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OIL AND TOXIC MATERIAL
SPILL CONTINGENCY PLAN
CADILLAC EXPLORATIONS LIMITED
PRAIRIE CREEK PROJECT, N. W. T.

Prepared by: Cadillac Explorations Limited
630 - 10101 Southport Road S. W.
Calgary, Alberta
T2W 4X9

Approved by:

PREAMBLE

This Spill Contingency Plan is effective April 1, 1982, and applies to all operations of Cadillac Explorations Limited licenced by the N. W. T. Water Board in the area of Prairie Creek, Latitude 61⁰33'N and Longitude 124⁰48'W.

The following formal distribution has been made of this Plan:

- Northwest Territories Water Board
- Department of Indian and Northern Affairs
- Environment Canada

Additional copies and updates of this Plan may be obtained by writing to:

Mr. Ronald Emes
Manager, Human Resources
Cadillac Explorations Limited
630 - 10201 Southport Road S. W.
Calgary, Alberta
T2W 4X9

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1. SCOPE AND PURPOSE

The purpose of the Cadillac Explorations Limited Oil and Toxic Material Spill Contingency Plan is to outline the means for responding to spills of petroleum products or toxic materials in a way that will minimize potential health hazards, environmental damage, and clean-up costs. The objectives of this Plan are:

1. to describe potential health and environmental risks arising from the release of any environmentally hazardous material at the Prairie Creek mine/mill complex and along the winter road leading to the mine.
2. to define procedures for the containment and clean-up of spills.
3. to define the reporting procedure and communications network to be used in the event of a spill.
4. to identify specific individuals and their responsibilities in a spill response situation.
5. to provide an inventory of equipment and materials which could be used to safely contain a spill of oil or toxic material.
6. to provide a list of contacts through which more equipment and supplies could be obtained in a response to a spill.
7. to provide a list of contacts which could provide more detailed information about specific toxic materials and acceptable methods of containment, treatment and disposal.

The most toxic materials which are to be used on-site include:

- sodium cyanide
- calcium hypochlorite
- copper sulphate

Petroleum products which could pose an environmental threat in case of a spill include:

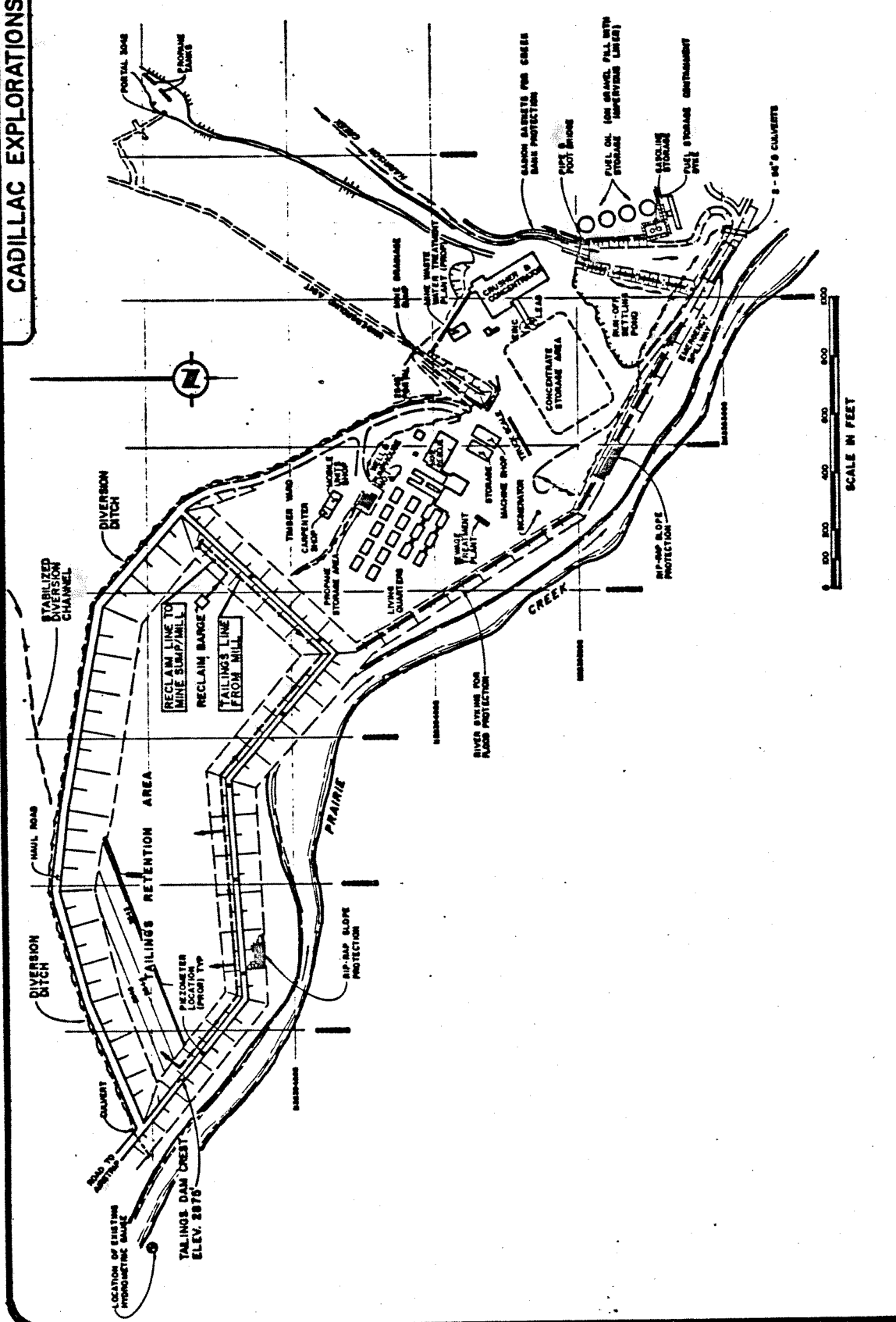
- aviation fuels
- gasoline
- diesel fuel
- lubricating oils
- hydraulic fluids

Less toxic substances proposed for use at the mine include:

- sodium isopropyl xanthate
- sodium metabisulphite
- ANFO (ammonium nitrate/fuel oil mixture)
- ethylene glycol-based antifreeze
- MIBC (methyl isobutyl carbinol)
- Dowfroth 1012 (polypropylene glycol methyl ether)
- hydrated lime (calcium hydroxide)
- soda ash (sodium carbonate)

Almost all of the aforementioned substances will be stored and used in the mine/mill complex. All of these materials will be transported to the mine by truck along the winter road during the period of December through March each year.

The Prairie Creek mine/mill complex is shown in Figure 1. The winter road, from the Liard Highway to the mine, is shown in Figure 6 (in Section 8, Environmental Mapping).



PRAIRIE CREEK PROJECT SITE PLAN

FIGURE 1

There are four possible types of spills involving the above materials at the mine/mill complex and along the winter road. These are:

- a spill of solid material on land
- a spill of solid material which reaches a stream
- a spill of liquid material on land
- a spill of liquid material which reaches a stream.

For this project, spills on land would have a greater probability of occurrence than spills which would gain access to a watercourse. Spills on land are generally easier to contain and clean-up, and usually restrict any environmental damage to a very limited area. The greatest containment and recovery problem would result from any spills in which a large volume of the spilled material would reach a flowing watercourse. Figure 2 identifies the various types of spill possibilities and shows a general spill response for each type.

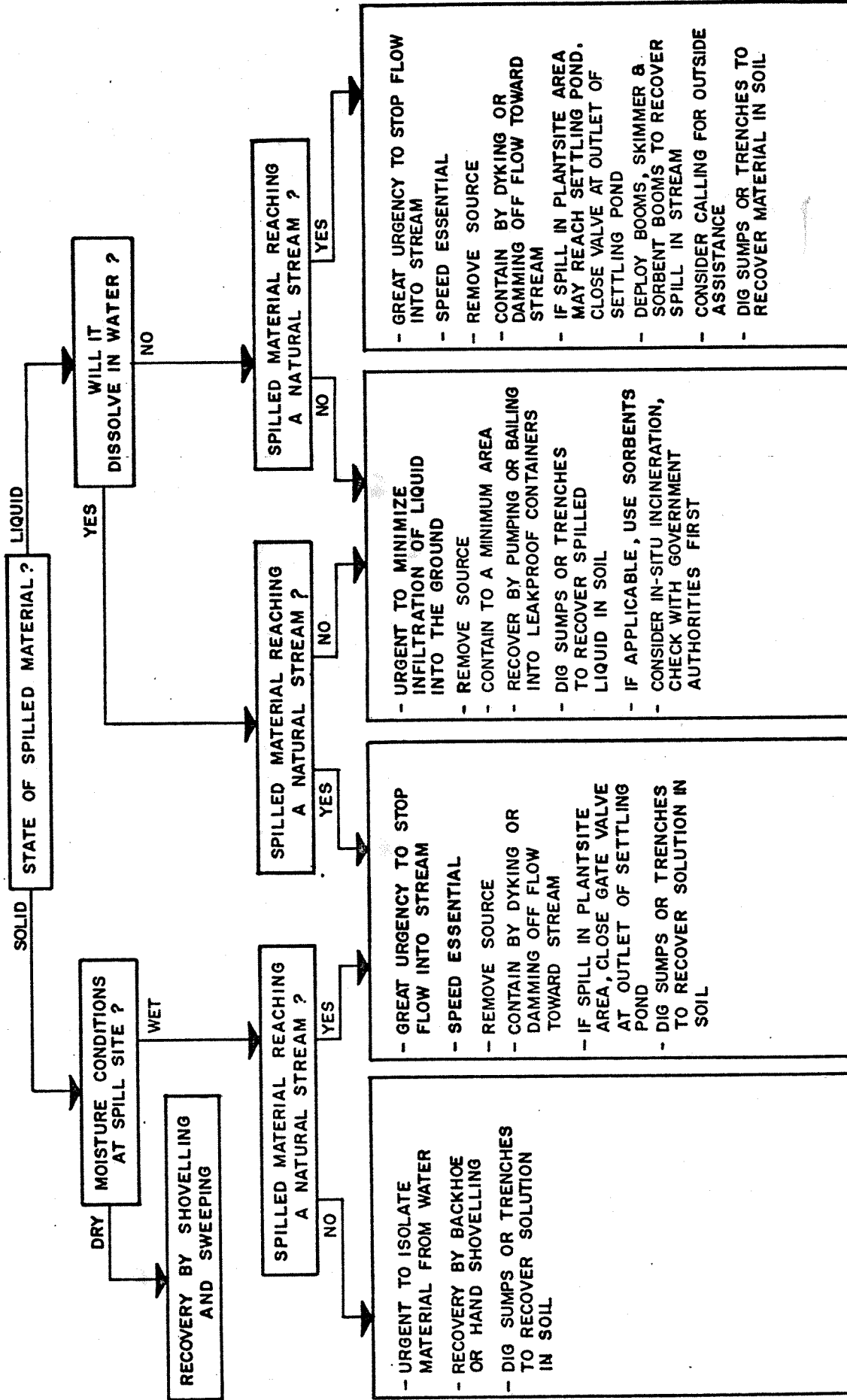
Cadillac Explorations Limited will assist in the reporting, containment and clean-up of spills along the winter road between the Liard River and the mine. This does not, however, relieve the supplier or the trucking firm of any legal liability arising from a spill along the winter road. If necessary, materials, equipment and manpower would be dispatched from the minesite to contain and clean up spills of materials ordered by Cadillac Explorations Limited and destined for the Prairie Creek operation.

It is the policy of Cadillac Explorations Limited to initiate clean-up activity when in the opinion of its management, the Company name is clearly associated with the spilled material. As well, it is the Company policy:

- to comply with existing regulations
- to provide such protection of the environment as is technically feasible and economically practical
- to co-operate with other groups working on protection of the environment
- to inform government officials without delay of all oil or hazardous material spills of significance
- to ensure that information about spills which is supplied to the employees and the public is complete and accurate.

Items of Federal and Territorial legislation relevant to oil and toxic material spill prevention in the Northwest Territories are listed in Appendix 1.

This Spill Contingency Plan will be up-dated regularly by the Company to incorporate new information, changes in personnel, and changes in the equipment inventory.



NOTE: FOR MORE SPECIFIC INSTRUCTIONS, CONSULT THE APPROPRIATE ACTION PLAN

GENERAL SPILL RESPONSE

FIGURE 2

2. ALERTING AND REPORTING PROCEDURE

All Company employees are to be educated about the following procedure for reacting to and reporting a spill upon its discovery:

1. The person discovering the spill should assess the hazard to his own health and safety and to other persons in the vicinity. If a danger of gas poisoning or an explosion is perceived, then he should leave the area and warn others in the vicinity to leave also. If warranted, a call for first aid and/or fire-fighting assistance must be made immediately.
2. If safe to do so, and if possible, he should try to stop the flow of the hazardous material (e.g. by shutting off a valve, or by blocking the flow, or by changing the position of a leaking container).
3. The person discovering the spill should try to gather as much of the following information as possible:
 - identification or accurate description of the substance spilled
 - an estimate of the amount spilled, and whether or not the spilling has been stopped
 - exact location of the spill
 - whether or not the spilled material has reached a flowing watercourse, or threatens to do so
 - if a spill is moving, an estimate of its speed
 - actions already initiated
 - apparent cause of the spill.

4. He should report the spill without delay to the following person by radio or, if applicable, by telephone:

Mr. Klaus Meyer, Mill Superintendent

If Klaus Meyer is not available, he should try to contact:

Mr. Walter Behling, Mine Superintendent

If Walter Behling is also not available, he should try to contact:

The Environmental Technician (appointment pending)

The minesite telephone number is: (604) 774-3667.

If reporting by radio, and none of the aforementioned individuals is immediately available, the person discovering the spill should call the dispatcher and give the dispatcher the details of the spill. It will be the dispatcher's duty to relay the information as quickly as possible to one of the above three contacts.

The person receiving the spill report will become the On-scene Co-ordinator (OSC) for that particular spill, until his duties are relieved by a superior (if he is a back-up OSC), or until the spill has been contained, cleaned-up, disposed of, and fully reported on.

Upon receiving a report of a spill, the OSC will carry out the following:

1. If injury or serious health threat exists, the OSC will call the Safety Supervisor if the person reporting the spill has not already done so. The Safety Supervisor will dispatch the appropriate first aid and/or rescue team to the spill scene.
2. If a fire has started, or if highly flammable material has been spilled, the OSC will call the Fire Chief if the person reporting the spill has not already done so. The Fire Chief will dispatch a fire-fighting crew to the spill scene.
3. The OSC will alert the Response Team Leader (RTL) and tell him to prepare to visit the spill scene immediately. The OSC should ensure that the RTL will have a radio for direct communication.
4. The OSC should consult the appropriate ACTION PLAN contained in this Spill Contingency Plan to refresh his memory about the spilled material's properties and recommended methods for containment. If further information is required, the OSC should call the appropriate information source listed in Section 4, Emergency Telephone Numbers.
5. The OSC will assess the requirements for men, equipment, materials and tools to contain the spill in light of what resources are immediately available. The OSC will contact a foreman (or foremen) to mobilize men, equipment, materials and tools to contain and recover the spill. Upon reaching the site, the foremen will take directions from the RTL. The urgency will depend upon the nature of the particular spill. Obviously a large petroleum product spill into a watercourse would warrant far more urgency and priority than would a small spill of a solid product on dry land.

6. If the spill is too large and/or too far away to be handled entirely by the Company's resources, the OSC will call for outside assistance. Telephone numbers for contacting such assistance are listed in Section 4.
7. The OSC will alert the Environmental Advisor. Together they will determine what, if any, sampling should be done. The OSC may require technical advice from the Environmental Advisor regarding impacts of various clean-up options.
8. Once the initial response has been activated the OSC will contact the relevant Company and Government authorities. Their telephone numbers appear in Section 4.

All oil and hazardous material spills of significance must be reported to the Government authorities without delay.

9. The OSC will request frequent reports from the RTL about developments at the spill scene, and will ensure that all necessary and available assistance is provided to the spill response team as the situation evolves.
10. The OSC will begin planning for transport and disposal of the recovered material.
11. The OSC will gather all relevant information and prepare a spill report.

For convenience and quick reference, the procedures listed above are displayed on a large-sized flow chart suitable for mounting on a wall. The chart is located in the pocket inside the back cover of this Plan, and is entitled On-Scene Co-ordinator's Alerting and Reporting Guide.

The Response Team Leader would normally be:

Dale Ward, Supervisor of Maintenance

In his absence, the back-up RTL would be the Shop Foreman.

The Environmental Advisor would normally be:

The Environmental Technician (appointment pending)

The public relations contact at Head Office for information regarding spills or other environmental emergencies would be:

Mr. Ronald Emes, Manager - Human Resources
Telephone Number: (403) 255-3405

3.0 RESPONSE TEAM ORGANIZATION

The response team organization is summarized in Figure 3. The On-Scene Co-ordinator (OSC) is the key person in a spill response situation. Reporting directly to him will be the Response Team Leader (RTL), who will be at the spill scene, directing the foremen in the containment, recovery and disposal phases of a spill clean-up. The OSC will also alert and direct the Fire Chief and Safety Supervisor, as required, should fire, injury, or health threats be apparent in conjunction with the spill.

