Preliminary Hazard Analysis

Chemical Immobilisation and Solidification Process

Chemsal Pty Ltd

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1. INTRODUCTION

The Chemsal Chemical Waste Storage and Treatment Facility has been previously approved to receive, store, treat and transfer a range of dangerous and hazardous goods from a variety of industry, domestic and commercial sources. In June 2009, a Part 3A Modification Request was submitted to the NSW Department of Planning (DoP) to modify the project approval under Section 75W of the *Environmental Planning and Assessment Act, 1979*, relating to the introduction and operation of the proposed Chemical Immobilisation and Solidification (CIS) process.

The Director General's requirements include further details on the hazardous materials to be stored in the proposed CIS waste area and a risk assessment, demonstrating the proposal would not significantly increase the overall risks of the project. Advitech Pty Limited was engaged by Entech Industries to conduct the risk assessment and Preliminary Hazard Analysis for the proposed CIS process at Chemsal's St Marys facility.

It should be noted that this report was prepared by Advitech Pty Limited for Chemsal ("the customer") in accordance with the scope of work and specific requirements agreed between Advitech and the customer. This report was prepared with background information, terms of reference and assumptions agreed with the customer. The report is not intended for use by any other individual or organisation and as such, Advitech will not accept liability for use of the information contained in this report, other than that which was intended at the time of writing.

1.1 Site Location and Surrounding Land Users

Chemsal operates a Chemical Waste Storage and Treatment Facility at 40 Christie Street, St Marys in New South Wales (Lot 431 DP854814) (**Figure 1**).

Figure 1: Site Location

The allotment is part of Precinct 2 Dunheve/St Marys (Industrial Land) under the *Penrith Development Control Plan*, 1996. It is zoned 4(a) General Industry. The surrounding land use is primarily industrial; with the closest residential property approximately 600 metres to the east of the site.

1.2 Project Description

The Chemsal facility currently undertakes the storage, and limited processing of waste chemicals. Chemsal is proposing to incorporate a Chemical Immobilisation and Solidification (CIS) process for the treatment of selected wastes received at the site, instead of storing and transferring these to offsite treatment facilities.

1.3 Process Description – Current Operations

A wide range of waste chemicals are currently transported to the Chemsal facility by vehicles. The trucks are unloaded within the bunded "unloading area" of the warehouse building. The waste chemicals are sorted into the relevant warehouse or processing area.

The Chemsal facility currently undertakes a limited number of processes on site including:

- Flammable processing;
- Can crusher and paint recovery;
- Laboratory services; and
- Fluorescent lamp resource recovery.

These processes have been previously subjected to HAZOP studies, and are not the focus of this risk assessment.

In addition to these processes, a number of dedicated storage locations are used to collect and store hazardous and dangerous goods. These storage depot locations will not vary following the proposed development.

1.4 Process Description - Chemical Immobilisation and Solidification (CIS)

The objective of CIS treatment is to immobilise contaminants in a non-leachable, solidified matrix. This is achieved by adding chemical reagents to a waste stream, mixing to ensure homogeneity, and then curing the mixture to achieve a solid mass.

The reagents used in the CIS process include Portland cement and Dolocrete. The process is typically used to treat inorganic contaminants such as heavy metals, but can also be used to treat organic contaminated materials.

The CIS process involves conveying contaminated material into a high shear mixing device (such as a pan mixer, pug mill, or similar that complies with the DECCW mixing policy). Reagents are added to the mixing device and the mixture is thoroughly homogenised. The treated product is then placed in a curing area.

Samples are tested by NATA accredited laboratories to ensure that the treated product meets the requirements for unconfined compressive strength and leachability testing (as per NSW EPA (2008) *Waste Classification Guidelines*). Any batch that fails the QA test would be re-processed by crushing and then re-fixed. Batches meeting the criteria will be disposed of as General Solid Waste to a suitably licensed landfill.

1.5 Dangerous Goods Storage

The proponent has advised that a range of waste chemicals classified as dangerous goods are currently stored on the site. **Appendix I** contains the dangerous goods manifest which outlines the maximum storage capacity for each substance. The type and volume of the dangerous goods outlined in the manifest will not alter with this development. Several new reagents will be introduced to the site for the new process including:

- Sodium sulphide;
- Ferric salts;
- Magnesium hydroxide;
- Hydrated lime; and
- Portland cement.

Sodium sulphide and ferric salts are classified as Class 8 dangerous goods. They will be stored in the current Class 8 storage area with the cumulative volume of the these substances and the existing Class 8 substances being maintained below the total Class 8 storage capacity outlined in **Table 1**. The other reagents are not classified as dangerous goods and will be stored in the reagent storage area shown in **Figure 2**. Chemsal currently employ strict inventory control of all their storage volumes to ensure the delivery of additional volumes of dangerous goods can be accommodated on site within the existing storage volumes and not exceed the maximum storage capacities outlined in **Table 1**.

