CUMBERLAND
RESOURCES LTD.

MEADOWBANK GOLD PROJECT

SPILL CONTINGENCY PLAN

JANUARY 2005

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DESCRIPTION OF SUPPORTING DOCUMENTATION

Cumberland Resources Ltd. (Cumberland) is proposing to develop a mine on the Meadowbank property. The property is located in the Kivalliq region approximately 70 km north of the Hamlet of Baker Lake on Inuit-owned surface lands. Cumberland has been actively exploring the Meadowbank area since 1995. Engineering, environmental baseline studies, and community consultations have paralleled these exploration programs and have been integrated to form the basis of current project design.

The Meadowbank project is subject to the environmental review and related licensing and permitting processes established by Part 5 of the Nunavut Land Claims Agreement. To complete an environmental impact assessment (EIA) for the Meadowbank Gold project, Cumberland followed the steps listed below:

1. Determined the VECs (air quality, noise, water quality, surface water quantity and distribution, permafrost, fish populations, fish habitat, ungulates, predatory mammals, small mammals, raptors, waterbirds, and other breeding birds) and VSECs (employment, training and business opportunities; traditional ways of life; individual and community wellness; infrastructure and social services; and sites of heritage significance) based on discussions with stakeholders, public meetings, traditional knowledge, and the experience of other mines in the north.

2. Conducted baseline studies for each VEC and compared / contrasted the results with the information gained through traditional knowledge studies (see Column 1 on the following page for a list of baseline reports).

3. Used the baseline and traditional knowledge studies to determine the key potential project interactions and impacts for each VEC (see Column 2 for a list of EIA reports).

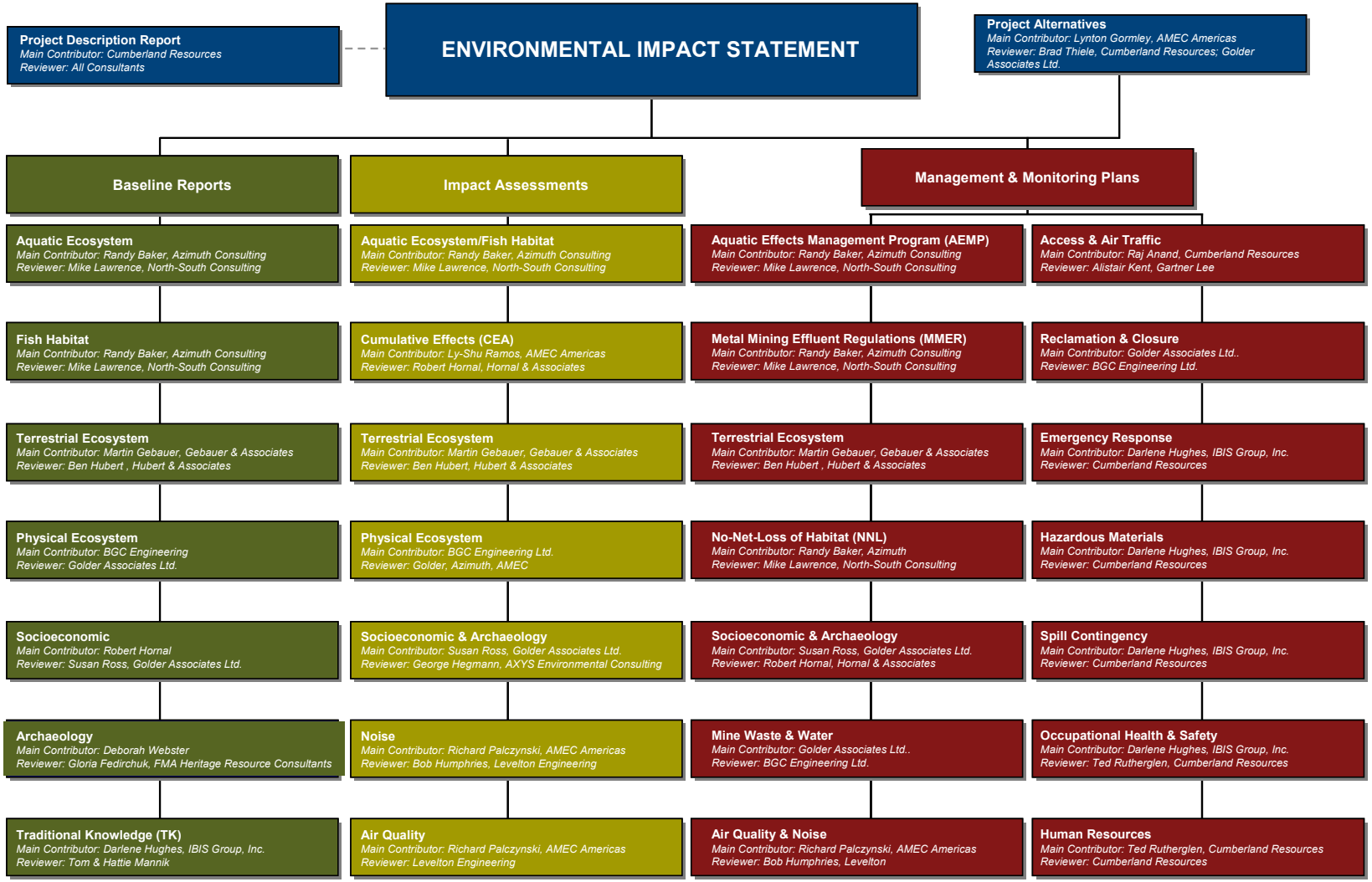
4. Developed preliminary mitigation strategies for key potential interactions and proposed contingency plans to mitigate unforeseen impacts by applying the precautionary principle (see Column 3 for a list of management plans).

5. Developed long-term monitoring programs to identify residual effects and areas in which mitigation measures are non-compliant and require further refinement. These mitigation and monitoring procedures will be integrated into all stages of project development and will assist in identifying how natural changes in the environment can be distinguished from project-related impacts (monitoring plans are also included in Column 3).

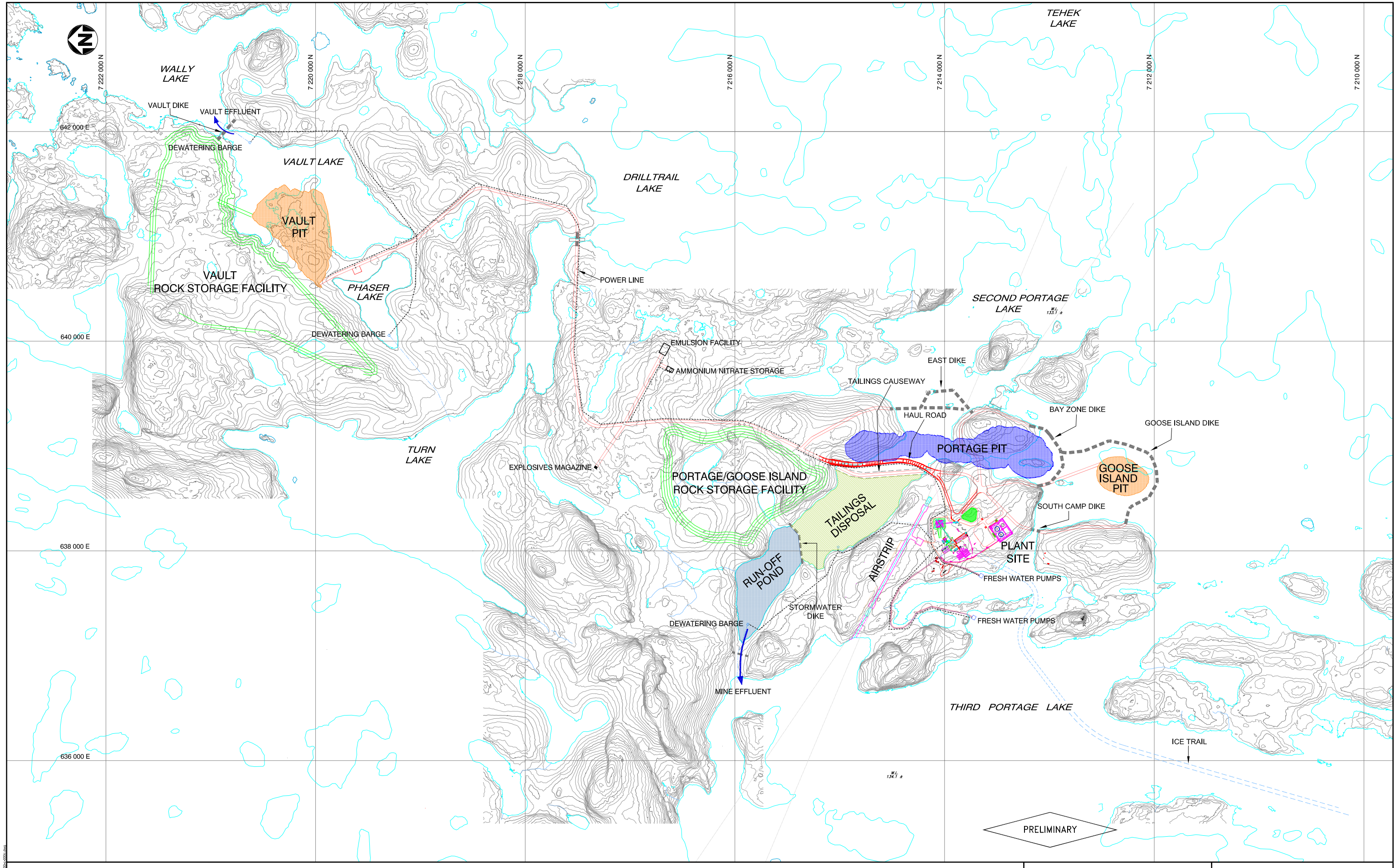
6. Produce and submit an EIS report to NIRB.

As shown on the following page, this report is part of the documentation series that has been produced during this six-stage EIA process**.**

EIA DOCUMENTATION ORGANIZATION CHART



PROJECT LOCATION MAP



Proposed Mine Site Layout

CUMBERLAND RESOURCES LTD.
Meadowbank Gold Project

SECTION 1 • INTRODUCTION

1.1 SCOPE OF THE SPILL CONTINGENCY PLAN

This plan has been prepared by Cumberland Resources Ltd. (Cumberland) to address the terms of reference, as issued by the Nunavut Impact Review Board (NIRB) for the environmental assessment of the Meadowbank Gold project. This Spill Contingency Plan (SCP) covers gold mining, processing, transportation and related activities at the Meadowbank site.

