Title: South Port Ammonia Response Plan

South Port Ammonia Response Plan (ARP)
Cold Stores

Emergency Contact List	
South Port	**Active Refrigeration**
Hayden Mikkelsen – Container Operations Manager C - 021 678 808	Grant Weston - Senior Refrigeration Engineer C – 021 406 876 After hours phone – (03) 215 9973
Sian Tarrant – Container Services Manager C – 027 308 4690	
Gareth Jones – Cold Stores Supervisor C – 022 078 8156	
Warren Shuttleworth – Cold Stores Foreman C – 021 777 237	
Tarryn Hamilton – Cold Stores Leading Hand C – 027 812 4085	
Charlotte Melvin – Health & Safety Manager C – 027 562 2470	
Security Gatehouse 03 212 7828	

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Purpose

The purpose of this document is to provide information and guidance around (anhydrous) ammonia used as the refrigerant held on site at the cold store department.

Introduction

The ammonia refrigeration system is designed, built, maintained and inspected to strict regulatory and industry standards. Catastrophic failure or serious leaks in plants complying to these standards are very uncommon. An uncontrolled release of anhydrous ammonia (over 99% pure ammonia) can be extremely serious and there are controls and a plan in place to reduce the risk to anyone in the area.

Physical Description

- Ammonia is a toxic and corrosive gas. Ammonia creates a significant environmental risk as it is ecotoxic.
- Ammonia is present as both a liquid (in the condensed phase) and a gas.
- On release of liquid ammonia, gas will immediately be produced which will be visible as a white cloud.
- Ammonia released as a vapour (rather than from spilt liquid) will be colourless and have a pungent odour. It is lighter than air so will tend to rise.
- Ammonia gas is classed as non-flammable; however, the vapour is an explosive flammable (from 16% to 25% by volume in air). A strong ignition source must be present, such as a naked flame for ignition to occur.
- Gas spread will be affected by volume released, temperature, wind speed and direction.
- Ammonia will easily dissolve in water. Water vapour can be used to control ammonia gas and subsequently an aqueous liquid containing ammonia will be produced.

Exposure

- Ammonia is a *'self-evacuating'* gas (when a person smells the gas they instinctively move away.) The effects on people of exposure to ammonia gas depends on the concentration of the gas and length of exposure:
    - Low concentrations (5ppm-50ppm) - odour will be detectable.
    - Moderate concentrations (50 to 150 ppm) - eye, throat and skin irritation as well as a cough and mucous build-up.
    - High concentrations (>150 ppm) - scarring of lung tissue, lower lung inflammation and fluid on the lungs.
    - Exposure to concentrations of ammonia of >150 ppm could be fatal after 15 to 30 minutes. 2000 to 5000 ppm could cause death in a relatively short period from prevention of oxygen uptake.

Spill

- Spill Kit is available in the engine room and Store 2 ELA.
- Storm water drain outside engine room – mitigate any chemical and/or oil spill into drain using the spill kit available. This is because if spilt liquid ammonia or ammonia gas dissolved in water (from control measures or during rain), is allowed to enter site drains it creates a significant environmental risk as it is toxic to plants and animals. At a concentration of 0.02 mg/L non ionised ammonia can be lethal to sensitive species.

Ammonia Emergency Preparedness

Location of Ammonia

- The location of ammonia on site is in the cold store engine room and associated storage area. Bulk storage of ammonia is found within the engine room, and the external north wall between the engine room and blast freezers.
- Approximate amount of ammonia on site is 4000kgs (4 Tonne).

Physical Systems

- The ammonia compressor emergency stop button is located at the east side of the engine room roller door.
- The ammonia system on site has high pressure and low-pressure components.
- The pressure vessel is external to the building but within the fenced area and the safety relief valves will vent directly to the atmosphere. There are tags on all valves naming them.
- Fire service (FENZ) to assess the risk of the possibility of the vented ammonia cloud being dispersed into the local area and become a hazard to the local community. (Vent to atmosphere).
- Page 8 shows map of pipework locations at the Cold stores

Alarm Systems

- There are four analysers installed in the engine room along with one in each evaporator room of each store. Evaporators measure 200ppm and 800ppm.
- All the analysers are connected to a visual flashing light and audible alarm, which is located on the external wall of the engine room entrance.
- The alarm will be activated if the compressor faults or trips out both during business hours and after hours.
- The watch house is automatically alerted (by siren and glowing light on their alarm panel) when ammonia alarm is activated.
- The watch house phones the cold store supervisor and Active Refrigeration to undertake assessment and remedial action as required.

Wind Vane

- Two wind vanes are located with one each on the roofs of stores one and two. Wind vane Locations are shown on the site plan. Visibility in various conditions was considered, e.g. foggy.
- Induction of employees and contractors entering the area includes where the wind vanes are located and what to do in the event of an evacuation.

PPE – Additional

- Only trained personnel can enter the area.
- Use of site supplied breathing apparatus (BA) equipment can be used by **suitably trained people** (FENZ and Active refrigeration) for rescue line of sight (snatch and grab) only or to shut off king valve/receiver outlet valve and isolation valves only if safe to do so.

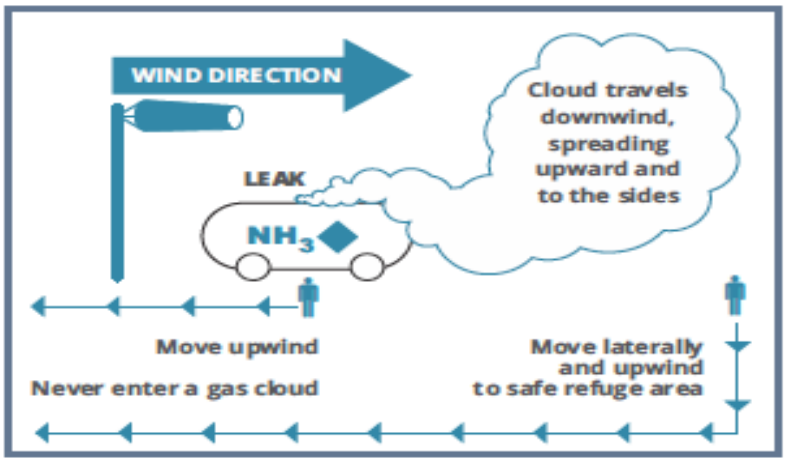
Shelter in place

- The ***"shelter in place"*** allocated area is located inside the **cold stores smoko room** should the need for the shelter in place location change the decision and consideration to next suitable location is to be made by the emergency warden.
- If sheltering inside, ensure windows and doors are closed. Air conditioning does not need to be switched off.
- Shelter in place is to be used when the threat of an ammonia cloud is low due to cold or still conditions. **The term, shelter-in-place, means to seek immediate shelter and remain there during an emergency rather than evacuate the area**. It is always preferred to evacuate.

Escaping Ammonia Threats

The Initial Isolation Zone around an ammonia release is 30m to 150m. Escape by moving laterally and upwind, or shelter-in-place. Isolation Zone 30m for small release, 150m for large release. 300m for catastrophic release.