The responsibilities and duties of the OSC and the RTL are outlined as follows:

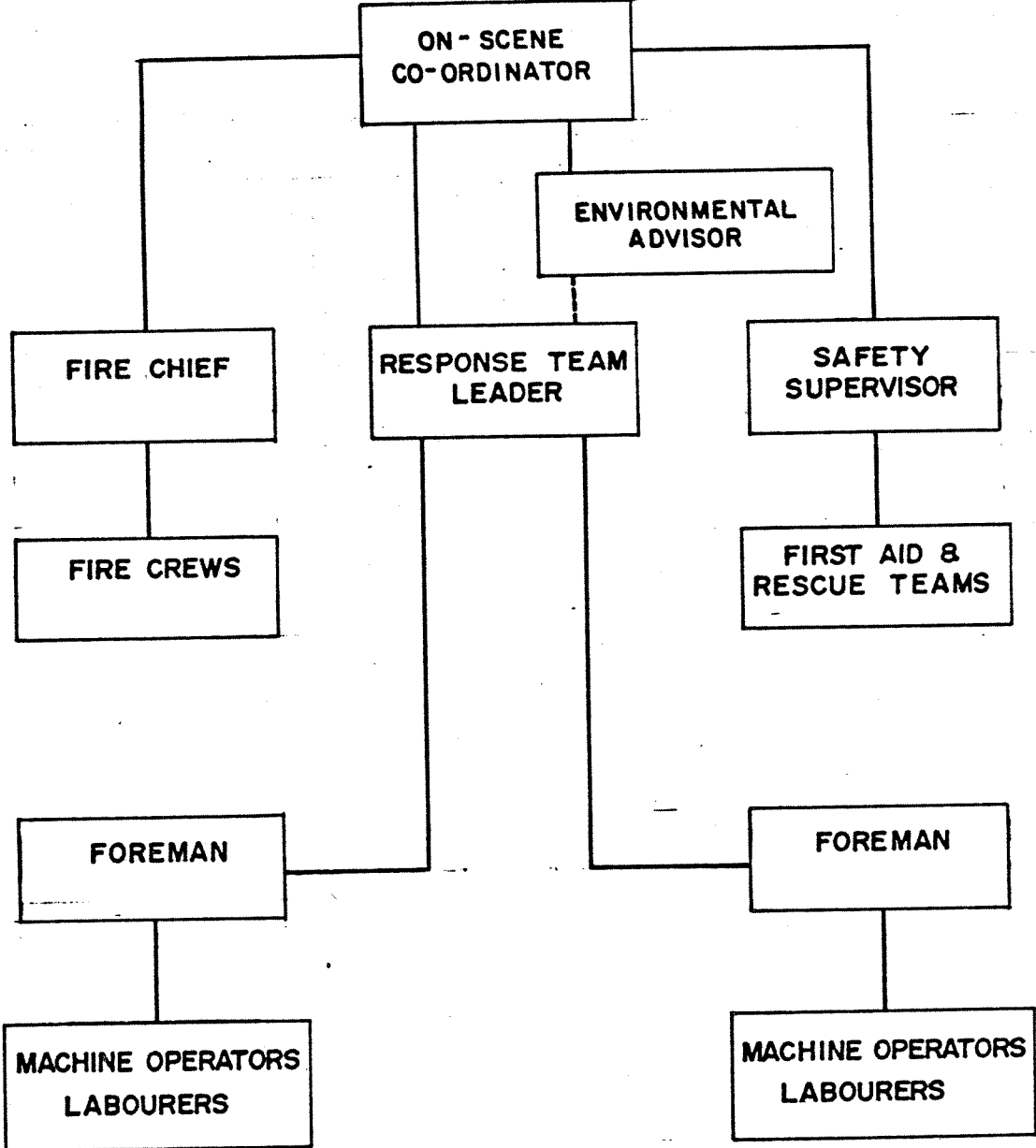
On-Scene Co-ordinator

Scope of Responsibility

Has complete authority over clean-up personnel at the spill scene.

Duties

- evaluates the initial situation and assesses the magnitude of the problem.
- activates the response plan and calls out the key personnel in the response team, as he deems appropriate to meet the situation.
- develops the overall plan of action for the containment and clean-up of the specific incident (utilizing field observers); and delegates the responsibility of putting the plan into effect to the key personnel in the response team.



SPILL RESPONSE TEAM ORGANIZATION

FILE NO 1561 DATE MARCH 1982

FIGURE 3

- ensures that the assigned responsibilities are carried out and that co-ordination exists between supervisory team members.
- ensures that all mine personnel are educated about spill procedures and hazards associated with spills.
- ensures that the Spill Contingency Plan is up-dated regularly.
- ensures that spill control equipment is maintained, and that the supply of spill control materials is replenished after use.
- ensures that all spill response personnel receive adequate training.
- organizes mock spill exercises.

Response Team Leader

Scope of Responsibilities

Responsible for all field operations in the clean-up of the spill.

Duties

- directs the Spill Response Team in containment, clean-up and disposal operations including operational support.
- develops a plan of action with the OSC and implements the Contingency Plan.
- conveys all appropriate information and relays orders to supervisory personnel.

- keeps the OSC informed at all times.
- assists the OSC in his regular maintenance and training duties.

Environmental Advisor

Scope of Responsibilities

Responsible for providing technical advice on environmental matters relating to spills, and for the collection and analysis of samples.

Duties

- provides OSC with advice on what the anticipated environmental impacts of a spill would likely be, and estimates the effectiveness of various containment, recovery and disposal options.
- determines what sampling should be undertaken in the event of a spill, in the absence of direction from government or company authorities.
- collects samples using the appropriate methods and containers for the particular spilled material and arranges for sample analysis.

4. EMERGENCY TELEPHONE NUMBERS

MINESITE

Minesite communication between key locations will be primarily by radio. Mobile radios are installed in many of the minesite vehicles. Portable hand-held radios will be made available to key personnel in a spill situation. One radio frequency will be monitored at all times by a dispatcher at a base radio station. A communications system will be installed which will allow drivers of trucks supplying materials to the mine to communicate with the minesite dispatcher from most locations along the winter road.

In emergencies, proceed as follows:

First Aid call by radio: 1. the Safety Supervisor
or: 2. the First Aid Attendant
or: 3. the dispatcher

Fire call by radio: 1. the Fire Chief
or: 2. the dispatcher

Spill call by radio: 1. Klaus Meyer, Mill Superintendent
or: 2. Walter Behling, Mine Superintendent
or: 3. David Mahaffy, Chief Geologist
or: 4. the dispatcher.

Minesite telephone number: (604) 774-3667.

GOVERNMENT NOTIFICATION

Report spill to ONE of the following:

Government of the Northwest Territories, Chief Environmental Protection Officer.

Telephone: (403) 873-7554

or: (403) 873-2611

Department of Indian Affairs and Northern Development, Controller, Water Management, Yellowknife, N. W. T.

Telephone: (403) 873-4421

Environment Canada, Yellowknife, N. W. T.

Telephone: (403) 873-3456

Follow up immediately by identical telephone call to Sub-regional Co-ordinator in Fort Smith Sub-region.

Telephone: (403) 872-2023.

COMPANY HEAD OFFICE NOTIFICATION

1. Ronald Emes, Cadillac Explorations Limited, Calgary
Telephone: (403) 255-3405 (office)
or: (403) 278-1504 (home)

2. T. W. Bowman, Cadillac Explorations Limited, Calgary
Telephone: (403) 255-3405 (office)
or: (403) 278-8916 (home)

ADVICE AND ASSISTANCE OUTSIDE OF COMPANY

Chemical Spills During Transportation

For emergency advice, call TEAP, (Transportation Emergency Assistance Plan of the Canadian Chemical Producers Association)

24-hour emergency telephone number: (403) 477-8339.

Chemical Product Information

For emergency information about: sodium cyanide
sodium isopropyl xanthate
hydrated lime

call Canadian Industries Limited

24-hour emergency telephone number: (416) 226-6117.

For emergency information about: copper sulphate
MIBC
Dowfroth 1012
ethylene glycol antifreeze

call DOW Chemical of Canada Ltd.

24-hour emergency telephone number: (519) 339-3711.

For emergency information about: NILITE (ANFO Explosive)

call Du Pont Canada Inc.

emergency telephone number: (705) 472-1300

Oil Products Spills

For emergency advice, information or assistance call:

Hay River Co-op (of which Gulf is a member)

24-hour emergency telephone numbers: (403) 874-2442

(403) 874-2201

If spill is on winter road nearer to Liard River than Prairie Creek, call attendant at Blackstone spill control equipment depot by radio.

5. ACTION PLANS

The following pages contain 13 "action plans", one for each type of substance which, if spilled in significant amounts at sensitive locations, could cause noticeable environmental damage. Each action plan contains the following:

- suggested initial spill response actions
- notable hazards of the material(s)
- suggested action for fire, if applicable
- recommended recovery methods
- recommended disposal methods
- basic properties of the material(s)
- statement of potential environmental threat posed by the material(s)
- description of the containers used for transportation and storage of the material(s)
- name of the supplier of the material(s).

Each action plan is intended to be a guide for an OSC or RTL. Because it is impossible to address every potential spill situation at the minesite or along the winter road, the action plans have been formulated to suit the more likely spill possibilities, and may not be applicable in every case. The ultimate decision-making responsibility for spill response actions must lie with the OSC.

ACTION PLAN FOR SPILL OF SODIUM CYANIDE

INITIAL SPILL

RESPONSE

- TEST for presence of hydrocyanic acid (HCN) gas
- DO NOT ENTER area containing sodium cyanide dust or HCN gas without self-contained breathing apparatus
- STOP spill at source if possible
- PREVENT solid sodium cyanide from contacting acid, acid salts (such as copper sulphate), or water
- if sodium cyanide does contact water, CONTAIN solution to as small an area as possible. Consider dyking
- if solution enters plantsite outdoor drainage system, CLOSE GATE VALVE at outlet of settling pond
- if HCN gas is being produced, WEAR PROTECTIVE CLOTHING AND BREATHING APPARATUS, VENTILATE and ADD HYDRATED LIME to slow the reaction
- ISOLATE area of spill, preferably by roping off affected area and posting appropriate hazard signs.

HAZARDS

- extremely toxic by ingestion or inhalation (of dust)
- corrosive to skin, due to strong alkalinity
- liberates highly toxic HCN gas if sodium cyanide comes in contact with any acid or acid salts
- contact with carbon dioxide (CO₂) produces HCN gas in lesser, but possibly dangerous quantities
- contact with water may produce small amounts of HCN gas
- HCN gas can be absorbed through the skin.

ACTION FOR

FIRE

- sodium cyanide is not flammable and will not support combustion, however, HCN gas is flammable

SODIUM CYANIDE

- DO NOT USE CARBON DIOXIDE (CO₂) extinguishers to fight a fire involving sodium cyanide, as this may produce toxic and flammable HCN gas
- if water is used to fight a fire involving sodium cyanide, treat runoff as though it was a spill of sodium cyanide solution. Do not allow runoff to reach a stream.

RECOVERY

- spills of solid sodium cyanide on dry surfaces can be shovelled into containers. Crews should wear dust masks while shovelling or sweeping up spills
- spills of solid sodium cyanide on wet surfaces or exposed to rain should be shovelled into waterproof containers as soon as possible to minimize the quantity of sodium cyanide being dissolved. Affected area should be sprayed with solution of calcium hypochlorite to neutralize cyanide
- sodium cyanide, as a solid or in solution, must not be allowed access to any flowing stream, as its recovery from such a stream outside the plantsite area is virtually impossible. Inside the plantsite area, the gate valve at the outlet of the settling pond should be closed, and the contents of the pond should be pumped to the mill sump until the cyanide concentration in the pond is reduced to allowable levels
- soil contaminated with sodium cyanide should be excavated if the affected groundwater threatens to travel to an adjacent flowing stream
- solutions of sodium cyanide which are not recovered can be neutralized by addition of lime and calcium hypochlorite
- sorbents may be used to contain and recover spilled solutions.

SODIUM CYANIDE

DISPOSAL

- solid sodium cyanide recovered from a spill may be used in the mill if it is of acceptable quality
- solid sodium cyanide, all sodium cyanide solutions recovered from the spills, and soil containing sodium cyanide should be added to the mill circuits under the direction of the Mill Superintendent, or disposed of in the tailings pond.

PROPERTIES

- chemical formula NaCN
- white solid (pellets)
- very soluble in water
- aqueous solution is strongly alkaline and decomposes rapidly
- solid sodium cyanide absorbs moisture from the air, and tends toward a liquid state.

ENVIRONMENTAL

THREAT

- very toxic to fish and other forms of aquatic life at concentrations considerably less than 1 mg/l.

CONTAINERS

- transported and stored in 50-kg steel drums.

SUPPLIER

- Mackenzie and Fiemann Ltd.

ACTION PLAN FOR SPILL OF
CALCIUM HYPOCHLORITE

INITIAL SPILL

RESPONSE

- TEST for presence of chlorine gas
- STOP spill at source if possible
- PREVENT solid calcium hypochlorite from contacting acids, organic materials or water
- if calcium hypochlorite does contact water, CONTAIN solution to as small an area as possible. Consider dyking
- if solution enters plantsite outdoor drainage system CLOSE GATE VALVE at outlet of settling pond
- ISOLATE area of spill preferably by roping off affected area.

HAZARDS

- toxic by ingestion, inhalation and skin contact
- dangerous fire risk in contact with organic materials or acids
- moderate explosion hazard if heated above 100°C
- can produce toxic chlorine gas if heated or in contact with acids

ACTION FOR

FIRE

- calcium hypochlorite is not flammable, but will vigorously support combustion
- move drums of calcium hypochlorite away from fire if possible
- cool calcium hypochlorite containers with water to prevent explosion
- if water is used to fight a fire involving calcium hypochlorite treat runoff as though it was a spill of calcium hypochlorite solution. Do not allow runoff to reach a flowing stream.

CALCIUM HYPOCHLORITE

RECOVERY

- spills of solid calcium hypochlorite on dry surfaces can simply be shovelled into containers. Crews should wear dust masks and protective clothing while shovelling or sweeping up spill.
- spills of solid calcium hypochlorite on wet surfaces or exposed to rain should be shovelled into waterproof containers as soon as possible to minimize the amount of calcium hypochlorite being dissolved. Affected areas can be treated with sodium metabisulphite to detoxify calcium hypochlorite solution
- calcium hypochlorite, as a solid or in solution, must not be allowed access to any flowing stream, as its recovery from such a stream outside the plantsite area is virtually impossible. Inside the plantsite area, the gate valve at the outlet of the settling pond should be closed. Depending on the inflow, the contents of the pond should either be pumped to the mill sump or tailings pond, or detained in the settling pond area until the residual chlorine concentration is reduced to acceptable levels
- calcium hypochlorite in water which is not recovered can be treated with sodium metabisulphite to greatly reduce the toxicity of the solution to fish

DISPOSAL

- solid calcium hypochlorite recovered from a spill may be used in the mill if it is of acceptable quality
- solid calcium hypochlorite and all calcium hypochlorite solutions should be added to the mill circuit under the direction of the Mill Superintendent, or disposed of in the tailings pond.

CALCIUM HYPOCHLORITE

- PROPERTIES
- chemical formula $\text{Ca}(\text{OCl})_2$
 - white crystalline solid
 - strong oxidizing material
 - very soluble in water

ENVIRONMENTAL

THREAT

- very toxic to fish and other forms of aquatic life at concentrations considerably less than 1 mg/l.

CONTAINERS

- transported and stored in 25-kg poly-lined cardboard kegs.

SUPPLIER

- Van Waters and Rogers Ltd.

ACTION PLAN FOR SPILL OF COPPER SULPHATE

INITIAL SPILL

RESPONSE

- STOP spill at source if possible
- PREVENT solid copper sulphate from contacting water
- if copper sulphate does contact water, CONTAIN solution to as small an area as possible. Consider dyking
- if solution enters plantsite outdoor drainage system CLOSE GATE VALVE at outlet of settling pond
- ISOLATE area of spill preferably by roping off affected area.

HAZARD

- toxic by ingestion.

ACTION FOR

FIRE

- copper sulphate is not flammable and will not support combustion
- if water is used to fight a fire involving copper sulphate, treat runoff as though it was a spill of copper sulphate solution. Do not allow runoff to reach a flowing stream.

COPPER SULPHATE

RECOVERY

- spills of solid copper sulphate on dry surfaces can simply be shovelled into containers
- spills of solid copper sulphate on wet surfaces or exposed to rain should be shovelled into waterproof containers as soon as possible to minimize the quantity of copper sulphate being dissolved
- copper sulphate, as a solid or in solution, must not be allowed access to any flowing stream, as its recovery from such a stream outside the plantsite area is virtually impossible. Inside the plantsite area, the gate valve at the outlet of the settling pond should be closed, and the contents of the pond should be pumped to the mill sump or tailings pond until the copper concentration in the settling pond is reduced to allowable levels
- to reduce toxicity to fish, the concentration of dissolved copper in water can be minimized by adding hydrated lime to the water until the pH of the water is in the range of 9 to 10. This treatment is recommended for standing water, not for flowing streams
- soil contaminated with copper sulphate should be excavated if the affected groundwater threatens to travel to an adjacent flowing stream
- sorbents may be used to contain and recover spilled solutions.

DISPOSAL

- solid copper sulphate recovered from a spill may be used in the mill if it is of acceptable quality
- solid copper sulphate, all copper sulphate solutions and soil containing copper sulphate should be added to the mill circuits under the direction of the Mill Superintendent, or disposed of in the tailings pond.

COPPER SULPHATE

- PROPERTIES
- chemical formula $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
 - blue crystalline solid, turning white upon dehydration
 - soluble in water
 - slowly dehydrates in air.

ENVIRONMENTAL

THREAT

- toxic to fish and other forms of aquatic life. Toxicity decreases greatly with an increase in the alkalinity and hardness of the water. Toxic concentrations for most fish are much less than 1 mg/l for soft water, and near 1 mg/l for hard water.

CONTAINERS

- transported and stored in 25-kg lined cardboard kegs which are packed in 1-tonne capacity wooden boxes.

SUPPLIER

- Van Waters and Rogers Ltd.

