

DUNLOP VINYL ADHESIVE

Chemwatch Material Safety Data Sheet
Issue Date: 28-Feb-2006
NA477ECP

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Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

DUNLOP VINYL ADHESIVE

STATEMENT OF HAZARDOUS NATURE

Considered a Hazardous Substance according to the criteria of the New Zealand Hazardous Substances New Organisms legislation.

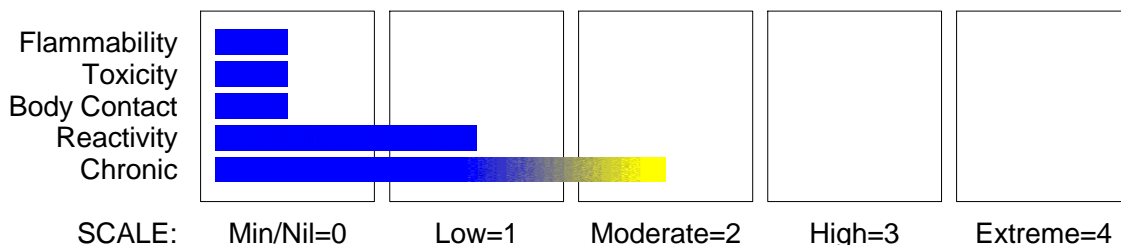
PRODUCT USE

Acrylic latex specifically formulates for adhering most types of commercial unbacked flexible vinyl sheeting, most foam backed vinyl and most types of vinyl tiles.

SUPPLIER

Company: Ardex NZ Pty Ltd
Address:
32 Lane Street
Woolston
Christchurch,
NZL
Telephone: +64 3384 3029
Fax: +64 3384 9779

HAZARD RATINGS



Section 2 - HAZARDS IDENTIFICATION

GHS Classification

Chronic Aquatic Hazard Category 3
Reproductive Toxicity Category 1B

EMERGENCY OVERVIEW

HAZARD

DANGER
Determined by Chemwatch using GHS/HSNO criteria:
6.8A 9.1C
May damage the unborn child
Harmful to aquatic life with long lasting effects

PRECAUTIONARY STATEMENTS

Prevention

Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.

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Section 2 - HAZARDS IDENTIFICATION

Avoid release to the environment.
Use personal protective equipment as required.

Response

IF exposed or concerned: Get medical advice/ attention.

Storage

Store locked up.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
non hazardous ingredients		40-70
acrylic co- polymer dispersion		30-60
naphtha petroleum, light aromatic solvent	64742-95-6.	1-5
hydrocarbon solvent, as toluene	108-88-3	1-5

Section 4 - FIRST AID MEASURES

NEW ZEALAND POISONS INFORMATION CENTRE 0800 POISON (0800 764 766)
NZ EMERGENCY SERVICES: 111

SWALLOWED

- Immediately give a glass of water.
- First aid is not generally required. If in doubt, contact a Poisons Information Centre or a doctor.

EYE

- If this product comes in contact with eyes:
- Wash out immediately with water.
 - If irritation continues, seek medical attention.
 - Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

SKIN

- If skin or hair contact occurs:
- 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.
- Other measures are usually unnecessary.

NOTES TO PHYSICIAN

Treat symptomatically.

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

- There is no restriction on the type of extinguisher which may be used.
- Use extinguishing media suitable for surrounding area.

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Section 5 - FIRE FIGHTING MEASURES

FIRE FIGHTING

- Alert Fire Brigade and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves for fire only.
- Prevent, by any means available, spillage from entering drains or water courses.
- Use fire fighting procedures suitable for surrounding 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.

FIRE/EXPLOSION HAZARD

- Non combustible.
 - Not considered a significant fire risk, however containers may burn.
- Decomposition may produce toxic fumes of: carbon dioxide (CO₂),
typical of burning organic material.
May emit poisonous fumes.

other pyrolysis products

FIRE INCOMPATIBILITY

- Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result.
-

Section 6 - ACCIDENTAL RELEASE MEASURES

EMERGENCY PROCEDURES

MINOR SPILLS

- Clean up all spills immediately.
- Avoid contact with skin and eyes.
- Wear impervious gloves and safety goggles.
- Trowel up/scrape up.
- Place spilled material in clean, dry, sealed container.
- Flush spill area with water.

MAJOR SPILLS

Minor hazard.

