptable 10 x 10-6 per year (as per table above) but is within 1 x 10-6 and it be noted that Sherpa do state in 11.2.6 ***that this is not a complete picture of cumulative risk in the area as there are numerous other MHF's in the vicinity***

The community has a right to know what the cumulative risk is and the authors of the EIS should have noted the land use status of Molineux Point.

Transport

Bumborah Point Road, Simblist Road and Friendship Road are purpose-built roads serving heavy vehicles accessing the port area. They all have wide carriageways to allow multiple

heavy vehicle movements and allow for adequate swept turning paths. They all have a 60 km/h speed limit and suitable street lighting.



Bumborah Point Road is also an active transport route for pedestrians and cyclists, particularly the latter who access the Prince of Wales Tourist Drive and Molineux Point. This area marks the end of the Eastern Beaches Coastal Walk which is one of the top tourist attractions on Trip Advisor.

Provision needs to be made for safe cycling and pedestrian access as residential growth, as part of the Government's regional growth strategy, will drive increased demand for recreational space and recreational activities. This local community received nothing from the 'bonanza sale' of Port Botany even though the proceeds were *significantly more than the $3 billion previously anticipated from the sale,* http://www.smh.com.au/nsw/ports-sale-adds-43b-to-coffers-for-key-projects-20130412-2hquy.html

In addition, the Transport for NSW Sydney 's Cycling Future http://www.transport.nsw.gov.au/sydneys-cycling-future (launched by Ministers Gay and Berejiklian) identifies the **Port Botany – Airport precinct as a priority for facilitating commuter cycling to address major road congestion and improve workforce health.**

There is no mention of cycling in this EIS

Recommendations:

- **Transport plan should include detailed active transport strategy.**

- **Community Consultation should include a public forum facilitated by Department of Planning with regulators Workcover and EPA as well as Fire and Rescue to communicate cumulative risk and emergency management as well as projections. All to be recorded for future reference on NSW Planning webpage**

- **The Port Botany Land Use Study and the Randwick/Botany Industrial risk study need to be updated and the process include genuine community consultation and full disclosure.**

Appendix C

Air Quality Impact Assessment

Appendix C Air Quality Impact Assessment

Vopak Terminal B4
Vopak Terminals Pty Ltd
18-Dec-2015

Air Quality Impact Assessment

Vopak Terminal B4 - State Significant Development

Air Quality Impact Assessment

Vopak Terminal B4 - State Significant Development

Client: Vopak Terminals Pty Ltd

ABN: 67004754750

Prepared by

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18-Dec-2015

Job No.: 60344169

AECOM in Australia and New Zealand is certified to the latest version of ISO9001, ISO14001, AS/NZS4801 and OHSAS18001.

Quality Information

Document Air Quality Impact Assessment

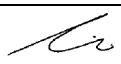
Ref 60344169

Date 18-Dec-2015

Prepared by Holly Marlin / Adam Plant

Reviewed by David Rollings

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
A	03-Jun-2015	Draft for client review	James McIntyre Associate Director - Environment	
B	06-Aug-2015	Draft for Client Review	James McIntyre Associate Director - Environment	
C	17-Aug-2015	Draft for NSW Ports Review	Simon Murphy Project Manager	
D	08-Oct-2015	NSW Ports Review	Simon Murphy Project Manager	
E	18-Dec-2015	Final Report	Simon Murphy Project Manager	

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1.0 Introduction

1.1 Project Overview

This Air Quality Impact Assessment (AQIA) was prepared by AECOM Australia Pty Ltd (AECOM) to support the Environmental Impact Statement (EIS) prepared on behalf of Vopak Terminals Pty Ltd (Vopak) for a State Significant Development (SSD) application for the Stage B4 Expansion Project. The expansion project consists of the construction and operation of a petroleum tank farm at Port Botany, NSW, which would consist of seven storage tanks with a total nominal capacity of 200 ML (the Project).

The main potential sources of air emissions associated with the proposed development are vapour emissions (volatile organic compounds, or VOCs) from the storage and transfer of fuels. The purpose of this assessment was to estimate the emissions of VOCs from the facility and the resultant concentrations of these pollutants at sensitive receptor locations. This report provides details of the methodology and results of the dispersion modelling of VOC emissions.

1.2 Scope of Work

This assessment was undertaken to address the NSW Department of Planning and Environment Secretary's Environmental Assessment Requirements (SEARs) issued for the project (SSD 7000) on 30 April 2015. The key matters raised by the Secretary relevant to this assessment are outlined in **Table 1**.

Table 1 Secretary's Environmental Assessment Requirements

Secretary's Environmental Assessment Requirement	Section Addressed
A quantitative assessment of the air quality and odour impacts of the development on surrounding receivers	**Section 6.0**
Details of mitigation, management and monitoring measures for preventing and/or minimising emissions	**Section 8.0**
An assessment of the potential greenhouse gas emissions of the proposed development	**Section 7.0**

The assessment was undertaken in accordance with the Environment Protection Authority (EPA) Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (The Approved Methods) (DEC, 2005). VOC emissions associated with diesel and gasoline storage from the operation of the facility were estimated through dispersion modelling using the CALPUFF model, with emissions estimated using TANKS program with the NPI databases.

The air quality assessment included relevant pollutants from the NSW EPA Approved Methods for Modelling and Assessment of Air Pollutants in NSW (DEC 2005) for individual odorous air pollutants listed in Table 7.4a of the NSW EPA Approved Methods. It compared these against the stated criteria, including cumene, cyclohexane, toluene and xylenes. The odorous pollutant criteria presented have been selected based on the stricter value of the either the toxicity level or odour nuisance level for each of these specific pollutants. As odours associated with the operations would be as a result of the VOC emissions, and the VOCs assessed included those from the NSW EPA Approved Methods for odorous pollutants, the VOC assessment was considered to adequately address both air quality and odour impacts.

1.3 Structure of Report

The structure of the remainder of the report is as follows:

- **Section 2** provides a description of the Project.
- **Section 3** describes the existing environment, including a review of existing air quality and local climate conditions.
- **Section 4** outlines the impact assessment criteria used in this assessment.
- **Section 5** provides a detailed description of the air quality assessment methodology.

- **Section 6** provides an assessment of the potential air quality impacts of the Project on the local air shed and provides assessment of relevant criteria against identified sensitive receptors.
- **Section 7** describes the mitigation measures that are currently used at the Facility or that are recommended to be implemented as part of the Project.
- **Section 8** provides the study conclusions.
- **Section 9** contains a list of reference documents used in the study.

2.0 Project Description

The Project consists of the construction and operation of a liquid fuels (finished or refined petroleum) storage depot. This would involve the construction of seven storage tanks with a total nominal capacity of 200 ML. Vopak proposes to undertake the Project in two stages:

- Stage 1 (B4A):
  - Construction of three storage tanks and bunding dedicated to ADO (diesel fuel with a nominal total capacity of 105,000 m^3);
  - Construction of new pipelines/culverts to inter-connect with the Site B (B1) manifold;
  - Installation of manifold/transfer pumps and connections to utilities; and
  - Extension of existing Site B fire protection system to the B4A site.
- Stage 2 (B4B):
  - Construction of four storage tanks (nominal total capacity of 95,000 m^3) capable of storing any Class 3 combustible product:
  - Construction of additional transfer pipelines to Site B manifold systems; and
  - New fire protection system complying with AS 1940 requirements.

2.1 Development Location

The existing Site is located on part of the former Qenos Hydrocarbon Terminal at 39 Friendship Road, Port Botany, which protrudes into Botany Bay. The site is approximately 12 km south-east of the Sydney Central Business District. Vopak currently operates Site A and B Terminals in Port Botany, located at 49 Friendship Road and 20 Friendship Road respectively.

The site is surrounded by industrial properties, including operations handling containers, bulk liquids and petrochemicals. Sydney Airport is located to the northwest of the site. Closest residential areas are located approximately 1.4 km to the east of the site, across Yarra Bay.

2.2 Infrastructure

The dimensions of the proposed tanks are summarised in **Table 2**.

Table 2 Proposed Tanks

Area	Tank No.	Diameter (m)	Height (m)	Shell Volume (m^3)	Fill Volume (m^3)	Operating Volume (m^3)	Product
A	110-01	43.5	24.7	36,700	35,200	33,700	Diesel
	110-02	43.5	24.7	36,700	35,200	33,700	
	110-03	43.5	24.7	36,700	35,200	33,700	
B	110-04	41	24	31,600	30,300	29,000	Gasoline/ petroleum
	110-05	41	24	31,600	30,300	29,000	
	110-06	29	24	15,800	15,000	14,500	
	110-07	29	24	15,800	15,000	14,500	

The Area A tanks would be made from carbon steel, each with a supported carbon steel cone roof, and would be free venting. The Area B tanks would be carbon steel floating roof tanks with external aluminium domes, with air-scoop roof flanges. All tanks would be painted white.

\Projects\60344169\4. Tech work area\4.5 Graphics\FIGURES\EIS\60344169 F2 Site Location 13 08 2015 TO Rev A

AECOM

SITE LOCATION

Environmental Impact Statement
Vopak Terminals, Port Botany, New South Wales

FIGURE 1

2.3 Project Construction

2.3.1 Program of Works

The proposed construction timetable is for work to commence in Quarter 4, 2015 and be completed by early 2017. An indicative program of works for the construction phase, relative to the main construction activities, is shown in **Table 3**. Stages B4A and B4B would be constructed separately.

Table 3 Proposed Timeline for Each Stage of Construction Activities

Item	Description	Start (Week)	Finish (Week)
Mobilisation	- Initial mobilisation of construction team to the site and establishment of construction infrastructure such as construction office, car parking laydown areas. - Establish construction site fencing and security measures.	1	9
Civil works	- Modify site drainage to isolate and control runoff from the construction site; - Bund wall sub base preparation; - Construct vertical bund walls; - Prepare for and construct tank foundation; and - Apply asphalt to remaining hardstand areas.	10	14
Tank works	- Fabrication and installation of tanks in Site B4 - Hydrostatic testing of tanks	15	54
Fire and safety systems installation	- Piping installation for connection to fire ring main. - Installation of fire water sprays systems. - Installation of fire detection system.	23	54
Electrical works	- Installation of electrical control systems - Connection to existing Vopak terminal management systems. - Connection to utility electrical supplies.	25	56
Commissioning	- Testing and commissioning of fuel import and export systems. - Testing and commissioning of fire management systems.	57	70

2.3.2 Construction Emissions

Activities that have the potential to result in airborne pollutants during the construction phase include earthmoving during site preparation and handling of any excavated material. Prior to construction activities taking place, a Construction Environmental Management Plan (CEMP) would be prepared to address the management of potential environmental impacts associated with construction activities. The CEMP would include measures to manage and mitigate air quality and odour emissions. As the works would be intermittent in nature, the implementation of an appropriate CEMP is expected to adequately mitigate any construction emissions from the Site as discussed in **Section 8.1**. As such, Construction emissions were not assessed quantitatively in the AQIA.

2.4 Project Operations

2.4.1 Operational Overview

The Project would facilitate the following operations:

- Ship unloading to Site B4 directly from BLB1 or BLB2 or via Site B3;
- Tank to tank transfers with Site B3;
- Tank recirculation.

The Project will be connected to the existing Site B3 Vopak Terminal truck load-out gantry. Vopak recently lodged a modification application for the Site B3 consent, which sought approval for the increase in throughput of the gantry, which would occur if the B4 project is undertaken. The modification took into consideration the additional traffic generation, gantry pump noise, air quality impacts and other potential impacts associated with the increased gantry throughput. As such, this assessment focuses on activities on Site B4 only.

2.4.2 Operational Emissions

The main emissions of interest for fuel storage activities are VOCs. VOCs are organic compounds with a vapour pressure exceeding 0.13 kPa at a temperature of 20^{o}C. VOCs have been implicated as a precursor in the production of photochemical smog, which causes atmospheric haze, eye irritation and respiratory problems. VOCs can be emitted from storage tanks, filling stations vents, pipelines and process equipment leaks at plant associated with fuel storage. The primary emission sources are storage tank and pipeline losses.

3.0 Existing Environment

3.1 Air Quality

The pollutants of prime interest in NSW are ozone and particulates, with levels of these pollutants approaching or exceeding the national standards prescribed in the National Environment Protection Measure for Ambient Air Quality (NEPM) on occasion. The Vopak facility is not expected to generate significant levels of ozone or particulates.

Port Botany is the major NSW port for the handling of containers, bulk liquids and petrochemicals. The international and domestic airport terminals are located nearby, as are major arterial roads and the botany Freight Rail line. Industrial uses dominate the surrounding area, including the sections of Banksmeadow and Matraville abutting Port Botany.

No local monitoring of VOCs was identified at the time of preparation of this report. It should be noted that VOC assessments are to consider project contributions only; that is, cumulative assessment, which requires the consideration of background pollutant concentrations, is not required (DEC, 2005).

3.2 Regional Meteorology

The Bureau of Meteorology (BOM) records long-term meteorological data at a number of automatic weather stations around the country. The station that best represents the site is located at Sydney Airport, approximately 4.5 kilometres northwest of the Vopak B4 site, across Botany Bay. A summary of the long-term data recorded at this station is provided below; more data are provided in **Appendix B**.

The warmest temperatures occur between November and March, with the warmest average maximum temperatures occurring in January (26.5ºC). The coldest temperatures are recorded in the winter months, with the lowest average minimum temperature occurring in July (7.2ºC).

The highest average rainfall is recorded in June (122.8 mm), while September is the driest month (60.2 mm). Humidity in the area is typically between 50 and 74 %. Average wind speeds range from 12.6 – 25.3 kilometres per hour, and are typically higher at 3 pm compared to 9 am. Winds are predominantly from the northwest at 9 am, with also frequent winds from the western direction. At 3 pm, the winds swing around to predominantly blow from the northeast and southeast. Southerly winds are common both in the morning and afternoon.

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4.0 Assessment Criteria

The EPA specifies impact assessment criteria for a range of pollutants (DEC, 2005). The criteria and associated averaging periods for the pollutants considered in this assessment are shown in **Table 4**.The pollutants represent those included in the NPI TANKS database as being constituents of diesel and gasoline fuel for which the EPA has impact assessment criteria.

Table 4 NSW EPA Assessment Criteria

Pollutant	Criteria (µg/m^3)	Averaging Period	Percentile	Applicable location
Benzene	29	1 hour	99.9th	At and beyond the boundary of the facility
Cumene	21	1 hour	99.9th	At the nearest existing or likely off-site sensitive receptor
Cyclohexane	19,000	1 hour	99.9th	At and beyond the boundary of the facility
Ethylbenzene	8,000	1 hour	99.9th	At and beyond the boundary of the facility
n-Hexane	3,200	1 hour	99.9th	At and beyond the boundary of the facility
Toluene	360	1 hour	99.9th	At the nearest existing or likely off-site sensitive receptor
Xylenes	190	1 hour	99.9th	At the nearest existing or likely off-site sensitive receptor

For consistency, all pollutant concentrations were assessed at the site boundary and beyond.

A level 2 assessment has been applied in this assessment. The tank fuel throughputs and tank design data are site specific and the meteorological data was created specific for the project site. The meteorological data used included a combination of prognostic TAPM data and surface station data from the local area in accordance with the guidance document "*Generic Guidance and Optimum Model Settings for the CALPUFF Modelling System for Inclusion into the Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*" Barclay & Scire (2011).

Site-specific liquid / vapour are not available for the site. The values used were based on the Australian Government provided national Pollutant Inventory (NPI) default values. It is AECOMs experience that these values are considered to be conservative and would likely result in an overestimation of actual emissions. Recent work on a similar tank farm showed a diesel liquid benzene percentage composition of closer to 0.004% rather than the default NPI value of 0.03%, and a cumene value of 0.02% compared to the default 0.96%.

Given the above information, the application of a level 2 assessment for the Project is considered a reasonable approach.

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5.0 Assessment Methodology

5.1 Site Emission and Dispersion Models

5.1.1 TANKS Emission Model

Emission rates for the fuel storage tanks were generated using the TANKS program. TANKS is a Windows-based computer software program that estimates VOC and hazardous air pollutant (HAP) emissions from fixed- and floating-roof storage tanks. TANKS is based on the emission estimation procedures from Chapter 7 of EPA's Compilation Of Air Pollutant Emission Factors (AP-42). TANKS uses chemical, meteorological, roof fitting, and rim seal data to generate emissions estimates for several types of storage tanks including:

- vertical and horizontal fixed roof tanks;
- internal and external floating roof tanks;
- domed external floating roof tanks; and
- underground tanks.

5.1.2 TAPM Meteorological Model

TAPM predicts three-dimensional meteorology, including terrain-induced circulations. TAPM is a PC-based interface that is connected to databases of terrain, vegetation and soil type, leaf area index, sea-surface temperature, and synoptic-scale meteorological analyses for various regions around the world. TAPM is used to predict meteorological parameters at both ground level and at heights of up to 8,000 m above the surface; these data are required by the CALPUFF model. The TAPM output file requires processing through a program such as CALTAPM to generate a file that is used within CALMET to generate the three-dimensional wind fields required by the CALPUFF dispersion model.

The NSW EPA has released guidance documentation (Barclay and Scire, 2011) on the optimum settings for the use of the CALPUFF modelling system. One modelling approach provided in the document is the use of a 'Hybrid Mode' whereby numerical prognostic three-dimensional meteorological model data, in a 3D.DAT file, along with surface observation data gained from a representative nearby surface monitoring station, are combined. The CALTAPM program converts the TAPM data into a 3D.DAT file, which can be input directly into the CALMET meteorological processer.

5.1.3 CALPUFF Air Dispersion Model Suite

Various air dispersion models are required for the successful modelling of air quality impacts from the Site. These are: The Air Pollution Model (TAPM), which is used to generate prognostic meteorological data; CALTAPM, which is used to process the TAPM output into a format suitable for input into the CALMET model; CALMET, which generates three-dimensional wind fields used in the dispersion modelling; CALPUFF, which predicts the movement and concentration of pollutants; and CALPOST, which is used to process the CALPUFF output files.

CALPUFF is the NSW EPA model of choice for areas that are affected by coastal breezes, coastal fumigation or complex terrain. The Project site is located in a coastal area and, hence, the CALPUFF model was chosen for use in the AQIA. The CALPUFF modelling system consists of three main components and a set of pre-processing and post-processing programs. The main components of the modelling system are CALMET (a diagnostic three-dimensional meteorological model), CALPUFF (an air quality dispersion model), and CALPOST (a post-processing package). The main CALPUFF related software package programs are described in the following sections.

5.1.3.1 CALMET

CALMET is a meteorological model that develops hourly wind and temperature fields on a three-dimensional gridded modelling domain. Associated two-dimensional fields such as mixing height, surface characteristics and dispersion properties are also included in the file produced by CALMET. CALMET produces a meteorological file that is used within the CALPUFF model to predict the movement of pollution.