ACTION PLAN FOR SPILL OF
GASOLINE & AVIATION FUEL

INITIAL SPILL

RESPONSE

- STOP the flow if possible
- ELIMINATE all possible sources of IGNITION, e.g. extinguish cigarettes, shut off motors (from a remote location if surrounded by vapours)
- EVACUATE danger area
- CAREFULLY CONSIDER the hazards and merits of trying to contain the spill. Contain only if safe to do so, and obvious benefit of containment is apparent, e.g. contain if flowing towards a creek. Otherwise leave gasoline to spread and evaporate. Do not attempt to contain a gasoline spill on water. Allow it to spread and evaporate
- VENTILATE vapours if spilled in an enclosed area.

HAZARDS

- highly flammable,
- forms explosive mixture with air
- easily ignited by flame or spark
- moderately toxic by ingestion, highly toxic if aspirated.

ACTION FOR

FIRE

- use CO₂, dry chemical, foam or water spray (fog), although water may spread the fire
- use jet streams to wash away burning gasoline
- use fog streams to protect rescue team and trapped people
- use water to cool surface of tanks
- divert the gasoline to an open area and let it burn off under control
- if the fire is put out before all gasoline is consumed, beware of re-ignition

GASOLINE & AVIATION FUEL

- where gasoline is running downhill, try to contain it at the bottom and divert the fire uphill toward the source
- rubber tires are almost impossible to extinguish after involvement with a fire. Have vehicles with burning tires removed from the danger area.

RECOVERY

- unburned gasoline can be soaked up by sand and peat moss, or by commercial sorbents such as Graboil or Conwed
- if necessary, contaminated soil should be excavated
- gasoline entering the ground can be recovered by digging sumps or trenches and pumping from below the water table.

DISPOSAL

- evaporation
- incineration under controlled conditions.

GASOLINE & AVIATION FUEL

- PROPERTIES
- chemical composition: mixture of hydrocarbons in the range C₄ to C₁₂
 - amber coloured liquids
 - volatile
 - not soluble, floats on water.

ENVIRONMENTAL

THREAT

- moderately toxic to fish and other aquatic organisms
- may create unsightly film on water.

CONTAINERS

- Gasoline will be transported by tanker trucks and stored in the tank farm. Aviation fuel will be transported in steel drums and stored at the airstrip in limited quantities.

SUPPLIER

- Gulf Canada Limited.

ACTION PLAN FOR SPILL OF DIESEL FUEL

INITIAL SPILL

RESPONSE

- STOP the flow if possible
- ELIMINATE open flame ignition sources
- CONTAIN flow of oil by dyking, barricading or blocking flow by any means available. Use earth-moving equipment if nearby
- if flow has reached flowing natural stream, mobilize team to deploy river boom, skimmer and sorbent booms
- if spill threatens to enter the plantsite outdoor drainage system, close gate valve at outlet of settling ponds.

HAZARDS

- slightly toxic by ingestion, highly toxic if aspirated
- flammable.

ACTION FOR

FIRE

- use CO₂, dry chemical, foam or water spray (fog), although water may spread the fire
- use fog streams to protect rescue team and trapped people
- use water to cool surface of tanks
- divert the diesel fuel to an open area and let it burn off under control
- if the fire is put out before all diesel fuel is consumed, beware of re-ignition
- where diesel fuel is running downhill, try to contain it at the bottom and divert the fire uphill toward the source

DIESEL FUEL

- rubber tires are almost impossible to extinguish after involvement with a fire. Have vehicles with burning tires removed from the danger area.

RECOVERY

- unburned diesel fuel can be soaked up by sand and peat moss, or by commercial sorbents such as Graboil or Conwed
- if necessary, contaminated soil should be excavated
- diesel fuel entering the ground can be recovered by digging sumps or trenches and pumping from below the water table.
- diesel fuel on a water surface should be recovered by skimmers and sorbent booms (See Section on Recovery of Oil Spills).

DISPOSAL

- incineration under controlled conditions. Obtain permission from government authorities
- burial at an approved site.

DIESEL FUEL

- PROPERTIES
- chemical composition: mixture of hydrocarbons in the range C₉ to C₁₈
 - clear, oily liquid
 - not soluble, floats on water.

ENVIRONMENTAL

THREAT

- moderately toxic to fish and other aquatic organisms
- harmful to waterfowl
- may create unsightly film on water.

CONTAINERS

- transported by tanker truck and stored in the tank farm.

SUPPLIER

- Gulf Canada Limited.

ACTION PLAN FOR SPILL OF
LUBRICATING & HYDRAULIC OILS

INITIAL SPILL

RESPONSE

- STOP the flow if possible
- ELIMINATE open flame ignition sources
- CONTAIN flow of oil by dyking, barricading or blocking flow by any means available. Use earth-moving equipment if nearby
- if flow has reached flowing natural stream mobilize team to deploy river boom, skimmer and sorbent booms
- if spill threatens to enter the plantsite outdoor drainage system, close gate valve at outlet to settling ponds.

HAZARDS

- slightly toxic by ingestion
- combustible

ACTION FOR

FIRE

- use CO₂, dry chemical, foam or water spray (fog), although water may spread the fire
- use fog streams to protect rescue team and trapped people
- use water to cool surface of tanks
- divert the oil to an open area and let it burn off under control
- if the fire is put out before all oil is consumed, beware of re-ignition
- rubber tires are almost impossible to extinguish after involvement with a fire. Have vehicles with burning tires removed from the danger area.

LUBRICATING & HYDRAULIC OILS

RECOVERY

- unburned oil can be soaked up by sand and peat moss, or by commercial sorbents such as Graboil or Conwed
- if necessary, contaminated soil should be excavated
- oil on a water surface should be recovered by skimmers and sorbent booms (See Section on Recovery of Oil Spills).

DISPOSAL

- incineration under controlled conditions. Obtain permission from government authorities
- burial at an approved site.

LUBRICATING & HYDRAULIC OILS

- PROPERTIES
- chemical composition: mixture of hydrocarbons and conventional industrial oil additives
 - generally viscous liquids, various colours
 - not soluble, floats on water.

ENVIRONMENTAL

- THREAT
- moderately toxic to fish and other aquatic organisms
 - harmful to waterfowl
 - may create unsightly film on water and shorelines.

- CONTAINERS
- transported and stored in steel drums.

- SUPPLIER
- Gulf Canada Limited.

ACTION PLAN FOR SPILL OF
SODIUM ISOPROPYL XANTHATE

INITIAL SPILL

- RESPONSE
- STOP spill at source if possible
 - PREVENT sodium isopropyl xanthate from contacting water
 - if xanthate does contact water, CONTAIN solution to as small an area as possible
 - if solution enters plantsite outdoor drainage system CLOSE GATE VALVE at outlet of settling pond
 - ISOLATE area of spill preferably by roping off affected area.

HAZARDS

- flammable
- releases toxic sulphur dioxide (SO₂) gas during combustion
- decomposes in moist or acidic conditions, and can produce toxic and flammable carbon disulphide
- may cause skin irritation
- low oral toxicity.

ACTION FOR

FIRE

- test for presence of SO₂ gas
- wear self-contained breathing apparatus for protection from SO₂ gas poisoning
- use water spray (fog), or dry chemical
- if water is used to fight a fire involving sodium isopropyl xanthate, treat runoff as though it was a spill of xanthate solution. Do not allow runoff to reach a flowing stream.

SODIUM ISOPROPYL XANTHATE

RECOVERY

- spills of solid xanthate on dry surfaces can simply be shovelled into containers
- spills of solid xanthate on wet surfaces or exposed to rain should be shovelled into waterproof containers as soon as possible to minimize the quantity of xanthate being dissolved
- sodium isopropyl xanthate, as a solid or in solution, must not be allowed access to any flowing stream
- sorbents, such as Hazorb, may be used to contain and recover spilled xanthate.

DISPOSAL

- solid xanthate recovered from a spill may be used in the mill if it is of acceptable quality
- solid xanthate and all xanthate solutions should be added to the mill circuits under the direction of the Mill Superintendent, or disposed of in the tailings pond.

SODIUM ISOPROPYL XANTHATE

- PROPERTIES
- chemical formula $(\text{CH}_3)_2\text{CHO CS}_2\text{Na}$
 - white or yellow 10 mm diameter pellets
 - soluble in water
 - decomposes readily in water

ENVIRONMENTAL

THREAT

- toxic to fish and other aquatic life at concentrations less than 1 mg/l, however sodium isopropyl xanthate quickly decomposes to non-toxic substances in solution.

CONTAINERS

- transported and stored in 205-litre steel drums.

SUPPLIER

- Canadian Industries Limited.

ACTION PLAN FOR SPILL OF
ANFO EXPLOSIVES

INITIAL SPILL

RESPONSE

- STOP spill at source if possible
- ELIMINATE all possible sources of ignition
- PREVENT ANFO from contacting water
- if ANFO does contact water, CONTAIN solution to as small an area as possible. Consider dyking
- if solution enters plantsite outdoor drainage system CLOSE GATE VALVE at outlet of settling pond
- ISOLATE area of spill preferably by roping off affected area.

HAZARDS

- may explode under confinement or high temperatures
- flammable
- low toxicity.

ACTION FOR

FIRE

- for fires involving large quantities of ANFO, evacuate and do not attempt to fight fire
- for fires involving small quantities of ANFO, use large amounts of water to extinguish
- ANFO may detonate in fire, under severe impact or confinement.

ANFO EXPLOSIVES

RECOVERY

- spills of ANFO on dry surfaces can simply be shovelled into containers
- spills of ANFO on wet surfaces or exposed to rain should be shovelled into waterproof containers as soon as possible to minimize the quantity of ammonium nitrate being dissolved
- ANFO, or a resulting ammonium nitrate solution, must not be allowed access to any flowing stream. For spills reaching the outdoor drainage system inside the plantsite area, the gate valve at the outlet of the settling pond should be closed and the contents of the pond should be pumped to the mill sump or tailings pond.
- sorbents, such as peat moss, Conwed or Graboil should be used to recovery any oil emanating from the ANFO spill
- soil heavily contaminated with ammonium nitrate should be excavated if the affected groundwater threatens to travel to an adjacent flowing stream.

DISPOSAL

- ANFO recovered from a spill may be used in the mine
- ammonium nitrate solutions and soil containing ammonium nitrate should be disposed of in the tailings pond
- sorbents used to recover the oil may be incinerated under controlled conditions or buried at an approved site
- ANFO can be disposed of by detonation or incineration under knowledgeable supervision.

ANFO EXPLOSIVES

PROPERTIES

- chemical composition:
 - 94% prilled ammonium nitrate (NH_4NO_3)
 - 6% No. 2 fuel oil
- trade name: Nilite
- small porous pellets coated with oil, may be dyed with bright colours
- ammonium nitrate is very soluble in water; the oil is not soluble and will float
- strong oxidizing agent
- flammable.

ENVIRONMENTAL

THREAT

- ammonium nitrate is moderately toxic to fish and other aquatic organisms. Toxicity increases with increased pH of the water.

CONTAINERS

- ANFO will be transported and stored in 25 kg poly bags.

SUPPLIER

- Ace Explosives Limited
Edmonton, Alberta
- manufactured by Du Pont.

ACTION PLAN FOR SPILL OF
SODIUM METABISULPHITE

INITIAL SPILL

- RESPONSE
- STOP spill at source if possible
 - PREVENT sodium metabisulphite from contacting water
 - if sodium metabisulphite does contact water, CONTAIN solution to as small an area as possible.

HAZARDS

- strong skin irritant.

ACTION FOR

FIRE

- no special precautions.

RECOVERY

- spills of solid sodium metabisulphite on dry surfaces can simply be shovelled into containers
- spills of solid sodium metabisulphite on wet surfaces or exposed to rain should be shovelled into waterproof containers as soon as possible to minimize the quantity being dissolved
- sodium metabisulphite, as a solid or in solution, must not be allowed access to any flowing stream
- sorbents may be used to contain and recover spilled solutions.

DISPOSAL

- solid sodium metabisulphite recovered from a spill may be used in the mill if it is of acceptable quality
- solid sodium metabisulphite and its solutions should be disposed of in the tailings pond.

SODIUM METABISULPHITE

- PROPERTIES
- chemical formula $\text{Na}_2\text{S}_2\text{O}_5$
 - white crystalline powder
 - soluble in water
 - noncombustible
 - readily decomposes to harmless substances in water.

ENVIRONMENTAL

THREAT

- toxic to fish and other aquatic life at concentrations in the order of 60 mg/l and greater, however sodium metabisulphite readily decomposes to non-toxic substances in solution.

CONTAINERS

- transported and stored in 45-kg lined paper bags which are packed in 1-tonne capacity wooden boxes.

SUPPLIER

- Van Waters and Rogers Ltd.

ACTION PLAN FOR SPILL OF
HYDRATED LIME

INITIAL SPILL

- RESPONSE
- STOP spill at source if possible
 - PREVENT hydrated lime from contacting water
 - if lime does contact water, CONTAIN solution to as small an area as possible.

HAZARDS

- skin irritant.

ACTION FOR

FIRE

- no special precautions.

RECOVERY

- spills of hydrated lime on dry surfaces can simply be shovelled into containers
- spills of lime on wet surfaces or exposed to rain should be shovelled into waterproof containers as soon as possible to minimize the quantity of lime being dissolved
- sorbents may be used to contain and recover spilled solutions.

DISPOSAL

- hydrated lime recovered from a spill may be used in the mill if it is of acceptable quality
- solid lime and all lime solutions should be disposed of in the tailings pond.

HYDRATED LIME

- PROPERTIES
- chemical formula Ca(OH)_2
 - white crystalline powder
 - slightly soluble in water.

ENVIRONMENTAL

- THREAT
- toxic to fish and other aquatic life at concentrations in the order of 50 mg/l and greater.

- CONTAINERS
- transported and stored in lined paper bags which are packed in 1-tonne capacity wooden boxes.

- SUPPLIER
- Canadian Industries Limited.

ACTION PLAN FOR SPILL OF
ETHYLENE GLYCOL ANTIFREEZE

INITIAL SPILL

- RESPONSE
- STOP the flow at source if possible
 - ELIMINATE open flame ignition sources
 - CONTAIN flow of antifreeze by dyking, barricading or blocking flow by any means available
 - PREVENT antifreeze from entering any flowing streams
 - if spill threatens to enter the plantsite outdoor drainage system, CLOSE GATE VALVE at outlet of settling pond.

- HAZARDS
- moderately toxic by ingestion and inhalation
 - flammable.

ACTION FOR
FIRE

- use CO₂, dry chemical, foam or water spray (fog).

RECOVERY

- ethylene glycol antifreeze can be soaked up by peat moss or by commercial sorbents such as Hazorb
- access to spilled or recovered ethylene glycol by mammals should be prevented.

DISPOSAL

- incineration under controlled conditions. Obtain permission from government authorities
- burial at an approved site.

ETHYLENE GLYCOL ANTIFREEZE

- PROPERTIES
- chemical composition:
 - 96% ethylene glycol ($\text{CH}_2\text{OHCH}_2\text{OH}$)
 - 4% water and rust inhibitors
 - clear, syrupy liquid
 - soluble in water
 - flammable.

ENVIRONMENTAL

THREAT

- low to moderate toxicity for fish and other aquatic organisms
- attractive smell and taste to some mammals, and toxic by ingestion.

CONTAINERS

- transported and stored in 205-litre steel drums.

SUPPLIER

- DOW Chemical of Canada Ltd.

ACTION PLAN FOR SPILL OF
METHYL ISOBUTYL CARBINOL (MIBC)

INITIAL SPILL

RESPONSE

- STOP the flow at source if possible
- ELIMINATE ignition sources
- CONTAIN flow of MIBC by dyking, barricading or blocking flow by any means available
- if spill threatens to enter plantsite outdoor drainage system, CLOSE GATE VALVE at outlet of settling ponds.

HAZARDS

- slightly toxic by ingestion and inhalation
- flammable.

ACTION FOR

FIRE

- use CO₂, dry chemical, foam or water spray (fog), although water may spread the fire
- if the fire is put out before all MIBC fuel is consumed, beware of re-ignition.

RECOVERY

- MIBC can be soaked up by peat moss, or by commercial sorbents such as Hazorb, Graboil or Conwed.

DISPOSAL

- incineration under controlled conditions. Obtain permission from government authorities
- burial at an approved site.

METHYL ISOBUTYL CARBINOL (MIBC)

- PROPERTIES
- chemical formula $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{CH}(\text{CH}_3)_2$
 - colourless liquid
 - slightly soluble and floats on water
 - flammable.

ENVIRONMENTAL

- THREAT
- slightly toxic to fish and other aquatic organisms.

- CONTAINERS
- transported and stored in 205-litre steel drums.

- SUPPLIER
- Van Waters and Rogers Ltd.

ACTION PLAN FOR SPILL OF
DOWFROTH 1012

INITIAL SPILL

RESPONSE

- STOP the flow at source if possible
- ELIMINATE open flame ignition sources
- CONTAIN flow of Dowfroth 1012 by dyking, barricading or blocking flow by any means available
- if spill threatens to enter the plantsite outdoor drainage system, CLOSE GATE VALVE at outlet of settling ponds.

HAZARDS

- slightly toxic by ingestion.

ACTION FOR

FIRE

- use CO₂, dry chemical, foam or water spray (fog).

RECOVERY

- DOWFROTH 1012 can be soaked up by commercial sorbents such as Hazorb.

DISPOSAL

- incineration under controlled conditions. Obtain permission from government authorities
- burial at an approved site.

DOWFROTH 1012

- PROPERTIES
- chemical composition: polypropylene glycol methyl ether
 - amber-coloured liquid
 - soluble in water
 - combustible.

ENVIRONMENTAL

THREAT

- slightly toxic to fish and other aquatic organisms.

CONTAINERS

- transported and stored in 205-litre steel drums.

SUPPLIER

- Van Waters and Rogers Ltd.

