1. PURPOSE

Confined spaces present unique health and safety problems often involving invisible hazards. This SOP details safe work practices to be followed at all work sites involving sewerage facilities including manholes, wet wells and pump stations. All East Gippsland Water (EGW) staff and contractors have a shared responsibility for safety in such environments.

2. APPROVAL

Managing Director

3. SAFETY

This procedure recognises that employers, managers, employees and contractors have statutory obligations under *Occupational Health & Safety* legislation and has been prepared in order to meet specific needs and work conditions for EGW staff and contractors.

Potential risks and hazards involving sewerage facilities include:

- Fire and explosion from flammable liquids and gases
- Toxic gases
- Drowning
- Asphyxiation due to lack of oxygen
- Falling from ladders, stairs, landings etc.
- Fumes from welding and combustion engines
- Manual handling in a restricted space
- Vapours from solvents and paints
- Infections due to exposure to waste water and/or other pathogens

4. DEFINITIONS

Authorised Persons:
Person who is authorised to take control of a confined space entry work crew.

Competent Person:
Any employee who has completed approved confined space entry initial or refresher training within the last 12 months, and has also been trained in these procedures and been deemed by their works superintendent/assistant works superintendent to be capable of correctly performing a confined space entry task.

Contaminant:
Is any dust, mist, vapour, gas, liquid or other substance which maybe harmful to a person's health and safety.

Flammable Range:
Is the range of flammable gas or vapour (% by volume in air) in which explosion can occur upon ignition. Expressed by the range between the Lower Explosive Limit (LEL) and the Upper Explosive Limit (UEL).

Health and Safety Representative:
Any elected Health and Safety representative.

Lower Explosive Limit (LEL):
Is the concentration of flammable gas, mist or vapour in air below which an explosive gas atmosphere will not be formed.

Safe Oxygen Level:
A minimum oxygen content in the atmosphere of 19.5% per volume and a maximum oxygen content of 23.5% under normal atmospheric pressure.

Sewerage Facilities:
All elements of a sewer system including manholes, wet wells, pump stations and sewer treatment works components

Upper Explosive Limit (UEL):
Is the concentration of flammable gas, mist or vapour in air above which an explosive gas atmosphere will not be formed.

5. RESPONSIBILITIES

All EGW tasks involving confined space entry will be carried out in accordance with Part 3.4 of the Occupational Health and Safety Regulations 2007; the WorkSafe Victoria Code of Practice for Confined Spaces; and Australian Standard AS 2865-2001 Safe Working in a Confined Space. This SOP has been developed to accord with these documents. This version supersedes all previous instructions relating to such work in sewerage facilities.

5.1 Executive Manager Operations is to:

- ensure that all appropriate actions are taken to implement this SOP.
- ensure that resources are made available to enable initial training and the annual refresher training to be carried out.
- hold supervisors under his direction accountable for meeting the objectives of this policy.

5.2 Works Superintendents are to ensure that:

- all available information on Confined Space Entry is made available to all staff.
- Confined Space Entry training is carried out as required.
- equipment listed in Appendix 1 is available.
- Entry Permits and atmospheric test results for their area of responsibility are retained in accordance with this SOP.
- new employees receive training before they perform the roles of entry or standby person.

5.3 Competent Persons are to:

- ensure that the procedures detailed in this manual are followed by the Authority's staff and contractors whenever entry is required to a sewerage facility/confined space.
- present themselves for refresher training as required.
- record the results of atmospheric testing as required and advise the workplace supervisor and other staff of any dangerous atmospheres.
- ensure that the correct safety equipment is being used, and that all safety equipment is in good order and only being used for the task that it was designed.
- report any defective equipment to their supervisor.

5.4 Health and Safety Representatives.

Health and Safety Representatives should work with management in promoting the adoption on safe working practices in relation to work in confined spaces. In particular they should encourage the following practices:

- The prompt reporting of any unsafe atmospheres to the supervisor.
- The prompt reporting of any defective safety equipment to the supervisor.
- Bringing any suggestions for improvement to equipment or procedures to the notice of their Supervisor or the OHS Officer.