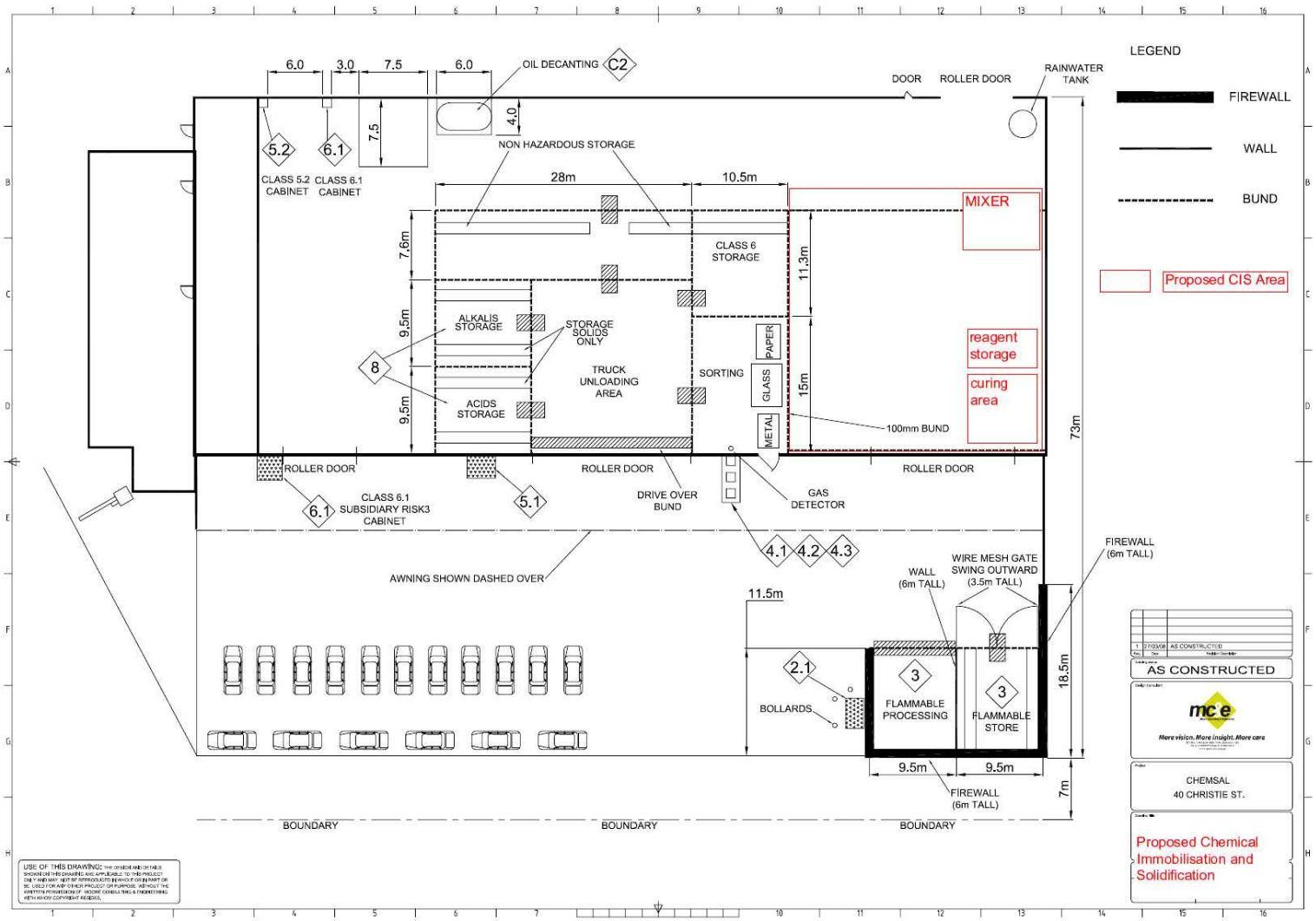

Figure 2: Layout of the Chemsal Facility

2. STATUTORY REQUIREMENTS

Preliminary risk screening of the proposed development is required under *NSW State Environmental Planning Policy No 33 (SEPP 33).* SEPP 33 requires potentially hazardous and/or offensive developments to undertake a PHA to determine the level of risk to people, property and the environment at the proposed location and in the presence of controls. Should the risk level exceed the criteria of acceptability, or if the controls are assessed as inadequate to prevent offensive impacts on the surrounding land users the development is classified as 'hazardous industry' or 'offensive industry' respectively and may not be permissible within most industrial zones in NSW.

A development may also be considered potentially hazardous with respect to the transport of dangerous goods. A proposed development may be potentially hazardous if the number of generated traffic movements (for significant quantities of hazardous materials entering or leaving the site) is above the cumulative annual or peak weekly vehicle movements. Table 2 in the document *Applying SEPP 33* (Department of Urban Affairs and Planning (DUAP), 1994) outlines the screening thresholds for transportation.

2.1 Objectives

The objectives of the PHA include:

- Identification of hazard scenarios associated with the proposed CIS process at the Chemsal facility;
- Analysis of the consequences (effects) for people and the environment and their probability (likelihood or frequency) of occurrence for each hazard scenario;
- Qualitative assessment of relative risks by estimating the resultant risk to the surrounding land users and environment to provide guidance within any subsequent semi quantitative or quantitative risk assessments;
- Ensure that the proposed safeguards are adequate, and thus demonstrate that the operation will not impose a level of risk that is intolerable with respect to its surroundings; and
- Meet the requirements for inclusion of the hazard identification session minutes within the development assessment.

3. METHODOLOGY

3.1 General

A PHA aims to provide sufficient information and assessment of risks to demonstrate that a project satisfies the risk management requirements of the proponent company and the relevant public authorities. Within this context the primary role of the PHA is to demonstrate that the residual risk levels are acceptable in relation to the surrounding land use and that risk will be appropriately managed.

This is done by systematically:

- Identifying hazards and abnormal process conditions that could lead to hazards.
- Identifying inherent and existing safeguards.
- Assessing the risks by determining the probability (likelihood) and consequence (severity) of hazardous events for people and the surrounding land uses and environment.
- Identifying opportunities to reduce the risks by elimination, minimisation and/or incorporation of additional protective measures. This will demonstrate that the operation will not impose a level of risk that is intolerable with respect to its surroundings.

3.2 Preliminary Risk Screening

A preliminary risk screening of the proposed development is required under SEPP 33 to determine the need for a PHA when there are no specific requirements from the Director General. The preliminary screening assesses the storage of specific dangerous goods classes that have the potential for significant off-site effects. Specifically, the assessment involves the identification of classes and quantities of all dangerous goods to be used, stored or produced on site with respect to storage depot locations.

