Methane, chloro-: Human health tier II assessment

27 November 2014

CAS Number: 74-87-3

Preface

This assessment was carried out by staff of the National Industrial Chemicals Notification and Assessment Scheme (NICNAS) using the Inventory Multi-tiered Assessment and Prioritisation (IMAP) framework.

The IMAP framework addresses the human health and environmental impacts of previously unassessed industrial chemicals listed on the Australian Inventory of Chemical Substances (the Inventory).

The framework was developed with significant input from stakeholders and provides a more rapid, flexible and transparent approach for the assessment of chemicals listed on the Inventory.

Stage One of the implementation of this framework, which lasted four years from 1 July 2012, examined 3000 chemicals meeting characteristics identified by stakeholders as needing priority assessment. This included chemicals for which NICNAS already held exposure information, chemicals identified as a concern or for which regulatory action had been taken overseas, and chemicals detected in international studies analysing chemicals present in babies' umbilical cord blood.

Stage Two of IMAP began in July 2016. We are continuing to assess chemicals on the Inventory, including chemicals identified as a concern for which action has been taken overseas and chemicals that can be rapidly identified and assessed by using Stage One information. We are also continuing to publish information for chemicals on the Inventory that pose a low risk to human health or the environment or both. This work provides efficiencies and enables us to identify higher risk chemicals requiring assessment.

The IMAP framework is a science and risk-based model designed to align the assessment effort with the human health and environmental impacts of chemicals. It has three tiers of assessment, with the assessment effort increasing with each tier. The Tier I assessment is a high throughput approach using tabulated electronic data. The Tier II assessment is an evaluation of risk on a substance-by-substance or chemical category-by-category basis. Tier III assessments are conducted to address specific concerns that could not be resolved during the Tier II assessment.

These assessments are carried out by staff employed by the Australian Government Department of Health and the Australian Government Department of the Environment and Energy. The human health and environment risk assessments are conducted and published separately, using information available at the time, and may be undertaken at different tiers.

This chemical or group of chemicals are being assessed at Tier II because the Tier I assessment indicated that it needed further investigation.

For more detail on this program please visit:www.nicnas.gov.au

Disclaimer

Acronyms & Abbreviations

Chemical Identity

Synonyms	chloromethane methyl chloride
Structural Formula	
Molecular Formula	CH3Cl
Molecular Weight (g/mol)	50.49
Appearance and Odour (where available)	Colourless gas with mildly sweet odour
SMILES	CCl

Import, Manufacture and Use

Australian

No specific Australian use, import, or manufacturing information has been identified.

International

The following international uses have been identified through the European Union (EU) Registration, Evaluation and Authorisation of Chemicals (REACH) dossiers; the Organisation for Economic Cooperation and Development Screening information data set International Assessment Report (OECD SIAR); Galleria Chemica; the Substances and Preparations in the Nordic countries (SPIN); and the United States (US) National Library of Medicine's Hazardous Substances Data Bank (HSDB).

The chemical has reported domestic use as a static guard (used at 0.0004 % concentration) (US Household Products Database).

The chemical has reported site-limited uses including:

- as an intermediate producing other chloromethanes, silicones, quaternary amines, butyl rubber and surfactants;
- as a methylating agent in organic reactions;
- as a blowing agent in some polystyrene and polyurethane foams;
- as an extractant for oils, fats and resins;
- producing tetramethyl lead and fluids used in thermometric and thermostatic equipment; and
- for processing timber products.

The chemical is no longer used significantly as a refrigerant (US EPA, 2001).

The chemical has reported non-industrial use including in:

- pesticides; and
- pharmaceuticals.

Restrictions

Australian

No known restrictions have been identified.

International

The chemical is listed on the following (Galleria Chemica):

- EU Cosmetics Regulation 1223/2009 Annex II—List of substances prohibited in cosmetic products;
- New Zealand Cosmetic Products Group Standard—Schedule 4: Components cosmetic products must not contain;

- Health Canada List of prohibited and restricted cosmetic ingredients (The Cosmetic Ingredient 'Hotlist'); and
- The Association of Southeast Asian Nations (ASEAN) Cosmetic Directive Annex II Part 1: List of substances which must not form part of the composition of cosmetic products.