6. PROCEDURE

6.1 Procedures mandatory

Procedures specified in this SOP are mandatory; binding on all EGW staff and contractors; apply to all work in sewerage facilities; and are designed to minimise hazards associated with work in these environments. Failure by EGW staff to adhere to the processes specified may result in disciplinary action. Similar action or penalties may apply to EGW contractors found breaching requirements as specified in this SOP. This SOP is to be read in conjunction with SOP096 – Working with Wastewater.

6.2 Distribution of SOP

A copy of this SOP is available in the Contractor Safety On-line section of EGW's website.

6.3 Confined Space Entry Permit (Form 036)

All work in confined spaces is to be subject to the completion of a confined space entry permit, duly authorised and signed before any person enters the confined space. Completed permits are to be maintained at the relevant depot and held with the relevant Form 048 Field Work Hazard Identification and Control Checklist.

The use of Form 036a is restricted to routine entry for cleaning sewer pump stations only and may be modified by Depot Superintendents to include sewer pump station identifiers in the outer columns.

6.4 Smoking, Welding and Fires

Smoking, welding, lighting fires or other naked lights in, or within 6 metres of the entrance to any confined space is prohibited. If hot work needs to be performed in the confined space, a Hot Work Permit must be issued (part of Form 036).

6.5 Matches and Cigarette Lighters

Matches or cigarette lighters are not to be carried on a person while working in, or inspecting sewerage facilities.

6.6 Equipment

6.6.1 Portable Lighting and Electrical Equipment

Given that EGW staff will not enter an atmosphere where the concentration of gas exceeds 5% of the LEL or remain in an atmosphere where the concentration of gas exceeds 10% of the LEL, conventional portable lighting and electrical equipment may be used. However, torches with globes and outer covers or lenses are to be used rather than sealed beam types.

6.6.2 Safety Helmets

Safety helmets are to be worn when working in, or inspecting sewer manholes, wet wells and drains where practicable. If it is not deemed practicable to wear a safety helmet, the competent person is to document the reasons for this on the entry permit. Safety helmets must be worn when work is being performed above the person in the confined space.

6.6.3 Warning Signs and Barricades

(a) When working in roadways or other traffic areas, erect warning signs and barricades. Follow the guidelines in the relevant Australian Standards Traffic Management Handbooks, copies of which are available at all depots.

(b) When working in footpaths or unfenced private properties, erect barricades or install mesh covers at unattended open manholes. At night, place barricades and lights at all open manholes.

(c) Confined Space Entry warning signs must be erected at each job site during any work on confined spaces. The signs must specify that it is a confined space and that entry to the confined space is by permit only.

6.6.4 Safety Lines

(a) Anyone working in a manhole must wear an approved harness with a safety line attached, unless there is potential for the safety line to tangle in equipment while working. In this case, the safety line may be disconnected but must remain at the base of the access ladder and be reconnected before ascent out of the confined space. Unless barricaded with a suitable fall prevention device, the observer/stand by person is also to be connected to a safety line whilst around an open manhole.

(b) Control the ascent and descent of personnel below by attending the safety line to prevent falling.

(c) When working in manholes deeper than 2 metres, a winch must be used to control the safety line.

(d) Constantly control the safety line whilst people are working below and connected to the safety line.

(e) Do not use safety lines or harnesses for any other than their designed purpose.

6.6.5 Self Rescue Breathing Sets

An Australian Standards approved self rescue breathing set must be available for each person working below and carried within easy reach to provide immediate access if required. Staff must be appropriately trained in the use of such equipment.

6.7 Testing the Air

The air shall be tested prior to entry to any sewer.

6.7.1 Equipment

Air testing shall be conducted using an Australian Standards approved gas detection meter with four sensors for Flammable Gas, Oxygen, Hydrogen Sulphide and Carbon Monoxide. Prior to each use gas detectors are to be:

- checked for calibration date (within 6 months)
- checked for sufficient battery power and life
- zeroed in clean fresh air to establish a benchmark reference; and
- challenged using certified challenge gases.

