Prestons Waste Treatment Facility
Amendment Report

Appendix K

Liquid and hazardous waste risk identification and minimisation report

ARCADIS

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Acronyms and Abbreviations

Acronym	Definition
DAF	Dissolved Air Flotation
EPA	Environment Protection Authority
GAC	Granular Activated Carbon
HVAC	Heating, ventilation and air conditioning
LTI	Lost time injury
LWTP	Liquid Waste Treatment Plant
MTI	Medical treatment injury
OAQMP	Operational Air Quality Management Plan
OEMP	Operational Environment Management Plan
OWMP	Operational Waste Management Plan
PPE	Personnel Protective Equipment
SFARP	So Far As Reasonably Practicable
The Facility	The Prestons Waste Treatment Facility (WTF), to be developed and operated by HiQ Waste Treatment Services Pty Ltd (HiQ) at 9-13 Whyalla Place, Prestons NSW
Tpa	Tonnes per annum
VCZ	Volcanic Clinoptilolite Zeolite

1 Introduction

The Prestons Waste Treatment Facility (WTF), to be developed and operated by HiQ Waste Treatment Services Pty Ltd (HiQ) at 9-13 Whyalla Place, Prestons NSW (the Facility), will process and treat up to 210,500 tonnes per annum (tpa) of contaminated soils, sludges and liquid wastes.

This includes operation of a Liquid Waste Treatment Plant (LWTP) which will receive and treat 70,000 kilolitres (kL) of liquid waste, comprising:

- Non-Per- and polyfluoroalkyl substances (PFAS) liquid waste
- PFAS liquid waste
- Recovered liquid waste from drill muds
- Recovered liquid waste from sediments and sludges.

Hazardous waste in the form of bulk soils and sediments and sludges will be received at the Facility.

This Liquid and Hazardous Waste Risk Identification and Management Report has been prepared to assess risks associated with the receipt and treatment of hazardous waste and liquid wastes and to identify measures to minimise those risks. This Report forms part of, and should be read in conjunction with, the Operational Waste Management Plan (OWMP). The management and operational procedures for liquid waste are outlined in Section 6.4 of the OWMP.

In addition, consideration has been given to risks and mitigation associated with the receival and handling of Dangerous Goods. Some liquid waste and packaged waste brought to site may meet the classification of Dangerous Goods Code Class 8, Packing Groups II and III, and would therefore be considered hazardous waste. Additionally, PFAS contaminated materials may be classified as Dangerous Goods Class 9 Packing Group III due to it's potential to be an "environmentally hazardous substance". Waste that meets these classifications would be transported to the Site in accordance with the requirements of the Australian Dangerous Goods Code (NTC, 2022).

In some cases, reagents that are classified as Dangerous Goods would be required to treat waste within the WTF. While not a waste type, risks associated with the storage and use of reagents has also been considered within this report.

1.1 Purpose and requirements of this report

A complete risk assessment for all operations of the Facility has been prepared (Hazard Identification Report - Sherpa, 2024). The intention of this report is to identify those risks and mitigation measures from the broader Hazard Identification Report that are associated with:

- Hazardous waste
- Liquid waste.

This report has been prepared in response to consultation carried out with the NSW Environment Protection Authority (EPA) who requested the preparation of a Liquid Waste Risk Identification and Minimisation Report and a Hazardous Waste Risk Identification and Minimisation Report. This report has been prepared to consider *both* liquid and hazardous waste.

Table 1-1 outlines the requirements specified for the report.

Table 1-1 EPA requirements and where these have been addressed

EPA requirement	Where addressed
Hazardous waste	
i. Potential for unplanned releases of hazardous chemicals and waste from all activities conducted at the premise including, but not limited to bulk storage tanks, drum and IBC storage area, sludge tanks, materials unloading and blending areas, and wastewater treatment systems.	Section 3
ii. Assessment of the risks presented by potential unplanned releases of hazardous chemicals and waste from each activity considered in direction (i).	Section 3
iii. Identification of guidelines and standards relevant to the management of hazardous chemicals associated with each activity considered in direction (i).	Section 3
iv. Comparison of current infrastructure and practices for the management of potential unplanned releases of hazardous chemicals and waste from each activity considered in direction (i) against the standards identified in (iii).	The Facility is not currently operational. No current practices are therefore applicable for hazardous waste management.
v. Strategies to reduce risk identified in direction (ii) and to address identified issues with current infrastructure and practices identified in the comparison required by (iv).	Section 3 See response to item (iv) above.
vi. Preferred options to minimise potential risks to the environment posed by the storing and handling of hazardous chemicals and wastes, based on the strategies identified in direction (v).	All of the strategies identified in (v) will be put in place to manage the potential risks.
Liquid waste	
i. Potential for unplanned releases of liquid chemicals and waste from all activities conducted at the premise including, but not limited to bulk storage tanks, drum and IBC storage area, materials unloading and blending areas, and wastewater treatment systems.	Section 3
ii. Assessment of the risks presented by potential unplanned releases of liquid chemicals and waste from each activity considered in direction (i).	Section 3
iii. Identification of guidelines and standards relevant to the management of liquids associated with each activity considered in direction (i).	Section 3
iv. Comparison of current infrastructure and practices for the management of potential unplanned releases of liquid chemicals and waste from each activity considered in direction (i) against the standards identified in (iii).	The LWTP comprises a new extension to the existing facility and will comprise entirely new infrastructure. No current practices are therefore applicable for liquid waste.
v. Strategies to reduce risk identified in direction (ii) and to address identified issues with current infrastructure and practices identified in the comparison required by (iv).	Section 3 See response to item (iv) above.

EPA requirement	Where addressed
vi. Preferred options to minimise potential risks to the environment posed by the storing and handling of liquid chemicals and wastes, based on the strategies identified in direction (v).	All of the strategies identified in (v) will be put in place to manage the potential risks.

1.2 Hazardous Waste Classification

Certain wastes have properties that make them hazardous or potentially harmful to human health or the environment. The NSW EPA Waste Classification Guidelines – Part 1: Classification of Waste (EPA, 2014) outlines waste that is considered to be hazardous, including pre-classified waste (Table 1-2). For waste that will be received at the WTF, the waste generator is responsible for providing a Consignment Authorisation (CA), any UN Hazard Code (if applicable for dangerous goods), Dangerous Goods classification (class and packing group, if applicable), and waste form, in accordance with regulatory requirements.

Table 1-2 Hazardous Waste Classification

Hazardous waste classification	Description	Proposed waste to be received at the Prestons WTF
Pre-classified hazardous waste	The following waste types (other than special waste or liquid waste) have been pre-classified by the EPA as 'hazardous waste': • Containers, having previously contained a substance of Class 1, 3, 4, 5 or 8 within the meaning of the Transport of Dangerous Goods Code, or a substance to which • Division 6.1 of the Transport of Dangerous Goods Code applies, from which residues have not been removed by washing or vacuuming • Coal tar or coal tar pitch waste (being the tarry residue from the heating, processing or burning of coal or coke) comprising of more than 1% (by weight) of coal tar or coal tar pitch waste • Lead-acid or nickel-cadmium batteries (being waste generated or separately collected by activities carried out for business, commercial or community services purposes) • Lead paint waste arising otherwise than from residential premises or educational or childcare institutions • Any mixture of the wastes referred to above.	• Packaged waste containing, or formerly containing Dangerous Goods CodeClass 8 Packing Group II and III waste are proposed to be received at the Facility for storage. • It is noted that coal tar waste may be received at the Facility but only if it contains less than 1% (by weight) or coal tar or coal tar pitch waste and would therefore not constitute hazardous waste.
Waste that poses hazardous characteristics	If a waste has not been classified under Steps 1–3, it must be classified as 'hazardous waste' if it is a dangerous good under any of the following classes or divisions of the Transport of Dangerous Goods Code:	• Packaged and liquid waste containing Dangerous Goods Code Class 8 Packing Group II and III waste are proposed to be received at the Facility for

Hazardous waste classification	Description	Proposed waste to be received at the Prestons WTF
	• Class 1: Explosives • Class 2: Gases (compressed, liquefied or dissolved under pressure) • Division 4.1: Flammable solids (excluding garden waste, natural organic fibrous material and wood waste, and all physical forms of carbon such as activated carbon and graphite) • Division 4.2: Substances liable to spontaneous combustion (excluding garden waste, natural organic fibrous material and wood waste, and all physical forms of carbon such as activated carbon and graphite) • Division 4.3: Substances which when in contact with water emit flammable gases • Class 5: Oxidising agents and organic peroxides • Division 6.1: Toxic substances • Class 8: Corrosive substances.	storage. However, under the Waste Classification Guidelines, these would be classified as Liquid Waste (rather than Hazardous waste).
Additional hazardous waste classifications	Waste may be deemed to be hazardous based on the Toxicity Characteristic Leaching Procedure (TLCP) and Specific Contaminant Concentration (SCC) characteristics of the waste. Table 2 in the *Waste Classification Guidelines Part 1: Classifying Waste* (EPA, 2014) prescribes the limits above which waste would be considered hazardous.	• Soil to be received at the facility (code N120) may present the TCLP and SCC characteristics that would deem it to be Hazardous.

Table 1-3 provides an indicative breakdown of the tonnes per annum for each waste type by waste classification. It is noted that the proportion of waste volumes split between the different waste classifications may differ year on year, in response to market forces, however the total volumes for any waste type would not be exceeded.

Table 1-4 shows the intended volumes of treated waste following treatment.

Table 3 EPA *Waste Classification Guidelines Part 1: Classifying waste* provides contaminant concentrations that deem waste to be either restricted solid waste or hazardous waste, based on the specific contaminant types and its concentration. Annexure B of the Updated Proposal Description provides a list of the contaminant concentrations for the hazardous waste proportion and packaged waste proportion of the waste to be Facility.

Table 1-3 Waste type by classification – pre treatment

Type of Waste	Management	Acid Sulfate Soils (indicative tpa)	Liquid waste (indicative tpa)	General solid non-putrescible (indicative tpa)	Restricted solid waste (indicative tpa)	Hazardous waste (indicative tpa)	Total Tonnes per Annum
Packaged waste – Liquid	Contaminated packaged waste: no treatment, only storage Non-contaminated waste: shredding and offtake for disposal		35,000				**40,000t**
Packaged waste – Solid				5,000			
PFAS contaminated soils	Storage only				7,500		**7,500t**
Bulk soils	Various methods:				34,800	23,200	**58,000t**
Contaminated soils	*Primarily immobilisation*				*30,000*	*20,000*	*50,000t*
Contaminated soils	*Primarily bioremediation*				*4,800*	*3,200*	*8,000t*
ASS	Acid neutralisation in batches	26,000					**26,000t**
Drill muds	Dewatering and liquid waste treatment		200	1800			**2,000t**
Sediments and sludges	Dependent on moisture content of sludges – dewatering, liquid waste treatment and soil decontamination		700	700	2,800	2,800	**7,000t**
Liquid waste	Treated and validated in 50 kL batches through the LWTP		70 ML				**70 ML**
	Total						**210,500**

Table 1-4 Waste type by classification - post treatment

Type of Waste	Management	Acid Sulfate Soils (indicative tpa)	Compliant trade wastewater	Liquid waste (indicative tpa)	General solid non-putrescible (indicative tpa)	Restricted solid waste (indicative tpa)	Hazardous waste (indicative tpa)	Total Tonnes per Annum
Packaged waste – Liquid	Contaminated packaged waste: no treatment, only storage			35,000				**40,000t**
Packaged waste – Solid	Non-contaminated waste: shredding and offtake for disposal				5,000			
PFAS contaminated soils	Storage only					7,500		**7,500t**
Bulk soils	Various methods:				34,800	23,200		**58,000t**
Contaminated soils	*Primarily immobilisation*				*30,000*	*20,000*		*50,000t*
Contaminated soils	*Primarily bioremediation*				*4,800*	*3,200*		*8,000t*
ASS	Acid neutralisation in batches				26,000			**26,000t**
Drill muds	Dewatering and liquid waste treatment		200		1800			**2,000t**
Sediments and sludges	Dependent on moisture content of sludges – dewatering, liquid waste treatment and soil decontamination		700		3,500	2,800		**7,000t**

Type of Waste	Management	Acid Sulfate Soils (indicative tpa)	Compliant trade wastewater	Liquid waste (indicative tpa)	General solid non-putrescible (indicative tpa)	Restricted solid waste (indicative tpa)	Hazardous waste (indicative tpa)	Total Tonnes per Annum
Liquid waste	Treated and validated in 50 kL batches through the LWTP		70 ML					**70 ML**
	Total							**210,500**

1.3 Dangerous Goods Dangerous Goods

Some liquid waste and packaged waste that may be brought to Site may meet the classification of Dangerous Goods Code Class 8, Packing Groups II and III. Liquid waste that meets this classification would be transported to the Site in accordance with the requirements of the Australian Dangerous Goods Code (ADG Code) (National Transport Commission, 2023). If brought to Site in a tanker the liquid waste would be transferred to a designated tank in the LWTP, or if packaged, it would be stored in a designated location within Compartment 3. Liquid waste classified as Code Class 8, Packing Groups II and III would be stored and handled in accordance with AS 3780-2008: *The storage and handling of corrosive substances*.

Table 1-5 sets out the limits that will apply to the storage of Class 8 Dangerous Goods at the facility and Table 1-6 sets out the transport limits that will apply to the transport of Class 8 Dangerous Goods to the facility.

Table 1-5: Storage limits for Class 8 Dangerous Goods

DG	PG	Form	Bulk, soil or packaged	Category	Storage (tonne equivalent (te)	Total for PG (te)	Applying SEPP 33 threshold (te)
8	II	Liquid	Packaged	Reagent	10	23	25
			Bulk	Waste	10		
		Liquid or solid	Packaged	Waste	3		
	III	Liquid	Bulk	Waste	40	45	50
		Liquid or solid	Packaged	Waste	5		

Table 1-6: Transport movements for 8 Dangerous Goods

DG Class/ Division	Form, bulk/packaged, load	Peak Weekly	Cumulative Annual
8	Liquid, bulk, load >2 te	30	500
	Liquid or solid, packaged, >5 te		

Additionally, PFAS contaminated materials may be classified as Dangerous Goods Class 9 Packing Group III due to it's potential to be an "environmentally hazardous substance". In accordance with "Applying SEPP 33", Class 9 Dangerous Goods are not subject to the screening method to determine likelihood of significant off-site risk. Notwithstanding, WorkCover NSW would be notified, and appropriate manifests and emergency management plans would be prepared if the quantity of Class 9 material at the Facility exceeds the threshold of 10,000kg or L. Once the material is accepted onsite, appropriate environmental controls would be implemented to manage the storage of PFAS contaminated soils, and for treatment of PFAS contaminated liquid waste.

It is noted that the procedure for accepting waste on to the Site is described in the OWMP. This describes that the waste generator will classify the waste as part of the pre-screening process which will determine its dangerous goods class and packing code. Wastes that are classified as dangerous goods, other than solid and/or liquid waste that is classified as Class 8, PG II and III, and PFAS classified as Class 9 PG III, would not be permitted on Site.

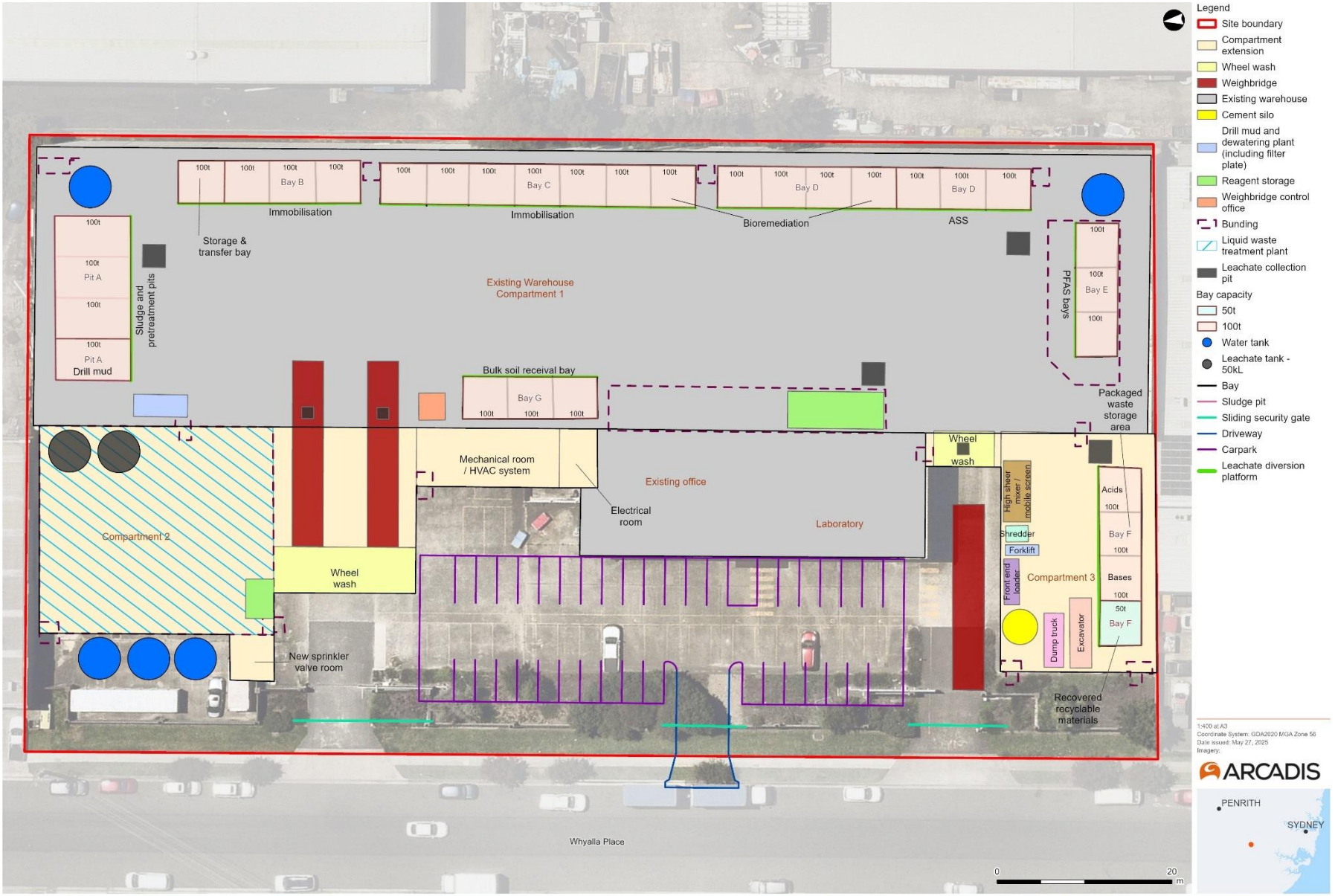

Figure 1-1 Facility layout

1.4 Reagents

In addition to the Liquid and Hazardous waste proposed to be accepted at the Facility (Table 1-2) some reagents that meet the classification of Dangerous Goods would be stored and used during waste treatment. In particular, Hydrochloric acid (37 wt. %) and Caustic soda (30 wt.%) would be used as reagents for treatment of waste, both of which are classified as Dangerous Goods Class 8 Packaging Group II. These reagents would be used to treat liquid waste in the LWTP, and when not in use, hydrochloric acid would be stored within a safety cabinet within the reagent storage area in Compartment 1, and caustic soda would be stored in the reagent storage area in Compartment 2.

While not classified as Dangerous Goods, other reagents proposed to be used in waste treatment may have hazardous characteristics (such as Bentonite). As above, it is noted that reagents are not classified as waste, however, have been considered here to assess all risks associated with hazardous materials to be handled at the Facility.

1.5 Liquid Waste treatment

1.5.1 Liquid waste

Liquid waste will be received at the Facility from industrial uses or internal Facility uses (i.e. as a by-product of other material processing methods, truck wheel wash and dewatering) and will largely involve liquids contaminated by organics, acidity and alkalinity (pH), heavy metals, nutrients, PFAS and suspended solids. Liquid wastes to be brought to the Facility are subject to the Batch Control Procedure and Preliminary Waste Screening Procedures outlined in Section 5.2 and 5.3 of the OWMP.

Liquid wastes will be delivered to the Facility in tanker trucks and unloaded directly into the LWTP Holding Tanks located in Compartment 2, as identified in Figure 1-1 and described in Section 5.7.4 of the OWMP. A designated set of Holding Tanks is dedicated to PFAS contaminated liquid waste. Compartment 2 is bunded for liquid containment in accordance with pertinent Australian Standards and will be lined with epoxy sealer.

The LWTP will be used to treat leachate wastewater and liquid waste from external sources. A custom designed and built LWTP is proposed for the treatment of liquid waste consisting of two separate treatment trains. As shown in the LWTP layout in Figure 1-2 , one treatment train is dedicated to PFAS contaminated wastewater (left-hand side), and one for non-PFAS contaminated wastewater (right-hand side). The main process components of the treatment trains are summarised below in Table 1-7.

The Facility will have its own laboratory and a designated Chemist to oversee the entire treatment process. The Facility Chemist will conduct all pre-treatment testing in the laboratory before approving batches to be treated on a commercial scale. The Chemist is responsible for the overall performance of the wastewater treatment process and the compliance with trade waste discharge. The Facility will also employ a Chemical Engineer to oversee the process and compliance.

Table 1-7 Liquid Waste treatment main process components

PFAS contaminated liquid waste treatment train	Non-PFAS contaminated liquid waste treatment train
• Four 135 KL holding tanks • Four 2 KL Zeolite filters • Twelve 2 KL GAC filters • Four 2 KL Ion exchange resin filters • One 20 KL sludge tank / thickener • Pump • One 50 KL mixing tank • One 50 KL clarifier • One plate filter press • One 20 KL filter feed tank • Dosing system • Four 50 KL treated water tanks	• Four 135 KL holdings tanks • Two 1 KL separated oil storage tanks • One 6 KL coalescing plate oil separator • Four 2 KL GAC filters • Dosing system • Four 2 KL zeolite filters • One 50 KL mixing tank • One 50 KL clarifier • Pump • One plate filter press • One 20 KL sludge tank / thickener • One 20 KL filter feed tank • Four 50 KL treated water tanks

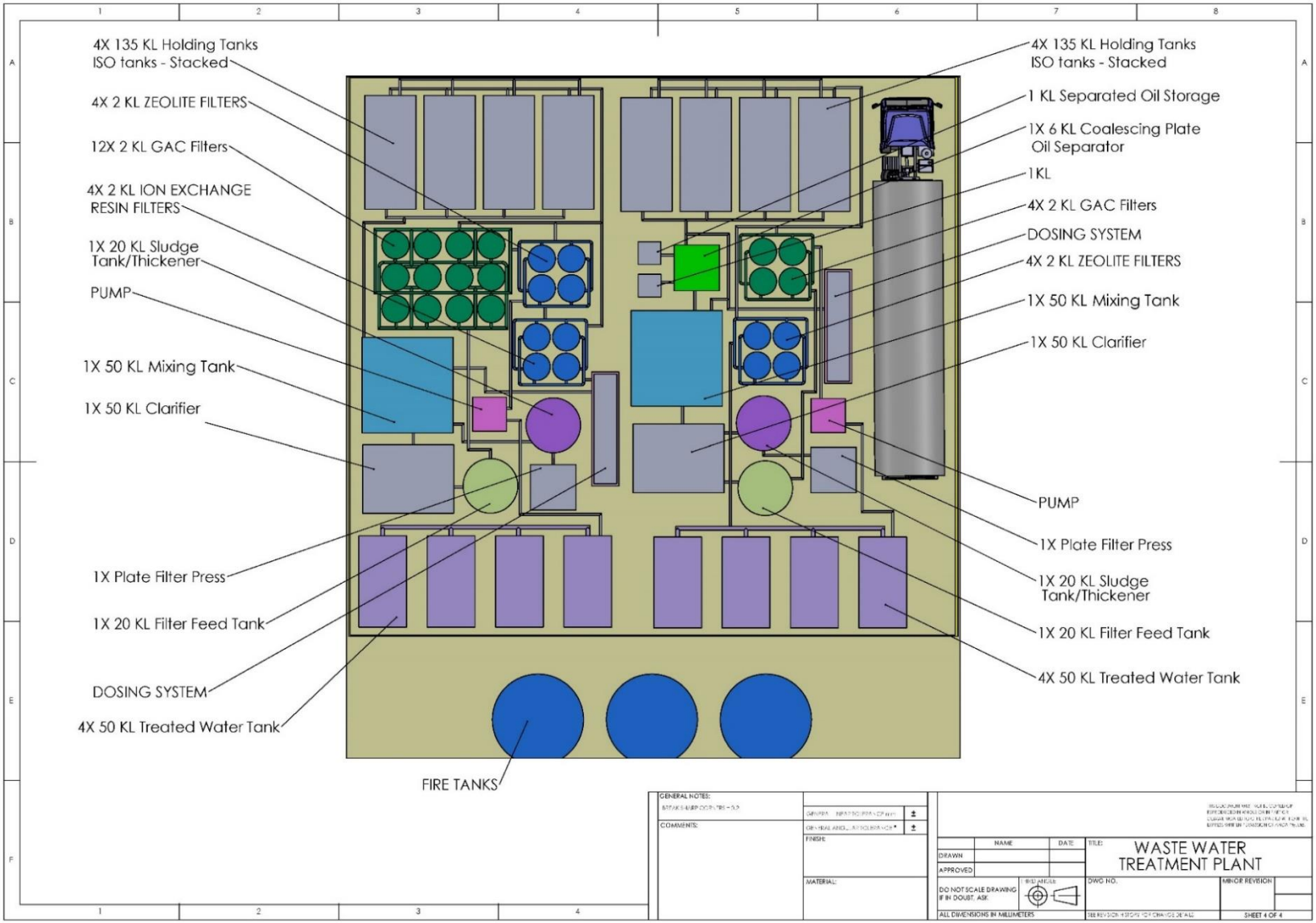

Figure 1-2 Liquid waste treatment plant schematic (subject to detailed design)

1.5.2 Non-PFAS contaminated liquid waste

The treatment procedure of liquid wastes that do not contain PFAS is outlined in Table 1-8 and shown on Figure 1-3.