Evacuation Strategy



First Aid

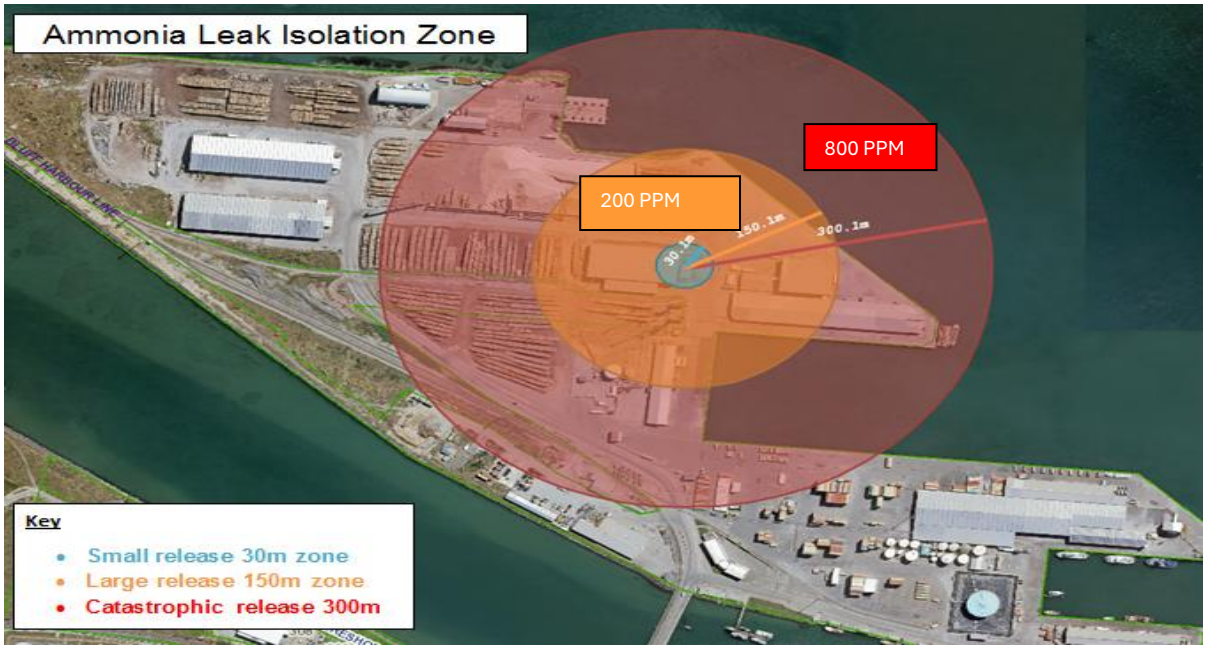
First aid measures should be followed. For all exposure seek medical attention urgently. (Refer to SDS for anhydrous ammonia).

Exposure	Response
Inhalation	• Remove victim from exposure (if safe to do so). • Remove contaminated clothing and loosen remaining clothing (do not do this if the ammonia has soaked onto the clothing). • Allow patient to assume comfortable position and keep warm and keep at rest until recovered. • If difficulty breathing or blue colour of the lips, check there are no obstructions of the air way. • Apply artificial respiration (CPR) if not breathing.
Skin Contact	• Treat as a cold burn. • If spilt on skin or hair, then immediately drench with running water for at least 10 minutes and remove clothing (watch out for clothing frozen to skin). Move patient to tepid (temperature-controlled water) shower to continue drenching skin and clothes if required. • Shower is **located at the rear of the engine room** • Continue to wash with plenty of water until advised to stop by medical professional or poisons centre. • Be mindful of the risk of hypothermia to the victim
Eye Contact	• **An eye wash station (shower) is located at the rear of the engine room**. • Immediately wash in and around the eye with large amounts of tepid water for at least 15 minutes. Hold the eyelids apart. • Ask if the person is wearing contact lenses and advise medical personnel.
Ingestion	• Immediately wash mouth with water. • If swallowed do not induce vomiting. • Give a glass of water to drink.
Notes to Physician	• Give details of the exposure. E.g. type, time, treatment given. • Arrange for transport to physician.

Site Plans and Isolation Zones

Ammonia leak isolation zone

- Any cloud will change shape depending on wind speed and direction.
- Centre of zone is the engine room which is the source of the leak in this example. Note that the source may be any pipeline where ammonia is held.



Port Users in each zone

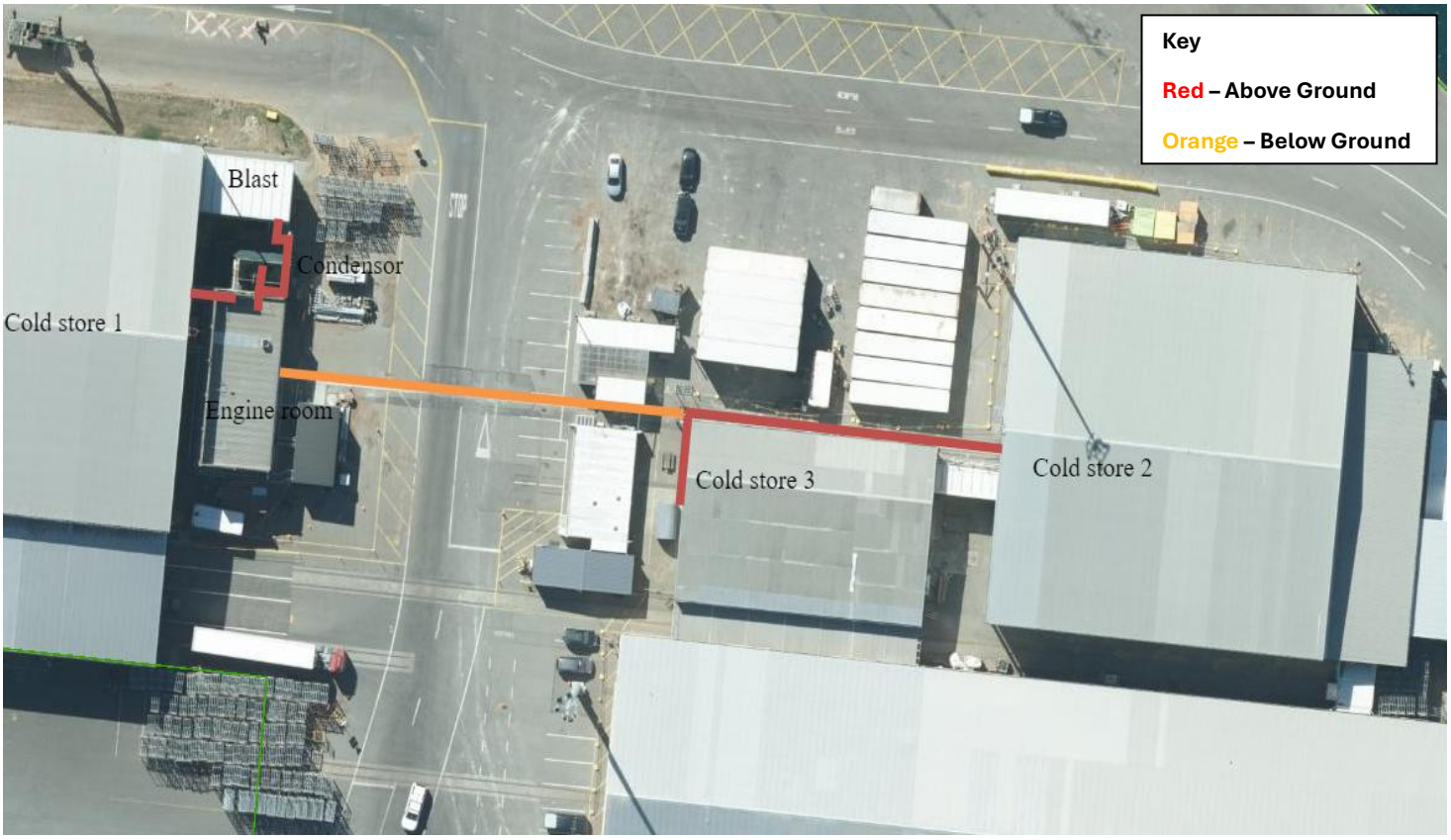
Orange Zone (150m exclusion zone) – 200 ppm