- Clear area of personnel.
- Alert Fire Brigade and tell them location and nature of hazard.
- Control personal contact by using protective equipment as required.
- Prevent spillage from entering drains or water ways.
- Contain spill with sand, earth or vermiculite.
- Collect recoverable product into labelled containers for recycling.
- Absorb remaining product with sand, earth or vermiculite and place in appropriate containers for disposal.
- Wash area and prevent runoff into drains or waterways.
- If contamination of drains or waterways occurs, advise emergency services.

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.

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Section 7 - HANDLING AND STORAGE

- DO NOT enter confined spaces until atmosphere has been checked.
- DO NOT allow material to contact humans, exposed food or food utensils.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately. Launder contaminated clothing before re-use.
- 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 conditions are maintained.

SUITABLE CONTAINER

- Polyethylene or polypropylene container.
- Packing as recommended by manufacturer.
- Check all containers are clearly labelled and free from leaks.

STORAGE INCOMPATIBILITY

- Avoid reaction with oxidising agents.

STORAGE REQUIREMENTS

- Store in original containers.
- Keep containers securely sealed.
- Store in a cool, dry, well-ventilated area.
- Store away from incompatible materials and foodstuff containers.
- 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
New Zealand Workplace Exposure Standards (WES)	toluene (Toluene)	50	188

The following materials had no OELs on our records

- naphtha petroleum, light aromatic solvent: CAS:64742- 95- 6

EMERGENCY EXPOSURE LIMITS

Material	Revised IDLH Value (mg/m ³)	Revised IDLH Value (ppm)
toluene		500

MATERIAL DATA

Not available. Refer to individual constituents.

INGREDIENT DATA

NAPHTHA PETROLEUM, LIGHT AROMATIC SOLVENT:
TOLUENE:

These exposure guidelines have been derived from a screening level of risk assessment and should not be construed as unequivocally safe limits. ORGS represent an 8-hour time-weighted average unless specified otherwise.

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Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

CR = Cancer Risk/10000; UF = Uncertainty factor:

TLV believed to be adequate to protect reproductive health:

LOD: Limit of detection

Toxic endpoints have also been identified as:

D = Developmental; R = Reproductive; TC = Transplacental carcinogen

Jankovic J., Drake F.: A Screening Method for Occupational Reproductive

American Industrial Hygiene Association Journal 57: 641-649 (1996).

NAPHTHA PETROLEUM, LIGHT AROMATIC SOLVENT:

TOLUENE:

Established occupational exposure limits frequently do not take into consideration reproductive end points that are clearly below the thresholds for other toxic effects. Occupational reproductive guidelines (ORGs) have been suggested as an additional standard. These have been established after a literature search for reproductive no-observed-adverse effect-level (NOAEL) and the lowest-observed-adverse-effect-level (LOAEL). In addition the US EPA's procedures for risk assessment for hazard identification and dose-response assessment as applied by NIOSH were used in the creation of such limits. Uncertainty factors (UFs) have also been incorporated.

NAPHTHA PETROLEUM, LIGHT AROMATIC SOLVENT:

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 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: 25-100 ppm*, 125 mg/m³*

[Various Manufacturers]

CEL TWA: 50 ppm, 125 mg/m³

TOLUENE:

Exposure limits with "skin" notation indicate that vapour and liquid may be absorbed

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through intact skin. Absorption by skin may readily exceed vapour inhalation exposure. Symptoms for skin absorption are the same as for inhalation. Contact with eyes and mucous membranes may also contribute to overall exposure and may also invalidate the exposure standard.

Odour Threshold Value: 0.16-6.7 (detection), 1.9-69 (recognition)

NOTE: Detector tubes measuring in excess of 5 ppm, are available.

High concentrations of toluene in the air produce depression of the central nervous system (CNS) in humans. Intentional toluene exposure (glue-sniffing) at maternally-intoxicating concentration has also produced birth defects. Foetotoxicity appears at levels associated with CNS narcosis and probably occurs only in those with chronic toluene-induced kidney failure. Exposure at or below the recommended TLV-TWA is thought to prevent transient headache and irritation, to provide a measure of safety for possible disturbances to human reproduction, the prevention of reductions in cognitive responses reported amongst humans inhaling greater than 40 ppm, and the significant risks of hepatotoxic, behavioural and nervous system effects (including impaired reaction time and incoordination). Although toluene/ethanol interactions are well recognised, the degree of protection afforded by the TLV-TWA among drinkers is not known.

