New Botany Paper Mill
Project B9

RESPONSE TO SUBMISSIONS FROM THE EXHIBITION OF THE ENVIRONMENTAL ASSESSMENT

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1. Introduction

1.1 General

AMCOR Packaging proposes to construct and operate a new paper making facility (referred to as the New Paper Mill), which uses 100% recycled waste paper, at their Botany site in Sydney, NSW. The New Paper Mill would replace the two existing papermaking machines (No. 7 and No. 8) at the site, increasing paper making capacity from the current 250,000 tonnes per year to around 345,000 tonnes per year. Replacement of the two 1960s vintage paper machines with a single machine, incorporating modern technology, would result in significant increases in the efficiency of the paper making process. The New Paper Mill would produce savings in energy and water use per unit of paper production and would improve the environmental performance of the facility.

The New Paper Mill would be designed specifically to minimise environmental impacts such as noise, odour and water discharges. By starting with a "clean slate" many of the mitigation measures can be built directly into the New Paper Mill and associated infrastructure. The environmental impact of the current operations, although acceptable, are not best practice because much of the infrastructure is old and was designed and built when environmental standards were lower.

An Environmental Assessment prepared under Part 3A of the *Environmental Planning and Assessment Act* has been prepared for the New Paper Mill and publicly exhibited. As a result of the exhibition a number of submission were received, which are discussed in greater detail in the following sections.

1.2 Planning Process

The approval of the Minister for Planning would be required for the project, as the development would be a "Major Project" under a new *State Environmental Planning Policy (SEPP) – (Major Projects) 2005.* Under this SEPP development for the purposes of "paper recycling" which employs more than 100 people or has a capital investment value of more than $30 million is considered a "Major Project" and therefore would require assessment and approval under Part 3A of the *Environmental Planning and Assessment Act*.

The requirements for the form and content of the Environmental Assessment (EA), together with requirements for public exhibition, were provided in October 2005. An EA has been prepared and was on public exhibition between 20 December 2006 and 4 February 2007.

As a result of the public exhibition, 17 submissions from Government stakeholders and the public were received. This submissions report provides AMCOR's response to those submissions and

will assist the Department of Planning in deciding whether the development can proceed and under what conditions.

1.3 Summary of Submissions

A total of 17 submissions were received by the Department of Planning during the exhibition period. Nine (9) submissions were from State or Local government stakeholders, 7 were from community stakeholders and 1 was from a community environmental organisation. A detailed summary of the submissions are contained in Appendix D.

Number	Submitter
1	Department of Planning
2	Department of Planning - Hazards
3	Sydney Water
4	Depart of Environment and Conservation
5	Randwick Council
6	Department of Natural Resources
7	Nature Conservation Council
8	Sydney Ports Corporation
9	Goran Milosevic
10	Julie Abbot
11	Chris & Alison Smith
12	Andrew Castle
13	Anna Diruma
14	Michael Sutedja
15	Various - Community
16	RTA
17	Railcorp

1.4 This Report

This submissions report includes:

- Chapter 1 – Introduction
- Chapter 2- Response to Submissions
- Chapter 3 – Response to Randwick Council's proposed conditions of consent
- Chapter 4 – Revised Statement of Commitments
- Appendix A – Revised Preliminary Hazard Assessment
- Appendix B – Revised Noise Assessment
- Appendix C – Letter from Structural Engineer on Heritage Wall
- Appendix D – Summary of Submissions

2. Response to Submissions

Each of the received submissions were assessed to identify the relevant issues raised. For each issue AMCOR's response is presented in the following sections. A number of issues raised were common across a number of submissions (eg. Odour) and a single response to these issues has been provided. The responses to issues raised have been grouped together by environmental aspect (eg. all issues relating to stormwater have been grouped together). Appendix D provides details on how specific issues have been identified from the submissions.

Randwick Council have also provided a list of recommended approval conditions. These have been assessed separately and are discussed in Section 3.

2.1 Wastewater Management

2.1.1 Wastewater disposal and management & Discharge to Botany Bay– Sydney Water (3a), Randwick Council (5h) Nature Conservation Council (7d)

AMCOR in consultation with Sydney Water is currently undertaking detailed studies to develop a sustainable and environmentally acceptable solution to manage wastewater discharges from its New Paper Mill. Currently AMCOR discharges on average 4 ML/day of wastewater and runoff from approximately 8.6 ha of the paper mill site to the SWSOOS. Due to rainwater infiltration and inflow into the sewer system upstream of Botany, flows in the SWSOOS increase after rainfall potentially resulting in overflows from the sewer system to the environment. These overflows are regulated via an Environmental Protection Licence for the Sewerage System issued by Department of Environment and Conservation (DEC). As the licence holder Sydney Water is required to manage the sewerage system to ensure that there is no increase in the frequency of overflows based upon a base case sewerage system performance agreed with the DEC.

AMCOR's current discharge to the SWSOOS is charactertised by a high degree of variability in volume due the stormwater component of the discharge and the operational characteristics of the water management system (which sometimes results in large volumes of water being rapidly discharged). Consequently Sydney Water requires AMCOR's discharge to the sewer to cease when a certain level of flow is reached in the sewer, to minimise any overflows from the sewer system due to the highly variable discharge. When AMCOR is not allowed to discharge to sewer, it is forced to discharge to Botany Bay after diluting the wastewater by approximately 6 fold with seawater via old seawater cooling intakes. This discharge is undertaken in accordance with the Environment Protection Licence issued for the site.

With the New Paper Mill, the volume of wastewater requiring disposal will increase slightly (to 4.3 ML/day). However, in the EA Amcor has committed to the following measures which will significantly decrease the variability of discharges.

- Design the New Paper Mill water system with sufficient inbuilt storage capacity and process control systems to maintain a relatively constant wastewater discharge under all operating conditions.
- Reduce the area of the paper mill site draining to the SWSOOS from 8.6ha to less than 3 ha – which would further reduce the variability of discharges to the SWSOOS.

It should be noted that implementation of the above measures will increase the project capital cost significantly and negatively influence the project viability.

Relative to the overall capacity of the SWSOOS and flows in wet weather, the constant rate discharge AMCOR is proposing, would only be a minor contribution to flow and levels in the SWSOOS, and therefore the proposed discharge may not result in increased overflows from the SWSOOS. AMCOR in consultation with Sydney Water is currently modelling a number of constant rate discharge scenarios to assess the impact of the proposed discharge on overflow frequency performance. This would be the preferred solution to the issue of wastewater discharges.

If Amcor's proposed discharge was to result in an increase in the frequency of overflows from the sewer other options that would be considered to make the SWSOOS accessible to AMCOR at all times would include:

- Removal of all stormwater discharges to the SWSOOS which would result in wastewater only being discharged to the SWSOOS at a constant rate.
- Liaising with Sydney Water to identify whether there are any other options such as constructing a pipeline to connect the New Paper Mill to the sewer system downstream of key constrictions or overflow locations or direct to Malabar STP.

Construction of additional wastewater treatment plant to further increase the rate of recycling in the Mill is not considered an option by AMCOR as the technology is yet to be proven in brown grade recycled Paper Mills. Regardless of the operational issues construction of such a plant would result in a major increase in capital expenditure and would render the project financially unviable.

2.1.2 Existing Non-Compliance with Trade Waste Limits – Randwick Council (3f)

The New Paper Mill would be designed to ensure that the wastewater discharge complies with trade waste requirements in the current Agreement including temperature and pH. The design of the stock/water management system will ensure that it is stable under all operating conditions and hence more controllable.

A heat exchange /cooling system will be included in the New Paper Mill design to maintain the trade waste discharge temperature below 38 degC. The final design of the system will be

determined by the overall heat balance of the New Paper Mill which will be calculated during detailed engineering.

The pH of trade waste will be continuously monitored and automatically controlled by the addition of caustic soda. It should be noted that since the pH control regime for the existing effluent was modified six months ago there has been 100% compliance.

During the transition period, trade waste discharge would be similar in quality to the existing discharge, with possibly marginally better quality due to the influence of the New Paper Mill.

2.1.3 Sewer Corrosion and Modification of Trade Waste Limits – Sydney Water (3g)

The New Paper Mill would be designed to comply with current Sydney Water trade wastewater quality acceptance requirements. If the SWSOOS downstream of the Paper Mill discharge location was declared critical and trade waste acceptance levels were modified to the levels noted in Sydney Water's submission, the current design of New Paper Mill would not be able to meet these discharge requirements (particularly BOD). To meet these modified trade waste requirements would require additional water treatment systems which would seriously jeopardise the financial viability of the project.

Should this issue arise in the future AMCOR would work with Sydney Water to develop a solution acceptable to both parties.

2.1.4 Wastewater treatment system for New Paper Mill- Sydney Water (3h)

The existing DAF plant would remain as the primary method of wastewater treatment. The performance of the DAF would be significantly improved as the overall water management systems would be much more stable in the New Paper Mill.

In addition the wastewater treatment infrastructure for the New Paper Mill would include:

- Wastewater storage capacity,
- Discharge flow monitoring (magnetic flowmeter) and automatic control
- Automatic dosing to control pH
- Cooling system to control wastewater temperature.

Full details of this infrastructure would be provided in the Section 73 Compliance Certificate application and Operational Water Management Plan.

2.1.5 Trade waste discharges during construction and commissioning – Sydney Water (3i)

During construction and commissioning, the monitoring of the quality and quantity of trade waste discharges would be undertaken to the satisfaction of Sydney Water. It is expected that these conditions would be detailed in the Section 73 Compliance Certificate rather than the Minister's Conditions of Approvals.

2.1.6 Approval for discharge to Bunnerong Canal – Sydney Ports (8a)

If either stormwater or wastewater continues to be discharged to Bunnerong Canal, Sydney Ports would be provided with appropriate information to assess the impact of the discharge on the quality and quantity of water in Bunnerong Canal.

2.2 Stormwater management

2.2.1 Stormwater discharge to SWSOOS – Sydney Water (3b), Randwick Council (5x)

AMCOR is currently reviewing the options for stormwater management on-site including the discharge of the stormwater to sewer. As noted in the EA, the area potentially draining to the SWSOOS will be reduced significantly (by at least 70%) and will only consist of the wastepaper storage yard and surrounding access road. Stormwater runoff from these areas can not be treated by conventional methods and therefore sewer disposal may be the only option. AMCOR is researching alternative methodologies to treat this stormwater with the objective of removing all stormwater discharge to the SWSOOS. If an appropriate and feasible method is identified, stormwater would be discharged into Bunnerong Canal rather than the SWSOOS.

2.2.2 Stormwater discharge locations – Randwick Council - 5g

Stormwater would be discharged into one or more of the adjacent stormwater systems, namely:

- Underground stormwater drainage system in Botany Rd or Macauley St
- Long Dam;
- Bunnerong Canal directly
- Bunnerong Canal via Saltwater Cooling Outfall.

Appropriate consultation, studies and design would be undertaken to ensure that the stormwater discharges do not cause flooding, meet technical requirements and are appropriately sized. This information would be contained in the Operational Water Management Plan (SoC:35).

2.2.3 Flooding study to determine levels– Randwick Council (5i and 5j)

A detailed flooding study on the impact of a variety flooding scenarios has been prepared for the eastern side of the site, namely looking at Bunnerong Canal. This study found that the 1 in 100 year flood is unlikely to have a significant impact on the site provided some overland flood pathways are maintained. The information from this flood study will be used to inform the final design levels for the New Paper Mill.

A preliminary flood study for the western section of the site, namely Long Dam and McCauley Street has also been undertaken indicating minimal impacts from the 1 in 100 year flood. A more detailed study will be undertaken to provide input to final design levels.

2.2.4 Impacts of Stormwater Discharge on Bunnerong Canal – Sydney Water (3c)

AMCOR recognises that there will probably be increased stormwater discharge to Bunnerong Canal as a result of the New Paper Mill development.

As noted in SoC 35 an Operational Water Management Plan would be prepared which would contain details of stormwater management, design of the stormwater system and assessment of impact on the stormwater system. This plan would be prepared in consultation with the appropriate owners of the downstream stormwater systems including Randwick Council, Sydney Water and Sydney Ports.

2.3 Potable Water Supply

2.3.1 Peak Daily Draw-off – Sydney Water (3d)

Sydney Water requested that additional information be supplied on the peak daily draw-off for the New Paper Mill to determine whether sufficient capacity is available in the surrounding water supply system. Due to the improved process and water management on-site the peak daily draw-off during normal operations of the New Paper Mill will be significantly lower than the Existing Paper Mill.

The exact peak daily draw-off volumes will be provided to Sydney Water once the detailed design has been completed and as part of the Section 73 Compliance Certificate.

2.3.2 Treatment of groundwater and stormwater to replace potable water usage – Randwick Council (5d, 5f)

As noted in the EA, there will be a 55% reduction in potable water use by the New Paper Mill when compared to the Existing Paper Mill. This is due to the substitution of non-potable water for potable water in some processes in the Existing Paper Mill that use potable water. Also the water use efficiency of the New Paper Mill per unit of paper produced will be greater than the Existing Paper Mill.

Over the past 20 years, potable water use at the Paper Mill has decreased significantly due to pro-active management measures to substitute potable water with groundwater/stormwater from Long Dam and the aggressive implementation of on-site water reduction strategies. AMCOR has recently commissioned a new Reverse Osmosis Water Treatment Plant to treat groundwater/stormwater from Long Dam to produce water suitable for use in the steam boilers. AMCOR is also a commercial member of Sydney Water's Every Drop Counts Program which aims to reduce potable water use. AMCOR is also a designated water user under the *Water Savings Order 2005* and has prepared a Water Savings Action Plan, which details measures to further reduce potable water use.

AMCOR will continue to work with Sydney Water and DEUS to further reduce its potable water use in an environmentally and economically sustainable manner.

2.3.3 Rainwater to substitute for potable water use – Randwick Council (5e), Nature Conservation Council (7c)

A study to assess the feasibility of capturing rainwater to use in the process was undertaken which concluded that it was economically unfeasible as:

- Rainwater would still require treatment before substitution for potable water;
- rainwater tanks would supply about 1% of total water demand and would have significant costs.

2.3.4 Using water from the Orica Water Treatment Plant to substitute for potable Water – Department of Natural Resources (6c)

As noted in the Environmental Assessment, water from the Orica Groundwater Reverse Osmosis Treatment Plant may be a suitable substitute for potable water. However it would need to meet the following requirements

1) Does not cost any more than the current water supply;
2) Is delivered to the site via a pipeline;
3) Is uncontaminated as a significant portion of the paper produced at the Botany site is used for food packaging;
4) Does not have a high total dissolved solids (TDS) content; and
5) Provide a dependable supply of water into the future.

It is understood that there have been operational issues with the Orica RO Treatment Plant and they would have been unable to meet the quality requirements. However, these issues may have been resolved and during the design phase the use of water from Orica's Groundwater RO Treatment Plant would be investigated as a substitute for potable water.

It should be noted that AMCOR is currently indirectly using excess water from Orica's Treatment Plant to substitute for groundwater extractions (See 2.5.1)

2.4 Non-Potable Water Supply

2.4.1 Failure of Non-Potable Water Supply and Contingency – Sydney Water (3e)

As for the Existing Paper Mill, AMCOR would temporarily rely on potable water from Sydney Water's water distribution network if its non-potable water supply was to fail (eg. A significant contamination incident of Long Dam). This would only be a contingency measure until the non-potable water became available again. It should be noted that it is in AMCOR's interests to minimise the period of use of potable water due to cost. Appropriate mechanisms to allow this to occur would be negotiated with Sydney Water.

2.4.2 Using additional stormwater from Long Dam –Randwick Council (5c)

As for the Existing Paper Mill, the New Paper Mill will extract its non-potable water requirements from Long Dam. In dry weather, Long Dam contains mainly groundwater extracted from AMCOR's Snape Park Borefield, whereas after rainfall a mixture of groundwater and stormwater collects in the dam. Since the control system for the groundwater extraction system at Snape Park has been installed, groundwater extractions have decreased and are matched to the New Paper Mill's water demands. After rainfall this results in a greater proportion of stormwater to groundwater in Long Dam and therefore more stormwater is extracted for use in the New Paper Mill. There are no other economically feasible options for increasing stormwater use such as increasing the capacity of Long Dam or on-site stormwater storages.

2.5 Groundwater

2.5.1 Existing Licence and Sustainability of Groundwater Extractions – Department of Natural Resources (6a), Nature Conservation Council (7a, 7b)

One submission incorrectly states that there will be increased groundwater extraction due to the New Paper Mill, when in fact there will be decreased extraction due to the installation of a control system which allows AMCOR to extract only as much water as it needs. AMCOR recognises that the Botany Sands Aquifer is an important source of water for the region and therefore this control system has been recently installed and is currently operating. Pumping from the Snape Park Borefield is based upon the water level of Long Dam - ie. when the water level drops pumping commences until a pre-determined level is reached and then pumping ceases.

Currently Orica is also discharging approximately 3 ML/day of excess water from its groundwater treatment plant upstream of Long Dam. This water from the Orica groundwater treatment combined with stormwater runoff is currently meeting the majority of AMCOR's water needs and its borefield at Snape Park is only operating intermittently. Therefore AMCOR's current

groundwater demand is historically low. It is noted that the Orica groundwater treatment plant discharge can not be relied on into the future as Orica is likely to find alternative users of this water.

It is recognised that the groundwater extraction sustainability report presented in the Environment Assessment is dated and more up to date information is required as there has been a significant increase in the number of groundwater extraction licenses granted by Department of Natural Resources for the Botany Sands Aquifer over the past 15 years. However, it also should be noted that the groundwater extraction rates that were assessed as being sustainable in the report were significantly higher than AMCOR currently or proposes to extract (ie. up to four times higher at 20 ML/day).

It is proposed that this reassessment of groundwater extraction sustainability be undertaken through a recent application by AMCOR to DNR to rehabilitate one of the bores in the Snape Park Borefield. Once this bore is rehabilitated, pumping tests on the borefield can be undertaken. This would also ensure that if the New Paper Mill was not to proceed, an assessment would be undertaken on the current sustainability of pumping from Snape Park. The methodology for this assessment would be developed in consultation with the Department of Natural Resources.

2.5.2 Piping of Groundwater from Snape Park – Department of Natural Resources (6b)

The water savings due to a reduction in leakage and evaporation through constructing a pipeline from the Snape Park borefields to the Long Dam are likely to be small as:

- The stormwater canal is concrete lined and in good condition so leakage from the system would be low;
- Over 50% of the length of the stormwater canal between Snape Park and Long Dam is underground and in many areas where the canal is open it is tree lined (about 25%). Long Dam has the highest potential for evaporation, however, given that its volume is only 3 ML and the daily water extraction from the dam is greater than this, actual evaporation is likely to be very small given the residence time. Therefore the evaporation rates associated with pumping the water from Snape Park would be very low.

Although it would be desirable to pipe the water from the Snape Park Borefields to the AMCOR site, the cost and disruption to the community in constructing a pipeline would be significant for minimal water savings.

2.5.3 Groundwater contamination – Department of Natural Resources (6d)

As noted in the EA, groundwater beneath the Paper Mill site has been monitored at various times over the past 10 years. All studies have concluded that there are elevated levels of phosphorus and some metals in the groundwater, however, the source of these are off-site or reflect the natural chemistry of the groundwater. Therefore the Existing Paper Mill is not causing any contmaiantion of groundwater.

The construction of the New Paper Mill may require some dewatering of soils. As noted in the Environmental Assessment an appropriate dewatering plan would be prepared to manage this activity. All chemicals and fuels would be stored appropriately during construction to minimise any risk of groundwater contamination. Also any existing underground storage tanks would be removed to ensure that there is no further risk of contamination.

During operation the risk of groundwater contamination would be limited to the storage and use of chemicals and fuels. SoC 12 and 13 commits to designing and operating chemical and fuel storages to meet appropriate requirements which in turn would minimise any risk of groundwater contamination.

2.6 Noise

2.6.1 Night Noise Criterion – Department of Environment and Conservation (4a, 13a)

Based upon the revisions to Industrial Noise Policy (August 2006) revised noise criteria for the New Paper Mill were calculated and re-modelling of the noise impacts from the New Paper Mill was undertaken (Appendix B). The revised criteria are:

Day	46 dB(A)
Evening	39 dB(A)
Night	38 dB(A)

Since the previous noise assessment was prepared the design of the New Paper Mill has progressed and the new design features were able to be included in the assessment. Also additional noise mitigation measures were required for the New Paper Mill to meet these stricter criteria. The revised noise assessment demonstrates the New Paper is able to meet the stricter noise criteria.

2.6.2 Pressure relief system noise – Community (11b)

It is recognised that the pressure relief system on the Existing Paper Mill sometimes causes intrusive noise when operational. The pressure relief system of the New Paper Mill will be designed to minimise noise emissions to acceptable levels.

2.7 Odour

2.7.1 Odour Emissions – DEC (4b), Nature Conservation Council of NSW (7f), Community 9, 10, 11c, 11d, 12a, 13b, 14b, 15

There were a number of community submissions commenting on the odour emissions from the Existing and New Paper Mill. Many of the submissions suggested that odours would be worse with the New Paper Mill, however, AMCOR is confident that odour impacts from the New Paper Mill will be significantly lower as:

- The New Paper Mill will be designed specifically to minimise odour impacts, unlike the Existing Paper Mill which has evolved in a relatively ad hoc manner over time;
- The New Paper Mill is further away from residential areas;
- The process and water management systems will be inherently more stable – and will be less prone to experiencing problems. Significant odour events from the Existing Paper Mill are often linked to problems/failures of the water and process management systems
- Dead areas in the water management system will be eliminated. These dead areas in the Existing Paper Mill allow the build-up of micro-organisms which are implicated in causing odours;
- The modelling has been based on conservative odour generation rates (due to the lack of other data) and actual odour generation rates are likely to be lower.
- AMCOR has committed to undertaking remedial measures if the odour from New Paper Mill results in unacceptable impacts

2.7.2 Post Commissioning Odour Assessment – Department of Environment and Conservation (4c)

AMCOR would undertake an appropriate post-commissioning odour assessment of the New Paper Mill to confirm the predictions of the odour modelling in the Environmental Assessment. The Statement of Commitments have been updated to reflect this.

2.8 Heritage – Randwick Council - 5k, Department of Planning (1a)

As noted in the heritage assessment, the significance of the façade of the disused finishing mill and associated structures are their linkages with paper making at the site over the past 100 years. The New Paper Mill will continue the history of paper making at this site.

The façade is locally heritage listed (ie not State listed) and in extremely poor condition. Its structural characteristics would not allow it to be incorporated into the New Paper Mill building and retention of the façade alone would require significant structural support. A letter from an structural engineer registered with Randwick Council is included in Appendix C detailing these issues.

2.9 Contamination and Remediation

2.9.1 Underground Storage Tanks and Remediation – Randwick Council (5l)

As noted in the Environmental Assessment, the soils beneath the proposed development area contain some areas of localised minor contamination. Further investigations would also be required in areas that were not accessible to previous investigations. Based upon the new and existing information a Remediation Action Plan would be developed which would aim to reuse material where acceptable (ie. meets guidelines for a site with an industrial use) or off-site disposal at an appropriately licensed facility. For the current development application it is not intended to remediate land outside the proposed New Paper Mill area. The exception to this would be chemical and fuel storages (including underground storage tanks) in the Existing Paper Mill which would be decommissioned and the surrounding soil remediated (if necessary).

Also asbestos may be removed from the Existing Paper Mill buildings depending on the condition and structural characteristics of the asbestos. For example, if the asbestos is in poor condition and poses a risk then it will be removed. However, if the asbestos is in good condition (ie does not pose an immediate health risk) and has a role in maintaining the structural stability of a building it would not be removed until a decision has been reached on the fate of the existing buildings.

SoC 20 commits to undertaking further investigations and the preparation and implementation of a Remediation Action Plan (if required). It should be noted that AMCOR would be required to comply with relevant legislation and guidelines pertaining to contaminated sites and disposal of contaminated material. AMCOR has already engaged a registered Contaminated Site Auditor and is the process of planning further investigations and management plans. AMCOR has also started the removal of asbestos from some buildings on site.

2.9.2 Site Audit Statement – Randwick Council (5m)

As noted above, appropriate legislation and guidelines regarding contaminated sites and their assessment and management would be followed. This would include a Site Audit Statement and Summary Report, if required.

2.10 Hazard

2.10.1 Revised Hazard Assessment – Department of Planning (2A)

A revised Hazard Assessment meeting the requirements of SEPP33 and the Multi-Criteria Hazard Assessment Guidelines has been prepared and is included in Appendix B. Since the previous version of the Hazard Assessment was prepared there has been a rationalisation of existing hazardous goods storages and more information has become available on the types and quantities of hazardous goods that will be used and stored on-site in the New Paper Mill.

Overall the New Paper Mill will result in a reduction in hazards compared to the Existing Paper Mill – and a lower risk than previously reported in the Environmental Assessment.

2.10.2 Bunding and drainage of chemical storage areas – Sydney Water (3j)

As noted in the Environmental Assessment, all chemical and fuel storages would be appropriately bunded and would not drain directly or indirectly to sewer or the stormwater system. SoC: 12 and 13 details AMCOR's commitments in relation to chemical and fuel storage on site.

2.11 Traffic and Parking

2.11.1 Internal traffic and parking design – Randwick Council (5n)

Wherever appropriate the design of site accesses, internal carpark layouts, loading areas and internal circulation areas will meet AS2980.1 and the RTA's *Guide to Traffic Generating Developments*.

2.11.2 Number of Parking Spaces – Randwick Council (5o)

It is recognised the number of car spaces proposed for the New Paper Mill does not meet the Council DCP or RTA policy requirements. It should be noted that the New Paper Mill is a relatively "boutique" development and therefore there are no specific guidelines that are appropriate for this type of industry. The proposed number of car spaces has been based upon estimates of the number of employees, contractors, visitors and maintenance personnel that would typically be present on site at any one time. Further details and justification for the number of car parking spaces would be provided once the detailed design is complete.

2.11.3 Detailed operational traffic study– Randwick Council (5p, 5q)

The Environmental Assessment assessed the impact of increased operational traffic movements on the signalised intersection at AMCOR's site access on Botany Road. This was considered sufficient to address the operational impacts of the New Paper Mill. Randwick Council has requested that a detailed operational traffic study be completed including network modelling. It is not considered necessary to undertake this as:

- Any impacts of increased traffic movements would be on the road system managed by the RTA. The RTA has not requested an operational traffic study.
- The 2002 Annual Average Daily Traffic volume along the section of Botany Rd relevant to the AMCOR site is approximately 20,000 movements per day. Of these 20,000 traffic movements currently only 372 movements are a result of the AMCOR's operations (<2 %). Therefore AMCOR's contribution to traffic movements is extremely low.

- With the New Paper Mill operational traffic movements are predicted to increase by 31 movements per day which is an increase of approximately 0.15% compared to 2002 movements. This is negligible and does not warrant a more detailed assessment;
- The predicted increase in traffic movements associated with the Port Botany Expansion dwarf any increased associated with the New Paper Mill

2.11.4 Heavy vehicle access from McCauley St – Randwick Council (5r)

Currently the McCauley Street entrance to the site is used by vehicles accessing the Engineering store. This includes less than 10 light vehicles and 1 rigid 6-12 tonne truck daily delivering supplies to the Engineering Store. AMCOR proposes to maintain this same level of access from McCauley Street to the New Paper Mill. AMCOR is also considering moving the access from McCauley St further south. This would include closing the access near Australia St and constructing a new access adjacent to Raymond Rd on McCauley St. This would have a number of advantages including increasing the distance between the access and residents, reducing the lendht of road impacted by AMCOR vehicles and aligning the entrance closer to the likely new boundary of AMCOR's land.

During construction AMCOR may require access to and from the site from McCauley Street. This is likely to be during activities that require significant short term traffic movements (eg. Concrete pours) or for loads that are too big to be accommodated by existing access on Botany Road. This access is likely to be via the southern end of McCauley Street near Botany Road and as far as way from residents and businesses as practical. If access from McCauley Street is required, Randwick Council and RTA would be consulted to determine their requirements for access and traffic management, before preparing an appropriate traffic management plan for their approval.

2.11.5 Heavy vehicle routes & No left turn from site into Botany Rd – Randwick Council (5s), Community (11a)

Currently the vast majority of heavy vehicles accessing and leaving the site are from the west via Botany Road as this route provides access the Southern Cross Drive, the M5 and other major roads. Most incoming wastepaper and all outgoing finished product deliveries are from destinations west and north of the Paper Mill site. The only heavy vehicles (< 5 trucks daily) leaving or accessing the site from the east are 2-12 tonne trucks which collect wastepaper from the local area east of the Paper Mill site. It is proposed that this arrangement continue. It is not considered necessary that AMCOR sign agreements to formalise truck routes unless it can be demonstrated that heavy vehicle movements associated with AMCOR's operations are causing a problem.