Table 1-8 Non-PFAS contaminated liquid waste treatment procedure

Personal Protective Equipment
Prior to handling of liquid waste, appropriate PPE is to be worn at all times in accordance with the Health and Safety Plan for the Facility.
Environmental Controls
Environmental controls for the treatment of non-PFAS liquid waste will include: • Ventilation system to be managed in accordance with the OAQMP during loading and unloading of material and treatment of material • Appropriately equipped spill kits are located throughout the WTF • An emergency / spill response procedure is provided within the Operational Environment Management Plan (OEMP) • Fully impervious surfaces provided within Compartment 2 with rollover bunding (250mm) of the entirety of area to contain 110% of the largest tank capacity and in compliance with AS 3780 for the storage and handling of Class 8 liquid. Tanks fitted with overflow protection and alarms to alert operators in the event of a spill • Processing lines include isolation valves, alarms, and manual emergency stop mechanism, which can be operated to isolate water within specific tanks or processing lines • An emergency wash shower is located within the Compartment 2 area (adjacent to the entry door) • Replacement parts (for pumps and isolation valves) kept on site.
Step 1 – Holding tank
Liquid waste is received into the holding / equalisation tanks from either: • Bulk Tanker Deliveries (10 KL or 20 KL) – External • Decanting water from settling pits, wheel wash, soil washing – Internal The holding tanks for each treatment train have a combined capacity of 540 KL and consist of 4 x135 KL (or similar sized) tanks. The holding tanks also act as equalisation tanks and provides a buffer for any potentially highly contaminated loads that are received, providing a somewhat stable / uniform contaminant feed for the downstream treatment.
Step 2 – Coalescing plate oil separator
The coalescing plate oil separator is specially designed to treat oily water and trap oil and grease. Other treatment components are designed to treat dissolved organics such as TPH and PAHs. The size of the coalescing plate filter is approximately 6 KL, and this equipment will be used where oily water separation is required, depending on the composition of the incoming liquid waste.
Step 3 – Chemical dosing system for oil separator
The coalescing plate separator by itself is adequate to treat the oily water and maintain regulatory compliance of treated water discharged to trade waste. However, if emulsions or oily waters with high amounts of dissolved oil are to be treated, then chemical dosing will be necessary to spilt or coagulate the emulsion prior to further separation. The chemical dosing system will consist of both acids and coagulants, with both of these dosing systems used as required to treat the varying incoming liquid waste. The chemical reagents will be pumped from 1000L IBC's using small chemical dosing pumps. The plant operator will determine when to use the coagulants, which would typically be a result of bench scale testing to determine the need for a coagulant to be used.
Step 4 – Mixing tank (neutralisation tanks/precipitation tank)
Treatment reagents (refer to Step 5) are pumped into a 50 KL mixing tank where they are mechanically mixed with the liquid waste using a mechanical mixer. The primary purpose of the mixing tank is to keep solids and precipitates in suspension and to ensure that treatment reagents have enough contact or reaction time with the contaminants in the liquid waste to either:

- Neutralise Acidity or Alkalinity
- Precipitate Heavy Metals
- Adsorb Organics.

The principal technology to remove heavy metal pollutants from liquid waste is by chemical precipitation. Chemical precipitation includes two secondary removal mechanisms: coprecipitation and adsorption. Precipitation processes are characterised by the solubility of the metal to be removed. They are generally designed to precipitate trace metals to their solubility limits and obtain additional removal by coprecipitation and adsorption during the precipitation reaction.

There are many different treatment variables that affect these processes. They include the optimum pH, the type of chemical treatments used, and the number of treatment stages, as well as the temperature and volume of wastewater, and the chemical properties of the pollutants to be removed. Each of these variables directly influences treatment objectives and costs. Treatability studies will be performed by an onsite Chemist to optimise the relevant variables, so that trade waste discharge goals are met.

The mixing tank is 50 KL and will be operated as a batch process. The mixing tank is fed by supply pumps from the storage and equalisation tanks, via the oil water separator, and the output of the mixing is pumped to the primary clarifier.

Step 5 –Chemical dosing system for mixing/neutralisation/precipitation tank

Various chemicals will be used to treat liquid waste. Due to the variability of the incoming liquid waste, a variety of chemical reagents will likely need to be used to provide effective treatment and maintain compliance to trade waste discharge. All reagents proposed to be used are considered industry standard liquid waste treatment reagents. All reagents used in the chemical dosing system will be pumped to the mixing tank.

The following is a summary of reagents to be used in the LWTP, also detailed the purpose of each reagent:

- Hydrochloric Acid (37% w/w) – precipitation of heavy metals and neutralising alkalinity
- Caustic soda (30% w/w) – precipitation of Heavy metals and Neutralising acidity
- Aluminium Sulphate Solution (28% w/w, or powdered) – coagulating agent, precipitation of phosphate
- Polymer (liquid or powdered) – coagulating agent
- Activated Carbon (powdered) – adsorption of organics, PFAS, elimination of odour
- Magnesium Oxide (powdered) – precipitation of heavy metals, neutralising acidity
- Ferrous Sulphate (powdered) – reducing agent for metals.

All reagents used in powdered form will be mixed with water in the dosing system prior to pumping to the mixing tank.

Step 6 – Clarifier

The clarifier is used to separate solids from liquids using gravity separation. After the mixing tank process, heavy metal precipitates and absorbed organics are suspended and require separation prior to discharge to trade waste. The primary clarify will be a 50 KL lamella coalescing plate type with a conical base vessel to allow solids to be collected. Solids will then be tested and classified, depending on the waste classification solids will be treated onsite or removed for offsite disposal (Refer to Step 8, below).

Step 7 – Sand & carbon (MMF) filtration

After the primary clarifier, a series of sand and carbon filters (also known as Multi Media Filters (MMF)) will be used to “polish” the treated water prior to disposal to trade waste. Sand filtration effectively removes particles down to 20 microns that have not been separated in the primary clarification stage. Activated carbon adsorption effectively removes colour and organics that have not been separated in the primary clarification.

Although sand and carbon filtration is not likely to be essential to meet trade waste discharge criteria, it is seen as an added layer of protection and additional treatment.

The sand and carbon filtration system will need backwashing periodically. The backwashed solids will be fed back into the storage and equalisation tanks. When the activated carbon and/or sand material is spent the material will be containerised, transferred to the ‘packaged waste storage area’ and transferred offsite to an appropriately licensed disposal facility.

Step 8 – Dewatering

The solids produced from the primary clarifier will be high in moisture content and require dewatering. This will be accomplished through a plate filter press. The filter press will take high moisture solids and dewater to less than 20% moisture and produce a filter cake.

The filter cake produced from the filter press will be variable in composition due to the variability of the liquid waste to be treated. The filter cake will be classified as a restricted solid waste due to be being a by-product from a treatment process. Each batch of filter cake will be analysed to determine if it can be accepted at a restricted solid waste landfill. Typically, filter cake will meet landfill acceptance criteria as General Solid Waste or Restricted Solid Waste allowing landfill disposal. However, if the filter cake is hazardous, the filter cake will be treated and immobilised/stabilised according to the contaminants present before offsite landfill disposal.
Step 9 – Trade Waste Discharge
The trade waste discharge will have provisions for flow monitoring and sampling, both of which will be required by Sydney Water. It is planned to install an in-line flow monitoring, as this allows real time monitoring and recording of flows as well as cumulative flow measurements. The trade waste discharge will also have a suitable sampling point for periodic sampling by the regulator.
Sampling and Disposal of Treated Wastewater
Liquid waste will be sampled at several points through the treatment train to confirm the effectiveness of treatment, and prior to disposal. Treated liquid waste will be tested for compliance with Sydney Water's trade wastewater specification prior to discharge to sewer. Some treated liquid waste that meets re-use criteria may be reused onsite for dust suppression. By-products of these processes include sludge which will undergo further dewatering via a screw press, with the dewatered material tested and either disposed to landfill or treated further using bulk soil methodologies described in Section 6.2.1 of the OWMP. Spent filtration media will be stored in labelled containers, sampled and analysed. Disposal will be determined based on this analysis with disposal options being directed to landfill disposal, treatment prior to disposal to landfill (onsite or offsite) or disposal via thermal destruction (e.g. in Victoria). Waste transport protocols will be followed (e.g. waste tracking and interstate consignment authorisations). Waste oil may also be generated as a by-product and will be stored in 1 kL IBCs and will be taken to a suitably licenced oil recycling facility for further treatment.
Offtake Procedure and Decontamination
Once the liquid waste has been removed from the Facility, the LWTP untreated wastewater holding tanks must be decontaminated using Liquinox. The holding tanks must be saturated with the solution and left to soak for 2 to 24 hours. The holding tanks must then be rinsed with water and left to dry prior to being used again. Alternatively, excess water should be pumped out and treated through the LWTP. When not in use, the Liquinox is to be stored within the reagent storage area.

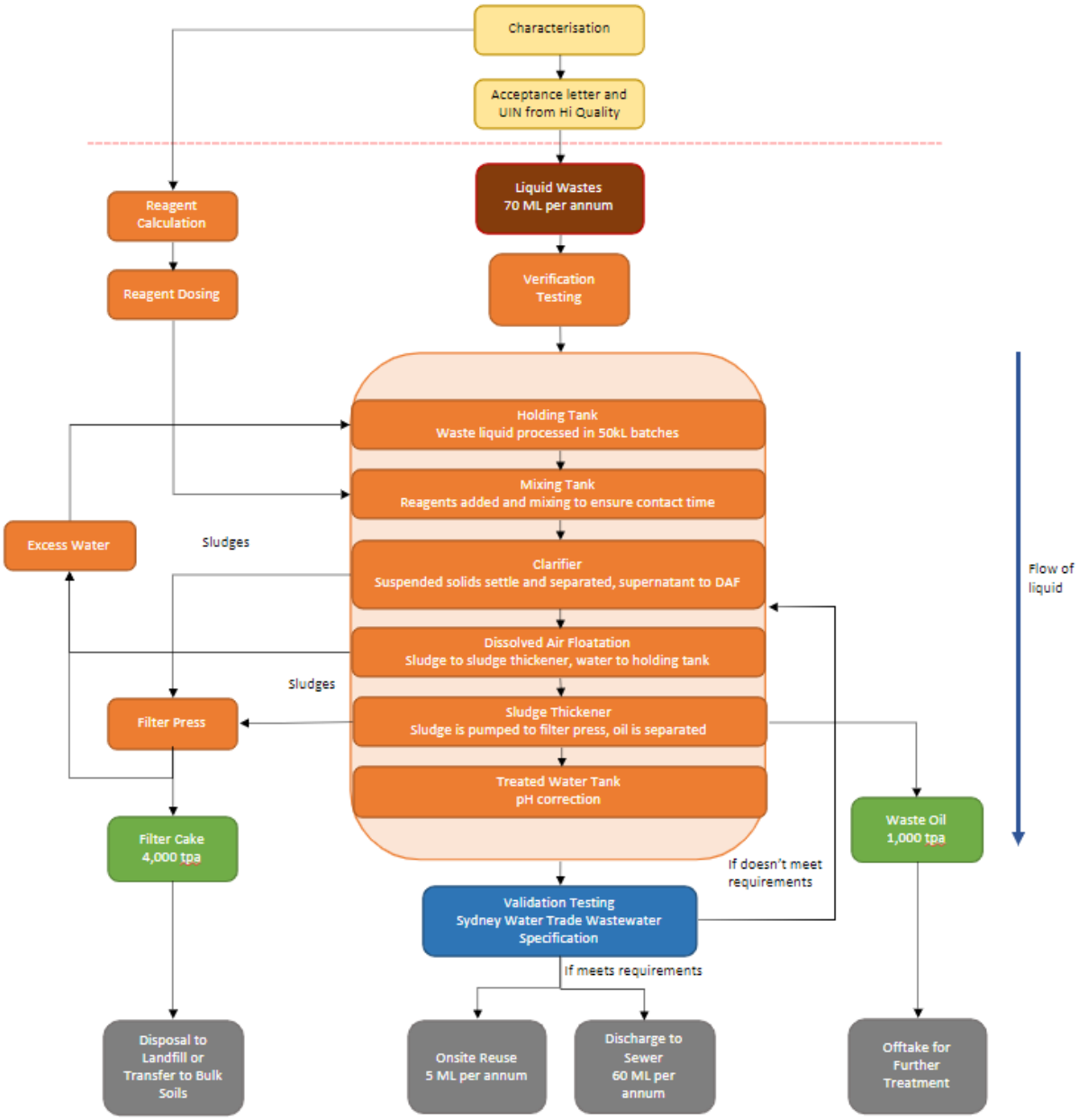

Figure 1-3 Non-PFAS liquid waste process flow

1.5.3 PFAS contaminated liquid waste

The LWTP for treatment of liquid wastes containing PFAS is similar to that described above, with additional steps, highlighted in bold:

1. A holding tank
2. A chemical dosing and mixing tank
3. A clarifier to remove sludges and other solids. Primary chemical treatment with anionic and cationic coagulation, flocculation, chlorination, pH adjustment, settlement, and clarification with addition of powdered activated carbon and zeolite
4. **Secondary treatment through VCZ mechanical and ion exchange media filtration**
5. **Tertiary treatment through coal GAC adsorption media filtration**
6. **Quaternary treatment through coconut catalytic microporous GAC adsorption media filtration**
7. **Quinary treatment through a weak base anion exchange resin media filtration**
8. **Senary treatment through ultra-high activity enhanced kinetic mesoporous GAC adsorption media filtration**
9. A holding tank for storage and testing prior to discharge.

The treatment procedure of liquid wastes that contain PFAS is shown in Figure 1-4.

Liquid waste will be sampled at several points through the treatment train to confirm the effectiveness of treatment, and prior to disposal. Treated liquid waste will be tested for compliance with Sydney Water's trade wastewater specification prior to discharge to sewer.

By-products of these processes include sludge which will undergo further dewatering via a screw press, with the dewatered material tested and either disposed to landfill (Table 7-3 of the OWMP) or treated further using bulk soil methodologies described in Section 6.2.1 of the OMWP. The spent filtration media will be containerised and disposed of at an appropriately licensed landfill or interstate licenced thermal treatment facility.

Waste oil may also be generated as a by-product and will be stored in 1 kL IBCs and will be taken to a suitably licenced oil recycling facility for further treatment.

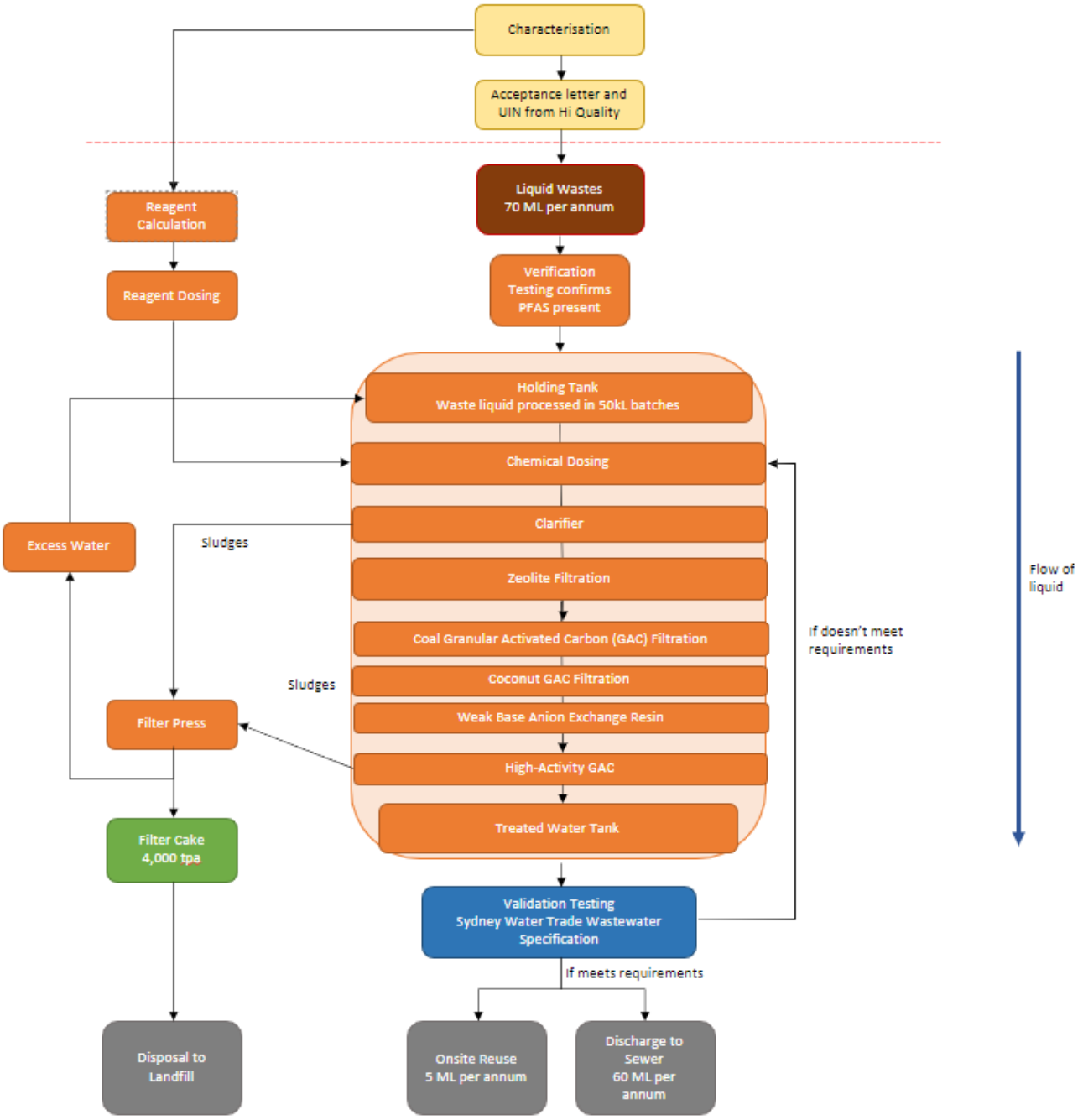

Figure 1-4 PFAS contaminated liquid waste process flow

2 Risk identification methodology

As noted, a complete risk assessment for all operations of the Facility has been prepared (Hazard Identification Report - Sherpa, 2024). The key objectives of the risk assessment were to:

1. Confirm events that could lead to a loss of containment or loss of control of liquid waste and reagent material that may have a safety or environmental impact
2. Identify the causes, potential safety and environmental consequences (onsite and offsite), and proposed preventative and mitigative controls of identified events
3. Qualitatively assess the unmanaged and managed safety and environmental risk for each event using the HiQ risk matrix
4. Identify additional controls and action items required where the managed risk was considered 'High' or 'Medium' risk to meet HiQ risk acceptability criteria and assist in demonstrating risks are reduced So Far As Reasonably Practicable (SFARP)
5. Prepare a HAZID study report to meet the expectations of NSW Department of Planning Housing and Infrastructure (DPHI) Hazardous Industry Planning Advisory Paper (HIPAP) No.6 Hazard Analysis
6. Prepare a HAZID study report that can be used to improve the WTF design, prepare operations related documents and identify actions to undertake further environmental and safety studies (Hazard Identification Report - Sherpa, 2024).

2.1 Risk Assessment Matrix

The below risk assessment matrix has been used to determine the level of risk posed by the Facility's activities.

Table 2-1 Risk Assessment Matrix

		Likelihood				
		A) Rare	**B) Unlikely**	**C) Possible**	**D) Probable**	**E) Almost Certain**
Consequence	**1) Slight**	Low	Low	Low	Medium	Medium
	2) Minor	Low	Low	Medium	Medium	Medium
	3) Severe	Low	Medium	Medium	Medium	High
	4) Major	Medium	Medium	Medium	High	High
	5) Catastrophic	Medium	Medium	High	High	High

Table 2-2 Risk Score

Risk	Action Required
Low	Acceptable level of risk. Attempt to eliminate risk but higher risk levels take priority.
Medium	Can be acceptable if controls are in place. Attempt to reduce to low.
High	Unacceptable level of risk. Controls must be in place to reduce to lower levels.

Table 2-3 Likelihood Description

Level	Likelihood description	Description
A	Rare	Exceptional circumstances required to occur.
B	Unlikely	Not likely to happen in normal circumstances.
C	Possible	Has occurred before under normal circumstances.
D	Probable	Expected to happen under normal circumstances.
E	Almost Certain	Expected to happen regularly under normal circumstances.

Table 2-4 Severity Description

Level	Severity Description	Safety	Environment
1	Slight	Injury requiring no / minimal first aid treatment with internal incident report.	No / minimal environmental impact. No regulatory or punitive action. Internal incident report.
2	Minor	Lost time injury (LTI) resulting in temporary / medium term impairment.	Low environmental impact. Minor breach of legislation. Warning notice issued by regulator.
3	Severe	Medical treatment injury (MTI) resulting in long term / permanent impairment.	Medium level of harm to environment over an extended period of time. Systemic minor breaches of legislation. Company charged with minor fine (Tier 3).
4	Major	Single fatality or critical life-threatening injury.	Serious environmental harm. Moderate breaches / single material breach of legislation. Company charged with moderate fine (Tier 2).
5	Catastrophic	Multiple fatalities.	Permanent or long-term serious environmental harm. Material breaches of legislation. Company charged with material fine (Tier 1) and loss of operation / license.

2.2 Risk identification

The 'Hazard Identification Report' (Sherpa, 2024) broadly considered risk associated with the receipt and treatment of liquid waste under nine broad categories:

- Waste and reagent receival
- Liquid waste treatment reagent and treatment materials spills
- Incompatible mixing of liquids
- Liquid waste spills
- Incomplete wastewater treatment
- Other reagents
- Packaged waste
- Fire / ignition
- Natural events and hazards.

A total of 46 risks were identified as associated with the Facility, described in Section 3.

Section 3 provides a detailed description of each of these risks. Risks are classified as being applicable to:

- Hazardous waste or material only) – 'H'
- Liquid waste only – 'L'
- Both waste types (typically where liquid waste may be considered to be hazardous) – 'B'
- Reagents – 'R' (while not a waste type risks associated with reagents have also been considered within this report)

3 Risk Identification and management

3.1 Waste and reagent receival

3.1.1 Risk identification

As reagent deliveries are received at the Facility there is potential for accidental spills as a result of loss of control of a delivery vehicle, or reagent leaks from a delivery vehicle. Additionally, there is potential for accidental acceptance of unacceptable waste types if improper classification of waste occurs prior to delivery onsite. A total of four risks associated with waste and reagent receival were identified in the 'Hazard Identification Report' (Sherpa, 2024). These are summarised in Table 3-1, as well as the unmitigated likelihood and consequence of each risk, showing no High risks, two Medium Safety risks and one Medium Environmental risk.