3.3 Risk Classification and Prioritisation

The Department of Planning's (DoP) document *Multi-Level Risk Assessment* suggests the use of preliminary analysis of the risks related to a proposed development to enable the selection of the most appropriate level of risk assessment in the PHA. This preliminary analysis includes risk classification and prioritisation based on a risk assessment undertaken during review of the design for the proposed installation.

There are three levels of risk assessment. A level one assessment is essentially qualitative identifying all possible risk scenarios and their relevant consequences and likelihoods. An evaluation of the risks should be completed in conjunction with the qualitative criteria in *HIPAP No. 4*. It should demonstrate that adequate safeguards are in place to ensure the ongoing safety of the proposal. A level two assessment is semi-quantitative and should include sufficient quantification of any significant off-site consequences to determine that the relevant risk criteria will be met. A level three assessment is a full quantification of the relevant risk scenarios and should be conducted in accordance with *HIPAP No. 6*.

4. PRELIMINARY RISK SCREENING

Table 1 summarises the current maximum storage capacities of substances defined as Dangerous Goods (DG) in accordance with the *Australian Code for the Transport of Dangerous Goods by Road and Rail* (ADG Code) and compares them against the storage screening thresholds in Table 3 of *Applying SEPP 33* (DUAP, 1994). The addition of sodium sulphide and ferric salts is included in the Class 8 storage capacity.

Table 1: Hazardous Materials Inventory

DG Class	Packing Group (PG)	Total Storage Capacity	Location	Screening Threshold	
				Threshold Quantity	Distance to Boundary
2.1	-	0.5 tonne	LPG, above ground	16 m^3	-
3	I, II, and III	92 m^3	Flammable store and flammable processing	2 m^3	7 m
4.1	II and III	10 kg	Class 4.1 cabinet	5 tonne	-
4.2	I, II, and III	10 kg	Class 4.2 cabinet	1 tonne	-
4.3	I, II, and III	10 kg	Class 4.3 cabinet	1 tonne	-
5.1	II and III	0.2 tonne	Class 5.1 storage area	5 tonne	-
5.2	II	0.2 tonne	Class 5.2 cabinet	10 tonne	-
6.1[A]	I	10 L	Class 6.1 cabinet	0.5 m^3	-
6.1	II and III	9.9 m^3	Class 6.1 cabinet	0.5 m^3	-
6.1 (sub 3)	II and III	0.5 tonne	Class 6.1 (sub 3) cabinet	0.5 tonne	-
8[B]	I, II, and III	5 m^3	Acid store	5 m^3	-
8[C]	I, II, and III	5 m^3	Alkali store	5 m^3	-
8	II	0.5 kg	Fluorescent lamp recovery	25 m^3	-
C2		2 m^3	C2 Storage Area	-	--

A - Chloropicrin only

B - Includes ferric salts

C - Includes sodium sulfide

The substances were grouped according to the dangerous goods class due to the large number of different chemicals in the inventory. A full list of substances to be stored in the facility is presented in **Appendix I**.

4.1 Storage Quantity Screening

Applying SEPP33 states that where substances of the same dangerous goods class but different packing group are stored in the same general area, the entire volume for that dangerous good should be assessed according the most hazardous packaging class.

The maximum storage capacity for dangerous good Classes 3 and 6.1 exceed the relevant screening threshold although no additional chemicals will be incorporated in these areas as part of this development and are therefore not relevant to this assessment.

Class 8 dangerous goods of packaging groups I, II and III, are stored in the acids and alkali storage areas (located adjacent to each other). According to Table 3 of *Applying SEPP33*, Class 8PGI dangerous goods are considered potentially hazardous at volumes greater than 5 tonnes. The total storage capacity of 10 tonnes exceeds the threshold and therefore is classified as potentially hazardous.

Based on the SEPP 33 screening criteria described above, this development is classified as potentially hazardous with respect to the storage and handling of corrosive substances (Class 8). And therefore a PHA has been prepared to demonstrate that the development will not significantly increase the overall risks associated with the operation of the site.

4.2 Transport Screening

The transport of dangerous goods to and from the site will not vary from the initial assessment completed in MCE's *Final Hazard Analysis* (FHA) of the site in 2007. This assessment found that only Classes 3 and 6.1 will be carried in significant quantities. This development will not involve any variation in these substances and therefore the development will not significantly increase the risks associated with the transport of dangerous goods.

5. RISK ASSESSMENT

In order to identify the potential hazards involved in the proposal, a facilitated risk assessment was conducted via a telephone conference on 22 September 2009.

5.1.1 Objective

The objective of the risk assessment was:

- To revise and score the risk assessment from MCE's FHA of the Class 8 storage areas; and
- To identify and evaluate additional risks associated with the CIS process with the potential to create off-site impacts.

5.2 Assumptions

In undertaking the risk assessment a number of assumptions were made. These include:

- All plant and equipment is operated and installed in accordance with appropriate Australian Standards, codes and guidelines;
- Dangerous goods quantities and locations are as notified/supplied by Chemsal;
- Dangerous goods are stored in accordance with the ADG Code, relevant standards and guidelines even if not a licensable quantity; and
- All equipment and systems are designed to be inherently safe.

5.3 Methodology

The risk assessment was conducted in the form of a structured workshop, facilitated by Advitech and attended by Entech and Chemsal personnel involved in the facility's design, development and operation. A systematic approach within the framework of *AS 4360 Risk Management* was used to identify risk scenarios and minimise the possibility of missing important information. The minutes of the meeting provide a record of the procedure used and the information obtained (**Appendix II**).

5.4 Terms and Definitions

At the commencement of each workshop, the team is briefed on the context of the risk assessment and the methodology that will be used. The terms and definitions shown in **Table 2** are discussed at relevant stages during the workshop.