2.11.6 Use of rail transport – Randwick Council (5t), Nature Conservation Council (7e)

As noted in the Environmental Assessment, rail transport of the finished product is used for some interstate deliveries and this would continue into the future. Wherever practical and economically feasible AMCOR would increase the proportion of finished products delivered interstate by rail.

As the vast majority of AMCOR's NSW customers for finished product are in Liverpool it is not economic (and energy efficient) to deliver the finished product by rail.

As wastepaper is mainly sourced from many locations throughout Sydney, it would not be feasible to organise rail transport to deliver the product to the site.

2.11.7 Construction Traffic Management Plan – Sydney Ports (8b), RTA (16a)

As presented in the Environmental Assessment SoC: 32 commits AMCOR to prepare a Construction Traffic Management Plan to meet the requirements of and in consultation with Randwick Council and the RTA. Sydney Ports Corporation would also be consulted during the preparation as requested in their submission.

2.11.8 Operational Traffic Management Plan – Sydney Ports (8c)

SoC: 33 commits AMCOR to preparing and implementing an Operational Environmental Management Plan – which would also detail traffic management procedures to minimise truck queuing and other traffic impacts. Sydney Ports Corporation would be consulted during the preparation of the plan as requested in their submission.

2.12 Waste Management Plan – Randwick Council (5w)

As presented in the Environmental Assessment, SoC: 31 commits AMCOR to prepare a Construction Waste Management Plan for the approval of the Director- General of the Department of Planning.

SoC: 33 also commits AMCOR to preparing an Operational Environmental Management Plan with operational waste management as one of the issues that will be addressed in the plan.

2.13 Approvals

2.13.1 Section 73 Compliance Certificate – Sydney Water (3k)

SoC No: 9 commits AMCOR to obtaining a Section 73 Compliance Certificate from Sydney Water.

2.14 Utilities

2.14.1 Impact and restoration of utilities – Randwick Council (5u)

AMCOR would undertake appropriate consultation with services providers to determine their design and construction requirements – for both services that require relocation and services for the New Paper Mill. AMCOR would meet all other typical requirements of service providers.

2.14.2 Replacing overhead wires with underground cables- Randwick Council (5v)

The overhead cables along McCauley Street and Botany Road in the vicinity of the New Paper Mill do not service the site, rather they supply power for street lighting and to business and residential properties in the surrounding areas. Therefore AMCOR consider it unreasonable that they should be required to meet any costs associated with the relocation of these cables underground.

Planning and Zoning

2.14.3 Preparation of Masterplan & Excess Land – Randwick Council (5a, 5b), Community (11e)

Apart from selling the land sometime in the future AMCOR has made no decisions regarding the excess land that will be available once the New Paper Mill is fully operational and the Existing Paper Mill is decommissioned. This includes the process for sale, the degree of remediation and demolition to be completed before sale and the likely use of the land. These matters would be determined once the New Paper Mill is fully operational. However, as part of the contract of sale AMCOR would not permit the new land owner to develop the land for residential or other potentially sensitive use (eg. Nursing home) to preserve a buffer between its operations and the nearest residential areas. It is noted that Randwick Council or Department of Planning is unlikely to allow the re-zoning of the excess land from industrial to a residential land zoning.

The final use of the land would be determined by the new land owner and could include either commercial or industrial premises. This would be subject to separate development application processes for the subdivision and for the construction and operation and the new uses. The Environmental Assessment for the New Paper Mill is not seeking to subdivide the site or define potential new uses.

Given the uncertainty about the future use and sale of the excess land it would be premature to prepare a masterplan for the excess land. The most appropriate time for a masterplan would be for any application to subdivide the land to enable sale.

2.14.4 Zoning and Surrounding Land Use – Community (13c), Community (14a)

A number of community submissions suggested that it was inappropriate to have heavy industry in close proximity to residential areas and that the New Paper Mill should be located elsewhere. It

should be noted that paper making has been undertaken at the site for over 100 years and the Botany area contains many other heavy industries.

AMCOR considered a number of other alternative locations for the New Paper Mill (as presented in the Environmental Assessment) and concluded other sites had significant constraints which made them unsuitable mainly in the availability of services or adverse environmental impacts. Also as wastepaper and cardboard collected from the Sydney metropolitan area is the main source of raw product for the New Paper Mill, transport costs and energy use is minimised by locating the New Paper Mill at Botany.

The New Paper Mill would be designed to meet appropriate noise and odour guidelines for residential areas and will significantly improve the amenity of the surrounding residential areas compared to the existing operations.

2.15 Energy

2.15.1 Minimising greenhouse gas emissions – Randwick Council (5z), Nature Conservation Council (7g)

As noted in the Environmental Assessment, there will be an improvement in the energy efficiency of the paper making process, resulting in the New Paper Mill using less energy per unit of paper produced when compared to the Existing Paper Mill. However, it is recognised that the total energy used by the New Paper Mill will be higher than Existing Paper Mill due to the higher production of the New Paper Mill.

Amcor's Paper and Board Division as a member of the Greenhouse Challenge has energy and waste reduction targets supported by action plans in place. Over the last six years substantial improvements in energy efficiency and waste minimisation have delivered significant reductions in greenhouse gas emissions. The New Paper Mill will further enhance the Division's Greenhouse gas emission performance as its energy and waste efficient production will replace less efficient production not only from the Botany site but other interstate sites as well.

Amcor will continue to adopt a holistic approach at Divisional level to ensure the improvement trend is sustained. Opportunities in the packaging supply chain are currently under review. It is also worth noting that recycling paper and board as performed at the botany Mill has significant environmental benefits. Firstly it is diverted from landfill where its degradation would release significant amounts of Greenhouse gases and secondly by replacing virgin pulp it saves significant tracts of forest from being harvested.

Once an economic and legislative framework for Greenhouse gas management in Australia has been developed and implemented Amcor will consider any further measures deemed necessary.

2.16 Visual Impact

2.16.1 Signage details – Randwick Council (5aa)

The Environmental Assessment presented concept visual representations of the exterior of the New Paper Mill including signage. Final signage would be determined in the detailed design phase and comply with Randwick Council and SEPP64 requirements.

2.16.2 Colour Scheme and Materials – Randwick Council (5ab)

The Environmental Assessment presented concept visual representations of the exterior of the New Paper Mill including colour scheme and materials. Final colour scheme and materials would be determined in the detailed design phase and comply with Randwick Council and other relevant requirements.

2.17 General

2.17.1 Employment and economic benefits of New Paper Mill – Randwick Council (5y)

The New Paper Mill will result in economic benefits for the local area and region. This includes additional jobs during construction and indirect employment during operation through site servicing and flow on effects to users of AMCOR's finished product. It should be noted that direct employment at the site will decrease due to increased automation of the paper making process.

2.17.2 Tree Removal – Randwick Council (5ac)

SoC 39: commits AMCOR to preparing a Landscape and Visual Amenity Plan which will detail landscaping features and species, ongoing vegetation and weed management and other aspects relating to vegetation management.

3. Randwick Council's Approval Conditions

Randwick Council in its submission has proposed development approval conditions to be considered by Department of Planning. AMCOR have considered these proposed conditions and in the table below responded to them.

Number	Issue	Yes/No/Modified	Comment
1	Security Deposit of $10000	No	AMCOR is a large multinational company committed to remaining in the area for many decades into the future – and therefore is not a risk of ignoring any obligations or damages
2	Conditions for Refunding Security Deposit	No	See above
3	Notification of Council of obtaining occupation certificate	Yes	None
4	Pre-construction damage survey	Yes	AMCOR intends to undertake this survey in conjunction with Council
5a	Removal of redundant vehicle crossings	Yes	None
5b	Reconstruct – northern most vehicle crossing	Modified	Either the existing access would be maintained and upgraded or a new access would be created just north of finished product building. This would be used to access the site from McCauley St and the other access would be de-commissioned
5c	Kerb and guttering	No	Due to AMCOR's low usage of McCauley St AMCOR does not consider the costs of kerb and guttering in the area should be AMCOR's responsibility
5d	Reconstruction of McCauley St	No	Very few AMCOR related vehicles use McCauley St (<10 light vehicles and 1 12 tonne truck per day). There are other users which impact the road more significantly and therefore it is unfair to impose this condition on AMCOR
5e	Drainage works McCauley St	No	Due to AMCOR's low usage of McCauley St AMCOR does not consider the costs of drainage should be AMCOR's responsibility
5f	Footpath McCauley St	No	There is currently no footpath along this side of McCauley St. If a footpath is constructed it would terminate at Botany Rd where there is no connecting footpath or pedestrian crossing at the traffic lights.
5g	Landscaping	Yes	Landscaping would comply with Councils requirements
6	Restoration of damaged Council footpaths, verges etc	Yes	None
7	Approval under Roads Act	Modified	This would only applied to works in Council

Number	Issue	Yes/No/Modified	Comment
			controlled roads
8	Certification of works in roads and reserves	Modified	This would only applied to Council controlled roads
9	Council's fees	Yes	
10	Design specification for vehicular crossings	Yes	None
11	Heavy vehicles using McCauley St	No	See Section 2 of this document
12	Heavy vehicles using other roads	No	See Section 2 of this document
13	Letters of agreement - construction	No	See Section 2 of this document
14	Letters of agreement - Operation	No	See Section 2 of this document
15	Construction Traffic Management Plan	Yes	
16	Compliance with Construction TMP	Yes	
17	Construction vehicles using McCauley St	No	See Section 2 of this document
18	Number of Parking spaces	Yes	
19	Design Alignment Level	Yes	
20	Design Alignment Level	Yes	
21	Easement identification and relocation	Yes	
22	Public utility impact assessment	Yes	
23	Cost for re-location	Yes	
24	Approval from utility organisations	Yes	
25	Substation location	Yes	
26	Relocation of overhead powerlines	No	See Section 2 of this document
27	Section 73 Compliance Certificate	No	Already statement of commitment
28	Notice of requirements	No	No condition required as part of existing process
29	Notice of requirements - PCA	no	No condition required as part of existing process
30	Section 73 Compliance Certificate - PCA	No	No condition required as part of existing process
31-38	Flooding	Yes – but modified	See Section 2 of this document
39-59	Stormwater system design	Yes –but modified	AMCOR would meet Randwick Council's requirements as detailed in these conditions, however, does not believe all conditions need

Number	Issue	Yes/No/Modified	Comment
			to included in Conditions of Approval
60	Discharge of stormwater to sewer	No	Alternative plans for stormwater
61	Waste management plan	No	Already Statement of Commitment
62	Waste management	No	Already Statement of Commitment
63	Removal of trees	Yes	
64	Preservation of trees	Yes	
65	Tree management plan	No	Already Statement of Commitment
66	Weed management	No	Already Statement of Commitment
67		No	Repeat of previous conditions

4. Revised Statement of Commitments

GENERAL

1) Development will be carried out generally as described in *New Paper Mill Project B9, Environmental Assessment*, prepared by Sinclair Knight Merz and dated December 2006;

2) The Applicant will notify the Director-General, Council and the DEC of the events listed under a) to d) below. Notification will be in writing and received at least two weeks prior to the particular event.

   a) commencement of the demolition period;

   b) commencement of the construction period. In the event that construction is staged and/ or subject to multiple Construction Certificates, notification will be undertaken at the commencement of each stage and/ or Certificate;

   c) commencement of the transition period; and

   d) commencement of the operation period.

PRODUCTION LIMIT

3) At no time will more than one of the existing paper-making machines (No.7 and No. 8) be commercially operated concurrently with the new paper mill. For the purpose of this condition, "operated" will be defined as any activity involving either the existing No. 7 or No. 8 paper-making machine that results in the production, or intended production, of paper or paper products from that machine.

4) The production capacity of the new paper mill will be limited to approximately 345,000 tonnes per annum of finished product. For the purpose of this condition, "approximately" will be within 15% of 345,000 tonnes per annum, subject to compliance with environmental parameters specified in this approval and/ or any Environment Protection Licence for the new paper mill.

DEMOLITION

5) All demolition works undertaken on the site will be conducted in accordance with the provisions of *AS2601-1991 The Demolition of Structures*, as in force at 1 July, 1993.

6) All demolition activities involving asbestos will be carried out in accordance with the relevant WorkCover Guidelines and Clause 42 of the Protection of the Environmental Operations (Waste) Regulation 2005.

Elevation of Structures

7) Prior to the commencement of the construction period and as required, the Applicant will obtain the written approval of the Sydney Airports Corporation Limited for all temporary and permanent structures associated with the new paper mill and requiring approval under the *Civil*

Aviation (Buildings Control) Regulations. The Applicant will submit to the Director-General, a copy of the written approval of SACL for these structures within 14 days of receiving the approval.

SERVICES

8) Prior to the commencement of the construction period, the Applicant will obtain written evidence that satisfactory arrangements have been made with the relevant energy, water, sewerage, gas and telephone service authorities for the provision of relevant utilities to the new paper mill.

Trade Waste and Sewer Access

9) The Applicant will obtain a Section 73 Compliance Certificate from SWC under the *Sydney Water Act 1994*. In seeking the Compliance Certificate, the Applicant will supply to SWC all information necessary for SWC to assess the impacts of the New Paper Mill on SWC's infrastructure.

10) AMCOR would enter into negotiations with Sydney Water to increase the availability of the SWSOOS to receive wastewater discharges in wet weather. This would include investigating other on-site management measures to eliminate untreated process water discharges to Botany Bay;

11) The New Paper Mill would be designed and operated to meet the requirements of Section 120 of the Protection of the Environment Operations Act.

HAZARDS MANAGEMENT

12) Impervious bunds will be constructed around all stores of dangerous goods on the site. Bunds will be designed and installed in accordance with the DEC's Environment Protection Manual Technical Bulletin – Bunding and Spill Management" and with relevant Australian Standards.

13) In relation to dangerous goods, the New Paper Mill will comply with the requirements of the *Occupational Health and Safety Act 2000*, as administered by WorkCover NSW, and if necessary be licensed under that Act.

NOISE MANAGEMENT

14) Construction and demolition activities associated with the new paper mill that are likely to cause an audible noise impact on any residential property will only be conducted during normal construction hours, namely:

    a) 7:00 am to 6:00 pm, Mondays to Fridays inclusive;

    b) 8:00 am to 1:00 pm on Saturdays;

    c) at no time on Sundays or Public Holidays.

Construction and demolition activities associated with the new paper mill that do not cause an audible noise impact on any residential property may be conducted at any time.

15) Delivery of materials required for construction and demolition activities associated with the new paper mill are permitted outside normal construction hours provided:
    a) the delivery of material is required by police or other relevant authority for safety reasons; and/ or
    b) the operation or personnel or equipment of the new and/ or existing paper mill is endangered.

    Should a) and/ or b) be applicable, the Applicant will undertake to notify the DEC and affected residents of the delivery prior to the event. Should a delivery be required in the case of an emergency, the Applicant will undertake to notify the DEC and affected residents within a reasonable period.

16) Audible construction and demolition activities outside normal construction hours may only be varied with the prior written approval of DEC.

17) The New Paper Mill would be designed and operated to meet the following noise limits at all sensitive receivers:
    a) Daytime (7am-6pm Mon to Sat and 8am-6pm Sunday & Public Holidays) = LA_{eq} 46 dB(A)
    b) Evening (6pm-10pm) = LA_{eq} 39 dB(A)
    c) Night (At all other times except daytime and evening) = LA_{eq} 38 dB(A)

ODOUR MANAGEMENT

18) The New Paper Mill would be designed and operated to not cause the emission of offensive odours from the premises and meet the requirements of Section 129 (1) of the Protection of the Environment Operations Act

19) If, after the New Paper Mill was to become operational, offensive odours were found to be emitted, AMCOR would investigate the source and cause of the offensive odours and implement reasonable and feasible mitigation measures to reduce the impacts to acceptable levels. These mitigation measures may include:
    a) Reviewing and modifying operational processes and procedures;
    b) Reviewing and modifying water management processes;
    c) Modification of site infrastructure including stacks heights, exhaust flows and water management systems;
    d) Reviewing and implementing any new proven effective technology.

CONTAMINATION

20) Before construction commences, further investigations will be undertaken to clearly identify the type and extent of any soil contamination. If required a Remediation Action Plan would be prepared and implemented.

HERITAGE

21) An appropriately qualified archaeologist will be present on site when bulk excavations are occurring to identify any unknown indigenous heritage sites or relics.

22) Archival recording of heritage structures and site associations as recommended in the heritage assessment will be undertaken prior to demolition.

23) In the event that an Aboriginal relic is uncovered on the site, all activities in the vicinity of the relic will cease and the Applicant will notify the Department of Environment and Conservation immediately. Where applicable, relevant guidelines and requirements of legislation would be complied with.

24) In the event that any unknown non-indigenous relic is uncovered on the site at any time, all activities in the vicinity of the relic will cease and the Applicant will notify the Heritage Office immediately. Where applicable, relevant guidelines and requirements of legislation would be complied with.

GROUNDWATER

25) A control system on the groundwater bores at Snape Park will be installed to control groundwater extraction rates in relation to the New Paper Mill water requirements and to minimise overall groundwater extraction.

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

26) The Applicant will prepare and submit for the approval of the Director-General a Construction Environmental Management Plan at least a month before demolition commences. The CEMP would be prepared in consultation with DEC and Council and address issues, impacts and mitigation measures associated with demolition and construction. The CEMP would be prepared in accordance with *Guideline for the Preparation of Environmental Management Plans* (DIPNR 2004)

Construction Noise Management Plan

27) At least a month before demolition commences the Applicant will prepare and submit for the approval of the Director-General, a Construction Noise Management Plan. The Plan will include:

    a) identification of potentially noise-affected properties and applicable noise goals for those properties;

    b) best management practices and mitigation measures;

c) performance goals for the site with regard to noise emissions during the construction period;

d) details of noise-producing equipment to be employed on the site, including equipment noise levels;

e) measures to be employed to minimise noise emissions and noise impacts, demonstrating best practice in design, operation and maintenance of equipment;

f) a program to monitor noise emissions from the site, and methods to be employed to monitor noise emissions;

g) details of procedures to receive community complaints in relation to noise impacts, and

h) contingency measures to deal with incidents when exceedences of noise limits have occurred, or noise complaints have been received.

Construction Dust Management Plan

28) At least a month before demolition commences the Applicant will prepare and submit for the approval of the Director-General, a Construction Dust Management Plan. The Plan will:

a) be prepared and implemented with an aim to minimise, so far as practical, air quality impacts on surrounding land uses during construction*;*

b) identify existing and potential sources of dust and specification of appropriate monitoring intervals and locations.;

c) detail measures to minimise the generation of dust;

d) contain actions to ameliorate impacts if they exceed the relevant criteria; and

e) contain details of a reactive management system intended to reduce the day-to-day impacts of dust.

Construction Soil and Water Management Plan

29) At least a month before demolition commences the Applicant will prepare and submit for the approval of the Director-General, a Soil and Water Management Plan. The Plan will :

a) be prepared in accordance with the Department of Housing's publication *Managing Urban Stormwater: Soils and Construction*; and

b) detail measures to be employed during the demolition and construction periods to minimise soil erosion and prevent sediment from the site polluting lands and/ or waters;

c) identify the potential for, and mitigation measures against, erosion and sedimentation associated with the transition and operation periods;

30) In the event that dewatering is to occur on the site, the Applicant will apply to DNR for any necessary licence or approval, and will meet any reasonable requirement of DNR in this respect.

Construction Waste Management Plan

31) At least a month before demolition commences the Applicant will prepare and submit for the approval of the Director-General a Construction Waste Management Plan. The Plan will :

a) be prepared and implemented with an aim to detail measures to minimise the production and impact of waste produced at the new paper mill during the demolition and construction, through the implementation of waste reduction, reuse and recycling principles;

b) identify types and quantities of waste materials produced on the site during the demolition and construction;

c) detail programs aimed at minimising the production of waste at the site through the implementation of management measures;

d) details of potential reuse and recycling avenues for waste materials produced on the site, including collection and handling procedures;

e) details of appropriate disposal routes in the event that reuse and recycling avenues are not available or are not practicable; and

f) detail programs for involving and encourage employees and contractors to minimise domestic waste production on the site and reuse/ recycle where appropriate.

Construction Traffic Management Plan

32) The Applicant will prepare for the approval of the Director-General (and in consultation with Sydney Ports, Council and RTA) a Construction Traffic Management Plan. The plan would be submitted at least a month before demolition commences.

OPERATIONAL ENVIRONMENTAL MANAGEMENT PLAN

33) The Applicant will prepare and submit for the approval of the Director-General an Operational Environmental Management Plan (OEMP) at least a month before commissioning of the New Paper Mill commences. The OEMP would be prepared in consultation with DEC, Randwick Council and Sydney Ports (where appropriate) and address issues, impacts and mitigation measures associated with commissioning, transition and operation of the New Paper Mill. The OEMP would be prepared in accordance with *Guideline for the Preparation of Environmental Management Plans* (DIPNR 2004). The OEMP would detail management measures for the following environmental aspects:

a) Noise

b) Waste

c) Stormwater and Process Water

d) Heritage

e) Traffic

f) Air Quality

g) Groundwater

h) Chemicals and fuels

Operational Air Quality Management Plan

34) The Applicant will prepare and submit for the approval of the Director-General an Air Quality Management Plan at least a month before construction of the paper machine building commences. The Plan will :

a) be prepared and implemented with an aim to minimise, so far as practical, air quality impacts on surrounding land uses during the transition and operation periods of the new paper mill;

b) identify existing and potential sources of dust and odours .

c) include an air quality monitoring plan prepared in accordance with the DEC's publication *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*. This will include:

I. ongoing performance assessments and validation of no offensive odours; and

II. a full odour emissions survey to confirm that during the Transition phase odour impacts would not be greater than the combined operation of existing B7 and B8 machines or a fully operational B9 (whichever is greater).

III. a full odour emissions survey once the New Paper is full operational to confirm the odour emission predictions

d) include actions to ameliorate impacts if they exceed the relevant criteria;

e) include design of a reactive management system intended to reduce the day-to-day impacts of dust and odours as a result of activities associated with the new paper mill;

f) include the establishment and operation of a meteorological station complying with the *Approved methods for sampling and analysis* and the *Australian Standard AS2923- 1987*, at the site. The meteorological station will provide measurements including wind speed, wind direction, temperature and variability of wind direction to be monitored continuously.

Operational Water Management Plan

35) The Applicant will prepare a Water Management Plan in consultation with Randwick Council, Sydney Water and Sydney Port (where appropriate) for the approval of the Director-General. The Water Management Plan would be submitted at least a month before construction commences. The Water Management Plan will consider:

a) Stormwater Management including

1) details of all catchment areas within the site, including potential sources of water pollution within each catchment, treatment and/ or discharge points for each catchment and a water quality testing regime for each catchment, if appropriate;
2) calculations, designs and plans for all stormwater systems, including pipes, drainage lines, screens and flow-balancing devices with clear justification of each system's ability to effectively handle stormwater under all likely conditions;
3) measures to segregate stormwater draining from different areas of the site, depending on the quality and treatment requirements (if any) of the water;
4) measures to prevent uncontrolled run-off (where permissible) from the site impacting on surrounding land uses;

b) Process Water Management, including
1) details of how site water consumption will be minimised through water reuse and recycling;
2) details of all process water treatment systems for the new paper mill, including programs for the maintenance of the systems and water quality monitoring regimes, where appropriate.

Landscape and Visual Amenity Management Plan

36) The Applicant will prepare in consultation with Council and submit for the approval of the Director-General a Landscape and Visual Amenity Management Plan. The Plan would be submitted at least a month before construction of the paper machine building commences. The Plan will detail measures to minimise the impacts of the new paper mill on local visual amenity and will consider :

a) Landscape Management, including:
1) details of all landscaping to be undertaken on the site, including flora species, location of grassed areas, garden beds and other vegetated areas, and mature height and width measurements for all flora species;
2) details of the maximisation of flora species endemic to the locality in landscaping the site;
3) measures to prevent vehicle encroachment onto landscaped areas;
4) a program to ensure that all landscaped areas on the site are maintained in a tidy, healthy state and that the appearance of landscaped areas is comparable to the design intention for those areas.

b) Visual Amenity Management, including:
1) colours, materials, architectural features and finishes of all external surfaces on the site, and how these will be compatible with adjacent development to maintain the integrity and amenity of the building and streetscape;

2) a program to ensure that the appearance of the site is maintained to a standard comparable to the intended and designed appearance of the site;

3) signage

Community Liaison Group

37) The Applicant will continue to liaise with the Botany Mill Community Liaison Group (CLG) on matters affecting the local community, compliance with conditions of this consent and the environmental performance of the new paper mill. The Applicant will make provision for meeting facilities and other reasonable expenses of the CLG. The Applicant will take minutes of each CLG meeting and submit a copy of those minutes to DEC with its regular reporting under its Environmental Protection Licence and will provide a copy to the Director-General and Council on request.

38) A Community Liaison Plan would be prepared in consultation with the Botany Mill CLG (with a copy being provided to the Director-General) to detail consultation and communication activities and strategies to inform and consult the community on the demolition, construction and initial operation of the New Paper Mill.

Complaints Procedure

39) Prior to the commencement of the demolition period, the Applicant will ensure that the following are available for community complaints:

a) a telephone number on which complaints about the new paper mill can be registered; and

b) a postal address where written complaints may be lodged.

The Applicant will meet the requirements for complaints handling as detailed in the EPL for the facility. The Complaints Register will be made available at any time for inspection by the Director-General, the DEC or Council.

Environmental Representative

40) Prior to the demolition period, the Applicant will nominate at least one Environmental Representative who will be:

a) responsible for all Management Plans required under this consent;

b) responsible for considering and advising on matters specified in the conditions of this consent, and compliance with such matters;

c) responsible for receiving and responding to complaints;

d) required to facilitate an induction and training program for all persons involved with the construction and operation of the new paper mill; and

e) given the authority and independence to require reasonable steps to be taken to avoid or minimise unintended or adverse environmental impacts, and failing the effectiveness of such steps, to stop work immediately if an adverse impact on the environment is likely to occur.

The Applicant will notify the Director-General of the name(s) and contact details of the Environmental Representative (s) upon appointment, and any changes to that appointment.

New Conditions

41) An assessment of the sustainability of AMCOR's groundwater extraction at Snape Park would be undertaken to the satisfaction of the Department of Natural Resources.

42) All redundant chemical storage facilities and underground storage tanks would be decommissioned and remediated (if required).

Appendix A – Revised Hazard Assessment

Proposed New Paper Mill Botany

PRELIMINARY HAZARD ANALYSIS

- Final Draft, Rev02
- 4 April 2007

Proposed New Paper Mill
Botany

PRELIMINARY HAZARD ANALYSIS

- Final Draft, Rev02
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Contents

1. Introduction

1.1 Background

AMCOR Packaging proposes to construct and operate a new paper making facility (referred to as the New Paper Mill), which uses 100% recycled waste paper, at their Botany site in Sydney, NSW. The New Paper Mill would replace the two existing 1960s vintage papermaking machines at the site, with a single machine, incorporating modern technology.

The upgrade to the proposed New Paper Mill will require changes to the type and quantities of chemicals stored and handled at the site. An initial screening level assessment of the proposed guidelines of DG associated with the New Paper Mill indicated that screening level thresholds (as defined in SEPP33) were exceeded and, hence, it is necessary to perform a Preliminary Hazard Analysis for the facility.

Amcor has commissioned Sinclair Knight Merz to conduct the PHA study and to report on the study findings, incorporating any recommendations so that Amcor can implement these prior to commencement of operations with the new products.

This document reports on the results of the PHA study conducted for the proposed DG storages, including design, handling and operations at Botany, NSW.

1.2 Objectives

The objectives of the study are to:

- Prepare a Preliminary Hazard Analysis (PHA) for the proposed New Paper Mill at Botany, NSW, in accordance with Hazardous Industry Planning Advisory Paper (HIPAP) No.6 – Hazard Analysis Guidelines (Ref.1); and
- provide a report on the results of the PHA study for submission to the regulatory authority in support of the Environmental Assessment.

1.3 Scope of Work

The scope of work is to conduct a PHA of the proposed New Paper Mill at Botany, NSW, in accordance with HIPAP No.6 to demonstrate that the facility is potentially hazardous and not hazardous in accordance with the requirements of SEPP 33 and land use safety planning requirements. The study does not include the assessment of any other Amcor Paper Mill facilities.

2. Methodology

2.1 SEPP33 Application

SEPP33 has been established to determine whether facilities storing and handling dangerous goods have the potential to be hazardous or offensive. A screening method has been developed and is presented in the document "Applying SEPP33" (Ref.2). To determine whether SEPP33 is applicable, the storage of Class 8 Corrosive liquids has been selected as an example.