Stolthaven Terminals	Site Office: 03 212 7970, Terminal Manager: 027 230 0290 (John)
SSA Stevedores	Manager 027 406 6293 (Edward Marfell); Operations Supervisor 027-203-3497 (Andrew McKay)
NFA Log Yards	Logging Manager: (Craig Unahi) Operations Supervisor: 027 650 9623 (Hadleigh) Foreman: 027 911 3740 (Scott)
Southwood Export	Site Office: 03 218 2073, Selwyn Hermes 029 244 6980
ADM Shed 5	027 528 8558 (Colin)
Vessels in port	Notify watch house and request vessel/s are contacted using recognised radio channel 12/14 or ships agent.

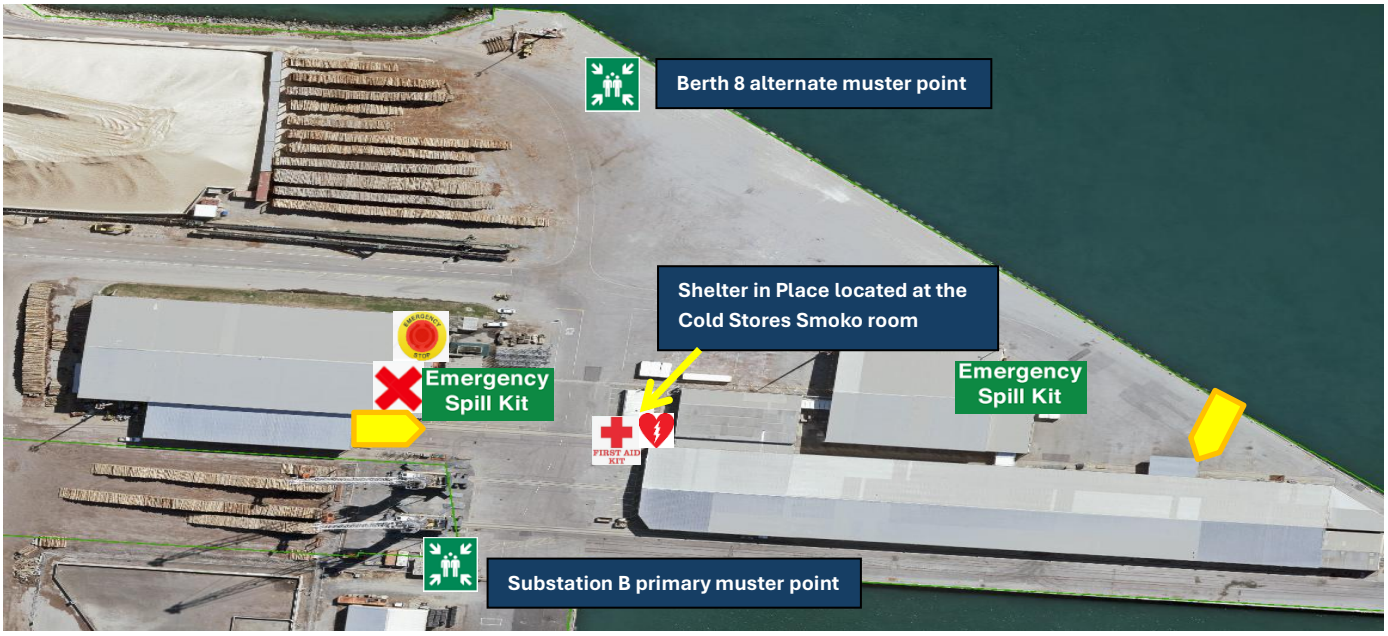
Red Zone (300m exclusion zone) – 800 ppm

Orange zone	Include the orange zone contact if a red zone leak includes.
Syncrolift Real Journeys	Site Office: 03 212 6017, Syncrolift Co-ordinator 027 522 0307 (Rob Dixon). Duty person (Shaun McKellar) 027 343 4272: Rob to contact Real Journeys
Pneumatic Contractors	Offsite office (Bond Str, Invercargill): 03 218 4173 Foreman 021 359 984 (Kurt Graham)
South Port Container Operations	Office: 03 212 6011, Container Operations Manager: 021 678 808 (Hayden Mikkelsen) Depot Supervisor 027-345-7013 (Kenny James) Container Terminal Supervisor: 027-520-6312 (Graham Brown) Fleet Maintenance Supervisor: 027-301-1066 (Max Beer) Kenny, Max, Graham –would contact contractors including Port Maintenance and Medlog.
Vessels in port Marine	Notify watch house and request vessel/s are contacted using recognised radio channel 12/14 or ships agent. Marine: Scott Faithfull 021-802-965
Admin offices	Emergency wardens: Donna Goodman — Nicky Bottger 027-296-3653 Sam Withey 027-446-3832 — Oxana Lee 021-139-8454

Ammonia Pipework Plan



Cold Stores Area Map



	Compressor Emergency Stop – located outside of the engine room
	Ammonia isolation valve/King valves – located under cooling tower
	Wind vane – located Cold Store 1 and Shed 5 canopy
	First Aid Kit – located at the cold store office
	Defibrillator (AED) – located at the cold store office also located at the dairy smoko room, gate house and pilot boat
	Spill kit – located in engine room and in store 2 ELA
	Emergency shower and eye wash – located behind the engine room
	Muster Station
Manual Ammonia/ Fire Alarm switches	Located throughout stores, Same call points as fire alarm.
Ammonia alarm/light	Located On top of engine room above admin door. Red light will flash and alarm will sound.