Table 2: Risk Assessment Terms and Definitions

Term	Definition
Risk Assessment	The formalised means by which hazards are systematically identified, assessed, ranked according to perceived risk, and addressed by means of appropriate and effective controls. Such an assessment is generally undertaken by a group with extensive knowledge of the system or area being reviewed.
Asset	Tangible and intangible items of value or processes, procedures or tasks performing as intended.
Hazard	A source of potential harm or a situation with the potential to cause loss.
Risk Scenario	An identified situation where an asset and hazard could come together to create a risk event.
Barrier	The current intended systems, procedures or equipment in place (or included as part of the design) or actions taken to eliminate or mitigate a hazard, or render the risk of occurrence acceptable.
Consequence	The outcome of a risk scenario expressed qualitatively, being a loss, injury, disadvantage or gain.
Likelihood	The likely frequency of a risk scenario occurring.
Risk	The chance of a potential hazard being realised that will have an impact on a desired outcome. It is measured in terms of consequence and likelihood.

5.5 Key Elements

The focus of the risk assessment was the equipment and processes relating to the Class 8 storage area and the proposed CIS equipment and process. These elements were considered as individual assets.

Advitech provided some generic hazard guidewords to enable risk scenarios with off-site implications to be comprehensively identified. The hazard guidewords used during the risk assessment of the upgraded facility are listed in **Table 3**.

Table 3: Guidewords

Hazard Guidewords
Loss of containment
Noise
Visual impact
Air/dust
Vibration
Fire/explosion
Transport
Services
Sensitive areas
Maintenance
Timing
Materials of construction
Access
Natural hazards

5.6 Risk Identification

The risk identification process was conducted in a comprehensive and systematic manner, so that as far as practicable, all possible risk scenarios were identified. The CIS process (the asset) was paired systematically with each hazard guideword (**Table 3**).

For each asset - hazard pair, the workshop team determined whether a plausible risk scenario existed. If a risk scenario did exist, it was further studied according to **Section 3.6**. If no scenario existed, the team moved on to the next pair. In some cases, more than one scenario existed for an asset - hazard pair.

5.7 Risk Analysis

For each risk scenario identified, the workshop team described the possible causes and potential consequences of the risk scenario, and the current barriers in place to prevent the risk scenario occurring or minimise the consequences. Each risk scenario was then scored, and actions to eliminate or mitigate the risk were proposed. Consequences were scored according to **Table 4**, and then likelihood was scored according to **Table 5**. The resulting risk was scored according to **Table 6**.

It should be noted that when determining consequence scores for each risk scenario, the 'most probable' consequence was scored, with all current barriers deemed to have failed. The likelihood score for each scenario was then assessed presuming the current barriers were in place. Advitech's Risk Classification System was used for this risk assessment.

Table 4: Classification of Consequence

Category	Personnel	Financial	Environment	Community, Compliance, Reputation
1 Catastrophic	Fatality	Huge loss (e.g. > $10m) (e.g. > $1m)	Short and long term impacts; alteration to biological or biochemical systems; toxicological effects; shutdown during investigation. E.g. Ok Tedi (PNG), fish kills.	Inter/national public/media outrage; shutdown order; public enquiry; major prosecution and fines.
2 Major	Extensive injury or illness, permanent disability	Major loss (e.g. $1m - 10m) (e.g. $100k - 1m)	Offsite release; long-term impact (>1 reporting period); fine, investigation or prosecution. E.g. Significant discharge of pollutant into air or water.	Widespread public/media concern; major breach; significant fines; investigation.
3 Moderate	Injury or illness requiring hospital admission, LTI, restricted work	High loss (e.g. $100k - 1m) (e.g. $10 - 100k)	Offsite release; transient impact (<1 reporting period); reportable breach of license conditions; fine or prosecution. E.g. Persistent noise or odour complaints.	Public/media attention outside local area; regulation breach; reportable; fines likely.
4 Minor	Reversible injury or illness requiring offsite medical treatment	Medium loss (e.g. $10 - 100k) (e.g. $1k - 10k)	Contained onsite; clean-up may require outside assistance; reportable to authorities (e.g. EPA). E.g. large chemical spill (i.e. IBC, pallet of drums) into bund.	Local public/media attention; minor regulation breach; reportable to authorities.
5 Insignificant	Negligible injuries requiring first aid treatment (onsite) or less	Low loss (e.g. < $10k) (e.g. < $1k)	Contained onsite; transient impact; not reportable. E.g. small chemical spill into bund.	Not noticeable to public/media, not reportable.

Table 5: Classification of Likelihood

Category	Description	Indicative Frequency
A Common	Expected to occur, happens often	1 a year or more frequent
B Likely	Has occurred, heard of it happening here or somewhere similar	1 in 10 yrs or so
C Possible	Could occur, unusual but possible, may happen within working lifetime	1 in 40 yrs or so
D Unlikely	Not expected to occur, remotely possible	1 in 100 yrs or so
E Rare	Conceivable only in exceptional circumstances, practically impossible	1 in 1000 yrs or less frequent

Table 6: Risk Assessment Matrix

CONSEQUENCE \ LIKELIHOOD	A	B	C	D	E
1	25	24	22	19	15
2	23	21	18	14	10
3	20	17	13	9	6
4	16	12	8	5	3
5	11	7	4	2	1

Ranking	Range	Priority
Extreme	20 - 25	Requires urgent and immediate attention, senior management response needed.
High	12 - 19	Requires proactive management, senior management attention needed.
Moderate	6 - 11	Requires active monitoring, management responsibility must be assigned.
Low	1 - 5	Does not require active management, manage with routine procedures.

5.8 Risk Treatment

In general, each identified risk scenario had actions assigned by the workshop team, to treat the risk. In some cases, the workshop team deemed current barriers to be adequate to address the risk, and no further action was required.

