RoClean L211
MATERIAL SAFETY DATA SHEET

PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

TRADE NAME (AS LABELED):	**RoClean L211**
CHEMICAL NAME/CLASS:	Amines
SYNONYM:	Mixture
PRODUCT USE:	Reverse Osmosis Membrane Treatment
SUPPLIER/MANUFACTURER'S NAME:	**AVISTA TECHNOLOGIES**
ADDRESS:	140 Bosstick Blvd San Marcos, CA 92069
24 HOUR EMERGENCY NO.:	1-800-424-9300 (United States) 1-703-527-3887 (International Collect)
BUSINESS PHONE:	(760) 744-0536
DATE OF PREPARATION:	January 5, 2009, Revised November 18, 2010

2. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product is a clear, colorless to amber colored, corrosive solution with a light, disinfectant odor. Depending on the duration of contact, over-exposures can severely irritate the skin or eyes and respiratory system, or cause burns. This product is neither reactive nor flammable. Thermal decomposition of this product produces irritating vapors and toxic gases (e.g. carbon monoxide, carbon dioxide, oxides of nitrogen and sodium). Emergency responders must wear personal protective equipment (and have appropriate fire-extinguishing protection) suitable for the situation to which they are responding.

INHALATION: If the vapors, mists or sprays of this solution are inhaled, symptoms of exposure may include breathing difficulty, irritation of the mucus membranes, coughing, nasal congestion, and a sore throat. Inhalation of high concentrations of this product may produce central nervous system depression, with symptoms such as lethargy, drowsiness, staggering and sleepiness. Chronic inhalation exposures to Monoethanolamine (a component of this product) may produce liver, kidney and pulmonary damage. Severe inhalation over-exposures of this product can lead to chemical pneumonitis, pulmonary edema, and death.

CONTACT WITH SKIN or EYES: Depending on the duration of skin contact, skin overexposures may cause reddening, discomfort, severe irritation or chemical burns. Monoethanolamine, a component of this product, may cause sensitization upon prolonged or repeated exposure in susceptible individuals. Subsequent exposure to small amounts of the product may result in an allergic-type reaction. Repeated skin overexposures to this product may cause dermatitis (dry, red skin). Direct eye contact with the liquid can cause stinging, tearing and redness. Severe eye overexposures may cause burns, pain, reddening, watering, and possibly, blindness. Exposure to relatively low concentrations of mist and vapors of Monoethanolamine (a component of this product) may cause a visual disturbance known as “blue haze” or “halo vision”. Several hours after exposure, vision becomes foggy or blurred, objects may appear bluish and there may be halos around lights. Affected persons may experience no eye discomfort or pain. The effect normally clears up within a day and causes no permanent injury.

SKIN ABSORPTION: Monoethanolamine, a component of this product may be absorbed through the skin, effects similar to those described for inhalation or ingestion would be anticipated.

NSF Certified to NSF/ANSI 60

DRINKING WATER TREATMENT ADDITIVE CLASSIFIED BY NSF INTERNATIONAL TO ANSI/NSF 60 AS STANDARD DRINKING WATER TREATMENT CHEMICAL FOR USE OFF-LINE IN REVERSE OSMOSIS SYSTEMS.

HAZARD IDENTIFICATION (continued)

INGESTION: Ingestion is not anticipated to be a likely route of exposure to this product. If this product is swallowed, it may cause irritation or burns of the mouth, throat, esophagus and other tissues of the digestive system. Symptoms of such over-exposure can include nausea, vomiting, and diarrhea. Ingestion of large volumes of this product may be fatal.

INJECTION: Accidental injection of this product can cause burning, reddening, and swelling in addition to the wound.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in **Lay Terms**.

ACUTE: Inhalation exposure may cause coughing, sneezing, and difficulty breathing. Depending on the duration of contact, over-exposures can severely irritate or burn tissues of the eyes, skin, mucous membranes and any other contaminated tissue. Ingestion may cause stomach pains, cramps, and irritation or damage of the tissues of the digestive system. Low vapor and mist concentrations may cause a temporary visual disturbance known as “blue haze” or “halo effect”.

CHRONIC: Prolonged or repeated skin overexposure to this product may cause dermatitis (dry, red skin). Prolonged inhalation of the vapors or mists may lead to respiratory disorders (e.g. bronchitis). Monoethanolamine, a component of this product, may cause sensitization in susceptible individuals. Chronic overexposures to this product can cause kidney, liver and pulmonary damage. Refer to Section 11 (Toxicology Information) for additional information on this product’s components.

TARGET ORGANS: **Acute:** Skin, eyes, respiratory system.

Chronic: Skin, respiratory system, central nervous system, liver and kidneys.

HAZARD SYMBOLS:

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM (HMIS)

Health	**3**
Flammability	**0**
Physical Hazard	**0**
Protective Equipment	**D**

HMIS PERSONAL PROTECTIVE EQUIPMENT RATING: Industrial Use situations: D; Face shield, gloves, body protection

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in **Lay Terms**.

