

DR 60 CLEANER/REMOVER

Chemwatch Independent Material Safety Data Sheet
Issue Date: 5-Nov-2009
NC317ECP

CHEMWATCH 22-4974
Version No:2.0
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Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

DR 60 CLEANER/REMOVER

PROPER SHIPPING NAME

AEROSOLS

PRODUCT USE

■ Application is by spray atomisation from a hand held aerosol pack.
Used in NDT testing as cleaner/remover.

SUPPLIER

Company: Callington Haven Pty Ltd
Address:
PO Box 144
Rydalmere
NSW, 2116
AUS

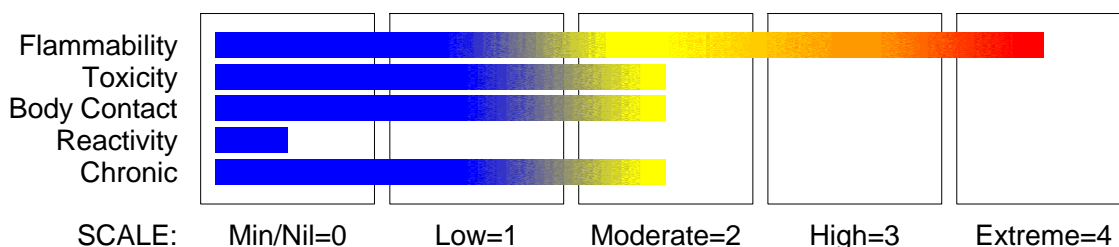
Company: Callington Haven Pty Ltd
Address:
30 South Street
Rydalmere
NSW, 2116
AUS
Telephone: +61 2 9898 2788
Emergency Tel: 1800 039 008 (24 hours)
Emergency Tel: +61 3 9573 3112
Fax: +61 2 9684 4215
Email: sales@calhaven.com.au

Section 2 - HAZARDS IDENTIFICATION

STATEMENT OF HAZARDOUS NATURE

NON-HAZARDOUS SUBSTANCE. DANGEROUS GOODS. According to the Criteria of NOHSC, and the ADG Code.

CHEMWATCH HAZARD RATINGS



POISONS SCHEDULE

None

RISK

Risk Codes
R12
R44
R67

Risk Phrases

- Extremely flammable.
- Risk of explosion if heated under confinement.
- Vapours may cause drowsiness and dizziness.

SAFETY

Safety Codes
S16

Safety Phrases

- Keep away from sources of ignition. No smoking.

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Section 2 - HAZARDS IDENTIFICATION

S23	■ Do not breathe gas/ fumes/ vapour/ spray.
S24	■ Avoid contact with skin.
S51	■ Use only in well ventilated areas.
S09	■ Keep container in a well ventilated place.
S07	■ Keep container tightly closed.
S60	■ This material and its container must be disposed of as hazardous waste.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
naphtha petroleum, heavy, hydrotreated	64742-48-9.	NotSpec
hydrocarbon propellant	68476-85-7.	NotSpec

Section 4 - FIRST AID MEASURES

SWALLOWED

- - Not considered a normal route of entry.
- If swallowed do NOT induce vomiting.
- If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.
- Observe the patient carefully.
- Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious.
- Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink.
- Seek medical advice.

EYE

- If this product comes in contact with the eyes:
- Immediately hold eyelids apart and flush the eye continuously with running water.
- Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
- Continue flushing until advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes.
- Transport to hospital or doctor without delay.
- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

SKIN

- If skin contact occurs:
- Immediately remove all contaminated clothing, including footwear.
- Flush skin and hair with running water (and soap if available).
- Seek medical attention in event of irritation.

INHALED

- - If fumes or combustion products are inhaled remove from contaminated area.
- Lay patient down. Keep warm and rested.
- Prosthesis such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
- Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.
- Transport to hospital, or doctor.

NOTES TO PHYSICIAN

- For acute or short term repeated exposures to petroleum distillates or related hydrocarbons:
- Primary threat to life, from pure petroleum distillate ingestion and/or inhalation, is respiratory failure.

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Section 4 - FIRST AID MEASURES

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- Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnoea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO₂ 50 mm Hg) should be intubated.
 - Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
 - A chest x-ray should be taken immediately after stabilisation of breathing and circulation to document aspiration and detect the presence of pneumothorax.
 - Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitisation to catecholamines. Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
 - Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients. [Ellenhorn and Barceloux: Medical Toxicology].