Trigger Action Response Plan (TARP)

This Trigger Action Response Plan (TARP) is designed to give quick information to all workers in areas that have ammonia, once ammonia is smelt and/or detected outside of its normal environment (Engine room)

The information is in four categories:

Green - level 1 normal operations

This shows what the relevant people should be trained/competent prior to any incident occurring.

Blue - level 2 Zone of release may be at source OR 30m from source

This shows the first actions people should take to start to move people out of the immediate area, alert other parties to start their roles and identify the source.
Release may not be enough to trigger the 200ppm alarms in the engine room but can be detected by people in the area. Alarms may be triggered manually at call points. Manual alarms are directly outside building

Orange – level 3 action, Zone of release may be up to 150m from the source

This shows that part or whole departments may be required to evacuate, specialized PPE must be used when dealing with the leak/spill and Management must start to make alternate plans for stock and processing.
The ammonia alarm triggered automatically, yellow 200ppm alarm light glowing in engine room indicates the location of the leak.

Red - level 4 escalation/evacuation Zone of release may be more than 150m from the source

This level involves emergency services on site to assist.
The ammonia alarm triggered automatically, red 400 ppm alarm light glowing in engine room indicates the location of the leak.

The parts per million (ppm) concentration is taken in the ambient air around the leak, not directly at the source of the leak.

Job Roles

Operator/worker:	Person working in an area who is not classified under one of the following descriptions.
Supervisor:	Person who is in charge of running a part of or entire department.
Foreman/Leading hand:	Takes the place of or assists the Supervisor in the event that the Supervisor is not there.
Safety Team:	Develops safety procedures.
Wardens:	Responsible for taking the roll call. Liaises with FENZ on arrival. When FENZ arrives, carries out handover of situation.
Management team:	In charge of site and departments. Will take on key logistical roles during an incident.
Security:	Monitors site security. Calls emergency services if requested to give details and update of situation. Takes a communication role between key parties during an emergency.

	No issues involving ammonia **(<0ppm)**	**Smell of ammonia or minor leak** **Approx. 1-50ppm but could be up to 200ppm** **The leak may be very localized (in the engine room) and may be up to 30m zone** **Alarm could be manually triggered by an operator /worker.**	**Confirmed leak in specific location** **Leak up to 200ppm and alarm triggered automatically.** **Zone may be moving and making a 150m zone**	**If leak is uncontrolled/major and in an occupied area carry out a full evacuation.** **Leak more than 200ppm and alarm triggered automatically.** **Leak is a release covering an area greater than 150m.**
All Employees at any time	• All employees and contractors check the wind vane while evacuating and if safe to do so move **laterally and upwind** of the building to evacuation point. • Know where muster stations are. • Follow instructions of the Fire Wardens or emergency services. • Refer any media communications to the Management Team.			
Operator/ Worker	• Production as normal. • Be familiar with evacuation procedures and muster station location. • Know the sound of the ammonia alarm and where it is located. • Know where the wind vanes are located, and which way is upwind of the vane.	• Report issue to supervisor straight away. • Clear immediate area of people. • Wait for instructions from the supervisor or leading hand. • Trigger the alarm.	• Check direction of wind-on-wind vane. • Evacuate immediate department/area. • Follow Plant evacuation procedures. • Assist others. • Follow instructions from Supervisor/Foreman.	• Follow instructions at muster station. • Do not re-enter the building until the ALL CLEAR has been given. • Wait for further instruction from supervisor.
Supervisor and/or Foreman	• Normal operations. • Report any issues/concerns involving ammonia. • Be trained in the use of ammonia monitor. • Be familiar with evacuation procedures and muster station location.	• Move people away from the immediate area and must people to the ***"Shelter in Place"*** location • Phone Active Refrigeration service engineers on 03 2159973. • Trigger the alarm. • Source the ammonia monitor. • Turn on the ammonia monitor in clear fresh air and take a reading of the area affected. • If ammonia monitor is over 25ppm clear immediate area; If over 35ppm clear a larger area of department and prepare for further evacuation. • Phone Emergency Services on 111 and request FENZ attendance. • Arrange for the SPNZ emergency barricade trailer to be delivered from container terminal building if it is safe to do so. More 'emergency use only' cones are available in the crane parts store in the container terminal building.	• Evacuate immediate department and surrounding areas to ***"Shelter in Place"*** location • Consider evacuation of nearby areas, e.g. log yard, other buildings container terminal • Notify Management. • Consider WorkSafe notifiable incident requirements. • Arrange for gatehouse/watch house to stop traffic entering the area. • Arrange for gatehouse/ watch house to contact any vessel in the zone. Use the radio channel 12/14 or contact the ship's agent. They can choose to evacuate or clear the decks of people to accommodation and shut down ventilation.	• Take muster of the department and notify watchman ASAP. • Phone Emergency Services on 111 and request FENZ attendance. • Follow instruction from FENZ.
Foreman/ Leading Hands	• Be familiar with evacuation procedures and muster station location • Be trained in the use of ammonia monitors	• Take on the role of the Supervisor when absent. • Assist with cordons/moving people out of immediate area • Monitor situations and give updates to relevant people when required.	• Maintain contact with relevant people and provide updates as required. • Monitor ambient ammonia levels. • Ensure people are not entering the area.	• Follow site evacuation procedures. • Follow all instructions given.

	No issues involving ammonia **(<0ppm)**	**Smell of ammonia or minor leak** **Approx. 1-50ppm but could be up to 200ppm** **The leak may be very localized (in the engine room) and may be up to 30m zone**	**Confirmed leak in specific location** **Leak up to 200ppm and alarm triggered automatically.** **Zone may be moving and making a 150m zone**	**If leak is uncontrolled/major and in an occupied area carry out a full evacuation.** **Leak more than 200ppm and alarm triggered automatically.** **Leak is a release covering an area greater than 150m.**
Wardens	• Be familiar with evacuation procedures and muster station locations. • Be trained in the use of ammonia monitor.	• Conduct roll call • Identify any missing personnel including last known location. • Make sure FENZ has been contacted if required and follow any instructions given by Emergency personnel • Monitor situations and give updates to relevant people when required. • When Fire Service Services arrive provide them with the following information: 1. Any missing personnel including last known location; AND 2. Possible alarm/evacuation cause; AND 3. Location of incident and best access		
Health and Safety Team	• Be trained in the use of ammonia monitor. • Be familiar with evacuation procedures and muster station location.	• Communication with Supervisor. • Monitor situation for escalation. • Notify Management. • Follow any instructions given by Emergency personnel		
Security/ Watchman	• Be familiar with evacuation procedures and muster station location. • Understand alarm system in the gatehouse. • Be familiar with communications role in emergencies.	• The alarm in gatehouse will sound and light will glow to show that ammonia leak has occurred. Press the button to disable the sound. • Follow instructions of the Cold Store Supervisor. • Contact Cold Store Supervisor by telephone if outside normal work hours. • Contact Active Refrigeration service engineers on 03 2159973 if alarms trigger outside work hours. • May be requested to call 111 and request FENZ attendance. • Make sure road closures are in place – anything from the gatehouse onwards, no further access onto Port • Maintain radio communications with vessel as necessary: 1. The ship may choose to clear the decks of personnel to the accommodation, shut down ventilation and remain in the accommodation block. 2. The fastest way to alert a vessel is either using VHF channel 12/14 OR via the ship's agent. • In the event of site evacuation, it is the ship's master's decision whether to evacuate the ship. They may do this via the seaward side using accommodation ladder OR the lifeboat.		
Management team	• Be familiar with evacuation procedures and muster station location • Be trained in site emergency management.	• Monitor situation as required • Make plans for other operations. • Make alternate arrangements for evacuated workers as required. • Liaise with other team members. • Follow all instructions given by emergency personnel. • Undertake any environmental controls.	• Follow all instructions given.	• Follow all instructions given.