ACTION PLAN FOR SPILL OF
SODA ASH

INITIAL SPILL

- RESPONSE
- STOP spill at source if possible
 - PREVENT soda ash from contacting water
 - if soda ash does contact water, CONTAIN solution to as small an area as possible.

- HAZARDS
- none.

ACTION FOR

- FIRE
- no special precautions.

RECOVERY

- spills of soda ash on dry surfaces can simply be shovelled into containers
- spills of soda ash on wet surfaces or exposed to rain should be shovelled into waterproof containers as soon as possible to minimize the quantity of soda ash being dissolved
- sorbents may be used to contain and recover spilled solutions.

DISPOSAL

- soda ash of acceptable quality recovered from a spill may be used in the mill under the direction of the Mill Superintendent
- solid soda ash and all soda ash solutions should be disposed of in the tailings pond.

SODA ASH

- PROPERTIES - chemical formula Na_2CO_3
- grayish-white powder
- soluble in water.

ENVIRONMENTAL

- THREAT - toxic to fish and other aquatic life at concentrations in the order of 100 mg/l and greater.

- CONTAINERS - transported and stored in lined paper bags which are packed in 1-tonne capacity wooden boxes.

- SUPPLIER - Van Waters and Rogers Ltd.

6. OIL SPILL RECOVERY PROCEDURES

The severity of the environmental threat posed by spills of light oils (diesel fuel) or heavy oils (lubricating oils and hydraulic fluids) depends primarily on the volume of oil spilled and the potential for the spilled oil to enter a sensitive watercourse. Several streams in the area are exposed to a remote possibility of an oil spill reaching them. Prairie Creek is the principal stream near the mine, and is among the most sensitive in the region. Other sensitive streams which are crossed or paralleled by the winter road include the Liard River, Grainger River, Tetcela River and Fishtrap Creek.

Oil Spills Reaching Prairie Creek

There exists a potential for oil spills to enter Prairie Creek at the mine/mill complex, or upstream of it along the winter road. The ideal location for containing and recovering an oil spill from Prairie Creek is immediately downstream from the mine. Cadillac Explorations Limited will select an accessible location on Prairie Creek, to which personnel could travel within less than five minutes from the minesite, for the containment and recovery of spilled oil in Prairie Creek. This control site will be selected on the basis of suitability for rapid deployment of booms, anchors, skimmer, pump and containers.

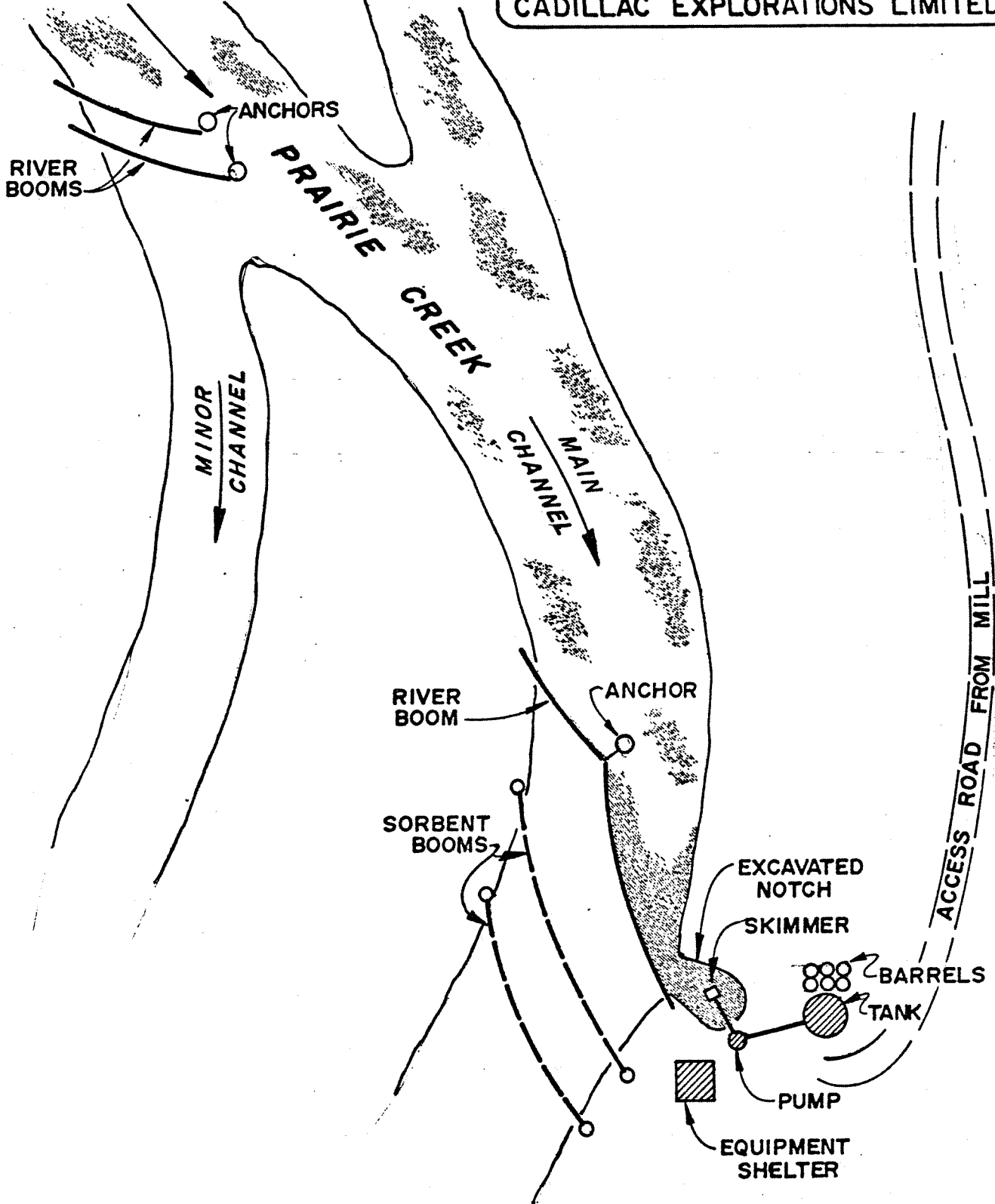
It is anticipated that oil spills during ice-free periods will be contained using a river boom which will be deployed at an angle across Prairie Creek in such a manner that oil will be deflected towards the left bank (i.e. the minesite side of Prairie Creek). A "notch" will be excavated into the left bank with a backhoe at the control site and will provide a quiet pool into which the oil would be diverted for recovery by a skimmer. The oil skimmed off the water surface will be pumped into leak-proof containers by a portable pump. Sorbent booms may be deployed downstream from the main boom to pick up any oil which might escape the main boom. In case the flow may be

divided into more than one channel at the recovery site, oil can be deflected from side channels using shorter booms. The aforementioned arrangement is shown on Figure 4.

In addition, sorbent batts such as Graboil can be tossed into the creek at the spill site or downstream of it. These batts will float to places where the oil tends to concentrate, such as back eddies, and will selectively absorb the oil while repelling water. These batts would then be retrieved, wrung out and re-used or disposed of.

If an oil spill entered Harrison Creek from a source upstream of the road crossing, such as the pipeline crossing, one ideal location to stop the progress of the spill would be near the upstream ends of the two large culverts passing beneath the road. Weirs made of plywood or planks could be quickly improvised to contain the oil, while allowing the water to pass underneath them. Alternatively, if water depth permitted, a short boom could be deployed upstream of the culverts in Harrison Creek. If some oil managed to bypass these barriers on Harrison Creek, a boom would be deployed downstream at the control site on Prairie Creek.

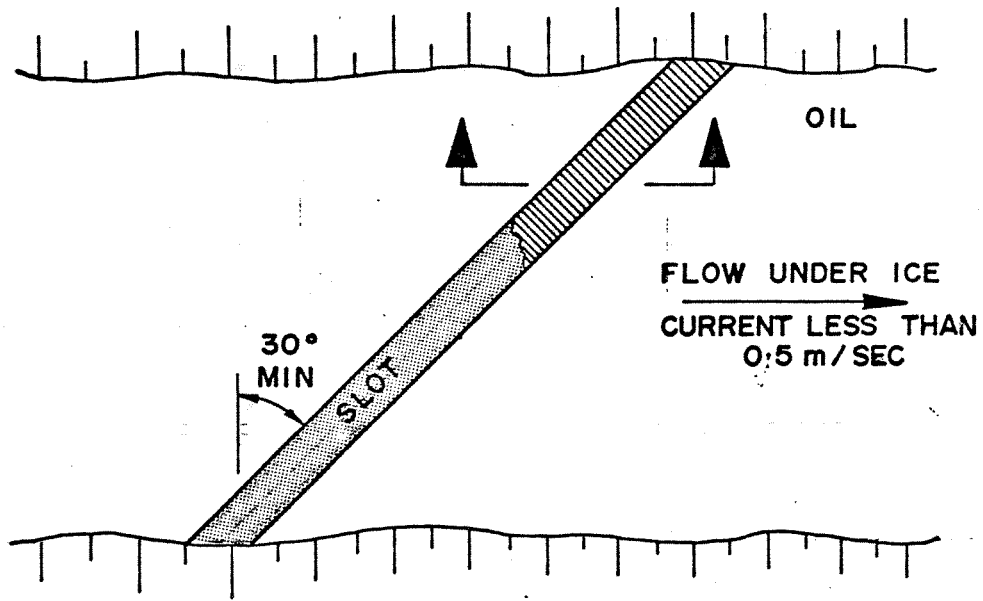
During periods when Prairie Creek would be completely iced over, the slot method would be used to capture and contain oil spills which travel beneath the ice. This method would involve the cutting of a one-metre wide slot through the ice diagonally across the river, and positioning a skimmer at the downstream end of the slot to recover the oil (Figure 5). The slot would be cut with chain saws and the ice would be removed by lifting it out of the slot in blocks. In order for this method to work, the bottom surface of the ice must be adequately submerged in the water across the entire width of the stream. Improvised "booms" of planks or plywood could be installed to divert the oil down the slot if the ice was not in contact with the water across the entire stream, or alternatively, some of the ice



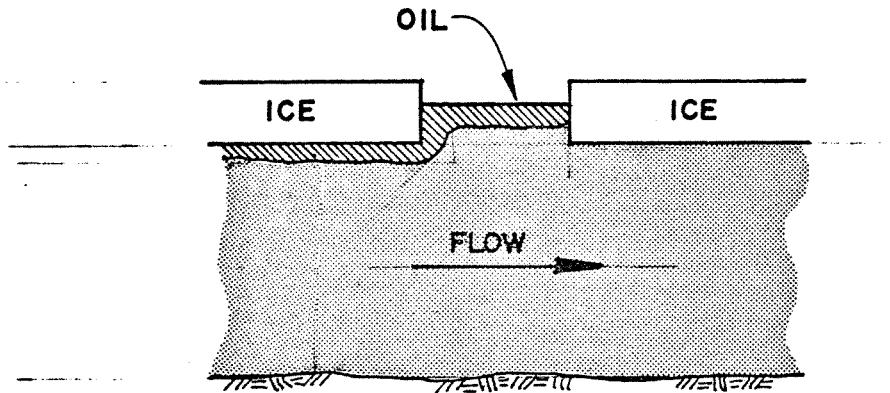
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TYPICAL ARRANGEMENT OF OIL SPILL CONTAINMENT AND RECOVERY EQUIPMENT

FIGURE 4



PLAN



SECTION

ICE SLOT METHOD OF OIL SPILL CONTAINMENT

FIGURE 5

FILE NO 1561 DATE MARCH 1982

blocks cut from the slot could be pushed under the ice sheet on the downstream side of the slot to partially block the flow and thus raise the water level.

All specialized spill control equipment and materials at the minesite will be stored in a bolted steel tank which will be converted to a spill equipment shelter. Booms, sorbents, skimmer, trash pump, accessories and containers will be housed in this water-proof, secure shelter. Protective clothing and other emergency equipment will be located with first aid and mine rescue supplies.

Oil Spills in Other Streams

Oil spills at stream crossings along the winter road in most cases would not pose a major problem because the streams would be either entirely frozen, or at least covered by ice and snow. This would likely prevent most spills from reaching water before they could be recovered by methods used for land spills.

If an oil spill at a stream crossing were to flow into the water through an opening in the ice, containment would require the use of a helicopter or snowmobile to transport men and equipment to suitable locations downstream. Ice slotting and skimming would probably be the most feasible means for recovering the spilled oil. It is likely that assistance from the Hay River Co-op, of which Gulf Canada Limited is a member, would be required to contain and recover such a spill.

A depot of spill control equipment (Blackstone depot) will be located near the Liard River crossing site at the eastern terminus of the winter road. This depot would contain a river boom, a 2-ft. Pedco skimmer, sorbents, a PVC liner, and basic tools such as shovels and rakes. Storage of oil spill control equipment at this location would allow a faster response to oil spills occurring near the eastern end of the winter road. The location of this proposed depot is shown in Figure 6 (in Section 8, Environmental Mapping).

Land-Based Oil Spills

Spills of oil on land should be contained to a minimum area by dyking. Pooled oils could be pumped or bailed into containers. Oily surfaces can be cleaned using sorbents, such as peat moss, Graboil or Conwed, which would "soak up" the oil. Sorbents would require collection and disposal after use. Graboil and Conwed can be reused after squeezing or wringing out the oil, but would eventually require disposal.

Soil or snow impregnated with oil may require excavation and removal if it threatens to enter a stream eventually. Trenches or sumps may be required to collect light oils and gasoline which has infiltrated into the gravel.

In certain instances, in-situ incineration may be the best disposal method. Other disposal options include the burning of waste oil, sorbents and impregnated soil in an incinerator or the burial of waste materials at an approved site. The selection of disposal method and disposal sites would be contingent upon government approval.

Figure 6 also shows the location of a site along the road which can be used as a temporary containment basin for recovered oil, toxic material or contaminated soil or water. Other suitable depressions in the ground surface which could be used as temporary containment basins may be identified when the need arises. At those containment areas situated completely in clay or rock, no site preparation will be necessary. All other containment areas will be lined with PVC sheeting before the deposition of any material is initiated. One PVC liner will be stored at the minesite and another will be stored at the Blackstone depot.

7. TAILINGS SPILL RESPONSE

If leakage of water from the tailings pond ever occurred, indications of small amounts of tailings pond water seeping through the tailings pond embankment would probably be detected through the observation of water levels in the piezometers installed in the embankment. If a leak was confirmed, the water in the nearest piezometers would have to be sampled and analyzed without delay to determine the quality of the leakage water. If the water quality was found to be acceptable, no action beyond routine monitoring of the piezometer levels and water quality would be required. If the water quality was not acceptable, estimates of the seepage would have to be made. Seepage estimates, together with estimates of flows in Prairie Creek, would be used to calculate dilutions available in Prairie Creek and to determine the significance of the leakage in terms of receiving water quality. If it was determined that the waters of Prairie Creek were being impaired with respect to their use by aquatic life, the leak would have to be controlled by the installation of a permanent seal in the dam. A method such as pressure grouting might be employed to achieve the seal.

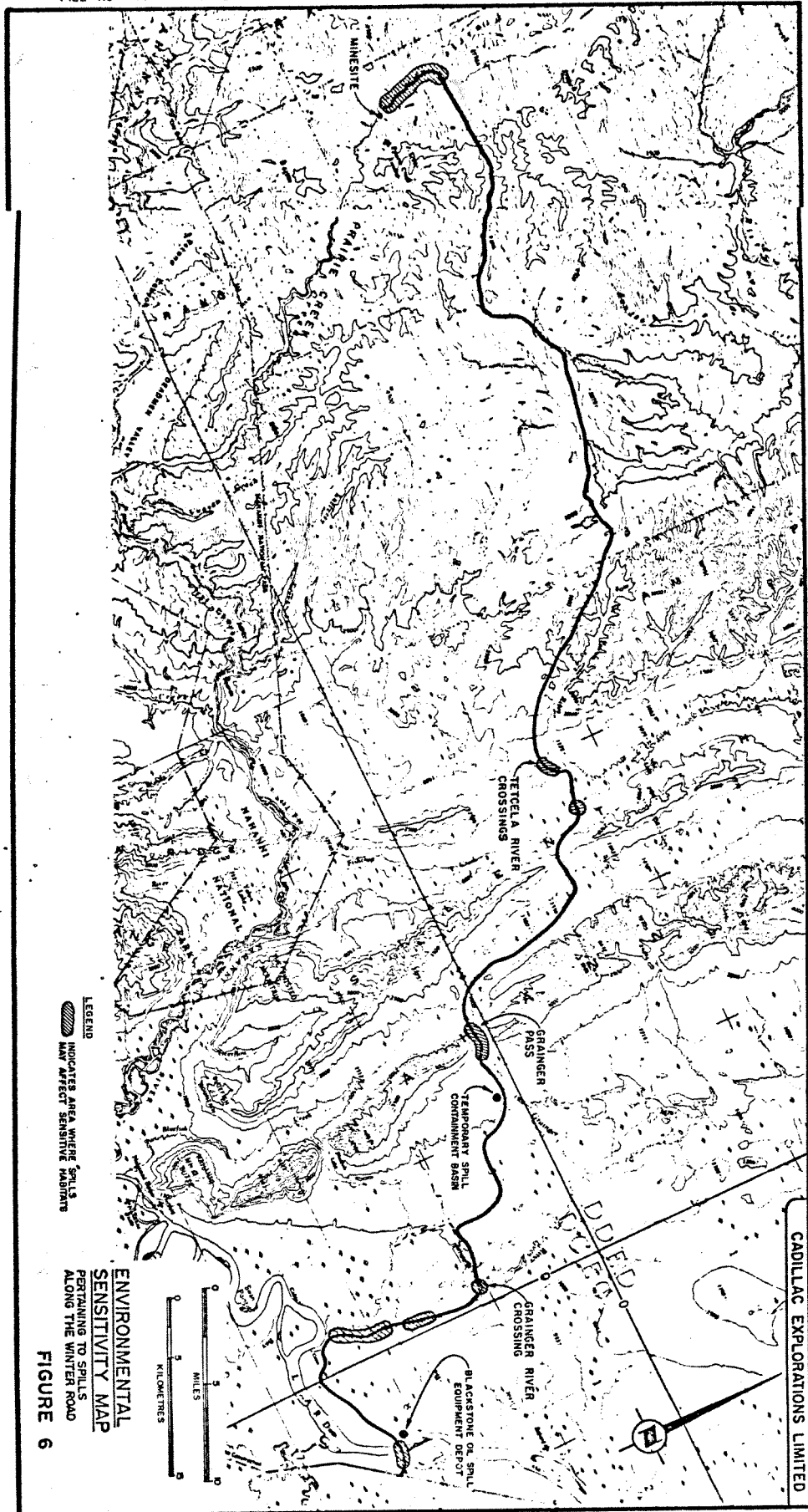
If a leak were to become detectable on the surface of the dam, then the OSC would immediately arrange to have a sump dug on the Prairie Creek side of the dam below the leak, and to have a pump installed to convey the leaked water back into the tailings pond. This would be a temporary arrangement, installed only to provide time for the planning and installation of a permanent seal in the dam.

