



Management of Chlorinated Solvents

Strategic Environmental Compliance and Performance Review



Office of
Environment
& Heritage

Management of Chlorinated Solvents

Strategic Environmental Compliance and Performance Review

This Strategic Environmental Compliance and Performance Review was undertaken by the Compliance and Assurance Section, Office of Environment and Heritage NSW.

More information

For technical information on the matters discussed in this paper, contact the OEH Compliance and Assurance Section on (02) 9995 5000.

Cover photos

Main: Warehouse storage of packaged chemicals, including chlorinated solvents (E Howard/OEH)
Top: Exterior placarding on a warehouse storing dangerous goods, including chlorinated solvents classified as Class 6: Toxic substances (E Howard/OEH); *Middle:* A degreasing tank (R West/OEH);
Bottom: Hazmat box containing emergency response plan for effective management of onsite environmental emergencies (N Wilmot/OEH)

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Executive summary

The NSW Office of Environment and Heritage (OEH) has completed a review of the management of chlorinated solvents to help improve environmental performance.

The review focused on requirements in New South Wales environment protection licences for the management of chlorinated solvents across various industry types. These included chemical production and storage, metallurgical activities, and waste storage and processing. The review involved compliance audits, together with research into best environmental management practices.

The objectives of the review were to:

- assess the level of licensee compliance with the requirements in environment protection licences for the handling, storage and disposal of chlorinated solvents
- assess the adequacy and appropriateness of the current management practices and procedures used by licensees to handle, store and dispose of chlorinated solvents.

The scope was limited to examining the following activities in relation to the management of chlorinated solvents:

- storage and handling of chlorinated solvents
- maintenance of plant and equipment
- emergency management
- waste storage and disposal.

About this report

This report summarises the findings of the compliance audits completed by OEH.

The report also provides:

- guidance on how licensees who work with chlorinated solvents can improve their environmental performance by implementing best environmental management practices
- information on other initiatives to help licensees improve their environmental performance.

Key findings

The audits and review of best environmental management practice demonstrate that licensees can improve their environmental performance and reduce the potential for environmental harm by:

- ensuring that chlorinated solvents are stored in areas made from materials that are substantially resistant and sufficiently impervious to chlorinated solvents to enable spills to be recovered and prevent environmental harm
- ensuring that packaged goods containing chlorinated solvents are clearly labelled to indicate this and that placards displayed in buildings storing these Class 6.1 toxic chemicals are readily identifiable so that appropriate action can be taken in emergencies
- developing and implementing an emergency management plan covering all incidents that may occur on site
- properly maintaining plant and equipment, including the seals over expansion joints in concrete floors, chemical storage areas, storage tanks and fixed pipelines so that any potential risk of soil and groundwater contamination is minimised.

OEH has completed a systematic and rigorous process of follow-up action to ensure that management issues identified at the audited sites are being addressed.

The issues identified are similar to those found in the 2005 environmental compliance program on liquid chemical storage, handling and spill management practices (DEC 2005a; DEC 2005b; DEC 2006b). Following this earlier exercise, OEH developed an education program to raise awareness and improve industry

environmental performance. This included a training course to help industry and regulators understand and implement appropriate procedures and measures for the storage, handling and spill management of liquid chemicals and a series of liquid waste fact sheets providing important information on best management practices. A resource kit – *Storing and Handling Liquids: Environmental Protection* (DECC 2007) – is also available on the OEH website.

The findings of this review into chlorinated solvents show that further improvements are required in the way the chemicals are stored and handled. OEH will therefore continue to run workshops and training courses for both industry and regulators and more actively promote the resources available on the website.

Valuable information for licensees

The review findings provide valuable information to assist licensees manage chlorinated solvents and improve their environmental performance. Some initiatives identified as part of this review include:

- improving and changing production practices to enable the use, where possible, of non-toxic alternatives to chlorinated solvents to produce a product of similar quality
- installing either a steel lining or lining using a compatible sealant in containment areas where chlorinated solvents are held or stored to provide a barrier to eliminate the risk of contamination of soil and groundwater.

The findings of this review will also be factored into the ongoing OEH review of licences and assessment of applications for new licences. OEH will continue to work with licensees to improve their environmental performance at sites across NSW.

Related initiatives

The following related initiatives will also assist relevant stakeholders, such as industry and local government, to identify ways in which they can reduce their impact on the environment and help improve environmental performance.

- *Environmental Compliance Report: Liquid Chemical Storage, Handling and Spill Management* (DEC 2005a; DEC 2005b; DEC 2006b – see key findings above) is available at www.environment.nsw.gov.au/licensing/complianceaudit.htm
- *Strategic Environmental Compliance and Performance Review: Preventing Contaminated Sites* (DECC 2008b) focuses on increasing industry awareness of activities and practices with the potential to result in contaminated sites and best environmental management practices to reduce the likelihood of this occurring; available at www.environment.nsw.gov.au/licensing/complianceaudit.htm
- The National Industrial Chemicals Notification and Assessment Scheme (NICNAS) provides a national notification and assessment scheme to protect the health of the public, workers and the environment from the harmful effect of industrial chemicals. NICNAS assesses all chemicals new to Australia as well as those already in use. For more on the scheme, visit www.nicnas.gov.au/
- A national framework for the environmental management of chemicals ('NChEM') was endorsed by the Environment Protection and Heritage Council in 2007. This included a Ministerial Agreement and National Action Plan to improve environmental aspects of Australia's chemical management system and promote consistent regulation across states and territories. More details at www.ephc.gov.au/taxonomy/term/75
- Following a campaign focused on the dry cleaning industry, OEH developed the *Managing Dry Cleaning Waste* information package (DECCW 2009) which contains information on the environmentally responsible management and safe handling of dry cleaning waste including perchloroethylene and is available at www.environment.nsw.gov.au/waste/drycleaningwaste.htm
- 'Information Sheet 4: Hazardous substances and liquid waste' (DECC 2008a) outlines appropriate storage, use and disposal of chemicals. Initially developed for the automotive servicing and repairs industry, the principles outlined can also be applied to sites with similar environmental issues. It is available at www.environment.nsw.gov.au/sustainbus/autorepairers.htm

1. Strategic environmental compliance and performance reviews

In addition to its other regulatory activities, OEH undertakes an ongoing program of strategic environmental compliance and performance reviews. The aim of these reviews is to encourage industry to improve its environmental performance. The reviews combine audits to assess compliance with environmental legislation with research into best environmental management practices. Industry, licensees, state agencies, local government, the community and other stakeholders provide input into various stages of the review process.

Selecting activities and sectors for review

The reviews focus on priority environmental issues. Previous reviews looked at:

- the wood preservation industry
- liquid chemical storage, handling and spill management practices
- preventing contaminated sites
- environmental impacts of industrial estates
- industry monitoring
- managing the reuse of effluent.

Industry sectors and activities targeted for strategic environmental compliance and performance reviews are chosen by assessing major environmental and community concerns alongside OEH corporate objectives and strategies.

Criteria considered include:

- the likelihood of harm to human health and the environment from an activity
- the complexity of an activity
- emissions and wastes from an activity
- gaps in understanding an activity
- environmental performance
- location of an activity
- community concern
- the opportunity to make significant environmental gains in relation to an activity
- opportunities for integration with other OEH programs.

For more information on these reviews, visit www.environment.nsw.gov.au/licensing/complianceaudit.htm

2. Review of the management of chlorinated solvents

What are chlorinated solvents?

Chlorinated solvents are a large group of chemicals that contain chlorine, such as methylene chloride. They are widely used for a range of industrial and commercial purposes, including degreasing and dry cleaning, and in a host of mixing and thinning solutions. The chlorine-containing chemical structure helps to efficiently dissolve organic substances like fats and grease and also serves as a raw material in the production of other chemicals.