Table 3-1 Waste and reagent receival risk identification

Event (Hazard)	Type (H, L, B, R)	Cause	Consequence	Safety			Environment		
				Likelihood	Conseq-uence	Risk Rank	Likelihood	Conseq-uence	Risk Rank
Receival of unacceptable waste types / incompatible material	B	• Inadvertent waste mixing (undetected contaminant) • Improper cataloguing of waste • Incorrect classification of waste type • Mixing of waste batches	**Safety:** • Cross-contamination, unwanted reactions. It should be noted that the concentration of materials received would be dilute and would not result in combustion. • Harm to personnel **Environment:** • Release of dangerous goods waste materials	Possible	Minor	Medium	Possible	Slight	Low

Event (Hazard)	Type (H, L, B, R)	Cause	Consequence	Safety			Environment		
				Likelihood	Conseq-uence	Risk Rank	Likelihood	Conseq-uence	Risk Rank
Loss of control of a reagent vehicle in the carpark	R	• Reagent truck driver error • Poor markings, speeding, new driver	**Safety:** • Harm to personnel • Damage to nearby vehicles in carpark (Escalated: Fire or Explosion) **Environment:** • Loss of containment of reagents, unwanted reactions, leak of reagent material beyond site boundary • Pollution of waterways / mixing with stormwater system / groundwater • Release of dust / odours / biohazards	Rare	Severe	Low	Rare	Severe	Low
Leak of reagent material from transport truck in the carpark	R	• Improper securing of reagent containers during transport • Improper closing of truck storage •	**Safety:** • Harm to personnel (skin contact, inhalation). Impact to skin may cause irritation but not serious burn/damage (without a long exposure period) **Environment:** • Leak of reagent material beyond site boundary (Whyalla Place), unwanted reactions. Pollution of waterways / mixing with stormwater system / ground water • Release of dust and odours	Rare	Slight	Low	Rare	Slight	Low

Event (Hazard)	Type (H, L, B, R)	Cause	Consequence	Safety			Environment		
				Likelihood	Conseq-uence	Risk Rank	Likelihood	Conseq-uence	Risk Rank
Loss of control of a waste vehicle within Compartment 1	H	• Waste truck driver error • Poor markings, speeding, new driver, evening operations	**Safety:** • Harm to personnel (impact) • Damage to heavy vehicles (forklift, excavator, front loader, mobile plant) • Damage to site equipment (dewatering, mobile plant) **Environment:** • Mixing of waste batches, unwanted reactions, loss of containment beyond designated bays or beyond bunded region of warehouse • Release of dust and odours	Possible	Severe	Medium	Possible	Minor	Medium

3.1.2 Relevant guidelines and standards

In order to manage and minimise the potential risks associated with waste and reagent receival at the Facility, the following guidelines and standards will be followed:

- *IChEMS Minimum Standards (DCCEEW, 2022):* This risk assessment and the environmental controls have been developed in accordance with the minimum standards
- *Safety Data Sheet Caustic Soda Liquid, Revision 4* (Redox, 2016): The management of caustic soda at the Facility would be in accordance with the safety data sheet
- *Safety Data Sheet Hydrochloric Acid, >25%, Revision 6* (Redox, 2019): The management of hydrochloric acid would be in accordance with this safety data sheet
- *The Waste Classification guidelines Part 1: Classifying waste* (EPA, 2014): The proposal would follow these guidelines in order to appropriately classify waste onsite
- *Hazardous waste storage and processing: guidance for liquid waste industry* (EPA, 2017): this guidance has been considered for the management of potentially hazardous materials onsite
- *Liquid Waste Fact Sheet – Protecting the environment and your business, responding to spills* (DEC, 2005): the spill response in the OEMP has been drafted in line with this factsheet
- *Australian Dangerous Goods Code* (NTC, 2024): has been considered for the management of Dangerous Goods
- *Managing risks of hazardous chemicals in the workplace, Code of Practice* (Safe Work Australia, 2023): this code of practice has been considered with regards to identifying the risks associated with hazardous chemicals in the workplace.

3.1.3 Preventative controls and mitigation

The following preventative controls and mitigation would be put in place to manage the risks identified above:

Design features:

- Appropriately equipped spill kits are located throughout the WTF
- Scrubber / HVAC system to be operated in accordance with the OAQMP, ensuring air quality impacts are minimised (in the event a waste vehicle loses control within Compartment 1)
- Fully impervious surfaces provided within the Facility with rollover bunding (250mm) of the entirety of area to contain 110% of the largest tank capacity and in compliance with AS 3780 and AS4681 for the storage and handling of Class 8 and Class 9 liquids to prevent any spills exiting the Facility
- Emergency wash showers are provided throughout the WTF

Waste receival process:

- All wastes received at the Facility are to be tracked from the waste generator through to destination facility (e.g. landfill), consistent with the Protection of the Environment Operations (Waste) Regulation 2014.
- Prior to receipt at the Facility, the Facility chemist will verify the waste material to be received via bench scale testing.
- When loads of non-conforming waste are identified, the customer will be asked to leave the facility immediately with the load. The event is then recorded within the Facility's "Rejected loads register".
- If an unauthorised Class of Dangerous Goods is delivered to the Facility it will be stored in isolation and the customer will be contacted immediately to return and collect the material.

Other management controls:

- An emergency / spill response is provided within the OEMP
- Staff training and inductions will be provided for all staff working onsite as outlined in the OEMP
- Mandatory minimum PPE requirements for all staff are prescribed in the OWMP including eyewear, protective clothing and covered footwear
- Reagent deliveries would be received via the car parking area, separate to the waste truck receival area. No interaction between reagent delivery vehicles and waste load trucks.
- Trusted suppliers would be used for delivery of reagents who would have their own protocols in place for delivery
- The reagents that would be used at the Facility are non-combustible.

3.1.4 Residual risks

Following the implementation of the controls and mitigation identified above, the residual risks have been reduced to one medium safety risk and no medium environmental risks (Table 3-2).

Table 3-2 Waste and reagent receival residual risks - Controlled

Event (Hazard)	Controls	Safety			Environment		
		Likelihood	Consequence	Risk Rating	Likelihood	Consequence	Risk Rating
Receival of unacceptable waste types / incompatible material	• Generator screening / acceptance protocol • OEMP / OWMP unexpected finds protocol • Rejected loads protocol for onsite receival • PPE for personnel	Rare	Minor	Low	Rare	Slight	Low
Loss of control of a reagent vehicle in the carpark	• Reagents are non-reactive (cementitious) or natural bacteria (*Bascillus cereus*) • Parking location - no interaction of reagent deliveries with waste trucks • Trusted suppliers / packaging • Infrequent deliveries - smaller quantities of material • Site manager knowledge of deliveries / schedule • Spill kits • OEMP emergency procedures • PPE for personnel	Rare	Severe	Low	Rare	Severe	Low

Event (Hazard)	Controls	Safety			Environment		
		Likelihood	Consequence	Risk Rating	Likelihood	Consequence	Risk Rating
Leak of reagent material from transport truck in the carpark	• Reagents are non-reactive (cementitious) or natural (bacteria) • Parking location - no interaction of reagent deliveries with waste trucks • Trusted suppliers / packaging • Infrequent deliveries - smaller quantities of material • Site manager knowledge of deliveries / schedule • Spill kits • OEMP response protocols • PPE for personnel	Rare	Slight	Low	Rare	Slight	Low
Loss of control of a waste vehicle within Compartment 1	• SWWM protocols • Weigh bridge operator to guide to designated bay • Driver training • Bunding within warehouse to withstand 1 tanker load (20 KL) of lost waste • Entire building is at negative pressure (• Scrubber / HVAC system • OEMP - emergency response plan	Unlikely	Severe	Medium	Unlikely	Minor	Low

3.2 Liquid waste reagent and treatment materials spills

3.2.1 Risk identification

During operation of the LWTP there is potential for reagents and/or treatment materials to spill from the LWTP as a result of machine failure or human error. A total of 17 risks associated with reagent and treatment material spills from the LWTP were identified in the 'Hazard Identification Report' (Sherpa, 2024). These are summarised in Table 3-3, as well as the unmitigated likelihood and consequence of each risk, showing no high risks, six medium safety risks and no medium environmental risks.

Table 3-3 Liquid waste treatment reagent and treatment material spill risk identification -Unmitigated

Event (Hazard)	Type (H, L, B, R)	Potential cause	Consequence	Safety			Environment		
				Likelihood	Consequence	Risk Rank	Likelihood	Consequence	Risk Rank
Hydrochloric acid (37 wt.%) spill	R	• Pump malfunction • Leak in piping	**Safety:** • Harm to personnel. It is noted that the concentration of acid is highly diluted (similar to pool acids). Impact to skin may cause irritation but not serious burn/damage (without a long exposure period) • Damage to equipment **Environment:** • Improper dosing and incomplete treatment of liquid waste • Pollution of soil, groundwater and local waterways	Possible	Severe	Medium	Rare	Minor	Low

Event (Hazard)	Type (H, L, B, R)	Potential cause	Consequence	Safety			Environment		
				Likelihood	Consequence	Risk Rank	Likelihood	Consequence	Risk Rank
Caustic soda (30 wt.%) spill	R	• Pump malfunction • Leak in piping	**Safety:** • Harm to personnel. It is noted that the concentration of the caustic soda may cause irritation if in contact with skin but would require long exposure time to result in severe damage. • Damage to equipment **Environment:** • Improper dosing and incomplete treatment of liquid waste • Pollution of soil, groundwater and local waterways	Possible	Severe	Medium	Rare	Minor	Low
Aluminium sulfate (28 wt.%) spill	R	• Mishandling of 20 kg by operator	**Safety:** • Harm to personnel **Environment:** • Environmental impact on aquatic life if released to water ways • Improper dosing and incomplete treatment of liquid waste • Pollution of soil, groundwater and local waterways	Rare	Minor	Low	Rare	Minor	Low

Event (Hazard)	Type (H, L, B, R)	Potential cause	Consequence	Safety			Environment		
				Likelihood	Consequence	Risk Rank	Likelihood	Consequence	Risk Rank
Polymer spill	R	• Mishandling of 20 kg by operator	• Improper dosing and incomplete treatment of liquid waste	Rare	Minor	Low	Rare	Minor	Low
Activated carbon spill	R	• Mishandling of 20 kg by operator	**Safety:** • Formation of combustible carbon cloud - fire / ignition **Environment:** • Improper dosing and incomplete treatment of liquid waste	Unlikely	Severe	Medium	Rare	Minor	Low
Magnesium oxide spill	R	• Mishandling of 20 kg by operator	**Environment:** • Improper dosing and incomplete treatment of liquid waste • Potential to alter nearby soil conditions and effect ecosystems	Rare	Minor	Low	Rare	Minor	Low
Ferrous sulfate spill	R	• Mishandling of 20 kg by operator	**Environment:** • Improper dosing and incomplete treatment of liquid waste	Rare	Minor	Low	Rare	Minor	Low
Clarifier contaminants	R	• High inflow	**Safety:** • Solid particulates carried through system clogging downstream filtration equipment or overflowed onto LWTP floor • Slips / falls	Possible	Minor	Medium	Rare	Slight	Low

Event (Hazard)	Type (H, L, B, R)	Potential cause	Consequence	Safety			Environment		
				Likelihood	Consequence	Risk Rank	Likelihood	Consequence	Risk Rank
MMF filtration media spill	L	• High inflow • Blockage / pressure build-up • Media Exchange	**Safety:** • Harm to personnel	Unlikely	Slight	Low	Rare	Slight	Low
VCZ spill	R	• High inflow • System blockage / pressure build-up • Media exchange	**Safety:** • Harm to personnel	Unlikely	Slight	Low	Rare	Slight	Low
Activated carbon spill	R	• High inflow • System blockage / pressure build-up • Media exchange	**Safety:** • Damage to equipment **Environment:** • Ineffective filtration of incoming liquid waste	Unlikely	Slight	Low	Rare	Slight	Low
Coconut GAC spill	R	• High inflow • System blockage / pressure build-up	**Safety:** • Damage to equipment **Environment:** • Ineffective filtration of incoming liquid waste	Unlikely	Slight	Low	Rare	Slight	Low
Resin spill	L	• High inflow • System blockage / pressure build-up • Media exchange	**Environment:** • Ineffective filtration of incoming liquid waste	Unlikely	Slight	Low	Rare	Slight	Low

Event (Hazard)	Type (H, L, B, R)	Potential cause	Consequence	Safety			Environment		
				Likelihood	Consequence	Risk Rank	Likelihood	Consequence	Risk Rank
Kinetic GAC spill	L	• High inflow • System blockage / pressure build-up	**Safety:** • Damage to equipment **Environment:** • Ineffective filtration of incoming liquid waste	Unlikely	Slight	Low	Rare	Slight	Low
Hydrochloric acid (37 wt.%) spill in the reagent storage area	R	• Pump malfunction • Leak from IBC	**Safety:** • Harm to personnel. It is noted that the concentration of acid is highly diluted (similar to pool acids). Impact to skin may cause irritation but not serious burn/damage (without a long exposure period) **Environment:** • Pollution of soil, groundwater and local waterways	Possible	Severe	Medium	Rare	Minor	Low

Event (Hazard)	Type (H, L, B, R)	Potential cause	Consequence	Safety			Environment		
				Likelihood	Consequence	Risk Rank	Likelihood	Consequence	Risk Rank
Caustic soda (30 wt.%) spill in the reagent storage area	R	• Pump malfunction • Leak from IBC	**Safety:** • Harm to personnel. It is noted that the concentration of the caustic soda may cause irritation or damage if in contact with skin and eyes but would require long exposure time to result in severe damage. **Environment:** • Pollution of soil, groundwater and local waterways	Possible	Severe	Medium	Rare	Minor	Low
Spent filtration media spill	L	• Improper handling - human error • Compromise of IBC tank	• N/A	Unlikely	Slight	Low	Rare	Slight	Low

3.2.2 Relevant guidelines and standards

In order to manage and minimise the potential risks associated with a reagent and treatment material spill at the Facility, the following guidelines and standards will be followed:

- *IChEMS Minimum Standards (DCCEEW, 2022):* This risk assessment and the environmental controls have been developed in accordance with the minimum standards
- *AS1894 The storage and handling of non-flammable and combustible liquids*: Bunding of the Facility will be in accordance with this Australian Standard
- *AS3780 The storage and handling of corrosive substances*: Bunding of the Facility will be in accordance with this Australian Standard
- *Table 3-4*: Bunding of the Facility will be in accordance with this Australian Standard
- *Storing and Handling Liquids: Environmental Protection, Participant's Manual* (DECC, 2007): The Facility's management of liquid waste has been developed in line with this guide
- *Waste Classification Guidelines Part 1: Classifying waste* (EPA, 2014): This guideline has been used to determine the classification of liquid waste
- *Liquid Waste Fact Sheet – Protecting the environment and your business, responding to spills* (DEC, 2005): the spill response in the OEMP has been drafted in line with this factsheet
- *Managing risks of storing chemicals in the workplace, guidance material* (SafeWork Australia, 2020): This guidance material has been consulted to determine appropriate segregation of hazardous reagents.

3.2.3 Preventative controls and mitigation

The following preventative controls and mitigation will be put in place to manage the risks identified above.

Caustic Soda and Hydrochloric Acid reagents, which are classified as Dangerous Goods Class 8, PG II, will be stored separately. Hydrochloric acid will be stored in a locked safety cabinet within the reagent storage area in Compartment 1, whilst caustic soda will be stored in the reagent storage area in Compartment 2. Safety Data Sheets (SDS) for Caustic Soda and Hydrochloric Acid are provided in Appendix B. The SDS for both of these chemicals suggest that they are incompatible with one another and should be stored separately. As per the SDS, the following storage measures will be put in place for each of the reagents (Table 3-4).

Table 3-4 Caustic Soda and Hydrochloric Acid Storage Requirements

Reagent	Storage Requirements
Caustic Soda	Store in a cool, dry and well-ventilated place, out of direct sunlight. Keep containers securely sealed. Check regularly for spills and leaks. Keep away from heat and sources of ignition – no smoking. Keep away from foodstuffs and incompatible materials. Must be stored separate from acids. Keep only in original container or corrosive resistant container/container with a resistant inner liner. Do NOT use aluminium, galvanised or tin-plated containers.
Hydrochloric Acid	Store in a cool, dry and well-ventilated place, out of direct sunlight. Keep container tightly closed. Containers should be labelled and protected from damage. Keep away from heat and sources of ignition – no smoking. Keep away from foodstuffs and incompatible materials. Must be stored separate from caustic soda. Store locked up. If stored indoors, building floors should be acid resistant with drains to a treatment system. Electrical equipment should be flameproof and protected against corrosive action. Keep only in original container or suitable material, i.e. rubber lined steel, PVC/FRP, FRP. Containers should have a safety relief valve – care should be taken to release any internal pressure slowly.

Hydrochloric acid will be stored on its own within a locked safety cabinet. Appropriate signage will be used on the cabinet to denote it contains Hydrochloric Acid; only suitably authorised personnel will be provided access to the cabinet.

Key design and management features for the storage and handling of reagents that are DGs include:

- An emergency wash shower is located within the Compartment 2 area (adjacent to the entry door) – and in Compartment 1 in accordance with the SDS for Caustic Soda and Hydrochloric Acid reagents
- The reagent storage areas in Compartment 1 and Compartment 2 are located in a dry, cool, ventilated (via HVAC system) area out of direct sunlight
- No heat or ignition sources will be permitted within Compartment 2 or the reagent storage area of Compartment 1. HiQ Hot Works protocol will be implemented should hot works be required, and all DGs will be removed from Compartment 2 prior to any Hot Works being carried out
- Access to fire reels and extinguishers, in accordance with the NCC and selected, located and distributed in accordance with AS 2444:2001
- When not in use containers will remain securely sealed. The substances will not be removed from their original container
- Appropriate use of signage and placards denoting dangerous goods.

Additional design features of the LWTP and Compartment 2 include:

- Processing lines include isolation valves which can be operated to isolate water within specific tanks or processing lines
- Replacement parts (for pumps and isolation valves) kept on site
- Fully impervious surfaces provided within Compartment 2 with rollover bunding (250mm) of the entirety of area to contain 110% of the largest tank capacity and in compliance with AS 3780 for the storage and handling of Class 8 liquids to prevent any spills exiting Compartment 2
- Process controls including Emergency Stop and liquid level monitoring with alarms
- The Compartment is fully undercover and enclosed by a fire-rated wall
- Compartment is lined with epoxy sealer
- Appropriately equipped spill kits are located throughout the WTF
- Scrubber / HVAC system to be operated in accordance with the OAQMP, ensuring air quality impacts are minimised.

Other management controls:

- Staff training will be provided for all staff working within the LWTP including Facility specific training as well as training utilising applicable materials as outlined within *Storing and Handling Liquids: Environmental Protection* (DECC, 2007)
- Regular maintenance of plant and equipment will be carried out with a particular focus on regular maintenance of pumps and isolation valves
- Mandatory minimum PPE requirements for all staff are prescribed in the OWMP including eyewear, protective clothing and covered footwear.
- Staff to work in pairs at all times, with two-way radios connecting to site management personnel
- Use of relatively dilute reagents in the LWTP. The concentration and level of dilution of reagents is such that direct contact with skin may cause irritation, but will not result in burn/damage without prolonged exposure- allowing personnel time to access the emergency shower.

3.2.4 Residual risks

Following the implementation of the controls and mitigation identified above, the residual risks have been reduced to four medium safety risks (Table 3-5).

Table 3-5 Reagent and treatment material spills residual risks – Controlled

Event (Hazard)	Controls	Safety			Environment		
		Likelihood	Consequence	Risk Rating	Likelihood	Consequence	Risk Rating
Hydrochloric acid (37 wt.%) spill	• Use of dilute acid • OWMP - Mixing protocols / Operator training • Regular maintenance checks on pumps (preventative maintenance to change diaphragm's) • Isolation valves on processing lines • Dual operation team • Plant operators carry a two-way radio at all times • Bunding of LWTP (OEMP) • Emergency shower • Mandatory PPE for personnel • Separated storage location	Unlikely	Severe	Medium	Rare	Minor	Low
Caustic soda (30 wt.%) spill	• Use of relatively dilute base • OWMP - Mixing protocols / Operator training • Regular maintenance checks on pumps (preventative maintenance to change diaphragms) • Isolation valves on processing lines • Dual operation team • Plant operators carry a two-way radio at all times • Bunding of LWTP (OEMP) • Emergency shower • Mandatory PPE for personnel	Unlikely	Severe	Medium	Rare	Minor	Low
Aluminium sulfate (28 wt.%) spill	• Maximum limits of reagents transported (OEMP) • Scrubber / HVAC system • Spill kits (OEMP) • Mandatory PPE for personnel	Rare	Minor	Low	Rare	Minor	Low

Event (Hazard)	Controls	Safety			Environment		
		Likelihood	Consequence	Risk Rating	Likelihood	Consequence	Risk Rating
Polymer spill	• Maximum limits of reagents transported (OEMP) • Scrubber / HVAC system • Spill kits (OEMP) • Mandatory PPE for personnel	Rare	Minor	Low	Rare	Minor	Low
Activated carbon spill	• Running of air operated pumps, no electric motors reducing ignition sources • Downstream equipment using AC to further treat relevant contaminants preventing environmental impacts • Scrubber / HVAC system • Mandatory PPE for personnel	Rare	Severe	Low	Rare	Minor	Low
Magnesium oxide spill	• Maximum limits of reagents transported (OEMP) • Scrubber / HVAC system • Spill kits (OEMP) • Mandatory PPE for personnel	Rare	Minor	Low	Rare	Minor	Low
Ferrous sulfate spill	• Maximum limits of reagents transported (OEMP) • Scrubber / HVAC system • Spill kits (OEMP) • Mandatory PPE for personnel	Rare	Minor	Low	Rare	Minor	Low
Clarifier contaminants	• Daily decontamination of LWTP floor (OWMP) • Solids management outlined in OWMP • Bunding of LWTP (OEMP) • Mandatory PPE for personnel	Unlikely	Minor	Low	Rare	Slight	Low
MMF filtration media spill	• Maintenance checks on piping and process unit integrity • OWMP operating protocols • Mandatory PPE for personnel	Unlikely	Slight	Low	Rare	Slight	Low
VCZ spill	• OWMP operating protocols • Mandatory PPE for personnel	Unlikely	Slight	Low	Rare	Slight	Low

Event (Hazard)	Controls	Safety			Environment		
		Likelihood	Consequence	Risk Rating	Likelihood	Consequence	Risk Rating
Activated carbon spill	• OWMP operating protocols • Mandatory PPE for personnel	Unlikely	Slight	Low	Rare	Slight	Low
Coconut GAC spill	• OWMP operating protocols • Mandatory PPE for personnel	Unlikely	Slight	Low	Rare	Slight	Low
Resin spill	• OWMP operating protocols • Mandatory PPE for personnel	Unlikely	Slight	Low	Rare	Slight	Low
Kinetic GAC spill	• OWMP operating protocols • Mandatory PPE for personnel	Unlikely	Slight	Low	Rare	Slight	Low
Hydrochloric acid (37 wt.%) spill in the reagent storage area	• Use of relatively dilute acid • OWMP - Mixing protocols / Operator training • Regular maintenance checks on pumps (preventative maintenance to change diaphragms) • Isolation valves on processing lines • Dual operation team • Plant operators carry a two-way radio at all times • Bunding of LWTP • Emergency shower • Mandatory PPE for personnel • Separated storage location	Unlikely	Severe	Medium	Rare	Minor	Low
Caustic soda (30 wt.%) spill in the reagent storage area	• Use of relatively dilute base • OWMP - Mixing protocols / Operator training • Regular maintenance checks on pumps (preventative maintenance to change diaphragm's) • Isolation valves on processing lines • Dual operation team • Plant operators carry a two-way radio at all times • Bunding of LWTP • Emergency shower • Mandatory PPE for personnel	Unlikely	Severe	Medium	Rare	Minor	Low

Event (Hazard)	Controls	Safety			Environment		
		Likelihood	Consequence	Risk Rating	Likelihood	Consequence	Risk Rating
Spent filtration media spill	• Segregation of media in different drums based on treatment stage • Operators forklift certified (enter through truck bay) • Spill kits • Mandatory PPE for personnel	Rare	Slight	Low	Rare	Slight	Low

3.3 Incompatible mixing of waste

3.3.1 Risk identification

During operation of the Facility there is potential for reagents and wastes to be unintentionally mixed either as a result of human error or due to a spill. One additional risk associated with incompatible mixing occurring during the immobilisation process has been considered here. A total of three risks associated with incompatible mixing of waste were identified in the 'Hazard Identification Report' (Sherpa, 2024). These are summarised in Table 3-6, as well as the unmitigated likelihood and consequence of each risk, showing no high risks, two medium safety risks and no medium environmental risks.