5.1.3.2 CALPUFF

CALPUFF is a non-steady-state three-dimensional Gaussian puff model developed for the US Environmental Protection Agency (US EPA) and approved by the NSW EPA for use in situations where basic Gaussian plume models are not effective, such as areas with complex meteorological or topographical conditions, including coastal

areas with re-circulating sea breezes. The CALPUFF model substantially overcomes the basic limitations of the steady-state Gaussian plume models, and as such, was chosen as the most suitable dispersion model for the AQIA and Site Model. Some examples of applications for which CALPUFF may be suitable include:

- Near-field impacts in complex flow or dispersion situations:
  - complex terrain;
  - stagnation, inversion, recirculation, and fumigation conditions;
  - overwater transport and coastal conditions;
  - light wind speed and calm wind conditions;
- Long range transport;
- Visibility assessments and Class I area impact studies;
- Criteria pollutant modelling, including application to development applications;
- Secondary pollutant formation and particulate matter modelling; and
- Buoyant area and line sources (e.g. forest fires and aluminium reduction facilities).

5.1.3.3 CALPOST

The CALPOST program is used to process the outputs of the CALPUFF program into a format defined by the user. Results can be tabulated for selected options including percentiles, selected days, gridded results or discrete locations, and can be adjusted to account for chemical transformation and background values.

The program default settings were used for the CALPOST program, ensuring that the correct averaging periods, percentiles and receptors were selected to meet the NSW EPA ambient pollutant criteria assessed (DEC, 2005).

5.2 Dispersion Modelling

5.2.1 Model Input Parameters

A summary of the data and parameters used as inputs to TAPM, CALMET and CALPUFF is shown in **Table** 5. Details of the TANKS inputs (and outputs) are provided in **Appendix C**.

Table 5 Summary of Model Input Parameters

Parameter	Input
TAPM	
Horizontal resolution	40 x 40 grid points; outer grid spacing 30,000 m x 30,000 m with an inner grid spacing of 1,000 metres.
Grid centre coordinates	33 deg 59 min E, 151 deg 13 min S
Vertical levels	Defaults
Land use data	Default TAPM database
Simulation length	1 January – 31 December 2014
CALMET (v6.42)	
Meteorological grid domain	35 km x 35 km
Meteorological grid resolution	250 metre resolution (140 x 140 grid cells)
Reference grid coordinate (centre)	335182 E, 6238801 S
Cell face heights in vertical grid	0, 20, 40, 80, 160, 320, 640, 1200, 2000 and 3000 m
Simulation length	1 year (2014)
Surface meteorological stations	Sydney Airport (BOM)

Parameter	Input
Upper air meteorological station	No upper air stations. The 3-dimensional gridded prognostic data from TAPM (M3d) were used as the initial guess wind-field for CALMET
Terrain and land use data	Terrain elevations were extracted from the NASA Shuttle Radar Topography Mission data set (SRTM3 90 metre resolution). Land use data taken from GLCC Australia Pacific (~1 km resolution)
CALPUFF (v6.42)	
Computational grid	10 km x 10 km approximately centred on the site
Sampling grid	4 km x 4 km with a nesting factor of 5 (~49 metres spacing), approximately centred on the site; converted to discrete receptors
Number of sensitive receptors	The sampling grid was converted to discrete receptor locations. A total of 6241 discrete receptor locations were assessed.
Dispersion option	Dispersion coefficient. use turbulence computed from micrometeorology
Meteorological modelling period	1 January 2014 – 31 December 2014

5.3 Assessment Scenarios

A single scenario was assessed, which considered emissions from all tanks associated with the proposed Project; that is, the three diesel tanks proposed for Stage 4A, and the four mixed use tanks, which will initially be used for gasoline storage, associated with the proposed Stage 4B. The assessment was conducted for continuous operation of the facility, assuming constant emissions occurring 24 hours per day, 7 days per week, 365 days per year.

5.4 Model Inputs

The inputs used in the modelling are described in the following sections.

5.4.1 Meteorology

For the TANKS model, the Australian database was used. The database contains meteorological data for Sydney Airport, which were selected for this assessment.

The meteorological data are used by the CALPUFF model in different ways to estimate the dispersion of air pollutants:

- Ambient temperature is used to incorporate thermal buoyancy effects when calculating the rise and dispersion of pollutant plumes;
- Wind direction determines the direction in which pollutants will be carried;
- Wind speed influences the dilution and entrainment of the plume into the air continuum;
- Atmospheric stability class is a measure of atmospheric turbulence and the dispersive properties of the atmosphere. Most dispersion models utilise six stability classes, ranging from A (very unstable) to F (stable/very stable); and
- Vertical mixing height is the height at which vertical mixing occurs in the atmosphere.

Meteorological data for the period January – December 2014 were used in this assessment. Prognostic meteorological data were generated using TAPM for upper air conditions for a 40 km x 40 km grid with a 1 km grid spacing centred close to the Vopak site. The TAPM output (processed using CALTAPM) was then used, with surface station data from the Bureau of Meteorology monitoring station at Sydney Airport, as input into the CALMET meteorological module to compute the wind fields used by CALPUFF. Sydney Airport is approximately 4.5 kilometres northwest of the Vopak B4 site, across Botany Bay. Analyses of the meteorological data used in the modelling are provided in **Appendix B**. The data were considered to be representative of meteorological conditions around the site.

5.4.2 Terrain

Digital terrain data used to generate the upper air prognostic meteorological data were obtained from the TAPM 9 second DEM database covering an area of 40 km by 40 km on a 1 km grid, roughly centred on the Vopak facility. For the CALMET model, the geophysical processor was used to convert land use and terrain data from WebGIS (SRTM3 for terrain at approximately a 90 metre resolution) and GLCC Australia Pacific (approximate 1 kilometre resolution) throughout the meteorological domain.

5.4.3 Building Wake Effects

The dispersion of pollutants emitted from stack sources may be affected by aerodynamic wakes generated by winds having to flow around buildings. Building wakes generally decrease the distance downwind at which stack plumes comes into contact with the ground, which may result in higher ground level pollutant concentrations closer to the emission source.

As no stack sources were included in the modelling, building wake effects were not accommodated in this assessment.

5.4.4 Source Characteristics

Fuel storage tanks are sources of fugitive emissions. Details of the tank parameters and emission rates are provided in the following sections.

5.4.4.1 TANKS Details

The diesel tanks (Tanks 110-01, 110-02, 110-03) were entered into the TANKS model with the following parameters (provided by Vopak):

- Type: Vertical fixed roof;
- Diameter: 142.71 feet;
- Height: 79.89 feet;
- Maximum liquid height: 77.26 feet;
- Average liquid height: 49.2112 feet;
- Working volume: 9,246,020 US gallons; and
- Tank turns: 24.

Tanks 110-04 and 110-05 (gasoline) were assessed with the following parameters:

- Type: Domed external floating roof;
- Diameter: 134.51 feet;
- Working volume: 8,221,033 US gallons; and
- Tank turns: 24.;

Tanks 110-06 and 110-07 (gasoline) were assessed with the following parameters:

- Type: Domed external floating roof;
- Diameter: 95.14 feet;
- Working volume: 4,247,886 US gallons; and
- Tank turns: 24.

The product component databases prepared for Australian fuel for the NPI were used for the TANKS modelling. The default values of the fuel type compositions were compared against the values in the current NPI Emission Estimation Technique Manual. The diesel values were found to be the same, and were used for the TANKS emission estimations. The database did not contain default values for gasoline; as such, the unleaded petrol values published in the NPI EET (DSEWPC, 2012) were entered manually into the TANKS program and used to calculate emissions from the proposed gasoline tanks. A copy of the TANKS output is provided in **Appendix C**.

Table 6 Fuel Composition – Substance Proportions (NPI)

Substance	Typical Composition (%)	
	Diesel	Unleaded Petrol (ULP)
Benzene	0.03	0.933
Cumene	0.975	0.1
Cyclohexane	0.01	0.765
Ethylbenzene	0.11	1.533
n-Hexane	0.01	1.83
Toluene	0.1	5.603
Xylenes	0.345	7.747
Source: Table 2: Minimum amount of individual substances in fuel stored to trip the Category 1 reporting threshold (10 tonnes), DSEWPC (2012).		

The monthly emissions of the above pollutants in pounds were converted to an emission rate for each tank in grams per second assuming constant emissions (24/7/365). These were used as the emission rates in CALPUFF as an hourly varying emissions file.

5.4.4.2 CALPUFF Details

The tank parameters used in CALPUFF are provided in **Table 7**. The horizontal and vertical spreads were calculated according to the ISC3 User Guide (USEPA, 1995) – the horizontal spread was the length of side divided by 4.3 (single volume source), and the vertical spread was the vertical dimension of source (height) divided by 2.15 (surface based source)

Table 7 Tank Parameters

Tanks	Diameter (m)	Height (m)	Horizontal Spread (m)	Vertical Spread (m)
110-01, 110-02, 110-03	43.5	24.7	10.12	11.49
110-04, 110-05	41	24	9.53	11.16
110-06, 110-07	29	24	6.74	11.16

5.4.5 Emission Rates

Emission rates were calculated using the TANKS emission estimation model detailed in **Section 5.1**. The fuel throughput of each tank was evenly allocated to each month of the year within the TANKS model. The monthly emission rates were estimated in kilograms per month and calculated back to grams per second (g/s) for each month for use in the dispersion model and are provided in **Appendix C**.

Monthly emission rates were used as an input to the CALPUFF dispersion model, which is considered to provide a more robust method for emission estimation that better accounts for seasonal atmospheric influences when compared to using an annual average. Monthly calculated emission rates, compared to annual emission rates, have the potential to increase emissions in summer months during higher temperatures, however these months generally have higher wind speeds and better dispersion resulting in potentially lower ground level impacts. Conversely. emissions in winter months during lower temperatures may be lower, while winds are likely to be lower and hence less dispersion and potentially higher ground level impacts. The TANKS model does not provide data for time periods less than one month.

5.4.6 Sensitive Receptors

The EPA considers sensitive receptors to be areas where people are likely to either live or work, or engage in recreational activities. The nearest sensitive receptors are the caretaker's residence at the Botany Cemetery (approximately 1.4 km away) and residential properties on Yarra Road and Elaroo Avenue, Philip Bay to the southeast, approximately 1.8 km away.

As indicated in **Section 4.0**, the impact assessment criteria for the pollutants assessed are applied either at the site boundary and beyond or at the closest existing or future sensitive receptor. In order to provide a thorough assessment of pollutant concentrations surrounding the facility, a grid 4 km x 4 km with a 49 metre spacing, approximately centred on the site, was assessed. Additionally, receptors were placed along the approximate boundary of the Project. Concentrations predicted at on-site locations were excluded from the results. The receptors are shown in **Figure 2**, indicated as blue crosses.

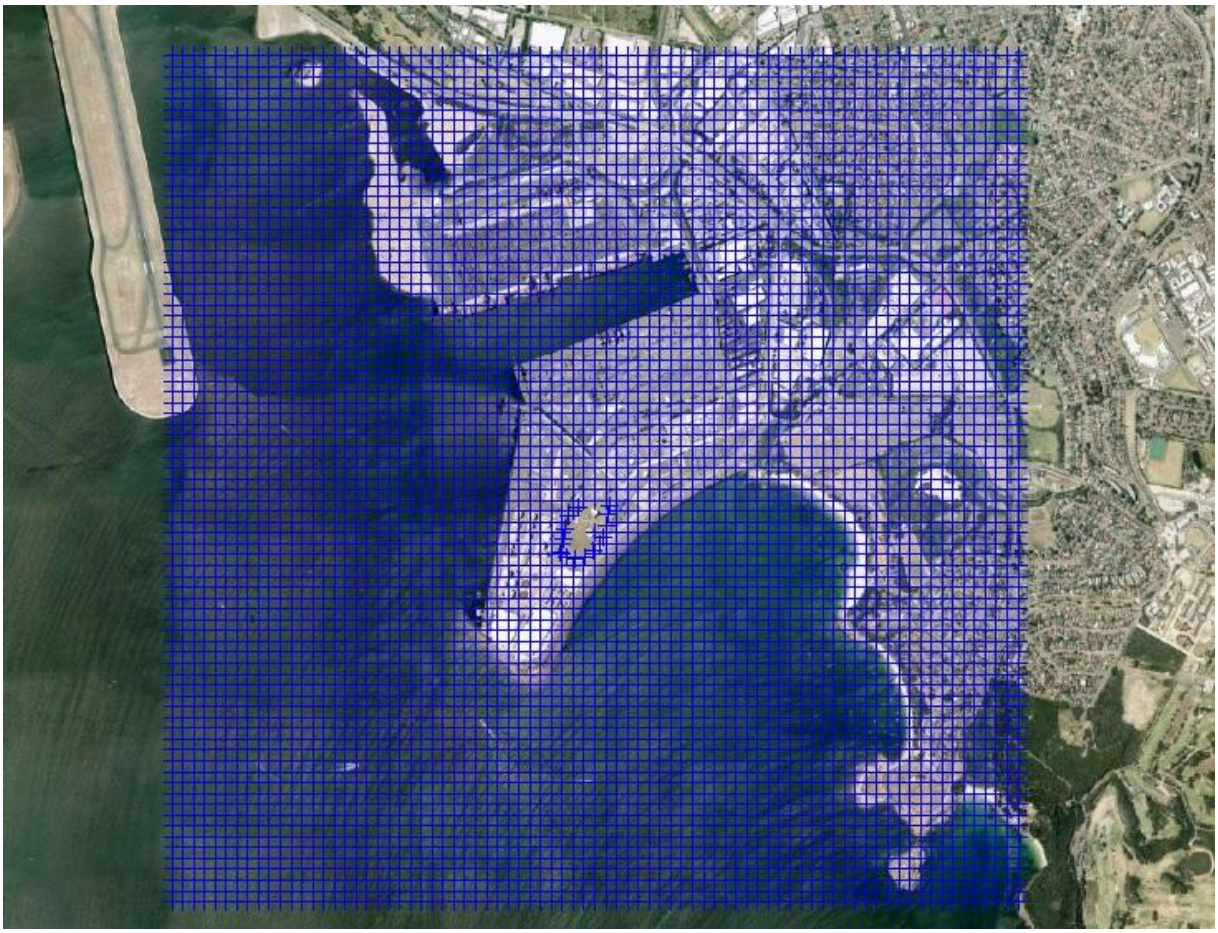

Figure 2 Sensitive Receptor Locations

5.5 Limitations and Conservatism of Dispersion Modelling

The atmosphere is a complex, physical system, and the movement of air in a given location is dependent on a number of variables, including temperature, topography and land use, as well as larger-scale synoptic processes. Dispersion modelling is a method of simulating the movement of air pollutants in the atmosphere using mathematical equations. The model equations necessarily involve the current understanding of the complex environmental interactions and chemical reaction processes involved, available input data, processing time and data storage limitations. The model configuration particularly affects model predictions during certain meteorological conditions and source emission types. For example, the prediction of pollutant dispersion under low wind speed conditions (typically defined as those less than 1 m/s) or for low-level, non-buoyant sources, is problematic for most dispersion models. To accommodate these effects, the model is configured to provide conservative estimates of pollutant concentrations at particular locations.

The results of dispersion modelling, therefore, provide an overly conservative indication of the worst likely level of pollutants within the modelling domain. While the models, when used appropriately and with high quality input data, can provide very good indications of the scale of pollutant concentrations and the likely locations of the maximum concentrations occurring, their outputs should not be considered to be representative of exact pollutant concentrations at any given location or point in time.

6.0 Dispersion Modelling Results

The predicted ground level concentrations resulting from the dispersion model are summarised in **Table 8**. The EPA's assessment criteria for the assessed pollutants apply to the 99.9th percentile for site-specific assessments, such as this AQIA. The highest 99.9th percentile concentrations predicted at any location within the modelling domain (i.e. the receptor grid and the boundary receptors) are presented below.

Table 8 Predicted Maximum Ground Level Concentrations 99.9th Percentile (µg/m^3)

Pollutant	Criteria (µg/m^3)	Maximum Predicted 99.9th Percentile Concentration (µg/m^3)	Pollutant Impact % of Criteria
Benzene	29	2.1	7.1%
Cumene	21	3.1	14.7%
Cyclohexane	19,000	1.5	0.008%
Ethylbenzene	8,000	1.5	0.02%
n-Hexane	3,200	2.6	0.1%
Toluene	360	2.2	0.6%
Xylenes	190	2.1	1.1%

As shown, the predicted pollutant concentrations were all well below their respective assessment criteria. The predicted cumene concentrations were the closest to the criteria, representing 15 % of the criterion value. As shown in the following contour plot, **Figure 3**, the predicted concentrations of cumene decreased with increasing distance from the site, with concentrations at very low levels at the residential areas closest to the site. The same dispersion pattern occurred for the other pollutants.

Figure 3 Predicted 99.9th Percentile Cumene Concentrations (ug/m3)

7.0 Greenhouse Gas Emissions

Greenhouse gases (GHGs) are gases found in the atmosphere that absorb outgoing heat that is reflected from the sun. The primary GHG is carbon dioxide (CO_2). Different GHGs have different heat absorbing capacities. In order to achieve a basic unit of measurement, each GHG is compared to the absorptive capacity of CO_2, and measurements and estimates of GHG levels are reported in terms of CO_2 equivalent emissions (CO_2-e).

Australia's National Greenhouse Gas Inventories are designed to provide estimates of Australia's net GHG emissions and track Australia's progress towards its internationally-agreed GHG reduction targets. Australia has published annual national GHG inventories for each year from 1990 to 2012 inclusive. In 2012 (the latest available data), Australia's total GHG emissions were estimated to be 554.6 Mt CO_2-e. Of these emissions, approximately 4.8 % (26.816 Mt CO_2-e) were attributed to the transport, postal and warehousing sector[1]. This would include road transport distribution of fuels from Vopak.

Estimation of the GHG emissions associated with the proposed terminal's operations was undertaken using the emission factors and methods outlined in the NGA Factors[2]. The NGA Factors provide three types of assessment categories:

- **Scope 1**, which covers direct emissions from sources within the boundary of an organisation, such as fuel combustion and manufacturing processes;
- **Scope 2**, which covers indirect emissions from the consumption of purchased electricity, steam or heat produced by another organisation; and
- **Scope 3**, which includes all other indirect emissions that are a consequence of an organisation's activities but are not from sources owned or controlled by the organisation; that is, emissions associated with the production of fuels, and emissions associated with the transmission and distribution of purchased electricity.

The main operations likely to generate GHGs at the proposed terminal are:

- Electricity to run operations such as fuel pumps and lighting (Scopes 2 and 3);
- Delivery and distribution of fuels via road and ship tanker (Scope 3);
- Passenger vehicles transporting staff to and from site (Scope 3); and
- Combustion of fuel distributed from the facility (Scope 3).