If a leak or rupture in the tailings pipeline were discovered, the flow of tailings through the pipe would be immediately stopped. A spill of tailings caused by a rupture in the tailings pipeline would be contained, if possible, by dykes which could be quickly built up by heavy machinery on site. If the tailings were to enter the plantsite drainage system before a dyke could be completed,

then the gate valve at the outlet of the plantsite settling pond would be closed and the contents of the pond would be pumped to the tailings pond. This spilled tailings would be recovered using machinery such as loaders and trucks, and would be disposed of in the tailings pond.

8. ENVIRONMENTAL MAPPING

The environmental impact of a spill occurring along the winter road would greatly depend upon its exact location. Along most of the winter road, spills of oil or toxic material would not travel far and would cover a relatively small area. The impact of such spills on wildlife would be insignificant. However, at certain locations along the winter road, such as stream crossings, the potential may exist for a spill to be carried by flowing water and, thus, to become more widespread. It is likely that most animals would avoid the spill area and refrain from drinking water tainted by most of the substances which will be transported along the winter road, however, aquatic organisms would not be able to avoid the toxic effects that might be caused by spills into flowing streams. For these reasons, certain areas along the winter road have been identified as environmentally sensitive. These areas are shown on Figure 6. A spill occurring in any of these areas will demand the greatest urgency and will receive the highest priority for its containment and recovery, so that the environmental impacts are minimized.



ENVIRONMENTAL SENSITIVITY MAP PERTAINING TO SPILLS ALONG THE WINTER ROAD
FIGURE 6

CADILLAC EXPLORATIONS LIMITED



9. RESOURCE INVENTORY

The following equipment, machinery, and tools will be available at the minesite or at the Blackstone depot during normal operations:

<u>Protective Clothing and Equipment</u>	<u>Quantity</u>
emergency suits	20
disposable coveralls	50
face shields	10
goggles	10
chemical resistant gloves (e.g. neoprene)	20 pairs
dust masks	100
chest waders	10 pairs
rubber boots	20 pairs
self-contained breathing apparatus	5 sets
Drager Multi Gas Detector with tubes for HCN, Cl ₂ , SO ₂ and CS ₂ gases	1

<u>Specialized Oil Recovery Equipment</u>	<u>Quantity</u>
Bennett river booms length:	300 ft.
2-ft. mini Pedco skimmers	2
sorbent booms length:	250 ft.
Homelite trash pumps c/w 2" dia. hoses	2
Port-a-Tank containers	1
205-litre steel drums (clean, empty, no leaks)	20
Sorbents: Graboil batts	8 pkgs. (400 batts)
Graboil rolls	1 pkg. (2 rolls)
Hazorb	1 box (120 pillows)
Peat Moss	50 bales
Graboil sorbent wringer	1
20-mil PVC liners	2 (each 60' x 60' approx.)

Heavy Machinery On-Site

- 17 Caterpillar Tractors
- 21 Trucks
- 6 Front-end Loaders
- 2 Graders
- 3 Backhoes
- 3 Cranes

Tools and Miscellaneous Equipment On-Site

- 1 Zodiac inflatable boat with 10 h.p. outboard motor
- 2 snowmobiles
- 1 portable floodlight and generator unit
- 5 portable radios
- 4 chain saws
- 4 ice augers
- 10 axes
- 20 shovels
- 10 rakes
- rope (500')

10. TRAINING AND EXERCISES

The elements of this Contingency Plan must be tested by mock spill exercises, just as fire-fighting capability is tested and improved by fire drills. It is the responsibility of the OSC to stage such mock spill exercises. The purposes of these exercises are:

- to train personnel in the methods of spill control and the use of spill control equipment and materials
- to familiarize personnel with the potential hazards arising from spills of certain materials
- to test the communications systems to be used in a spill
- to test the equipment used for spill control
- to identify potential shortcomings in spill response plans.

The location and material identified for mock spill exercises would be varied to give the response team a broad training for dealing with a wide variety of spill situations.

At least two mock spill exercises will be held in the first year of operation, one for an oil product spill and one for a toxic chemical spill. At least one exercise per year will be held thereafter.

Key personnel in the response team will require training in spill control techniques. The On-Scene Co-ordinator and the Response Team Leader will be trained, either on-site or outside, to use equipment, such as booms and skimmers, for oil spill control, and to apply proper methods for containment and recovery of hazardous chemical spills.

One source for training course information is the petroleum Industry Training Service (PITS). This organization provides training of up-to-date methods for oil spill control, and has considerable expertise in spill control in rivers. A contact for information on the PITS training programme is:

Mr. Wayne Wetmore
Petroleum Industry Training Services
Calgary, Alberta

Telephone: (Area Code 403) - 230-4501.

11. SUPPORTING DOCUMENTS

1. Beak Consultants Limited, 1981. Prairie Creek Project - Fall Fisheries Study, 1981. Prepared for Cadillac Explorations Limited, Calgary, Alberta.
2. Beak Consultants Limited, 1981. Prairie Creek Project - Fisheries and Invertebrate Studies, 1981. Prepared for Cadillac Explorations Limited, Calgary, Alberta.
3. Beak Consultants Limited, 1981. Prairie Creek Project - Vegetation and Wildlife Studies, January to July, 1981. Prepared for Cadillac Explorations Limited, Calgary, Alberta.
4. Beak Consultants Limited, 1982. Summary Document - Prairie Creek Project - Water Quality and Aquatic Biology. Prepared for Cadillac Explorations Limited, Calgary, Alberta.
5. Department of Indian Affairs and Northern Development (DIAND), 1975. Northwest Territories Water Board, Cadillac Explorations Limited, Prairie Creek Operation, Potential Mine Water Quality Survey Network.
6. Ker, Priestman & Associates Ltd., 1980. Environmental Evaluation for Cadillac Explorations Limited; Prairie Creek Project, N. W. T.
7. Ker, Priestman & Associates Ltd., 1980. Preliminary Environmental Evaluation for Mine, Mill and Camp; Prepared for Cadillac Explorations Limited, Prairie Creek Project, N. W. T.
8. Ker, Priestman & Associates Ltd., 1980. Preliminary Environmental Evaluation for Winter Access Road; Prepared for Cadillac Explorations Limited, Prairie Creek Project, N. W. T.

APPENDIX 1

RELEVANT LEGISLATION

APPENDIX 1

RELEVANT LEGISLATION

Under the Northern Inland Waters Act, the N. W. T. Water Board issues Licences for Water Use and waste disposal which require preparation of the Spill Contingency Plan. There are, however, a number of other items of Federal and Territorial Legislation relevant to oil and toxic material spill prevention in the N. W. T. These include:

<u>Legislation</u>	<u>Administering Agency</u>
Northern Inland Waters Act	Department of Indian and Northern Affairs
Arctic Waters Pollution Prevention Act	Department of Indian and Northern Affairs
Territorial Lands Act	Department of Indian and Northern Affairs
Fisheries Act	Department of Environment
Environment Contaminants Act	Department of Environment
Migratory Birds Convention Act	Department of Environment
Ocean Dumping Control Act	Department of Environment
Navigable Waters Protection Act	Department of Transport
Transportation of Dangerous Goods Act	Department of Transport
Canada Shipping Act	Department of Transport
Public Health Ordinance	Government of the Northwest Territories
Petroleum Products Ordinance	Government of the Northwest Territories
Environmental Protection Ordinance	Government of the Northwest Territories
Pesticide Ordinance	Government of the Northwest Territories

Most of this legislation is oriented towards the maintenance of water quality by preventing the deposit of waste. Some of this legislation, however, provide penalties for failure to report spills and failure to comply with regulations for storage of petroleum products, etc. Supervisory personnel at an industrial operation should be acutely familiar with these pieces of legislation.

APPENDIX 2

HAZARDOUS MATERIAL INFORMATION

APPENDIX 2

HAZARDOUS MATERIAL INFORMATION

Table of Contents

Sodium Cyanide
Calcium Hypochlorite
Copper Sulphate
Gasoline
Diesel Fuel
Typical Lubricating Oil
Sodium Isopropyl Xanthate
ANFO Explosives
Calcium Hydroxide (Hydrated Lime)
Ethylene Glycol (Antifreeze)
Methyl Isobutyl Carbinol (MIBC)
Dowfroth 1012

SODIUM CYANIDE



Sodium Cyanide

Chemical Safety Data Sheet

Section I. Identification of Product	
Trade Name and Synonyms Sodium Cyanide (98/99%)	Chemical Name and Synonyms Sodium Cyanide
Chemical and Physical State Cyanide; Solid	Molecular Formula NaCN

Emergency Tel. No. Montreal, Que. (514) 861-1211
Toronto, Ont. (416) 226-6117

Section II. Physical Properties	
Appearance and Odour White crystalline deliquescent solid (pillow-shaped pieces and granules) with the distinctive odour of hydrocyanic acid.	
Boiling Point (°C) (approx) 1500 (2732°F)	Melting Point (°C) — Freezing Point (°C) (approx) 560 (1040°F)
Vapour Pressure (mm Hg) 1 at 817°C (1503°F)	Specific Gravity (Water = 1 at 4°C) 1.60 - 1.62 (for solid)
Bulk Density not available	Vapour Density (Air = 1) N/A
Solubility in water 34% by wt. at 15°C (59°F)	Other Solvents slightly soluble in alcohol

Section III. Fire and Explosion Hazard Data	
Flash Point (°C) Method none	Autoignition Temperature (°C) none
Flammable Limits (% by Vol. in Air)	Lower Upper none
Would any material saturated with this product be subject to spontaneous combustion? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Materials:
Fire Extinguishing Data	Water spray. Use agent suitable for surrounding fire.
Special Fire Fighting Procedures	Water may be used to fight a fire in an area containing sodium cyanide. Cool all affected containers with large quantities of water. Wear complete protective clothing, eye protection and self-contained breathing apparatus.
Unusual Fire and Explosion Hazards	Strong reducing agent. Incombustible by itself, but contact with moisture or acid liberates highly toxic and very flammable hydrogen cyanide gas. Carbon dioxide type extinguishers should not be used to combat fires involving sodium cyanide solutions because of the possible formation of toxic hydrocyanic acid gas.

Section IV. ○ Reactivity Data			
Stability	Unstable		Conditions to Avoid Contact with moist air and acids.
	Stable	X	
Incompatibility (Materials to Avoid) Acid, acid fumes and moisture. Reacts violently with nitrates and other oxidizing agents.			
Hazardous Decomposition Products Hydrogen cyanide or hydrocyanic acid gas.			
Hazardous Polymerization	May Occur		Conditions to Avoid ----
	Will Not Occur	X	

Section V. ○ Health Hazard Data	
Threshold Limit Value (TLV - TWA) (as CN) skin: 5 mg/m ³ (as HCN) skin: 10 ppm 11 mg/m ³	LC ₅₀ N.A. LD ₅₀ oral-rat: 6440 ug/kg
Effects of Overexposure when inhaled — Weakness, headache, dizziness, profuse breathing, nausea, and vomiting. This may be followed by weak and irregular heartbeat, unconsciousness, convulsions, coma and death. Violent poison.	
In contact with eyes — Severe irritation caused by corrosive nature of sodium cyanide. May result in loss of sight.	
In contact with skin — Severe irritation. May produce ulcers which are slow in healing. If NaCN is absorbed through the skin in sufficient quantity to produce acute poisoning, the symptoms would be similar to those described under inhaled.	
Ingested — Poison. May be fatal if swallowed. Symptoms would be like those described under inhaled.	
Emergency and First Aid Procedures: Inhalation — Remove to fresh air. Break capsule of amyl nitrite in a handkerchief or cloth and allow patient to inhale the vapour by nose for 15 - 20 seconds at a time. Repeat every 5 minutes for 25 minutes using a new ampoule on each occasion. If not breathing, give artificial respiration. Give oxygen by qualified personnel if breathing is difficult. Get medical help immediately.	
Eyes — Hold eyelids open and flush with clean water for at least 15 minutes. Use eye irrigation fountain if available. Get medical help promptly.	
Skin — Remove contaminated clothing immediately and flush with large quantities of soap and water. No ointments or salves should be applied for 24 hours. Get medical help promptly.	
Ingestion — Get medical help immediately. Keep patient warm and quiet. Give one full glass of cyanide antidote. *Refer to reverse side of last page for antidote and dose.	

Section VI. ○ Special Protection Information	
Ventilation Requirements Mechanical ventilation.	
Respiratory Protection Canister-type respirators approved by the U.S. Bureau of Mines fitted with the proper canister for absorbing hydrogen cyanide vapours when concentrations are known to be very low (<1%). Self-contained breathing apparatus must be worn when conc. are high or unknown.	
Protective Gloves Rubber or neoprene	Eye Protection Tight-fitting chemical goggles
Other Protective Equipment Rubber boots and rubber suits depending on exposure. Safety showers and eye wash fountains should be installed in storage and handling areas.	

Section VII. • Special Requirements

Precautions in Handling and Storing Store in air tight containers in a cool, dry, well-ventilated location away from acids and oxidizing materials. Protect against physical damage. Wear proper protective clothing when handling.

Other Precautions Persons handling cyanide must wash thoroughly before eating. Food must not be eaten in a building where cyanide is used. Workers handling cyanide should be instructed in the use of the antidote and in artificial respiration.

Section VIII. • Spill or Leak Procedures

Steps to be taken in event of Spill or Release Do not allow chemical to enter sewers or waterways. Collect spilled material for later disposal. Final decontamination should be effected by washing entire area thoroughly with sodium hypochlorite solution. If spill is in a water course, dam off.

Environmental Effects Harmful to aquatic life in very low concentrations. Prevent entry into potable water intakes, waterways and watercourses. Notify nearest pollution control authority promptly.

Neutralizing Chemicals Sodium hypochlorite, calcium hypochlorite, chlorine.

Waste Disposal Waste sodium cyanide must not be discharged into sewers or streams. It must also not be mixed with acid wastes since reaction with the acid present could result in the liberation of toxic hydrocyanic acid gas. Waste sodium cyanide should be neutralized using sodium hypochlorite commercial strength to which caustic soda (liquid or dry) has been added to make the solution more alkaline (pH of 8.5-10). Dilute the sodium hypochlorite solution with equal parts of water. Solid cyanide should be dissolved in water before treatment with neutralizing chemicals. The presence of a chlorine residual will indicate the neutralization of the waste sodium cyanide.

Section IX. • References

1. CIL Technical Manual Data Sheet "Sodium Cyanide."
2. MCA SD-30
3. Sax N.I. Dangerous Properties of Industrial Materials, 4th ed. 1975
4. National Fire Protection Association Hazardous Chemicals Data 1973
5. The International Technical Information Institute, "Toxic and Hazardous Industrial Chemicals Safety Manual 1975"
6. The Merck Index 9th ed. 1976
7. American Conference of Governmental Industrial Hygienists 1978.

This product information is believed to be accurate but by its issuance Canadian Industries Limited assumes no responsibility nor does it guarantee any results. Before any product is used, the label should be carefully read.



**Canadian Industries Limited
Chemicals**

*CYANIDE ANTIDOTE:

Keep the following solutions, obtainable from any pharmacist, ready for use:

- A. 158 grams B.P. ferrous sulphate crystals ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$) and 3 grams of B.P. citric acid dissolved in 1 liter of cold water.
- B. 60 grams anhydrous sodium carbonate (Na_2CO_3) dissolved in 1 liter of distilled water.

DOSE: Mix equal quantities of A and B to make approximately 250 ml (8 oz) glassful and swallow the mixture. The above solutions will keep indefinitely provided the ferrous sulphate is stored away from direct sunlight.

CALCIUM HYPOCHLORITE

124 Calcium hypochlorite Ca(OCl)₂

Synonym:	Calcium oxychloride (Improperly called).
Uses:	Bleaching agent, oxidizing agent.
Properties:	Mol wt 142.99; sp gr 2.35. White crystals; decomposes at 100°C; decomposed by water and alcohol; not hygroscopic; strong oxidizer.
Hazardous Potentials:	
A) Flammability:	May cause ignition in contact with organic materials or with acids.
B) Toxicity:	Symptoms: Irritation of eyes, skin and mucous membranes.
Handling & Storage:	Protect against physical damage. Store in a cool, well-ventilated place. Storage of extended time especially during hot summer should be avoided. When containers are exposed to fire, and especially in case of high chlorine content, containers may burst. Wear safety glasses and respirator.
Emergency Treatment and Measures:	
Fire Precautions	Use water for extinguishing fires.
(In case of outbreaks):	
Spills and Leakage:	Cover with weak reducing agents such as hypo, bisulfites or ferrous salts. Bisulfites or ferrous salts need additional promoter of some 3M-H ₂ SO ₄ for rapid reaction. Transfer the slurry (or sludge) into a large container of water and neutralize with soda ash. Drain into the sewer with abundant water.
Disposal and Waste Treatment:	Use vast volume of concentrated solution of reducing agent (bisulfites or ferrous salts with 3M-H ₂ SO ₄ or hypo). Neutralize with soda ash or dilute HCl. Drain into the sewer with abundant water.