It is proposed to store in the order of about 100,000L of class 8, packaging group II corrosive liquids at the New Paper Mill building. These goods will be stored in two dedicated chemical storage areas located outside the proposed new mill. Table 3 from the document "Applying SEPP33" lists the screening threshold for Class 8 liquids which for packaging group II liquids is 25,000L. The proposed storage quantity (100,000L), is above the threshold, hence the SEPP33 applies to the site and a PHA is required to determine whether the site remains as potentially hazardous considering the proposed safety features at the site.

- **Table 2-1 Summary of Dangerous Goods during Operation of New Paper Mill**

Dangerous Good Class and type	Packing Class	Maximum quantity for New Paper Mill Operation	SEPP 33 Screening Level	Above SEPP 33 Screening Level
2.1 (LPG)	N/A	6,775L	16,000 L	No
2.1 (Acetylene)	N/A	1,000kg	1000 m^3	No
2.2	N/A	100 L	Not Hazardous by SEPP33	No
3	III	1,600 L	> 1,000,000 L	No
6.1 (b)	III	80 kg	2500 L	No
8	II	105,000 L	25 000 L	Yes
C1	N/A	40,000 L	None	No
C2	N/A	100,000 L	None	No

2.2 Multi Level Risk Assessment

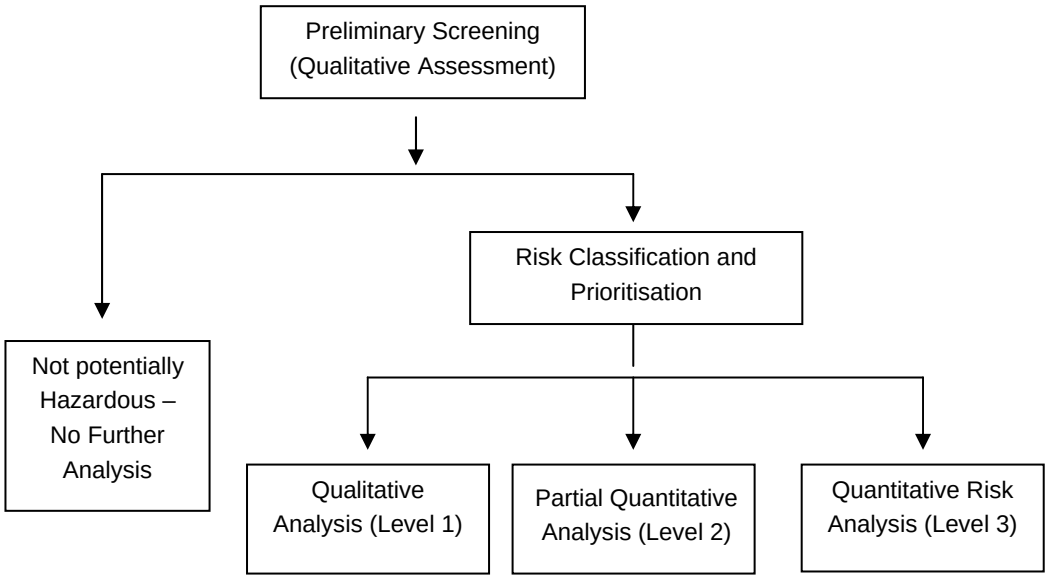
The Department of Planning (DoP) Multi Level Risk Assessment (Ref.3) approach was used for the SEPP 33 study of the proposed New Paper Mill and associated chemical storage areas at Botany , NSW. The approach considered the development in the context of its location, the quantity and type (i.e. hazardous nature) of dangerous goods stored and used, and its technical and safety management control. The Multi Level Risk Assessment Guidelines are intended to assist industry, consultants and the consent authorities to carry out and evaluate risk assessments at an appropriate level for the facility being studied.

The Multi Level Risk Assessment approach is summarised in **Figure 2-1**. There are three levels of assessment, depending on the outcome of preliminary screening. These are:

- **Level 1** – **Qualitative Analysis**, primarily based on the hazard identification techniques and qualitative risk assessment of consequences, frequency and risk;
- **Level 2** – **Partially Quantitative Analysis**, using hazard identification and the focused quantification of key potential offsite risks; and
- **Level 3** – **Quantitative Risk Analysis (QRA)**, based on the full detailed quantification of risks, consistent with Hazardous Industry Planning Advisory Paper No.6 – Guidelines for Hazard Analysis (Ref. 1).

Figure 2-1

THE MULTI LEVEL RISK ASSESSMENT APPROACH



The "Applying SEPP 33" (Ref.2) guideline may also be used to assist in the selection of the appropriate level of assessment. This guideline states the following:

"It is considered that a qualitative PHA may be sufficient in the following circumstances:

- *where materials are relatively non-hazardous (for example corrosive substances and some classes of flammables);*
- *where the quantity of materials used are relatively small;*

- *where the technical and management safeguards are self-evident and readily implemented; and*
- *where the surrounding land uses are relatively non-sensitive.*

In these cases, it may be appropriate for a PHA to be relatively simple. Such a PHA should:

- *identify the types and quantities of all dangerous goods to be stored and used;*
- *describe the storage/processing activities that will involve these materials;*
- *identify accident scenarios and hazardous incidents that could occur (in some cases, it would also be appropriate to include consequence distances for hazardous events);*
- *consider surrounding land uses (identify any nearby uses of particular sensitivity); and*
- *identify safeguards that can be adopted (including technical, operational and organisational), and assess their adequacy (having regards to the above matters).*

A sound qualitative PHA which addresses the above matters could, for some proposals, provide the consent authority with sufficient information to form a judgement about the level of risk involved in a particular proposal".

The proposed DG stores at the site will store a range of products including corrosives, toxic substances and flammable liquids. Hence, a qualitative assessment is not considered adequate for this site. However, as there are a number of corrosive materials stored, and as bunding is provided for all DG depots on site, it is considered that a semi-quantitative approach would be best suited to this study. Hence, the following approach has been applied:

- **New Paper Mill Operations Description** – the main concepts of the operation of the proposed New Paper Mill was discussed with the Amcor. The general operational principles of the manufacturing process and storage areas for the New Paper Mill, including the DG storages were described and recorded for inclusion in the report. This is a key component of understanding hazards and risks associated with the site operations.
- **Hazard Identification** – from the description provided by the Amcor site contacts, a hazard analysis was conducted. This included an assessment of methods by which loss of control of plant and storage operations could take place, based on available information. Where incidents were identified to have the potential to impact offsite areas, the incident was carried forward for further analysis (consequences). Those incidents identified to have no impact beyond the immediate plant area were not carried forward for further analysis.
- **Consequence Analysis** – Those incidents identified to have a potential to impact offsite were carried forward from the hazard identification to consequence analysis. Each incident was discussed with the site operators to determine the details of the potential incident impacts and

the safeguards employed to mitigate incident consequences. The results of loss of control were also discussed with the site staff to determine the consequences of these incidents. Those incidents identified to have a detrimental impact on the surrounding areas and land uses (adjacent sites) were carried forward to the risk assessment component of the study. Where no offsite impact was identified, the incident was eliminated from further analysis.

- **Frequency Analysis** – each incident carried forward for risk assessment was subjected first to a frequency analysis, including a human factors assessment. The modelling was performed using fault end event tree analysis. Incident frequency data was obtained from failure frequency data bases and combined in the fault and event trees to reach an overall incident frequency. The resultant incident frequency was carried forward to the risk analysis component of the study.

- **Risk Assessment** – the incident consequence and frequency analysis results were combined to determine the frequency of each offsite incident at the Amcor site. The results of the analysis were compared to the criteria issued by the regulator (DoP) and Hazardous Industry Planning Advisory paper No.4 (Ref.10) to determine whether such criteria were exceeded.

- **Reporting** – on completion of the assessment a draft report was developed and submitted to Amcor facility management for review to ensure all points of fact were correct in the document. The report was corrected for points of fact error and a final report issued for submission to Department of Planning.

3. Description of the Existing and Proposed Operations at the Site

3.1 Land Use

The Amcor site is located at Botany Road, Matraville, NSW. The proposed land is zoned 4(a) industrial and the proposed facility is permitted in this zoning providing the facility is not classified as "Hazardous or Offensive". The surrounding area is characterised by industrial and commercial facilities and residential as follows:

- **West** –Commercial offices on the western side of McCauley Street and Light Industrial /warehousing facilities;
- **South** –Botany Road and Port Botany. The closest site is the CTAL Container Terminal a containers storage facility. Other uses (>300m away) include Bulk Liquids Storage Area, the P&O Container Terminal, and Patrick Container Terminal (Australian Stevedore) are located to the south and south-east
- **East and north east**: Residential.

An Aerial photograph showing the site and the surrounds is shown on **Figure 3-1.** The closest zoned residential area is located to the north and east of the site, off Australia Avenue, Partanna Avenue, Moorina Avenue, Murrabin Avenue and McCauley Street. The nearest residences, located off Partanna Avenue and Australia Avenue, are approximately 30-50 m from the mill boundary.

3.2 General Site Characteristics and Operations

The facility is located on a 15.5 hectare site within the Matraville industrial area owned by AMCOR. The site is bounded to the south by Botany Road, to the north by Australia Avenue, to the west by McCauley Street, and extends east to the end of Partanna Avenue.

The facility at Botany Paper making operations on AMCOR's Botany site commenced in 1901 with Federal Paper Mills' construction of No. 1 machine. A further 7 paper making machines were added progressively during the next 70 years, accompanied by various building expansion works and decommissioning of older machines. AMCOR Packaging now operates the paper making facility at Botany, where the majority of paper making activities occur towards the eastern end of the site at the No. 7 and No. 8 paper making machines.

The site is currently occupied by the following:

- Paper mill on the northeastern side of the site (between Botany Rd. and Partanna Ave.), which consists of No. 7 and No. 8 machines
- Waste paper treatment plant in the centre of the site

- Waste paper storage area in the centre of the site
- Auxiliary operations on the north western corner of the site.
- Derelict buildings on the west and south western corner of the site

Fire pumps/tanks and fire fighting equipment control facilities are located throughout the site.

The facility operates 24 hours a day, seven days per week, 363 days per year. The facility operates three shifts in general.

3.3 Manufacturing Process and Operations

The paper making process involves re-processing of waste paper to produce paper and board for conversion to corrugated boxes. The general process involves

- pulping of the paper in water to separate the waste paper into fibres in a slurry mix,
- separation of contaminants from the fibre slurry mix
- Screening of the slurry mix to remove other contaminants
- Separation of the fibres into “Long” and “Short” fibres.
- Intermediate storage of fibres based on size
- Spreading of the clean fibre slurry onto a porous mesh to drain off water and create a paper web
- Roll pressing of the paper web to remove further water
- Passing over steam heated metal rollers to remove more water
- Addition of starch and final water removal
- Winding and finishing

Figure 3-1
BOTANY MILL AND SURROUNDS

3.3.1 Existing Chemical Storage Areas

Table 3-1: Existing Dangerous Goods

No	Depot Type	Goods	Class	UN No	PG	Capacity /Max quantity (Litres unless otherwise stated)	Typical Quantity Litres unless otherwise stated	Approx Distance to Nearest Residence (m)
TNK 1	Above ground tank	Potassium Hydroxide Solution (Prestige Fb9090)	8	1814	II	2500 L		175
TNK 2	Process vessel	Hypochlorite Solution	8	1791	II	1500 L		269
TNK 4	Above ground tank	Sodium Hydroxide Solution	8	1824	II	600 L		160
TNK 5	Above ground tank	Hypochlorite Solution	8	1791	II	1500 L		374
TNK 6	Above ground tank	Sodium Hydroxide Solution	8	1824	II	13000 L		125
TNK 7	Process vessel	Hypochlorite Solution	8	1791	II	4000 L		245
TNK 9	Tank (IBC)	Ammonium Persulphate	5.1	1444	III	4000 L		265
TNK 10	Above ground tank	Sodium Hydroxide Solution	8	1824	II	2000 L		243
TNK 11	Above ground tank	Sodium Hydroxide Solution	8	1824	II	5000 L		277
TNK12	Above ground tank	Combustible Liquid	C1	00C1	N/A	15000L		146
TNK 14	Tank (IBC)	Potassium Hydroxide Solution (Prestige Fb9090)	8	1814	II	1500 L		110
TNK 15	Above ground tank	Ammonium Persulphate	5.1	1444	III	3000 L		200
TNK 16	Above ground tank	Sodium Hydroxide Solution	8	1824	II	21000 L		187
TNK 17	Above ground tank	Flammable Liquid Corrosive Nos (C35)	3	2924	N/A	800 L		75
TNK 18	Above ground tank	Sulfuric Acid	8	1830	II	4600 L		150
TNK 19	Tank (IBC)	Sodium Hydroxide Solution	8	1824	II	1500 L		150
TNK 20	Above ground tank	Sodium Hydroxide Solution	8	1824	II	1500 L		150
TNK21	Above ground tank	Sodium Hydroxide Solution	8	1824	II	1000 L		100
LPG	Above ground tank	Petroleum Gases,Liquified	2.1	1075	N/A	6773L		100

No	Depot Type	Goods	Class	UN No	PG	Capacity /Max quantity (Litres unless otherwise stated)	Typical Quantity Litres unless otherwise stated	Approx Distance to Nearest Residence (m)
OIL1	Above ground tank	Combustible Liquid – Exempt	C2	00C2	N/A	13500L		170
OIL2	Above ground tank	Combustible Liquid – Exempt	C2	00C2	N/A	18000L		250
	Above ground tank	Combustible Liquid	C1	00C1	N/A	20000 L		118
STR1	Roofed Store	Sodium Hydroxide Solution	8	1824	N/A	30000L	3900kg	153
STR2	Roofed Store	Flammable Liquid Corrosive Nos	8	2924	N/A	30000L	600L	288
STR2	Roofed Store	Degreaser	6.1	2588	III		80kg*	288
STR2	Roofed Store	Sodium Hydroxide Solution	C2	1824	II		425kg	103
STR2	Roofed Store	Potassium Hydroxide Solution	C2	1814	II		7800kg	228
CYL1	Cylinder Store	Oxygen, Compressed	2.2	1072	N/A	120M^3	40M^3	60
CYL1	Cylinder Store	Rare Gases And Oxygen Mixture,Compressed	2.2	1981	N/A		40M^3	60
CYL2	Cylinder Store	Acetylene, Dissolved	2.1	1001	N/A	1650KG	50M^3	60
CYL2	Cylinder Store	Petroleum Gases, Liquefied	2.1	1075	N/A		100kg	60
OIL3	Underground tank	Exempt - Storage Area Liquids C1	C1		N/A	5000L	5000L	175
OIL 4	Underground tank	Exempt - Storage Area Combustible Liquid 2	C1	00CS	N/A	40000L	20000L	175
OIL 5	Above ground tank	Exempt - Storage Area Combustible Liquid 2	8	00C2	N/A	2000L	1500L	138

*Note: Since the previous PHA was prepared AMCOR has undergone a significant rationalisation of its chemical use and storages. This includes ceasing the use of Class 6.1 biocides for water treatment. Consequently the volume of Class 6 substances stored on site has reduced significantly from over 30000L to 80kg.

A summary of the total amount of dangerous goods currently stored on the site is presented in **Table 3-2.**

Table 3-2: Summary of Existing Dangerous Goods Storage on the site

Class	Packing	Maximum Quantity
2.1	N/A	1650kg
2.1	N/A	6773L
2.2	N/A	120M^3
3	N/A	1600L
5	III	7000L
6.1	N/A	80kg
8	II	91000L
8	II	8225kg
C1	N/A	40000L
C2	N/A	73500L

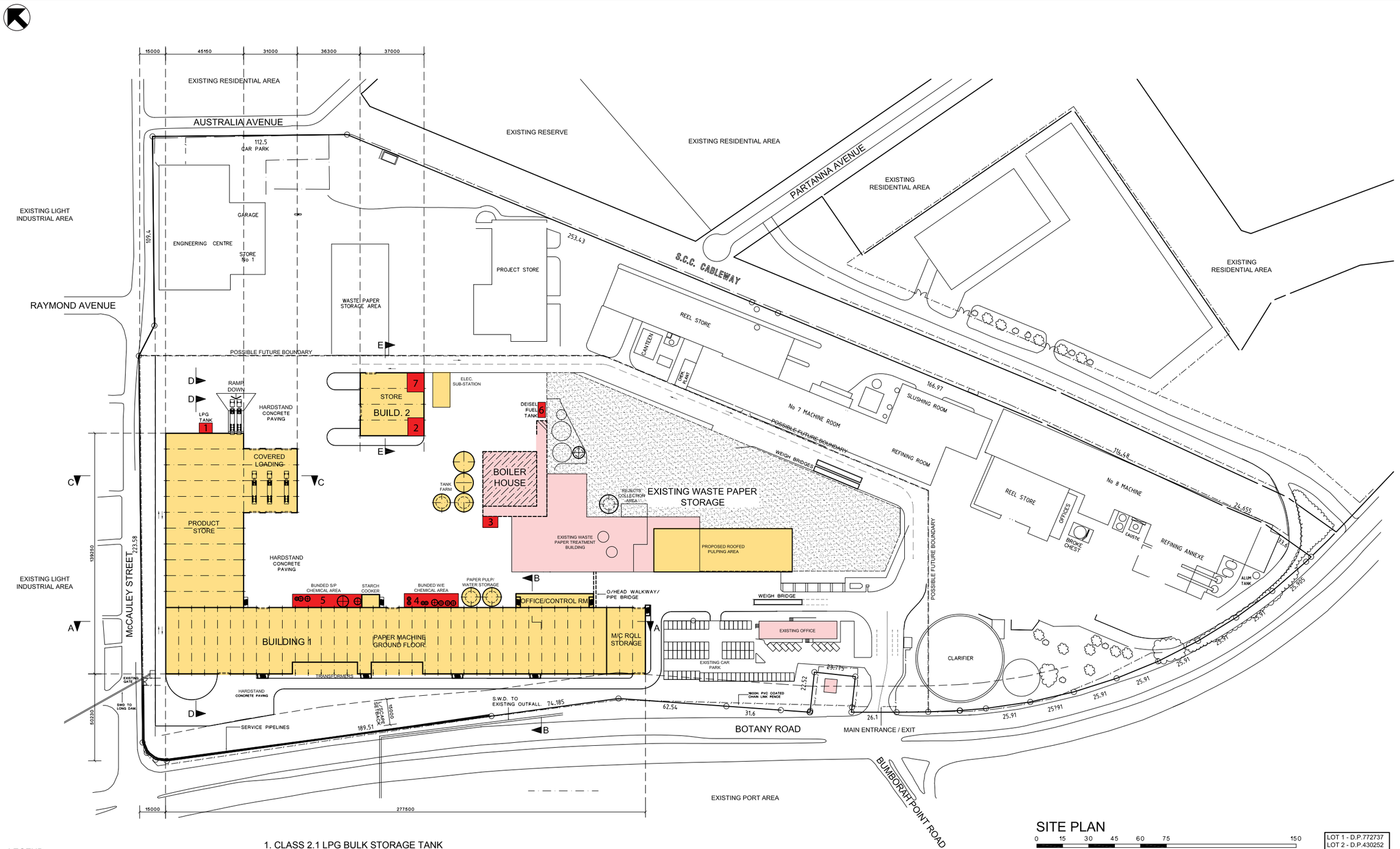
3.4 Proposed New Mill

3.4.1 Overview of Manufacturing Operations for New Mill

The New Paper Mill would be located within the existing AMCOR site, along the southern boundary, in the western corner (See **Figure 3-2**). This area is currently occupied by derelict buildings and derelict and active service infrastructure. This location would place the proposed New Paper Mill furthest away from residential development. The buildings would be set back 15m from the site boundary along McCauley Street and between 15m and 45m from site boundary along Botany Road.

\The overall paper making process at the New Paper Mill would be similar to the existing process used at the Botany site. However there will be additional sub processes and significant technological improvements.

The New Paper Machine would be located within a largely enclosed building having a footprint approximately 275 m long by 40 m wide.



LEGEND:

- EXISTING BUILDING/STRUCTURE REMAINING OPERATIONAL
- PROPOSED BUILDING
- PROPOSED DANGEROUS GOODS STORAGE

1. CLASS 2.1 LPG BULK STORAGE TANK
2. CLASS 2.1 (ACETYLENE) AND CLASS 2.2 (COMPRESSED GASES) CYLINDER STORAGE
3. CLASS 3 (MORPHOLINE) 1600L BULK TANK
4. CLASS 8 (SODIUM HYDROXIDE) BULK STORAGE & CLASS 6.1(b) (BIOCIDE) DRUM STORAGE
5. CLASS 8 (SODIUM HYPOCHLORITE & CAUSTIC LIQUIDS) BULK STORAGE
6. CLASS C1 (DIESEL) ABOVE GROUND BULK STORAGE TANKS
7. CLASS C2 (OILS AND GREASES) DRUM STORAGE

SITE PLAN

0 15 30 45 60 75 150

SCALE IN METRES (1:750)

NOTE: REFER TO LANDSCAPE PLAN PREPARED BY TAYLOR BRAMMAR LANDSCAPE ARCHITECTS PTY.LTD. FOR FULL DETAILS OF PROPOSED LANDSCAPING.

LOT 1 - D.P.772737
LOT 2 - D.P.430252
LOT 13 - D.P.236739
LOT 27 - D.P.236738
LOT 1 - D.P.182378
LOT 28 - D.P.236738
LOT 33 - D.P.236738
LOT 1 - D.P.363611

Figure 3-2
NEW PAPER MILL - DANGEROUS GOODS STORAGE AREA

3.4.2 Auxiliary Buildings & Infrastructure

Additionally the following infrastructure would be constructed:

- Finished Product Store and Despatch Area;
- Underground Services Infrastructure including water pipes, gas mains, electricity conduits, sewers and stormwater systems;
- Electricity Sub-Station;
- Internal Access Roads;
- Modifications to the Waste Paper Mill;
- Engineering Store and Workshop; and
- Chemical Storage Areas.

The Electricity Sub-Station would be moved approximately 120m north east of its current location. The sub-station would be moved prior to the construction of the New Paper Mill.

3.4.3 Description of Operations Involving Dangerous Goods at New Mill

Amcor propose to store a number of Dangerous Goods (DGs) for use in the New Paper Mill. These are:

- Class 2.1 Flammable Gas;
- Class 3 Flammable Liquid;
- Class 8 Corrosive Liquids; and
- Class 6.1 Toxic Substances.

There are other materials stored and used on-site, however these are non-dangerous.

There would be a reduction in the quantity of Class 6.1 (Toxic) substances stored on site compared to the Existing Operations.

Flammable Gas

There will be two types of flammable gas used on the site, LPG and acetylene

LPG will be stored in a single tank located north of the product store. **Figure 3-2** shows the location of the tank. The tank will be 6775 litres in capacity and will be used for filling LPG cylinders for the forklifts used onsite. The tank will be installed to comply with the requirements of *AS1596-2000,* The Storage and Handling of LP Gas.

The tank will be filled by a dedicated LPG tanker from an LP Gas company. Drivers are trained in the refilling of tanks and conduct these operations many hundreds of times a year.

Acetylene will be stored in cylinders in a dedicated area in Building 2 (See **Figure 3-2**). The cylinders will be G size (50L water capacity) and will be chained in the storage to prevent them from falling over.

Combustible Liquids (Diesel)

Diesel will be stored in two above ground storage tanks east of the boiler house. The diesel will be used to supply diesel fuel to front end loaders used for moving waste paper. The tanks will have a capacity of 15,000L and 25,000L and will be designed in accordance with AS1940, including provision of secondary containment. The 15,000L tank will be relocated from the existing mill area.

The tanks will be refilled using a tanker truck that will attend the site and transfer fuel from the truck mounted tank using a truck mounted pump. The fuel tanker driver will control all fuel transfer operations and remain with the transfer vehicle during the full fuel transfer. The fuelling connection point will be contained within the hardstand/kerbed area.

Combustible Liquids (Oil)

Combustible liquids will consists of oils and greases which are required for the paper mill machines and auxiliary machinery throughout the site. These will be stored in 205L drums in the following manner:

- One central storage area provided with secondary containment inside Building 2
- Storage of minimal quantities in several locations within the new mill and auxiliary services area to service day to day operations. This will typically consist of one to two drums in various locations. All locations will be provided with local secondary containment.

Combustible oils will be delivered in 205L drums by truck.

Flammable Liquids

The Class 3 flammable liquid (morpholine) is used for boiler operation. It will be delivered in 205L drums and transferred to a 1,600L bulk tank. The bulk storage tank is stored in a bunded storage area external to the south western corner of the boiler house, which is provided with secondary containment and be designed in accordance with AS1940.

Corrosive Liquids

Corrosive liquids (Sodium hydroxide, potassium hydroxide and sodium hypochlorite) will be stored in bulk storage tanks in two dedicated storage areas outside the new mill. **Figure 3-2** shows the location of these storage areas. The tanks will range from about 10,000 litre to 50,000 litre in capacity and the stored chemicals will be used for various uses including:

- Controlling the pH of the starch solution applied to the paper to improve its strength
- Controlling the pH in the wastewater discharged to sewer
- Application at the size press to control the absorbency of the paper
- Cleaning the paper machine.
- Use as a biocide or as a raw material for in situ biocide generation (sodium hypochlorite only).

Each chemical tank will be located in an appropriately bunded area.

Delivery of these materials will be by bulk tanker. The unloading area will be provided with secondary containment and an operator will be in attendance at all times during unloading.

3.4.4 Proposed New Chemical Storage Areas and Dangerous Goods Quantities for New Mill

Purpose designed and built Chemical Storage Areas would be constructed with the New Paper Mill. The New Main Chemical Storage Areas would be located north of the New Paper Mill building in dedicated storage areas and contain all Class 6.1 and 8 substances. LPG would be stored adjacent Product Store. All chemical storages associated with Machine No.7 and Machine No. 8 would be decommissioned. Class 3 substances would be stored adjacent to the Boiler house in a bunded area. **Table 3-3** lists the quantity of dangerous goods which would be used and stored in each area of the proposed new mill.

These new Chemical Storage Areas would have appropriate safety measures as per the requirements of the dangerous goods storage standards and codes. Any spills or leakages in the bunded areas of the main chemical storage areas (ie. Corrosive Liquids) would be reincorporated into the process water system or disposed offsite via licensed contractors. The main new Chemical Storage Area would be constructed adjacent to the New Paper Mill building (**Figure 3-2**) and would store all bulk Class 8 chemicals. A separate bunded delivery area for bulk chemicals would also be installed to ensure that chemical operations and deliveries are separated from other activities. This would be a significant improvement on existing operations.

Table 3-3: List Of Dangerous Goods Proposed For Storage At The New Mill

Depot No. and Name of DG	Un.No.	Class	PG	Quantity Stored (Typical)	Storage Type & Location*
1. LPG	1075	2.1	N/A	6775	Above ground tank north of product store
2. Acetylene	1001	2.1	N/A	1000 kg	Cylinders in storage area outside Store (Building 2)
2. Compressed gases	1981, 1072	2.2	N/A	100m^3	
3. Morpholine	2054	3	III	1,600	Bulk storage tank in bunded storage area outside south western corner of Boiler house
4. Biocide	2810	6.1(b)	II	80L (20L containers)	Roofed and fenced locked store, adjacent to new pulp and water storage tanks
4. Sodium hydroxide	1824	8	II	60,000	
5. Sodium hypochlorite	1791	8	II	15,000	Roofed store, west of the proposed new starch cooker
5. Corrosive liquids (caustic solutions)	1893 1824	8	II	40,000	
6. Diesel	N/A	C1	N/A	40,000	Above ground storage tank north east of the boiler house
7. Oils and Greases	N/A	C2	N/A	100,000	Storage area within Building 2 and stores in main paper machine building

3.4.5 Proposed Safety Features at the New Mill

The facility will be constructed to comply with the requirements of the relevant Australian Standards, which includes the following features, both mandatory and voluntary.

- **Bunding –** the Class 8 (NaOH, Sodium hypochlorite and caustic liquid) tanks will be contained within two central bunded and caged areas north of the paper mill. The 20L containers of Class 6.1(b) liquids will also be stored within one of these central bunded areas. All bunding for Class 8 corrosives will be coated with epoxy to prevent corrosion. Class C1 Diesel Bulk storage tank will be contained in a bunded area. Individual bunded areas would be constructed for each type of chemical with a capacity of 120%. The Class 3 Flammable liquid (morpholine) will be stored outside the Boiler house in a bunded area. Class C2 (oil) drums in

the main storage area in the Store will be in a bunded area. All combustible and flammable liquid storage areas will comply with AS1940 (Ref 6). Liquefied flammable gas areas will not be bunded.