Existing Work Health and Safety Controls

Hazard Classification

The chemical is classified as hazardous, with the following risk phrases for human health in the Hazardous Substances Information System (HSIS) (Safe Work Australia):

- Xn; R48/20 (repeated dose toxicity)
- R40 Carc. Cat 3 (carcinogenicity)

Exposure Standards

Australian

The chemical has an exposure standard of 103 mg/m^3 (50 ppm) time weighted average (TWA) and 207 mg/m^3 (100 ppm) short-term exposure limit (STEL).

International

The following exposure standards are identified (Galleria Chemica).

TWA

- 100–105 mg/m^3 (50 ppm) in Canada (Alberta, British Columbia, Quebec, Saskatchewan), Egypt, Estonia, France and Germany;
- 210 mg/m^3 (100 ppm) in Canada (Yukon); and
- 50–60 mg/m^3 (25 ppm) in Bulgaria, China and Denmark.

STEL

- 200–210 mg/m^3 (100 ppm) in Canada (Alberta, British Columbia, Quebec, Saskatchewan), Egypt, Estonia and France;
- 260 mg/m^3 (125 ppm) in Canada (Yukon); and
- 100–120 mg/m^3 in Bulgaria and China.

Health Hazard Information

The chemical is a volatile gas at ambient temperatures, unless compressed. Skin or eye irritation and sensitisation and oral or dermal toxicity are not considered relevant to the routes of exposure.

Toxicokinetics

The chemical is absorbed following inhalation exposure and rapidly reaches equilibrium in exhaled air and in the blood of both humans and animals. The blood:air partition coefficient for humans was determined (in vivo) to be 2.12–2.48, from inhaling the chemical vapour at 20.7 mg/m^3, and 2.47 for rats using an in vitro technique (OECD, 2003).

The chemical is highly volatile and does not accumulate in the tissues. Following inhalation, the chemical is metabolised rapidly and eliminated in exhaled air and in urine. Blood clearance was biphasic, with a half-life of 15 minutes in rats; 50 minutes in dogs and 50–90 minutes in humans (ATDSR, 1998; OECD, 2003; HSDB).

In humans, the primary metabolic route for the chemical is via a glutathione (GSH)-mediated pathway to form sulfur-containing compounds (S-methylglutathione, S-methylcysteine). The other identified metabolic route, which occurs to a lesser extent, is oxidation by cytochrome P450 (specifically by the isozyme CYP2E1) to yield formaldehyde and formic acid (US EPA, 2001; OECD, 2003). The kidneys of male mice were found to have the highest P450 content, and significant amounts of formaldehyde were found compared with those of female mice and rats (US EPA, 2001).

Acute Toxicity

Oral

The chemical is a gas and not expected to cause acute oral toxicity.

The chemical was reported to have low acute oral toxicity in rats. However, the median lethal dose (LD50) was reported to be 1800 mg/kg bw in rats (OECD, 2003), which falls within the hazard classification range (<2000 mg/kg bw).

Dermal

No data are available.

Inhalation

The available information indicates that the chemical has moderate acute inhalation toxicity in animals. Therefore, hazard classification is warranted.

The median lethal concentration (LC50) was 4000–6300 mg/m^3 in male mice (six hours), 5300–5400 mg/m^3 in rats (four hours) and 17000–17500 mg/m^3 (six hours) in female mice. Sublethal effects observed in rats and mice following acute exposure include ataxia, tremors, limb paralysis and loss of coordination, and cerebellar lesions (ATDSR, 1998; US EPA, 2001; OECD, 2003).