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

- - Water spray or fog.
- Foam.
- Dry chemical powder.
- BCF (where regulations permit).
- Carbon dioxide.

FIRE FIGHTING

- - Alert Fire Brigade and tell them location and nature of hazard.
- May be violently or explosively reactive.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water course.
- If safe, switch off electrical equipment until vapour fire hazard removed.
- Use water delivered as a fine spray to control fire and cool adjacent area.
- DO NOT approach containers suspected to be hot.
- Cool fire exposed containers with water spray from a protected location.
- If safe to do so, remove containers from path of fire.
- Equipment should be thoroughly decontaminated after use.

When any large container (including road and rail tankers) is involved in a fire, consider evacuation by 100 metres in all directions.

FIRE/EXPLOSION HAZARD

- - Liquid and vapour are highly flammable.
 - Severe fire hazard when exposed to heat or flame.
 - Vapour forms an explosive mixture with air.
 - Severe explosion hazard, in the form of vapour, when exposed to flame or spark.
 - Vapour may travel a considerable distance to source of ignition.
 - Heating may cause expansion or decomposition with violent container rupture.
 - Aerosol cans may explode on exposure to naked flames.
 - Rupturing containers may rocket and scatter burning materials.
 - Hazards may not be restricted to pressure effects.
 - May emit acrid, poisonous or corrosive fumes.
 - On combustion, may emit toxic fumes of carbon monoxide (CO).
- Other combustion products include: carbon dioxide (CO₂).

FIRE INCOMPATIBILITY

- Avoid contamination with strong oxidising agents as ignition may result.

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Section 5 - FIRE FIGHTING MEASURES

HAZCHEM: 2YE

Personal Protective Equipment

Gas tight chemical resistant suit.

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

- - Clean up all spills immediately.
- Avoid breathing vapours and contact with skin and eyes.
- Wear protective clothing, impervious gloves and safety glasses.
- Shut off all possible sources of ignition and increase ventilation.
- Wipe up.
- If safe, damaged cans should be placed in a container outdoors, away from all ignition sources, until pressure has dissipated.
- Undamaged cans should be gathered and stowed safely.

MAJOR SPILLS

- - Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- May be violently or explosively reactive.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water courses
- No smoking, naked lights or ignition sources.
- Increase ventilation.
- Stop leak if safe to do so.
- Water spray or fog may be used to disperse / absorb vapour.
- Absorb or cover spill with sand, earth, inert materials or vermiculite.
- If safe, damaged cans should be placed in a container outdoors, away from ignition sources, until pressure has dissipated.
- Undamaged cans should be gathered and stowed safely.
- Collect residues and seal in labelled drums for disposal.

Personal Protective Equipment advice is contained in Section 8 of the MSDS.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- - Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
- DO NOT enter confined spaces until atmosphere has been checked.
- Avoid smoking, naked lights or ignition sources.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- DO NOT incinerate or puncture aerosol cans.
- DO NOT spray directly on humans, exposed food or food utensils.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately.
- Use good occupational work practice.
- Observe manufacturer's storing and handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working

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Section 7 - HANDLING AND STORAGE

conditions are maintained.

SUITABLE CONTAINER

- - Aerosol dispenser.
- Check that containers are clearly labelled.

STORAGE INCOMPATIBILITY

- Avoid storage with oxidisers.

STORAGE REQUIREMENTS

- - Store in original containers in approved flame-proof area.
- DO NOT store in pits, depressions, basements or areas where vapours may be trapped.
- No smoking, naked lights, heat or ignition sources.
- Keep containers securely sealed. Contents under pressure.
- Store away from incompatible materials.
- Store in a cool, dry, well ventilated area in an upright position.
- Avoid storage at temperatures higher than 40 deg C.
- Protect containers against physical damage and check regularly for leaks.
- Observe manufacturer's storing and handling recommendations.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m ³	Notes
Australia Exposure Standards	naphtha petroleum, heavy, hydrotreated (Petrol (gasoline))		900	(see Chapter 16)
Australia Exposure Standards	hydrocarbon propellant (LPG (liquified petroleum gas))	1000	1800	

EMERGENCY EXPOSURE LIMITS

Material	Revised IDLH Value (mg/m ³)	Revised IDLH Value (ppm)
hydrocarbon propellant		2, 000 [LEL]

NOTES

Values marked LEL indicate that the IDLH was based on 10% of the lower explosive limit for safety considerations even though the relevant toxicological data indicated that irreversible health effects or impairment of escape existed only at higher concentrations.