Appendices

Appendix 1 – Security Cold Store Alarms Procedure

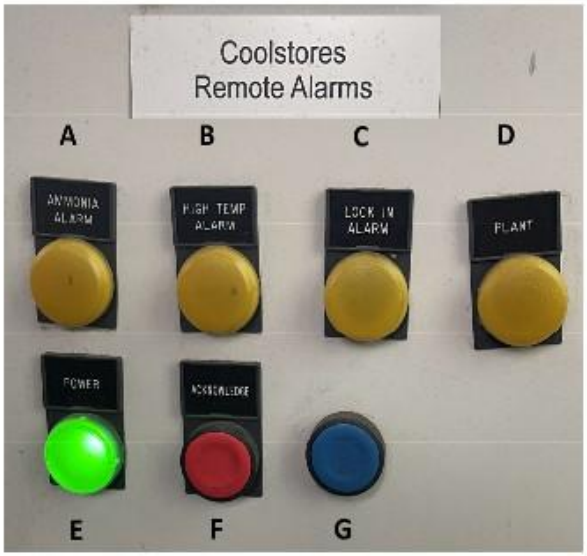
		Doc Number	Page
Manual:	Security Procedure	SEC 04	1 of 3
Title:	**Cold Store Alarms**		

PURPOSE: To ensure correct process is followed relating to monitoring, actioning, and responding to alarms and events at the Cold Store. **Read the attached South Port Ammonia Response Plan.**

SCOPE: The alarm panel in the Security Gate House monitors 4 alarms for the Cold Stores, Ammonia, High Temperature, Lock in, & Plant. The SOP will cover what actions are to be taken when responding to each alarm.

PPE REQUIRED:

Mandatory PPE	
Hi Viz	Steel cap boots
	



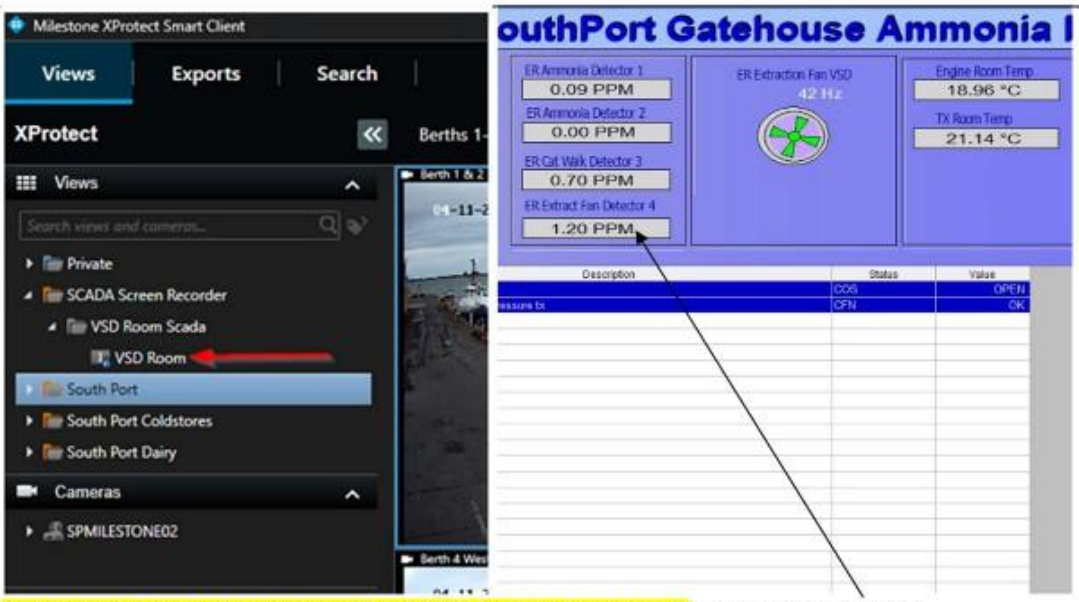
Button/Light	Name/Function
A	Ammonia Alarm
B	High Temp Alarm
C	Lock In Alarm
D	Plant Alarm
E	Panel Power Indicator
F	Acknowledge Alarm Button
G	Silence Alarm Button

KEY STEPS:

Alarm System	Description
1. Alarm– Ammonia	Response for an Ammonia Alarm
2. Alarm– High Temperature	Response for a High Temperature Alarm
3. Alarm– (Person) Lock in	Response for a Lock in Alarm
4. Alarm - Plant	Response for a Plant Alarm

1. Ammonia Alarm Steps

1. Alarm (Light A) will be received on the Security Alarm Panel in the Gate House.
2. Press button 'G' to silence alarm.
3. Check Milestone to ascertain severity of the leak = Log into Milestone (CCTV System) > SCADA Screen Recorder > VSD Room Scada > VSD Room (See below).



4. Contact Active Refrigeration – 03 215 9973 (call until answered) Give the PPM Readings.
5. Contact Gareth Jones – 022 078 8156 and give him the PPM Readings.
6. Next, send out an SMS message via Gallagher (see separate process on how to do this). Depending on the PPM reading, decide if it falls into the Orange or Red category, then follow the next steps:
    a. **Orange zone**: Ammonia levels 1 to 200PPM = send the "Orange Alert" message through Gallagher to evacuate people in the Orange zone (everyone within 150m radius of the leak).
    b. **Red zone**: Ammonia levels 201PPM and higher = send the "Red Alert" message through Gallagher to evacuate people in the Red zone (everyone within 300m radius of the leak).
7. Once contact has been made, select button F to acknowledge the alarm.
8. Update Shift Report with details (Date/time/actions completed).