- **Loading Bunds –** Speed bump style bunds will be installed around all bulk liquid loading and unloading areas.
- **Retention Systems –** The forecourt area outside the new Paper Mill Building will be provided with a separate drainage system to collect any spills in this area. This will be to ensure that any spills outside bunded areas during unloading or transfer are contained within the site. This will include provision of a gross pollutant trap (GPT) and oil separator, as well as a lockable valve which can be closed to isolate the stormwater system in the event of a spill. The exact design and details of this system has not been finalised.
- **Sprinkler System –** a sprinkler system will be installed throughout the facility including the paper machine building and finished product storage area.
- **Fire Extinguishers –** dry chemical powder and carbon dioxide fire extinguishers will be provided throughout the warehouse storage, electrical switchrooms and offices/amenities. The fire extinguishers will be selected and located in accordance with AS2444 (Ref.7).
- **Fire Main and Hydrants –** the site is fitted with a fire main service, installed in accordance with AS2419-2005 (Ref.12). Fire hydrants are provided throughout the site and are within access distance (according to AS2419) for the proposed DG storage and use areas.

The site will operate a safety management system (SMS) that includes an emergency response plan and spill clean up procedures. **However, it will be necessary to provide a comprehensive SMS for the new specific storages containing DGs.**

3.5 Use and Storage of Chemicals during Commissioning/Transition

During the Commissioning (or transition) stage of the new paper mill, there will be a short period where both the existing and new storage areas will be in operation (3-6 months). These storage areas are located on opposite sides of the site. The safety features at the new and old mill will be operational throughout this phase to manage this risk.

Table 3-4: List of Dangerous Goods for Storage during Commissioning/Transition

No	Depot Type	Goods	Class	UN No	PG	Capacity /Max quantity (Litres unless otherwise stated)	Typical Quantity Litres unless otherwise stated	Approx Distance to Nearest Residence (m)
Existing Mill								
TNK 1	Above ground tank	Potassium Hydroxide Solution (Prestige Fb9090)	8	1814	II	2500 L		175
TNK 4	Above ground tank	Sodium Hydroxide Solution	8	1824	II	600 L		160
TNK 5	Above ground tank	Hypochlorite Solution	8	1791	II	1500 L		374
TNK 6	Above ground tank	Sodium Hydroxide Solution	8	1824	II	13000 L		125
TNK 9	Tank (IBC)	Ammonium Persulphate	5.1	1444	III	4000 L		265
TNK 10	Above ground tank	Sodium Hydroxide Solution	8	1824	II	2000 L		243
TNK12	Above ground tank	Combustible Liquid	C1	00C1	N/A	15000L		150
TNK 17	Above ground tank	Flammable Liquid Corrosive Nos (C35)	3	2924	N/A	800 L		75
TNK 20	Above ground tank	Sodium Hydroxide Solution	8	1824	II	1500 L		150
TNK21	Above ground tank	Sodium Hydroxide Solution	8	1824	II	1000 L		100
LPG	Above ground tank	Petroleum Gases,Liquified	2.1	1075	N/A	6773L		100
OIL1	Above ground tank	Combustible Liquid – Exempt	C2	00C2	N/A	13500L		170
	Above ground tank	Combustible Liquid	C1	00C1	N/A	20000 L		118
STR1	Roofed Store	Sodium Hydroxide Solution	8	1824	N/A	30000L	3900kg	153
STR2	Roofed Store	Flammable Liquid Corrosive Nos	3 (8)	2924	N/A	30000L	600L	288
STR2	Roofed Store	Pesticides, Solid, Toxic Nos	5.1	2588			80kg	288
STR2	Roofed Store	Sodium Hydroxide Solution	C2	1824	II		425kg	103
STR2	Roofed Store	Potassium Hydroxide Solution	C2	1814	II		7800kg	228
CYL1	Cylinder Store	Oxygen, Compressed	2.2	1072	N/A	$120M^3$	$40M^3$	60
CYL1	Cylinder Store	Rare Gases And	2.2	1981	N/A		$40M^3$	60

No	Depot Type	Goods	Class	UN No	PG	Capacity /Max quantity (Litres unless otherwise stated)	Typical Quantity Litres unless otherwise stated	Approx Distance to Nearest Residence (m)
Existing Mill								
		Oxygen Mixture, Compressed						
CYL2	Cylinder Store	Acetylene, Dissolved	2.1	1001	N/A	1650kg	$50M^3$	60
CYL2	Cylinder Store	Petroleum Gases, Liquefied	2.1	1075	N/A		100kg	60
OIL3	Underground tank	Exempt - Storage Area Liquids C1	C1		N/A	5000L	5000L	175
OIL 4	Underground tank	Exempt - Storage Area Combustible Liquid 2	C1	00CS	N/A	40000L	20000L	175
OIL 5	Above ground tank	Exempt - Storage Area Combustible Liquid 2	8	00C2	N/A	2000L	1500L	138
New Paper Mill								
	Bunded Chemical Storage Area	Sodium Hydroxide	8	1824	II	60,000	20000	300
	Bunded Chemical Storage Area	Corrosive liquid (Sodium hypochlorite, Caustic solution)	8	1791 1893	II	45,000	25000	300
	Bunded Chemical Storage Area	Biocide	6.1(b)	2810	II	80kg		
	Above ground tank	Combustible Liquid	C1	00C1	N/A	25000L		150
	Bunded Chemical Storage Area	Lubrication Oil	C2	00C1	N/A	100,000	30,000	300

3.6 SEPP33 Screening Level Assessment – New Paper Mill

3.6.1 Storage of Dangerous Goods

A comparison of the quantities of dangerous goods to be stored onsite in the New Paper Mill against the SEPP 33 Screening Level guidelines is presented in **Table 3-5**. The only class of dangerous goods which exceeds SEPP 33 screening level guidelines is Class 8 (Corrosive Liquids).

Class C1 and C2 (combustible) liquids which are stored on site should theoretically be classified as Class 3 (Flammable Liquids) substances because of the presence of other Class 3 substances on site. However, in this instance it was not necessary because the volume of Class 3 liquids on site is extremely low (< 5000 L) and are stored at least 50 m from C1 and C2 substances.

Table 3-5: SEPP33 Screening of Dangerous Goods during Operation

Dangerous Good Class	Typical Materials	New Paper Mill Operation .	Distance from nearest residences	SEPP 33 Screening Level	Above SEPP 33 Screening Level
2.1	LPG (litres)	6,775	185 m	16,000 L	No
	Acetylene-dissolved (kg)	1,000	300 m	1000 m^3	No
2.2	Compressed Gases (litres)	100	300 m	Class 2.2 Goods not considered Hazardous by SEPP33	No
3	Boiler Treatment Chemicals (Morpholine) (litres)	1,600	285 m	> 1,000,000 L	No
6.1	Toxic Liquid (kg)	80	300 m	2500 L	No
8	Sodium Hydroxide (litres)	60,000	300 m	25 000 L	Yes
	Sodium Hypochlorite (litres)	15,000	300 m		
	Corrosive Liquids (litres)	30,000	300 m		
C1	Combustible Liquid – Diesel (litres)	40,000	NA	None	No
C2	Oil & Grease (litres)	100,000	NA	None	No

3.6.2 Delivery of Chemicals

Presented in **Table 3-6** is a summary of suppliers, delivery routes and the approximate number of deliveries per week for major chemicals. In terms of risk from the transport of these substances, the direct chemical delivery route uses major road transport routes and does not deviate into suburban streets. This presents very little risk to surrounding receptors. There are 2 chemical deliveries a day which would include Class 3, 5.1, 6.1 and 8 substances. This equates to approximately 14 deliveries a week which is below the SEPP 33 screening level threshold for all substances except Class 6.1 (Toxic) substances. The delivery volumes and frequencies of other dangerous goods on site are considered low and do not warrant any special consideration.

Table 3-6: Transport Routes of the Delivery of Chemicals

Chemical Class	Supplier	Traffic Route	Approx No. of Deliveries Per Week
Classes 2.1 and 2.2	-	Vary dependent on deliveries to other customers	4
Class 3	USF Chemfeed - Homebush	Foreshore Road, General Holmes Drive, Botany Road / O'Riordan Street, Gardeners Road, Ricketty Street (Canal Rd), Princes Highway, Forrest Road, Stoney Creek Road, King Georges Road, Homebush Bay Drive	2
	Veolia - Seven Hills[1]	-	
Class 6.1 & 8 (Hydroxide and Hypochlorite)	Orica – Botany	Denison Road, Beauchamp Road and Botany Road	4
	Spectrum - North Ryde	Hermitage Road West Ryde, Victoria Road,, Western Distributor Freeway, Elizabeth Street, Park Street, Wouldiam Street, Bourke Street, Eastern Distributor, Dowling Street,, Wentworth Ave, Denison Street, Beauchamp Road, Botany Road.	

4. Hazard Identification

4.1 General Hazard Identification

A hazard identification table has been developed and is presented at **Appendix A**. Those hazards identified to have a potential impact offsite are assessed in detail in the following section of this document.

4.2 Properties of Hazardous Materials Stored and Used

Table 3-3 lists the type and quantity of DGs stored and handled at the New Paper Mill. All Dangerous Goods on site will be stored in accordance with the Australian Dangerous Goods Code (Ref.4) and the NSW Occupational Health and Safety (Dangerous Goods Amendment) Regulation (2005) (Ref.8), and AS 1940-2004. The goods will be stored in accordance with the requirements of a manifest site, under the OH&S DG Regulations, including a detailed risk assessment of the various storages in accordance with the requirements of the OH&S DG Regs.

A summary table of the hazardous materials stored and used, and their properties, is presented at **Table 4-1.**

Table 4-1

Properties of the Dangerous Goods Proposed for Storage at the New Mill

Material Name	Class	Hazardous Properties
Liquefied Flammable Gas – LPG	2.1	Liquid spillage vaporises and causes gas cloud, which may ignite and explode. Storage in bulk may be impacted by jet flame resulting in Boiling Liquid Expanding Vapour Explosion (BLEVE)
Acetylene Cylinders	2.1	Gas is flammable and cans may explode and rocket adding to and/or spreading an incident if cylinders are heated by adjacent fire
Compressed gases	2.2	Gas is not flammable but cylinders may explode resulting in hazard to people (e.g. projectiles)
Flammable Liquid	3	Liquid is flammable and will burn if ignited resulting in pool fire in the boiler house
Toxic Substance	6.1	Stored as a liquid, which is toxic and may impact people and the biophysical environment if released from storage containers or during dosing
Corrosive Substance	8	Stored as a liquid, which is corrosive and may impact people and the biophysical environment if released from the tank storage area or process vessel.
Combustible Liquid	C1	Liquid is combustible and will burn if ignited resulting in pool fire. It also has the potential to ignite if in the presence of prolonged extreme heat or spreading an incident if heated by adjacent fire
Combustible Liquid	C2	Liquid is combustible with a very high flash point (and low ignition potential) but still has the potential to ignite in the presence of an ignition source or to add to an incident in the presence of an adjacent fire

4.3 Detailed Hazard Identification

4.3.1 Liquefied Flammable Gases – Class 2.1 – Spill and Fire

Liquefied flammable gases are gases stored under pressure at ambient temperature. If released via a storage container failure, a portion of the gas will "flash" into a vapour whilst the remaining liquefied gas will form a pool under the spill area. The pool of liquefied gas will eventually evaporate, adding to the initial flash gas cloud.

In a confined area ignition of a gas cloud could result in a gas cloud explosion, causing a percussive wave and destroying objects within the wave path. However, in the open, a gas cloud is more likely to burn rapidly, resulting in a flash fire, which does not result in a percussive wave (Ref.11). Fatalities may result from people caught within the flash fire.

It is noted that the proposed New Paper Mill will store about 7000 litres LPG in a bulk tank located near the western side of the site, outside the Product Store. This area is well ventilated and in the open, hence, gas release and cloud explosion is not considered a credible incident in this storage. However, gas release, delayed ignition and flash fire would be a credible scenario. In addition, gas release and immediate ignition resulting in jet fire would also be considered a credible incident.

In the event a gas jet fire impinges on the vessel shell, there is a potential for the vessel to heat resulting in increased gas pressure in the vessel and vaporisation of the LPG. The gas would be released via the pressure relief valves, preventing vessel explosion. However, a point would be reached where the liquid level in the vessel would fall below the area where the flame impingement occurs leading to localised heating of the vessel shell. This would result in eventual vessel failure and release of boiling expanding liquid. The jet flame would ignite the liquid leading to a boiling liquid expanding vapour explosion (BLEVE).

Based on the proposed location of the LPG tank, over 30m from the western boundary there is a potential for offsite impact from incidents in this storage area. Hence, this incident has been carried forward for risk analysis.

4.3.2 Acetylene – Class 2.1 – Gas Release, explosion and Fire

Acetylene will be stored on site in "G" size cylinders for use in metal cutting operations at the site. The cylinders will be stored in depots complying with the requirements of AS4332-2004 (Ref 8) and the NSW Occupational Health and Safety (Dangerous Goods Amendment) Regulation – 2005 (the Regulation). The storage will comply with the minor storage quantities listed in AS4332 and the Regulation and therefore under these requirements, the risks are considered to be low due to the following:

- all cylinders will be secured to prevent them from falling over;
- ignition sources close to the storage will be eliminated;

- storages will be located clear of potential fire incidents (i.e. heat radiation impact); and
- storages will be well clear of site boundaries (i.e. no impact offsite in the unlikely event of an incident);

Based on the above safety features, the fact that the storage quantity is considered minor by the Australian Standards and the Regulation and the location of the storages clear of site boundaries, incidents involving acetylene cylinders have not been carried forward for further analysis.

4.3.3 Diesel Fuel Delivery and transfer

Diesel fuel deliveries are made by fuel tanker, which is located adjacent to the bulk fuel storage tank and the fuel transferred by flexible hose. An operator is present at all times during the fuel delivery, hence, spills can be responded to instantly and transfer terminated.

Diesel will be transferred from the above ground storage tank to onsite loading machines regularly. The transfer will occur at the diesel tank storage location, also using a transfer hose. Onsite personnel will be present at all times during the fuel transfer process, hence, spills can also be responded to instantly and transfer terminated. In addition, there will be secondary containment around the loading/unloading and fuel transfer area which will ensure that any spill is contained within the immediate area and will not leave the site.

In the event of a hose failure during fuel delivery or transfer, the spill could spread to the transfer point resulting in a pool fire. This has the potential for heat radiation to impact the waste paper storage area which is approximately 20m east of the tank. Hence, this incident has been carried forward for further analysis.

4.3.4 Diesel Fuel Storage – Spill and Potential Fire

Diesel fuel will be stored in two bulk diesel tanks with capacities of 15,000 and 25,000 Litres. Whilst the fuel is contained within the tanks, there is little hazard. However, fuel may leak from the primary tank containment which could result in a diesel leak to the environment. To prevent spills, the tank will be designed with bunding around the tanks and fill point with 120% of the largest tanks capacity, reducing the potential for release beyond the tank area. The risk of releases to the environment from a bunded area with adequate capacity is low, and therefore this risk has not been carried forward for further assessment.

A single walled tank with a bunded area has a general full bund fire frequency of about $1x10^{-5}$p.a. (Ref.14). However, due to the location of the tank close to the waste paper storage area, this represents a risk in the event that tank fire could result in a significant fire in the waste paper storage area. This incident has therefore been carried forward for further analysis.

4.3.5 Flammable DGs – Class 3 PG II Spill and Potential Environmental Impact

The flammable Class 3 liquid (morpholine) will be stored on site in a small bulk storage tank (1,600L). This tank is located in an external storage area outside the south western side of the boiler building. No decanting will be performed within the storage area.

The external DG bulk storage area where the Class 3 liquid will be stored will be bunded in accordance with AS1940-2004 (Ref.6). In the event of a tank leak the leaked material will collect inside the bunded area and will not be released offsite.

Fire hose reels and extinguishers are located throughout the facility and will be installed adjacent to the Class 3 Depot (in accordance with the requirements of AS1940-2004 (Ref.6)). Hydrants are located both inside the boiler room and in the external site areas outside the boiler room and within 70m of the Class 3 Depot (as required by AS2419-2005 (Ref.12)). The Class 3 flammable liquids store will be located about 180m from the boundary . This long distance from the site boundaries will ensures that any fire impact will be minimised to the adjacent sites.

As the amount of Class 3 liquid stored is low (<2000L) and the Class 3 DG storage will be bunded (as required by AS1940), it is considered that a leak of Class 3 flammable materials will be a low environmental risk. However, notwithstanding the containment of spills on site, it will be necessary to have provision for rapid spill clean up to prevent spill ignition and potential fire in the Boiler house and external DG storage area. Hence, **the following recommendations are made:**

- **Spill kits should be located adjacent to the Class 3 flammable liquids Depot;**
- **All staff should be trained in the use of spill kits;**
- **A site emergency plan should be developed, including spill response procedures.**

Based on the low risk of environmental impact, this incident has not been carried forward for further analysis.

4.3.6 Flammable Liquid Class 3 PG II– Spill, Ignition and Fire (Fire in DG Storage area)

A leak of material within the Class 3 DG storage area may result in a pool of flammable liquid under the tank in the bund. The only piece of electrical equipment in the vicinity of this storage area is an electric driven pump used to transfer morpholine into the process. This pump will be appropriately designed and insulated so that it does not represent an ignition source.

Notwithstanding the lack of ignition sources within the immediate vicinity of the store there is a potential for spillage to occur within the store from faulty drums or dropped drums whilst loading. Whilst it is unlikely for drums to leak during loading, due to the drum inspection requirements on delivery of a consignment, a dropped drum resulting in drum damage and spillage is a credible scenario. The storage bund would prevent spills from reaching offsite areas, however, ignition of spills would result in a fire, which may radiate heat from the storage area. The impact of fires

would be limited due to the location of the Class 3 flammable liquids DG storage area on site in relation to the adjacent site (150m away from the boundary).

However, there is a potential for the fire to impact the diesel fuel tank towards the east. This incident has been carried forward for further analysis.

4.3.7 Flammable Liquid Class 3 PG II– Spill, Ignition and Fire (Unloading Incident)

All material deliveries (loading and unloading) at the Amcor site will be performed using drummed goods. There will be no bulk deliveries at the facility (i.e. no tanks).

Class 3 flammable liquid drums will arrive as palletised loads on trucks. A site forklift will be used to unload the materials and transfer them to the Class 3 DG store for storage. In the event of a drum or container falling from a pallet during unloading, there is a potential for drum or container to be damaged and leak. All goods delivered to the Amcor site will be stored in 200 litre containers, hence. spillage would be minimised to the spread of materials from a 200 Litre drum (i.e. terminal spread area). An analysis of the spill potential for materials delivered in 200 litre drums is given below.

Morpholine will be delivered to site in 200 litre metal drums. Drums will be secured on pallets by metal banding. In the unlikely event of metal band failure, a drum may fall from a pallet during truck unloading, the drum may strike the concrete adjacent to the truck, resulting in split and release of flammable material. It is recognised that the lifting height from the truck could reach 1.5 to 2m and, hence, there is a potential for a drum wall to split when falling from this height. However, it is noted that the Class 3 Storage area will be bunded. However final design of the storage and loading area is not finalised. **It is recommended that the unloading area be bunded to minimise the risk of a spill off site.**

If the unloading area was bunded and a drum was dropped causing a split, the material would pool, and if ignited would result in a pool fire. This has the potential to impact the diesel fuel tank towards the east and the existing waste paper storage area to the south east. This incident has been carried forward for further analysis.

4.3.8 Corrosive DGs - Class 8 Liquids – Spill

There will be two dedicated chemical storage Areas outside the New Paper Mill which will store Class 8 corrosive substances (Sodium hydroxide, potassium hydroxide and sodium hypochlorite). These materials will be stored and delivered to the site in bulk.

All deliveries and dispatches will be unloaded in the forecourt area outside the New Paper Mill building, which will be provided with a separate drainage system as described in **Section 3.4.5**. The Class 8 storage areas will also be bunded. Hence, any leaks will be contained on-site and will not reach external drains.

Unloading incidents, such as split hose or fitting release during transfer may result in a spill. However, as the unloading area will be bunded and as outlined above the forecourt area will be designed so that it has the capacity to contain well in excess of the largest container delivered/dispatched and be equipped with a shut-off valve. Hence, there will be no spill off-site from loading/unloading incidents. In addition, a driver will be in attendance to isolate leaks and spills to minimise the quantity of liquid released.

Sodium hypochlorite is not a hazard on its own, however there is an additional hazard if it is mixed with acid or another material where chlorine gas can be formed. However, there will be no acid stored on the site in the New Paper Mill and there are no other chemicals used on site which will be able to form chlorine gas in the presence of sodium hypochlorite. This does not require further analysis

The potential for corrosive material spill and release off-site is low and, hence, this incident has not been carried forward for further analysis. Notwithstanding the low potential for off-site corrosive/toxic material spill, **it is recommended that these materials be included in the site spill clean up procedures**.

4.3.9 Toxic DGs - Class 6.1 Liquids – Spill

Class 6.1 toxic substances will be stored in one of the two purpose built Chemical Storage Areas outside the New Paper Mill. Like the flammable liquid incidents described above, Class 6.1(b) liquids (biocides) will be delivered to site in 205 litre drums. The storage quantity of biocides (80kg) is classed as minor storage (<500kg) according to *AS4452—1997 Storage and Handling of Toxic Substances (*Ref. 23). The storage area will meet the requirements of *AS4452-1997* and the risks will be managed in accordance with the standard.

All deliveries and dispatches will be unloaded in the forecourt area outside the mill, which will be provided with a separate drainage system and/or a contained unloading area as described in **Section 3.4.3** and **3.4.5**. The Class 6.1 storage area will also be bunded. Hence, any leaks will be contained on-site and will not reach external drains.

Unloading incidents, such as dropped drums, may result in drum splits and spilled contents. However, the unloading area will have capacity to contain well in excess of the largest container delivered/dispatched (205 litres). Hence, there will be no spill off-site from loading/unloading incidents.

The potential for toxic material spill and release off-site is low and the storage area will be classed as minor storage in accordance with *AS4452-1997* and, hence, this incident has not been carried forward for further analysis. Notwithstanding the low potential for off-site corrosive/toxic material spill, **it is recommended that these materials be included in the site spill clean up procedures**.

4.3.10 Combustible Oil Loading/unloading (Class C2) - Spill

All deliveries of combustible oils to the Amcor site will involve portable drums or containers (25L to 205L). There will be no bulk deliveries of oils to the site.

A site forklift will be used to unload the materials and transfer them to the main combustible oil storage area which will be inside the separate Storeroom building (Building 2). In the event of a drum or container falling during unloading, there is a potential for the drum or container to be damaged and leak. All goods delivered to the Amcor site will be stored in containers with a volume of 205L or less, hence spillage would be minimised to the spread of materials from a 205 Litre drum (i.e. terminal spread area). An analysis of the spill potential for materials delivered in 205 litre drums is given below.

Combustible oils will be delivered to site in metal drums (<205L). Unloading incidents, such as dropped drums, may result in drum splits and spilled contents. However, it is noted that the unloading operations will involve movement into Building 2, which is a building. The final design of the storage and loading area and inside of Building area is not finalised. **It is recommended that the unloading area be bunded to minimise the risk of a spill off site. In addition, final design of the drainage in Building 2 should consider the need to contain any spills resulting during unloading operations.**

Combustible oils will also need to be transferred from the main storage area (Building 2) to the Mill. This will require transfer across an open area of approximately 100m. There is also potential for spill during internal site transfer operations. All transfers of drums will be performed by forklift. The transfer route will pass through the courtyard area in front of the mill which will be provided with a separate drainage system and/or containment system. This will minimise the potential for any oils spilt to leave the site.

If a drum was dropped causing a split, the material would pool, and if ignited would result in a pool fire. However, due to the high flash point of combustible materials this is unlikely in the absence of an ignition source. Ignition sources will be eliminated from unloading operations by prohibiting smoking and ensuring that no electrical equipment is in the unloading area, and storage of the Class 3 flammables in a separate area to Combustible oils. The potential for this to occur is low once appropriate controls are implemented, so this has not been carried forward for further analysis.

4.3.11 Combustible Oil Storage (Class C2) – Spill

Combustible oils will be stored in small drums (25 to 205L) around the site. The central storage area will be inside the store (Building 2). Small quantities (maximum of 1-2 drums) will also be stored adjacent to machines for daily usage within the mill area. There is some potential for spillage and leakage in storage.

It should be noted that combustible oils will be stored separately from Class 3 flammable liquids (outside boiler house over 50m from Building 2), hence the Class 3 liquids will have no impact on the potential for fire from the combustible oils. To prevent potential drum leakage, all drums delivered to site will be inspected and no drums will be accepted on site showing signs of damage or leaks.

The main storage area will be provided with secondary containment. In the event of a spill, this will be contained by the secondary containment and will not leave the immediate area (or the site). The oils are combustible, however they have a very high flash point and therefore pooling of oil in the storage area is not likely to result in a fire unless an ignition source is present. Ignition sources will be eliminated from the storage area through prohibiting smoking in the storage area and elimination of other spark sources (electrical equipment) in the storage area. Therefore, the risk for off site leakage or fire in the main storage area is low and this scenario has not been carried forward for further analysis. I**t is recommended that the final design of the building is checked to ensure that spark sources are eliminated from the oil storage area.**

The minor storage areas in the mill will involve minor quantities and will be provided with localised containment systems (such as pallets with inbuilt containment). In the event of a spill it will be contained in the containment systems. Combustible oils are difficult to ignite because of their high flash point, and there will be no substation in the Mill building and all electrical systems will be designed appropriately to minimise fire risk and spark.

4.3.12 Cylinder Storage (Class 2.2) – Explosion

The cylinders will be stored in a storage area inside the Store (Building 2) with a maximum of 20 G size cylinders in storage at any one time. The cylinder storage area will be classed as minor storage (<2000L) according to AS4332-1995 (Ref 9) and the NSW OH&S (Dangerous Goods Amendment) Regulation 2005 (Ref 8). As the gases in the cylinders are Class 2.2 and hence are non-toxic and non flammable, and will be chained in place in accordance with AS4332-1995, there is no potential for fatalities or injuries on or off site. Therefore incidents in this storage area has not been carried forward for further analysis.

4.3.13 Contaminated Fire Water

In the event that a fire occurs, there will be a need to apply a fire extinguishing medium, such as dry powder from extinguishers or water from fire hose reels or hoses, to extinguish the fire.

It is understood that the site will be fitted with bunded areas for the diesel storage, Class 3 flammables storage and the two purpose built chemical storage areas for corrosives. In addition the forecourt area outside the mill (near the corrosive chemical storage areas) will be provided with a separate drainage system. However, release of contaminated water that escapes beyond the immediate bunded storage may escape to the environment. There is currently no onsite retention

system available for such releases. It is planned to investigate contaminated fire water storage requirements during final design of the storage areas and drainage systems.

The *NSW Government's Best Practice Guidelines for Contaminated Water Retention and Treatment Systems*, specifies requirements for retention of Fire Water. These guidelines should be applied during the design process.

It is therefore recommended that as part of detailed design, investigation into possible designs which will incorporate onsite detention systems be considered. At this stage, the procedure and practicalities for the handling of potentially contaminated water which may be required should also be considered. This should include identifying the capacity of the site and site systems to retain contaminated water (using the NSW Guidelines mentioned above), methods for treatment of such retained water (onsite treatment or selection of appropriate waste treatment organisations and their contact details).

4.4 Effect during transition/Decommissioning Phase

During Transition Paper Machine No. 7 would be decommissioned and all chemicals directly used in its operation would be removed (See **Table 3-4**). Machine No.8 and auxiliary infrastructure such as the DAF would still be operational. The stores of Class 3 (Boiler Treatment - Morpholine) substances would be moved from the existing store and transferred to another store outside the boiler room (refer **Figure 3-2**). The cylinders of acetylene, rare gases and compressed air would also be moved to the store at No. 20.

The existing storage areas which will exist in parallel with construction of the New storage areas for the New Paper will have been operating for a number of years and there have been no major incidents. Therefore these storage areas can currently be considered to be proved to be non hazardous and within acceptable risk levels.

The new storage areas will be constructed on the opposite side of the site to the existing storage areas (>250m away), hence there will be limited risk of interaction between chemicals in the new and old storage areas. The hazard risk assessment has shown that the proposed new storage areas represent an acceptable risk.

It is noted that sulphuric acid is currently stored on the site and this could represent a risk if there was a pathway for it to come in contact with the Class 8 Corrosive Sodium hypochlorite to form chlorine gas. However, the sulphuric acid tank is associated with the old boilers at the site which have recently been upgraded to new boilers which use a reverse osmosis system. This sulphuric acid tank therefore is no longer in use and will be decommissioned in the next few months prior to the transition/commissioning phase. This potential risk will have been eliminated prior to construction of the New Paper Mill.