For this assessment, estimation of emissions was undertaken for the activities listed above.

7.1 Electricity Consumption

Vopak estimates the electricity consumption of the Project will be 600,000 kWh per year. Estimated emissions associated with electricity consumption are provided in **Table 9**.

Table 9 GHG Emissions from Electricity Use

Emissions Type	Emission Factor* (kg CO_2-e/kWh)	GHG Emissions (t CO_2-e)
Scope 2	0.86	516
Scope 3	0.13	78
Full Fuel Cycle (total)	**0.99**	**594**
* Latest estimate for consumption of electricity in NSW. Source: Table 41, NGA Factors, December 2014		

[1] National Inventory by Economic Sector, Australian Government Department of the Environment (2013). National Inventory by Economic Sector, http://ageis.climatechange.gov.au/ANZSIC.aspx; accessed 13 May 2015.
[2] DOE. (2014). National Greenhouse Accounts Factors - Australian National Greenhouse Accounts. December 2014 Update. Commonwealth of Australia (Department of the Environment).

7.2 Fuel Consumption

The facility's operations involve three sources of fuel consumption: fuel dispatch by truck; fuel delivery by ship; and staff commuting. Estimates of GHG emissions associated with these activities are provided below. While emissions associated with the delivery and dispatch of fuel and staff commuting could be argued to be indirect as they will not be under the direct control of Vopak (i.e. Scope 3) emissions, these activities were conservatively assessed as Scope 1 emissions.

7.2.1 Delivery and Dispatch of Fuel

The estimates of emissions associated with the dispatch of fuel from the site were made assuming the trucks would be rigid diesel tankers. Each truck was assumed to travel 200 km, with a fuel consumption rate of 0.285 L/km[3]. Vopak advised that the average road tanker volume would be 40,000 litres per trip, resulting in around 119,560 trucks per year to move the proposed 4,786 ML per year throughput. The estimated emissions associated with these truck movements are shown in **Table 10**.

Table 10 Scope 1 Emissions - Dispatch of Fuels by Truck (Diesel-powered)

Greenhouse Gas	Emission Factor (kg CO_2-e/GJ)	Energy Content Factor (Diesel) (GJ/kL)	Emissions (t CO_2-e/year)
CO_2	69.2	38.6	9,109
CH_4	0.2		26
N_2O	0.5		66
Total			**9,201**
* Source: Table 4, NGA Factors, December 2014			

The estimated emissions associated with the delivery of diesel by ship are shown in **Table 11**. Based on advice from Vopak, each ship was assumed to travel for a total of ten days and have a capacity of 60,000 m^3 (or approximately 60,000,000 litres), resulting in an expected 80 ship deliveries per year. Each ship was assumed to burn approximately 36 tonnes of diesel fuel per day[4].

Table 11 Scope 1 Emissions - Delivery of Diesel by Ship

Greenhouse Gas	Emission Factor (kg CO_2-e/GJ)	Energy Content Factor (Diesel) (GJ/kL)	Emissions (t CO_2-e/year)
CO_2	69.2	38.6	74,573
CH_4	0.2		216
N_2O	0.5		539
Total			**75,328**
* Source: Table 4, NGA Factors, December 2014			

7.2.2 Staff Movements

Emissions associated with staff commuting to and from the site were estimated as shown in **Table 12**. Staff were all assumed to drive gasoline-powered cars with a conservative fuel consumption rate of 0.19 L/km[5], and have a total commuting distance of 20 kilometres.

[3] VicRoads GHG Calculator Spreadsheet; references Australian Greenhouse Office Factors and Methods Workbook, December 2006.
[4] Fuel consumption of ship taken from Stopford, M. (1997). Maritime Economics, Routledge.
[5] Fuel Consumption Guide Database 1986 - 2003. Consumption rate provided represents maximum consumption rate of all passenger vehicles excluding luxury models by Bentley, Rolls Royce and Ferrari.

Table 12 Scope 1 Emissions – Passenger Vehicles for Commuting Staff

Greenhouse Gas	Emission Factor (kg CO_2-e/GJ)	Energy Content Factor (Gasoline) (GJ/kL)	Emissions (t CO_2-e/year)
CO_2	66.7	34.2	31.6
CH_4	0.6		0.3
N_2O	2.3		1.1
Total			**33.0**
* Source: Table 4, NGA Factors, December 2014			

7.2.3 Consumption of Vopak Fuel by End Users

Indirect emissions of GHGs will also occur due to the use (combustion) of the fuels distributed by the Project. Estimates of these Scope 3 emissions are shown in **Table 13**. The Project would have an annual estimated throughput of around 2,520 ML of diesel and 2,266 ML of gasoline.

Table 13 Scope 3 Emissions - Consumption of Fuel Distributed by Proposed Facility

Fuel Type	Emission Factor* (kg CO_2-e/GJ)	Energy Content Factor ^ (GJ/kL)	Throughput (ML)	GHG Emissions (t CO_2-e/year)
Diesel	5.3	38.6	2,520	515,542
Gasoline	5.3	34.2	2,266	410,663
Total				**926,204**
* Table 40, NGA Factors, December 2014 ^ Table 4, NGA Factors, December 2014				

7.3 Emissions Summary

The total estimated GHG emissions associated with operation of the Project are shown in **Table 14**. The scale of these emissions in the broader context of GHG emissions from the transport and storage sector and from Australia as a whole is not considered significant. As shown, the total emissions of the proposed expansion were estimated at 1 Mt CO_2-e per year, equating to approximately 0.18 % of the total Australian emissions (554.57 Mt CO_2-e) and 3.8 % of the total transport, postal and warehousing emissions (26.8 Mt CO_2-e) in Australia in 2012. The greatest contributor to emissions was the consumption of the fuel supplied by Vopak end users (91.6 % of Vopak's estimated emissions).

Table 14 Greenhouse Gas Emissions Summary

Activity	Estimated GHG Emissions (t CO_2-e/year)
Electricity consumption	594
Fuel consumption – delivery and dispatch (truck)	9,201
Fuel consumption – delivery (ship)	75,328
Fuel consumption – staff commuting	33
Fuel consumption by end users	926,204
Total GHG emissions	**1,011,360**

The relationship between GHG concentrations and climate change is very complex and nonlinear. As such, the effect of the emission of this amount of GHGs on the environment or climate change cannot be estimated. The proposed development represents a minor source of GHG emissions, both in terms of the economic sector emissions and Australia's national emissions. As such, the GHG emissions associated with the proposed expansion are not expected to significantly adversely affect the environment.

8.0 Recommended Mitigation Measures

8.1 Construction Mitigation Measures

Mitigation of air quality impacts relating to construction works essentially relates to management such works. For any construction activity, the focus should be on implementing a strict dust and air quality management regime. Mitigation measures for the Project are to be detailed in the Construction Environmental Management Plan (CEMP). All reasonable and feasible management measures should be documented and employed where practicable to do so. Management plans and monitoring programs should be suitably documented for easy reference throughout the process.

Vopak has prepared CEMPs as part of the construction of the existing neighbouring facilities and for subsequent modifications, which provide the framework for the implementation of environmental management requirements necessary for the construction phase of the Project. Prior to each construction phase the CEMP was updated and reviewed by the relevant agency stakeholders as nominated by the Project Approval. Subject to approval, the Project will also be subject to a specific CEMP that incorporates the outcomes and recommendations of the EIS.

A key objective of the CEMP is to clearly outline the procedures to address and manage potential environmental impacts associated with the activities. As a minimum, the plan should outline the following aspects related to the works:

- Environmental Policy;
- Environmental Management Structure, Communication and Responsibility;
- Approval and Licensing Requirements;
- Reporting;
- Emergency Contacts and Response;
- Environmental Management Activities and Controls;
- Environmental Monitoring;
- Complaints;
- Corrective Action; and
- Environmental Management Plan Review.

The mitigation measures recommended for inclusion for the construction period are as follows:

- All vehicles and plant/equipment should be fitted with appropriate emission control equipment and be serviced and maintained in accordance with the manufacturers' specifications. Smoke from vehicles/plant should not be visible for more than ten seconds;
- Trucks entering and leaving the premises that are carrying loads of dust-generating materials must have their loads covered at all times, except during loading and unloading;
- Hard surfaces or paving should be used where possible, as unpaved routes can account for a significant proportion of fugitive dust emissions, particularly during dry/windy conditions. Routes should be inspected regularly and repaired when necessary, and roads should be swept and watered as required to limit dirt/dust build up and potential dust generation during windy conditions;
- Any areas on site that are not covered with hard surfaces should be vegetated wherever possible to minimise wind erosion and associated dust generation;
- All vehicles should be switched off when not in use for extended periods;
- Use of water carts and/or road sweeping to minimise dust generation. The frequency of operation is to be increased during dry windy conditions which create a higher potential for dust generation;
- Wetting and covering of stockpiles where hazardous material has been encountered;
- Active excavation area works are wet down with hoses; and
- Housekeeping is maintained to keep exposed areas to a minimum.

8.2 Operational Mitigation Measures

Operational mitigation measures are those implemented after operations have commenced in accordance with its development consent. Operational mitigation measures focus on undertaking of specific activities in a manner designed to minimise environmental impacts.

An Air Quality Management Plan (AQMP) should be prepared in accordance with conditions of consent and the Environment Protection Licence for Project. The following information should be included:

- Sensitive receptors in proximity to the site;
- The legislative framework and standards applicable to the operation;
- Potential contributors to off-site pollutant impacts, including the pollutants that are of concern;
- Mitigation measures required to minimise the operation's effects on local air quality;
- Contingency plans for complaints and pollution incidents; and
- Review and reporting protocols.

9.0 Conclusion

AECOM conducted an assessment of the potential effects on air quality associated with the operation of the proposed Vopak B4 expansion, which consists of bulk liquid fuel storage terminal at Port Botany, NSW. Vopak proposes to import approximately 2,520 ML of diesel and 2,266 ML of gasoline per annum by ship, which would be stored in tanks prior to dispatch via truck. The site would have a total storage capacity of around 200 ML.

This assessment investigated the effects of the proposed operations on the air quality of the surrounding environment. The assessment of air emissions was limited to VOCs during operation of the proposed facility. VOC concentrations at sensitive receptor locations were estimated through dispersion modelling using the CALPUFF program.

The results of the modelling predicted that all assessed VOC concentrations would be less than the relevant EPA guideline criteria at all sensitive receptor locations assessed (at and beyond the site boundary). The highest pollutant concentrations at any selected discrete receptor was for cumene, where the Project contribution represented 15% of the criterion.

Greenhouse gas emissions associated with electricity consumption, delivery and dispatch of fuel, staff movements and consumption of Vopak fuel by end users were considered. The total emissions of the proposed expansion were estimated at 1 Mt CO_2-e per year, equating to approximately 0.18 % of the total Australian emissions (554.57 Mt CO_2-e) and 3.8 % of the total transport, postal and warehousing emissions (26.8 Mt CO_2-e) in Australia in 2012. The greatest contributor to emissions was the consumption of the fuel supplied by Vopak end users (91.6 % of Vopak's estimated emissions). The estimated emissions of greenhouse gases associated with the Project were considered to be minor in the context of emissions for the sector and Australia's total emissions.

The Project is not, therefore, expected to adversely affect the air environment or the amenity of sensitive receptors.

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10.0 References

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Appendix A

Pollutants of Potential Concern

Appendix A Pollutants of Potential Concern

Polycyclic Aromatic Hydrocarbons (PAHs)

PAHs are a group of over 100 chemicals, which are formed through the incomplete combustion of organic materials, such as petrol. Exposure to these chemicals can cause a range of adverse reactions, including irritation of the eyes, nose and throat and skin. Exposure to very high levels can result in symptoms such as headaches, nausea, damage to the liver and kidneys, and damage to red blood cells. A number of PAHs were declared to be probably or possibly carcinogenic to humans by the IARC.

PAHs can attach to dust particles and be transported through the air. The compounds break down over days or weeks through chemical reactions in the atmosphere.

PAHs are moderately or highly acutely toxic to birds and aquatic organisms and moderately/highly chronic toxicity to aquatic life. Some can cause damage and death to crops. PAHs can bioaccumulate, and are moderately persistent in the environment.

Volatile organic compounds

Organic compounds with a vapour pressure at 20 °C exceeding 0.13 kPa are referred to as volatile organic compounds (VOCs). VOCs were implicated as a major precursor in the production of photochemical smog, which causes atmospheric haze, eye irritation and respiratory problems. VOCs are emitted from vehicle exhausts.

Three primary VOCs (benzene, toluene and xylenes) are components of petroleum and diesel fuel and are typically the focus for assessments of engine combustion emissions.

Benzene

Benzene is an airborne substance that is a precursor to photochemical smog. Benzene exposure commonly occurs through inhalation of air containing the substance. It can also enter the body through the skin, although it is poorly absorbed this way. Low levels of benzene exposure result from car exhaust.

Benzene is considered to be a toxic health hazard and a carcinogen. It has high acute toxic effects on aquatic life and long-term effects on marine life and agricultural crops. Human exposure to very high levels for even brief periods of time can potentially result in death, while lower level exposure can cause skin and eye irritation, drowsiness, dizziness, headaches and vomiting, damage to the immune system, leukaemia and birth defects.

Toluene

Toluene (methylbenzene) is a highly volatile chemical that quickly evaporates to a gas if released as a liquid. Due to relatively fast degradation, toluene emissions are usually confined to the local area in which it is emitted. Human exposure typically occurs through breathing contaminated air, but toluene can also be ingested or absorbed through the skin (in liquid form). Toluene usually leaves the body within twelve hours.

Short-term exposure to high levels of toluene can cause dizziness, sleepiness, unconsciousness and sometimes death. Long-term exposure can cause kidney damage and permanent brain damage that can lead to speech, vision and hearing problems, as well as loss of muscle and memory functions. The substance can cause membrane damage in plant leaves, and is moderately toxic to aquatic life with long-term exposure.

Xylenes

Xylenes are flammable liquids that are moderately soluble in water. They are quickly degraded by sunlight when released to air, and rapidly evaporate when released to soil or water. They are used as solvents and in petrol and chemical manufacturing.

Xylenes can enter the body through inhalation or skin absorption (liquid form), and can cause irritation of the eyes and nose, stomach problems, memory and concentration problems, nausea and dizziness. High-level exposure can cause death. The substances have high acute and chronic toxicity to aquatic life and can adversely affect crops.

Appendix B

Meteorological Data Analyses

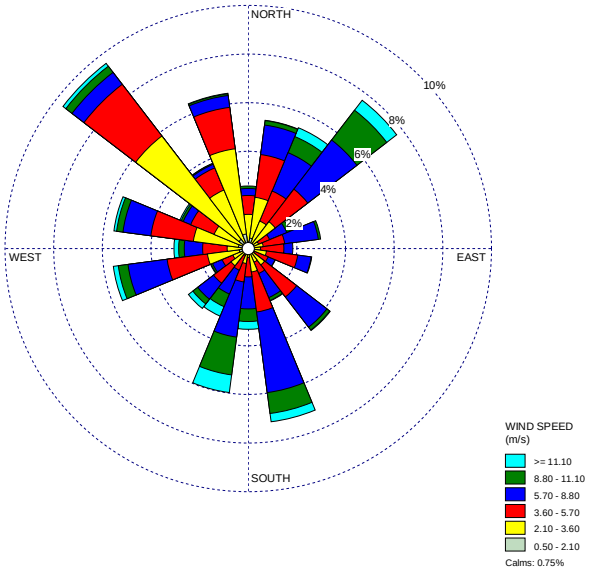
Appendix B Meteorological Data Analyses

Wind Rose Comparison

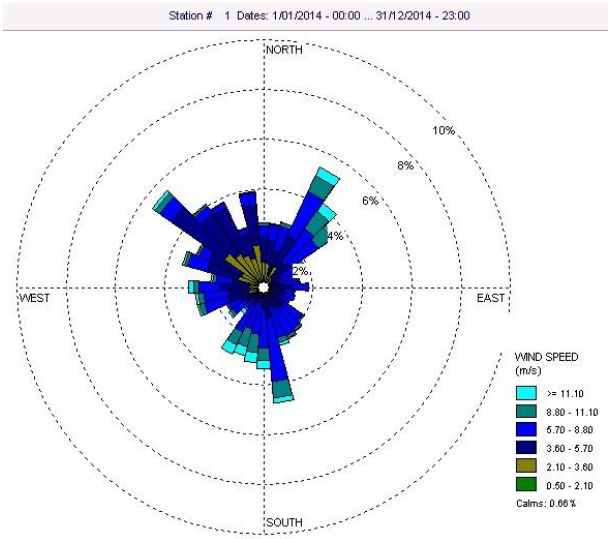
Wind roses were prepared to compare the data used in the modelling to data recorded at Sydney Airport. The annual wind roses for the CALMET data and Sydney Airport for 2014 were similar, showing a strong components from the northeasterly, northwesterly and south-southeasterly directions. The Sydney Airport data showed stronger winds than were predicted by CALMET. As the tanks are volume sources, with no thermal buoyancy, lighter wind speeds represent worse conditions for dispersion, which would be expected to result in higher predicted pollutant concentrations. The annual percentage of calms (0.75 % for CALMET versus 0.66 % for Sydney Airport) were very similar.

The long term data from Sydney Airport (1939 – 2010) were also compared to the 2014 CALMET outputs. Long term data were only available for 9 am and 3 pm hours, which are shown in the following wind roses. The wind directions at 9 am showed similar data, with a large proportion of winds from the northwest and south. The 3 pm wind roses both showed a strong northeasterly component for both datasets, however the Sydney Airport data did show a larger southerly and easterly component. . Again, the wind speeds recorded at Sydney Airport were typically stronger than those predicted by CALMET.