Table 3-6 Incompatible mixing of reagents and waste risk identification - Unmitigated

Event (Hazard)	Type (H, L, B, R)	Potential cause	Consequence	Safety			Environment		
				Likelihood	Consequence	Risk Rank	Likelihood	Consequence	Risk Rank
Incompatible mixing in the mixing tank of the LWTP	B	• Human error • Treatment miscalculation • Improper labelling / confusion of reagents	**Safety:** • Unwanted reactions (heat generation, toxic vapour generation). **Environment:** • Untreated waste moving through treatment process	Possible	Minor	Medium	Rare	Minor	Low
Incompatible mixing resulting from a spill in the reagent storage area of Compartment 2	B	• Compromise of packaging • Human error / mishandling	**Safety:** • Harm to personnel (skin, eye, respiratory) • Unwanted reactions. Note as acids and caustics are dilute and in the form of concentrate while a reaction may result in heat generation it would not result in combustion. • Corrosion/damage to bunding	Possible	Severe	Medium	Rare	Severe	Low

Event (Hazard)	Type (H, L, B, R)	Potential cause	Consequence	Safety			Environment		
				Likelihood	Consequence	Risk Rank	Likelihood	Consequence	Risk Rank
			Environment: • Release of undiluted chemicals to soil / groundwater / waterways (danger to aquatic life)						
Mixing of incompatible materials in the high shear mixer	H	• Remnant waste in excavator during transfer • Inadequate decontamination procedure • Residue material left on high shear mixer belt • Overflow of liquid contaminant from bund	**Environment:** • Unwanted reactions • Disruption to treatment protocol and release of untreated waste to landfill / contaminated wastewater or leachate to local waterways	Possible	Slight	Low	Unlikely	Minor	Low

3.3.2 Relevant guidelines and standards

In order to manage and minimise the potential risks associated with incompatible mixing of waste at the Facility, the following guidelines and standards will be followed:

- *IChEMS Minimum Standards (DCCEEW, 2022):* This risk assessment and the environmental controls have been developed in accordance with the minimum standards
- *AS1894 The storage and handling of non-flammable and combustible liquids*: Bunding of the Facility will be in accordance with this Australian Standard
- *AS3780 The storage and handling of corrosive substances*: Bunding of the Facility will be in accordance with this Australian Standard
- *Storing and Handling Liquids: Environmental Protection, Participant's Manual* (DECC, 2007): The Facility's management of liquid waste has been developed in line with this guide
- *Waste Classification Guidelines Part 1: Classifying waste* (EPA, 2014): This guideline has been used to determine the classification of liquid waste
- *Liquid Waste Fact Sheet – Protecting the environment and your business, handling liquid waste* (DEC, 2005): This factsheet has been considered in the development of the Facility's management of liquid waste.

3.3.3 Preventative controls

The following preventative controls and mitigation will be put in place to manage the risks identified above.

Design features include:

- Appropriately equipped spill kits are located throughout the WTF
- Access to fire reels and extinguishers, in accordance with the NCC and selected, located and distributed in accordance with AS 2444:2001
- Fully impervious surfaces provided within the Facility with rollover bunding (250mm) of the entirety of area in compliance with AS 3780 and and AS4681 for the storage and handling of Class 8 and Class 9 Dangerous Goods
- The leachate system will capture any spilt reagents.

Management controls:

- Staff training will be provided for all staff working within the LWTP including Facility specific training as well as training utilising applicable materials as outlined within ***Storing and Handling Liquids: Environmental Protection*** (DECC, 2007)
- Mandatory minimum PPE requirements for all staff are prescribed in the OWMP including eyewear, protective clothing and covered footwear.

The 'Hazard Identification Report' noted that co-location of multiple waste types within the Facility was addressed during the HAZID workshop through discussion of contamination and mixing scenarios. It was noted by HiQ that as a result of the bulk soils solid nature, significant cross contamination was considered unlikely due to the low mobility of the waste. It is also noted that no mixing of waste loads will occur, further reducing the likelihood of unintentional mixing and risks associated with incompatible waste types.

3.3.4 Residual risks

Following the implementation of the controls and mitigation identified above, the residual risks have been reduced to one medium safety risk (Table 3-7).

Table 3-7 Incompatible mixing of reagents and waste residual risks - Controlled

Event (Hazard)	Controls	Safety			Environment		
		Likelihood	Consequence	Risk Rating	Likelihood	Consequence	Risk Rating
Incompatible mixing in the mixing tank	• Dilute acid / caustic reagent • Relative volume of liquid waste compared to added reagents • OWMP - treatment protocols • Mandatory PPE for personnel	Unlikely	Minor	Low	Rare	Minor	Low
Incompatible mixing resulting from a spill in the reagent storage area	• OEMP requiring segregation according to Australian guidelines • Spill kits • Fire extinguishers • Spill training • Bunding of LWTP • Leachate system • Mandatory PPE for personnel	Unlikely	Severe	Medium	Rare	Severe	Low
Mixing of incompatible materials in the high shear mixer	• Types of soil waste (non-hazardous and similar contaminant types) • Decontamination procedure • Individual treatment of batches (treatment / storage) • OWMP - management requirements • Overseen by supervisor (visual inspection) • Testing post-treatment to verify conformity to waste regulations, if unacceptable further treatment is performed	Unlikely	Slight	Low	Rare	Slight	Low

3.4 Liquid waste spills

3.4.1 Risk identification

As liquid waste is received, treated and discharged at the LWTP there is potential risk of spills and leaks. A total of 14 risks associated with spills and leaks at the LWTP were identified in the 'Hazard Identification Report' (Sherpa, 2024). These are summarised in Table 3-8, as well as the unmitigated likelihood and consequence of each risk, showing no high risks, 13 medium safety risks and 12 medium environmental risks.

Table 3-8 Liquid waste spill risk identification - Unmitigated

Event (Hazard)	Type (H, L, B, R)	Potential cause	Consequence	Safety			Environment		
				Likelihood	Consequence	Risk Rank	Likelihood	Consequence	Risk Rank
Holding tanks liquid waste spill	L	• Inaccurate unloading of waste truck • Leak in tank • Overflow of tank • Pump failure	**Safety:** • Harm to personnel (saturation with liquid waste) **Environment:** • Mixing of liquid waste batches • Contamination of drill mud • Partial flooding of compartment 1 • Leak to outside of building confines (soil / waterways / groundwater)	Possible	Severe	Medium	Unlikely	Severe	Medium
Liquid waste spill resulting from operation of the coalescing	L	• Overflow of separator • High / uncontrolled inflow	**Safety** • Harm to personnel (saturation with liquid waste)	Possible	Severe	Medium	Unlikely	Severe	Medium

Event (Hazard)	Type (H, L, B, R)	Potential cause	Consequence	Safety			Environment		
				Likelihood	Consequence	Risk Rank	Likelihood	Consequence	Risk Rank
plate oil separator		• Machinery malfunction	**Environment:** • Mixing of liquid waste batches • Leak to outside of building confines (soil/ waterways / groundwater)						
Oil spill from the coalescing plate oil separator	L	• High inflow • Machinery malfunction	**Safety:** • Oil overflow and potential ignition source • Harm to personnel (saturation with liquid waste, inhalation) **Environment:** • Leak to outside of building confines (soil / waterways / groundwater) • Release fumes / odours	Unlikely	Minor	Low	Unlikely	Minor	Low
Liquid waste spill from the mixing tank	L	• Overflow from incoming waste stream • Overflow from incoming dosing agents • Overmixing of system	**Safety:** • Harm to personnel (saturation with liquid waste) **Environment:** • Pollution of soil, groundwater and local waterways	Possible	Severe	Medium	Unlikely	Severe	Medium

Event (Hazard)	Type (H, L, B, R)	Potential cause	Consequence	Safety			Environment		
				Likelihood	Consequence	Risk Rank	Likelihood	Consequence	Risk Rank
Liquid waste spill from the clarifier	L	• High inflow	**Safety:** • Harm to personnel (saturation with liquid waste) • Compromise of Compartment 1 boundary and contamination of waste piles **Environment:** • Pollution of soil, groundwater and local waterways	Possible	Severe	Medium	Unlikely	Severe	Medium
Liquid waste spill from the Multi Media Filters (MMF)	L	• High inflow • Blockage / pressure build-up	**Safety:** • Harm to personnel (saturation with liquid waste) • Damage to equipment • Compromise of Compartment 1 boundary and contamination of waste piles **Environment:** • Pollution of soil, groundwater and local waterways	Possible	Severe	Medium	Unlikely	Severe	Medium
Liquid waste spill from the	L	• High inflow • Poor equipment sealing	**Safety:**	Possible	Severe	Medium	Unlikely	Severe	Medium

Event (Hazard)	Type (H, L, B, R)	Potential cause	Consequence	Safety			Environment		
				Likelihood	Consequence	Risk Rank	Likelihood	Consequence	Risk Rank
plate filter press		• System blockage	• Harm to personnel (saturation with liquid waste) • Damage to equipment • Compromise of Compartment 1 boundary and contamination of waste piles **Environment:** • Release of leachate in solids disposal						
Liquid waste spill from the Volcanic Clinoptilolite Zeolite (VCZ) mechanical and IE filtration	L	• High inflow • System blockage / pressure build-up	**Safety:** • Harm to personnel (saturation with liquid waste) • Damage to equipment • Compromise of Compartment 1 boundary and contamination of waste piles **Environment:** • Pollution of soil, groundwater and local waterways	Possible	Severe	Medium	Unlikely	Severe	Medium
Liquid waste spill from the GAC	L	• High inflow • System blockage / pressure build-up	**Safety:** • Harm to personnel (saturation with liquid waste)	Possible	Severe	Medium	Unlikely	Severe	Medium

Event (Hazard)	Type (H, L, B, R)	Potential cause	Consequence	Safety			Environment		
				Likelihood	Consequence	Risk Rank	Likelihood	Consequence	Risk Rank
adsorption filtration			• Damage to equipment • Compromise of Compartment 1 boundary and contamination of waste piles **Environment:** • Pollution of soil, groundwater and local waterways						
Liquid waste spill from the Coconut Granular Activated Carbon (GAC) Adsorption	L	• High inflow • System blockage / pressure build-up	**Safety:** • Harm to personnel (saturation with liquid waste) • Damage to equipment • Compromise of Compartment 1 boundary and contamination of waste piles **Environment:** • Pollution of soil, groundwater and local waterways	Possible	Moderate	Low	Unlikely	Severe	Low
Liquid waste spill from the weak base anion exchange	L	• High inflow • System blockage / pressure build-up	**Safety:** • Harm to personnel (saturation with liquid waste) • Damage to equipment	Possible	Severe	Medium	Unlikely	Severe	Medium

Event (Hazard)	Type (H, L, B, R)	Potential cause	Consequence	Safety			Environment		
				Likelihood	Consequence	Risk Rank	Likelihood	Consequence	Risk Rank
			• Compromise of Compartment 1 boundary and contamination of waste piles **Environment:** • Pollution of soil, groundwater and local waterways						
Liquid waste spill from the kinetic GAC adsorption	L	• High inflow • System blockage / pressure build-up	**Safety:** • Harm to personnel (saturation with liquid waste) • Damage to equipment • Compromise of Compartment 1 boundary and contamination of waste piles **Environment:** • Pollution of soil, groundwater and local waterways	Possible	Severe	Medium	Unlikely	Severe	Medium
Liquid waste spill from the holding tank/trade waste discharge	L	• High inflow • Leak in tank • Human error - release timing	**Safety:** • Harm to personnel (saturation with liquid waste) • Damage to equipment • Compromise of Compartment 1	Possible	Moderate	Low	Unlikely	Moderate	Low

Event (Hazard)	Type (H, L, B, R)	Potential cause	Consequence	Safety			Environment		
				Likelihood	Consequence	Risk Rank	Likelihood	Consequence	Risk Rank
			boundary and contamination of waste piles **Environment:** • Pollution of soil, groundwater and local waterways						
Liquid waste spill from the screw press	L	• High inflow • Poor equipment sealing	**Safety:** • Harm to personnel (saturation with liquid waste) • Damage to equipment • Compromise of Compartment 1 boundary and contamination of waste piles **Environment:** • Pollution of soil, groundwater and local waterways	Possible	Minor	Medium	Unlikely	Slight	Low

3.4.2 Relevant guidelines and standards

In order to manage and minimise the potential risks associated with a wastewater spill at the Facility, the following guidelines and standards will be followed:

- *IChEMS Minimum Standards (DCCEEW, 2022):* This risk assessment and the environmental controls have been developed in accordance with the minimum standards
- *AS1894 The storage and handling of non-flammable and combustible liquids*: Bunding of the Facility will be in accordance with this Australian Standard
- *AS3780 The storage and handling of corrosive substances*: Bunding of the Facility will be in accordance with this Australian Standard
- *Storing and Handling Liquids: Environmental Protection, Participant's Manual* (DECC, 2007): The Facility's management of liquid waste has been developed in line with this guide
- *Waste Classification Guidelines Part 1: Classifying waste* (EPA, 2014): This guideline has been used to determine the classification of liquid waste
- *Liquid Waste Fact Sheet – Protecting the environment and your business, handling liquid waste* (DEC, 2005): This factsheet has been considered in the development of the Facility's management of liquid waste
- *Liquid Waste Fact Sheet – Protecting the environment and your business, responding to spills* (DEC, 2005): the spill response in the OEMP has been drafted in line with this factsheet

3.4.3 Preventative controls and mitigation

The following preventative controls and mitigation will be put in place to manage the risks identified above.

Design features include:

- Fully impervious surfaces provided within Compartment 2 with rollover bunding (250mm) of the entirety of area to contain 110% of the largest tank capacity and in compliance with AS 3780 and AS4681 for the storage and handling of Class 8 and Class 9 liquids to prevent any spills exiting Compartment 2
- Compartment 2 to be lined with epoxy sealer
- Tanks fitted with overflow protection and alarms to alert operators in the event of a spill
- Processing lines include isolation valves which can be operated to isolate water within specific tanks or processing lines
- The Compartment is fully undercover and enclosed by a fire-rated wall
- An emergency wash shower is located within the Compartment 2 area (adjacent to the entry door)
- Appropriately equipped spill kits are located throughout the WTF
- Use of signage
- Replacement parts (for pumps and isolation valves) kept on site.

Management controls:

- Mandatory minimum PPE requirements for all staff are prescribed in the OWMP including eyewear, protective clothing and covered footwear
- Regular maintenance of plant and equipment will be carried out with a particular focus on the maintenance of pumps and isolation valves
- An emergency / spill response is provided within the OEMP
- Staff training will be provided for all staff working within the LWTP including Facility specific training as well as training utilising applicable materials as outlined within ***Storing and Handling Liquids: Environmental Protection*** (DECC, 2007)
- Staff to work in pairs at all times, with two-way radios connecting to site management personnel.

3.4.4 Residual risks

Following the implementation of the controls and mitigation identified above, the residual risks have been reduced to two medium safety risks and two medium environmental risks (Table 3-9), with all other risks characterised as low.

Table 3-9 Liquid waste spills residual risks - Controlled

Event (Hazard)	Controls	Safety			Environment		
		Likelihood	Consequence	Risk Rating	Likelihood	Consequence	Risk Rating
Holding tanks liquid waste spill	• All tanks include overflow protection and alarms (OEMP) • Visual inspection during loading / operation • Training / use of trusted transport operators • Maintenance checks on tank integrity • Bunding (for LWTP and Compartment 1) • OEMP emergency / spill response • Isolation of processing line with valves • Mandatory PPE for personnel • Compartment lined with epoxy sealer	Unlikely	Severe	Medium	Unlikely	Severe	Medium
Liquid waste spill resulting from operation of the coalescing plate oil separator	• Supporting supervisor • Equipment alarms • Visual inspection during operation • OWMP protocol and operator training • Maintenance checks on equipment • Bunding of LWTP • Compartment is lined with epoxy sealer • OEMP emergency / spill response • Mandatory PPE for personnel	Unlikely	Severe	Medium	Unlikely	Severe	Medium
Oil spill from the coalescing plate oil separator	• Dual operation team • Equipment alarms • Visual inspection during operation • OWMP protocol and operator training • Maintenance checks on equipment	Rare	Minor	Low	Rare	Minor	Low

Event (Hazard)	Controls	Safety			Environment		
		Likelihood	Consequence	Risk Rating	Likelihood	Consequence	Risk Rating
	• Bunding of LWTP (OEMP) • OEMP emergency / spill response • Mandatory PPE for personnel						
Liquid waste spill from the mixing tank	• Dual operation team • All tanks include overflow protection and alarms (OEMP) • Visual inspection during loading / operation • Operator training • Maintenance checks on tank integrity • Bunding of LWTP • Compartment lined with epoxy sealer • OEMP emergency / spill response • Isolation of processing line with valves • Mandatory PPE for personnel	Rare	Severe	Low	Rare	Severe	Low
Liquid waste spill from the clarifier	• Dual operation team • All tanks include overflow protection and alarms (OEMP) • Visual inspection during loading / operation • Operator training • Maintenance checks on tank integrity • Bunding of LWTP • Compartment is lined with epoxy sealer • OEMP emergency / spill response • Isolation of processing line with valves • Mandatory PPE for personnel	Rare	Severe	Low	Rare	Severe	Low
Liquid waste spill from the MMF	• Dual operation team • All tanks include overflow protection and alarms (OEMP) • Visual inspection during loading / operation • Operator training • Maintenance checks on tank integrity • Bunding of LWTP • Compartment lined with epoxy sealer	Rare	Severe	Low	Rare	Severe	Low

Event (Hazard)	Controls	Safety			Environment		
		Likelihood	Consequence	Risk Rating	Likelihood	Consequence	Risk Rating
	• OEMP emergency / spill response • Isolation of processing line with valves • Mandatory PPE for personnel						
Liquid waste spill from the plate filter press	• Dual operation team • All tanks include overflow protection and alarms (OEMP) • Visual inspection during loading / operation • Operator training • Maintenance checks on tank integrity • Bunding of LWTP • Compartment lined with epoxy sealer • OEMP emergency / spill response • Isolation of processing line with valves • Mandatory PPE for personnel	Rare	Severe	Low	Rare	Severe	Low
Liquid waste spill from the VCZ mechanical and IE filtration	• Dual operation team • All tanks include overflow protection and alarms (OEMP) • Visual inspection during loading / operation • Operator training • Maintenance checks on tank integrity • Bunding of LWTP • Compartment lined with epoxy sealer • OEMP emergency / spill response • Isolation of processing line with valves • Mandatory PPE for personnel	Rare	Severe	Low	Rare	Severe	Low
Liquid waste spill from the GAC adsorption filtration	• Dual operation team • All tanks include overflow protection and alarms (OEMP) • Visual inspection during loading / operation • Operator training • Maintenance checks on tank integrity • Bunding of LWTP (OEMP) • OEMP emergency / spill response	Rare	Severe	Low	Rare	Severe	Low

Event (Hazard)	Controls	Safety			Environment		
		Likelihood	Consequence	Risk Rating	Likelihood	Consequence	Risk Rating
	• Isolation of processing line with valves • Mandatory PPE for personnel						
Liquid waste spill from the Coconut GAC Adsorption	• Dual operation team • All tanks include overflow protection and alarms (OEMP) • Visual inspection during loading / operation • Operator training • Maintenance checks on tank integrity • Bunding of LWTP (OEMP) • OEMP emergency / spill response • Isolation of processing line with valves • Mandatory PPE for personnel	Rare	Moderate	Low	Rare	Moderate	Low
Liquid waste spill from the weak base anion exchange	• Dual operation team • All tanks include overflow protection and alarms (OEMP) • Visual inspection during loading / operation • Operator training • Maintenance checks on tank integrity • Bunding of LWTP (OEMP) • OEMP emergency / spill response • Isolation of processing line with valves • Mandatory PPE for personnel	Rare	Severe	Low	Rare	Severe	Low
Liquid waste spill from the kinetic GAC adsorption	• Dual operation team • All tanks include overflow protection and alarms (OEMP) • Visual inspection during loading / operation • Operator training • Maintenance checks on tank integrity • Bunding of LWTP • Compartment lined with epoxy sealer • OEMP emergency / spill response • Isolation of processing line with valves • Mandatory PPE for personnel	Rare	Severe	Low	Rare	Severe	Low

Event (Hazard)	Controls	Safety			Environment		
		Likelihood	Consequence	Risk Rating	Likelihood	Consequence	Risk Rating
Liquid waste spill from the holding tank/trade waste discharge	• Dual operation team • All tanks include overflow protection and alarms (OEMP) • Visual inspection during loading / operation • Operator training • Maintenance checks on tank integrity • Bunding of LWTP • Compartment lined with epoxy sealer • OEMP emergency / spill response • Isolation of processing line with valves • Mandatory PPE for personnel	Rare	Moderate	Low	Rare	Severe	Low
Liquid waste spill from the screw press	• Dual operation team • All tanks include overflow protection and alarms (OEMP) • Visual inspection during loading / operation • Operator training • Maintenance checks on tank integrity • Bunding of LWTP • Compartment lined with epoxy sealer • OEMP emergency / spill response • Isolation of processing line with valves • Mandatory PPE for personnel	Rare	Moderate	Low	Rare	Moderate	Low

3.5 Incomplete liquid waste treatment

3.5.1 Risk identification

There are several instances which may lead to the incomplete treatment of a waste load, if this material is then released from the Facility it may pose a risk to the environment. One risk associated with incomplete liquid waste treatment was identified in the 'Hazard Identification Report' (Sherpa, 2024). This risk is summarised below in Table 3-10.

Table 3-10 Incomplete liquid waste treatment risk identification – Unmitigated

Event (Hazard)	Type (H, L, B, R)	Cause	Consequence	Safety			Environment		
				Likelihood	Consequence	Risk Rank	Likelihood	Consequence	Risk Rank
Incomplete waste treatment	B	• Malfunction of dosing system • Breakthrough of contaminants in adsorption media • Unknown contaminants • Incorrect generator certificate • Incorrect initial site testing	**Safety:** • Damage to downstream equipment **Environment:** • Pollution of soil, groundwater and local waterways	Rare	Slight	Low	Possible	Severe	Medium

3.5.2 Relevant guidelines and standards

In order to manage and minimise the potential risks associated with incomplete waste treatment at the Facility, the following guidelines and standards will be followed:

- *IChEMS Minimum Standards (DCCEEW, 2022):* This risk assessment and the environmental controls have been developed in accordance with the minimum standards
- *Storing and Handling Liquids: Environmental Protection, Participant's Manual* (DECC, 2007): The Facility's management of liquid waste has been developed in line with this guide
- *Waste Classification Guidelines Part 1: Classifying waste* (EPA, 2014): This guideline has been used to determine the classification of liquid waste
- *Liquid Waste Fact Sheet – Protecting the environment and your business, handling liquid waste* (DEC, 2005): This factsheet has been considered in the development of the Facility's management of liquid waste.

3.5.3 Preventative controls

The following preventative controls and mitigation will be put in place to manage the risks identified above.

Management controls:

- Implementation of the OWMP which outlines the treatment protocols to be followed, minimising the risk of incomplete liquid waste treatment
- Regular maintenance of plant and equipment will be carried out with a particular focus on regular maintenance of pumps and isolation valves
- Setup schedule for periodic change out of media, supplemented with periodic sampling before and after activated carbon and resin adsorption units.
- Sampling prior to discharge to sewer will ensure that liquid waste has been treated sufficiently. If test results revealed treatment had been unsuccessful a new treatment train will be identified, and the liquid waste will undergo further treatment.
- Trade Waste Agreement to be in place with Sydney Water prior to release to sewer of any liquid waste
- Following discharge, the liquid waste is then treated by an offsite treatment plant prior to discharge into the environment.

3.5.4 Residual risks

Following the implementation of the controls and mitigation identified above, the residual risks have been reduced to low (Table 3-11).

Table 3-11 Incomplete liquid waste treatment residual risks - Controlled

Event (Hazard)	Controls	Safety			Environment		
		Likelihood	Consequence	Risk Rating	Likelihood	Consequence	Risk Rating
Incomplete waste treatment	• OWMP - treatment protocols • Maintenance of pumps • Treated water sampled prior to discharge with any unacceptable liquid wastes recirculated for further treatment • Discharge to sewage is then further treated by an offsite treatment plant before discharge to environment	Rare	Slight	Low	Rare	Minor	Low

3.6 Other reagents

3.6.1 Risk identification

There is potential for a reagent spill to occur within Compartment 1 as a result of human error or due to improper packaging. Additionally, Bentonite would be used in some cases during the sludge treatment process in order to thicken sludges with an intermediate moisture content. Bentonite is a hazardous chemical which if spilt may have adverse safety and environmental impacts. Three risks related to other reagents used in Compartment 1 were identified in the 'Hazard Identification Report' (Sherpa, 2024). These risks are summarised below in Table 3-12.