This SCP is conceptual in nature and will be finalized prior to construction of the mine. Cumberland has also developed a draft "Emergency Response Plan," "Hazardous Materials management Plan," and "Occupational Health and Safety Plan." These plans are reported separately.

Section 1 of the SCP introduces the document. Section 2 defines a "spill" and the volumes of specific spill materials that need to be reported to the government spill response line. Section 3 provides the initial action plan, Section 4 the response organization, and Section 5 the action plans for specific materials on site. Section 6 describes the facilities found at the site, preventative measures taken to avoid incidents at these facilities, and response action in the event of an emergency. Section 7 lists the response equipment available at site and the location of the equipment. Section 8 provides background on the training provided to the response team on site.

A copy of Cumberland's Emergency Response Procedures for Spilled Chemical Substances is included as Appendix A.

1.2 PURPOSE OF THE SPILL CONTINGENCY PLAN

The purpose of this plan is to provide a practical source of information required to assess spill risks, develop an effective countermeasures program, and respond in a safe and effective manner to spill incidents. More specifically, the purpose is:

- to comply with Cumberland's environmental policy
- to identify the organization, responsibilities, and reporting procedures of the Meadowbank emergency response team in the event of an emergency or spill
- to provide readily accessible emergency information to the cleanup crews, management, and government agencies in the event of a spill
- to comply with federal and territorial regulations and guidelines pertaining to the preparation of contingency plans and notification requirements
- to promote the safe and effective recovery of spilled materials
- to minimize the environmental impacts of spills to water or land
- to provide site information on the facilities and contingencies in place if a spill or malfunction should occur.

This spill contingency plan has been prepared in accordance with the following reference documents:

- Northwest Territories Water Board. 1987. *Guidelines for Contingency Planning.*
- Northwest Territories Resources Wildlife and Economic Development Environmental Protection Service. 1988. *Spill Contingency Planning and Reporting Regulations.*
- CCME (Canadian Council for Ministers of the Environment). August 1994. *Environmental Code of Practice for Aboveground Storage Tank Systems Containing Petroleum Products.* National Task Force on Storage Tanks for the Canadian Council of Ministers of the Environment.
- Porter Dillon Limited. March 1997. *Preventing Site Contamination at Federal Facilities: A Guidance Manual.* Contaminated Sites Management Working Group. Environment Canada.

1.3 CUMBERLAND'S ENVIRONMENTAL POLICY

Cumberland is committed to the concept of sustainable development, which requires balancing good stewardship in the protection of human health and the natural environment with the need for economic growth. Cumberland's environmental policy is summarized below.

- conduct all activities in compliance with applicable legislation, and other requirements, providing for the protection of the environment, employees, and the public
- apply appropriate good management practices in the absence of legislation or where Cumberland believes more stringent criteria than those required by law are needed to advance environmental protection and to minimize environmental risks
- integrate the management of environmental, social, cultural, and economic issues into company business and planning
- protect the environment through the wise use of resources and prevention of adverse environmental impacts
- implement, maintain, and improve appropriate management systems and programs to achieve environmental objectives and to continually improve environmental performance through a process of regular review
- conduct research and establish programs to conserve resources, minimize wastes, improve processes, and protect the environment
- ensure awareness among employees and contractors of this environmental policy, promote shared responsibility and accountability for environmental obligations, and provide the support and training necessary to achieve these objectives
- communicate openly with governments, employees, local communities, and the public to sustain mutual understanding of environmental, social, and economic issues related to the project.

SECTION 2 • SPILLS

2.1 WHAT IS A SPILL?

For the purposes of this plan, a spill is defined as an accidental release of product into the environment that has the potential for adverse impact. The emergency/spill response team must be notified immediately of any spill or emergency.

2.2 MATERIALS & REPORTABLE SPILLS ON SITE

According to the Consolidation of Spill Contingency Planning and Reporting Regulations of the *Environmental Protection Act (*1990), where there is a reasonable likelihood of a spill in an amount equal to or greater than the amounts set out in Table 2.1, the spill must be reported to the GNWT 24-hour spill report line at 867.920.8130.

Table 2.1: Spill Volumes that Must Be Reported to the GNWT Spill Report Line

Transportation Class	Description of Contaminant	Amount Spilled
1	explosives	any amount
2.1	compressed gas (flammable)	any amount of gas from containers with a capacity greater than 100 L
2.2	compressed gas (non-corrosive, non-flammable	any amount of gas from containers with a capacity greater than 100 L
2.3	compressed gas	any amount
2.4	compressed gas (corrosive)	any amount
3.1, 3.2, 3.3	flammable liquid	100 L
4.1	flammable solid	25 kg
4.2	spontaneously combustible solids	25 kg
4.3	water reactant solids	25 kg
5.1	oxidizing substances	50 L of 50 kg
5.2	organic peroxides	1 L or 1 kg
6.1	poisonous substances	5 L or 5 kg
6.2	infectious substances	any amount
7	radioactive substances	any amount
8	corrosive substances	5 L of 5 kg
9.1 (in part)	miscellaneous substances	60 L or 60 kg
9.2	environmentally hazardous	1 L or 1 kg
9.3	dangerous wastes	5 L of 5 kg
9.1 (in part)	PCB mixtures of 5 ppm or more	0.5 L or 0.5 kg
None	other contaminants	100 L or 100 kg

Note: L = litre; kg = kilogram; PCB = polychlorinated biphenyls; ppm = parts per million.

SECTION 3 • INITIAL ACTION

Initial actions for spills as defined in Section 2 include ensuring safety, identifying and containing spill materials, reporting the spills to the on-site coordinator, alerting Cumberland's personnel and spill response team, notifying government agencies, and recording the incident. Additional information regarding roles and responsibilities of each party is provided in Section 4.

3.1 ENSURING SAFETY

Ensuring safety is the responsibility of all parties, particularly the first responder who has the most knowledge of the spill. In the event of a spill, the following tasks are recommended to ensure site and personnel safety:

- be alert – ensure safety of yourself and others
- assess the hazard to persons in the vicinity of the spill by assessing the dangers of exposure to the spill material
- shut off ignition sources – NO SMOKING
- attend to the injured
- call for assistance
- do not contain gasoline/aviation fuel if vapours might ignite
- allow gasoline or aviation fuel spills to evaporate
- keep people away from the spill site.

The primary form of ensuring safety is by using preventative measures. All personnel who deal with chemicals must have training in first aid and safe materials handling. In addition, regular training updates and site-specific exercises / drills are integral to preventing incidents.

3.2 IDENTIFYING, CONTAINING & REPORTING THE SPILL

Identifying the spill material is essential in both ensuring safety and containing the spill. The material properties must be known in order to (a) assess first aid measures to injured personnel and potential dangers, and (b) assess the appropriate containment measure for the spill material. In the event of a spill, the following tasks are recommended to properly contain the spilled material:

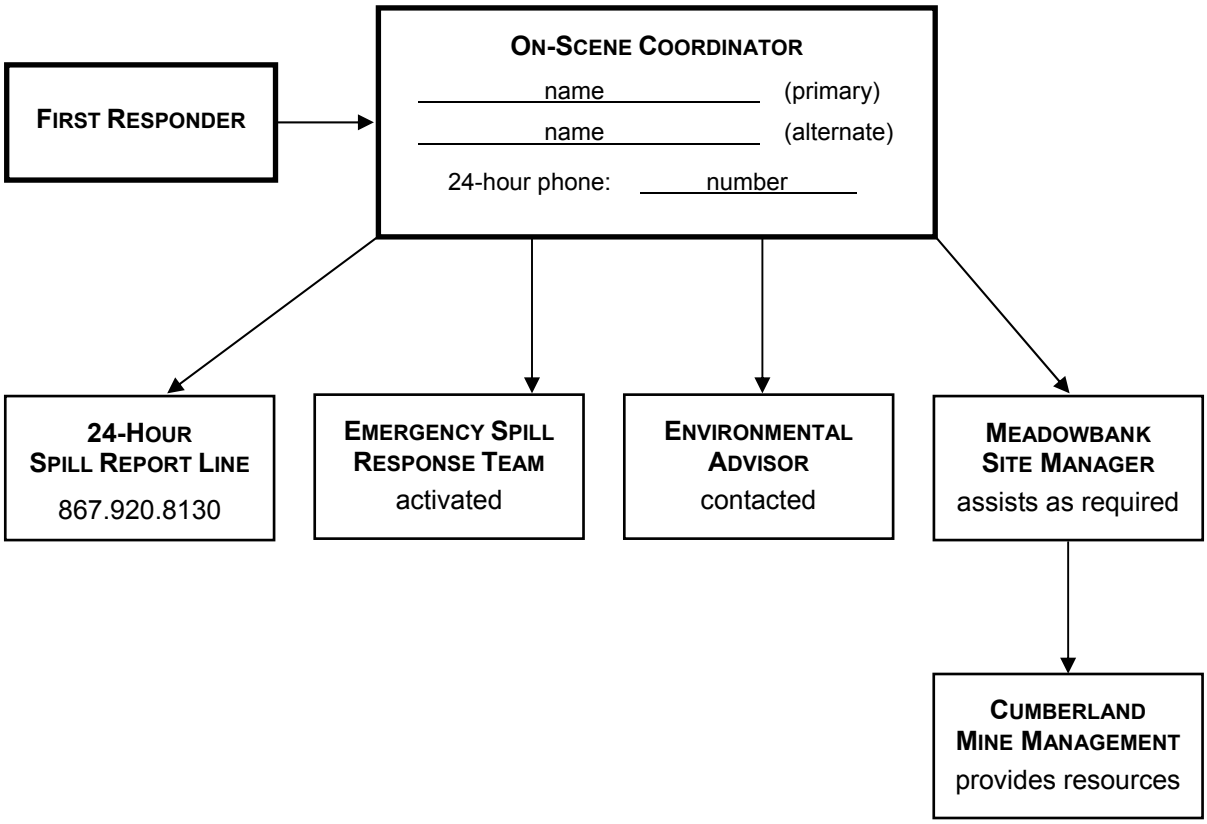
- assess the severity of the spill
- assess whether the spill, leak, or system failure can be readily stopped or brought under control
- stop product flow if possible
- contain and recover the spill as soon as possible
- wear impervious clothing, goggles, and gloves when containing the spill
- approach spill from up-wind IF IT IS SAFE TO DO SO.

Initial responsibilities for spill identification, containment, and reporting are outlined in Figure 3.1. The spill reporting procedure is depicted in Figure 3.2.