Hepatic and renal effects were observed in rats and mice following acute inhalation exposure at concentrations >2065 mg/m^3 (1000 ppm). Mice were more sensitive to these effects than rats, with reported effects on the kidneys (degeneration and regeneration of renal tubules) and liver (necrosis and degeneration). Other target organs susceptible to acute inhalation toxicity were the spleen (mice) at 4956 mg/m^3 (2400 ppm), testes and epididymides (rats) at 1033 mg/m^3 (500 ppm), and respiratory and cardiovascular systems (dogs) at 30975 mg/m^3 (15000 ppm) (ATDSR, 1998; OECD, 2003).

Observation in humans

The chemical causes effects on the central nervous system (CNS) following acute inhalation exposure; high concentrations may result in death in the absence of immediate medical attention. Effects on the liver, kidneys, lung, heart and gastrointestinal tract were observed at a higher exposure than that which caused CNS toxicity (OECD, 2003).

Neurological symptoms (ataxia, staggering, drowsiness, anorexia, blurred and double vision, convulsion, nausea, and coma) were reported in refrigerator repairmen when exposed to the chemical vapours from leaks at concentrations up to 600000 ppm (1239 mg/L). These symptoms generally occurred shortly after exposure and were reversible within several months, but could persist for a lifetime (ATDSR, 1998; US EPA, 2001).

Crew members (n = 17) of a fishing trawler exposed for two days to the chemical leaking from a refrigerator (located under their sleeping quarters) were examined for several years following exposure. Fifteen out of 17 displayed symptoms of intoxication following exposure. Nine displayed neurological symptoms during exposure. Four deaths were reported; one died within 24 hours of exposure, while two developed severe depression and committed suicide 11 and 18 months later. The fourth patient (disabled due to severe neurological and psychiatric deficits) died 10 years post exposure. Thirteen years after exposure, all remaining survivors had neurological symptoms (tremor, paralysis of accommodation (how the eye maintains focus), and peripheral neuropathy) (ATDSR, 1998; US EPA, 2001).

Case studies have also reported some degeneration in the cerebral cortex, spinal cord, and frontal and parietal atrophy following exposure to the chemical (US EPA, 2001). The exposure concentrations and duration were not stated.

Corrosion / Irritation

Skin Irritation

No data are available.

Eye Irritation

No data are available.

Sensitisation

Skin Sensitisation

No data are available.

Repeated Dose Toxicity

Oral

No data are available.

Dermal

No data are available.

Inhalation

The chemical is classified as hazardous with the risk phrase ‘Harmful: danger of serious damage to health by prolonged exposure through inhalation’ (Xn; R48/20) in HSIS (Safe Work Australia). The effects reported in a short-term exposure study in

female mice (cerebellar lesions at 200 mg/m^3 or 100 ppm) support this classification.

The primary effects observed in animal studies following repeated inhalation exposure were CNS symptoms, followed by effects on the liver, kidneys and the brain. Mice were more sensitive to the chemical than rats.

In a short-term inhalation study, female mice were exposed to the chemical vapour continuously for 22 hours/day for 11 days at 15, 50, 100, 150, 200 or 400 ppm (30, 100, 200, 300, 400 or 800 mg/m^3). The no observed adverse effect concentration (NOAEC) was 100 mg/m^3 (50 ppm), based on cerebellar lesions observed at 200 mg/m^3 (100 ppm) (OECD, 2003). When female mice were intermittently exposed to the chemical vapour for 5.5 hours/day for 11 days at 150, 400, 800, 1600 or 2400 ppm (300, 800, 1600, 3200 or 4800 mg/m^3) the NOAEC was reported to be 300 mg/m^3 (150 ppm). Treatment-related effects were not stated, although the lowest observed adverse effect concentration (LOAEC) was reported as 800 mg/m^3 (400 ppm) (OECD, 2003).