Risk treatment actions recorded in the workshop aimed to reduce the identified risk to **As Low As Reasonably Practicable** (ALARP). Most identified risks cannot be eliminated, but can be mitigated or reduced in some way. The preferred method of risk treatment uses engineered (physical) barriers to prevent the risk occurring, otherwise procedural controls may be proposed to prevent the risk, or respond appropriately if the risk scenario does occur.

It should be noted that in a workshop setting, it is inefficient to discuss detailed design issues when determining the most appropriate treatment for a risk scenario. As such, the actions recorded tend to be general in nature, e.g. “investigate further”, “consider issue in final design”, etc. The project team is responsible for designing suitable solutions, as well as ensuring that personnel are assigned responsibility for actions, and that every identified risk scenario is addressed.

5.9 Level of Risk Assessment

Multi-Level Risk Assessment (1997) provides guidance on choosing the level of assessment required based on dangerous goods classes. The storage and handling of Class 8 dangerous goods have limited potential for off-site harm provided appropriate technical and management controls are observed. Therefore, a qualitative analysis is sufficient when demonstrating compliance with all relevant standards and codes

5.9.1 Qualitative Risk Assessment

A qualitative assessment of the risks imposed by a development is required in accordance with the Department of Planning’s *Hazardous Industry Planning Advisory Paper No. 4* (HIPAP No. 4). There are four criteria that a potentially hazardous development is assessed against.

The criteria are:

1. All 'avoidable' risks should be avoided to ensure that risks are not introduced in an area where feasible alternatives are possible and justified.
2. Where the consequences of a hazardous incident are significant to people and the environment, then all feasible measures should be adopted so that the likelihood of such an incident occurring is very low.
3. The consequences of the more likely hazardous events should be contained within the boundaries of the installation.
4. Where there is an existing high risk from a neighbouring hazardous installation, additional hazardous developments should not be allowed if they add significantly to that existing risk.

Irrespective of the cumulative risk level from the whole installation, *HIPAP No. 4* requires the risk implications of high consequence and high likelihood risk scenarios to be examined to ensure risks to people and the environment are below the relevant risk criteria for each surrounding land use.

6. ASSESSMENT OUTCOMES

Results of the risk assessment were recorded during the workshop directly into a spreadsheet template provided by Advitech. The spreadsheet is treated as the formal minutes of the workshop, and ultimately forms the risk register for the project. The risk assessment spreadsheet is contained in **Appendix II**. All risks identified are referred to by their reference number and are analysed below.

Each hazard scenario was evaluated in terms of consequence and likelihood using the scoring methodology from **Tables 4** and **5**. A qualitative assessment of the resultant risk was then made using **Table 6**. The hazards identified are a result of deviation from normal operations and the qualitative risk assigned to each scenario takes into account the inherent and proposed physical, operational and organisational safeguards designed to reduce the consequence and likelihood of these hazards.

There were four high cumulative risk scenarios identified during the risk assessment (i.e. with a risk score of 12 or higher). They involved spillage of corrosive material in the acid or alkali storage areas for the current and post development situations (**Table 7**). The consequences for these risk scenarios involved possible impacts on onsite personnel. The risk score for possible offsite impacts was much lower due to appropriate bunding, availability of spill kits and the use of safe storage and handling techniques employed on the site. There were no identified risk scenarios with a high consequence or high likelihood score.

The difference between the current and post development operations is the addition of the sodium sulphide and ferric salts in the Class 8 storage areas. This was reflected in the risk assessment by a small increase in the likelihood of fume/odour generation with the potential to affect neighbours. Chemsal are considering installing an odour management system if required to ensure the potential of offensive odours affecting neighbours is as low as reasonably practicable.

The risk scenarios identified in the risk assessment of the proposed CIS process were classified as having a low risk score and therefore posses an acceptable level of risk on the neighbouring land users.

Table 7: High Cumulative Risk Scenarios

Ref	Asset	Scenario	Cause	Consequence	Current Barriers	C	L	R
1	Existing acid store	Spillage of material Reaction with incompatible chemicals	Droppage Poorly contained materials Damage from forklifts	**On Site Personnel** Chemical bums to skin and other areas of contact Inhalation of fumes generated by the material or by reaction with incompatible chemicals	PPE Handling procedures	3	C	13
5	Existing alkali store	Spillage of material Reaction with incompatible chemicals	Droppage Poorly contained materials Damage from forklifts	**On Site Personnel** Chemical bums to skin and other areas of contact Inhalation of fumes generated by the material or by reaction with incompatible chemicals	PPE Handling procedures	3	C	13
9	Post development acid store	Spillage of material Reaction with incompatible chemicals	Droppage Poorly contained materials Damage from forklifts	**On Site Personnel** Chemical bums to skin and other areas of contact Inhalation of fumes generated by the material or by reaction with incompatible chemicals	PPE Handling procedures	3	C	13
13	Post development alkali store	Spillage of material Reaction with incompatible chemicals	Droppage Poorly contained materials Damage from forklifts	**On Site Personnel** Chemical bums to skin and other areas of contact Inhalation of fumes generated by the material or by reaction with incompatible chemicals	PPE Handling procedures	3	C	13

6.1 Level of Risk Assessment

Applying SEPP 33 states:

- If any of the screening thresholds are exceeded then the proposed development should be considered potentially hazardous and a PHA is required to be submitted with the development application.
- If the quantities are close to the screening values and the development site is near a sensitive receiver then the proposed development is also considered to be potentially hazardous and a PHA is required.

Based on the above assessment the proposed development exceeds the storage threshold for dangerous goods Class 8 substances and therefore, further hazard analysis is required.