6.7.2 Routine Tests

Initial Test: Test the air around the confined space opening. Without introducing sparks, carefully crack open lid just enough to test inside the space. Then slowly test from the opening down into the space at one metre intervals. Beware of pockets of gas.

Peak levels should be checked to ensure they comply with the following:

- Oxygen between 19.5 and 23.5 % (see definition for *safe oxygen level*)
- Explosive gas less than 5% of the LEL for the gas
- Hydrogen Sulphide less than 10 ppm
- Carbon Monoxide less than 30 ppm

If the levels are found to be outside the above concentrations, **DO NOT ENTER** the space, increase ventilation and repeat the routine tests. If the second set of tests fails to pass, record the concentrations and advise the authorised person to determine what further action to take. This could involve further ventilation.

Keep the gas detector or its sample lead in the space at all times at working level while in the space to continuously monitor the work atmosphere and be on the alert for any alarms.

6.7.3 Explosive Gases

If explosive gases are found to be present at concentrations greater than 5% of their LEL after 10 minutes venting, all covers shall be replaced and the job location reported to the Works Superintendent/Executive Manager Operations immediately. No entry to a sewerage facility shall be permitted if the concentration of explosive gas is greater than 5% of its LEL.

Once the confined space has been entered and providing it is continuously monitored for LEL, evacuation must occur if the LEL of the gas reaches 10%.

In the event of an alarm for any substance, check the reading and get out.

6.8 Work Crew Sizes

The specific requirements for work crew sizes for all work in sewerage facilities are:

(a) Number of persons. There must be at least two people in the working party, one must remain at the opening to act as observer/stand by person and to assist the person in the space if needed. Where there is more than one person in the space, there must be an equal number at the opening/entry.

(b) Communication between the entry person and observer/stand by person is to be maintained at all times.

6.9 Communications

(a) Radio or telephone communication must be available on-site.

(b) Maintain regular and continuous communication between the surface and those below by using:

(i) Voice

(ii) Approved radio communication equipment

(iii) Signals on the safety line

One tug - stop (when in motion), two tugs -lower, three or more tugs - to attract attention

(c) Distress signal. It is essential to maintain communication between the surface and the work-site so that help can be given when someone indicates distress.

6.10 Distress/Emergency Procedures

6.10.1 Person Below

If the gas detector alarms or a dangerous gas is suspected; or the person experiences eye irritation, headache, dizziness, shortness of breath or nausea, the self rescue respirator is to be immediately put on and if unable to exit by self, signal distress to the observer/stand by person or tug on the lifeline.

6.10.2 Observer/Stand By Person

If a person working below gives a distress signal, follow the Emergency Procedures (Refer Appendix 8).

6.11 Personal Hygiene

6.11.1 Risk of Infection

The risk of infection is minimised by wearing gloves, eye protection, and keeping hands away from your face. Hands are to be washed thoroughly before eating or smoking.

6.11.2 Protective Creams

Barrier cream and hand cleaner is provided for use on hands and forearms.

6.11.3 Clothing

All contaminated work clothes and equipment are to be thoroughly cleaned. Contaminated clothing is to be laundered using washing facilities located within each depot.

6.11.4 Abrasions and Cuts

Abrasions and cuts are to be treated immediately, using the first aid kit. Details of any injury are to be entered in the Register of Injury, Illness and Disease, and an incident and investigation report completed and forwarded to the Health, Safety & Systems Coordinator.

6.12 Training

All personnel involved in confined space entry tasks must hold a current Confined Space Entry Record of Training card. The training is to be competency based to the required EGW standard.

Refresher training is provided annually for all field-based operations staff and is conducted locally.

Initial training for new operations employees is to be completed before the employee is used as either the entry or standby person on a confined space entry task. Such training may be provided locally, or is available at Chisholm Institute of Technical and Further Education.