This review focused in the following commonly used solvents:

- **Trichloroethylene** (also called TCE or TRIC) – a non-flammable, colourless liquid at room temperature now mainly used as a solvent to remove grease from metal parts. TCE can also be found in some household products, including typewriter correction fluid, paint removers, adhesives and spot removers.
- **Tetrachloroethylene** (also called tetrachloroethene, perchloroethylene or PERC) – a non-flammable, colourless liquid at room temperature which evaporates easily into the atmosphere. PERC has been produced commercially since the early 1900s primarily for dry cleaning and textile processing. It is also used in rubber coatings, solvent soaps, printing inks, adhesives, glues, sealants, polishes, lubricants and silicones; to produce chlorofluorocarbons (refrigerants); and for degreasing metals.
- **Methylene chloride** (also called dichloromethane or DCM) – a non-flammable, volatile, colourless liquid. DCM is used as a solvent for the synthesis of chemicals and pharmaceuticals; to produce polycarbonates and cellulose triacetate (for films and fibres) and polyurethane foam; in metal degreasing (surface treatment); and to remove paint.

The review did not cover other common chlorinated solvents such as carbon tetrachloride and 1,1,1-trichloroethane as they have been phased out in Australia under the Montreal Protocol because of their carcinogenic and ozone-depleting properties.

Chlorinated solvents are moderately volatile chemicals (with a boiling point between 40 and 121°C), about 1.5 times denser than water, with a low solubility in water and low viscosity.

Because of these physical and chemical properties, chlorinated solvents have the potential to cause contamination to air, water and soil, if not managed appropriately. They are also harmful to aquatic organisms and may cause long-term impacts in the aquatic environment. The importance of managing chlorinated solvents is discussed in more detail in the following section.

Importance of managing chlorinated solvents

Chlorinated solvents are used in a wide range of industrial applications and it is necessary to ensure that they are managed appropriately irrespective of the quantities used to reduce the risk of harm to the environment.

The misuse, improper handling, storage and disposal, deliberate dumping or accidental spillage of chlorinated solvents can lead to environmental harm because:

- of their mobility and ability to move as liquids or gases downward and laterally through the soil and into groundwater
- they are slow to degrade
- they are difficult to remove from soil and groundwater due to their low water solubility and inability to mix with water
- they are heavier than water and able to sink to the bottom of aquifers, trapping them inside the pores of soils and aquifers for a long time.

Every effort should be made to use engineering controls and management practices to ensure that these substances are used in the most environmentally responsible manner.

The traditional use of concrete for building the containment structures that store chlorinated solvents can cause major environmental issues for industrial premises. Solvents are able to seep through concrete and because of their high mobility can have a severe environmental impact through contamination of groundwater.

Historically, chlorinated solvents were often disposed of by spreading them out onto open ground to allow them to evaporate. While this practice has largely been discontinued, issues still arise as a result of inadequate handling and storage practices, such as solvents held in drums without containment or unsealed concrete containment areas and poor spill prevention measures during decanting.

Spills can occur during transfer to and from storage facilities as a result of equipment malfunctions where chlorinated solvents are used. For example, chlorinated solvents have traditionally been used for degreasing metal parts. However where this activity occurs in open tanks, the loss of solvents through leakage may go undetected and be attributed instead to evaporation.

Contamination may also result when solvents are used to wash down large pieces of machinery or clean floors.

The legacy of poor management of chlorinated solvents in the past is evident from findings around the world. In a study of groundwater quality in Birmingham in the UK, trichloroethylene (TCE) was detected in 78% of the boreholes examined and exceeded the UK drinking water standard of 30 micrograms/litre at 40% of the sites investigated (Lerner & Barrett 1996).

In the United States, the Department of Defence has identified hundreds of Air Force facilities that are contaminated from fuel spills, solvents used in cleaning aircraft parts, and inappropriate disposal. In the past, waste fuels and solvents were disposed of in landfills, sewers, disposal pits and fire training areas. Chlorinated solvents account for 10 of the top 20 organic contaminants detected most frequently at hazardous waste sites in the US. According to Air Force Center for Environmental Excellence (2000): 'The Department of Defence (DOD) has identified chlorinated solvents at nearly 50% of its 3212 contaminated waste sites and TCE appears as a major groundwater contaminant at 35% of all DOD sites.'

Due to past practices, the use of chlorinated solvents is now heavily regulated in Europe and the US with some forms banned altogether.

Issues around managing chlorinated solvents in NSW

Past poor management in handling chlorinated solvents have been identified as the major cause of a number of contaminated sites in NSW. Trichloroethylene is one of the most frequently detected chlorinated solvents in groundwater. A total of 34 contaminated sites in NSW (or 10% of all those declared contaminated, including major groundwater remediation projects) are affected by chlorinated solvents. Industrial activities that have resulted in contaminated sites include the manufacture of chemicals, sealants, metal and small arms manufacturing, and the storage of solvents.

Scope of this review

The audits in this review assessed compliance with the 'operating' conditions for the management of chlorinated solvents in the environment protection licences issued to each premise. Sites selected to be audited were those known to have stored and/or handled chlorinated solvents.

The scope was limited to examining the following activities in relation to the management of chlorinated solvents:

- storage and handling of chlorinated solvents
- maintenance of plant and equipment
- emergency management
- waste storage and disposal.

These activities were assessed against the audit criteria (the required performance standards) for the 24 hours prior to the end of the audit inspection.

Assessment of compliance was based on information supplied by the licensee, a review of records and documentation relating to the premises, and *AS/NZS 4452:1997 – The Storage and Handling of Toxic Substances* (AS/NZS 1997).

Premises audited

The review included 14 premises licensed by the OEH under the POEO Act (see Appendix A). The audited premises undertook the following activities as listed in Schedule 1 of the POEO Act:

- chemical production – dangerous goods
- chemical production – other
- chemical production – paint/polish/adhesives
- chemical production – pesticides
- chemical production – plastic resins
- chemical production – waste generation
- chemical storage
- metallurgical activities
- waste processing (non-thermal treatment)
- waste storage.

The OEH public register of licensing contains details of all licences issued under the *Protection of the Environment Operations Act 1997* (POEO Act). Licences are available on the OEH website at www.environment.nsw.gov.au/prpoeoapp/searchregister.aspx.

Audit methodology

The compliance audits were undertaken in accordance with the procedures and protocols in the *Compliance Audit Handbook* (DEC 2006a). When an audit is completed, the findings are presented to the audited organisation as an individual compliance audit report. These individual reports are publicly available in the OEH Library on Level 15, 59 Goulburn Street, Sydney: phone (02) 9995 5000.

The audits were limited to a review of each licensee's compliance with the legislation administered by OEH or the statutory instruments it has issued, as they relate to the management of chlorinated solvents. Audit findings were based on information from OEH files, information supplied by site representatives and observations made during site inspections.

The audit reports contain an action program outlining any non-compliance, recommended actions and agreed time frames which licensees must meet. OEH officers follow up on compliance audits to ensure licensees are implementing the actions required in the report by the agreed target date. OEH has a systematic and rigorous monitoring program that tracks these follow-ups to ensure the licensee completes all the required actions.

The findings presented in this report are a collation of the findings presented in the individual compliance audit reports.

Analysing the risks

The risks associated with the non-compliances identified were assessed and coded according to environmental significance.

Non-compliances were assessed against two criteria: the likelihood of environmental harm occurring and the level of environmental impact. The likelihood of environmental harm was determined by assessing:

- past environmental performance
- current environmental performance
- potential contributing factors.