In a repeated dose inhalation study (OECD Test Guideline (TG) 413), rats and mice (10/sex/dose) were exposed (whole body) to the chemical vapour at doses of 750, 1500 or 3000 mg/m^3 (375, 750 or 1500 ppm), six hours/day, five days/week for 90 days. At the highest concentration, the effects observed included increased serum alanine aminotransferase (ALT) values (in male mice), increased relative liver weights (in mice and female rats), increased relative kidney weights (in mice), hepatic infarction (in one female rat and one male mouse) and cytoplasmic vacuolisation of hepatocytes in both species. A NOAEC of 1500 mg/m^3 was established for both species (OECD, 2003; REACH).

In short-term (9–12-day) inhalation studies, rats and mice were exposed to the chemical vapour at 4000, 7000 or 10000 mg/m^3, and 1000, 2000 or 4000 mg/m^3, respectively. At the highest concentration, deaths occurred in both species, with all male mice being dead or moribund by day two of exposure. Mice exhibited CNS symptoms (ataxia) and haematuria (mainly in females) before dying. Other treatment-related lesions observed in mice were renal and hepatocellular degeneration and necrosis, and brain lesions (more severe in females). Male rats showed dose-dependent testicular lesions (reduced number of spermatids, separation of spermatocytes) at all concentrations. At concentrations ≥7000 mg/m^3, the rats showed CNS symptoms (incoordination of forelimbs, hind limb paralysis and convulsions), severe diarrhoea, and kidney, liver and brain lesions that were less severe than in mice (OECD, 2003; REACH).

In two-year combined chronic/carcinogenicity studies (OECD TG 453), rats and mice (120/sex/dose) were exposed to the chemical at doses of 100, 450 or 2000 mg/m^3, six hours/day, five days/week. At the highest concentration, mice displayed CNS disturbances, kidney and liver lesions (hepatocellular degeneration, renal tubule epithelial hyperplasia), cerebellar lesions (degeneration and atrophy of granular cells, dose-related in male mice), splenic atrophy and lymphoid depletion. Neurofunctional impairment was observed in female mice . Effects observed in rats at the highest dose were less severe, and involved increased heart, kidney, liver weights; decreased brain weights (in females); and testicular weights in males. A NOAEC of 450 mg/m^3 was established for both species (ATDSR, 1998; OECD, 2003; REACH).

Observation in humans

A number of studies have been conducted to evaluate the neurological functions in volunteers or workers occupationally exposed to the chemical. Most of the case studies are of unknown duration.

Case studies in workers have reported neurological and behavioural symptoms (loss of coordination, dizziness, blurred vision, mental confusion and depression), cardiovascular effects (low blood pressure, tachycardia and increased pulse rate) and hepatic effects (jaundice and cirrhosis) following repeated inhalation exposure for at least two weeks to low levels of the chemical (413–800 mg/m^3). Gastrointestinal effects (nausea, vomiting) were reported at higher exposure concentrations. Mental impairment was reported to persist up to two months in one of the patients, but the other symptoms were generally completely reversible (ATDSR, 1998, US EPA, 2001).

In an epidemiological study, foam workers co-exposed to the chemical at a concentration of approximately 72 mg/m^3 (35 ppm) for two years showed adverse effects in performance and cognitive functions. In a short-term study, healthy volunteers (eight

men, nine women) were exposed to the chemical vapour at concentrations of 41–310 mg/m^3, up to 7.5 hours/day, five days/week up to six weeks in an exposure chamber. No effects on clinical parameters, neurological systems (based on task performance) or behaviour were observed (ATDSR, 1998; WHO, 2000).

Genotoxicity

The available data indicate positive results for both in vitro and in vivo genotoxicity studies with the chemical. However, the in vivo studies have been conducted using very high concentrations and, therefore, no conclusion can be made on the genotoxic potential of the chemical.

The OECD (2003) report stated that the chemical 'at high concentrations, is a direct-acting mutagen in bacteria and human cells in culture (*in vitro*); however, *in vivo* genotoxic effects were not seen due to cytotoxicity occuring at high doses. Existing information indicates that chloromethane exposure does not result in DNA alkylation (i.e. no evidence of methylated products)'.