6.13 Excavations into Sewers

When a shaft or trench is excavated to enable a 'cut in' to a sewer main or manhole, the following procedures are to be followed during the period the sewer is being broken into and until it is resealed.

- Complete Entry Permit (Section 6.3)
- Use harness and safety lines if practicable (safety lines may need to be disconnected if they are likely to tangle with ground support structures)
- Use winch or sewer access device if practicable (width of trench may not permit the use of winches)
- Self rescue respirator (Section 6.6.5)
- Air testing (Section 6.7)
- Work Crew sizes (Section 6.8)
- Communications (Section 6.9)

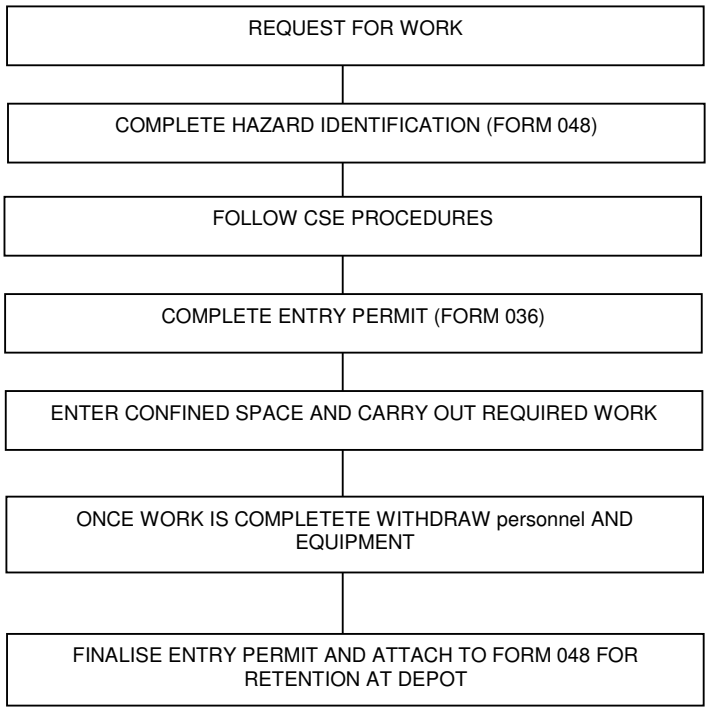
Air testing should be conducted from just prior to the break in until sufficient back filling is replaced to ensure no gases are released from ground contaminated by sewerage spills or surcharge.

6.14 Basic Confined Space Entry Procedure

1. Prior to entering any new Confined Space a Work Site Hazard Identification must be carried out using Form 048.
2. Complete Form 036 - Confined Space Entry Permit.
3. Ensure that adequate trained personnel (at least two) are on site.
4. Ensure CSE signage is erected at the work site.
5. Ventilate the Confined Space for at least 10 minutes (refer Appendix 3).
6. Carry out a pre-entry atmospheric test on the Confined Space using a gas detector. (Check for within calibration date.) If the atmosphere is found to be safe, continue,
7. Prior to entering the Confined Space the entry permit (Form 036) must be completed and particular emphasis paid to ensuring pre-entry test results are recorded and that a review of Isolation Requirements and Changing Conditions in the Confined Space has occurred.
8. Review and carry out any Lockout and Isolation needs that may be required to stop any machinery or electrical equipment or valves activating operating whilst work is carried out in the Confined Space.
9. Ensure that continuous monitoring of the atmosphere occurs whilst work is carried out in the Confined Space.
10. Once work is completed in the Confined Space and all staff have been removed the entry permit must be finalised. The completed Form 036 should be attached to the Form 048 and retained at the depot in accordance with normal requirements.

6.15 Flow Chart

The following flow chart is a summary of the entry requirements of this SOP.



7. RISK MANAGEMENT

Adherence to this SOP will reduce the risk associated with confined space entry into sewers and sewer systems.