COPPER SULPHATE



Product Name **COPPER SULPHATE**

Material Safety Data Sheet

I Product Identification

Manufacturer's Name **Cominco Ltd.** Telephone (Emergency only) **(604) 364-4214**
 Address **Kimberley, B.C.**
 Trade Name and Synonyms **Copper Sulphate, Blue Vitriol**
 Chemical Name and Synonyms **Blue Stone, Roman Vitriol**

II Hazardous Ingredients

Ingredients	%	TLV (units)
Cu SO₄ · 5H₂O		
Industrial Crystals (100% + 8 mesh)		
copper cu	25	
copper dusts		1.0 mg/m³

III Physical Data

Blue crystals, turn white when heated excessively.

Appearance and Odor		
Specific Gravity (H ₂ O = 1)	2.28	Vapour Pressure
Vapour Density (Air = 1)		Solubility in H ₂ O, % by wt.
% Volatiles by Vol.		Evaporation Rate (Butyl Acetate = 1)
Boiling Point 760 mm Hg		Melting Point

IV Fire and Explosion Data

Flash Point (Test Method)	NA	Autoignition Temperature	NA
Flammable Limits in Air, % by Vol.	Lower	Upper	
Extinguishing Media	<input type="checkbox"/> water fog <input type="checkbox"/> foam <input type="checkbox"/> CO ₂ <input type="checkbox"/> dry chemical other—specify		
Special fire fighting procedures	does not burn		
Unusual fire and explosion hazard	none		

Please complete other side



Product Name **COPPER SULPHATE**

Material Safety Data Sheet

VII Spill or Leak Procedures

Steps to be taken if material is released or spilled

Contain the spill. Gather in containers. **DO NOT** release into water courses. For large spills phone Waste Control without delay (604) 364 - 4182 or 364 - 4318. Failing to reach them phone Emergency Centre (604) 364 - 4214.

Neutralizing Chemicals

Waste Disposal Method

Return to supplier or deliver to consignee. Do not release to sewers. **KEEP OUT OF WATERWAYS.** Disposal must conform to municipal, provincial and federal regulations.

VIII Special Protection Information

Ventilation Requirements

Local Exhaust required where dust occurs	Special
Mechanical (general)	Other

Specific Personal Protective Equipment

Respiratory (specific) Approved NIOSH dust respirator

Eye not normally necessary Safety glasses Chemical Workers Goggles Gas Tight Goggles or equivalent Face shield

Gloves rubber or neoprene

Other Clothing and Equipment

IX Special Precautions

Precautionary Statements

Other Handling and Storage Requirements

Storage in a dry place. Can corrode mild steel.

Reverse side may be used for additional information

Prepared by: **W.F. Hastings**

Address: **Cominco Ltd. Trail, BC.**

Date: **July 19, 1978**

Health Hazard Information Used in trace amounts as a food supplement. For larger concentration it can serve as a fungicide, insectide and germicide.

General Hazard Data

Copper compounds are toxic

Routes of exposure

Inhalation

Avoid inhaling the dust or fumes

Skin Contact

mild irritant

Skin Absorption

Eye Contact

mild irritant

Ingestion

of a large quantity causes nausea, vomiting, gastric pain. Wash hands before smoking or eating.

Effects of Overexposure

Acute Overexposure

dizziness, exhaustion, anemia, cramps, convulsions.

Chronic Overexposure

symptoms attributed to damage of the nervous system and kidneys have been recorded

Emergency and First Aid Procedures

Eyes:

Flush thoroughly for 15 minutes

Skin:

Wash with soap and water

Inhalation:

Remove to fresh air

Aspiration:

Get Medical Aid.

Notes to Physician

Reactivity Data

Stability

Unstable

Conditions to Avoid

Stable

X

Incompatibility

water

acid

base

corrosive

oxidizing material

reducing material

other—specify

Hazardous Decomposition Products

When heated it gives off water of hydration, resulting in a white powder which could cause dusting.

Thermal Polymerization

May Occur

Conditions to Avoid

Will Not Occur

X

GASOLINE



PRODUCT TOXICOLOGY AND CHARACTERISTICS

GULF CANADA LIMITED

DATE May 1979

MATERIAL SAFETY DATA SHEET NO. 020-001

MANUAL SECTION D1

SECTION 1 - PRODUCT INFORMATION	
1. PRODUCT NAME GULF REGULAR LEADED GASOLINE	SUPPLIED BY: GULF CANADA LIMITED, 800 BAY STREET, TORONTO, ONTARIO M5W 1E5 TELEPHONE: (416) 924-4141
2. PRODUCT TYPE Fuel	
3. TRADE NAME/SYNONYM Gasoline-Leaded	
4. CHEMICAL: FAMILY/NAME/FORMULA Hydrocarbons	
5. COMPOSITION Complex mixture of aliphatic and aromatic hydrocarbons in the range of C ₄ to C ₁₂ . May contain up to 4 volume % of benzene. Lead content does not exceed 0.77 g/L.	

SECTION 2 - HAZARDOUS INGREDIENTS			
COMPONENT	%	HAZARD	EXPOSURE STANDARD*
1. Gasoline Gasoline vapors* (See Section 2.2)	100	Flammability Health/Inhalation	--- 200-300 ppm See Section 5.1
Benzene	<4.0	Health/Inhalation	10 ppm
2. *Gasoline vapors as formed when product used without adequate ventilation. Contains small concentration of conventional gasoline additives regarded as non-hazardous in normal usage.			
*STANDARD ONLY FOR COMPONENT LISTED. FULL PRODUCT HEALTH HAZARD DESCRIBED IN SECT. 5.			

SECTION 3 - PHYSICAL DATA			
1. BOILING RANGE °C (°F)	25-220 (75-430) (SV)	6. SPECIFIC GRAVITY 15/15°C	0.8
2. VAPOR PRESSURE (mm Hg)	<555 @ 25°C max (SV)	7. VOLATILE FRACTION VOLUME %	100
3. VAPOR DENSITY (AIR=1)	3.0-4.0	8. EVAPORATION RATE (n-BUTYL ACETATE = 1)	0.7-1.2 (SV)
4. SOLUBILITY IN WATER	Negligible	9. VISCOSITY cS (SUV) 38°C (100°F)	<7.4 (<50)
5. APPEARANCE AND ODOR	Amber liquid, characteristic odor, volatile.		

SECTION 4 - FIRE AND EXPLOSION HAZARD DATA			
1. FLASH POINT °C (°F)	-45 (-50) TCC	2. EXPLOSIVE LIMITS	LEL 1.3 UEL 7.6
3. EXTINGUISHING MEDIA	<input checked="" type="checkbox"/> CARBON DIOXIDE <input checked="" type="checkbox"/> DRY CHEMICAL <input checked="" type="checkbox"/> FOAM <input type="checkbox"/> WATER STREAMS <input checked="" type="checkbox"/> WATER SPRAY (FOG) <input type="checkbox"/> OTHER		
FIRE FIGHTING AS IN B CLASS FIRES.		With caution (disperse vapors)	
4. SPECIAL FIRE FIGHTING PROCEDURES	5. FIRE HAZARD IDENTIFICATION NFPA STD. 704-M		
Shut off fuel source. Use water to cool surface of tanks. Water may spread the fire.		HEALTH <u>1</u> FLAMMABILITY <u>3</u> REACTIVITY <u>0</u>	
6. FIRE AND EXPLOSION HAZARDS Easily ignited by flame or spark, forms explosive mixtures with air.			
7. Autoignition Temp. 255°C Per NFPA Std. 321 Flammable liquid Class IA.			

NA = NOT APPLICABLE EST = ESTIMATED APP. OR = APPROXIMATELY ND = NO DATA AVAILABLE LIT = LITERATURE VALUE
 ** REFERS, WHERE APPLICABLE, TO SOLVENT COMPONENT ONLY. SV=subject to seasonal variation

SECTION 5 - HEALTH HAZARD DATA

1. EXPOSURE STANDARD
 Varies with benzene content. Estimated to be about 200-300 ppm.

2. EFFECTS OF OVEREXPOSURE (A) Vapors affect central nervous system with resulting dizziness, narcosis, cardiac irregularities. (B) Dries and defats skin, dermatitis on continuous exposure. (C) Moderately irritating. (D) Moderately toxic (Gleason, Goselin, Hodge Acute Toxicity Scale). (E) Highly hazardous - irritation of respiratory tract. Chemical pneumonitis is likely to develop.

3. EMERGENCY AND FIRST AID PROCEDURES
 (A) Remove from exposure. Administer artificial respiration or oxygen if necessary.
 (B) Remove contaminated clothing, wash skin with soap and water.
 (C) Flush with copious amounts of water for at least 15 minutes.
 (D&E) Do NOT induce vomiting. Seek medical aid.

4. *ANTIDOTE*

CODE USED ABOVE: (A)-INHALATION (B)-SKIN CONTACT (C)-EYES (D)-INGESTION (E)-ASPIRATION

SECTION 6 - REACTIVITY DATA

1. STABILITY UNSTABLE STABLE CONDITIONS TO AVOID: NA

2. INCOMPATIBILITY
 Strong oxidizing agents may ignite the product.

3. HAZARDOUS DECOMPOSITION PRODUCTS
 NA. On normal combustion: H₂O, CO₂, C and some CO are formed.

4. HAZARDOUS POLYMERIZATION MAY OCCUR WILL NOT OCCUR CONDITIONS TO AVOID: NA

5. CORROSIVITY. MATERIAL IS: ACID BASE NEUTRAL. PH NA

SECTION 7 - SPILL OR LEAK PROCEDURES

1. ELIMINATE SOURCES OF IGNITION STOP/REDUCE FLOW CONTAIN WITH BARRICADES SCRAPE UP/SHOVEL IN DISPOSAL CONTAINERS
 PUMP BACK TO STORAGE EVAPORATE/BURN SMALL AMOUNTS IN HOOD ABSORB/COLLECT RESIDUE OTHER During cleanup avoid ignition and personnel exposure. Notify authorities.

2. DISPOSAL: COLLECT INCINERATE UNDER CONTROLLED CONDITIONS OTHER

3. MUST AVOID Never dispose by means of public sewers and drainage systems.

SECTION 8 - SPECIAL PROTECTION INFORMATION

	DURING TIME OF USE	GAS, VAPOR, MIST > EXP. LMT.	SPECIAL - PROCESS
1. GENERAL VENTILATION	Yes	Yes	---
LOCAL EXHAUST	Adequate	Yes	---
RESPIRATORY PROTECTION	(1)	(3)	---

CODE USED FOR RESPIRATORY PROTECTION: (1) Usually none. (2) Particle-removing air purifying respirator (mechanical filter). (3) Full face mask, supplied air. (4) Other

2. EYE PROTECTION SAFETY GLASSES CHEMICAL GOGGLES FACE SHIELD

3. SKIN PROTECTION - TYPE Gloves, apron
 MATERIAL Butyl or neoprene rubber
 CONDITIONS If splashing occurs

4. OTHER PROTECTIVE EQUIPMENT
 Protective garment

SECTION 9 - SPECIAL PRECAUTIONS

1. HANDLING AND STORAGE PRECAUTIONS
 Handle as highly flammable and volatile liquid. Avoid static accumulation by grounding and bonding. Store in closed containers away from heat, sparks and open flame.

2. OTHER PRECAUTIONS
 To be used as a fuel only. Avoid prolonged or repeated skin contact. Immediately remove contaminated clothing, launder before reuse. Do NOT siphon by mouth. High aspiration hazard. Use with adequate ventilation. Observe local fire regulations.

NOTICE: The data and information presented herein are based upon tests, research and reports which are considered by us to be reliable and believed to be accurate. The data and information are presented without warranty, guarantee or liability on our part, and are presented to the customer for his own consideration, investigation and verification.

DIESEL FUEL



PRODUCT TOXICOLOGY AND CHARACTERISTICS

GULF CANADA LIMITED

DATE July 1978

MATERIAL SAFETY DATA SHEET NO. 170-040

MANUAL SECTION D1

SECTION 1 - PRODUCT INFORMATION

1. PRODUCT NAME GULF DIESEL 40	SUPPLIED BY: GULF CANADA LIMITED, 800 BAY STREET, TORONTO, ONTARIO M5W 1E5 TELEPHONE: (416) 924-4141
2. PRODUCT TYPE Fuel	
3. TRADE NAME/SYNONYM Distillate Fuel	
4. CHEMICAL: FAMILY/ NAME OF GROUP Hydrocarbons	
5. COMPOSITION Complex mixture of aromatic and aliphatic hydrocarbons in the range of C ₉ to C ₁₈ . Aromatic content of mixture is 20% maximum.	

SECTION 2 - HAZARDOUS INGREDIENTS

COMPONENT	%	HAZARD	EXPOSURE STANDARD*
1. Distillate Fuel Oil Mist Benzene	100 (See Section 2.2) Absent	Flammability Health/Inhalation	--- 5 mg/m ³ See Section 5.1
2. Oil mist in air, induced mechanically or by atomization.			

*STANDARD ONLY FOR COMPONENT LISTED. FULL PRODUCT HEALTH HAZARD DESCRIBED IN SECT. 5.

SECTION 3 - PHYSICAL DATA

1. BOILING RANGE °C (°F)	145-320 (300-610)	6. SPECIFIC GRAVITY 15/15°C	=0.9
2. VAPOR PRESSURE (mm Hg)	<10	7. VOLATILE FRACTION VOLUME %	NA
3. VAPOR DENSITY (AIR=1)	4.5	8. EVAPORATION RATE (n-BUTYL ACETATE = 1)	NA
4. SOLUBILITY IN WATER	Negligible	9. VISCOSITY cS (SUV) 38°C (100°F)	<7.4 (<50)
5. APPEARANCE AND ODOR	Clear, oily liquid, characteristic odor.		

SECTION 4 - FIRE AND EXPLOSION HAZARD DATA

1. FLASH POINT °C (°F)	50 (120) TCC	2. EXPLOSIVE LIMITS	LEL 0.7	UEL 6.0
3. EXTINGUISHING MEDIA	<input checked="" type="checkbox"/> CARBON DIOXIDE <input checked="" type="checkbox"/> DRY CHEMICAL <input checked="" type="checkbox"/> FOAM <input type="checkbox"/> WATER STREAMS <input checked="" type="checkbox"/> WATER SPRAY (FOG) With caution <input type="checkbox"/> OTHER			
FIRE FIGHTING AS IN <u>B</u> CLASS FIRES.				
4. SPECIAL FIRE FIGHTING PROCEDURES	5. FIRE HAZARD IDENTIFICATION NFPA STD. 704-M			
Shut off fuel source. Use water to cool surface of tanks. Water may spread the fire.		HEALTH <u>0</u> FLAMMABILITY <u>2</u> REACTIVITY <u>0</u>		
6. FIRE AND EXPLOSION HAZARDS	NA			
7. Autoignition Temp.	245°C			

NA = NOT APPLICABLE EST = ESTIMATED APP. OR = APPROXIMATELY ND = NO DATA AVAILABLE LIT = LITERATURE VALUE
 ** REFERS, WHERE APPLICABLE, TO SOLVENT COMPONENT ONLY.

SECTION 5 - HEALTH HAZARD DATA

1. EXPOSURE STANDARD
For mist particulate - 5 mg/m³
2. EFFECTS OF OVEREXPOSURE
(A) NA (B) Minimal irritation. (C) Minimal irritation.
(D) Slightly toxic (Gleason, Gosselin, Hodge Toxicity Scale), gastrointestinal tract irritation. (E) Highly hazardous - irritation of respiratory tract. Chemical pneumonitis is likely to develop.
3. EMERGENCY AND FIRST AID PROCEDURES
(A) Remove from exposure. Administer artificial respiration or oxygen if necessary.
(B) Remove contaminated clothing, wash skin thoroughly.
(C) Wash with copious amounts of water for at least 15 minutes.
(D) Do NOT induce vomiting. See Section 5.4. Seek medical aid. (E) Seek medical aid.
4. *ANTIDOTE* Administer 2-4 oz. vegetable oil and 1-2 oz. activated charcoal.
CODE USED ABOVE: (A)-INHALATION (B)-SKIN CONTACT (C)-EYES (D)-INGESTION (E)-ASPIRATION

SECTION 6 - REACTIVITY DATA

1. STABILITY UNSTABLE STABLE CONDITIONS TO AVOID: NA
2. INCOMPATIBILITY
Strong oxidizing agents may ignite the product.
3. HAZARDOUS DECOMPOSITION PRODUCTS
NA. On normal combustion: H₂O, CO₂, C and some SO₂ and CO are formed.
4. HAZARDOUS POLYMERIZATION MAY OCCUR WILL NOT OCCUR CONDITIONS TO AVOID: NA
5. CORROSIVITY. MATERIAL IS: ACID BASE NEUTRAL. PH NA

SECTION 7 - SPILL OR LEAK PROCEDURES

1. ELIMINATE SOURCES OF IGNITION STOP/REDUCE FLOW CONTAIN WITH BARRICADES SCRAPE UP/SHOVEL IN DISPOSAL CONTAINERS
 PUMP BACK TO STORAGE EVAPORATE/BURN SMALL AMOUNTS IN HOOD ABSORB/COLLECT RESIDUE OTHER Notify authorities
2. DISPOSAL: COLLECT INCINERATE UNDER CONTROLLED CONDITIONS OTHER
3. MUST AVOID Never dispose by means of public sewers and drainage systems.