ACUTE: This product is an irritant. Depending on the duration of contact, overexposures can irritate or burn the eyes, skin, mucous membranes, and any other exposed tissue. Inhalation may cause coughing and difficulty breathing. Eye contact can cause harm

CHRONIC: Repeated skin overexposures to low concentrations can cause dermatitis (dry, red skin). Repeated inhalation of the dusts or particulates may cause respiratory disorders (e.g., bronchitis). Refer to Section 11 (Toxicology Information) for additional information on this product’s components.

TARGET ORGANS: Acute: Skin, eyes, respiratory system.

Chronic: Skin, eyes, respiratory system.

CANADIAN WHMIS SYMBOLS:

E - Corrosive Materials

3. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	% w/w	EXPOSURE LIMITS IN AIR					
			ACGIH-TLVs		OSHA-PELs			OTHER
			TWA mg/m^3	STEL mg/m^3	TWA mg/m^3	STEL mg/m^3	IDLH mg/m^3	mg/m^3
Monoethanolamine	Proprietary	< 24	7.5	15	8	15	30 ppm	NIOSH RELs: TWA = 8 STEL = 15 DFG MAKs: TWA = 5.1 PEAK = 2 MAK, 5 minutes, momentary value (Danger of cutaneous absorption) MAK Pregnancy Risk Group Classification: C
Chelate Agent	Proprietary	< 9	NE	NE	NE	NE	NE	NE
pH Adjusting Agent	Proprietary	< 6	NE	2 (Ceiling)	2	NE	10	NIOSH REL: STEL = 2 (Ceiling)
Propylene Glycol	Proprietary	< 5	NE	NE	NE	NE	NE	NE
Chelate Agent	Proprietary	< 4	NE	NE	NE	NE	NE	NE
Surfactant	Proprietary	2-3	NE	NE	NE	NE	NE	NE
Water and other components which are present in less than 1 percent concentration (0.1% concentration for potential carcinogens, reproductive toxins, respiratory tract sensitizers and mutagens).		Balance	None of the other components contribute significant additional hazards at the concentration present in this product. All pertinent hazard information has been provided in this document, per the requirements of the Federal Occupational Safety and Health Administration Standard (29 CFR 1910.1200), U.S. State equivalent Standards and Canadian Workplace Hazardous Materials Identification System Standards (CPR 4).					

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

Victims of chemical exposure must be taken for medical attention if any adverse effects occur. Rescuers should be taken for medical attention if necessary. Take a copy of label and MSDS to physician or health professional with victim.

SKIN EXPOSURE: If this product contaminates the skin, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Do NOT interrupt flushing. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim should seek immediate medical attention if any adverse exposure symptoms develop.

EYE EXPOSURE: If this product enters the eyes, open victim's eyes while under gently running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Do NOT interrupt flushing. Victim must seek medical attention.

INHALATION: If airborne particulates of this product are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Remove or cover gross contamination to avoid exposure to rescuers.

INGESTION: If this product is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. DO NOT INDUCE VOMITING. Have victim rinse mouth with water, if conscious. Never induce vomiting or give a diluent (e.g., water) to someone who is unconscious, having convulsions, or unable to swallow. If contaminated individual is convulsing, maintain an open airway and obtain immediate medical attention.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Acute or chronic respiratory conditions or disorders involving the “Target Organs” (see Section 3, “Hazard Identification”) may be aggravated by overexposure to dusts or particulates of this product.

FIRST-AID MEASURES (continued)

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate overexposure. Provide oxygen, if necessary. Pulmonary function tests, chest X-rays, and nervous system evaluations may prove useful. Consultation with an ophthalmologist is recommended if eye exposure leads to tissue damage.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable.
AUTOIGNITION TEMPERATURE: Not applicable.
FLAMMABLE LIMITS (in air by volume, %):

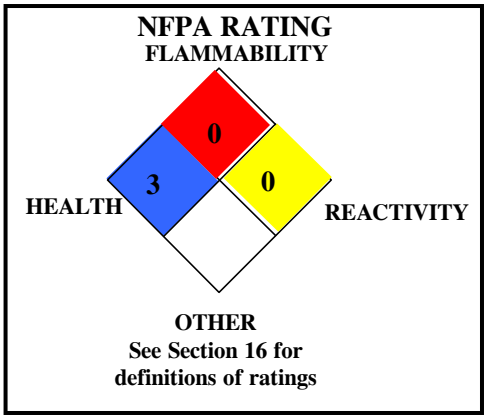
Lower: Not applicable.
Upper: Not applicable.

FIRE EXTINGUISHING MATERIALS: This material will not contribute to the intensity of a fire. Use extinguishing material suitable to the surrounding fire.

Water Spray: YES Carbon Dioxide: YES
Foam: YES Dry Chemical: YES
Halon: YES Other: Any "ABC" Class

UNUSUAL FIRE AND EXPLOSION HAZARDS: This product is corrosive and presents a severe inhalation and contact hazard to firefighters. When involved in a fire, this product may decompose and produce irritating fumes and toxic gases (e.g., carbon oxides, phosphorus oxides, and sodium oxides).