PERSONAL PROTECTION

EYE

- Safety glasses with side shields
- 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

- Wear chemical protective gloves, eg. PVC.
- Wear safety footwear or safety gumboots, eg. Rubber.

OTHER

- Overalls.
- P.V.C. apron.
- Barrier cream.
- Skin cleansing cream.
- Eye wash unit.

RESPIRATOR

Respiratory protection may be required when ANY "Worst Case" vapour-phase concentration is exceeded (see Computer Prediction in "Exposure Standards").

Protection Factor (Min)	Half- Face Respirator	Full- face Respirator
10 x ES	A- - AUS A- - PAPR- AUS	- -
20 x ES	-	A- - AUS

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100 x ES	-	A- - PAPR- AUS
	-	A- - 2
	-	A- - PAPR- 2

^ - Full-face.

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

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

Off white slightly alkaline paste; dispersible in water.

PHYSICAL PROPERTIES

Mixes with water.

Molecular Weight: Not Applicable

Melting Range (°C): Not Available

Solubility in water (g/L): Miscible

pH (1% solution): Not Available

Volatile Component (%vol): 28 (water)

Relative Vapour Density (air=1): Not Available

Lower Explosive Limit (%): Not Applicable

Autoignition Temp (°C): Not Applicable

State: Non Slump Paste

Boiling Range (°C): 100 (initial)

Specific Gravity (water= 1): 1.3

pH (as supplied): 8- 9

Vapour Pressure (kPa): Not Available

Evaporation Rate: Not Available

Flash Point (°C): Not Applicable

Upper Explosive Limit (%): Not Applicable

Decomposition Temp (°C): Not Available

Viscosity: Not Available

log Kow (Sangster 1997):

2.73

log Kow: 2.1-3

Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

CONDITIONS CONTRIBUTING TO INSTABILITY

Product is considered stable and hazardous polymerisation will not occur.

Section 11 - TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

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Section 11 - TOXICOLOGICAL INFORMATION

SWALLOWED

The material has NOT been classified by EC Directives or other classification systems as "harmful by ingestion". This is because of the lack of corroborating animal or human evidence. The material may still be damaging to the health of the individual, following ingestion, especially where pre-existing organ (e.g liver, kidney) damage is evident. Present definitions of harmful or toxic substances are generally based on doses producing mortality rather than those producing morbidity (disease, ill-health). Gastrointestinal tract discomfort may produce nausea and vomiting. In an occupational setting however, ingestion of insignificant quantities is not thought to be cause for concern.

EYE

Although the material is not thought to be an irritant (as classified by EC Directives), direct contact with the eye may produce transient discomfort characterised by tearing or conjunctival redness (as with windburn).

SKIN

Repeated exposure may cause skin cracking, flaking or drying following normal handling and use.

Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

INHALED

The material is not thought to produce adverse health effects or irritation of the respiratory tract (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable control measures be used in an occupational setting.

CHRONIC HEALTH EFFECTS

Substance accumulation, in the human body, may occur and may cause some concern following repeated or long-term occupational exposure.

There is some evidence from animal testing that exposure to this material may result in toxic effects to the unborn baby.

Constant or exposure over long periods to mixed hydrocarbons may produce stupor with dizziness, weakness and visual disturbance, weight loss and anaemia, and reduced liver and kidney function. Skin exposure may result in drying and cracking and redness of the skin. Chronic exposure to lighter hydrocarbons can cause nerve damage, peripheral neuropathy, bone marrow dysfunction and psychiatric disorders as well as damage the liver and kidneys.

TOXICITY AND IRRITATION

Not available. Refer to individual constituents.

NAPHTHA PETROLEUM, LIGHT AROMATIC SOLVENT:

unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY

Oral (rat) LD50: >5000 mg/kg *

Inhalation (rat) LC50: >3670 ppm/8 h *

Inhalation (rat) TClO: 1320 ppm/6h/90D- I

IRRITATION

Nil Reported

Lifetime exposure of rodents to gasoline produces carcinogenicity although the relevance to humans has been questioned. Gasoline induces kidney cancer in male rats as a consequence of accumulation of the alpha2-microglobulin protein in hyaline droplets in the male (but not female) rat kidney. Such abnormal accumulation represents lysosomal overload and leads to chronic renal tubular cell degeneration, accumulation of cell debris, mineralisation of renal medullary tubules and necrosis. A sustained regenerative proliferation occurs in epithelial cells with subsequent neoplastic transformation with continued exposure. The alpha2-microglobulin is produced under the influence of hormonal controls in male rats but not in females and, more importantly, not in humans.