Table 3-12 Other reagent risk identification- Unmitigated

Event (Hazard)	Type (H, L, B, R)	Cause	Consequence	Safety			Environment		
				Likelihood	Consequence	Risk Rank	Likelihood	Consequence	Risk Rank
Reagent spill within the reagent storage area in Compartment 1	R	• Human error - waste truck, heavy machinery, on-foot collision • Improper / degradation of packaging	**Safety:** • Harm to personnel (skin, eye, respiratory, carcinogenic) • Corrosion/damage to bunding • Unwanted reactions **Environment:** • Release of undiluted chemicals to waterways (danger to aquatic life)	Unlikely	Severe	Medium	Rare	Severe	Low
Bentonite spill	R	• Malfunction of dosing system • Overflowing of sludge pits • Aggressive mixing during bentonite dosing	• **Safety:** • Harm to personnel (inhalation) • Dosing of incorrect waste batch, unwanted reactions **Environment:** • Potential air pollution due to the release of dust and particulate matter	Possible	Minor	Medium	Possible	Minor	Medium
Cementitious stabiliser spill	R	• Remnant waste in excavator during transfer	• **Environment:** • Unwanted reactions	Possible	Slight	Low	Unlikely	Minor	Low

Event (Hazard)	Type (H, L, B, R)	Cause	Consequence	Safety			Environment		
				Likelihood	Consequence	Risk Rank	Likelihood	Consequence	Risk Rank
		• Inadequate decontamination procedure • Residue material left on high shear mixer belt • Overflow of liquid contaminant from bund	• Disruption to treatment protocol and release of untreated waste to landfill / contaminated wastewater or leachate to local waterways						

3.6.2 Relevant guidelines and standards

In order to manage and minimise the potential risks associated with a reagent spill at the Facility, the following guidelines and standards will be followed:

- *IChEMS Minimum Standards (DCCEEW, 2022):* This risk assessment and the environmental controls have been developed in accordance with the minimum standards
- *The Waste Classification guidelines Part 1: Classifying waste* (EPA, 2014): The Proposal would follow these guidelines in order to appropriately classify waste onsite
- *Hazardous waste storage and processing: guidance for liquid waste industry* (EPA, 2017): This guidance has been considered for the management of potentially hazardous materials onsite
- *Liquid Waste Fact Sheet – Protecting the environment and your business, responding to spills* (DEC, 2005): The spill response in the OEMP has been drafted in line with this factsheet
- *Managing risks of storing chemicals in the workplace, guidance material* (SafeWork Australia, 2020): This guidance material has been consulted to determine appropriate separation of hazardous reagents.

3.6.3 Preventative controls

The following preventative controls and mitigation would be put in place to manage the risks identified above.

Design features:

- The pits have been designed with three layers of lining to ensure the longevity of the pits and reduce the potential for spills
- Separation of sludge pits from soil treatment area to prevent cross contamination
- Bentonite would be transported in a bulker bag via a forklift, minimising quantities being handled
- Access to fire reels and extinguishers, in accordance with the NCC and selected, located and distributed in accordance with AS 2444:2001
- Appropriately equipped spill kits are located throughout the WTF
- Scrubber / HVAC system to be operated in accordance with the OAQMP, ensuring air quality impacts are minimised.
- Fully impervious surfaces provided within the Facility with rollover bunding (250mm) of in compliance with AS 3780 and AS4681 for the storage and handling of Class 8 and Class 9 liquids.

Management controls:

- Staff training and inductions will be provided for all staff working onsite as outlined in the OEMP
- Regular maintenance checks of the sludge pits would occur to ensure that there are no cracks or issues that could lead to material spilling from the pits
- Appropriately equipped spill kits are located throughout the WTF
- Mandatory minimum PPE requirements for all staff are prescribed in the OWMP including eyewear, protective clothing and covered footwear.

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3.6.4 Residual risks

Following the implementation of the controls and mitigation identified above, the residual risks have been reduced to low (Table 3-13).

Table 3-13 Other reagent residual risks - Controlled

Event (Hazard)	Controls	Safety			Environment		
		Likelihood	Consequence	Risk Rating	Likelihood	Consequence	Risk Rating
Reagent spill within the reagent storage area in Compartment 1	• OEMP stating segregation according to Australian guidelines • Operator training / handling procedures • Spill kits • Fire extinguishers • Specific bunding isolating reagent storage from warehouse floor • Leachate diversion system • PPE for personnel	Rare	Severe	Low	Rare	Severe	Low
Bentonite spill	• Design of pits (layered with appropriate headroom) • Separation of sludge pits from soil treatment area • Transported in a bulker bag • Operator protocols / training / maintenance checks / induction • Spill kits • PPE for personnel	Rare	Minor	Low	Rare	Minor	Low
Cementitious stabiliser spill	• Bulk container transport when moving • OWMP for immobilisation • Enclosed / negative pressure of treatment facility (limits exposure) • HVAC / Scrubber system • OEMP spill response • PPE for personnel	Unlikely	Minor	Low	Rare	Slight	Low

3.7 Packaged waste

3.7.1 Risk identification

Two risks associated with packaged waste were identified in the 'Hazard Identification Report' (Sherpa, 2024). These risks are summarised below in Table 3-14.

Table 3-14 Packaged waste treatment risk identification – Unmitigated

Event (Hazard)	Type (H, L, B, R)	Cause	Consequence	Safety			Environment		
				Likelihood	Consequence	Risk Rank	Likelihood	Consequence	Risk Rank
Accidental acceptance of dangerous goods	B	• Unintended contamination • Mislabelled waste drums	**Safety:** • Harm to personnel (flammable materials, toxic odours) **Environment:** • Pollution of air quality • Leak of liquid wastes beyond site boundary and contamination of local waterways / entry into storm water system	Probable	Severe	Medium	Possible	Severe	Medium
Natural events leading to a compromise in the storage of packaged waste	B	• High rainfall • Compromise of facility roofing	**Safety:** • Unwanted reactions **Environment:** • Cross-contamination of waste batches • Loss of containment through compromise of packaging • Pollution of soil, groundwater and local waterways	Rare	Minor	Low	Rare	Minor	Low

3.7.2 Relevant guidelines and standards

In order to manage and minimise the potential risks associated with incomplete waste treatment at the Facility, the following guidelines and standards will be followed:

- *IChEMS Minimum Standards (DCCEEW, 2022):* This risk assessment and the environmental controls have been developed in accordance with the minimum standards
- *The Waste Classification guidelines Part 1: Classifying waste* (EPA, 2014): The proposal would follow these guidelines in order to appropriately classify waste onsite
- *Hazardous waste storage and processing: guidance for liquid waste industry* (EPA, 2017): this guidance has been considered for the management of potentially hazardous materials onsite
- *Liquid Waste Fact Sheet – Protecting the environment and your business, responding to spills* (DEC, 2005): the spill response in the OEMP has been drafted in line with this factsheet
- *Australian Dangerous Goods Code* (NTC, 2024): has been considered for the management of Dangerous Goods
- *Protection of the Environment Operations (Waste) Regulation 2014*: Tracking of waste from the waste generator to the destination facility would be in accordance with this regulation.

3.7.3 Preventative controls

The following preventative controls and mitigation would be put in place to manage the risks identified above.

Waste receival process:

- All wastes received at the Facility are to be tracked from the waste generator through to destination facility (e.g. landfill), consistent with the Protection of the Environment Operations (Waste) Regulation 2014.
- Prior to receipt at the Facility, the Facility chemist will verify the waste material to be received via bench scale testing.
- When loads of non-conforming waste are identified, the customer will be asked to leave the facility immediately with the load. The event is then recorded within the Facility's "Rejected loads register".
- If an unauthorised Class of Dangerous Goods is delivered to the Facility it will be stored in isolation and the customer will be contacted immediately to return and collect the material.

Design features:

- All reagents and waste classed as Class 8 Dangerous Goods will be stored on shelving above the Probable Maximum Flood (PMF) and in accordance with the relevant Australian Standards.
- Fully impervious surfaces provided within the Facility with rollover bunding (250mm) of the entirety of area to contain 110% of the largest tank capacity and in compliance with AS 3780 and AS4681 for the storage and handling of Class 8 and Class 9 liquids to prevent any spills exiting the Facility.

Management controls:

- The emergency response procedure is detailed in Section 5.11 of the OEMP
- Staff training and inductions will be provided for all staff working onsite as outlined in Section 5.6 of the OEMP
- Mandatory minimum PPE requirements for all staff are prescribed in the OWMP including eyewear, protective clothing and covered footwear.
- Should a flood emergency become apparent, the Flood Emergency Response Plan will be implemented. This Plan, to be drafted prior to operation, would include controls to be undertaken prior to floodwater impacting the Site. This may include such controls as ceasing operations, removing hazardous soil from the Site, closing facility doors, pumping leachate pits to the temporary holding tank or LWTP, or to containers stored above the flood level.

3.7.4 Residual risks

Following the implementation of the controls and mitigation identified above, the residual risks have been reduced to low (Table 3-15 Packaged waste residual risks – ControlledTable 3-15).

Table 3-15 Packaged waste residual risks – Controlled

Event (Hazard)	Controls	Safety			Environment		
		Likelihood	Consequence	Risk Rating	Likelihood	Consequence	Risk Rating
Accidental acceptance of dangerous goods	• Chemical analysis or an SDS for each packaged waste batch • Non-conforming protocols	Rare	Severe	Low	Rare	Severe	Low
Natural events leading to a compromise in the storage of packaged waste	• Hazardous waste stored in line with Australian guidelines • Class 8 Dangerous Goods stored above flood level (1 in 500 years)	Rare	Minor	Low	Rare	Minor	Low

3.8 Fire / ignition

3.8.1 Risk identification

In the rare event that an open flame was present near the coalescing plate oil separator there may be potential for a fire to ignite. One risk associated with fire / ignition was identified for the LWTP in the 'Hazard Identification Report' (Sherpa, 2024). This risk is summarised below in Table 3-16.

Table 3-16 Fire risk identification - Unmitigated

Event (Hazard)	Type (H, L, B, R)	Potential cause	Consequence	Safety			Environment		
				Likelihood	Consequence	Risk Rank	Likelihood	Consequence	Risk Rank
Open flame near the coalescing plate oil separator	L	• Machinery malfunction • External ignition source (operator, office) against protocol	**Safety:** • Harm to personnel • Damage to equipment **Environment:** • Release of hazardous vapours / fumes • Pollution of local air quality spreading to nearby residential, commercial, and recreational facilities • Spread to compartment 1 waste piles	Rare	Severe	Low	Rare	Minor	Low

3.8.2 Relevant guidelines and standards

In order to manage and minimise the potential risks associated with a fire at the Facility, the following guidelines and standards will be followed:

- *IChEMS Minimum Standards (DCCEEW, 2022):* This risk assessment and the environmental controls have been developed in accordance with the minimum standards
- Portable fire extinguishers will be provided throughout the building (in accordance with the National Construction Code (NCC) and selected, located and distributed in accordance with AS 2444:2001)
- Regular testing and maintenance of fire safety systems (in accordance with AS 1851 Routine service of fire protection systems and equipment).

3.8.3 Preventative controls

The following preventative controls and mitigation will be put in place to manage the risks identified above.

Design features include:

- Incorporation of fire walls in the Facility's' design
- Inclusion of a fire shutter
- Fire sprinkler system
- Fire detection systems
- Access to fire reels and extinguishers, in accordance with the NCC and selected, located and distributed in accordance with AS 2444:2001
- Use of signage.

Management controls:

- Mandatory minimum PPE requirements for all staff are prescribed in the OWMP including eyewear, protective clothing and covered footwear.
- No heat or ignition sources will be permitted within Compartment 2. HiQ Hot Works protocol will be implemented should hot works be required, and all DGs will be removed from Compartment 2 prior to any Hot Works being carried out
- Staff training will be provided for all staff working within the LWTP including Facility specific training as well as training utilising applicable materials as outlined within ***Storing and Handling Liquids: Environmental Protection*** (DECC, 2007).

3.8.4 Residual risks

Following the implementation of the controls and mitigation identified above, the residual risks remain low (Table 3-17).

Table 3-17 Fire residual risks - Controlled

Event (Hazard)	Controls	Safety			Environment		
		Likelihood	Consequence	Risk Rating	Likelihood	Consequence	Risk Rating
Open flame near the coalescing plate oil separator	• Fire wall enclosing compartments • Fire shutter • OEMP - Fire reel, extinguisher • Mandatory PPE for personnel • Hot Works Protocol to be implemented should any hot works be required within Compartment 2	Rare	Severe	Low	Rare	Minor	Low

3.9 Natural events and hazards

3.9.1 Risk identification

Extreme weather events may pose a risk to the Facility's operation, and in a worst-case scenario, potentially leading to pollution of the surrounding environment. One risk associated with extreme weather events impacting the LWTP was identified in the 'Hazard Identification Report' (Sherpa, 2024). This risk is summarised below in Table 3-18.

Table 3-18 Natural events and hazards risk identification – Unmitigated

Event (Hazard)	Type (H, L, B, R)	Cause	Consequence	Safety			Environment		
				Likelihood	Consequence	Risk Rank	Likelihood	Consequence	Risk Rank
Natural events (flooding)	B	• High rainfall • Compromise of facility roofing • External flooding	**Safety:** • Compromise of reagent packaging leading to exposure to personnel **Environment:** • Pollution of soil, groundwater and local waterways	Rare	Minor	Low	Rare	Minor	Low

3.9.2 Relevant guidelines and standards

In order to manage and minimise the potential risks associated with natural events and hazards at the Facility, the following guidelines and standards will be followed:

- *IChEMS Minimum Standards (DCCEEW, 2022):* This risk assessment and the environmental controls have been developed in accordance with the minimum standards
- *AS1894 The storage and handling of non-flammable and combustible liquids*: Bunding of the Facility will be in accordance with this Australian Standard
- *AS3780 The storage and handling of corrosive substances*: Bunding of the Facility will be in accordance with this Australian Standard
- *Storing and Handling Liquids: Environmental Protection, Participant's Manual* (DECC, 2007): The Facility's management of liquid waste has been developed in line with this guide
- *Liquid Waste Fact Sheet – Protecting the environment and your business, handling liquid waste* (DEC, 2005): This factsheet has been considered in the development of the Facility's management of liquid waste

3.9.3 Preventative controls

The following preventative controls and mitigation will be put in place to manage the risks identified above.

Design features include:

- Fully impervious surfaces provided within Compartment 2 with rollover bunding (250mm) of the entirety of area to contain 110% of the largest tank capacity and in compliance with AS 3780 and AS4681 for the storage and handling of Class 8 and Class 9 liquids to prevent any spills exiting Compartment 2. The bunding will also act in keeping flood waters from entering the Facility.
- Reagents and waste classed as Class 8 Dangerous Goods will be stored on shelving above the Probable Maximum Flood (PMF) and in accordance with the relevant Australian Standards.
- Above ground tanks will prevent contamination of flood water in the unlikely case of an extreme weather event leading to flooding of the Facility.
- New structures to be built in accordance with the Building Code of Australia (2022).

Management controls:

- The emergency response procedure is detailed in the OEMP
- Mandatory minimum PPE requirements for all staff are prescribed in the OWMP including eyewear, protective clothing and covered footwear.
- Should a flood emergency become apparent, the Flood Emergency Response Plan will be implemented. This Plan, to be drafted prior to operation, would include controls to be undertaken prior to floodwater impacting the Site. This may include such controls as ceasing operations, removing hazardous soil from the Site, closing facility doors, pumping leachate pits to the temporary holding tank or LWTP, or to containers stored above the flood level.

3.9.4 Residual risks

Following the implementation of the controls and mitigation identified above, the residual risks have been reduced to low (Table 3-19).

Table 3-19 Natural events and hazards residual risks – Controlled

Event (Hazard)	Controls	Safety			Environment		
		Likelihood	Consequence	Risk Rating	Likelihood	Consequence	Risk Rating
Natural events (flooding)	• Bunding preventing entry of water to LWTP • Reagents and waste classed as Class 8 Dangerous Goods will be stored above flood level • Above ground tanks prevent contamination of flood water • Emergency response (OEMP) • Mandatory PPE for personnel	Rare	Slight	Low	Rare	Slight	Low

4 Conclusion

In summary, a total of 46 risks were identified in relation to liquid and hazardous waste. Of these; 18 risks were identified in relation to reagents, two risks were identified in relation to hazardous waste, 19 risks were identified in relation to liquid waste and seven risks were identified in relation to both hazardous and liquid waste. There were no High risk (unmanaged or managed) environmental and safety events identified in relation to the management of liquid waste at the Facility.

4.1 Liquid waste

A total of 26 hazards were identified in relation to the management of liquid waste (including the seven that were identified for both liquid and hazardous waste). Each of these hazards were ranked against Safety and Environmental criteria. Prior to the implementation of control measures this comprised 15 Medium and 11 Low risk Safety hazards, and 12 Medium and 14 Low risk Environmental hazards. The Facility will be operated in accordance with applicable Australian standards and guidelines, has incorporated numerous design and operational control measures and has response mitigation measures identified. With these in place the residual risk rating, taking into account the controls in place, were found to be three Medium and 23 Low Safety risks and two Medium and 24 Low Environmental risks.

The key safety risks to personnel identified were associated with the release of liquid waste from the initial holding tanks, as well as loss of containment of concentrated reagents, specifically hydrochloric acid and caustic soda. The proposed controls include tank overflow protection, isolation valve installation on processing lines, and the bunding of the LWTP.

The key environmental risk was associated with the release of liquid waste from the initial holding tanks. Liquid waste stored here could be captured from a mixture of waste piles within the main warehouse and hence poses a significant environmental impact due to the mixture of potential contaminants present. Each tank is designed to hold 135 kL, with the potential release of the full volume to reach the stormwater system and result in contamination. This holding tank area was found to have the higher risk when compared to the processing units of the LWTP which are smaller in size. When considering the proposed controls (i.e. bunding containing 110% of largest tank capacity in compliance to AS 3780 and AS4681 for the storage and handling of Class 8 and Class 9 liquids the managed environmental risk was categorised as Medium.

4.2 Hazardous waste

No High risk (unmanaged or managed) environmental and safety events have been identified in relation to the management of hazardous waste and reagents at the Facility. A total of nine hazards were identified in relation to the management of hazardous chemicals and waste. Each of these hazards were ranked against Safety and Environmental criteria. Prior to the implementation of control measures this comprised five Medium and four Low risk Safety hazards, and three Medium and six Low risk Environmental hazards. The Facility would be operated in accordance with applicable Australian standards and guidelines, has incorporated numerous design and operational control measures and has response mitigation measures identified. With these in place the residual risk rating, taking into account the controls in place, were found to be two Medium and seven Low Safety Risks and nine Low Environmental risks.

The key risks to personnel identified were associated with accidental spills of hazardous reagents and accidental acceptance of Dangerous Goods. The proposed controls include the generator screening and acceptance protocols, spill kits, bunding of the reagent storage area.

The key environmental risks were associated with a bentonite spill leading to potential air pollution, loss of control of a waste vehicle within Compartment 1 and accidental acceptance of Dangerous Goods. The proposed

controls include bunding within Compartment 1 to withstand one tanker load of lost waste, availability of spill kits, PPE for personnel and the non-conforming waste protocol.

Appendix A Waste Contaminant and Reagent Classifications

Compound Name	Process Unit/Waste Treatment	Expected Concentration/Volume	Hazardous/ADG Codes	Safety/Environmental Consequences
Waste Contaminants				
BaP	Sludge Chemical Separation Immobilisation WWTP - Oil Sep	< 500 mg/kg (Imb.)	ADG Class 9, Packing III Hazardous Skin 1, Mutagenicity 1B, Carcinogenicity 1A, Reproductive 1B	**Safety** Avoid breathing dust Personal Protective Equipment (PPE) Produces CO and CO_2 during combustion **Environment** Very toxic to aquatic life with long lasting effects (not mobile from low solubility)
Coal Tar	Sludge Chemical Separation Immobilisation	< 1 wt.%	ADG Class 9, Packing III Hazardous Inhalation 3, Dermal 4, Skin 2, Eye 2A, Mutagenicity 1B, Carcinogenicity 1A, Reproductive 1B, Organ 1	**Safety** Avoid breathing dust PPE **Environment** Toxic to aquatic life with long lasting effects (specifically benzene, toluene, and naphthalene)

Compound Name	Process Unit/Waste Treatment	Expected Concentration/Volume	Hazardous/ADG Codes	Safety/Environmental Consequences
Arsenic	Sludge Chemical Separation Immobilisation	< 5 wt.%	ADR/RID Class 6.1, Packing II Hazardous Oral 3, Inhalation 3, Kin 2, Eye 1, Carcinogenicity 1A, Short-term aquatic 1, Long-term aquatic 1	**Safety** Avoid breathing dust PPE **Environment** Toxic to fish, aquatic invertebrates, algae, bacteria
Tebuconazole	Sludge Chemical Separation Immobilisation	920 mg/kg	Hazardous Reproduction 2, oral 4, Aquatic (short/long) 1	**Safety** Avoid swallowing PPE **Environment** Very toxic to aquatic life with long lasting effects Low mobility in soil
Di-2-Ethyl Hexyl Phthalate	Sludge Chemical Separation Immobilisation	2,400 mg/kg	Hazardous Reproduction 1B	**Safety** Avoid swallowing PPE **Environment** Potential harm to aquatic life No soil mobility data

Compound Name	Process Unit/Waste Treatment	Expected Concentration/Volume	Hazardous/ADG Codes	Safety/Environmental Consequences
Copper- Chrome-Arsenate	Sludge Chemical Separation Immobilisation	Unknown	Hazardous Carcinogenicity 1A	**Safety** Combustible dust PPE **Environment** Not environmentally hazardous
Cresol	Sludge Chemical Separation Immobilisation	Unknown	ADR/RID Class 6.1, Packing II Hazardous Oral 3, Dermal 3, Skin 1B, Eye 1	**Safety** Avoid swallowing PPE **Environment** Potential harm to aquatic life with some evidence of bioaccumulation (solubility too low to harm)
Cyanide	Sludge Chemical Separation Immobilisation	< 4000 mg/kg (Imb.)	Hazardous Oral 4, Dermal 4, Inhalation 4	**Safety** Contact with acids liberates very toxic gas PPE **Environment** Very toxic to aquatic life and highly mobile in soil due to solubility in the form of Sodium Cyanide (NaCN)
AC	Sludge Chemical Separation Immobilisation	Unknown	Non-hazardous	**Safety** Combustible material PPE **Environment** No data

Compound Name	Process Unit/Waste Treatment	Expected Concentration/Volume	Hazardous/ADG Codes	Safety/Environmental Consequences
Beryllium	Sludge Chemical Separation Immobilisation	Unknown	Hazardous Oral 3, Inhalation 2, Skin 2, Eye 2, Carcinogenicity 1B, Organ 3	**Safety** Do not breathe dust PPE **Environment** No data
Chromium (VI)	Sludge Chemical Separation Immobilisation	< 5 wt.%	ADR/RID Class 5.1, Packing II Hazardous Oxidising 1, Oral 3, Inhalation 2, Dermal 3, Skin 1A, Eye 1, Respiratory 1, Mutagenicity 1B, Carcinogenicity 1A, Reproductive 2, Organ 3, Aquatic 1	**Safety** Strong oxidizer (in oxide form), may cause fire Do not breathe dust PPE **Environment** Very toxic to aquatic life with long lasting effects (pH shift)
Selenium	Sludge Chemical Separation Immobilisation	< 5 wt.%	Hazardous Oral 3, Inhalation 3, Organ 2	**Safety** Avoid swallowing PPE **Environment** Potentially toxic to aquatic life (solubility is too low for real harm)

Compound Name	Process Unit/Waste Treatment	Expected Concentration/Volume	Hazardous/ADG Codes	Safety/Environmental Consequences
Nickel	Sludge Chemical Separation Immobilisation WWTP - Oil Separator WWTP - Mixing Tank	< 5 wt.%	Hazardous Skin 1, Carcinogenicity 2, Organ 1	**Safety** Do not breathe dust PPE **Environment** Potentially toxic to aquatic life
Copper	Sludge Chemical Separation Immobilisation WWTP - Oil Separator WWTP - Mixing Tank	< 5 wt.%	Non-hazardous	**Safety** PPE **Environment** No data
Silver	Sludge Chemical Separation Immobilisation WWTP - Oil Separator WWTP - Mixing Tank	< 5 wt.%	Hazardous Aquatic 1,	**Safety** PPE **Environment** Very toxic to aquatic life