Explosion Sensitivity to Mechanical Impact: Not applicable.
Explosion Sensitivity to Static Discharge: Not applicable.



SPECIAL FIRE-FIGHTING PROCEDURES: Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Chemical resistant clothing may be necessary. Move containers from fire area if it can be done without risk to personnel. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas. Rinse contaminated equipment thoroughly with citric acid solution (or another neutralizer for bases) before returning such equipment to service.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a spill, clear the affected area and protect people. For small releases, clean up spilled liquid wearing gloves, goggles, faceshield, and suitable body protection. The minimum Personal Protective Equipment recommended for response to non-incidental releases should be **Level B: triple-gloves (neoprene gloves and nitrile gloves over thin-mil nitrile gloves), chemical resistant suit and boots, hard hat, and Self-Contained Breathing Apparatus.** Monitor the area for dusts of this product's components and the level of oxygen. Monitoring must indicate that exposure levels are below those provided in Section 2 (Composition and Information on Ingredients) and that oxygen levels are above 19.5% before anyone is permitted in the area without Self-Contained Breathing Apparatus. Sweep up or vacuum spilled solid. Neutralize residue with citric acid or other neutralizing agent for bases. Decontaminate the area thoroughly. Test area with litmus paper to ensure neutralization. Place all spill residues in a suitable container. Dispose of in accordance with applicable U.S. Federal, State, or local procedures, or appropriate Canadian standards (see Section 13, Disposal Considerations).

PART III *How can I prevent hazardous situations from occurring?*

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat or drink while handling this material. Avoid generating airborne dusts of this product. Remove contaminated clothing immediately. Wipe down area routinely to avoid the accumulation of dusts of this product.

HANDLING and STORAGE (continued)

STORAGE AND HANDLING PRACTICES: All employees who handle this material should be trained to handle it safely. Keep container tightly closed when not in use. If this product is transferred into another container, only use portable containers and tools approved for basic solid. Store containers in a cool, dry location, away from direct sunlight, or sources of intense heat. Material should be stored in secondary containers or in a diked area, as appropriate. Store containers away from incompatible chemicals (see Section 10, Stability and Reactivity). Storage areas should be made of corrosion resistant materials. Post warning and "NO SMOKING" signs in storage and use areas, as appropriate. Empty containers may contain residual material that is corrosive; therefore, empty containers should be handled with care. Never store food, feed, or drinking water in containers which held this product.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely if necessary. Collect all rinsates and dispose of according to applicable U.S. Federal, State, or local procedures or appropriate Canadian standards.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided in Section 2 (Composition and Information on Ingredients). Ensure eyewash/safety shower stations are available near areas where this product is used.

RESPIRATORY PROTECTION: None needed under normal conditions of use. Maintain airborne contaminate concentrations below guidelines listed in Section 2 (Composition and Information on Ingredients). Use NIOSH approved respirators if ventilation is inadequate to control airborne dusts. If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations, or the Canadian CSA Standard Z94.4-93 and applicable standards of Canadian Provinces. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998).

EYE PROTECTION: Use approved safety goggles or safety glasses, as described in OSHA 29 CFR 1910.133. A full face-shield should be used when handling more than 10 pounds of this material. Splash goggles with a faceshield may be needed if splash hazards exist.

HAND PROTECTION: Wear chemical impervious gloves (e.g., rubber, Neoprene).

BODY PROTECTION: Use body protection appropriate for task (e.g., Tyvek suit, rubber apron) to protect from splashes and sprays.

HMIS PERSONAL PROTECTIVE EQUIPMENT RATING: D (Face Shield, Gloves, Apron)

9. PHYSICAL and CHEMICAL PROPERTIES

RELATIVE VAPOR DENSITY (air = 1): < 1.
SPECIFIC GRAVITY: 1.05 – 1.2
SOLUBILITY IN WATER: Soluble.
VAPOR PRESSURE, mm Hg @ 20°C: Not established.
EVAPORATION RATE (water = 1): Slower than water.
MELTING/FREEZING POINT: < 0^{o}C (< 32^{o}F).
BOILING POINT: > 100^{o}C (> 212^{o}F).
pH: 10.5 – 11.5 (2% aqueous solution)
ODOR THRESHOLD: Odorless
COEFFICIENT OF OIL/WATER DISTRIBUTION (PARTITION COEFFICIENT): Not established.
APPEARANCE AND COLOR: This product is a clear, colorless to amber-colored liquid with a light disinfectant odor.
HOW TO DETECT THIS SUBSTANCE (warning properties): Litmus paper will turn blue when in contact with solutions of this product.

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: Thermal decomposition of this product may generate carbon oxides, phosphorus oxides, and sodium oxides.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong acids, oxidizers

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Avoid contact with incompatible chemicals.

PART IV *Is there any other useful information about this material?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following toxicology information is available for the product and its components greater than 1 % in concentration.