Figure 3.1: Cumberland's Initial Action Plan

ENSURE SAFETY…	**ENSURE SAFETY OF YOURSELF & OTHERS** The first responder must: • ensure personal and site safety • assess hazards and attend to injured • prevent spills from occurring
IDENTIFY & CONTAIN…	**IDENTIFY & CONTAIN THE SPILL USING SPILL RESPONSE ACTION INFORMATION** The first responder must identify and contain the spill if it is safe to do so
REPORT…	**REPORT TO THE ON-SCENE COORDINATOR** The first responder must report the spill to the on-scene coordinator, including the spill type, location, cause, and volume
ALERT…	**ALERT THE SPILL RESPONSE TEAM** The on-scene coordinator must contact the spill response team and be a liaison between all parties
NOTIFY…	**NOTIFY GOVERNMENT AGENCIES** The on-scene coordinator must contact: • **GNWT 24-hour spill report line: 867.920.8130 first** • Department of Indian Affairs and Northern Development • Environment Canada
RECORD…	**RECORD THE FACTS OF THE SPILL** The on-scene coordinator must ensure that the following forms are complete: • spill report forms • incident report forms • photographs

Figure 3.2: Spill Reporting Procedure



SECTION 4 • RESPONSE ORGANIZATION

In accordance with the initial action plan described in Section 3, the response organization details the roles and responsibilities of each party involved in the spill. In the event that it is not safe to attempt a cleanup effort internally, the on-scene coordinator will contact the environmental advisor and the GNWT spill report line to coordinate cleanup using external resources.

4.1 FIRST RESPONDERS

The person who has caused a spill or is the first to observe the spill is the first responder. The roles and responsibilities of the first responder are as follows:

- ensure site and personnel safety
- assess the preliminary severity and source of the spill
- identify and contain the spill, if it is safe to do so
- immediately report to and work with the on-scene coordinator
- participate in spill response as a member of the clean up crew.

4.2 ON-SCENE COORDINATOR

The on-scene coordinator must be knowledgeable with regard to site operations, initial response actions, and spill response equipment and facilities. Responsibilities of the on-scene coordinator are as follows:

- assume complete authority over cleanup personnel and the spill scene
- evaluate the initial situation and assess the magnitude of the problem
- report the spill to the 24-hour spill report line at 867.920.8130
- alert key personnel in the response team, as deemed appropriate, to handle the situation
- develop the overall plan of action for containment and cleanup of the specific incident, as well as direct and implement the plan
- ensure assigned responsibilities are carried out and the activities of team members are coordinated
- assess the requirements for people, equipment, materials, and tools to contain the spill in light of what resources are immediately available; urgency will depend on the nature of the spill
- follow up with regulatory and licensing reporting requirements
- with the aid of the environmental advisor, act as a spokesperson with the public, media, and government agencies, as required

- ensure that the spill response team is provided with proper personal protective equipment (PPE)
- ensure that all spill response personnel receive adequate training to fulfil their responsibilities as part of the spill response team.

4.3 SPILL RESPONSE PERSONNEL & MEADOWBANK SITE MANAGER

The spill response team consists of the first responder and specifically trained staff who are on site and ready to aid in the cleanup of a spill. Responsibilities are as follows:

- liaise with on-scene coordinator and keep him/her informed of cleanup activities
- ensure on-site resources for spill response and cleanup are available
- assist in obtaining any additional resources not available on site
- ensure that appropriate PPE is worn properly
- conduct cleanup of spills under the direction of the on-scene coordinator
- liaise with public, media, and government.

4.4 ENVIRONMENTAL ADVISOR

In terms of spills, the environmental manager is contracted to Cumberland for the following:

- liaise with the on-scene coordinator
- provide technical advice on the anticipated environmental impacts of the spill
- advise on the effectiveness of various containment, recoveries, and disposal options, and suggest the most appropriate approach
- develop sampling programs for collection and analysis of samples to identify and monitor possible contaminant levels
- monitor the effectiveness of the cleanup operation and recommend further work, if necessary.

4.5 PROJECT CONSTRUCTION MANAGER

The project construction manager is potentially required to inform team members of the detailed nature of the operations to be performed in the event of a facility malfunction causing a spill during the construction phase. The responsibilities of the project construction manager are as follows:

- liaise with Cumberland personnel resources and keep them informed of cleanup activities
- assist the on-scene coordinator and spill team as needed, particularly in obtaining any additional resources not available onsite for spill response and cleanup.

4.6 SPILL RESPONSE TEAM LIST & CONTACT INFORMATION

The members of the emergency spill response team, their duties, location, and phone numbers are listed in Table 4.1. Other important contacts are listed in Table 4.2.

Table 4.1: Sample Spill Response Team Contact Information Chart

Position	Name/Location	24-Hour Contact #
Territory Government	24-hour spill report line	Ph 867.920.8130
On-Scene Coordinator		Ph Fax Radio channel #2
On-Scene Coordinator		Ph Fax Radio channel #2 Globalstar
Assistant Site Manager		Ph Fax Radio channel #2
Meadowbank Site Manager		Ph Fax Radio channel #2
Environmental Advisor		Ph Cell 24 Hr Pager
Personnel	Spill response personnel available on site to assist with spill and emergency response activities	Ph Cell
Project Construction Manager		Ph Fax Radio channel #2
Cumberland Resources Management Representative		Ph Fax
Meadowbank Senior Environmental Manager		Ph Fax
Meadowbank Environmental Coordinator		Ph Fax

Note: This table to be filled in at a later date as appropriate.

Table 4.2: Other Important Emergency Phone Numbers

Baffin Regional Hospital (Iqualuit)	979.7300
Yellowknife RCMP	669.1111
Cambridge Bay RCMP	983.2111
Department of Indian Affairs and Northern Development	669.2500
DIAND, Water Resource Division	669.2651
Environment Canada, Environmental Protection Branch	920.8500
Workers' Compensation Board	920.3888
Fire Marshall's Office	873.7944
Department of Environment Health	983.7328
Poison Control Centre	920.4111
GNWT Spill Report Fax Line	873.6924
CANUTEC (Spill Support Information)	613.996.6666
Charter Aircraft (for Evacuation)	
Air Tindi	669.8200
First Air	983.2077
Arctic Sun West	873.4464
Nunasi Helicopters	873.3306
Canadian Helicopters	669.9604
Great Slave Helicopters	873.2081
Adlair Aviation	983.2569

Note: The Area Code is 867 unless specified.

SECTION 5 • ACTION PLANS FOR SPECIFIC MATERIALS ON SITE

This preliminary plan is designed to introduce the basic requirements for the efficient and safe cleanup of the materials that may be spilled during the operation of the Meadowbank project. In addition to sodium hydroxide, hydrochloric acid, sodium cyanide, copper sulphate, sodium metabisulphite, and propane, the consumables shown in Table 5.1 will be present on site. A more detailed plan, which will include chemical-specific response requirements, will be developed before mine operations commence.

Table 5.1: Consumable Chemical Materials On Site

Consumables (large quantities required annually)	Consumables (relatively small quantities required)
Diesel, hydraulic, lube, and waste oils and greases	Hydrofluoric acid
Gasoline and Jet B aviation fuel	Nitric acid
Ethylene glycol	Camp maintenance products (detergents, cleaning fluids and powders, light bulbs, etc.)
Ammonium nitrate	Office supplies
Ammonium nitrate fuel oil (ANFO) explosive	Laboratory chemicals
Hydrated lime	Shop supplies (batteries, hardware, fasteners, solvents, machining lubricants, etc.)
Percol flocculent	Surface and underground drilling consumables (drill bits, etc.)
Acetylene	
Ferrosilicon	
Ferric sulphate	
Biological wastes from the sewage treatment plant	
Dynamite and packaged emulsion explosives	
Emulsifiers (N7, N16, N23) for bulk emulsion explosives	
Sodium nitrate	
Glass beads for bulk emulsion explosives	
Bulk emulsion boosters	
Perimeter explosives	
Incinerator ash	
Paints	
Solvents	
Chemicals in batteries	
Cement	
Lime	
Food products	

The following subsections are presented in accordance with the material classifications provided in Table 2.1 of Section 2. Material classes not applicable to the site or those containing materials not found in significant quantities are not included.

5.1 EXPLOSIVE MATERIALS

Explosive materials on site include ANFO, bulk and packaged emulsions, and compressed gases that could ignite (e.g., acetylene). Initial actions regarding explosives include the removal of personnel from the immediate area and the elimination of ignition sources if possible to ensure site and personnel safety. Personnel must not attempt to contain or remove spills. Personnel handling explosive materials will be fully trained on a regular basis. The environmental advisor and on-scene coordinator will contact and coordinate the appropriate measures for explosives cleanup.

Compressed gases such as acetylene and propane are not expected to be stored in large quantities. Vapours cannot be contained when released, and it is important that personnel withdraw immediately from any such release. If tanks are damaged, the gas should be allowed to disperse, with no attempt at recovery.

5.2 FLAMMABLE LIQUIDS

The most common flammable materials stored and handled on site are liquids such as diesel, hydraulic, lubricants, waste oils, and aviation fuel. Action plans for spills of these materials are outlined below.

Action Plan for Fuel Spills on Land

- Place soil berms down slope of the running or seeping fuel. Place plastic tarps over the berm and at its foot to allow the fuel to pool on the plastic for easy capture. Use absorbents to absorb the fuel collected on the tarp. Squeeze the pads to release the absorbed fuel into empty drums for re-use. Pump larger pools back into drums, empty storage tanks, or a “Tidy” tank. It is especially important to prevent the fuel from entering any body of water, where the spill will have greater environmental impact.

- Soak up spills on rock with particulate absorbent or absorbent sheeting. Place the used absorbent in drums for disposal.

- If contaminated soil or vegetation must be removed, contact the government authority identified by the 24-hour spill report line (867.920.8130) for approval before proceeding.

Action Plan for Fuel Spills on Snow

Snow works well as a natural absorbent to collect and contain spilled fuel.

- Compact the affected snow into snow berms lined with plastic sheeting.
- Scrape up and store the snow-fuel mixture in a lined area or in drums for future disposal.

Action Plan for Fuel Spills on Water

These materials are hydrophobic (absorb hydrocarbons and repel water). Absorbent booms are often relied on to recover hydrocarbons that escape containment booms.

- Immediately limit the area of the spill on water using absorbent pads and similar materials to capture small spills on water.
- Deploy and slowly draw in absorbent booms to encircle and absorb the spilled fuel.
- Recover larger spills on water with floating skimmers and pumps, as required.