8. REFERENCES

- Occupational Health and Safety Act 2004
- Occupational Health and Safety Regulations 2007, Part 3.4
- WorkSafe Victoria Code of Practice for Confined Spaces
- WorkSafe Victoria Code of Practice for Hazardous Substances
- Australian safety and Compensation Commission (formerly National Occupational Health & Safety Commission) Exposure Standards for Atmospheric Contaminants in the Occupational Environment, 3rd edition
- AS 2865:2001 Safe Working in Confined Spaces

Legal ramifications are dealt with in detail in the *SafeAS Management System Guide* (Volume 1 section 8 OHS Legal Framework).

9. REFERENCED FORMS

- Form 036 - Confined Space Entry Permit
- Form 048 - Field Work Hazard Identification and Control Checklist

APPENDICES

Appendix 1 - Safety Equipment
Appendix 2 - Personal Hygiene
Appendix 3 - Notes on Ventilation of Sewers
Appendix 4 - Check Lists
Appendix 5 - Dangerous Gases
Appendix 6 - Emergency Procedures
Appendix 7 - Work District Emergency Numbers

APPENDIX 1

SAFETY EQUIPMENT

Equipment Checklist

The following is a list of equipment that is to be available for use for confined space entry tasks.

1. First Aid Kits
2. Safety Helmets
3. Safety Harnesses
4. Safety Lines
5. Self Rescue Breathing Apparatus (Australian Standards approved)
6. Air Line Breathing Apparatus and sufficient spare air cylinders.
7. Torches and other lighting
8. Personnel Winches
9. Electronic Gas Detection Meters (Australian Standards approved, four sensor)
10. Mechanical Blowers and Ducting
11. Water Hoses for Spray Ventilation
12. Traffic Warning Signs, Barricades, Flashing Lights, Witches Hats, Delineators and Red Flags (conforming to Australian Standard 1742.3, Manual of uniform traffic control devices Part 3: Traffic control devices for works on roads, or Standards Australia Handbooks HB81.1 – 1996 or HB81.2 – 1996, as appropriate)
13. Portable Radio Facilities or Mobile Telephone
14. Spare Battery for radio/telephone and torch
15. Confined Space Entry warning signs
16. Gloves, safety glasses/goggles, gumboots.
17. Hand cream

APPENDIX 2

PERSONAL HYGIENE

A2.1 Prevention

- Good personal hygiene is important.
- Rashes and skin irritations should be seen early by a local doctor, then reported to the Occupational Health Division.
- Recurring cases of rashes should be investigated with the view to finding a cause.
- Substitution of chemicals known to be irritants or allergens should be made.
- Maintain cleanliness of general work areas.
- Ensure availability of adequate washing facilities at the job site.
- Use protective clothing (i.e gloves, spectacles, overalls, etc.)

A2.2 Hand Care

- Use protective gloves provided that are appropriate to the task.
- Barrier creams should be re-applied frequently during the day (wash before re-application). They act as a barrier to irritant chemicals, promote "skin consciousness" and make the removal of contact factors easier.
- Harsh detergent, chemical or petroleum based solvents (kerosene, turpentine, thinners), or hard mineral spirits, must be avoided as they damage the skin making it more vulnerable to drying and cracking.
- Abrasive cake soaps containing around 30% insoluble mineral abrasive silica and feldspar should not be present. Abrasive soaps should not be used on a regular basis as they are harsh on the skin. Their use should be limited to difficult cleaning tasks. They should be used rapidly and thoroughly rinsed off, followed by the application of a moisturising cream.
- Only recommended hand cleaners and barrier creams should be used. These have been chosen for their safe properties (lack of solvents so they do not dry out the skin's natural oils).

A2.3 Personal Hygiene Practices

- Hands and face should be thoroughly cleaned prior to eating, drinking and smoking.
- Hands should be washed before and after using the toilet.
- Shower at the end of the day.
- Use clean clothing as often as possible.
- Take care of your hands.

NOTES ON VENTILATION OF SEWERS

It can normally be expected that the sewage flow will tend to drag the air along the top of the pipe in the same direction as the flow. The air will only be able to move if there is some form of opening at either end to act as intake and exhaust vents.