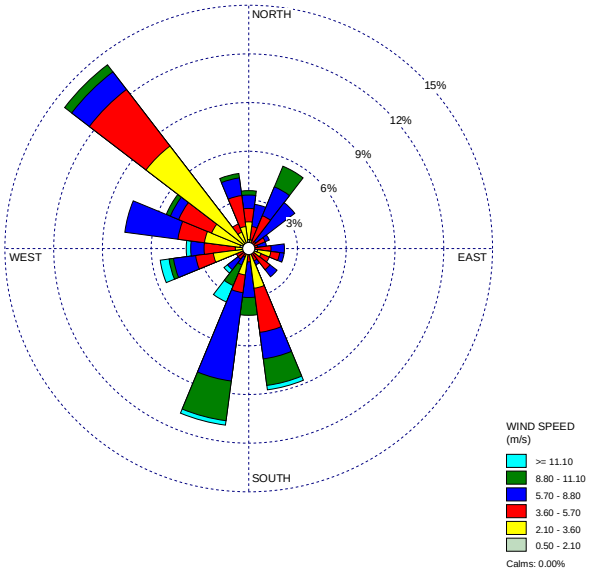
CALMET vs Sydney Airport



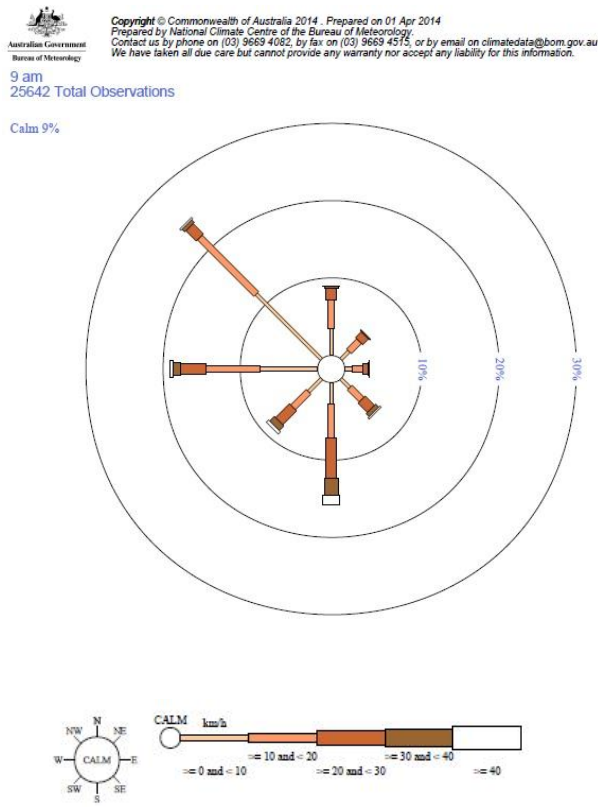
CALMET – annual, all hours 2014



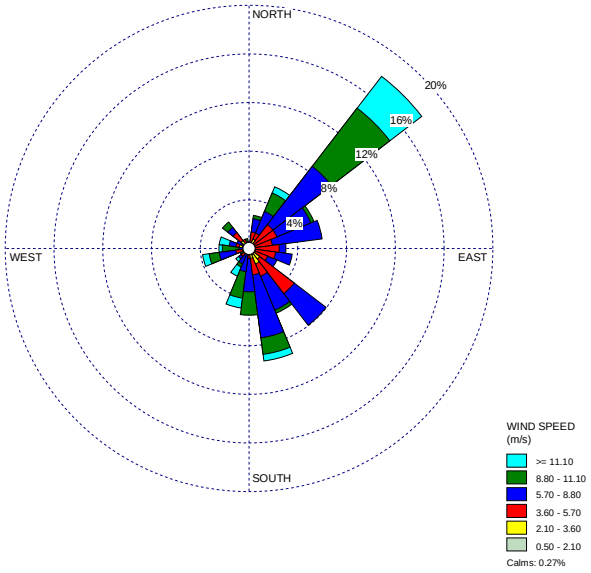
Sydney Airport – annual, all hours, 2014



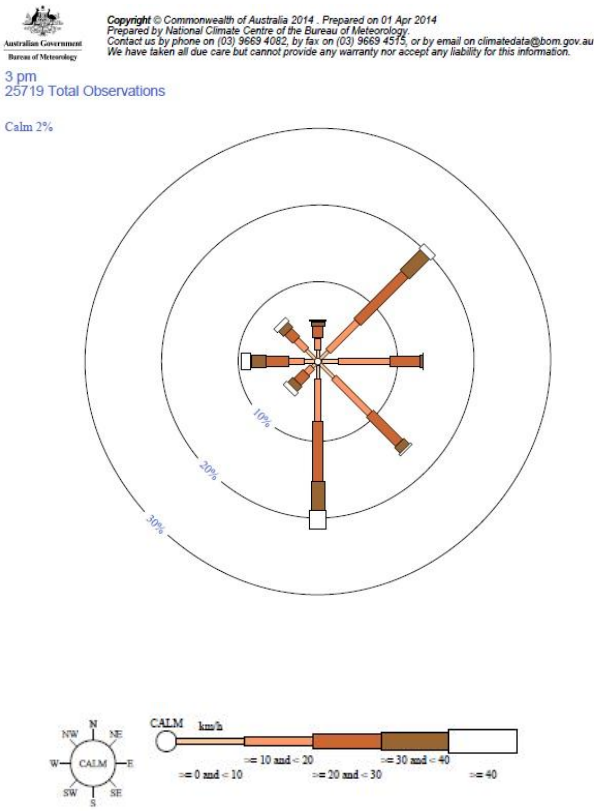
CALMET – annual, 9 am, 2014



Sydney Airport – annual, 9 am, 1939 – 2010



CALMET – annual, 3 pm, 2014



Sydney Airport – annual, 3 pm, 1939 - 2010

Climate Averages: Sydney Airport AMO (Site Number 066037) – 1939 - 2015

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Years		
Average temperature (°C)																
Maximum	26.5	26.4	25.3	22.9	20	17.6	17	18.3	20.6	22.6	24.1	25.8	22.3	76	1939	2015
Minimum	18.9	19.1	17.6	14.2	10.9	8.7	7.2	8.2	10.5	13.2	15.4	17.5	13.5	76	1939	2015
Average rainfall																
Rainfall (mm)	94	111.9	115.4	109.3	98.7	122.8	69.9	77	60.2	70.7	81.5	74.1	1085.4	86	1929	2015
Number of days of rain ≥ 1 mm	8	8.6	9.2	8.6	8.5	8.8	6.6	6.9	6.8	7.8	8.4	7.8	96	86	1929	2015
Average 9 am conditions																
Temperature (°C)	22.4	22.3	21.1	18.2	14.6	11.9	10.8	12.5	15.7	18.4	19.9	21.6	17.4	71	1939	2010
9 am relative humidity (%)	70	73	73	71	73	74	71	65	62	61	64	66	69	60	1939	2010
9 am wind speed (km/h)	14.4	13.8	12.9	12.9	12.6	13.4	13.3	14.4	15.5	16.3	16	14.8	14.2	70	1939	2010
Average 3 pm conditions																
Temperature (°C)	24.8	24.8	23.9	21.7	19	16.6	16.1	17.2	19	20.7	22.1	23.9	20.8	71	1939	2010
3 pm relative humidity (%)	60	63	61	59	58	57	52	49	51	54	56	58	57	60	1939	2010
3 pm wind speed (km/h)	24.1	23	21	19.3	17.1	17.8	18.2	20.8	23.1	24.6	25.3	25.2	21.6	70	1939	2010
Source: http://www.bom.gov.au/climate/averages/tables/cw_066037.shtml; accessed 14 May 2015																

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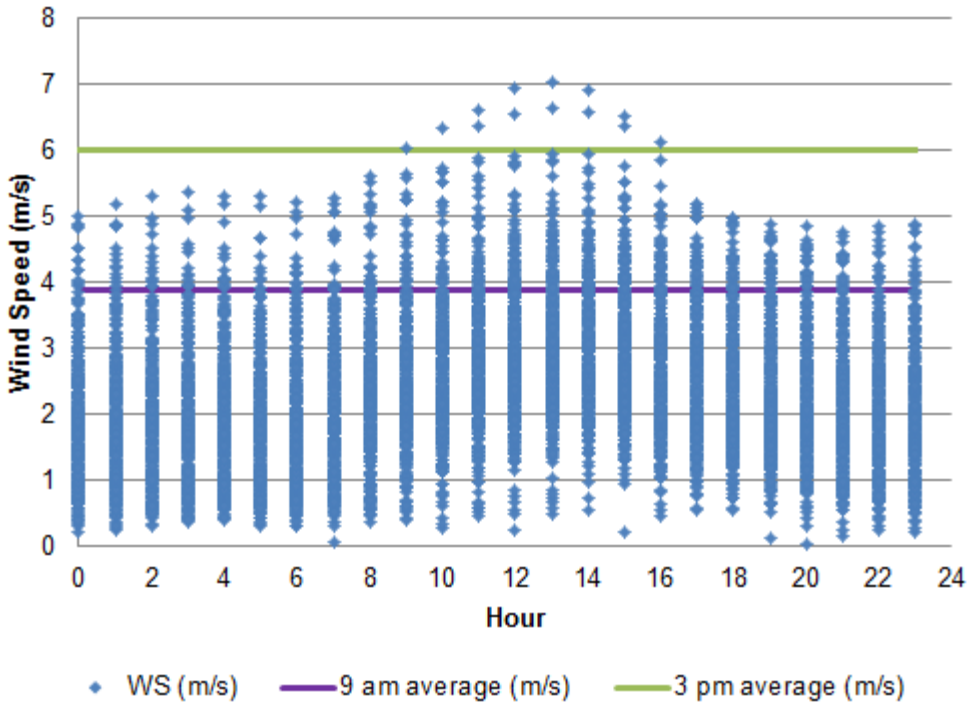
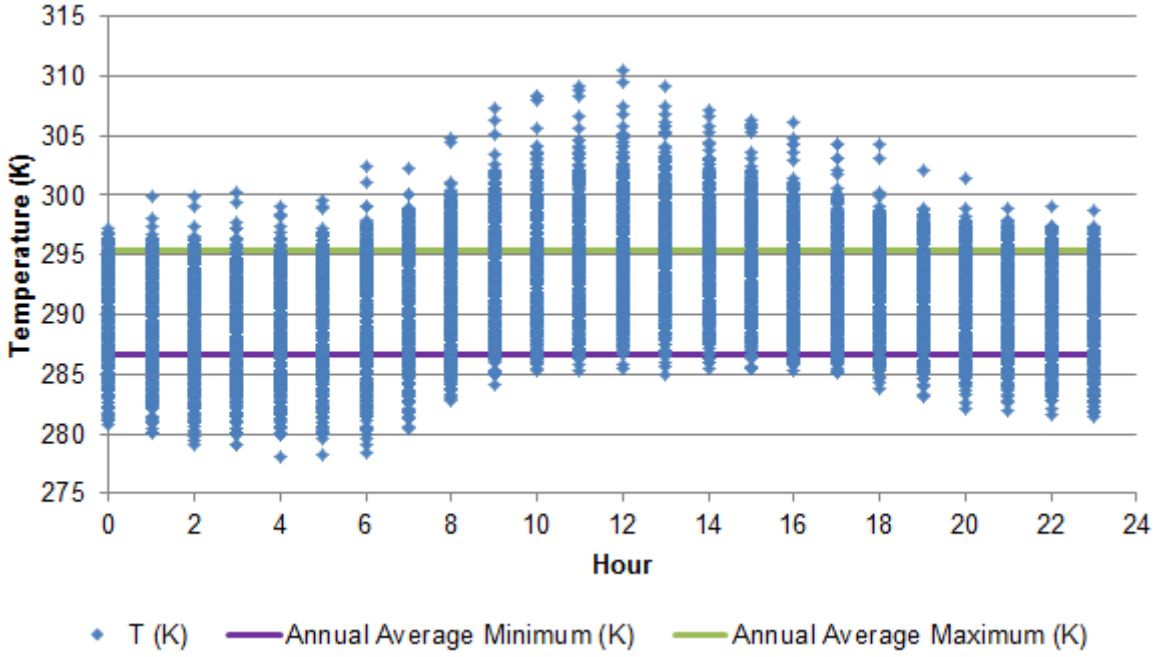
The wind speed data generated by the CALMET model were compared to the long term average data from Sydney Airport. As shown in the figure below, the wind speeds used in the modelling ranged from 7.04 m/s to 0.05 m/s. The 9 am and 3 pm averages from Sydney Airport were 3.9 m/s and 6 m/s respectively, which were within the range of data used in the assessment and, as such, considered to be representative of local conditions.



Wind Speed Data Comparison – CALMET (2014) vs Sydney Airport Long-term Data (1939 – 2015)

The CALMET temperature data were compared to the long-term Sydney Airport averages. As shown in the figure below, the CALMET temperature data ranged from 278.15 K to 310.55 K, compared to an annual average maximum and minimum for Sydney Airport of 286.65 K and 295.45 K respectively. As such, the CALMET data were found to reasonably represent the temperature of the area.


315
310
305
300
295
290
285
280
275
Temperature (K)
0
2
4
6
8
10
12
14
16
18
20
22
24
Hour
T (K)
Annual Average Minimum (K)
Annual Average Maximum (K)

Appendix C

TANKS Details

Appendix C TANKS Details

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	VOPAK 110-04 & 110-05
City:	Sydney Airport Amo
State:	NSW
Company:	VOPAK
Type of Tank:	Domed External Floating Roof Tank
Description:	Domed extrenal floating roof tanks for gasoline (assumed ULP)

Tank Dimensions

Diameter (ft):	134.51
Volume (gallons):	8,221,033.00
Turnovers:	24.00

Paint Characteristics

Internal Shell Condition:	Light Rust
Shell Color/Shade:	Aluminum/Specular
Shell Condition	Good

Roof Characteristics

Type:	Double Deck
Fitting Category	Typical

Tank Construction and Rim-Seal System

Construction:	Welded
Primary Seal:	Mechanical Shoe
Secondary Seal	None

Deck Fitting/Status	Quantity
Access Hatch (24-in. Diam.)/Bolted Cover, Gasketed	1
Automatic Gauge Float Well/Unbolted Cover, Ungasketed	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	2
Unslotted Guide-Pole Well/Ungasketed Sliding Cover	1
Gauge-Hatch/Sample Well (8-in. Diam.)/Weighted Mech. Actuation, Gask.	1
Roof Drain (3-in. Diameter)/Open	2
Roof Leg (3-in. Diameter)/Adjustable, Double-Deck Roofs	40
Rim Vent (6-in. Diameter)/Weighted Mech. Actuation, Gask.	1

Meterological Data used in Emissions Calculations: Sydney Airport Amo, NSW (Avg Atmospheric Pressure = 14.74 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

VOPAK 110-04 & 110-05 - Domed External Floating Roof Tank
Sydney Airport Amo, NSW

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 10)	Jan	74.38	66.31	82.45	64.84	5.7233	N/A	N/A	66.4970			92.84	Option 4: RVP=10, ASTM Slope=3
Benzene						1.7176	N/A	N/A	78.1100	0.0093	0.0039	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0861	N/A	N/A	120.2000	0.0010	0.0000	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.7659	N/A	N/A	84.1600	0.0077	0.0033	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethyl benzene						0.1760	N/A	N/A	106.1700	0.0153	0.0007	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Gasoline (RVP 10)						6.8023	N/A	N/A	66.0000	0.8149	0.9701	92.00	Option 4: RVP=10, ASTM Slope=3
Hexane (-n)						2.7482	N/A	N/A	86.1700	0.0183	0.0123	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.5091	N/A	N/A	92.1300	0.0560	0.0070	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1473	N/A	N/A	106.1700	0.0775	0.0028	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 10)	Feb	73.73	66.39	81.07	64.84	5.6548	N/A	N/A	66.4942			92.84	Option 4: RVP=10, ASTM Slope=3
Benzene						1.6889	N/A	N/A	78.1100	0.0093	0.0039	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0842	N/A	N/A	120.2000	0.0010	0.0000	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.7371	N/A	N/A	84.1600	0.0077	0.0033	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethyl benzene						0.1724	N/A	N/A	106.1700	0.0153	0.0007	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Gasoline (RVP 10)						6.7217	N/A	N/A	66.0000	0.8149	0.9703	92.00	Option 4: RVP=10, ASTM Slope=3
Hexane (-n)						2.7051	N/A	N/A	86.1700	0.0183	0.0122	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.4995	N/A	N/A	92.1300	0.0560	0.0069	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1442	N/A	N/A	106.1700	0.0775	0.0028	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 10)	Mar	72.23	65.18	79.29	64.84	5.4992	N/A	N/A	66.4877			92.84	Option 4: RVP=10, ASTM Slope=3
Benzene						1.6242	N/A	N/A	78.1100	0.0093	0.0038	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0799	N/A	N/A	120.2000	0.0010	0.0000	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.6720	N/A	N/A	84.1600	0.0077	0.0032	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethyl benzene						0.1641	N/A	N/A	106.1700	0.0153	0.0006	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Gasoline (RVP 10)						6.5386	N/A	N/A	66.0000	0.8149	0.9706	92.00	Option 4: RVP=10, ASTM Slope=3
Hexane (-n)						2.6076	N/A	N/A	86.1700	0.0183	0.0121	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.4781	N/A	N/A	92.1300	0.0560	0.0068	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1372	N/A	N/A	106.1700	0.0775	0.0027	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 10)	Apr	68.85	62.48	75.22	64.84	5.1600	N/A	N/A	66.4732			92.84	Option 4: RVP=10, ASTM Slope=3
Benzene						1.4853	N/A	N/A	78.1100	0.0093	0.0038	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0708	N/A	N/A	120.2000	0.0010	0.0000	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.5322	N/A	N/A	84.1600	0.0077	0.0032	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethyl benzene						0.1467	N/A	N/A	106.1700	0.0153	0.0006	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Gasoline (RVP 10)						6.1391	N/A	N/A	66.0000	0.8149	0.9714	92.00	Option 4: RVP=10, ASTM Slope=3
Hexane (-n)						2.3978	N/A	N/A	86.1700	0.0183	0.0119	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.4325	N/A	N/A	92.1300	0.0560	0.0066	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1226	N/A	N/A	106.1700	0.0775	0.0026	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 10)	May	65.20	59.77	70.62	64.84	4.8130	N/A	N/A	66.4576			92.84	Option 4: RVP=10, ASTM Slope=3
Benzene						1.3466	N/A	N/A	78.1100	0.0093	0.0036	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0620	N/A	N/A	120.2000	0.0010	0.0000	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.3922	N/A	N/A	84.1600	0.0077	0.0031	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethyl benzene						0.1298	N/A	N/A	106.1700	0.0153	0.0006	106.17	Option 2: A=6.975, B=1424.255, C=213.21