Action Plan for Fuel Spills on Ice

- Compact snow around the edge of the spill to serve as a berm; if time permits, line the berm with plastic sheeting.
- Although the ice will reduce the rate of seepage of fuel into water, immediately scrape up the contaminated snow and ice.
- Alternatively, the government may give permission to burn off pools of fuel (contact the 24-hour spill report line).
- Place the remaining contaminated snow in sealed drums or in a lined berm on land.

Fuel that escapes under the ice through breaks or cracks is extremely difficult to collect. Seek expertise from the environmental advisor immediately.

5.3 OXIDIZING SUBSTANCES

Where an oxidizing substance such as ammonium nitrate is spilled, safety measures include avoiding inhalation (e.g., by using a dust mask or half faced respirator), ingestion, and eye contact. Spills on land will be contained by diking or barrier. Ammonium nitrate in particular mixes with water. Spills in water will therefore be dammed or diverted.

5.4 POISONOUS & INFECTIOUS SUBSTANCES

Poisonous and infectious substances such as biological wastes from the sewage treatment plant, laboratory chemicals, and solvents are potentially hazardous when inhaled, ingested, and in contact with the eye. Initial preventative measures include wearing appropriate personal protective equipment (impermeable gloves, eye protection, and respirators appropriate for the size and type of spill). In the event of a spill on land, the material will be contained by diking or barrier. Liquids spilled in water will be dammed and diverted. Where raw sewage is spilled, the spill material can be placed back into the sewage treatment plant to be re-processed.

5.5 CORROSIVE SUBSTANCES

The most corrosive substances on the site are caustic soda and hydrochloric acid. Personnel dealing with these substances will be limited to selectively trained staff. Personnel will be trained regularly in

prevention, storage, and handling and will be drilled regularly with spill exercises. In the event of a spill, safety measures will be implemented immediately. Personnel will be removed from the area of the spill until appropriate spill containment is acquired and protective gear is donned. Before handling corrosive materials, personnel must review safety, storage, and handling measures. The spill material will be neutralized with lime and/or soda ash prior to containment.

SECTION 6 • TAILINGS LINE OPERATION & SPILL RESPONSE

- Senior mill management must approve any changes of operation regarding any part on the mill tailings line, or operation of the tailings facility at large.
- All changes made in the operation of the mill tailings or the tailings facility must be logged in the tailings log book in the control room.
- If the tailings line is shut down with management approval, the line being shut down must be thoroughly flushed, drained at the low point or low points and left open at the low point or points until the line is to be used again and all spigots and the respective line must be open and clear.
- In case of emergency during full mill operation, the line must be completely drained at all low points and all spigot valves must be open and clear.
- At all times if the mill is down there must be sufficient water added to the tailings box to keep the spigots clear and to avoid sanding or freezing the tailings line.
- When operating the mill at reduced tonnage there must be sufficient water added to the tailings box so as not to sand or freeze the tailings line and keep the spigots running free and clear.
- Any maintenance of any kind including piping or spigotting at the tailings facilities must be approved by senior mill management.
- This standard operating procedure may change at any time to improve standards of operation.

Any leaks or unusual occurrences observed by anyone at the tailings facility must be reported to mill management and the date and time of the occurrence must be logged in the tailings facility logbook.

In case of major tailings line failure the plant process must be shut down as per controlled emergency procedure manually, in case there is a failure of the automated flow differential system. Spill neutralization and clean up must be followed up immediately along with the tailings line repair. The mill foreman would oversee the containment, cleanup, and repair procedure and draw on other departments as required per the site emergency response plan. A spill report must be filed immediately after cleanup of the spill.

SECTION 7 • RESPONSE EQUIPMENT

7.1 GENERAL EQUIPMENT

Cumberland's spill response resource inventory is listed in Table 7.1. Automatic fire suppression equipment (automatic ceiling sprinklers) will be in place in all buildings occupied by personnel. Fire extinguishers will be located in clearly marked locations in accommodations, shops, fuelling stations, the cold storage warehouse, the helicopter pad and other areas where flammable substances are stored and/or handled. Spill kits will be located at the fuel farm, fuelling stations, airstrip, helicopter pad, and other locations where spills of hazardous substances could occur.

A checklist of the required items for each spill response kit or equipment storage area will be provided. Spill response supplies will be checked against the lists on a quarterly basis and any deficiencies remedied immediately. The checklists will be reviewed whenever new chemicals are added to on-site activities to ensure that relevant spill cleanup supplies are present. Material safety data sheets (MSDS) for all the chemicals present in the vicinity of the spill kit will be kept near the kits, and will be updated as necessary to ensure that all MSDS data area up to date. The expiry dates of the MSDS will be tracked for every chemical present on site to help identify and replace those that are about to expire. MSDS are provided by the chemical suppliers. (See Appendix B for a sample of MSDSs for sodium cyanide and ammonium nitrate).

7.2 SPILL KITS

The locations and types of spill kits to be provided at each facility are listed in Table 7.2. The size and contents of the variously sized spill kits are listed in Tables 7.3 to 7.7.

Table 7.1: Spill Response Resource Inventory

24-Hour Response Equipment	**Number**
Front-end loaders	3
Aluminum boats	2
Tandem axle trucks	up to 7
Single axle truck	1
Tractor dozers / snow plough	3
Trucks (¾ ton)	5
Spill Equipment	**Availability**
Fuel detention boom	X
Absorbent booms	
Absorbent pillows	X
Absorbent material	X
Portable oil skimmer	
Portable pumps and hoses	X
Shop vacuum	X
Used oil cubes (1,600 L capacity)	X
Ice auger	X
Tiger torch	X
Chain saw	X
Hand-tools (shovels, rakes)	X

Table 7.2: Types of Spill Kits at Each Location

Facility	Location	Kit
Airstrip	Apron area	2 x 95 L kits
Crusher	By fuel tank	1 x 95 L kit
Camp emergency genset area	Outside east end of genset	1 x 95 L kit
Permanent genset area	Day tank area	1 x 425 L kit
Pilot plant	Main entrance door	1 x 425 L kit
Procon shop area	Genset side of mine dry	1 x 425 L kit
Tank farm	North berm west end	1 x 425 L kit
	West end fuel module	1 x 425 L kit
	East end fuel module	1 x 425 L kit
	West side waste oil area	1 x 95 L kit
	South berm in centre	1 x 425 L kit
Fresh water intake	Pumphouse	Pumphouse kit
Jet B storage – helicopter refuel	Refuel area	1 x 95 L kit
Bulk emulsion plant	Diesel storage area & chemical mixing areas	3 x 425 L kits 5 shovels 10 empty 205 L drums
Ammonium nitrate storage		Ammonium nitrate storage kit
Plant facility	Acid storage area	Acid spill kit
Plant facility	Acid process area	Acid spill kit
Laydown areas		3 x 425 L kits 5 shovels 10 empty 205 L drums
Explosives storage		1 x 425 L kit per building, and 1 explosives cleanup kit per storage building
Landfarm		1 x 95 L kit additional liner material (tarps, etc.)
Landfill	Leachate collection points	3 x 425 L kits 5 shovels 10 empty 205 L drums
Exhaust fan area	Diesel storage areas & engine room	2 x 95 L kit at each location
Core shack	Chemical storage area	2 x 95 L kits
Batch plant		2 x 95 L kits

Table 7.3: 95 L Spill Kit Contents

Number	Size	Description
25 pieces	17" x 19"	Oil selective pads
25 pieces	18" x 18"	Universal pads
10 pounds		“Eatum” floor sweep
1 piece	36" x 48"	Polyethylene disposable bag
1 pair		Chemical resistant gloves
1 pair		Uvex safety goggles
1 each	95 L	Metal containment drum

Table 7.4: 425 L Spill Kit Contents

Number	Size	Description
10 pieces	3" x 4'	Universal socks
4 pieces	5" x 10'	Oil selective boom
100 pieces	17" x 19"	Oil selective pads
50 pieces	18" x 18"	Universal pads
15 pounds		“Eatum” floor sweep
2 pieces	36" x 48"	Poly disposable bag
2 pair		Chemical resistant gloves
1 pair		Uvex safety goggles
1 each	425 L	Metal containment drum

Table 7.5: 23 L Spill Kit Contents

Number	Size	Description
2 each	3" x 4'	Boom socks
10 each	18" x 18"	Absorbent pads
1 pair		Rubber gloves
1 kilogram		Absorbent
1 each		Garbage bag

Table 7.6: Acid Spill Kit Contents (Polyethylene Container Only)

Number	Size	Description
Equivalent volume to stored acid (approximately 2,500 L)		Lime
3 sets		Fully enclosed acid-proof suits & self-contained breathing apparatus in nearby room (safe distance from fumes)
3 each		Full face respirators with chemical acid cartridges
3 pair		Laboratory coats with splash aprons made of natural rubber, neoprene, or Viton
20 pair		Medium to heavy weight natural rubber, neoprene, or Viton gloves
3 each	20 L	Polyethylene sealable buckets
2 litres		Calcium gluconate gel (must be refrigerated)
20 pair		Disposable exam gloves (to apply calcium gluconate gel)

Note: A combination eyewash/shower will be present nearby and tested monthly.

Table 7.7: Ammonium Nitrate Storage Spill Kit Contents

Number	Size	Description
2 boxes		Chemical-resistant gloves
2 pair		Uvex safety goggles
2 pair		Tyvek coveralls
2 pair		Half-mask respirators with organic filters & National Institute for Occupational Safety & Health (NIOSH) / Occupational Safety & Health Association approved dust respirator
3 each	205 L	Metal containment drums
2 each		Shovels
1 box		Plastic garbage bags

7.3 MOBILE ENVIRONMENTAL RESPONSE UNIT

The site manager is responsible for ensuring that the services of a qualified mobile environmental response unit are available. This includes ensuring that contracts are in place for the provision of these services.

SECTION 8 • TRAINING & EMERGENCY/SPILL EXERCISE

8.1 TRAINING

A designated spill response team consisting of on-site personnel will be established. Cumberland will ensure that the response team is trained and present at all times. All members of the team will be trained and familiar with emergency and spill response resources, including their location and access, the spill contingency plan, and appropriate emergency spill response methodologies. Spill response team training will be conducted annually to ensure that sufficient team members are present and to ensure that training is up to date. The following training will be included:

- a review of the spill response plan and responsibilities of the team members
- the nature, status, and location of fuel and chemical storage facilities
- the on-site and off-site spill response equipment, and how to use it
- emergency contact lists
- desktop exercises of “worst case” scenarios
- the likely causes and possible effects of spills.