All current and future operations and storage facilities at the site currently comply with the relevant codes and standards including NSW Workcover's *Storage and Handling of Dangerous Goods* Code of Practice, AS 1940-2004 *The storage and handling of flammable and combustible liquids*, AS 3780-2008 *The storage and handling of corrosive substances*, AS 4326-2008 *The storage and handling of oxidizing agents* and AS/NZS 4452:1997 *The storage and handling of toxic substances*. A qualitative assessment is therefore sufficient to show that the risks posed by the development are within acceptable limits.

6.2 Qualitative Risk Analysis

A qualitative risk assessment was conducted in accordance with Section 3 of *HIPAP No. 4*. There are four qualitative criteria that a potentially hazardous development is assessed against.

All 'avoidable' risks should be avoided to ensure that risks are not introduced in an area where feasible alternatives are possible and justified.

All storage and processes at the facility are designed as inherently safe to avoid unnecessary risk scenarios. Chemsal have procedures in place, e.g. emergency plan, safety training, etc. to ensure all risks are at an acceptable level.

Where the consequences of a hazardous incident are significant to people and the environment, then all feasible measures should be adopted so that the likelihood of such an incident occurring is very low.

There were no risk scenarios identified with significant consequences to people or the environment.

The consequences of the more likely hazardous events should be contained within the boundaries of the installation.

There were no hazard scenarios identified with a high likelihood of occurrence.

Where there is an existing high risk from a neighbouring hazardous installation, additional hazardous developments should not be allowed if they add significantly to that existing risk.

The identified high risk scenarios involve onsite impacts to personnel and the development would therefore not add significantly to existing risk levels at neighbouring industrial sites.

7. CONCLUSION

All risks identified during the risk assessment with high cumulative scores have been qualitatively assessed and have demonstrated effective technical and management controls to ensure the ongoing suitability of the proposed development. No hazard scenarios identified had the potential to present an unacceptable risk to the surrounding land users. Under the scope of this assessment the development therefore will not significantly increase the overall risks involved in the operations at the site.

8. REFERENCES

The following information was used in the preparation of this report:

1. Commonwealth Government, 1999, *Australian Code for the Transport of Dangerous Goods by Road and Rail* (ADG Code).
2. Council of Standards Australia, 2004, *Risk Management*.
3. Department of Urban Affairs & Planning, 1994, *Applying SEPP 33*, New South Wales Government.
4. Department of Urban Affairs & Planning, 1992, *State Environmental Planning Policy No. 33 - Hazardous and Offensive Development*, New South Wales Government.
5. Department of Urban Affairs & Planning, 1990, *Hazardous Industry Planning Advisory Paper No. 4 - Risk Criteria for Land Use Safety Planning*, New South Wales Government
6. Department of Urban Affairs & Planning, 1992, *Hazardous Industry Planning Advisory Paper No. 6 - Guidelines for Hazard Analysis*, New South Wales Government.
7. Department of Urban Affairs & Planning, 1997, *Multi-level Risk Assessment*, New South Wales Government.

Appendix I

Dangerous Goods Manifest

Un Number	Correct Shipping Name	Class	Subsidiary Risk	HAZCHEM Code	Packing Group	location	Quantity	Units	Other Comments
1993	Flammable Liquid N.O.S	3		3[Y]E	PG I, PGII or PG III	Flammable Processing	1,500	Litres	Inclusive of Paints and Flammable Liquids.
1993	Flammable Liquid N.O.S	3		3[Y]E	PG I, PGII or PG III	Flammable Store Packages	15,000	Litres	
1263	PAINT	3		3[Y]E	PG I, PGII or PG III	Flammable Store Packages	15,000	Litres	
1993	Flammable Liquid N.O.S	3		3[Y]E	PG I, PGII or PG III	Flammable Store Tankage	50,000	Litres	
1263	PAINT	3		3[Y]E	PG I, PGII or PG III	Flammable Store Tankage	10,000	Litres	
1263	PAINT	3		3[Y]E	PG I, PGII or PG III	Paint Can Crusher	500	Litres	
2929	Toxic Liquid, Flammable, Organic N.O.S	6.1	3	3WE	PG I or PGII	Class 6.1 Flammables Storage Area	500	kg	PG II or PG III

Un Number	Correct Shipping Name	Class	Subsidiary Risk	HAZCHEM Code	Packing Group	location	Quantity	Units	Other Comments
3287	Toxic Liquid, Inorganic N.O.S	6.1		2X	PG I, PGII or PG III	Class 6.1 Storage Area	4,090	Litres	PG II or PG III
2810	Toxic Liquid, Organic N.O.S	6.1		2X	PG I, PGII or PG III	Class 6.1 Storage Area	4,000	Litres	PG II or PG III
2811	Toxic Solid, Organic, N.O.S	6.1		2XE	PG I, PGII or PG III	Class 6.1 Storage Area	200	Litres	PG II or PG III
3288	Toxic Solid, Inorganic, N.O.S	6.1		2X	PG I, PGII or PG III	Class 6.1 Storage Area	200	Litres	PG II or PG III
2809	Mercury	8		2X	PGII	Fluorescent Lamp Recovery	500	Grams	
3278	Organophosphorus Compound, Toxic, NOS	6.1		2X	PGII or PG III	Class 6.1 Storage Area	1,500	Litres	PG II or PG III
1580	Chloropicrin	6.1		2X	PGI	Class 6.1 PG I Metal Cabinet	10	Litres	PG I Only
3266	Corrosive Liquid, Basic, Inorganic N.O.S	8		2X	PG I, PGII or PG III	Acid Store	1,500	Litres	