The level of environmental impact was assessed by considering factors such as the quantity and toxicity of the material and the sensitivity of the receiving environment.

After these assessments were made, information was transferred into the risk analysis matrix shown in Table 1.

Table 1: Risk analysis matrix

		Likelihood of environmental harm occurring		
		Certain	Likely	Less likely
Level of environmental impact	High	Code red	Code red	Code orange
	Moderate	Code red	Code orange	Code yellow
	Low	Code orange	Code yellow	Code yellow

Non-compliances assessed as 'code red' suggest they are of considerable environmental significance and therefore must be dealt with as a matter of priority. 'Code orange' risk assessments for non-compliance still pose a significant risk of harm to the environment, but can be given a lower priority than red risk assessments. A non-compliance assessed as 'code yellow' suggests that it could receive a lower priority but should still be addressed.

There are also a number of licence conditions such as those relating to administration, monitoring and reporting requirements that do not have a direct environmental significance, but are still important to the integrity of the regulatory system. Non-compliance with these conditions is given a blue colour code.

3. Findings of the review

This section of the report summarises the non-compliances and other issues identified and reported on in the individual compliance audits conducted by OEH. Non-compliances are identified as a result of licensees not complying with conditions of their environment protection licence.

Risk analysis of identified non-compliances

Non-compliances identified during the review were categorised using the risk-analysis matrix illustrated in Table 1.

The percentages of non-compliances found in each category during the audit process are shown in Table 2. This review focused on operating requirements relating to the management of chlorinated solvents.

Table 2: Percentage of non-compliances found in each risk category

Colour code of issue	Code red (high risk)	Code orange	Code yellow	Code blue	Total
No. of non-compliances	0	1*	37	0**	38
Percentage	0%	3%	97%	0%	100%

* See page 10 for code orange non-compliance.

** No code blue non-compliances were recorded as it was outside the scope of the audit to assess administration, monitoring and reporting conditions.

Identified non-compliances

Handling and movement of chlorinated solvents

Leaks and spills from the handling and movement of chlorinated solvents can pollute surface waters, soil and groundwater because of the chemicals' physical properties: denser than water but less viscous than it. Problems include leaking or broken hoses; inadequate containment of transfer areas; and poor maintenance of plant and equipment used in the transfer of solvents. The risks of such incidents occurring could be minimised by ensuring that the plant and equipment used in the handling and movement of chlorinated solvents is maintained and operated in the most environmentally responsible manner.

This review assessed the handling and movement of chlorinated solvents during the following three separate activities:

- **delivery and/or dispatch** of chlorinated solvents involving the movement and handling of bulk goods received at a premises and any packaged goods or waste generated leaving the premises
- **transport within a premises** where chlorinated solvents are moved to other areas on site either in containers or drums on hand trolleys or forklifts or pumped via pipeline to a storage tank or final end use
- **temporary storage** of chlorinated solvents, essentially their 'transit storage' as defined in Section 1.5.37 of AS/NZS 4452:1997 (AS/NZS 1997) as the 'storage of toxic substances held in transit for at least 12 hours and not more than three normal working days'.



Poorly maintained transfer and handling area for chlorinated solvents with transfer points not labelled and cracks in the concrete floor (R West/OEH)

The review identified the following non-compliances:

Operational non-compliances

At individual premises:

- not ensuring that written procedures for the loading/unloading of chlorinated solvents are located at transfer points and near transfer lines containing chlorinated solvents
- not ensuring that transfer points and pipelines are clearly labelled and have flow direction marks as required by AS/NZS 4452:1997.

At multiple premises:

- not ensuring expansion joints on concrete floors are sealed and sufficiently impervious to the chemicals being handled in the chemical unloading area (*two premises*).

Maintenance non-compliances

At individual premises:

- not maintaining seals on expansion joints on concrete floors in the loading/unloading area
- not ensuring the maintenance and regular inspection of transfer pipelines.

At multiple premises:

- not maintaining concrete floor and containment walls to ensure that they are sufficiently impervious to chemicals being unloaded, with cracks observed in the concrete (*two premises*)
- not maintaining the sump in unloading areas to ensure sufficient capacity to capture spills (*two premises*).

Storage of chlorinated solvents including waste

Storage requirements vary, depending on the quantity of chlorinated solvents being stored either as a product or a waste. Storage areas include bulk storage tanks, packaged goods storage facilities including intermediate bulk container (IBC) storage areas, waste storage areas and damaged container storage areas. Chemical leaks and spills from storage areas where containment facilities are not designed to be impervious to chlorinated solvents have the potential to contaminate soil and groundwater. Alternatively, they may drain or be flushed to waters, causing surface water pollution.

Responsible storage of chlorinated solvents includes ensuring that packaged goods, IBCs, bulk tanks and the buildings which house them are labelled and placarded correctly as required by AS/NZS 4452:1997. Inappropriate labelling or placarding of chlorinated solvents increases the risk of incorrect emergency action or handling of the chemicals resulting in harm to the environment and risks to workers' health.

The storage of chlorinated solvents was assessed in this review by examining production areas that work with chlorinated solvents and the areas used to store them.



Bulk methylene chloride tank with no placarding (R West/OEH)

The review identified the following non-compliances with licence requirements:

Operational non-compliances

At individual premises:

- sight level glass for a trichloroethylene storage tank impeded by another structure, making it difficult for visual inspection
- trichloroethylene storage tank overflow pipe positioned to allow flow of liquid over outer surface of the tank and its supports, potentially undermining its integrity
- splash guards on chlorinated solvents tanks positioned incorrectly, potentially not capturing trajectory spills within containment area
- fixed pipelines transporting chlorinated solvent waste not adequately contained in the event of a leak or spill
- manually operated valves not clearly marked to indicate 'open' and 'closed' positions and liquid lines not clearly marked to indicate flow direction
- compound used to store chlorinated solvent waste constructed of materials not sufficiently impervious to chlorinated solvents.

At multiple premises:

- containers of chlorinated solvents not labelled as required by AS/NZS 4452:1997 (*six premises*)
- facilities used to store chlorinated solvents displaying incorrect placard or not having any placard for Class 6 toxic chemicals as required by AS/NZS 4452:1997 (*three premises*)
- substances, including wastes classified as incompatible with chlorinated solvents, not segregated as required by AS/NZS 4452:1997 (*two premises*)
- expansion joints on concrete floors not adequately sealed and sufficiently impervious to chemicals being stored (*three premises*).

Maintenance non-compliances

At individual premises:

- cracks in containment wall at a waste storage area.

At multiple premises:

- not ensuring all leaks and spills cleaned up from containment area (*two premises*)
- seal over expansion joints on concrete floors not maintained in proper and efficient condition (*two premises*)
- cracks observed in concrete floors (*two premises, with one being a code orange non-compliance due to its proximity to a stormwater channel and high groundwater level*).



Unsealed expansion joint in concrete (N Wilmot/OEH)

Emergency management

Incidents resulting from the storage and handling of chlorinated solvents may cause leaks, spills, fires, explosions and the release of vapours. These can be minor incidents (such as small-scale spills and leaks able to be dealt with by on-site personnel using spill management procedures and spill kits) or major incidents (e.g. emergencies which are generally large scale, require an urgent response, and may involve the emergency services).

The scale and complexity of emergency management planning required at a premises is proportional to a number of factors, including the size of the facility, its location, the nature of chemicals stored and operations carried out on the site, and the number of staff. Inadequate and inappropriate emergency management can cause serious pollution incidents. For example, untrained or poorly trained staff flushing spills or leaks down stormwater drains can pollute surface and groundwater.