The chemical gave positive results in several in vitro assays (WHO, 2000; US EPA 2001; OECD, 2003):

- positive results in bacterial reverse mutation assays with strains of *Salmonella typhimurium* and *Escherichia coli* at a range of concentrations (10000–600000 mg/m^3);
- induced mutation and sister chromatid exchanges (SCE) in human lymphoblasts, without metabolic activation; and
- positive results in an unscheduled DNA synthesis (UDS) test in rat hepatocytes and spermatocytes, without metabolic activation.

The in vivo studies that have been conducted with very high concentrations of the chemical demonstrated that:

- the chemical did not induce UDS in rat hepatocytes, spermatocytes and tracheal epithelial cells when exposed to the chemical vapour at 6000–7000 mg/m^3, six hours/day for up to five days. A marginal increase in UDS in hepatocytes was observed after an acute three-hour exposure to a high concentration of 30900 mg/m^3 (US EPA, 2001; OECD, 2003);
- the chemical gave positive results in dominant lethal assays in rats when exposed to the chemical at 6190 mg/m^3, but subsequent studies have indicated this to be a result of inflammation in the epididymis and vas deferens, leading to cytotoxicity. No evidence of DNA alkylation was reported in rats or mice (OECD, 2003); and
- the chemical gave positive results in a sex-linked recessive lethal test in *Drosophila melanogaster* at a dose level of 412000 mg/m^3 (OECD, 2003).

The positive results observed at these high concentrations were suggested to be due to cytotoxicity (OECD, 2003).

Carcinogenicity

The chemical is classified as a Cat. 3 carcinogen with the risk phrase ‘Limited evidence of a carcinogenic effect (R40)’ in the HSIS (Safe Work Australia). While available data do not clearly support this classification, there also is insufficient evidence in this Tier II assessment to recommend its removal from the HSIS.

The International Agency for Research on Cancer (IARC) classified the chemical as ‘not classifiable as to its carcinogenicity to humans (Group 3)’. IARC (1999) concluded that ‘There is *inadequate evidence* for the carcinogenicity of methyl chloride in humans. There is *inadequate evidence* for the carcinogenicity of methyl chloride in experimental animals’ The United States Environmental Protection Agency (US EPA) classified the chemical as ‘not classifiable as to its human carcinogenicity’ (Group D) (US EPA, 2001).

The only animal carcinogenicity study available is a two-year combined chronic carcinogenicity bioassay in rats and mice (see **Repeat dose toxicity: Inhalation**). At the highest concentration (2000 mg/m^3), statistically significant increased incidences of renal tumours (renal cortical adenoma, adenocarcinoma, papillary cystadenoma, cystadenocarcinoma and tubular cystadenoma), and renal cortical tubuloepithelial hyperplasia and karyomegaly, were observed in male mice. Two renal adenomas were observed in male mice at 465 mg/m^3 and were considered to be treatment-related. No renal tumours were detected in female mice or rats (US EPA, 2001; OECD, 2003).

Renal tumours observed in male mice were considered to be related to the CYP2E1 oxidative metabolism (see **Toxicokinetics**). The male mouse kidney contains the highest levels of endogenous CYP2E1 (compared with female mice and rats), which then aids the formation of formaldehyde (a known carcinogen) that can lead to renal tumours. This mode of action may be of little relevance to humans due to this specific isozyme not being detected in human kidneys. The possibility of other cytochrome P450 isozymes (CYP3A and CYP4F present in human kidneys) metabolising the chemical into toxic intermediates has not been evaluated (US EPA, 2001; OECD, 2003; Health Canada, 2009).

Cohort studies in humans have shown no association between exposure to the chemical and cancer of any type. No evidence of excess mortality from cancer in occupational settings was reported (US EPA, 2001; OECD, 2003).

Reproductive and Developmental Toxicity

Based on the available data, it is not possible to make a conclusion on the reproductive and developmental toxicity of the chemical. The reproductive and developmental effects were inconsistent across species. Reproductive effects (testicular lesions) were more prominent in male rats compared with mice, but occurred only at high concentrations (>1030 mg/m^3). Developmental effects were observed in mice (≥1030 mg/m^3), but the results were inconsistent. Rats showed foetal effects only at concentrations that resulted in maternal toxicity.