Compound Name	Process Unit/Waste Treatment	Expected Concentration/Volume	Hazardous/ADG Codes	Safety/Environmental Consequences
Cadmium	Sludge Chemical Separation Immobilisation WWTP - Oil Separator WWTP - Mixing Tank	< 5 wt.%	TDG Class 6.1, Packing 1 Hazardous Flammable 2, Oral 4, Dermal 4, Inhalation 2, Mutagenicity 2, Carcinogenicity 1A, Reproductive 2, Organ 3	**Safety** Combustible dust PPE **Environment** Very toxic to aquatic life with long lasting effects
Mercury	Sludge Chemical Separation Immobilisation WWTP - Oil Separator WWTP - Mixing Tank	< 5 wt.%	ADR/RID Class 8, Packing III Hazardous Inhalation 2, Reproductive 1B, Organ 1, Aquatic 1	**Safety** Do not breathe dust PPE **Environment** Very toxic to aquatic life with long lasting effects
Lead	Sludge Chemical Separation Immobilisation WWTP - Oil Separator WWTP - Mixing Tank	< 5 wt.%	ADR/RID Class 9, Packing III Hazardous Reproductive 1A, Organ 1, Aquatic 1	**Safety** Do not breathe dust PPE **Environment** Very toxic to aquatic life with long lasting effects, non-biodegradable and bioconcentrates

Compound Name	Process Unit/Waste Treatment	Expected Concentration/Volume	Hazardous/ADG Codes	Safety/Environmental Consequences
Total Petroleum Hydrocarbons (C10 - C36)	Sludge Chemical Separation Bioremediation Immobilisation WWTP - Oil Sep	< 5 wt.% (Bio.) < 20 wt.% (Imb.)	Hazardous Flammable 2, Oral 4, Skin 2, Eye 2A, Organ 3, Aquatic 1	**Safety** Highly flammable liquid and vapour PPE **Environment** Very toxic to aquatic life with long lasting effects
Total Recoverable Hydrocarbons	Sludge Chemical Separation Bioremediation Immobilisation WWTP - Oil Sep	< 5 wt.% (Bio.)	Hazardous Skin 2, Eye 2, Carcinogenicity 2, Organ 3, Aspiration 1, Aquatic 2, Ozone 1	**Safety** Do not breathe fumes Do not swallow PPE **Environment** Toxic to aquatic life with long lasting effects Harms public health and the environment by destroying ozone in the upper atmosphere
Polycyclic Aromatic Hydrocarbon	Sludge Chemical Separation Bioremediation Immobilisation	< 13,000 mg/kg (Imb.)	Hazardous Inhalation 4, Carcinogenicity 1, Reproduction 2, Organ 2, Aspiration 1	**Safety** PPE **Environment** May accumulate in sediments or penetrate soil causing ground water contamination

Compound Name	Process Unit/Waste Treatment	Expected Concentration/Volume	Hazardous/ADG Codes	Safety/Environmental Consequences
Phenols (non-halogenated)	Sludge Chemical Separation Bioremediation Immobilisation	< 2,000 mg/kg (Imb.)	Hazardous Oral 3, Inhalation 3, Dermal 3, Skin 1B, Eye 1, Mutagenicity 2, Organ 2, Aquatic 2	**Safety** Avoid swallowing Do not breathe dust PPE **Environment** Toxic to aquatic life with long lasting effects
Benzene (BTEXN)	Sludge Chemical Separation Bioremediation	Unknown	Hazardous Flammable 2, Skin 2, Eye 2A, Mutagenicity 1B, Carcinogenicity 1A, Organ 1, Aspiration 1	**Safety** Highly flammable liquid and vapour PPE **Environment** Endangers drinking water supplies if in soil/water, potential harm to aquatic life
Toluene (BTEXN)	Sludge Chemical Separation Bioremediation	Unknown	Hazardous Flammable 2, Skin 2, Reproductive 2, Organ 3, Aspiration 1	**Safety** Highly flammable liquid and vapour PPE **Environment** Potentially harmful to aquatic life, shows bioaccumulation potential

Compound Name	Process Unit/Waste Treatment	Expected Concentration/Volume	Hazardous/ADG Codes	Safety/Environmental Consequences
Ethylbenzene (BTEXN)	Sludge Chemical Separation Bioremediation	Unknown	ADR/RID Class 3, Packing II Hazardous Flammable 2, Inhalation 4, Organ 2, Aspiration 1	**Safety** Highly flammable liquid and vapour PPE **Environment** Potentially harmful to aquatic life
Xylene (BTEXN)	Sludge Chemical Separation Bioremediation	Unknown	Hazardous Flammable 3, Inhalation 4, Dermal, 4m Skin 2, Eye 2, Organ 3, Aspiration 1	**Safety** Highly flammable liquid and vapour PPE **Environment** Potentially harmful to aquatic life
Napthalene (BTEXN)	Sludge Chemical Separation Bioremediation	Unknown	Hazardous Flammable 2, Carcinogenicity 2, Aquatic 1	**Safety** Flammable solid PPE **Environment** Very toxic to aquatic life with long lasting effects, not biodegradable
Acid Sulfate	ASS Treatment	< 5.5 pH	Hazardous Skin 2, Eye 2A	**Safety** PPE **Environment** Low mobility expected and is not an environmental threat

Compound Name	Process Unit/Waste Treatment	Expected Concentration/Volume	Hazardous/ADG Codes	Safety/Environmental Consequences
PFAS	PFAS soil storage WWTP - Oil Separator WWTP - Mixing Tank WWTP - Ion Exchange WWTP - GAC Filtration WWTP - Coconut GAC	< 72 mg/kg	Hazardous Flammable 2, Oral 3, Inhalation 3, Dermal 3, Carcinogenicity 2, Reproductive 2, Organ 2	**Safety** Highly flammable liquid and vapour PPE **Environment** Potentially toxic to aquatic life
Perfluorooctane Sulfonic Acid (PFOS)	PFAS soil storage	< 1.8 mg/kg	Hazardous Oral 4, Inhalation 4, Carcinogenicity 2, Reproductive 1B, Organ 1, Aquatic 2	**Safety** PPE **Environment** Toxic to aquatic life with long lasting effects
Perfluorohexane-1-Sulfonic Acid (PFHxS)	PFAS soil storage	< 1.8 mg/kg	Hazardous Flammable 2, Oral 3, Dermal 3, Skin 2, Eye 2B, Inhalation 4, Organ 1	**Safety** Highly flammable PPE **Environment** Potentially harmful to aquatic life, hydrolyses readily on contact with water
Perfluorooctanoic Acid (PFOA)	PFAS soil storage	< 18 mg/kg	Hazardous Carcinogenicity 2, Respiratory 1B, Eye 1, Oral 4, Inhalation 4	**Safety** PPE **Environment** Hazardous to water even in small quantities

Compound Name	Process Unit/Waste Treatment	Expected Concentration/Volume	Hazardous/ADG Codes	Safety/Environmental Consequences
Boron	Provided waste codes	Unknown	Hazardous Oral 4	**Safety** Do not swallow PPE **Environment** No ecological problems expected
Vanadium	Provided waste codes	Unknown	Hazardous Oral 3, Inhalation 2, Mutagenicity 2, Carcinogenicity 1B, Reproductive 2, Organ 3, Aquatic 2	**Safety** Do not breathe in dust PPE **Environment** Toxic to aquatic life with long lasting effects
Cobalt	Provided waste codes	Unknown	Hazardous Aquatic 1, Respiratory 1	**Safety** Do not breathe in dust PPE **Environment** Toxic to aquatic life with long lasting effects
Zinc	Provided waste codes	Unknown	Non-hazardous	**Safety** May liberate toxic fumes in a fire **Environment** Poor solubility limits environmental impacts

Compound Name	Process Unit/Waste Treatment	Expected Concentration/Volume	Hazardous/ADG Codes	Safety/Environmental Consequences
Antimony	Provided waste codes	Unknown	Hazardous Carcinogenicity 2, Organ 2	**Safety** Do not breathe in dust PPE **Environment** Toxic to aquatic life with long lasting effects, not mobile due to poor solubility
Tellurium	Provided waste codes	Unknown	Hazardous Inhalation 4, Skin 1B, Reproductive 1B	**Safety** Do not breathe in dust PPE **Environment** Toxic to aquatic life with long lasting effects
Barium	Provided waste codes	Unknown	Hazardous Water contact 2, Skin 2, Eye 2A, Organ 3	**Safety** When in contact with water emits flammable gases PPE **Environment** No documented environmental impact
Thallium	Provided waste codes	Unknown	Hazardous Kin 2, Eye 2A, Metal Corrosive 1	**Safety** Potentially corrosive to metals PPE **Environmental** No documented environmental impact

Compound Name	Process Unit/Waste Treatment	Expected Concentration/Volume	Hazardous/ADG Codes	Safety/Environmental Consequences
Asbestos	General Contaminant	None - this material is not accepted onsite.	Hazardous Carcinogenicity 1A, Organ 1	**Safety** Do not breathe dust PPE **Environment** No documented environmental impacts
Treatment Reagents				
Biodegradable Surfactant	Chemical separation (soils)	2 tonne		Further details required, but Hi-Quality has commented it is non-hazardous.
OPC	Primary Immobilisation	< 50 tonne	Hazardous Skin 2, Eye 1, Organ 2	**Safety** Do not breathe dust PPE **Environment** Non-toxic when a cured solid, but high pH may result in adverse effects on aquatic life Product forms an alkaline slurry when mixed with water, low degradability and low mobility
GGBFS	Primary Immobilisation	< 50 tonne	Hazardous Skin 2, Eye 2A, Organ 3, Cancer 1A	**Safety** Do not breathe dust PPE **Environment** Non-toxic when a cured solid, but high pH may result in adverse effects on aquatic life Product forms an alkaline slurry when mixed with water, low degradability and low mobility

Compound Name	Process Unit/Waste Treatment	Expected Concentration/Volume	Hazardous/ADG Codes	Safety/Environmental Consequences
Pulverised Fuel Ash	Primary Immobilisation	< 50 tonne	Hazardous Skin 2, Eye 2A, Cancer 1A, Organ 1, Aquatic 4	**Safety** May contain Chromium (VI) PPE **Environment** No documented environmental effects
Cement Kiln Dust	Primary Immobilisation	< 50 tonne	Hazardous Skin 1C, Eye 2B, Organ 3	**Safety** Do not breathe dust PPE **Environment** Non-toxic when a cured solid, but high pH may result in adverse effects on aquatic life Product forms an alkaline slurry when mixed with water, low degradability and low mobility
Calcium Oxide	Primary Immobilisation	< 50 tonne	Hazardous Skin 2, Eye 1, Organ 3	**Safety** Do not breathe dust PPE **Environment** Do not empty into drains, potential impact to aquatic life (minor)
Magnesium Oxide	Primary Immobilisation WWTP - Mixing Tank	5 tonne 2 tonne WWTP	Non-hazardous	**Safety** PPE **Environment** Poor solubility limits ecological effects on plants and aquatic organisms

Compound Name	Process Unit/Waste Treatment	Expected Concentration/Volume	Hazardous/ADG Codes	Safety/Environmental Consequences
Super Phosphate	Immobilisation	5 tonne	Non-hazardous	**Safety** PPE **Environment** Not anticipated to cause any adverse effects to plants or animals
Lime	Secondary Immobilisation	< 50 tonne	Hazardous Skin 2, Eye 1, Organ 3	**Safety** Thermal decomposition can lead to the release of irritating vapours PPE **Environment** Water soluble and may spread in water systems Not environmentally hazardous, however, may affect pH of waterways with the potential to harm aquatic life
Sodium Silicate	Secondary Immobilisation	< 50 tonne	Hazardous Skin 2, Eye 2A	**Safety** May liberate toxic fumes in fire including oxides of silicon and sodium PPE **Environment** Harmful effect due to pH shift Mobile in soil but quickly depolymerises into inert silica

Compound Name	Process Unit/Waste Treatment	Expected Concentration/Volume	Hazardous/ADG Codes	Safety/Environmental Consequences
Organophilic Clay	Secondary Immobilisation	< 50 tonne	Hazardous Skin 2, Eye 2A, Organ 3	**Safety** Potentially carcinogenic PPE **Environment** No documented environmental impacts
Natural Pozzolans	Secondary Immobilisation	< 50 tonne	Hazardous Skin 2, Eye 2A, Organ 2, Cancer 1A	**Safety** Do not breathe dust PPE **Environment** No documented environmental impacts
Bentonite	Sludge Thickening Secondary Immobilisation	< 50 tonne	Hazardous Skin 2, Eye 2A, Organ 3	**Safety** Do not breathe dust PPE **Environment** Low toxicity to aquatic species
Bacteria	Bioremediation	1 tonne		Further details from Hi-Quality required.
Urea	Bioremediation	5 tonne	Non-hazardous	**Safety** PPE **Environment** Toxic to algae, discharge into environment should be avoided

Compound Name	Process Unit/Waste Treatment	Expected Concentration/Volume	Hazardous/ADG Codes	Safety/Environmental Consequences
Aglime	ASS Treatment	20 tonne	Non-hazardous	**Safety** PPE **Environment** No impact to environment
HCl	WWTP - Mixing Tank	5 tonne 2 tonne WWTP	ADG Class 8, Packing II Hazardous Corrosive 1, Skin 1, Eye 1, Organ 3	**Safety** PPE **Environment** Do not empty into drains, large amount will affect pH and harm aquatic organisms, mobile due to solubility
Caustic Soda (NaOH)	WWTP - Mixing Tank	5 tonne 2 tonne WWTP	ADG Class 8, Packing II Hazardous Corrosive 1, Skin 1A, Eye 1	**Safety** Do not breathe fumes PPE **Environment** Do not empty into drains, large amount will affect pH and harm aquatic organisms, mobile due to solubility
$AlSO_4$	WWTP - Mixing Tank	5 tonne 2 tonne WWTP	Hazardous Skin 1A, Eye 1, Oral 4, Cell Mutagenicity 2, Aquatic 2	**Safety** PPE **Environment** Very toxic to aquatic life
Polymer	WWTP - Mixing Tank	2 tonne 2 tonne WWTP		Further details from Hi-Quality required

Compound Name	Process Unit/Waste Treatment	Expected Concentration/Volume	Hazardous/ADG Codes	Safety/Environmental Consequences
AC	WWTP - Mixing Tank WWTP - GAC Filtration WWTP - Coconut GAC Filtration	2 tonne	Non-hazardous	**Safety** Combustible material (dust) PPE **Environment** No data
Ferrous sulphate	WWTP - Mixing Tank	5 tonne 2 tonne WWTP	Hazardous Oral 4, dermal 4, inhalation 4, Skin 2, Eye 2A	**Safety** Contact with most metals generates flammable and explosive hydrogen gas PPE **Environment** Some toxicity to small aquatic organisms (mosquito fish, water flea)
VCZ	WWTP - Secondary PFAS Wastewater Treatment	Unknown	Non-hazardous	**Safety** PPE **Environment** Is a natural mineral with no harmful effects
Ion Exchange Resin	WWTP - Secondary PFAS Wastewater Treatment	Unknown		Further details from Hi-Quality required.
Anion Exchange Resin	WWTP - Quinary PFAS Wastewater Treatment	Unknown		Further details from Hi-Quality required.

Compound Name	Process Unit/Waste Treatment	Expected Concentration/Volume	Hazardous/ADG Codes	Safety/Environmental Consequences
Decon-90	Decontamination	Unknown	Hazardous Maybe corrosive, skin irritation, eye irritation	**Safety** PPE **Environment** Biodegradable High alkalinity may affect aquatic organisms if released into water course untreated

Appendix B Reagent Safety Data Sheets

1. IDENTIFICATION

Product Name	**Caustic Soda Liquid**
Other Names	Caustic soda solution; Sodium hydroxide solution
Uses	Chemical manufacture; cleaning/washing agents/additives; adhesives; flotation agents; pH regulation; solvent; water treatment; photochemical; reducing agent; hydraulic fracturing.
Chemical Family	No Data Available
Chemical Formula	NaOH.H2O
Chemical Name	Sodium hydroxide, aqueous solution
Product Description	>=5% aqueous solution.

Contact Details of the Supplier of this Safety Data Sheet

Organisation	Location	Telephone
Redox Pty Ltd	2 Swettenham Road Minto NSW 2566 Australia	+61-2-97333000
Redox Pty Ltd	11 Mayo Road Wiri Auckland 2104 New Zealand	+64-9-2506222
Redox Inc.	3960 Paramount Boulevard Suite 107 Lakewood CA 90712 USA	+1-424-675-3200
Redox Chemicals Sdn Bhd	Level 2, No. 8, Jalan Sapir 33/7 Seksyen 33, Shah Alam Premier Industrial Park 40400 Shah Alam Sengalor, Malaysia	+60-3-5614-2111

Emergency Contact Details

For emergencies only; DO NOT contact these companies for general product advice.

Organisation	Location	Telephone
Poisons Information Centre	Westmead NSW	1800-251525 131126
Chemcall	Australia	1800-127406 +64-4-9179888
Chemcall	Malaysia	+64-4-9179888
Chemcall	New Zealand	0800-243622 +64-4-9179888
National Poisons Centre	New Zealand	0800-764766
CHEMTREC	USA & Canada	1-800-424-9300 CN723420 +1-703-527-3887

2. HAZARD IDENTIFICATION

Poisons Schedule (Aust) Schedule 6

Globally Harmonised System

Hazard Classification		Hazardous according to the criteria of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS)	
Hazard Categories		Corrosive to Metals - Category 1 Skin Corrosion/Irritation - Category 1A Serious Eye Damage/Irritation - Category 1	
Pictograms			
Signal Word		Danger	
Hazard Statements		**H290**	May be corrosive to metals.
		H314	Causes severe skin burns and eye damage.
Precautionary Statements	Prevention	**P260**	Do not breathe gas/mist/vapours/spray.
		P280	Wear protective gloves/protective clothing/eye protection/face protection.
	Response	**P301 + P330 + P331**	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
		P303 + P361 + P353	IF ON SKIN (or hair): Remove/take off immediately all contaminated clothing. Rinse skin with water/shower.
		P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
		P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
		P310	Immediately call a POISON CENTER or doctor/physician.
		P363	Wash contaminated clothing before reuse.
		P390	Absorb spillage to prevent material damage.
	Storage	**P405**	Store locked up.
		P406	Store in corrosive resistant container with a resistant inner liner.
	Disposal	**P501**	Dispose of contents/container in accordance with local / regional / national / international regulations.

National Transport Commission (Australia)
Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification	Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Environmental Protection Authority (New Zealand)
Hazardous Substances and New Organisms Amendment Act 2015

HSNO Classifications	Health Hazards	**6.1D**	Substances that are acutely toxic - Harmful
		6.1E	Substances that are acutely toxic –May be harmful, Aspiration hazard
		8.1A	Substances that are corrosive to metals
		8.2B	Substances that are corrosive to dermal tissue UN PGII
		8.3A	Substances that are corrosive to ocular tissue
	Environmental Hazards	**9.1D**	Substances that are slightly harmful to the aquatic environment or are otherwise designed for biocidal action

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients

Chemical Entity	Formula	CAS Number	Proportion
Sodium hydroxide	NaOH	1310-73-2	>=5 - <=50 %
Water	H2O	7732-18-5	Balance %

4. FIRST AID MEASURES

Description of necessary measures according to routes of exposure

Swallowed IF SWALLOWED: Rinse mouth, then drink (slowly) 1 - 2 glasses of water. Do NOT induce vomiting. Immediately call a Poison Centre or doctor/physician for advice. Urgent hospital treatment is likely to be needed. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. Never give anything by mouth to an unconscious person. Transport to hospital or doctor without delay.

Eye IF IN EYES: Immediately flush eyes with running water for several minutes, holding eyelids open and occasionally lifting the upper and lower lids. Immediately call a Poison Centre or doctor/physician for advice. Remove contact lenses if present and easy to do. Continue flushing until advised to stop by a Poisons Information Centre or a doctor, or for at least 15 minutes. Transport to hospital or doctor without delay.

Skin IF ON SKIN (or hair): Remove contaminated clothing and shoes immediately. Flush skin and hair with running water for 20 - 30 minutes. Immediately call a Poison Centre or doctor/physician for advice. In case of gross contamination, drench contaminated clothing and skin with plenty of water before removing clothes. For minor skin contact, avoid spreading material on unaffected skin. Transport to hospital or doctor without delay.

Inhaled IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a Poison Centre or doctor/physician for advice. Apply resuscitation if victim is not breathing - Do not use direct mouth-to-mouth method if victim ingested or inhaled the substance; use alternative respiratory method or proper respiratory device; Administer oxygen if breathing is difficult. Transport to hospital or doctor without delay.

Advice to Doctor Keep victim calm and warm - Obtain immediate medical care. Alkalis continue to cause damage after exposure. Reaction may be delayed up to 24 hours after exposure; affected individuals need complete rest and must be kept under medical observation even if no symptoms are (yet) manifested. Ensure that attending medical personnel are aware of the identity and nature of the product(s) involved, and take precautions to protect themselves.

Medical Conditions Aggravated by Exposure No information available.

5. FIRE FIGHTING MEASURES

General Measures Alert Fire Brigade and tell them location and nature of hazard. If safe to do so, move undamaged containers from fire area. Cool containers with water spray until well after fire is out. Avoid getting water inside containers.

Flammability Conditions Non-combustible; Material itself does not burn.

Extinguishing Media If material is involved in a fire, use dry chemical, Carbon dioxide (CO2), foam or water spray for extinction - Do not use water jets.

Fire and Explosion Hazard Not considered a significant fire risk, however containers may burn. Containers may explode when heated. Contact with metals may evolve flammable hydrogen gas.

Hazardous Products of Combustion Fire or heat will produce irritating, toxic and/or corrosive gases.

Special Fire Fighting Instructions Contain runoff from fire control or dilution water - Runoff may be toxic and/or corrosive and pollute waterways.

Personal Protective Equipment Liquid-tight chemical protective clothing (splash suit) in combination with self-contained breathing apparatus (SCBA) should be used. Fully-encapsulating, gas-tight suits should be worn for maximum protection. Structural firefighter's uniform is NOT effective for this material.

Flash Point No Data Available

Lower Explosion Limit No Data Available

Upper Explosion Limit No Data Available

Auto Ignition Temperature No Data Available

Hazchem Code 2R

6. ACCIDENTAL RELEASE MEASURES

General Response Procedure	Ensure adequate ventilation - Ventilate enclosed spaces before entering. ELIMINATE all ignition sources. Do not touch or walk through spilled material. Clean up all spills immediately. Do not breathe vapours and prevent contact with eyes, skin and clothing.
Clean Up Procedures	Absorb with earth, sand or other non-combustible material and transfer to a suitable, properly labelled container for disposal (see SECTION 13).
Containment	Stop leak if safe to do so – Prevent entry into waterways, drains or confined areas. Cover with dry earth, sand or other non-combustible material followed by plastic sheet to minimise spreading.
Decontamination	Drains for storage or use areas should have retention basins for pH adjustments and dilution of spills before discharge or disposal of material.
Environmental Precautionary Measures	Small spillages and decontamination run-off may be washed to drains with large quantities of water. Due care must however still be exercised to avoid unnecessary pollution of watercourses.
Evacuation Criteria	Spill or leak area should be isolated immediately. Keep unauthorised personnel away. Keep upwind and to higher ground. Large spill: Alert Fire Brigade and tell them location and nature of hazard; Consider downwind evacuation.
Personal Precautionary Measures	Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (see SECTION 8). Large spill: Wear SCBA and chemical splash suit. Fully-encapsulating, gas-tight suits should be worn for maximum protection.

7. HANDLING AND STORAGE

Handling	Safety showers and eyewash facilities should be provided within the immediate work area for emergency use. Ensure adequate ventilation. Handle in accordance with good industrial hygiene and safety practice. Do not breathe mist/vapours/spray and prevent contact with eyes, skin and clothing. Do not ingest. Wear protective gloves/protective clothing/eye protection/face protection (see SECTION 8). Avoid overheating (decomposition). Keep away from sources of ignition - No smoking. Absorb spillage to prevent material damage (see SECTION 6).
Storage	Store in a cool, dry and well-ventilated place, out of direct sunlight. Keep containers securely sealed. Check regularly for spills and leaks. Keep away from heat and sources of ignition - No smoking. Keep away from foodstuffs and incompatible materials (see SECTION 10). Store locked up.
Container	Keep only in the original container or corrosive resistant container/container with a resistant inner liner. Do NOT use aluminium, galvanised or tin-plated containers.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

General	COMPONENT: Sodium hydroxide (CAS No. 1310-73-2): - Safe Work Australia Exposure Standard: TWA = 2 mg/m3 Peak limitation. - New Zealand WES: TWA = 2 mg/m3 Ceiling. - NIOSH REL/OSHA PEL: 2 mg/m3 Ceiling. - Immediately dangerous to life or health (IDLH) concentration: 10 mg/m3.
Exposure Limits	No Data Available
Biological Limits	No information available.
Engineering Measures	A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area.
Personal Protection Equipment	- Respiratory protection: In case of inadequate ventilation, wear respiratory protection. Recommended: Particulate/mist filter respirator (refer to AS/NZS 1715 & 1716). - Eye/face protection: Wear appropriate eye protection to prevent eye contact. Recommended: Properly fitted chemical goggles. - Hand protection: Wear protective gloves. Recommended: Elbow length PVC gloves. - Skin/body protection: Wear appropriate personal protective clothing to prevent skin contact. Recommended: Overalls, PVC apron. When handling corrosive liquids, wear trousers or overalls outside of boots, to avoid spills entering boots.
Special Hazards Precaustions	Drains for storage or use areas should have retention basins for pH adjustments and dilution of spills before discharge or disposal of material. Do not allow wash water from cleaning or process equipment to enter drains. It may be necessary to collect all wash water for treatment before disposal.