All instructors will be highly qualified in spill response and prevention methods. All personnel and contractors at the project site will be familiar with spill reporting requirements. This will be ensured by conducting an orientation and training program on initial spill response procedures for all contractors and new personnel. Attendance will be tracked on site and re-training done annually. Fuel-handling crews will be fully trained in the safe operation of the facilities, spill prevention techniques, and initial spill response. Similarly, staff involved with the process, tailings, and wastewater systems will be trained in the safe operation of these systems. These crews will be re-trained annually; retraining schedules will be tracked on site.

Training programs will include regular workplace hazardous materials information system (WHMIS) and transportation of dangerous goods (TDG) training for all employees who use or are responsible for chemicals on site. A qualified trainer will provide WHMIS and TDG training. Additional safe chemical handling training will be conducted for employees handling or working in the vicinity of dangerous chemicals such as caustic soda, hydrochloric acid, explosives, and fuels. Completion dates of this training will be tracked and re-training done annually.

Re-training for TDG will be completed every three years. Employee TDG training status will be tracked by on-site personnel so that re-training can be done before expiry of previous TDG training. All new staff handling or responsible for chemical use will receive Occupational Safety and Health Association (OSHA) training and annual refresher courses. Dates of course attendance will be tracked so that refresher courses can be offered prior to expiry of the previous course. Qualified trainers will provide the OSHA training.

The on-site environmental manager will ensure that records of current training are retained, employee training expiry dates are tracked, and re-training is completed in a timely manner.

8.2 EMERGENCY/SPILL EXERCISE

Cumberland will conduct regular emergency/spill exercises to test the response of the spill response team to system failures, emergencies, or spills. The on-scene coordinator will prepare a report noting the response time, personnel involved, and any problems or deficiencies encountered. This report will be used to evaluate the ability of personnel to respond to spills and to determine areas requiring improvement. The results of this report will be used in subsequent training exercises in order to continually improve the training program.

APPENDIX A

Emergency Response Procedures for Spilled Chemical Substances

APPENDIX B

Material Safety Data Sheets

MSDS Number: **S4034** * * * * * *Effective Date:* ***07/07/04*** * * * * * *Supercedes:* ***05/11/04***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS | J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

SODIUM HYDROXIDE

1. Product Identification

Synonyms: Caustic soda; lye; sodium hydroxide solid; sodium hydrate
CAS No.: 1310-73-2
Molecular Weight: 40.00
Chemical Formula: NaOH
Product Codes:
J.T. Baker: 3717, 3718, 3721, 3722, 3723, 3728, 3734, 3736, 5045, 5565
Mallinckrodt: 7001, 7680, 7708, 7712, 7772, 7798

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sodium Hydroxide	1310-73-2	99 - 100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! CORROSIVE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. CAUSES BURNS TO ANY AREA OF CONTACT. REACTS WITH WATER, ACIDS AND OTHER MATERIALS.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White Stripe (Store Separately)

Potential Health Effects

Inhalation:
Severe irritant. Effects from inhalation of dust or mist vary from mild irritation to serious damage of the upper respiratory tract, depending on severity of exposure. Symptoms may include sneezing, sore throat or runny nose. Severe pneumonitis may occur.
Ingestion:
Corrosive! Swallowing may cause severe burns of mouth, throat, and stomach. Severe scarring of tissue and death may result. Symptoms may include bleeding, vomiting, diarrhea, fall in blood pressure. Damage may appears days after exposure.
Skin Contact:
Corrosive! Contact with skin can cause irritation or severe burns and scarring with greater exposures.
Eye Contact:
Corrosive! Causes irritation of eyes, and with greater exposures it can cause burns that may result in permanent impairment of vision, even blindness.
Chronic Exposure:
Prolonged contact with dilute solutions or dust has a destructive effect upon tissue.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician, immediately. Wash clothing before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:

Perform endoscopy in all cases of suspected sodium hydroxide ingestion. In cases of severe esophageal corrosion, the use of therapeutic doses of steroids should be considered. General supportive measures with continual monitoring of gas exchange, acid-base balance, electrolytes, and fluid intake are also required.

---

5. Fire Fighting Measures

Fire:

Not considered to be a fire hazard. Hot or molten material can react violently with water. Can react with certain metals, such as aluminum, to generate flammable hydrogen gas.

Explosion:

Not considered to be an explosion hazard.

Fire Extinguishing Media:

Use any means suitable for extinguishing surrounding fire. Adding water to caustic solution generates large amounts of heat.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Keep unnecessary and unprotected people away from area of spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. Do not flush caustic residues to the sewer. Residues from spills can be diluted with water, neutralized with dilute acid such as acetic, hydrochloric or sulfuric. Absorb neutralized caustic residue on clay, vermiculite or other inert substance and package in a suitable container for disposal.

US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

---

7. Handling and Storage

Keep in a tightly closed container. Protect from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture and incompatibilities. Always add the caustic to water while stirring; never the reverse. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product. Do not store with aluminum or magnesium. Do not mix with acids or organic materials.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
- OSHA Permissible Exposure Limit (PEL):
2 mg/m3 Ceiling
- ACGIH Threshold Limit Value (TLV):
2 mg/m3 Ceiling

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half facepiece particulate respirator (NIOSH type N95 or better filters) may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest.. A full-face piece particulate respirator (NIOSH type N100 filters) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
White, deliquescent pellets or flakes.

Odor:
Odorless.

Solubility:

111 g/100 g of water.
Specific Gravity:
2.13
pH:
13 - 14 (0.5% soln.)
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
1390C (2534F)
Melting Point:
318C (604F)
Vapor Density (Air=1):
> 1.0
Vapor Pressure (mm Hg):
Negligible.
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Very hygroscopic. Can slowly pick up moisture from air and react with carbon dioxide from air to form sodium carbonate.
Hazardous Decomposition Products:
Sodium oxide. Decomposition by reaction with certain metals releases flammable and explosive hydrogen gas.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Sodium hydroxide in contact with acids and organic halogen compounds, especially trichloroethylene, may causes violent reactions. Contact with nitromethane and other similar nitro compounds causes formation of shock-sensitive salts. Contact with metals such as aluminum, magnesium, tin, and zinc cause formation of flammable hydrogen gas. Sodium hydroxide, even in fairly dilute solution, reacts readily with various sugars to produce carbon monoxide. Precautions should be taken including monitoring the tank atmosphere for carbon monoxide to ensure safety of personnel before vessel entry.
Conditions to Avoid:
Moisture, dusting and incompatibles.

---

11. Toxicological Information

Irritation data: skin, rabbit: 500 mg/24H severe; eye rabbit: 50 ug/24H severe; investigated as a mutagen.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Sodium Hydroxide (1310-73-2)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: SODIUM HYDROXIDE, SOLID
Hazard Class: 8
UN/NA: UN1823
Packing Group: II
Information reported for product/size: 300LB

International (Water, I.M.O.)

Proper Shipping Name: SODIUM HYDROXIDE, SOLID
Hazard Class: 8
UN/NA: UN1823
Packing Group: II
Information reported for product/size: 300LB

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
Sodium Hydroxide (1310-73-2)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Sodium Hydroxide (1310-73-2)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Sodium Hydroxide (1310-73-2)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Sodium Hydroxide (1310-73-2)	1000	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: No Fire: No Pressure: No
Reactivity: Yes (Pure / Solid)

Australian Hazchem Code: 2R
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **1**
Label Hazard Warning:
POISON! DANGER! CORROSIVE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. CAUSES BURNS TO ANY AREA OF CONTACT. REACTS WITH WATER, ACIDS AND OTHER MATERIALS.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe dust.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give

anything by mouth to an unconscious person. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 3.

Disclaimer:

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **F1360** * * * * * *Effective Date:* ***08/10/04*** * * * * * *Supercedes:* ***11/02/01***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS | J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

FERRIC SUBSULFATE SOLUTION

1. Product Identification

Synonyms: Ferric sulphate, basic, solution; iron hydroxide sulfate; Monsel's solution
CAS No.: 1310-45-8
Molecular Weight: 737.7
Chemical Formula: Fe4(OH)2(SO4)5 (approx.) solution
Product Codes:
J.T. Baker: 2041
Mallinckrodt: 5548, 6430

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Ferric Subsulfate	1310-45-8	40 - 70%	Yes
Water	7732-18-5	30 - 60%	No

3. Hazards Identification

Emergency Overview

CAUTION! MAY BE HARMFUL IF SWALLOWED. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 1 - Slight
Flammability Rating: 0 - None
Reactivity Rating: 0 - None
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES
Storage Color Code: Orange (General Storage)

Potential Health Effects

Although little information is available in the literature, it is expected that the health hazards for iron compounds reflect those for this material.

Inhalation:
May cause irritation to the respiratory tract.
Ingestion:
Low toxicity in small quantities but larger dosages may cause nausea, vomiting, diarrhea, and black stool. Pink urine discoloration is a strong indicator of iron poisoning. Liver damage, coma, and death from iron poisoning has been reported.
Skin Contact:
No adverse effects expected.
Eye Contact:
Splashes may cause irritation.
Chronic Exposure:
No information found.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. Get medical attention for any breathing difficulty.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.
Skin Contact:
Wash exposed area with soap and water. Get medical advice if irritation develops.
Eye Contact:
Wash thoroughly with running water. Get medical advice if irritation develops.

5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust.

7. Handling and Storage

Store in a tightly closed container. Protect against physical damage, direct sunlight, and freezing. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-ACGIH Threshold Limit Value (TLV):
1 mg/m3 (TWA) soluble iron salt as Fe
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half facepiece particulate respirator (NIOSH type N95 or better filters) may be worn for up to ten times the

exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest.. A full-face piece particulate respirator (NIOSH type N100 filters) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear protective gloves and clean body-covering clothing.

Eye Protection:
Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
Reddish-brown liquid.

Odor:
Nearly odorless.

Solubility:
Miscible in water.

Specific Gravity:
ca. 1.54

pH:
Acidic to litmus.

% Volatiles by volume @ 21C (70F):
No information found.

Boiling Point:
Decomposes.

Melting Point:
No information found.

Vapor Density (Air=1):
No information found.

Vapor Pressure (mm Hg):
No information found.

Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Freezes at cool temperatures. Light sensitive.

Hazardous Decomposition Products:
Oxides of sulfur and the contained metal.