In any case, the natural ventilation draft can be upset from time to time by a number of factors. A mechanical blower can readily overpower the natural processes. The wind blowing across the top of a vent will create a local suction that will vary from vent to vent, depending upon the local strength of the wind and the exposure of the vent. The daily flow variations will cause air to be drawn in or expelled as the depth of the sewage rises and falls. The direction and strength of the draft at any one time will be a combination of all these effects.

The practice of opening the work manhole and the upstream and downstream manhole permits the sewer flow to set up a draught from upstream to downstream, in the course of which, the work manhole will act as a secondary intake or exhaust, depending on local circumstances.

Opening the manholes above and below the work ensures that air in the work manhole is turned over whichever way the sewer is venting. However, because the work manhole is in the middle, the turnover of air is slow. Obviously, the turnover of air in the work manhole will be much more efficient if the work is arranged so that whatever ventilation pressures are at work will suck air from the work manhole. These procedures require that manhole covers be progressively removed in order to find the method that most reliably causes this to happen.

For ordinary reticulation sewers, opening a cover can be relied upon to produce a draught that will turn the air over in 5 minutes. However, that draught will often be too slight to detect. If it cannot be detected, there can be no guarantee whether the draught in the manhole is intake or exhaust. If selective removal of covers does not result in a detectable draught, the procedures require a reversion to the old system of opening covers upstream and downstream and allowing the manhole length to breathe for at least 5 minutes.

Main sewers have a significantly greater capacity to suddenly discharge toxic fumes into the work manhole. Industrial sewers are more likely to contain toxic substances. Deep manholes require a longer time to ventilate. The procedures will only permit entry to these manholes if there is a definite flow of fresh air into the work manhole.

It is expected that it will frequently be necessary to use forced ventilation for such work. In setting up a fan, remember that the movement of air at any one point will be the result of the many ventilation forces at work. Depending on circumstances, the blower might be putting most of its effort into neutralising the natural ventilation forces. The blower will be much more effective if you set up to reinforce the natural ventilation.

The most reliable ventilation process will be achieved by sealing off all the airways except the ones you are interested in. Air curtains of plastic strips hung across the mouth of a manhole do not attempt to provide a perfect seal but seriously restrict the air flow along the sewer. For smaller sewers, a sandbag, a silt trap or a bat held in the flow upstream section will assist in restricting air flow along the sewer. The best ventilation conditions will be achieved by sealing off the airway on the upstream side of the work manhole and on the downstream side of the downstream manhole, and by sucking air from the downstream manhole.

The use of airline breathing apparatus is compulsory for certain types of work and encouraged for work where the air is safe but unpleasant. The airline can provide proper protection against oxygen deficiency, hydrogen sulphide and other toxic gases up to 100 times their WorkSafe TWA concentrations, but provides no protection against an explosive atmosphere. Expert analysis of the air is necessary before entry can be made in these circumstances.

NOTE: Thermal convection acting at vent pipes on properties may cause air movement up sewers on warm days.

CHECK LISTS

A4.1 Isolation of the confined space:

Incoming sewers
Electrical services (pumps, penstocks)
Hazardous substances (sewage, sludge)
Mechanical services (drive shafts)

A4.2 Hazards likely to be encountered:

Oxygen deficiency
Flammable gas
Toxic gases
- Hydrogen Sulphide
- Carbon Monoxide
- Other (check for likely Trade Waste discharges in the vicinity)

Work processes
- Welding
- Power leads
- Drilling
- Chemicals
- Traffic and/or pedestrians

A4.3 Safety Equipment:

Respiratory protection
- Airline
- Self Contained Breathing Apparatus (SCBA)
- Self Rescue Breathing Apparatus

Gas detector(s) - ensure battery operation and within 6 month calibration date
Harness
Winch
Eye protection
Hand protection
Safety footwear
Safety helmet
Hearing protection
Ventilation
- Natural
- Mechanical
- Spray

Traffic warning devices
Lighting
Confined Space Entry warning signs

A4.4 Work crews:

Training
Gang sizes required
Responsible Officers

A4.5 Communications:

With emergency services
Between ground party and entry personnel

DANGEROUS GASES

There are three main gas hazards in a confined space environment:

- Lack of oxygen
- Explosive gases
- Toxic gases

Following is a brief description of the type of flammable and toxic gases that may be encountered in the sewer environment.