MATERIAL DATA

DR 60 CLEANER/REMOVER:

Not available

NAPHTHA PETROLEUM, HEAVY, HYDROTREATED:

■ Sensory irritants are chemicals that produce temporary and undesirable side-effects on the eyes, nose or throat. Historically occupational exposure standards for these irritants have been based on observation of workers' responses to various airborne concentrations. Present day expectations require that nearly every individual should be protected against even minor sensory irritation and exposure standards are established using uncertainty factors or safety factors of 5 to 10 or more. On occasion animal no-observable-effect-levels (NOEL) are used to determine these limits where human results are unavailable. An additional approach, typically used by the TLV committee (USA) in determining respiratory standards for this group of chemicals, has been to assign ceiling values (TLV C) to rapidly acting irritants and to assign short-term exposure limits (TLV STELs) when the weight of evidence from irritation, bioaccumulation and other endpoints combine to warrant such a limit. In contrast the MAK Commission (Germany) uses a five-category system based on

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Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

intensive odour, local irritation, and elimination half-life. However this system is being replaced to be consistent with the European Union (EU) Scientific Committee for Occupational Exposure Limits (SCOEL); this is more closely allied to that of the USA.

OSHA (USA) concluded that exposure to sensory irritants can:

- cause inflammation
- cause increased susceptibility to other irritants and infectious agents
- lead to permanent injury or dysfunction
- permit greater absorption of hazardous substances and
- acclimate the worker to the irritant warning properties of these substances thus increasing the risk of overexposure.

Odour threshold: 0.25 ppm.

The TLV-TWA is protective against ocular and upper respiratory tract irritation and is recommended for bulk handling of gasoline based on calculations of hydrocarbon content of gasoline vapour. A STEL is recommended to prevent mucous membrane and ocular irritation and prevention of acute depression of the central nervous system. Because of the wide variation in molecular weights of its components, the conversion of ppm to mg/m³ is approximate. Sweden recommends hexane type limits of 100 ppm and heptane and octane type limits of 300 ppm. Germany does not assign a value because of the widely differing compositions and resultant differences in toxic properties.

Odour Safety Factor (OSF)

OSF=0.042 (gasoline).

REL TWA: 300 ppm

as VM & P naphtha

TLV TWA: 300 ppm, 1370 mg/m³

[EXXON]

PERSONAL PROTECTION



EYE

- - Safety glasses with side shields; or as required,
- Chemical goggles.
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59].

HANDS/FEET

- - No special equipment needed when handling small quantities.
- OTHERWISE: Wear general protective gloves, eg. light weight rubber gloves. Or as required: Wear chemical protective gloves, eg. PVC. Wear safety footwear.

OTHER

- No special equipment needed when handling small quantities.
- OTHERWISE:
 - Overalls.
 - Skin cleansing cream.
 - Eyewash unit.
 - Do not spray on hot surfaces.

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RESPIRATOR

■ Selection of the Class and Type of respirator will depend upon the level of breathing zone contaminant and the chemical nature of the contaminant. Protection Factors (defined as the ratio of contaminant outside and inside the mask) may also be important.

Breathing Zone Level ppm (volume)	Maximum Protection Factor	Half- face Respirator	Full- Face Respirator
1000	10	AX- AUS	-
1000	50	-	AX- AUS
5000	50	Airline *	-
5000	100	-	AX- 2
10000	100	-	AX- 3
	100+		Airline**

* - Continuous Flow

** - Continuous-flow or positive pressure demand.

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required. For further information consult site specific CHEMWATCH data (if available), or your Occupational Health and Safety Advisor.

ENGINEERING CONTROLS

■ Use in a well-ventilated area.

General exhaust is adequate under normal operating conditions. If risk of overexposure exists, wear SAA approved respirator. Correct fit is essential to obtain adequate protection. Provide adequate ventilation in warehouse or closed storage areas.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE

■ Supplied as an aerosol pack. Contents under PRESSURE. Contains highly flammable hydrocarbon propellant. Clear highly flammable liquid with petroleum odour; dispersible in water.