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Section 11 - TOXICOLOGICAL INFORMATION

* [Devoe]

TOLUENE:

unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY

Oral (human) LDLo: 50 mg/kg

Oral (rat) LD50: 636 mg/kg

Inhalation (human) TCLo: 100 ppm

Inhalation (man) TCLo: 200 ppm

Inhalation (rat) LC50: >26700 ppm/1h

Dermal (rabbit) LD50: 12124 mg/kg

IRRITATION

Skin (rabbit):20 mg/24h- Moderate

Skin (rabbit):500 mg - Moderate

Eye (rabbit):0.87 mg - Mild

Eye (rabbit): 2mg/24h - SEVERE

Eye (rabbit):100 mg/30sec - Mild

The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterised by skin redness (erythema) and swelling the epidermis. Histologically there may be intercellular oedema of the spongy layer (spongiosis) and intracellular oedema of the epidermis.

Section 12 - ECOLOGICAL INFORMATION

Drinking Water Standards:

hydrocarbon total: 10 ug/l (UK max.).

Do NOT allow product to come in contact with surface waters or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment wash-waters.

Wastes resulting from use of the product must be disposed of on site or at approved waste sites.

DO NOT discharge into sewer or waterways.

Refer to data for ingredients, which follows:

NAPHTHA PETROLEUM, LIGHT AROMATIC SOLVENT:

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 of the material 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 the material will degrade to water and carbon dioxide, while under anaerobic processes it will produce water, methane and carbon dioxide.

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.

Drinking Water Standards:

hydrocarbon total: 10 ug/l (UK max.).

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

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Section 12 - ECOLOGICAL INFORMATION

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. 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.

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 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.

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 (Eastcott et al.

1989). 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

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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 volatilize 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 volatilized. 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, 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

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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 volatilization 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 1-0.5% 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.

TOLUENE:

Hazardous Air Pollutant:	Yes
Fish LC50 (96hr.) (mg/l):	7.3- 22.8
BCF<100:	13.2 (EELS)
log Kow (Sangster 1997):	2.73
log Pow (Verschueren 1983):	2.69
BOD5:	5%
COD:	21%
ThOD:	3.13
Half- life Soil - High (hours):	528
Half- life Soil - Low (hours):	96
Half- life Air - High (hours):	104
Half- life Air - Low (hours):	10
Half- life Surface water - High (hours):	528
Half- life Surface water - Low (hours):	96
Half- life Ground water - High (hours):	672
Half- life Ground water - Low (hours):	168
Aqueous biodegradation - Aerobic - High (hours):	528
Aqueous biodegradation - Aerobic - Low (hours):	96
Aqueous biodegradation - Anaerobic - High (hours):	5040
Aqueous biodegradation - Anaerobic - Low (hours):	1344
Aqueous biodegradation - Removal secondary treatment - High (hours):	75%

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Photolysis maximum light absorption - High (nano- m):	268
Photolysis maximum light absorption - Low (nano- m):	253.5
Photooxidation half- life water - High (hours):	1284
Photooxidation half- life water - Low (hours):	321
Photooxidation half- life air - High (hours):	104
Photooxidation half- life air - Low (hours):	10

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 of the material 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 the material will degrade to water and carbon dioxide, while under anaerobic processes it will produce water, methane and carbon dioxide.

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.

DO NOT discharge into sewer or waterways.

log Kow: 2.1-3

log Koc: 1.12-2.85

Koc: 37-250

log Kom: 1.39-2.89

Half-life (hr) air: 2.4-104

Half-life (hr) H₂O surface water: 5.55-528

Half-life (hr) H₂O ground: 168-2628

Half-life (hr) soil: <48-240

Henry's Pa m³ /mol: 518-694

Henry's atm m³ /mol: 5.94E-03

BOD 5 if unstated: 0.86-2.12,5%

COD: 0.7-2.52,21-27%

ThOD: 3.13

BCF: 1.67-380

Log BCF: 0.22-3.28

Section 13 - DISPOSAL CONSIDERATIONS

- Recycle wherever possible or consult manufacturer for recycling options.
- Consult State Land Waste Authority for disposal.
- Bury or incinerate residue at an approved site.
- Recycle containers if possible, or dispose of in an authorised landfill.