Gasoline (RVP 10)						5.7300	N/A	N/A	66.0000	0.8149	0.9723	92.00	Option 4: RVP=10, ASTM Slope=3
Hexane (-n)						2.1870	N/A	N/A	86.1700	0.0183	0.0116	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.3874	N/A	N/A	92.1300	0.0560	0.0063	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1083	N/A	N/A	106.1700	0.0775	0.0024	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 10)	Jun	62.86	57.86	67.85	64.84	4.6008	N/A	N/A	66.4478			92.84	Option 4: RVP=10, ASTM Slope=3
Benzene						1.2636	N/A	N/A	78.1100	0.0093	0.0036	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0569	N/A	N/A	120.2000	0.0010	0.0000	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.3083	N/A	N/A	84.1600	0.0077	0.0030	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethyl benzene						0.1198	N/A	N/A	106.1700	0.0153	0.0006	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Gasoline (RVP 10)						5.4797	N/A	N/A	66.0000	0.8149	0.9729	92.00	Option 4: RVP=10, ASTM Slope=3
Hexane (-n)						2.0602	N/A	N/A	86.1700	0.0183	0.0114	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.3607	N/A	N/A	92.1300	0.0560	0.0061	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.0999	N/A	N/A	106.1700	0.0775	0.0023	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 10)	Jul	62.18	56.76	67.59	64.84	4.5404	N/A	N/A	66.4450			92.84	Option 4: RVP=10, ASTM Slope=3
Benzene						1.2402	N/A	N/A	78.1100	0.0093	0.0036	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0555	N/A	N/A	120.2000	0.0010	0.0000	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.2847	N/A	N/A	84.1600	0.0077	0.0030	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethyl benzene						0.1170	N/A	N/A	106.1700	0.0153	0.0006	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Gasoline (RVP 10)						5.4085	N/A	N/A	66.0000	0.8149	0.9730	92.00	Option 4: RVP=10, ASTM Slope=3
Hexane (-n)						2.0244	N/A	N/A	86.1700	0.0183	0.0114	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.3532	N/A	N/A	92.1300	0.0560	0.0061	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.0975	N/A	N/A	106.1700	0.0775	0.0023	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 10)	Aug	64.27	57.71	70.84	64.84	4.7283	N/A	N/A	66.4538			92.84	Option 4: RVP=10, ASTM Slope=3
Benzene						1.3133	N/A	N/A	78.1100	0.0093	0.0036	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0600	N/A	N/A	120.2000	0.0010	0.0000	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.3586	N/A	N/A	84.1600	0.0077	0.0031	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethyl benzene						0.1258	N/A	N/A	106.1700	0.0153	0.0006	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Gasoline (RVP 10)						5.6302	N/A	N/A	66.0000	0.8149	0.9725	92.00	Option 4: RVP=10, ASTM Slope=3
Hexane (-n)						2.1362	N/A	N/A	86.1700	0.0183	0.0116	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.3766	N/A	N/A	92.1300	0.0560	0.0062	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1049	N/A	N/A	106.1700	0.0775	0.0024	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 10)	Sep	66.99	59.50	74.48	64.84	4.9806	N/A	N/A	66.4652			92.84	Option 4: RVP=10, ASTM Slope=3
Benzene						1.4132	N/A	N/A	78.1100	0.0093	0.0037	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0662	N/A	N/A	120.2000	0.0010	0.0000	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.4594	N/A	N/A	84.1600	0.0077	0.0031	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethyl benzene						0.1379	N/A	N/A	106.1700	0.0153	0.0006	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Gasoline (RVP 10)						5.9277	N/A	N/A	66.0000	0.8149	0.9719	92.00	Option 4: RVP=10, ASTM Slope=3
Hexane (-n)						2.2883	N/A	N/A	86.1700	0.0183	0.0117	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.4090	N/A	N/A	92.1300	0.0560	0.0064	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1151	N/A	N/A	106.1700	0.0775	0.0025	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 10)	Oct	70.02	61.92	78.11	64.84	5.2749	N/A	N/A	66.4781			92.84	Option 4: RVP=10, ASTM Slope=3
Benzene						1.5320	N/A	N/A	78.1100	0.0093	0.0038	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0738	N/A	N/A	120.2000	0.0010	0.0000	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.5792	N/A	N/A	84.1600	0.0077	0.0032	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethyl benzene						0.1525	N/A	N/A	106.1700	0.0153	0.0006	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Gasoline (RVP 10)						6.2744	N/A	N/A	66.0000	0.8149	0.9712	92.00	Option 4: RVP=10, ASTM Slope=3
Hexane (-n)						2.4684	N/A	N/A	86.1700	0.0183	0.0120	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.4477	N/A	N/A	92.1300	0.0560	0.0066	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1275	N/A	N/A	106.1700	0.0775	0.0026	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 10)	Nov	72.12	63.71	80.53	64.84	5.4871	N/A	N/A	66.4872			92.84	Option 4: RVP=10, ASTM Slope=3
Benzene						1.6192	N/A	N/A	78.1100	0.0093	0.0038	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0795	N/A	N/A	120.2000	0.0010	0.0000	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.6669	N/A	N/A	84.1600	0.0077	0.0032	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethyl benzene						0.1635	N/A	N/A	106.1700	0.0153	0.0006	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Gasoline (RVP 10)						6.5243	N/A	N/A	66.0000	0.8149	0.9707	92.00	Option 4: RVP=10, ASTM Slope=3
Hexane (-n)						2.6001	N/A	N/A	86.1700	0.0183	0.0121	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.4764	N/A	N/A	92.1300	0.0560	0.0068	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1367	N/A	N/A	106.1700	0.0775	0.0027	106.17	Option 2: A=7.009, B=1462.266, C=215.11

Gasoline (RVP 10)	Dec	73.77	65.37	82.18	64.84	5.6592	N/A	N/A	66.4944			92.84	Option 4: RVP=10, ASTM Slope=3
Benzene						1.6908	N/A	N/A	78.1100	0.0093	0.0039	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0843	N/A	N/A	120.2000	0.0010	0.0000	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.7389	N/A	N/A	84.1600	0.0077	0.0033	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethyl benzene						0.1726	N/A	N/A	106.1700	0.0153	0.0007	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Gasoline (RVP 10)						6.7269	N/A	N/A	66.0000	0.8149	0.9703	92.00	Option 4: RVP=10, ASTM Slope=3
Hexane (-n)						2.7079	N/A	N/A	86.1700	0.0183	0.0122	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.5001	N/A	N/A	92.1300	0.0560	0.0069	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1444	N/A	N/A	106.1700	0.0775	0.0028	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

VOPAK 110-04 & 110-05 - Domed External Floating Roof Tank
Sydney Airport Amo, NSW

Month:	January	February	March	April	May	June	July	August	September	October	November	December
Rim Seal Losses (lb):	528.5384											
Seal Factor A (lb-mole/ft-yr):	5.8000											
Seal Factor B (lb-mole/ft-yr (mph)^n):	0.3000											
Average Wind Speed (mph):	0.0000											
Seal-related Wind Speed Exponent:	2.1000											
Value of Vapor Pressure Function:	0.1223											
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	5.7233											
Tank Diameter (ft):	134.5100											
Vapor Molecular Weight (lb/lb-mole):	66.4970											
Product Factor:	1.0000											
Withdrawal Losses (lb):	23.9433											
Net Throughput (gal/mo.):	16,442,066.0000											
Shell Clingage Factor (bbl/1000 sqft):	0.0015											
Average Organic Liquid Density (lb/gal):	5.8161											
Tank Diameter (ft):	134.5100											
Roof Fitting Losses (lb):	65.0242											
Value of Vapor Pressure Function:	0.1223											
Vapor Molecular Weight (lb/lb-mole):	66.4970											
Product Factor:	1.0000											
Tot. Roof Fitting Loss Fact.(lb-mole/yr):	95.9800											
Average Wind Speed (mph):	0.0000											
Total Losses (lb):	617.5059											

		Roof Fitting Loss Factors			
Roof Fitting/Status	Quantity	KFa(lb-mole/yr)	KFb(lb-mole/(yr mph^n))	m	Losses(lb)
Access Hatch (24-in. Diam.)/Bolted Cover, Gasketed	1	1.60	0.00	0.00	1.1048
Automatic Gauge Float Well/Unbolted Cover, Ungasketed	1	14.00	5.40	1.10	9.6666
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	2	6.20	1.20	0.94	8.5618
Unslotted Guide-Pole Well/Ungasketed Sliding Cover	1	31.00	150.00	1.40	21.4045
Gauge-Hatch/Sample Well (8-in. Diam.)/Weighted Mech. Actuation, Gask.	1	0.47	0.02	0.97	0.3245
Roof Drain (3-in. Diameter)/Open	2	1.50	0.21	1.70	2.0714
Roof Leg (3-in. Diameter)/Adjustable, Double-Deck Roofs	40	0.82	0.53	0.14	22.6474
Rim Vent (6-in. Diameter)/Weighted Mech. Actuation, Gask.	1	0.71	0.10	1.00	0.4902

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: January, February, March, April, May, June, July, August, September, October, November, December

VOPAK 110-04 & 110-05 - Domed External Floating Roof Tank
Sydney Airport Amo, NSW

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawl Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Gasoline (RVP 10)	5,599.02	287.32	688.83	0.00	6,575.17
Benzene	21.08	2.68	2.59	0.00	26.35
Cumene (Isopropyl benzene)	0.11	0.29	0.01	0.00	0.41
Cyclohexane	17.82	2.20	2.19	0.00	22.21
Ethyl benzene	3.44	4.40	0.42	0.00	8.26
Gasoline (RVP 10)	5,438.47	234.13	669.08	0.00	6,341.68
Hexane (-n)	66.68	5.26	8.20	0.00	80.14
Toluene	36.92	16.10	4.54	0.00	57.56
Xylene (-m)	14.50	22.26	1.78	0.00	38.55

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	VOPAK 110-01, -02, -03
City:	Sydney Airport Amo
State:	NSW
Company:	VOPAK
Type of Tank:	Vertical Fixed Roof Tank
Description:	VOPAK vertical fixed roof free venting tanks for B4A - diesel

Tank Dimensions

Shell Height (ft):	79.89
Diameter (ft):	142.71
Liquid Height (ft) :	77.26
Avg. Liquid Height (ft):	49.21
Volume (gallons):	9,246,020.00
Turnovers:	24.00
Net Throughput(gal/yr):	221,904,480.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	Aluminum/Specular
Shell Condition	Good
Roof Color/Shade:	Aluminum/Specular
Roof Condition:	Good

Roof Characteristics

Type:	Dome
Height (ft)	13.78
Radius (ft) (Dome Roof)	142.71

Breather Vent Settings

Vacuum Settings (psig):	0.00
Pressure Settings (psig)	0.00

Meterological Data used in Emissions Calculations: Sydney Airport Amo, NSW (Avg Atmospheric Pressure = 14.74 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

VOPAK 110-01, -02, -03 - Vertical Fixed Roof Tank
Sydney Airport Amo, NSW

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	Jan	74.38	66.31	82.45	64.84	0.0158	0.0124	0.0199	118.0761			186.01	Option 1: VP70 = .009 VP80 = .012
Benzene						1.7176	1.3878	2.1095	78.1100	0.0003	0.0513	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0861	0.0646	0.1135	120.2000	0.0098	0.0837	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.7659	1.4338	2.1588	84.1600	0.0001	0.0176	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Distillate fuel oil no. 2						0.0103	0.0081	0.0130	130.0000	0.9842	0.6994	188.00	Option 1: VP70 = .009 VP80 = .012
Ethyl benzene						0.1760	0.1348	0.2277	106.1700	0.0011	0.0193	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.7482	2.2497	3.3335	86.1700	0.0001	0.0274	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.5091	0.4007	0.6412	92.1300	0.0010	0.0507	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1473	0.1125	0.1911	106.1700	0.0035	0.0506	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Distillate fuel oil no. 2	Feb	73.73	66.39	81.07	64.84	0.0155	0.0124	0.0191	118.0645			186.01	Option 1: VP70 = .009 VP80 = .012
Benzene						1.6889	1.3906	2.0381	78.1100	0.0003	0.0515	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0842	0.0648	0.1084	120.2000	0.0098	0.0834	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.7371	1.4367	2.0873	84.1600	0.0001	0.0176	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Distillate fuel oil no. 2						0.0101	0.0081	0.0124	130.0000	0.9842	0.6995	188.00	Option 1: VP70 = .009 VP80 = .012
Ethyl benzene						0.1724	0.1351	0.2181	106.1700	0.0011	0.0193	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.7051	2.2540	3.2273	86.1700	0.0001	0.0275	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.4995	0.4016	0.6168	92.1300	0.0010	0.0507	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1442	0.1128	0.1829	106.1700	0.0035	0.0505	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Distillate fuel oil no. 2	Mar	72.23	65.18	79.29	64.84	0.0148	0.0120	0.0181	118.0282			186.01	Option 1: VP70 = .009 VP80 = .012
Benzene						1.6242	1.3459	1.9484	78.1100	0.0003	0.0518	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0799	0.0620	0.1020	120.2000	0.0098	0.0828	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.6720	1.3915	1.9975	84.1600	0.0001	0.0178	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Distillate fuel oil no. 2						0.0097	0.0078	0.0118	130.0000	0.9842	0.6996	188.00	Option 1: VP70 = .009 VP80 = .012
Ethyl benzene						0.1641	0.1297	0.2062	106.1700	0.0011	0.0192	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.6076	2.1858	3.0937	86.1700	0.0001	0.0277	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.4781	0.3871	0.5865	92.1300	0.0010	0.0508	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1372	0.1082	0.1728	106.1700	0.0035	0.0503	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Distillate fuel oil no. 2	Apr	68.85	62.48	75.22	64.84	0.0134	0.0109	0.0162	117.9402			186.01	Option 1: VP60 = .0065 VP70 = .009
Benzene						1.4853	1.2505	1.7555	78.1100	0.0003	0.0526	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0708	0.0561	0.0887	120.2000	0.0098	0.0815	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.5322	1.2951	1.8040	84.1600	0.0001	0.0181	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Distillate fuel oil no. 2						0.0087	0.0071	0.0106	130.0000	0.9842	0.6996	188.00	Option 1: VP60 = .0065 VP70 = .009
Ethyl benzene						0.1467	0.1183	0.1809	106.1700	0.0011	0.0190	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.3978	2.0402	2.8052	86.1700	0.0001	0.0283	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.4325	0.3565	0.5217	92.1300	0.0010	0.0510	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1226	0.0986	0.1514	106.1700	0.0035	0.0499	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Distillate fuel oil no. 2	May	65.20	59.77	70.62	64.84	0.0120	0.0100	0.0141	117.8705			186.01	Option 1: VP60 = .0065 VP70 = .009
Benzene						1.3466	1.1605	1.5568	78.1100	0.0003	0.0533	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0620	0.0508	0.0754	120.2000	0.0098	0.0798	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.3922	1.2040	1.6041	84.1600	0.0001	0.0184	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Distillate fuel oil no. 2						0.0078	0.0065	0.0092	130.0000	0.9842	0.7004	188.00	Option 1: VP60 = .0065 VP70 = .009

Ethyl benzene						0.1298	0.1077	0.1556	106.1700	0.0011	0.0188	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.1870	1.9022	2.5059	86.1700	0.0001	0.0289	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.3874	0.3278	0.4559	92.1300	0.0010	0.0511	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1083	0.0897	0.1301	106.1700	0.0035	0.0493	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Distillate fuel oil no. 2	Jun	62.86	57.86	67.85	64.84	0.0111	0.0094	0.0130	117.7778			186.01	Option 1: VP60 = .0065 VP70 = .009
Benzene						1.2636	1.1004	1.4463	78.1100	0.0003	0.0540	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0569	0.0472	0.0683	120.2000	0.0098	0.0791	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.3083	1.1430	1.4929	84.1600	0.0001	0.0186	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Distillate fuel oil no. 2						0.0072	0.0061	0.0085	130.0000	0.9842	0.6996	188.00	Option 1: VP60 = .0065 VP70 = .009
Ethyl benzene						0.1198	0.1007	0.1419	106.1700	0.0011	0.0188	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.0602	1.8095	2.3386	86.1700	0.0001	0.0294	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.3607	0.3088	0.4197	92.1300	0.0010	0.0514	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.0999	0.0838	0.1185	106.1700	0.0035	0.0491	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Distillate fuel oil no. 2	Jul	62.18	56.76	67.59	64.84	0.0108	0.0090	0.0129	117.7424			186.01	Option 1: VP60 = .0065 VP70 = .009
Benzene						1.2402	1.0668	1.4363	78.1100	0.0003	0.0543	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0555	0.0453	0.0677	120.2000	0.0098	0.0789	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.2847	1.1089	1.4828	84.1600	0.0001	0.0187	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Distillate fuel oil no. 2						0.0070	0.0059	0.0084	130.0000	0.9842	0.6992	188.00	Option 1: VP60 = .0065 VP70 = .009
Ethyl benzene						0.1170	0.0969	0.1407	106.1700	0.0011	0.0188	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.0244	1.7577	2.3235	86.1700	0.0001	0.0295	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.3532	0.2982	0.4165	92.1300	0.0010	0.0515	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.0975	0.0806	0.1175	106.1700	0.0035	0.0491	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Distillate fuel oil no. 2	Aug	64.27	57.71	70.84	64.84	0.0116	0.0093	0.0142	117.8389			186.01	Option 1: VP60 = .0065 VP70 = .009
Benzene						1.3133	1.0956	1.5658	78.1100	0.0003	0.0536	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0600	0.0470	0.0760	120.2000	0.0098	0.0795	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.3586	1.1381	1.6132	84.1600	0.0001	0.0185	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Distillate fuel oil no. 2						0.0076	0.0060	0.0093	130.0000	0.9842	0.7002	188.00	Option 1: VP60 = .0065 VP70 = .009
Ethyl benzene						0.1258	0.1002	0.1568	106.1700	0.0011	0.0188	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.1362	1.8021	2.5195	86.1700	0.0001	0.0290	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.3766	0.3073	0.4588	92.1300	0.0010	0.0512	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1049	0.0833	0.1310	106.1700	0.0035	0.0492	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Distillate fuel oil no. 2	Sep	66.99	59.50	74.48	64.84	0.0126	0.0099	0.0159	117.9149			186.01	Option 1: VP60 = .0065 VP70 = .009
Benzene						1.4132	1.1517	1.7220	78.1100	0.0003	0.0529	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0662	0.0502	0.0864	120.2000	0.0098	0.0806	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.4594	1.1951	1.7703	84.1600	0.0001	0.0182	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Distillate fuel oil no. 2						0.0082	0.0064	0.0103	130.0000	0.9842	0.7003	188.00	Option 1: VP60 = .0065 VP70 = .009
Ethyl benzene						0.1379	0.1067	0.1766	106.1700	0.0011	0.0189	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.2883	1.8886	2.7548	86.1700	0.0001	0.0286	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.4090	0.3250	0.5105	92.1300	0.0010	0.0510	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1151	0.0888	0.1478	106.1700	0.0035	0.0495	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Distillate fuel oil no. 2	Oct	70.02	61.92	78.11	64.84	0.0138	0.0107	0.0176	117.9470			186.01	Option 1: VP70 = .009 VP80 = .012
Benzene						1.5320	1.2316	1.8906	78.1100	0.0003	0.0524	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0738	0.0550	0.0980	120.2000	0.0098	0.0821	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.5792	1.2759	1.9395	84.1600	0.0001	0.0180	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Distillate fuel oil no. 2						0.0090	0.0070	0.0114	130.0000	0.9842	0.6990	188.00	Option 1: VP70 = .009 VP80 = .012
Ethyl benzene						0.1525	0.1160	0.1985	106.1700	0.0011	0.0191	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.4684	2.0112	3.0074	86.1700	0.0001	0.0282	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.4477	0.3504	0.5670	92.1300	0.0010	0.0511	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1275	0.0967	0.1663	106.1700	0.0035	0.0502	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Distillate fuel oil no. 2	Nov	72.12	63.71	80.53	64.84	0.0148	0.0114	0.0188	118.0247			186.01	Option 1: VP70 = .009 VP80 = .012
Benzene						1.6192	1.2931	2.0102	78.1100	0.0003	0.0518	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0795	0.0587	0.1064	120.2000	0.0098	0.0827	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.6669	1.3382	2.0594	84.1600	0.0001	0.0178	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Distillate fuel oil no. 2						0.0096	0.0074	0.0122	130.0000	0.9842	0.6996	188.00	Option 1: VP70 = .009 VP80 = .012
Ethyl benzene						0.1635	0.1233	0.2144	106.1700	0.0011	0.0192	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.6001	2.1054	3.1859	86.1700	0.0001	0.0277	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.4764	0.3702	0.6074	92.1300	0.0010	0.0508	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1367	0.1028	0.1798	106.1700	0.0035	0.0503	106.17	Option 2: A=7.009, B=1462.266, C=215.11