Hazardous Polymerization:
Will not occur.
Incompatibilities:
No incompatibility data found.
Conditions to Avoid:
Light and low temperatures.

---

11. Toxicological Information

No LD50/LC50 information found relating to normal routes of occupational exposure.

--------\Cancer Lists\--

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Ferric Subsulfate (1310-45-8)	No	No	None
Water (7732-18-5)	No	No	None

---

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

---

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

---

14. Transport Information

Not regulated.

---

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Ferric Subsulfate (1310-45-8)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Ferric Subsulfate (1310-45-8)	Yes	Yes	No	No
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Ferric Subsulfate (1310-45-8)	No	No	No	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Ferric Subsulfate (1310-45-8)	No	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: No Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: None allocated.
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **1** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
CAUTION! MAY BE HARMFUL IF SWALLOWED. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT.
Label Precautions:
Avoid contact with eyes, skin and clothing.

Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.
INTENDED FOR FDA APPROVED USE ONLY.
NOT ON THE TSCA INVENTORY.

Label First Aid:

If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. Get medical attention for any breathing difficulty. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes.

Product Use:

For Food and Drug or Research and Development use

Revision Information:

No Changes.

Disclaimer:

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

Material Safety Data Sheet
Calcium Oxide

ACC# 04030

Section 1 - Chemical Product and Company Identification

MSDS Name: Calcium Oxide
Catalog Numbers: C114-3, C114-50, C117-500
Synonyms: Lime; Quicklime; Burnt lime; Calx; Unslaked lime; Fluxing lime; Calcia; Pebble lime.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
1305-78-8	Calcium oxide	>98	215-138-9

Hazard Symbols: C
Risk Phrases: 34

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: white, light yellow, light gray powder. **Danger!** Corrosive. May cause severe respiratory and digestive tract irritation with possible burns. Causes eye and skin irritation and possible burns. Moisture sensitive. Reacts with water releasing heat and forming alkaline Ca(OH)2 solution.
Target Organs: Respiratory system, eyes, skin, mucous membranes.

Potential Health Effects

Eye: Produces irritation, characterized by a burning sensation, redness, tearing, inflammation, and possible corneal injury. Causes eye irritation and possible burns.
Skin: Contact with skin causes irritation and possible burns, especially if the skin is wet or moist. May cause deep, penetrating ulcers of the skin.
Ingestion: May cause severe gastrointestinal tract irritation with nausea, vomiting and possible burns. May cause circulatory system failure. May cause perforation of the digestive tract. May cause excess salivation, painful swallowing, rapid pulse and thermal burns.
Inhalation: May cause severe irritation of the upper respiratory tract with pain, burns, and inflammation. Inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema.
Chronic: Prolonged or repeated skin contact may cause dermatitis. Chronic inhalation may cause

nasal septum ulceration and perforation.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical aid immediately.
Skin: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.
Ingestion: If swallowed, do NOT induce vomiting. Get medical aid immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Contact with moisture or water may generate sufficient heat to ignite nearby combustible materials.
Extinguishing Media: Do NOT use carbon dioxide. Do NOT use halogenated agents. Use flooding quantities of water as spray.
Flash Point: Not applicable.
Autoignition Temperature: Not available.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 0; Instability: 1

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Avoid generating dusty conditions. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Do not get in eyes, on skin, or on clothing. Use only with adequate ventilation. Avoid breathing dust.
Storage: Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from water. Corrosives area. Storage under a nitrogen blanket has been recommended.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Calcium oxide	2 mg/m3 TWA	2 mg/m3 TWA 25 mg/m3 IDLH	5 mg/m3 TWA

OSHA Vacated PELs: Calcium oxide: 5 mg/m3 TWA (not in effect as a result of reconsideration)

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Section 9 - Physical and Chemical Properties

Physical State: Powder

Appearance: white, light yellow, light gray

Odor: Odorless.

pH: Not available.

Vapor Pressure: Negligible.

Vapor Density: Not available.

Evaporation Rate: Negligible.

Viscosity: Not available.

Boiling Point: 2850 deg C @ 760 mm Hg

Freezing/Melting Point:2570 deg C

Decomposition Temperature: Not available.

Solubility: reacts with water with evolution of heat

Specific Gravity/Density:3.3000g/cm3

Molecular Formula: CaO

Molecular Weight:56.08

Section 10 - Stability and Reactivity

Chemical Stability: Absorbs carbon dioxide from the air. Hygroscopic: absorbs moisture or water from the air. Reacts with water releasing heat and forming alkaline Ca(OH)2 solution.

Conditions to Avoid: Exposure to moist air or water.

Incompatibilities with Other Materials: React with water to form calcium hydroxide and heat; reacts with carbon dioxide to form calcium carbonate. Incompatible with ethanol, boric oxide + calcium chloride, and interhalogens such as boron trifluoride, chlorine trifluride, fluorine, hydrofluoric acid, phosphorus pentoxide, perchlorates, nitrates, and permanganates, acids.

Hazardous Decomposition Products: Calcium hydroxide.

Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 1305-78-8: EW3100000
LD50/LC50:
Not available.

Carcinogenicity:
CAS# 1305-78-8: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.
Epidemiology: No data available.
Teratogenicity: No data available.
Reproductive Effects: No data available.
Neurotoxicity: No data available.
Mutagenicity: No data available.
Other Studies: No data available.

Section 12 - Ecological Information

Ecotoxicity: No data available. Mosquito fish, TLm=240 ppm/24H, Sunfish, 100 ppm/3hr. is toxic. vector snail, 300 ppm/24hr is lethal.
Environmental: No information available.
Physical: No information available.
Other: None.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	No information available.				No information available.
Hazard Class:					
UN Number:					
Packing Group:					

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 1305-78-8 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA

CERCLA Hazardous Substances and corresponding RQs
None of the chemicals in this material have an RQ.
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 1305-78-8: acute, reactive.
Section 313
No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants. This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA. None of the chemicals in this product are listed as Priority Pollutants under the CWA. None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 1305-78-8 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.
California No Significant Risk Level: None of the chemicals in this product are listed.

European / International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
C
Risk Phrases:
R 34 Causes burns.

Safety Phrases:
S 25 Avoid contact with eyes.
S 36/37/39 Wear suitable protective clothing, gloves and eye/face protection.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)

CAS# 1305-78-8: 1

Canada - DSL/NDSL

CAS# 1305-78-8 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of E.

Canadian Ingredient Disclosure List

CAS# 1305-78-8 is listed on the Canadian Ingredient Disclosure List.

Exposure Limits

CAS# 1305-78-8: OEL-AUSTRALIA:TWA 2 mg/m3 OEL-AUSTRIA:TWA 5 mg/m3 OEL-BELGIUM:TWA 2 mg/m3 OEL-DENMARK:TWA 2 mg/m3 OEL-FINLAND:TWA 2 mg /m3 OEL-FRANCE:TWA 2 mg/m3 OEL-GERMANY:TWA 5 mg/m3 OEL-INDIA:TWA 2 mg/m3 OEL-THE NETHERLANDS:TWA 2 ppm (5 mg/m3) OEL-THE PHILIPPINES:TW A 5 mg/m3 OEL-POLAND:TWA 2 mg/m3 OEL-SWEDEN:TWA 2 mg/m3;STEL 5 mg/m3 OEL-TURKEY:TWA 5 mg/m3 OEL-UNITED KINGDOM:TWA 2 mg/m3 OEL IN BULGA RIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV OEL IN NEW ZEALAND, SING APORE, VIETNAM check ACGI TLV

Section 16 - Additional Information

MSDS Creation Date: 12/12/1997
Revision #6 Date: 10/10/2001

Material Safety Data Sheet
Calcium fluoride

ACC# 03960

Section 1 - Chemical Product and Company Identification

MSDS Name: Calcium fluoride
Catalog Numbers: S79943, C89-250, C89-500, NC9084559, XXC8950KG
Synonyms: Calcium difluoride; Fluorite; Fluorspar; Acid-Spar.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7789-75-5	Calcium fluoride	100	232-188-7

Hazard Symbols: XN
Risk Phrases: 20/22

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: white solid. Causes eye and skin irritation. May cause respiratory tract irritation. May cause cardiac disturbances. May cause kidney damage. May cause lung damage. **Warning!**
Target Organs: Kidneys, heart, lungs, skeletal structures.

Potential Health Effects

Eye: Causes eye irritation.
Skin: Causes skin irritation. Chronic inhalation may cause lung damage, bronchitis, and silicosis. May decrease blood clotting.
Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea. Ingestion of large amounts of fluoride may cause salivation, nausea, vomiting, abdominal pain, fever, labored breathing. Exposure to fluoride compounds can result in systemic toxic effects on the heart, liver, and kidneys. It may also deplete calcium levels in the body leading to hypocalcemia and death. May cause bone structure abnormalities.
Inhalation: Causes respiratory tract irritation. May cause heart disturbances, possibly leading to cardiac arrest and death. May cause hyperactive reflexes and muscular spasms. May cause respiratory arrest.
Chronic: Prolonged or repeated exposure may cause permanent bone structure abnormalities. May cause kidney injury. Chronic inhalation may cause lung damage, bronchitis, and silicosis. May

decrease blood clotting. Chronic exposure to fluoride compounds may cause systemic toxicity.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid immediately. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Destroy contaminated shoes.
Ingestion: Call a poison control center. If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical aid.

Inhalation: Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Get medical aid. Do NOT use mouth-to-mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
Notes to Physician: Administration of calcium disodium EDTA may be useful in acute poisoning with its use at the discretion of qualified medical personnel.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.
Extinguishing Media: Substance is noncombustible; use agent most appropriate to extinguish surrounding fire.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, observing precautions in the Protective Equipment section. Avoid generating dusty conditions. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Wash hands before eating. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with skin and eyes. Keep container tightly closed. Avoid ingestion and inhalation. Wash clothing before reuse.
Storage: Store in a cool, dry, well-ventilated area away from incompatible substances. Keep

containers tightly closed. Store protected from moisture.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Calcium fluoride	none listed	none listed	none listed

OSHA Vacated PELs: Calcium fluoride: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to minimize contact with skin.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Section 9 - Physical and Chemical Properties

Physical State: Solid
Appearance: white
Odor: none reported
pH: Not available.
Vapor Pressure: Not applicable.
Vapor Density: Not available.
Evaporation Rate: Not applicable.
Viscosity: Not applicable.
Boiling Point: Not available.
Freezing/Melting Point:2593 deg F
Decomposition Temperature: Not available.
Solubility: 0.0016% @18C
Specific Gravity/Density:3.180
Molecular Formula: CaF2
Molecular Weight:78.08

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Dust generation, moisture, excess heat.
Incompatibilities with Other Materials: Reacts with hot concentrated sulfuric acid to liberate hydrogen fluoride.
Hazardous Decomposition Products: Irritating and toxic fumes and gases, fluoride fumes.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 7789-75-5: EW1760000
LD50/LC50:
CAS# 7789-75-5:
Oral, rat: LD50 = 4250 mg/kg;
Oral, rat: LD50 = 4417 mg/kg;
Carcinogenicity:
CAS# 7789-75-5:
IARC: IARC Group 3 - not classifiable (listed as Fluorides, inorganic).
Epidemiology: No information available.
Teratogenicity: No information available.
Reproductive Effects: No information available.
Neurotoxicity: No information available.
Mutagenicity: No information available.
Other Studies: See actual entry in RTECS for complete information.