5. Consequence Analysis

5.1 Incidents Carried Forward for Consequence Analysis

From the qualitative hazard identification conducted above, seven incidents have been carried forward for further analysis, these are:

- An unloading/loading accident resulting in Class 3 flammable liquids spill, ignition and fire outside the boiler house (potential impact on the diesel tank and the existing waste paper storage area);
- A storage fire in the Class 3 flammable liquids storage (potential to impact the diesel tank and the existing waste paper storage area);
- Spill during diesel transfer and unloading result resulting in fire (potential to affect the waste paper storage area); and
- Diesel tank fire (potential to affect the waste paper storage area);
- LPG release, delayed ignition and flash fire with fire impact to passers by on McCauley Street
- LPG Release, immediate ignition and jet fire with heat radiation impact to McCauley Street;
- LPG Release, jet fire, impingement on the vessel and resultant BLEVE;

Detailed consequence analysis of these incidents has been performed in **Appendix B**. A summary of the heat radiation impact analysis results is presented below.

5.2 LPG Incidents

The LPG tank is a standard 7000 litre horizontal tank with hemispherical ends. These tanks are installed in numerous facilities throughout Australia and operate without incident. Catastrophic failure of the tank is unlikely as the tanks are designed to Australian Standards (AS1210-Ref.13) and are thoroughly and rigorously tested including "X" ray and hydrostatic testing. This design methodology virtually eliminates the potential for design and construction defects. Tanks are also fitted with pressure relief valves (PRVs), also eliminating the potential for failure of the vessel through overpressure.

The most likely scenario is a failure of the gaskets installed at the various flanges throughout the system, however, the LPG storage tank has minimal pipework installed. The tank is used for the refuelling of fork lifts and therefore has very minimal pipelines. Flanges are limited and leak sources are few. Gaskets used in the flanges are the spiral wound type reducing the potential for release.

The catastrophic failure of a spiral wound gasket is eliminated by the installation of the steel backing ring. The more likely scenario is the beginning of a leak between the flange face and the gasket resulting in a "wire-cut" across the flange face. Such failures result in small diameter leaks, in the order of 1-3mm.

A second leak source could result from the filling of the tank. Incidents from this source are most likely to occur as a result of split or failed flexible hoses between the fuelling vehicle and the storage tank/vessel. However, in this case the incidents would be attended by the LPG delivery driver. The delivery vehicle is fitted with an emergency shut down button that isolates the delivery tanker from the vessel. The vessel is fitted with a non-return valve on the liquid filling nozzle, hence, the potential for releases from leaks in the hoses would be limited.

Based on the above analysis, the most likely incidents to occur at the LPG storage are related to leaks from flanges. Hence, the incidents assessed in this analysis are:

- Gas Release from a flange resulting in gas accumulation and flash fire;
- Gas release from a flange resulting in jet fire; and
- Gas release from a flange, jet fire impact on the vessel and BLEVE.

5.2.1 LPG Flash Fire

In the event of a release of gas from a flange, there is a potential for the gas to accumulate and a delayed ignition to occur. This would not result in a gas cloud explosion as the area where the LPG vessel is located is in the open and there is no confinement that would cause such an explosion (Ref.11). The more likely event is a flash fire.

In the event of a flash fire people who are outside the flammable range of the cloud are not considered to be impacted by the fire. However, those caught inside the flammable range (i.e. within the fire itself) are considered fatalities.

The flash fire analysis is conducted in detail in **Appendix B (Section B1)**. The analysis was conducted using the TNO Effects model (Ref.15) and the results of the analysis estimated that the maximum distance to Lower Explosive Limit (LEL), in the worst case conditions (i.e. wind weather conditions favourable to cloud formation) is 3.3m. Hence, the gas cloud does not extend beyond the site boundary or 30m from the tank This incident has not been carried forward for further analysis as the consequences do not impact offsite.

5.2.2 LPG Jet Fire

In the event of an immediate ignition of a leak of LPG from a flange, the result would be a jet fire which would radiate heat to the surrounding areas. Injuries or fatalities may result where people are impacted by heat radiation, however this depends upon the magnitude of the heat radiation impact.

Hazardous Industry Planning Advisory Paper No.4,"Risk Criteria for Land Use Safety Planning" (Ref.10), indicates that heat radiation impacts below 2kW/m^2 will have little impact on people. A detailed jet fire analysis is conducted in **Appendix B (Section B2)**. The summary of the jet fire analysis results is presented below.

Distance to a Heat Radiation Level of 2kW/m^2 - 4m

SEP – 106.9 kW/m^2

Flame Length – 2.78m

Frustum Width (base) – 0.15m

Frustum Width (end) – 0.7m

Lift off – 0.34m

The distance to a heat radiation level of 2kW/m^2 from a jet fire at the LPG vessel is estimated to be 4m. Hence, the level of heat radiation at the site boundary is considered negligible as the site boundary is over 30m from the LPG tank location. This incident has not been carried forward for further analysis.

5.2.3 LPG BLEVE

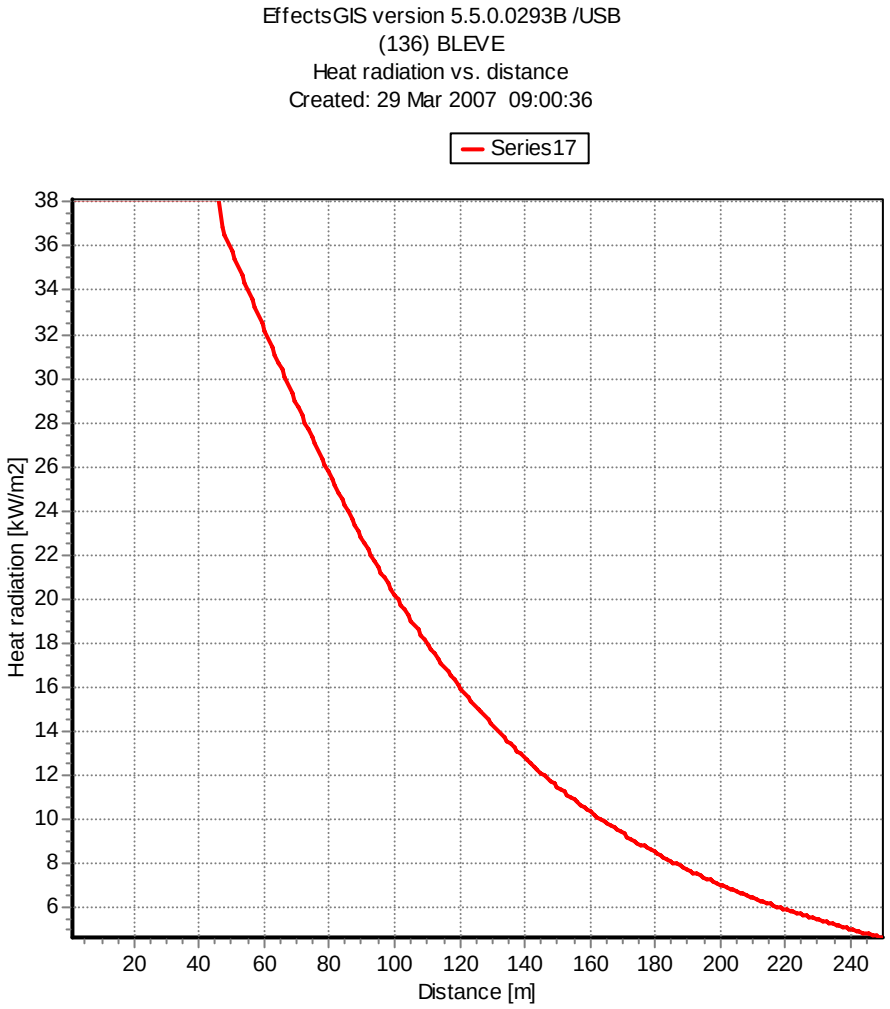
In the event the jet fire analysed in **Section 5.2.3** impacts on the vessel shell, there is a potential for the shell to heat resulting in eventual vessel shell failure leading to a boiling liquid expanding vapour explosion (BLEVE). The BLEVE phenomena occurs with little pressure wave as the gas expands from liquid to vapour as it is released, burning as the expansion continues creating a fireball, which radiates heat to the surrounding area. Hence, fatalities result where people are impacted by the fireball directly, or by the higher levels of heat that are radiated from the fireball surface. However, it is noted that the BLEVE is a reasonably rapid event, occurring over a period of seconds where relatively small quantities (e.g. 3500 L) are involved.

Notwithstanding the BLEVE discussion above, such an event would not occur rapidly as the initial fire impact would be below the vessel liquid level. It would take considerable time for the liquid to boil and the vapour to be released via the PRVs to the point where the fire would impact the vessel shell above the liquid level. In many actual BLEVE cases this has taken well over an hour to occur (Ref.19).

A detailed BLEVE analysis is conducted in **Appendix B** (**Section B3**). The analysis indicated that the BLEVE would develop a fireball with a diameter of 91.9m would occur over a 6.9 second period. The LPG tank is located about 30m from the site boundary and, hence, with a fireball radius 91.9m the incident would impact beyond the site boundary by about 60m. An analysis of the heat

radiation impact was conducted using the TNO Software EFFECTS©. The results of the analysis are shown in **Figure 5-1.**

Figure 5-1: BLEVE Heat Radiation Impact



As noted above, the LPG tank is located about 30m from the site boundary and, hence, with a fireball radius of 91m the incident would impact beyond the site boundary into McCauley Street and the light industrial properties on the other side of McCauley street. The distance to a range of heat radiation heat radiation impact levels is as follows:

4.7kW/m^2 (burns occur within 30 seconds) - 250m.

12.5kW/m^2 (burns occur within 10-35 seconds) - 140m

35kW/m^2 (burns occur within 3-10 seconds,1% chance of fatality in 10s) - 91.9m (fire ball diam.)

It is noted that a BLEVE would not occur immediately a jet fire impacts the vessel shell, hence, there would be sufficient time to effect an evacuation of the area that may be impacted by the BLEVE. It is therefore **recommended that in the event of a fire incident of any kind in the vicinity of the LPG storage, the area surrounding the LPG storage up to a distance of 160m be evacuated. It is also recommended that the site emergency assembly points be located at least 250m from the LPG storage area.**

Notwithstanding the fact that the recommendation is made that the site should be evacuated in the event of a fire in the vicinity of the LPG storage, the BLEVE incident impacts offsite above fire and heat radiation levels that could cause immediate fatality. Hence, this incident has been carried forward for frequency and risk analysis.

5.3 Diesel Fire Incidents

5.3.1 Diesel tank Fire

Two diesel tanks will be installed on site (15,000 Litres and 25,000 Litres) for fuelling heavy vehicles. Both tanks will be bunded to prevent any spills from escaping beyond the immediate area of the tanks, hence, there will be no environmental impacts from spills at the tanks. However, a spill will result in a combustible liquid pool in the base of the bund that if ignited would result in a pool fire.

A detailed consequence analysis has been conducted for both bund fire incidents and is presented at **Appendix B**. A summary of the results is presented **in Table 5-1**.

Table 5-1: Distance to Selected heat Radiation Impact

Full Bund Fires – 15,000 and 25,000L Tanks

Heat Radiation Level (kW/m^2)	15,000l TANK	25,000L TANK
	Distance (m)	Distance (m)
35	13.7	21.5
23	14.9	23
15	16.3	25
12.5	17.1	25.9
8	19.4	29
6	21.2	31.3
4.7	22.8	33.6
2	31	45

A review of the heat radiation impact criteria listed in HIPAP No.4 lists the following:

Heat Radiation (kW/m^2)	Effect
1.2	Received from the sun at noon in summer
2.1	Minimum to cause pain after 1 minute
4.7	Will cause pain in 15-20 seconds and injury after 30 seconds' exposure (at least second degree burns will occur)
12.6	• Significant chance of fatality for extended exposure. High chance of injury • Causes the temperature of wood to rise to a point where it can be ignited by a naked flame after long exposure • Thin steel with insulation on the side away from the fire may reach a thermal stress level high enough to cause structural failure
23	• Likely fatality for extended exposure and chance of fatality for instantaneous exposure • Spontaneous ignition of wood after long exposure • Unprotected steel will reach thermal strees temperatures which can cause failure • Pressure vessel needs to be relieved or failure would occur
35	• Cellulosic material will pilot ignite within one minute's exposure • Significant chance of fatality for people exposed instantaneously

HIPAP No.4 also indicates that heat radiation contours should not exceed a level of $4.7kW/m^2$ at the site boundary. Heat radiation values in excess of this level require further analysis (i.e. Risk). The distance from the diesel storage area to the site boundary will be approximately 100m for both the 25,000 Litres tank and 15,000 Litre tank. It can be seen from **Table 5-1** that the heat radiation contour for $4.7kW/m^2$ is well within the site boundary for both incidents, hence, no further offsite analysis is conducted for this scenario.

The fires in the diesel bunds may also impact other DG storages in the adjacent areas or the paper storage area close to the proposed diesel storage location. The Class 3 flammable liquids store will be located over 75m and on the other side of the boiler building both the 25,000 Litre 15,000 Litre tank. HIPAP No.4 indicates that incident propagation could occur when the heat radiation impact at adjacent facilities exceeds 15kW/m^2. It can be seen from **Table 5.1** that the heat radiation at the Class 3 flammable liquids store will not exceed 2kW/m^2. Hence, no further on-site incident analysis has been conducted for this scenario. The paper storage area, adjacent to the proposed diesel location is expected to be located 20 m from the tank bunds. Taking a conservative approach, heat radiation at this distance would be in excess of 35kW/m^2. At this level, ignition of the paper would be immediate, and the fire would propagate to the paper store. Hence, it would be necessary to provide separation of a fire wall between the diesel storage and paper storage or move the tanks. Therefore it is recommended that during detailed planning stage, the location of the tanks are considered carefully, subject to hazard analysis and adoption of one of the following:

- The tanks are sited in a location so that the edge of the bunds are at least 25m from the closest point where waste paper will be stored when the waste paper storage area is at or above capacity;
- A fire wall should be installed which is at least 10m high and extend beyond the bunded area by a minimum of 5m.

5.3.2 Diesel Fuel Unloading Incident - Fire

Diesel is delivered to site in road tankers. The road tanker will park alongside the diesel fuel tank inside a “speed-hump” style containment area. The tanker driver will connect a flexible hose between the tanker and tank filling point and pump the diesel to the tank. The worst case credible incident during this operation would be a hose rupture or coupling separation during the transfer operation. This would release fuel to the bunded area under the transfer location. The spill would be contained within the “bunded” area, hence, there would be no release to drains and no environmental impact.

However, an ignition of the spill would result in a localised bund fire. A detailed analysis of this incident has been conducted in **Appendix B**. The results of the analysis are summarised **in Table 5-2.**

This incident above has been conducted for a tanker transfer involving the diesel tank filling using a 50mm hose. Fuelling of heavy vehicles will also be conducted using a flexible hose at a “bowser” type fuelling point. The fuelling of heavy vehicles will use a flexible hose of about 30mm diameter (or less). Hence, spills in this area will be smaller and incident consequences are smaller. Therefore, **Table 5.2** can be used as an indicator to the anticipated heat radiation impact from fires at the heavy vehicle fuelling bowser.

Table 5-2: Distance to Selected Heat Radiation Impact Fuel Transfer Operations for Tank Filling

Heat Radiation Level (kW/m^2)	Distance (m)
35	10.2
23	11
15	12.1
12.5	12.8
8	14.4
6	15.8
4.7	17
2	23

The distance from the diesel transfer area to the site boundary will be approximately 100m for both the 25,000 Litres tank and 15,000 Litre tank. It can be seen from **Table 5.2** that the heat radiation contour for 4.7kW/m^2 is well within the site boundary for both incidents, hence, no further offsite analysis is conducted for this scenario.

The fires in the diesel transfer area also impact other DG storages in the adjacent areas or the paper storage area close to the proposed diesel storage location. The paper store is located 20m from the 25,000 Litres tank transfer area and 20m from the 15,000 Litres tank transfer area. HIPAP No.4 indicates that incident propagation could occur when the heat radiation impact at adjacent facilities does exceeds 15kW/m^2 . Hence, this incident has not be carried forward for further analysis.

5.4 Class 3 Flammable Incidents

5.4.1 Class 3 Flammable Liquids Storage Area Fire

Class 3 flammable liquid is stored for addition to the boiler in order to treat the boiler water and prevent corrosion and biological growth (algae). The liquid is stored in 200 Litre drums on pallets within a bunded store near the boiler house. In the event of an incident, leading to a leak and fire, a full bund fire would occur as the worst case incident. This scenario has been modelled in detail in **Appendix B**. The results of the analysis are summarised in **Table 5.3**.

The distance from the Class 3 storage area to the site boundary is over 100m. It can be seen from **Table 5.3** that the heat radiation contour for 4.7kW/m^2 is well within the site boundary for both incidents, hence, no further offsite analysis is conducted for this scenario.

The fires in the Class 3 storage area can also impact other DG storages in the adjacent areas or the boiler house area. It is understood that the boiler house is constructed with masonry brick walls, hence, there will be no fire impact in this area. The diesel tanks are located on the other side of the

boiler house to the Class 3 storage area, so there also will be no fire impact to the diesel tanks. Hence, this incident has not been carried forward for further analysis.

5.4.2 Class 3 Flammable Liquids Handling Fire

The Class 3 flammable liquid will be transported by a forklift truck either on a pallet or using a drum handling fitting, attached to the forklift. During transfer a drum may fall from a pallet, resulting in a damaged drum, leak and subsequent spill. The liquid spill would be relatively small (about 7.1m in diameter - see **Appendix B**), hence, this could be readily handled and contained using the spill kits provided in the area, hence, nor further analysis on environmental impact has been conducted for this scenario. However, should the spill ignite, a pool fire would result radiating heat to surrounding areas. A detailed analysis of the dropped drum incident has been conducted in **Appendix B**. The results of this analysis are summarised in **Table 5-3**. The distance from the Class 3 drum handling storage area to the site boundary is over 100m. It can be seen from **Table 5-3** that the heat radiation contour for 4.7kW/m^2 is well within the site boundary for both incidents, hence, no further offsite analysis is conducted for this scenario.

Table 5-3: Distance to Selected Heat Radiation Impact
Full Bund Fires and Dropped Drum Fire – Class 3 Store

Heat Radiation Level (kW/m^2)	Full Bund Fire	Dropped Drum Fire
	Distance (m)	Distance (m)
35	8	14.1
23	8.5	15.2
15	9.5	16.8
12.5	10	17.6
8	11.2	20
6	12.2	21.5
4.7	13.2	23.5
2	18	32

The fires in the Class 3 drum handling area can also impact other DG storages in the adjacent areas or the boiler house area. It is understood that the boiler house is constructed with masonry brick walls, hence, there will be no fire impact in this area. The closest DG store to the Class 3 drum handling area is Bunded Chemical Storage Area for the Class 8 Corrosives. The closest of these is located approximately 50m from the store and the heat radiation at this distance is less than 2kW/m^2. HIPAP No.4 indicates that incident propagation could occur when the heat radiation impact at adjacent facilities exceeds 15kW/m^2. Hence, this incident has not been carried forward for further analysis.

6. Frequency Analysis

6.1 Incidents Carried Forward for Frequency Analysis

Only one incident was carried forward for frequency analysis; a BLEVE in the LPG tank at the site. A detailed frequency analysis for this postulated incident is conducted in this section of the report.

6.2 LPG BLEVE Frequency Analysis

The LPG storage vessel is designed to contain about 6,.770kg of LPG. The vessel will be designed in accordance with AS1596 (Ref.5) which requires specific safety inclusions. These are:

- Non-return valve on the filling point;
- Excess flow valves on the liquefied gas outflow nozzles;
- Pressure relief valves;
- Manual isolation valves on all nozzles;
- Pressure testing of all lines and vessel; and
- Spiral would gaskets on all joints;

A BLEVE can only occur where a flame from a flange impacts the vessel shell. There are only three flanges on the proposed tank within the jet flame length estimated in **Section 5**, one on the tank filling line, one on the vapour return line and one on the line supplying LPG to the filling location. All other flanges are further away from the tank than the jet flame length estimated in **Section 5**, meaning that any leaks and release ignition from these flanges would not result in flame impact on the tank.

The frequency of leak from each line will be different as the fittings on each line are different. The following analysis has been conducted for each line.

6.2.1 Vapour return Flange

Flange leak frequency has been selected as $1x10^{-4}$ chances of failure per year (p.a.), based on a spiral wound gasket joint (Ref.16). Once the leak has occurred it must be ignited for a jet flame to impact the vessel. The ignition probability of a gas release has been selected as 0.01 (Ref.17). In the event a fire occurs at the vapour return flange adjacent to the vessel, there are two LPG supply sources; one from the LPG filling tanker and one from the vessel itself.

The filling operation is staffed by the tanker driver. In the event of a leak and/or fire, the tanker driver will shut down the gas transfer to the tank preventing continuing fire and eliminating the BLEVE potential. This can be achieved by activation of the emergency shut down system on the tanker or manually by closing valves. However, the operator may fail to close the valves or make

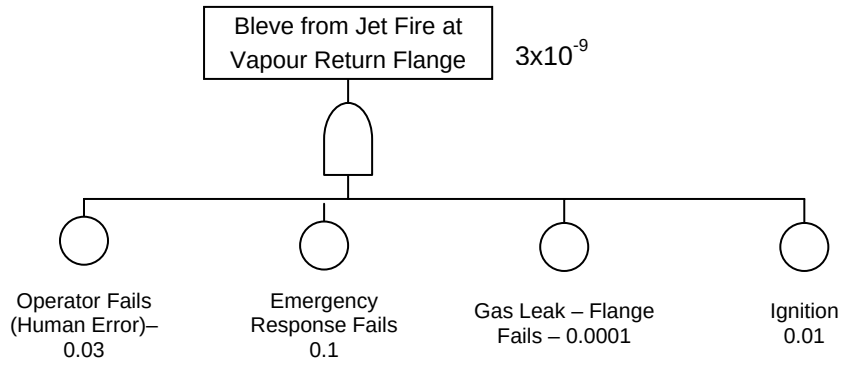
an error, resulting in continued fire and potential for BLEVE. Human error probability has been selected as 0.03 (Ref.18).

From the analysis conducted in **Section 5**, a BLEVE does not occur immediately when the jet fire impacts on the liquid space, however, the vapour return line is located at the top of the vessel and a fire could impact the vessel in the vapour space area immediately it starts. Hence, no account of emergency response has been taken account of in this part of the analysis, which yields a conservative frequency result.

In the event the tanker driver cannot isolate the fuel (LPG) feed to the fire, emergency response can be effected to apply cooling water to the area where the jet fire impacts the vessel. This will prevent BLEVE. It is possible that personnel involved with the emergency response could make an error resulting in ineffectual prevention of cooling water. It has been conservatively estimated that emergency response error would occur 1 in 10 incidents or 0.1.

A fault tree has been developed to determine the BLEVE frequency from a vapour return flange fire. This is shown in **Figure 6-1.**

Figure 6-1: Bleve Frequency – Jet Fire At Vapour Return Flange



The BLEVE frequency as a result of a vapour return flange fire has been estimated to be $3x10^{-9}$ p.a. This is conservative as the values selected for failure frequencies and probabilities are at the upper range of the frequency data, with the exception of the flange leak, which has been selected at the lower end, due to the specific use of spiral wound gaskets, minimising the potential for flange leaks.

6.2.2 Tank Filling Flange

Filling of the vessel with LPG is performed through a nozzle on the vessel fitted with a Non-Return Valve. A leak from the filling nozzle flange has been selected as $1x10^{-4}$ p.a., based on the installation of spiral wound gaskets in all flanges (Ref.16). Ignition probability has been estimated to be 0.01 (Ref.17).

The filling operation is staffed by the tanker driver. In the event of a leak and/or fire, the tanker driver will shut down the gas transfer to the tank preventing continuing fire and eliminating the BLEVE potential. This can be achieved by activation of the emergency shut down system on the tanker or manually by closing valves. However, the operator may fail to close the valves or make an error, resulting in continued fire and potential for BLEVE. Human error probability has been selected as 0.03 (Ref.18).

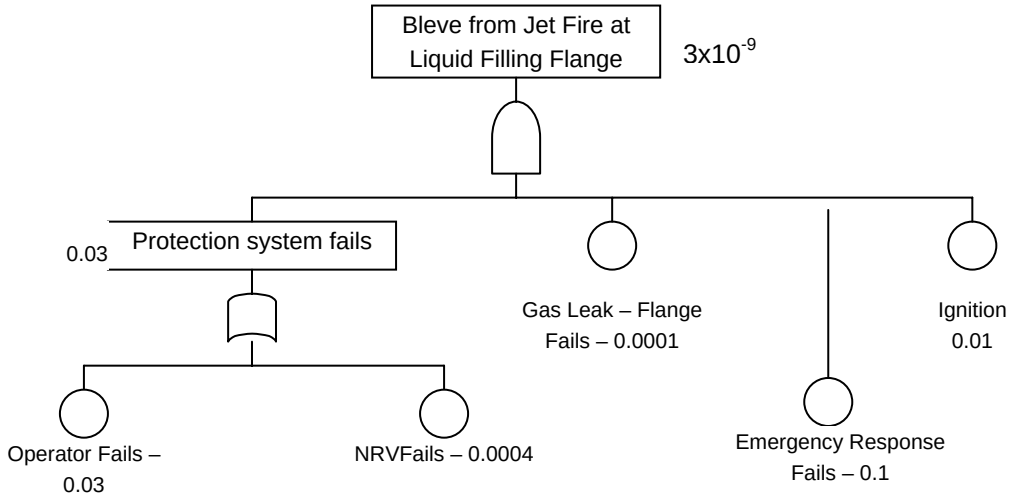
In the event the driver effectively isolates the tanker from the leaking flange, LPG may still flow back from the tank. However, the non-return valve (NRV) installed on the tank would prevent this. Failure of the valve to seat would result in continued release and fire. The failure rate (λ) of the NRV has been selected as 0.01 p.a. (Ref.16). The probability of failure is estimated using the fractional dead time (FDT) methodology where FDT = ½ λ t, t being the test period. Assuming the NRV is checked at each fill (i.e. driver shuts down the system and checks no return from the tank), and assuming a fill once per month (conservative) then FDT = 0.5 x 0.01 x 1/12 = 0.0004.

In the event the tanker driver cannot isolate the fuel (LPG) feed to the fire, emergency response can be effected to apply cooling water to the area where the jet fire impacts the vessel. This will prevent BLEVE. It is possible that personnel involved with the emergency response could make an error resulting in ineffectual application of cooling water. It has been conservatively estimated that emergency response error would occur 1 in 10 incidents or 0.1.

A fault tree has been developed to determine the BLEVE frequency from a liquid filling nozzle flange fire. This is shown in **Figure 6-2.**

The BLEVE frequency as a result of a liquid filling nozzle flange fire has been estimated to be $3x10^{-9}$ p.a. This is conservative as the values selected for failure frequencies and probabilities are at the upper range of the frequency data, with the exception of the flange leak, which has been selected at the lower end, due to the specific use of spiral would gaskets, minimising the potential for flange leaks.

Figure 6-2: Bleve Frequency – Jet Fire At Liquid Filling Nozzle Flange



6.2.3 LPG Supply to Site - Flange

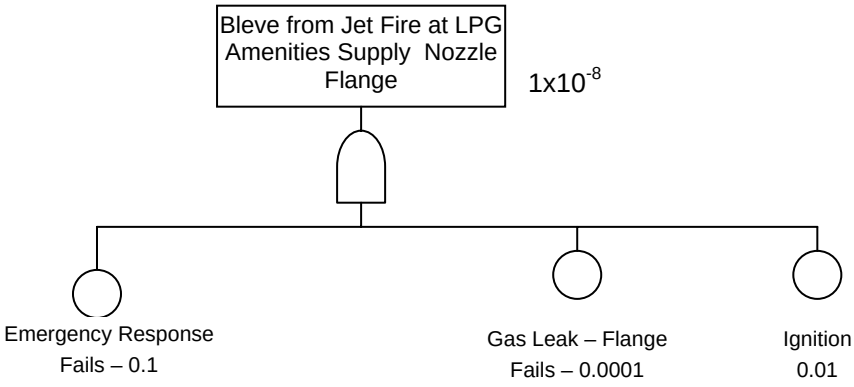
The supply of LPG to the site is performed through a nozzle on the vessel. A leak from the nozzle flange has been selected as $1x10^{-4}$ p.a., based on the installation of spiral wound gaskets in all flanges (Ref.16). Ignition probability has been estimated to be 0.01 (Ref.17).

In the event of a jet fire at the tank, a BLEVE would not occur immediately as it would take considerable time for the tank to heat and fail. A review of BLEVE incidents throughout the world indicates that failures of tanks under direct flame impact can take up to 1-2 hours to fail. Hence, it is possible that personnel involved with the emergency response could provide fire water cooling to the tank preventing the tank failure. However, personnel responding to such an incident could make an error resulting in ineffectual application of cooling water. It has been conservatively estimated that an emergency response error would occur 1 in 10 incidents or 0.1.

A fault tree has been developed to determine the BLEVE frequency from a forklift fuelling nozzle flange fire. This is shown in **Figure 6-3.**

The BLEVE frequency as a result of a fire at the site supply flange has been estimated to be $1x10^{-8}$ p.a. This is conservative as the values selected for failure frequencies and probabilities are at the upper range of the frequency data, with the exception of the flange leak, which has been selected at the lower end, due to the specific use of spiral would gaskets, minimising the potential for flange leaks.