Work Hygienic Practices	Do not eat, drink or smoke when using this product. Remove contaminated clothing and shoes immediately - Do NOT allow clothing wet with material to stay in contact with skin. Wash contaminated clothing and shoes before reuse.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Liquid
Appearance	Clear liquid
Odour	Slight odour
Colour	Clear slightly hazy water-white
pH	>12 (as supplied)
Vapour Pressure	No Data Available
Relative Vapour Density	No Data Available
Boiling Point	~142 °C (50% soln.)
Melting Point	No Data Available
Freezing Point	~12 °C
Solubility	Miscible with water
Specific Gravity	approx. 1.52 (50% soln.)
Flash Point	No Data Available
Auto Ignition Temp	No Data Available
Evaporation Rate	No Data Available
Bulk Density	No Data Available
Corrosion Rate	No Data Available
Decomposition Temperature	No Data Available
Density	No Data Available
Specific Heat	No Data Available
Molecular Weight	No Data Available
Net Propellant Weight	No Data Available
Octanol Water Coefficient	No Data Available
Particle Size	No Data Available
Partition Coefficient	No Data Available
Saturated Vapour Concentration	No Data Available
Vapour Temperature	No Data Available
Viscosity	No Data Available
Volatile Percent	No Data Available
VOC Volume	No Data Available
Additional Characteristics	No information available.
Potential for Dust Explosion	Not applicable.
Fast or Intensely Burning Characteristics	No information available.
Flame Propagation or Burning Rate of Solid Materials	No information available.
Non-Flammables That Could Contribute Unusual Hazards to a Fire	No information available.
Properties That May Initiate or Contribute to Fire Intensity	Non-combustible; Material itself does not burn.
Reactions That Release Gases or Vapours	Fire or heat will produce irritating, toxic and/or corrosive gases.
Release of Invisible Flammable Vapours and Gases	Contact with metals may evolve flammable hydrogen gas.

10. STABILITY AND REACTIVITY

General Information	May be corrosive to metals. Attacks some plastics, rubber, coatings and metals (aluminium, tin, zinc, etc, and their alloys), producing flammable hydrogen gas.
Chemical Stability	Product is considered stable; Unstable in the presence of incompatible materials.
Conditions to Avoid	Avoid overheating (decomposition). Keep away from sources of ignition.
Materials to Avoid	Incompatible/reactive with strong acids, acid chlorides, acid anhydrides and chloroformates. Avoid contact with copper, aluminium and their alloys.
Hazardous Decomposition Products	Fire or heat will produce irritating, toxic and/or corrosive gases.
Hazardous Polymerisation	No information available.

11. TOXICOLOGICAL INFORMATION

General Information

- Acute toxicity: Corrosive following ingestion. Ingestion of Sodium hydroxide may result in severe burns to the mouth, throat and stomach, pain, nausea and vomiting, swelling of the larynx and subsequent suffocation, perforation of the gastro-intestinal tract.
- Skin corrosion/irritation: Corrosive; Causes severe skin burns. Sodium hydroxide burns are not immediately painful; onset of pain may be delayed. It causes deep penetrating burns and necrosis. The skin is discoloured and becomes brown or black, which can make initial assessment of the injury difficult. There could be recurring skin breakdown over a long period [NICNAS].
- Eye damage/irritation: Corrosive; Causes serious eye damage. Oedema, destruction of the epithelium, corneal opacification and iritis may occur.
- Respiratory/skin sensitisation: Sodium hydroxide is not considered a skin sensitiser [NICNAS].
- Germ cell mutagenicity: No evidence for a mutagenic activity [NICNAS].
- Carcinogenicity: No information available.
- Reproductive toxicity: No information available.
- STOT (single exposure): Inhalation of alkaline corrosives may produce irritation of the respiratory tract with coughing, choking, pain and mucous membrane damage. Pulmonary oedema may develop in more severe cases; symptoms may be delayed.
- STOT (repeated exposure): Repeated or prolonged exposure to corrosives may result in the erosion of teeth, inflammatory and ulcerative changes in the mouth and necrosis of the jaw; Bronchial irritation, with cough, and bronchial pneumonia may ensue. The material may produce severe skin irritation after prolonged or repeated exposure, and may produce a contact dermatitis (nonallergic).
- Aspiration toxicity: No information available.

Acute

Ingestion

Acute toxicity (Oral):
COMPONENT: Sodium hydroxide (CAS No. 1310-73-2):
- LD50, Rabbit: 325 mg/kg

Carcinogen Category None

12. ECOLOGICAL INFORMATION

Ecotoxicity	COMPONENT: Sodium hydroxide (CAS No. 1310-73-2): - LC50, Fish: 4.16 mg/L (96 h).
Persistence/Degradability	COMPONENT: Sodium hydroxide (CAS No. 1310-73-2): - Low persistence in water/soil. - Low persistence in air.
Mobility	COMPONENT: Sodium hydroxide (CAS No. 1310-73-2): - Low mobility in soil (KOC = 14.3).
Environmental Fate	Prevent entry into drains and waterways.
Bioaccumulation Potential	COMPONENT: Sodium hydroxide (CAS No. 1310-73-2): - Low bioaccumulative potential (Log Kow = -3.8796).
Environmental Impact	No Data Available

13. DISPOSAL CONSIDERATIONS

General Information	Recycle wherever possible, or dispose of in accordance with local/regional/national regulations.
Special Precautions for Land Fill	No information available.

14. TRANSPORT INFORMATION

Land Transport (Australia)
ADG Code

Proper Shipping Name	SODIUM HYDROXIDE SOLUTION
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
EPG	37 Toxic And/Or Corrosive Substances Non-Combustible
UN Number	1824
Hazchem	2R
Pack Group	II
Special Provision	No Data Available

Land Transport (Fiji)
ADG Code

Proper Shipping Name	SODIUM HYDROXIDE SOLUTION
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
EPG	37 Toxic And/Or Corrosive Substances Non-Combustible
UN Number	1824
Hazchem	2R
Pack Group	II
Special Provision	No Data Available

Land Transport (Malaysia)
ADR Code

Proper Shipping Name	SODIUM HYDROXIDE SOLUTION
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
EPG	37 Toxic And/Or Corrosive Substances Non-Combustible
UN Number	1824
Hazchem	2R
Pack Group	II
Special Provision	No Data Available

Land Transport (New Caledonia)
ADG Code

Proper Shipping Name	SODIUM HYDROXIDE SOLUTION
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available

EPG	37 Toxic And/Or Corrosive Substances Non-Combustible
UN Number	1824
Hazchem	2R
Pack Group	II
Special Provision	No Data Available

Land Transport (New Zealand)
NZS5433

Proper Shipping Name	SODIUM HYDROXIDE SOLUTION
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
EPG	37 Toxic And/Or Corrosive Substances Non-Combustible
UN Number	1824
Hazchem	2R
Pack Group	II
Special Provision	No Data Available

Land Transport (United States of America)
US DOT

Proper Shipping Name	SODIUM HYDROXIDE SOLUTION
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
ERG	154 Substances - Toxic and/or Corrosive (Non-Combustible)
UN Number	1824
Hazchem	2R
Pack Group	II
Special Provision	No Data Available

Sea Transport
IMDG Code

Proper Shipping Name	SODIUM HYDROXIDE SOLUTION
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
UN Number	1824
Hazchem	2R
Pack Group	II
Special Provision	No Data Available
EMS	F-A, S-B
Marine Pollutant	No

Air Transport
IATA DGR

Proper Shipping Name	SODIUM HYDROXIDE SOLUTION
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
UN Number	1824
Hazchem	2R
Pack Group	II
Special Provision	No Data Available

National Transport Commission (Australia)
Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification	Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

15. REGULATORY INFORMATION

General Information	No Data Available
Poisons Schedule (Aust)	Schedule 6

Environmental Protection Authority (New Zealand)
Hazardous Substances and New Organisms Amendment Act 2015

Approval Code	HSR001576

National/Regional Inventories

Australia (AICS)	Listed
Canada (DSL)	Not Determined
Canada (NDSL)	Not Determined
China (IECSC)	Not Determined
Europe (EINECS)	Listed
Europe (REACh)	Not Determined
Japan (ENCS/METI)	Not Determined
Korea (KECI)	Not Determined
Malaysia (EHS Register)	Not Determined
New Zealand (NZIoC)	Listed
Philippines (PICCS)	Not Determined
Switzerland (Giftliste 1)	Not Determined
Switzerland (Inventory of Notified Substances)	Not Determined
Taiwan (NCSR)	Not Determined
USA (TSCA)	Listed

16. OTHER INFORMATION

Related Product Codes	CAUBUL1000, CAUSOB0300, CAUSOB0301, CAUSOB0400, CAUSOB0600, CAUSOB0900, CAUSOB1000, CAUSOB1001, CAUSOB1002, CAUSOB1003, CAUSOB1004, CAUSOB1005, CAUSOB1006, CAUSOB1007, CAUSOB1008, CAUSOB1009, CAUSOB1010, CAUSOB1011, CAUSOB1012, CAUSOB2000, CAUSOB2001, CAUSOB2002, CAUSOB2003, CAUSOB2004, CAUSOB2010, CAUSOB2015, CAUSOB2200, CAUSOB2500,

CAUSOB2501, CAUSOB2502, CAUSOB2503, CAUSOB2510, CAUSOB2700, CAUSOB2701, CAUSOB2702, CAUSOB2800, CAUSOB3000, CAUSOB3001, CAUSOB3200, CAUSOB3201, CAUSOB3300, CAUSOB3301, CAUSOB3500, CAUSOB3600, CAUSOB4000, CAUSOB4500, CAUSOB4600, CAUSOB4900, CAUSOB4901, CAUSOB4902, CAUSOB4903, CAUSOB4904, CAUSOB5000, CAUSOB5001, CAUSOB5100, CAUSOB5500, CAUSOB6000, CAUSOB6001, CAUSOB7000, CAUSOB7500, CAUSOB7501, CAUSOB7502, CAUSOB7700, CAUSOB8000, CAUSOB9000, CAUSOB9100, CAUSOB9400, CAUSOC1000, CAUSOC1001, CAUSOC1002, CAUSOC1100, CAUSOC2450, CAUSOC2500, CAUSOC2501, CAUSOC3000, CAUSOD0500, CAUSOD0600, CAUSOD0601, CAUSOD0700, CAUSOD0800, CAUSOD0900, CAUSOD1000, CAUSOD1001, CAUSOD1002, CAUSOD1003, CAUSOD1004, CAUSOD1005, CAUSOD1006, CAUSOD1007, CAUSOD1050, CAUSOD1100, CAUSOD1101, CAUSOD1200, CAUSOD1300, CAUSOD1400, CAUSOD1500, CAUSOD1600, CAUSOD1700, CAUSOD1701, CAUSOD1702, CAUSOD1703, CAUSOD1708, CAUSOD1720, CAUSOD1800, CAUSOD1801, CAUSOD1802, CAUSOD1803, CAUSOD1804, CAUSOD1805, CAUSOD1806, CAUSOD1807, CAUSOD1808, CAUSOD1809, CAUSOD1810, CAUSOD1811, CAUSOD1812, CAUSOD1813, CAUSOD1814, CAUSOD1815, CAUSOD1816, CAUSOD1817, CAUSOD1818, CAUSOD1819, CAUSOD1820, CAUSOD1821, CAUSOD1822, CAUSOD1823, CAUSOD1824, CAUSOD1825, CAUSOD1826, CAUSOD1827, CAUSOD1828, CAUSOD1829, CAUSOD1830, CAUSOD1831, CAUSOD1832, CAUSOD1833, CAUSOD1834, CAUSOD1835, CAUSOD1836, CAUSOD1837, CAUSOD1838, CAUSOD1839, CAUSOD1840, CAUSOD1841, CAUSOD1842, CAUSOD1843, CAUSOD1844, CAUSOD1845, CAUSOD1846, CAUSOD1847, CAUSOD1848, CAUSOD1849, CAUSOD1850, CAUSOD1851, CAUSOD1852, CAUSOD1853, CAUSOD1854, CAUSOD1855, CAUSOD1856, CAUSOD1857, CAUSOD1858, CAUSOD1859, CAUSOD1860, CAUSOD1861, CAUSOD1862, CAUSOD1863, CAUSOD1864, CAUSOD1865, CAUSOD1866, CAUSOD1867, CAUSOD1868, CAUSOD1869, CAUSOD1870, CAUSOD1871, CAUSOD1872, CAUSOD1873, CAUSOD1874, CAUSOD1875, CAUSOD1876, CAUSOD1877, CAUSOD1878, CAUSOD1879, CAUSOD1880, CAUSOD1881, CAUSOD1882, CAUSOD1883, CAUSOD1884, CAUSOD1885, CAUSOD1886, CAUSOD1887, CAUSOD1888, CAUSOD1889, CAUSOD1890, CAUSOD1891, CAUSOD1892, CAUSOD1893, CAUSOD1894, CAUSOD1895, CAUSOD1896, CAUSOD1897, CAUSOD1898, CAUSOD1899, CAUSOD1900, CAUSOD1901, CAUSOD1902, CAUSOD1903, CAUSOD1904, CAUSOD1905, CAUSOD1906, CAUSOD1907, CAUSOD1908, CAUSOD1909, CAUSOD1910, CAUSOD1911, CAUSOD1912, CAUSOD1913, CAUSOD1914, CAUSOD1915, CAUSOD1916, CAUSOD1917, CAUSOD1918, CAUSOD1919, CAUSOD1920, CAUSOD1921, CAUSOD1922, CAUSOD1923, CAUSOD1924, CAUSOD1925, CAUSOD1926, CAUSOD1927, CAUSOD1928, CAUSOD1929, CAUSOD1930, CAUSOD1931, CAUSOD1932, CAUSOD1933, CAUSOD1934, CAUSOD1935, CAUSOD1936, CAUSOD1937, CAUSOD1938, CAUSOD1939, CAUSOD1940, CAUSOD1941, CAUSOD1942, CAUSOD1943, CAUSOD2000, CAUSOD2001, CAUSOD2017, CAUSOD2020, CAUSOD2050, CAUSOD2051, CAUSOD2052, CAUSOD2055, CAUSOD2100, CAUSOD2200, CAUSOD2300, CAUSOD2500, CAUSOD2501, CAUSOD2600, CAUSOD2700, CAUSOD2800, CAUSOD2900, CAUSOD2910, CAUSOD2948, CAUSOD3000, CAUSOD3010, CAUSOD3020, CAUSOD3100, CAUSOD3200, CAUSOD3201, CAUSOD3300, CAUSOD3301, CAUSOD3302, CAUSOD3310, CAUSOD3315, CAUSOD3400, CAUSOD3401, CAUSOD3500, CAUSOD3600, CAUSOD3605, CAUSOD3610, CAUSOD3700, CAUSOD4000, CAUSOD4001, CAUSOD4100, CAUSOD4201, CAUSOD4202, CAUSOD4203, CAUSOD4500, CAUSOD4600, CAUSOD4650, CAUSOD4700, CAUSOD4800, CAUSOD4801, CAUSOD4900, CAUSOD4901, CAUSOD5000, CAUSOD5001, CAUSOD5100, CAUSOD5105, CAUSOD5500, CAUSOD6000, CAUSOD6500, CAUSOD6600, CAUSOD6700, CAUSOD7000, CAUSOD7100, CAUSOD7200, CAUSOD7400, CAUSOD7500, CAUSOD7600, CAUSOD7700, CAUSOD7800, CAUSOD7900, CAUSOD7901, CAUSOD8000, CAUSOD8001, CAUSOD8100, CAUSOD8200, CAUSOD8250, CAUSOD8260, CAUSOD8261, CAUSOD8262, CAUSOD8263, CAUSOD8264, CAUSOD8300, CAUSOD8900, CAUSOD8901, CAUSOD8982, CAUSOD9100, CAUSOD9200, CAUSOD9300, CAUSOD9301, CAUSOD9302, CAUSOD9400, CAUSOI0200, CAUSOI0201, CAUSOI0300, CAUSOI0800, CAUSOI0900, CAUSOI1000, CAUSOI1001, CAUSOI1002, CAUSOI1003, CAUSOI1004, CAUSOI1100, CAUSOI1101, CAUSOI1200, CAUSOI1201, CAUSOI1300, CAUSOI1400, CAUSOI1500, CAUSOI1600, CAUSOI1700, CAUSOI1701, CAUSOI1800, CAUSOI2000, CAUSOI2001, CAUSOI2002, CAUSOI2200, CAUSOI2300, CAUSOI2400, CAUSOI2401, CAUSOI2405, CAUSOI2500, CAUSOI2600, CAUSOI2800, CAUSOI2801, CAUSOI2900, CAUSOI2901, CAUSOI2902, CAUSOI3000, CAUSOI3001, CAUSOI3100, CAUSOI3101, CAUSOI3200, CAUSOI3201, CAUSOI3250, CAUSOI3300, CAUSOI3301, CAUSOI3302, CAUSOI3303, CAUSOI3304, CAUSOI3400, CAUSOI3500, CAUSOI3600, CAUSOI3700, CAUSOI3800, CAUSOI3900, CAUSOI4000, CAUSOI4001, CAUSOI4100, CAUSOI4200, CAUSOI4300, CAUSOI4600, CAUSOI4700, CAUSOI4701, CAUSOI4800, CAUSOI4801, CAUSOI4900, CAUSOI4901, CAUSOI4902, CAUSOI5000, CAUSOI5100, CAUSOI5500, CAUSOI6000, CAUSOI6001, CAUSOI6100, CAUSOI6500, CAUSOI6600, CAUSOI6700, CAUSOI6800, CAUSOI6900, CAUSOI7000, CAUSOI7800, CAUSOI7900, CAUSOI7901, CAUSOI7902, CAUSOI8000, CAUSOI8001, CAUSOI8100, CAUSOI8500, CAUSOI8800, CAUSOI8900, CAUSOI9000, CAUSOI9100, CAUSOI9200, CAUSOS1000

Revision 4

Revision Date 03 Nov 2016

Reason for Issue Updated SDS

Key/Legend

< Less Than
> Greater Than
AICS Australian Inventory of Chemical Substances
atm Atmosphere
CAS Chemical Abstracts Service (Registry Number)
cm² Square Centimetres
CO2 Carbon Dioxide
COD Chemical Oxygen Demand
deg C (°C) Degrees Celcius
EPA (New Zealand) Environmental Protection Authority of New Zealand
deg F (°F) Degrees Farenheit
g Grams

g/cm³ Grams per Cubic Centimetre
g/l Grams per Litre
HSNO Hazardous Substance and New Organism
IDLH Immediately Dangerous to Life and Health
immiscible Liquids are insoluable in each other.
inHg Inch of Mercury
inH2O Inch of Water
K Kelvin
kg Kilogram
kg/m³ Kilograms per Cubic Metre
lb Pound
LC50 LC stands for lethal concentration. LC50 is the concentration of a material in air which causes the death of 50% (one half) of a group of test animals. The material is inhaled over a set period of time, usually 1 or 4 hours.
LD50 LD stands for Lethal Dose. LD50 is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals.
ltr or **L** Litre
m³ Cubic Metre
mbar Millibar
mg Milligram
mg/24H Milligrams per 24 Hours
mg/kg Milligrams per Kilogram
mg/m³ Milligrams per Cubic Metre
Misc or **Miscible** Liquids form one homogeneous liquid phase regardless of the amount of either component present.
mm Millimetre
mmH2O Millimetres of Water
mPa.s Millipascals per Second
N/A Not Applicable
NIOSH National Institute for Occupational Safety and Health
NOHSC National Occupational Heath and Safety Commission
OECD Organisation for Economic Co-operation and Development
Oz Ounce
PEL Permissible Exposure Limit
Pa Pascal
ppb Parts per Billion
ppm Parts per Million
ppm/2h Parts per Million per 2 Hours
ppm/6h Parts per Million per 6 Hours
psi Pounds per Square Inch
R Rankine
RCP Reciprocal Calculation Procedure
STEL Short Term Exposure Limit
TLV Threshold Limit Value
tne Tonne
TWA Time Weighted Average
ug/24H Micrograms per 24 Hours
UN United Nations
wt Weight

1. IDENTIFICATION

Product Name	**Hydrochloric acid, >25%**
Other Names	Hydrochloric acid 31 - 33%; Hydrochloric acid 32%; Hydrochloric acid 33%
Uses	Industrial use.
Chemical Family	No Data Available
Chemical Formula	HCl
Chemical Name	Aqueous hydrogen chloride
Product Description	No Data Available

Contact Details of the Supplier of this Safety Data Sheet

Organisation	Location	Telephone
Redox Pty Ltd	2 Swettenham Road Minto NSW 2566 Australia	+61-2-97333000
Redox Pty Ltd	11 Mayo Road Wiri Auckland 2104 New Zealand	+64-9-2506222
Redox Inc.	3960 Paramount Boulevard Suite 107 Lakewood CA 90712 USA	+1-424-675-3200
Redox Chemicals Sdn Bhd	Level 2, No. 8, Jalan Sapir 33/7 Seksyen 33, Shah Alam Premier Industrial Park 40400 Shah Alam Sengalor, Malaysia	+60-3-5614-2111

Emergency Contact Details

For emergencies only; DO NOT contact these companies for general product advice.

Organisation	Location	Telephone
Poisons Information Centre	Westmead NSW	1800-251525 131126
Chemcall	Australia	1800-127406 +64-4-9179888
Chemcall	Malaysia	+64-4-9179888
Chemcall	New Zealand	0800-243622 +64-4-9179888
National Poisons Centre	New Zealand	0800-764766
CHEMTREC	USA & Canada	1-800-424-9300 CN723420 +1-703-527-3887

2. HAZARD IDENTIFICATION

Poisons Schedule (Aust) Schedule 6

Globally Harmonised System

Hazard Classification

Hazardous according to the criteria of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS)

Hazard Categories

Corrosive to Metals - Category 1

Skin Corrosion/Irritation - Category 1B

Serious Eye Damage/Irritation - Category 1

Specific Target Organ Toxicity (Single Exposure) - Category 3

Pictograms

Signal Word

Danger

Hazard Statements

H290	May be corrosive to metals.
H314	Causes severe skin burns and eye damage.
H335	May cause respiratory irritation.
H433	Harmful to terrestrial vertebrates.

Precautionary Statements

Prevention	**P260**	Do not breathe fume/mist/vapours/spray.
	P280	Wear protective gloves/protective clothing/eye protection/face protection.
	P271	Use only outdoors or in a well-ventilated area.
Response	**P303 + P361 + P353**	IF ON SKIN (or hair): Remove/take off immediately all contaminated clothing. Rinse skin with water/shower.
	P310	Immediately call a POISON CENTER or doctor/physician.
	P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
	P390	Absorb spillage to prevent material damage.
	P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
	P363	Wash contaminated clothing before reuse.
	P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
Storage	**P403 + P233**	Store in a well-ventilated place. Keep container tightly closed.
	P406	Store in corrosive resistant container with a resistant inner liner.
	P405	Store locked up.
Disposal	**P501**	Dispose of contents/container in accordance with local / regional / national / international regulations.

National Transport Commission (Australia)

Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification

Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Environmental Protection Authority (New Zealand)

Hazardous Substances and New Organisms Amendment Act 2015

HSNO Classifications

Health Hazards	**6.1B**	Substances that are acutely toxic - Fatal
	6.1D	Substances that are acutely toxic - Harmful
	8.1A	Substances that are corrosive to metals
	8.2B	Substances that are corrosive to dermal tissue UN PGII
	8.3A	Substances that are corrosive to ocular tissue

Environmental Hazards	**9.1D**	Substances that are slightly harmful to the aquatic environment or are otherwise designed for biocidal action
	9.3C	Substances that are harmful to terrestrial vertebrates

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients

Chemical Entity	Formula	CAS Number	Proportion
Water	H2O	7732-18-5	<75 %
Hydrochloric acid	HCl	7647-01-0	>25 %

4. FIRST AID MEASURES

Description of necessary measures according to routes of exposure

Swallowed IF SWALLOWED: If conscious and alert, rinse mouth then drink 200 - 300 mL water to dilute the substance. Do NOT induce vomiting. Immediately call a Poison Centre or doctor/physician for advice. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain an open airway and prevent aspiration; Rinse mouth, then drink more water. Keep victim calm and warm - Obtain immediate medical care. Never give anything by mouth to an unconscious or convulsing person.