Un Number	Correct Shipping Name	Class	Subsidiary Risk	HAZCHEM Code	Packing Group	location	Quantity	Units	Other Comments
3267	Corrosive Liquid, Basic, Inorganic N.O.S	8		2X	PG I, PGII or PG III	Acid Store	3,500	Litres	
3264	Corrosive Liquid, Acidic, Inorganic N.O.S	8		2X	PG I, PGII or PG III	Alkali Store	2,000	Litres	
3265	Corrosive Liquid, Acidic, Organic N.O.S	8		2X	PG I, PGII or PG III	Alkali Store	3,000	Litres	
3161	Liquefied Gas, Flammable, NOS	2.1		2WE			500	kg	Quantities of flammable gas for example porta-gas Bottles.
1325	Flammable Solid, Organic, N.O.S	4.1		1[Z]	PGII or PGIII		10	kg	Small Volumes are received from laboratories
	Substances liable to Spontaneous Combustion	4.2			PG I, PGII or PG III		10	kg	Small Volumes are received from laboratories
	Substances That in contact with water will emit flammable gases	4.3			PG I, PGII or PG III		10	kg	Small Volumes are received from laboratories

Un Number	Correct Shipping Name	Class	Subsidiary Risk	HAZCHEM Code	Packing Group	location	Quantity	Units	Other Comments
1479	Oxidising Solids, NOS	5.1		1Y	PG II or PGIII		200	kg	Typically Pool Chlorine.
	Oxidising Solids, NOS	5.2		1Y	PG II		200	kg	Organic Peroxides
	Combustibles	C2					2000	Litres	Oil (C2)

Table. A-1 Hazardous Inventory at Chemsal

Appendix II

Risk Assessment Minutes

RISK ASSESSMENT DETAILS AND CONTEXT

Client:	Chemsal / Entech Industries
Project:	Chemsal CIS Process Upgrade
Job Number:	J0090274
Folder Number:	F10744
Risk Context:	Chemsal Waste Facility
Description:	The Chemsal Chemical Waste Storage and Treatment Facility has been previously approved to receive, store, treat and transfer a range of dangerous and hazardous goods from a variety of industry, domestic and commercial sources. In June 2009, a Part 3A Modification Request was submitted to the NSW Department of Planning (DoP) to modify the project approval under Section 75W of the Environmental Planning and Assessment Act 1979, relating to the introduction and operation of the proposed Chemical Immobilisation and Solidification (CIS) process.
Date:	Tuesday, 22 September 2009
Author:	Advitech
Objectives of Assessment:	A PHA aims to provide sufficient information and assessment of risks to demonstrate that a project satisfies the risk management requirements of the proponent company and the relevant public authorities. Within this context the primary role of the PHA is to demonstrate that the residual risk levels are acceptable in relation to the surrounding land use and that risk will be appropriately managed.
Agreed Scope, Boundaries, Limitations:	The risk assessment was conducted in two stages. Stage one involved a review and risk score of the risk assessment from Chemsal's Final Hazard Analysis for the current Class 8 storage facility. A comparrison was made or the risk scenarios for pre and post development. Stage two involved a risk assessment of the propsed CIS process area and operations.
Key Stakeholders:	Chemsal, Entech Industries, DoloMatrix, St Marys Neighbours

RISK ASSESSMENT METHODOLOGY

Risk Context:	Chemsal Waste Facility
Introduction:	Advitech was engaged by Entech to conduct a risk assessment on the proposed CIS process at Chemsal's Waste Facility at St Marys. The risk assessment workshop was held on 22/09/2009.
Methodology:	The risk assessment was conducted in the form of a structured workshop, facilitated by Advitech and attended by relevant stakeholders. The results of the workshop were input directly into this worksheet by an Advitech representative. Risk scenarios were identified in a systematic process, utilising hazard guidewords described below.
Assets:	Assets were defined as "tangible and intangible items of value or processes, procedures or tasks performing as intended". The system(s) studied were broken down into assets on the basis of current and future operations.
Hazards:	Hazards were defined as "sources of potential harm or situations with the potential to cause a loss". The hazard guidewords used to assist in risk identification were loss of containment, noise, visual impact, air/dust, vibration, incompatable dangerous goods, fire/explosion, transport, services, sensitive areas, maintenance, timing, materials of construction, access and natural hazards.
Risk Classification:	Risk scenarios were classified (scored) according to Advitech's Risk Classification System.
Results:	The results of the risk assessment workshop are given in the following spreadsheet.
General Comments & Notes:	The Class 8 Storage Risk Assessment was obtained fromMoore Consulting and Engineering's (2007) *Final Hazard Analysis Waste Chemical and Treatment Facility*
Note:	It should be noted that Advitech Pty Limited prepared these risk assessment workshop results for the client in accordance with the scope of work and specific requirements agreed between Advitech and the customer. These notes were prepared with background information, terms of reference and assumptions agreed with the customer. The results of the workshop are not intended for use by any other individual or organisation and as such, Advitech will not accept liability for use of the information contained in these results, other than that which was intended at the time of writing.
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MEETING ATTENDANCE

Date	Attendee Name	Part Day (x)	Position
22-Sep-09	Neil Townsend		Operations Manager - Entech Industries
	Aaron Hajinakitas		Operations Manager - Chemsal
	Jim Kelty		Facilitator - Advitech
	Rachel Kneller		Scribe - Advitech