Figure 6-3: Bleve Frequency – Jet Fire At Site Supply Flange



6.2.4 Cumulative BLEVE Frequency

The total BLEVE frequency is the summation of all three frequency estimates. Hence, the frequency carried forward to the Risk Assessment section of the report is:

BLEVE Frequency = (0.3+0.3+1) x 10^{-8} = $1.6x10^{-8}$ p.a.

7. Risk Analysis

7.1 Offsite Risks

Only one incident was identified to have consequences in offsite areas exceeding published criteria (Ref. 10 – HIPAP 4), this was a BLEVE at the LPG storage tank located about 30m from the site boundary.

It was identified that other potential hazardous incidents did not exceed published criteria (Ref. 10 – HIPAP 4) due to the location of the dangerous goods storages and hazardous facilities well clear of the site boundaries.

7.2 BLEVE Risks

The consequence analysis identified that the BLEVE fireball would impact with a radius of 46m and about 15m offsite. However, the fireball heat radiation would impact much further. Fatalities would occur as a result of people at the site boundary (west – McCauley Street) impacted by the fire ball. Hence, there is a risk of fatalities at the site boundary to the west (McCauley Street).

At the boundary to the west and north, the fireball from the BLEVE will extend into the adjacent sites by about 15m. People in this area would be immediately impacted by the BLEVE fireball and fatalities would result if people were within 15m of the boundary fence at McCauley Street.

Hence, the probability of fatality as a result of a BLEVE at the LPG storage is 1 and therefore the fatality risk is:

BLEVE Fatality Risk = Fatality Probability x BLEVE Frequency

BLEVE Fatality Risk = 1 x 1.6 x 10^{-8} p.a. or 0.016 chances in a million per year (pmpy).

7.3 Risk Criteria

Risk criteria are published by a number of regulatory authorities. For NSW, Hazardous Industry Planning Advisory Paper No 4 (Ref.10) has been used. **Table 7-1** repeats the HIPAP 4 risk criteria.

The adjacent land at the site boundary can be classed as residential, as the public can access this area from residences close by. The risk criterion for residential zones is 1 chance in a million per year or 1 pmpy. The assessed fatality risk for the BLEVE scenario is 0.016 pmpy. Hence, the site does not exceed the recommended risk levels.

Table 7-1: Risk Criteria Published In HIPAP 4(Ref. 10)

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

7.4 Summary of Risk Assessment

In summary, there were no postulated incidents identified to exceed consequence and risks from the installations and operations at the proposed Amcor site.

It is noted that the analyses conducted in this assessment are very conservative. The data used was that from the upper range of the data sets (i.e. the conservative end, with the exception of flange leaks) and the results of the analysis would be at the upper end of the risk scale. It is considered that a more detailed analysis would yield lower risks in all cases.

7.5 Effect on Botany Risk Contours

As the site is located in the Botany area, the effect on changes in dangerous goods storage on the risk contours for the Botany area as presented in the *Botany/Randwick Land Use Industrial Area Safety Study (DoP 2001)* has been considered.

A comparison between the Dangerous Goods storage for the Old Mill and the proposed New Mill is presented in **Table 7-2.** The proposed changes to the Amcor site will result in the elimination of Class 5 Dangerous Goods storage, and Class 8 Acids. Quantities of combustible oils (Class C2) will slightly increase, however Class C2 are low risk substances and this does not represent an increased use. Based on this hazard assessment, and the reduction in storage of Dangerous Goods, it is concluded that the proposed change in Dangerous Goods storage at the Amcor Botany site will not have any long term impact on the Cumulative Risk Contours.

- **Table 7-2 Summary of Dangerous Goods for New Mill and Old Mill**

Dangerous Good Class and type	Packing Class	Maximum quantity for New Paper Mill Operation	Maximum Quantity in Old Mill
2.1 (LPG)	N/A	6,775L	6773L
2.1 (Acetylene)	N/A	1,000kg	1650kg
2.2	N/A	100m^3	120m^3
3	III	1,600	1600
5	III	Nil	7000L
6.1 (b)	III	80kg	80kg
8	II	105,000L	91,000L
			8225kg
C1	N/A	40,000L	40000
C2	N/A	100,000L	73500

Further to the assessment of the storage quantities of dangerous goods detailed above, the consequence analysis indicates that only one incident has the potential to result in offsite impact. Hence, this will be assessed for risk. In the event that the risk is assessed to be acceptable (i.e. within the HIPAP criteria, then there will be no risk impact offsite greater than $1x10^{-6}$ p.a. and there will be no impact to the cumulative risk contours.

8. References

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22. AS2430-2004, “Classification of Hazardous Areas”, Standards Association of Australia, Sydney.
23. AS4452-1997 “Storage and Handling of Toxic Substances”, Standards Association of Australia, Sydney.

Appendix A Hazard Identification

Site Area	Cause	Consequence	Proposed Safeguard
LPG Tanker Unloading (Class 2.1)	- Split hose, gas release	- Delayed ignition, Flash fire and jet fire - Immediate ignition and Jet fire Heat radiation impact to area adjacent to the unloading point.	- Operator in attendance during all transfer operations; - LPG deliveries performed by a dedicated LPG gas supplier; - Emergency transfer shut down provided on vehicle; - Non-return valve installed on delivery pipework and excess flow valves on vessel - Hose reels and hydrants available in the area; - LPG storage is located in an isolated area of the site with no ignition sources; - Delivery driver training and competency testing (note drivers make thousands of deliveries each year without incident); - Site is staffed 24 hours per day, staffed trained in use of first attack fire fighting equipment.
LPG Forklift fuelling	- Split hose and gas release - Ignition of release from Electrical Fault	- Delayed ignition, Flash fire and jet fire - Immediate ignition and Jet fire - Heat radiation impact to area adjacent to the unloading point.	- Facility is designed in accordance with AS1596 (Ref.5) - Operator in attendance during all transfer operations; - Hose reels and hydrants available in the area; - LPG storage is located in an isolated area of the site with no ignition sources; - Forklift driver training and competency testing; - Site is staffed 24 hours per day, staffed trained in use of first attack fire fighting equipment.

Site Area	Cause	Consequence	Proposed Safeguard
LPG Tank	- Component failure and gas release	- Delayed ignition and flash fire - Immediate ignition and jet fire - Jet fire impact on tank and BLEVE	- Tank is designed in accordance with AS1596; - Tank isolation provided at the tank; - Hydrants available to provide cooling if required; - Storage is relatively small per tank (<7000 litres); - Flanges on the vessel minimised and oriented away from storage; - Area is isolated from ignition sources, minimising fire potential.
Truck Loading/ Unloading (Class 3)	- Drum damage from dropped pallet - Drum damage from forklift tines	- Minor spill, small pool of flammable liquid (Class 3) - Minor spill - Small Pool Fire	- Operator in attendance during all transfer operations; - Nominal container/drum size range no more than 205L, minimising size of spill; - Drums transferred outside boiler house which will have a covered, bunded area, minimising chance of spill outside facility; - Fire extinguishers and hose reels available in the boiler house near the loading/ unloading area - Forklift driver training and competency testing.
Dangerous Goods Storage (Class 3)	- Leak in Bulk tank leading to release - Ignition of release from Electrical Fault - Ignition of release from Hot Work	- Class 3 Storage area	- Storage area will be designed to comply with AS1940-2004 (Ref.6) - Bulk tank will be subject to regular inspection and maintenance program - First aid fire fighting equipment available (e.g. fire hose reels and extinguishers); - Fire fighting training of personnel; - Control of ignition sources (eg. no smoking in or around the boiler house or loading/unloading areas); - All Class 3 liquids will be stored externally (outside the boiler house) in a covered and bunded storage area to minimise potential for high temperatures - Spill kits available on site

Site Area	Cause	Consequence	Proposed Safeguard
Dangerous Goods Storage (Class 3)	Spill results in ignition and pool fire	- Class 3 storage fire	- Staff in attendance during all DG handling operations; - Bulk tank will be subject to regular inspection and maintenance program - First aid fire fighting equipment available (e.g. fire hose reels and extinguishers); - Control of ignition sources (eg. no smoking in or around the boiler house or loading/unloading areas); - No electrical equipment used in the store
Dangerous Goods Storage (Class 6.1)	Toxic materials release	Potential for spill to escape offsite and into drains adjacent to chemical storage area	- Drum inspection upon delivery to site - Regular storage inspections - Small quantity spilled from single drum leak - Individual storage area for toxic material will be bunded - Spill kits available on site - Class 6.1(b) Response kit and procedure available on –site - Training for personnel involved with Class 6.1(b) activities and processes
Truck Loading/ Unloading (Class 6.1)	- Drum damage from dropped pallet - Drum damage from forklift tines	- Minor spill, small pool of toxic liquid - Minor spill	- Operator in attendance during all transfer operations; - Nominal container & drum size no greater than 200 litres, minimising size of spill; - Drums transferred in area at the front of the New mill minimising chance of spill outside facility; - Unloading area will be fully bunded - Awning installed over the forecourt area outside the new mill limiting the potential for stormwater to be contaminated by spills

Site Area	Cause	Consequence	Proposed Safeguard
Dangerous Good Storage (Class 8)	- Component failure and Corrosive Liquid release	- Tank leak into bund	- Bunded area contains 110% of tank - Tank inspection and testing regime - Regular inspection and maintenance during operating hours / 24 hour 7 day week operations - Tank materials are corrosion resistant - Bund is coated with epoxy resin -
Truck Loading/unloading (Class 8)	- Split hose or fitting release during transfer, corrosive liquid release	- Spill to surrounding area and transfer point	- Speed bump style bunding and associated collection sump around unloading area to contain spills - Driver in attendance to isolate leaks spills - Spill kit in area - Hoses regularly tested by supplier in accordance with the ADG Code - A separate drainage system or retention system will be provided to the forecourt area outside the paper mill where unloading and transfer occurs.
Diesel Bulk Storage (Class C1)	Fuel spill, ignition and fire	- Fuel escape offsite, environmental impact - Pool fire leading to heat radiation impact at the site boundary	- Tank will be designed to comply with AS1940-2004 (Ref.6) - Tank will be double walled with leak detection in the space between walls - Spill pad (with gutter) installed under the tank - Electrical components in the area of the tank are installed in accordance with AS2430-2004. - Fire fighting equipment installed adjacent to the tank (fire extinguishers, hose reels and hydrants) - Emergency response plan available including first attack fire fighting procedures and site emergency evacuation - Storage will be over 70m from site boundary

Site Area	Cause	Consequence	Proposed Safeguard
Diesel fuel delivery (Class C1)	Fuel spill	- Spill into drains near unloading point - Potential spill offsite into stormwater system	- Personnel in attendance during fuel delivery transfer - Fuel unloading area bunded to prevent direct spill to the drains - Site emergency plan to respond to spills
Combustible Oil Loading/unloading (Class C2)	- Drum damage from dropped pallet - Drum damage from forklift tines	- Minor spill, small pool of oil - Spill into drains near unloading location - Small pool fire in the presence of an ignition source or adjacent fire	- Operator in attendance during all transfer operations; - Nominal container & drum size range from 25 to 200 litres, minimising size of spill; - Most of the drums will be loaded/unloaded inside Building No. 2 or inside the paper which are enclosed buildings. Transfer route from Building 2 to the mill will be via mill courtyard area which will have a separate drainage system. This will minimise the chance of spill outside facility; - Fire extinguishers and hose reels available in Building 2 and the Mill where loading and unloading will occur; - Forklift driver training and competency testing.
Combustible Oil Storage (Class C2)	Oil spill	- Minor spill, small pool of oil - Oil escape offsite, environmental impact	- Drum inspection upon delivery to site - Regular storage inspections - Small quantity spilled from single drum leak - Major storage area will be provided with secondary containment - Minor storage locations inside mill area will be provided with some form of bunding (eg. Pallet with in built secondary containment, small bunded areas)
Cylinder Storage (Class 2.2)	Cylinder handling (loading/unloading from chained area)	- Dropped cylinders - Exploding and moving cylinders due to damage - Split containers, release, ignition and fire	- Cylinders are chained in position to dangerous movement of cylinders - Personnel have access to first attack fire fighting equipment (extinguishers & hose reels) - Forklift drivers are trained (hazards, fire response and forklift operation)

Site Area	Cause	Consequence	Proposed Safeguard
Cylinder Storage (Class 2.2)	Fire in the storage area	- Potential for cylinders to heat and explode, rocketing into other warehouse areas and creating secondary fires	- Cylinder area will have chains - No smoking or ignition sources will be around the cylinder store (i.e. electrical equipment is flameproof) - First attack fire fighting equipment available adjacent to the cylinder store - All cylinder pressure tested at regular intervals as required by regulations - Minor release for single cylinder failure

Appendix B Consequence Analysis

B1 LPG Flash Fire

In the event of a gas release from a flange or valve stem at the LPG storage tank area, there is a potential for the gas to accumulate and form a cloud, which could reach flammable concentration as it mixes with the surrounding air. In the event of a delayed ignition the cloud would "flash" rather than explode as there are few, if any, restrictions and confinements around the location of the LPG vessel.

A "wire-cut" across the face of a SWG was estimated to have an equivalent diameter of 3mm. Valve leaks may occur around the valve stem, between the stem and the body. Assuming a 1mm gap between the stem and the body, the potential equivalent diameter of leak for a 12.5mm valve stem is calculated by:

Area of annulus = $\pi/4\ (D_o - D_i) = \pi/4\ (0.0135 - 0.0125) = 2x10^{-5}m^2$

Equivalent diameter of hole = $(2x10\text{-}5 \times 4/\pi)^{0.5} = 5mm$

The rate of gas release from a valve stem at the LPG storage vessel was calculated using the TNO Effects Software© (Ref.15). The input diameter for the release was 5mm (worst case) and the release distance down the pipeline from the vessel was estimated to be 1m (i.e. close to the vessel). The model indicated that the release rate stabilised at 0.05kg/s.

To estimate the downwind distance to the lower flammable limit (LEL) of the gas release the Effects (Ref.15) gas dispersion model was used. The release rate of 0.05kg/s was input into the effects model using the following additional input values to determine the downwind distance to the LEL (note that a Pasquill stability constant of F1 was used as the worst case dispersion condition, meaning the stability conditions giving the longest distance to the LEL):

Jet Orientation - Vertical
Duration of Release – 3600s (value used to ensure stabilised cloud was established)
Diameter of Jet – 0.3m
Height above ground – 0.5m
Initial liquid mass fraction – 0 (minor leak, flash immediately to vapour)
Vapour Temp after expansion - -42.25°C
Pasquill Stability – F (most conservative)
Wind speed – 1m/s (conservative)
Ambient Temp. – 20°C
Ambient Humidity – 80%
Roughness – Cultivated Land

Time t after start – 1800 s (selected to ensure stable period of cloud development)
Distance downwind – 20m
Distance perpendicular (Y) – 0
Distance vertical (Z) – 1.6
No. time steps for concentration – 0
Time Factor – 3
X Co-ordinate - 0
Y Co-ordinate – 0
Predefined wind direction – user defined
Wind comes from – 180^{o}

The results of the analysis using the effects model estimated that the maximum distance to Lower Explosive Limit (LEL) is 3.3m

B2 LPG Jet Fire

Based on the same scenario detailed in **Section B1**, but accounting for an immediate ignition, the resultant scenario is a jet fire with heat radiation impacts to the surrounding area. The TNO Effects model was used to estimate the heat radiation impact from a jet fire at a flange. The following input values were used in the effects model to estimate the jet fire impacts:

Chemical Name – Propane
Mass Flow Rate – 0.05kg/s
Height of leak above ground – 0.5m
Initial pressure – 6 bar
Initial Temp. - -42-25^{o}C
Outflow angle – 90o (vertical)
Wind Speed – 5m/s
Ambient Temp. – 20^{o}C
Ambient Humidity – 80%
Fraction $C0_2$ in atmosphere – 12%
Distance from release point – 10m (approx distance to site boundary)
Exposure Duration – 60 s
Protective clothing – Yes
X Co-ordinate - 0
Y Co-ordinate – 0
Outflow angle – 90^{o}

The results of the analysis using the effects model estimated that the following impact results for the immediate ignition of a release at a flange:

Distance to Heat radiation level of 2kW/m^2 – 4m (perpendicular to the flame)
SEP – 106.9 kW/m^2
Flame Length – 2.78m
Frustum Width (base) – 0.15m
Frustum Width (end) – 0.7m
Lift off – 0.34m

B3 LPG BLEVE

In the event the jet flame impinges directly on the shell of the vessel, there is a potential for the vessel contents to heat and the vessel pressure to rise leading to release of gas via the PRV. Eventually the vessel liquid level will fall to a point where the jet flame impinges on the shell above the liquid level, resulting in shell weakening and failure. The vessel failure results in the release of the boiling gas leading to a boiling liquid expanding vapour explosion (BLEVE).

The BLEVE dimensions (fire ball size and duration can be estimated using the following formula:

Diameter of Fireball (D) = $6.48M^{0.325}$ metres

Duration of fire (t) = $0.852M^{0.26}$ seconds

The mass of LPG remaining after initial boil off has occurred (i.e. during the initial flame impingement, is estimated to be 3,500kg (i.e. ½ total vessel capacity)

Hence, impact consequences are:

D = $6.48\ (3500)^{0.325}$ = 91.9m

t = $0.852\ (3500)^{0.26}$ = 6.9

B4 Diesel Storage or Unloading Fire

B4.1 Diesel Fuel Fire Analysis

Two diesel tanks are used on site for t he storage of fuel; the tank capacities are 25000L and 15000L. The tanks will be located at the north eastern end of the boiler house area, approximately 15-20m west of the waste paper storage area. The tanks are located closest to the waste paper storage area (than the boundary), hence, the heat radiation analysis has initially been conducted for fires which may affect the waste paper storage area. In the event the heat radiation at the waste

paper storage area exceeds acceptable criteria for this fire, the site boundary incidents will be assessed. However, where there is no offsite impact (above criteria) for the waste paper storage area, no further analysis will be performed for the diesel storage tanks.

B4.2 15,000 Litres Diesel Storage Fire Analysis

The 15,000 Litre diesel tank will be used to fuel heavy vehicles handling the paper materials in the storage area on site. The tank will be bunded to contain any spills or leaks that may occur in the tank.

In the worst case incident, diesel fuel could leak into the bund and be ignited, resulting in a full bund fire. The bund for the 15,000 Litre tank has assumed to be 6m square and hence a full bund fire will have a liquid pool diameter of:

$$D = (4/\pi \times 6x6)^{0.5} = 6.77m$$

Figure B.1 shows an illustration of a typical pool fire in a bunded storage. It can be seen from this illustration that the flame burns above the bund walls in the depot and is affected by wind, causing the flame to tilt with the wind direction.

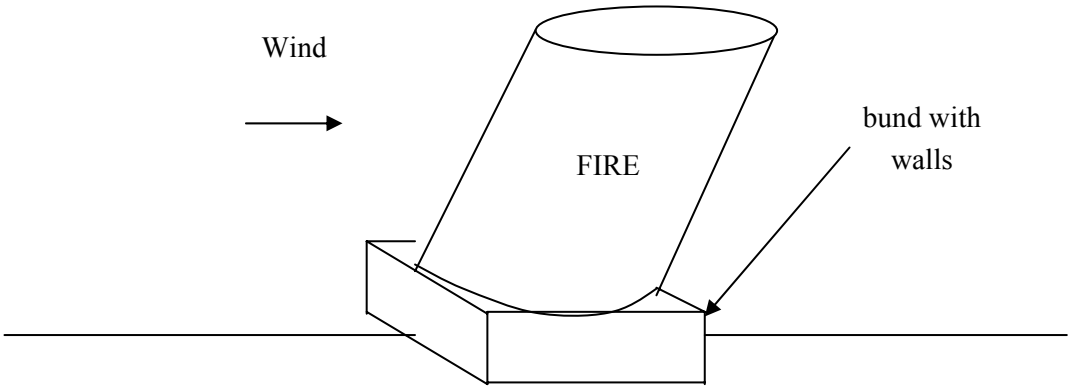

FIGURE B.1
EXAMPLE OF TYPICAL FIRE IN A STORE

Whilst the depot (bund) is rectangular in shape, the fire will act as a cylinder within the rectangular store, the flames being drawn into a cylindrical shape as a result of the updraft within the fire. Heat from the cylindrical flame radiates to the surrounding area. A number of mathematical models may

be used for estimating the heat radiation impacts at various distances from the fire. The point source method is adequate for assessing impacts in the far field, however, a more effective approach is the view factor method, which uses the flame shape to determine the fraction of heat radiated from the flame to a target. The radiated heat is also reduced by the presence of water vapour and carbon dioxide in the air. The formula for estimating the heat radiation impact at a set distance is:

$$Q = E F \tau$$

Where: Q = incident heat flux at the receiver (kW/m^2)
E = surface emissive power of the flame (kW/m^2)
F = view factor between the flame and the receiver
τ = atmospheric transmissivity

Figure B.2 shows the heat radiation path for the fire. It can be seen from this figure that flame tilt and height above ground level will have impacts on the amount of heat flux received by the target.

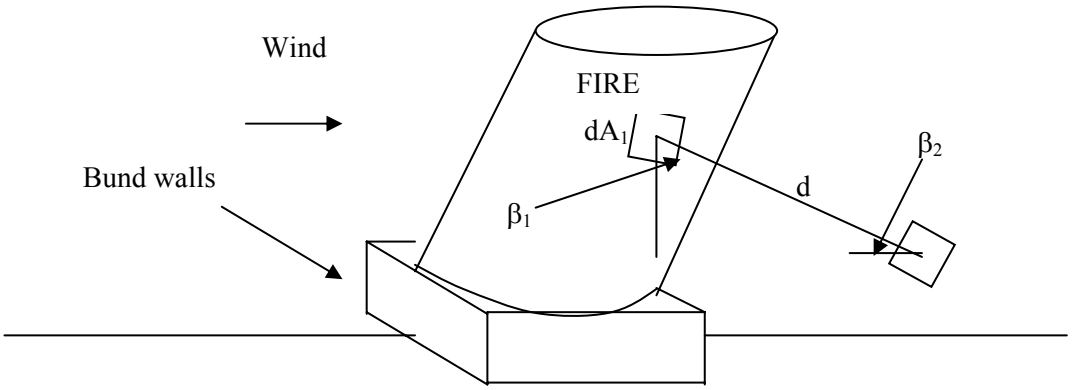

FIGURE B.2
HEAT RADIATION IMPACT ON A TARGET FROM A CYLINDRICAL FLAME

The calculation of the view factor (F) in **Figure B.2** depends upon the shape of the flame and the location of the flame to the receiver. F is calculated using an integral over the surface of the flame, S. The formula can be shown as:

$$F = \iint_S \frac{\cos\beta_1 \cos\beta_2}{\pi d^2}$$ (see **Section B.2.3** for development of this formula)

The above formula may be solved using the double integral or using a numerical integration method in spread sheet form. This is explained in **Section B5.3**.

Development of the Numerical Integration Model

Introduction

The spreadsheet calculator (SSC) determines the radiation flux experienced at a "target" originating from a cylindrical fire. It is intended typically for fires of flammable liquids (Class 3) though it can be used with any material so long as the "emissivity" of the flame is known. This is the heat flux at the surface of the flame and is given in kilo Watts per square metre (kW/m^2). The other parameters needed are: diameter of the fire, height of the fire walls, distance to target, height of flame, tilt of flame caused by wind. It is assumed that the walls have some height although there is no reason not to use the calculator for pool fires at ground level by entering a zero height.

Design Basis

The SSC is designed on the basis of finite elements. The fire is assumed to be in the shape of a cylinder of the same diameter as the equivalent pool diameter. The height of the fire can be calculated using the following formula:

$$L = 42D\left(\frac{m}{\rho_o (gD)^{0.5}}\right)^{0.61}$$ (Ref.20)

where: L= mean flame height (m)
D= pool diameter (m)
ρ_o= ambient air density (typically 1.2 kg/m3)
m= mass burning rate (kg/m2s) = 0.0667, based on 5mm/min burn down rate (Ref.14)
g= acceleration due to gravity (9.81 m/s2)

Once the flame height is known, the surface of the cylinder can be divided into many separate plane surfaces. To do this, a plan view of the fire was drawn and the relevant distances and angles allocated. The plan view is for the target and the base of the fire in the same horizontal plane.

The angle "theta" is varied from zero to 90 degrees in intervals of 2.5 degrees. Zero deg. represents the straight line joining the centre of the tank to the target (x0, x1, x2) while 90 deg. is the point at the extreme left hand side of the fire base. In this way the fire surface is divided up into

elements of the same angular displacement. Note the tangent to the circle in plan. This tangent lies at an angle, gamma, with the line joining the target to where the tangent touches the circle (x4). This angle varies from 90 deg at the closest distance between the tank and the target (x0) and gets progressively smaller as theta increases. As theta increases, the line x4 subtends an angle phi with x0. By similar triangles we see that the angle gamma is equal to 90-theta-phi. This angle is important because the sine of the angle give us the proportion of the projected area of the plane. When gamma is 90 deg, sin(gamma) is 1.0, meaning that the projected area is 100% of the actual area.

Before the value of theta reaches 90 degrees the line x4 becomes tangential to the circle. The fire cannot be seen from the rear and negative values appear in the view factors to reflect this. The SSC filters out all negative contributions.

For the simple case, where the fire is of unit height, the view factor of an element is simply given by the expression:

$VF = \Delta A.\ \sin(\text{gamma})/(\pi.\ x4.\ x4)$ .... Eq 1

where ΔA is the area of an individual element at ground level.

Note the denominator ($\pi.\ x4.\ x4$) is a term that describes the inverse square law for radiation assumed to be distributed evenly over the surface of a sphere.

Applying the above approach, we see the value of x4 increase as theta increase, and the value of sin(gamma) decreases as theta increase. This means that the contribution of the radiation from the edge of the circular fire drops off quite suddenly compared to a view normal to the fire. Note that the SSC adds up the separate contributions of Eq 1 for values of theta between zero until x4 makes a tangent to the circle.

It is now necessary to do two things: (i) to regard the actual fire as occurring on top of a fire wall (store) and (ii) to calculate and sum all of the view factors over the surface of the fire from its base to its top. The overall height of the flame is divided into 10 equal segments. The same geometric technique is used. The value of x4 is used as the base of the triangle and the height of the flame plus the tank, as the height. The hypotenuse is the distance from target to the face of the flame (called X4'). The angle of elevation to the element of the fire (alpha) is the arctangent of the height over the ground distance. From the cos(alpha) we get the projected area for radiation. Thus there is a new combined distance and an overall equation becomes:

$VF = \Delta A.\ \sin(\text{gamma}).\cos(\text{alpha})/(\pi.\ x4'.\ x4')$ .... Eq 2

The SCC now turns three dimensional. The vertical axis represents the variation in theta from 0 to 90 deg representing half a projected circle. The horizontal axis represents increasing values of flame height in increments of 10%. The average of the extremes is used (e.g. if the fire were 10 m high then the first point would be the average of 0 and 1 i.e. 0.5 m), the next point would be 1.5 m and so on).

Thus the surface of the flame is divided into 360 equal area increments per half cylinder making 720 increments for the whole cylinder. Some of these go negative as described above and are not counted because they are not visible. Negative values are removed automatically.

The sum is taken of the View Factors in Eq.2. Actually the sum is taken without the ΔA term. This sum is then multiplied by ΔA which is constant. The value is then multiplied by 2 to give both sides of the cylinder. This is now the integral of the incremental view factors. It is dimensionless so when we multiply by the emissivity at the "face" of the flame, which occurs at the same diameter as the fire base (o pool), we get the radiation flux at the target.

Analysis Results

Prior to the development of the model, parameters were developed (e.g. pool equivalent diameter, flame height, SEP, wind tilt, etc.).

Flame Height:

$$L = 42D\left(\frac{m}{\rho_0 (gD)^{0.5}}\right)^{0.61}$$

where: L= mean flame height (m)
D= pool diameter (m)
ρo= ambient air density (typically 1.2 kg/m3)
m= mass burning rate (kg/m2s) = 0.0667, based on 5mm/min burn down rate (Ref.14)
g= acceleration due to gravity (9.81 m/s2)

Using a diameter of 6.77m, the flame height is 13.57m.

Wind Tilt - can be calculated using the following formula:

$$\frac{\tan\theta}{\cos\theta} = 3.13Fr^{0.431} \quad \text{and} \quad Fr = \frac{U^2}{gD}$$

Where: θ = angle of tilt

Fr = Froude Number of the pool fire
g = acceleration due to gravity (9.81m/s^2)
D = diameter of the pool
U = wind velocity

An average wind value of 5m/s has been used for this calculation. This would be a reasonable assumption based on a wind range of between 1 and 5m/s that would be expected in the area.