ETHANOLAMINE:

Open irritation test (skin-Rabbit) 505 mg: Moderate

Standard Draize test (Skin-Rabbit) 250 µg: Severe

LD_{50} (Oral-Rat) 1720 mg/kg

LD_{50} (Oral-Mouse) 700 mg/kg: Behavioral: somnolence (general depressed activity); Behavioral: muscle contraction or spasticity; Lungs, Thorax, or Respiration: dyspnea

LD_{50} (Oral-Rabbit) 1 gm/kg

LD_{50} (Oral-Guinea Pig) 620 mg/kg

LD_{50} (Intraperitoneal-Rat) 67 mg/kg

LD_{50} (Intraperitoneal-Mouse) 50 mg/kg

LD_{50} (Subcutaneous-Rat) 1500 mg/kg

LD_{50} (Skin-Rabbit) 1 mL/kg

LD_{50} (Intravenous-Rat) 225 mg/kg: Behavioral: somnolence (general depressed activity), muscle contraction or spasticity; Lungs, Thorax, or Respiration: dyspnea

LD_{50} (Intramuscular-Rat) 1750 mg/kg

LC (Inhalation-Mouse) > 2420 mg/m^3/2 hours

LC (Inhalation-Cat) > 2420 mg/m^3/2 hours

LDLo (Oral-Mammal-Species Unspecified) 1400 mg/kg

TDLo (Oral-Rat) 115 gm/kg/90 days-continuous: Liver: changes in liver weight; Kidney, Ureter, Bladder: changes in bladder weight; Related to Chronic Data: death

TDLo (Oral-Rat) 105 mg/kg/30 weeks-intermittent: Liver: liver function tests impaired, changes in liver weight; Nutritional and Gross Metabolic: weight loss or decreased weight gain

TCLo (Inhalation-Rat) 66 ppm/24 hours/30 days-continuous: Behavioral: somnolence (general depressed activity); Skin and Appendages: dermatitis, irritative (after systemic exposure); Related to Chronic Data: death

TCLo (Inhalation-Rat) 400 mg/m^3/5 hours/26 weeks-intermittent: Lungs, Thorax, or Respiration: respiratory depression; Liver: liver function tests impaired; Kidney, Ureter, Bladder: proteinuria

TCLo (Inhalation-Rat) 300 mg/m^3/5 hours/26 weeks-intermittent: Kidney, Ureter, Bladder: proteinuria, other changes in urine composition; Nutritional and Gross Metabolic: weight loss or decreased weight gain

TCLo (Inhalation-Dog) 102 ppm/24 hours/30 days-continuous: Behavioral: somnolence (general depressed activity); Skin and Appendages: dermatitis, irritative (after systemic exposure); Related to Chronic Data: death

TCLo (Inhalation-Guinea Pig) 75 ppm/24 hours/24 days-continuous: Behavioral: somnolence (general depressed activity); Skin and Appendages: dermatitis, irritative (after systemic exposure); Related to Chronic Data: death

TDLo (Oral-Rat) 500 mg/kg: female 6-15 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus), fetal death, Specific Developmental Abnormalities: musculoskeletal system

TDLo (Oral-Rat) 4500 mg/kg: female 6-15 day(s) after conception: Reproductive: Maternal Effects: other effects

TDLo (Oral-Rat) 500 mg/kg: female 6-15 day(s) after conception: Reproductive: Specific Developmental Abnormalities: urogenital system

TDLo (Skin-Rat) 2250 mg/kg: female 6-15 day(s) after conception: Reproductive: Maternal Effects: other effects

Cytogenetic analysis (Human-Lymphocyte) 100 µmol/L

Sister chromatid exchange (Human-Lymphocyte) 1 mmol/L

PROPYLENE GLYCOL:

Skin-Human 500 mg/7 days Mild irritation effects

Skin-Human 104 mg/3 days-intermittent Moderate irritation effects

Skin-man: 10%/2 days

Eye effects-Rabbit, adult 100 mg Mild irritation effects

Eye effects-Rabbit, adult 500 mg/24 hours Mild irritation effects

TDLo (Oral-Child) 79 g/kg/56 weeks-intermittent: Central nervous system effects, BRN

TDLo (Parenteral-Infant) 10 g/kg/3 days-continuous: Systemic effects

LD_{50} (Oral-Rat): 20 g/kg

LD_{50} (Oral-Mouse) 22 g/kg

LD_{50} (Oral-rabbit) 18500 mg/kg

LD_{50} (Oral dog) 22 gm/kg

LD_{50} (Oral-guinea pig) 18350 mg/kg

LD_{50} (Oral-quail) > 2080 mg/kg

LD_{50} (Skin-rabbit) 20800 mg/kg

LD_{50} (Intraperitoneal-Rat) 6660 mg/kg

LD_{50} (Intraperitoneal-Mouse) 9718 mg/kg

LD_{50} (Subcutaneous-Rat) 22,500 mg/kg

LD_{50} (Subcutaneous-Mouse) 17,370 mg/kg

LDLo (Subcutaneous-guinea pig) 15500 mg/kg

LD_{50} (Intravenous-Rat) 6423 mg/kg

LD_{50} (Intravenous-Mouse) 6630 mg/kg

LD_{50} (Intravenous-rabbit) 6500 mg/kg

LD_{50} (Intravenous-dog) 26 gm/kg

LDLo (Intravenous-chicken) 27 gm/kg: Vascular: other changes

LD_{50} (Intramuscular-Rat) 14 g/kg

TCLo Inhalation-rat) 2180 mg/m^3/6 hours/90 days-intermittent: Behavioral: food intake (animal); Endocrine: changes in spleen weight; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: dehydrogenases