PHYSICAL PROPERTIES

Liquid.

Gas.

Mixes with water.

Molecular Weight: Not applicable.

Specific Gravity (water=1): Not available

pH (1% solution): Not applicable.

Evaporation Rate: Not available

Lower Explosive Limit (%): 1.8

Decomposition Temp (°C): Not Available

Boiling Range (°C): Not available

Solubility in water (g/L): Miscible

Vapour Pressure (kPa): 345 @ 21C

Relative Vapour Density (air=1): >1

Upper Explosive Limit (%): 9.5

State: Liquid

Melting Range (°C): Not available.

pH (as supplied): Not applicable

Volatile Component (%vol): Not available

Flash Point (°C): Not Available

Autoignition Temp (°C): Not available.

Viscosity: Not A vailable

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Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

CONDITIONS CONTRIBUTING TO INSTABILITY

- - Elevated temperatures.
 - Presence of open flame.
 - Product is considered stable.
 - Hazardous polymerisation will not occur.
- For incompatible materials - refer to Section 7 - Handling and Storage.*

Section 11 - TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

- Not normally a hazard due to physical form of product. Ingestion may result in nausea, pain, vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

EYE

- The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

SKIN

- The material may cause skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin. Toxic effects may result from skin absorption. The material may accentuate any pre-existing skin condition.

INHALED

- Inhalation of high concentrations of gas/vapour causes lung irritation with coughing and nausea, central nervous depression with headache and dizziness, slowing of reflexes, fatigue and inco-ordination. WARNING: Intentional misuse by concentrating/inhaling contents may be lethal.

CHRONIC HEALTH EFFECTS

- Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes. [PATTYS]. Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following. WARNING: Aerosol containers may present pressure related hazards.

TOXICITY AND IRRITATION

- Not available.

CARCINOGEN

Gasoline (NB: Overall evaluation upgraded from 3 to 2B with supporting evidence from other relevant data)	International Agency for Research on Cancer (IARC) Carcinogens	Group	2B
Petroleum solvents	International Agency for Research on Cancer (IARC) Carcinogens	Group	3

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Section 11 - TOXICOLOGICAL INFORMATION

Section 12 - ECOLOGICAL INFORMATION

Refer to data for ingredients, which follows:

NAPHTHA PETROLEUM, HEAVY, HYDROTREATED:
HYDROCARBON PROPELLANT:

■ For hydrocarbons:

Environmental fate:

The lower molecular weight hydrocarbons are expected to form a "slick" on the surface of waters after release in calm sea conditions. This is expected to evaporate and enter the atmosphere where it will be degraded through reaction with hydroxy radicals.

Some hydrocarbon will become associated with benthic sediments, and it is likely to be spread over a fairly wide area of sea floor. Marine sediments may be either aerobic or anaerobic. The material, in probability, is biodegradable, under aerobic conditions (isomerised olefins and alkenes show variable results). Evidence also suggests that the hydrocarbons may be degradable under anaerobic conditions although such degradation in benthic sediments may be a relatively slow process.

Under aerobic conditions hydrocarbons degrade to water and carbon dioxide, while under anaerobic processes they produce water, methane and carbon dioxide.

Alkenes have low log octanol/water partition coefficients (Kow) of about 1 and estimated bioconcentration factors (BCF) of about 10; aromatics have intermediate values (log Kow values of 2-3 and BCF values of 20-200), while C5 and greater alkanes have fairly high values (log Kow values of about 3-4.5 and BCF values of 100-1,500)

The estimated volatilisation half-lives for alkanes and benzene, toluene, ethylbenzene, xylene (BTEX) components were predicted as 7 days in ponds, 1.5 days in rivers, and 6 days in lakes. The volatilisation rate of naphthalene and its substituted derivatives were estimated to be slower

Indigenous microbes found in many natural settings (e.g., soils, groundwater, ponds) have been shown to be capable of degrading organic compounds. Unlike other fate processes that disperse contaminants in the environment, biodegradation can eliminate the contaminants without transferring them across media.