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	No information available.				No information available.
Hazard Class:					
UN Number:					
Packing Group:					

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 7789-75-5 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA

CERCLA Hazardous Substances and corresponding RQs
None of the chemicals in this material have an RQ.
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 7789-75-5: acute.
Section 313
No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants. This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA. None of the chemicals in this product are listed as Priority Pollutants under the CWA. None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 7789-75-5 can be found on the following state right to know lists: New Jersey.
California No Significant Risk Level: None of the chemicals in this product are listed.

European / International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols:
XN
Risk Phrases:
R 20/22 Harmful by inhalation and if swallowed.

Safety Phrases:
S 24/25 Avoid contact with skin and eyes.

WGK (Water Danger/Protection)
CAS# 7789-75-5: 0
Canada - DSL/NDSL
CAS# 7789-75-5 is listed on Canada's DSL List.
Canada - WHMIS
This product has a WHMIS classification of D2B.
Canadian Ingredient Disclosure List
CAS# 7789-75-5 (listed as Fluorides, inorganic) is listed on the Canadian Ingredient Disclosure List.
Exposure Limits
CAS# 7789-75-5: OEL-AUSTRALIA:TWA 2.5 mg(F)/m3 OEL-BELGIUM:TWA 2.5 mg(F)/m3 OEL-CZECHOSLOVAKIA:TWA 1 mg(F)/m3;STEL 5 mg(F)/m3 OEL-DENMA

RK:TWA 2.5 mg(F)/m3 OEL-FINLAND:TWA 2.5 mg(F)/m3 OEL-FRANCE:TWA 2.5 mg(F)/m3 OEL-GERMANY:TWA 2.5 mg(F)/m3 OEL-HUNGARY:TWA 1 mg(F)/m3;STEL 2 mg(F)/m3 OEL-THE NETHERLANDS:TWA 2.5 mg(F)/m3 OEL-THE PHILIPPINES:TWA 2.5 mg(F)/m3 OEL-POLAND:TWA 1 mg(F)/m3 OEL-RUSSIA:STEL 0.5 ppm (2.5 mg/m3) OEL-SWEDEN:TWA 2 mg(F)/m3 OEL-SWITZERLAND:TWA 1.8 ppm (1.5 mg(F)/m3);STEL 9.0 ppm OEL-THAILAND:TWA 2.5 mg(F)/m3 OEL-TURKEY: TWA 2.5 mg(F)/m3 OEL-UNITED KINGDOM:TWA 2.5 mg(F)/m3 OEL IN BULGARIA , COLOMBIA, JORDAN, KOREA check ACGIH TLV OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

Section 16 - Additional Information

MSDS Creation Date: 3/22/1999
Revision #3 Date: 2/25/2003

The MSDS format adheres to the standards and regulatory requirements of the United States and may not meet regulatory requirements in other countries.

HYDROGEN PEROXIDE (70%)

8250CR Revised 12-OCT-1996

CHEMICAL PRODUCT/COMPANY IDENTIFICATION

Material Identification

"ALBONE", "TYSUL" are registered trademarks of DuPont.

Corporate MSDS Number : DU000113
Formula : H2O2
Molecular Weight : 34.02

Tradenames and Synonyms

"ALBONE"
"TYSUL"
"ALBONE" SG

Company Identification

MANUFACTURER/DISTRIBUTOR
DuPont Chemical Solutions Enterprise
1007 Market Street
Wilmington, DE 19898

PHONE NUMBERS
Product Information : 1-800-441-7515 (outside the U.S. 302-774-1000)
Transport Emergency : CHEMTREC 1-800-424-9300(outside U.S. 703-527-3887)
Medical Emergency : 1-800-441-3637 (outside the U.S. 302-774-1000)

COMPOSITION/INFORMATION ON INGREDIENTS

Components

Material	CAS Number	%
HYDROGEN PEROXIDE	7722-84-1	70
WATER	7732-18-5	30

Components (Remarks)

Strength is expressed in weight percent (WT%).

HAZARDS IDENTIFICATION

Potential Health Effects

Hydrogen peroxide may cause severe irritation or burns of the skin, eyes and mucous membranes. Splashes in the eye can cause severe eye damage with ulceration of the cornea, and may cause irreversible eye damage, including blindness. Skin exposure can result in bleaching of the skin and hair.

Inhalation of concentrated vapors can cause irritation of the nose and throat with chest discomfort, cough, difficulty in breathing and shortness of breath.

Ingestion can cause irritation of the upper gastrointestinal tract with pain and distention of the stomach and esophagus due to liberation of oxygen.

Gross overexposure by ingestion may be fatal.

HUMAN HEALTH EFFECTS:

Skin contact with aqueous solutions of less than 50% may cause irritation with discomfort or rash. Higher or prolonged exposure may result in skin burns or ulceration. Evidence suggests that skin permeation can occur in amounts capable of producing systemic toxicity. Effects of eye contact with aqueous solutions of less than 5% may include eye irritation with discomfort, tearing, or blurring of vision. Higher or prolonged exposure may result in eye corrosion with corneal or conjunctival ulceration. Contact with aqueous concentrations of greater than 10% may result in eye corrosion with corneal or conjunctival ulceration with possible irreversible eye damage, including blindness.

Overexposure by inhalation may cause irritation of the upper respiratory passages or nonspecific discomfort such as nausea, headache, or weakness. Higher inhalation exposure may lead to temporary lung irritation effects with cough, discomfort, difficulty breathing, or shortness of breath; or fatality from gross overexposure. Ingestion may cause irritation of the gastrointestinal tract with upper abdominal pain, "heartburn", nausea, vomiting, and diarrhea. "Coffee grounds" vomitus and black tarry stools may occur as a result of gastrointestinal tract bleeding. Additional effects from overexposure include red blood cell destruction or gas embolism. When used as colonic lavage, hydrogen peroxide has caused gas embolism and gangrene of the intestine at concentrations down to 0.75%. Gross overexposure by ingestion may be fatal.

Individuals with preexisting diseases of the skin, eyes, or lungs may have increased susceptibility to the toxicity of excessive exposures.

(HAZARDS IDENTIFICATION - Continued)

Carcinogenicity Information

None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, OSHA or ACGIH as a carcinogen.

FIRST AID MEASURES

First Aid

INHALATION
If inhaled, immediately remove to fresh air . If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

SKIN CONTACT
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician. Wash contaminated clothing and shoes promptly and thoroughly.

EYE CONTACT
In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

INGESTION
If swallowed, do not induce vomiting. Give large quantities of water. Never give anything by mouth to an unconscious person. Call a physician.

Notes to Physicians

If swallowed, large amounts of oxygen may be released quickly. The distention of the stomach or esophagus may be injurious. Insertion of a gastric tube may be advisable.

FIRE FIGHTING MEASURES

Flammable Properties

Will not burn, but decomposition, which may be caused by heat or contamination, will release oxygen which will increase the explosive limit range and burning rate of flammable vapors.

(FIRE FIGHTING MEASURES - Continued)

Fire and Explosion Hazards:

Powerful oxidizer. Contact with clothing or combustibles will frequently cause fire. Contact with organic liquids or vapors may cause immediate fire or explosion, especially if heated. Under certain circumstances, detonation may be delayed. Oxygen release from hydrogen peroxide may force organic or hydrogen vapors into an explosive range. Follow appropriate National Fire Protection Association (NFPA) codes.

Extinguishing Media

Use only water.

Fire Fighting Instructions

Flood with water. Cool tank/container with water spray.

Wear full protective clothing (rubber suit and boots) including chemical splash goggles or hood and self-contained breathing apparatus.

ACCIDENTAL RELEASE MEASURES

Safeguards (Personnel)

NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

Accidental Release Measures

Comply with Federal, State, and local regulations on reporting releases of wastes. Flood area with water and drain to an approved chemical sewer or wastewater treatment system, including municipal sewers if approved. May be destroyed with sodium metabisulfite or sodium sulfite (1.9 lbs. SO2 equivalent per lb. of peroxide) after diluting to 5-10% peroxide.

The Extremely Hazardous Substance List Reportable Quantity is 1 lb. for 70% hydrogen peroxide.

If HYDROGEN PEROXIDE (70%) is spilled and not recovered, or is recovered as a waste for treatment or disposal, the CERCLA Reportable Quantity is 100 lbs. (release of an unlisted Hazardous Waste characteristic of ignitibility).

HANDLING AND STORAGE

Handling (Personnel)

Use extreme care when attempting any reactions because of fire and explosion potential (immediate or delayed). Conduct all initial experiments on a small scale and protect personnel with adequate shielding as the reactions are unpredictable, and may be delayed, and may be affected by impurities, contaminants, temperature, etc. Do not get in eyes. Avoid contact with skin and clothing. Wash thoroughly after handling. Avoid contact with flammable or combustible materials. Avoid contamination from any source including metals, dust, and organic materials. In the event of an accident where large volumes of hydrogen peroxide might come into contact with external fires or with incompatible chemicals, a one-half mile area from the incident should be evacuated.

Storage

Store in a properly vented container or in approved bulk storage facilities. Do not block vent. Do not store on wooden pallets. Do not store where contact with incompatible materials could occur, even with a spill (see "Hazardous Reactivity"). Have water source available for diluting. Do not add any other product to container. Never return used or unused peroxide to container, instead dilute with plenty of water and discard. Rinse empty containers thoroughly with clean water before discarding. (See "Waste Disposal".)

EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls

Use sufficient ventilation to keep employee exposure below recommended exposure limits.

Personal Protective Equipment

EYE/FACE PROTECTION

Wear coverall chemical splash goggles. In addition, where the possibility exists for eye or face contact due to splashing or spraying of material, wear chemical splash goggles/full-length face shield combination.