The review identified the following non-compliances with licence requirements at individual premises:

- procedures required by AS/NZS 4452:1997 for dealing with all types of incidents that might arise at the premises missing from emergency management plan
- no systems in place to manage minor incidents
- no emergency management plan.

Other issues identified

The review also identified a number of issues of environmental concern that were beyond the scope of the audit. For example:

- laboratory staff not aware of the location of the Material Safety Data Sheets for chemicals stored within the laboratory
- drums storing chemicals not labelled correctly with some containing multiple labels with conflicting information and others retaining their original labelling
- waste containing polychlorinated biphenyls (PCBs) not adequately labelled and being stored with non-dangerous goods in a storage compound without placarding and with unsealed cracks in the concrete bunding
- inadequate maintenance of secondary containment structure for a 30,000-litre storage tank with cracked seals over joints in the structure and not sufficiently impervious should a spill occur.



Being prepared for emergencies minimises the risk of harm to the environment from spills or leaks (E Howard/OEH)



A drum with a label 'Methylene chloride' being reused to store another chemical (polyol) (R West/OEH)

4. After the review

Follow-up by OEH

OEH follow-ups have confirmed that the non-compliances identified by the audits are being addressed by licensees to improve their environmental performance. The licensees have undertaken the following activities:

Handling and movement of chlorinated solvents

Work instructions for the delivery of chlorinated solvents have been developed and copies placed at the solvent delivery point. All chlorinated solvent transfer lines have been labelled to show content and flow direction as required by AS/NZS 4452:1997 and signs placed adjacent to manually operated valves indicating 'open' and 'closed' positions.

Containment of chlorinated solvent storage and loading/unloading areas

All expansion joints in storage and loading/unloading areas have been resealed and any cracks and/or gaps in the containment structures repaired. Procedures have been developed and implemented to ensure that the expansion joint seals and containment wall structures are inspected and maintained regularly to provide an impervious barrier to chlorinated solvents. Procedures for regular clean-up of any liquid that accumulates in the storage and loading/unloading area sumps have also been developed and implemented to ensure they are able to capture any spills or leaks.

Splash guards have been repaired or extended, allowing them to capture trajectory leaks within the containment area. Containment has also been provided to capture leaks or spills from fixed overhead pipelines.

Labelling and placarding of chlorinated solvents

All chlorinated solvent containers have been labelled appropriately and placards with relevant information placed in all storage areas.

Segregation of chemicals

The storage of chlorinated solvents has been reviewed and measures implemented to ensure that solvents are adequately segregated from incompatible chemicals and waste.

Emergency management

Emergency management plans have been developed or updated to deal with all types of emergencies that may arise at premises as required by AS/NZS 4452:1997.

Integration with licence reviews

The findings of this review will be used to guide the regular review by OEH of environment protection licences. Section 78 of the POEO Act requires OEH to review environment protection licences once every five years. The licence reviews:

- focus on desired environmental outcomes
- enhance consistency between licences issued to an industry
- improve the effectiveness of the licensing system
- strengthen OEH accountability to stakeholders.

Integrating these licence reviews with other regulatory activities, such as compliance audit programs, results in a holistic approach to licensing.

This review's findings will also help OEH assess any future applications for new licences.

5. Best environmental management practices for chlorinated solvents

Responsible management of chlorinated solvents is important to minimise the environmental and human risks posed by these chemicals. These risks can be reduced through the use of best environmental management practices.

This section of the report promotes the use of best management practices for the unloading, handling, transfer and storage of chlorinated solvents to improve environmental performance. It also provides guidance about incident management and important considerations for appropriately dealing with the disposal of chlorinated solvent waste.

There are some general considerations and practices in relation to chlorinated solvents that are applicable to all liquid chemical storage and handling activities. OEH has developed best practice guidance for industry as a result of an earlier environmental compliance and performance review (DEC 2005a; DEC 2005b; DEC 2006b). The review assessed the environmental performance of a range of industrial sites working with liquid chemicals against regulatory requirements and researched best environmental management practices.

Information from this review and additional education and training material on responsible chemical management and dealing with liquid chemical waste can be found on the OEH website at www.environment.nsw.gov.au/sustainbus/liquids.htm or see DECC 2007.

Standards and other guidance materials

While reviewing best environmental management practices for managing chlorinated solvents, OEH researched current environmental management standards and guidance in Australia and overseas. This included the relevant standards and codes of practice for the proper storage and handling of chlorinated solvents and guidelines addressing environmental risk. Several Australian standards and codes of practice are relevant to managing chemicals in general as well as providing specific information for managing chlorinated solvents.

The following guidance material is particularly relevant to managing chlorinated solvents:

- *AS/NZS 4452:1997 – The Storage and Handling of Toxic Substances* (AS/NZS 1997) provides requirements for the storage and handling of substances classified as dangerous goods Class 6.1 under the Australian Dangerous Goods Code.
- The National Occupational Health and Safety Commission's *Storage of Chemicals: Guidance Note for Placarding Stores for Dangerous Goods and Specified Hazardous Substances* (NOHSC 1990) recommends the information to be shown on placards for hazardous substances stores and is the basis for uniform requirements between Australian states and territories.
- NOHSC's *National Code of Practice for the Labelling of Workplace Substances* (NOHSC 1994a) provides practical guidance on meeting requirements for the labelling of hazardous substances.
- The European Chlorinated Solvent Association's *Storage and Handling of Chlorinated Solvents* (ECSA 2000) provides information for distributors and users of chlorinated solvents on their safe handling and how to minimise the risk of environmental harm.

OEH has also produced a valuable online resource, *Environmental Management Planning*, to help industries build more sustainable organisations with a commitment to drive environmental improvement: www.environment.nsw.gov.au/sustainbus/envmgtplanning.htm.

These guidelines are designed to help organisations plan for potential environmental incidents, highlight statutory compliance obligations, identify and rank environmental issues specific to each site, and provide assistance on preparing monitoring and reporting plans.

The best environmental management practices for the management of chlorinated solvents discussed below have been identified from the research of the standards, codes of practice and guidelines.

Where chlorinated solvents are handled or stored on a site, it is important to follow the general practices for chemical handling and spill management. There are also additional practices that should be undertaken specifically in relation to chlorinated solvents due to their toxicity and ability to enter and contaminate the environment. These practices are outlined below.

Environmental considerations

Chlorinated solvents have the potential to damage the environment if they are released into the air, water or soil.

To minimise the risks they pose to the environment from their use and storage at industrial sites, the following general principles should be followed:

- If possible, use an alternative to chlorinated solvents, such as aqueous cleaners.
- Minimise the use of chlorinated solvents on site. If chlorinated solvents are used, reuse and recycle them wherever possible.
- Cover openings in equipment and vessels where chlorinated solvents are used or stored to minimise the escape of vapours. If used during a process, recover and reuse solvent vapours from heat or condensation for reuse. Exhaust systems may also be used to remove or treat solvent vapours before their release into the atmosphere.
- Minimise the number of transfer locations and processes on site. Ensure that these transfer areas are designed and equipped for the chlorinated solvents being handled.
- Ensure that all areas storing chlorinated solvents (either in bulk or packaged form) are designed and operated in accordance with the necessary standards (see details below on handling, movement and storage of chlorinated solvents).
- Do not allow any chlorinated solvents to drain to stormwater or onto an unprotected surface.
- Clean up any spills and leaks immediately and dispose of waste in accordance with legal requirements.