The final products of microbial degradation are carbon dioxide, water, and microbial biomass. The rate of hydrocarbon degradation depends on the chemical composition of the product released to the environment as well as site-specific environmental factors. Generally the straight chain hydrocarbons and the aromatics are degraded more readily than the highly branched aliphatic compounds. The n-alkanes, n-alkyl aromatics, and the aromatics in the C10-C22 range are the most readily biodegradable; n-alkanes, n-alkyl aromatics, and aromatics in the C5-C9 range are biodegradable at low concentrations by some microorganisms, but are generally preferentially removed by volatilisation and thus are unavailable in most environments; n-alkanes in the C1-C4 ranges are biodegradable only by a narrow range of specialised hydrocarbon degraders; and n-alkanes, n-alkyl aromatics, and aromatics above C22 are generally not available to degrading microorganisms. Hydrocarbons with condensed ring structures, such as PAHs with four or more rings, have been shown to be relatively resistant to biodegradation. PAHs with only 2 or 3 rings (e.g., naphthalene, anthracene) are more easily biodegraded. In almost all cases, the presence of oxygen is essential for effective biodegradation of oil. The ideal pH range to promote biodegradation is close to neutral (6-8). For most species, the optimal pH is slightly alkaline, that is, greater than 7.

All biological transformations are affected by temperature. Generally, as the temperature increases, biological activity tends to increase up to a temperature where enzyme denaturation occurs.

Atmospheric fate: Alkanes, isoalkanes, and cycloalkanes have half-lives on the order of 1-10 days, whereas alkenes, cycloalkenes, and substituted benzenes have half-lives of 1 day or less. Photochemical oxidation products include aldehydes, hydroxy compounds, nitro compounds, and peroxyacyl nitrates. Alkenes, certain substituted aromatics, and naphthalene are potentially susceptible to direct photolysis.

Ecotoxicity:

Based on test results, as well as theoretical considerations, the potential for bioaccumulation may be high. Toxic effects are often observed in species such as blue mussel, daphnia, freshwater green algae, marine copepods and amphipods.

The values of log Kow for individual hydrocarbons increase with increasing carbon number within homologous series of generic types. Quantitative structure activity relationships (QSAR), relating log Kow values of single hydrocarbons to toxicity, show that water solubility decreases more rapidly with increasing Kow than does the concentration causing effects. This relationship varies somewhat with species of hydrocarbon, but it follows that there is a log Kow limit for hydrocarbons, above which, they will not exhibit acute toxicity;

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Section 12 - ECOLOGICAL INFORMATION

this limit is at a log Kow value of about 4 to 5. It has been confirmed experimentally that for fish and invertebrates, paraffinic hydrocarbons with a carbon number of 10 or higher (log Kow >5) show no acute toxicity and that alkylbenzenes with a carbon number of 14 or greater (log Kow >5) similarly show no acute toxicity. QSAR equations for chronic toxicity also suggest that there should be a point where hydrocarbons with high log Kow values become so insoluble in water that they will not cause chronic toxicity, that is, that there is also a solubility cut-off for chronic toxicity. Thus, paraffinic hydrocarbons with carbon numbers of greater than 14 (log Kow >7.3) should show no measurable chronic toxicity.

NAPHTHA PETROLEUM, HEAVY, HYDROTREATED:

HYDROCARBON PROPELLANT:

- Drinking Water Standards: hydrocarbon total: 10 ug/l (UK max.).

DR 60 CLEANER/REMOVER:

HYDROCARBON PROPELLANT:

- DO NOT discharge into sewer or waterways.

DR 60 CLEANER/REMOVER:

NAPHTHA PETROLEUM, HEAVY, HYDROTREATED:

■ PAHs travel through the atmosphere as a gas or attached to dust particles. They are carried by air currents and deposited by dry or wet (rain, dew, etc) deposition. When deposited in water they sink to the bottom of lakes and rivers. Some will move through the soil to contaminate groundwater.

Polycyclic aromatic hydrocarbons (PAHs) are ubiquitous in the marine environment, occurring at their highest environmental concentrations around urban centres.

Two factors, lipid and organic carbon, control to a large extent the partitioning behaviour of PAHs in sediment, water and tissue; the more hydrophobic a compound, the greater the partitioning to non-aqueous phases. These two factors, along with the octanol-water partition coefficient, are the best predictors of this partitioning and can be used to determine PAH behaviour and its bioavailability in the environment.

The lipid (fat) phase, of all organisms, contains the highest levels of PAHs: organic carbon associated with sediment or dissolved in water has a great influence on bioavailability resulting from its ability to adsorb.