Section 14 - TRANSPORTATION INFORMATION

HAZCHEM: None

NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS:UN, IATA, IMDG

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Section 15 - REGULATORY INFORMATION

REGULATIONS

Dunlop Vinyl Adhesive (CAS: None):

No regulations applicable

naphtha petroleum, light aromatic solvent (CAS: 64742-95-6) is found on the following regulatory lists:
International Council of Chemical Associations (ICCA) - High Production Volume List
New Zealand Inventory of Chemicals (NZIoC)
OECD Representative List of High Production Volume (HPV) Chemicals

toluene (CAS: 108-88-3) is found on the following regulatory lists:
GESAMP/EHS Composite List of Hazard Profiles - Hazard evaluation of substances transported by ships
IMO IBC Code Chapter 17: Summary of minimum requirements
IMO MARPOL 73/78 (Annex II) - List of Noxious Liquid Substances Carried in Bulk
International Agency for Research on Cancer (IARC) Carcinogens
International Air Transport Association (IATA) Dangerous Goods Regulations
New Zealand Hazardous Substances and New Organisms (HSNO) Act - Dangerous Goods
New Zealand Hazardous Substances and New Organisms (HSNO) Act - Hazardous Substances Register
New Zealand Hazardous Substances and New Organisms (HSNO) Act - Pesticides
New Zealand Inventory of Chemicals (NZIoC)
New Zealand Poisons Schedule [NLV]
New Zealand Workplace Exposure Standards (WES)
OECD Representative List of High Production Volume (HPV) Chemicals
United Nations Convention Against Illicit Traffic in Narcotic Drugs and Psychotropic Substances - Table II
United Nations List of Precursors and Chemicals Frequently used in the Illicit Manufacture of Narcotic Drugs and Psychotropic Substances Under International Control - Table II
WHO Guidelines for Drinking-water Quality - Guideline values for chemicals that are of health significance in drinking-water

Specific advice on controls required for materials used in New Zealand can be found at

<http://www.ermanz.govt.nz/search/registers.html>

Section 16 - OTHER INFORMATION

NEW ZEALAND POISONS INFORMATION CENTRE

0800 POISON (0800 764 766)

NZ EMERGENCY SERVICES: 111

REPRODUCTIVE HEALTH GUIDELINES

Established occupational exposure limits frequently do not take into consideration reproductive end points that are clearly below the thresholds for other toxic effects. Occupational reproductive guidelines (ORGs) have been suggested as an additional standard. These have been established after a literature search for reproductive no-observed-adverse effect-level (NOAEL) and the lowest-observed-adverse-effect-level (LOAEL). In addition the US EPA's procedures for risk assessment for hazard identification and dose-response assessment as applied by NIOSH were used in the creation of such limits. Uncertainty factors (UFs) have also been incorporated.

Ingredient	ORG	UF	Endpoi nt	CR	Adeq TLV
naphtha petroleum, light aromatic solvent	12 mg/m3	100	D	NA	-
toluene	9.6 mg/m3	10	D	NA	-

These exposure guidelines have been derived from a screening level of risk assessment and should not be construed as unequivocally safe limits. ORGS represent an 8-hour time-weighted average unless specified otherwise.

CR = Cancer Risk/10000; UF = Uncertainty factor:

TLV believed to be adequate to protect reproductive health:

LOD: Limit of detection

Toxic endpoints have also been identified as:

D = Developmental; R = Reproductive; TC = Transplacental carcinogen

Jankovic J., Drake F.: A Screening Method for Occupational Reproductive

American Industrial Hygiene Association Journal 57: 641-649 (1996).

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EXPOSURE STANDARD FOR MIXTURES

"Worst Case" computer-aided prediction of vapour components/concentrations:

Composite Exposure Standard for Mixture (TWA) (mg/m³): 125 mg/m³

If the breathing zone concentration of ANY of the components listed below is exceeded,

"Worst Case" considerations deem the individual to be overexposed.

Component Breathing Zone ppm Breathing Zone mg/m³ Mixture Conc: (%)

Component	Breathing zone (ppm)	Breathing Zone (mg/m ³)	Mixture Conc (%)
naphtha petroleum, light aromatic solvent	50.00	125.0000	5.0

Operations which produce a spray/mist or fume/dust, introduce particulates to the breathing zone.

If the breathing zone concentration of ANY of the components listed below is exceeded,

"Worst Case" considerations deem the individual to be overexposed.

At the "Composite Exposure Standard for Mixture" (TWA) (mg/m³): 125 mg/m³

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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