Handling, movement and storage of chlorinated solvents

Chlorinated solvents may be delivered to, or dispatched from, industrial premises in bulk or in packaged form (in drums, bottles and other smaller containers). Large quantities of chlorinated solvents may be transported in intermediate bulk containers (IBCs) by forklift or from bulk storage tanks through designated pipes to where they are used as part of an industrial process. Bulk chlorinated solvents may also be decanted into smaller containers using designated filling equipment. Smaller quantities of chlorinated solvents may be transported to where they are required in their original packaging, whether in steel drums or bottles, by forklift or hand trolley.

In addition to the general best environmental management practices used for the handling, movement and storage of chemicals, the following specific practices should be followed to minimise potential environmental harm from those activities involving chlorinated solvents:

Containment

- All bulk and other containers (such as drums) storing chlorinated solvents (including waste solvents) should be constructed of a compatible material which is resistant to attack. Stainless steel or carbon-steel of a welded construction coated with a solvent-resistant lining is recommended for bulk tanks. However, coated tanks are not recommended for storing methylene chloride as this solvent may attack the coating. Galvanised steel, aluminium and reactive metals should not be used. Plastics are generally not suitable, especially for long-term use.

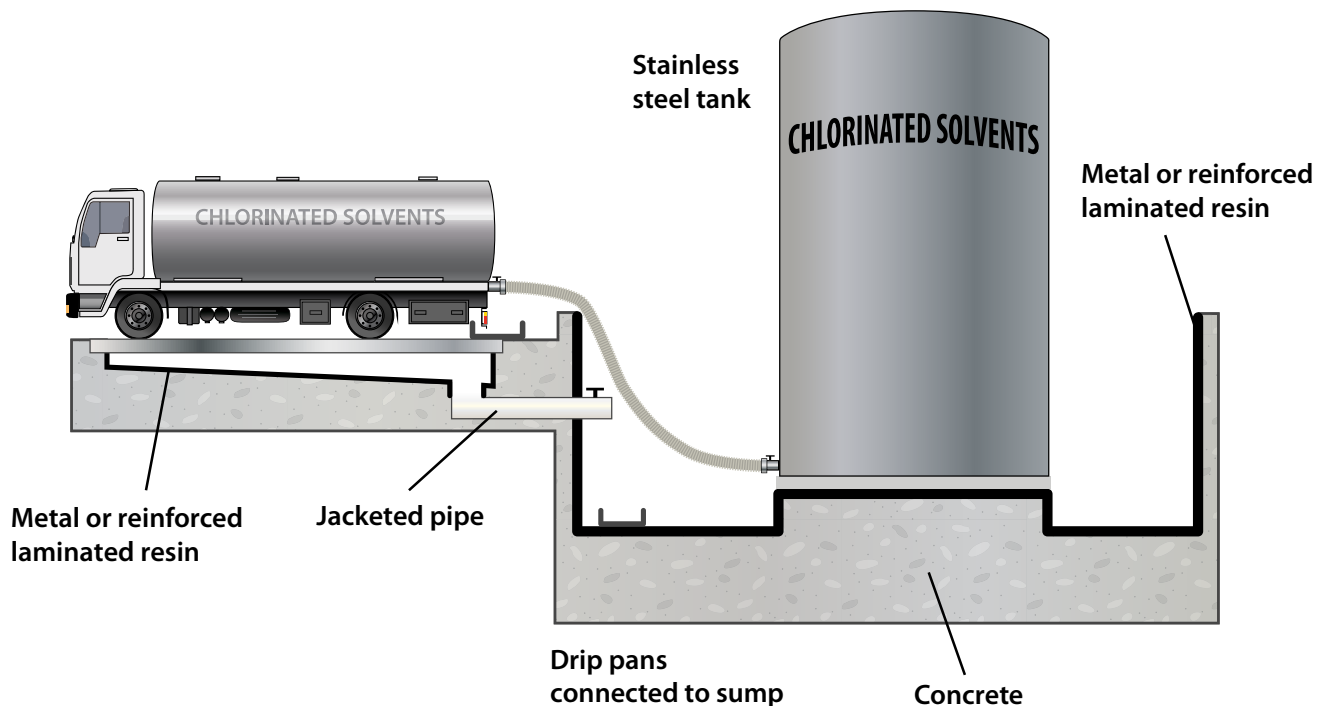
- Areas where chlorinated solvents are handled, including delivery/dispatch areas, and storage compounds should be constructed of material resistant to attack and sufficiently impervious to chlorinated solvents and with enough containment capacity to capture potential spills or leaks. Concrete by itself is not sufficient because it can be permeated by chlorinated solvents. Concrete should either be lined with an appropriate and compatible sealant or laminate or with steel.
- When moving packaged chlorinated solvents and IBCs, ensure that adequate mobile secondary containment (such as a mobile trough) is provided to capture any leaks or spills. Packages should also be adequately harnessed or secured during transport to storage areas.
- Chlorinated solvents in bulk or as packaged goods should be stored in designated storage compounds. If this is not possible, they may be stored in a compound with adequate segregation from any incompatible substances.
- Chlorinated solvents stored on site 'in transit' (i.e. for at least 12 hours but no longer than three working days) should meet the specific requirements for this type of storage outlined in AS/NZS 4452:1997.



Steel lining on a containment area used to store trichloroethylene (J Ramadan/OEH)

Transfer equipment

- All pumps, valves, seals, gaskets, meters and instrumentation used in the handling and movement of chlorinated solvents must be of a suitable design and construction for use with chlorinated solvents. In particular, aluminium or reactive metals should not be used as a reaction may occur between these metals and the solvent, causing corrosion and possible equipment failure.
- Pipelines transferring chlorinated solvents should be constructed of solvent-resistant and-compatible materials such as carbon-steel, hot-dip galvanised steel or stainless steel. All pipe connections should also be made of this type of material.
- Pipelines should also be either welded or flanged and screw fittings avoided.
- Pipes and transfer points should be clearly marked, indicating the chlorinated solvent being transferred and the direction of flow.
- Hoses used to transfer chlorinated solvents should be seamless, flexible and constructed of solvent-resistant and -compatible material (such as stainless steel) or lined with a resistant material (such as PTFE – polytetrafluoroethylene). Lined hoses should also be sheathed in, for example, a stainless steel metal braid or neoprene rubber (ECSA 2000). Interlocked, spiral-type hoses should not be used.
- Chlorinated solvents delivered in bulk and transferred to storage tanks by hose or pipe should follow the OEH liquid chemical storage and handling guidance outlined in DECC 2007.
- Chlorinated solvents should not be transferred or decanted in a transit area except in the case of an emergency.



Appropriate method of transferring and storing chlorinated solvents (adapted from ECSA 2000)

Maintenance

- Regular inspections should be undertaken to:
 - ensure that all bulk and other storage containers storing chlorinated solvents are maintained in good condition and their integrity is not compromised
 - ensure that all areas where chlorinated solvents are handled, including delivery/dispatch areas and storage compounds, are maintained in good condition and free of cracks
 - detect losses or leaks from equipment used to transfer chlorinated solvents and ensure that valves, pumps, couplings and seals are maintained regularly.
- Preventative maintenance should also be undertaken to ensure that plant and equipment associated with the handling, movement and storage of chlorinated solvents is maintained in a proper and efficient condition.

Labelling

- All drums and other containers storing chlorinated solvents (including solvent waste) must be labelled as required by AS/NZS 4452:1997.
- Where chlorinated solvents are transferred or decanted from one container to another, the new container should be labelled with the safety and environmental information identified on the original label. There are specific labelling requirements depending on the size of the container and the context of its use. These requirements can be found in AS/NZS 4452:1997 and the *National Code of Practice for the Labelling of Workplace Substances* (NOHSC 1994a).