Distillate fuel oil no. 2	Dec	73.77	65.37	82.18	64.84	0.0155	0.0120	0.0198	118.0653			186.01	Option 1: VP70 = .009 VP80 = .012
Benzene						1.6908	1.3527	2.0956	78.1100	0.0003	0.0515	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0843	0.0624	0.1125	120.2000	0.0098	0.0834	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.7389	1.3984	2.1448	84.1600	0.0001	0.0176	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Distillate fuel oil no. 2						0.0101	0.0078	0.0129	130.0000	0.9842	0.6995	188.00	Option 1: VP70 = .009 VP80 = .012
Ethyl benzene						0.1726	0.1305	0.2258	106.1700	0.0011	0.0193	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.7079	2.1963	3.3128	86.1700	0.0001	0.0275	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.5001	0.3894	0.6364	92.1300	0.0010	0.0507	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1444	0.1089	0.1895	106.1700	0.0035	0.0505	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

VOPAK 110-01, -02, -03 - Vertical Fixed Roof Tank
Sydney Airport Amo, NSW

Month:	January	February	March	April	May	June	July	August	September	October	November	December
Standing Losses (lb):	359.2188											
Vapor Space Volume (cu ft):	602,281.9370											
Vapor Density (lb/cu ft):	0.0003											
Vapor Space Expansion Factor:	0.0609											
Vented Vapor Saturation Factor:	0.9694											
Tank Vapor Space Volume:												
Vapor Space Volume (cu ft):	602,281.9370											
Tank Diameter (ft):	142.7100											
Vapor Space Outage (ft):	37.6531											
Tank Shell Height (ft):	79.8900											
Average Liquid Height (ft):	49.2120											
Roof Outage (ft):	6.9751											
Roof Outage (Dome Roof)												
Roof Outage (ft):	6.9751											
Dome Radius (ft):	142.7100											
Shell Radius (ft):	71.3550											
Vapor Density												
Vapor Density (lb/cu ft):	0.0003											
Vapor Molecular Weight (lb/lb-mole):	118.0761											
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0158											
Daily Avg. Liquid Surface Temp. (deg. R):	534.0495											
Daily Average Ambient Temp. (deg. F):	72.2500											
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731											
Liquid Bulk Temperature (deg. R):	524.5100											
Tank Paint Solar Absorptance (Shell):	0.3900											
Tank Paint Solar Absorptance (Roof):	0.3900											
Daily Total Solar Insulation Factor (Btu/sqft day):	2,038.0000											
Vapor Space Expansion Factor												
Vapor Space Expansion Factor:	0.0609											
Daily Vapor Temperature Range (deg. R):	32.2630											
Daily Vapor Pressure Range (psia):	0.0076											
Breather Vent Press. Setting Range(psia):	0.0000											
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0158											
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0124											
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0199											
Daily Avg. Liquid Surface Temp. (deg R):	534.0495											
Daily Min. Liquid Surface Temp. (deg R):	525.9837											
Daily Max. Liquid Surface Temp. (deg R):	542.1152											
Daily Ambient Temp. Range (deg. R):	13.9000											
Vented Vapor Saturation Factor												
Vented Vapor Saturation Factor:	0.9694											
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0158											

Vapor Space Outage (ft):	37.6531
Working Losses (lb):	821.9557
Vapor Molecular Weight (lb/lb-mole):	118.0761
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0158
Net Throughput (gal/mo.):	18,492,040.0000
Annual Turnovers:	24.0000
Turnover Factor:	1.0000
Maximum Liquid Volume (gal):	9,246,020.0000
Maximum Liquid Height (ft):	77.2600
Tank Diameter (ft):	142.7100
Working Loss Product Factor:	1.0000
Total Losses (lb):	1,181.1745

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: January, February, March, April, May, June, July, August, September, October, November, December

VOPAK 110-01, -02, -03 - Vertical Fixed Roof Tank
Sydney Airport Amo, NSW

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	8,401.54	3,229.04	11,630.59
Benzene	440.64	169.02	609.66
Cumene (Isopropyl benzene)	686.17	264.32	950.48
Cyclohexane	151.47	58.08	209.56
Distillate fuel oil no. 2	5,878.07	2,259.11	8,137.18
Ethyl benzene	160.19	61.64	221.83
Hexane (-n)	236.94	90.81	327.75
Toluene	428.35	164.55	592.90
Xylene (-m)	419.72	161.52	581.24

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	VOPAK 110-06 & 110-07
City:	Sydney Airport Amo
State:	NSW
Company:	VOPAK
Type of Tank:	Domed External Floating Roof Tank
Description:	Domed External Floating Roof Tanks - gasoline - B4B

Tank Dimensions

Diameter (ft):	95.14
Volume (gallons):	4,247,886.00
Turnovers:	24.00

Paint Characteristics

Internal Shell Condition:	Light Rust
Shell Color/Shade:	Aluminum/Specular
Shell Condition	Good

Roof Characteristics

Type:	Double Deck
Fitting Category	Typical

Tank Construction and Rim-Seal System

Construction:	Welded
Primary Seal:	Mechanical Shoe
Secondary Seal	None

Deck Fitting/Status	Quantity
Access Hatch (24-in. Diam.)/Bolted Cover, Gasketed	1
Automatic Gauge Float Well/Unbolted Cover, Ungasketed	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1
Unslotted Guide-Pole Well/Ungasketed Sliding Cover	1
Gauge-Hatch/Sample Well (8-in. Diam.)/Weighted Mech. Actuation, Gask.	1
Roof Drain (3-in. Diameter)/Open	1
Roof Leg (3-in. Diameter)/Adjustable, Double-Deck Roofs	25
Rim Vent (6-in. Diameter)/Weighted Mech. Actuation, Gask.	1

Meterological Data used in Emissions Calculations: Sydney Airport Amo, NSW (Avg Atmospheric Pressure = 14.74 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

VOPAK 110-06 & 110-07 - Domed External Floating Roof Tank
Sydney Airport Amo, NSW

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 10)	Jan	74.38	66.31	82.45	64.84	5.7233	N/A	N/A	66.4970			92.84	Option 4: RVP=10, ASTM Slope=3
Benzene						1.7176	N/A	N/A	78.1100	0.0093	0.0039	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0861	N/A	N/A	120.2000	0.0010	0.0000	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.7659	N/A	N/A	84.1600	0.0077	0.0033	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethyl benzene						0.1760	N/A	N/A	106.1700	0.0153	0.0007	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Gasoline (RVP 10)						6.8023	N/A	N/A	66.0000	0.8149	0.9701	92.00	Option 4: RVP=10, ASTM Slope=3
Hexane (-n)						2.7482	N/A	N/A	86.1700	0.0183	0.0123	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.5091	N/A	N/A	92.1300	0.0560	0.0070	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1473	N/A	N/A	106.1700	0.0775	0.0028	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 10)	Feb	73.73	66.39	81.07	64.84	5.6548	N/A	N/A	66.4942			92.84	Option 4: RVP=10, ASTM Slope=3
Benzene						1.6889	N/A	N/A	78.1100	0.0093	0.0039	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0842	N/A	N/A	120.2000	0.0010	0.0000	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.7371	N/A	N/A	84.1600	0.0077	0.0033	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethyl benzene						0.1724	N/A	N/A	106.1700	0.0153	0.0007	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Gasoline (RVP 10)						6.7217	N/A	N/A	66.0000	0.8149	0.9703	92.00	Option 4: RVP=10, ASTM Slope=3
Hexane (-n)						2.7051	N/A	N/A	86.1700	0.0183	0.0122	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.4995	N/A	N/A	92.1300	0.0560	0.0069	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1442	N/A	N/A	106.1700	0.0775	0.0028	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 10)	Mar	72.23	65.18	79.29	64.84	5.4992	N/A	N/A	66.4877			92.84	Option 4: RVP=10, ASTM Slope=3
Benzene						1.6242	N/A	N/A	78.1100	0.0093	0.0038	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0799	N/A	N/A	120.2000	0.0010	0.0000	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.6720	N/A	N/A	84.1600	0.0077	0.0032	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethyl benzene						0.1641	N/A	N/A	106.1700	0.0153	0.0006	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Gasoline (RVP 10)						6.5386	N/A	N/A	66.0000	0.8149	0.9706	92.00	Option 4: RVP=10, ASTM Slope=3
Hexane (-n)						2.6076	N/A	N/A	86.1700	0.0183	0.0121	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.4781	N/A	N/A	92.1300	0.0560	0.0068	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1372	N/A	N/A	106.1700	0.0775	0.0027	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 10)	Apr	68.85	62.48	75.22	64.84	5.1600	N/A	N/A	66.4732			92.84	Option 4: RVP=10, ASTM Slope=3
Benzene						1.4853	N/A	N/A	78.1100	0.0093	0.0038	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0708	N/A	N/A	120.2000	0.0010	0.0000	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.5322	N/A	N/A	84.1600	0.0077	0.0032	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethyl benzene						0.1467	N/A	N/A	106.1700	0.0153	0.0006	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Gasoline (RVP 10)						6.1391	N/A	N/A	66.0000	0.8149	0.9714	92.00	Option 4: RVP=10, ASTM Slope=3
Hexane (-n)						2.3978	N/A	N/A	86.1700	0.0183	0.0119	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.4325	N/A	N/A	92.1300	0.0560	0.0066	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1226	N/A	N/A	106.1700	0.0775	0.0026	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 10)	May	65.20	59.77	70.62	64.84	4.8130	N/A	N/A	66.4576			92.84	Option 4: RVP=10, ASTM Slope=3
Benzene						1.3466	N/A	N/A	78.1100	0.0093	0.0036	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0620	N/A	N/A	120.2000	0.0010	0.0000	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.3922	N/A	N/A	84.1600	0.0077	0.0031	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethyl benzene						0.1298	N/A	N/A	106.1700	0.0153	0.0006	106.17	Option 2: A=6.975, B=1424.255, C=213.21

Gasoline (RVP 10)						5.7300	N/A	N/A	66.0000	0.8149	0.9723	92.00	Option 4: RVP=10, ASTM Slope=3
Hexane (-n)						2.1870	N/A	N/A	86.1700	0.0183	0.0116	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.3874	N/A	N/A	92.1300	0.0560	0.0063	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1083	N/A	N/A	106.1700	0.0775	0.0024	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 10)	Jun	62.86	57.86	67.85	64.84	4.6008	N/A	N/A	66.4478			92.84	Option 4: RVP=10, ASTM Slope=3
Benzene						1.2636	N/A	N/A	78.1100	0.0093	0.0036	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0569	N/A	N/A	120.2000	0.0010	0.0000	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.3083	N/A	N/A	84.1600	0.0077	0.0030	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethyl benzene						0.1198	N/A	N/A	106.1700	0.0153	0.0006	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Gasoline (RVP 10)						5.4797	N/A	N/A	66.0000	0.8149	0.9729	92.00	Option 4: RVP=10, ASTM Slope=3
Hexane (-n)						2.0602	N/A	N/A	86.1700	0.0183	0.0114	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.3607	N/A	N/A	92.1300	0.0560	0.0061	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.0999	N/A	N/A	106.1700	0.0775	0.0023	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 10)	Jul	62.18	56.76	67.59	64.84	4.5404	N/A	N/A	66.4450			92.84	Option 4: RVP=10, ASTM Slope=3
Benzene						1.2402	N/A	N/A	78.1100	0.0093	0.0036	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0555	N/A	N/A	120.2000	0.0010	0.0000	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.2847	N/A	N/A	84.1600	0.0077	0.0030	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethyl benzene						0.1170	N/A	N/A	106.1700	0.0153	0.0006	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Gasoline (RVP 10)						5.4085	N/A	N/A	66.0000	0.8149	0.9730	92.00	Option 4: RVP=10, ASTM Slope=3
Hexane (-n)						2.0244	N/A	N/A	86.1700	0.0183	0.0114	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.3532	N/A	N/A	92.1300	0.0560	0.0061	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.0975	N/A	N/A	106.1700	0.0775	0.0023	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 10)	Aug	64.27	57.71	70.84	64.84	4.7283	N/A	N/A	66.4538			92.84	Option 4: RVP=10, ASTM Slope=3
Benzene						1.3133	N/A	N/A	78.1100	0.0093	0.0036	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0600	N/A	N/A	120.2000	0.0010	0.0000	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.3586	N/A	N/A	84.1600	0.0077	0.0031	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethyl benzene						0.1258	N/A	N/A	106.1700	0.0153	0.0006	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Gasoline (RVP 10)						5.6302	N/A	N/A	66.0000	0.8149	0.9725	92.00	Option 4: RVP=10, ASTM Slope=3
Hexane (-n)						2.1362	N/A	N/A	86.1700	0.0183	0.0116	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.3766	N/A	N/A	92.1300	0.0560	0.0062	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1049	N/A	N/A	106.1700	0.0775	0.0024	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 10)	Sep	66.99	59.50	74.48	64.84	4.9806	N/A	N/A	66.4652			92.84	Option 4: RVP=10, ASTM Slope=3
Benzene						1.4132	N/A	N/A	78.1100	0.0093	0.0037	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0662	N/A	N/A	120.2000	0.0010	0.0000	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.4594	N/A	N/A	84.1600	0.0077	0.0031	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethyl benzene						0.1379	N/A	N/A	106.1700	0.0153	0.0006	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Gasoline (RVP 10)						5.9277	N/A	N/A	66.0000	0.8149	0.9719	92.00	Option 4: RVP=10, ASTM Slope=3
Hexane (-n)						2.2883	N/A	N/A	86.1700	0.0183	0.0117	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.4090	N/A	N/A	92.1300	0.0560	0.0064	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1151	N/A	N/A	106.1700	0.0775	0.0025	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 10)	Oct	70.02	61.92	78.11	64.84	5.2749	N/A	N/A	66.4781			92.84	Option 4: RVP=10, ASTM Slope=3
Benzene						1.5320	N/A	N/A	78.1100	0.0093	0.0038	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0738	N/A	N/A	120.2000	0.0010	0.0000	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.5792	N/A	N/A	84.1600	0.0077	0.0032	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethyl benzene						0.1525	N/A	N/A	106.1700	0.0153	0.0006	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Gasoline (RVP 10)						6.2744	N/A	N/A	66.0000	0.8149	0.9712	92.00	Option 4: RVP=10, ASTM Slope=3
Hexane (-n)						2.4684	N/A	N/A	86.1700	0.0183	0.0120	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.4477	N/A	N/A	92.1300	0.0560	0.0066	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1275	N/A	N/A	106.1700	0.0775	0.0026	106.17	Option 2: A=7.009, B=1462.266, C=215.11
Gasoline (RVP 10)	Nov	72.12	63.71	80.53	64.84	5.4871	N/A	N/A	66.4872			92.84	Option 4: RVP=10, ASTM Slope=3
Benzene						1.6192	N/A	N/A	78.1100	0.0093	0.0038	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0795	N/A	N/A	120.2000	0.0010	0.0000	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.6669	N/A	N/A	84.1600	0.0077	0.0032	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethyl benzene						0.1635	N/A	N/A	106.1700	0.0153	0.0006	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Gasoline (RVP 10)						6.5243	N/A	N/A	66.0000	0.8149	0.9707	92.00	Option 4: RVP=10, ASTM Slope=3
Hexane (-n)						2.6001	N/A	N/A	86.1700	0.0183	0.0121	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.4764	N/A	N/A	92.1300	0.0560	0.0068	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1367	N/A	N/A	106.1700	0.0775	0.0027	106.17	Option 2: A=7.009, B=1462.266, C=215.11

Gasoline (RVP 10)	Dec	73.77	65.37	82.18	64.84	5.6592	N/A	N/A	66.4944			92.84	Option 4: RVP=10, ASTM Slope=3
Benzene						1.6908	N/A	N/A	78.1100	0.0093	0.0039	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cumene (Isopropyl benzene)						0.0843	N/A	N/A	120.2000	0.0010	0.0000	120.20	Option 2: A=6.9636, B=1460.793, C=207.78
Cyclohexane						1.7389	N/A	N/A	84.1600	0.0077	0.0033	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethyl benzene						0.1726	N/A	N/A	106.1700	0.0153	0.0007	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Gasoline (RVP 10)						6.7269	N/A	N/A	66.0000	0.8149	0.9703	92.00	Option 4: RVP=10, ASTM Slope=3
Hexane (-n)						2.7079	N/A	N/A	86.1700	0.0183	0.0122	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.5001	N/A	N/A	92.1300	0.0560	0.0069	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Xylene (-m)						0.1444	N/A	N/A	106.1700	0.0775	0.0028	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

VOPAK 110-06 & 110-07 - Domed External Floating Roof Tank
Sydney Airport Amo, NSW

Month:	January	February	March	April	May	June	July	August	September	October	November	December
Rim Seal Losses (lb):	373.8395											
Seal Factor A (lb-mole/ft-yr):	5.8000											
Seal Factor B (lb-mole/ft-yr (mph)^n):	0.3000											
Average Wind Speed (mph):	0.0000											
Seal-related Wind Speed Exponent:	2.1000											
Value of Vapor Pressure Function:	0.1223											
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	5.7233											
Tank Diameter (ft):	95.1400											
Vapor Molecular Weight (lb/lb-mole):	66.4970											
Product Factor:	1.0000											
Withdrawal Losses (lb):	17.4913											
Net Throughput (gal/mo.):	8,495,772.0000											
Shell Clingage Factor (bbl/1000 sqft):	0.0015											
Average Organic Liquid Density (lb/gal):	5.8161											
Tank Diameter (ft):	95.1400											
Roof Fitting Losses (lb):	51.4746											
Value of Vapor Pressure Function:	0.1223											
Vapor Molecular Weight (lb/lb-mole):	66.4970											
Product Factor:	1.0000											
Tot. Roof Fitting Loss Fact.(lb-mole/yr):	75.9800											
Average Wind Speed (mph):	0.0000											
Total Losses (lb):	442.8054											