TDLo (Intraperitoneal-Mouse) 100 mg/kg (15 days preg): Teratogenic effects

TDLo (Intraperitoneal-Mouse) 100 mg/kg (11 days preg): Reproductive effects

LDLo (Intramuscular-rabbit) 6300 mg/kg: Behavioral: somnolence (general depressed activity); Behavioral: coma; Lungs, Thorax, or Respiration: respiratory stimulation

DNA Inhibition (Mouse-Subcutaneous) 8000 mg/kg

Cytogenetic Analysis (Subcutaneous-Mouse) 8000 mg/kg

Cytogenetic Analysis (Hamster-fibroblast) 32 g/L

pH Adjusting Agent:

Standard Draize Test (Eye-Monkey) 1%/24 hours: Severe

Standard Draize Test (Skin-Rabbit) 500 mg/24 hours: Severe

Standard Draize Test (Eye-Rabbit) 400 µg: Mild

Standard Draize Test (Eye-Rabbit) 1%: Severe

Standard Draize Test (Eye-Rabbit) 50 µg/24 hours: Severe

Standard Draize Test (Eye-Rabbit) 1 mg/24 hours: Severe

Rinsed with water (Eye-Rabbit) 1 mg/30 seconds: Severe

LD_{50} (Intraperitoneal-Mouse) 40 mg/kg

LDLo (Oral-Rabbit) 500 mg/kg

Cytogenetic Analysis (Parenteral-Grasshopper) 20 mg

Cytogenetic Analysis (Hamster-Lung) 10 mmol/L

Cytogenetic Analysis (Hamster-Ovary) 16 mmol/L

Chelate Agent:

Standard Draize Test (Skin-Rabbit, adult) 500 mg/24 hours: Moderate irritation effects

Standard Draize Test (Eye -Rabbit, adult) 1900 mg

Standard Draize Test (Eye-Rabbit, adult) 100 mg/24 hours: Moderate irritation effects

LD_{50} (Intraperitoneal-Rat) 1548 mg/kg: Behavioral: convulsions or effect on seizure threshold; Lungs, Thorax, or Respiration: cyanosis; Gastrointestinal: changes in structure or function of salivary glands

TOXICOLOGICAL INFORMATION (Continued)

LD_{50} (Intraperitoneal-Mouse) 1364 mg/kg: Behavioral: convulsions or effect on seizure threshold; Lungs, Thorax, or Respiration: cyanosis; Gastrointestinal: changes in structure or function of salivary glands

LD_{50} (Intravenous-Mouse) 170 mg/kg: Behavioral: convulsions or effect on seizure threshold; Lungs, Thorax, or Respiration: cyanosis; Gastrointestinal: changes in structure or function of salivary glands

LD_{50} (Intravenous-Rabbit) 449 mg/kg: Behavioral: convulsions or effect on seizure threshold; Lungs, Thorax, or Respiration: cyanosis; Gastrointestinal: changes in structure or function of salivary glands

IRRITANCY OF PRODUCT: This product can be moderately to severely irritating to contaminated tissue.
SUSPECTED CANCER AGENT: The components of this product are not found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, and CAL/OSHA, and therefore are neither considered to be nor suspected to be cancer-causing agents by these agencies.
SENSITIZATION TO THE PRODUCT: The Monoethanolamine component of this product may cause sensitization upon prolonged or repeated exposure in sensitive individuals.
TOXICOLOGICAL SYNERGISTIC PRODUCTS: No information is currently available on toxicologically synergistic products of this material.
REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this product and its components on the human reproductive system.

Mutagenicity: This product is not reported to produce mutagenic effects in humans. Human mutation data are available for Sodium Hydroxide, Monoethanolamine and Propylene Glycol (components of this product); these data were obtained during clinical studies on specific animal tissues exposed to high doses of this compound.

Embryotoxicity: This product is not reported to produce embryotoxic effects in humans.

Teratogenicity: This product is not reported to cause teratogenic effects in humans. Clinical studies on test animals exposed to relatively high doses of Propylene Glycol (components of this product) provided teratogenic data.

Reproductive Toxicity: This product is not reported to cause reproductive effects in humans. Clinical studies on test animals exposed to relatively high doses of Propylene Glycol (components of this product) provided reproductive toxicity data.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

BIOLOGICAL EXPOSURES INDICES (BEIs): Currently, there are no Biological Exposure Indices (BEIs) for any component of this product.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: The components of this product will decompose into other organic and inorganic compounds over time under normal environmental conditions. Additional environmental data are available as follows:

ETHANOLAMINE:

K_{OW} = -1.31 (est.)