Accumulation of PAHs occurs in all marine organisms; however there is a wide range in tissue concentrations resulting from variable environmental concentrations, level and time of exposure, and species ability to metabolize these compounds. PAHs generally partition in lipid-rich tissues and their metabolites are found in most tissues. In fish, bile and liver accumulate the highest levels of parent PAH and metabolites. In invertebrates, the highest concentrations can be found in the internal organs, such as the liver and pancreas; tissue concentrations appear to follow seasonal cycles which may be related to variations in lipid content or spawning cycles.

The primary mode of toxicity for PAHs in soil dwelling terrestrial invertebrates is non-specific non-polar narcosis. The uptake of PAHs by earthworms occurs primarily by direct contact with the soluble phase of soil solution (interstitial pore-water).

Microbial degradation of PAHs is a key process in soils. Biodegradation of PAHs may take place over a period of weeks to months. Mixed microbial populations in sediment/water systems may degrade some PAHs, with degradation progressively decreasing with increasing molecular weight. The rate of degradation is dependent on nutrient content and the bacterial community in soil.

PAHs in soils undergo a weathering process such that the lighter chain fractions are removed (primarily by volatilisation). Heavier fractions bind to soil organic matter and remain behind in the top soil horizon. As the mixture of PAHs age, bioavailability changes as the fraction remaining bind more tightly.

In general the more soluble a PAH, the higher the uptake by plants while the reverse is true for uptake by earthworms and uptake in the gastrointestinal tract of animals.

■ For petroleum derivatives:

Chemical analysis for all individual compounds in a petroleum bulk product released to the environment is generally unrealistic due to the complexity of these mixtures and the laboratory expense. Determining the chemical composition of a petroleum release is further complicated by hydrodynamic, abiotic, and biotic processes that act on the release to change the chemical character.

The longer the release is exposed to the environment, the greater the change in chemical character and the harder it is to obtain accurate analytical results reflecting the identity of the release. After extensive weathering, detailed knowledge of the original bulk product is often less valuable than current site-specific information on a more focused set of hydrocarbon components. Health assessment efforts are frequently frustrated by three primary problems: (1) the inability to identify and quantify the individual compounds

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Section 12 - ECOLOGICAL INFORMATION

released to the environment as a consequence of a petroleum spill; (2) the lack of information characterizing the fate of the individual compounds in petroleum mixtures; and (3) the lack of specific health guidance values for the majority of chemicals present in petroleum products. To define the public health implications associated with exposure to petroleum hydrocarbons, it is necessary to have a basic understanding of petroleum properties, compositions, and the physical, chemical, biological, and toxicological properties of the compounds most often identified as the key chemicals of concern.

Environmental fate:

Petroleum products released to the environment migrate through soil via two general pathways: (1) as bulk oil flow infiltrating the soil under the forces of gravity and capillary action, and (2) as individual compounds separating from the bulk petroleum mixture and dissolving in air or water. When bulk oil flow occurs, it results in little or no separation of the individual compounds from the product mixture and the infiltration rate is usually fast relative to the dissolution rate. Many compounds that are insoluble and immobile in water are soluble in bulk oil and will migrate along with the bulk oil flow. Factors affecting the rate of bulk oil infiltration include soil moisture content, vegetation, terrain, climate, rate of release (e.g., catastrophic versus slow leakage), soil particle size (e.g., sand versus clay), and oil viscosity (e.g., gasoline versus motor oil).

As bulk oil migrates through the soil column, a small amount of the product mass is retained by soil particles. The bulk product retained by the soil particles is known as "residual saturation".

Depending upon the persistence of the bulk oil, residual saturation can potentially reside in the soil for years. Residual saturation is important as it determines the degree of soil contamination and can act as a continuing source of contamination for individual compounds to separate from the bulk product and migrate independently in air or groundwater. Residual saturation is important as it determines the degree of soil contamination and can act as a continuing source of contamination for individual compounds to separate from the bulk product and migrate independently in air or groundwater. When the amount of product released to the environment is small relative to the volume of available soil, all of the product is converted to residual saturation and downward migration of the bulk product usually ceases prior to affecting groundwater resources. Adverse impacts to groundwater may still occur if rain water infiltrates through soil containing residual saturation and initiates the downward migration of individual compounds. When the amount of product released is large relative to the volume of available soil, the downward migration of bulk product ceases as water-saturated pore spaces are encountered. If the density of the bulk product is less than that of water, the product tends to "float" along the interface between the water saturated and unsaturated zones and spread horizontally in a pancake-like layer, usually in the direction of groundwater flow. Almost all motor and heating oils are less dense than water. If the density of the bulk product is greater than that of water, the product will continue to migrate downward through the water table aquifer under the continued influence of gravity. Downward migration ceases when the product is converted to residual saturation or when an impermeable surface is encountered.