Hence, for a diameter of 6.77m and a wind velocity of 3m/s, the wind tilt is 49 degrees.

Surface Emissive Power (SEP) – is a function of the fire magnitude (i.e. diameter and height), which governs the amount of heat at the surface of the fire. Larger fires tend to generate larger quantities of soot or smoke, which shields the more luminous components of the flame. Large diameter pool fires average an SEP of about 20kW/m^2. The average SEP of an 80m kerosene fire is about 10kW/m^2, suggesting the correlation is conservative (Ref.14).

The correlation Johnson (Ref.21) give the following formula for calculating the SEP of a flame:

$$SEP = SEPm \exp(-sD) + Es (1-\exp(-sD))$$

Where:
- SEP = the total surface emissive power of the flame
- SEPm = the maximum surface emissive power of luminous spots on a large hydrocarbon fuel flame (140kW/m2)
- SEPs = the surface emissive power of a smokey flame (20kW/m2)
- S = 0.12m-1 (an experimentally determined parameter)
- D = diameter of the pool

Based on the above formula, the calculated SEP for the diesel fire is 73.3kW/m^2.

Transmissivity – is the reduction in heat radiation due to the presence of water vapour and carbon dioxide in the atmosphere between the radiation source and the target. This can be calculated using the following formula:

$$\text{Transmissivity} = 1.006 - 0.01171(\log 10X(H_2O) - 0.02368(\log_{10}X(H_2O)))^2 - 0.03188(\log_{10}X(CO_2) + 0.001164(\log_{10}X(CO_2)))^2$$

Where: $X(H_2O)$ = (RH x L x Smm x 2.88651 x 102)/T

$X(CO_2)$ =	L x 273/T
RH =	relative humidity
L =	path length in metres
Smm =	saturated water vapour pressure in mm mercury (= 17.535 @ 293K)
T =	temperature in degrees Kelvin (293K)

The distance from the flame (bund) to the a heat radiation impact of 4.7kW/m^2 is about 17m. Relative humidity is selected as 70% (0.7). Using these values and the values listed above, the transmissivity parameter is calculated to be 0.82.

Summary of Inputs to the SCC Model

Using the methodology presented in Section B2 the following inputs have been developed for the heat radiation model.

Fire Diameter	6.77m
Fire height	13.57m
Flame tilt	49 degrees
SEP	73.3kW/m2
Transmissivity	0.82

Consequence Analysis (SCC Model Results)

The SCC model was entered into a Microsoft Excel spread sheet and the data above input to the model. The distance to a heat radiation level of 4.7kW/m^2 was estimated to be 22.8m

A full analysis of the distance to selected heat radiation levels was conducted for the fire. **Table B1** summarises the results of the analysis.

B4.3 25,000 Litres Diesel Storage Fire

Like the 15,000 Litres diesel storage fire, the worst case incident for a larger tank fire would be a full bund fire. The bund has been assumed to be 12m x 13.5m. Based on this bund size the equivalent fire diameter is:

$$D = (4/\pi \times 12 \times 13.5)^{0.5} = 14.4m$$

Using this value in the SCC, it was estimated that the distance to a heat radiation level of 4.7kW/m^2 was 33.6m. A full analysis of the distance to selected heat radiation levels was conducted for the fire. **Table B1** summarises the results of the analysis.

TABLE B1
Distance to Selected Heat Radiation Impact
Full Bund Fires – 25,000l & 15,000l Tanks

Heat Radiation Level (kW/m^2)	15,000l TANK	25,000L TANK
	Distance (m)	Distance (m)
35	13.7	21.5
23	14.9	23
15	16.3	25
12.5	17.1	25.9
8	19.4	29
6	21.2	31.3
4.7	22.8	33.6
2	31	45

B4.4 Diesel Fuel Unloading Fire

Diesel fuel will be delivered to site in tankers and unloaded to the diesel fuel tanks by flexible hose, connected between the tanker and tank filling point. The transfer will be attended by the tanker driver for the full unloading process and the driver will monitor the transfer and shut down the transfer in the event of any spills. The transfer area will be bunded by a "speed-hump" style containment area to prevent any spills escaping the immediate transfer point. The unloading area will be fitted with spill kits to provide immediate clean-up, preventing exposure of the combustible liquids to ignition sources. However, in the unlikely event of an ignition, a pool fire would result, radiating heat to the surrounding area.

The most likely fuel spill scenario would involve a hose or coupling failure resulting in the spill of the hose contents into the spill retention/containment area around the tanker. Once the spill occurs, the tanker driver will isolate the fuel transfer using emergency shut-off buttons on the tanker within 5 to 10 seconds, which will stop the transfer and isolate the valves on the tanker. Hence, only the transfer hose contents and the fluid flow for 10 seconds will leak to the ground. The transfer hose is 50mm in diameter and about 8m long. Hence, the volume in the hose is:

$$V = \pi/4\ 0.05^2 \times 8 = 0.016 m^3 \text{ or } 16 \text{ litres}$$

The tanker pump would transfer liquid at about 300 Litres/minute, hence, the flow for 10 seconds would be 50 Litres. The total spill quantity would therefore be 66 Litres.

A 66 Litre spill would spread to the bund area at a depth of 5mm (Ref.17), hence, the spread diameter (flame diameter) is estimated by:

$$D = [(4/\pi \times 0.065)/0.005]^{0.5} = 4.1m$$

Using this value in the SCC, it was estimated that the distance to a heat radiation level of 4.7kW/m^2 was 17m. A full analysis of the distance to selected heat radiation levels was conducted for the fire. **Table B2** summarises the results of the analysis.

TABLE B2
Distance to Selected Heat Radiation Impact
Fuel Transfer Operations for Tank Filling

Heat Radiation Level (kW/m^2)	Distance (m)
35	10.2
23	11
15	12.1
12.5	12.8
8	14.4
6	15.8
4.7	17
2	23

The incident above has been conducted for a tanker transfer involving the diesel tank filling using a 50mm hose. Fuelling of heavy vehicles will also be conducted using a flexible hose at a "bowser" type fuelling point. The fuelling of heavy vehicles will use a flexible hose of about 30mm diameter (or less). Hence, spills in this area will be smaller and incident consequences are smaller. Therefore, **Table B2** can be used as an indicator to the anticipated heat radiation impact from fires at the heavy vehicle fuelling bowser.

B5 Class 3 Flammable Liquids Drum Handling and Bund Fire Incidents

Class 3 flammable liquid (morpholine) is stored in a 1,600L bulk storage tank. During loading/unloading, a drum may fall from a pallet, resulting in drum damage, split and liquid spill. Additional incidents that could occur as a result of handling drums is the piercing of a drum with forklift tines, and incident not uncommon in drum handling areas. In addition, the bulk storage tank may develop a leak or fault, resulting in release. The Class 3 storage area will be bunded, hence any spills that occur in this area will be contained and there will be no environmental impact.

However, in the event an ignition occurs, the Class 3 bunded area could catch fire resulting in a full bund fire. The bund dimensions are 2m x 3m and the equivalent diameter for a full bund fire is:

$$D = (4/\pi \times 2 \times 3)^{0.5} = 2.8 \text{ m}$$

Using this value in the SCC, it was estimated that the distance to a heat radiation level of 4.7kW/m^2 was 13.2m. A full analysis of the distance to selected heat radiation levels was conducted for the fire. Table B3 summarises the results of the analysis.

In addition, should a drum fall from a pallet outside the bunded area the liquid from the damaged drum would be released onto the concrete area around the drum handling/Class 3 storage point. A 200 litre drum spill would, in the worst case, spread to a thickness of 5mm (Ref.17) resulting in a pool diameter of:

$$D = [(4/\pi \times 0.2)/0.005]^{0.5} = 7.1\text{m}$$

Using this value in the SCC, it was estimated that the distance to a heat radiation level of 4.7kW/m^2 was 23.5m. A full analysis of the distance to selected heat radiation levels was conducted for the fire. Table B3 summarises the results of the analysis.

TABLE B3
Distance to Selected Heat Radiation Impact
Full Bund Fires and Dropped Drum Fire – Class 3 Store

Heat Radiation Level (kW/m^2)	Full Bund Fire	Dropped Drum Fire
	Distance (m)	Distance (m)
35	8	14.1
23	8.5	15.2
15	9.5	16.8
12.5	10	17.6
8	11.2	20
6	12.2	21.5
4.7	13.2	23.5
2	18	32

Appendix C MSDSs for Class 6.1 Goods

MATERIAL SAFETY DATA SHEET

COMPANY DETAILS

Company: MANTEK
Address - Street: 7 RALPH STREET ALEXANDRIA
- City : SYDNEY
- State : NSW Postcode: 2015
Telephone Number(Office Hours): (02) 9669 0261
Emergency Telephone Number(Outside Office Hours): (02) 92140755
Date of Issue: SEPT - 2004
Fax Number: (02) 9693 1562

IDENTIFICATION

Product Name: ELECTRA SAF-95

Other Names: SOLVENT CLEANER/DEGREASER

Manufacturer's Product Code: 0136

Statement of Hazardous Nature:
CLASSIFIED AS HAZARDOUS ACCORDING TO CRITERIA OF NOHSC

UN Number: 2810

Dangerous Goods Class & Sub-risk: CLASS 6.1(b). NO SUBRISK

Hazchem Code: 3Z

Poisons Schedule: SCHEDULE 6

Packaging Group: III

Pack Size: 25, 60 AND 205 LITRE CONTAINERS

Container Type:
DOVE GRAY, MILD STEEL CONTAINER WITH PHOSPHATED PLUG

Major Recommended Uses: AS A SOLVENT CLEANER/DEGREASER FOR USE ON ELECTRICAL EQUIPMENT AND METAL PARTS.

Major recommended Method(s) of Application:
BY PAINTING, SPRAYING OR DIPPING PRODUCT ONTO SURFACES TO BE CLEANED.

Physical Description/Properties

Appearance: A CLEAR, COLOURLESS, NON-VISCOUS LIQUID WITH AN ORANGE/CHLORINATED SOLVENT ODOUR.

Boiling Point: 87ºC

Melting Point: NOT APPLICABLE

Vapour Pressure: <40mm Hg

Specific Gravity: 1.04

Flashpoint: NON FLAMMABLE
Flashpoint Method: P.M.C.C
Flammability Limits (%): NOT AVAILABLE

Solubility in Water (g/L): NEGLIGIBLE

Other Properties:
EVAPORATION RATE: >0.1 (BUTYL ACETATE = 1) %
VOLATILES: 100

Ingredients

Chemical Entity	CAS No	Proportion	Synonyms
ALIPHATIC PETROLEUM DISTILLATES	64742-88-7	30-60%	WHITE SPIRIT
TRICHLOROETHYLENE	79-01-6	10-30%	ACETYLENE TRICHLORIDE
TETRACHLOROETHYLENE	127-18-4	10-30%	PERCHLOROETHYLENE, PERC
D-LIMONENE	5989-27-5	<10%	ORANGE TERPENES

HEALTH HAZARD INFORMATION

Health Effects

Acute - Swallowed:
MAY CAUSE NAUSEA, HEADACHE, VOMITING AND LOSS OF CONSCIOUSNESS. ASPIRATION INTO LUNGS CAN CAUSE LUNG DAMAGE.

Acute - Eye: WILL CAUSE IRRITATION, REDDENING AND TEARING. MAY CAUSE IRREPARABLE EYE DAMAGE.

Acute - Skin:
MAY CAUSE IRRITATION, REDDENING AND DE-FATTING OF THE SKIN.

Acute - Inhaled: INHALATION CAN LEAD TO CENTRAL NERVOUS SYSTEM DEPRESSION, HEADACHE, DIZZINESS AND LOSS OF CONSCIOUSNESS. MAY ALSO CAUSE IRRITATION TO THE UPPER RESPIRATORY TRACT.

Chronic:
CHRONIC EXPOSURE CAN CAUSE CENTRAL NERVOUS SYSTEM DEPRESSION, LIVER AND KIDNEY DAMAGE AND THE POSSIBILITY OF IRREVERSIBLE EFFECTS. MAY CAUSE SKIN SENSITISATION BY SKIN CONTACT IN SENSITIVE INDIVIDUALS.

First Aid

Swallowed: IF SWALLOWED, GIVE 3 OR 4 GLASSES OF WATER. DO NOT INDUCE VOMITING. SEEK MEDICAL ATTENTION IMMEDIATELY.

Eye: IF IN EYES, WASH WITH COPIOUS AMOUNTS OF WATER FOR 15 MINUTES. SEEK MEDICAL ATTENTION IMMEDIATELY.

Skin: REMOVE CONTAMINATED CLOTHING AND WASH AFFECTED AREA WITH SOAP AND WATER THOROUGHLY. IF REDDENING OR IRRITATION OF SKIN PERSISTS, SEE A DOCTOR.

Inhaled: REMOVE VICTIM TO FRESH AIR AND TREAT SYMPTOMATICALLY. IF BREATHING IS DIFFICULT, GIVE OXYGEN OR ARTIFICIAL RESPIRATION IF BREATHING HAS STOPPED.

First Aid Facilities: EYEWASH STATION SHOULD BE NEARBY.

Advice to Doctor:
ASPIRATION OF THE PRODUCT DURING VOMITING CAN CAUSE PULMONARY DAMAGE OR DEATH. KEEP PATIENT'S HEAD BELOW HIPS TO PREVENT THIS. GASTRIC LAVAGE SHOULD BE CONSIDERED.

PRECAUTIONS FOR USE

Exposure Standards:
TRICHLOROETHYLENE – TWA: 50ppm(270mg/m^3); STEL: 200ppm(1080mg/m^3)
TETRACHLOROETHYLENE – TWA: 50ppm (340mg/m^3); STEL: 150ppm (1020mg/m^3)

Engineering Controls: LOCAL EXHAUST IS ADEQUATE. IF RISK OF VAPOUR BUILD-UP, USE AN APPROVED ORGANIC VAPOUR RESPIRATOR.

Personal Protection: SAFETY GOGGLES AND FACE SHIELD SHOULD BE WORN WHEN USING THIS PRODUCT, ALONG WITH VITON OR PVA/PVC GLOVES, ENCLOSED FOOTWEAR AND OVERALLS OR APRON.

Flammability: NOT A HAZARD

SAFE HANDLING INFORMATION

Storage and Transport: STORE IN A COOL, DRY, WELL-VENTILATED PLACE, IN THE ORIGINAL CONTAINER. STORE BELOW 49°C.
TRANSPORTATION: UN 2810, CLASS 6.1, 3Z GRP III

Spills and Disposal: CONTAIN SPILL AND PREVENT FROM ENTERING WATER SOURCES. VENTILATE AREA AND WEAR PROTECTIVE CLOTHING. USE SAND OR ABSORBENT MATERIAL. PLACE INTO LABELLED CONTAINERS FOR DISPOSAL ACCORDING TO LOCAL, STATE AND FEDERAL LAWS.

Fire/Explosion Hazard: AT DECOMPOSITION TEMPERATURE, CAN RELEASE CARBON DIOXIDE, CARBON MONOXIDE, HYDROGEN CHLORIDE AND PHOSGENE.

OTHER INFORMATION:
KEEP OUT OF REACH OF CHILDREN. READ ENTIRE LABEL BEFORE USING PRODUCT. INCOMPATIBLE WITH STRONG ALKALIS, ACIDS, SELECTED AMINES AND ALUMINIUM(IN THE PRESENCE OF WATER AND CLOSE CONTACT UNDER PRESSURE).

CONTACT POINT
Title/Position: TECHNICAL SERVICES CHEMIST
Section: TECHNICAL DEPARTMENT
Telephone Number: 02 9669 0208

Appendix B – Revised Noise Assessment

Amcor Botany Mill Upgrade

NOISE ASSESSMENT

- SUBMISSIONS REPORT
- Rev 2
- 19 April 2007

Amcor Botany Mill Upgrade

NOISE ASSESSMENT

- Rev 2
- 19 April 2007

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Contents

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1. Introduction

The DEC NSW Industrial Noise Policy (INP) is the primary guideline for assessing the potential impact from noise emissions for both new and existing developments. Changes to the way existing industrial noise sources are assessed were introduced with the Application Notes to the INP, issued July 2006. The Environmental Assessment (EA) of the Amcor Paper Mill Upgrade was undertaken and was largely completed prior to the publication of the DEC notes to the INP and therefore did not include the revised methodology for identifying urban/industrial amenity criteria.

As a result of the change to the Amenity Criteria definitions for urban/industrial, a more stringent noise criterion is used and therefore the reassessment of the potential for noise impacts is necessary. This report supplements the earlier EA incorporating submissions and comments from Planning. The revised assessment identifies the new Amenity Criteria and the predicted noise levels at nearby noise sensitive receivers to meet this criteria.

2. Revised noise criteria

Amenity Noise Criteria

The amenity criteria apply to the L_{Aeq} Level determined for the period of assessment of day evening or night. The definition of the noise amenity classification for the residential area surrounding the AMCOR site is classified as an urban/industrial interface based on the description for this type of location in the DEC's Industrial Noise Policy. The DEC NSW Industrial Noise Policy - Application Notes, issued July 2006, provide for the revision of the INP classification of receiver type listed in Table 2.1 of the INP under certain circumstances. Where the re-development of an existing site is considered to be substantial in nature, the receiver type is to be accordingly reclassified to reflect the most appropriate category based on the location of the receivers. In the case of the Amcor redevelopment, the works are considered to be substantial enough to reclassify the receiver types in the vicinity of the site to "urban".

The DEC recommends that for a residence located in an urban area an acceptable amenity criteria would be 60, 50 and 45 dB(A) $L_{Aeq\ period}$ for day, evening and night respectively. Modifying values for the amenity criteria are applied when there is existing industrial noise sources present. The amenity criteria are then decreased in accordance with Table 2.2 of the INP, which has a sliding scale depending on the estimated noise contribution from existing industry.

From the EA, the measured existing L_{Aeq} noise levels for day evening and night are 56, 49 and 48 dB(A) respectively. A subjective assessment of existing ambient noise environment at night was included in the EA. This estimated the existing industrial noise influence as having a contribution of L_{Aeq} 47 dB(A) with traffic noise accounting for the balance. Other significant projects in the vicinity of the Amcor Paper Mill have estimated the existing industrial noise as being 48 dB(A), which has previously been accepted by the DEC and used as the basis for setting noise goals at the nearby residential receivers.

Applying the revised classification of receiver type to the Amcor development Table 2.2 of the INP indicates a penalty of 10 dB(A) be applied to the existing industrial noise levels for the night time. Similarly, the daytime and evening amenity criteria have had the same adjustment applied. The modified amenity noise criteria for an urban receiver are presented in **Table 2-1**.

Table 2-1 Revised Project Specific Noise Criteria

	Day	Evening	Night-time
Intrusiveness Criteria	$L_{Aeq15\ min}$	$L_{Aeq15\ min}$	$L_{Aeq15\ min}$
Project Specific RBL levels	45 dB(A)	44 dB(A)	42 dB(A)
Project Intrusiveness Criteria	50 dB(A)	49 dB(A)	47 dB(A)
Amenity Criteria	$L_{Aeq\ 11hr}$	$L_{Aeq\ 4hr}$	$L_{Aeq\ 9hr}$
Acceptable Amenity Criteria	60 dB(A)	50 dB(A)	45 dB(A)
Existing $L_{Aeq\ period}$ Noise levels	56 dB(A)	49 dB(A)	48 dB(A)
Modified Amenity	-10 dB(A)	-10 dB(A)	-10 dB(A)
Project Amenity Criteria	46 dB(A)	39 dB(A)	38 dB(A)
Project Specific Noise Levels	$L_{Aeq\ day}$	$L_{Aeq\ evening}$	$L_{Aeq\ night}$
	46 dB(A)	**39 dB(A)**	**38 dB(A)**

The Amenity Criteria presented in **Table 2-1** for the day, evening and night time noise levels at the nearest residential receivers has been calculated based on previous noise monitoring data presented in the EA. However, while this indicates a modified criteria of 38 dB(A), the adoption of the Amenity Criteria from similar projects in the vicinity of Port Botany means that a consistent $L_{Aeq\ night}$ noise criteria of 38 dB(A) at the nearest residential receivers will be applied to the B9 Mill Upgrade proposal.

The noise level set by the Amenity Criteria is very low compared to the existing noise levels in the vicinity of the Paper Mill and in achieving these levels at the nearest residential locations it is expected that the Paper Mill would be inaudible for much of the time.

3. Revised Noise Assessment

3.1 Amended Methodology

Previously the noise assessment used measurements of existing equipment as well as the estimated level from new equipment to predict the noise level at the most affected residential receivers. Since the writing of the EA additional design work has been completed allowing a more accurate representation of the expected noise sources from within the site. These details have been incorporated into the noise model to provide a revised assessment of impacts.

As the result of upgrading the paper machine some processes and associated equipment would become redundant and would therefore be removed from service. As this old equipment is replaced and relocated for the new Paper Machine, it is expected that there would be a reduction in existing noise environment around the plant.

Noise levels from equipment associated with new processes that will not be housed inside a building, such as the disk thickeners and some pumps and motors, have been estimated at a noise level required to meet the noise criteria at the nearby residences. As part of the equipment procurement process, all equipment is to have a nominal Sound Power Level of 85 dB(A). Where equipment external to buildings cannot be sourced with this specification, additional attenuation measures should be implemented. **Section 4** provides information on the management of these types of impact where appropriate.

3.2 Noise Modelling Approach

3.2.1 Overview

SoundPLAN noise prediction software was used to predict noise levels from the new plant layout at the nearby residential locations. The noise model implemented the ISO 9613-2 *Attenuation of sound during propagation outdoors* algorithms to predict noise levels at the nearby residences for both daytime and night time scenarios. The use of the ISO 9613-2 algorithm is for the prediction of impacts under favourable noise propagation conditions. This includes an average of a 3m/s wind or a moderate temperature inversion in the modelled results.

Although the project specific noise levels are taken from the $L_{Aeq\ period}$ Amenity criteria the $L_{Aeq\ 15\ min}$ has been used in the modelling to determine the noise levels at the nearest receivers. Due to the nature of the operations at the Amcor site the general noise emissions related to production do not vary dramatically throughout the day or night time instead they tend to be heard as a background hum from a distance. The compliance with the $L_{Aeq\ period}$ goals using an intrusiveness type $L_{Aeq\ 15\ min}$ assessment is conservative and indicates that development should comply under most operational scenarios when compared to the Amenity Criteria.

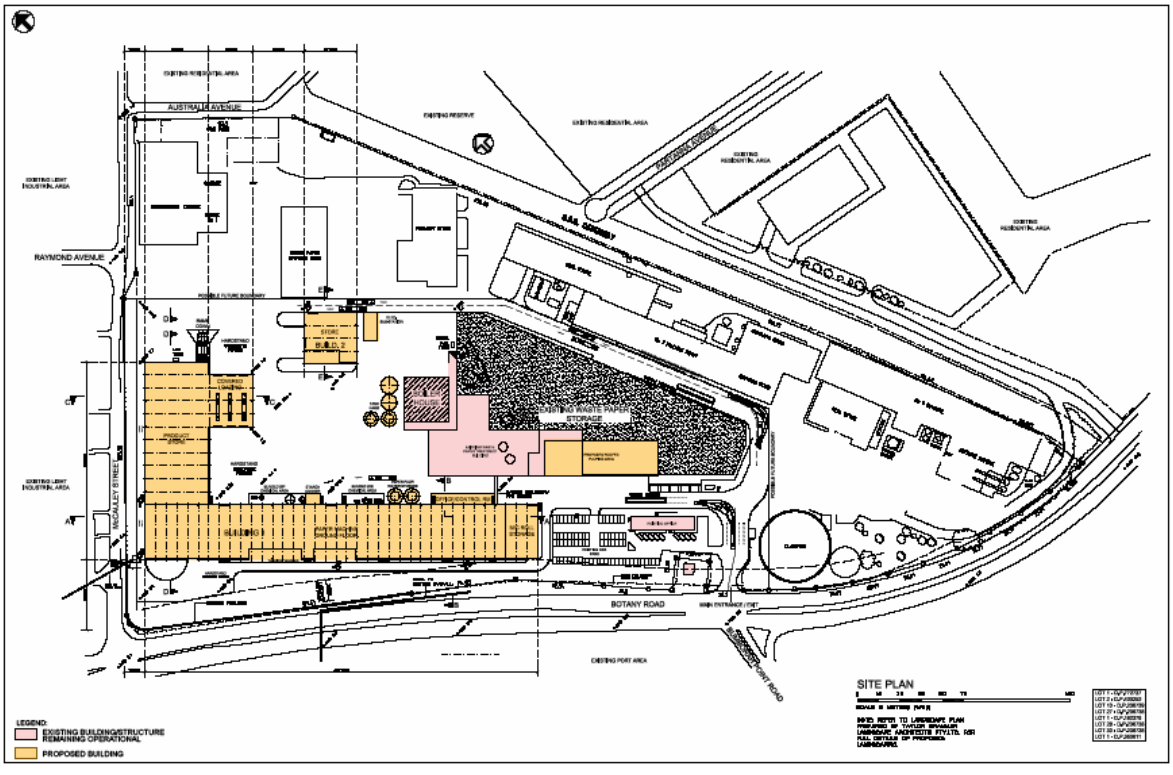
3.2.2 Sources of Noise Emissions

A revised list of noise sources used in the modelling of noise levels from the Paper Mill is presented in **Table 3-1** for the significant items of plant including building facades, new and existing external plant and mobile plant. The proposed layout shown in **Figure 3-1** is the same as the EA and shows the location of the new paper machine building as well as other buildings that would be replaced or demolished as part of the proposal. The proposed location of the new No.9 machine on the south western boundary is shown in yellow.

After the proposed B9 Paper Machine Upgrade project is completed, the land currently occupied by the B7 & B8 Paper Machines is likely to be redeveloped. The specifics of the type of development and the timing are not known at this point in time. It should however, be noted that this is not part of the current Development Application for the Paper Machine Upgrade although there is the potential for additional noise impacts as the result of the future removal of the existing buildings.

While the form of development is not known, it is likely that any redevelopment would include the erection of new buildings, which would continue to act as a noise barrier between residential locations and the Amcor Site. It is recognised that the redevelopment of this land may require additional mitigation measures for noise sources on the Amcor site in order to account for any differences between actual noise emissions and the Amenity Criteria at the nearest residences.

Figure 3-1 Proposed Site Layout



- **Table 3-1 Significant Building and Equipment Sound Power Levels**

Description	SWL dB(A)
Front end Loader	107
Truck product despatch	107
New fibre silo pumps and agitators	103
Paper machine building (internal)	102
Large Pump	98
Truck waste paper deliveries	95
Waste paper plant (internal)	95
Disc thickener	90
Boiler house (internal)	85
Chemical dosing	82
Product store (internal)	80

Table 3-1 lists the sound power levels for the new and existing buildings and the existing external equipment. For sources such as the facades of buildings the area is indicative of the noise radiating surface area.

Fan and exhaust stack items listed in **Table 4-2** of the EA have had a revised estimate of vents and stack emissions. The vent sources do vary depending on the application however for calculation purposes it has been assumed that all emissions are treated to at least a SWL of 72 dB(A). In some cases the exhaust stacks would be treated with silencers to achieve these noise levels.

3.3 Predicted Noise from Operations

Noise emissions from operational scenarios will vary throughout the day and night with certain activities occurring for only a short period of time. The main differences in operations between the day time and night time are from the waste paper truck deliveries and finished product despatch. For the daytime scenario operation of the Front End Loader (FEL) as well as waste paper deliveries, finished product despatch and other deliveries are likely to occur randomly through out the day. At night time waste paper and other deliveries are not likely to occur however the FEL would be operational for some of the time and infrequent despatch of paper products would also occur.

The revised assessment has included several scenarios that identify the various operational modes of the Paper Mill during both the daytime and the night time. An evening assessment scenario has not been included in the modelled scenarios. As previously indicated in the EA, the night time scenario is likely to be the limiting situation due to reduced background noise levels during this time. A description of each modelled operational scenario is given below:

- **Scenario 1** Day time (7am - 6pm) as a $L_{Aeq\ 15min}$ level including deliveries from waste paper trucks and despatch of finished paper products and operation of the FEL for 10 out of every 15 minutes loading the pulping plant.

- **Scenario 2** Night time (10pm - 7am) as a $L_{Aeq\ 15min}$ level including the worst 15 minute period whereby the FEL is operational for 10 out of every 15 minutes and the despatch of paper products from the product store at the rate of 1 truck in the 15 minute period.

- **Scenario 3** Night time (10pm - 7am) as a $L_{Aeq\ 15min}$ with pulp and mill operations only. No Front End Loader operational and no waste paper deliveries or finished products despatch.