Water Solubility: Miscible.

Bioconcentration: A bioconcentration factor (BCF) of was estimated for 2-aminoethanol (MEA) based on a log Kow of -1.31. This BCF value and complete solubility of MEA in water suggest that this compound does not bioconcentrate significantly in aquatic organisms

Biodegradation: Biological oxygen demand (BOD): 78%, 5 days; (theoretical) 0%, 5 days; 64%, 20 days.

Persistence: Biodegrades at moderate rate.

Terrestrial Fate: If released to soil, Ethanolamine is expected to biodegrade fairly rapidly following acclimatization, with a half-life on the order of days to week. Ethanolamine will leach in soil to groundwater. Volatilization is not a significant fate process from the soil.

Aquatic Fate: If released to water, Ethanolamine should undergo biodegradation. The half-life in water is expected to be from a few days to weeks, depending on the acclimatization in the aquatic system.

Atmospheric Fate: If released to the atmosphere, Ethanolamine is expected to exist entirely in the vapor phase. The primary mechanism of removal from the atmosphere would be by reaction with photochemically generated hydroxyl radicals, with an expected half-life of 4 hours. The complete solubility if Ethanolamine suggests that it will also be removed by precipitation.

ECOLOGICAL INFORMATION (continued)

PROPYLENE GLYCOL:

Log K_{ow} = -0.30--1.41

Biodegradation: Standard dilution BOD water, 5-day 64% theoretical biochemical oxygen demand, sewage inocula. Warburg respirometer, 40-day 78% theoretical biochemical oxygen demand, sewage inocula. Nutrient broth, 100% degradation in 4 days (aerobic conditions), 100% degradation in 4-9 days (anaerobic conditions), activated sludge, or digester sludge inocula, no significant degradation in sterile controls. Standard dilution BOD water, 5-day 2.2% theoretical biochemical oxygen demand, 10-day 56.7% theoretical biochemical oxygen demand, 50-day 80% theoretical biochemical oxygen demand, sewage inocula. Standard dilution BOD water, 5-day 62% theoretical biochemical oxygen demand, 20-day 79% theoretical biochemical oxygen demand, sewage inocula; synthetic seawater dilution, 5-day 55% theoretical biochemical oxygen demand, 20-day 83% theoretical biochemical oxygen demand, raw wastewater inocula. Sewage die-away, 74.5% theoretical biochemical oxygen demand in 5 days.

Bioconcentration: Based on a log Kow of -0.92, the BCF for 1,2-propanediol can be estimated to be from a recommended regression-derived equation.

pH Adjusting Agent:

Water Solubility = 9 g/0.9 ml water

BOD: None.

Octanol/Water Partition Coefficient: SRP4: Too low to be measured (or possibly virtually 0)

Persistence: Can persist for extended periods of time.

Chelate Agent:

Water solubility ≈ 103 g/mL; Water solubility ≅ 1000g/L @20°C

Biological Oxygen Demand = 20 mg O_2/g product, Chemical Oxygen Demand = 575 mg O_2/g product.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: This product may be harmful to animal life if large volumes of it are released into the environment. Refer to section 11 (Toxicological Information) for information on the effects of components of this product on test animals.

EFFECT OF CHEMICAL ON AQUATIC LIFE: This product may be harmful to contaminated aquatic life (especially if large volumes of it are released into an aquatic environment. Additional aquatic toxicity data are available as follows:

pH Adjusting Agent:

Acute Hazard Level:

Lethal pH (goldfish) = 10.9

Lethal pH (bluegill) = 10.5

LC_{100} (*Cyprimus carpio)* 24 hours = 180 ppm/ 25°C

TL_m (mosquito fish) 96 hours = 125 ppm/ fresh water

TL_m (bluegill) 48 hours = 99 mg/L/ tap water

ETHANOLAMINE:

EC_0 (*Pseudomonas putida* bacteria) 16 hours = 6,300 mg/L

EC_0 (*Microcystis aeruginosa* algae) 8 days = 1.6 mg/L

EC_0 (*Scenedesmus quadricauda* green algae) 7 days = 0.75 mg/L

EC_0 (*Entosiphon sulcatum* protozoa) 72 hours = 300 mg/L

EC_0 (*Uronema parduczi* Chatton-Lwoff protozoa) = 2,945 mg/L

LD_{50} (goldfish) 24 hours = 190 mg/L (@ pH 10.1)

LD_{50} (goldfish) 96 hours = 170 mg/l (@ pH 10.1)

LD_{50} (goldfish) 24 hours = > 5,000 mg/L (@ pH 7)

LD_{50} (goldfish) = > 5000 mg/L, 24 hours

PROPYLENE GLYCOL:

EC_{50} (*Photobacterium phosphoreum*, bacteria) 30 minutes = 26,800 mg/L

TD (*Chlorella pyrenoidosa*, algae) = 92,000 mg/L

EC_0 (*Daphnia magna*, crustacean) 48 hours = < 4,295 mg/L

EC_{50} (*Daphnia magna*, crustacean) 48 hours = 34,400 mg/L

EC_{100} (*Daphnia magna*, crustacean) 48 hours = 50,000 mg/L

PROPYLENE GLYCOL (continued):