Good example of a placard for trichloroethylene (J Ramadan/OEH)

- Where chlorinated solvents are stored in bulk tanks and housed inside a building, the building as well as the tank must be placarded as required by AS/NZS 4452:1997. This is particularly important if other chemicals are being stored, so that each chemical can be correctly identified. All stand-alone tanks must also be placarded.

Emergency and incident management

The likelihood and severity of incidents involving chlorinated solvents can be minimised through good site design and layout, sound engineering, good operating practices, and proper instruction and training of staff.

Incident management is split into dealing with minor incidents (small-scale spills and leaks such as those from a 40-litre container) and major incidents (generally large-scale and requiring an urgent response possibly involving emergency services).

Minor incidents

- A spill response plan should be developed, implemented, reviewed and updated as required.
- Spill response training and drills should be conducted regularly or as appropriate.
- Adequate supplies of spill response equipment (including inert absorbent material) should be maintained in accessible locations.
- Spills should be cleaned up immediately with the liquid and other clean-up waste disposed of properly.
- Up-to-date Material Safety Data Sheets for the chlorinated solvents stored or used on site should be available in accessible locations and staff should understand the hazardous nature of these substances.

Major incidents

- An emergency management plan to deal with major incidents should be developed, implemented, reviewed and updated as required.
- Staff should be trained in emergency response procedures.
- Practice drills using the emergency response plan should occur regularly.
- Response equipment should be provided to allow emergencies to be dealt with immediately.
- Any major incident should be reported immediately to the appropriate authorities, such as OEH, Fire and Rescue NSW and WorkCover NSW.
- All premises should have adequate measures to contain contaminated firewater on site.

Considerations for emergency management in relation to general liquid chemical handling and storage are also relevant to chlorinated solvents. Refer to the OEH liquid chemical storage and handling guidance outlined in DECC 2007 for this information.

Treatment and disposal of solvent waste

Liquid waste from industrial processes containing chlorinated solvents must be stored and disposed of appropriately and in accordance with the POEO Act. In NSW, chlorinated solvents are classified as dangerous goods of a toxic/hazardous nature and have special treatment and disposal requirements.

There are three main options for dealing with liquid chlorinated solvent waste generated from industrial premises:

- **Store the waste in suitably constructed drums or tanks on site for collection by a licensed waste management company:** Several NSW companies and across other parts of Australia are licensed to collect, treat and/or dispose of this type of waste. Contaminated solid waste should also be stored in suitably constructed containers and disposed of by an appropriately licensed waste contractor.

- **Check if the local water authority allows discharge to sewer of the type of waste generated:** A trade waste agreement or permit from a local water authority must be held before discharging any wastewater to sewer. The agreement or permit will set out discharge conditions for trade waste.
- **Treat and reuse the waste on site** if appropriate.

Waste containing chlorinated solvents should be regarded in the same way as any other chlorinated solvents stored or handled on site. The same practices outlined above should be followed.

There are also other considerations associated with the disposal of waste storage containers:

- Used drums and containers may be rinsed out on site. Where this occurs, containers should be triple-rinsed and the washwaters directed to the sewer or a treatment facility on site before disposal.
- Labels on containers should be retained until the containers are washed and rinsed.
- Remove all old labels where containers are reused after being washed and rinsed.



Good example of a label providing the required information on a waste drum containing trichloroethylene (J Ramadan/OEH)

International trends in the use of chlorinated solvents

Historically, chlorinated solvents have been used in a variety of industrial applications and on a relatively large scale, but their use is declining. This is mainly due to an increasing recognition of their hazardous nature and the legacy of contaminated sites because of poor management in the past. In the United States and elsewhere, including Australia, many sites require extensive remediation due to solvent contamination of aquifers and groundwater.

Some chlorinated solvents (including carbon tetrachloride and methyl chloroform) are recognised as having high ozone-depleting potential and global warming properties and have generally been banned in Australia and elsewhere under the Montreal Protocol. Other solvents, including trichloroethylene, perchloroethylene and methylene chloride, are not regulated by the protocol as they have low ozone-depleting potential, but are classed as highly volatile organic compounds, which can contribute to the formation of smog with detrimental impacts on the environment and human health.

Current and emerging technologies are producing cleaner and greener alternatives to chlorinated solvents which can be used for many of the same purposes as chlorinated solvents (particularly cleaning and degreasing). Consideration should be given to using more environmentally sustainable alternatives for industrial purposes without compromising product quality and economic objectives. Since 1990, research in the US (e.g. Thomas & Ellenbecker 1997) and elsewhere has seen the development of a number of alternatives, especially for use in industrial cleaning. Environment Canada also refers to alternatives to solvents at www.ec.gc.ca/rsd-sdr/default.asp?lang=En&n=29A9A2F2-1. These alternatives have their advantages and disadvantages and may not be appropriate in all applications.

Where no alternative to chlorinated solvents exists or they are more effective than a substitute for a particular purpose, the quantities of solvents used or stored on site should be minimised, and storage and handling systems designed and managed using best environmental management practices.

6. Relevant legislation

Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) makes the Environment Protection Authority (EPA), local councils and other public authorities responsible for pollution prevention and control. The EPA is part of OEH, which exercises certain statutory licensing functions and powers under the POEO Act, in the name of the EPA.

The EPA is also the appropriate regulatory authority for:

- regulating activities listed in Schedule 1 of the POEO Act
- premises where scheduled activities are carried out
- ensuring compliance with environment protection licences
- regulating activities carried out by the state or a public authority.

In nearly all other cases the appropriate regulatory authority is the local council. A local council may exercise its powers under the POEO Act only in relation to the local council's own area.

OEH licenses and regulates premises that undertake scheduled activities and meet the licensing threshold. Activity types include coal mines, livestock intensive industries, waste facilities, petroleum works and sewage treatment systems. For a full list of all the scheduled activities and the classifications under them, refer to Schedule 1 of the POEO Act at www.legislation.nsw.gov.au/fragview/inforce/act+156+1997+sch.1+0+N.

Environment protection licences issued under the POEO Act set environmental performance requirements. Licences may specify a required performance outcome or a specific environmental management practice. Licence conditions take into account factors such as surrounding environmental conditions, type of activity and available technology. Pollution reduction programs and pollution studies are often attached to licences, requiring licensees to carry out work within a specified time frame to enable them to comply with environmental requirements. Depending on the type of activity, licensees may be required to undertake monitoring for water, noise or air, for example.

The POEO Act prohibits certain actions that may pose a risk to the environment, including the pollution of waters (section 120) and leaks and spills of substances (section 116). These restrictions apply to industries and activities whether or not they are licensed.

Authorised officers are appointed to help regulatory authorities exercise their functions under the POEO Act. The powers of authorised officers include powers of entry and search and to question and identify persons.

The types of notices issued by authorised officers include:

- notices to provide information and records (see Chapter 7 of the POEO Act)
- clean-up, prevention, prohibition and compliance cost notices (Chapter 4, POEO Act)
- notices to vary environment protection licences, including attaching pollution reduction programs (Chapter 3, POEO Act)
- penalty notices for Tier 3 offences such as breach of licence conditions or the POEO Act.

Contaminated Land Management Act 1997

Contamination of an area of land through poor management practices can have major economic, legal and planning implications for the local community. Contamination can limit future land uses or increase costs for developers and councils. The investigation of contaminated sites and their clean-up is important to protect human health and the environment.

The *Contaminated Land Management Act 1997* (CLM Act) establishes a legal framework for investigating and, if appropriate, remediating land areas where contamination presents a 'significant risk of harm' to human health or other aspects of the environment within NSW.