In a two-generation reproductive toxicity study (OECD TG 416), groups of Fischer 344 (F344) rats (40 males, 80 females/dose) were exposed to the chemical vapour at 0, 300, 950 or 3000 mg/m^3 (0, 150, 475 or 1500 ppm). The F0 generation were exposed for 10 weeks (six hours/day, five days/week) pre-mating and during a two-week mating period (six hours/day, seven days/week). The F0 dams were further exposed to gestation day (GD) 18, then from postnatal days (PND) 4–28 (exposure ceased from GD 18–PND 3). The exposure schedule for the F1 generation was similar to F0, with the exception of the highest concentration of 3000 mg/m^3. At the highest concentration, no litters were born in the F0 generation and decreased spermatogenesis was observed in the males. At 950 mg/m^3, significantly fewer litters were born (exposed or unexposed), mated to exposed F0 males. The NOAEC for the F0 generation was established as 300 mg/m^3, based on reduced male fertility observed at 950 mg/m^3. The effects on decreased fertility and the number of litters were less significant in the F1 generation, but no NOAEC was determined (OECD, 2003; REACH).

In acute and repeated dose inhalation toxicity studies, testicular effects (decreased testicular and epididymal weights, degeneration of seminiferous epithelium, delayed spermiation, sperm abnormalities) were observed in male rats at concentrations >1030 mg/m^3 (see **Acute** and **Repeat dose toxicity**). Subsequent studies on testicular effects indicated that preimplantation loss observed in rat studies was due to the cytotoxicity of the chemical to the sperm at the time of exposure (ATSDR, 1998; US EPA, 2001). The OECD (2003) suggested that the testicular effects observed could be 'secondary, as pronounced CNS changes occur in the presence of these effects being observed' (OECD, 2003).

In two developmental toxicity studies (OECD TG 414), female C57BL/6 mice (33/dose), bred to male C3H mice to produce B6C3F1 foetuses, were exposed to the chemical vapour at doses of 0, 206, 1030 or 3090 mg/m^3 or 0, 515, 1030 or 1545 mg/m^3, six hours/day on GD 6–18. The dams displayed severe maternal toxicity (neurotoxicity and urogenital bleeding) at doses ≥1545 mg/m^3. At doses ≥1030 mg/m^3, a statistically significant increase in foetal heart defects was observed in the absence of maternal toxicity. The developmental NOAECs for the two studies were 206 and 515 mg/m^3 respectively. The maternal NOAEC for both studies was established at 1030 mg/m^3 (OECD, 2003; REACH). However, heart defects were not observed in another similar study in mice exposed to the chemical at 0, 515, 620 or 2064 mg/m^3 on GD 11.5–12.5 (US EPA, 2001).

In another developmental toxicity study, F344 rats (25/dose) were also exposed to the chemical at doses of 0, 206, 1030 or 3090 mg/m^3 on GD 7–19. At the highest dose (3090 mg/m^3), maternal effects (decreased body weight and weight gain) and foetal effects (reduced female crown-rump length and foetal body weights) were observed. No developmental malformations were reported (US EPA, 2001; OECD, 2003; REACH).

Other Health Effects

Neurotoxicity

Neurological symptoms were evident in acute and repeated dose inhalation toxicity studies in both animals and humans. These effects have been considered in the hazard classification of the chemical for acute and repeated dose inhalation toxicity.

The effects observed in animal inhalation studies following acute exposure to high concentrations of the chemical included ataxia, tremor, limb paralysis, delayed coordination and convulsions. Repeated exposures to low concentrations of the chemical have caused severe neurotoxicity symptoms in mice.