EC_{50} (*Daphnia magna*, crustacean) 24 hours = > 10,000 mg/L

EC_{100} (*Daphnia magna*, crustacean) 24 hours = > 10,000 mg/L

EC_{50} (*Nitocra spinipes*, crustacean) 96 hours = > 10,000 mg/L

LC_{50} (*Lebistes reticulatus*, guppy) 48 hours > 10,000 mg/L

LC_{50} (*Carassius auratus*) 24 hours = > 5,000 mg/L

LC_{50} (*Salmo gairdneri*) 24 hours = 50,000 mg/L

LC_{50} (*Pimephales promelas*) 96 hours = 54,900 mg/L

LC_{50} (Artemia salina) 24 hours = >10,000 mg/L

LC_{100} (*Pimephales promelas*) 96 hours = 65,610 mg/L

NOEC (*Pimephales promelas*) 96 hours < 47,829 mg/L

fingerling trout: at 50,000 mg/l at 10°C: no mortality or apparent signs of stress were produced during a 25-hr exposure period (static bioassay)

Chelate Agent:

LC_{100} (*Cyprinus carpio*) 24 hours = 180 ppm/ at 25°C

TLm (mosquito fish) 96 hours = 125 ppm/ (fresh water)

TLm (bluegill) 48 hours = 99 mg/L/ (tap water)

LC_{50} (*Lepomis macrochirus* bluegill) 96 hours = 486 mg/L

LC_{50} (*Lepomis macrochirus* bluegill) 96 hours = 490-1030 mg/L (static bioassay)

LC_{50} (*Lepomis macrochirus* bluegill) 96 hours = > 500 mg/L

LC_{50} (*Leuciscus Idus*) 96 hours = > 500 mg/L

LC_{50} (Algae) 72 hours = 10-100 mg/L

LC_{50} (*Daphnae*) 24 hours > 100 mg/L

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate U.S. Federal, State, and local regulations or with regulations of Canada. This product, if unaltered by the handling, may be disposed of by treatment at a permitted facility or as advised by your local waste regulatory authority.

EPA WASTE NUMBER: Not applicable as supplied.

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME:	Amines, liquid, corrosive, n.o.s. (Ethanolamine)
HAZARD CLASS NUMBER and DESCRIPTION:	8 (Corrosive)
UN IDENTIFICATION NUMBER:	UN 2735
DOT LABEL(S) REQUIRED:	Corrosive (Class 8)
PACKAGING GROUP:	II

NORTH AMERICAN RESPONSE GUIDEBOOK NUMBER (1996): 154

NATIONAL MOTOR FREIGHT CLASSIFICATION: LTL: 100; T: 70

MARINE POLLUTANT: No component of this product is listed as a marine pollutant by the D.O.T. (49 CFR 172.101, Appendix B).

NOTE: Shipments of this product may be shipped under small quantity and limited quantity exceptions as indicated under 49 CFR §173.4 and 49 CFR §173.150, if all requirements are met.

Small Quantity Exception (49 CFR 173.4): Small quantities of Class 8 material are not subjected to other requirements of the Hazardous Materials Regulations (Subchapter C) when the maximum quantity per inner receptacle is limited to 30 mL (liquids). Refer to 49 CFR 173.4 for specific information in packaging small quantity materials.

Limited Quantity Exceptions [49 CFR 173.154(b)]: Limited quantities for Class 8, Packing Group II materials have inner packagings not over 1.0 L (liquids) net capacity each, packed in strong outer packaging.

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This material is considered as dangerous goods, per Transport Canada regulations. Use above U.S. DOT shipping information for shipments to Canada.

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: None of the components of this product are subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act.

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for the components of this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lbs (4,540 kg) therefore applies, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): pH Adjusting Agent 1,000 lbs (45.4 kg). 100 lb (45.4 kg) for unlisted hazardous wastes of characteristic of corrosivity (D002).

U.S. TSCA INVENTORY STATUS: All components of this product are listed on the TSCA Inventory.

OTHER U.S. FEDERAL REGULATIONS: Not applicable.

U.S. STATE REGULATORY INFORMATION: Components of this product are covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: PH Adjusting Agent, Monoethanolamine.

California - Permissible Exposure Limits for Chemical Contaminants: PH Adjusting Agent, Monoethanolamine.

Florida - Substance List: PH Adjusting Agent, Monoethanolamine.

Illinois - Toxic Substance List: PH Adjusting Agent, Monoethanolamine.

Kansas - Section 302/313 List: PH Adjusting Agent.

Massachusetts - Substance List: PH Adjusting Agent, Monoethanolamine.

Michigan - Critical Materials Register: No.

Minnesota - List of Hazardous Substances: PH Adjusting Agent, Monoethanolamine.

Missouri - Employer Information/Toxic Substance List: PH Adjusting Agent, Monoethanolamine.

New Jersey - Right to Know Hazardous Substance List: PH Adjusting Agent Monoethanolamine.