DEFINITIONS

Exposure Standard represents an airborne concentration of a substance in a person's breathing zone, which according to current knowledge, should neither impair employees' health nor cause them undue discomfort.

mg/m^3 means milligrams of substance per cubic metre of air at 25°C and at one atmosphere pressure

ppm means parts of vapour or gas per million parts of contaminated air by volume

PEAK means the maximum concentration that should not be exceeded at any time during a working day – applied to rapidly acting substances and irritants

STEL means 'short term exposure limit' – an atmospheric concentration averaged over a 15 minute period, and the maximum uncontrolled exposure to a substance allowed for this period – usually applied where adverse health effects can be caused by relatively high short term exposure

TWA means 'time weighted average' – an atmospheric concentration averaged over an 8 hour working day and applies to a 40 hour working week, and the maximum uncontrolled exposure to a substance allowed for this period

HEAVY GASES

Hydrogen Sulphide

Relative density	-	1.19 (air = 1)
Exposure standard	-	TWA 10 ppm STEL 15 ppm
Gas characteristics	-	Distinctive odour (rotten eggs) but not evident at high concentrations. Colourless, explosive, very poisonous, inflammable (5% LEL=2150 ppm)
Effects on the body	-	This gas is rapidly fatal even in low amounts, a concentration of 0.2% (2000 ppm) causing death in a few minutes. In low (but dangerous) concentrations, the gas will be initially detectable by its distinctive rotten egg odour. However, the gas will quickly paralyse the sense of smell and it may be mistakenly believed that the gas has dispersed. In high concentrations, paralysis of the sense of smell will occur after only seconds contact. It will cause irritation of the eyes and nose slightly less intense than that due to chlorine.
Testing method	-	Electronic gas detection meter, Drager tubes.

Petrol Vapour

Relative density	-	2.50 to 4.00 (air = 1)

Exposure standard	-	TWA 900 mg/m³
Gas characteristics	-	Distinctive odour, colourless, flammable, explosive.
Effects on the body	-	Suffocating. A concentration of 1 to 2% is dangerous and over 2% is rapidly fatal.
Testing method	-	Smell, Drager tube.

Anaesthetics

Gas characteristics	-	Usually sweet - sickly.
Effects on the body	-	Dulls senses.
Testing method	-	Can be detected by smell.

Carbon Dioxide

Relative density	-	1.53 (air = 1)
Exposure standard	-	TWA 5,000 ppm STEL 30,000 ppm
Gas characteristics	-	Odourless, colourless, non-flammable, will not support combustion.
Effects on the body	-	This gas has no odour. It acts as a stimulus to the respiratory nerves which will increase the breathing possibly up to the gasping stage. If present in large quantities, it may cause an acid taste. Causes ears to ring. 10% concentration (100,000 ppm) cannot be endured for more than a few minutes. Collapse or death will be caused by asphyxiation due to lack of oxygen.
Testing method	-	Electronic meter (low oxygen), Drager tubes.

Chlorine

Relative density	-	2.49 (air = 1)
Exposure standard	-	1 ppm (**peak** limitation)
Gas characteristics	-	Yellowish-green gas, choking odour, non-flammable.
Effects on the body	-	Yellow-green gas, irritates eyes, nose and throat causing coughing and pain in the chest. In liquid form, it irritates the skin. Will kill quickly even in very low concentrations.
Testing method	-	Drager tubes. Concentrations as low as 0.02 parts per million can be detected by smell.