In a neurotoxicity study, female mice (12/dose) were exposed to the chemical vapour either continuously or intermittently for 11 days. The main effects observed were cerebellar degeneration at 200 mg/m^3 with continuous exposure; performance decrements ≥1652 mg/m^3 with intermittent exposure and at 310 mg/m^3 with continuous exposure; moribundity at 300 mg/m^3 by day 10 with continuous exposure (ATDSR, 1998; US EPA, 2001; OECD, 2003; REACH). See **Repeat dose toxicity: Inhalation**).

Case reports of neurotoxicity in humans mainly consisted of exposures to chemical vapours due to leaks from defective refrigerators (see **Acute** and **Repeat dose toxicity**). The common symptoms reported include nausea, tremor, mental confusion, blurred and double vision, fatigue, ataxia and depression (ATDSR, 1998; OECD, 2003). An NOAEC of 100–200 mg/m^3 has been indicated for neurotoxicity effects in humans (OECD, 2003).

Risk Characterisation

Critical Health Effects

Inhalation is the main route of exposure for the chemical. The critical health effects for risk characterisation include harmful systemic effects following acute and repeated inhalation exposure.

The chemical is highly volatile and acute or repeated exposures to the vapour can cause neurotoxic effects (dizziness, tremor, ataxia, blurred vision). The chemical is also classified in HSIS as a Category 3 carcinogen.

Public Risk Characterisation

Given the uses identified for the chemical, it is unlikely that the public will be exposed. Hence, the public risk from this chemical is not considered to be unreasonable.

Occupational Risk Characterisation

During product formulation, inhalation exposure might occur, particularly where manual or open processes are used. Worker exposure to the chemical at lower concentrations could also occur while using formulated products containing the chemical. The level and route of exposure will vary depending on the method of application and work practices employed.

Given the critical systemic long-term and acute health effects, the chemical could pose an unreasonable risk to workers unless adequate control measures to minimise inhalation exposure are implemented. The chemical should be appropriately classified and labelled to ensure that a person conducting a business or undertaking (PCBU) at a workplace (such as an employer) has adequate information to determine the appropriate controls.

The data available support an amendment to the hazard classification in the HSIS (Safe Work Australia) (refer to **Recommendation** section).

NICNAS Recommendation

Assessment of the chemical is considered to be sufficient, provided that the recommended amendment to the classification is adopted, and labelling and all other requirements are met under workplace health and safety and poisons legislation as adopted by the relevant state or territory.

Regulatory Control

Work Health and Safety

The chemical is recommended for classification and labelling under the current approved criteria and adopted GHS as below. This assessment does not consider classification of physical and environmental hazards.

Hazard	Approved Criteria (HSIS)[a]	GHS Classification (HCIS)[b]
Acute Toxicity	Harmful by inhalation (Xn; R20)	Harmful if inhaled - Cat. 4 (H332)
Repeat Dose Toxicity	Harmful: danger of serious damage to health by prolonged exposure through inhalation (Xn; R48/20)*	May cause damage to organs through prolonged or repeated exposure through inhalation - Cat. 2 (H373)
Carcinogenicity	Carc. Cat 3 - Limited evidence of a carcinogenic effect (Xn; R40)*	Suspected of causing cancer - Cat. 2 (H351)

[a] Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(2004)].

[b] Globally Harmonized System of Classification and Labelling of Chemicals (GHS) United Nations, 2009. Third Edition.

[*] Existing Hazard Classification. No change recommended to this classification

Advice for industry

Control measures

Control measures to minimise the risk from inhalation exposure to the chemical should be implemented in accordance with the hierarchy of controls. Approaches to minimise risk include substitution, isolation and engineering controls. Measures required to eliminate, or minimise risk arising from storing, handling and using a hazardous chemical depend on the physical form and the manner in which the chemical is used. Examples of control measures which could minimise the risk include, but are not limited to:

- using closed systems or isolating operations;
- using local exhaust ventilation to prevent the chemical from entering the breathing zone of any worker;
- health monitoring for any worker who is at risk of exposure to the chemical, if valid techniques are available to monitor the effect on the worker’s health;
- air monitoring to ensure control measures in place are working effectively and continue to do so;

- minimising manual processes and work tasks through automating processes;
- work procedures that minimise splashes and spills;
- regularly cleaning equipment and work areas; and
- using protective equipment that is designed, constructed, and operated to ensure that the worker does not come into contact with the chemical.