Context: Chemsal Waste Facility **Date:** 22/09/2009

Section: Class 8 Storage Area - Existing Case

Ref	N/A	Asset	Hazard	Scenario	Cause	Consequence	Current Barriers	C	L	R	Action	Comments
1		Acid Storage	Class 8 Storage	Spillage of material Reaction with incompatible chemicals	Droppage Poorly contained materials Damage from forklifts	On Site Personnel Chemical bums to skin and other areas of contact Inhalation of fumes generated by the material or by reaction with incompatible chemicals	PPE Handling procedures	3	C	13		Correct handling and identification procedures are necessary
2						Neighbours Fumes generated by incompatible chemicals	Separation and storage remote from incompatable materials	4	D	5		The reaction with incompatable materials may lead to propagation of the incident is considered remote with the use of separation
3						Environment Leakage into drain and escape into surrounding environment	Spill kits Bunding Site spill containment	5	C	4		Controls of bunding and spill containment are considered to make any bio physical effects remote
4						Propagation Reaction with Incompatible chemicals, source of ignition or generation of toxic plume	Separation from incompatable materials that may result in reactions	3	D	9		The reaction with incompatable materials may lead to propagation of the incident is considered remote with the use of separation
5		Alkali Storage	Class 8 Storage	Spillage of material Reaction with incompatible chemicals	Droppage Poorly contained materials Damage from forklifts	On Site Personnel Chemical bums to skin and other areas of contact Inhalation of fumes generated by the material or by reaction with incompatible chemicals	PPE Handling procedures	3	C	13		Correct handling and identification procedures are necessary
6						Neighbours Fumes generated by incompatible chemicals	Separation and storage remote from incompatable materials	4	D	5		The reaction with incompatable materials may lead to propagation of the incident is considered remote with the use of separation
7						Environment Leakage into drain and escape into surrounding environment	Spill kits Bunding Site spill containment	5	C	4		Controls of bunding and spill containment are considered to make any bio physical effects remote
8						Propagation Reaction with Incompatible chemicals, source of ignition or generation of toxic plume	Separation from incompatable materials that may result in reactions	3	D	9		The reaction with incompatable materials may lead to propagation of the incident is considered remote with the use of separation

Context: Chemsal Waste Facility **Date:** 22/09/2009

Section: Class 8 Storage Area - Post CIS Development

Ref	N/A	Asset	Hazard	Scenario	Cause	Consequence	Current Barriers	C	L	R	Action	Comments
9		Acid Storage	Class 8 Storage	Spillage of material Reaction with incompatible chemicals	Droppage Poorly contained materials Damage from forklifts	On Site Personnel Chemical bums to skin and other areas of contact Inhalation of fumes generated by the material or by reaction with incompatible chemicals	PPE Handling procedures	3	C	13		Correct handling and identification procedures are necessary
10						Neighbours Fumes generated by incompatible chemicals	Separation and storage remote from incompatable materials	4	C	8	Consider installing odour management, i.e. carbon filter and/or masking agent	The reaction with incompatable materials may lead to propagation of the incident is considered remote with the use of separation Fume extraction will depend on the type of waste accepted on site
11						Environment Leakage into drain and escape into surrounding environment	Spill kits Bunding Site spill containment	5	C	4		Controls of bunding and spill containment are considered to make any bio physical effects remote
12						Propagation Reaction with Incompatible chemicals, source of ignition or generation of toxic plume	Separation from incompatable materials that may result in reactions	3	D	9		The reaction with incompatable materials may lead to propagation of the incident is considered remote with the use of separation
13		Alkali Storage	Class 8 Storage	Spillage of material Reaction with incompatible chemicals	Droppage Poorly contained materials Damage from forklifts	On Site Personnel Chemical bums to skin and other areas of contact Inhalation of fumes generated by the material or by reaction with incompatible chemicals	PPE Handling procedures	3	C	13		Correct handling and identification procedures are necessary
14						Neighbours Fumes generated by incompatible chemicals	Separation and storage remote from incompatable materials	4	C	8	Consider installing odour management, i.e. carbon filter and/or masking agent	The reaction with incompatable materials may lead to propagation of the incident is considered remote with the use of separation Fume extraction will depend on the type of waste accepted on site
15						Environment Leakage into drain and escape into surrounding environment	Spill kits Bunding Site spill containment	5	C	4		Controls of bunding and spill containment are considered to make any bio physical effects remote
16						Propagation Reaction with Incompatible chemicals, source of ignition or generation of toxic plume	Separation from incompatable materials that may result in reactions	3	D	9		The reaction with incompatable materials may lead to propagation of the incident is considered remote with the use of separation

Context: Chemsal Waste Facility **Date:** 22/09/2009

Section: CIS Processing Area

Ref	N/A	Asset	Hazard	Scenario	Cause	Consequence	Current Barriers	C	L	R	Action	Comments
17		CIS Process	Loss of Containment				All additional waste is solids Storm water shutoff Unloading inside building	4	D	**5**		
18			Noise		Noise from mixer and/or baghouse	Noise complaint from neighbour	All equipment inside building and under 80 dB(A) Baghouse below limits No operation at night Closest neighbour 500 m	4	D	**5**		
19			Visual Impact				Existing Building Stack not visable off site	5	D	**2**		
	x		Air/Odour				Odorous materials not accepted on site					
20			Air/Dust	Reagents dumped into hopper and used in mixer	Reagents entering process	Dust cloud impacting opn on site	Reagents stored in individual bags Automated system Extraction system over mixer	5	C	**4**		
21			Air/Dust	Reagents dumped into hopper and used in mixer	Reagents entering process Baghouse failure	neighbours	Reagents stored in individual bags Automated system Extraction system over mixer	4	D	**5**		
22			Air/Dust	Bag dropped off truck	incorrect handling procedures	neighbours	Inspect bags Procedures Unloading inside building	5	C	**4**		
	x		Vibration									
23			Incompatable Dangerous Goods	Waste of different class in contact			All wastes will be solids and segregated	4	D	**5**		
24			Fire / Explosion				Separated from flammable materials with sufficient distance not to impact on the Class 3 storage	4	D	**5**		
25			Transport				Vehicle movements will not increase from FHA					
	x		Services									
	x		Sensitive Areas									
	x		Maintenance									
	x		Timing									

Context: Chemsal Waste Facility **Date:** 22/09/2009

Section: CIS Processing Area

Ref	N/A	Asset	Hazard	Scenario	Cause	Consequence	Current Barriers	C	L	R	Action	Comments
	x		Materials of Construction									
	x		Access				Fenced and alarmed site Everything stored in the building					
	x		Natural Hazards				Packaged DGs Storm water shutoff with large storage					