2. High Temperature Alarm Steps

1. Alarm (Light B) will be received on the Security Alarm Panel in the Gate House.
2. Contact – Active Refrigeration, Ph 03 215 9973 (Call every 10 minutes and if no answer after 1 hour, Contact Gareth Jones – 022 078 8156)
3. Once contact has been made, select button F to acknowledge.
4. Email Gareth Jones (gjones@southport.co.nz) advising of alarm and contact time with Active Refrigeration
5. Update Shift Report with details (Date/time/actions completed)

3. Person Lock in Alarm Steps

1. Alarm (Light C) will be received on the Security Alarm Panel in the Gate House.
2. Contact Gareth Jones – 022 078 8156 (If unanswered contact Warren Shuttleworth on 021 777 237)
3. Once contact has been made, select button F to acknowledge the alarm.
4. Security Patrol to attend the site and perform a visual inspection.
5. Update Shift Report with details (Date/time/actions completed)

4. Plant Alarm Steps

1. Alarm (Light D) will be received on the Security Alarm Panel in the Gate House
2. Contact – Active Refrigeration, Ph 03 215 9973 (Call every 10 minutes and if no answer after 1 hour, contact Gareth Jones – 022 078 8156)
3. Once contact has been made, select button F to acknowledge.
4. Email Gareth Jones (gjones@southport.co.nz) advising of alarm and contact time with Active Refrigeration
5. Update Shift Report with details (Date/time/actions completed)

Document Ownership and Revision History

Responsible Role[1]	Port Facility Security Coordinator,
Accountable Role[2]	Port Facility Security Operator
Consulted Role(s)[3]	Marine Operations Manager, Security Team.
Informed Role(s)[4]	Security team

- [1]Responsible for the creation and maintenance of this document, and can approve, if delegated, by the Accountable role
- [2]Accountable for the ownership of this document
- [3]Consulted (if any) as a materially interested party in the document.
- [4]Informed (if any) of any decisions or actions that effect this document.

Revision History

Version#	Date	Author	Revision (i.e., what changes were made?)
4.0	Nov. 2024	Mark Egginton	New procedures for Ammonia leak and inserted Ammonia Response Plan.

Document's Security Classification - INTERNAL

Description: Information whose unauthorised disclosure, particularly outside of South Port, would be inappropriate and inconvenient.

Disclosure to anyone outside of South Port requires management authorisation.

Appendix 2 – Ammonia Anhydrous Safety Data Sheet (SDS)

SAFETY DATA SHEET

Revision date: 13-Oct-2021

Revision Number 6

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product identifier

Product Name	AMMONIA - ANHYDROUS
Product Code(s)	000031098301

Other means of identification

Proper shipping name	AMMONIA, ANHYDROUS
UN number	1005
CAS No.	7664-41-7
Synonyms	Ammonia anhydrous; Ammonia gas; Anhydrous ammonia; Ammonia liquid; Big N; Ammonia cylinder (used).
Pure substance/mixture	Substance
Formula	NH3

Recommended use of the chemical and restrictions on use

Recommended use	Fertilizer, preparation of fertilizers, refrigerant, chemical synthesis, manufacturing chemical.
Uses advised against	No information available.

Supplier

Ixom Operations Pty Ltd
ABN: 51 600 546 512
Level 8, 1 Nicholson Street
Melbourne 3000
Australia

Telephone Number: +61 3 9906 3000

Emergency telephone number

Emergency telephone number **1 800 033 111 (ALL HOURS)**

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

GHS Classification

Classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG).

Classified as a hazardous chemical in accordance with the criteria of Safe Work Australia - Globally Harmonized System (GHS).

Flammable gases	Category 2
Gases under pressure	Liquefied gas
Acute toxicity - Oral	Category 4
Acute toxicity - Inhalation (Gases)	Category 3
Skin corrosion/irritation	Category 1 Sub-category B
Serious eye damage/eye irritation	Category 1
Acute aquatic toxicity	Category 1

SIGNAL WORD
Danger

Label elements

Hazard statements
H221 - Flammable gas
H280 - Contains gas under pressure; may explode if heated
H302 - Harmful if swallowed
H314 - Causes severe skin burns and eye damage
H331 - Toxic if inhaled
H400 - Very toxic to aquatic life

Precautionary Statements - Prevention
Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking
Do not breathe mist, vapours, spray.
Wash hands thoroughly after handling
Do not eat, drink or smoke when using this product
Use only outdoors or in a well-ventilated area
Wear protective gloves / protective clothing / eye protection / face protection
Avoid release to the environment
Precautionary Statements - Response
Immediately call a POISON CENTER or doctor/physician
Specific treatment (see First aid on this SDS)
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
IF ON SKIN (or hair):
Remove/Take off immediately all contaminated clothing
Rinse skin with water/shower
Wash contaminated clothing before reuse
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
IF SWALLOWED: Rinse mouth. DO NOT induce vomiting
IF SWALLOWED: Call a POISON CENTER or doctor if you feel unwell
Leaking gas fire: Do not extinguish, unless leak can be stopped safely
Eliminate all ignition sources if safe to do so
Collect spillage
Precautionary Statements - Storage
Store in a well-ventilated place. Keep container tightly closed
Store locked up
Protect from sunlight
Precautionary Statements - Disposal
Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Other hazards which do not result in classification
AUH071 - Corrosive to the respiratory tract
General Hazards

Poisons Schedule (SUSMP) 6

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance

Chemical name	CAS No.	Weight-%
Ammonia	7664-41-7	>99.5
Impurities	-	to 100

4. FIRST AID MEASURES

Description of first aid measures

General advice Immediate medical attention is required. Take a copy of the Safety Data Sheet when going for medical treatment. For advice, contact a Poisons Information Centre (e.g. phone Australia 13 11 26; New Zealand 0800 764 766) or a doctor.

Emergency telephone number Poisons Information Center, Australia: 13 11 26
Poisons Information Center, New Zealand: 0800 764 766

Inhalation Remove to fresh air and keep at rest in a position comfortable for breathing. If breathing is difficult, (trained personnel should) give oxygen. Immediately give oxygen if victim turns blue (lips, ears, fingernails). If breathing has stopped, give artificial respiration. Get medical attention immediately.

Eye contact Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Keep eye wide open while rinsing. Call a physician immediately.

Skin contact Immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Seek immediate medical attention/advice. A physician should see the patient promptly if contact with the product has resulted in blistering of the dermal surface or in deep tissue freezing.

Caution - material can be very cold. For dermal contact or suspected frostbite, remove contaminated clothing and flush affected areas with lukewarm water. DO NOT USE HOT WATER. Clothing frozen to the skin should be thawed before being removed. Call a physician immediately.

Ingestion Call a physician immediately. Rinse mouth thoroughly with water. Not an expected route of exposure.

Self-protection of the first aider Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination. Use personal protective equipment as required. See section 8 for more information. Avoid contact with skin, eyes, and clothing.

Most important symptoms and effects, both acute and delayed

Symptoms Difficulty in breathing. Coughing and/ or wheezing. Burning sensation. Irritating. May cause redness and tearing of the eyes. Erythema (skin redness). Contact with very cold material can cause freeze burns.

Indication of any immediate medical attention and special treatment needed

Note to physicians Treat symptomatically. Material may be very cold and may cause freeze burns. Delayed pulmonary edema may occur. Can cause corneal burns. Can act as an asphyxiant.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media

Suitable Extinguishing Media	Water spray or fog. Foam. Dry chemical or CO2. Water spray can be used to bring down vapour but should not be used on pools of liquid ammonia. Ammonia solutions are alkaline.
Small Fire	Water spray or fog. Dry chemical or CO2.
Large Fire	Water spray or fog.
Unsuitable extinguishing media	No information available.