SECTION 8 - SPECIAL PROTECTION INFORMATION

	DURING TIME OF USE	GAS, VAPOR, MIST > EXP. LMT.	SPECIAL - PROCESS
1. GENERAL VENTILATION	NA	Yes	---
LOCAL EXHAUST	NA	Yes	---
RESPIRATORY PROTECTION	(1)	(3)	---

CODE USED FOR RESPIRATORY PROTECTION: (1) Usually none. (2) Particle-removing air purifying respirator (mechanical filter).
(3) Full face mask, supplied air. (4) Other

2. EYE PROTECTION SAFETY GLASSES CHEMICAL GOGGLES FACE SHIELD

3. SKIN PROTECTION - TYPE Gloves, apron
MATERIAL Butyl or neoprene rubber
CONDITIONS If splashing occurs

4. OTHER PROTECTIVE EQUIPMENT
Protective garment

SECTION 9 - SPECIAL PRECAUTIONS

1. HANDLING AND STORAGE PRECAUTIONS
Handle as flammable liquid. Ground and bond to prevent static accumulation. Store in closed containers away from heat, sparks and open flame. Observe pertinent fire regulations.
2. OTHER PRECAUTIONS
Avoid oil mist inhalation and prolonged or repeated skin contact. Immediately remove contaminated clothing, launder and dry before reuse. Do NOT siphon by mouth - high aspiration hazard.

NOTICE: The data and information presented herein are based upon tests, research and reports which are considered by us to be reliable and believed to be accurate. The data and information are presented without warranty, guarantee or liability on our part, and are presented to the customer for his own consideration, investigation and verification.

LUBRICATING OIL



PRODUCT TOXICOLOGY AND CHARACTERISTICS



DATE August 1978

MATERIAL SAFETY DATA SHEET NO. 490-063

MANUAL SECTION D2

SECTION 1 - PRODUCT INFORMATION	
1. PRODUCT NAME GULF ARDEE 10	SUPPLIED BY: GULF CANADA LIMITED, 800 BAY STREET, TORONTO, ONTARIO M5W 1E5 TELEPHONE: (416) 924-4141
2. PRODUCT TYPE Lubricating Oil	
3. TRADE NAME/SYNONYM NA	
4. CHEMICAL: FAMILY/NAME/FORMULA Hydrocarbons, mixture of	
5. COMPOSITION Formulated from refined, hydrotreated hydrocarbon base stocks and conventional industrial oil additives.	

SECTION 2 - HAZARDOUS INGREDIENTS			
COMPONENT	%	HAZARD	EXPOSURE STANDARD*
1. Oil mist (See Section 2.2)	-	Health/Inhalation	5 mg/m ³ (Oil mist particulate) See Section 5.1
2. Oil mist in air, induced mechanically or by atomization. Additive component is regarded as non-hazardous in normal usage.			
*STANDARD ONLY FOR COMPONENT LISTED. FULL PRODUCT HEALTH HAZARD DESCRIBED IN SECT. 5.			

SECTION 3 - PHYSICAL DATA			
1. BOILING Pt. °C (°F)	338 (640) (IBP)	6. SPECIFIC GRAVITY 15/15°C	0.88
2. VAPOR PRESSURE (mm Hg)	NA	7. VOLATILE FRACTION VOLUME %	0
3. VAPOR DENSITY (AIR=1)	NA	8. EVAPORATION RATE (n-BUTYL ACETATE = 1)	NA
4. SOLUBILITY IN WATER	Nil	9. VISCOSITY cS (SUV) 38°C (100°F)	32 (148)
5. APPEARANCE AND ODOR	Dark, with characteristic odor.		

SECTION 4 - FIRE AND EXPLOSION HAZARD DATA			
1. FLASH POINT °C (°F)	202 (395) COC	2. EXPLOSIVE LIMITS NA	LEL --- UEL ---
3. EXTINGUISHING MEDIA	<input checked="" type="checkbox"/> CARBON DIOXIDE <input checked="" type="checkbox"/> DRY CHEMICAL <input checked="" type="checkbox"/> FOAM <input type="checkbox"/> WATER STREAMS <input checked="" type="checkbox"/> WATER SPRAY (FOG) <input type="checkbox"/> OTHER		
FIRE FIGHTING AS IN B CLASS FIRES.			
4. SPECIAL FIRE FIGHTING PROCEDURES	5. FIRE HAZARD IDENTIFICATION NFPA STD. 704-M		
Solid streams of water are likely to spread the fire.	HEALTH <u>0</u> FLAMMABILITY <u>1</u> REACTIVITY <u>0</u>		
6. FIRE AND EXPLOSION HAZARDS			
NA			
7.			

NA = NOT APPLICABLE EST = ESTIMATED APP. OR = APPROXIMATELY ND = NO DATA AVAILABLE LIT = LITERATURE VALUE
 ** REFERS, WHERE APPLICABLE, TO SOLVENT COMPONENT ONLY.

SECTION 5 - HEALTH HAZARD DATA

1. EXPOSURE STANDARD
For mist particulate - 5 mg/m³

2. EFFECTS OF OVEREXPOSURE
(B&C) Minimally irritating.
(D) Slightly toxic (Gleason, Gosselin and Hodge Acute Toxicity Scale). Minimal gastrointestinal irritation.
(E) Minimally hazardous. Pulmonary irritation - minimal.

3. EMERGENCY AND FIRST AID PROCEDURES
(B) Remove by wiping, followed by washing with soap and water.
(C) Flush with copious amounts of water. Seek medical aid.
(D&E) Do NOT induce vomiting. Seek medical aid.

4. *ANTIDOTE*

CODE USED ABOVE: (A)-INHALATION (B)-SKIN CONTACT (C)-EYES (D)-INGESTION (E)-ASPIRATION

SECTION 6 - REACTIVITY DATA

1. STABILITY UNSTABLE STABLE CONDITIONS TO AVOID: ---

2. INCOMPATIBILITY
Strong oxidizing agents may ignite the product.

3. HAZARDOUS DECOMPOSITION PRODUCTS
None

4. HAZARDOUS POLYMERIZATION MAY OCCUR WILL NOT OCCUR CONDITIONS TO AVOID: ---

5. CORROSIVITY, MATERIAL IS: ACID BASE NEUTRAL, pH NA

SECTION 7 - SPILL OR LEAK PROCEDURES

1. ELIMINATE SOURCES OF IGNITION STOP/REDUCE FLOW CONTAIN WITH BARRICADES SCRAPE UP/SHOVEL IN DISPOSAL CONTAINERS
 PUMP BACK TO STORAGE EVAPORATE/BURN SMALL AMOUNTS IN HOOD ABSORB/COLLECT RESIDUE OTHER

2. DISPOSAL: COLLECT INCINERATE UNDER CONTROLLED CONDITIONS OTHER

3. MUST AVOID Never dispose by means of public sewers and drainage systems.

SECTION 8 - SPECIAL PROTECTION INFORMATION

	DURING TIME OF USE	GAS, VAPOR, MIST > EXP. LMT.	SPECIAL - PROCESS
1. GENERAL VENTILATION	No	Yes	---
LOCAL EXHAUST	No	Yes	---
RESPIRATORY PROTECTION	No	(2)	---

CODE USED FOR RESPIRATORY PROTECTION: (1) Usually none. (2) Particle-removing air purifying respirator (mechanical filter).
(3) Full face mask, supplied air. (4) Other

2. EYE PROTECTION SAFETY GLASSES
None under CHEMICAL GOGGLES
norm. cond. FACE SHIELD

3. SKIN PROTECTION - TYPE Gloves
MATERIAL PVA, neoprene, butyl rubber
CONDITIONS Repeated, prolonged skin contact

4. OTHER PROTECTIVE EQUIPMENT
NA

SECTION 9 - SPECIAL PRECAUTIONS

1. HANDLING AND STORAGE PRECAUTIONS
Is combustible. Open flames and other sources of ignition should be eliminated from storage areas. Observe pertinent local fire regulations.

2. OTHER PRECAUTIONS
Oil mist inhalation and repeated or prolonged skin contact should be avoided. Stained clothing should be removed and laundered before reuse.

NOTICE: The data and information presented herein are based upon tests, research and reports which are considered by us to be reliable and believed to be accurate. The data and information are presented without warranty, guarantee or liability on our part, and are presented to the customer for his own consideration, investigation and verification.

SODIUM ISOPROPYL XANTHATE

MATERIAL SAFETY DATA SHEET

SODIUM ISOPROPYL XANTHATESection 1 - NAME & PRODUCTManufacturer's Name

DOW CHEMICAL OF CANADA, LIMITED

City, Province, Postal Code

SARNIA, ONTARIO N7T 7K7

Emergency Phone No. 24 Hours

519-339-3711

Trade Name

Z* - 11 Flotation agent

Synonyms

Sodium isopropyl xanthate

Section 2 - PHYSICAL DATA

Boiling Point	-	Decomposes
Vapor Pressure (mm Hg at 20°C)	-	Solid
Vapor Density (air = 1)	-	N.A.
Appearance	-	3/8" diameter pellet - white or yellow powder
Solubility in Water	-	Completely soluble
Specific Gravity (H ₂ O = 1)	-	(Density 43)
% Volatile by Volume	-	N.A.

Section 3 - FIRE AND EXPLOSION HAZARD DATA

Flash Point (and method used)	-	None
Flammable Limits (STP in air)		
L.F.L.	-	N.A.
U.F.L.	-	N.A.

Extinguishing Media

Water Fog

Dry Chemical

Special Fire Fighting Protection Equipment and Hazards

Gives off sulfur dioxide during combustion.

Section 4 - REACTIVITY DATA

Stability (Normal Conditions)	-	Stable
Conditions to Avoid	-	In the open, store drums on their sides. Excessive trapped moisture may cause ignition on exposure to air.

Incompatibility

Materials to avoid	-	Acid
	-	Oxidizing Material
	-	Copper, zinc, aluminium, and their alloys.

MATERIAL SAFETY DATA SHEET

SODIUM ISOPROPYL XANTHATE

Section 4 - REACTIVITY DATA - Cont'd

Incompatibility

Hazardous Decomposition Products - Carbon disulfide, sulfur dioxide

Section 5 - SPILL OR LEAK PROCEDURES

Steps to be taken in case material is released or spilled - Sweep up immediately.

Disposal Method - Incinerate with caution for sulfur dioxide emission. Wash small quantities of material with generous amounts of water.

Section 6 - HEALTH HAZARD DATA

Ingestion - Low oral toxicity

Eye Contact - Only slightly irritating to the eye

Skin Contact - Likely to produce slight irritation on dry, intact skin. May burn abraded or moist skin on repeated, prolonged contact.

Skin Absorption - Low in toxicity by abrasion.

Inhalation - TLV - None established.

FIRST AID PROCEDURES

EYES - Flush with flowing water at least 15 minutes. If irritation persists after washing, get medical attention.

SKIN - Remove contaminated clothing; thoroughly clean before reuse. Wash skin with soap and water. Any persistent irritation should receive medical attention.

INHALATION - Not likely a problem.

INGESTION - Not likely a problem. If swallowed induce vomiting promptly; get medical help. No specific antidote known.

NEVER GIVE FLUIDS OR INDUCE VOMITING IF PATIENT IS UNCONSCIOUS OR HAVING CONVULSIONS.

Section 7 - SPECIAL PROTECTION INFORMATION

Ventilation -

Respirator protection (Specify type) - None likely to be required. Use dust respirator if conditions require it.

Protective Clothing - Ordinarily only clean clothes are required. Where gross contact is likely, wear suitable clothing such as rubber gloves, aprons, etc.

MATERIAL SAFETY DATA SHEET

SODIUM ISOPROPYL XANTHATE

Section 7 - SPECIAL PROTECTION INFORMATION - Cont'd

Eye Protection - Safety glasses with side shields.

Section 8 - SPECIAL PRECAUTIONS OR OTHER COMMENTS

Precautions to be taken in handling and storing.

Avoid eye and skin contact.

Store in a cool, dry place. Before using obtain complete handling information on solid and solutions from Dow Chemical of Canada, Limited, Research and Development, Sarnia, Ontario N7T 7K7 (519-339-3662)

*Trademark of The Dow Chemical Company

N.A. = Not applicable

ANFO EXPLOSIVES



DU PONT CANADA INC.

MATERIAL SAFETY DATA SHEET

#5

SECTION I PRODUCT IDENTIFICATION

TRADE NAME FR NITRO CARBO NITRATE	C.A.S. NUMBER
SYNONYMS	FORMULA
MANUFACTURER'S NAME Du Pont Canada Inc.	
ADDRESS P.O. Box 660, Station "A", Montreal, Quebec H3C 2V1	TELEPHONE NUMBERS REGULAR (514) 861-3861 EMERGENCY (705) 472-1300

SECTION II HAZARDOUS INGREDIENTS

NAME	%	TLV* (Units)	NAME	%	TLV (Units)
Ammonium Nitrate Prills	94.0				
#2 Fuel Oil	6.0				
Du Pont Red Oil Dye	trace				

SECTION III PHYSICAL DATA

BOILING POINT (°C) N/A	SPECIFIC GRAVITY (H ₂ O = 1) 0.79-0.85
MELTING POINT (°C) N/A	PERCENT VOLATILE BY VOLUME (%) N/A
VAPOR PRESSURE (kPa) N/A	EVAPORATION RATE (_____ = 1) N/A
VAPOR DENSITY (AIR = 1) N/A	SOLUBILITY IN WATER Fairly soluble
APPEARANCE AND ODOR Pink prills, fuel oil odour.	

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) (°C) 60-73.3 for fuel oil #2; 33.0 for Red Oil dye	FLAMMABLE LIMITS Flammable	LEL	UEL
EXTINGUISHING MEDIA Water		AUTOIGNITION TEMPERATURE (°C) 257 for Fuel Oil #2	
SPECIAL FIRE FIGHTING PROCEDURES In small quantities try to extinguish fire with plenty of water. Do not fight fires involving large quantities. Evacuate area promptly.			
UNUSUAL FIRE AND EXPLOSION HAZARDS Will detonate when suitably primed. May detonate in fire, or from severe impact, or from sufficient confinement.			

*TLV = Threshold Limit Value (A.C.G.I.H.)

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NOTICE FROM DU PONT: The information on this Material Safety Data Sheet is provided by Du Pont free of charge. While believed to be reliable it is intended for use by skilled persons at their own risk. Du Pont assumes no responsibility for events resulting or damages incurred from its use. The information on 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.

DATE OF ISSUE:

6/80

SECTION V HEALTH HAZARD DATA

PERMISSIBLE EXPOSURE LEVEL(S)

N/A

ROUTES OF EXPOSURE

Skin contact

EFFECTS OF OVEREXPOSURE

Might cause headache from inhaling large concentration of fuel oil vapour.

EMERGENCY AND FIRST AID PROCEDURES

Skin: Wash with water

SECTION VI REACTIVITY DATA

STABILITY

UNSTABLE

CONDITIONS TO AVOID

Heat and confinement can lead to

STABLE

X

detonation

INCOMPATIBILITY (Materials to avoid)

Can react vigorously with reducing materials.

HAZARDOUS DECOMPOSITION PRODUCTS

Nitric, nitrous oxides; carbon monoxide

HAZARDOUS
POLYMERIZATION

N/A

MAY OCCUR

CONDITIONS TO AVOID

WILL NOT OCCUR

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Clean up with non-sparking tools. Wash area with large amounts of water after consulting local pollution regulations.

NEUTRALIZING CHEMICALS

N/A

WASTE DISPOSAL METHOD

Shoot or burn under knowledgeable supervision.

SECTION VIII SPECIAL PROTECTION INFORMATION

VENTILATION REQUIREMENTS

None required.

PROTECTIVE EQUIPMENT
RESPIRATORY

N/A

EYE AND FACE

N/A

HAND AND ARM

Gloves recommended.

OTHER CLOTHING AND EQUIPMENT

No special equipment needed.

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

Keep cool and unconfined.

OTHER PRECAUTIONS

Refer to CTC & Explosives Act for storage & transportation. Also refer to Transport Canada's publication "Emergency Response Guide for Dangerous Goods".

CALCIUM HYDROXIDE

123 Calcium hydroxide Ca(OH)₂

Synonyms:	Calcium hydrate, slaked lime, lime hydrate.
Uses:	Mortar, cement, gypsum and other construction materials. Lubricants, insecticides, aqueous paints, paper pulp, water treatment agent.
Properties:	Mol wt 74.10; sp gr 2.08 - 2.34; dehydrates at 580°C turning to CaO (slaked lime); soft, white crystalline powder, alkaline with acidic taste. Almost insol in water; sol in glycerine, acid, syrup, ammonium chloride solution. In dissolving in an acid, it generates a great deal of heat. Insol in alcohol. After absorbing carbon dioxide in the air, gradually turns to calcium carbonate.
Hazardous Potentials:	
Toxicity:	There is no especial toxicity though its pulverized dusts irritates skin. TDL: LD ₅₀ owl-rat 7.34 g/kg
Handling & Storage:	Store under tightly capped condition. Wear rubber gloves, large-size face mask, protective clothings.
Spills and Leakage:	Collect and remove with a broom in a large bucket. Dilute with water and neutralize the 6M-HCl. Drain into the sewer with sufficient water.
Disposal and Waste Treatment:	Put into large vessel containing water. Neutralize with HCl. Discharge into the sewer with sufficient water.

From: Toxic and Hazardous Industrial Chemicals Safety Manual,
International Technical Information Institute, Tokyo, 1981.