RESPIRATORS

Where there is potential for airborne exposure in excess of applicable limits, wear NIOSH approved respiratory protection.

(EXPOSURE CONTROLS/PERSONAL PROTECTION - Continued)

PROTECTIVE CLOTHING

Where there is potential for skin contact, have available and wear as appropriate: impervious gloves, apron, pants, jacket, hood, and boots; or totally encapsulating chemical suit with breathing air supply. Permeation data supplied by vendors indicate that impervious materials such as natural rubber, natural rubber plus neoprene, nitrile, or polyvinylchloride afford adequate protection.

Do not wear leather gloves or leather shoes (uppers or soles) because they can ignite following contact with peroxide. Cotton clothing can also ignite. This effect may be within minutes, or delayed. Clothing fires and skin damage occur less quickly with 50% or lower hydrogen peroxide than with 70% material, but adequate personal protection is essential for all industrial concentrations. Protective skin creams offer no protection from hydrogen peroxide and should not be used.

Exposure Guidelines

Applicable Exposure Limits

HYDROGEN PEROXIDE

PEL	(OSHA)	: 1 ppm, 1.4 mg/m3 (90%) - 8 Hr TWA
TLV	(ACGIH)	: 1 ppm, 1.4 mg/m3, 8 Hr. TWA, A3
AEL *	(DuPont)	: None Established

* AEL is DuPont’s Acceptable Exposure Limit. Where governmentally imposed occupational exposure limits which are lower than the AEL are in effect, such limits shall take precedence.

PHYSICAL AND CHEMICAL PROPERTIES

Physical Data

Boiling Point	: 126 C (259 F) @ 760 mm Hg
Vapor Pressure	: 8 mm Hg @ 25 C (77 F) 20 mm Hg @ 40 C (104 F)
Vapor Density	: 1.02 Calculated
Melting Point	: -40 C (-40 F)
Evaporation Rate	: 1
Solubility in Water	: 100 WT%
pH	: Apparent pH = 0.5
Form	: Clear liquid
Color	: Colorless
Specific Gravity	: 1.3 @ 25 C (77 F)
Odor	: Pungent (slight), Irritating.

STABILITY AND REACTIVITY

Chemical Stability

Unstable with heat or contamination; liberation of oxygen gas may result in dangerous pressures. (See "Decomposition", below.)

Incompatibility with Other Materials

Incompatible with most flammables/combustibles (see "Fire and Explosion Hazards") as well as cyanides, nitric acid, potassium permanganate, and many other oxidizing and reducing agents. Mixtures with both organics and some acids may be especially reactive.

Decomposition

Contamination or heat may cause self-accelerating exothermic decomposition with oxygen gas and steam release that can cause dangerous pressures. May react dangerously with rust, dust, dirt, iron, copper, heavy metals or their salts (such as mercuric oxide or chloride), alkalis, and with organic materials (especially vinyl monomers).

Polymerization

Polymerization will not occur.

TOXICOLOGICAL INFORMATION

Animal Data

Inhalation 8-hour LC50	:	>2,000 ppm in rats (90% H_2O_2)
Skin absorption LD50	:	9,200 mg/kg (70% H_2O_2) in rabbits
Oral LD50	:	805 mg/kg (70% H_2O_2) in rats

At aqueous concentrations of less than 50% hydrogen peroxide skin irritation occurs, but at greater concentrations hydrogen peroxide is corrosive to the skin. Concentrations less than 5% in aqueous solutions are eye irritants; solutions between 5% and 10% range from severe eye irritants to being corrosive; concentrations greater than 10% are corrosive to the eye. The compound is not a skin sensitizer in animals.

Repeated inhalation exposures produced nasal discharge, bleached hair, and respiratory tract congestion with some deaths occurring in rats and mice exposed to concentrations greater than 67 ppm. Dogs exposed by inhalation to 7 ppm for 6 months had lung and skin irritation.

The effects from single high oral doses include convulsions. Repeated administration of the compound in the diet of

(TOXICOLOGICAL INFORMATION - Continued)

animals resulted in growth inhibition, reduced weight gain, abnormal liver function, ulcers, and discoloration of the stomach lining with swelling. Long-term administration to mice in the drinking water resulted in gastric erosions and duodenal hyperplasia.

One study by skin application suggested no carcinogenic activity. Results of an ingestion study with mice suggested that hydrogen peroxide might be carcinogenic. However, the FDA and other organizations have reviewed this study and concluded there is insufficient evidence that hydrogen peroxide is carcinogenic. An unpublished, long-term study with rats revealed no evidence of carcinogenicity. Female rats treated with 10% hydrogen peroxide produced offspring of lower body weight and some structural abnormalities, but these changes were attributed to maternal toxicity. Hydrogen peroxide produced genetic damage to bacterial and mammalian cells in culture, but one study in animals indicated it did not produce genetic damage. Limited tests in animals demonstrate no reproductive toxicity.

ECOLOGICAL INFORMATION

Ecotoxicological Information

Aquatic Toxicity

96-hour LC50, catfish: 37.4 mg/L

DISPOSAL CONSIDERATIONS

Waste Disposal

Comply with Federal, State, and local regulations. If approved, may be diluted and drained to a municipal sewer or waste treatment plant. May be diluted and drained through a scrap metal pit (iron, copper, etc.) to reduce peroxide concentration. Hydrogen peroxide may be an RCRA regulated hazardous waste upon disposal due to the oxidizing characteristic under the ignitibility category.

TRANSPORTATION INFORMATION

Shipping Information

DOT/IMO

Proper Shipping Name	: HYDROGEN PEROXIDE AQUEOUS SOLUTIONS, STABILIZED
Hazard Class	: 5.1
UN No.	: 2015
DOT/IMO Label	: OXIDIZER, CORROSIVE

(TRANSPORTATION INFORMATION - Continued)

Subsidiary Hazard Class : 8
Packing Group : I

Shipping Containers

Tank Cars.
Tank Trucks.

ISO (Sea) Tanks
Bottles

REGULATORY INFORMATION

U.S. Federal Regulations

TSCA Inventory Status : Reported/Included.

TITLE III HAZARD CLASSIFICATIONS SECTIONS 311, 312

Acute : Yes
Chronic : No
Fire : No
Reactivity : Yes
Pressure : Yes

LISTS:

SARA Extremely Hazardous Substance	-Yes
CERCLA Hazardous Material	-(*)
SARA Toxic Chemicals	-No

*See Disposal Information.

CANADIAN WHMIS CLASSIFICATIONS:

C; E; F

HYDROGEN PEROXIDE (70%) is listed by OSHA as a Highly Hazardous Chemical in Appendix A to 29 CFR 1910.119. Use of this product may require compliance with 29 CFR 1910.119, Process Safety Management of Highly Hazardous Chemicals.

OTHER INFORMATION

NFPA, NPCA-HMIS

NFPA Rating
Health : 2
Flammability : 0
Reactivity : 3

Oxidizer.

(Continued)

NPCA-HMIS Rating
Health : 3
Flammability : 0
Reactivity : 3

Personal Protection rating to be supplied by user depending on use conditions.

Additional Information

For further information, see DuPont HYDROGEN PEROXIDE Storage and Handling Bulletin.

The data in this Material Safety Data Sheet relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process.

Responsible for MSDS : MSDS Coordinator
> : DuPont Chemical Solutions Enterprise
Address : Wilmington, DE 19898
Telephone : (800) 441-7515

# Indicates updated section.

This information is based upon technical information believed to be reliable. It is subject to revision as additional knowledge and experience is gained.

End of MSDS

U.S BORAX & CHEMICAL CORP -- BORAX ANHYDROUS -- 6810-00F006161

Product Identification

Product ID:BORAX ANHYDROUS
MSDS Date:01/01/1987
FSC:6810
NIIN:00F006161
MSDS Number: BBVBH
=== Responsible Party ===
Company Name:U.S BORAX & CHEMICAL CORP/LOS ANGELES, CA 90010
Emergency Phone Num:(213) 381-5311
CAGE:FO177
=== Contractor Identification ===
Company Name:U S BORAX AND CHEMICAL CORP
Address:3075 WILSHIRE BLVD
Box:2781 T
City:LOS ANGELES
State:CA
ZIP:90010-1207
Country:US
CAGE:24611
Company Name:U.S BORAX & CHEMICAL CORP/LOS ANGELES, CA 90010
CAGE:FO177

Composition/Information on Ingredients

Ingred Name:SODIUM TETRABORATE, DECAHYDRATE
CAS:1303-96-4
RTECS #:VZ2275000
Fraction by Wt: 100%
OSHA PEL:10 MG/M3
ACGIH TLV:5 MG/M3; 9192

Hazards Identification

Effects of Overexposure:MODERATE SKIN & EYE IRRITANT

First Aid Measures

First Aid:SKIN/EYES: WASH WITH WATER.

Fire Fighting Measures

Extinguishing Media:NONE: MATERIAL HAS FIRE RETARDANT PROPERTIES.
Fire Fighting Procedures:NONE
Unusual Fire/Explosion Hazard:NONE

Accidental Release Measures

Spill Release Procedures:STANDARD DISPOSAL PROCEDURES - PRESENTS NO HEALTH HAZARD.

Handling and Storage

Handling and Storage Precautions:NONE NEEDED
Other Precautions:NONE NEEDED

Exposure Controls/Personal Protection

Respiratory Protection:NO SPECIAL PROTECTION REQUIRED.
Ventilation:LOCAL EXHAUST: NORMAL
Protective Gloves:NOT NEEDED
Eye Protection:AVOID EYE CONTACT
Other Protective Equipment:NONE
Supplemental Safety and Health
MSDS UNDATED. THEORETICAL B2O3 VALUE IN ANHYDROUS BORAX: 69.2% B2O3.

========== Physical/Chemical Properties ==========

Spec Gravity:2.4
Solubility in Water:MODERATE
Appearance and Odor:WHITE, SOLID ODORLESS
Percent Volatiles by Volume:NONE

========== Stability and Reactivity Data ==========

Stability Indicator/Materials to Avoid:YES
NONE
Stability Condition to Avoid:KEEP DRY: SLOWLY ABSORBS ATMOSPHERIC OR FREE WATER. _
Hazardous Decomposition Products:NONE
Conditions to Avoid Polymerization:KEEP DRY.

========== Disposal Considerations ==========

Waste Disposal Methods:STANDARD DISPOSAL PROCEDURES - PRESENTS NO HEALTH HAZARD.