Specific hazards arising from the chemical

Specific hazards arising from the chemical	May form flammable vapour mixtures with air. May form explosive mixtures with air. May be ignited by heat, sparks or flames. All potential sources of ignition (open flames, pilot lights, furnaces, spark producing switches and electrical equipment etc) must be eliminated both in and near the work area. Do NOT smoke. Flameproof equipment is necessary in all areas where this chemical is being used. Nearby equipment must be earthed. Flammable concentrations of ammonia can accumulate in the vapour space of storage containers/vessels.
Hazardous combustion products	Nitrogen oxides. Ammonia. Hydrogen.

Special protective actions for fire-fighters

Special protective equipment for fire-fighters	Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Vapors can form explosive mixtures with air. Fight fire remotely due to the risk of explosion. Fires to be fought from a protected location. Consider evacuation. Cool containers with flooding quantities of water until well after fire is out. Move containers from fire area if you can do it without risk. Do not direct water at source of leak or safety devices; icing may occur.
Hazchem code	2XE

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions	Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Remove all sources of ignition. Ensure adequate ventilation. Avoid breathing vapors or mists. Use personal protective equipment as required. See section 8 for more information. Seek specialist advice. Avoid contact with skin, eyes and inhalation of vapors.
Other information	Refer to protective measures listed in Sections 7 and 8.
For emergency responders	Shut off ignition sources. Ventilate the area. Work up wind or increase ventilation. Use personal protection recommended in Section 8. Seek specialist advice.

Environmental precautions

Environmental precautions	Should not be released into the environment. Local authorities should be advised if significant spillages cannot be contained. Prevent entry into waterways, sewers, basements or confined areas. Prevent product from entering drains. Keep out of waterways.

Methods and material for containment and cleaning up

Methods for containment	Stop leak if you can do it without risk.

Methods for cleaning up Work up wind or increase ventilation. This material is a liquefied gas.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Do not breathe vapor or mist. Avoid contact with skin, eyes, and clothing. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Protect cylinders from physical damage; do not drag, roll, slide or drop. Contents under pressure. Use personal protection equipment. Keep out of reach of children.

Ammonia gas is generally lighter than air and will disperse under normal conditions. However, when ammonia liquid contacts air the gas produced may be heavier than air. Prevent concentration in hollows and sumps. DO NOT enter confined spaces where vapour may have collected. Ammonia can lead to a reduction of oxygen concentration by displacement or dilution. The minimum oxygen concentration in air should be 18% by volume under normal atmospheric pressure.

General hygiene considerations Wear suitable gloves and eye/face protection. Avoid breathing vapors or mists. Wash hands before breaks and after work.

Conditions for safe storage, including any incompatibilities

Storage Conditions Keep containers tightly closed in a cool, well-ventilated place. Check cylinders regularly for leaks. Store away from foodstuffs and sources of heat or ignition.

This material is a Scheduled Poison and must be stored, maintained and used in accordance with the relevant regulations.

Packaging materials The transport of liquefied ammonia in a tank or bulk container made of quenched and tempered steel is prohibited unless the liquefied ammonia contains not less than 0.2% water mass. Ensure pressure gauges and fittings are not made of copper, zinc or alloys (eg brass). Refer to AS/NZS 2022 Anhydrous ammonia - Storage and Handling.

Incompatible materials Acids. Acid anhydrides. Acid chlorides. Halogens. Heavy metals. Heavy-metal compounds. Ethylene oxide. Boron. Chlorites. Chlorates. Silver. Sulfur. Oxidizing agents.

Poisons Schedule (SUSMP) 6

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Limits

Ammonia: 8hr TWA = 17 mg/m^3 (25 ppm), 15 min STEL = 24 mg/m^3 (35 ppm)

As published by Safe Work Australia Workplace Exposure Standards for Airborne Contaminants.

TWA - The time-weighted average airborne concentration of a particular substance when calculated over an eight-hour working day, for a five-day working week.

STEL (Short Term Exposure Limit) - the airborne concentration of a particular substance calculated as a time-weighted average over 15 minutes, which should not be exceeded at any time during a normal eight hour work day. According to current knowledge this concentration should neither impair the health of, nor cause undue discomfort to, nearly all workers.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls

Engineering controls

Showers
Eyewash stations
Ventilation systems.
Apply technical measures to comply with the occupational exposure limits. Ensure adequate ventilation, especially in confined areas.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as personal protective equipment

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, CHEMICAL GOGGLES, SAFETY SHOES, FACE SHIELD OR AIR MASK, GLOVES (Long).

Eye/face protection

Face protection shield. Tight sealing safety goggles.

Skin and body protection

Wear suitable protective clothing. Chemical resistant apron. Overalls. Protective shoes or boots.

Hand protection

Impervious gloves.

Respiratory protection

If determined by a risk assessment an inhalation risk exists, wear an air supplied respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716.

Environmental exposure controls

No information available.

Thermal hazards

Caution - material can be very cold.
Avoid contact with escaping gas.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Compressed liquefied gas
Appearance	No information available.
Color	Colourless
Odor	Intensely irritating ammoniacal odour. Pungent
Odor threshold	5-53 ppm

Property	**Values**	**Remarks • Method**
pH	No data available	None known
pH (as aqueous solution)	No data available	None known

Melting point / freezing point	-77.7 C	None known
Boiling point / boiling range	-33.4 C	None known
Flash point	Not available	None known
Evaporation rate	No data available	None known
Flammability (solid, gas)	No data available	None known
Flammability Limit in Air		None known
Upper flammability or explosive limits	28%	
Lower flammability or explosive limits	15%	
Vapor pressure	960 kPa @ 25C	None known
Vapor density	0.6	None known
Relative density	0.68 (-33C)	None known
Water solubility	Soluble in water	None known
Solubility(ies)	Soluble in ether and Alcohol	None known
Partition coefficient	No data available	None known
Autoignition temperature	651 C	None known
Decomposition temperature	No data available	None known
Kinematic viscosity	0.266cP @ -34 C	None known
Dynamic viscosity	No data available	None known

Other information

VOC Content (%)	100
Molecular formula	NH3

10. STABILITY AND REACTIVITY

Reactivity

Reactivity Reacts violently with acids. Hygroscopic.

Chemical stability

Stability Stable under recommended storage conditions. Dissolves exothermically in water. Hygroscopic.

Explosion data

Sensitivity to mechanical impact None.

Sensitivity to static discharge No information available.

Possibility of hazardous reactions

Possibility of hazardous reactions Corrosive to copper, zinc and their alloys. Can react explosively with chlorine, hypochlorites or other strong oxidising agents.

Hazardous polymerization Hazardous polymerization does not occur.

Conditions to avoid

Conditions to avoid Keep away from open flames, hot surfaces and sources of ignition. Loss of containment.