In broad terms, the CLM Act establishes a two-tier approach to responsibility for regulating contaminated land:

- OEH, which uses its powers under the CLM Act to address site contamination that is significant enough to warrant regulation under the CLM Act given the site's current or approved use
- local councils who regulate other contamination using the planning and development framework through State Environmental Planning Policy No. 55: Remediation of Land and *Managing Land Contamination: Planning Guidelines SEPP 55 – and Remediation of land* (DUAP & EPA 1998) to determine what remediation is required to ensure the land is suitable for a different use.

OEH uses a range of powers to ensure that contamination is addressed and has established a scheme to ensure that the public has appropriate information about contaminated sites. More information on the CLM Act is available on the OEH website at www.environment.nsw.gov.au/clm/.

Dangerous Goods (Road and Rail Transport) Act 2008

OEH administers the *Dangerous Goods (Road and Rail Transport) Act 2008*, which adopts uniform national requirements for the transport of dangerous goods, including the requirements of the Australian Dangerous Goods Code. The Act and its Regulations ensure the proper classification, packaging, labelling and transport of dangerous goods, which can put people, property and the environment at risk if they are not handled appropriately.

OEH licenses transporters of dangerous goods, including some transporters who transport solvents under the Act. The Australian Dangerous Goods Code includes a full list and classification criteria for all classes and divisions of dangerous goods.

For more information, visit www.environment.nsw.gov.au/hazmat/

Occupational Health and Safety Act 2000

WorkCover NSW is primarily responsible for administering the *Occupational Health and Safety Act 2000*, including the Occupational Health and Safety (General) Regulation 2001, in relation to the storage and handling of dangerous goods in the workplace.

For more information, visit www.workcover.nsw.gov.au/healthsafety/healthsafetytopics/dangerousgoods/Pages/default.aspx

7. Related initiatives

The following related initiatives also assist relevant stakeholders, such as industry and local government, identify ways in which they can reduce their impact on the environment and help improve environmental performance.

Environmental Compliance Report: Liquid Chemical Storage, Handling and Spill Management

In 2005, OEH conducted an environmental compliance review of liquid chemical storage handling and spill management.

The review focused on encouraging industries to improve their environmental performance by assessing compliance with legislative requirements and reviewing best environmental management practices. Three public reports were released which summarised the findings of the audits, provided a review of best environmental management practice, and outlined the steps taken to improve environmental compliance in relation to liquid chemical storage, handling and spill management practices.

For more information about the review, visit www.environment.nsw.gov.au/licensing/complianceaudit.htm

OEH followed up the review with a range of educational and regulatory actions, including an education program to raise awareness and improve the environmental performance of industry and a training course to help industry and regulators understand and implement appropriate procedures and measures for the storage, handling and spill management of liquid chemicals.

Five liquid waste fact sheets (DEC 2005c) were also released providing important information on best management practices for managing liquid waste handling and storage, and how to prevent and respond to spills and reduce liquid waste through cleaner production initiatives.

For the other related guidance, see:

- *Liquid Waste Fact Sheets: Protecting the Environment and Your Business* at www.environment.nsw.gov.au/waste/liquidwastefs.htm
- *Storing and Handling Liquids: Trainer's Manual* and associated resources at www.environment.nsw.gov.au/sustainbus/liquids.htm

Strategic Environmental Compliance and Performance Review: Preventing Contaminated Sites

This review focused on preventing future contaminated sites. Its objective was to increase the awareness of activities and practices that have the potential to result in industrial sites becoming contaminated and best environmental management practices to reduce the likelihood of site contamination.

The report summarises the findings of the review, including the outcomes of the audit program, together with practical advice and information about how to minimise the potential for contamination of soil and surface or groundwater from industrial activities.

For more information about the review, visit www.environment.nsw.gov.au/licensing/complianceaudit.htm

National Industrial Chemicals Notification and Assessment Scheme (NICNAS)

NICNAS is a national statutory scheme established in 1990 to provide notification and assessment of industrial chemicals to protect the health of the public, workers and the environment. NICNAS assesses all chemicals new to Australia as well as those already in use in response to concerns about their safety on health and environmental grounds. The scheme increases public knowledge about chemicals and chemical safety through:

- more than 2400 scientific assessment reports that contain safety recommendations for the handling and labelling of particular chemicals and details of any restrictions or bans on the import or manufacture of them

- the Chemical Gazette which is published electronically every month and provides information such as changes to NICNAS legislation or newly assessed chemicals
- the Australian Inventory of Chemical Substances which lists the properties of more than 38,000 chemicals.

Trichloroethylene and methylene chloride are two chlorinated solvents that have been assessed by NICNAS as priority existing chemicals (PEC). This means that, on reasonable grounds, they have been declared to give rise to adverse health or environmental effects in their manufacture, use or disposal, or with the potential to do so.

For more information about NICNAS, visit www.nicnas.gov.au/

In June 2001, NICNAS conducted a preliminary risk assessment on tetrachloroethylene. As a result, a safety information sheet was developed outlining its environmental and human risks and some recommendations for its use in particular industrial applications. This is available at www.nicnas.gov.au/publications/information_sheets/safety_information_sheets/sis_19_tetrachloroethylene_pdf.pdf

National environmental management of chemicals

A national framework for the environmental management of chemicals (known as 'NChEM') was endorsed by the Environment Protection and Heritage Council in 2007. This included a Ministerial Agreement and National Action Plan to improve environmental aspects of Australia's chemical management system and promote consistent regulation across states and territories. The NChEM working group has representatives from Commonwealth and State and Territory environment agencies and is progressing the implementation of Council of Australian Governments (COAG) decisions based on the recommendations of a 2008 Productivity Commission Report on Chemicals and Plastics Regulation. For further information, visit www.ephc.gov.au/taxonomy/term/75

Guidance for the dry cleaning industry

Perchloroethylene (a chlorinated solvent) is used as a dry cleaning solvent and the waste produced from the cleaning process is likely to contain carcinogens and be toxic to the environment. As a result of a campaign focused on the dry cleaning industry, OEH developed an information package to assist the industry to better understand the environmental risks and responsibilities associated with their business and provide practical information on managing the industry's key environmental issues. This included *Managing dry cleaning waste*, a brochure detailing how to responsibly store perchloroethylene and dry cleaning waste containing the chemical and dispose of it lawfully.

For more information about this program, visit www.environment.nsw.gov.au/waste/drycleaningwaste.htm

Environmental Action for Automotive Servicing and Repairs

In May 2008, OEH developed a guide to provide auto repairers with valuable information on improving their environmental performance. The guide summarises the NSW environmental law that applies to this industry and provides practical information for each key environmental issue. In particular, as part of this guide, 'Information Sheet 4: Hazardous substances and liquid waste' was developed, outlining the appropriate storage, use and disposal of liquid chemicals. While the fact sheets are designed for the automotive industry, the principles they contain can be applied to any industry dealing with similar environmental issues.

For more information, visit www.environment.nsw.gov.au/sustainbus/autorepairers.htm.

Appendix A: Premises audited in this review

Individual compliance audit reports for these facilities are publicly available in the OEH Library on Level 15, 59 Goulburn Street, Sydney; phone (02) 9995 5302.