		Roof Fitting Loss Factors			
Roof Fitting/Status	Quantity	KFa(lb-mole/yr)	KFb(lb-mole/(yr mph^n))	m	Losses(lb)
Access Hatch (24-in. Diam.)/Bolted Cover, Gasketed	1	1.60	0.00	0.00	1.1048
Automatic Gauge Float Well/Unbolted Cover, Ungasketed	1	14.00	5.40	1.10	9.6666
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1	6.20	1.20	0.94	4.2809
Unslotted Guide-Pole Well/Ungasketed Sliding Cover	1	31.00	150.00	1.40	21.4045
Gauge-Hatch/Sample Well (8-in. Diam.)/Weighted Mech. Actuation, Gask.	1	0.47	0.02	0.97	0.3245
Roof Drain (3-in. Diameter)/Open	1	1.50	0.21	1.70	1.0357
Roof Leg (3-in. Diameter)/Adjustable, Double-Deck Roofs	25	0.82	0.53	0.14	14.1546
Rim Vent (6-in. Diameter)/Weighted Mech. Actuation, Gask.	1	0.71	0.10	1.00	0.4902

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: January, February, March, April, May, June, July, August, September, October, November, December

VOPAK 110-06 & 110-07 - Domed External Floating Roof Tank
Sydney Airport Amo, NSW

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawl Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
Gasoline (RVP 10)	3,960.23	209.90	545.29	0.00	4,715.42
Benzene	14.91	1.96	2.05	0.00	18.92
Cumene (Isopropyl benzene)	0.08	0.21	0.01	0.00	0.30
Cyclohexane	12.61	1.61	1.74	0.00	15.95
Ethyl benzene	2.43	3.22	0.33	0.00	5.98
Gasoline (RVP 10)	3,846.67	171.04	529.66	0.00	4,547.37
Hexane (-n)	47.16	3.84	6.49	0.00	57.50
Toluene	26.12	11.76	3.60	0.00	41.47
Xylene (-m)	10.26	16.26	1.41	0.00	27.93

TANKS 4.0.9d
Emissions Report - Detail Format
Total Emissions Summaries - All Tanks in Report

Emissions Report for: January, February, March, April, May, June, July, August, September, October, November, December

Tank Identification				Losses (lbs)
VOPAK 110-04 & 110-05	VOPAK	Domed External Floating Roof Tank	Sydney Airport Amo, NSW	6,575.17
VOPAK 110-01, -02, -03	VOPAK	Vertical Fixed Roof Tank	Sydney Airport Amo, NSW	11,630.59
VOPAK 110-06 & 110-07	VOPAK	Domed External Floating Roof Tank	Sydney Airport Amo, NSW	4,715.42
Total Emissions for all Tanks:				22,921.17

Appendix D

Emission Rates

Appendix D Emission Rates

TANK	Month	Monthly Emission Rate g/s						
		Benzene	Cumene	Cyclohexane	Ethylbenzene	Hexane	Toluene	Xylene
DT01	January	1.03E-02	1.67E-02	3.52E-03	3.86E-03	5.48E-03	1.01E-02	1.01E-02
	February	1.06E-02	1.71E-02	3.63E-03	3.96E-03	5.65E-03	1.04E-02	1.04E-02
	March	9.37E-03	1.50E-02	3.21E-03	3.47E-03	5.01E-03	9.19E-03	9.10E-03
	April	8.57E-03	1.33E-02	2.95E-03	3.11E-03	4.61E-03	8.32E-03	8.14E-03
	May	7.32E-03	1.10E-02	2.52E-03	2.59E-03	3.96E-03	7.02E-03	6.77E-03
	June	6.93E-03	1.01E-02	2.39E-03	2.41E-03	3.77E-03	6.59E-03	6.30E-03
	July	6.76E-03	9.83E-03	2.33E-03	2.34E-03	3.68E-03	6.42E-03	6.11E-03
	August	7.50E-03	1.11E-02	2.59E-03	2.63E-03	4.06E-03	7.17E-03	6.88E-03
	September	8.54E-03	1.30E-02	2.94E-03	3.06E-03	4.61E-03	8.24E-03	8.00E-03
	October	9.22E-03	1.44E-02	3.17E-03	3.37E-03	4.95E-03	8.99E-03	8.83E-03
	November	1.01E-02	1.61E-02	3.45E-03	3.73E-03	5.39E-03	9.87E-03	9.77E-03
	December	1.02E-02	1.66E-02	3.51E-03	3.84E-03	5.47E-03	1.01E-02	1.01E-02
DT02	January	1.03E-02	1.67E-02	3.52E-03	3.86E-03	5.48E-03	1.01E-02	1.01E-02
	February	1.06E-02	1.71E-02	3.63E-03	3.96E-03	5.65E-03	1.04E-02	1.04E-02
	March	9.37E-03	1.50E-02	3.21E-03	3.47E-03	5.01E-03	9.19E-03	9.10E-03
	April	8.57E-03	1.33E-02	2.95E-03	3.11E-03	4.61E-03	8.32E-03	8.14E-03
	May	7.32E-03	1.10E-02	2.52E-03	2.59E-03	3.96E-03	7.02E-03	6.77E-03
	June	6.93E-03	1.01E-02	2.39E-03	2.41E-03	3.77E-03	6.59E-03	6.30E-03
	July	6.76E-03	9.83E-03	2.33E-03	2.34E-03	3.68E-03	6.42E-03	6.11E-03
	August	7.50E-03	1.11E-02	2.59E-03	2.63E-03	4.06E-03	7.17E-03	6.88E-03
	September	8.54E-03	1.30E-02	2.94E-03	3.06E-03	4.61E-03	8.24E-03	8.00E-03
	October	9.22E-03	1.44E-02	3.17E-03	3.37E-03	4.95E-03	8.99E-03	8.83E-03
	November	1.01E-02	1.61E-02	3.45E-03	3.73E-03	5.39E-03	9.87E-03	9.77E-03
	December	1.02E-02	1.66E-02	3.51E-03	3.84E-03	5.47E-03	1.01E-02	1.01E-02
DT03	January	1.03E-02	1.67E-02	3.52E-03	3.86E-03	5.48E-03	1.01E-02	1.01E-02
	February	1.06E-02	1.71E-02	3.63E-03	3.96E-03	5.65E-03	1.04E-02	1.04E-02
	March	9.37E-03	1.50E-02	3.21E-03	3.47E-03	5.01E-03	9.19E-03	9.10E-03
	April	8.57E-03	1.33E-02	2.95E-03	3.11E-03	4.61E-03	8.32E-03	8.14E-03
	May	7.32E-03	1.10E-02	2.52E-03	2.59E-03	3.96E-03	7.02E-03	6.77E-03
	June	6.93E-03	1.01E-02	2.39E-03	2.41E-03	3.77E-03	6.59E-03	6.30E-03
	July	6.76E-03	9.83E-03	2.33E-03	2.34E-03	3.68E-03	6.42E-03	6.11E-03
	August	7.50E-03	1.11E-02	2.59E-03	2.63E-03	4.06E-03	7.17E-03	6.88E-03

TANK	Month	Monthly Emission Rate g/s						
		Benzene	Cumene	Cyclohexane	Ethylbenzene	Hexane	Toluene	Xylene
	September	8.54E-03	1.30E-02	2.94E-03	3.06E-03	4.61E-03	8.24E-03	8.00E-03
	October	9.22E-03	1.44E-02	3.17E-03	3.37E-03	4.95E-03	8.99E-03	8.83E-03
	November	1.01E-02	1.61E-02	3.45E-03	3.73E-03	5.39E-03	9.87E-03	9.77E-03
	December	1.02E-02	1.66E-02	3.51E-03	3.84E-03	5.47E-03	1.01E-02	1.01E-02
GT04	January	4.31E-04	6.17E-06	3.62E-04	1.28E-04	1.31E-03	9.27E-04	5.94E-04
	February	4.68E-04	6.77E-06	3.94E-04	1.40E-04	1.42E-03	1.01E-03	6.50E-04
	March	4.05E-04	5.99E-06	3.41E-04	1.23E-04	1.23E-03	8.77E-04	5.72E-04
	April	3.81E-04	5.94E-06	3.21E-04	1.20E-04	1.16E-03	8.33E-04	5.59E-04
	May	3.33E-04	5.51E-06	2.81E-04	1.09E-04	1.01E-03	7.37E-04	5.11E-04
	June	3.23E-04	5.56E-06	2.73E-04	1.08E-04	9.83E-04	7.21E-04	5.11E-04
	July	3.06E-04	5.34E-06	2.59E-04	1.04E-04	9.34E-04	6.86E-04	4.89E-04
	August	3.25E-04	5.46E-06	2.74E-04	1.07E-04	9.89E-04	7.21E-04	5.04E-04
	September	3.62E-04	5.81E-06	3.05E-04	1.16E-04	1.10E-03	7.95E-04	5.43E-04
	October	3.81E-04	5.83E-06	3.21E-04	1.18E-04	1.16E-03	8.29E-04	5.51E-04
	November	4.18E-04	6.18E-06	3.52E-04	1.27E-04	1.27E-03	9.04E-04	5.90E-04
	December	4.23E-04	6.12E-06	3.56E-04	1.27E-04	1.29E-03	9.12E-04	5.88E-04
GT05	January	4.31E-04	6.17E-06	3.62E-04	1.28E-04	1.31E-03	9.27E-04	5.94E-04
	February	4.68E-04	6.77E-06	3.94E-04	1.40E-04	1.42E-03	1.01E-03	6.50E-04
	March	4.05E-04	5.99E-06	3.41E-04	1.23E-04	1.23E-03	8.77E-04	5.72E-04
	April	3.81E-04	5.94E-06	3.21E-04	1.20E-04	1.16E-03	8.33E-04	5.59E-04
	May	3.33E-04	5.51E-06	2.81E-04	1.09E-04	1.01E-03	7.37E-04	5.11E-04
	June	3.23E-04	5.56E-06	2.73E-04	1.08E-04	9.83E-04	7.21E-04	5.11E-04
	July	3.06E-04	5.34E-06	2.59E-04	1.04E-04	9.34E-04	6.86E-04	4.89E-04
	August	3.25E-04	5.46E-06	2.74E-04	1.07E-04	9.89E-04	7.21E-04	5.04E-04
	September	3.62E-04	5.81E-06	3.05E-04	1.16E-04	1.10E-03	7.95E-04	5.43E-04
	October	3.81E-04	5.83E-06	3.21E-04	1.18E-04	1.16E-03	8.29E-04	5.51E-04
	November	4.18E-04	6.18E-06	3.52E-04	1.27E-04	1.27E-03	9.04E-04	5.90E-04
	December	4.23E-04	6.12E-06	3.56E-04	1.27E-04	1.29E-03	9.12E-04	5.88E-04
GT06	January	3.09E-04	4.48E-06	2.60E-04	9.28E-05	9.38E-04	6.67E-04	4.30E-04
	February	3.36E-04	4.91E-06	2.83E-04	1.02E-04	1.02E-03	7.26E-04	4.71E-04
	March	2.91E-04	4.35E-06	2.45E-04	8.91E-05	8.84E-04	6.32E-04	4.14E-04
	April	2.74E-04	4.31E-06	2.31E-04	8.67E-05	8.32E-04	6.00E-04	4.05E-04
	May	2.39E-04	4.01E-06	2.02E-04	7.89E-05	7.28E-04	5.31E-04	3.71E-04
	June	2.32E-04	4.04E-06	1.96E-04	7.86E-05	7.06E-04	5.20E-04	3.70E-04

TANK	Month	Monthly Emission Rate g/s						
		Benzene	Cumene	Cyclohexane	Ethylbenzene	Hexane	Toluene	Xylene
	July	2.20E-04	3.88E-06	1.86E-04	7.52E-05	6.70E-04	4.95E-04	3.55E-04
	August	2.33E-04	3.97E-06	1.97E-04	7.77E-05	7.10E-04	5.20E-04	3.66E-04
	September	2.60E-04	4.22E-06	2.19E-04	8.40E-05	7.90E-04	5.73E-04	3.93E-04
	October	2.73E-04	4.23E-06	2.30E-04	8.56E-05	8.31E-04	5.97E-04	3.99E-04
	November	3.00E-04	4.49E-06	2.52E-04	9.19E-05	9.10E-04	6.51E-04	4.27E-04
	December	3.04E-04	4.44E-06	2.56E-04	9.18E-05	9.22E-04	6.57E-04	4.25E-04
GT07	January	3.09E-04	4.48E-06	2.60E-04	9.28E-05	9.38E-04	6.67E-04	4.30E-04
	February	3.36E-04	4.91E-06	2.83E-04	1.02E-04	1.02E-03	7.26E-04	4.71E-04
	March	2.91E-04	4.35E-06	2.45E-04	8.91E-05	8.84E-04	6.32E-04	4.14E-04
	April	2.74E-04	4.31E-06	2.31E-04	8.67E-05	8.32E-04	6.00E-04	4.05E-04
	May	2.39E-04	4.01E-06	2.02E-04	7.89E-05	7.28E-04	5.31E-04	3.71E-04
	June	2.32E-04	4.04E-06	1.96E-04	7.86E-05	7.06E-04	5.20E-04	3.70E-04
	July	2.20E-04	3.88E-06	1.86E-04	7.52E-05	6.70E-04	4.95E-04	3.55E-04
	August	2.33E-04	3.97E-06	1.97E-04	7.77E-05	7.10E-04	5.20E-04	3.66E-04
	September	2.60E-04	4.22E-06	2.19E-04	8.40E-05	7.90E-04	5.73E-04	3.93E-04
	October	2.73E-04	4.23E-06	2.30E-04	8.56E-05	8.31E-04	5.97E-04	3.99E-04
	November	3.00E-04	4.49E-06	2.52E-04	9.19E-05	9.10E-04	6.51E-04	4.27E-04
	December	3.04E-04	4.44E-06	2.56E-04	9.18E-05	9.22E-04	6.57E-04	4.25E-04

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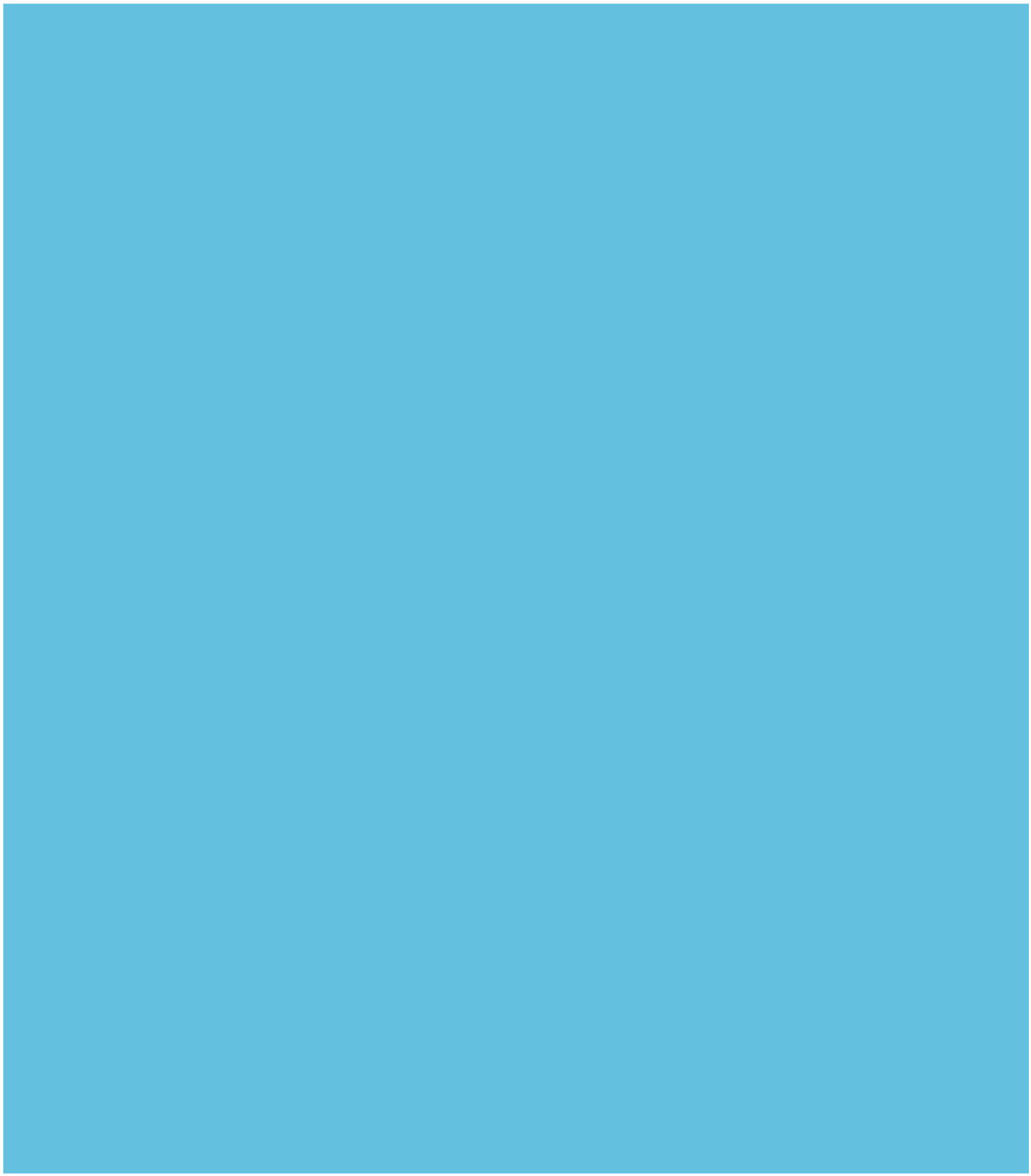


Appendix D

Supplementary Information Regarding Vapour Cloud Assessment Method

Appendix D Supplementary Information Regarding Vapour Cloud Assessment Method

Supplementary information regarding Vapour Cloud Assessment method

Extract from response to DP&E in relation to the 75W development: Ref Sherpa consulting letter to Vopak (addressing the DP&E Adequacy Review - Vopak S75W MOD), document ID 20940-LET-001.DOCX, dated 21 August 2015 and email to DP&E's D Yau, 1st Oct 2015 for the B4 development

An additional calculation example is also provided to show 3500m3/hr results for overfill case for B4 area.