Guidance on managing risks from hazardous chemicals are provided in the *Managing risks of hazardous chemicals in the workplace—Code of practice* available on the Safe Work Australia website.

Personal protective equipment should not solely be relied upon to control risk and should only be used when all other reasonably practicable control measures do not eliminate or sufficiently minimise risk. Guidance in selecting personal protective equipment can be obtained from Australian, Australian/New Zealand or other approved standards.

Obligations under workplace health and safety legislation

Information in this report should be taken into account to help meet obligations under workplace health and safety legislation as adopted by the relevant state or territory. This includes, but is not limited to:

- ensuring that hazardous chemicals are correctly classified and labelled;
- ensuring that (material) safety data sheets ((M)SDS) containing accurate information about the hazards (relating to both health hazards and physicochemical (physical) hazards) of the chemical are prepared; and
- managing risks arising from storing, handling and using a hazardous chemical.

Your work health and safety regulator should be contacted for information on the work health and safety laws in your jurisdiction.

Information on how to prepare an (M)SDS and how to label containers of hazardous chemicals are provided in relevant codes of practice such as the *Preparation of safety data sheets for hazardous chemicals—Code of practice* and *Labelling of workplace hazardous chemicals—Code of practice*, respectively. These codes of practice are available from the Safe Work Australia website.

A review of the physical hazards of the chemical has not been undertaken as part of this assessment.

References

Agency for Toxic Substances & Disease Registry (ATSDR) 1998. Toxicological Profile for Chloromethane. Accessed October 2014 at http://www.atsdr.cdc.gov/toxprofiles/tp106.pdf

ChemIDPlus Advanced. Accessed October 2014 at http://chem.sis.nlm.nih.gov/chemidplus/

Galleria Chemica. Accessed October 2014. http://jr.chemwatch.net/galleria/

Hazardous Substances Data Bank (HSDB). National Library of Medicine. Accessed on October 2014 at http://toxnet.nlm.nih.gov.

Health Canada 2009. Screening Assessment for the Challenge. Methane, chloro- (Methyl chloride). Accessed October 2014 at http://www.ec.gc.ca/ese-ees/E517B46B-E682-4182-AE0F-AEC716DB98C0/batch6_74-87-3_en.pdf

International Agency for Research on Cancer (IARC) 1999. IARC Monographs on the evaluation of carcinogenic risks to humans. Vol. 71, Re-evaluation of some organic chemicals, hydrazine and hydrogen peroxide. Methyl Chloride, pp 737-747. Accessed October 2014 at http://monographs.iarc.fr/ENG/Monographs/vol71/mono71-32.pdf

OECD 2003. SIDS Initial Assessment Profile on Chloromethane. Accessed October 2014 at http://www.inchem.org/documents/sids/sids/CLMETHANE.pdf

REACH Dossier. Chloromethane (CAS No. 74-87-3). Accessed October 2014 at http://echa.europa.eu/web/guest/information-on-chemicals/registered-substances.

Safe Work Australia (SWA). Hazardous Substances Information System (HSIS). Accessed October 2014 at http://hsis.safeworkaustralia.gov.au/HazardousSubstance

Substances in Preparations in Nordic Countries (SPIN). Accessed October 2014 at http://188.183.47.4/dotnetnuke/Home/tabid/58/Default.aspx

US EPA 2001. Toxicological Review of Methyl Chloride. Accessed October 2014 via the US EPA Integrated Risk Information System (IRIS) http://www.epa.gov/iris/subst/1003.htm

World Health Organisation (WHO) 2000. Concise International Chemical Assessment Document 28 (CICAD). Methyl Chloride. Accessed October 2014 at http://whqlibdoc.who.int/publications/2000/9241530286.pdf

Last update 27 November 2014