LIGHT GASES

Ammonia

Relative density	-	0.60 (air = 1)
Exposure standard	-	TWA 25 ppm STEL 35 ppm
Gas characteristics	-	Colourless, strong characteristic odour, irritating, explosive.
Effects on the body	-	Irritant to respiratory system, eyes and skin.
Testing method	-	Concentrations from 5 ppm can be detected by smell, Drager tubes.

Carbon Monoxide

Relative density	-	0.97 (air = 1)
Exposure standard	-	TWA 50 ppm STEL 200 ppm
Gas characteristics	-	Odourless, colourless, flammable (5% LEL = 6,250 ppm), explosive, non-irritating, very poisonous.
Effects on the body	-	Exceedingly poisonous when inhaled and it is colourless, tasteless and odourless. The symptoms are dizziness, headache, drowsiness, weakness of legs, dimness of vision, loss of hearing and palpitations all leading to complex collapse. Victims must be moved into the open air, kept warm and must not exert themselves. Victims must be kept awake at all costs and if this is not possible, apply artificial respiration (not mouth to mouth) and oxygen.
Testing method	-	Electronic gas detection meter. Drager tubes.

Methane

Relative density	-	0.55 (air = 1)
Gas characteristics	-	Odourless, colourless, flammable (5% LEL = 2,500 ppm)
Effects on the body	-	Deprives tissue of oxygen and does not support life.
Testing method	-	Electronic meter, Drager tubes.

Sludge Digestion Tank Gas

Relative density	-	variable
Gas characteristics	-	May be practically odourless and colourless but flammable. Consists principally of Methane and Carbon Monoxide with small amounts of Hydrogen Sulphide Nitrogen and Sulphuric compounds.
Effects on the body	-	Will not support life.

Nitrogen

Relative density	-	0.97 (air = 1)
Gas characteristics	-	Colourless, odourless.
Effects on the body	-	High concentrations are associated with a lack of oxygen.
Testing method	-	Electronic meter (low oxygen levels).

APPENDIX 6

EMERGENCY PROCEDURES

If a worker is overcome:

1 Do not attempt to rescue if you cannot protect yourself from the same hazards that have overwhelmed your workmate.

2 Summon help:

a From the rest of the work crew;

b From your Depot contact number:

Bairnsdale:	**5152 4012**
Lakes Entrance:	**5155 1367**
Mallacoota:	**5158 0414**
Omeo:	**5159 1548**
Orbost:	**5154 2205**

c From the Ambulance Service and/or Fire Brigade **000**

3 Apply first aid as quickly as possible.

4 **Obtain medical treatment:**

If the victim is unconscious or showing significant symptoms, summon an ambulance. If the victim has been only mildly affected, he or she may be driven to the nearest public hospital.

Remember to provide your exact location (including VicMap reference if possible) and a return mobile telephone number.

Medical opinion must be obtained in every case of gas attack or suspected gas attack.

Gassing victims must never be permitted to drive until declared fit by a doctor.

5 Once the needs of the patient have been attended to, report the circumstances to your supervisor (to allow the incident to be fully investigated and the cause identified).

6. **Emergency Phone Numbers:**

Fire Brigade	**000**
Ambulance	**000**
Police	**000**

APPENDIX 7

WORK DISTRICT EMERGENCY NUMBERS

Emergency Phone Numbers for Work Districts

Bairnsdale	Ambulance:	000
	Hospital:	5150 3333
	Fire Brigade:	5152 3000
	Police:	5152 0500

Lakes Entrance	Ambulance:	000
	Community Health Centre:	5155 1314
	Fire Brigade:	5155 1737
	Police:	5155 1206

Mallacoota	Ambulance:	000
	Hospital:	5158 0777
	Fire Brigade:	5158 0288
	Police:	5158 0280

Omeo	Ambulance:	000
	Hospital:	5159 1233
	Fire Brigade:	5159 1231
	Police:	5159 1222

Orbost	Ambulance:	5154 3000 or 000
	Hospital:	5154 1277
	Fire Brigade:	5154 1323
	Police:	5154 1073