ETHYLENE GLYCOL (REGULAR)

ETHYLENE GLYCOL (REGULAR)

M A T E R I A L S A F E T Y D A T A S H E E T PAGE: 1
DOW CHEMICAL OF CANADA, LTD. SARNIA, ONT. N7T 7M1 EMERGENCY PHONE: 519-339-3711

EFFECTIVE DATE: 25 JUL 78

PRODUCT CODE: 30478

PRODUCT NAME: ETHYLENE GLYCOL (REGULAR)

MSD: 0597

INGREDIENTS (TYPICAL VALUES-NOT SPECIFICATIONS) : % :
ETHYLENE GLYCOL (ESSENTIALLY) : 100 :

SECTION 1 PHYSICAL DATA

BOILING POINT: 387.1F : SOL. IN WATER: COMPLETELY MISCIBLE
VAP PRESS: 0.12 MMHG @ 25C : SP. GRAVITY: 1.1155 @ 20/20C
VAP DENSITY (AIR=1): VERY LOW : % VOLATILE BY VOL: ESSENTIALLY ZERO
APPEARANCE AND ODOR: COLORLESS LIQUID - PRACTICALLY ODORLESS

SECTION 2 FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: 232F : FLAMMABLE LIMITS (STP IN AIR)
METHOD USED: PENSKY MARTENS C.C. : LFL: 3.2% UFL: NOT DETER.
EXTINGUISHING MEDIA: WATER FOG, ALCOHOL FOAM, CO2, AND DRY CHEMICAL.
SPECIAL FIRE FIGHTING EQUIPMENT AND HAZARDS: NONE

SECTION 3 REACTIVITY DATA

STABILITY: WILL IGNITE IN AIR AT 775F. (413C).
INCOMPATIBILITY: OXIDIZING MATERIAL.
HAZARDOUS DECOMPOSITION PRODUCTS: ----
HAZARDOUS POLYMERIZATION: WILL NOT OCCUR.

SECTION 4 SPILL, LEAK, AND DISPOSAL PROCEDURES

ACTION TO TAKE FOR SPILLS (USE APPROPRIATE SAFETY EQUIPMENT): FLUSH WITH
WATER. SOAK UP WITH ABSORBENT MATERIAL. DIKE TO CONTAIN TO PREVENT
WATER POLLUTION.
DISPOSAL METHOD: SALVAGE, OR BURN AFTER CONSULTING WITH LOCAL
AUTHORITIES. RECOVER WITH VACUUM TRUCK AND RETURN TO PLANT FOR
REPROCESSING.

SECTION 5 HEALTH HAZARD DATA

INGESTION: LOW SINGLE DOSE ORAL FOR ANIMALS; MODERATE FOR HUMANS.
EYE CONTACT: ESSENTIALLY NO IRRITATION.
SKIN CONTACT: ESSENTIALLY NO IRRITATION.
SKIN ABSORPTION: ABSORBED THROUGH SKIN, BUT LOW IN TOXICITY BY THIS

(CONTINUED ON PAGE 2)

(R) INDICATES A REGISTERED OR TRADEMARK NAME OF THE DOW CHEMICAL COMPANY

ETHYLENE GLYCOL (REGULAR)

M A T E R I A L S A F E T Y D A T A S H E E T PAGE: 2
DOW CHEMICAL OF CANADA, LTD. SARNIA, ONT. N7T 7M1 EMERGENCY PHONE: 519-339-3711

EFFECTIVE DATE: 25 JUL 78 PRODUCT CODE: 30478
PRODUCT (CONT'D): ETHYLENE GLYCOL (REGULAR) MSD: 0597

SECTION 5 HEALTH HAZARD DATA (CONTINUED)

SKIN ABSORPTION: (CONTINUED)
ROUTE.

INHALATION: ACGIH TLV: 100 PPM AS A VAPOR; 10 MG/CU METER AS A
PARTICULATE (1977).

EFFECTS OF OVEREXPOSURE: DRUNKENNESS, CENTRAL NERVOUS SYSTEM DEPRESSION,
NARCOSIS.

SECTION 6 FIRST AID--NOTE TO PHYSICIAN

FIRST AID PROCEDURES:

EYES: IRRIGATION OF THE EYE IMMEDIATELY FOR FIVE MINUTES IS GOOD
SAFETY PRACTICE. CONSULT MEDICAL.

SKIN: WASH OFF IN FLOWING WATER. DECONTAMINATE CLOTHING AND ACCES-
SORIES BEFORE REUSE. GOOD PERSONAL HYGIENE.

INHALATION: REMOVE TO FRESH AIR IF EFFECTS OCCUR. CONSULT MEDICAL.

INGESTION: TOXIC BY INGESTION. INDUCE VOMITING IMMEDIATELY. CALL A
PHYSICIAN AND/OR TRANSPORT TO EMERGENCY FACILITY.

NOTE TO PHYSICIAN: STAIN FOR EVIDENCE OF CORNEAL ABRASION OR INJURY.
MAY CAUSE NEUROLOGIC SIGNS AND SYMPTOMS. MAY CAUSE KIDNEY DAMAGE.
MAY CAUSE ELECTROLYTE IMBALANCE. SUGGEST BASELINE CBC, UA, AND 12
TEST. SUGGEST BASELINE ELECTROLYTES. CONSULT STANDARD LITERATURE.
USE OF ALCOHOL MAY BE HELPFUL.

SECTION 7 SPECIAL HANDLING INFORMATION

VENTILATION: RECOMMEND CONTROL OF VAPORS TO SUGGESTED GUIDE.

RESPIRATORY PROTECTION: NONE LIKELY TO BE NEEDED UNLESS MATERIAL IS
HANDLED HOT. FOR SPRAY MISTS - USE AN APPROVED DUST RESPIRATOR.

PROTECTIVE CLOTHING: CLEAN, BODY-COVERING CLOTHING.

EYE PROTECTION: NOT NORMALLY NECESSARY.

SECTION 8 SPECIAL PRECAUTIONS AND ADDITIONAL INFORMATION

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: AVOID INGESTION.

PRACTICE REASONABLE CAUTION AND PERSONAL CLEANLINESS. AVOID SKIN AND
EYE CONTACT.

ADDITIONAL INFORMATION: ----

LAST PAGE

(R) INDICATES A REGISTERED OR TRADEMARK NAME OF THE DOW CHEMICAL COMPANY

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M. I. B. C.



INDUSTRIAL HYGIENE

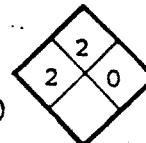
JUN 1 1978

SHELL CANADA LIMITED

MATERIAL SAFETY DATA SHEET

Shell Canada Code 719-300

Hazard Rating (NFPA-704M)



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SECTION I

MANUFACTURERS NAME	SHELL CANADA LIMITED		EMERGENCY TELEPHONE NO.	416-597-7042 (bus. hrs.)	
ADDRESS	P.O. BOX 400, TERMINAL A, TORONTO, ONTARIO, M5W 1E1				
CHEMICAL NAME AND SYNONYMS	Methyl Amyl Alcohol; MIBC	TRADE NAME	Methyl Isobutyl Carbinol		
CHEMICAL FAMILY	Alcohol	FORMULA	CH ₃ CH(OH) CH ₂ CH(CH ₃) ₂		

SECTION II HAZARDOUS INGREDIENTS*

COMPOSITION	%	SPECIES	LD50		LC50	
			ORAL	DERMAL	CONCENTRATION	HOURS
Purity (% wt.)	98.5	Mice	1.5ml /kg		20 mg /l	10 H
		Rat	1410mg/kg			
		Rabbit		3560 mg/kg		
BENZENE CONTENT % wt.	nil					
PAH CONTENT						

REFERENCES

- 1976 NIOSH Registry of the Toxic Effects of Chemical Substances.
- Shell Chemical Co. U.S. Industrial Hygiene Bulletins, SC: 57-110 and 111.
- NFPA Fire Protection Guide on Hazardous Materials, 5th ED., 1973
- ITI Toxic and Hazardous Industrial Chemicals Manual, 1975.

SECTION III PHYSICAL DATA

BOILING POINT °F(°C)	266-271	130-132	SPECIFIC GRAVITY (H ₂ O=1) @60°F (15.6°C)	.807-.809
VAPOR PRESSURE (mmHg) @68°F (20°C)		2.2	PERCENT VOLATILE BY VOLUME (%)	100
VAPOR DENSITY (AIR=1)		3.5	EVAPORATION RATE (nBuAc=1) nBuAc/MIBC	.27
SOLUBILITY IN WATER		Slight	VISCOSITY	
APPEARANCE AND ODOR	Colourless liquid, sharp odour		AUTOIGNITION TEMP °F(°C)	

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED) °F(°C)	102 (39)	Tag Closed Cup	FLAMMABLE LIMITS % VOL. IN AIR	Lel	Uel
EXTINGUISHING MEDIA	Alcohol foam, CO ₂ , dry chemical (preferred)			1.0	5.5
SPECIAL FIRE FIGHTING PROCEDURES	Water may be ineffective except as a fog. Handle as a flammable liquid.				
UNUSUAL FIRE AND EXPLOSION HAZARDS	Vapour forms an explosive mixture between upper and lower flammable limits.				

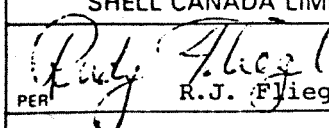
SECTION V HEALTH HAZARD DATA		MIBC
THRESHOLD LIMIT VALUE Current TLV 25ppm (100 mg/m³) (1977, ACGIH)		
EFFECTS OF OVEREXPOSURE (Moderately irritating to skin and eyes. Can cause defatting dermatitis)		
SKIN AND EYES	((skin) and conjunctivitis (eyes).	
INHALATION:	(Anesthesia, headache, nausea, dizziness, Central Nervous System depression, irritation of throat and respiratory passages.	
INGESTION:	Anesthesia, headache, nausea, dizziness, CNS depression.	
CARCINOGENIC HAZARD:		
EMERGENCY AND FIRST AID PROCEDURES		
INHALATION: Remove victim to fresh air and restore breathing if necessary. Seek medical attention.		
SKIN & EYES: Wash contaminated skin with mild soap and water. Flush eyes with water for at least 15 mins. Wash contaminated clothing before reuse.		
INGESTION: DO NOT INDUCE VOMITING. Guard against aspiration into lungs. Seek medical attention.		

SECTION VI REACTIVITY DATA			
STABLE	<input checked="" type="checkbox"/>	UNSTABLE	<input type="checkbox"/>
CONDITIONS TO AVOID Avoid sparks and open flame sources.			
INCOMPATIBLE MATERIALS Avoid contact with strong oxidizing materials.			
HAZARDOUS DECOMPOSITION PRODUCTS CO, CO ₂ produced on combustion.			
HAZARDOUS POLYMERIZATION	YES	NO	<input checked="" type="checkbox"/>
CONDITIONS TO AVOID			

SECTION VII SPILL OR LEAK PROCEDURES	
STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED Avoid sparks and open flame sources. Wear adequate respiratory protection. Flush with water to an open, well ventilated area. Remove to a container.	
WASTE DISPOSAL METHOD Dispose of by controlled burning or reprocessing. MIBC is classed as being practically non-toxic to aquatic life (NIOSH, 1976).	

SECTION VIII SPECIAL PROTECTION INFORMATION	
RESPIRATORY PROTECTION (Specify type) Approved organic canister mask or air pack.	
VENTILATION	LOCAL EXHAUST Must be provided.
	MECHANICAL (General) Electrical and mechanical equipment should be spark proof.
PROTECTIVE GLOVES Impervious rubber gloves	EYE PROTECTION Chemical safety goggles to guard against splashing.
OTHER Overalls, apron	

SECTION IX SPECIAL PRECAUTIONS	
PRECAUTIONS TO BE TAKEN IN HANDLING, STORAGE AND USE: Store in a cool, well ventilated area. Avoid sparks and open flame sources. Avoid excessive heat. Avoid breathing vapours. Avoid contact with skin to prevent defatting action. Use normal, good personal hygiene.	

SHELL CANADA LIMITED	Shell Canada Limited assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally Shell Canada Limited, assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in his use of the material.
 PER R.J. Fiegl	
DATE June, 1978	

DOWFROTH (R) 1012 FLOTATION FROTHER

MATERIAL SAFETY
DATA SHEET

Dow Chemical of Canada Limited, Sarnia, Ontario N7T 7K7

EMERGENCY PHONE NUMBERS: SARNIA (519)339-3711; FORT SASKATCHEWAN (403)998-8282

EFFECTIVE DATE: 12 FEB 79

PRODUCT CODE: 23624

PRODUCT NAME: DOWFROTH (R) 1012 FLOTATION FROTHER

MSD: 0393

INGREDIENTS (TYPICAL VALUES-NOT SPECIFICATIONS)

: % :

POLYPROPYLENE GLYCOL METHYL ETHER

: :

SECTION 1

PHYSICAL DATA

BOILING POINT: 590F : SOL. IN WATER: COMPLETELY MISCIBLE
VAP PRESS: <0.01 MMHG @ 20C : SP. GRAVITY: 0.985 25/25C
VAP DENSITY (AIR=1): ---- : % VOLATILE BY VOL: 100
APPEARANCE AND ODOR: AMBER LIQUID

SECTION 2

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: 310F : FLAMMABLE LIMITS (STP IN AIR)
METHOD USED: PMCC : LFL: NOT DETER. UFL: NOT DETER.
EXTINGUISHING MEDIA: WATER FOG, ALCOHOL FOAM, CO2, DRY CHEMICAL.
SPECIAL FIRE FIGHTING EQUIPMENT AND HAZARDS: ----

SECTION 3

REACTIVITY DATA

STABILITY: AVOID OXIDIZERS
INCOMPATIBILITY: OXIDIZING MATERIAL
HAZARDOUS DECOMPOSITION PRODUCTS: ---
HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

SECTION 4

SPILL, LEAK, AND DISPOSAL PROCEDURES

ACTION TO TAKE FOR SPILLS (USE APPROPRIATE SAFETY EQUIPMENT): DO NOT ALLOW TO
CONTAMINATE GROUND WATER. ABSORB IF POSSIBLE, AVOID IGNITION.
DISPOSAL METHOD: BURN.

SECTION 5

HEALTH HAZARD DATA

INGESTION: LOW SINGLE DOES ORAL TOXICITY; LD50 (RAT) BETWEEN 1260 AND 2520
MG/KG.
EYE CONTACT: MAY CAUSE MODERATE IRRITATION AND SLIGHT TRANSIENT CORNEAL
INJURY.
SKIN CONTACT: SINGLE SHORT EXPOSURE - NO IRRITATION. REPEATED, PROLONGED
EXPOSURE - UP TO POSSIBLE MILD IRRITATION, DEPENDING UPON SEVERITY.
SKIN ABSORPTION: MAY BE ABSORBED IF EXPOSURE IS REPEATED AND PROLONGED.
VERY LOW TOXICITY; LD50 RABBIT GREATER THAN 20,000 MG/KG (SINGLE 24
HR. EXPOSURE).
INHALATION: NO GUIDE FOR CONTROL KNOWN. LOW TOXICITY AND LOW DEGREE OF
VOLAILITY.
EFFECTS OF OVEREXPROSURE: CENTRAL NERVOUS SYSTEM DEPRESSION AT HIGH
LEVELS.

SECTION 6

FIRST AID--NOTE TO PHYSICIAN

FIRST AID PROCEDURES:

EYES: IRRIGATE WITH FLOWING WATER IMMEDIATELY AND CONTINUOUSLY FOR
15 MINUTES. REFER TO MEDICAL PERSONNEL.
SKIN: CONTACT WILL PROBABLY CAUSE NO MORE THAN IRRITATION. WASH OFF
IN FLOWING WATER OR SHOWER. WASH CLOTHING BEFORE REUSE.
INHALATION: REMOVE TO FRESH AIR IF EFFECTS OCCUR. CONSULT MEDICAL.
INGESTION: LOW IN TOXICITY. INDUCE VOMITING IF LARGE AMOUNTS ARE
INGESTED.

MATERIAL SAFETY
DATA SHEET

- Cont'd DOWFROTH (R) 1012 FLOTATION FROTHER

SECTION 6

FIRST AID--NOTE TO PHYSICIAN

NOTE TO PHYSICIAN:

EYES: STAIN FOR EVIDENCE OF CORNEAL ABRASION OR INJURY. IF CORNEA IS BURNED, INSTILL ANTIBIOTIC STEROID PREPARATION FREQUENTLY. CONSULT OPHTHALMOLOGIST.

SKIN: IF BURN IS PRESENT, TREAT AS ANY THERMAL BURN. DECONTAMINATE CLOTHING AND ACCESSORIES BEFORE REUSE.

RESPIRATORY: NO EFFECT EXPECTED.

ORAL: -----

SYSTEMIC: HUMAN EFFECTS NOT ESTABLISHED. NO SPECIFIC ANTIDOTE. TREATMENT BASED ON THE SOUND JUDGMENT OF THE PHYSICIAN AND THE INDIVIDUAL REACTIONS OF THE PATIENT.

SECTION 7

SPECIAL HANDLING INFORMATION

VENTILATION: GOOD ROOM VENTILATION USUALLY ADEQUATE FOR MOST OPERATIONS.
RESPIRATORY PROTECTION: NONE NORMALLY NEEDED. FOR EMERGENCIES, A SELF-CONTAINED BREATHING APPARATUS OR A FULL-FACE RESPIRATOR AS APPROVED BY NIOSH IS RECOMMENDED.

PROTECTIVE CLOTHING: CLEAN, BODY-COVERING CLOTHING.

EYE PROTECTION: CHEMICAL WORKERS GOGGLES.

SECTION 8

SPECIAL PRECAUTIONS AND ADDITIONAL INFORMATION

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: PRACTICE REASONABLE CARE AND CLEANLINESS. AVOID BREATHING VAPOR IF GENERATED.

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