As the bulk product migrates through the soil column, individual compounds may separate from the mixture and migrate independently. Chemical transport properties such as volatility, solubility, and sorption potential are often used to evaluate and predict which compounds will likely separate from the mixture. Since petroleum products are complex mixtures of hundreds of compounds, the compounds characterized by relatively high vapor pressures tend to volatilise and enter the vapor phase. The exact composition of these vapors depends on the composition of the original product. Using gasoline as an example, compounds such as butane, propane, benzene, toluene, ethylbenzene and xylene are preferentially volatilised. Because volatility represents transfer of the compound from the product or liquid phase to the air phase, it is expected that the concentration of that compound in the product or liquid phase will decrease as the concentration in the air phase increases.

In general, compounds having a vapor pressure in excess of 10-2 mm Hg are more likely to be present in the air phase than in the liquid phase. Compounds characterized by vapor pressures less than 10-7 mm Hg are more likely to be associated with the liquid phase. Compounds possessing vapor pressures that are less than 10-2 mm Hg, but greater than 10-7 mm Hg, will have a tendency to exist in both the air and the liquid phases. Lighter petroleum products such as gasoline contain constituents with higher water solubility and volatility and lower sorption potential than heavier petroleum products such as fuel oil.

Data compiled from gasoline spills and laboratory studies indicate that these light-fraction hydrocarbons tend to migrate readily through soil, potentially threatening or affecting groundwater supplies. In contrast, petroleum products with heavier molecular weight constituents, such as fuel oil, are generally more persistent in soils, due to their relatively low water solubility and volatility and high sorption capacity.

Solubility generally decreases with increasing molecular weight of the hydrocarbon compounds. For compounds having similar molecular weights, the aromatic hydrocarbons are more water soluble and mobile in water than the aliphatic hydrocarbons and branched aliphatics are less water-soluble than straight-chained aliphatics.

Aromatic compounds in petroleum fuels may comprise as much as 50% by weight; aromatic compounds in the C6-C13,

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Section 12 - ECOLOGICAL INFORMATION

range made up approximately 95% of the compounds dissolved in water.

Indigenous microbes found in many natural settings (e.g., soils, groundwater, ponds) have been shown to be capable of degrading organic compounds. Unlike other fate processes that disperse contaminants in the environment, biodegradation can eliminate the contaminants without transferring them across media.

The final products of microbial degradation are carbon dioxide, water, and microbial biomass. The rate of hydrocarbon degradation depends on the chemical composition of the product released to the environment as well as site-specific environmental factors. Generally the straight chain hydrocarbons and the aromatics are degraded more readily than the highly branched aliphatic compounds. The n-alkanes, n-alkyl aromatics, and the aromatics in the C10-C22 range are the most readily biodegradable; n-alkanes, n-alkyl aromatics, and aromatics in the C5-C9 range are biodegradable at low concentrations by some microorganisms, but are generally preferentially removed by volatilisation and thus are unavailable in most environments; n-alkanes in the C1-C4 ranges are biodegradable only by a narrow range of specialized hydrocarbon degraders; and n-alkanes, n-alkyl aromatics, and aromatics above C22 are generally not available to degrading microorganisms. Hydrocarbons with condensed ring structures, such as PAHs with four or more rings, have been shown to be relatively resistant to biodegradation. PAHs with only 2 or 3 rings (e.g., naphthalene, anthracene) are more easily biodegraded. PAHs with only 2 or 3 rings (e.g., naphthalene, anthracene) are more easily biodegraded. A large proportion of the water-soluble fraction of the petroleum product may be degraded as the compounds go into solution. As a result, the remaining product may become enriched in the alicyclics, the highly branched aliphatics, and PAHs with many fused rings.

