BLACKIE MENDHAM
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Consultants Advice Notice

Project:	Newcold Warehouse, Marsden Park	**Ref No.:**	Q16-086
From:	Renton Parker	**Date**	25th August, 2017
		Revision	0

	Attention	**Company**	**Email**
To:	Ashleigh Keyser	EMKC	Ashleigh.keyser@Em-kc.com
CC:			

Re: Response to Department of Planning – Hazards and Risks

1.0 Introduction

1.1 Background

The Department of Planning has issues several queries relating to the Preliminary Hazard Analysis prepared for the Newcold warehouse to be developed in Marsden Park, NSW as part of the public comment. To address these queries this Consultants Advice Notice (CAN) has been developed detailing the queries and the response from Blackie Mendham Pty Ltd.

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1.	The original development approved under SSD 6799 included a refrigeration unit with up to seven tonnes of ammonia as a refrigerant. Please identify whether there are any changes in the preliminary design and the proposed safeguards for the refrigeration system under this modification	The proposed system will use between 3,500 – 5,500 kg of ammonia; however, the assessment within the PHA has been conducted based on 7,000 kg as noted in Section 3.5 of the PHA in line with the previously approved quantity under SSD 6799.
2.	A similar refrigeration system will usually need to be topped up occasionally to compensate for the loss of ammonia during the refrigeration process. This information is not included in the PHA. Please provide information on the dangerous goods transport to the facility, including transport frequency, package size, and top up inventory, if available.	As it's a closed system topping up is not necessary, this will only occur during commissioning and in case a major leak happened. Topping up will be done by a professional refrigeration company with the proper safety equipment and exclusion zones in place. In summary, top ups are not expected other than during commissioning. In the event of a major leak, top up would be carried out under a change of management process as this is non-routine activity.
3.	Please provide information on the storage mechanism of anhydrous ammonia and details of all equipment. This information must include tank/vessel size, pipe size, the size of the largest connection to the following equipment: tank, pump, heat exchanger, and compressor, condenser vessels. The Department considers 20 mm as the largest release from the pump and compressors may be underestimating the potential impact from a toxic release.	The requested level of detail is currently unknown in terms of sizing of equipment; however, the following is likely to be included in the design based on a similar setup constructed in Melbourne. • Evaporative condenser • Water relief tank • Liquid receiver • Air purger • High temperature accumulator • Economiser • Low temperature accumulator • High and low temperature compressors Likely failure modes for the pumps and compressors would be failure of compressor/pump seals which would only result in an area of release around the damaged portion of the seal as ammonia may escape around the dislodged/damaged seal. Therefore, an equivalent of 20 mm

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		hole was assumed to allow for the releasing area around the seals which is considered appropriate.
4.	What would be the worst-case release scenario from the refrigeration system? Releases from tank/vessel does not appear to have been discussed in the PHA, but is identified in Table A1. Please clarify if releases from the storage tanks has been considered in the analysis.	The largest release scenario would be based on a pipe rupture which was modelled as 50 mm based on a guillotine rupture of the pipework. While tanks have not specifically been discussed, failures relating to the tank are likely to occur at nozzles, flanges and pipework rather than the tank shell itself due to the robust design and testing of tanks. Subsequently, releases from tanks are presumed to have been accounted for in the modelling of the pipes, flanges, valves.
5.	Table A1 describes sprinkler systems fitted in the compressor houses as safeguards. Is the sprinkler system automatically started on detection of ammonia release in the compressor house? Would there be any scenario leading to the contaminated water leaving the facility?	Review of the design in consultation with the designers indicates the sprinkler system is not included in the design. Notwithstanding this, it is proposed to include a bund beneath the storage tank which is to be capable of containing the full volume of the storage tank.
6.	Section 6.2.2 mentions gas detectors will be located throughout the facility and they will be connected to alarm systems and to isolation valves. Would the isolation valves close automatically upon detection of ammonia gas release?	It is proposed that upon detection of ammonia within the facility, the isolation valves would close to prevent the continued flow of ammonia through the system such that release through the unidentified release point is discontinued. The system can then be investigated to identify the point of release and have it corrected prior to de-isolation of the system.
7.	In the event of ammonia release, the toxicity effect on human is explained in Section 4.4. This section established that exposure of 100 ppm can cause immediate nose and throat irritation and exposure of 25 ppm should not cause adverse health effects nor cause undue discomfort to nearly all people. However, in Section 7.2, it appears that 200 ppm is selected as the end point for risk of irritation and 500 ppm is selected as the endpoint for risk to injury without clear explanation on how these end points have been chosen. Referring to the Acute Exposure Guideline Levels (AEGL) for ammonia, it is noted that for 30 ppm and 220 ppm a 10 minute duration is adopted	Review of the AEGL values indicates these provides a much more conservative analysis and provide a greater assessment of more vulnerable populations. It is agreed that these values are more appropriate for assessment; hence, it is proposed to adopt these in the study in lieu of the existing reported values. However, adding these values into the model does not change the contours generated as the frequency of the initiating event is less than the permissible risk criteria.

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	for AEGL-1 and AEGL-2, respectively. These AEGL values differ from the values adopted in the PHA. Please provide further information on the following: - The rationale for choosing these end points for assessment. Depending on the release duration, selection of 500 ppm as serious injury may be underestimating the potential toxic effect; and - What is the assumed release durations for ammonia.	The scenarios that may have far reaching effects (i.e. medium and large releases) were estimated to have flow rates of approximately 9 and 56 kg/s respectively. Based on a 7,000 kg system, this would result in releases for full mass of the system occurring in approximately 780 s and 125 s respectively. To ensure sufficient conservatism in the dispersion, a release duration of 900 s was modelled which exceeds the realistic release durations.
8.	The toxic dispersion distances are not provided. Please provide the dispersion distances to fatality, injury and irritation, with reference to surrounding land uses.	The scenario that would results in the further downwind distances is a large release (50 mm) in F1.5 conditions. The following values have been taken for irritation, injury and fatality based on a 30 minute exposure using AEGL values: Irritation: 30 ppm Injury: 220 ppm Fatality: 1,600 ppm The corresponding impact distances are: Irritation: 2,890 m Injury: 2,718 m Fatality: 1,980 A nearly 3 km impact distance has the potential for exposure to areas which could be residential, or contain sensitive receptors (i.e. childcare centres). However, it is noted the fatality risk as defined in the contours only partially impact over the site boundary; hence, these receptors would not be impacted by fatality risk exceeding the acceptable criteria of 0.5 pmpy. A review of the impact distances with reference to the acceptable risk criteria indicates injury does not occur (solely based on the initiating events) without considering wind stabilities nor direction to achieve the required impact. Therefore, the actual impact that may result in injury or

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		irritation is substantially lower than the acceptable injury and irritation criteria.