Scheduled activity	Licence number	Accountable party
Chemical production: dangerous goods	5686	Buckman Laboratories Pty Ltd
Chemical production: paint/polish/adhesives	2785	The Valspar (Australia) Corporation Pty Ltd
Chemical production: other	828	Orica Australia Pty Ltd
Chemical production: other	12202	Sigma-Aldrich Pty Ltd
Chemical production: plastic resins	4244	Foamco Industries Pty Ltd
Chemical production: pesticides	472	Cheminova (MFG) Pty Ltd
Chemical production: waste generation	5961	Memcor Australia Pty Ltd
Chemical storage	7127	Boeing Aerostructures Australia Pty Ltd
Metallurgical activities	1098	Crane Enfield Metals Pty Ltd
Waste processing (non-thermal treatment)	4806	Veolia Environmental Services (Australia) Pty Ltd
Waste storage	5790	Solvents Australia Pty Ltd
Waste storage	6091	Transpacific Industries Pty Ltd
Waste storage	12628	Dolomatrix Australia Ltd
Waste storage	12943	Tox Free (New South Wales) Pty Ltd

Glossary

Appropriate regulatory authority (ARA)	The EPA, a local authority or a public authority prescribed for the purposes of section 6(3) of the POEO Act
Aquatic organisms	Organisms which live in water
Aquifer	A layer of rock or soil that is able to hold or transmit water
Audit	A systematic, independent and documented verification process of objectively obtaining and evaluating audit evidence to determine whether specified criteria are met
Audit criteria	Defined requirements against which the auditor compares collected audit evidence with criteria including regulatory requirements, standards, guidelines or any other specified requirements
Authorised officer	Person appointed under Part 7.2 of the POEO Act by an appropriate regulatory authority
Boiling point	Temperature at which the vapour pressure of a substance equals the atmospheric or other designated pressure
Bulk storage	Container storing 1000 litres or kilograms or more including IBC, large storage tanks or demountable tanks
Bund(ed)	Embankment or wall, which may form part of the perimeter of a compound, designed to contain spills of liquids with both the bund and the compound floor made of sufficiently impervious material to retain spills or leaks
Chlorinated solvent	Organic solvent containing chlorine atoms: examples include methylene chloride, perchloroethylene and 1,1,1 trichloroethylene used as cleaning agents
Class (of dangerous goods)	The number assigned to dangerous goods which exhibit a common single or most significant risk, determined from the criteria in the UN Manual of Tests and Criteria and listed in the Australian Dangerous Goods Code
Compliance	Sufficient and appropriate evidence to demonstrate a particular requirement has been complied with and is within the scope of the audit
Container	Anything in or by which dangerous goods are wholly or partly encased, covered, enclosed, contained or packed, whether such a thing is empty or partially or completely full, but does not include a vehicle or freight container
Containment	Impervious barrier or drainage system where spills of chemicals, oils, sewage, etc. are contained within, rather than being absorbed at the surface
Contaminated land (site)	Legally defined as land where a substance is present at a concentration higher than is normally found on land in the same area, where that substance presents a risk of harm to human health or the environment including land which has been contaminated by migration from another site
Dangerous good	Substance or article prescribed by the regulations as dangerous goods, or Substance or article determined by a Competent Authority in accordance with the regulations to be a dangerous good
Degreasing	Removal of grease, oil or other lubricant-type materials by immersion in an effective solvent
Density	Mass per unit volume

Effluent	<p>Wastewater from sewage collection or treatment plants, or</p> <p>Wastewater from collection or treatment systems that are ancillary to processing industries involving livestock, agriculture, wood, paper or food, being wastewater conveyed from the place of generation by means of a pipe, canal or other conventional method used in irrigation (but not by means of a tanker or truck), or</p> <p>Wastewater from collection or treatment systems that are ancillary to intensive livestock, aquaculture or agricultural industries, being wastewater released by means of a pipe, canal or other conventional method used in irrigation as part of day-to-day farming operations.</p>
Environment protection licence	Licence that authorises the carrying out of scheduled development work or scheduled activities or controls water pollution arising from non-scheduled activities, being a licence issued under Chapter 3 of the POEO Act and in force
Evaporate	To change or cause to change from liquid or a solid state to a vapour
Expansion joint (concrete)	Joint in a concrete or masonry structure designed to permit expansion without damage to the structure
Groundwater	Subsurface water contributing to the water table, an aquifer or a confined aquifer
Handling	Includes conveying, manufacturing, processing, possessing, using, preparing for use, treating, dispensing, packing, selling, offering for sale, supplying, transferring, loading and unloading, rendering harmless, abandoning, destroying and disposing of dangerous goods
Incompatible (goods)	Goods incompatible with particular dangerous goods because they are likely to interact with the dangerous goods when mixed or otherwise brought into contact with them
Intermediate bulk container (IBC)	<p>Rigid or flexible portable packaging for the transport or storage of dangerous goods that:</p> <ul style="list-style-type: none"> • has a capacity of not more than: <ul style="list-style-type: none"> for solids of Packing Group I packed in a composite, fibreboard, flexible, wooden or rigid plastics or wooden container – 1500 litres for solids of Packing Group I packed in a metal container – 3000 litres for solids or liquids of Packing Groups II and III – 3000 litres • is designed for mechanical handling • is resistant to the stresses produced in usual handling and transport
Licensing threshold	Level of production or processing (or capacity to produce or process) above which an activity becomes scheduled under the POEO Act
Major incident	Significant event where the amount or toxic nature of the chemical released or potentially released can cause serious harm to community health or the environment
Material safety data sheet (MSDS)	Document which provides information on the identification, health hazards, precautions for use and safe handling of a special chemical product, and which complies with NOHSC 1994b in Australia
Minor incident	Where the amount or nature of the released or potentially released substance cannot cause serious harm to community health or the environment and the material is identified as a substance with minor hazardous properties
Monitoring	Data collection, analysis and interpretation to determine the state of a system and how it is changing
Non-compliance	Clear evidence within the scope of an audit demonstrating a particular requirement has not been met

Organic contaminant	Carbon-based chemical, such as solvents and pesticides
Packaged goods	Dangerous goods that are: <ul style="list-style-type: none"> • in relation to dangerous goods of Class 2, in a container with a capacity of not more than 500 litres, or • in relation to dangerous goods of other classes, in a container with – a capacity of not more than 450 litres, and a net mass of not more than 400 kilograms
Placard	Sign or notice for display in a public place
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
Quality assurance	System of procedures, checks, audits and corrective actions to ensure that environmental monitoring and sampling, and other technical and reporting activities are of the highest achievable quality
Quality control	Overall system of activities that measures the attributes and performance of a process to verify that they meet the stated requirements established
Receiving environment	Bodies of water that receive runoff or wastewater discharges, such as rivers, streams, lakes, estuaries and groundwater
Remediation	Process of addressing contamination by removing, dispersing, destroying, reducing or mitigating the contamination of a parcel of land
Scheduled activity	Activity listed in Schedule 1 to the POEO Act
Scope (of an audit)	Defines the extent and boundaries of an audit such as locations, organisational units, activities and processes to be audited, and the time period
Sight level glass	Glass tube used to indicate the liquid level in a pipe, tank, or the like
Solubility	Measure of how much solute can be dissolved in a specific solvent: chlorinated solvents have low solubility in water.
Stormwater	Rainwater that has been collected in guttering/pipes or has run off from the surrounding land
Substantially resistant	Materials used in the construction of compounds and/or bunds that are able to resist attack by any toxic substance
Sufficiently impervious	In the case of bunds and compound floors, those able to retain spills and leaks until they are cleaned up
Sump	Pit, well or containment structure where water or other liquids are collected
Transfer point	Point in a conveying operation where a substance is transferred from one point to another; could be the junction of two pipelines or point of transfer from a bulk container to a drum, etc.
Vapour	Substance in a gaseous state
Viscosity	Measure of the resistance of a fluid to flow: an example is water having a low viscosity and moving readily, while honey is a 'thicker' fluid with a higher viscosity and slow moving. The less viscous the fluid is, the greater its ease of movement.
Volatility	Property of changing readily from a solid or liquid to a vapour and directly related to a substance's vapour pressure: at a given temperature, a substance with higher vapour pressure vaporises more readily than a substance with a lower vapour pressure.

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