In almost all cases, the presence of oxygen is essential for effective biodegradation of oil. Anaerobic decomposition of petroleum hydrocarbons leads to extremely low rates of degradation. The ideal pH range to promote biodegradation is close to neutral (6-8). For most species, the optimal pH is slightly alkaline, that is, greater than 7. The moisture content of the contaminated soil will affect biodegradation of oils due to dissolution of the residual compounds, dispersive actions, and the need for microbial metabolism to sustain high activity. The moisture content in soil affects microbial locomotion, solute diffusion, substrate supply, and the removal of metabolic by-products. Biodegradation rates in soils are also affected by the volume of product released to the environment. At concentrations of 0.5% of oil by volume, the degradation rate in soil is fairly independent of oil concentrations. However, as oil concentration rises, the first order degradation rate decreases and the oil degradation half-life increases. Ultimately, when the oil reaches saturation conditions in the soil (i.e., 30-50% oil), biodegradation virtually ceases.

Excessive moisture will limit the gaseous supply of oxygen for enhanced decomposition of petroleum hydrocarbons. Most studies indicate that optimum moisture content is within 50-70% of the water holding capacity.

All biological transformations are affected by temperature. Generally, as the temperature increases, biological activity tends to increase up to a temperature where enzyme denaturation occurs. The presence of oil should increase soil temperature, particularly at the surface. The darker color increases the heat capacity by adsorbing more radiation. The optimal temperature for biodegradation to occur ranges from 18 C to 30 C. Minimum rates would be expected at 5 C or lower.

HYDROCARBON PROPELLANT:

Marine Pollutant: Not Determined

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
DR 60 Cleaner/Remover naphtha petroleum, heavy, hydrotreated hydrocarbon propellant		No data		
		No data		
		No data		

continued...

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Section 13 - DISPOSAL CONSIDERATIONS

- - Consult State Land Waste Management Authority for disposal.
- Discharge contents of damaged aerosol cans at an approved site.
- Allow small quantities to evaporate.
- DO NOT incinerate or puncture aerosol cans.
- Bury residues and emptied aerosol cans at an approved site.

Section 14 - TRANSPORTATION INFORMATION



Labels Required: FLAMMABLE GAS
HAZCHEM: 2YE (ADG7)

ADG7:

Class or division:	2	Subsidiary risk:	None
UN No.:	1950	UN packing group:	None
Special provisions:	63, 190, 277, 327	Packing Instructions:	None
Notes:	None	Limited quantities:	See SP 277
Portable tanks and bulk containers - Instructions:	None	Portable tanks and bulk containers - Special provisions:	None
Packagings and IBCs - Packing instruction:	P003, LP02	Packagings and IBCs - Special packing provisions:	PP17, PP87, L2

Shipping Name:AEROSOLS

Land Transport UNDG:

Class or division:	2	Subsidiary risk:	None
UN No.:	1950	UN packing group:	None

Shipping Name:AEROSOLS

Maritime Transport IMDG:

IMDG Class:	2.1	IMDG Subrisk:	SP63
UN Number:	1950	Packing Group:	None
EMS Number:	F- D, S- U	Special provisions:	63 190 277 327 959
Limited Quantities:	See SP277		

Shipping Name: AEROSOLS

Section 15 - REGULATORY INFORMATION

POISONS SCHEDULE: None

REGULATIONS

Regulations for ingredients

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Section 15 - REGULATORY INFORMATION

naphtha petroleum, heavy, hydrotreated (CAS: 64742-48-9) is found on the following regulatory lists;

"Australia Hazardous Substances", "Australia High Volume Industrial Chemical List (HVICL)", "International Council of Chemical Associations (ICCA) - High Production Volume List", "OECD Representative List of High Production Volume (HPV) Chemicals"

hydrocarbon propellant (CAS: 68476-85-7,68476-86-8) is found on the following regulatory lists;

"Australia Exposure Standards", "Australia Hazardous Substances", "Australia High Volume Industrial Chemical List (HVICL)", "OECD Representative List of High Production Volume (HPV) Chemicals"

No data for DR 60 Cleaner/Remover (CW: 22-4974)

Section 16 - OTHER INFORMATION

INGREDIENTS WITH MULTIPLE CAS NUMBERS

Ingredient Name	CAS
hydrocarbon propellant	68476- 85- 7, 68476- 86- 8

■ Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references.

■ The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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This is the end of the MSDS.