Eye IF IN EYES: Immediately flush eyes with running water for at least 15 minutes, holding eyelids open and occasionally lifting the upper and lower lids. Immediately call a Poison Centre or doctor/physician for advice. Remove contact lenses if present and easy to do. If irritation persists, continue rinsing. Keep victim calm and warm - Obtain immediate medical care. Do not transport victim until the recommended flushing period is completed, unless flushing can be continued during transport.

Skin IF ON SKIN (or hair): Remove contaminated clothing and shoes immediately. Flush skin and hair with running water for at least 15 minutes. Immediately call a Poison Centre or doctor/physician for advice. In case of gross contamination, drench contaminated clothing and skin with plenty of water before removing clothes. For minor skin contact, avoid spreading material on unaffected skin. Keep victim calm and warm - Obtain immediate medical care. Do not transport victim until the recommended flushing period is completed, unless flushing can be continued during transport. During transport or if medical treatment is delayed, immerse the affected area in iced water. If immersion is not practicable, apply compresses of iced water. Wash contaminated clothing and shoes before reuse; Discard heavily contaminated clothing and shoes in a manner which limits further exposure.

Inhaled IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a Poison Centre or doctor/physician for advice. Apply resuscitation if victim is not breathing – Do not use direct mouth-to-mouth method if victim ingested or inhaled the substance; use alternative respiratory method or proper respiratory device. Administer oxygen if breathing is difficult. Keep victim calm and warm - Obtain immediate medical care.

Advice to Doctor Corrosive effects on the skin and eyes may be delayed, and damage may occur without the sensation or onset of pain. Symptoms may appear up to 48 hrs after exposure. Strict adherence to first aid measures following any exposure is essential. SPEED IS ESSENTIAL. Treat symptomatically. Ensure that attending medical personnel are aware of the identity and nature of the product(s) involved, and take precautions to protect themselves.

Medical Conditions Aggravated by Exposure No information available.

5. FIRE FIGHTING MEASURES

General Measures If safe to do so, move undamaged containers from fire area. Cool containers with water spray until well after fire is out. Water spray may be used to knock down escaping vapour. Avoid getting water inside containers. When any large containers are involved in a fire, consider evacuation of areas within 800 m in all directions.

Flammability Conditions Non-combustible; Material does not burn, but may produce toxic and/or corrosive fumes upon heating.

Extinguishing Media If material is involved in a fire, use dry chemical, Carbon dioxide (CO2), foam or water spray for extinction. Use extinguishing media suitable for surrounding fires.

Fire and Explosion Hazard Will react with many compounds (some violently) releasing flammable, toxic and/or corrosive gases and runoff. Contact with metals may evolve flammable hydrogen gas. Containers may explode when heated or contaminated with water.

Hazardous Products of Combustion	Fire will produce irritating, toxic and/or corrosive gases, including chlorine.
Special Fire Fighting Instructions	Contain runoff from fire control or dilution water - Runoff may be toxic and/or corrosive and may pollute waterways.
Personal Protective Equipment	Liquid-tight chemical protective clothing (splash suit) in combination with self-contained breathing apparatus (SCBA) should be used. Structural firefighter's uniform is NOT effective for this material.
Flash Point	No Data Available
Lower Explosion Limit	No Data Available
Upper Explosion Limit	No Data Available
Auto Ignition Temperature	No Data Available
Hazchem Code	2R

6. ACCIDENTAL RELEASE MEASURES

General Response Procedure	Ensure adequate ventilation - Ventilate enclosed spaces before entering. ELIMINATE all ignition sources. Do not touch or walk through spilled material. Do not breathe mist/vapours and prevent contact contact with eyes, skin and clothing.
Clean Up Procedures	Absorb with earth, sand or other non-combustible material; Use clean non-sparking tools to collect material and place it into suitable containers for later disposal (see SECTION 13).
Containment	Stop leak if safe to do so – Prevent entry into waterways, drains or confined areas. Cover with dry earth and/or other non-combustible material followed by plastic sheet to minimise spreading. Vapour-suppressing foam may be used to control vapours; Water spray may be used to knock down or divert vapour clouds.
Decontamination	If possible, neutralize contaminant at the spilled area with lime, limestone, sodium carbonate (soda ash), sodium bicarbonate, and dilute sodium hydroxide. Ensure adequate decontamination of tools and equipment following clean up.
Environmental Precautionary Measures	Small spillages and decontamination run-off may be washed to drains with large quantities of water. Due care must however still be exercised to avoid unnecessary pollution of watercourses.
Evacuation Criteria	Spill or leak area should be isolated immediately. Keep unauthorised personnel away. Keep upwind and to higher ground. Large spill: Consider downwind evacuation of areas within 250 m.
Personal Precautionary Measures	Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (see SECTION 8). Large spill: Wear SCBA and chemical splash suit.

7. HANDLING AND STORAGE

Handling	Safety showers and eyewash facilities should be provided within the immediate work area for emergency use. Ensure adequate ventilation - Use only outdoors or in a well-ventilated area. Handle in accordance with good industrial hygiene and safety practice. Do not breathe mist/vapours and prevent contact with eyes, skin and clothing. Do not ingest. Wear protective gloves/protective clothing/eye protection/face protection (see SECTION 8). CORROSIVE: Always add acid to water during dilution - NEVER add water to acid. Avoid contact with common metals. Use corrosion-resistant structural materials. Absorb spillage to prevent material damage (see SECTION 6).
Storage	Store in a cool, dry and well-ventilated place, out of direct sunlight. Keep container tightly closed. Containers should be labelled and protected from damage. Keep away from heat and sources of ignition - No smoking. Keep away from foodstuffs and incompatible materials (see SECTION 10). Store locked up. If stored indoors, building floors should be acid resistant with drains to a treatment system. Electrical equipment should be flameproof and protected against corrosive action.
Container	Keep only in the original container or suitable material, i.e. rubber lined steel, PVC/FRP, FRP. Containers should have a safety relief valve - Care should be taken to release any internal pressure slowly.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

General	For Hydrochloric acid (CAS No. 7647-01-0): - Safe Work Australia (SWA) Exposure Standard: TWA = 5 ppm (7.5 mg/m3) Peak limitation. - New Zealand Workplace Exposure Standard (WES): TWA = 5 ppm (7.5 mg/m3) Ceiling. - OSHA PEL/NIOSH REL: TWA = 5 ppm (7 mg/m3) Ceiling.

	- Immediately dangerous to life or health (IDLH) concentration: 50 ppm.
Exposure Limits	No Data Available
Biological Limits	No information available.
Engineering Measures	A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Atmospheric levels should be controlled in compliance with the occupational exposure limit. Electrical equipment should be flameproof and protected against corrosive action.
Personal Protection Equipment	- Respiratory protection: Wear respiratory protection in case of inadequate ventilation, if facing concentrations above the exposure limit or unknown concentrations. Recommended: Chemical cartridge respirator or air-purifying respirator, providing protection against acid gas (Filter Type E); Supplied air respirator or self-contained breathing apparatus (SCBA). - Eye/face protection: Wear appropriate eye protection to prevent eye contact. Recommended: Wear chemical goggles and full face shield. - Hand protection: Wear protective gloves. Recommended: Wear impervious gloves, e.g. Nitrile rubber (full contact); Latex gloves (splash contact). - Skin/body protection: Wear appropriate personal protective clothing to prevent skin contact. Recommended: Wear impervious protective clothing, including boots, lab coat, apron or full-body suit.
Special Hazards Precaustions	Hydrogen, a highly flammable gas, can accumulate to explosive concentrations inside drums, or any types of steel containers or tanks upon storage.
Work Hygienic Practices	Do not eat, drink or smoke when using this product. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Wash contaminated clothing thoroughly before reuse.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Liquid
Appearance	Clear liquid
Odour	Pungent
Colour	Colourless to slightly yellow
pH	<1 (Neat)
Vapour Pressure	No Data Available
Relative Vapour Density	No Data Available
Boiling Point	81.5 - 110 °C
Melting Point	-74 °C
Freezing Point	No Data Available
Solubility	Miscible with water
Specific Gravity	1.0 - 1.2
Flash Point	No Data Available
Auto Ignition Temp	No Data Available
Evaporation Rate	>1 (Butyl acetate = 1)
Bulk Density	No Data Available
Corrosion Rate	No Data Available
Decomposition Temperature	No Data Available
Density	No Data Available
Specific Heat	No Data Available
Molecular Weight	No Data Available
Net Propellant Weight	No Data Available
Octanol Water Coefficient	No Data Available
Particle Size	No Data Available
Partition Coefficient	No Data Available
Saturated Vapour Concentration	No Data Available
Vapour Temperature	No Data Available
Viscosity	No Data Available
Volatile Percent	No Data Available

VOC Volume	No Data Available
Additional Characteristics	No information available.
Potential for Dust Explosion	Not applicable.
Fast or Intensely Burning Characteristics	No information available.
Flame Propagation or Burning Rate of Solid Materials	No information available.
Non-Flammables That Could Contribute Unusual Hazards to a Fire	Will react with many compounds (some violently) releasing flammable, toxic and/or corrosive gases and runoff.
Properties That May Initiate or Contribute to Fire Intensity	Non-combustible; Material does not burn, but may produce toxic and/or corrosive fumes upon heating.
Reactions That Release Gases or Vapours	When heated to decomposition, emits toxic hydrogen chloride fumes. Can react violently if in contact with oxidising agents, liberating chlorine.
Release of Invisible Flammable Vapours and Gases	Contact with metals will produce hydrogen gas which can form explosive mixtures with air.

10. STABILITY AND REACTIVITY

General Information	Decomposes on heating, with release of (highly) toxic gases/vapours (chlorine). Reacts exothermically with many compounds. Reacts violently with (some) bases. Reacts with (strong) oxidizers, with release of (highly) toxic gases/vapours (chlorine). Reacts with (some) metals, with release of highly flammable gases/vapours (hydrogen).
Chemical Stability	Material is stable under normal conditions.
Conditions to Avoid	Keep away from heat and sources of ignition.
Materials to Avoid	Incompatible/reactive with strong mineral acid, strong bases, metals, metal oxides, hydroxides, amines, carbonates and other alkaline materials; cyanides, sulfides, sulfites, sulfuric acid and formaldehyde; oxidising agents.
Hazardous Decomposition Products	When heated to decomposition, emits toxic hydrogen chloride fumes. Contact with metals will produce hydrogen gas which can form explosive mixtures with air. Can react violently if in contact with oxidising agents, liberating chlorine.
Hazardous Polymerisation	Hazardous polymerisation does not occur.

11. TOXICOLOGICAL INFORMATION

General Information

- Acute toxicity: Acute lethal effects are expected due to the corrosive nature of the chemical. Ingestion will immediately cause corrosion of and damage to the gastrointestinal tract. Potential sequelae following ingestion include perforation, scarring of the oesophagus or stomach and stricture formation causing dysphagia or gastric outlet obstruction.
- Skin corrosion/irritation: Corrosive - Causes severe skin burns. Contact with this material will cause burns to the skin.
- Eye damage/irritation: Corrosive - Causes serious eye damage. May cause permanent impairment of vision, including blindness.
- Respiratory/skin sensitisation: Not expected to cause respiratory or skin sensitization reactions.
- Germ cell mutagenicity: Hydrogen chloride does not have any significant mutagenic potential.
- Carcinogenicity: IARC has designated Hydrochloric acid as being not classifiable as to its carcinogenicity to humans. i.e. Category 3.
- Reproductive toxicity: No information available.
- STOT (single exposure): May cause respiratory irritation. Higher concentrations are corrosive to the mucous membrane. Acute inhalation (mist or vapour) may cause coughing, hoarseness, inflammation and ulceration of the respiratory tract and chest pain. Fluid build up on the lung (pulmonary oedema) may occur up to 48 hours after exposure and could prove fatal.
- STOT (repeated exposure): Not considered to cause serious damage to health from repeated exposure. However, local irritation effects are expected due to the corrosivity of the chemical. Chronic occupational exposure has been reported to cause gastritis, chronic bronchitis, dermatitis and photosensitisation.
Prolonged exposure to low concentration may cause dental discolouration and erosion.
- Aspiration toxicity: No information available.

Acute

Ingestion

Acute toxicity (Oral):
COMPONENT: Hydrochloric acid (CAS No. 7647-01-0):
- LD50, Rats (female): 238 - 277 mg/kg bw. (3.3% conc.) [NICNAS].

Carcinogen Category	None

12. ECOLOGICAL INFORMATION

Ecotoxicity	Aquatic toxicity: - LC50, Fish (Gambusia affinis): 282 mg/L (96 h) [Hydrochloric acid]. - EC50, Daphnia (Water flea): 56 mg/L (72 h) [Hydrochloric acid].
Persistence/Degradability	Persistence is unlikely based on available information.
Mobility	No information available.
Environmental Fate	Large discharges may contribute to the acidification of water and be fatal to fish and other aquatic life. Can cause damage to vegetation. Can cause severe damage to aquatic plants.
Bioaccumulation Potential	No information available.
Environmental Impact	No Data Available

13. DISPOSAL CONSIDERATIONS

General Information	Dispose of contents/container through a licensed waste contractor and in accordance with local/regional/national regulations. Decontamination and destruction of containers should be considered.
Special Precautions for Land Fill	Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together, if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals.

14. TRANSPORT INFORMATION

Land Transport (Australia)
ADG Code

Proper Shipping Name	HYDROCHLORIC ACID
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
EPG	40 Toxic And/Or Corrosive Substances Non-Combustible - Water Reactive
UN Number	1789
Hazchem	2R
Pack Group	II
Special Provision	No Data Available

Land Transport (Fiji)

Proper Shipping Name	HYDROCHLORIC ACID
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
EPG	40 Toxic And/Or Corrosive Substances Non-Combustible - Water Reactive
UN Number	1789
Hazchem	2R
Pack Group	II

Special Provision	No Data Available

Land Transport (Malaysia)
ADR Code

Proper Shipping Name	HYDROCHLORIC ACID
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
EPG	40 Toxic And/Or Corrosive Substances Non-Combustible - Water Reactive
UN Number	1789
Hazchem	2R
Pack Group	II
Special Provision	No Data Available

Land Transport (New Caledonia)

Proper Shipping Name	HYDROCHLORIC ACID
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
EPG	40 Toxic And/Or Corrosive Substances Non-Combustible - Water Reactive
UN Number	1789
Hazchem	2R
Pack Group	II
Special Provision	No Data Available

Land Transport (New Zealand)
NZS5433

Proper Shipping Name	HYDROCHLORIC ACID
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
EPG	40 Toxic And/Or Corrosive Substances Non-Combustible - Water Reactive
UN Number	1789
Hazchem	2R
Pack Group	II
Special Provision	

Land Transport (Papua New Guinea)

Proper Shipping Name	HYDROCHLORIC ACID
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
EPG	40 Toxic And/Or Corrosive Substances Non-Combustible - Water Reactive
UN Number	1789
Hazchem	2R
Pack Group	II
Special Provision	No Data Available

Land Transport (United States of America)
US DOT

Proper Shipping Name	HYDROCHLORIC ACID
Class	8 Corrosive Substances

Subsidiary Risk(s)	No Data Available
ERG	157 Substances - Toxic and/or Corrosive (Non-Combustible / Water-Sensitive)
UN Number	1789
Hazchem	2R
Pack Group	II
Special Provision	No Data Available

Sea Transport
IMDG Code

Proper Shipping Name	HYDROCHLORIC ACID
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
UN Number	1789
Hazchem	2R
Pack Group	II
Special Provision	No Data Available
EMS	F-A, S-B
Marine Pollutant	No

Air Transport
IATA DGR

Proper Shipping Name	HYDROCHLORIC ACID
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
UN Number	1789
Hazchem	2R
Pack Group	II
Special Provision	No Data Available

National Transport Commission (Australia)
Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification	Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

15. REGULATORY INFORMATION

General Information	No Data Available
Poisons Schedule (Aust)	Schedule 6

Environmental Protection Authority (New Zealand)
Hazardous Substances and New Organisms Amendment Act 2015

Approval Code	HSR001557

National/Regional Inventories

Australia (AICS)	Listed

Canada (DSL)	Not Determined
Canada (NDSL)	Not Determined
China (IECSC)	Not Determined
Europe (EINECS)	Not Determined
Europe (REACh)	Not Determined
Japan (ENCS/METI)	Not Determined
Korea (KECI)	Not Determined
Malaysia (EHS Register)	Not Determined
New Zealand (NZIoC)	Listed
Philippines (PICCS)	Not Determined
Switzerland (Giftliste 1)	Not Determined
Switzerland (Inventory of Notified Substances)	Not Determined
Taiwan (NCSR)	Not Determined
USA (TSCA)	Not Determined

16. OTHER INFORMATION

Related Product Codes

HYACIB1000, HYACIB1500, HYACIB1600, HYACIB1893, HYACIB1895, HYACIB1897, HYACIB1900, HYACIB1901, HYACIB1902, HYACIB1903, HYACIB1904, HYACIB1940, HYACIB1941, HYACIB1959, HYACIB2000, HYACIB2100, HYACIB2200, HYACIB2300, HYACIB2500, HYACIB2510, HYACIB3000, HYACIB3001, HYACIB3002, HYACIB3003, HYACIB3004, HYACIB3005, HYACIB3006, HYACIB3007, HYACIB3016, HYACIB3050, HYACIB3060, HYACIB3200, HYACIB3500, HYACIB3600, HYACIB3700, HYACIB3701, HYACIB3702, HYACIB3703, HYACIB3705, HYACIB4000, HYACIB4005, HYACIB5000, HYACIB6000, HYACIB6700, HYACIB6900, HYACIB7500, HYACIB7900, HYACIB8000, HYACIB8001, HYACIB8100, HYACIB8500, HYACIB8501, HYACIB8502, HYACIB9000, HYACIB9500, HYACIB9600, HYACIB9601, HYACIB9602, HYACIB9603, HYACIB9604, HYACIC1000, HYACIC1001, HYACIC1300, HYACIC1500, HYACIC1861, HYACIC2000, HYACIC2001, HYACIC3000, HYACIC3001, HYACIC3002, HYACIC3003, HYACIC3004, HYACIC3005, HYACIC3006, HYACIC3007, HYACIC3008, HYACIC3050, HYACIC3070, HYACIC3300, HYACIC3400, HYACIC3700, HYACIC4003, HYACIC4004, HYACIC4400, HYACIC5000, HYACIC6000, HYACIC6300, HYACIC6301, HYACIC6500, HYACIC7300, HYACIC7500, HYACIC7501, HYACIC7502, HYACIC7505, HYACIC8000, HYACID0800, HYACID1000, HYACID1001, HYACID1002, HYACID1003, HYACID1004, HYACID1005, HYACID1006, HYACID1007, HYACID1008, HYACID1009, HYACID1010, HYACID1011, HYACID1012, HYACID1013, HYACID1014, HYACID1015, HYACID1016, HYACID1017, HYACID1018, HYACID1019, HYACID1020, HYACID1021, HYACID1022, HYACID1023, HYACID1024, HYACID1025, HYACID1026, HYACID1027, HYACID1028, HYACID1030, HYACID1200, HYACID1300, HYACID1301, HYACID1400, HYACID1500, HYACID1501, HYACID1600, HYACID1700, HYACID1701, HYACID1730, HYACID1733, HYACID1801, HYACID1802, HYACID1803, HYACID1804, HYACID1805, HYACID1806, HYACID1807, HYACID1808, HYACID1812, HYACID1813, HYACID1814, HYACID1815, HYACID1816, HYACID1817, HYACID1818, HYACID1821, HYACID1822, HYACID1823, HYACID1824, HYACID1825, HYACID1826, HYACID1827, HYACID1828, HYACID1829, HYACID1830, HYACID1831, HYACID1832, HYACID1833, HYACID1834, HYACID1835, HYACID1836, HYACID1837, HYACID1838, HYACID1839, HYACID1840, HYACID1841, HYACID1842, HYACID1857, HYACID1858, HYACID1859, HYACID1860, HYACID1861, HYACID1862, HYACID1863, HYACID1864, HYACID1865, HYACID1866, HYACID1867, HYACID1868, HYACID1869, HYACID1870, HYACID1871, HYACID1872, HYACID1873, HYACID1874, HYACID1875, HYACID1876, HYACID1877, HYACID1878, HYACID1879, HYACID1880, HYACID1881, HYACID1882, HYACID1883, HYACID1884, HYACID1885, HYACID1886, HYACID1887, HYACID1888, HYACID1889, HYACID1890, HYACID1891, HYACID1892, HYACID1893, HYACID1894, HYACID1895, HYACID1896, HYACID1897, HYACID1898, HYACID1899, HYACID1900, HYACID1901, HYACID1902, HYACID1903, HYACID1904, HYACID1905, HYACID1906, HYACID1907, HYACID1908, HYACID1909, HYACID1910, HYACID1911, HYACID1912, HYACID1913, HYACID1914, HYACID1915, HYACID1917, HYACID1919, HYACID1924, HYACID1927, HYACID1930, HYACID1932, HYACID1934, HYACID1935, HYACID1936, HYACID1937, HYACID1940, HYACID1941, HYACID1942, HYACID1943, HYACID1948, HYACID1957, HYACID1958, HYACID2000, HYACID2001, HYACID2002, HYACID2003, HYACID2034, HYACID2040, HYACID2100, HYACID2200, HYACID2300, HYACID2400, HYACID2500, HYACID2501, HYACID2505, HYACID2506, HYACID2507, HYACID2508, HYACID2509, HYACID2510, HYACID2600, HYACID2900, HYACID3000, HYACID3001, HYACID3002, HYACID3006, HYACID3050, HYACID3100, HYACID3500, HYACID3600, HYACID3700, HYACID3701,

HYACID4000, HYACID4200, HYACID5000, HYACID5100, HYACID5500, HYACID6000, HYACID6010, HYACID6050, HYACID6500, HYACID6501, HYACID7000, HYACID7100, HYACID7200, HYACID7300, HYACID7500, HYACID8000, HYACID8100, HYACID9500, HYACID9501, HYACID9502, HYACID9503, HYACID9505, HYACID9506, HYACID9507, HYACID9508, HYACIL1000

Revision 6

Revision Date 25 Apr 2019

Reason for Issue SDS updated

Key/Legend

< Less Than
> Greater Than
AICS Australian Inventory of Chemical Substances
atm Atmosphere
CAS Chemical Abstracts Service (Registry Number)
cm² Square Centimetres
CO2 Carbon Dioxide
COD Chemical Oxygen Demand
deg C (°C) Degrees Celcius
EPA (New Zealand) Environmental Protection Authority of New Zealand
deg F (°F) Degrees Farenheit
g Grams
g/cm³ Grams per Cubic Centimetre
g/l Grams per Litre
HSNO Hazardous Substance and New Organism
IDLH Immediately Dangerous to Life and Health
immiscible Liquids are insoluable in each other.
inHg Inch of Mercury
inH2O Inch of Water
K Kelvin
kg Kilogram
kg/m³ Kilograms per Cubic Metre
lb Pound
LC50 LC stands for lethal concentration. LC50 is the concentration of a material in air which causes the death of 50% (one half) of a group of test animals. The material is inhaled over a set period of time, usually 1 or 4 hours.
LD50 LD stands for Lethal Dose. LD50 is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals.
ltr or **L** Litre
m³ Cubic Metre
mbar Millibar
mg Milligram
mg/24H Milligrams per 24 Hours
mg/kg Milligrams per Kilogram
mg/m³ Milligrams per Cubic Metre
Misc or **Miscible** Liquids form one homogeneous liquid phase regardless of the amount of either component present.
mm Millimetre
mmH2O Millimetres of Water
mPa.s Millipascals per Second
N/A Not Applicable
NIOSH National Institute for Occupational Safety and Health
NOHSC National Occupational Heath and Safety Commission
OECD Organisation for Economic Co-operation and Development
Oz Ounce
PEL Permissible Exposure Limit
Pa Pascal
ppb Parts per Billion
ppm Parts per Million
ppm/2h Parts per Million per 2 Hours
ppm/6h Parts per Million per 6 Hours
psi Pounds per Square Inch
R Rankine
RCP Reciprocal Calculation Procedure
STEL Short Term Exposure Limit
TLV Threshold Limit Value
tne Tonne
TWA Time Weighted Average
ug/24H Micrograms per 24 Hours
UN United Nations
wt Weight