The scenarios outlined above include the typical worst impact for a 15 minute period to compare against the 12 or 8 hour Amenity Criteria. This is likely to produce a conservative estimate of the noise level at residential locations as the operations modelled during the night time in particular would not occur regularly every 15 minutes. Product despatch and operation of the FEL are infrequent events that occur on an as needs basis and therefore cannot be accurately predicted for over a 24 hour period. The current operation of the FEL loading waste paper includes periods of up to 30 minutes of loading followed by 30 minutes of down time. It is expected that this system of operation would be consistent with achieving the night time Amenity Criterion.

Table 3-2 presents the results of the noise modelling for each of the scenarios above.

Table 3-2 Predicted Noise Levels at Key Residential Locations

Location	Predicted Noise Level ISO9613-2 Adverse Conditions $L_{Aeq\ 15\ Min}$			Revised Project Amenity Criteria $L_{Aeq\ Period}$	
	Scenario 1	Scenario 2	Scenario 3	Day	Night
Cnr Macauley and Australia Avenue	46	39	37	46	38
Australia Avenue	47	40	38	46	38
Murrabin Avenue	45	38	37	46	38
Partanna Avenue	44	36	35	46	38
Moorina Avenue	31	30	28	46	38

The predictions indicate that noise emissions from the site may generate an exceedance of the noise criteria during the day of approximately 1dB(A) at Australia Avenue with marginal compliance at other locations. The night time scenarios are effectively split into two operational modes one with the plant and ancillary equipment operational the other with the plant only operational. Scenario 2, which includes the ancillary equipment, indicates that with the FEL and a product despatch occurring there may be a marginal exceedance of the night time Amenity Criteria at two of the

residential receiver locations. However, this exceedance is small and as identified previously is based on a worst 15 minute scenario. In practice the predicted noise levels are likely to be below the existing ambient noise levels and very close to background noise levels. When only the Paper Mill emissions are considered, the predicted noise levels are expected to be at or below the night time Amenity Criteria.

The noise level contours for each of the scenarios are shown in **Figure 3-2**,**Figure 3-3** and **Figure 3-4** below.

Source:
Photography supplied by SKM 2002

File Name: EN01893_A_011a
File Location: \EN01893\Technical\GIS
Date: 28/4/2007
Revision: 1
Datum: GDA94, MGA Zone 56

0 100 200
Metres

N

AMCOR
Scenario 1 Noise Contours
Figure 3-2

SKM

Source:
Photography supplied by SKM 2002

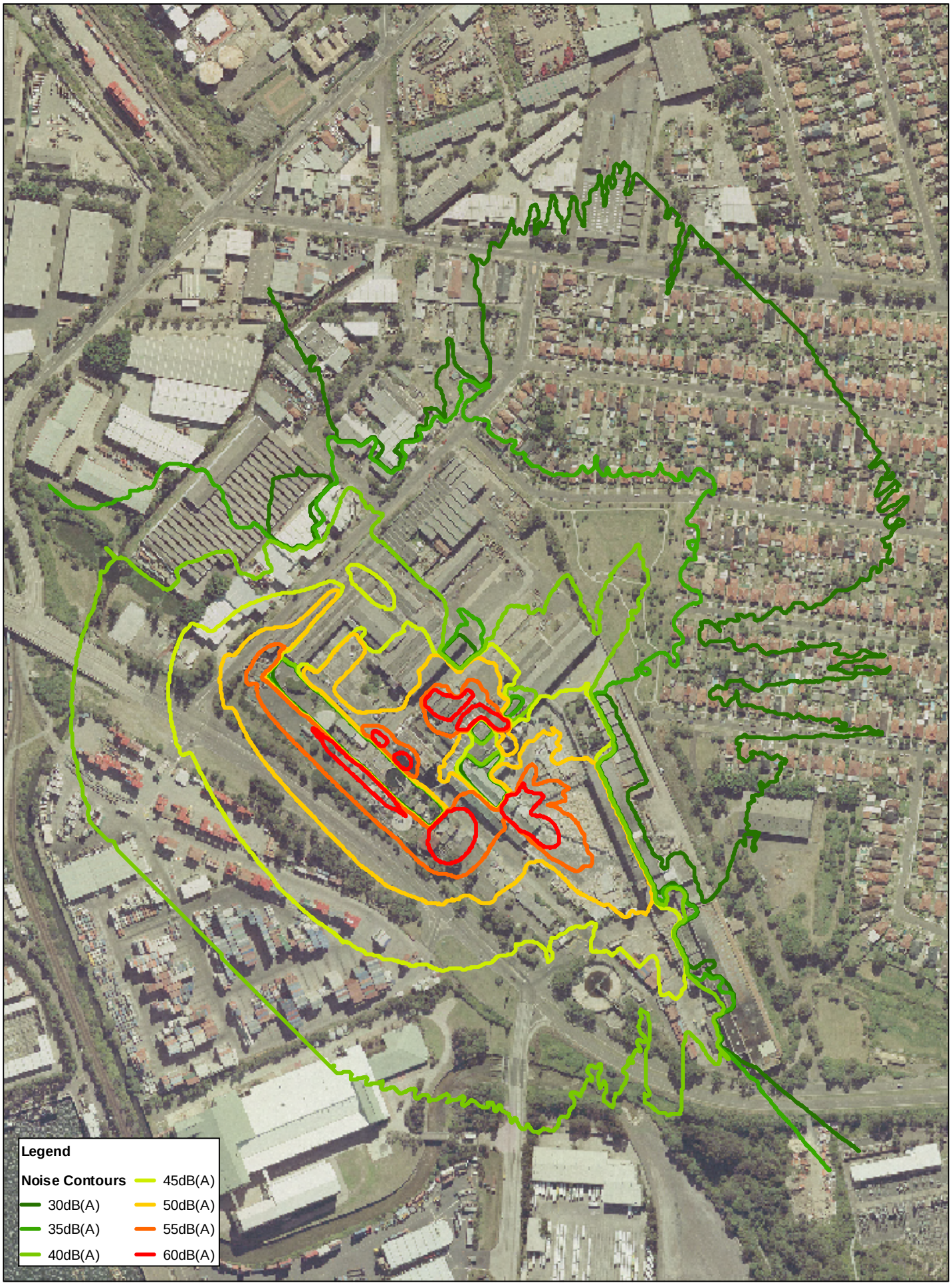
File Name: EN01893_A_010a
File Location: \EN01893\Technical\GIS
Date: 28/4/2007
Revision: 1
Datum: GDA94, MGA Zone 56

0 100 200
Metres

N

AMCOR
Scenario 2 Noise Contours
Figure 3-3

SKM



Source:
Photography supplied by SKM 2002

File Name: EN01893_A_009a
File Location: \EN01893\Technical\GIS
Date: 28/4/2007
Revision: 1
Datum: GDA94, MGA Zone 56

0 100 200
Metres

N

AMCOR
Scenario 3 Noise Contours
Figure 3-4

SKM

4. Noise Management and Mitigation Measures

Noise mitigation and management measures were previously identified in the EA however some additional mitigation measures would be necessary in order to achieve the more stringent revised Amenity Criteria.

- During the night time the utilisation of the FEL should be controlled to minimise the operational times.
- Product despatch should also ensure that finished paper deliveries are kept to a minimum during the hours of 10 pm – 7 am.
- Vent stacks shall be silenced to a Sound Power Level not exceeding 72 dB(A) in all cases.
- Noisy plant such as blowers etc should be enclosed in an appropriately designed acoustic room within the paper processing building.
- Outdoor noise sources such as pumps and motors in bunded areas may require additional noise attenuation where low noise motors are not available for the duty. These could be implemented as absorptive noise screens or individual enclosures where necessary.
- Some existing openings in the paper preparation plant that face the residential receivers are to be sealed with a masonry wall as access to these areas from outside would no longer be required.

5. Summary

An additional noise assessment addressing requirements of the DEC has been undertaken for the Amcor Paper Mill B9 Upgrade. This additional assessment incorporates a more stringent Amenity Criteria for noise impacts at the nearest residential receivers to the proposed works as detailed in the DEC document *Additional Notes to the Industrial Noise Policy*. In achieving these noise levels at the nearest residential receiver it is expected that noise attenuation and mitigation for the project will be applied where reasonable and feasible to new buildings and equipment associated with the project.

The results of the noise modelling indicate that the day time noise goals can be achieved at the most affected residential locations in Australia Avenue with the potential of a marginal exceedance of the Amenity Criteria. When all associated activities within the plant are undertaken for the night time scenario, a marginal exceedance of the noise goals is possible. The predictions for this situation are however expected to be conservative because of the time base used to assess the impacts. When only the Plant is operational during the night time period, general compliance with the Amenity Criteria is indicated.

Appendix A

Term	Definition
Ambient noise	The all-encompassing noise associated within a given environment. It is the composite of sounds from many sources, both near and far.
Annoyance	Any sound that is perceived as irritating or a nuisance.
Rating Background Level (RBL)	The single-figure background level used in the EPA's *Industrial Noise Policy*. The ABL is the median of the daily 10th percentile level of the background noise levels for each day, evening and night time period. That is, three assessment background levels are determined for each 24-h period. The procedure is defined in Appendix B of the EPA's *Industrial Noise Policy.*
Attenuation	In acoustics, the diluting or holding back of the energy of sound waves as they pass through a material. Materials are rated for their ability to prevent sounds from travelling through them.
A–weighting	An adjustment made to sound level measurement, by means of an electronic filter, to approximate the response of the human ear.
Background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is de-scribed using the L_{A90} descriptor.
Barrier	Any natural or artificial physical barrier to the propagation of noise.
Buffer	An area of land between an assessment site and a noise-sensitive land use, used as open space or for some other noise-tolerant land use.
Compliance	The process of checking that source noise levels meet with the noise limits in a statutory context.
Construction activities	Activities that are related to the establishment phase of a development and that would occur on a site for only a limited period of time.
Day	The period from 0700 to 1800.
Evening	The period from 1800 to 2200.
Night	The period from 2200 to 0700.
dB(A)	(A weighted decibel) A single number measurement of the sound pressure based on the decibel but weighted to approximate the response of the human ear with respect to frequencies.
Intrusive noise	Refers to noise that intrudes above the background level by more than 5 dB (A)..The intrusiveness criterion is set out in Section 2.1 of the EPA's *Industrial Noise Policy.*
L_{A90}	The A-weighted sound pressure level that is exceeded for 90 % of the time over which a given sound is measured. This is considered to represent the background noise. During a 15 minute survey, it would represent the quietest 90 seconds.
L_{Aeq}	The equivalent continuous noise level—the level of noise equivalent to the energy-average of noise levels occurring over a measurement period
$L_{A,Max}$	Maximum noise level measured at a given location over a specified time interval.
L_{A1}	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L_{A10}	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured. The L 10 level measured over a 1-hour period.

Appendix C – Additional Heritage Information

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Raelene Oliver
Amcor Ltd
1891 Botany Rd
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7 December 2006

Letter ROliver 061207.doc
EN01893

Dear Raelene

Heritage Structures at Botany Mill

This letter has been prepared in response to a request from Amcor to provide a summary assessment of a number of reports which have been prepared at the above site. The building areas addressed in these reports concern the brick wall to McCauley St (western section), the water tower and the former rotary digester, beater and refiner rooms.

The reports examined are:

- Preliminary Heritage Assessment, Amcor Paper Australia Botany Mill. Grahame Brooks and Associates (GBA). Undated, received at Randwick City Council 6 January 1998.
- Amcor Botany Mill Upgrade, McCauley St Matraville, Assessment of Heritage Impact. Grahame Brooks and Associates Pty Ltd, 3 July 2000;
- Heritage Wall to McCauley St Matraville, Structural Engineering Report. Sinclair Knight Merz (SKM) July 2000;
- Demolition of PM No 1 and Associated Buildings. Richard Rodd and Associates, 8 May 2006;
- Structural Report-Water Tower. SRIV Engineering, 6 October 2006.
- Structural Report-Wall Façade to McCauley St. SRIV Engineering, 6 October 2006.

In addition an inspection of the wall was carried out to confirm observations noted in the above reports.

These reports were examined in response to the recommendation of the Consultant Heritage Planner for Randwick Council that the areas addressed in the reports be retained as part of the proposed site redevelopment.

SKM

Results of Site Inspection

During the inspection, the external façade of the brick wall to McCauley St and the water tower were closely examined and a photographic record carried out. Due to access restrictions, the rotary digester, beater and refinery rooms could only be inspected from the adjacent door opening. The result of our inspection and a concurrent examination of the above reports are noted below.

1) Water Tower

The water tank is supported on a massive brick structure approximately 15m high. The walls on two sides contain openings with a third being essentially a blank wall. The fourth wall adjoins a building and could not be examined. The only features in the wall construction were arches over the openings, but in general the walls contained no significant examples of merit from an engineering or masonry perspective.

All three brick walls contain significant cracks. In addition, a number of steel tie rods appear to have been inserted into the walls. The purpose of these rods could not be confirmed however it is likely that they were installed to stabilise previous cracked or damaged brickwork.

Loss of mortar has occurred in particular on the north-west face where large areas of mortar loss and loose bricks were noted. Some mortar courses appear to have been repointed.

Some of the largest cracks in the brickwork appear to have been caused by corrosion of the steel beams embedded in the brickwork.

The water tank appears to be of cast iron construction with riveted joints. Extensive areas of corrosion were noted to the cast iron and these appear to have caused the cracking in the upper courses of the brickwork.

I have examined the engineering report on the water tower prepared by SRIV Engineering and agree with the main conclusions contained therein.

As a result of my site inspection and examination of the above reports, I believe that the water tower structure does not comply with current requirements for structural adequacy with a potential for individual bricks to fall without warning. To retain the structure would require rebuilding of the majority of the brickwork, and replacement of the water tank. The scale of the repairs would be such that a complete rebuild of the water tower and tank would be necessary.

As a result of the extensive damage to the water tower and the tank, and its construction of conventional brickwork with no unique features, I see no reason to retain the tower or the tank.

SKM

It is noted in the 1998 GBA report that the tank and tower hold some research potential as an example of contemporary mechanical engineering in the early 20th century. Accordingly it is recommended that the original fabric should be subjected to archival recording prior to any demolition. I agree with this recommendation.

2) Rotary Digester, Beater and Finishing Room

These areas could not be examined closely however it appears that there is a combination of a number of different types of construction including timber and steel roof trusses, concrete suspended slabs and floor slabs, concrete and cast iron columns and load-bearing brick walls. The condition of the structures could not be examined; however the 1998 GBA report notes the general poor condition, damage due to water penetration, extensive cracking and corrosion to the cast iron columns.

In my opinion, the construction was generally of a conventional form typical of construction practises of the early 20th century in with no unique or distinctive features. As a result, I see no reason to retain these rooms.

3) Brick Wall to McCauley St

The brick wall is of single storey construction approximately 5m high with a short two storey section at the former office entrance. The wall is divided into a series of separate panels by pilasters with windows in each panel. The windows are of steel construction with reinforced concrete lintels supporting the brickwork over the windows. Cast iron downpipes have been incorporated into the lower section of the wall. A stepped parapet has been constructed on the top of the wall

Damage and deterioration were noted in the wall as follows:

a) Significant cracking at parapet level due to movement of the upper section of the parapet along the damp-proof course at roof level. This movement is generally due to the absence of any expansion joints in the length of the building which has resulted in excessive expansion and contraction due to thermal effects and the inherent expansion behaviour of clay bricks.

b) Cracking and spalling of the concrete in the lintels over the windows due to corrosion of the steel reinforcement. This damage is widespread having occurred in the majority of the lintels. Due to on-going exposure to the marine atmosphere at the site, this damage will continue at an accelerating rate.

c) The steel windows have suffered corrosion due to the marine atmosphere and in a number of locations, have caused cracking where the windows are fixed into the adjacent brickwork. Since the fixing cannot be accessed for the purposes of rectification, this cracking will continue at an accelerating rate.

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d) Cracking was noted in the brickwork due to corrosion of the cast iron down pipes and rainwater headers, and to foundation movements.

If the wall was to be retained, not only would the above damaged areas require rectification, but measures would be required to ensure that the causes of the damage were also removed. This would likely require the complete replacement of the concrete window lintels and replacement of all the windows. In addition, it may be necessary to replace the whole length of the parapet. It is noted in the SKM report of July 2000 that retention of the wall may also require the parapet to be stabilised under the action of earthquake loading.

Further, the retention of the wall would require an extensive, permanent propping and bracing system to be constructed on the interior side of the wall. In general, I agree with the conclusions of the SRIV report of October 2006, however, I believe that it is possible to apply the propping system without the necessity to provide a temporary system on the street side of the wall.

As a result of my site inspection and an examination of the above reports, I note the extensive work required to repair the current damage, prevent future damage and to stabilise the wall. In addition, I do not believe that the wall is an example of innovative or structurally significant construction. Accordingly I do not believe that there is an engineering justification to retain the wall.

Conclusions

As a result of my inspection of the wall and other areas, and an examination of the reports supplied, I do not believe that the structures examined for this report are structurally significant. This opinion, together with the extensive work required to repair the structures, leads me to conclude that demolition of the structures examined is justified.

Nevertheless, a detailed record of the facilities to be demolished should be prepared, both in a written and a photographic form. The written record should include a history of the site, the equipment installed and the personnel involved. The photographic record should be bound in a form which can be retained in a library collection for reference by future researchers. I am aware of a hard-cover book "Botany Mill" written by J. Peter Thoeming published in 2004 which appears to satisfy the requirements noted for the written record.

I hope the above details sufficient for your purposes. However, if you have any queries or require clarification of any points, please call me on 9928 2280.

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Yours truly,

Arthur Maltby
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Appendix D – Submissions

Stakeholder/Submitter	No.	ID	Issue	Summary
Department of Planning	1	A	Heritage	There is a discrepancy within various heritage reports; the brick facades on McCauley St are listed as heritage items in the Randwick LEP, but the Brooks report of 2005 supports their demolition.
Department of Planning	2	A	Hazard	Further analysis is required on the hazards associated with the paper mill and the PHA needs to be updated. Information regarding; the layout of the facility, detailed explanation of the paper making process, surrounding land uses and hazardous substance/chemicals must be included in the PHA.
Sydney Water	3	A	Wastewater disposal and management	The Southern and Western Sydney Ocean Outfall Sewer (SWSOOS) cannot accept AMCOR process water and dirty site rainwater discharges without verification through the developed hydraulic models. Discharge control options are currently under consideration by AMCOR, which include; various water treatment arrangements (roofing and reduction of storage area for waste paper), on site storage volume for process water and dirty site rainwater and on site stormwater management
		B	Stormwater discharge to SWSOOS	AMCOR should prepare a 'whole of site' stormwater management plan, it will; distinguish between wastewater and stormwater; explain the function, structure and efficiency of the existing and proposed stormwater systems; and the rationalise and limit stormwater discharge to the SWSOOS
		C	Impacts of stormwater discharge on Bunnerong Canal	Stormwater drains into the main channel of the Bunnerong Catchment (SWC11) before discharging into Botany Bay via (SWC12). The use of Water Sensitive Urban Design (WSUD) throughout the site would contribute to improving stormwater quality.
		D	Peak daily discharge	The EA indicates a projected decrease in potable water consumption from the existing 500,700KL per annum to 326,000KL per annum during the transitional period and eventually to 224,300KL pa.
		E	Failure of non-potable water supply and contingency	The EA does not identify a contingent water supply in the event of failure of non-potable water supply, AMCOR should address this. Sydney Water requests the details of this so it can assess the risk involved.

Stakeholder/Submitter	No.	ID	Issue	Summary
		F	Existing non-compliance with trade waste limits	AMCOR does not comply with all conditions outlined in their current Trade Waste Agreement. AMCOR regularly exceeds the sewer acceptable standard for both pH and temperature
		G	Sewer corrosion and modification of trade waste limits	There is evidence of corrosion in the SWSOOS where the paper mill discharges. New requirements in the trade waste agreements would be necessary if corrosion is declared critical (30ºC, BOD 600mg/L, pH 7-10)
		H	Wastewater treatment systems for new paper mill	AMCOR will need to provide further details of proposed treatment for trade wastewater including details of all buffer tank sizes and details of the system to manage/control flow rate discharge.
		I	Trade waste discharges during construction and commissioning	Sydney Water is concerned about trade wastewater during construction. No details of the new wastewater pre-treatment system have been provided nor has the location of the pre-treatment system been provided.
		J	Bunding and drainage of chemical storage areas	Areas where chemicals are unloaded and/or stored should be appropriately bunded so they do not drain into the sewer/stormwater
		K	Approvals	The need for a 'Section 73 Compliance Certificate' from Sydney Water.
Department of Environment and Conservation	4	A	Night noise criterion	The DEC does not accept the projected noise levels for the Project B9, especially at night. A revised noise assessment is required
		B	Odour emissions	The proposed upgrade and expansion will reduce impacts at surrounding sensitive receptors from 5-6OU/m^3 to less than 5OU/m^3
		C	Post commissioning odour assessment	Post-commissioning odour monitoring is undertaken for all discharge points associated with the new paper mill
Randwick Council	5	A	Preparation of master plan	The land is greater than 4000m^2 and is considered a major redevelopment and therefore master plan is required
		B	Excess land	A concept plan should be developed for the whole of the site because there is excess land to be excised and sold in the future. Remediation should be dealt with now and not by the future landholder.

Stakeholder/Submitter	No.	ID	Issue	Summary
		C	Using additional stormwater from Long Dam	Additional water from Long Dam for industrial water supply should be considered. Stormwater should also be utilised when available.
		D	Treatment of groundwater and stormwater to replace potable water usage	Groundwater/stormwater should replace the use of potable water
		E	Rainwater to substitute for potable water use	Rainwater tanks should be installed; replace potable water use
		F	Potable water	Additional requirements for the further treatment and reuse of water from the Long Dam and Orica site should be used for the reduction in potable water use
		G	Stormwater	Stormwater run-off from the redeveloped site must be discharged into; an underground drainage system in botany street, via new and/or existing kerb inlets pits; and/or a suitably sized infiltration system; and/or the Long Dam
		H	Discharge to Botany Bay	The discharge of treated process water into Botany Bay should cease as part of this proposal
		I	Flooding study to determine building levels	No flood study has been undertaken for the various catchments that drain through or adjacent to the subject development site. A study must be undertaken prior to preparation of Construction Certificate and referenced as part of the EAR
		J	Flooding study to determine building levels	A drainage analysis should be undertaken to determine the impact of flooding may have on the height of the development and/or floor to ceiling heights of the development
		K	Heritage	A conservation plan for the McCauley Street façade should be prepared in accordance with the principles of the Australian ICOMOS Burra Charter.

Stakeholder/Submitter	No.	ID	Issue	Summary
		L	USTs and Remediation	The UST's should be removed and tank pit excavations should be validated in accordance with Work Cover requirements and DEC Guidelines under the Contaminated land Management Act 1997
		M	Site audit statement	A Site Audit Statement and Summary Report will need to be prepared in accordance with the DEC Guidelines.
		N	Design to meet AS2980.1 (traffic and parking)	Access driveway, internal car park layouts, loading area and internal circulation area should comply with AS2890.1 (2004) and the RTA's Guide to Traffic Generating Developments
		O	Number of parking spaces	Car parking proposed does not meet RTA and Council requirements
		P	Impact of signalised intersections	The EAR does not model the impacts of the proposed development on the surrounding signalised intersections
		Q	Detailed traffic study	The applicant should prepare a detailed traffic and transport study, in consultation with Randwick City Council and the RTA. It should include estimates of the traffic movements generated by the mill and safety concerns associated with vehicles queuing adjacent to the site frontage in Botany Road.
		R	Heavy vehicle access from McCauley St	Heavy vehicle access from Botany Road only. There should be no increase in vehicles entering/exiting the site via the driveway crossing.
		S	Heavy Vehicle routes	Heavy vehicle routes shall include Foreshore Road, Botany Road, Beauchamp Road and Denison Road. They should not utilise residential streets through Matraville town centre.
		T	Use of rail transport	Improvements should be made in regards to rail usage
		U	Impact and restoration of utilities	A public utility impact assessment should be carried out on all public utility services which is associated and/or adjacent to the development. A detailed assessment of all easements, pipelines, services etc burdening the site should be undertaken.
		V	Replacing overhead wires with	Underground cables should replace overhead wires in the vincinity of the development

Stakeholder/Submitter	No.	ID	Issue	Summary
			underground cables	
		W	Construction Waste Management Plan	A construction and demolition waste management plan should be prepared, submitted for approval and be approved prior to the issuing of a Construction Certificate for the proposed development.
		X	Stromwater discharge to SWSOOS	Stormwater runoff from waste/storage areas shall be graded and drained to the sewer to the requirements of Sydney Water
		Y	Employment and economic benefits of new paper mill	Should be quantified
		Z	Minimizing greenhouse gas emissions	Efforts should be made to minimize greenhouse gas production through the use of green power and/or through purchasing the equivalent in renewable energy certificates
		Aa	Signage details	Signage details were not provided for assessment
		Ab	Colour scheme and materials	A colour scheme and materials should be submitted. Corporate or bright colors shoud be avoided
		Ac	Tree removal	Any proposed tree to be removed should be replaced with suitable sized replacements
Department of Natural Resources	6	A	Existing licence and sustainability of groundwater extractions	It is expected that the licence held by AMCOR will go through a volumetric conversion process and an entitlement will be assigned as part of conversion to the requiremtns of the Water Mangement Act (2000)
		B	Piping of groundwater from Snape Park	Significant evaporation and leakage losses are likely with the current open channel discharge. The Department considers that the best management practice for the transportation and storage of water is in enclosed conduits and vessels ie pipes and tanks .

Stakeholder/Submitter	No.	ID	Issue	Summary
		C	Using water from the Orica Water Treatment Plant to substitute for potable water	The Department recommends that further investigation is needed for an alternative water supply, generated from the ORICA Water Treatment Plant.
		D	Groundwater contamination	There needs to be requirements to prevent any contamination of the groundwater
Nature Conservation Council of NSW	7	A	Existing licence and sustainability of groundwater extractions	The plant uses 5ML/day and will increase to 5.6ML/day. Main source; Botany Bay aquifer
		B	Existing licence and sustainability of groundwater extractions	Mains water reduction will generally be made up by increasing groundwater extractions
		C	Rainwater to substitute for potable water use	Onsite retention is absent from the site and there is little evidence of onsite recycling. More needs to be done replace potable water with rainwater
		D	Wastewater disposal and management	Average discharge of 4ML/day - significant producer of waste water.
		E	Use of rail transport	Rail and shipping facilities at Botany Bay should be promoted to reduce vehicular freight on the road.
		F	Odour emissions	Odour problems occur, therefore it is necessary to monitor micro-organisms and pH levels so it can be minimized
		G	Minimizing greenhouse gas emissions	The use of alternative renewable electricity needs to be investigate and used in the paper mill so that statewide greenhouse emissions can be met

Stakeholder/Submitter	No.	ID	Issue	Summary
Sydney Ports	8	A	Approval for discharge to Bunnerong Canal	An existing agreement is in place between AMCOR and Sydney Ports regarding the discharge of water from the AMCOR site via Bunnerong Canal. Sydney Ports requests a copy of the Operational Water Management Plan by AMCOR for review.
		B	Construction Traffic Management Plan	Sydney Ports wants to be involved in the preparation of a Construction Traffic Management Plan to ensure that the impact on road movements in the area is significantly reduced.
		C	Operational Traffic Management Plan	Sydney Ports is willing wants to be involved in the preparation of a Operational Traffic Management Plan to ensure that the impact on road movements in the area is significantly reduced.
Goran Milosevic	9		Odour emissions	Concerns about odour
Julie Abbot	10		Odour emissions	Concerns about odour
Chris & Alison Smith	11	A	No left turn into Botany Road	Concerned about the amount of traffic during and after construction. Believes a 'no left turn' for vehicles over 6m should be put in place.
		B	Pressure relief system - Noise	Concerns regarding additional usage of the pressure release system once productivity at the mill is increased
		C	Odour emissions	Concerns about odour
		D	Odour Emissions	Steam vapour and odour from the clarifying tank
		E	Excess Land	The resident would like to know what is going to happen to the surrounding excess land. Whether or not it is for the proposed development or future housing
Andrew Castle	12	A	Odour emissions	Concerns about odour
Anna Dimura	13	A	Pollution; Noise;	Concerns about odour and noise
		B	Odour emissions	Concerns about odour
		C	Zoning and surrounding land use	The resident feels that the area around the paper mill is residential and it is not suitable for heavy industry.
Michael Sutedja	14	A	Zoning and	The resident feels that the area around the paper mill is residential and it is not suitable for

Stakeholder/Submitter	No.	ID	Issue	Summary
			surrounding land use	heavy industry.
		B	Odour emissions	Concerned about the level of air pollution and odour
"unknown"	15		Odour emissions	Concerns about odour
RTA	16	A	Construction Traffic Management Plan	The RTA discusses the need for a comprehensive Construction Traffic Management Plan.
Railcorp	17		DA	Railcorp has reviewed the DA and had no objections or concerns about its approval