Incompatible materials

Incompatible materials Acids. Acid anhydrides. Acid chlorides. Halogens. Heavy metals. Heavy-metal compounds. Ethylene oxide. Boron. Chlorites. Chlorates. Silver. Sulfur. Oxidizing agents.

Hazardous decomposition products

Hazardous decomposition products Nitrogen oxides. Ammonia. Hydrogen.

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Information on likely routes of exposure

Product Information No adverse health effects expected if the chemical is handled in accordance with this Safety Data Sheet and the chemical label. Symptoms or effects that may arise if the chemical is mishandled and overexposure occurs are:

Inhalation Toxic if inhaled. Inhalation of corrosive fumes/gases may cause coughing, choking, headache, dizziness, and weakness for several hours. Pulmonary edema may occur with tightness in the chest, shortness of breath, bluish skin, decreased blood pressure, and increased heart rate. Large exposures may be fatal. In high concentration the gas may cause a suffocation. Victim may not be aware of asphyxiation.

Eye contact Severely irritating to eyes. Causes burns. Corrosive to the eyes and may cause severe damage including blindness. When cold:. Contact with product may cause frostbite. Can result in permanent injury.

Skin contact Contact causes severe skin irritation and possible burns. Caution - material can be very cold. Contact with product may cause frostbite.

Ingestion Not an expected route of exposure. Can burn mouth, throat, and stomach.

Symptoms Irritation/Corrosion. Burning. May cause redness and tearing of the eyes. Coughing and/ or wheezing. May cause blindness. Difficulty in breathing. Erythema (skin redness).

Numerical measures of toxicity - Product Information

Chemical name	Oral LD50	Dermal LD50	Inhalation LC50
Ammonia	= 350 mg/kg (Rat)	-	= 2000 ppm (Rat) 4 h

See section 16 for terms and abbreviations

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation Causes severe burns.

Serious eye damage/eye irritation Causes burns. Causes serious eye damage.

Respiratory or skin sensitization No information available.

Germ cell mutagenicity No information available.

Carcinogenicity No information available.

Reproductive toxicity No information available.

STOT - single exposure No information available.

STOT - repeated exposure No information available.

Aspiration hazard No information available.

Chronic effects: Chronic exposure to ammonia may cause chemical pneumonitis and other lung effects.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity Keep out of waterways. Component (ammonia) is very toxic to aquatic life.

Chemical name	Algae/aquatic plants	Fish	Toxicity to microorganisms	Crustacea
Ammonia	-	LC50: =0.44mg/L (96h, Cyprinus carpio) LC50: 0.26 - 4.6mg/L (96h, Lepomis macrochirus) LC50: =1.17mg/L (96h, Lepomis macrochirus) LC50: 0.73 - 2.35mg/L (96h, Pimephales promelas) LC50: =5.9mg/L (96h, Pimephales promelas) LC50: >1.5mg/L (96h, Poecilia reticulata) LC50: =1.19mg/L (96h, Poecilia reticulata)	-	LC50: =25.4mg/L (48h, Daphnia magna)

Persistence and degradability

Persistence and degradability Ammonia is readily oxidised to nitrate, which is also toxic to fish.

Bioaccumulative potential

Bioaccumulation Bioaccumulation is not expected.

Chemical name	Partition coefficient
Ammonia	-1.14

Mobility

Mobility in soil After release, disperses into the air.

Other adverse effects

Other adverse effects High concentrations may harm aquatic life by the effect on pH.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations. Dispose of waste in accordance with environmental legislation.

14. TRANSPORT INFORMATION

ADG

Classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code) for Transport by Road and Rail; DANGEROUS GOODS.

UN number	1005
Proper shipping name	AMMONIA, ANHYDROUS
Hazard class	2.3
Subsidiary hazard class	8
Hazchem code	2XE

IATA

Classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; DANGEROUS GOODS.
TRANSPORT PROHIBITED under the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air in Passenger and Cargo Aircraft, and Cargo Aircraft Only.

UN number	1005
UN proper shipping name	AMMONIA, ANHYDROUS
Transport hazard class(es)	2.3
Subsidiary hazard class	8

IMDG

Classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; DANGEROUS GOODS.

UN number	1005
UN proper shipping name	AMMONIA, ANHYDROUS
Transport hazard class(es)	2.3
Subsidiary hazard class	8
IMDG EMS Fire	F-C
IMDG EMS Spill	S-U
Marine pollutant	Yes

15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

National regulations

Australia

Classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG).

Classified as a hazardous chemical in accordance with the criteria of Safe Work Australia - Globally Harmonized System (GHS).

See section 8 for national exposure control parameters

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Major hazard (accident/incident planning) regulation

Verify that license requirements are met

Chemical name	Threshold quantity (T)
Ammonia - 7664-41-7	200 tonne TQ anhydrous, liquefied or solution;relative density <0.880 at 15°C in water;with >50% Ammonia

National pollutant inventory

Subject to reporting requirement

Chemical name	National pollutant inventory
Ammonia - 7664-41-7	10 tonne/yr Threshold category 1 total

International Inventories

AIIC	This material is listed on the Australian Inventory of Industrial Chemicals.
NZIoC	This material is listed on the New Zealand Inventory of Chemicals.

Legend:
- Australian Inventory of Industrial Chemicals

International Regulations

The Montreal Protocol on Substances that Deplete the Ozone Layer Not applicable

The Stockholm Convention on Persistent Organic Pollutants Not applicable

The Rotterdam Convention Not applicable

16. OTHER INFORMATION

Reason(s) For Issue: 5 Yearly Revised Primary SDS

Issuing Date: 13-Oct-2021

This Safety Data Sheet has been prepared by Ixom Operations Pty Ltd (Toxicology and SDS Services).

Revision Note:
The symbol (*) in the margin of this SDS indicates that this line has been revised.

Key or legend to abbreviations and acronyms used in the safety data sheet

Legend Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
Ceiling	Maximum limit value	*	Skin designation
C	Carcinogen		

Key literature references and sources for data used to compile the SDS

EPA (Environmental Protection Agency)
Acute Exposure Guideline Level(s) (AEGL(s))
U.S. Environmental Protection Agency Federal Insecticide, Fungicide, and Rodenticide Act
U.S. Environmental Protection Agency High Production Volume Chemicals
Food Research Journal
Hazardous Substance Database
International Uniform Chemical Information Database (IUCLID)
Japan GHS Classification
Australian Industrial Chemicals Introduction Scheme (AICIS)
NIOSH (National Institute for Occupational Safety and Health)
National Library of Medicine's ChemID Plus (NLM CIP)
National Library of Medicine's PubMed database (NLM PUBMED)
National Toxicology Program (NTP)
New Zealand's Chemical Classification and Information Database (CCID)
Organization for Economic Co-operation and Development Environment, Health, and Safety Publications
Organization for Economic Co-operation and Development High Production Volume Chemicals Program
Organization for Economic Co-operation and Development Screening Information Data Set
RTECS (Registry of Toxic Effects of Chemical Substances)
World Health Organization

Disclaimer
This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

End of Safety Data Sheet