North Dakota - List of Hazardous Chemicals, Reportable Quantities: PH Adjusting Agent.

Pennsylvania - Hazardous Substance List: PH Adjusting Agent, Monoethanolamine, Propylene Glycol.

Rhode Island - Hazardous Substance List: PH Adjusting Agent, Monoethanolamine, Propylene Glycol.

Texas - Hazardous Substance List: PH Adjusting Agent, Monoethanolamine.

West Virginia - Hazardous Substance List: PH Adjusting Agent, Monoethanolamine.

Wisconsin - Toxic and Hazardous Substances: PH Adjusting Agent, Monoethanolamine.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): This product contains traces of Formaldehyde and Nitrilotriacetic acid, trisodium salt, and are on the California Proposition 65 list. WARNING: This product contains chemicals known to the State of California to cause cancer.

REGULATORY INFORMATION (continued)

ANSI LABELING (Z129.1): **DANGER!** MAY CAUSE SKIN AND EYE IRRITATION OR BURNS. MAY BE IRRITATING IF INHALED. HARMFUL IF SWALLOWED. MAY CAUSE SENSITIZATION AND ALLERGIC REACTION. Do not taste or swallow. Do not get on skin or in eyes. Avoid breathing mists or sprays. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling. Wear gloves, goggles, and suitable body protection if necessary. FIRST-AID: In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. If inhaled, remove to fresh air. If ingested, do not induce vomiting. Get medical attention if any adverse effects occur. IN CASE OF FIRE: Use water fog, dry chemical, CO_2, or "alcohol" foam. IN CASE OF SPILL: Absorb spill with inert material and place in suitable container. Consult Material Safety Data Sheet for additional information.

ENVIRONMENTAL HAZARDS: Do not discharge effluent containing this product into streams, ponds, estuaries, oceans or other waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit and the permitting authority has been notified in writing prior to discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority. For guidance, contact your State Water Board or Regional Office of the EPA.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: The components of this product are listed on the DSL/NDSL Inventory. OTHER CANADIAN REGULATIONS: Not applicable.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITY SUBSTANCES LISTS: Formaldehyde, a trace component of this product, is on the Second Priority Substances list under the Canadian Environmental Protection Act (CEPA).

CANADIAN WHMIS SYMBOLS: **Class E** (Corrosive)

This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

16. OTHER INFORMATION

PREPARED BY:	ADVANCED CHEMICAL SAFETY, Inc. 7563 Convoy Court San Diego, CA 92111 (858)-874-5577
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DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

CAS #: This is the Chemical Abstract Service Number which uniquely identifies each compound.

ACGIH - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits.

TLV - Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average **(TWA)**, the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling Level **(C)**. Skin absorption effects must also be considered.

OSHA - U.S. Occupational Safety and Health Administration.

PEL - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order.

IDLH - Immediately Dangerous to Life and Health **-** This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. **O**ccupational **S**afety and **H**ealth **A**dministration (**OSHA**). NIOSH issues exposure guidelines called **R**ecommended **E**xposure **L**evels (**REL**s). When no exposure guidelines are established, an entry of **NE** is made for reference.

HAZARD RATINGS:

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM: Health Hazard: **0** (minimal acute or chronic exposure hazard); **1** (slight acute or chronic exposure hazard); **2** (moderate acute or significant chronic exposure hazard); **3** (severe acute exposure hazard; onetime overexposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime overexposure can be fatal). Flammability Hazard: **0** (minimal hazard); **1** (materials that require substantial pre-heating before burning); **2** (combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]); **3** (Class IB and IC flammable liquids with flash points below 38°C [100°F]); **4** (Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]. Reactivity Hazard: **0** (normally stable); 1 (material that can become unstable at elevated temperatures or which can react slightly with water); **2** (materials that are unstable but do not detonate or which can react violently with water); **3** (materials that can detonate when initiated or which can react explosively with water); **4** (materials that can detonate at normal temperatures or pressures).

NATIONAL FIRE PROTECTION ASSOCIATION: Health Hazard: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure could cause death or major residual injury). Flammability Hazard and Reactivity Hazard: Refer to definitions for "Hazardous Materials Identification System".

FLAMMABILITY LIMITS IN AIR:

Much of the information related to fire and explosion is derived from the National Fire Protection Association (**NFPA**). Flash Point - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. Autoignition Temperature: The minimum temperature required to initiate combustion in air with no other source of ignition. LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION:

Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD_{50}** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC_{50}** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m^3** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV. Ecological Information: EC is the effect concentration in water.

REGULATORY INFORMATION:

This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Superfund Amendments and Reauthorization Act **(SARA)**; the Canadian Domestic/Non-Domestic Substances List **(DSL/NDSL)**; the U.S. Toxic Substance Control Act **(TSCA)**; Marine Pollutant status according to the **DOT**; the Comprehensive Environmental Response, Compensation, and Liability Act **(CERCLA or Superfund)**; and various state regulations. This section also includes information on the precautionary warnings which appear on the material's package label.