No.	Report Section	Item	Response/Explanation
1	Appendices	QRA The QRA generally addresses the SEARs in relation to hazards and risks. The approach is consistent with HIPAP No.6 and HIPAP No. 4. However, the following modelling inputs required further clarifications: 1. Consequence Modelling The Department agrees with most of the hazardous events that has been captured in the QRA, However in the event of VCE, only heat radiation impact arising from vapour cloud fire is considered as having potential impacts. Based on the Buncefield incident, a substantial vapour cloud may be developed and result in an explosion in a stable weather condition. Therefore, the overpressure effect in such event should be evaluated.	The UK HSE VCA method has been used to predict the extent of the flammable clouds resulting from gasoline overfill. The effect distance to the worst case ground level LEL (extent of a flashfire) is greater than the predicted distance to the 14 kPa overpressure levels (regarded as the minimum overpressure causing fatality). 'Fatality The Effect distance to LEL (100% fatality within the worst case ground level LEL for fatality risk calculations) is greater than the effect distance to 14 kPa (1% fatality due to overpressure effect for fatality calculations) hence any overpressure component would have minimal effect on the predicted fatality risk level in the QRA. See **attached example calculatio**n for largest overfill scenario (future growth maximum fill rates at Site B see TK0726/0729, and also B4 future growth case TK—110 04/05 for B4 area) Injury and Escalation The sum of the event frequencies for gasoline tank overfill events (the only possibility for flammable clouds resulting in overpressures offsite) is less than the frequency of exceedance criteria for escalation and injury risk at 50E-06. Each gasoline tank overfill has a delayed ignition event frequency of 8.5E-06 (As per event trees in Appendix D8.1) with a large flammable cloud only credible under F stability conditions. As per meteorological data in Appendix F, F stability conditions apply around 7% of the time. There are 14 tanks in gasoline service on average as per Table 3.3. This gives a total site gasoline overfill delayed ignition event frequency of 8.3E-06 per year which is well below 50E-06 per year. When including the B4 area, there are 14 tanks in gasoline service on average for the existing Site B (as per the 75W QRA) plus the 4 new ones at B4 as per Table 3.3. This gives a total site gasoline overfill delayed ignition event frequency across both sites of 11E-06 per year which is well below 50E-06 per year. Risk at any location would be correspondingly lower than the total event frequency once taking into account the spread of locations and directional factors.

Site B - example case:

		Case 4			
		Tk-0726/0729			
INPUT	Substance	Raw Gasoline	(Drop Down List)		
	Tank Diameter (D)	37.75	m		
	Tank Height (H)	24	m		
	Tank filling rate (M_{fuel}) kg/s	365	kg/s		
Ossy P Alim: If only volumetric filling rate is known, use this to calculate tank filling rate (Mfuel) by multiplying with	~~[WHERE RELEVANT]~~ Volumetric filling rate m3/s*	0.49	m^3/s		
	Temp of released fuel (T_{fuel})	22	ºC		
	Ambient Temperature (T_{air})	22	ºC		
	Release Duration (t)	1800	s		
	Molecular Mass (MM_{air})	28.84	kg/kmol		
	Ambient Pressure ($P_{ambient}$)	101325	Pa		
	Gas Constant ($R_{ideal\ gas}$)	8.314	J/K/mol		
	Density of air at $T_{ambient}$ ($\rho_{ambient}$)	1.19	kg/m^3		
SEE NOTES BELOW	[Pool Evap Only] Molecular Mass ($MM_{liquid\ vapourised\ from\ pool}$)		kg/kmol		
	[Pool Evap Only] Bund Area		m^2		
PARAMETERS	Fuel conc. at base of tank, C^{θ}_{fuel}	11.43	-		
(Lookup)	Fitted Parameter, α	0.936	-		
	Fitted Parameter, β	-0.264	-		
	Fitted Parameter, γ	0.0137	-		
	Fitted Parameter, δ	0.0179	-		
	$Fraction_{fuel<C8}$	1			
	Density of liquid pool at $T_{ambient}$ (ρ_{liquid})	750.00	kg/m^3		
	LFL	0.07			
CALCULATION	Mass of entrained air into cascade (M_{air})	242.6	kg/s		
(Overfill)	Fuel concentration correction factor (F)	1.523	-		
	Fuel concentration at tank base (C_{fuel})	17.4	% w/w		
	Mass of liq vapourised at tank foot ($M_{vapourised}$)	51.1	kg/s		
	Mass of liq at cascade foot as fine spray (M_{splash})	7.29	kg/s		
	Total mass of vapour in cloud (M_{cloud})	602.0	kg/s		
	Rate of increase in cloud volume (V_{cloud})	505.5	m^3/s		
	Vapour concentration in cloud (C_{cloud})	0.116	kg/m^3		
	Flammable when compared to LEL (@ 20 deg C)	Flammable			
2m cloud height	Distance to which cloud impedes escape (R_{escape})	380.5	m		
1m cloud height	Distance to which cloud may be ignited at low level ($R_{ignition}$)	538.2	m		
1.5m cloud height		439.4			
The 2014 JIP report also describes a distance for overpressure from the edge of the cloud (based on 2m cloud height).					
	Overpressure (bar)	2m cloud height	overpress > LEL at 1m?	1.5m cloud height	overpress > LEL at 1m?
1.00	0.70	390	NO	449	NO
0.5	0.35	399	NO	458	NO
0.2	0.21	411	NO	470	NO
0.01	0.14	426	NO	485	NO

B4 Example case – largest tank:

		Case 9			
		TK-110-04/05			
INPUT	Substance	Raw Gasoline	(Drop Down List)	* Sherpa added parameter	
	Tank Diameter (D)	41	m		
	Tank Height (H)	24	m		
	Tank filling rate (M_{fuel})	729	kg/s		
Ossy P Alim: If only volumetric filling rate is known, use this to calculate tank filling rate (Mfuel) by multiplying with density	~~[WHERE RELEVANT]~~ Volumetric filling rate*	0.97	m^3/s	3500m3/hr	
	Temp of released fuel (T_{fuel})	22	ºC		
	Ambient Temperature (T_{air})	22	ºC		
	Release Duration (t)	1800	s		
	Molecular Mass (MM_{air})	28.84	kg/kmol		
	Ambient Pressure ($P_{ambient}$)	101325	Pa		
	Gas Constant ($R_{ideal\ gas}$)	8.314	J/K/mol		
	Density of air at $T_{ambient}$ ($\rho_{ambient}$)	1.19	kg/m^3		
SEE NOTES BELOW	[Pool Evap Only] Molecular Mass ($MM_{liquid\ vapourised\ from\ pool}$)		kg/kmol		
	[Pool Evap Only] Bund Area		m^2		
PARAMETERS	Fuel conc. at base of tank, $C^{ø}_{fuel}$	11.43	-		
(Lookup)	Fitted Parameter, α	0.936	-		
	Fitted Parameter, β	-0.264	-		
	Fitted Parameter, γ	0.0137	-		
	Fitted Parameter, δ	0.0179	-		
	$Fraction_{fuel<C8}$	1			
	Density of liquid pool at $T_{ambient}$ (ρ_{liquid})	750.00	kg/m^3		
	LFL	0.07			
CALCULATION	Mass of entrained air into cascade (M_{air})	306.9	kg/s		
(Overfill)	Fuel concentration correction factor (F)	1.719	-		
	Fuel concentration at tank base (C_{fuel})	19.6	% w/w		
	Mass of liq vapourised at tank foot ($M_{vapourised}$)	75.0	kg/s		
	Mass of liq at cascade foot as fine spray (M_{splash})	14.58	kg/s		
	Total mass of vapour in cloud (M_{cloud})	793.0	kg/s		
	Rate of increase in cloud volume (V_{cloud})	665.9	m^3/s		
	Vapour concentration in cloud (C_{cloud})	0.135	kg/m^3		
	Flammable when compared to LEL (@ 20 deg C)	Flammable			
2m cloud height	Distance to which cloud impedes escape (R_{escape})	436.8	m		
1m cloud height	Distance to which cloud may be ignited at low level ($R_{ignition}$)	617.7	m	Used in QRA for flashfire effect zone - 100% fatality	
1.5m cloud height		504.3			

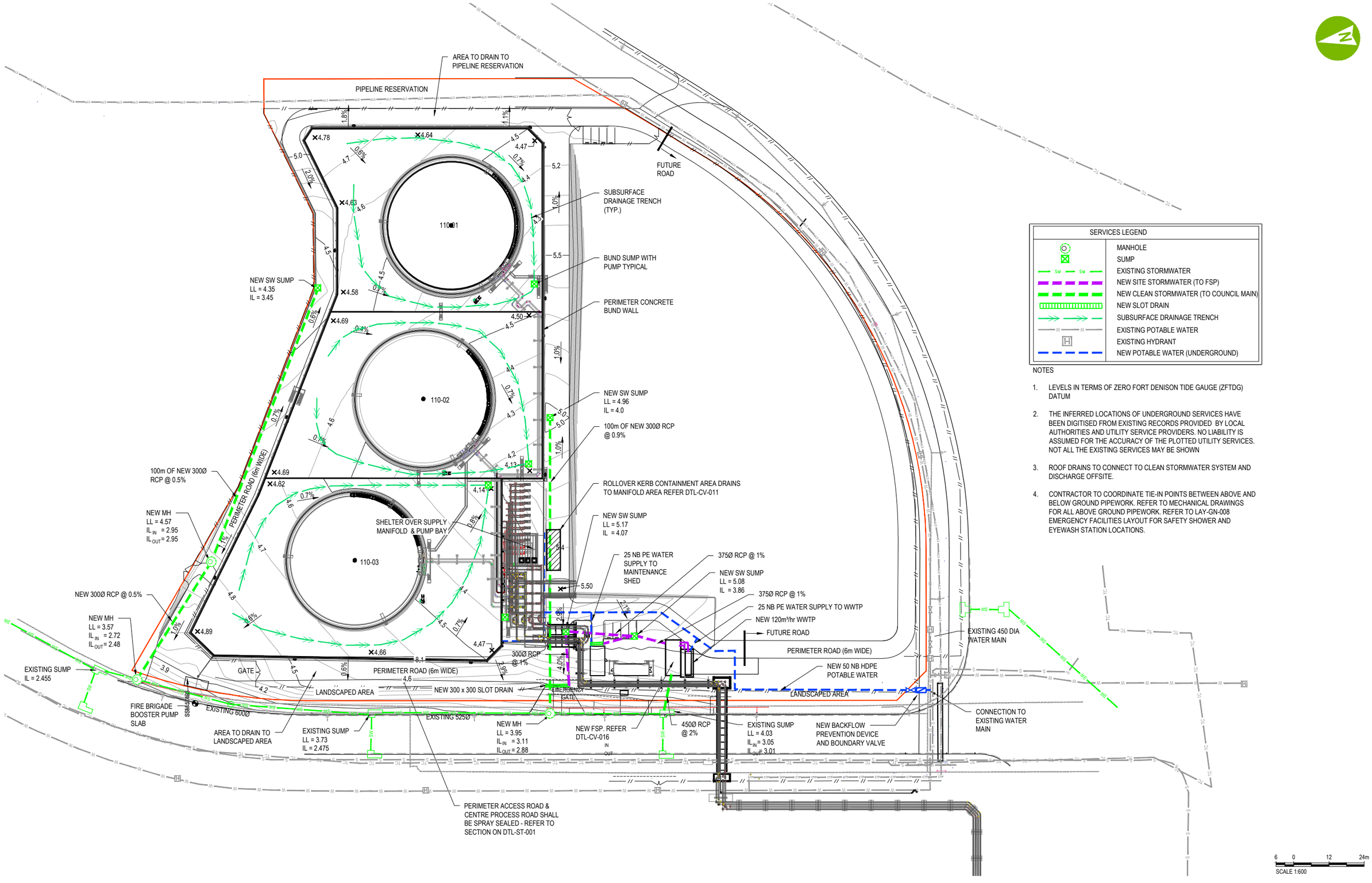
The 2014 JIP report also describes a distance for overpressure from the edge of the cloud (based on 2m cloud height).

	Overpressure (bar)	Distance to Overpressure at 2m cloud height	overpress > LEL at 1m?	Distance to Overpressure at 1.5m cloud height	overpress > LEL at 1m?
1.00	0.70	446	NO	513	NO
0.5	0.35	455	NO	523	NO
0.2	0.21	467	NO	535	NO
0.01	0.14	483	NO	550	NO

Appendix E

Drainage Plans

Appendix E Drainage Plans



SERVICES LEGEND	
	MANHOLE
	SUMP
SW SW	EXISTING STORMWATER
	NEW SITE STORMWATER (TO FSP)
	NEW CLEAN STORMWATER (TO COUNCIL MAIN)
	NEW SLOT DRAIN
	SUBSURFACE DRAINAGE TRENCH
M M	EXISTING POTABLE WATER
H	EXISTING HYDRANT
	NEW POTABLE WATER (UNDERGROUND)

NOTES

1. LEVELS IN TERMS OF ZERO FORT DENISON TIDE GAUGE (ZFTDG) DATUM
2. THE INFERRED LOCATIONS OF UNDERGROUND SERVICES HAVE BEEN DIGITISED FROM EXISTING RECORDS PROVIDED BY LOCAL AUTHORITIES AND UTILITY SERVICE PROVIDERS. NO LIABILITY IS ASSUMED FOR THE ACCURACY OF THE PLOTTED UTILITY SERVICES. NOT ALL THE EXISTING SERVICES MAY BE SHOWN
3. ROOF DRAINS TO CONNECT TO CLEAN STORMWATER SYSTEM AND DISCHARGE OFFSITE.
4. CONTRACTOR TO COORDINATE TIE-IN POINTS BETWEEN ABOVE AND BELOW GROUND PIPEWORK. REFER TO MECHANICAL DRAWINGS FOR ALL ABOVE GROUND PIPEWORK. REFER TO LAY-GN-008 EMERGENCY FACILITIES LAYOUT FOR SAFETY SHOWER AND EYEWASH STATION LOCATIONS.

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REV	DATE	REVISION DETAILS	APPROVED
A	03.03.14	ISSUED FOR CONCEPT DESIGN	MJK
B	14.03.14	+/- 10% STAGE DESIGN	MJK
C	28.09.15	ISSUED FOR DEFINE STAGE REVIEW	
D	16.10.15	ISSUED FOR HAZOP	PGH
E	06.11.15	ISSUED FOR TENDER (DRAFT)	PGH
F	12.11.15	ISSUED FOR TENDER	PGH

SCALE	SIZE
1:600	A1
DRAWN	Rex Bell
DESIGNED	Paul Sanchez
CHECKED	Matt Kemp

PRELIMINARY
NOT FOR CONSTRUCTION

APPROVED
DATE 06.11.15
PHIL HARWARD
PHIL HARWARD

PROJECT	VOPAK TERMINALS SYDNEY PTY LTD SITE B PETROLEUM - STAGE B4A
TITLE	GRADING & DRAINAGE PLAN

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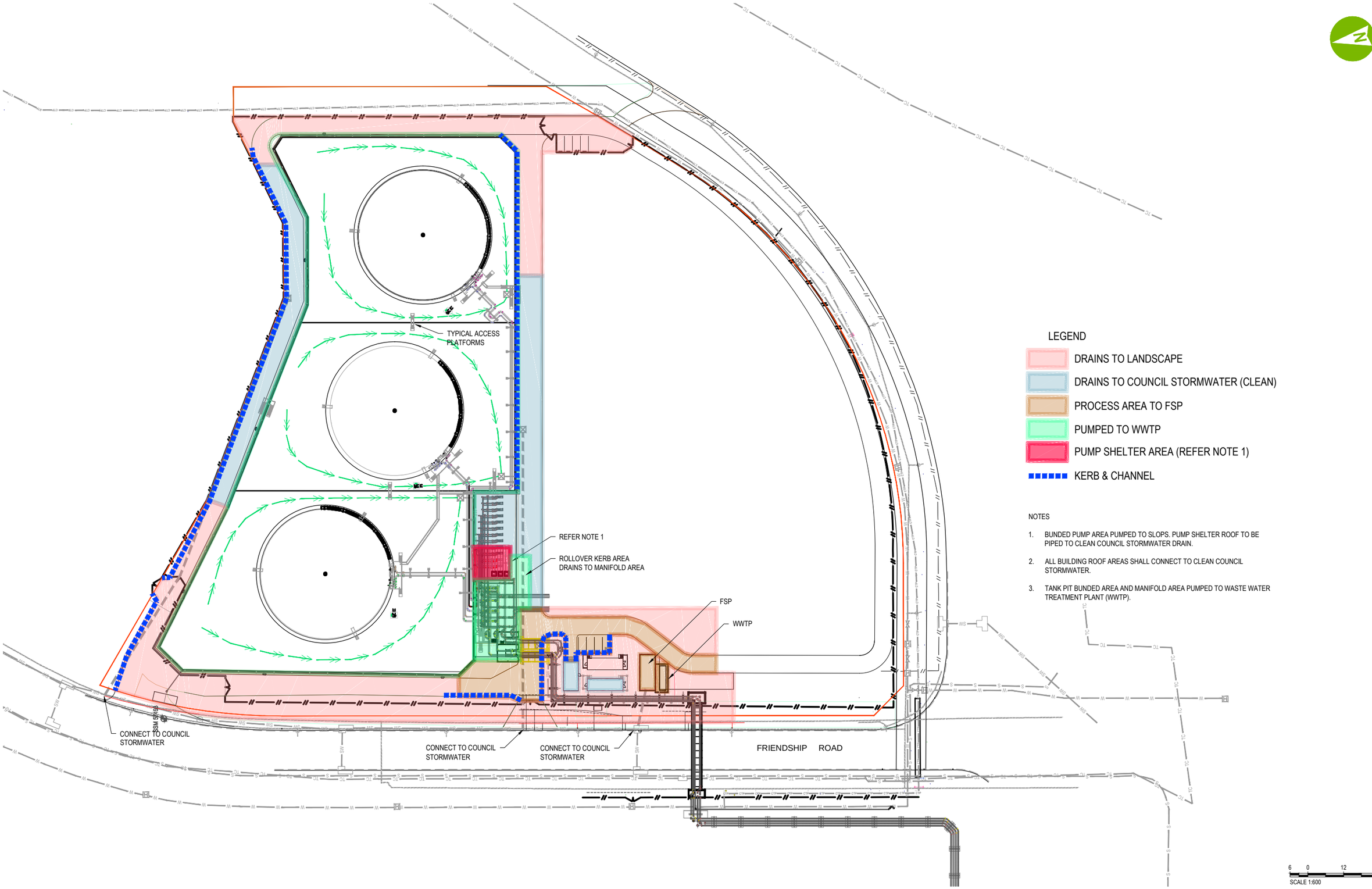

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CLIENT
Vopak

REV	DATE	REVISION DETAILS	APPROVED
A	06.11.15	ISSUED FOR TENDER	PGH

SCALE	SIZE
1:600	A1

DRAWN: Ian Holmes
DESIGNED: Jason Krall
CHECKED: Matt Kemp

PRELIMINARY
NOT FOR CONSTRUCTION

APPROVED
DATE 06.11.15
PHIL HARWARD
PHIL HARWARD

PROJECT: VOPAK TERMINALS SYDNEY PTY LTD
SITE B PETROLEUM - STAGE B4A

TITLE: STORMWATER CATCHMENTS

DRAWING No. | PROJECT No. | WBS | TYPE | DISC | NUMBER | REV
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